This ordinance becomes effective on: October 14, 2005.

ADOPTED BY THE MAYOR AND COUNCIL

September 13, 2005

ORDINANCE NO. 10197

RELATING TO ZONING: AMENDING ZONING DISTRICT BOUNDARIES IN THE AREA LOCATED ON THE EAST SIDE OF CAMPBELL AVENUE NORTH AND SOUTH OF ALLEN ROAD IN CASE C9-04-23, UMC NORTH PAD – CAMPBELL AVENUE, R-2 and O-3 TO PAD-11; AND SETTING AN EFFECTIVE DATE.

BE IT ORDAINED BY THE MAYOR AND COUNCIL OF THE CITY OF TUCSON, ARIZONA, AS FOLLOWS:

SECTION 1. The zoning district boundaries in the area located on the east side of Campbell Avenue north and south of Allen Road in Case C9-04-23 are hereby amended from R-2 and O-3 TO PAD-11 as shown on the attached map marked Ordinance No. 10197. All development with PAD-11 shall be in substantial compliance with the UMC North PAD adopted by the Mayor and Council September 13, 2005, and attached hereto as Exhibit "A."

SECTION 2. Notwithstanding any provision of the Tucson Code, no grading, grubbing, filling, excavation, construction, or other physical alteration of the site in furtherance of the project contemplated by this ordinance shall occur prior to the effective date of the PAD-11 zoning classification.

SECTION 3. This ordinance becomes effective thirty (30) days after it is adopted by the Mayor and Council and is available from the City Clerk.

SECTION 4. The provisions of this ordinance, including the attached conditions, cannot be given effect individually, and to this end, the provisions of this ordinance and the attached conditions are not severable.

SECTION 5. The various City officers and employees are authorized and directed to perform all acts necessary or desirable to give effect to this ordinance.

PASSED, ADOPTED, AND APPROVED by the Mayor and Council of the City of Tucson, Arizona, September 13, 2005 .

MAYOR

ATTEST:

CITY CLERK

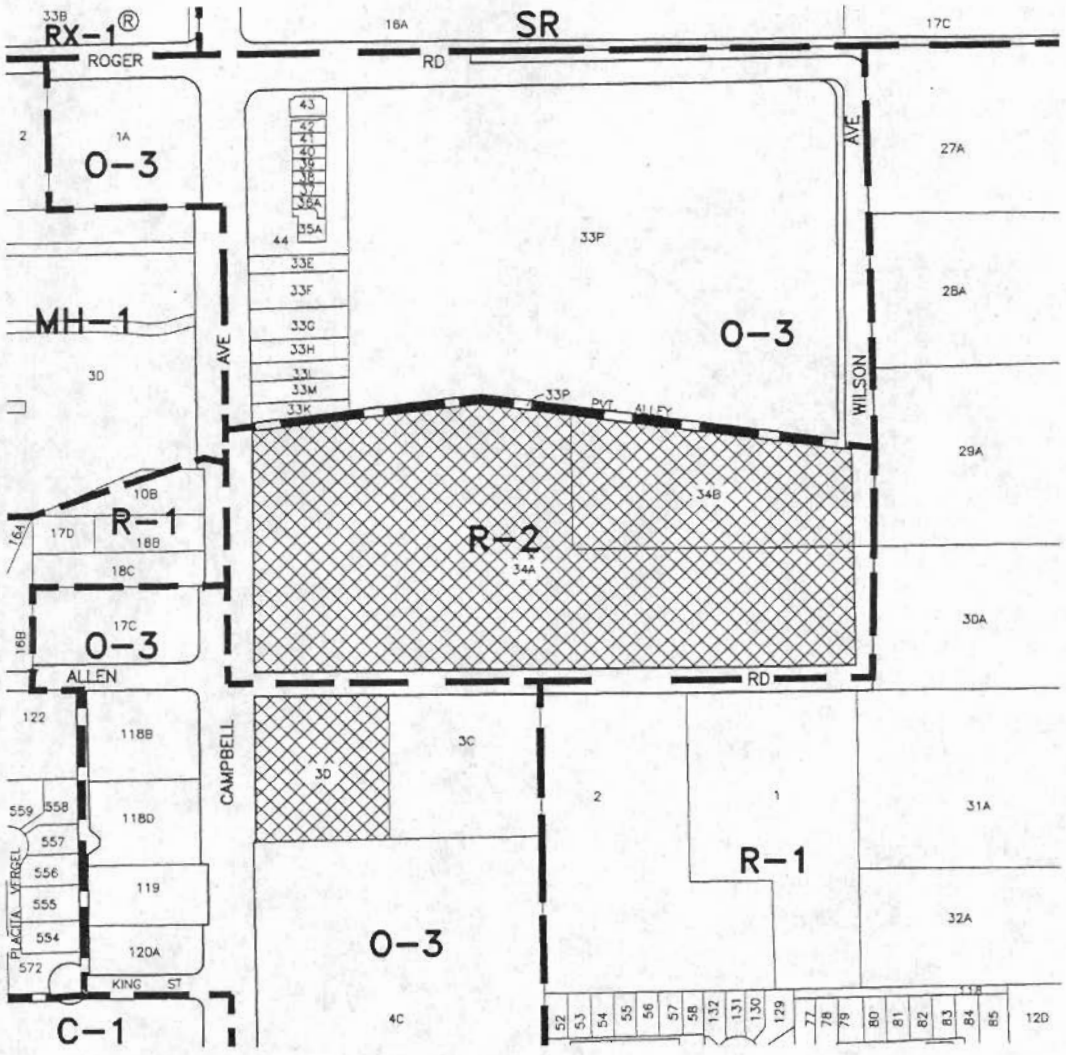
APPROVED AS TO FORM:

CITY ATTORNEY

REVIEWED BY:

CITY MANAGER

mwlm:dc
09/06/2005 10:37 AM



ORDINANCE MAP

AREA OF REZONING REQUEST Which is Zoned R-2 O-3 Will be Re-zoned to PAD-11

N orth
1" equals 400'
0 200 400 ft.

Legal Description A PORTION OF THE NW 1/4 OF SEC 29, T13S, R14E

Development Services Director

BASE MAP

Sec. 29

T. 13 R. 14

CITY OF TUCSON

Drawn by:

Initials HS

Date 8-29-2005

Ordinance Number 10197

Rezoning Case Number C9-04-23

Amendment Number

Adoption Date September 13, 2005

RECEIVED
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Lewis & Roca

UMC NORTH

Medical Park

PLANNED AREA DEVELOPMENT DISTRICT

Adopted: _____, 200__

By Ordinance No. _____

Date: September 13, 2005

City of Tucson

Planned Area Developments were originally adopted as "Specific Plans" pursuant to the Tucson *Zoning Code* and, subsequently, the Tucson *Land Use Code*. The terms "Specific Plan (SP")" and "Specific Planned (SP) Districts" were changed to "Planned Area Development (PAD)" and "Planned Area Development (PAD) Districts" by Ordinance 9374 adopted by Mayor and Council on April 10, 2000. This change in title does not affect the substantive provisions for the districts as adopted.

PLANNED AREA DEVELOPMENT

Prepared For:	City of Tucson Development Services Department Public Works Building 201 North Stone Avenue Tucson, Arizona 85701
Project Applicant:	University Medical Center Corp. 1501 N. Campbell Avenue Tucson, Arizona 85724
Site Planning and Architecture:	Anshen + Allen-LA 5055 Wilshire Blvd Los Angeles, CA 90036 Telephone: (323) 525-0500
Landscape and Engineering:	Tetra Tech, Inc. 33 North Stone Avenue, Suite 1500 Tucson, Arizona 85701 Telephone: (520) 623-7980
Transportation:	Curtis Lueck & Associates 5780 West Camino del Cerro Tucson, Arizona 85745 Telephone: (520) 743-8748
Legal:	Frank S. Bangs, Jr. Keri Lazarus Silvyn Lewis and Roca LLP One South Church Avenue, Suite 700 Tucson, Arizona 85701 Telephone: (520) 629-4405/629-4438

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C. Drainage Concept Report
D. Traffic Impact Analysis
E. Cultural Resources Survey
F. Healing Garden Design Concept

1.0 INTRODUCTION AND POLICY

The University Medical Center (UMC) has purchased and is redeveloping the former Tucson General Hospital site at Campbell Avenue and Allen Road in the City of Tucson (City) as UMC North Medical Park (UMC North). As presently conceived by UMC, the primary focus of UMC North will be to provide outpatient cancer treatment and related medical and residential services. It is UMC's goal to create an environment which is accessible and welcoming to patients, an environment which is itself part of the treatment, not simply its locale.

The former Tucson General Hospital had been developed over the years under a mix of relatively low-density residential and office zoning that then allowed hospitals. Subsequent changes to the City's zoning regulations, codified as the Land Use Code (LUC), made Tucson General a nonconforming use. That status became more problematic by UMC's discovery that few of the Tucson General buildings were currently serviceable under current medical development standards. Consequently, UMC worked with City staff and representatives of surrounding neighborhoods and existing nonresidential uses to identify an appropriate land use regulatory vehicle under which UMC's vision for UMC North could be realized. It soon became apparent that the best option was the City's Planned Area Development District (PAD).

1.1 Conformity with the General Plan and City Land Use Plans. Pursuing a course which would lead to the adoption of a PAD for UMC North, it was determined that an amendment to the City's North Side Area Plan, a component of the City's General Plan, would be required to make the policies of the Area Plan consistent with the proposed PAD. This was accomplished in late 2004 with the adoption of specific "UMC Medical Campus Policies" for the Tucson-Prince, Area 1 of the North Side Area Plan. The proposed UMC North PAD is consistent with those policies.

1.2 Rationale for the Use of PAD Zone. UMC recognizes that UMC North will very likely be developed over a number of years, depending on needs and available funding. Although UMC has committed to the uses it plans to make of the UMC North site, and has developed a broad concept plan for the development of those uses, it does not now know with sufficient certainty how those uses will eventually be realized to select conventional zoning districts which both afford UMC the flexibility it needs and protect neighboring uses from overly intense zoning. The PAD provides the optimum method of bridging the gap between certainty and flexibility.

1.3 Compatibility with Adjoining Uses. The UMC North site has been devoted to medical use for a number of years. Although the site is surrounded by a wide variety of uses – office, multi-family residential, educational and institutional – the medical use has proven to be compatible with them. To insure the continuation of that experience as UMC North is redeveloped, in 2004 UMC initiated a dialogue with neighboring property owners, representative neighborhood associations and the Ward 3 Council Office to inform its neighbors of UMC's plans and solicit their input. This has proven to be a productive process, leading to the successful adoption of the area plan amendment described above, and is continuing in the adoption of this PAD.

1.4 Physical and Economic Suitability/Feasibility. As will be explored in greater detail in the site analysis, the UMC North site is well-supported by existing public and private infrastructure. The site has accommodated relatively intense medical uses in the past, and can continue to do so under UMC's plans for its redevelopment. The redevelopment will provide enhanced medical services to the community and region as well as economic benefits in the form of construction employment and permanent medical staff.

Site Analysis

2.0 SITE ANALYSIS OF THE UMC NORTH MEDICAL PARK PLANNED AREA DEVELOPMENT

2.1 Introduction. The following site analysis and supporting studies contained in the Appendices address the relevant topics listed in LUC Section 2.6.3.6.B, "Site Analysis."

2.2 Topography. Topography in this area slopes gently from the southeast to the north, northwest and northeast. The site has a 4-foot change in elevation from the southeast to the northeast; however, there is a 6 to 7 foot elevation drop at the northwest corner of the site to the existing apartment complex located to the north. The current existing conditions are shown in the "Record of Survey with Topography," Figure 2.

2.3 Drainage. UMC North is located approximately 1,500 feet south of the Rillito River, between Campbell Avenue and Wilson Avenue. See attached aerial photograph, Figure 3. The general direction of surface drainage in this area is from the south to the north, towards the Rillito River. Stormwater runoff generally flows through the area as dispersed shallow sheet flow, with some concentration of flow in the existing street sections. The drainage areas impacting the site are depicted on Exhibit "A" to the Drainage Concept Report, Appendix "C". The drainage basin exhibit identifies eight key concentration points that are located either within or adjacent to the site. Runoff concentrating at these locations is addressed in the Drainage Concept Report. The site is not impacted by, or located in, a federally regulated floodplain as defined by the Federal Emergency Management Agency.

The site is not located within either a balanced or critical drainage basin as defined by the City of Tucson; therefore, stormwater detention would not be a normal requirement of development. Since the proposed development will generate less runoff volume than is currently generated by the site, stormwater retention would not be a normal requirement of development. However, water harvesting (selective stormwater retention for reuse) and stormwater detention are key elements of some of the drainage concepts being proposed in conjunction with the site.

Only two offsite drainage areas impact the site. The most significant drainage area extends as far south as Ft. Lowell Road (Concentration Point 2E on Exhibit "A" to the Drainage Concept Report). This drainage basin contains a mixture of land uses, which includes government facilities, high-density residential, and low-density residential, with the latter being the most dominant land use. During the 100-year event, runoff concentrating at Concentration Point 2E will be in excess of 100 cfs, which is the threshold value for the delineation of regulatory flood plains. The regulatory floodplain associated with this concentration point is depicted on Exhibit "B" to the Drainage Concept Report.

Approximately 70 percent of the site contributes runoff to the downstream concentration point associated with this flood plain (Concentration Point1E, Exhibit "A"). A small portion of the runoff that is generated within the boundary of this basin is intercepted by a storm drain constructed along the Wilson Avenue alignment. However, since the design capacity of a typical storm drain is limited to either the 2-year or 10-year discharge, and this particular storm drain intercepts runoff from outside the boundary of the drainage basin associated with Concentration Point 2E, it will not be one of the key elements of the drainage concept plan.

The second offsite drainage area contributing runoff to the site will not have a significant impact on the proposed development. Offsite runoff from the Masonic-Tucson Lodge No. 4 parcel, combined with onsite runoff, is captured by the Allen Road street section and delivered to the Campbell Avenue street section (Concentration Point 8E, Exhibit "A"). Most of the contributing drainage area is paved parking, and the land use is commercial. The existing drainage pattern will be maintained as part of the drainage concept plan, and no special drainage structures will be required to accommodate the runoff associated with this basin. Although Campbell Avenue includes a major storm drain, and it is reasonable to assume that its design capacity includes a low-flow contribution from the drainage area associated with Concentration Point 8E, this storm drain will not be one of the key elements of the drainage concept plan.

The remaining onsite drainage areas depicted on Exhibit "A" will, under developed conditions, contribute runoff to their respective downstream concentration points in a manner that is consistent with existing conditions.

2.4 Infrastructure. The site, being near the northern edge of the City limits, is located in an area that is already highly developed in terms of existing infrastructure. A large storm drain is located within Campbell Avenue and drains upstream stormwater flows along with the western one-third of the project site.

There are existing sanitary sewer lines located within Campbell Avenue and Allen Road to provide sanitary sewer conveyance for the project. A sewer capacity analysis may be required for ultimate build-out capacity and conveyance.

Existing utility easements are onsite and will need to be abandoned with new easements created for proposed utility services. Water, electricity, gas and cable will all be underground in joint utility trenches where feasible.

A 75-foot cell tower will be located onsite on a temporary basis until the cell antennae can be located on top of the proposed 75-foot building in Phase II.

2.5 Vegetation and Wildlife. With the exception of the University of Arizona experimental farm, the areas adjacent to and near the UMC North Medical Center are primarily clustered apartment dwellings with the exception of the few offices located on Campbell Avenue. The vegetation in the University of Arizona's experimental farm mirrors local crops. The vegetation in the apartment clusters consists of mostly exotics, and the wildlife consists of small animals and birds attracted by food provided by local residents.

2.6 Views. Distant views from the site to the southwest are composed of the distinctive silhouette of downtown Tucson's tall towers back-dropped against a crystal blue sky. To the west, across Interstate 10, stand the Tucson Mountains. North of the UMC North Medical Park, and on the far side of the Rillito River, are the Catalina Mountains, and to the east are the Rincon Mountains. Foreground views in all directions have a general urban quality of one or two-story residential or commercial structures.

2.7 Soils. Soils on this site and the adjoining parcels are comprised of sandy loam. These are well drained, aerated and workable for most of the year. Unless they have a very high

organic matter content, they are prone to drying out quickly and additional watering for plant materials may be needed. Structural concerns will be evaluated by geotechnical studies.

2.8 Zoning. The existing zoning of the parcel north of Allen Road is R-2 while the zoning of the parcel south of Allen Road is O-3. North of the subject site, the zoning is O-3 with R-1 to the east and southeast. On the west side of Campbell Ave., the zoning is R-1 and O-3 to the southwest. To the northwest of UMC, the zoning is MH-1. See Zoning Map, Figure 4.

2.9 Environmental. The nearest landfill is northeast of Allen Road on Cactus Blvd., but it has been closed since 1961. Historically, none of the areas on the UMC North Medical Park parcel, or any of the adjoining parcels, have been used for a public landfill. Additionally, the Tucson Stormwater Management Study of March 1995 established that the Christmas Wash, located just east of the adjoining University of Arizona experimental farm, falls under the Watercourse, Amenities, Safety, and Habitat (W.A.S.H.) ordinance and is subject to City regulations. The site is up gradient from the University of Arizona farm, so it should not experience any subsurface chemical migration from farm activities.

2.10 Open Spaces and Public Facilities.

2.10.1 Parks and Trails. Five parks are located close to the proposed UMC North Medical Park (see Figure 5):

a. Don Himmel Park at Limberlost just past 1st Avenue, ± 2 miles.
b. Rillito Racetrack Park on 1st Avenue just north of the Rillito Creek, ± 1.5 miles.
c. Rillito River Park along the Rillito Creek, ± 0.5 mile.
d. A local residential County Park on Camino Escuela located north of River Road, ± 1.2 miles.
e. Northside Park on Cactus Blvd. northeast of Allen Road, ± 0.5 mile.

Located less than 0.5 mile to the north at Campbell Avenue and Roger Road is the terminus point of a bicycle/multi-use path which travels north to join with the Rillito River Park.

2.10.2 Postal, Fire, Library Services. A post office is located just to the north of the site. This site is served by Tucson Fire located about two miles to the west at 250 W. King. The one-half mile square neighborhood from Tucson Boulevard to Country Club Road and Fort Lowell Road to Prince Road is listed on the National Register and in the City of Tucson as a Historic District. Several SunTran buses are routed along Campbell Avenue. Woods Public Library at 3455 North 1st Avenue is about 1.5 miles away.

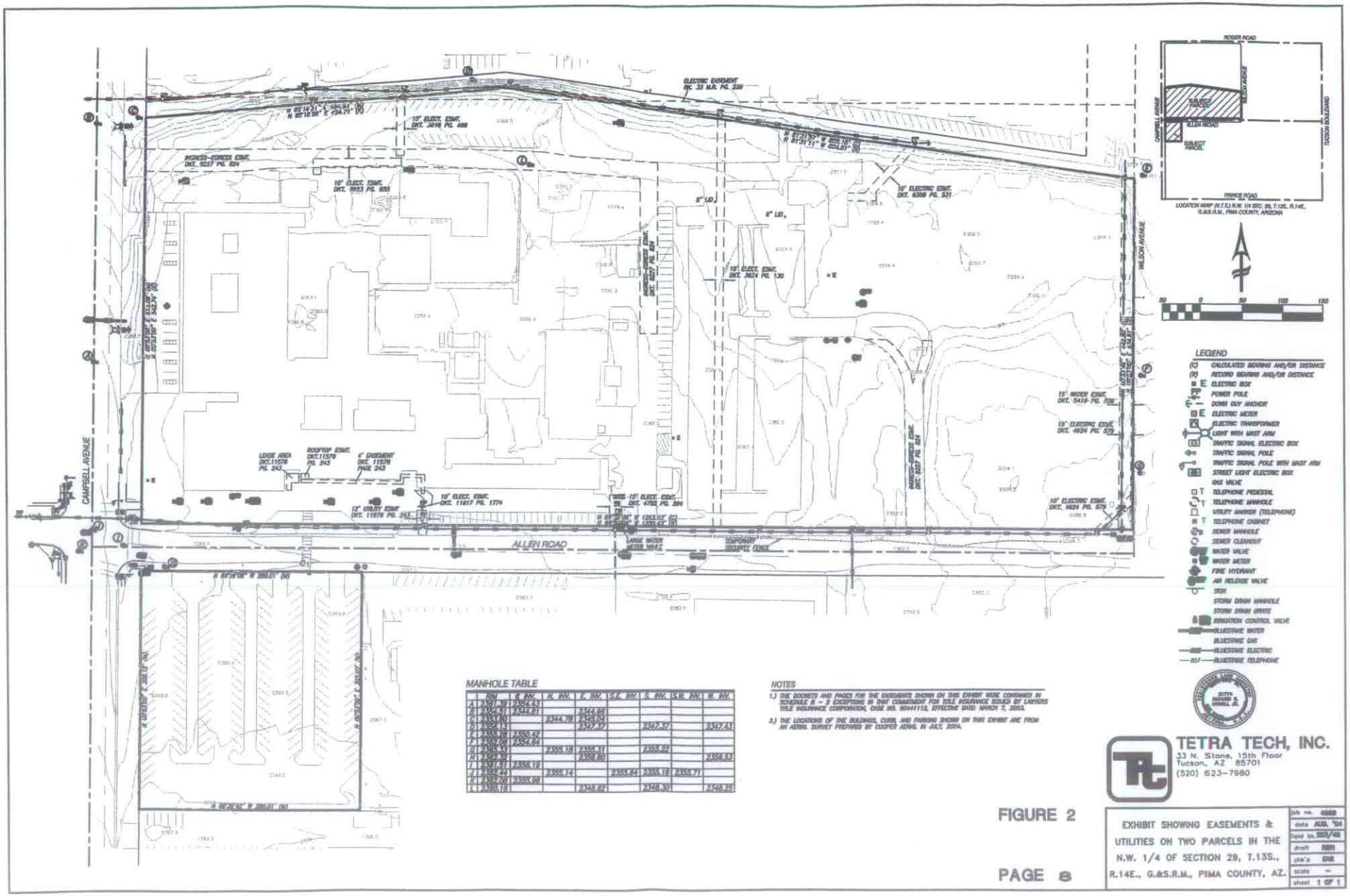
2.10.3 Traffic Circulation. Various forms of transportation are present in the area. There are bike and pedestrian trails along the Rillito River to the north that link to other trails to the west and east. There is currently a bus stop just north of Allen Road on Campbell Avenue along the site west property frontage. Existing parking facilities are located onsite south of Allen Road and additional parking facilities will be provided with future development.

Illustrations

Figure 1 – Location Map
Figure 2 – Record of Survey with Topography
Figure 3 – Aerial Photo with Topography
Figure 4 – Zoning Map
Figure 5 – Parks and Trails
Figure 6 – Streets; Public Facilities

UMC
North Medical Park

Figure 1
Local Location Map



MANHOLE TABLE

	RIM	E. INV.	N. INV.	E. INV.	S.E. INV.	S. INV.	S.W. INV.	W. INV.
A	2351.39	2354.43						
B	2354.51	2344.81		2344.86				
C	2353.80		2344.78	2345.04				
D	2356.13			2347.37		2347.37		2347.43
E	2355.28	2350.42						
F	2352.06	2354.84						
G	2355.33		2355.18	2355.31		2355.22		
H	2352.54			2356.60				2356.53
I	2351.51	2356.19						
J	2352.44		2355.14		2355.84	2355.18	2355.71	
K	2352.06	2355.98						
L	2350.18			2348.62		2348.30		2348.25

NOTES

1.) THE DOCKETS AND PAGES FOR THE EASEMENTS SHOWN ON THIS EXHIBIT WERE CONTAINED IN SCHEDULE B - 2 EXCEPTIONS IN THAT COMMITMENT FOR TITLE INSURANCE ISSUED BY LAWYERS TITLE INSURANCE CORPORATION, CASE NO. 00441112, EFFECTIVE DATED MARCH 7, 2003.

2.) THE LOCATIONS OF THE BUILDINGS, CURB, AND PARKING SHOWN ON THIS EXHIBIT ARE FROM AN AERIAL SURVEY PREPARED BY COOPER AERIAL IN JULY, 2004.

TETRA TECH, INC.
33 N. Stone, 15th Floor
Tucson, AZ 85701
(520) 623-7980

FIGURE 2

PAGE 8

EXHIBIT SHOWING EASEMENTS & UTILITIES ON TWO PARCELS IN THE N.W. 1/4 OF SECTION 29, T.13S., R.14E., G.&S.R.M., PIMA COUNTY, AZ.

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date	AUG. '04
field bk.	203/49
draft	RBH
ctk'd	EAB
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sheet	1 OF 1

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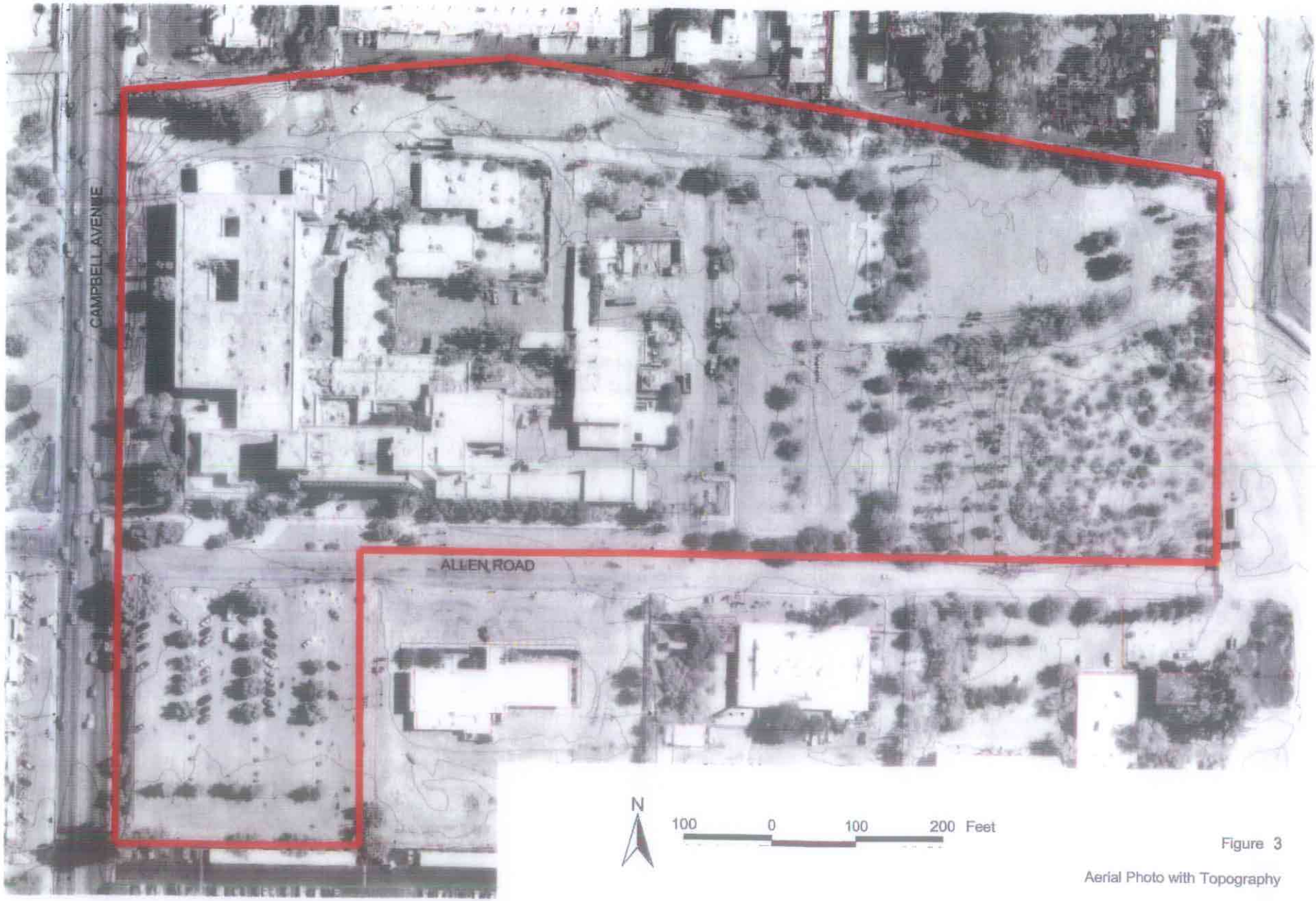


Figure 3

Aerial Photo with Topography

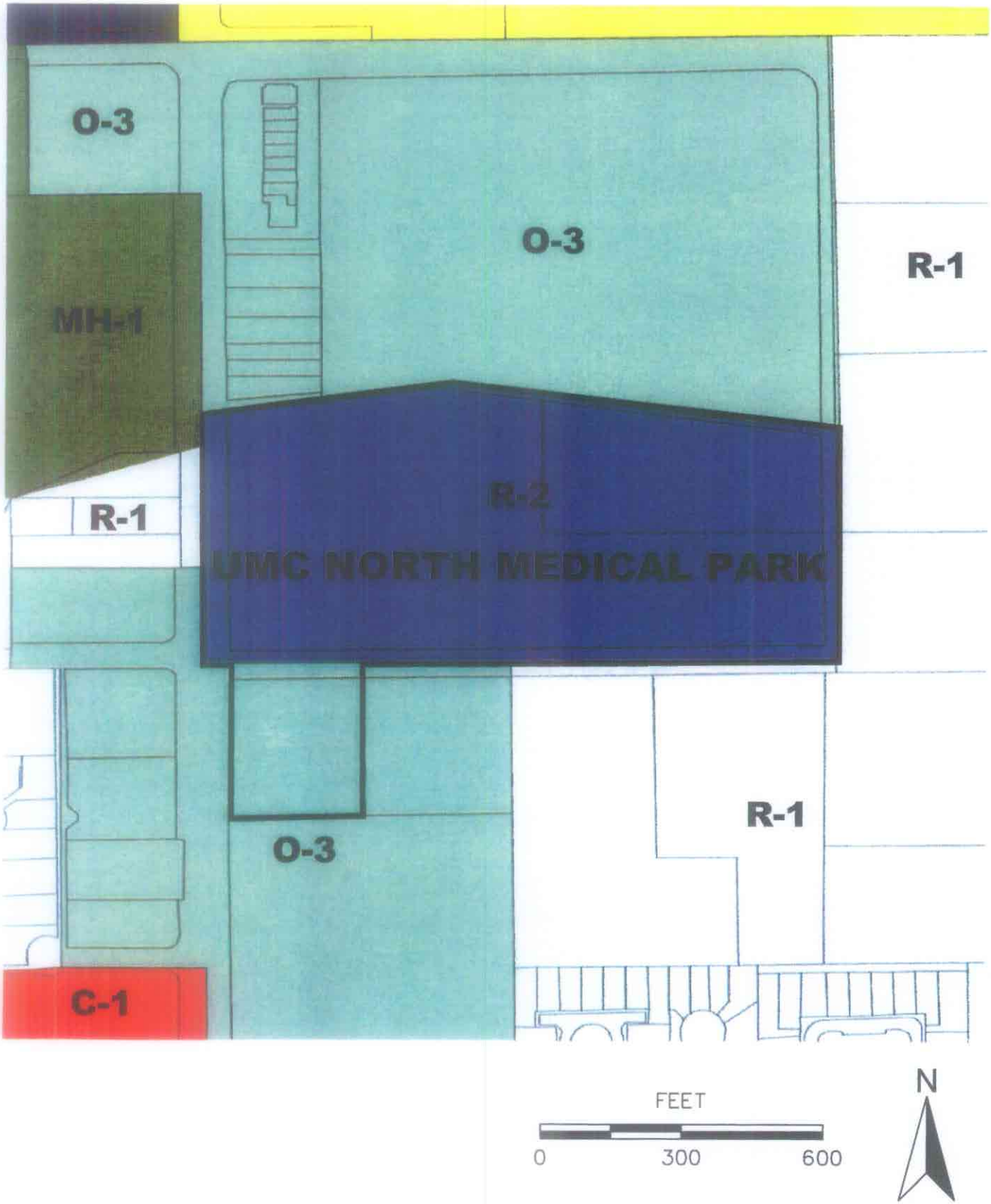


Figure 4
Zoning Map

UMC
North Medical Center

N

SCALE 1: 787

70 0 70 140 210

UMC
North Medical Park

Figure 5
Parks and Trails

UMC North Medical Park

Figure 6

Streets,
Public Facilities

3.0 PLANNED AREA DEVELOPMENT DISTRICT

3.1 Introduction The University Medical Center (UMC) is redeveloping the former Tucson General Hospital site at Campbell Avenue and Allen Road as UMC North Medical Park, a medical treatment campus (UMC North). Before approval of this UMC North Planned Area Development District (PAD), the City has approved a plan amendment to the Northside Area Plan to create policies for UMC North. This PAD complies with those adopted policies.

The PAD zoning is being used for UMC North to establish development criteria specific to a medical center campus, and to create development compatible with existing neighborhoods and adjacent uses. UMC has been working diligently with the neighboring property owners and neighborhood associations to establish development criteria that respect and enhance the surrounding community, and UMC will continue to work with its neighbors as UMC North is developed.

3.1.1 Purpose. This PAD is intended to provide the regulatory zoning provisions for UMC North to develop a cohesive, patient-friendly medical campus. The PAD Development Standards govern all material aspects of land use and development within UMC North. Where a provision of this PAD varies from provisions of the City's Land Use Code (LUC), the provisions of the PAD shall govern.

3.1.2 Area Description. UMC North is a site of approximately 16 acres composed of two parcels on the northeast corner of Campbell Avenue and Allen Road, and one parcel on the southeast corner of Campbell Avenue and Allen Road. See Aerial Photo with Topography, Figure 3.

The surrounding zoning is a combination of O-3, R-1, and some MH-1 on the west side of Campbell Avenue. See Figure 4. The adjacent uses include office complexes, two-story multi-family complexes, the University of Arizona Agricultural Research Center (U of A Farms), the Masonic Lodge, Federal agricultural and research facilities and Arizona Board of Regents facilities. There are some single-family site built and mobile homes to the west across Campbell Avenue.

The intersection at Campbell Avenue and Allen Road will be the primary access point to UMC North. Campbell Avenue is a designated Major Streets and Routes/Gateway Route adjacent to UMC North. Allen Road is a local residential collector street to the west of Campbell Avenue, and connects to the University of Arizona Farms to the east of Campbell Avenue.

3.1.3 Illustrative Site Plan. An illustrative site plan depicting how UMC North may appear at full buildout is provided in Figure 6. The redevelopment of the Tucson General Emergency/ICU building fronting on Campbell and the unifying healing garden feature are unlikely to be changed, but the exact location of other buildings and site improvements may differ from the illustrative site plan, as dictated by UMC needs and resources.

There was one archaeological site recorded during the survey, and referenced in the Cultural Resources Survey attached as an appendix and referenced as Site AZ BB:9:391. That site is not intended to be developed as part of Phase I, but may be developed in a later phase. If

disturbed, site-specific testing plan will be developed and implemented pursuant to the recommendation in the Cultural Resources Survey.

3.2 Circulation.

3.2.1 General. The Campbell Avenue/Allen Road entrance will be the primary entrance into UMC North. There will be a secondary access drive on Campbell Avenue, restricted to right-in and right-out traffic only, located approximately 450 feet north of Allen Road. A Traffic Impact Analysis (TIA) for Phase I of the UMC North development is attached as Appendix "D" to this PAD. Simultaneously with development plan submittal for any subsequent phase, UMC shall provide a supplemental traffic impact analysis for the phase of development proposed at that time.

As part of Phase I, and based on the TIA, UMC agrees with the City of Tucson that the following improvements will be made:

1. Provide a right turn lane (combined with a bus pull-out) along Campbell Avenue for northbound traffic entering the Medical Park from Campbell Avenue and exiting from Allen Road.
2. Provide a traffic diverter on Allen Road east of Campbell Avenue to prevent westbound traffic (exiting the Medical Park on Allen Road) from crossing Campbell Avenue to Allen Road west of Campbell Avenue. This diverter will be designed to allow southbound traffic on Campbell Avenue to enter the Medical Park by turning east from Campbell onto Allen Road.
3. Improve the traffic light at the Campbell/Allen intersection to meet City of Tucson current standards.

The City has agreed to provide the video detection system, the cabinet and controller, and the conduit under the roadway necessary for the traffic light improvement. UMC will be responsible for the remainder of the traffic light improvements including the engineering and construction of the required physical infrastructure improvements. Modifications to the schedule, design or extent of the above mentioned improvements will require the mutual agreement of TDOT and UMC, but will not require an amendment to this PAD.

3.2.2 Internal Street and Right-of-Way Standards

a. Streets

(i) Streets will be crowned to drain to curbs.

(ii) Streets are allowed to also serve to direct rainfall to landscaped areas and to designated storm drain locations.

(iii) Streets to be asphaltic concrete or other decorative paving material.

(iv) Sight visibility triangle of 15 feet is the minimum as allowed in the UMC North Medical Park Traffic Impact Analysis, Appendix D.

b. Parking Area Access Lanes (PAAL)

(i) PAALs may also serve as utility and ingress/egress easements.

(ii) PAALS are not required to be signed or striped, except for pedestrian crossings which shall have some markings or surface treatments to alert vehicular traffic of pedestrian areas.

(iii) PAALs shall be constructed of asphaltic concrete and may incorporate other all-weather materials for decorative treatments.

(iv) PAALS are permitted as indicated in the North PAAL Street Sections, Figure 8.

(v) Cross access agreements as necessary will be addressed in private covenants imposed on the site.

(vi) PAALS may be inverted for drainage purposes.

c. Curbs

(i) Curbs will be concrete.

(ii) Curb cuts are permitted for rain water harvesting in the swales adjacent to the roadways.

d. Sidewalks

(i) Sidewalks adjacent to streets to be located as shown in the Allen and North PAAL Street Sections on public right-of-way, Figures 8, 9.

(ii) Minimum separation between sidewalk and any adjacent structure of zero (0) feet is permitted.

(iii) All sidewalks shall be a minimum of five (5) feet in width.

(iv) Scuppers of adequate size are permitted below sidewalks to direct rainfall from buildings to plantings.

(v) Continuous landscaped areas are located between the street curb and all sidewalks internal to the UMC site.

e. Bicycles

(i) No Class 1 bicycle facilities required, but covered bicycle parking will be provided.

(ii) Class 2 requirements are as indicated in the City of Tucson Development Standards. Bicycle parking will be provided on the ground level.

3.3 Permitted Land Uses. The base zoning district proposed for UMC North is OCR-1. This zoning district shall be as described in Section 2.6.1 of the LUC, as modified by this PAD. No OCR-1 development designators shall apply because pertinent development standards are addressed in this PAD.

All land uses in OCR-1, LUC Section 2.6.1.2, as of the date of adoption of this PAD, except as listed below, shall be permitted in UMC North. Additional permitted uses shall include: parking structures; residential facilities associated with patient care; permanent cellular antennae, as long as they are located on the top of a building and blend in with the architecture of the building (see § 3.8.5 for treatment of temporary cellular antennae); "research and product development," as defined in LUC Section 6.3.5.20; conference and education center; "utilities use group, generating system," as defined in LUC Section 6.3.12.3; and other clinics, facilities, and uses to support the UMC North medical campus.

UMC North shall not permit the following uses, as defined in the LUC: "correctional use" (LUC Section 6.3.4.4), "vehicle rental and sales" (LUC Section 6.3.10.7), or any "industrial uses" (LUC Section 6.3.6), unless secondary to medical uses.

3.4 Development Standards

3.4.1 Mitigation Plan. The visual impact of the height and mass of new structures will be mitigated as viewed from the surrounding neighborhoods by the use of generous building setbacks on the north side of UMC North, the creation of "transition zones" for the street frontages of the main UMC North campus north of Allen Road, and with landscape screening on all other sides.

3.4.1.1 North Boundary: Because the existing natural grade of UMC North is several feet higher than the adjoining office and residential development to the north, the minimum setback for new structures will be 30 feet, with a landscape buffer included, along the entire northern boundary of the UMC North site. This will serve to screen the new buildings from view of the adjoining residential development, visually soften the site edge, and provide privacy for the existing residential development.

Cuts in excess of two (2) feet and within one hundred (100) feet of the developing site at the northwest corner may be necessary to preserve existing trees and provide safe access to the site and existing finished floor elevation (FFE).

Placement of fill in excess of two (2) feet may be necessary above existing grade at the northwest corner of the site due to preservation of existing trees and existing FFE to be maintained.

3.4.1.2 Transition Zones. To provide for a transition from the street frontages of that portion of UMC North located north of Allen Road, transition zones are established for the Campbell Avenue, Allen Road and Wilson Avenue frontages. The improvements in the transition zones may include screen walls, landscape features, shaded outdoor seating areas enclosed on not more than three sides, and other architectural/building elements that will be designed to shade building glazing and to provide graduated or layered building massing. The building improvements in this transition zone will be limited to 16 feet in height.

The dimensions of the transition zones are:

a. Campbell Avenue: Within 50 feet but not less than 20 feet from the Campbell Avenue site boundary.

b. Allen Road: Within a distance equal to one-half building height and not less than 10 feet from the Allen Road site boundary.

c. Wilson Avenue: Within a distance equal to one-half building height and not less than 10 feet from the Wilson Avenue site boundary.

3.4.1.3 South of Allen Road, West and South Site Boundaries. On the south side of Allen Road along the west site boundary, a building setback of 20 feet from the property line will be provided, with a dense landscape buffer planted within the setback. Use of a 10-foot setback and dense vegetative screen will also be used along the south site boundary. Sidewalks will be provided along Campbell Avenue, the north side of Allen Road, and the south side of Allen Road where adjacent to UMC property, all within the public right-of-way.

3.4.2 Building Envelope Regulations. In lieu of the development designators for the OCR-1 zone, the following standards for building coverage setback and height are established:

3.4.2.1 Minimum Site Area	0
3.4.2.2 Minimum Site Width	0
3.4.2.3 Minimum Separation Between Buildings	0
3.4.2.4 Maximum Site Coverage	None
3.4.2.5 Maximum Floor Area Ratio	None

3.4.2.6 Site Perimeter Building Setbacks For the purposes of this section, site perimeter building setbacks shall be measured from the site property boundaries.

a. Minimum setback from Campbell Avenue.

(i)	North of Allen Road	
	• 45-foot buildings	50 feet
	• Transition zone buildings and structures	20 feet
(ii)	South of Allen Road:	20 feet
b. Minimum setback from Allen Road		
(i)	North side of Allen Road	One-half building height
(ii)	South of Allen Road	10 feet
c. Minimum setback from Wilson Avenue		One-half building height
d. Minimum setback from northern site boundary		30 feet
e. Minimum setback from southern site boundary for the parcel south of Allen Road		10 feet
f. Minimum setback from eastern site boundary for the parcel south of Allen Road		10 feet
g. Building setbacks for any interior property lines		0 feet

3.4.2.7 Maximum Building Heights

a.	Buildings fronting Campbell Avenue north of Allen Road, and any building elsewhere on the site used for residential purposes.	45 feet
b.	Buildings fronting Allen Road within 80 feet east of the Campbell Avenue site boundary	55 feet, unless functional requirements necessitate floor-to-floor heights of 20 feet, or architectural elements necessitate greater overall building heights up to 65 feet
c.	Buildings fronting Allen Road over 80 feet east of the Campbell Avenue site boundary	75 feet, unless functional requirements necessitate boundary floor-to-floor heights of 20 feet, or architectural elements necessitate greater overall building heights up to 80 feet.

d.	Buildings fronting Campbell south of Allen Road and all other buildings, except for parking structures and buildings used for residential purposes	55 feet, unless functional requirements necessitate floor-to-floor heights of 20 feet, or architectural elements necessitate greater overall building heights up to 65 feet.
e.	Parking structures	45 feet, including elevator penthouse (potentially 5 parking levels, 4 above design grade)

3.4.3 Motor Vehicle and Bicycle Parking

3.4.3.1 Motor Vehicle Parking. Motor vehicle parking shall comply with the following:

a. Residential Uses: One space per two (2) beds.

b. For all other uses: One (1) space per 200 square feet of total gross floor area.

3.4.3.2 Bicycle Parking. UMC North will comply with the LUC, Section 3.3.4, for bicycle parking requirements only, with the following exception:

a. No class 1 bicycle facilities required but covered facilities will be provided.

b. Class 2 requirements are as indicated in the LUC, Section 3.3.4. Also, bicycle parking will be provided on the ground level.

3.4.4 Off-Street Loading. UMC North will comply with the LUC, Section 3.4.4.1.A, for off-street loading space and design requirements.

3.5 Landscape/Screening and Open Space Requirements

3.5.1 Design Philosophy. Open space is critical to the success of a treatment facility such as the UMC North. The healing and soothing qualities of plants and the associated small wildlife are well documented. UMC North will provide for substantial open space area in this PAD. The core of the medical park campus is a centralized outdoor space consisting of a series of continuous gardens. A shaded pathway connects all the gardens, and secondary paths provide access to the medical park buildings and parking areas. Shaded seating areas are located periodically along the paths.

Xeriscape principles will set the tone for the landscape philosophy. The majority of plant materials will be low water varieties. The need for potable water will be minimized with the integration of water harvesting concepts into the centralized outdoor space, as well as the peripheral landscaped screening areas. When high water plant use or water features are incorporated, they will be placed in high-use, highly visible locations to maximize their benefits.

3.5.2 Healing Garden and Pedestrian Network. In addition to the use of landscape buffers for screening new structures at the perimeter of the site, the Landscape Plan concept for this site includes a major unifying feature: the Healing Garden, and an associated network of pedestrian paths.

The Healing Garden will be the focal point for the primary UMC North campus located north of Allen Road, with views from clinical and treatment areas oriented toward this centralized outdoor space. This garden will offer patients visual relief and a pleasant environment. It will provide a wide variety of outdoor spaces for patients, their family members and the medical park staff to enjoy—everything from quiet, private, shaded seating areas for individuals wishing to meditate, to active recreational play areas for children to use while a family member is being treated inside the building.

As the site is developed from west to east, the Healing Garden landscape will be extended to the east, eventually reaching Wilson Avenue. The garden will serve as an internal "linear park" linking all of the various buildings on the campus, and providing several different types of garden environments. Within the Healing Garden, meandering pedestrian pathways will be constructed allowing the patients and staff to walk between parking areas and the different buildings on the campus in pleasant outdoor surroundings.

A more detailed description of the Healing Garden is provided in Appendix "G".

3.5.3 Landscape, Screening Standards. The following landscape standards are illustrated on the Landscape Concept Plan, Figure 10.

3.5.3.1 General

a. Area Plan. These standards shall meet or exceed Area Plan requirements.

b. Oasis Allowance. The oasis allowance shall be a maximum of 2.5 percent of site area.

(i) The oasis allowance must be located in high use areas: active recreation areas, social gathering points near buildings, areas of repose, eating areas, or protected areas where evaporation is minimal.

(ii) Turf is limited to oasis areas.

3.5.3.2 Street Landscape Borders

a. Campbell Avenue.

(i) One tree per 33 lineal feet of frontage (this requirement may be satisfied with new or existing vegetation).

(ii) Minimum 20-foot width measured from the property line.

(iii) Area from site boundary to street curb, not including the sidewalk, shall have plant material or inorganic treatment.

(iv) 50% of the ground plane must be covered with vegetative groundcover.

b. Allen Road. Minimum 10-foot wide low vegetative screen and trees pursuant to Figure 10.

c. Wilson Avenue. Minimum 10-foot wide low vegetative screen and trees pursuant to Figure 10.

3.5.3.3 Interior Landscape Borders. UMC North has three interior (non-street) borders: the north boundary of the parcel north of Allen Road and the south and east boundaries of the parcel south of Allen Road.

a. North boundary. Where adjacent to residential use, a 10-foot wide tall vegetation screen. Where possible, the existing vegetation along the property line will be retained, and additional landscaping south of the PAAL will be provided as shown on Figure 9. Trees will be provided at a ratio of 1 per 33 linear feet south of the PAAL.

b. South boundary. Where adjacent to residential use, a 10-foot wide tall vegetation screen.

c. East boundary. If the adjacent use is converted to a residential use, a 10-foot wide vegetative screen will be provided within the setback area.

3.5.3.4 Vehicular Use Areas

a. 1 canopy tree per eight vehicles in uncovered parking lots.

b. Planting area must be a minimum of 34 square feet and minimum 4 feet wide with a minimum 4 inch border.

c. Tree trunks must be protected from vehicular damage.

3.5.3.5 Screening

a. A screen may be vegetation, fence, wall, or earth berm unless otherwise specified below.

b. A 6-foot screen is required adjacent to the following uses: loading areas, solid waste storage, and utility service. Solid waste storage areas shall not have direct line of sight to adjacent properties, parking lots or pedestrian use areas.

c. Ground and roof-mounted mechanical equipment must be screened in its entirety (full height).

d. A 30 inch minimum screen is required along Campbell Avenue on the north and south sides of Allen Road, and the west side of Wilson.

3.5.3.6 Water Use

a. Grading, hydrology, and landscape structural plans are to be integrated to make the most of site storm water runoff for supplemental irrigation purposes.

b. The landscape plan shall indicate use of all runoff.

c. Harvesting of stormwater and runoff are required supplements to the drip irrigation system.

d. Ornamental Water Features:

(i) Locate within the oasis area.

(ii) Total water surface area cannot exceed 1% of the net site area.

(iii) The sum of the square feet of the water feature and turf cannot exceed total allowed for the oasis.

(iv) Moving water in a feature must be recycled within the feature.

(v) The feature shall be designed to prevent leaks.

3.5.3.7 Plant Materials

a. New plant materials shall be selected from the City of Tucson/Pima County Low Water Tolerant Plant List, except plant materials used in oasis areas.

b. Plant materials listed on the City of Tucson/Pima County Prohibited Plant List shall not be used for newly planted areas unless the plant is existing on site and will be salvaged and transplanted to newly planted areas.

c. Existing plants on the site that are listed on the City of Tucson/Pima County Prohibited Plant List shall be replaced with acceptable plant materials as listed in 3.5.3.6 when they die.

d. Plants known to attract bees or promote other undesirable conditions shall not be selected.

e. Mature canopy size of all plant materials shall be indicated on construction documents.

f. Plants shall be placed so as not to interfere with utilities.

g. Plants shall be selected with consideration of defensible space concepts.

h. All plant materials shall be watered by an automatic underground irrigation system.

(i) Existing and proposed design water pressures shall be verified and noted on the plans before irrigation installation begins.

(ii) Irrigation mainline layout shall be submitted with Development Plan.

i. Wherever possible, existing mature, healthy trees shall be preserved in place or salvaged and transplanted on site. Particular emphasis in this regard is placed on existing Aleppo pines located on the Campbell Avenue frontage.

3.6 Signage. The Special District section of the Tucson Sign Code applies to the PAD area. In the event the Tucson Sign Code is amended to permit special districts to establish specific regulations which apply within a Planned Area Development and are approved by the Mayor and Council, the following special regulations are approved for this PAD:

3.6.1 UMC may prepare and submit to the City a comprehensive sign plan for UMC North, which shall be reviewed for consistency with the objectives of this PAD by the Development Services Director.

3.6.2 No electronic message signs are allowed.

3.6.3 Illuminated signs shall be designed to minimize light pollution.

3.7 Lighting. In addition to the requirements of Chapter 6, Section 6-101, Outdoor Lighting Code, of the Tucson Code, any outdoor lighting utilized in conjunction with the medical/residential use shall be located and directed so as to eliminate glare toward streets and the adjoining O-3 and R-1 zones.

3.8 Infrastructure

3.8.1 General. The PAD site is located in an area that is already highly developed in terms of existing infrastructure. The new underground infrastructure systems will be located in the existing public right-of-way and maintained by the public agencies in charge of these facilities. The infrastructure will be phased.

3.8.2 Stormwater Drainage. The PAD site is also located within the Tucson General Wash Watershed, a watershed that, per the Tucson Stormwater Management Study as adopted in January, 1996, is designated as containing neither "balanced basins" nor "critical basins". The City has exempted the site from on site retention and detention facilities. However, the City of Tucson Detention/ Retention Manual requires that, for all commercial development larger than one acre in size, five-year threshold retention criteria be applied to all non-designated basins. This requirement, however, is not applicable to the UMC North subarea, because future impervious cover will actually be less than the impervious cover that currently exists within the subarea.

For site drainage design, particular attention has been paid to the use of rainwater to irrigate trees and landscaped areas and the "City of Tucson Water Harvesting Guidance Manual" was used extensively. Typical drainage will be allowed from individual buildings to micro retention basins in landscaped areas

Roads will be crowned to drain toward the curbs. There will be curb cuts at planting areas to permit excess rainwater to infiltrate. The PAALs receive minimal additional drainage other than what falls on them and they drain to the streets. Excess water in the streets will continue down the streets to a storm drain system. See Drainage Concept Report, Appendix "C".

Surface water will be directed to the proposed onsite detention/retention basin. Water will then be released to the north and northeast per existing drainage patterns. Stormwater flows will be conveyed to the Rillito Creek via a drainage system (surface or sub-surface) with the agreement of all affected property owners. The site is not in the 100-year floodplain.

3.8.3 Sewer. New sewer lines will be located underground in the PAALs and streets. This system will tie in to the existing sewer below Campbell Avenue.

3.8.4 Water. Water lines will also be located underground in the PAALs and streets. This site network ties into the existing lines under both Campbell Avenue and Allen Road.

3.8.5 Private Utilities. Electricity, gas, telephone and cable are located within the public right-of-way of Campbell Avenue and Allen Road. There are also existing "dry" utility services onsite that will either be abandoned or relocated depending upon the building location and respective utility demands. Utility easements will be provided for onsite services as required and existing easements will be abandoned as necessary.

A free standing, ground-mounted 75-foot tower for cellular phone service providers will be located onsite on a temporary basis pursuant to a conditional Special Exception Land Use approved by the City in 2004 (SE-04-13). The permanent cellular antenna will be located atop a sufficiently tall building at such time as that building is constructed. Discontinuance of the temporary cellular phone antenna tower will occur not later than one (1) years from the date of the issuance of a certificate of occupancy for the host building.

3.8.6 Solid Waste Collection. Waste collection receptacles will be located for trash collection by the City or private provider. Compaction type equipment may be used and collection from the site will be as required. The solid waste collection areas will have a 6-foot high screen on three sides.

3.9 Phasing. UMC will develop UMC North in a number of phases over a significant period of time, perhaps as long as 20 years, depending on UMC needs and resources. A logical description of future phases is depicted in Figure 11. However, the phases shown are not necessarily sequential, and the boundaries of a particular phase may change; e.g., UMC may choose to construct Phase 5 sooner than Phase 4. Prior to a development plan submittal UMC will hold a neighborhood meeting with representatives of the Campus Farms and Tucson-Prince neighborhood and give a presentation of the proposed development plan phase and its

compliance with the PAD. Documentation of these neighborhood meetings will be provided on each of these meetings along with the development plan submittal.

Simultaneously with development plan submittal for subsequent phases, UMC shall provide a traffic impact analysis for the phase being proposed at that time.

3.10 Implementation and Administration

3.10.1 Architectural and Design Review. Prior to a development plan (per phase), submittal, UMC will hold a neighborhood meeting with representatives of the Campus Farms and Tucson-Prince neighborhood and give a presentation of the proposed development plan phase and its compliance with the PAD. Documentation of these neighborhood meetings will be provided on each of these meetings along with the development plan submittal.

3.10.2 Interpretation. The City's Zoning Administrator shall have the power to implement and interpret this PAD within the parameters set forth in the LUC.

3.10.3 Definitions. For the purposes of this PAD, the following terms shall have the indicated meaning:

Buffer, Landscape. An area of land, landscaped with trees, shrubs, vegetative groundcover, rock, or other natural materials, or hardscape features intended to visually and physically separate buildings and other site improvements from adjoining public streets and properties.

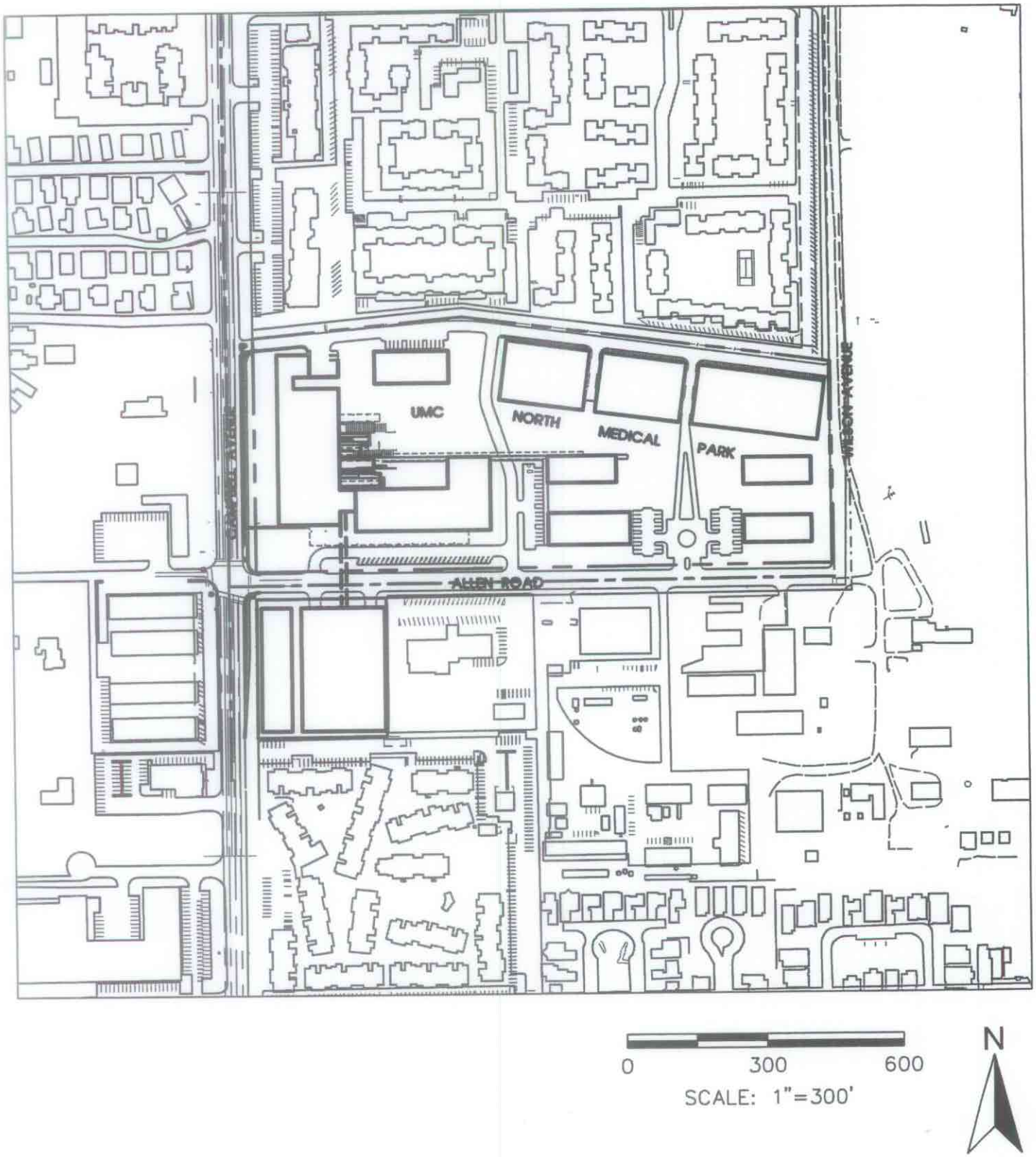
Setback. The minimum distance by which any building or structure must be separated from the external site boundary.

Site. The land designated for development under this PAD, consisting of tax assessor lots, Nos. 112-02-034A, 112-02-034B, and 112-02-003D, exclusive of any abutting public rights-of-way.

3.10.4 Amendment to the PAD. Any proposed change to this PAD shall be submitted to the Development Services Department Director, who shall review the item and ascertain whether or not the change is substantial based on the criteria established in LUC Section 2.6.3.11.B.3.

Illustrations

Figure 7 – Illustrative Site Plan
Figure 8 – Allen Road Street Section
Figure 9 – North PAAL Street Section
Figure 10 – Landscape Concept Plan
Figure 11 – Phasing Concept Plan

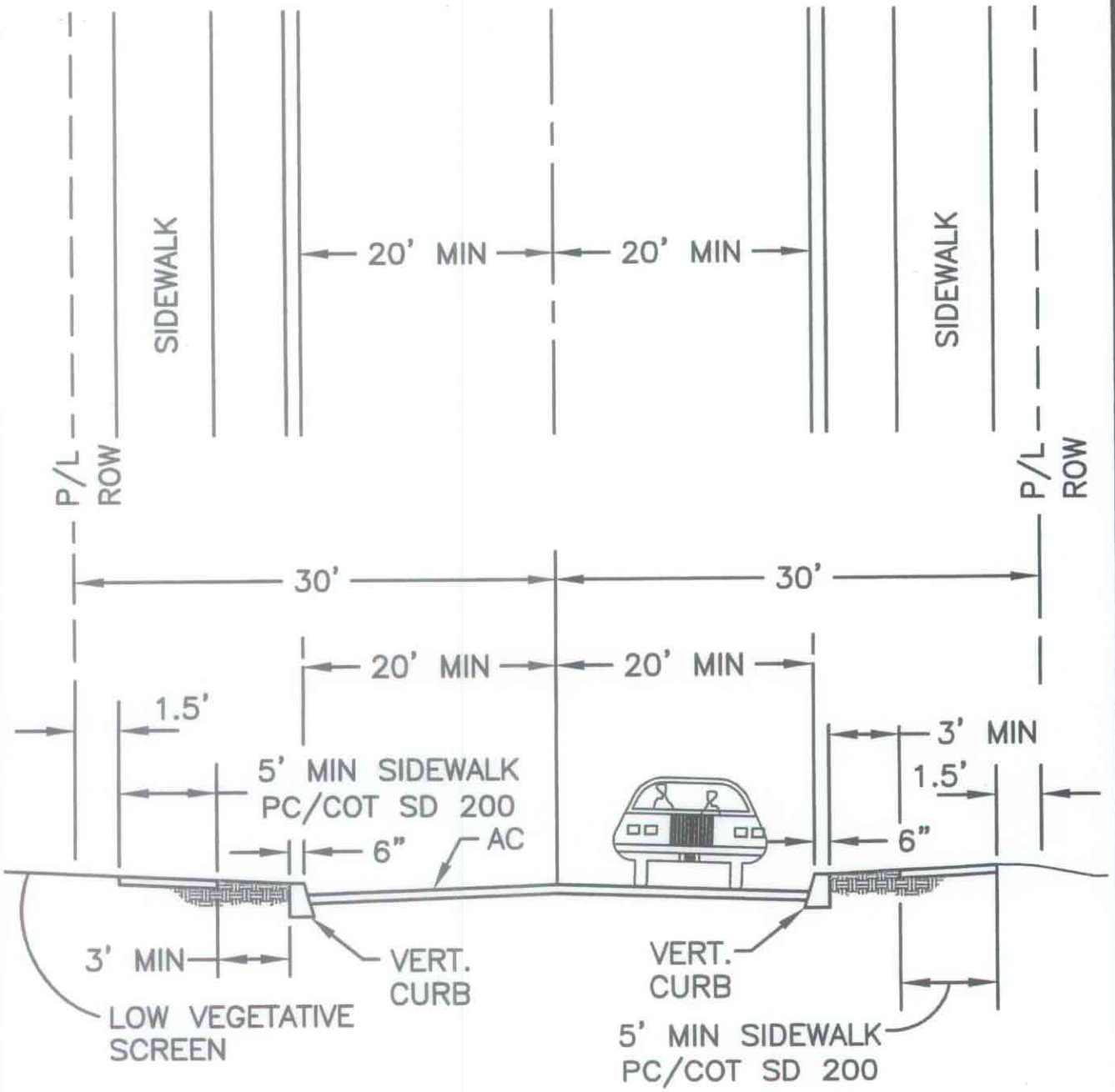


UMC
North Medical Park

Figure 7
Illustrative Site Plan

ALLEN ROAD

MOVEMENT/SPEEDS	SLOW/25 mph
TRAFFIC LANES	3 IN 40'
PARKING	NONE
CURB	VERTICAL
PLANTER	SOUTH SIDE–9.5' NORTH SIDE–5' MIN. CONTINUOUS
PLANTINGS	LOW WATER, DROUGHT TOLERANT



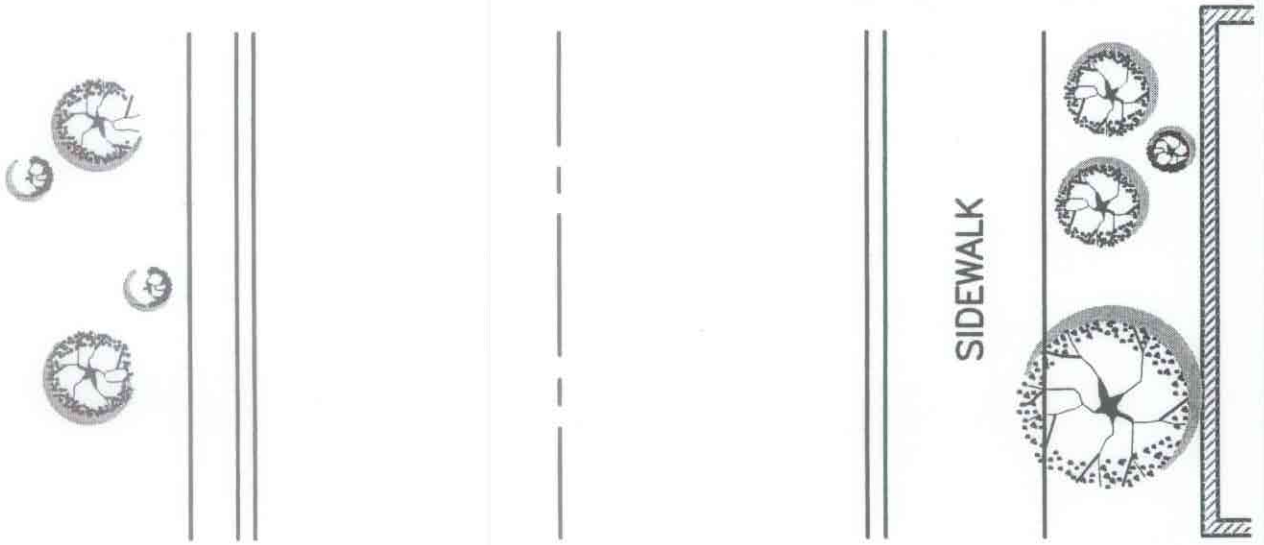
UMC NORTH MEDICAL PARK
ALLEN ROAD
STREET SECTION B–B
FIGURE 8

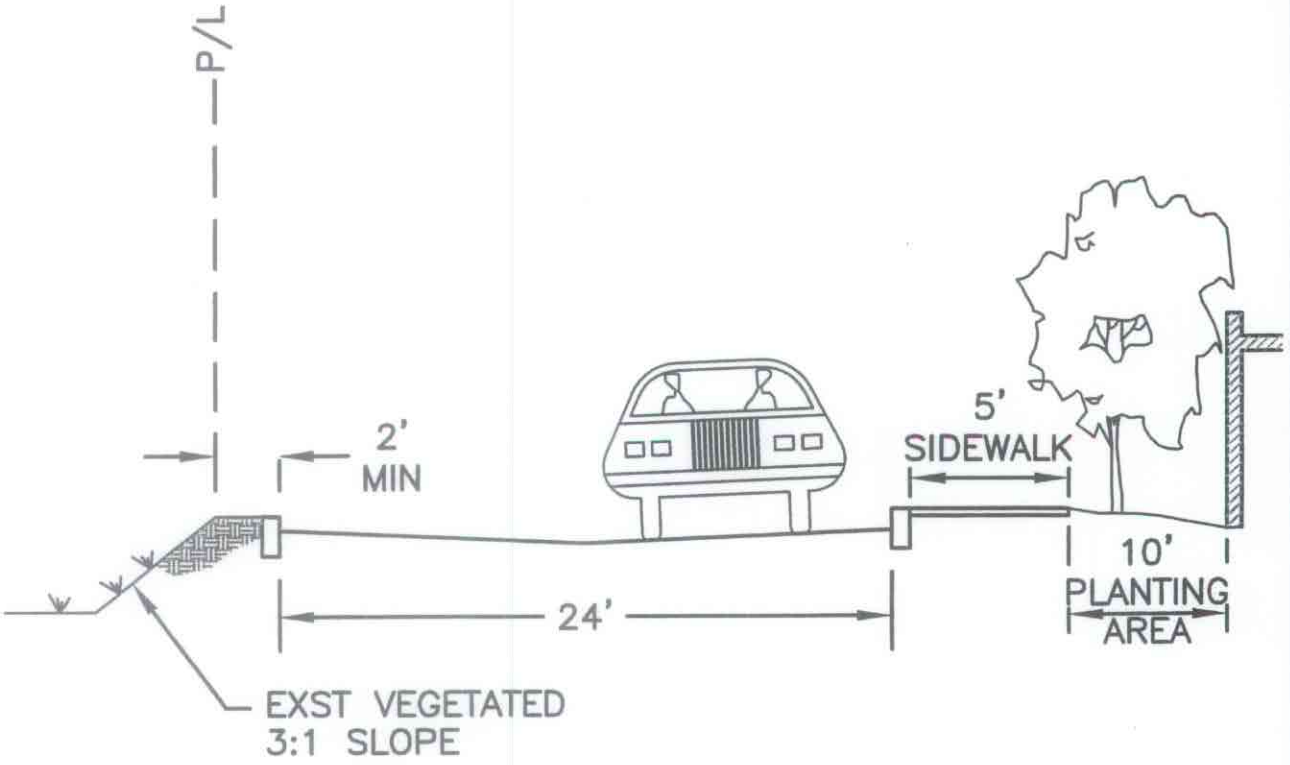
TETRA TECH, INC.
33 N. STONE AVENUE, SUITE 1500
TUCSON, ARIZONA 85701–1413
(520) 623–7980 FAX (520) 884–5278

P:\PUMC4669\Development\ALLEN STREET 8.5x11.DWG, 6/16/2005 10:44:04 AM, 1:1, KAB

NORTH PAAL

MOVEMENT/SPEEDS	SLOW/20 mph
TRAFFIC LANES	2 IN 24'
PARKING	NONE
CURB	VERTICAL
PLANTER	SOUTH SIDE–10' NORTH SIDE–2' MIN. CONTINUOUS
PLANTINGS	LOW WATER, DROUGHT TOLERANT





TETRA TECH, INC.
33 N. STONE AVENUE, SUITE 1500
TUCSON, ARIZONA 85701–1413
(520) 623–7980 FAX (520) 884–5278

UMC NORTH
MEDICAL PARK
NORTH PAAL
STREET SECTION A–A
FIGURE 9

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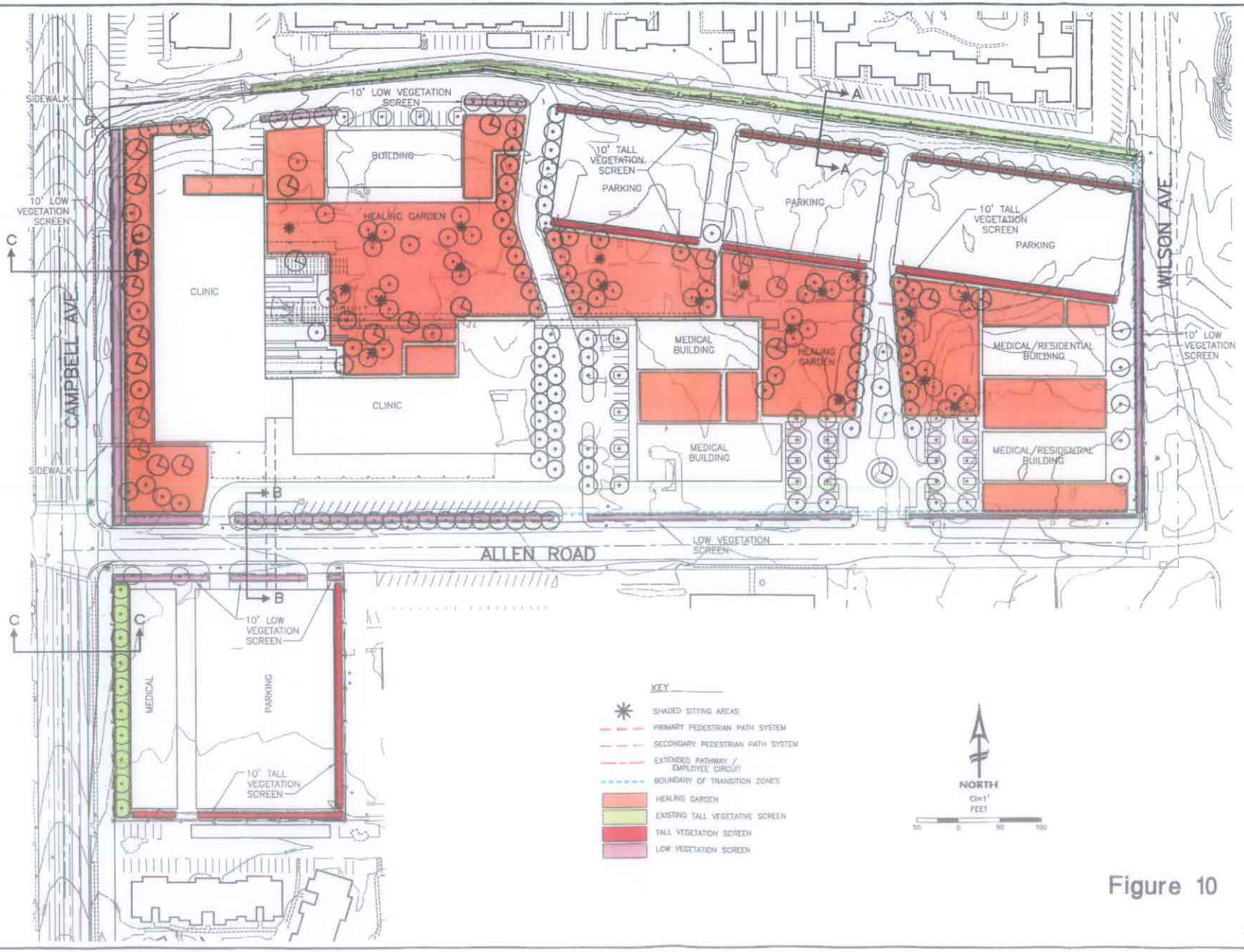


Figure 10

TETRA TECH, INC.

UMC
North Medical Park
LANDSCAPE CONCEPT PLAN

JOB NO. PUMC4669
DATE: April, 2005
SCALE: AS SHOWN
DWG. N / A
SHEET NO.: L1
1 OF 1

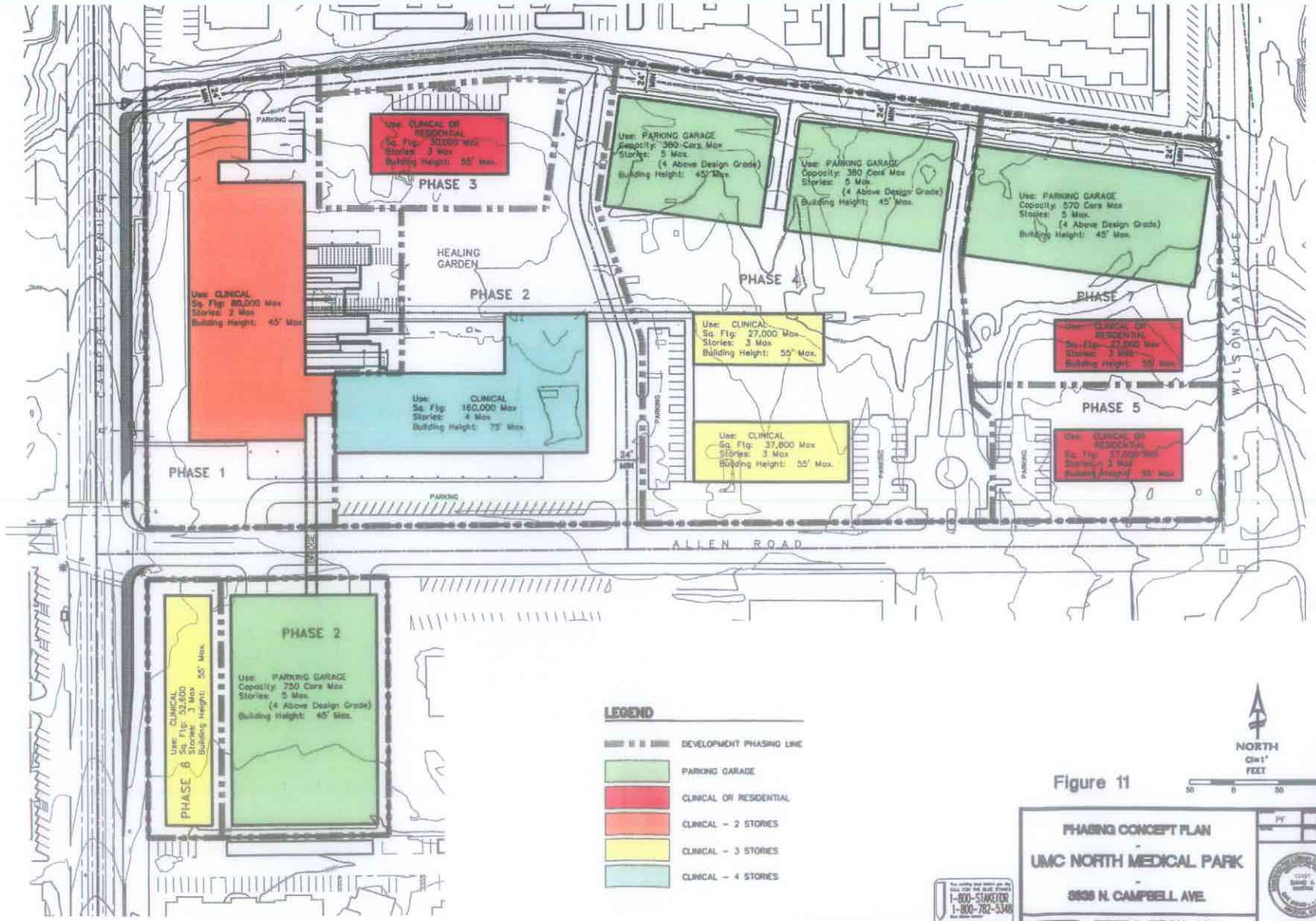


Figure 11

PHASING CONCEPT PLAN
-
UMC NORTH MEDICAL PARK
-
3838 N. CAMPBELL AVE.

TETRA TECH, INC.
33 N. Stone, 15th Floor
Tucson, AZ 85701 (520) 623-7980

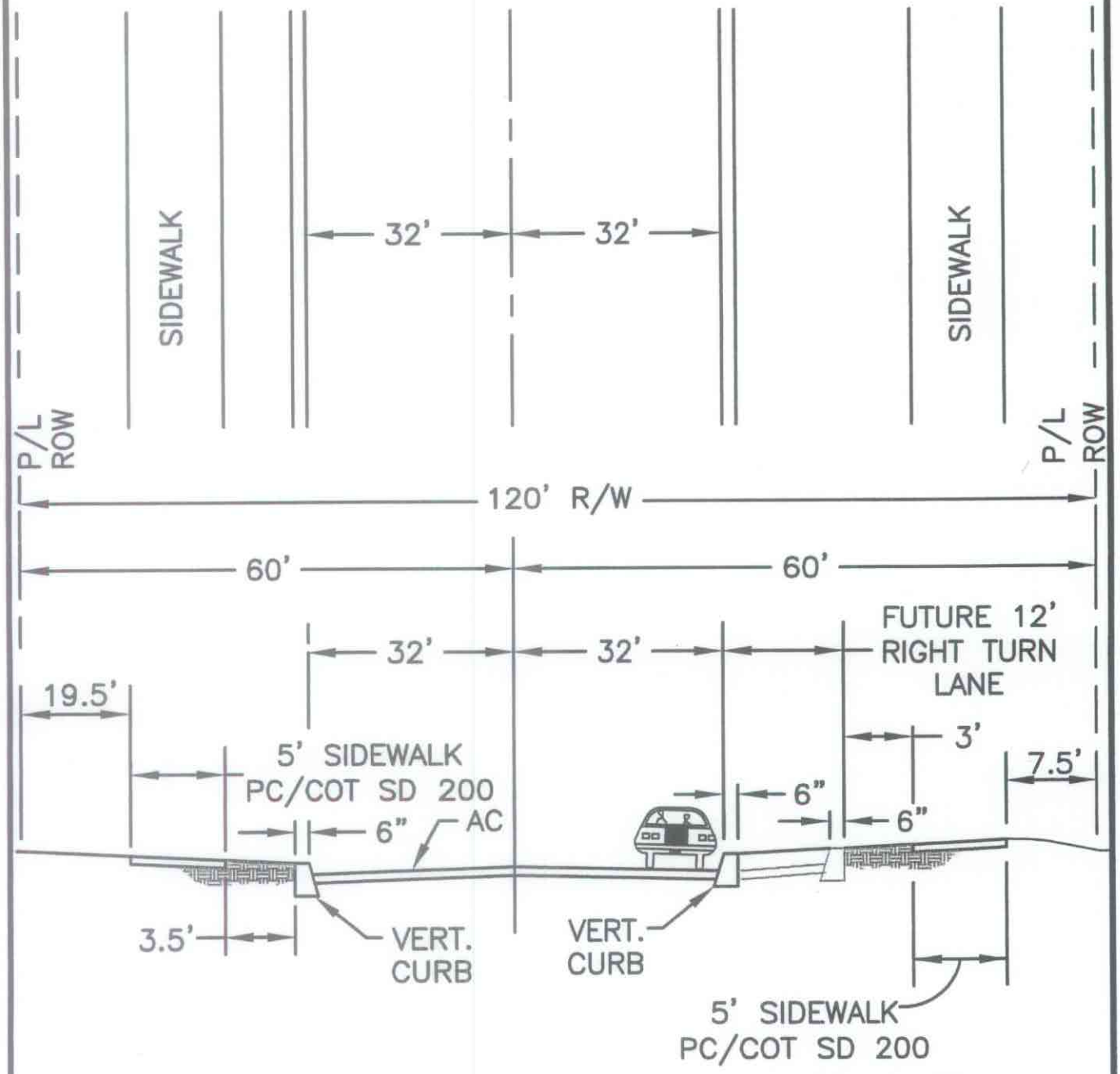
PF DM
DM

4669
MAR 2005
30 OF 30

1-800-STAKEYOR
1-800-782-5348

CAMPBELL AVENUE

MOVEMENT/SPEEDS _____ 35 mph
TRAFFIC LANES _____ 5 IN 64'
PARKING _____ NONE
CURB _____ VERTICAL



TETRA TECH, INC.
33 N. STONE AVENUE, SUITE 1500
TUCSON, ARIZONA 85701-1413
(520) 623-7980 FAX (520) 884-5278

UMC NORTH
MEDICAL PARK
CAMPBELL AVENUE
STREET SECTION C-C

FIGURE 12

P:\PUMC4669\Development\CAMPBELL AVE 8.5x11.DWG, 6/16/2005 11:59:05 AM, 1:1, KAB

Legal Description

LEGAL DESCRIPTION
PARCELS I AND II

PORTIONS OF THE NORTHWEST QUARTER OF SECTION 29, TOWNSHIP 13 SOUTH, RANGE 14 EAST, GILA AND SALT RIVER MERIDIAN, PIMA COUNTY, ARIZONA, SAID PORTIONS DESCRIBED AS FOLLOWS:

COMMENCING AT A BRASS CAP SURVEY MONUMENT AT THE NORTHWEST CORNER OF SAID SECTION 29, FROM WHICH A BRASS CAP IN HANDWELL AT THE WEST QUARTER CORNER OF SAID SECTION 29 BEARS SOUTH 00°53'00" WEST, A DISTANCE OF 2659.23 FEET;

THENCE SOUTH 00°53'00" WEST, ALONG THE WEST LINE OF SAID NORTHWEST QUARTER, A DISTANCE OF 1,329.61 FEET TO THE INTERSECTION OF ALLEN ROAD AS SHOWN ON BOOK 9 OF ROAD MAPS AT PAGE 33, RECORDS OF SAID PIMA COUNTY;

THENCE SOUTH 89°29'08" EAST, ALONG THE CENTERLINE OF SAID ALLEN ROAD, A DISTANCE OF 60.00 FEET TO THE INTERSECTION WITH THE EAST RIGHT-OF-WAY LINE OF CAMPBELL AVENUE, SAID INTERSECTION BEING **POINT "A"**;

THENCE NORTH 00°53'00" EAST, ALONG SAID EAST RIGHT-OF-WAY LINE, A DISTANCE OF 30.00 FEET TO THE **POINT OF BEGINNING** OF **PARCEL I**;

THENCE CONTINUE NORTH 00°53'00" EAST, ALONG SAID EAST RIGHT-OF-WAY LINE, A DISTANCE OF 513.09 FEET TO THE SOUTHERLY LINE OF MARJACK SUBDIVISION AS SHOWN IN BOOK 16 OF MAPS AND PLATS AT PAGE 97, RECORDS OF SAID PIMA COUNTY;

THENCE NORTH 85°19'21" EAST, ALONG SAID SOUTHERLY LINE, A DISTANCE OF 454.53 FEET;

THENCE SOUTH 81°31'57" EAST, ALONG SAID SOUTHERLY LINE, A DISTANCE OF 805.18 FEET TO THE INTERSECTION WITH THE WEST RIGHT-OF-WAY LINE OF WILSON AVENUE AS DESCRIBED IN DOCKET 11560 AT PAGE 9413, RECORDS OF SAID PIMA COUNTY;

THENCE SOUTH 00°33'48" WEST, ALONG SAID WEST RIGHT-OF-WAY LINE, A DISTANCE OF 442.80 FEET TO THE INTERSECTION WITH THE NORTH RIGHT-OF-WAY LINE OF SAID ALLEN ROAD;

THENCE NORTH 89°29'08" WEST, ALONG SAID NORTH RIGHT-OF-WAY LINE, A DISTANCE OF 1,253.03 FEET TO THE **POINT OF BEGINNING**.

CONTAINING 14.689 ACRES OR 639,851 SQUARE FEET, MORE OR LESS.

TOGETHER WITH THE FOLLOWING DESCRIBED PARCEL:

COMMENCING AT AFORESAID **POINT "A"**;

THENCE SOUTH 00°53'00" WEST, ALONG THE EAST RIGHT-OF-WAY LINE OF SAID CAMPBELL AVENUE, A DISTANCE OF 30.00 FEET TO THE INTERSECTION OF THE SOUTH RIGHT-OF-WAY LINE OF SAID ALLEN ROAD, SAID INTERSECTION BEING THE **POINT OF BEGINNING** OF **PARCEL II**;

THENCE SOUTH 89°29'08" EAST, ALONG SAID SOUTH RIGHT-OF-WAY LINE, A DISTANCE OF 280.01 FEET;

THENCE SOUTH 00°53'00" WEST, DEPARTING SAID SOUTH RIGHT-OF-WAY LINE, A DISTANCE OF 302.00 FEET;

THENCE NORTH 89°30'42" WEST, A DISTANCE OF 280.01 FEET TO THE INTERSECTION WITH THE EAST RIGHT-OF-WAY LINE OF SAID CAMPBELL AVENUE;

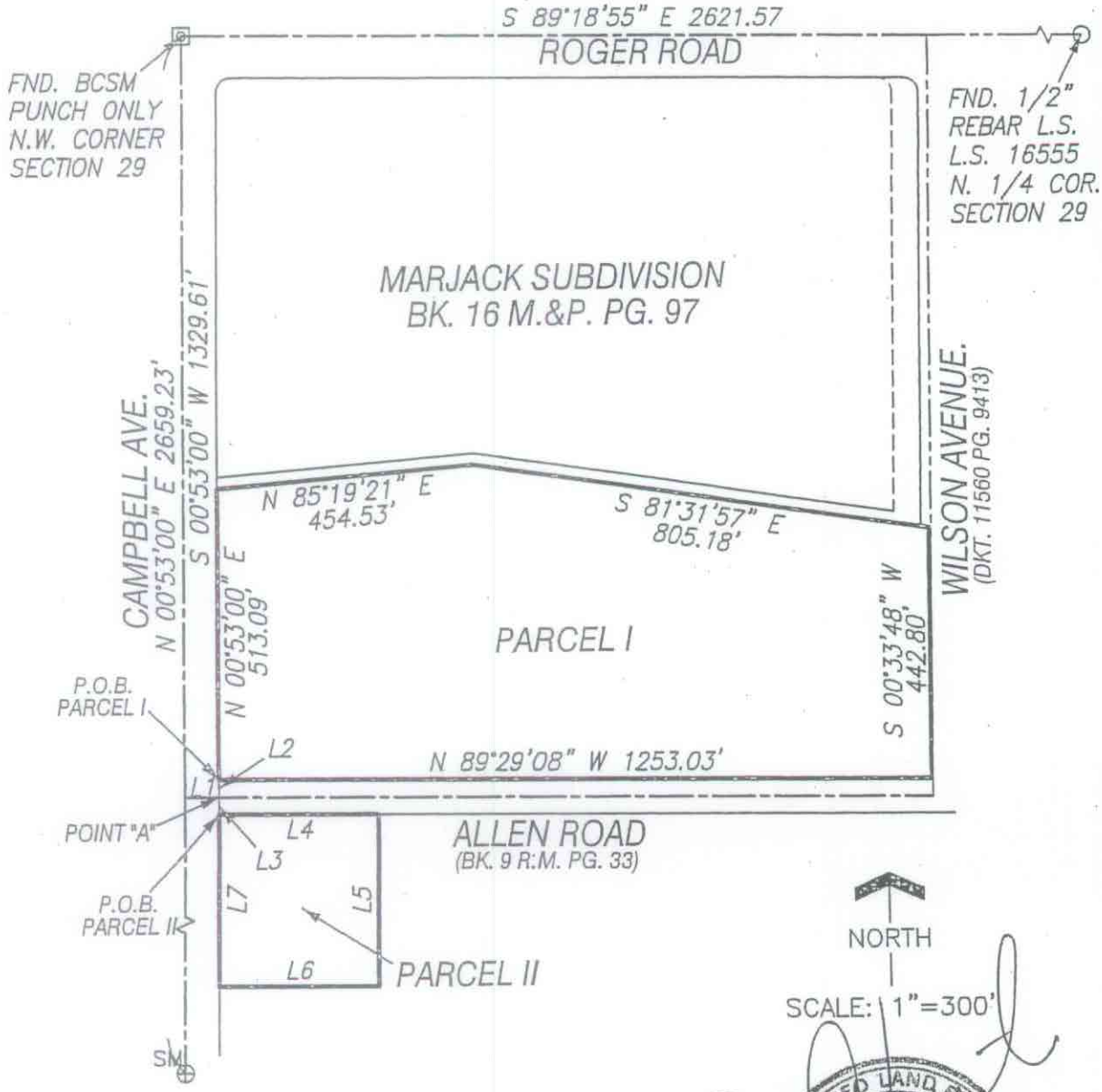
THENCE NORTH 00°53'00" EAST, ALONG SAID EAST RIGHT-OF-WAY LINE, A DISTANCE OF 302.12 FEET TO THE **POINT OF BEGINNING**.

CONTAINING 1.942 ACRES OR 84,577 SQUARE FEET, MORE OR LESS.

DAVID A. MARTIN, R.L.S.

EXHIBIT

PORTIONS OF THE NORTHWEST QUARTER OF SECTION 29, TOWNSHIP 13 SOUTH, RANGE 14 EAST, G.&S.R.M., PIMA COUNTY, ARIZONA



LINE TABLE

NUMBER	DIRECTION	DISTANCE
L1	S 89°29'08" E	60.00'
L2	N 00°53'00" E	30.00'
L3	S 00°53'00" W	30.00'
L4	S 89°29'08" E	280.01'
L5	S 00°53'00" W	302.00'
L6	N 89°30'42" W	280.01'
L7	N 00°53'00" E	302.12'

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
17363
DAVID ALLEN
MARTIN
Date Signed 6-2-05
ARIZONA, U.S.A.

TETRA TECH, INC.
INFRASTRUCTURE SOUTHWEST GROUP
33 N. Stone, 15th Floor
Tucson, AZ 85701 (520) 623-7980

DATE JAN. 2005
JOB NO. 4669

Drainage Concept Report

DRAINAGE CONCEPT REPORT
FOR
UMC NORTH MEDICAL PARK

Prepared for:

UMC Capital Planning and Projects
1690 N. Warren Ave., Bldg. 526, Rm. 151
Tucson, Arizona 85724

Prepared by:

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January 5, 2005

DRAINAGE

Existing Conditions

The proposed Arizona Cancer Center Clinic at UMC North is located approximately 1500 feet south of the Rillito River, between Campbell Avenue and Wilson Avenue (see attached aerial photograph). The general direction of surface drainage in this area is from the south to the north, towards the Rillito River. Stormwater runoff generally flows through the area as dispersed shallow sheet flow, with some concentration of flow in the existing street sections. The drainage areas impacting the site are depicted on Drainage Exhibit A. The drainage basin exhibit identifies nine key concentration points that are located either within or adjacent to the site. Runoff concentrating at these locations will be addressed as part of the concept drainage plan. The site is not impacted by, or located in, a federally regulated floodplain as defined by the Federal Emergency Management Agency.

The site is not located within either a balanced or critical drainage basin as defined by the City of Tucson; therefore, stormwater detention would not be a normal requirement of development. Since the proposed development will generate less runoff volume than is currently generated by the site, stormwater retention would not be a normal requirement of development. However, water harvesting (selective stormwater retention for reuse) and stormwater detention are key elements of some of the drainage concepts being proposed in conjunction with the site.

Only two offsite drainage areas impact the site. The most significant drainage area extends as far south as Ft. Lowell Road (Concentration Point 2E on Drainage Exhibit A). This drainage basin contains a mixture of land uses, which includes government facilities, high-density residential, and low-density residential, with the latter being the most dominant land use. During the 100-year event, runoff concentrating at Concentration Point 2E will be in excess of 100 cfs, which is the threshold value for the delineation of regulatory flood plains. The regulatory floodplain associated with this concentration point is depicted on Drainage Exhibit B. Approximately 70 percent of the site contributes runoff to the downstream concentration point associated with this flood plain (Concentration Point1E, Drainage Exhibit A). A small portion of the runoff that is generated within the boundary of this basin is intercepted by a storm drain constructed along the Wilson Avenue alignment. However, since the design capacity of a typical storm drain is limited to either the 2-year or 10-year discharge, and this particular storm drain intercepts runoff from outside the boundary of the drainage basin associated with CP 2E, it will not be one of the key elements of the drainage concept plan.

The second offsite drainage area contributing runoff to the site will not have a significant impact on the proposed development. Offsite runoff from the Masonic-Tucson Lodge #4 parcel, combined with onsite runoff, is captured by the Allen Road street section and delivered to the Campbell Avenue street section (Concentration Point 8E, Drainage Exhibit A). Most of the contributing drainage area is paved parking, and the land use is commercial. The existing drainage pattern will be maintained as part of the drainage concept plan, and no special drainage structures will be required to accommodate the runoff associated with this basin. Although Campbell Avenue includes a major storm drain, and it is reasonable to assume that its design

capacity includes a low-flow contribution from the drainage area associated with CP 8E, this storm drain will not be one of the key elements of the drainage concept plan.

The remaining onsite drainage areas depicted on Drainage Exhibit A will, under developed conditions, contribute runoff to their respective downstream concentration points in a manner that is consistent with existing conditions. The following table provides a summary of each drainage area, including its 100-year peak discharge.

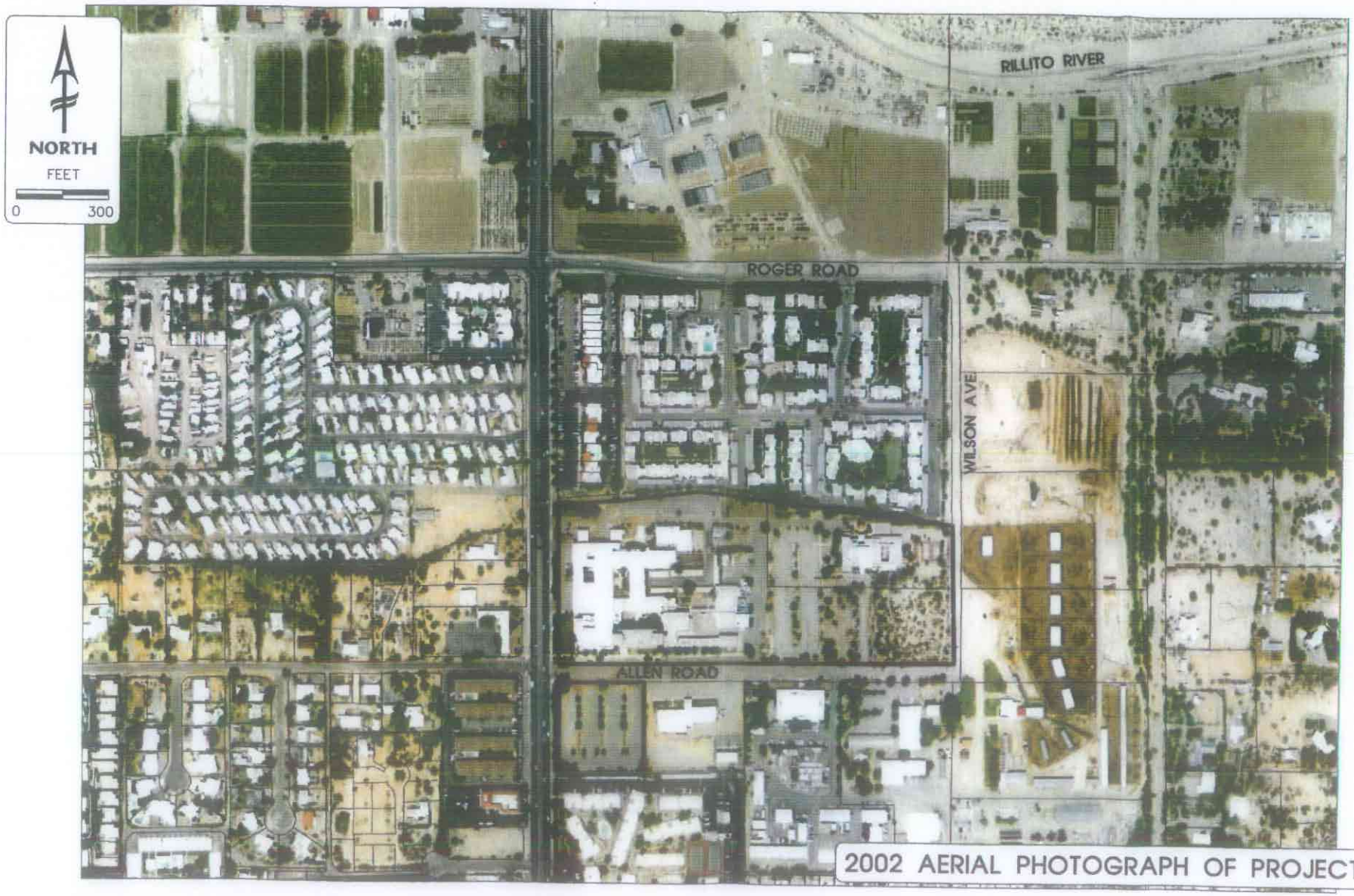
Concentration Point	Contributing Area	Area (acres)	Q_{100} (cfs)
1E	Offsite/Onsite	73.9	210
2E	Offsite	63.6	174
3E	Offsite	50.0	140
4E	Onsite	1.8	11
5E	Onsite	2.1	19
6E	Onsite	0.3	3
7E	Onsite	0.8	7
8E	Offsite/Onsite	4.5	33

Concept Drainage Design

A concept drainage design was formulated to address the conveyance of offsite and onsite runoff through the site. The drainage concept is depicted on the attached drainage exhibit (Drainage Exhibit C) and described in the following paragraph.

Depressed areas will be constructed onsite to collect all of the offsite and onsite runoff associated with Concentration Point 1E. Outflows from the depressed areas will be released into Wilson Avenue. The outlet would be located along the eastern boundary adjacent to Wilson Avenue. Outflows would then be conveyed north along Wilson Avenue to Roger Road in either an improved street section or an open channel constructed within the Wilson Avenue right-of-way. At Roger Road, two options exist. Flows will either be released in the southern right-of-way for conveyance to the Campbell Avenue intersection (which is the current downstream concentration point) or an open channel will be provided through the U of A farms property to convey flows directly to the Rillito River. For the second option, a drainage easement would be acquired from the State of Arizona to construct approximately 650 feet of open channel through the U of A farms property. Onsite runoff from all other drainage areas will be released in a manner consistent with existing conditions, and onsite water harvesting will also be a feature of the concept design.

Collectively, the depressed areas will be similar to a detention/retention basin with a controlled outlet structure, either pipes or an overflow weir. The depressed areas will be integrated into the proposed "Healing Garden". Water harvesting would occur in the retention portion of the basin, and flood control would be provided in the detention portion. The size of the overall basin (i.e., the surface area and depth) will depend on the final design outflow rate. Currently, the concept assumes a design outflow rate of 90 cfs, which is approximately equal to the existing 10-year peak discharge associated with Concentration Point 1E. The required surface area for this scenario would be approximately 2.0 acres for a basin having an average depth of three (3) feet.



2002 AERIAL PHOTOGRAPH OF PROJECT SITE

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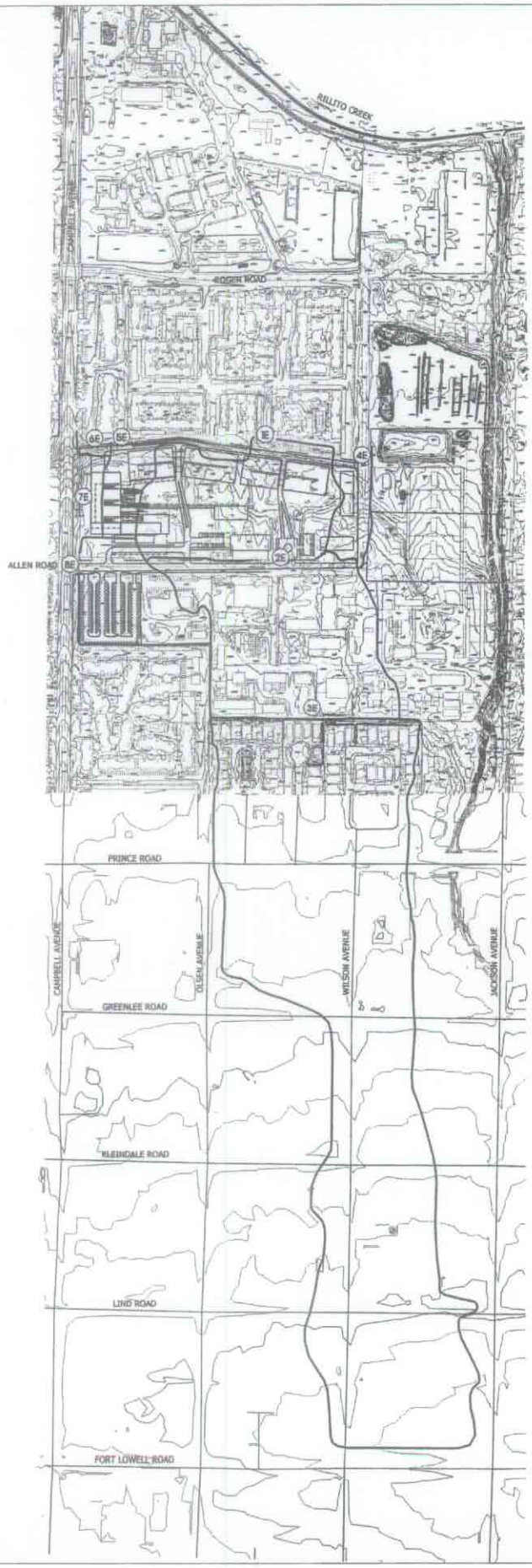
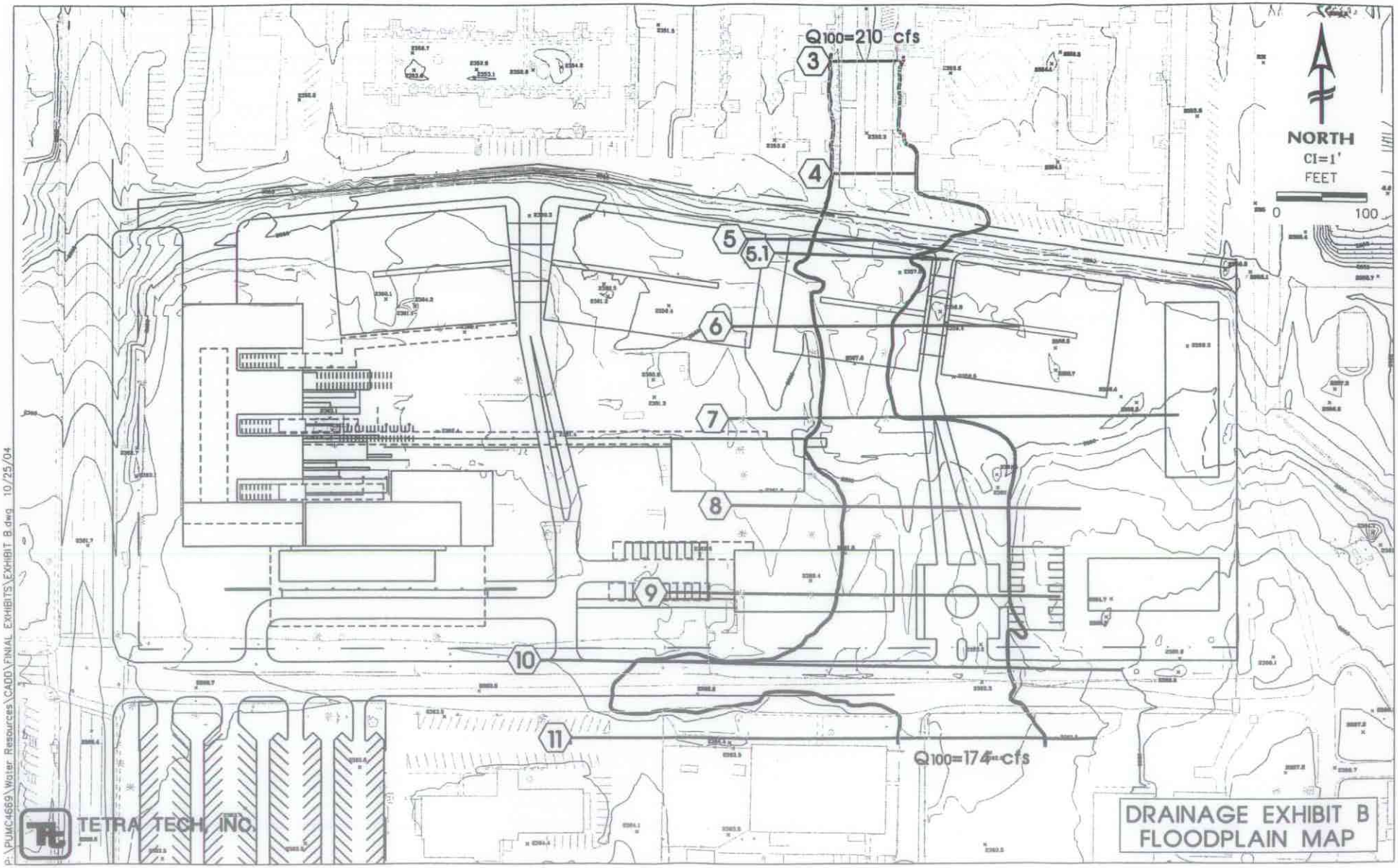


DRAINAGE EXHIBIT A
WATERSHED MAP

TETRA TECH, INC.



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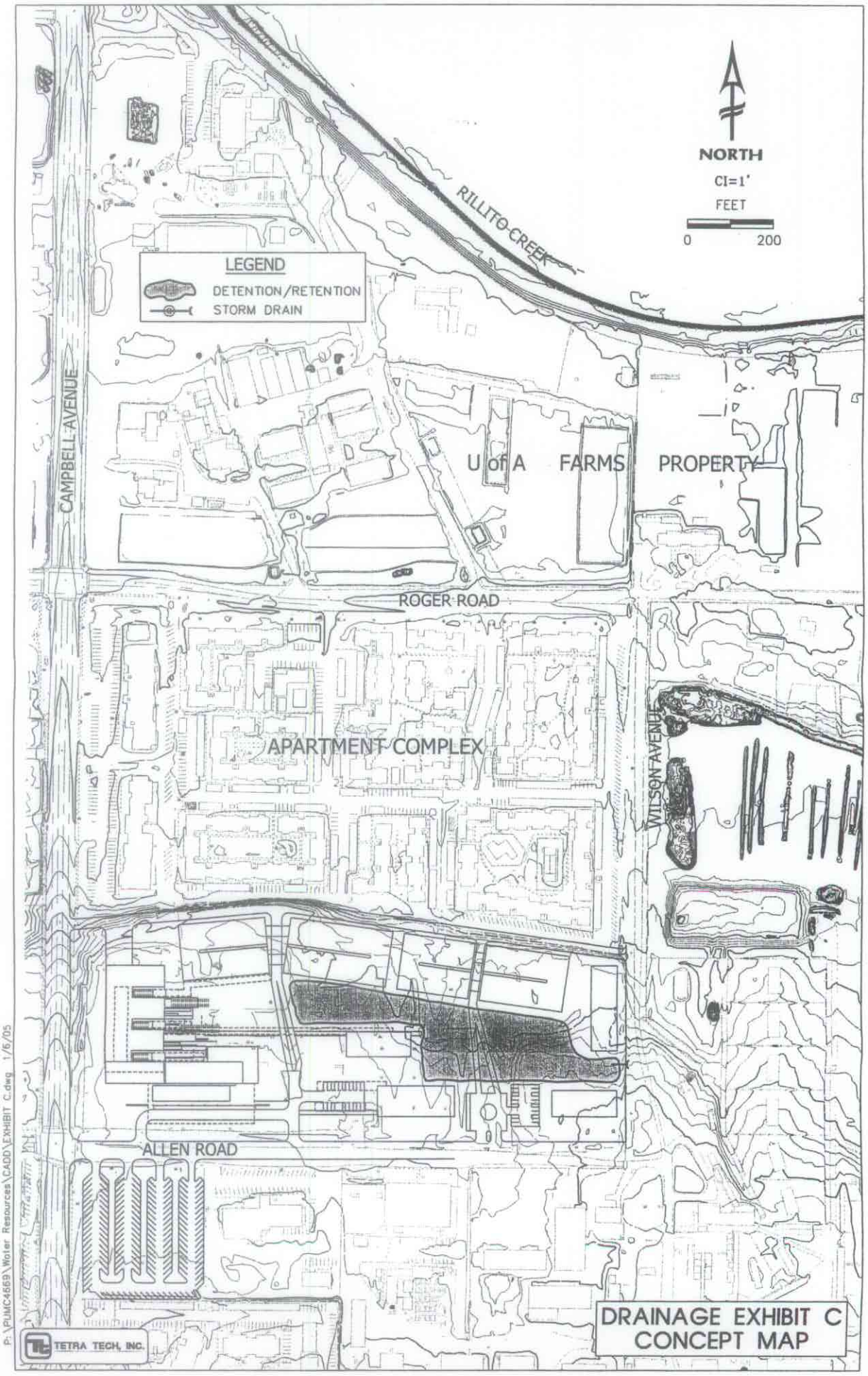
NORTH
CI=1'
FEET
0
200
LEGEND
DETENTION/RETENTION
STORM DRAIN
RILLITO CREEK
CAMPBELL AVENUE
U of A FARMS PROPERTY
ROGER ROAD
APARTMENT COMPLEX
WILSON AVENUE
ALLEN ROAD
TETRA TECH, INC.
DRAINAGE EXHIBIT C
CONCEPT MAP
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Traffic Impact Analysis

UNIVERSITY MEDICAL CENTER
NORTH MEDICAL PARK

Traffic Impact Analysis

Prepared for:

University Medical Center

TetraTech

City of Tucson, Arizona

Prepared by:

Curtis Lueck & Associates
5460 W. Four Barrel Court
Tucson, AZ 85743

March 10, 2005

University Medical Center North Medical Park
Traffic Impact Analysis

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March 10, 2005

NOTICE

This study has been prepared using available traffic data and forecasts, as well as limited field data collected specifically for this study. It is intended for use in making a determination regarding the transportation infrastructure needs of the study area. It is not intended for use as a design document, nor does it represent a standard or specification. The document is copyrighted by Curtis Lueck & Associates, 5460 West Four Barrel Court, Tucson, AZ 85743, telephone 520-743-8748. All rights are reserved pursuant to United States copyright law. The document may not be reproduced digitally or mechanically, in whole or in part, without the prior written approval of CLA, except as noted in the following. (1) Limited quotations may be made, for technical purposes only, as long as proper citation to the authors is provided. (2) Governmental agencies to which this report is submitted for review may make limited copies for internal use and to fulfill public requests under the Freedom of Information Act.

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1. Introduction and Summary of Key Findings

Project Overview

In 2001, University Medical Center purchased the Tucson General Hospital site for future office space. UMC is now renovating a portion of the property for use as an outpatient care facility for cancer patients. The facility is to be developed as medical clinics and is planned to provide diagnoses, treatment and counseling for patients. Short-term housing for patients and their families will be provided as part of the development plan for the project.

The project is located on the northeast corner of the signalized intersection of Campbell Avenue and Allen Road in the City of Tucson. Several portions of the existing property are currently being razed; however, UMC plans to keep and remodel the building on the northwest corner of the property for Phase 1 of the plan. The project location is shown in Exhibit 1.

Purpose of Report

The project developer has indicated that the project is to be built in at least two phases. This report addresses the traffic impacts from the first phase of the proposed development on the surrounding roadways. The development is projected to generate approximately 260 peak hour trips in the first phase of the project and approximately 410 peak hour trips by the second phase.

The entire site is envisioned to include approximately 400,000 square feet of medical facilities, which will be built out in several subsequent phases, although the specific facility uses have not yet been decided. The size of the Phase 1 development typically corresponds with the Analysis Category I from ADOT's *Traffic Impact Analysis for Proposed Development.* Category I TIAs are generally conducted for single-phase developments. However, City of Tucson staff has identified specific roadways and intersections surrounding the project site that are beyond the study area typically analyzed for a Category I TIA. This report includes the analysis of these specified facilities.

This report identifies the impacts of the Phase 1 trips on the surrounding roadway network including Campbell Avenue, Allen Road, River Road, Roger Road and Prince Road. It also assesses the performance of the major intersections serving this project. Recommendations are provided in the report for mitigating any impacts to the surrounding roadway network the site may produce.

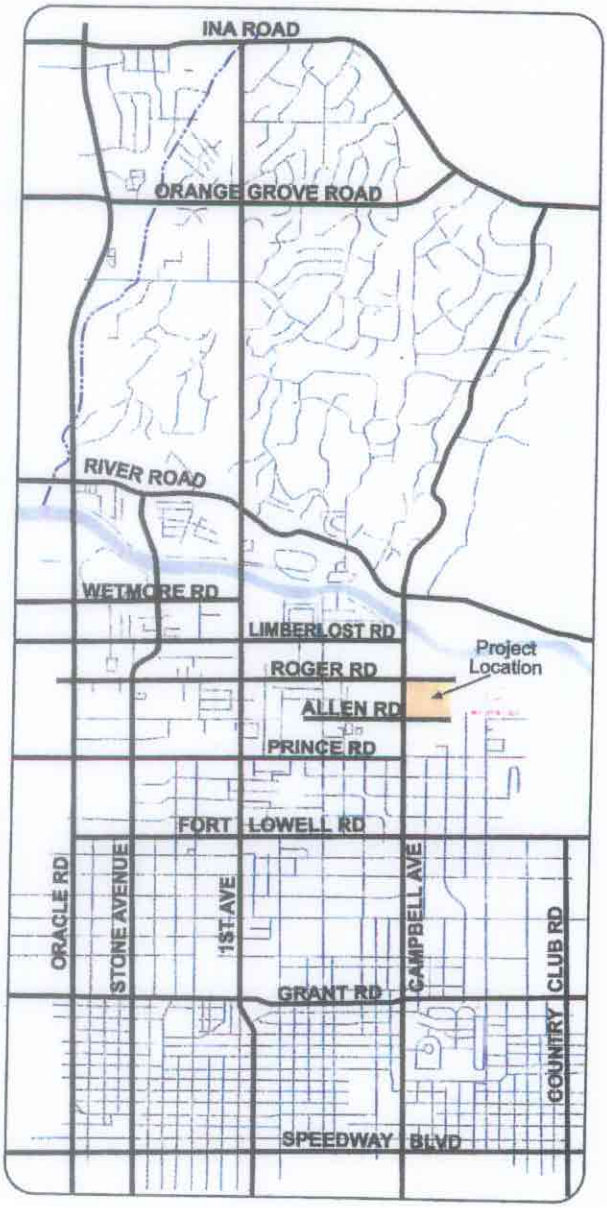


Exhibit 1 Project Location

Summary of Key Findings

- Campbell Avenue is currently over capacity based on daily traffic volumes. The addition of project trips will not degrade the roadway beyond its current LOS designation.
- The traffic signal at Campbell Avenue/Allen Road needs to be upgraded to current City of Tucson traffic signal standards. This will include the removal of existing poles and other hardware at the intersection and replacement with standard traffic signal equipment.
- Residents of the Campus Farm Neighborhood have expressed concerns about site related traffic on Allen Road. A through-traffic diverter can be provided to constrain the east-west through movements at the Campbell/Allen intersection, assuming that there is adequate right-of-way available.
- Site traffic is not expected to degrade the nearby intersections to unacceptable levels of service. In fact, the intersections of Campbell/Allen and Campbell/Roger will operate at LOS B or better with the project traffic. As the site develops, it may be necessary to add a north/south left turn phase at Campbell/Allen, however, this need will be evaluated in subsequent traffic studies for the site.
- The comparative trip generation analysis based on the **number of beds** in Tucson General Hospital shows that there would be over 1,100 additional trips associated with Phase 1 than were generated with Tucson General Hospital. However, if the **square foot analysis** is considered, Phase 1 will produce fewer trips than what were produced when Tucson General Hospital was open. The medical office daily trip rate used in the Phase 1 analysis is over twice the daily trip rate for Tucson General Hospital regardless of the trip rate category used for Tucson General Hospital. In either case, this study shows that the impact of the Phase 1 traffic on the local streets and intersections is relatively minor.

2. Proposed Development

The proposed development has the potential to contain approximately 400,000 square feet of medical-related facilities and approximately 2,200 parking spaces in 3-4 parking garages. 60,000 square feet of the facilities are part of the existing building on the northwest corner of the property. The existing loop driveways between Allen Road and a new northern driveway will be removed.

The first phase of the project will be the renovation of the existing building on the northwest corner of Campbell Avenue and Allen Road. Approximately 70,000 square feet of medical clinics will comprise this first phase. For the first phase, primary access to the project is proposed to be via the Campbell Avenue/Allen Road intersection. Surface parking will be provided east of the Phase 1 medical clinics. A schematic layout of Phase 1 of the development is provided in the appendix.

For future phases, the City of Tucson has indicated that a connection to Wilson Avenue, a short, discontinuous north/south street on the east side of the project should be improved to provide another access to the project from Roger Road. A new driveway on Campbell Avenue approximately 450 feet north of Allen Road will be limited to right-in, right-out movements only and only for service vehicles and staff use. Off-site and on-site signs will direct patients and visitors to surface drop-off and parking areas and parking garages via the intersections of Campbell/Roger and Campbell/Allen.

Land Use and Intensity

Exhibit 2 provides a summary of the proposed development through Phase 2. Land uses through Phase 2 have been proposed by the client, whereas land uses beyond Phase 2 are speculative at this time.

Exhibit 2 Proposed Land Use through Phase 2

Land Use	*Intensity*
Medical Clinics	*110,000 sf*
Temporary Housing for Patients and Families	*38,600 sf*
Parking Garages (2)	*1,250 spaces*

Of these land uses, only 70,000 square feet of medical clinics will be included in Phase 1.

Proposed Access

For Phase 1, the major access to the site will be via the existing signalized intersection of Campbell Avenue/Allen Road. A secondary access driveway will be off Campbell Avenue, approximately 450 feet north of Allen Road. The City of Tucson has indicated that a connection to Wilson Avenue, a short, discontinuous north/south street on the east side of the project should be improved to provide another access to the project from Roger Road as the site develops in later phases, and if warranted by the traffic analysis study.

Campbell Avenue would be the primary road providing access to the project. Allen Road is a local road for the Campus Farm neighborhood west of Campbell Avenue and non-residential land uses east of Campbell Avenue. Residents of the neighborhood west of Campbell Avenue have expressed concerns that the proposed project would encourage neighborhood cut-through

traffic. They have asked that the intersection be signed and/or reconstructed to provide a constraint to traffic traveling westbound from the Campbell Avenue/Allen Road intersection.

Access to the site is also provided via public transit service on Campbell Avenue. There is an existing bus stop on the east side of Campbell, immediately north of Allen Road and one on the west side of Campbell Avenue, south of Allen Road. The site is served by two Sun Tran bus routes (Routes 15 and 103). Sidewalks exist on both sides of Campbell Avenue for pedestrian access.

Development Phasing and Timing

The project will likely have more than two phases, with an ultimate buildout in 20-30 years. For the purposes of this report, Phase 1 will be the remodeling of, and addition to, the west side building and is assumed to be complete by 2006. Subsequent phasing is proposed to be: Phase 2 (by 2009), additional parking lots or parking garages and additional clinical/treatment facilities and short-term housing for patients and families; Phase 3 (buildout), additional clinical/treatment facilities and additional parking lots or garages. Only the impacts from Phase 1 are provided in this report.

3. Study Area Conditions

Study Area

The project site is located in north central Tucson. The project area roadways and intersections to be studied were identified in a meeting with City of Tucson staff. The intersections studied in this report are Campbell Avenue/River Road, Campbell Avenue/Roger Road, Campbell Avenue/Allen Road and Campbell Avenue/Prince Road.

Area of Significant Traffic Impact

The significant impact from this project is expected to be on Campbell Avenue between River Road and Prince Road.

Influence Area

The influence area of this project is expected to be city-wide, as it is the primary cancer treatment facility within Pima County. However, the traffic circulation will be affected mostly within the Campbell Avenue corridor.

Land Use

Existing land uses near the project are varied, although mostly residential. Land is zoned as O-3 on three of the four quadrants of the Campbell Avenue/Allen Road intersection. The parcel on the northeast quadrant of this intersection is zoned R-2, or Medium Density Residential.

Despite the zoning designations, the Trade Winds Apartments, are on the southwest side of this intersection, a UMC Employee park and ride lot is located on the southeast quadrant of the intersection, and an office building is on the northwest quadrant. North of the proposed project on the east side of Campbell are medical offices.

Site Access

The site will be accessed from Campbell Avenue on the west and from Allen Road on the south. Exhibit 3, Regional Transportation System illustrates the access to this area and also identifies the alternate modes available to the site.

Exhibit 3 Regional Transportation System

4. Analysis of Existing Conditions

Physical Characteristics

Existing Roads

Campbell Avenue in the vicinity of the project is a 5-lane roadway with two through lanes in each direction with a continuous left turn lane. North of River Road, it narrows to a two-lane road and enters Pima County. Campbell Avenue is posted with a 35 mph speed limit. Sidewalks exist on both sides of the roadway. North of Roger Road, Campbell Avenue is shown on the Tucson Bike Map as "for experienced riders". South of Roger Road, it is not designated as a bike route.

This road is a major north/south corridor that links the northern area of metropolitan Pima County to Valencia Road, near Tucson International Airport. Campbell Avenue transitions to Kino Boulevard near the Tucson city center and provides access to I-10 near its interchange with Ajo Way. Traffic signals are located at an average of ½ mile near the project area although the signal at Allen Road is ¼ mile from the signal at Roger Road. Direct access is provided to residential and business uses along the roadway.

Campbell Avenue - North of Allen Road

Allen Road is located south of the project site and provides access into the project via Campbell Avenue. It has two lanes on both sides of Campbell Avenue and is signed at 25 mph. West of Campbell Avenue, it serves the Campus Farm residential neighborhood. East of Campbell Avenue, it provides access to the UMC park and ride lot and existing buildings on the south side of Allen Road including a Masonic Lodge, the US Department of Agriculture Carl Hayden Bee Research lab and the University of Arizona Campus Farm. To the east of the project area, Allen Road enters the University of Arizona Campus Agricultural Center.

The intersection of Campbell Avenue/Allen Road is signalized with crosswalks on each leg. The signal is actuated with Campbell Avenue as the major road. Although the signal has a 90-second cycle, Campbell Avenue traffic has a continual green indication until Allen Road traffic arrives at the intersection.

Allen Road - East of Campbell Avenue

Other primary roads in the project area such as River Road, Roger Road and Prince Road intersect Campbell Avenue near the project site.

Exhibit 4 provides a physical inventory of the study area roadways. COT means City of Tucson, and CLT means continuous center left turn lane. Exhibit 5 illustrates the intersection laneage at the major intersections within the project area.

Exhibit 4 Roadway Inventory

Roadway Segment	Jurisdiction	No. Lanes	Median	Bike Route	Bus Route	Sidewalk	Speed Limit
Campbell Avenue	COT	5	CLT	No	Yes	Yes	35
Allen Road	COT	2	No	No	No	No	25
River Road	COT	4	Raised	Yes	Yes (west of Campbell)	Yes	45
Roger Road	COT	2	No	Yes	Yes (west of Campbell)	No	35
Prince Road	COT	5	CLT	Yes	Yes	Yes	35

Traffic Volumes and Level of Service

Level of service is a qualitative description of how well a roadway operates under prevailing traffic conditions based on average daily traffic volumes and capacity of the roadway. A grading system of A through F, similar to academic grades, is utilized. LOS A is free-flowing traffic, whereas LOS F is forced flow and extreme congestion. LOS D is generally accepted as the standard in urbanized areas. Segment performance based on daily volumes has been estimated using the planning methods from the Florida Department of Transportation (FDOT) which are based on methodologies found in the Highway Capacity Manual (HCM). Current performance of the intersections was analyzed using the Synchro 6 intersection analysis software.

Roadway Performance

Exhibit 6, Current Segment Performance, provides a summary of daily traffic, current roadway capacity, and LOS of the roadway segments serving this project. Campbell Avenue is currently operating over its LOS D capacity. Roger Road and Allen Road are operating under their LOS D capacities.

The Florida Department of Transportation (FDOT) assessment methods are widely used for planning applications. The estimated daily LOS D capacity for Campbell Avenue is for a non-state 4-lane roadway in an urban area. For Roger Road and Allen Road, the LOS D capacity is for a non-state 2-lane non-divided roadway. Criteria defining this capacity are found in the appendix. These assessment methods apply level of service standards from the Highway Capacity Manual for freeways and highways based on density, volume to capacity ratios and free-flow speeds.

There are a limited number of assessment tools for estimating daily level of service on roadways, and the FDOT assessment methods have been applied throughout the country by state and local agencies for estimating operations on roadways. Arizona and Florida have similar driver populations with many older drivers and tourists. The LOS standards and assessment methods are available online at www.dot.state.fl.us/planning.

Exhibit 5 Existing Intersection Laneage

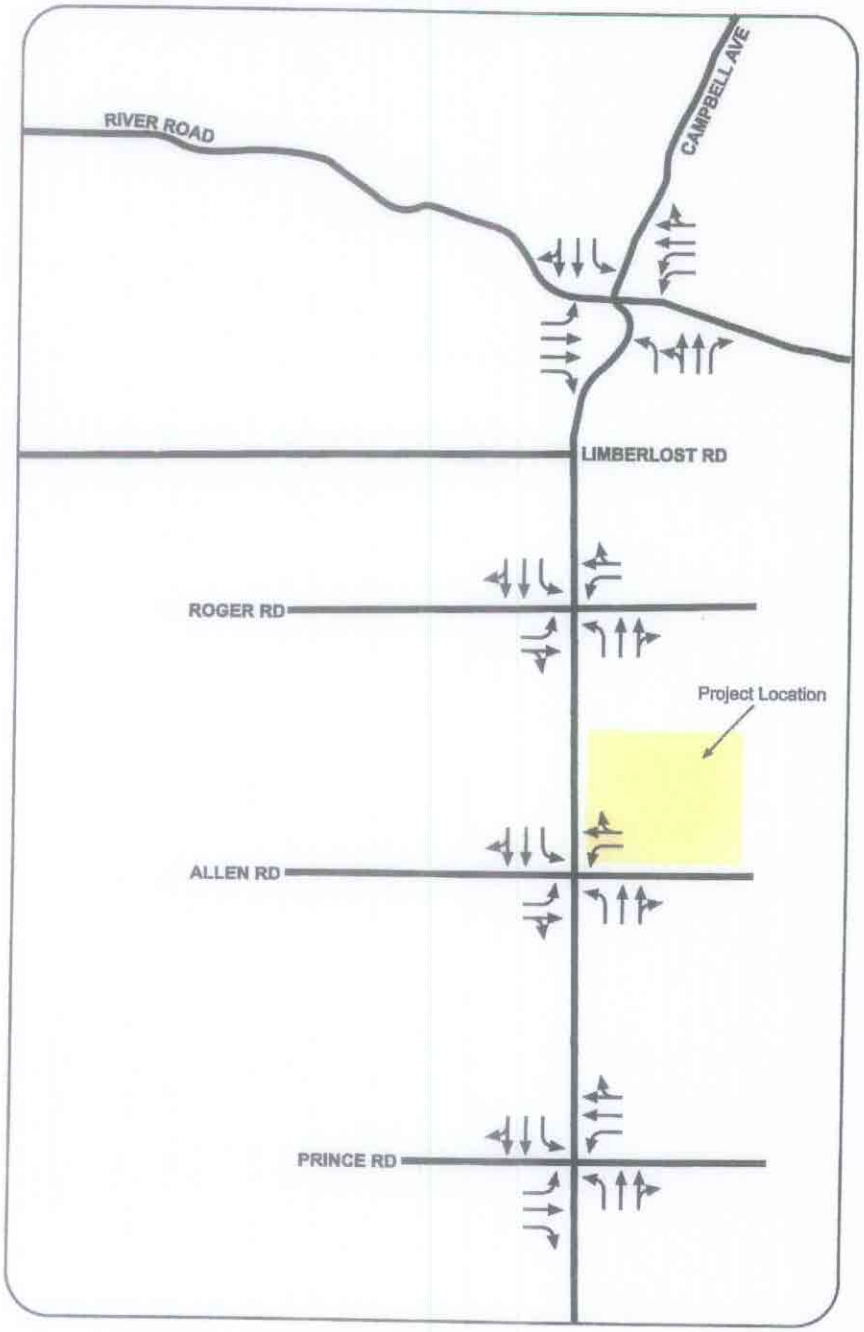


Exhibit 6 Current Segment Performance

Roadway Segment	Functional Class	Existing ADT	Source	Year	LOS D Capacity*	V/C**	Under/ Over LOS D Capacity
Campbell Avenue, North of Roger	Arterial	34,800	CLA	2004	31,100	1.1	Over
Campbell Avenue, North of Allen	Arterial	37,800	CLA	2004	31,100	1.2	Over
Campbell Avenue, North of Prince	Arterial	38,800	CLA	2004	31,100	1.2	Over
Roger Road, East of Campbell	Collector	2,600	CLA	2004	11,680	0.2	Under
Roger Road, West of Campbell	Collector	7,400	CLA	2004	11,680	0.6	Under
Allen Road, East of Campbell	Local	1,100	CLA	2004	8,000	0.1	Under
Allen Road, West of Campbell	Local	1,900	CLA	2004	8,000	0.2	Under

**Capacity based on Florida Department of Transportation Level of Service Tables*
***ADT/LOS D Capacity*

Intersection Performance

Exhibit 7 illustrates the existing morning and afternoon peak hour turning movement volumes at the study area intersections. Exhibit 8 shows the existing intersection performance at these intersections. The two signalized intersections nearest to the project both operate at LOS A or LOS B for both peak hours analyzed. The Allen Road/Campbell Avenue intersection is phased so the north/south traffic receives a continuous green indication in the absence of Allen Road traffic arriving at the intersection. At the River Road intersection, the northbound approach operates at LOS F in the PM peak hour and at the Prince Road intersection, the eastbound approach operates a LOS E in the PM peak hour. All other approaches operate at LOS D or better.

Exhibit 9 shows the queuing analysis results based on the existing intersection analysis. Queuing analyses are performed to evaluate the lane storage needs at intersections. The analysis shows that for each approach, there is adequate storage under existing conditions. It should be noted that there are long queues within the two-way left turn lane at the Prince/Campbell and River/Campbell intersections.

Exhibit 7 Current Peak Hour Turn Volumes

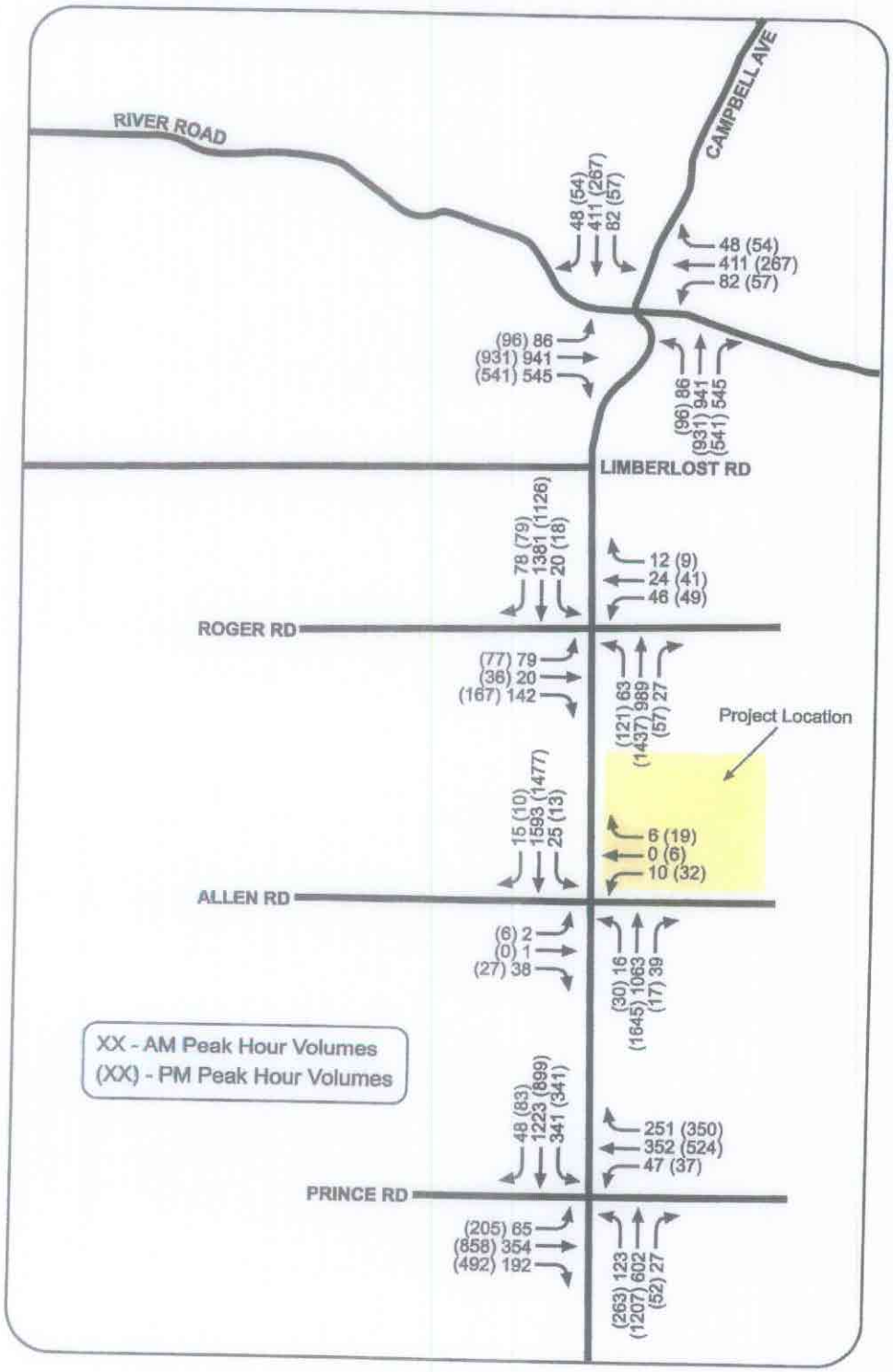


Exhibit 8 Existing Intersection Performance

INTERSECTION	EB LOS	WB LOS	NB LOS	SB LOS	Intersection LOS / Delay
Campbell/River					
Weekday AM Peak	C	C	D	D	C / 33.5
Weekday PM Peak	C	D	F	D	D / 51.3
Campbell/Roger					
Weekday AM Peak	C	D	A	A	A / 9.5
Weekday PM Peak	C	C	A	A	B / 10.4
Campbell/Allen					
Weekday AM Peak	B	B	A	A	A / 8.2
Weekday PM Peak	B	B	B	A	B / 10.2
Campbell/Prince					
Weekday AM Peak	D	C	B	C	C / 26.5
Weekday PM Peak	E	D	D	D	D / 48.8

Exhibit 9 Existing Intersection Queuing

Intersection	Lane	Existing 95th Percentile Queue (ft) – Highest Peak Hour	Existing Storage (ft)	Queue Exceeds Storage?
River Road	EB L	71	400	No
	EB R	162	1000	No
	WB L	163	400	No
	NB L	461	300*	No
	NB R	175	200	No
	SB L	78	140	No
Roger Road	EB L	95	125	No
	WB L	62	75	No
	NB L	87	TWLTL**	No
	SB L	9	TWLTL**	No
Allen Road	EB L	8	75	No
	WB L	19	75	No
	NB L	5	TWLTL**	No
	SB L	4	TWLTL**	No
Prince Road	EB L	94	100	No
	EB R	99	150	No
	WB L	47	100	No
	NB L	246	TWLTL**	No
	SB L	342	TWLTL**	No

**Storage length for inside left lane. Approach also includes a shared left/through lane.*
***TWLTL = Two Way Left Turn Lane*

Collision Data

Collision data for the four study area intersections are shown in Exhibit 10. The data were provided by ADOT for the period from 8/13/2001 to 11/13/2003. Collision rates for each intersection are also shown.

The intersections at Campbell/Prince and Campbell/River have relatively high collision rates. Typically, major intersections with collision rates over 1.0 crashes/million vehicles entering (MEV) require mitigation measures to improve the safety of the intersection. Also, with the exception of the Campbell/Roger intersection, the majority of the collisions were rear-end collisions. This is typical for signalized intersections.

Exhibit 10 Intersection Collision Summary

Location	From	No. of Crashes	Severity			Single Vehicle	Side-Swipe	Angle	Left Turn	Rear End	Back-ing	U-Turn	Head-On	Rate*
			PDO	Injury	Fatal									
Campbell/Prince	8/01 to 11/03	94	51	43	0	8	5	12	27	40	0	0	2	1.85
Campbell/Allen	8/01 to 11/03	23	6	17	0	6	0	1	1	14	1	0	0	0.83
Campbell/Roger	8/01 to 11/03	26	13	13	0	0	0	8	9	8	1	0	0	0.73
Campbell/River	8/01 to 11/03	56	30	25	1	2	4	8	19	21	0	1	1	1.34

Rate for Intersections: Crashes per Million Entering Vehicles

Alternate Modes

Public Transportation

Sheltered bus stops exist on Campbell Avenue just north and south of Allen Road. The site is currently served by SunTran routes 15 (Campbell) and 103 (Old Father Express).

Route 15 runs from the Tohono Tadai Transit center on Stone Avenue to Campbell Avenue via Roger Road and then south to 22nd Street. This route enters the University of Arizona campus and is heavily used by University of Arizona students, teachers and employees. This route also has a stop near University Medical Center south of Grant Road. The route runs on 15-minute headways most of the weekdays with hourly headways on the weekends.

Route 103 is an express route that operates during the weekday peak hours. The route begins on Ina Road near I-10 in the morning and travels east on Ina Road, south on Oracle Road, then south on Campbell Avenue via River Road. The route stops at major facilities such as UMC and the University of Arizona along its ultimate downtown destination at the Ronstadt Transit Center. There are two buses in the morning and two returning buses in the in the afternoon.

Current base fares are $1 per ride, with free transfers. Reduced fares and bus passes are available.

Bicycle Routes

Tucson is recognized internationally for its superior on-road and off-road bicycle facilities. The Pima Association of Governments bike map shows River Road and Prince Road as bike

routes. The Rillito River Park, which traverses the project area, contains paved bike paths on both sides of the Rillito River.

Pedestrian Facilities

The project site is served by pedestrian sidewalks on Campbell Avenue. The intersection at Campbell Avenue/Allen Road is signalized and has painted crosswalks. Pedestrian push buttons are located on the signal poles on the southwest, northeast and northwest corners of the intersection, although the pushbuttons are for east/west pedestrian movements only.

Park Trails

The Rillito River Park provides a continuous paved pathway from La Cholla Boulevard from the west to Campbell Avenue. The park provides ADA accessible facilities, horseback riding trails, bicycling, hiking/walking, picnic areas and restrooms.

5. Projected Traffic

Site Traffic Forecasting

The future traffic from the project is estimated using the trip rates contained in the *Institute of Traffic Engineers Trip Generation, 7th Edition,* for land-use category 720 – Medical-Dental Office Building. There is no land use category in the *Trip Generation* document associated with short-term housing for patients.

Trip generation is the mathematical product of land use intensity (building square footage, number of units, etc.) and the trip generation rate. The result is the total number of one-way trips expected to be generated by the project. These trips represent the number of vehicles estimated to enter and leave each component of the project. The forecast trips are often reduced to account for pass-by trips and diverted linked trips.

Although this report includes results related to Phase 1 of the development, a short discussion of land uses associated with later project phases is included here. It should be noted that Phase 2 land uses are not yet finalized and the development plan to include these land uses may be revised for future phases.

It is thought that most users (patients and family members) of the short-term housing facilities, a Ronald McDonald House and Hope Lodge, would remain within the medical campus area and that external trips would be minimal. The existing Ronald McDonald House on Speedway Boulevard can house up to 18 families and has between 5-10 salaried employees and between 10 to 20 volunteers per day[1]. It is assumed that the new facility will be similar in size to the existing Ronald McDonald House, but may accommodate up to 30 families, although according to UMC, many would not remain on-site. Eighteen occupied dwelling units are assumed in the trip generation analysis. Based on similar medical-related residential facilities (Congregate Care Facility, Land Use 253; Assisted Living, Land Use 254) in the *Trip Generation* document, an estimate of 2 daily trips per dwelling unit (DU) was assumed, with 0.1 trips/DU in the a.m. peak hour and 0.2 trips/DU in the p.m. peak hour. A 50/50 directional split was assumed for the daily and peak hour in/out distribution.

Trip Generation

The following exhibits provide the trip rates for the proposed uses during the average weekday and the resulting total trips through the first two phases of the project. Again, the assumptions for the Phase 2 land uses are tentative, as they may be revised in the future.

Exhibit 11 Trip Generation Rates

Land Use	ITE Land Use Code	Daily			AM Peak Hour			PM Peak Hour		
		Trip Rate	In	Out	Trip Rate	In	Out	Trip Rate	In	Out
Medical Office Building (70 ksf, Phase 1; 40 ksf, Phase 2)	720	36.13	50%	50%	2.48	79%	21%	3.72	27%	73%
Temporary Patient and Family Housing (18 Dwelling Units, Phase 2)	None	2	50%	50%	0.1	50%	50%	0.2	50%	50%

[1] Per telephone conversation with Matt Hitchcock, House Manager, Ronald McDonald House on 10/27/04.

Exhibit 12 Total Trips Generated

Land Use and Phase	# Units	Daily			AM Peak Hour			PM Peak Hour		
		Total	In	Out	Total	In	Out	Total	In	Out
Medical Office Building (70 ksf) – Phase 1	70	2,530	1,265	1,265	170	130	40	260	70	190
Add Medical Office Building (40 ksf) – Phase 2	40	3,980	1,990	1,990	270	210	60	410	110	300
Add Temporary Housing (18 DU) – Phase 2	18	4,020	2,010	2,010	272	211	61	414	112	302

External Trips

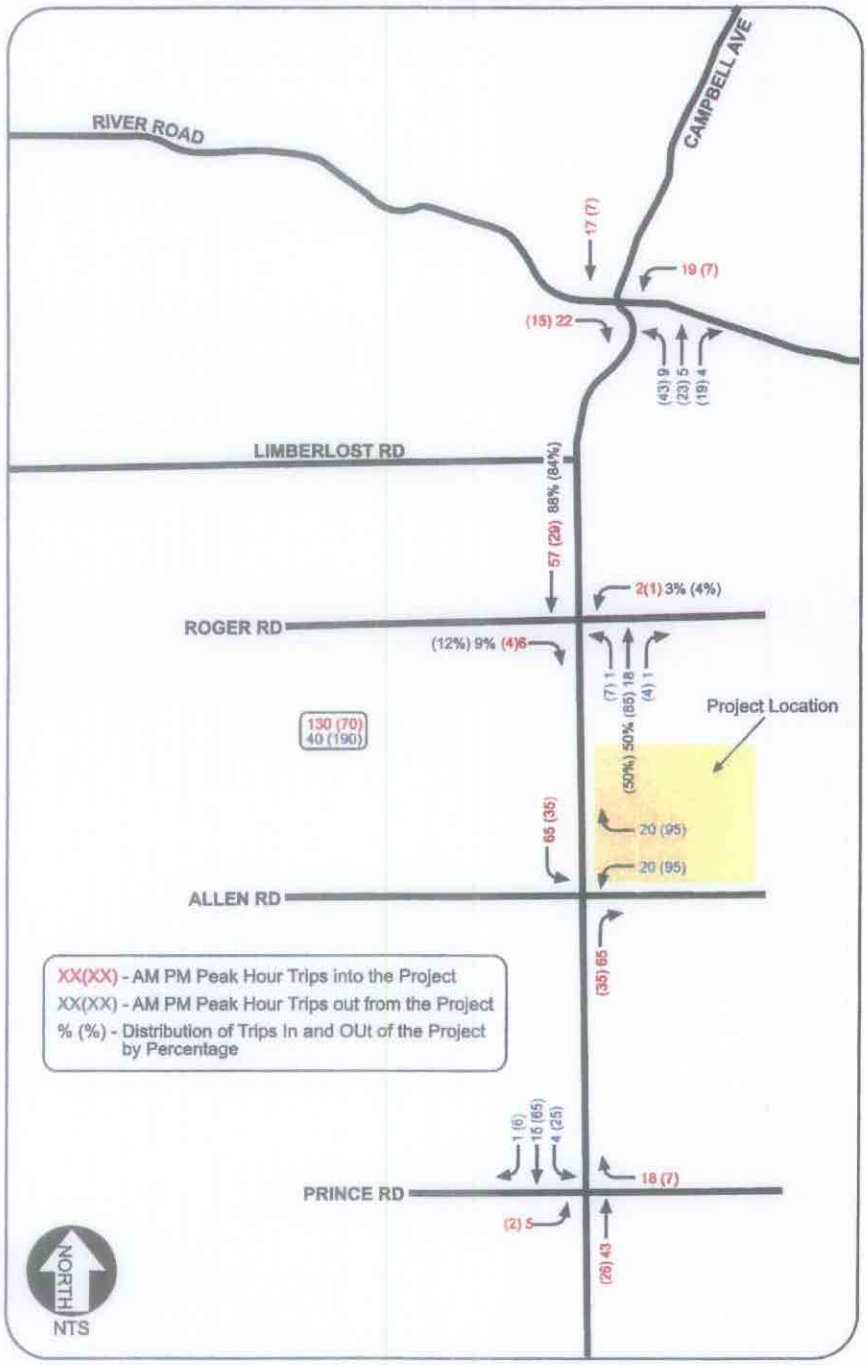
It is assumed for the purpose of this report that 100% of all trips are external trips – that is, there are no pass-by trips associated with these land uses.

Trip Distribution and Assignment

Trips generated by this project are assumed to be distributed 50% to the north of Allen Road and 50% to the south of Allen Road. Between 5% and 10% would arrive/depart via Roger Road. It is thought that the reconstruction of Wilson Avenue may increase traffic on Roger Road slightly and 20% of the site trips are distributed to Roger Road sometime after Phase 1, with the remainder distributed equally north and south of the project. Trips were distributed at the River Road/Campbell Avenue and Prince Road/Campbell Avenue based on existing turning movement patterns at those intersections.

The distributions and assignments for Phase 1 are shown in Exhibit13.

Exhibit 13 Site Traffic Distribution and Assignment – Phase 1



Non-Site Traffic Forecasting

Existing traffic (background traffic) was increased by 2 percent to represent regional growth during construction of the project. The resulting background traffic for the Phase 1 year (Year 2006) is illustrated in Exhibit 14.

Total Traffic

The future background traffic was added to the site traffic to estimate total traffic at the intersections for Phase 1. The resulting peak hour turn volumes are provided in Exhibit 15.

Exhibit 14 Year 2006 Background Traffic

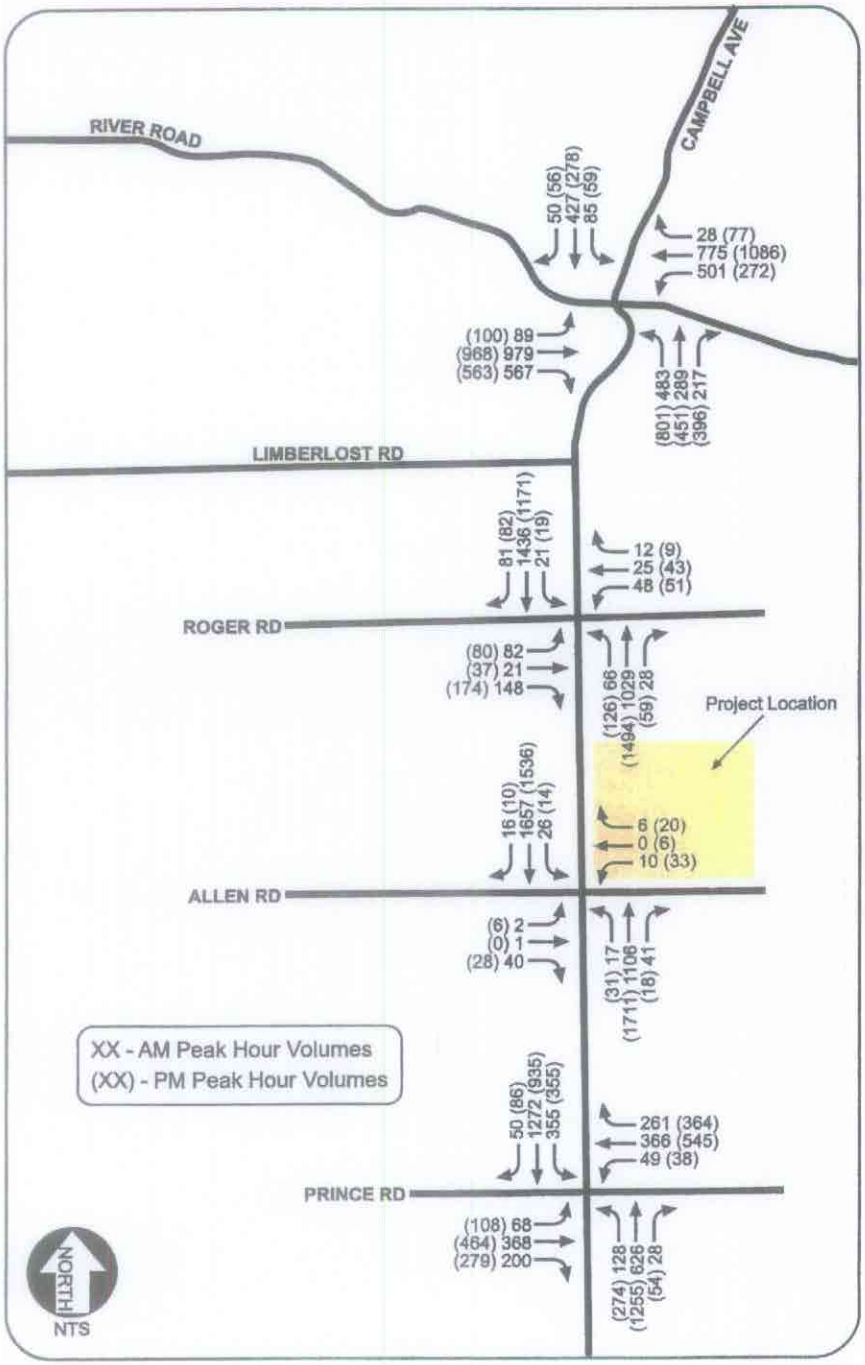
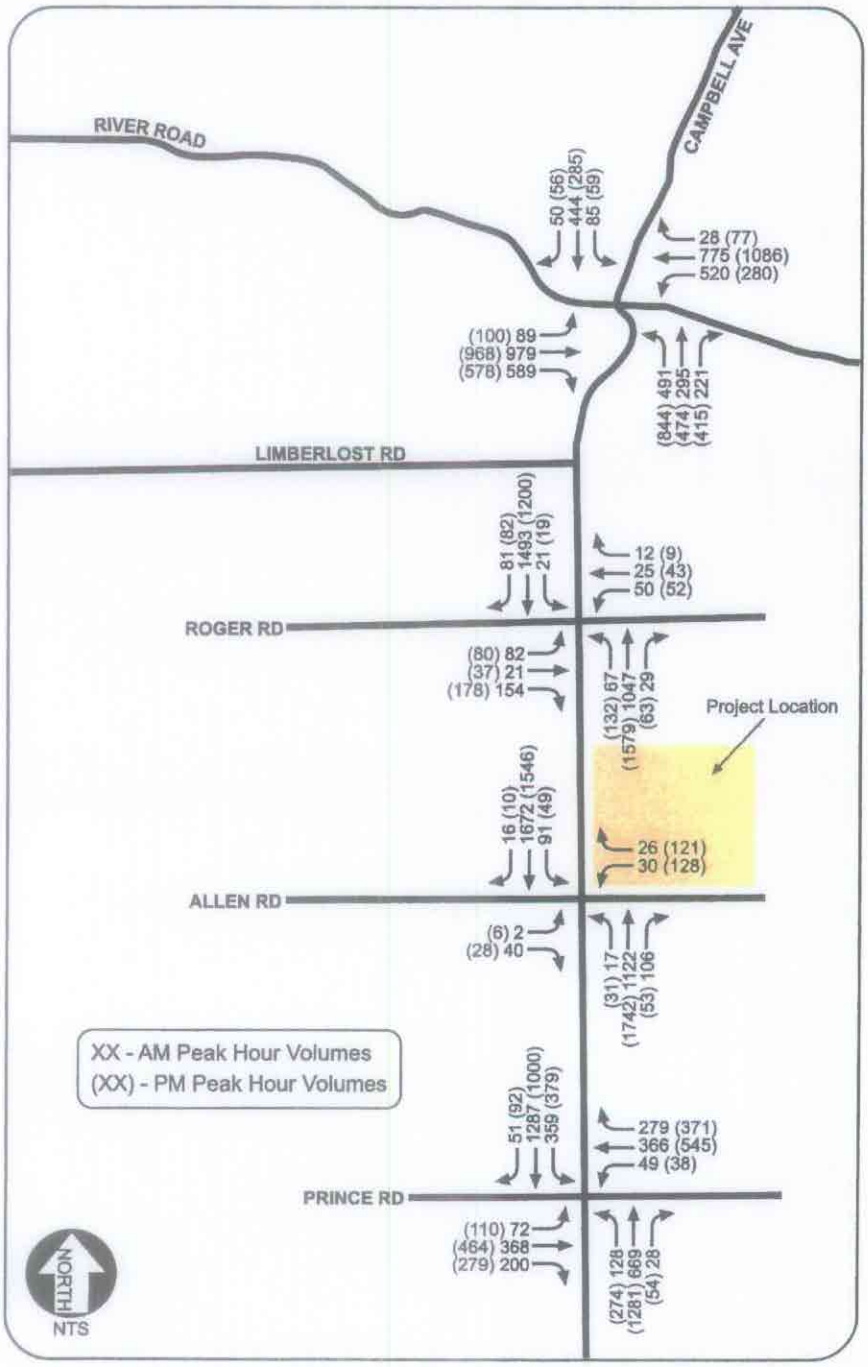


Exhibit 15 Year 2006 Total Traffic



Comparative Analysis with Tucson General Hospital Trip Generation

Tucson General Hospital was the previous user of the site property. Tucson General Hospital was a short-term hospital that had 120 beds within an approximate 155,000 square foot facility.

The trip generation of the previous hospital use is estimated from these estimates. The trip generation analysis was conducted on a per bed basis and on a per 1,000 square foot basis.

Exhibit 16 Comparative Trip Generation Analysis – Tucson General Hospital vs. Phase 1

	Daily Trip Rate	# Trips	Phase 1 Trips	Difference
TG Hospital (120 beds)	11.81	1,417	2,530	1,113
TG Hospital (155,000 sf)	17.57	2,723	2,530	-193
	Morning Trip Rate	**# Trips**	**Phase 1 Trips**	**Difference**
TG Hospital (120 beds)	1.13	136	170	34
TG Hospital (155,000 sf)	1.2	186	170	-16
	Evening Trip Rate	**# Trips**	**Phase 1 Trips**	**Difference**
TG Hospital (120 beds)	1.3	156	260	104
TG Hospital (155,000 sf)	1.18	183	260	77

Note: The "non-bed" trip rate analysis is based on trips per 1,000 square feet.

The comparative trip generation analysis based on the number of beds in Tucson General Hospital shows that there would be over 1,100 additional trips associated with Phase 1 than were generated with Tucson General Hospital. However, if the square foot analysis is considered, Phase 1 will produce fewer trips than what were produced when Tucson General Hospital was open. The medical office daily trip rate used in the Phase 1 analysis is over twice the daily trip rate for Tucson General Hospital regardless of the trip rate category used for Tucson General Hospital. In either case, the next chapter, Traffic and Circulation Analysis shows that the impact of the Phase 1 traffic on the local streets and intersections is relatively minor.

6. Traffic and Circulation Analysis

Roadway Performance

Exhibit 17 provides the existing daily volumes and future traffic forecast and roadway performance on the study area roadways for Phase 1. Daily volumes (ADTs), indicated in **bold** , show segments where the theoretical LOS D capacity of the roadway has been exceeded. Campbell Avenue is currently over capacity and the addition of additional trips on Campbell Avenue is minor.

Exhibit 17 Summary of Future LOS on Roadway Segments

Roadway Segment	Existing LOS D Capacity	Existing ADT	Year 2006 No Project	Year 2006 Project Trips	Year 2006 With Project
Campbell Avenue, North of Roger	31,100	**34,800**	**36,200**	1,100	**37,300**
Campbell Avenue, North of Allen	31,100	**37,800**	**39,300**	1,300	**40,600**
Campbell Avenue, North of Prince	31,100	**38,800**	**40,400**	1,300	**41,700**
Roger Road, East of Campbell	11,700	2,600	2,700	100	2,800
Roger Road, West of Campbell	11,700	7,400	7,700	100	7,800
Allen Road, East of Campbell	8,000	1,100	1,100	2,500	3,600
Allen Road, West of Campbell	8,000	1,900	2,000	0	2,000

Note: All volumes rounded to the nearest 100.

Intersection Performance

The intersections' performances were analyzed using the Synchro 6 analysis software. The existing configuration of each of the four intersections was assumed to remain the same for the "without project" condition, but the following conditions were added at the Campbell/Allen intersection for the "with project" conditions:

- Add separate northbound right turn lane
- Remove east/west through movement

These modifications were discussed with City staff as a condition of PAD approval and to respond to neighbors concerns about cut-through traffic on Allen Road.

The results of the intersection performance analyses are provided in Exhibit 18 and show that the impact of the project will not significantly change the future performance of the intersections. Although some of the intersection approaches are expected to operate at LOS E, this is primarily due to the increase in traffic volumes expected over the forecast years.

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Exhibit 18 Summary of Future Intersection Performance

INTERSECTION	Eastbound		Westbound		Northbound		Southbound		Intersection	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
AM PEAK HOUR										
Campbell/River										
2006 – Without Project	C	28.3	C	40.6	D	47.6	D	50.1	D	38.8
2006 – With Project	C	28.8	D	43.6	D	49.5	D	53.6	D	40.8
Campbell/Roger										
2006 – Without Project	C	31.8	C	33.8	A	7.3	A	6.5	A	9.7
2006 – With Project	C	33.4	D	35.8	A	7.0	A	6.8	A	9.9
Campbell/Allen										
2006 – Without Project	B	13.0	B	18.2	A	7.0	A	9.0	A	8.3
2006 – With Project	B	13.1	C	21.9	A	6.3	A	8.2	A	7.8
Campbell/Prince										
2006 – Without Project	D	43.6	C	29.1	B	18.9	B	19.0	C	24.9
2006 – With Project	D	43.8	C	29.3	B	19.5	C	22.7	C	26.7
PM PEAK HOUR										
Campbell/River										
2006 – Without Project	C	26.6	D	49.6	F	113.7	E	66.7	E	64.2
2006 – With Project	C	27.2	D	52.7	F	122.1	E	69.7	E	69.0
Campbell/Roger										
2006 – Without Project	C	27.7	D	36.9	B	14.7	A	5.7	B	13.1
2006 – With Project	C	28.9	D	45.1	B	13.6	A	5.8	B	12.9
Campbell/Allen										
2006 – Without Project	A	9.3	C	24.5	B	15.9	A	8.2	B	12.5
2006 – With Project	B	16.4	C	30.8	B	14.7	A	7.2	B	12.6
Campbell/Prince										
2006 – Without Project	E	73.0	E	70.6	E	60.7	D	39.7	E	58.8
2006 – With Project	E	77.3	E	71.3	E	75.0	D	44.6	E	65.5

Storage Lane Lengths

The storage lane lengths are an output in the Synchro analysis and are based on the 95th percentile expected queue at the intersections. The recommended changes based on Phase 1 traffic are provided in Exhibit 19.

Exhibit 19 Recommended Storage Lane Lengths

Intersection	Lane	Year 2006 95th Percentile Queue (ft) – Highest Peak Hour	Existing Storage (ft)	Queue Exceeds Storage?	Recommended Change
River Road	EB L	123	400	No	None
	EB R	250	1000	No	None
	WB L	222	400	No	None
	NB L	603	300*	Yes	City to Monitor – increase not site specific
	NB R	302	200	Yes	City to Monitor – increase not site specific
	SB L	92	140	No	None
Roger Road	EB L	93	125	No	None
	WB L	95	75	Yes	None, but monitor and reevaluate for future phases
	NB L	79	TWLTL**	No	None
	SB L	11	TWLTL**	No	None
Allen Road	EB L	16	75	No	None
	WB L	134	75	Yes	Design for expected queue, say 150'.
	WB R	106	N/A***	N/A	Design for expected queue, say 150'.
	NB L	6	TWLTL**	No	None
	NB R	6	N/A***	N/A	None
	SB L	43	TWLTL**	No	None
Prince Road	EB L	108	100	Yes	None
	EB R	114	150	No	None
	WB L	49	100	No	None
	NB L	238	TWLTL**	No	None
	SB L	401	TWLTL**	No	None

**Storage length for inside left lane. Approach also includes a shared left/through lane.*
***TWLTL = Two Way Left Turn Lane*
****N/A = Not applicable because no existing separate turn lane.*

Traffic Control Needs

The neighborhood west of Campbell Avenue wishes to restrict eastbound and westbound traffic through their neighborhood. A low-cost solution for this would be to sign the eastbound and westbound approaches to the intersection with left turn only and right turn only signs, as well as providing pavement markings on the two approach lanes with a left turn only arrow and a right turn only arrow. In this way northbound left turns and southbound right turns could still access Allen Road. A local example of this is found at the intersection of Thornydale Road/Horizon Hills Road in the Town of Marana for the eastbound and westbound approaches.

A more costly alternative would be to build a raised diverter similar to what the City of Tucson has placed at the 6th Street/Park Avenue intersection south of the University of Arizona. This raised diverter would allow for left and right turns from Allen Road, but not allow through vehicles on Allen Road. The northbound left turn and the southbound right turn movements would still be allowed.

At the Campbell Avenue/Allen Road intersection, based on discussions with City of Tucson staff, it is recommended that an exclusive northbound right turn lane be constructed. Although the intersection analysis shows that this intersection will operate acceptably without a right turn lane, the additional project traffic will increase the percentage of right turning vehicles on this approach. A right turn lane will reduce the potential for rear-end and other types of crashes at this intersection. For the east leg (westbound approach), there should be one exclusive left turn lane and one exclusive right turn lane.

Immediately north of Allen Road, a bus turnout should be constructed for the current stop location. This turnout should be constructed per Bus Bay Detail #2 shown in the current *Transportation Access Management Guidelines for the City of Tucson*. This widening will require the reconstruction of the sidewalk in front of the UMC North Building on Campbell Avenue. City staff recommends that this bus turnout should include a "knuckle" on the northeast corner of the curb to keep traffic turning right from Allen Road onto northbound Campbell Avenue from entering the bus bay.

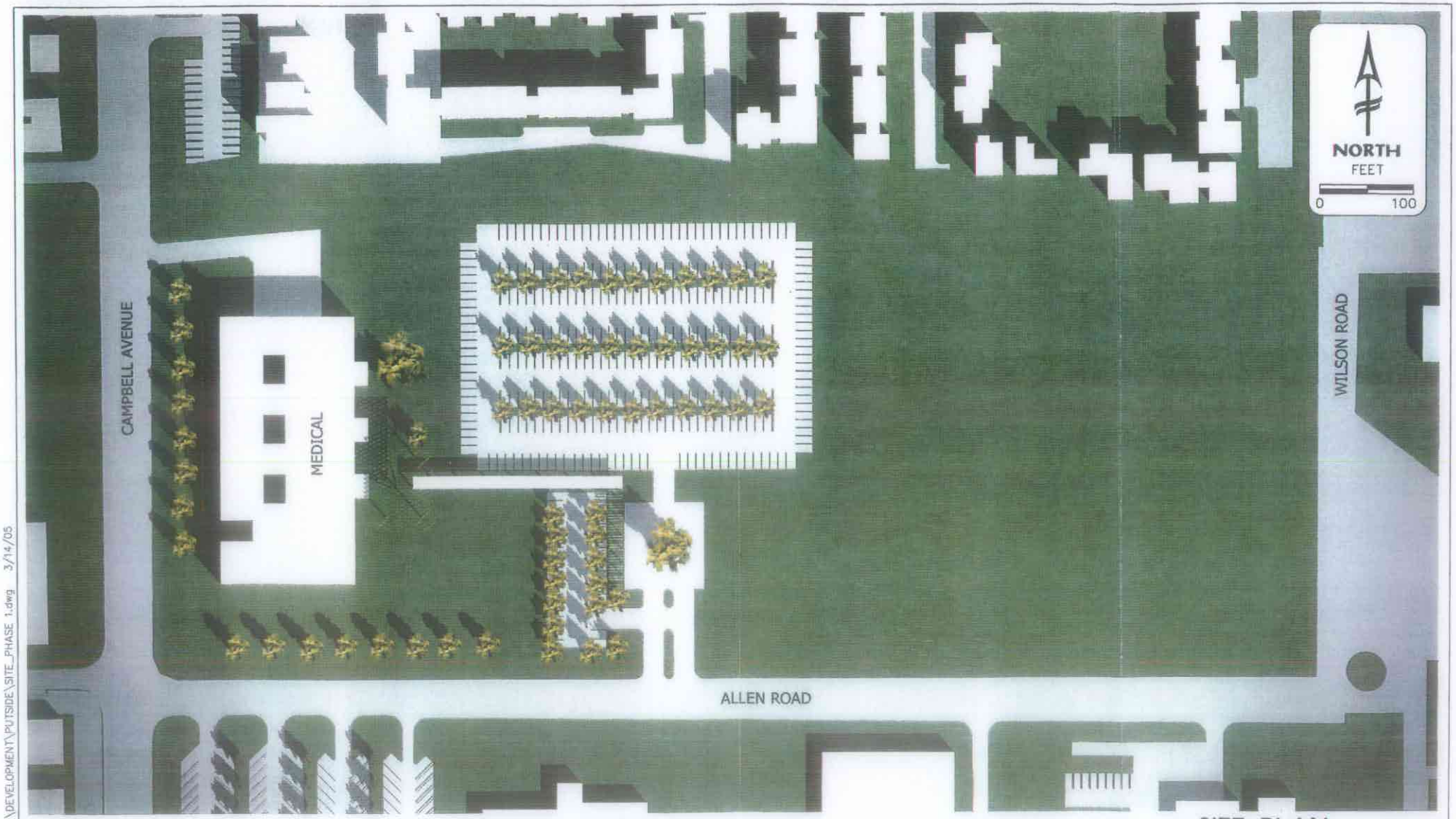
7. Recommendations and Conclusions

- Campbell Avenue is currently over capacity based on daily traffic volumes. The addition of project trips in Phase 1 will not degrade the roadway beyond its current LOS designation.
- The traffic signal at Campbell Avenue/Allen Road needs to be upgraded to current City of Tucson traffic signal standards. This will include the removal of existing poles and other hardware at the intersection and replacement with standard traffic signal equipment.
- A northbound right turn lane at the Campbell/Allen intersections is recommended to reduce the potential for rear-end collisions associated with the addition of site related trips at this intersection.
- Residents of the Campus Farm Neighborhood have expressed concerns about site related traffic on Allen Road. A through traffic diverter can be provided to constrain the east-west through movements at the Campbell/Allen intersection, assuming that there is adequate right-of-way available.
- Site traffic is not expected to degrade the nearby intersections to unacceptable levels of service. In fact, the intersections of Campbell/Allen and Campbell/Roger will operate at LOS B or better with the project traffic. As the site develops, it may be necessary to add a north/south left turn phase at Campbell/Allen, however, this need will be evaluated in subsequent traffic studies for the site.
- The use of Wilson Avenue will be addressed in the traffic analysis report for the next phase of the UMC North Medical Park expansion.
- When the development will expand to include additional medical facilities, it will be necessary to conduct another traffic analysis to identify impacts to the local roadway system associated with this expansion.
- The comparative trip generation analysis based on the **number of beds** in Tucson General Hospital shows that there would be over 1,100 additional trips associated with Phase 1 than were generated with Tucson General Hospital. However, if the **square foot analysis** is considered, Phase 1 will produce fewer trips than what were produced when Tucson General Hospital was open. The medical office daily trip rate used in the Phase 1 analysis is over twice the daily trip rate for Tucson General Hospital regardless of the trip rate category used for Tucson General Hospital. In either case, this study shows that the impact of the Phase 1 traffic on the local streets and intersections is relatively minor.

APPENDIX

APPENDICES

- Phase 1 Concept (Campbell Avenue is at top of the sheet)
- Synchro Analysis Sheets



TETRA TECH, INC.

SITE PLAN
UMC NORTH MEDICAL PARK
PHASE 1

P:\PUMC4669\DEVELOPMENT\PUTSIDE\SITE_PHASE 1.dwg 3/14/05

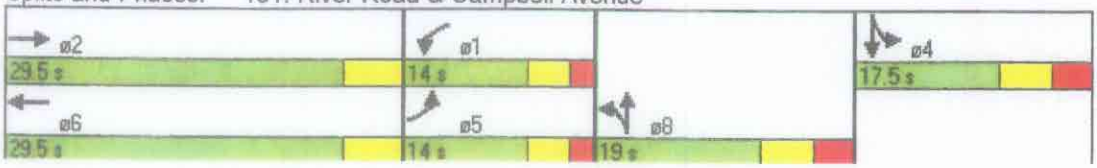
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		1000	400		400	300		200	140		200
Storage Lanes	1		1	2		0	1		1	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	3539	1583	3433	3522	0	1610	3316	1583	1770	3483	0
Flt Permitted	0.157			0.157			0.950	0.978		0.950		
Satd. Flow (perm)	292	3539	1583	567	3522	0	1610	3316	1583	1770	3483	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			434		5				222		13	
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		1236			1220			2840			753	
Travel Time (s)		18.7			18.5			55.3			14.7	
Volume (vph)	86	941	545	482	745	27	464	278	209	82	411	48
Peak Hour Factor	0.97	0.97	0.97	0.92	0.92	0.92	0.94	0.94	0.94	0.97	0.97	0.97
Lane Group Flow (vph)	89	970	562	524	839	0	254	536	222	85	473	0
Turn Type	pm+pt		Perm	pm+pt			Split		Perm	Split		
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6					8			
Detector Phases	5	2	2	1	6		8	8	8	4	4	
Minimum Initial (s)	4.0	3.0	3.0	4.0	3.0		10.5	10.5	10.5	10.5	10.5	
Minimum Split (s)	9.0	10.0	10.0	9.0	10.5		17.5	17.5	17.5	17.5	17.5	
Total Split (s)	14.0	29.5	29.5	14.0	29.5	0.0	19.0	19.0	19.0	17.5	17.5	0.0
Total Split (%)	17.5%	36.9%	36.9%	17.5%	36.9%	0.0%	23.8%	23.8%	23.8%	21.9%	21.9%	0.0%
Yellow Time (s)	3.0	4.5	4.5	3.0	4.5		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	0.0	0.0	2.0	0.0		3.0	3.0	3.0	3.0	3.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		Min	Min	Min	Min	Min	
Act Effct Green (s)	34.4	25.0	25.0	35.0	25.0		15.0	15.0	15.0	13.5	13.5	
Actuated g/C Ratio	0.42	0.31	0.31	0.44	0.31		0.19	0.19	0.19	0.17	0.17	
v/c Ratio	0.30	0.87	0.71	0.86	0.76		0.84	0.86	0.46	0.28	0.78	
Uniform Delay, d1	14.9	25.7	4.8	26.8	24.3		31.0	31.2	0.0	28.8	30.7	
Control Delay	20.6	35.2	11.2	42.7	29.2		56.5	46.6	7.9	32.0	41.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	20.6	35.2	11.2	42.7	29.2		56.5	46.6	7.9	32.0	41.6	
LOS	C	D	B	D	C		E	D	A	C	D	
Approach Delay		26.0			34.4			40.6			40.1	
Approach LOS		C			C			D			D	
Queue Length 50th (ft)	22	236	47	76	193		136	143	0	38	117	
Queue Length 95th (ft)	46	#344	162	#163	261		#273	#232	56	78	#187	
Internal Link Dist (ft)		1156			1140			2760			673	
Turn Bay Length (ft)	400		1000	400			300		200	140		
Base Capacity (vph)	305	1128	800	610	1126		304	626	479	301	603	
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	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0		0	0	0	8	0	
Reduced v/c Ratio	0.29	0.86	0.70	0.86	0.75		0.84	0.86	0.46	0.29	0.78	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 79.5
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 33.5 Intersection LOS: C
Intersection Capacity Utilization 80.1% 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.

Splits and Phases: 181: River Road & Campbell Avenue



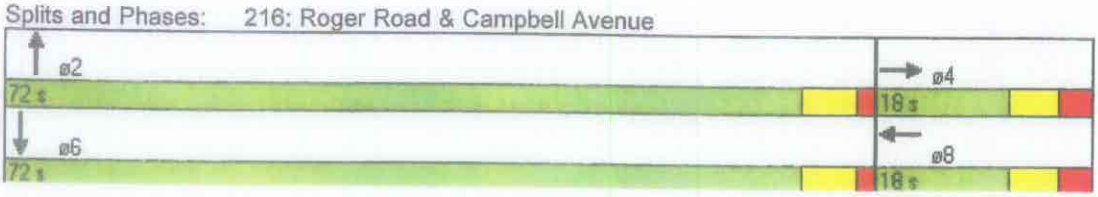
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		0	75		0	300		0	300		0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	1617	0	1770	1771	0	1770	3525	0	1770	3511	0
Flt Permitted	0.729			0.439			0.108			0.219		
Satd. Flow (perm)	1358	1617	0	818	1771	0	201	3525	0	408	3511	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		66			14			9			19	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1053			1043			1333			2840	
Travel Time (s)		20.5			20.3			26.0			55.3	
Volume (vph)	79	20	142	46	24	12	63	989	27	20	1381	78
Peak Hour Factor	0.90	0.90	0.90	0.84	0.84	0.84	0.88	0.88	0.88	0.87	0.87	0.87
Lane Group Flow (vph)	88	180	0	55	43	0	72	1155	0	23	1677	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	1.0	1.0		1.0	1.0		9.0	9.0		11.0	11.0	
Minimum Split (s)	8.0	8.0		8.0	8.0		15.0	15.0		17.0	17.0	
Total Split (s)	18.0	18.0	0.0	18.0	18.0	0.0	72.0	72.0	0.0	72.0	72.0	0.0
Total Split (%)	20.0%	20.0%	0.0%	20.0%	20.0%	0.0%	80.0%	80.0%	0.0%	80.0%	80.0%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.5	4.5		4.5	4.5	
All-Red Time (s)	3.0	3.0		3.0	3.0		1.5	1.5		1.5	1.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Min	C-Min		Min	Min	
Act Effct Green (s)	13.6	13.6		13.6	13.6		68.4	68.4		68.4	68.4	
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.76	0.76		0.76	0.76	
v/c Ratio	0.43	0.60		0.44	0.15		0.47	0.43		0.07	0.63	
Uniform Delay, d1	34.6	22.2		34.8	22.2		4.0	3.8		2.7	4.9	
Control Delay	39.4	28.9		43.6	25.1		19.3	6.0		3.8	6.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	39.4	28.9		43.6	25.1		19.3	6.0		3.8	6.4	
LOS	D	C		D	C		B	A		A	A	
Approach Delay		32.4			35.5			6.8			6.4	
Approach LOS		C			D			A			A	
Queue Length 50th (ft)	45	59		28	14		18	146		3	195	
Queue Length 95th (ft)	93	128		62	40		63	126		8	221	
Internal Link Dist (ft)		973			963			1253			2760	
Turn Bay Length (ft)	125			75			300			300		
Base Capacity (vph)	225	323		136	305		155	2717		314	2708	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.39	0.56		0.40	0.14		0.46	0.43		0.07	0.62	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 75 (83%), Referenced to phase 2:NBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.63
Intersection Signal Delay: 9.5 Intersection LOS: A
Intersection Capacity Utilization 74.6% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 216: Roger Road & Campbell Avenue



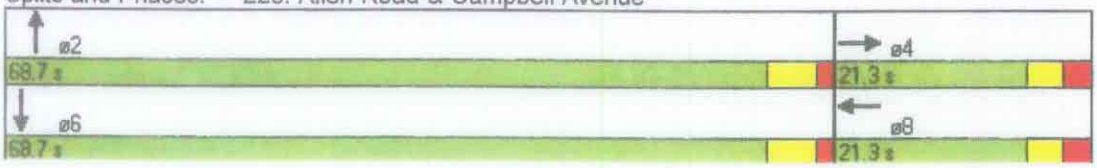
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	75		0	75		0	300		0	300		0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	1589	0	1770	1583	0	1770	3522	0	1770	3536	0
Flt Permitted	0.752			0.722			0.085			0.197		
Satd. Flow (perm)	1401	1589	0	1345	1583	0	158	3522	0	367	3536	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		41			128			10			2	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		1383			1014			1344			1333	
Travel Time (s)		37.7			27.7			26.2			26.0	
Volume (vph)	2	1	38	10	0	6	16	1063	39	25	1593	15
Peak Hour Factor	0.73	0.73	0.73	0.77	0.77	0.77	0.91	0.91	0.91	0.91	0.91	0.91
Lane Group Flow (vph)	3	53	0	13	8	0	18	1211	0	27	1767	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	1.0	1.0		1.0	1.0		9.5	9.5		9.5	9.5	
Minimum Split (s)	6.5	6.5		6.5	6.5		15.0	15.0		15.0	15.0	
Total Split (s)	21.3	21.3	0.0	21.3	21.3	0.0	68.7	68.7	0.0	68.7	68.7	0.0
Total Split (%)	23.7%	23.7%	0.0%	23.7%	23.7%	0.0%	76.3%	76.3%	0.0%	76.3%	76.3%	0.0%
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.5	2.5		2.5	2.5		1.5	1.5		1.5	1.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Ped	Ped		Ped	Ped		C-Min	C-Min		Min	Min	
Act Effct Green (s)	20.7	20.7		20.7	20.7		61.3	61.3		61.3	61.3	
Actuated g/C Ratio	0.23	0.23		0.23	0.23		0.68	0.68		0.68	0.68	
v/c Ratio	0.01	0.13		0.04	0.02		0.17	0.50		0.11	0.73	
Uniform Delay, d1	26.7	6.1		26.9	0.0		5.2	6.9		4.9	9.1	
Control Delay	28.5	13.5		28.7	0.0		7.2	7.7		3.2	8.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	28.5	13.5		28.7	0.0		7.2	7.7		3.2	8.2	
LOS	C	B		C	A		A	A		A	A	
Approach Delay		14.3			17.8			7.7			8.2	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)	1	5		6	0		3	147		2	346	
Queue Length 95th (ft)	7	25		19	0		m5	96		m4	109	
Internal Link Dist (ft)		1303			934			1264			1253	
Turn Bay Length (ft)	75			75			300			300		
Base Capacity (vph)	322	397		309	462		114	2535		264	2543	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.01	0.13		0.04	0.02		0.16	0.48		0.10	0.69	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 8 (9%), Referenced to phase 2:NBTL, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 8.2 Intersection LOS: A
Intersection Capacity Utilization 58.4% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 220: Allen Road & Campbell Avenue



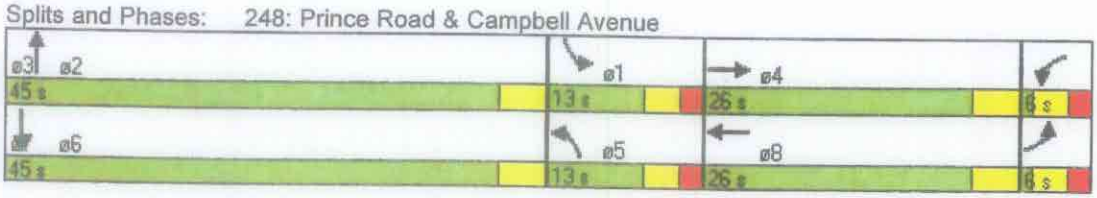
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		150	100		0	300		0	300		0
Storage Lanes	1		1	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	1863	1583	1770	3320	0	1770	3518	0	1770	3518	0
Flt Permitted	0.182			0.182			0.098			0.328		
Satd. Flow (perm)	339	1863	1583	339	3320	0	183	3518	0	611	3518	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			194		191			6			6	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1208			1458			487			1344	
Travel Time (s)		23.5			28.4			9.5			26.2	
Volume (vph)	65	354	192	47	352	251	123	602	27	341	1223	48
Peak Hour Factor	0.85	0.85	0.85	0.84	0.84	0.84	0.96	0.96	0.96	0.85	0.85	0.85
Lane Group Flow (vph)	76	416	226	56	718	0	128	655	0	401	1495	0
Turn Type	pm+pt		Perm	pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Detector Phases	7	4	4	3	8		5	2		1	6	
Minimum Initial (s)	1.0	11.0	11.0	1.0	11.0		1.0	11.0		1.0	11.0	
Minimum Split (s)	6.0	15.0	15.0	6.0	15.0		6.0	15.0		6.0	15.0	
Total Split (s)	6.0	26.0	26.0	6.0	26.0	0.0	13.0	45.0	0.0	13.0	45.0	0.0
Total Split (%)	6.7%	28.9%	28.9%	6.7%	28.9%	0.0%	14.4%	50.0%	0.0%	14.4%	50.0%	0.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	0.0	0.0	2.0	0.0		2.0	0.0		2.0	0.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Min		None	C-Min	
Act Effct Green (s)	24.5	21.9	21.9	24.5	21.9		51.3	42.4		51.3	42.4	
Actuated g/C Ratio	0.27	0.24	0.24	0.27	0.24		0.57	0.47		0.57	0.47	
v/c Ratio	0.58	0.92	0.42	0.42	0.75		0.49	0.39		0.87	0.90	
Uniform Delay, d1	27.9	33.1	3.7	25.9	22.7		20.5	15.9		19.7	22.7	
Control Delay	48.9	60.3	9.1	38.6	28.5		29.2	16.6		28.7	20.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	48.9	60.3	9.1	38.6	28.5		29.2	16.6		28.7	20.8	
LOS	D	E	A	D	C		C	B		C	C	
Approach Delay		43.0			29.3			18.7			22.5	
Approach LOS		D			C			B			C	
Queue Length 50th (ft)	31	231	14	23	147		29	125		59	278	
Queue Length 95th (ft)	#72	#366	61	47	190		72	168		#176	#329	
Internal Link Dist (ft)		1128			1378			407			1264	
Turn Bay Length (ft)	100		150	100			300			300		
Base Capacity (vph)	132	455	534	132	956		263	1660		464	1660	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.58	0.91	0.42	0.42	0.75		0.49	0.39		0.86	0.90	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 30 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 26.5 Intersection LOS: C
Intersection Capacity Utilization 77.4% 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.

Splits and Phases: 248: Prince Road & Campbell Avenue



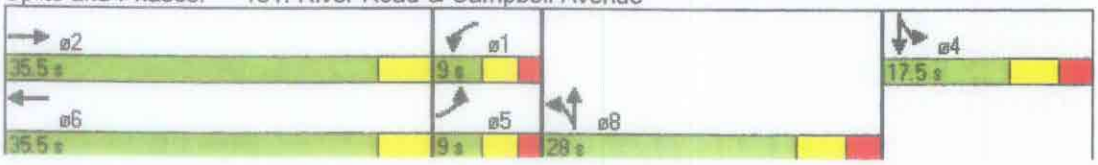
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		1000	400		400	300		200	140		200
Storage Lanes	1		1	2		0	1		1	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	3539	1583	3433	3504	0	1610	3312	1583	1770	3451	0
Flt Permitted	0.127			0.127			0.950	0.977		0.950		
Satd. Flow (perm)	237	3539	1583	459	3504	0	1610	3312	1583	1770	3451	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			595		9				262		22	
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		1236			1220			2840			753	
Travel Time (s)		18.7			18.5			55.3			14.7	
Volume (vph)	96	931	541	262	1044	74	770	434	381	57	267	54
Peak Hour Factor	0.91	0.91	0.91	0.92	0.92	0.92	0.93	0.93	0.93	0.96	0.96	0.96
Lane Group Flow (vph)	105	1023	595	285	1215	0	417	878	410	59	334	0
Turn Type	pm+pt		Perm	pm+pt			Split		Perm	Split		
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6					8			
Detector Phases	5	2	2	1	6		8	8	8	4	4	
Minimum Initial (s)	4.0	3.0	3.0	4.0	3.0		10.5	10.5	10.5	10.5	10.5	
Minimum Split (s)	9.0	10.0	10.0	9.0	10.5		17.5	17.5	17.5	17.5	17.5	
Total Split (s)	9.0	35.5	35.5	9.0	35.5	0.0	28.0	28.0	28.0	17.5	17.5	0.0
Total Split (%)	10.0%	39.4%	39.4%	10.0%	39.4%	0.0%	31.1%	31.1%	31.1%	19.4%	19.4%	0.0%
Yellow Time (s)	3.0	4.5	4.5	3.0	4.5		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	0.0	0.0	2.0	0.0		3.0	3.0	3.0	3.0	3.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		Min	Min	Min	Min	Min	
Act Effct Green (s)	36.6	31.5	31.5	36.5	31.5		24.0	24.0	24.0	13.5	13.5	
Actuated g/C Ratio	0.40	0.35	0.35	0.41	0.35		0.27	0.27	0.27	0.15	0.15	
v/c Ratio	0.59	0.83	0.63	0.81	0.99		0.97	0.99	0.67	0.22	0.62	
Uniform Delay, d1	24.6	26.7	0.0	29.6	28.8		32.6	32.9	9.8	33.6	33.4	
Control Delay	41.5	33.7	5.4	49.1	52.6		71.8	63.3	16.5	36.1	39.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	51.8	0.0	0.0	0.0	
Total Delay	41.5	33.7	5.4	49.1	52.6		71.8	115.1	16.5	36.2	39.2	
LOS	D	C	A	D	D		E	F	B	D	D	
Approach Delay		24.4			51.9			80.8			38.7	
Approach LOS		C			D			F			D	
Queue Length 50th (ft)	34	276	0	48	354		257	274	69	30	88	
Queue Length 95th (ft)	#71	357	72	#94	#506		#461	#410	175	66	133	
Internal Link Dist (ft)		1156			1140			2760			673	
Turn Bay Length (ft)	400		1000	400			300		200	140		
Base Capacity (vph)	178	1239	941	351	1232		429	883	614	266	536	
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	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0		0	111	0	8	0	
Reduced v/c Ratio	0.59	0.83	0.63	0.81	0.99		0.97	1.14	0.67	0.23	0.62	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.99
Intersection Signal Delay: 51.3 Intersection LOS: D
Intersection Capacity Utilization 81.9% 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.

Splits and Phases: 181: River Road & Campbell Avenue



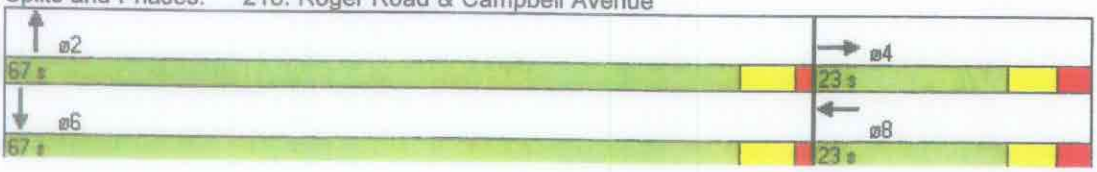
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		0	75		0	300		0	300		0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	1619	0	1770	1786	0	1770	3525	0	1770	3500	0
Flt Permitted	0.711			0.293			0.184			0.102		
Satd. Flow (perm)	1324	1619	0	546	1786	0	343	3525	0	190	3500	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		124			19			7			22	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1053			1043			1333			2840	
Travel Time (s)		20.5			20.3			26.0			55.3	
Volume (vph)	90	31	216	35	36	13	130	1476	42	12	1004	79
Peak Hour Factor	0.86	0.86	0.86	0.70	0.70	0.70	0.93	0.93	0.93	0.87	0.87	0.87
Lane Group Flow (vph)	105	287	0	50	70	0	140	1632	0	14	1245	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	1.0	1.0		1.0	1.0		9.0	9.0		11.0	11.0	
Minimum Split (s)	8.0	8.0		8.0	8.0		15.0	15.0		17.0	17.0	
Total Split (s)	23.0	23.0	0.0	23.0	23.0	0.0	67.0	67.0	0.0	67.0	67.0	0.0
Total Split (%)	25.6%	25.6%	0.0%	25.6%	25.6%	0.0%	74.4%	74.4%	0.0%	74.4%	74.4%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.5	4.5		4.5	4.5	
All-Red Time (s)	3.0	3.0		3.0	3.0		1.5	1.5		1.5	1.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Min	C-Min		Min	Min	
Act Effct Green (s)	16.6	16.6		16.6	16.6		65.4	65.4		65.4	65.4	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.73	0.73		0.73	0.73	
v/c Ratio	0.43	0.72		0.50	0.20		0.56	0.64		0.10	0.49	
Uniform Delay, d1	32.5	19.1		32.9	22.4		5.7	6.2		3.6	5.1	
Control Delay	35.3	25.7		43.4	23.7		17.8	7.0		6.6	6.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	35.3	25.7		43.4	23.7		17.8	7.0		6.6	6.3	
LOS	D	C		D	C		B	A		A	A	
Approach Delay		28.3			31.9			7.8			6.3	
Approach LOS		C			C			A			A	
Queue Length 50th (ft)	53	85		25	24		23	174		2	136	
Queue Length 95th (ft)	95	157		47	43		87	245		9	176	
Internal Link Dist (ft)		973			963			1253			2760	
Turn Bay Length (ft)	125			75			300			300		
Base Capacity (vph)	288	449		118	402		251	2586		139	2571	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.36	0.64		0.42	0.17		0.56	0.63		0.10	0.48	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 75 (83%), Referenced to phase 2:NBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 10.4 Intersection LOS: B
Intersection Capacity Utilization 82.9% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 216: Roger Road & Campbell Avenue



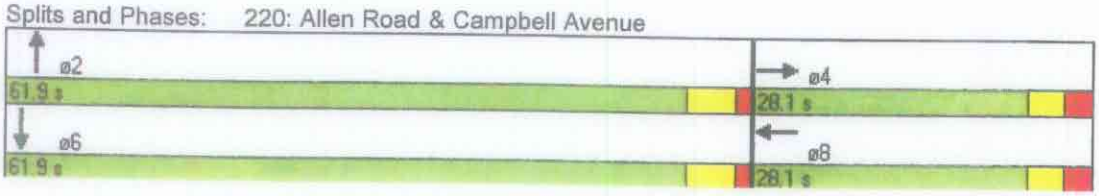
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	75		0	75		0	300		0	300		0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	1600	0	1770	1583	0	1770	3536	0	1770	3536	0
Flt Permitted	0.754			0.726			0.219			0.159		
Satd. Flow (perm)	1405	1600	0	1352	1583	0	408	3536	0	296	3536	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		45			78			2			1	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		1383			1014			1344			1333	
Travel Time (s)		37.7			27.7			26.2			26.0	
Volume (vph)	3	2	34	7	0	3	9	1222	11	4	1010	4
Peak Hour Factor	0.75	0.75	0.75	0.63	0.63	0.63	0.96	0.96	0.96	0.95	0.95	0.95
Lane Group Flow (vph)	4	48	0	11	5	0	9	1284	0	4	1067	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	1.0	1.0		1.0	1.0		9.5	9.5		9.5	9.5	
Minimum Split (s)	6.5	6.5		6.5	6.5		15.0	15.0		15.0	15.0	
Total Split (s)	28.1	28.1	0.0	28.1	28.1	0.0	61.9	61.9	0.0	61.9	61.9	0.0
Total Split (%)	31.2%	31.2%	0.0%	31.2%	31.2%	0.0%	68.8%	68.8%	0.0%	68.8%	68.8%	0.0%
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.5	2.5		2.5	2.5		1.5	1.5		1.5	1.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Ped	Ped		Ped	Ped		C-Min	C-Min		Min	Min	
Act Effct Green (s)	21.5	21.5		21.5	21.5		60.5	60.5		60.5	60.5	
Actuated g/C Ratio	0.24	0.24		0.24	0.24		0.67	0.67		0.67	0.67	
v/c Ratio	0.01	0.12		0.03	0.01		0.03	0.54		0.02	0.45	
Uniform Delay, d1	26.0	1.6		26.3	0.0		4.9	7.6		5.0	6.9	
Control Delay	26.3	10.0		26.7	0.0		9.1	13.9		4.2	5.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	26.3	10.0		26.7	0.0		9.1	13.9		4.2	5.6	
LOS	C	A		C	A		A	B		A	A	
Approach Delay		11.3			18.4			13.9			5.6	
Approach LOS		B			B			B			A	
Queue Length 50th (ft)	2	1		5	0		2	322		1	100	
Queue Length 95th (ft)	8	20		13	0		m3	m304		m1	110	
Internal Link Dist (ft)		1303			934			1264			1253	
Turn Bay Length (ft)	75			75			300			300		
Base Capacity (vph)	376	461		362	481		274	2378		199	2377	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.01	0.10		0.03	0.01		0.03	0.54		0.02	0.45	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 8 (9%), Referenced to phase 2:NBTL, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.54
Intersection Signal Delay: 10.2 Intersection LOS: B
Intersection Capacity Utilization 46.6% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 220: Allen Road & Campbell Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		150	100		0	300		0	300		0
Storage Lanes	1		1	1		0	1		0	1		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	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	1863	1583	1770	3327	0	1770	3518	0	1770	3493	0
Flt Permitted	0.174			0.174			0.114			0.114		
Satd. Flow (perm)	324	1863	1583	324	3327	0	212	3518	0	212	3493	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			226		171			6			12	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1208			1458			487			1344	
Travel Time (s)		23.5			28.4			9.5			26.2	
Volume (vph)	104	446	268	37	524	350	263	1207	52	341	899	83
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.92	0.92	0.92	0.97	0.92	0.92
Lane Group Flow (vph)	112	480	288	40	939	0	286	1369	0	352	1067	0
Turn Type	pm+pt		Perm	pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Detector Phases	7	4	4	3	8		5	2		1	6	
Minimum Initial (s)	1.0	11.0	11.0	1.0	11.0		1.0	11.0		1.0	11.0	
Minimum Split (s)	6.0	15.0	15.0	6.0	15.0		6.0	15.0		6.0	15.0	
Total Split (s)	7.0	27.0	27.0	7.0	27.0	0.0	17.0	39.0	0.0	17.0	39.0	0.0
Total Split (%)	7.8%	30.0%	30.0%	7.8%	30.0%	0.0%	18.9%	43.3%	0.0%	18.9%	43.3%	0.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	0.0	0.0	2.0	0.0		2.0	0.0		2.0	0.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Min		None	C-Min	
Act Effct Green (s)	26.0	23.0	23.0	26.0	23.0		48.0	35.0		48.0	35.0	
Actuated g/C Ratio	0.29	0.26	0.26	0.29	0.26		0.53	0.39		0.53	0.39	
v/c Ratio	0.79	1.01	0.50	0.28	0.96		0.85	1.00		1.04	0.78	
Uniform Delay, d1	30.7	33.5	5.6	22.9	26.9		29.5	27.3		31.6	23.8	
Control Delay	69.0	78.7	10.7	30.4	48.8		53.3	52.3		92.3	22.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		6.3	0.0	
Total Delay	69.0	78.7	10.7	30.4	48.8		53.3	52.3		98.6	22.2	
LOS	E	E	B	C	D		D	D		F	C	
Approach Delay		55.2			48.0			52.5			41.1	
Approach LOS		E			D			D			D	
Queue Length 50th (ft)	45	~277	27	15	233		107	399		~173	283	
Queue Length 95th (ft)	#94	#477	99	38	#364		#246	#563		#342	319	
Internal Link Dist (ft)		1128			1378			407			1264	
Turn Bay Length (ft)	100		150	100			300			300		
Base Capacity (vph)	142	476	573	142	978		338	1372		338	1366	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0		0	0		6	0	
Reduced v/c Ratio	0.79	1.01	0.50	0.28	0.96		0.85	1.00		1.06	0.78	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 30 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.04
Intersection Signal Delay: 48.8 Intersection LOS: D
Intersection Capacity Utilization 98.7% ICU Level of Service F
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.

Splits and Phases: 248: Prince Road & Campbell Avenue

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		1000	400		400	300		200	140		200
Storage Lanes	1		1	2		0	1		1	1		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	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	3539	1583	3433	3522	0	1610	3316	1583	1770	3483	0
Flt Permitted	0.155			0.129			0.950	0.978		0.950		
Satd. Flow (perm)	289	3539	1583	466	3522	0	1610	3316	1583	1770	3483	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			436		4				236		12	
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		1236			1220			2840			753	
Travel Time (s)		18.7			18.5			55.3			14.7	
Volume (vph)	89	979	567	501	775	28	483	289	217	85	427	50
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
Lane Group Flow (vph)	97	1064	616	545	872	0	270	569	236	92	518	0
Turn Type	pm+pt		Perm	pm+pt			Split		Perm	Split		
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6					8			
Detector Phases	5	2	2	1	6		8	8	8	4	4	
Minimum Initial (s)	4.0	3.0	3.0	4.0	3.0		10.5	10.5	10.5	10.5	10.5	
Minimum Split (s)	9.0	10.0	10.0	9.0	10.5		17.5	17.5	17.5	17.5	17.5	
Total Split (s)	15.0	35.0	35.0	15.0	35.0	0.0	21.0	21.0	21.0	19.0	19.0	0.0
Total Split (%)	16.7%	38.9%	38.9%	16.7%	38.9%	0.0%	23.3%	23.3%	23.3%	21.1%	21.1%	0.0%
Yellow Time (s)	3.0	4.5	4.5	3.0	4.5		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	0.0	0.0	2.0	0.0		3.0	3.0	3.0	3.0	3.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		Min	Min	Min	Min	Min	
Act Effct Green (s)	40.6	30.3	30.3	41.4	30.3		17.0	17.0	17.0	15.0	15.0	
Actuated g/C Ratio	0.44	0.34	0.34	0.46	0.34		0.19	0.19	0.19	0.17	0.17	
v/c Ratio	0.33	0.89	0.75	0.94	0.73		0.88	0.90	0.48	0.31	0.87	
Uniform Delay, d1	16.4	27.8	6.7	31.6	25.7		35.1	35.3	0.0	32.6	35.3	
Control Delay	22.6	37.3	13.6	58.0	29.7		66.0	55.2	8.1	36.2	52.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.2	0.0	
Total Delay	22.6	37.3	13.6	58.0	29.7		66.0	55.2	8.1	36.4	52.5	
LOS	C	D	B	E	C		E	E	A	D	D	
Approach Delay		28.3			40.6			47.6			50.1	
Approach LOS		C			D			D			D	
Queue Length 50th (ft)	27	294	79	107	223		165	175	0	47	149	
Queue Length 95th (ft)	53	#411	222	#208	292		#321	#276	60	92	#240	
Internal Link Dist (ft)		1156			1140			2760			673	
Turn Bay Length (ft)	400		1000	400			300		200	140		
Base Capacity (vph)	307	1219	831	581	1216		306	631	492	297	595	
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	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0		0	0	0	22	0	
Reduced v/c Ratio	0.32	0.87	0.74	0.94	0.72		0.88	0.90	0.48	0.33	0.87	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 89.4
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 38.8 Intersection LOS: D
Intersection Capacity Utilization 82.8% 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.

Splits and Phases: 181: River Road & Campbell Avenue

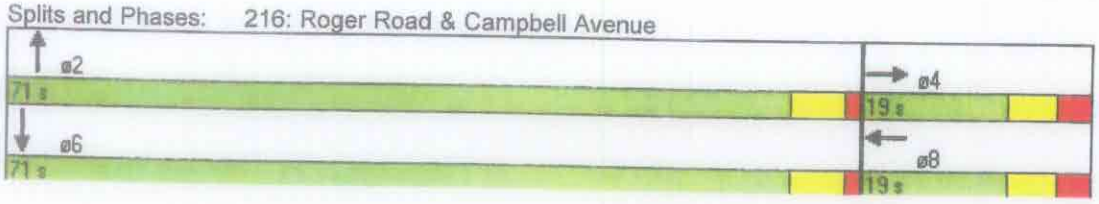
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		0	75		0	300		0	300		0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	1619	0	1770	1771	0	1770	3525	0	1770	3511	0
Flt Permitted	0.731			0.447			0.110			0.219		
Satd. Flow (perm)	1362	1619	0	833	1771	0	205	3525	0	408	3511	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		66			13			8			18	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1053			1043			1333			2840	
Travel Time (s)		20.5			20.3			26.0			55.3	
Volume (vph)	82	21	148	48	25	12	66	1029	28	21	1436	81
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
Lane Group Flow (vph)	89	184	0	52	40	0	72	1148	0	23	1649	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	1.0	1.0		1.0	1.0		9.0	9.0		11.0	11.0	
Minimum Split (s)	8.0	8.0		8.0	8.0		15.0	15.0		17.0	17.0	
Total Split (s)	19.0	19.0	0.0	19.0	19.0	0.0	71.0	71.0	0.0	71.0	71.0	0.0
Total Split (%)	21.1%	21.1%	0.0%	21.1%	21.1%	0.0%	78.9%	78.9%	0.0%	78.9%	78.9%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.5	4.5		4.5	4.5	
All-Red Time (s)	3.0	3.0		3.0	3.0		1.5	1.5		1.5	1.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Min	C-Min		Min	Min	
Act Effct Green (s)	14.0	14.0		14.0	14.0		68.0	68.0		68.0	68.0	
Actuated g/C Ratio	0.16	0.16		0.16	0.16		0.76	0.76		0.76	0.76	
v/c Ratio	0.42	0.60		0.40	0.14		0.46	0.43		0.07	0.62	
Uniform Delay, d1	34.4	22.3		34.3	22.0		4.1	3.9		2.8	4.9	
Control Delay	38.5	28.5		40.9	24.6		19.3	6.5		4.0	6.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	38.5	28.5		40.9	24.6		19.3	6.5		4.0	6.5	
LOS	D	C		D	C		B	A		A	A	
Approach Delay		31.8			33.8			7.3			6.5	
Approach LOS		C			C			A			A	
Queue Length 50th (ft)	46	61		27	13		21	170		3	192	
Queue Length 95th (ft)	92	130		63	41		68	131		9	244	
Internal Link Dist (ft)		973			963			1253			2760	
Turn Bay Length (ft)	125			75			300			300		
Base Capacity (vph)	236	335		145	318		157	2691		312	2683	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.38	0.55		0.36	0.13		0.46	0.43		0.07	0.61	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 75 (83%), Referenced to phase 2:NBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.62
Intersection Signal Delay: 9.7 Intersection LOS: A
Intersection Capacity Utilization 76.7% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 216: Roger Road & Campbell Avenue



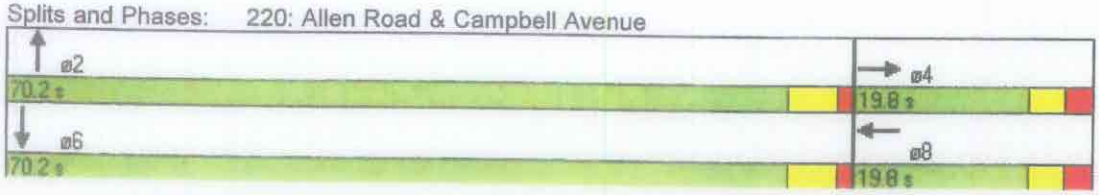
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	75		0	75		0	300		0	300		0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	1589	0	1770	1583	0	1770	3522	0	1770	3536	0
Flt Permitted	0.753			0.728			0.082			0.191		
Satd. Flow (perm)	1403	1589	0	1356	1583	0	153	3522	0	356	3536	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		40			126			11			3	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		1383			1014			1344			1333	
Travel Time (s)		37.7			27.7			26.2			26.0	
Volume (vph)	2	1	40	10	0	6	17	1106	41	26	1657	16
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
Lane Group Flow (vph)	2	44	0	11	7	0	18	1247	0	28	1818	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	1.0	1.0		1.0	1.0		9.5	9.5		9.5	9.5	
Minimum Split (s)	6.5	6.5		6.5	6.5		15.0	15.0		15.0	15.0	
Total Split (s)	19.8	19.8	0.0	19.8	19.8	0.0	70.2	70.2	0.0	70.2	70.2	0.0
Total Split (%)	22.0%	22.0%	0.0%	22.0%	22.0%	0.0%	78.0%	78.0%	0.0%	78.0%	78.0%	0.0%
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.5	2.5		2.5	2.5		1.5	1.5		1.5	1.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Ped	Ped		Ped	Ped		C-Min	C-Min		Min	Min	
Act Effct Green (s)	20.0	20.0		20.0	20.0		62.0	62.0		62.0	62.0	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.69	0.69		0.69	0.69	
v/c Ratio	0.01	0.11		0.04	0.02		0.17	0.51		0.11	0.75	
Uniform Delay, d1	27.0	2.5		27.5	0.0		4.9	6.7		4.7	8.9	
Control Delay	29.5	12.2		29.7	0.0		6.9	7.0		3.2	9.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	29.5	12.2		29.7	0.0		6.9	7.0		3.2	9.1	
LOS	C	B		C	A		A	A		A	A	
Approach Delay		13.0			18.2			7.0			9.0	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)	1	2		5	0		3	148		3	387	
Queue Length 95th (ft)	7	31		20	0		m5	95		m4	100	
Internal Link Dist (ft)		1303			934			1264			1253	
Turn Bay Length (ft)	75			75			300			300		
Base Capacity (vph)	312	385		302	450		113	2594		262	2602	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.01	0.11		0.04	0.02		0.16	0.48		0.11	0.70	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 8 (9%), Referenced to phase 2:NBTL, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 8.3 Intersection LOS: A
Intersection Capacity Utilization 60.2% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 220: Allen Road & Campbell Avenue



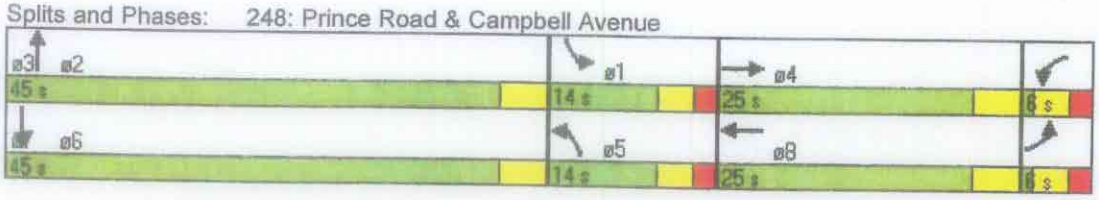
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		150	100		0	300		0	300		0
Storage Lanes	1		1	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	1863	1583	1770	3320	0	1770	3518	0	1770	3518	0
Flt Permitted	0.190			0.190			0.098			0.299		
Satd. Flow (perm)	354	1863	1583	354	3320	0	183	3518	0	557	3518	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			198		188			6			6	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1208			1458			487			1344	
Travel Time (s)		23.5			28.4			9.5			26.2	
Volume (vph)	68	368	200	49	366	261	128	626	28	355	1272	50
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
Lane Group Flow (vph)	74	400	217	53	682	0	139	710	0	386	1437	0
Turn Type	pm+pt		Perm	pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Detector Phases	7	4	4	3	8		5	2		1	6	
Minimum Initial (s)	1.0	11.0	11.0	1.0	11.0		1.0	11.0		1.0	11.0	
Minimum Split (s)	6.0	15.0	15.0	6.0	15.0		6.0	15.0		6.0	15.0	
Total Split (s)	6.0	25.0	25.0	6.0	25.0	0.0	14.0	45.0	0.0	14.0	45.0	0.0
Total Split (%)	6.7%	27.8%	27.8%	6.7%	27.8%	0.0%	15.6%	50.0%	0.0%	15.6%	50.0%	0.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	0.0	0.0	2.0	0.0		2.0	0.0		2.0	0.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Min		None	C-Min	
Act Effct Green (s)	23.8	21.0	21.0	23.8	21.0		52.2	42.6		52.2	42.6	
Actuated g/C Ratio	0.26	0.23	0.23	0.26	0.23		0.58	0.47		0.58	0.47	
v/c Ratio	0.54	0.92	0.42	0.39	0.74		0.51	0.43		0.86	0.86	
Uniform Delay, d1	28.0	33.6	2.3	26.1	22.7		21.2	16.2		20.1	21.9	
Control Delay	46.8	62.1	8.4	37.3	28.5		28.9	16.9		25.0	17.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	46.8	62.1	8.4	37.3	28.5		28.9	16.9		25.0	17.3	
LOS	D	E	A	D	C		C	B		C	B	
Approach Delay		43.6			29.1			18.9			19.0	
Approach LOS		D			C			B			B	
Queue Length 50th (ft)	31	223	8	22	138		30	138		52	111	
Queue Length 95th (ft)	#79	#394	65	49	203		80	185		#211	#411	
Internal Link Dist (ft)		1128			1378			407			1264	
Turn Bay Length (ft)	100		150	100			300			300		
Base Capacity (vph)	137	436	522	136	921		283	1667		460	1667	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.54	0.92	0.42	0.39	0.74		0.49	0.43		0.84	0.86	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 30 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 24.9 Intersection LOS: C
Intersection Capacity Utilization 79.9% 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.

Splits and Phases: 248: Prince Road & Campbell Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		1000	400		400	300		200	140		200
Storage Lanes	1		1	2		0	1		1	1		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	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	3539	1583	3433	3522	0	1610	3316	1583	1770	3486	0
Flt Permitted	0.155			0.129			0.950	0.978		0.950		
Satd. Flow (perm)	289	3539	1583	466	3522	0	1610	3316	1583	1770	3486	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			434		4				240		11	
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		1236			1220			2840			753	
Travel Time (s)		18.7			18.5			55.3			14.7	
Volume (vph)	89	979	589	520	775	28	491	295	221	85	444	50
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
Lane Group Flow (vph)	97	1064	640	565	872	0	275	580	240	92	537	0
Turn Type	pm+pt		Perm	pm+pt			Split		Perm	Split		
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6					8			
Detector Phases	5	2	2	1	6		8	8	8	4	4	
Minimum Initial (s)	4.0	3.0	3.0	4.0	3.0		10.5	10.5	10.5	10.5	10.5	
Minimum Split (s)	9.0	10.0	10.0	9.0	10.5		17.5	17.5	17.5	17.5	17.5	
Total Split (s)	15.0	35.0	35.0	15.0	35.0	0.0	21.0	21.0	21.0	19.0	19.0	0.0
Total Split (%)	16.7%	38.9%	38.9%	16.7%	38.9%	0.0%	23.3%	23.3%	23.3%	21.1%	21.1%	0.0%
Yellow Time (s)	3.0	4.5	4.5	3.0	4.5		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	0.0	0.0	2.0	0.0		3.0	3.0	3.0	3.0	3.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		Min	Min	Min	Min	Min	
Act Effct Green (s)	40.6	30.3	30.3	41.4	30.3		17.0	17.0	17.0	15.0	15.0	
Actuated g/C Ratio	0.44	0.34	0.34	0.46	0.34		0.19	0.19	0.19	0.17	0.17	
v/c Ratio	0.33	0.89	0.78	0.97	0.73		0.90	0.92	0.48	0.31	0.90	
Uniform Delay, d1	16.4	27.8	7.6	32.1	25.7		35.3	35.5	0.0	32.6	35.7	
Control Delay	22.6	37.3	15.5	65.0	29.7		68.6	57.7	8.1	36.2	56.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.2	0.0	
Total Delay	22.6	37.3	15.5	65.0	29.7		68.6	57.7	8.1	36.4	56.6	
LOS	C	D	B	E	C		E	E	A	D	E	
Approach Delay		28.8			43.6			49.5			53.6	
Approach LOS		C			D			D			D	
Queue Length 50th (ft)	27	294	97	114	223		169	179	0	47	156	
Queue Length 95th (ft)	53	#411	250	#222	292		#329	#285	61	92	#253	
Internal Link Dist (ft)		1156			1140			2760			673	
Turn Bay Length (ft)	400		1000	400			300		200	140		
Base Capacity (vph)	307	1219	830	581	1216		306	631	496	297	594	
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	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0		0	0	0	22	0	
Reduced v/c Ratio	0.32	0.87	0.77	0.97	0.72		0.90	0.92	0.48	0.33	0.90	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 89.4
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 40.8 Intersection LOS: D
Intersection Capacity Utilization 84.0% 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.

Splits and Phases: 181: River Road & Campbell Avenue

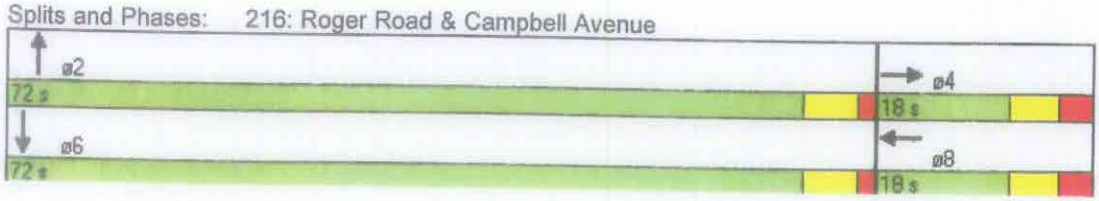
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		0	75		0	300		0	300		0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	1617	0	1770	1771	0	1770	3525	0	1770	3511	0
Flt Permitted	0.731			0.412			0.103			0.215		
Satd. Flow (perm)	1362	1617	0	767	1771	0	192	3525	0	400	3511	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		62			13			9			18	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1053			1043			1333			2840	
Travel Time (s)		20.5			20.3			26.0			55.3	
Volume (vph)	82	21	154	50	25	12	67	1047	29	21	1493	81
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
Lane Group Flow (vph)	89	190	0	54	40	0	73	1170	0	23	1711	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	1.0	1.0		1.0	1.0		9.0	9.0		11.0	11.0	
Minimum Split (s)	8.0	8.0		8.0	8.0		15.0	15.0		17.0	17.0	
Total Split (s)	18.0	18.0	0.0	18.0	18.0	0.0	72.0	72.0	0.0	72.0	72.0	0.0
Total Split (%)	20.0%	20.0%	0.0%	20.0%	20.0%	0.0%	80.0%	80.0%	0.0%	80.0%	80.0%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.5	4.5		4.5	4.5	
All-Red Time (s)	3.0	3.0		3.0	3.0		1.5	1.5		1.5	1.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Min	C-Min		Min	Min	
Act Effct Green (s)	14.2	14.2		14.2	14.2		67.9	67.9		67.9	67.9	
Actuated g/C Ratio	0.16	0.16		0.16	0.16		0.75	0.75		0.75	0.75	
v/c Ratio	0.42	0.62		0.45	0.14		0.50	0.44		0.08	0.65	
Uniform Delay, d1	34.1	23.4		34.3	21.8		4.4	4.1		2.9	5.2	
Control Delay	38.7	30.9		44.0	24.8		21.2	5.6		4.0	6.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	38.7	30.9		44.0	24.8		21.2	5.6		4.0	6.9	
LOS	D	C		D	C		C	A		A	A	
Approach Delay		33.4			35.8			6.5			6.8	
Approach LOS		C			D			A			A	
Queue Length 50th (ft)	45	66		28	13		20	152		3	214	
Queue Length 95th (ft)	93	139		67	42		87	124		9	247	
Internal Link Dist (ft)		973			963			1253			2760	
Turn Bay Length (ft)	125			75			300			300		
Base Capacity (vph)	232	326		130	312		147	2710		307	2701	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.38	0.58		0.42	0.13		0.50	0.43		0.07	0.63	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 75 (83%), Referenced to phase 2:NBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 9.8 Intersection LOS: A
Intersection Capacity Utilization 78.6% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 216: Roger Road & Campbell Avenue



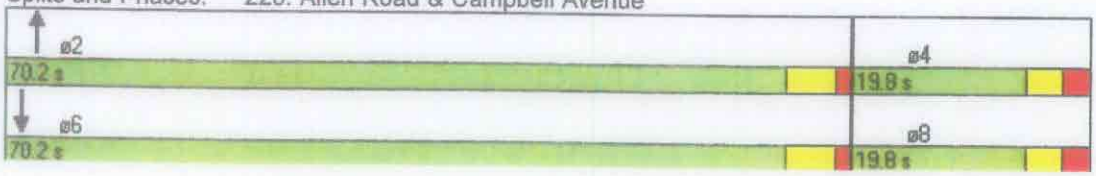
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	75		0	75		0	300		0	300		0
Storage Lanes	1		1	1		1	1		1	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50		50	50		50	50	50	50	50	50	
Trailing Detector (ft)	0		0	0		0	0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	0	1583	1770	0	1583	1770	3539	1583	1770	3536	0
Flt Permitted	0.950			0.950			0.079			0.198		
Satd. Flow (perm)	1770	0	1583	1770	0	1583	147	3539	1583	369	3536	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			39			28			117		3	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		1383			1014			1344			1333	
Travel Time (s)		37.7			27.7			26.2			26.0	
Volume (vph)	2	0	40	30	0	26	17	1122	108	91	1672	16
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
Lane Group Flow (vph)	2	0	43	33	0	28	18	1220	117	99	1834	0
Turn Type	custom		custom	custom		custom	Perm		Perm	Perm		
Protected Phases								2			6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phases	4		4	8		8	2	2	2	6	6	
Minimum Initial (s)	1.0		1.0	1.0		1.0	9.5	9.5	9.5	9.5	9.5	
Minimum Split (s)	6.5		6.5	6.5		6.5	15.0	15.0	15.0	15.0	15.0	
Total Split (s)	19.8	0.0	19.8	19.8	0.0	19.8	70.2	70.2	70.2	70.2	70.2	0.0
Total Split (%)	22.0%	0.0%	22.0%	22.0%	0.0%	22.0%	78.0%	78.0%	78.0%	78.0%	78.0%	0.0%
Yellow Time (s)	3.0		3.0	3.0		3.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.5		2.5	2.5		2.5	1.5	1.5	1.5	1.5	1.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Ped		Ped	Ped		Ped	C-Min	C-Min	C-Min	Min	Min	
Act Effct Green (s)	19.9		19.9	19.9		19.9	62.1	62.1	62.1	62.1	62.1	
Actuated g/C Ratio	0.22		0.22	0.22		0.22	0.69	0.69	0.69	0.69	0.69	
v/c Ratio	0.01		0.11	0.08		0.08	0.18	0.50	0.10	0.39	0.75	
Uniform Delay, d1	27.5		2.5	27.8		0.0	4.9	6.6	0.0	5.9	9.0	
Control Delay	29.5		12.4	30.0		12.4	7.4	6.8	1.0	6.5	8.3	
Queue Delay	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	29.5		12.4	30.0		12.4	7.4	6.8	1.0	6.5	8.3	
LOS	C		B	C		B	A	A	A	A	A	
Approach Delay								6.3			8.2	
Approach LOS								A			A	
Queue Length 50th (ft)	1		2	15		0	3	134	0	16	385	
Queue Length 95th (ft)	7		30	42		23	m5	100	m6	m16	108	
Internal Link Dist (ft)		1303			934			1264			1253	
Turn Bay Length (ft)	75			75			300			300		
Base Capacity (vph)	391		380	391		371	108	2603	1195	271	2602	
Starvation Cap Reductn	0		0	0		0	0	0	0	0	0	
Spillback Cap Reductn	0		0	0		0	0	0	0	0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0		0	0		0	0	0	0	0	0	
Reduced v/c Ratio	0.01		0.11	0.08		0.08	0.17	0.47	0.10	0.37	0.70	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 8 (9%), Referenced to phase 2:NBTL, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 7.8 Intersection LOS: A
Intersection Capacity Utilization 68.0% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 220: Allen Road & Campbell Avenue



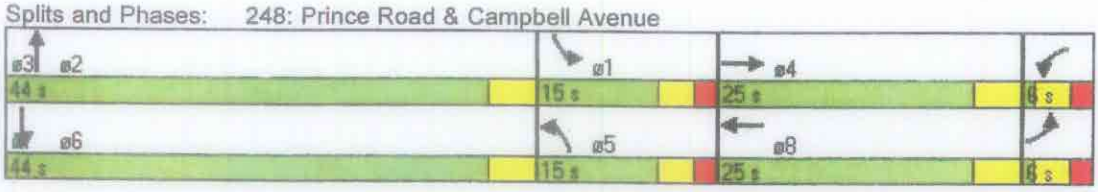
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		150	100		0	300		0	300		0
Storage Lanes	1		1	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	1863	1583	1770	3309	0	1770	3518	0	1770	3518	0
Flt Permitted	0.190			0.190			0.100			0.271		
Satd. Flow (perm)	354	1863	1583	354	3309	0	186	3518	0	505	3518	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			198		200			6			6	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1208			1458			487			1344	
Travel Time (s)		23.5			28.4			9.5			26.2	
Volume (vph)	72	368	200	49	366	279	128	669	28	359	1287	51
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
Lane Group Flow (vph)	78	400	217	53	701	0	139	757	0	390	1454	0
Turn Type	pm+pt		Perm	pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Detector Phases	7	4	4	3	8		5	2		1	6	
Minimum Initial (s)	1.0	11.0	11.0	1.0	11.0		1.0	11.0		1.0	11.0	
Minimum Split (s)	6.0	15.0	15.0	6.0	15.0		6.0	15.0		6.0	15.0	
Total Split (s)	6.0	25.0	25.0	6.0	25.0	0.0	15.0	44.0	0.0	15.0	44.0	0.0
Total Split (%)	6.7%	27.8%	27.8%	6.7%	27.8%	0.0%	16.7%	48.9%	0.0%	16.7%	48.9%	0.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	0.0	0.0	2.0	0.0		2.0	0.0		2.0	0.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Min		None	C-Min	
Act Effct Green (s)	23.9	21.0	21.0	23.8	21.0		52.2	41.6		52.2	41.6	
Actuated g/C Ratio	0.27	0.23	0.23	0.26	0.23		0.58	0.46		0.58	0.46	
v/c Ratio	0.57	0.92	0.42	0.39	0.76		0.48	0.46		0.89	0.89	
Uniform Delay, d1	28.4	33.6	2.3	26.1	22.5		20.7	17.1		22.1	23.0	
Control Delay	48.7	62.1	8.4	37.3	28.7		27.4	18.0		30.1	20.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	48.7	62.1	8.4	37.3	28.7		27.4	18.0		30.1	20.5	
LOS	D	E	A	D	C		C	B		C	C	
Approach Delay		43.8			29.3			19.5			22.6	
Approach LOS		D			C			B			C	
Queue Length 50th (ft)	32	223	8	22	141		30	154		69	143	
Queue Length 95th (ft)	#68	#394	65	49	206		79	204		#241	#542	
Internal Link Dist (ft)		1128			1378			407			1264	
Turn Bay Length (ft)	100		150	100			300			300		
Base Capacity (vph)	137	436	522	136	927		302	1632		450	1632	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.57	0.92	0.42	0.39	0.76		0.46	0.46		0.87	0.89	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 30 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 26.6 Intersection LOS: C
Intersection Capacity Utilization 80.7% 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.

Splits and Phases: 248: Prince Road & Campbell Avenue



Lanes, Volumes, Timings
181: River Road & Campbell Avenue

12/10/2004

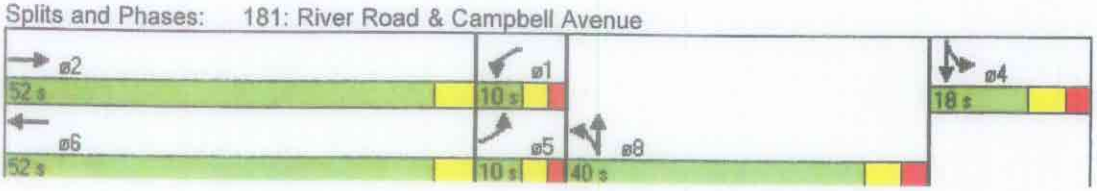
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		1000	400		400	300		200	140		200
Storage Lanes	1		1	2		0	1		1	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	3539	1583	3433	3504	0	1610	3312	1583	1770	3451	0
Flt Permitted	0.083			0.113			0.950	0.977		0.950		
Satd. Flow (perm)	155	3539	1583	408	3504	0	1610	3312	1583	1770	3451	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			612		7				203		16	
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		1236			1220			2840			753	
Travel Time (s)		18.7			18.5			55.3			14.7	
Volume (vph)	100	968	563	282	1086	77	801	451	396	59	278	56
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
Lane Group Flow (vph)	109	1052	612	307	1264	0	438	923	430	64	363	0
Turn Type	pm+pt		Perm	pm+pt			Split		Perm	Split		
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6					8			
Detector Phases	5	2	2	1	6		8	8	8	4	4	
Minimum Initial (s)	4.0	3.0	3.0	4.0	3.0		10.5	10.5	10.5	10.5	10.5	
Minimum Split (s)	9.0	10.0	10.0	9.0	10.5		17.5	17.5	17.5	17.5	17.5	
Total Split (s)	10.0	52.0	52.0	10.0	52.0	0.0	40.0	40.0	40.0	18.0	18.0	0.0
Total Split (%)	8.3%	43.3%	43.3%	8.3%	43.3%	0.0%	33.3%	33.3%	33.3%	15.0%	15.0%	0.0%
Yellow Time (s)	3.0	4.5	4.5	3.0	4.5		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	0.0	0.0	2.0	0.0		3.0	3.0	3.0	3.0	3.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		Min	Min	Min	Min	Min	
Act Effct Green (s)	52.0	46.0	46.0	52.0	46.0		36.0	36.0	36.0	14.0	14.0	
Actuated g/C Ratio	0.44	0.39	0.39	0.44	0.39		0.30	0.30	0.30	0.12	0.12	
v/c Ratio	0.72	0.76	0.62	0.92	0.92		0.89	0.91	0.69	0.30	0.86	
Uniform Delay, d1	38.8	31.2	0.0	40.2	34.1		39.1	39.5	18.0	47.5	48.7	
Control Delay	66.6	35.1	4.8	73.4	43.9		61.6	54.2	25.3	52.8	69.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0		5.1	122.9	0.3	0.3	0.0	
Total Delay	66.6	35.1	4.8	73.4	43.9		66.7	177.0	25.6	53.1	69.1	
LOS	E	D	A	E	D		E	F	C	D	E	
Approach Delay		26.6			49.6			113.7			66.7	
Approach LOS		C			D			F			E	
Queue Length 50th (ft)	45	361	0	67	474		358	380	157	46	141	
Queue Length 95th (ft)	#123	443	74	#140	#592		#571	#513	281	91	#226	
Internal Link Dist (ft)		1156			1140			2760			673	
Turn Bay Length (ft)	400		1000	400			300		200	140		
Base Capacity (vph)	151	1416	1000	334	1406		491	1011	624	210	424	
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	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0		27	288	20	18	0	
Reduced v/c Ratio	0.72	0.74	0.61	0.92	0.90		0.94	1.28	0.71	0.33	0.86	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 118.1
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 64.2 Intersection LOS: E
Intersection Capacity Utilization 84.7% 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.

Splits and Phases: 181: River Road & Campbell Avenue



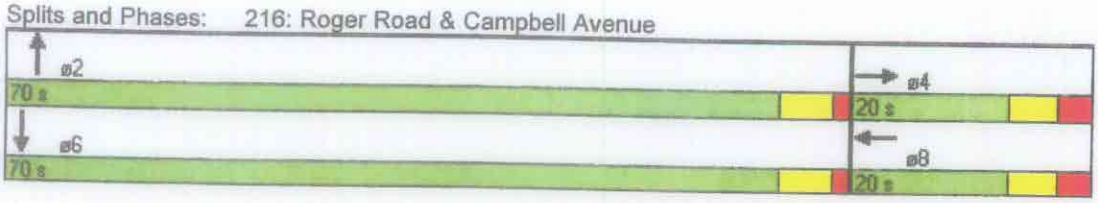
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		0	75		0	300		0	300		0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	1632	0	1770	1814	0	1770	3518	0	1770	3504	0
Flt Permitted	0.720			0.355			0.163			0.101		
Satd. Flow (perm)	1341	1632	0	661	1814	0	304	3518	0	188	3504	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		110			10			12			21	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1053			1043			1333			2840	
Travel Time (s)		20.5			20.3			26.0			55.3	
Volume (vph)	80	37	174	51	43	9	127	1494	59	19	1171	82
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
Lane Group Flow (vph)	87	229	0	55	57	0	138	1688	0	21	1362	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	1.0	1.0		1.0	1.0		9.0	9.0		11.0	11.0	
Minimum Split (s)	8.0	8.0		8.0	8.0		15.0	15.0		17.0	17.0	
Total Split (s)	20.0	20.0	0.0	20.0	20.0	0.0	70.0	70.0	0.0	70.0	70.0	0.0
Total Split (%)	22.2%	22.2%	0.0%	22.2%	22.2%	0.0%	77.8%	77.8%	0.0%	77.8%	77.8%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.5	4.5		4.5	4.5	
All-Red Time (s)	3.0	3.0		3.0	3.0		1.5	1.5		1.5	1.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Min	C-Min		Min	Min	
Act Effct Green (s)	14.4	14.4		14.4	14.4		67.6	67.6		67.6	67.6	
Actuated g/C Ratio	0.16	0.16		0.16	0.16		0.75	0.75		0.75	0.75	
v/c Ratio	0.40	0.65		0.52	0.19		0.61	0.64		0.15	0.52	
Uniform Delay, d1	33.9	17.9		34.6	26.9		5.1	5.3		3.1	4.5	
Control Delay	37.2	24.1		46.0	28.1		23.3	13.9		6.6	5.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	37.2	24.1		46.0	28.1		23.3	13.9		6.6	5.6	
LOS	D	C		D	C		C	B		A	A	
Approach Delay		27.7			36.9			14.7			5.7	
Approach LOS		C			D			B			A	
Queue Length 50th (ft)	44	61		28	23		58	475		3	141	
Queue Length 95th (ft)	90	136		#70	56		m85	432		12	184	
Internal Link Dist (ft)		973			963			1253			2760	
Turn Bay Length (ft)	125			75			300			300		
Base Capacity (vph)	247	391		122	343		230	2669		142	2660	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.35	0.59		0.45	0.17		0.60	0.63		0.15	0.51	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 75 (83%), Referenced to phase 2:NBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 13.1 Intersection LOS: B
Intersection Capacity Utilization 81.7% 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: 216: Roger Road & Campbell Avenue



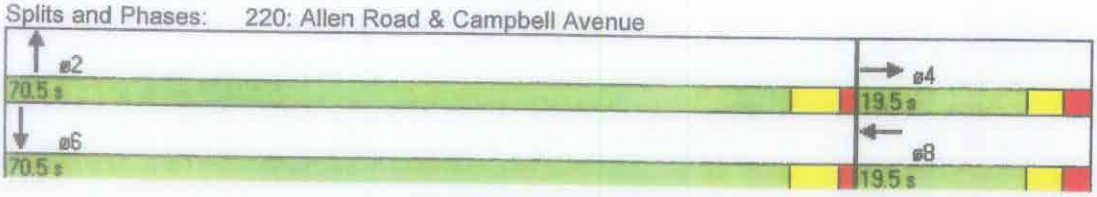
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	75		0	75		0	300		0	300		0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	1583	0	1770	1650	0	1770	3532	0	1770	3536	0
Flt Permitted	0.738			0.738			0.104			0.074		
Satd. Flow (perm)	1375	1583	0	1375	1650	0	194	3532	0	138	3536	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		53			22			3			2	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		1383			1014			1344			1333	
Travel Time (s)		37.7			27.7			26.2			26.0	
Volume (vph)	6	0	28	33	6	20	31	1711	18	14	1536	10
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
Lane Group Flow (vph)	7	30	0	36	29	0	34	1880	0	15	1681	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	1.0	1.0		1.0	1.0		9.5	9.5		9.5	9.5	
Minimum Split (s)	6.5	6.5		6.5	6.5		15.0	15.0		15.0	15.0	
Total Split (s)	19.5	19.5	0.0	19.5	19.5	0.0	70.5	70.5	0.0	70.5	70.5	0.0
Total Split (%)	21.7%	21.7%	0.0%	21.7%	21.7%	0.0%	78.3%	78.3%	0.0%	78.3%	78.3%	0.0%
Yellow Time (s)	3.0	3.0		3.0	3.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.5	2.5		2.5	2.5		1.5	1.5		1.5	1.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Ped	Ped		Ped	Ped		C-Min	C-Min		Min	Min	
Act Effct Green (s)	19.6	19.6		19.6	19.6		62.4	62.4		62.4	62.4	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.69	0.69		0.69	0.69	
v/c Ratio	0.02	0.08		0.12	0.08		0.25	0.77		0.16	0.69	
Uniform Delay, d1	27.7	0.0		28.2	6.7		5.1	9.0		4.7	8.0	
Control Delay	30.2	4.4		31.2	16.3		9.2	16.0		5.6	8.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	30.2	4.4		31.2	16.3		9.2	16.0		5.6	8.2	
LOS	C	A		C	B		A	B		A	A	
Approach Delay		9.3			24.5			15.9			8.2	
Approach LOS		A			C			B			A	
Queue Length 50th (ft)	3	0		16	3		11	345		2	335	
Queue Length 95th (ft)	16	12		45	27		m8	m217		m3	107	
Internal Link Dist (ft)		1303			934			1264			1253	
Turn Bay Length (ft)	75			75			300			300		
Base Capacity (vph)	299	387		299	377		143	2611		102	2613	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.02	0.08		0.12	0.08		0.24	0.72		0.15	0.64	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 8 (9%), Referenced to phase 2:NBTL, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 12.5 Intersection LOS: B
Intersection Capacity Utilization 63.0% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 220: Allen Road & Campbell Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		150	100		0	300		0	300		0
Storage Lanes	1		1	1		0	1		0	1		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	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	1863	1583	1770	3327	0	1770	3518	0	1770	3493	0
Flt Permitted	0.182			0.182			0.114			0.114		
Satd. Flow (perm)	339	1863	1583	339	3327	0	212	3518	0	212	3493	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			223		169			6			12	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1208			1458			487			1344	
Travel Time (s)		23.5			28.4			9.5			26.2	
Volume (vph)	108	464	279	38	545	364	274	1255	54	355	935	86
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
Lane Group Flow (vph)	117	504	303	41	988	0	298	1423	0	386	1109	0
Turn Type	pm+pt		Perm	pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Detector Phases	7	4	4	3	8		5	2		1	6	
Minimum Initial (s)	1.0	11.0	11.0	1.0	11.0		1.0	11.0		1.0	11.0	
Minimum Split (s)	6.0	15.0	15.0	6.0	15.0		6.0	15.0		6.0	15.0	
Total Split (s)	7.0	26.0	26.0	7.0	26.0	0.0	18.0	39.0	0.0	18.0	39.0	0.0
Total Split (%)	7.8%	28.9%	28.9%	7.8%	28.9%	0.0%	20.0%	43.3%	0.0%	20.0%	43.3%	0.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	0.0	0.0	2.0	0.0		2.0	0.0		2.0	0.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Min		None	C-Min	
Act Effct Green (s)	25.0	22.0	22.0	25.0	22.0		49.0	35.0		49.0	35.0	
Actuated g/C Ratio	0.28	0.24	0.24	0.28	0.24		0.54	0.39		0.54	0.39	
v/c Ratio	0.82	1.11	0.55	0.29	1.05		0.83	1.04		1.08	0.81	
Uniform Delay, d1	31.6	34.0	7.2	23.6	27.9		29.1	27.4		31.4	24.3	
Control Delay	74.8	108.8	12.7	31.2	72.3		50.4	62.9		91.0	20.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		4.6	0.0	
Total Delay	74.8	108.8	12.7	31.2	72.3		50.4	62.9		95.6	20.2	
LOS	E	F	B	C	E		D	E		F	C	
Approach Delay		73.0			70.6			60.7			39.7	
Approach LOS		E			E			E			D	
Queue Length 50th (ft)	48	~330	36	16	~284		112	~463		~198	105	
Queue Length 95th (ft)	#104	#521	114	39	#410		#251	#598		#377	261	
Internal Link Dist (ft)		1128			1378			407			1264	
Turn Bay Length (ft)	100		150	100			300			300		
Base Capacity (vph)	142	455	555	142	941		358	1372		358	1366	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0		0	0		4	0	
Reduced v/c Ratio	0.82	1.11	0.55	0.29	1.05		0.83	1.04		1.09	0.81	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 30 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.11
Intersection Signal Delay: 58.8 Intersection LOS: E
Intersection Capacity Utilization 102.1% ICU Level of Service G
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.

Splits and Phases: 248: Prince Road & Campbell Avenue

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		1000	400		400	300		200	140		200
Storage Lanes	1		1	2		0	1		1	1		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	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	3539	1583	3433	3504	0	1610	3312	1583	1770	3451	0
Flt Permitted	0.085			0.108			0.950	0.977		0.950		
Satd. Flow (perm)	158	3539	1583	390	3504	0	1610	3312	1583	1770	3451	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			628		7				204		15	
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		1236			1220			2840			753	
Travel Time (s)		18.7			18.5			55.3			14.7	
Volume (vph)	100	968	578	280	1086	77	844	474	415	59	285	56
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
Lane Group Flow (vph)	109	1052	628	304	1264	0	461	971	451	64	371	0
Turn Type	pm+pt		Perm	pm+pt			Split		Perm	Split		
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6					8			
Detector Phases	5	2	2	1	6		8	8	8	4	4	
Minimum Initial (s)	4.0	3.0	3.0	4.0	3.0		10.5	10.5	10.5	10.5	10.5	
Minimum Split (s)	9.0	10.0	10.0	9.0	10.5		17.5	17.5	17.5	17.5	17.5	
Total Split (s)	10.0	51.0	51.0	10.0	51.0	0.0	41.0	41.0	41.0	18.0	18.0	0.0
Total Split (%)	8.3%	42.5%	42.5%	8.3%	42.5%	0.0%	34.2%	34.2%	34.2%	15.0%	15.0%	0.0%
Yellow Time (s)	3.0	4.5	4.5	3.0	4.5		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	0.0	0.0	2.0	0.0		3.0	3.0	3.0	3.0	3.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		Min	Min	Min	Min	Min	
Act Effct Green (s)	51.7	45.7	45.7	51.7	45.7		37.0	37.0	37.0	14.0	14.0	
Actuated g/C Ratio	0.44	0.39	0.39	0.44	0.39		0.31	0.31	0.31	0.12	0.12	
v/c Ratio	0.73	0.77	0.63	0.94	0.93		0.92	0.94	0.71	0.31	0.88	
Uniform Delay, d1	39.1	31.9	0.0	41.4	34.9		39.3	39.7	18.7	47.8	49.3	
Control Delay	67.2	36.2	5.0	78.8	46.4		64.8	57.2	26.5	52.9	72.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0		7.0	133.0	0.3	0.3	0.0	
Total Delay	67.2	36.2	5.0	78.8	46.4		71.9	190.2	26.8	53.2	72.5	
LOS	E	D	A	E	D		E	F	C	D	E	
Approach Delay		27.2			52.7			122.1			69.7	
Approach LOS		C			D			F			E	
Queue Length 50th (ft)	46	366	0	68	481		380	403	173	46	145	
Queue Length 95th (ft)	#123	450	77	#145	#624		#603	#546	302	91	#235	
Internal Link Dist (ft)		1156			1140			2760			673	
Turn Bay Length (ft)	400		1000	400			300		200	140		
Base Capacity (vph)	150	1386	1002	323	1377		502	1033	634	209	421	
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	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0		27	288	20	18	0	
Reduced v/c Ratio	0.73	0.76	0.63	0.94	0.92		0.97	1.30	0.73	0.34	0.88	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 118.7
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 69.0 Intersection LOS: E
Intersection Capacity Utilization 86.1% 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.

Splits and Phases: 181: River Road & Campbell Avenue

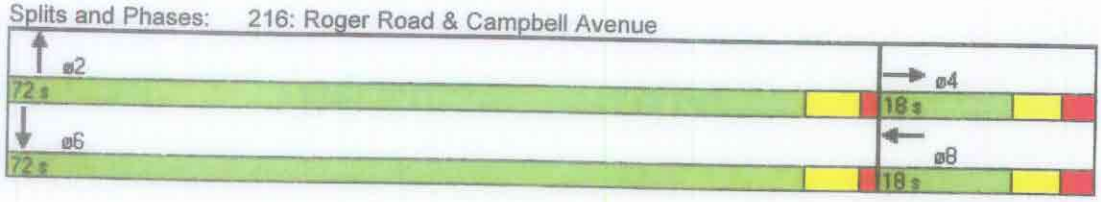
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		0	75		0	300		0	300		0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	1632	0	1770	1814	0	1770	3518	0	1770	3504	0
Flt Permitted	0.720			0.294			0.162			0.092		
Satd. Flow (perm)	1341	1632	0	548	1814	0	302	3518	0	171	3504	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		111			10			13			23	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1053			1043			1333			2840	
Travel Time (s)		20.5			20.3			26.0			55.3	
Volume (vph)	80	37	178	52	43	9	132	1579	63	19	1200	82
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
Lane Group Flow (vph)	87	233	0	57	57	0	143	1784	0	21	1393	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	1.0	1.0		1.0	1.0		9.0	9.0		11.0	11.0	
Minimum Split (s)	8.0	8.0		8.0	8.0		15.0	15.0		17.0	17.0	
Total Split (s)	18.0	18.0	0.0	18.0	18.0	0.0	72.0	72.0	0.0	72.0	72.0	0.0
Total Split (%)	20.0%	20.0%	0.0%	20.0%	20.0%	0.0%	80.0%	80.0%	0.0%	80.0%	80.0%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.5	4.5		4.5	4.5	
All-Red Time (s)	3.0	3.0		3.0	3.0		1.5	1.5		1.5	1.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Min	C-Min		Min	Min	
Act Effct Green (s)	15.1	15.1		15.1	15.1		66.9	66.9		66.9	66.9	
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.74	0.74		0.74	0.74	
v/c Ratio	0.39	0.64		0.62	0.18		0.64	0.68		0.17	0.53	
Uniform Delay, d1	33.3	17.7		34.7	26.4		5.6	5.9		3.4	4.8	
Control Delay	37.9	25.6		61.5	28.7		22.3	12.8		6.8	5.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	37.9	25.6		61.5	28.7		22.3	12.8		6.8	5.8	
LOS	D	C		E	C		C	B		A	A	
Approach Delay		28.9			45.1			13.5			5.8	
Approach LOS		C			D			B			A	
Queue Length 50th (ft)	42	59		28	22		69	466		4	179	
Queue Length 95th (ft)	92	#149		#95	58		m84	282		11	169	
Internal Link Dist (ft)		973			963			1253			2760	
Turn Bay Length (ft)	125			75			300			300		
Base Capacity (vph)	237	380		97	329		231	2691		131	2683	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.37	0.61		0.59	0.17		0.62	0.66		0.16	0.52	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 75 (83%), Referenced to phase 2:NBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 12.9 Intersection LOS: B
Intersection Capacity Utilization 84.4% 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: 216: Roger Road & Campbell Avenue



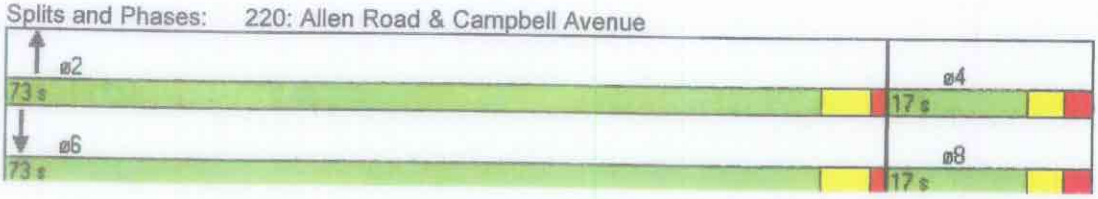
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	75		0	75		0	300		0	300		0
Storage Lanes	1		1	1		1	1		1	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50		50	50		50	50	50	50	50	50	
Trailing Detector (ft)	0		0	0		0	0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	0	1583	1770	0	1583	1770	3539	1583	1770	3536	0
Flt Permitted	0.950			0.950			0.108			0.079		
Satd. Flow (perm)	1770	0	1583	1770	0	1583	201	3539	1583	147	3536	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			30			39			58		2	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		1383			1014			1344			1333	
Travel Time (s)		37.7			27.7			26.2			26.0	
Volume (vph)	6	0	28	128	0	121	31	1742	53	49	1546	10
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
Lane Group Flow (vph)	7	0	30	139	0	132	34	1893	58	53	1691	0
Turn Type	custom		custom	custom		custom	Perm		Perm	Perm		
Protected Phases								2			6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phases	4		4	8		8	2	2	2	6	6	
Minimum Initial (s)	1.0		1.0	1.0		1.0	9.5	9.5	9.5	9.5	9.5	
Minimum Split (s)	6.5		6.5	6.5		6.5	15.0	15.0	15.0	15.0	15.0	
Total Split (s)	17.0	0.0	17.0	17.0	0.0	17.0	73.0	73.0	73.0	73.0	73.0	0.0
Total Split (%)	18.9%	0.0%	18.9%	18.9%	0.0%	18.9%	81.1%	81.1%	81.1%	81.1%	81.1%	0.0%
Yellow Time (s)	3.0		3.0	3.0		3.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.5		2.5	2.5		2.5	1.5	1.5	1.5	1.5	1.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Ped		Ped	Ped		Ped	C-Min	C-Min	C-Min	Min	Min	
Act Effct Green (s)	18.9		18.9	18.9		18.9	63.1	63.1	63.1	63.1	63.1	
Actuated g/C Ratio	0.21		0.21	0.21		0.21	0.70	0.70	0.70	0.70	0.70	
v/c Ratio	0.02		0.08	0.37		0.36	0.24	0.76	0.05	0.51	0.68	
Uniform Delay, d1	28.1		0.0	30.5		21.0	4.8	8.6	0.0	6.3	7.7	
Control Delay	31.5		12.9	35.4		25.9	7.8	15.1	3.1	18.9	6.9	
Queue Delay	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	31.5		12.9	35.5		25.9	7.8	15.1	3.1	18.9	6.9	
LOS	C		B	D		C	A	B	A	B	A	
Approach Delay								14.7			7.2	
Approach LOS								B			A	
Queue Length 50th (ft)	3		0	66		43	10	337	6	7	322	
Queue Length 95th (ft)	16		24	134		106	m6	m173	m3	m43	102	
Internal Link Dist (ft)		1303			934			1264			1253	
Turn Bay Length (ft)	75			75			300			300		
Base Capacity (vph)	371		356	371		363	154	2713	1227	113	2711	
Starvation Cap Reductn	0		0	0		0	0	0	0	0	0	
Spillback Cap Reductn	0		0	0		0	0	0	0	0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0		0	8		0	0	0	0	0	0	
Reduced v/c Ratio	0.02		0.08	0.38		0.36	0.22	0.70	0.05	0.47	0.62	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 8 (9%), Referenced to phase 2:NBTL, Start of Green
Natural Cycle: 45
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 12.6 Intersection LOS: B
Intersection Capacity Utilization 69.0% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 220: Allen Road & Campbell Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		150	100		0	300		0	300		0
Storage Lanes	1		1	1		0	1		0	1		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	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Satd. Flow (prot)	1770	1863	1583	1770	3323	0	1770	3518	0	1770	3493	0
Flt Permitted	0.182			0.182			0.118			0.118		
Satd. Flow (perm)	339	1863	1583	339	3323	0	220	3518	0	220	3493	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			223		176			5			12	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1208			1458			487			1344	
Travel Time (s)		23.5			28.4			9.5			26.2	
Volume (vph)	110	464	279	38	545	371	274	1281	54	379	1000	92
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
Lane Group Flow (vph)	120	504	303	41	995	0	298	1451	0	412	1187	0
Turn Type	pm+pt		Perm	pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Detector Phases	7	4	4	3	8		5	2		1	6	
Minimum Initial (s)	1.0	11.0	11.0	1.0	11.0		1.0	11.0		1.0	11.0	
Minimum Split (s)	6.0	15.0	15.0	6.0	15.0		6.0	15.0		6.0	15.0	
Total Split (s)	7.0	26.0	26.0	7.0	26.0	0.0	19.0	38.0	0.0	19.0	38.0	0.0
Total Split (%)	7.8%	28.9%	28.9%	7.8%	28.9%	0.0%	21.1%	42.2%	0.0%	21.1%	42.2%	0.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	0.0	0.0	2.0	0.0		2.0	0.0		2.0	0.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Min		None	C-Min	
Act Effct Green (s)	25.0	22.0	22.0	25.0	22.0		49.0	34.0		49.0	34.0	
Actuated g/C Ratio	0.28	0.24	0.24	0.28	0.24		0.54	0.38		0.54	0.38	
v/c Ratio	0.85	1.11	0.55	0.29	1.05		0.79	1.09		1.09	0.89	
Uniform Delay, d1	31.9	34.0	7.2	23.6	27.6		28.2	27.9		31.2	26.0	
Control Delay	78.4	108.8	12.7	31.2	72.9		44.8	81.2		96.1	27.3	
Queue Delay	0.0	7.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	78.4	115.8	12.7	31.2	72.9		44.8	81.2		96.1	27.3	
LOS	E	F	B	C	E		D	F		F	C	
Approach Delay		77.3			71.3			75.0			45.0	
Approach LOS		E			E			E			D	
Queue Length 50th (ft)	49	~330	36	16	~285		109	~494		~217	165	
Queue Length 95th (ft)	#108	#521	114	39	#411		#238	#630		#401	#222	
Internal Link Dist (ft)		1128			1378			407			1264	
Turn Bay Length (ft)	100		150	100			300			300		
Base Capacity (vph)	142	455	555	142	945		378	1332		378	1327	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	7	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.85	1.13	0.55	0.29	1.05		0.79	1.09		1.09	0.89	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 30 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.11
Intersection Signal Delay: 65.6 Intersection LOS: E
Intersection Capacity Utilization 104.5% ICU Level of Service G
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.

Splits and Phases: 248: Prince Road & Campbell Avenue

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ENVIRONMENTAL CONSULTANTS

A Cultural Resources Survey And Building Inventory On The Property of University Medical Center North, 3838 North Campbell Avenue, Tucson

Prepared for

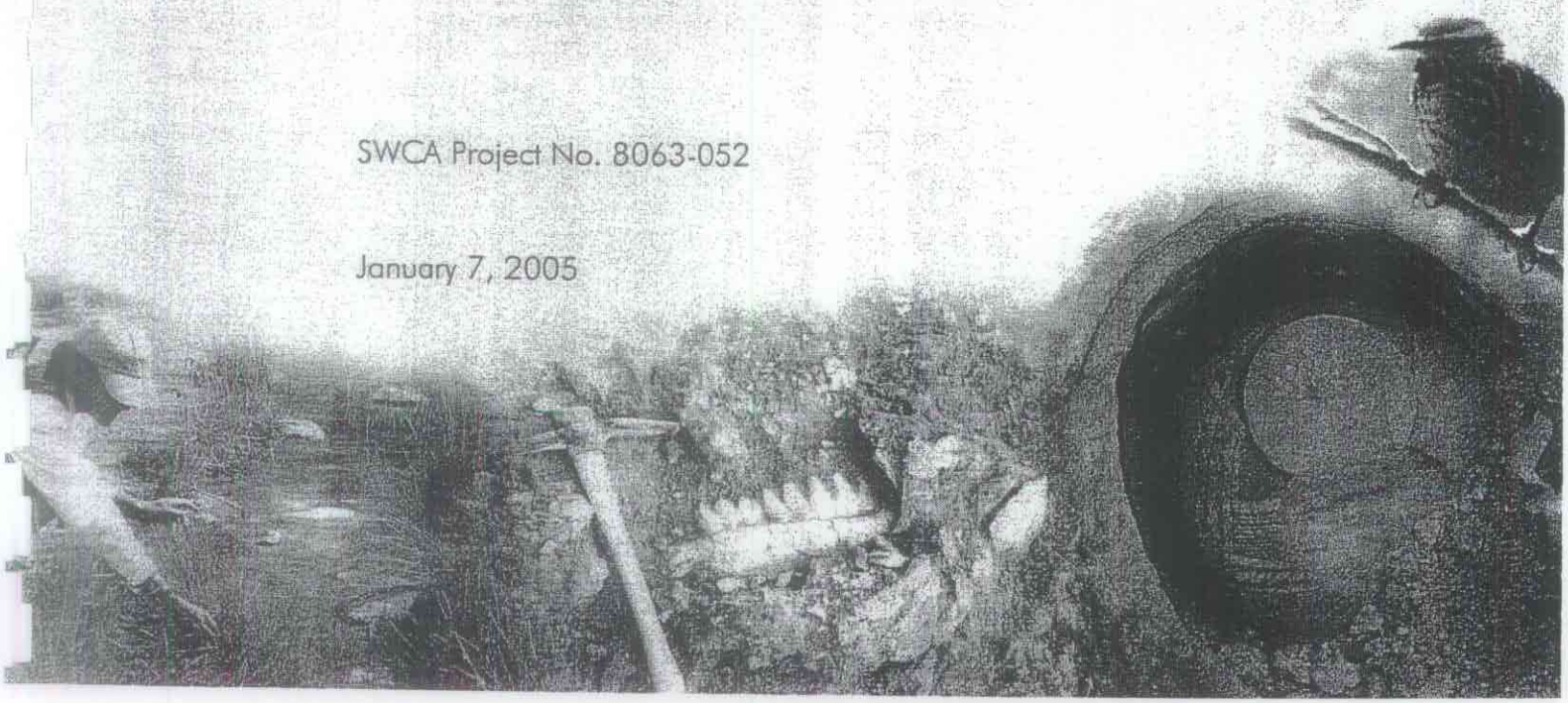
University Medical Center

Prepared by

James W. Steely And David M.R. Barr
SWCA® Environmental Consultants

SWCA Project No. 8063-052

January 7, 2005



A CULTURAL RESOURCES SURVEY AND BUILDING INVENTORY ON THE PROPERTY OF UNIVERSITY MEDICAL CENTER NORTH, 3838 NORTH CAMPBELL AVENUE, TUCSON

Prepared for

Mr. Stephen K. Brigham, Director
Capital Planning & Projects
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Tucson, Arizona 85724-5204

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SWCA Project No. 8063-052

January 7, 2005

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ABSTRACT

In April 2004, University Medical Center (UMC) commissioned SWCA Environmental Consultants to document significant cultural resources at the former Tucson General Hospital complex, 3838 North Campbell Avenue (northeast corner of intersection of East Allen Road and North Campbell Avenue (Figure 1).

The scope of work for this project involved five tasks: 1) archival research for both historic-period and archaeological cultural resources; 2) archaeological field survey of any undisturbed areas of the property to identify and record all cultural resources present; 3) inventory of all buildings on the property; 4) evaluation of all potentially significant cultural resources; and 5) composition of a report detailing all findings, evaluation, and recommendations.

This activity accomplished compliance with City of Tucson historic preservation requirements (Land Use Code, Section 2.8.8), contributed to UMC's Planned Area Development (PAD) for the site, and fulfilled an offer by UMC to the University of Arizona/College of Architecture, Planning and Landscape Architecture/ Preservation Studies for documentation of the Arthur Brown-designed 1968–1970 Bed Tower addition with its signature solar window screens.

The project architectural historian visited the site in May, June and July, 2004, for photography, inventory of buildings, and inventory of on-site architectural drawings. He also visited Gordon V. Brown, son and architectural partner of the late Arthur Brown (1900–1993), and arranged for the donation of original Tucson General Hospital drawings to the Arizona Architectural Archives, administered by the UA Preservation Studies program, and housed in an Arthur Brown building, a former Tucson school building. Archives director UA associate dean of architecture R. Brooks Jeffery accepted Brown's 1963–1970 Tucson General Hospital drawings on 23 June 2004. The donation included from Brown's collection his first-generation blueline copies of TGH drawings by Norman Hamill (1959) and Bert Thorud (1961).

The project archaeologist visited the site in June 2004 and pursued archival repositories in Tucson. His report is included as the Archaeological Field Survey and Evaluation of Potentially Significant Cultural Properties.

PROJECT BACKGROUND

On behalf of the Capital Planning & Projects Department of University Medical Center (UMC), SWCA undertook archival, architectural, and archaeological surveys on the former Tucson General Hospital (TGH) property (Figures 1 and 2). University Medical Center intended (in summer 2004) to raze existing structures on the TGH property and develop the land; the undertaking thus required clearance for demolition-permit approvals and to ensure proper mitigation of any significant historic properties prior to construction. UMC presumed that two of the buildings on the TGH property were originally part of the Harding/Catalina Guest Ranch, and the historic integrity of these structures required investigation. In addition, the 1968–1970 TGH Bed Tower designed by renowned Tucson architect Arthur T. Brown attracted the attention of local architectural historians and historic preservationists, and warranted investigation and documentation before demolition. Given that a small portion of the property was undeveloped, archaeological survey was necessary to provide clearance for this area.

This report is divided into three sections. The first deals with archival research, the second provides an inventory of buildings on the former TGH property, and the third section describes methods and results of the archaeological survey and evaluation.

ARCHIVAL RESEARCH

SOUTHERN ARIZONA OSTEOPATHIC PHYSICIANS

Dr. Andrew Taylor Still (1828–1917) developed the principals of osteopathic medicine in 1874 after practicing traditional medicine in Kansas and Missouri for two decades including surgical service during the Civil War. Dr. Still reasoned that a combination of patient-assisted diagnosis and "manipulative treatment" of bone joints, muscles, and blood circulation addressed most ailments more successfully than drugs and surgery. He named his approach "osteopathy" (Greek for 'disease of the bones') and founded an "osteopathic" medical school in Kirksville, Missouri, in 1892. A generation of "osteopaths," doctors of osteopathy—D.O.—emerged from Still's program and migrated to practices across the United States ("Osteopathy" 2004). By 1900 George W. Martin, D.O., opened Arizona's first osteopathy practice in Tucson and established the pattern that concentrated the state's future osteopathic services in southern Arizona. In 1920 the Eastern Arizona Society of Osteopaths formed a union of the handful of doctors of osteopathy practicing around Tucson and the region's mining communities. In 1942 Dr. Spencer Ellsworth established the state's first osteopathic hospital in Safford, northeast of Tucson. (Johnson 1992)

In 1949, 30 doctors of osteopathy practiced in southern Arizona, including 17 in Tucson who pooled their resources that year to found their own clinic, which they named Tucson General Hospital (TGH). The physicians acquired a maternity clinic, formerly "New Stork's Nest," at 2834 East Grant Road in Tucson and installed 15 patient beds in their new facility. These osteopaths attracted a particular market in Tucson for midwife services and delivery of babies, and by 1955 they had delivered 1,000 children at Tucson General Hospital. (Johnson 1992)

DUDE RANCHES IN THE TUCSON AREA

Arizona's transition from territory to state in 1912 brought its boast of offering residents and newcomers the "Five Cs": cattle, copper, cotton, citrus, and climate, the latter referring to the state's premier attraction for tourists. As the economic success of Arizona's large cattle operations declined after World War I, tourism increased with expansion of rail services and popularity of the automobile and tour bus.

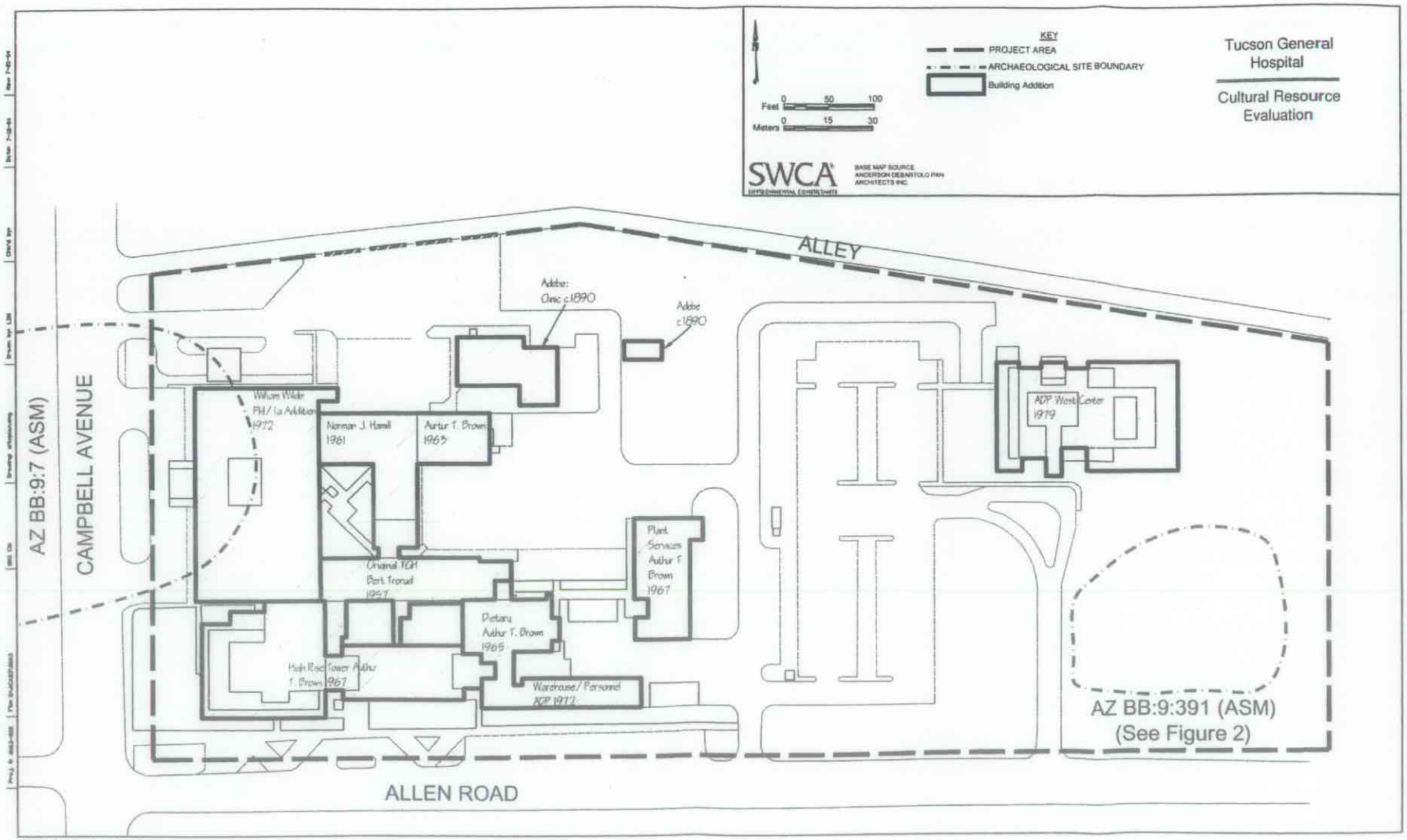

Figure 1. Project location.

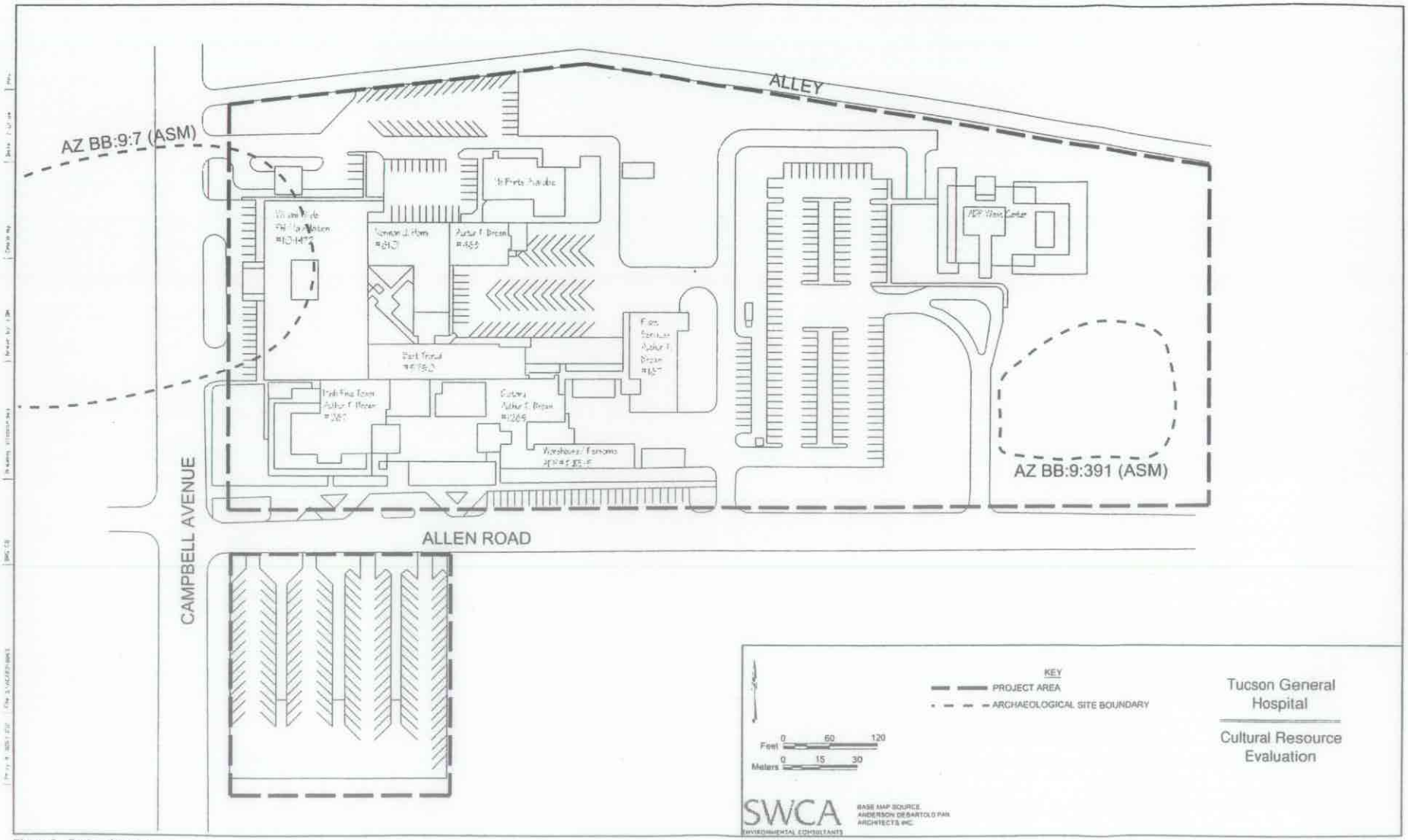

Figure 2. Project location.

Many working ranches diversified their services to include invitations for tourists to enjoy a romantic week or two in the rural West. Other bona fide cattle operations built ranch settings specifically to entertain "dudes"—urban men and women—from faraway cities.

A number of sources agree that the term "dude ranch" appeared in 1921 to describe vacation ranches throughout the Southwest. Arizona led this trend with a number of rural estates in the immediate orbit of Tucson, reached easily by train from the Eastern U.S. and California, then by "station wagons" from the nearest depot. These retreats offered working-ranch, extended-stay experiences for urban vacationers paying $20 to $30 per day during the popular winter season. "At the peak of guest-ranch popularity in the late 1940s," wrote Bob Womack in 1981 for the *Arizona Daily Star*, "Tucson boosters claimed there were more than 100 in this area" (Womack 1981).

The Harding Guest Ranch, also known as Catalina Guest Ranch for its northerly view of the Catalina Mountains, operated on 17 acres along North Campbell Avenue in Tucson and added new buildings as late as 1940 (Figure 3). However, the 1940s peak of dude ranch popularity also signaled their decline, and post-World War II tourism trends moved beyond this particular type of Arizona vacation. By 1954 Harding Ranch owner Michael Bleich leased his adobe guest-ranch buildings to the Valley School for Girls, and indicated to friends his desire to sell the property (Johnson 1992).

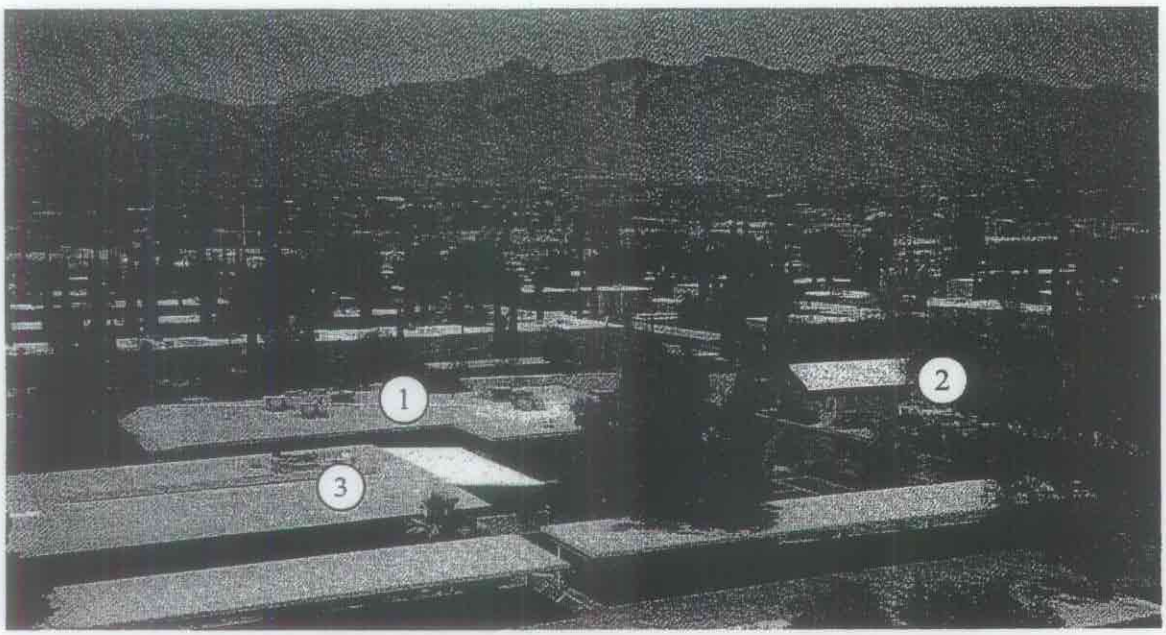

Figure 3. Former Harding/Catalina Guest Ranch buildings, c. 1940 at middle left (1), c. 1900 at middle right (2), both converted to hospital use in 1954. Nursing Wing of 1963 is at lower middle left (3), between c. 1940 adobe and parking shelter. Photo looking northeast from roof of Bed Tower, May 2004.

About that time Bleich visited with his doctor, Thomas J. Odom, D.O., and learned that Odom's fellow osteopaths had outgrown their compact Tucson General Hospital building on East Grant Road and sought new property with room for growth. The physicians weighed Bleich's offer of land and serviceable buildings "out in the country," against lingering hopes to build a downtown Tucson hospital, and against a plot of land they had just purchased in a developing Tucson suburb. Bleich and Odom prevailed in a vote of the investing osteopaths, and on 9 September 1954 Tucson General Hospital acquired the Harding Guest Ranch with "several different buildings" for $85,000 (Johnson 1992).

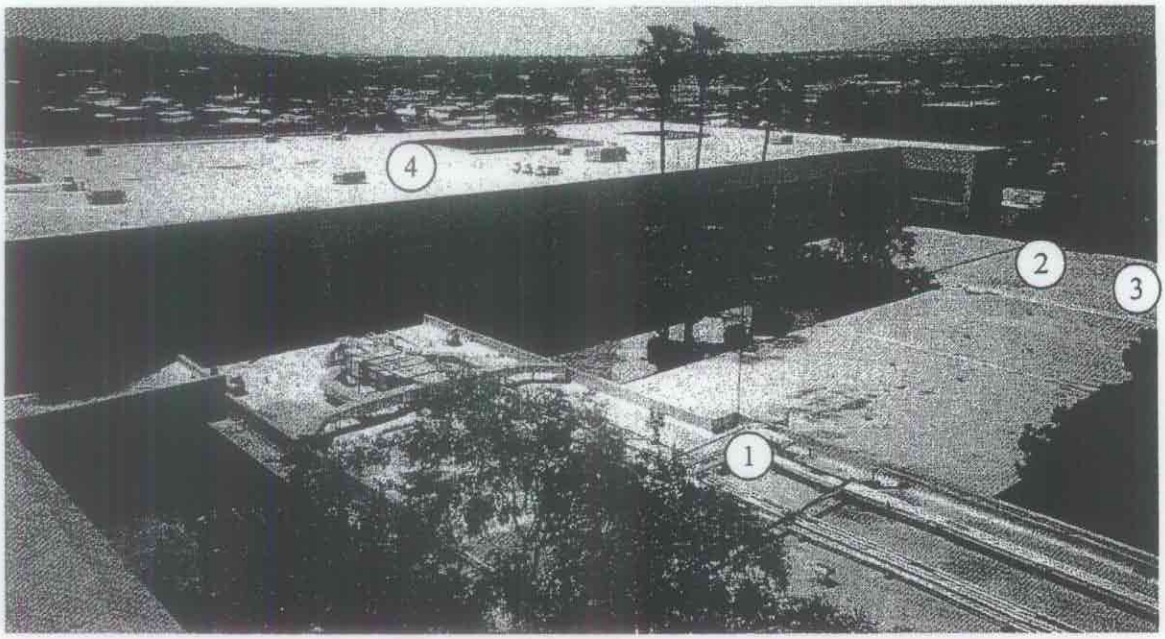

Figure 4. Tucson General Hospital, 1-story original 1959 building inverted T at lower center extending to middle right (1), 1961 North Wing at middle right (2), and extending out of picture to 1963 Nursing Wing (3), 2-story 1975 Emergency Room extending from middle left (4), looking northwest from roof of Bed Tower, May 2004.

commission to advance his climate-sensitive approach. His work attracted architectural magazine photographers and features in *Architectural Forum* (his 1936 home) and the British *Architectural Design* (the Red & Blue Drive-In of 1945) (Nequette and Jeffery 2002; Brown 1985).

Architectural Modernism in Tucson

Tucson attained a modest foothold in the early years of American architectural modernism through the prolific works of Henry Charles Trost (1860–1933). Strongly influenced during his early work in the 1880s and 1890s at Chicago in proximity to Louis Sullivan, Frank Lloyd Wright and others who gazed far beyond traditional European design precedents, Trost combined good business sense with structural innovation in his practice. In Tucson he designed many buildings including the Carnegie Free Library of 1900, the Santa Rita Hotel in 1902-1904, and the Ronstadt House of 1904 (Nequette and Jeffery 2002). Much of Trost's work drew massing and motifs from Spanish Colonial influence, with floral Sullivanesque ornament and other unconventional shuffles toward the simplicity of modernism. (Nequette and Jeffery 2002)

America's expansionism after World War I, its over-indulgence of the 1920s, and the severe economic shock of the Great Depression—all felt somewhat milder by Arizona than most of the country—inspired the next national wave of architectural modernism. The 1932 "International Style" exhibit at New York's Museum of Modern Art profoundly affected designers and clients for decades to come. The Chicago world's fair the next year amplified this wave and swept young architects like Arthur Brown into its momentum. "In this formalist presentation," write Anne Nequette and Brooks Jeffery in *A Guide to Tucson Architecture* (2002:290), "one saw work stripped of historical association: There were no pitched roofs, no applied ornament, and no symmetrical facades."

Innovative architects such as Arthur Brown understood this "formalism" as an opportunity to experiment with functionalism, including the comfort of a building's occupants. Otherwise, the American public's

fascination with the International Style, fueled after World War II by architectural journals and other popular press, soured with direct experiences inside such standardized buildings dropped into places with extreme climates. Therefore, a new phase of modernism, which Nequette and Jeffery cite as Critical Regionalism, emerged as early as the 1950s from a "synthesis of European modernist intentions with the cultural, geographical, and climatic concerns of a particular place.... In Tucson, the response to the harsh sunlight and generally constrained economics has led to some intelligent and innovative solutions" (Nequette and Jeffery 2002:291)

BROWN'S DESIGNS FOR TUCSON GENERAL HOSPITAL

Arthur Brown's first commission in 1963 for the steady expansion of Tucson General Hospital added a one-story Nursing Wing (Figures 3. and 4.) to the Thorud and Hamill wings of 1959 and 1961. This $67,060 job resulted in an overall **H**-plan building, probably as envisioned for periodic extension by the original Department of Health's standard hospital specifications (Brown 1963). Brown's TGH Dietary Wing commission in 1965 produced a two-story ell to the southeast, expanding existing kitchen and dishwashing functions, topped by an upstairs dining room with picture windows to the north that framed dramatic views of the Catalina Mountains (Brown 1965, Brown 2004) (Figure 5). While most of these additions were largely covered inside later expansions of TGH, their designs were apparently painstakingly functional with few expressions beyond their basic structures of exposed concrete, tawny brick infill, and aluminum-framed exterior glass. As one exception to TGH functionalism, the Dietary Wing's dining room featured a south-facing saw-tooth window wall and embellished outside staircase on its southeast corner.

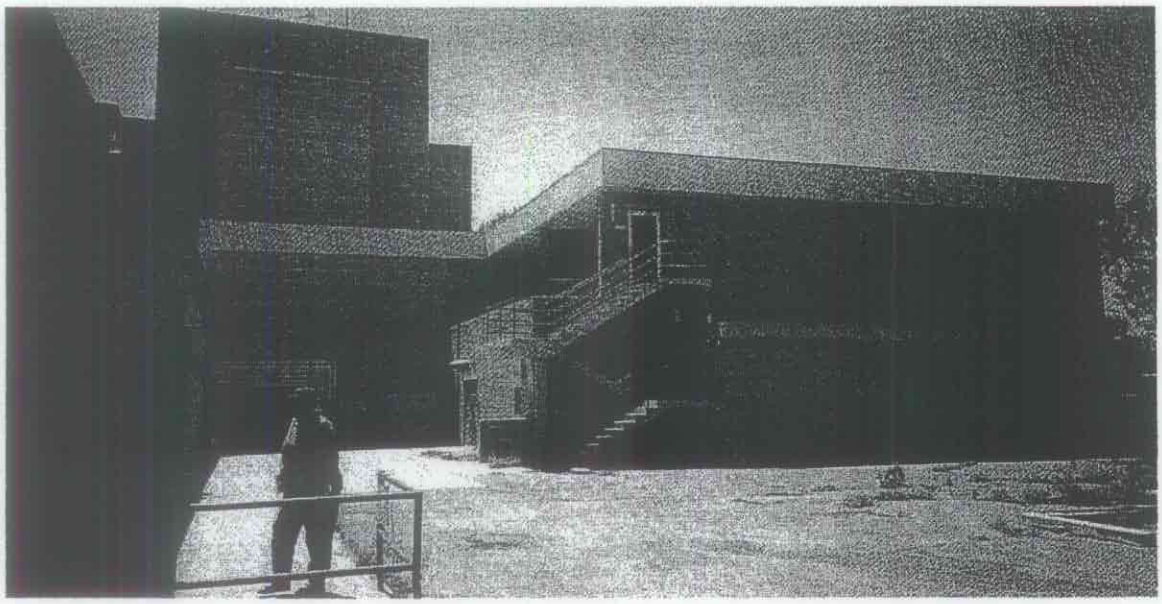

Figure 5. Tucson General Hospital, 2-story 1965 Dietary Wing at right, 1-story 1972 Warehouse/Personnel Wing at left, 1970 Bed Tower in background, looking west, May 2004.

Tucson's population continued steady growth in the decade, from 265,000 in 1960 to more than 350,000 by 1970, with thousands of new homes moving north toward the Catalina Mountains. In 1967 the Tucson General Hospital trustees projected considerable growth for their institution—207 beds by 1970, 308 beds by 1985—and commissioned Brown to design a Plant Services (Figure 6.) building as an expandable power and maintenance facility. The resulting free-standing two-story building brought some of Brown's best work in Critical Regionalism to the TGH campus. Tawny brick walls, each brick with pale kiln

marks for interest and texture, supported pre-cast concrete T beams set flush to form the flat roof surfaces. An underground tunnel connected electrical and plumbing systems to hospital buildings. One internal boiler served existing plant needs, with room for two additional boilers. (Brown 1967, Crone 1968)

Figure 6. Tucson General Hospital, 1967 Plant Services Building, looking northeast, June 2004.

By 1968 Tucson General initiated its boldest expansion to date, a "South Addition," that utilized its new power capacity and ample land for growth but broke the heretofore one-story, horizontal circulation pattern with a multi-story tower. Brown illustrated a number of proposals through artistic renderings—one of his specialties—including a compact tower of optional rectilinear or circular plan creating a new hospital entrance from Campbell Avenue (see Appendix B). His renderings started with a six-story tower—five floors of hospital space plus basement, flanked by six-story elevator towers—that faced south and re-oriented the hospital entrance to Allen Road. This new orientation removed most TGH automobile arrivals and parking from ever-busier Campbell Avenue. The final design resulted in a four-story "Bed Tower" with basement, flanked by five-story elevator pavilions, related to the existing hospital by a step-down series of windowless brick masses that protected interior functions from the west sun (Figure 7).

For the Bed Tower's structure, Brown originally proposed an unconventional space-frame assembly, an inventive light-weight approach to construction typical of Brown's experiments with structural innovation. He also planned a sunscreen integrated with the space frame's south elevation, according to his son Gordon V. Brown, who worked in his father's office during this TGH commission (Brown 2004). Another young designer in Brown's office at the time, University of Arizona architecture graduate Albert N. Hopper, represented the architects on the job site each day and developed a strong empathy with the contractor's superintendent, Alva LaRue of Connelly Construction Company. Both Hopper, now practicing in Bisbee, and Gordon Brown, practicing in Tucson, list the Tucson General Bed Tower as one of Arthur Brown's largest commissions, but comparable to some of his larger school complexes and his commission for Tucson's Palo Verde Psychiatric Hospital (demolished). (Brown 2004, Hopper 2004)

As constructed, a conventional steel frame appealed to the TGH budget, but Brown's sunscreen evolved into a signature assembly (and miniature space frame) of gold-anodized aluminum, glass, and steel. As ornament, a matching screen assembly was proposed for the north elevation of the main four floors of the Bed Tower, but Arthur Brown removed this embellishment from the working drawings (Brown 1968). As functional sunscreen, perforated-metal triangular hoods covered the upper half of each octagonal window unit, while an operational casement window occupied the lower half of each unit (Figure 8). The result blocked direct summer sun from patient rooms, but allowed solar heat gain in winter and diffused, golden light to brighten each room. The $2 million facility opened with 277 beds in 1970, served by 100 doctors of osteopathy registered in southern Arizona. (Brown 1968, Johnson 1992)

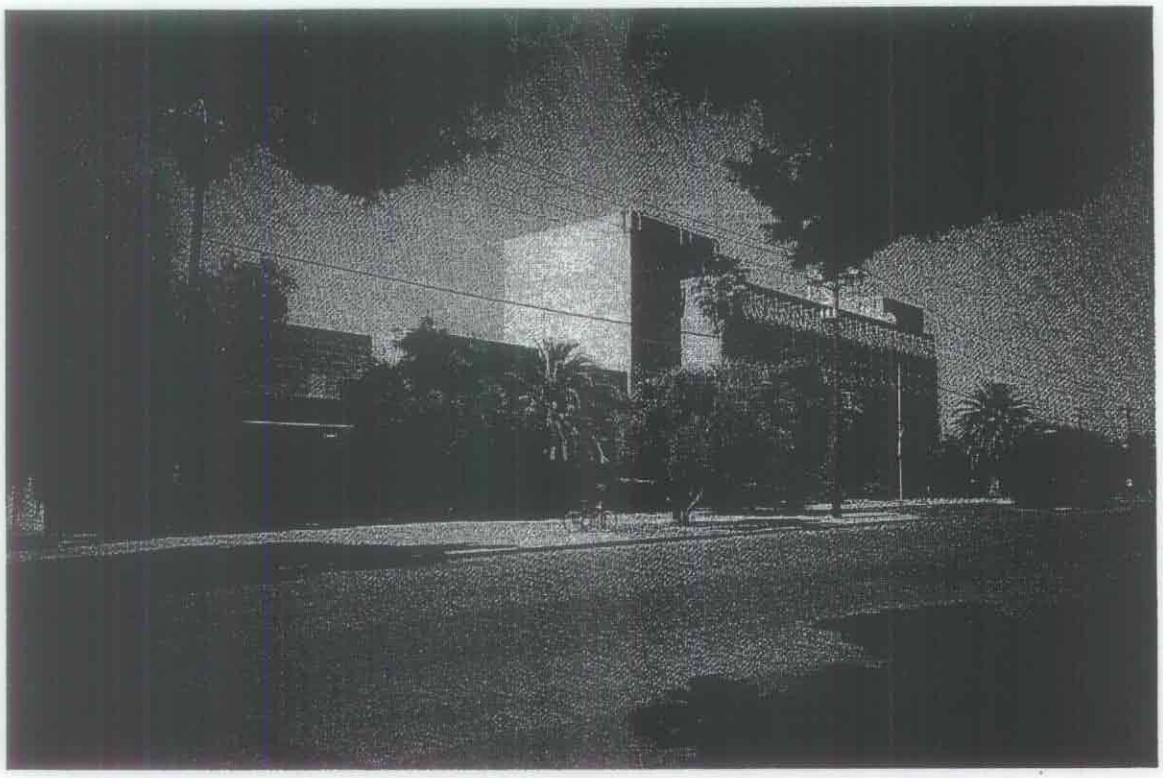

Figure 7. Tucson General Hospital, 1970 Bed Tower or "South Addition" with surgery wing at left, looking northeast, May 2004.

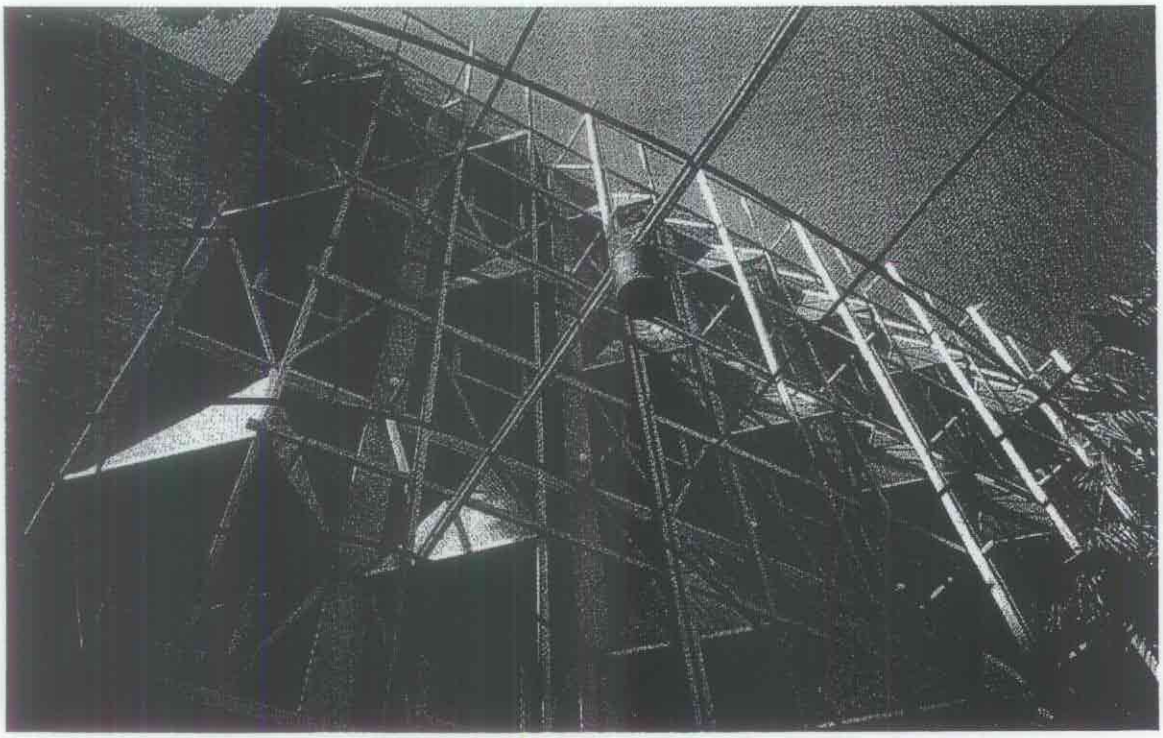

Figure 8. Tucson General Hospital, 1970 Bed Tower or "South Addition," detail of solar window screens (foreground partly obscured by dark structure of later entry door awning), looking northeast, May 2004.

Subsequent Expansion and Demise of Tucson General Hospital

Arthur Brown's lucrative relationship with Tucson General continued through at least three more commissions, including two phased remodelings of the 1959/1962 hospital building in 1969 and 1970 (Figure 2) totaling about $33,000 (Brown 1969, Brown 1970). In 1969 he also converted another old guest ranch nearby, the 17-unit Normandie Inn at the northeast corner of Prince and Campbell, into "Westcenter" for Tucson General's new alcoholic recovery program (Johnson 1992:51, Brown 2004).

Between 1972 and 1975 Tucson General added a two-story $4.5 million Emergency Room expansion at the northwest corner of the complex facing Campbell Avenue (Figure 9), designed by William Wilde, another of Tucson's first modernist architects. In 1972 the trustees also added a Warehouse/Personnel wing, designed by architects Anderson, DeBartolo Pan, Inc. (ADP), east of the Bed Tower.

But in 1974 southern Arizona's osteopaths warmed many generations of chilly relations with "allopathic physicians"—conventional medical doctors or M.D.s—to exchange services at all Tucson hospitals. In 1976 many D.O.s joined the staff of St. Mary's Hospital in Tucson. Thereafter Tucson General Hospital lost its exclusive position in the osteopath community, further diluting its traditional osteopathic patient market and revenue, and thus the exclusive osteopathic nature of TGH. (Johnson 1992).

In 1980 Westcenter moved into a new facility, designed by ADP, on the east side of the Tucson General campus, but the osteopaths gradually lost their ability to run an associated full-service hospital. In 1986 the trustees sold Tucson General Hospital to Summit Health Ltd., a California-based, multi-state health care operator. After 15 years of operation and continual remodelings, Summit closed Tucson General in 2001 and sold the property to University Medical Center (UMC). UMC planned its Arizona Cancer Center for the site without expectation of adaptive use of existing Tucson General Hospital buildings. Further review of the 1975 Emergency Room Building by Holben, Martin & White consulting structural engineers found that its structure could be adapted to code, seismic, and horizontal load standards for future use. The 1968-1970 Bed Tower's structure also was evaluated by the structural engineers, who found its as-built characteristics incapable of meeting new cancer-facility standards. Its demolition was expected by late 2004, following careful removal and storage of its distinctive solar screen for future use elsewhere. (Johnson 1992, Riley 2004).

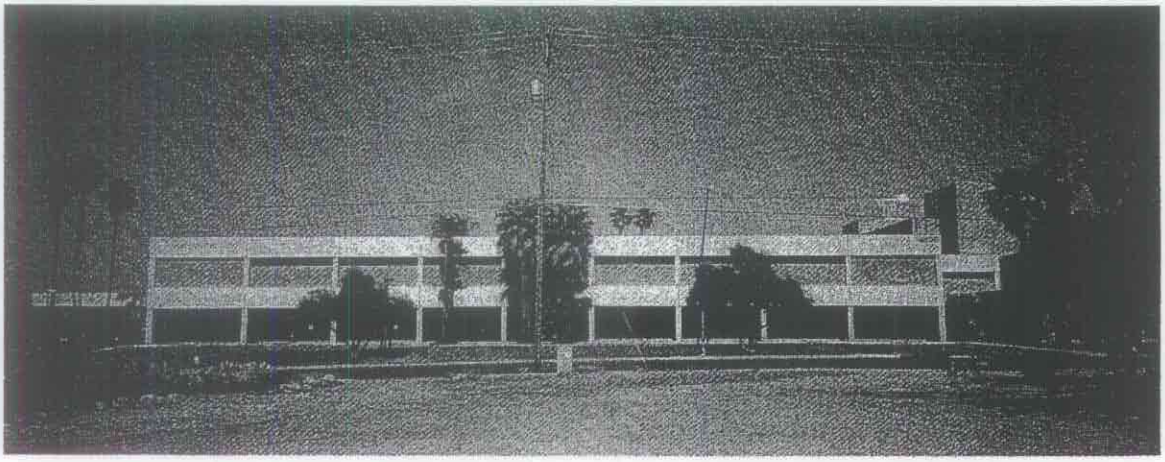

Figure 9. Tucson General Hospital, 2-story 1975 Emergency Room expansion along Campbell Avenue, 1970 Bed Tower visible at right, looking east, May 2004.

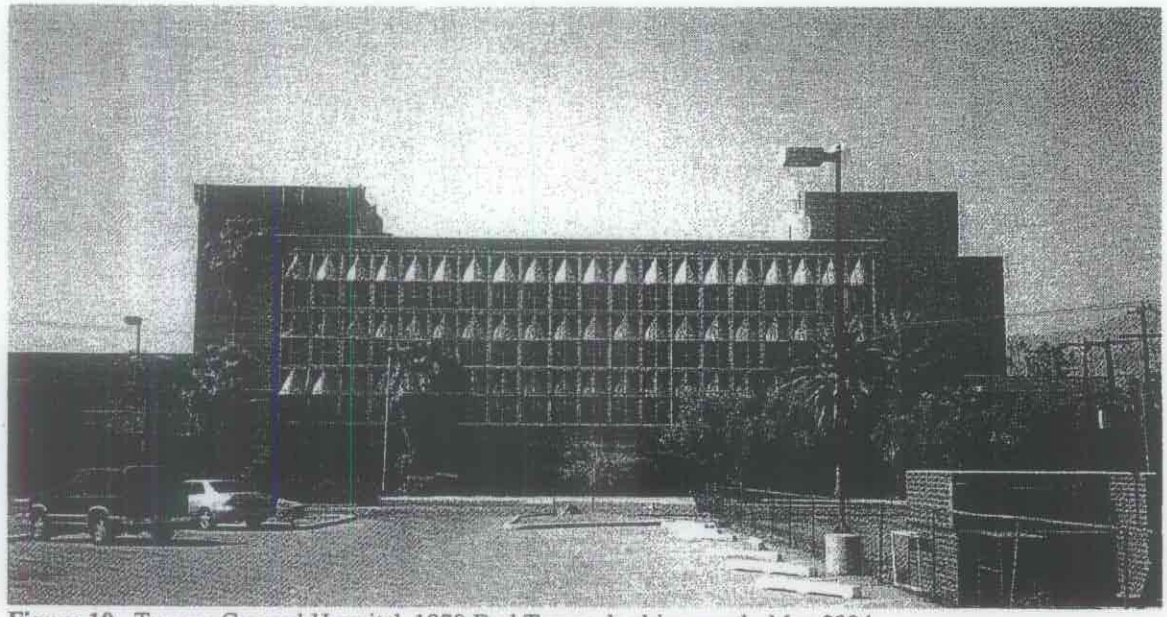

Figure 10. Tucson General Hospital, 1970 Bed Tower, looking north, May 2004.

INVENTORY OF BUILDINGS

Table 1. Inventory of Buildings

Institution	Building Name	Date Placed in Service	Designer	Cost
Harding Guest Ranch	Small Gable-end Adobe	c. 1900; TGH 1954	unknown; Arthur Softley	not available
Harding Guest Ranch	Large Flat-roof Adobe	c. 1940; TGH 1954	unknown; Arthur Softley	not available
Tucson General Hospital (TGH)	TGH: First Bldg. on Campbell	1959	Bert Thorud	$500,000
TGH	North Wing	1961	Norman Hamill	not available
TGH	Nursing Wing	1963	Arthur Brown	$67,060
TGH	Dietary Wing	1965	Arthur Brown	not available
TGH	Plant Services (Power & Maint.)	1967	Arthur Brown	not available
TGH	Westcenter (Prince Road)	1969	Arthur Brown	not available
TGH	South Addition (Bed Tower)	1970	Arthur Brown	$2 million
TGH	1959 and 1961 Bldgs Remodeling	1970	Arthur Brown	$33,000
TGH	Warehouse/Personnel Wing on Bed Tower	1972	Anderson, DeBartolo Pan (ADP)	not available
TGH	Emergency Room (plus ICU, etc.?)	1975	William Wilde	$4.5 million
TGH	Westcenter (TGH Campus)	1980	ADP	not available

ARCHAEOLOGICAL EVALUATION

In conjunction with the historic property evaluation for the TGH property, an archaeologist from SWCA Environmental consultants conducted 1) an archaeological sites records check and 2) a Class III cultural resources survey of the property. All undeveloped land, approximately 1.6 acres, within the TGH property was examined for archaeological remains (see Figure 2). The surveyed area measured 275 feet (83.6 m) north-south by 258 feet (78.4 m) east-west in the southeast portion of the TGH property.

ARCHAIC PERIOD

The extinction of large mammals, coupled with climatic change, at the end of the Pleistocene Epoch was at least one cause of a shift from the largely hunting-based economy of the Paleoindian period to the Archaic lifeway, which was based on the procurement of a broad spectrum of wild plants and animals. The Archaic manifestation in southern Arizona has been referred to as the Cochise culture (Sayles 1983; Sayles and Antevs 1941), which has been divided into several stages, including the Sulphur Springs (8000-6000 B C.), Chiricahua (6000-3000 B.C.), and San Pedro (3000 B.C.-A.D. 200) stages (Waters 1986). In general, Archaic period toolkits included flaked stone tools, such as projectile points mounted on atlatl darts or spears (Slaughter 1992:9), as well as a variety of grinding implements. Fratt (1992:19) indicates that the presence of ground stone tools "signals a major change in subsistence away from a focus on big-game hunting and plant gathering with little to no processing to more extensive and intensive plant procurement and processing." In the Sonoran Desert portion of the Southwest, critical wild resources were often too scattered and scarce to support truly sedentary populations. Therefore, generalized Archaic settlement patterns are characterized by high residential mobility (Huckell 1984), particularly in the Sulphur Springs and Chiricahua stages of the Archaic sequence.

EARLY CERAMIC PERIOD

Once thought to be the hallmarks of the Formative period, it is now clear that pit house construction, maize agriculture, and ceramic technology began at different times in the Southwest. Sites with evidence of maize agriculture and year-round sedentism, such as those investigated by Huckell (1983) and Mabry and Clark (1993d), demonstrate that relatively large numbers of people were settled in the Tucson Basin and surrounding areas prior to the development of ceramic technology.

The advent of ceramic vessels marked a significant change in storage technology. The earliest ceramic vessels, dating to approximately A.D. 1 to A.D. 425, are plain, brown ware, small neck-less jars and out-curved bowls (Deaver and Ciolek-Torrello 1995). Probably used for seed storage, these sand-tempered ceramics represent the initial attempts at ceramic vessel technology and occur over broad areas of the Southwest. Because they occur in many areas and are technologically similar, these plain wares suggest that the cultural differentiation characteristic of the later periods had not yet occurred.

Following the Plain Ware horizon, Deaver and Ciolek-Torrello (1995:485) define the Red Ware horizon characterized by slipped and polished red wares. This period lasts from approximately A.D. 425 to A.D. 650 (Deaver and Ciolek-Torrello 1995:514). A great variety of vessel forms is evident, including flared-necked jars and flat-rimmed bowls, the latter thought to be the hallmark of Hohokam ceramic technology. Thus, some cultural differentiation is evident by the sixth century in the Southwest, and minor influences from the Gila Basin may be apparent in the Tucson Basin.

Ceramics from these early periods resemble Mogollon pottery and appear to represent a broad pan-regional development in ceramic production. Sites that have been excavated in the Tucson Basin and that contained early plain ware and red ware include El Arbolito (AZ EE:1:153 [ASM]) (Huckell 1987, 1990), the Triangle Road Site (AZ BB:9:87 [ASM]) (Wellman 1999), and AZ BB:13:398 (ASM) (Deaver and Ciolek-Torrello 1995). In the Tucson Basin, the early Plain Ware Horizon is known as the Agua Caliente Phase (Ciolek-Torrello 1995); the Red Ware Horizon (also containing plain ware) is designated as the Tortolita phase. As mentioned above, Agua Caliente phase ceramics consists of plain, brown seed jars, short-necked globular jars, and out-curved bowls; whereas during the following Tortolita phase a wider variety of vessels forms is evident, some of which are red-slipped. Basin metates are the dominant metate form in the Agua Caliente phase, with the introduction of the trough metate occurring during the Tortolita phase.

Based on work at the Lonetree Site (AZ AA:12:120 [ASM]), Bernard-Shaw (1990) suggested that the Tortolita phase in the Northern Tucson Basin was somewhat equivalent to the latter part of the Vahki and earlier part of the Estrella phases in the Phoenix Basin. Because the suite of traits that define the Hohokam regional system are not yet present during this early formative stage, Deaver and Ciolek-Torrello (1995) have placed the beginning of the Hohokam occupation in the Tucson Basin at approximately A.D. 700, with the appearance of the Snaketown pottery style.

HOHOKAM CULTURE

The two prehistoric archaeological sites that have been recorded within the boundaries of the TGH property represent cultural manifestations of the Hohokam (although their exact temporal affiliation is not known at this time). The prehistoric Hohokam of central and southern Arizona practiced a formative lifeway that was dependent upon the cultivation of corn and other crops, as well as the exploitation of wild plant and animal resources. Hohokam culture probably developed out of the local Archaic hunter-gatherer and early agricultural traditions, with considerable influence from Mesoamerican cultures, and it successfully adapted to the arid conditions of the desert Southwest. The Hohokam "core area," where most distinctive cultural traits appear to have originated, is considered to be the Phoenix Basin, a region that is centered on the lower Salt and Gila river valleys.

The Tucson General Hospital property project area is located in an area once occupied by the Tucson Basin Hohokam, one of the several cultural branches that share important traits with the core area but that adapted differentially to their own particular environments (McGuire 1991). The Hohokam are particularly well-known for the construction of large-scale public features such as irrigation systems, ballcourts, and platform mounds. The Hohokam developed extensive exchange networks with the peoples of the Southwest and Mesoamerica that involved the import of decorated pottery, turquoise, raw shell, copper bells, and exotic animals, and the export of finished shell ornaments, pottery, and possibly foodstuffs (Crown 1991; Doyel 1991).

PIONEER PERIOD (A.D. 425-750)

Hohokam cultural history is generally divided into four temporal periods: Pioneer, Colonial, Sedentary, and Classic. The sequence of these periods has been substantiated in several areas, but the absolute dating of the periods continues to be the subject of serious debate (Dean 1991; Deaver and Ciolek-Torrello 1995; Haury 1976; Schiffer 1982; Wallace and Craig 1988). In the Phoenix Basin, a post-Classic period has been proposed and described (Chenault 1992; Sires 1984), but its cultural manifestations have not been identified in the Tucson Basin. Some disagreement exists concerning the date of the first Hohokam occupation in southern Arizona, but recent evidence places Hohokam villages in the Phoenix Basin around A.D. 1 (Cable and Doyel 1987; Dean 1991). The Pioneer period has traditionally been composed of four phases – Vahki, Estrella, Sweetwater, and Snaketown – which were developed based on stratigraphic and chronometric evidence from the large village of Snaketown (Gladwin et al. 1937; Haury 1976). More recent excavations in the Phoenix Basin, however, have led to a proposed pre-Vahki, Red Mountain phase that marks the transition from mobile to a sedentary adaptation.

Disagreement exists concerning the date of the first Hohokam occupation in Southern Arizona, and it is believed by some that a hiatus occurred between the Late Archaic occupation of the Tucson Basin and the succeeding Pioneer Period Hohokam occupation. The Pioneer period prior to the Snaketown phase remains ill-defined in the Tucson Basin, although several investigations along the Santa Cruz River have revealed late preceramic and very early pit house villages that demonstrate an in situ continuum from the Archaic to Hohokam cultures. Based on research at the Houghton Road (AZ BB:13:298[ASM]) and other sites, Ciolek-Torrello (1995) proposed an Agua Caliente phase in the Tucson Basin temporally equivalent

to the pre-Vahki, Red Mountain phase in the Phoenix Basin, although Deaver and Ciolek-Torrello (1995) do not assign a Hohokam cultural affiliation to the phase.

In the Northern Tucson Basin survey, Fish et al. (1992:Figure 2.1) identified Pioneer period sites in the same two settings as Late Archaic period sites: along the Santa Cruz River and at the foot of the Tortolita Mountains. Based on work at the Lonetree Site (AZ AA:12:120 [ASM]), Bernard-Shaw (1990) suggested a Tortolita phase in the northern Tucson Basin somewhat equivalent to the latter part of the Vahki and earlier part of the Estrella phases in the Phoenix Basin.

Colonial Period (A.D. 750-950)

Hohokam population increased markedly during the Colonial period, as improved irrigation technology in the Phoenix Basin, and to a limited extent along the Santa Cruz River, allowed for the reliable cultivation of maize, beans, squash, and cotton. Primary village sites became common along the major drainage systems. Ballcourts were constructed in these larger villages throughout southern Arizona (Kelly 1978:5; Wilcox and Sternberg 1983), and the inhumation burial practices that marked the earlier Pioneer period were largely replaced by cremation burial. Both of these occurrences indicate significant changes in cultural and ritual life of the Hohokam on a regional scale (Wilcox 1991:124). The material culture of the Tucson Basin Hohokam began to diverge in significant ways from that of the core area, most notably in ceramic technology. The Tucson Basin Colonial period is divided into two phases, the Cañada del Oro and the Rillito.

Sedentary Period (A.D. 950-1150)

During the Sedentary Period, which includes the Early, Middle, and Late Rincon subphases in the Tucson Basin, settlement changes included expansion from riverine environments to secondary drainages and bajadas. The repertoire of agricultural strategies expanded to include rock piles and rock pile fields located on the bajadas, possibly to enhance agave production. In contrast to the earlier phases, Rincon phase ceramics show a marked differentiation form contemporary Gila Basin styles. Ceramics from this period are distinguished by degeneration in the execution of line work and a bolder decorative style. Vessel construction was thicker and heavier than in earlier periods, and the distinctive Gila shoulder made its first appearance on the bodies of jars and ollas.

Classic Period (A.D. 1150-1450)

After A.D. 1150 dramatic changes occurred in Hohokam architectural styles, burial practices, and material culture. Adobe-walled pit houses replaced the pit house style of architecture and, later, by aboveground structures built of adobe and stone masonry. These structures were commonly incorporated in compounds that were surrounded, entirely or in part, by adobe and stone walls. Ballcourt construction ceased by the Classic period, but earthen platform mounds, which may have been conceptually derived from Mesoamerican pyramids, began to appear in the larger villages. An excellent example of a platform mound site of Classic period is the Marana Platform Mound and Compound (AZ AA:12:251[ASM]). Possibly due to an increase in warfare (or the threat thereof), the Tucson Basin Hohokam aggregated into larger primary villages located along the major drainages during the Classic period (Doelle and Wallace 1991). By the first part of the Classic period (the Tanque Verde phase) design styles of red-on-brown ceramics became simpler and more rectilinear. In the southern Tucson Basin, large village sites along the east margin of the floodplain, smaller sites, and seasonal settlements away from the river suggest a greater reliance on non-riverine agriculture. This phase was characterized by greater regionalization and integration of environmental diversity (Doelle 1988:285-286).

Many Tanque Verde phase sites were abandoned by the end of the phase, approximately A.D. 1300. In the succeeding Tucson Phase, the last definable Hohokam phase in the Tucson Basin, populations apparently aggregated into fewer, but larger, sites. Fish et al. (1992) indicate that both the southern Tucson Basin and Picacho Mountain areas contained substantial communities at this time. Roosevelt Red Ware (Salado Polychrome) pottery, presumably derived from the Tonto Basin, first appeared in assemblages of decorated ceramics during this period. Platform mounds were also constructed in several communities, indicating larger community organization (Downum 1993; Fish et al. 1992). During the Tucson phase, the southern Tucson Basin saw a significant decline in the use of non-riverine resources and may have seen an overall decline in population as well (Doelle 1988:283). By approximately A.D. 1450, however, much of the Hohokam social and economic structure had collapsed, perhaps as a result of warfare, malnutrition, drought, flooding, or some combination thereof.

Protohistoric Period and Historic Native American Period

The Protohistoric period, from the end of the Hohokam occupation around A.D. 1450 to Spanish contact at the end of the sixteenth century, is little understood in southern Arizona. Historical documents from the earliest Spanish contact suggest that the Sobaipuri, a Piman group, occupied the area at the end of the Protohistoric period (Doelle 1984). Archaeological evidence is sparse for the period, due in part to recent agricultural practices and urban expansion. Doelle (1984) also suggests that the material culture and architecture of the Sobaipuri were quantitatively less than that of the Hohokam, resulting in ephemeral and hard-to-find sites. Sobaipuri settlement has long been thought to be concentrated in villages located along the major watercourses of the Tucson Basin. Recent evidence suggests a bimodal settlement pattern with villages along the major watercourses and small seasonal occupations located in the foothills and on the bajadas (Harry 1993). Diagnostic artifacts associated with the Sobaipuri include Whetstone Plain and Sobaipuri Plain ceramics and small triangular points with deeply notch[illegible]

Table 2. Previous Surveys Completed Within One-Mile of Current Project Area

ASM Project Number	Project Name	Institute	Principle Investigator	Project Size
1980-110 (ASM)	Low Income Housing, 3339 East Bermuda	Arizona State Museum	S. Urban	1.5 acres
1981-45 (ASM)	Windwood	Arizona State Museum	S. Urban	4.2 acres
1981-75 (ASM)	Desert Fountain Patio Homes, Cactus Blvd North of Allen	Arizona State Museum	S. Urban	5.3 acres
1981-102 (ASM)	Stonybrook Apartments	Arizona State Museum	S. Urban	4.8 acres
1982-7 (ASM)	Winterhaven Townhomes, Prince and Country Club	Arizona State Museum	S. Urban	8.8 acres
1982-147 (ASM)	Hacienda del Rio Apartments	Arizona State Museum	S. Urban	23.3 acres
1982-179 (ASM)	Campbell Farms, University of Arizona Agricultural Station	Arizona State Museum	J. Madsen	80.7 acres
1983-7 (ASM)	Racquet Club Village, SE Corner of Country Club and Rillito River	Arizona State Museum	S. Urban	3.7 acres
1983-68 (ASM)	Roger Lane Townhomes	Arizona State Museum	S. Urban	0.7 acres
1983-80 (ASM)	Elysian Gardens	Arizona State Museum	S. Urban	4.5 acres
1983-83 (ASM)	Cactus Boulevard Property, Cactus and Allen	Arizona State Museum	S. Urban	6.1 acres
1984-108 (ASM)	Rillito Race Track Survey	Arizona State Museum	G. Hartmann	100.6 acres
1987-201 (ASM)	Alvernon Way Bridge/Rillito River W.O. 4BBRGH, FC-87-17	Institute For American Research	L. Mayro	92.8 acres
1987-208 (ASM)	Hacienda del Sol Road Improvements, Pima County W.O. 4BHDSR	Institute For American Research	L. Mayro	10.5 acres
1988-186 (ASM)	Rillito River: Campbell Avenue to Country Club	Institute For American Research	L. Mayro	30.3 acres

f Current Project Area, continued.

	Institute	Principle Investigator	Project Size
he Rillito	Statistical Research Inc.	Torrello et al.	1142.8
-91	Desert Archaeology, Inc.	L. Eppley	18.7 acres
	Desert Archaeology, Inc.	J. Bateman	0.4 acres
ndale	Desert Archaeology, Inc.	C. Goetze	35.2 acres
	Desert Archaeology, Inc.	L. Eppley	1.2 acres
	Desert Archaeology, Inc.	D. Swartz	16.4 acres
	Desert Archaeology, Inc.	L. Eppley	18.6 acres
	Desert Archaeology, Inc.	L. Eppley	113.0 acres
	Old Pueblo Archaeology Center	A. Lenhart	6.5 acres
quet Club	Desert Archaeology, Inc.	L. Eppley	4.2 acres
	Desert Archaeology, Inc.	L. Eppley	21.5 acres
	Desert Archaeology, Inc.	M. Stevens	40.0 acres
	Desert Archaeology, Inc.	M. Stevens	14.6 acres
	Desert Archaeology, Inc.	P. Castalia	32.9 acres
	Desert Archaeology, Inc.	J. Sliva	16.5 acres
	Desert Archaeology, Inc.	J. Sliva	64.8 acres

Table 2. Previous Surveys Completed Within One-Mile of Current Project Area, continued.

ASM Project Number	Project Name	Institute	Principle Investigator	Project Size
1998-148 (ASM)	Swan/Sunrise Main Survey	Desert Archaeology, Inc.	J. Sliva	36.6 acres
1999-55 (ASM)	Prince Road – I10 to 1st Avenue Survey	Desert Archaeology, Inc.	A. Diehl	45.8 acres
2000-3 (ASM)	River Road/1st Avenue to Campbell Avenue Cultural Resource Assessment	Old Pueblo Archaeology Center	J. Jones	296.1 acres
2000-224 (ASM)	Campbell-River Office Plaza 0.9 Acre Survey Project	Old Pueblo Archaeology Center	J. Jones	1.8 acres
2001-647 (ASM)	First/Limberlost SWC	Professional Archaeological Services and Technologies	D. Stephen	4.2 acres
2002-231 (ASM)	Tierra NPPP	Tierra Right-Of- Way Services	B. Montgomery	3.7 acres
2002-275 (ASM)	Mountain Ave., Roger to Fort Lowell Rd. Improvement Project	SWCA, Inc.	I. Hesse	13.5 acres
2003-467 (ASM)	River and Campbell Survey	Harris Environmental Group	S. Twilling	3.4 acres
2003-1530 (ASM)	W.O. 4TRRCA, River Rd. Campbell to Alvernon & Binghamton NR Nomination	Old Pueblo Archaeology Center	A. Dart	91.5 acres

Table 3. Previously Recorded Archaeological Resources Within One-Mile of Project Area

Site Number	Site Type	Cultural Affiliation	Temporal Affiliation	Reference
AZ BB:9:5 (ASM)	Diverse artifact scatter	Hohokam	A.D. 200 – 1500	ASM 1937a
AZ BB:9:7 (ASM)	Modest sized village with six trash mounds	Hohokam	A.D. 200 – 1500	ASM 1937b
AZ BB:9:8 (ASM)	Campsite or small village with artifacts	Hohokam	A.D. 200 – 1500	ASM 1937c
AZ BB:9:9 (ASM)	Artifact scatter	Hohokam Euro-American	A.D. 200 – 1500; A.D. 1900 – 1950	ASM 1937d
AZ BB:9:11 (ASM)	Small pithouse village with limited artifacts	Hohokam	A.D.200 – 1500	ASM 1937e
AZ BB:9:12 (ASM)	Artifact scatter	Hohokam	A.D. 200 – 1500	ASM 1937f
AZ BB:9:16 (ASM)	Artifact scatter	Hohokam	A.D. 200 – 1500	ASM 1937g
AZ BB:9:17 (ASM)	Artifact scatter	Hohokam	A.D. 200 – 1500	ASM 1937h
AZ BB:9:18 (ASM)	Artifact scatter/trash mound	Hohokam-Colonial Period Hohokam-Pre-Classic Hohokam-Middle Ceramic	A.D. 750 – 950 A.D. 450 – 1100 A.D. 1000 – 1300	ASM 1937i
AZ BB:9:111 (ASM)	Public building/child recreation area	Euro-American	A.D. 1900 – 1950	ASM 1976
AZ BB:9:238 (ASM)	Mormon settlement of Binghampton farming community. Some prehistoric artifacts recorded within settlement	Native American Historic	12000 B.C. – A.D. 1500 A.D. 1900 – 1950	ASM 1989
AZ BB:9:306 (ASM)	Historic buildings constructed ca. 1946 with some later renovations	Euro-American	A.D. 1900 – Present	ASM 1996
AZ BB:9:369 (ASM)	Historic water distribution site with associated buildings	Euro-American	A.D 1900 – 1950	ASM 2003

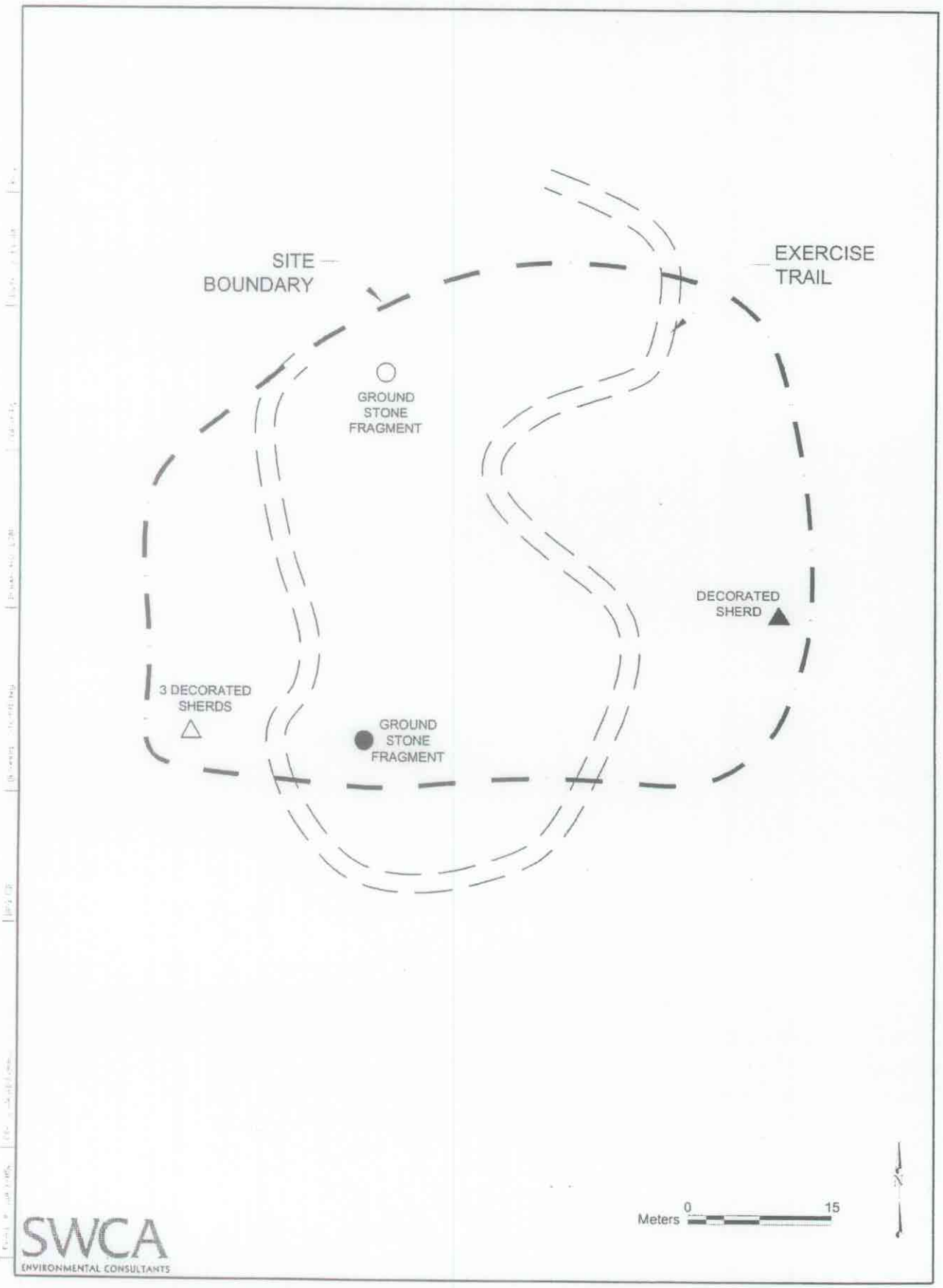

Figure 11. Site AZ BB:9:391 (ASM).

SURVEY METHODS

David Barr of SWCA conducted the Class III archaeological survey on June 18, 2004. The survey was conducted using standard archaeological techniques and following Arizona State Museum (ASM) guidelines for survey coverage and site recording methodologies. The undeveloped/undisturbed portion of the overall project area was covered in parallel transects spaced no more than 20 m (66 feet) apart. Following ASM specifications for pedestrian surveys, which state that one person can adequately cover up to 20 m in width, the study area was intensively surveyed. Ground visibility was excellent.

The ASM has established standards for the evaluation of cultural materials found as result of archaeological surveys. Briefly, to be considered an area of archaeological interest the property must

The modern rock ring is a circular rock alignment of measuring 1.5 m x 1.47 m in diameter (Figure 13). The outer perimeter consists of medium-sized river rocks. The interior stones are smaller and appear to be similar to that of landscaping stones. In the center of the ring is a large "W" constructed from medium-sized river rocks. The ring probably relates to the construction of the West Center and part of the exercise trail. No artifacts were located within or around this arrangement.

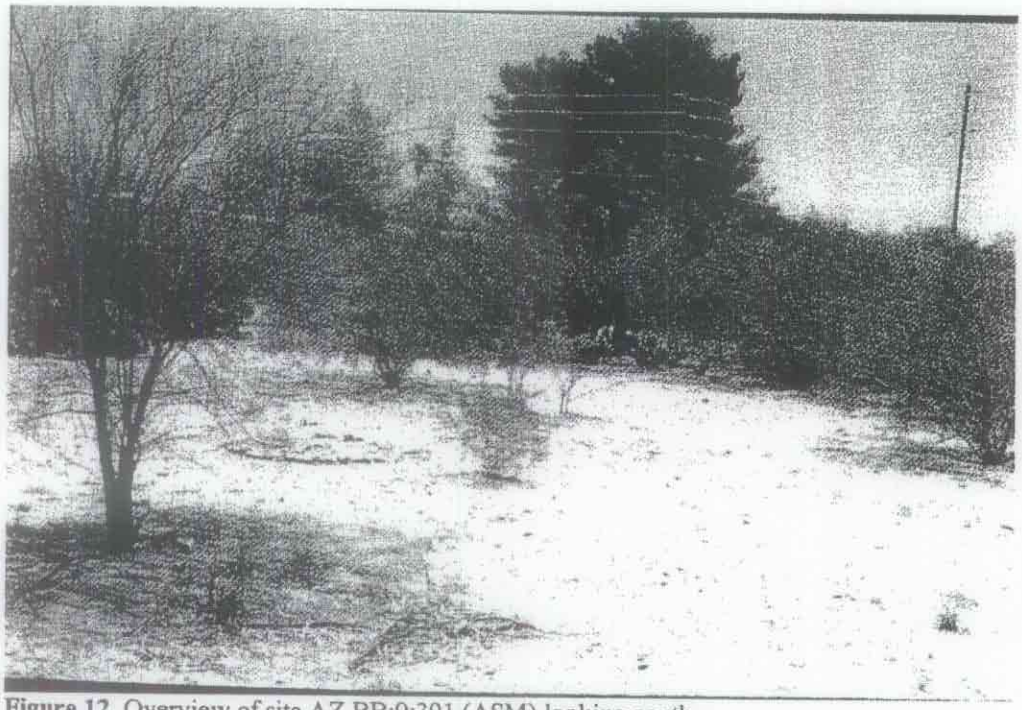

Figure 12. Overview of site AZ BB:9:391 (ASM) looking south.

Figure 13. Feature 1 circular rock ring located within site AZ BB:9:391 (ASM)

Evaluation of Potentially Significant Cultural Resources

Historic Architectural Context

For this 2004 study, SWCA consultants evaluated the former Tucson General Hospital within the Historic Context "Modern Architecture in Tucson, 1940-1970," as a conjectural title but an appropriate community-wide application. Tucson General Hospital's 1968–1970 Bed Tower was not evaluated beyond local significance because Phoenix, other Arizona communities and national parks in the state boast numerous examples of modernist-movement architecture, largely un-evaluated in a common statewide historic context. For example, the distinctive postwar branch-bank buildings of Phoenix-based Valley National Bank, extant in cities throughout Central Arizona, represent the same sort of "Critical Regionalism" practiced by Arthur Brown and his contemporaries. But no contextual information is readily available on these buildings or their relative significance.

On the other hand, all these modernist buildings as a group are threatened by lack of such information and evaluation, in addition to changing uses and typically high land values beneath their foundations. The loss of Arthur Brown's Bed Tower—and coincidentally the flagship building of a significant historic medical institution in Southern Arizona history—may seem trivial in the present environment occupied by only moderate interest in architectural modernism and the passing of its designers, builders and occupants. But this particular loss and its 2004 evaluation might incrementally inspire needed evaluations, and preservation efforts elsewhere.

University Medical Center commissioned this report as a photographic and historical record of TGH conditions before demolition, placing report copies in Tucson libraries and archives. UMC also facilitated donation of Arthur Brown's original TGH drawings—the Bed Tower as well as all other TGH buildings from 1959 to 1970—to the University of Arizona's Arizona Architectural Archives through the generosity of the architect's son and successor Gordon Brown. UMC asked its structural engineers in the summer of 2004 to evaluate the structural frames of the Bed Tower and the 1975 Emergency Room Wing for possible reuse (Holben, Martin & White 2004). The 1975 building's concrete frame will be reused because it is capable of meeting current building codes, including seismic factors and horizontal loading. Its broad column spacing and generous ceiling heights also allow UMC freedom of options for new equipment and mechanical-systems installation. The Bed Tower, unfortunately, because of its specifications when built, cannot now meet seismic, horizontal-load, floor-to-ceiling, or column-spacing standards for UMC's planned facilities.

Efforts to save the distinctive Bed Tower solar screen led to the creation of a new organization, Modern Architecture Preservation Project (MAPP), by University of Arizona architecture faculty members Anne Nequette and Brooks Jeffery, and others. Nequette and Jeffery's *A Guide to Tucson Architecture* (2002) featured the Arthur Brown's Bed Tower solar screen on its cover, accompanied by a building description in the "Modern" narrative and a biography on Brown, establishing credibility for the historic significance of the building, its solar response, and Brown's work. With donations from University Medical Center, Tucson Zoological Society, and others joining MAPP's first project, workers and volunteers removed the entire screen in sections on 23 October 2004. The components were then stored in a container on site, awaiting future use including application to a new building in Reid Park Zoo designed by Phil Swaim of Swaim Associates Architects in Tucson.

Significance

Four criteria are applied in the evaluation of cultural properties by the standards of the National Register of Historic Places (36 CFR 60.6). Normally, a property must be at least 50 years old and meet at least one

of these four criteria to be considered eligible for listing. The quality of significance in American history,

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1937d AZ BB:9:9 (ASM) On file at the Arizona State Museum, Tucson.

1937e AZ BB:9:11 (ASM) On file at the Arizona State Museum, Tucson.

1937f AZ BB:9:12 (ASM) On file at the Arizona State Museum, Tucson.

1937g AZ BB:9:16 (ASM) On file at the Arizona State Museum, Tucson.

1937h AZ BB:9:17 (ASM) On file at the Arizona State Museum, Tucson.

1937i AZ BB:9:18 (ASM) On file at the Arizona State Museum, Tucson.

1976 AZ BB:9:111 (ASM) On file at the Arizona State Museum, Tucson.

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APPENDIX A

ARIZONA HISTORIC PROPERTY INVENTORY FORMS

Site Update: ☐

PROPERTY IDENTIFICATION

Site No: _____ **Survey Area:** Tucson General Hospital property
Recorded by: SWCA **Date:** 4/26/2004

Historic Name(s): Harding Guest Ranch
Other Name(s): Catalina Guest Ranch

Address: 2105 E. Allen Road **Zip:** 85719 **Owner:** Univ. Medical Center

City Tucson ☐ **Vicinity** **County:** Pima **Tax Parcel No.** 112- 02- 034A
Township: 29 **Range:** 13 **Section:** 14 **Qtr. Sec. :** _____ **Acreage:** 11.8
Block: _____ **Lot(s):** _____ **Plat (Addition):** _____ **Year of Plat (Addition):** _____

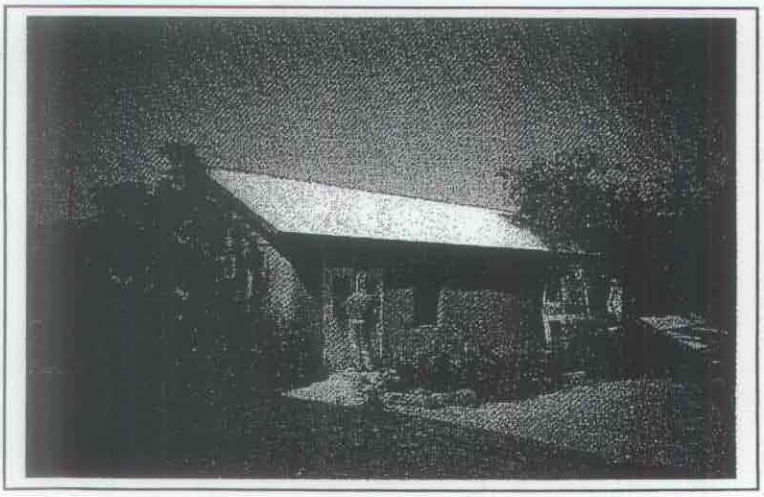
UTM Reference
Zone: _____ **Easting** _____ **Northing** _____ **USGS 7.5'** _____
GIS Source:

Uses / Functions: Hospital/Abandoned.
Land Status: Private/Non-profit.
Sources / Informants: Stephen K. Brigham, UMC Director of Capital Planning and Projects.

NATIONAL REGISTER STATUS (if listed, check the appropriate box)
☐ **Individually listed** ☐ **Contributing** ☐ **Noncontributing to** _____ **Historic District**
Date Listed: _____ ☐ **Determined Eligible by Keeper of National Register** **(date)** _____

RECOMMENDATIONS OF ELIGIBILITY (opinion of SHPO staff or survey consultant)
Property ☐ **is** ☐ **is not** **eligible individually**
Property ☐ **is** ☒ **is not** **eligible as a contributor to a potential historic district.**
☐ **More information needed to evaluate.**
If not considered eligible, state reason: Loss of Guest Ranch context, and integrity of design, workmanship, materials, setting, feeling and association.

PHOTO INFORMATION:
Date of Photo: 4/26/2004
View Direction NE
_____ Roll No.: _____
_____ Negative No.: _____



STRUCTURAL CONDITION
☐ **Good** *(well maintained, no serious problems apparent)*
☐ **Fair** *(some problems apparent)*
Describe:
☐ **Poor** *(major problems; imminent threat)*
Describe:
☒ **Ruin / Uninhabitable**
Describe: **Abandoned and partially gutted interiors.**

INTEGRITY

To be eligible for the NRHP, a property must have integrity, that is, it must be able to visually convey its importance. Provide specific detailed information below about the property's integrity. Use continuation sheets if necessary.

1. LOCATION ☒ **Original Site** ☐ **Moved (date)** _____ **From Original Site:** _____

2. DESIGN *(Describe alterations from the original design, including dates–known or estimated–when alterations were made).*

c. 1890 building measured 45 x 20 feet in original plan, two-room side-gabled building with later shed-roof addition on N elevation; c. 1940 building measured 64.25 x 50.60 feet in original plan of central hall and multiple rooms, flat roof, small W front addition, large E and SE additions c. 1955.

3. SETTING *(Describe the natural and/or built environment around the property).*

Office complex, parking lots, urban landscape.

Describe how the setting has changed since the property's period of significance:

Historic Guest Ranch setting was entirely erased with hospital complex expansion 1950s-1970s.

4. MATERIALS *(Describe the materials used in the following elements of the property).*

Walls (structure): adobe **Foundation:** earth; concrete **Roof:** gabled; flat

Windows: enclosed wood sash in c. 1890 building; steel casement in c. 1940 building

If the windows have been altered, what were they originally? _____

Wall Sheathing: stucco

If the sheathing has been altered, what was it originally? _____

5. WORKMANSHIP *(Describe the distinctive elements, if any, of craftsmanship or method of construction)).*

Adobe on c. 1890 building laid with mud plaster; adobe on c. 1940 building laid with high-lime-content mortar.

SIGNIFICANCE (Check one or more cirteria below and elaborate on continuation sheet)

☐ *To be eligible for the National Register of Historic Places (NRHP), a property must represent an important part of the history or built environment of an area. Note: a property need only be significant under one of the areas below to be eligible for the NRHP.*

☐ **A. HISTORIC EVENTS/TRENDS** *(On a continuation sheet describe how the property is associated either with a significant historic event, or with a trend or pattern of events important to the history of the nation, the state, or a local community).*

☐ **B. PERSON** *(On a continuation sheet describe how the property is associated with the life of a person significant in the past.*

☐ **C. DESIGN & CONSTRUCTION** *(On a continuation sheet describe how the property embodies the distinctive characteristics of a type, period, or method of construction, or that represents the work or a master, or possess high artistic values).*

Outbuildings: *(Describe any other building or structures on the property and whether they may be considered historic).*

☐ **D. INFORMATION TO YIELD**

Architect: unknown ☒ **Not determined** ☐ **Known (source):** _____

Builder: unknown ☒ **Not determined** ☐ **Known (source):** _____

Construction Date: c. 1890; c. 1940 ☐ **Known** ☒ **Estimated (source):** examination

Additional Information:

See accompanying Property Report. Building complex slated for demolition through Fall 2004.

Site Update: ☐

PROPERTY IDENTIFICATION

Site No: _____ **Survey Area:** Tucson General Hospital property
Recorded by: SWCA **Date:** 4/26/2004

Historic Name(s): Tucson General Hospital: South Addition / Bed Tower
Other Name(s): Harding Guest Ranch; Catalina Guest Ranch

Address: 3838 North Campbell Avenue **Zip:** 85719-1523 **Owner:** Univ. Medical Center

City Tucson ☐ **Vicinity** **County:** Pima **Tax Parcel No.** 112- 02- 034A
Township: 29 **Range:** 13 **Section:** 14 **Qtr. Sec. :** _____ **Acreage:** 11.08
Block: _____ **Lot(s):** _____ **Plat (Addition):** _____ **Year of Plat (Addition):** _____

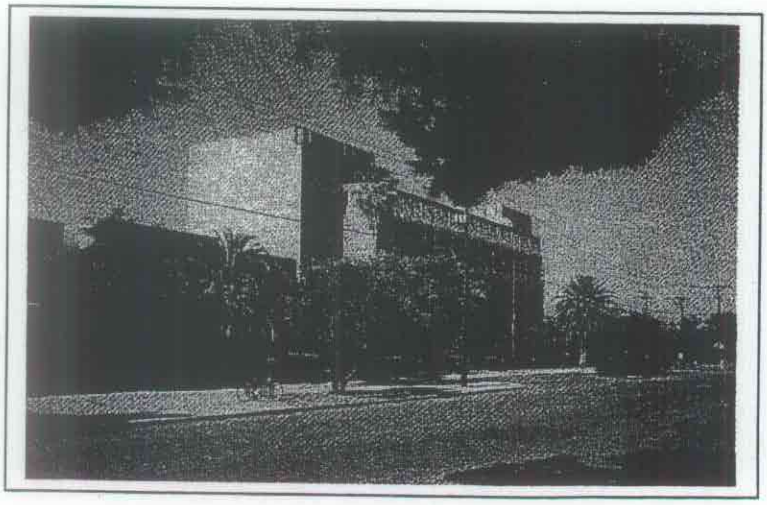
UTM Reference
Zone: _____ **Easting** _____ **Northing** _____ **USGS 7.5'** _____
GIS Source:

Uses / Functions: Hospital/Abandoned.
Land Status: Private/Non-profit.
Sources / Informants: Stephen K. Brigham, UMC Director of Capital Planning and Projects.

NATIONAL REGISTER STATUS (if listed, check the appropriate box)
☐ **Individually listed** ☐ **Contributing** ☐ **Noncontributing to** _____ **Historic District**
Date Listed: _____ ☐ **Determined Eligible by Keeper of National Register (date)** _____

RECOMMENDATIONS OF ELIGIBILITY (opinion of SHPO staff or survey consultant)
Property ☒ **is** ☐ **is not** **eligible individually**
Property ☐ **is** ☐ **is not** **eligible as a contributor to a potential historic district.**
☐ **More information needed to evaluate.**
If not considered eligible, state reason: See evaluation as <50-year-old property in attached Report.

PHOTO INFORMATION:
Date of Photo: 4/26/04
View Direction NE.
_____ Roll No.: _____
_____ Negative No.: _____



STRUCTURAL CONDITION
☐ **Good** *(well maintained, no serious problems apparent)*
☒ **Fair** *(some problems apparent)*
Describe: **Buildings abandoned; partial asbestos abatement.**
☐ **Poor** *(major problems; imminent threat)*
Describe:
☐ **Ruin / Uninhabitable**
Describe:

INTEGRITY

To be eligible for the NRHP, a property must have integrity, that is, it must be able to visually convey its importance. Provide specific detailed information below about the property's integrity. Use continuation sheets if necessary.

1. LOCATION ☒ **Original Site** ☐ **Moved (date)** _____ **From Original Site:** _____

2. DESIGN *(Describe alterations from the original design, including dates–known or estimated–when alterations were made).*

Modern / "Critical Regionalism" interpretation with conscious climate response through orientation, solar screen, flat roof, local (appearing) materials, modified courtyard form; 4-story middle block flanked by 5-story elevator towers, then blocks stepping down to one story on W and E.

3. SETTING *(Describe the natural and/or built environment around the property).*

Combination of urban development (S, W, N) with a small surviving desert landscape (SE property corner), adjacent to University of Arizona agricultural facilities and lands (E and farther N).

Describe how the setting has changed since the property's period of significance:

Hospital additions after the Bed Tower completion caused some public re-orientation of the facility to Campbell; otherwise, the hospital is part of the moderately dense urban development in this area that now meets the primary public views.

4. MATERIALS *(Describe the materials used in the following elements of the property).*

Walls (structure): Steel frame. **Foundation:** Concrete. **Roof:** Flat, built-up.

Windows: Aluminum casements, with custom Bed Tower windows at N and S, latter covered with signature golden-anodized aluminum solar screen on steel frame.

If the windows have been altered, what were they originally?

Wall Sheathing: Select soft, tan brick with kiln marks; stainless steel/aluminum solar screen assembly on S.

If the sheathing has been altered, what was it originally?

5. WORKMANSHIP *(Describe the distinctive elements, if any, of craftsmanship or method of construction)).*

Brickwork and solar screen assembly are exceptional, and cause this building to stand out among others at the hospital and of its timeframe, region and property type.

SIGNIFICANCE (Check one or more criteria below and elaborate on continuation sheet)

☐ *To be eligible for the National Register of Historic Places (NRHP), a property must represent an important part of the history or built environment of an area. Note: a property need only be significant under one of the areas below to be eligible for the NRHP.*

☐ **A. HISTORIC EVENTS/TRENDS** *(On a continuation sheet describe how the property is associated either with a significant historic event, or with a trend or pattern of events important to the history of the nation, the state, or a local community).*

☐ **B. PERSON** *(On a continuation sheet describe how the property is associated with the life of a person significant in the past.*

☒ **C. DESIGN & CONSTRUCTION** *(On a continuation sheet describe how the property embodies the distinctive characteristics of a type, period, or method of construction, or that represents the work or a master, or possess high artistic values).*

Outbuildings: *(Describe any other building or structures on the property and whether they may be considered historic).*
Adobe buildings adapted from the Harding/Catalina Guest Ranch survived until recent demolition (see accompanying Property Report).

☐ **D. INFORMATION TO YIELD**

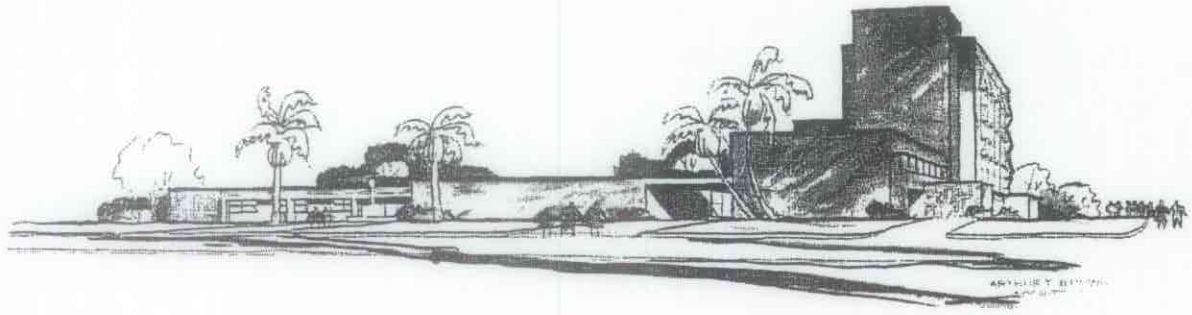
Architect:	Arthur T. Brown FAIA	☐	**Not determined**	☒	**Known (source):**	Biography
Builder:	Connelly Const. Co.	☐	**Not determined**	☒	**Known (source):**	Albert Hopper
Construction Date:	1967-1968	☒	**Known**	☐	**Estimated (source):**	Drawings

Additional Information:

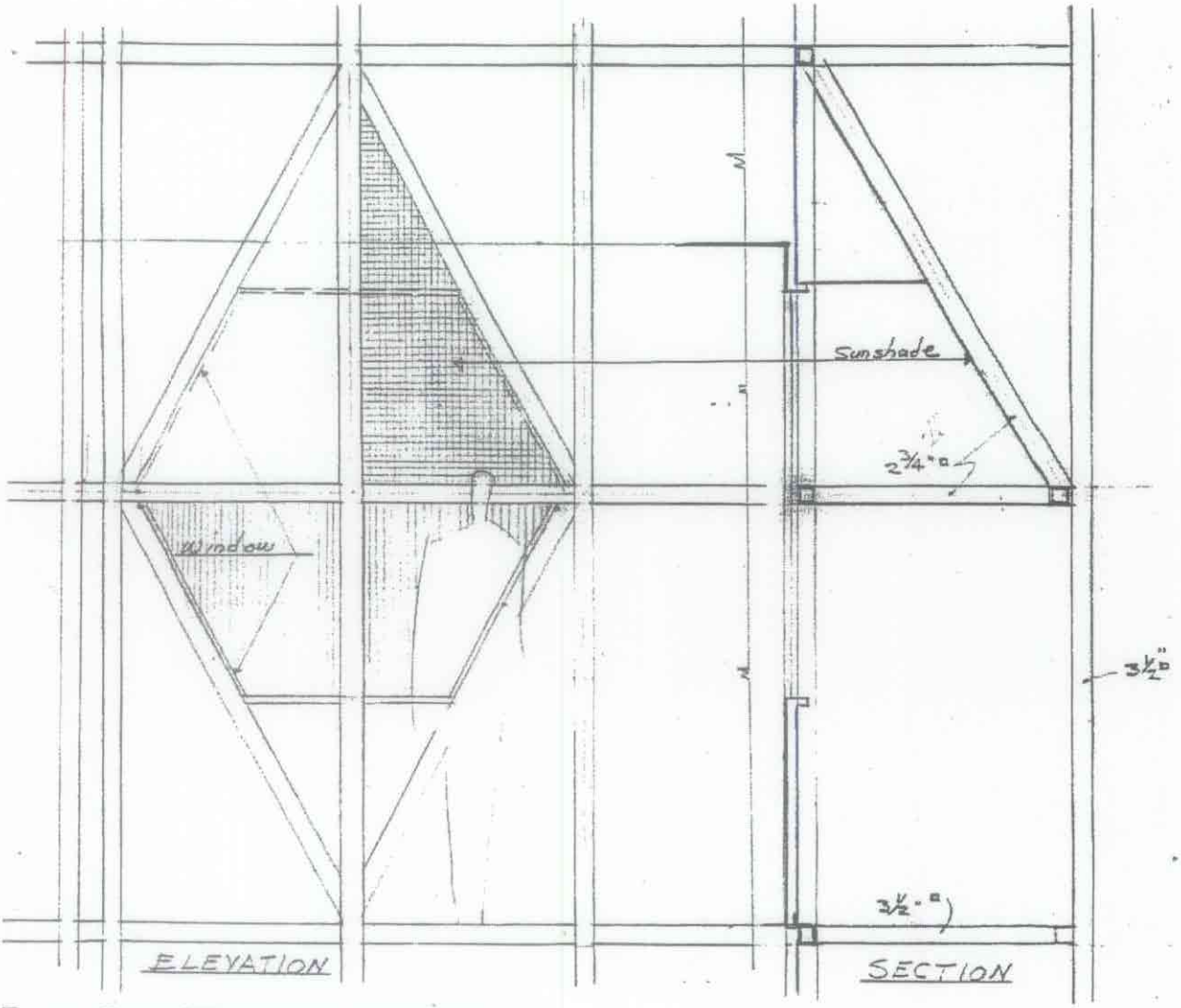
See accompanying Property Report. Building complex slated for demolition through Fall 2004.

APPENDIX B

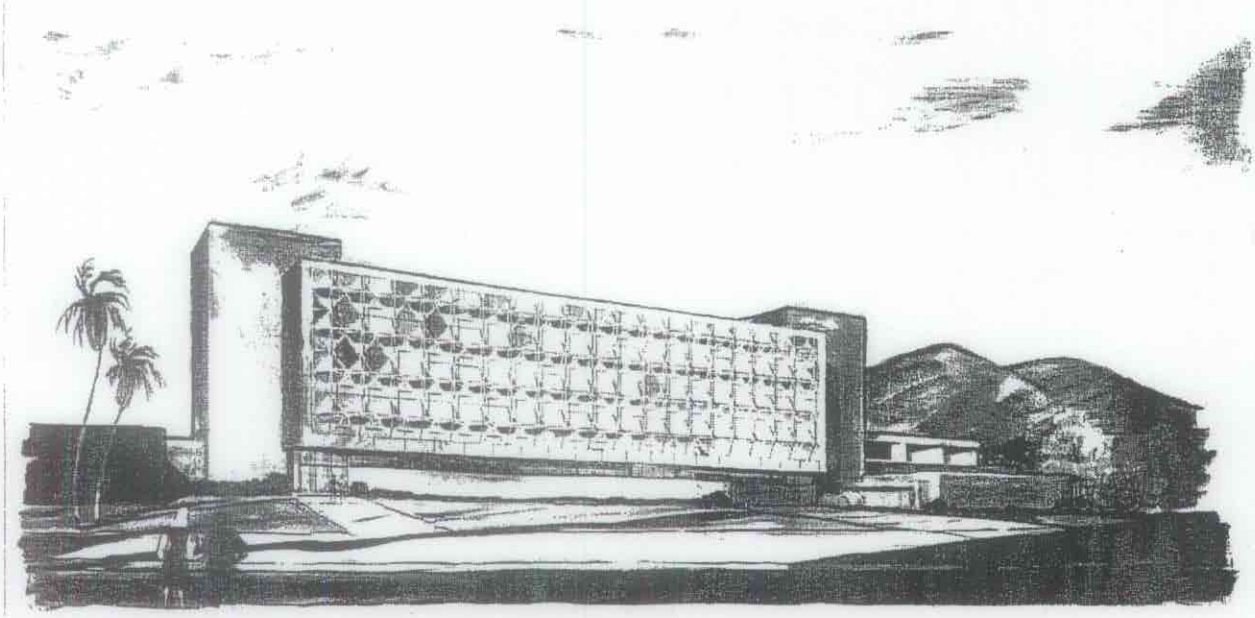
EXAMPLES OF ARTHUR T. BROWN WATERCOLOR RENDERINGS



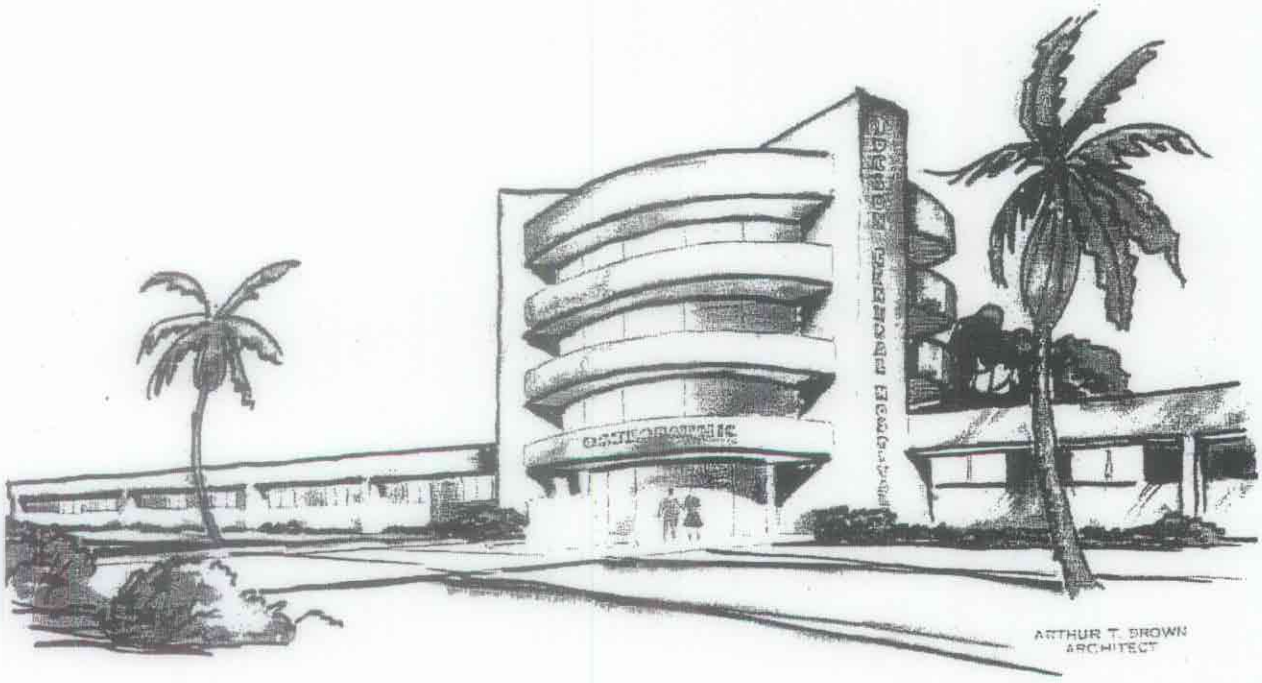
Tucson General Hospital rending from Campbell



Tucson General Hospital Sun Shade Detail



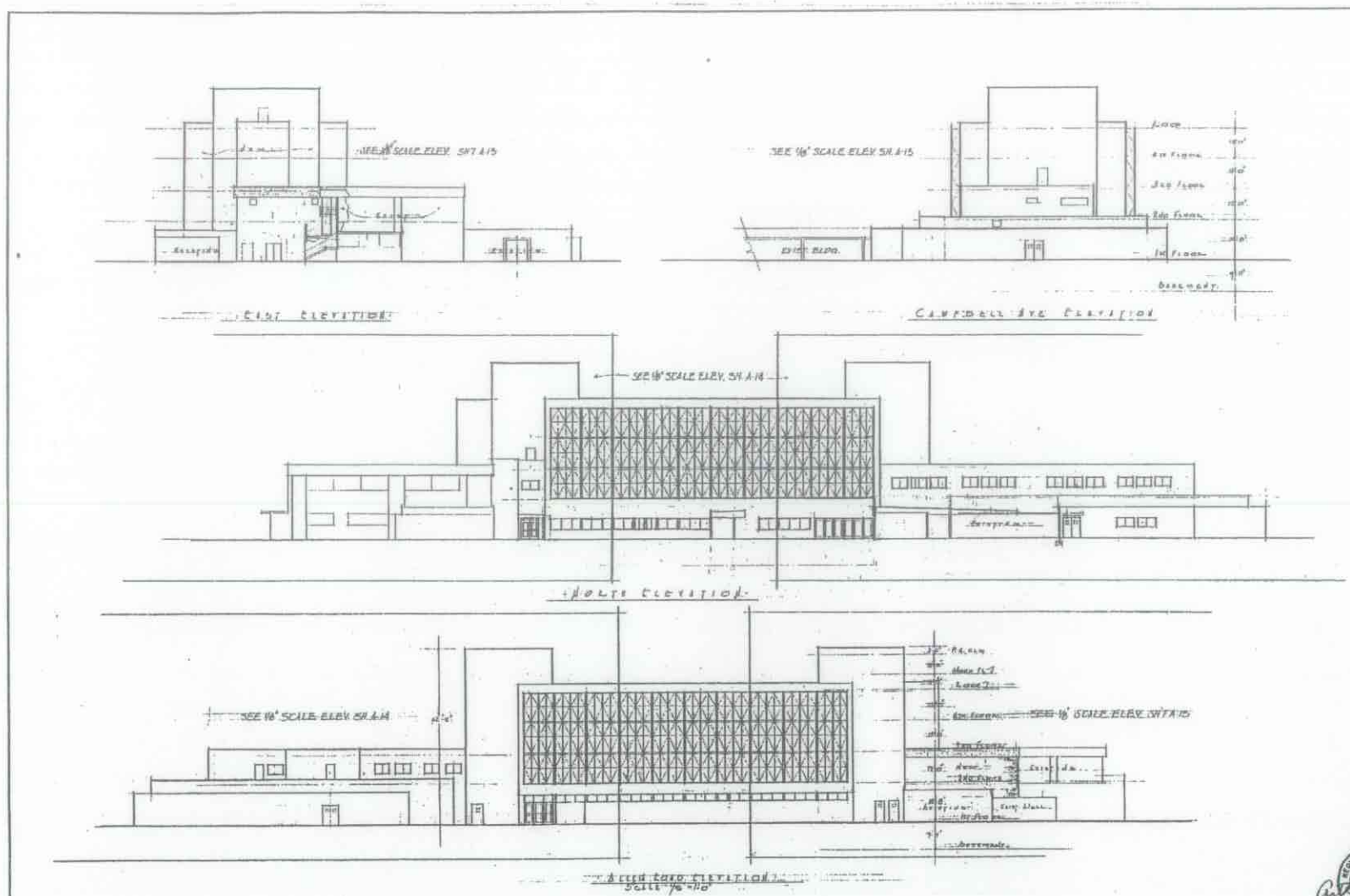
Tucson General Hospital rendering from Allen (South)



Tucson General Hospital alternative rendering design 2.

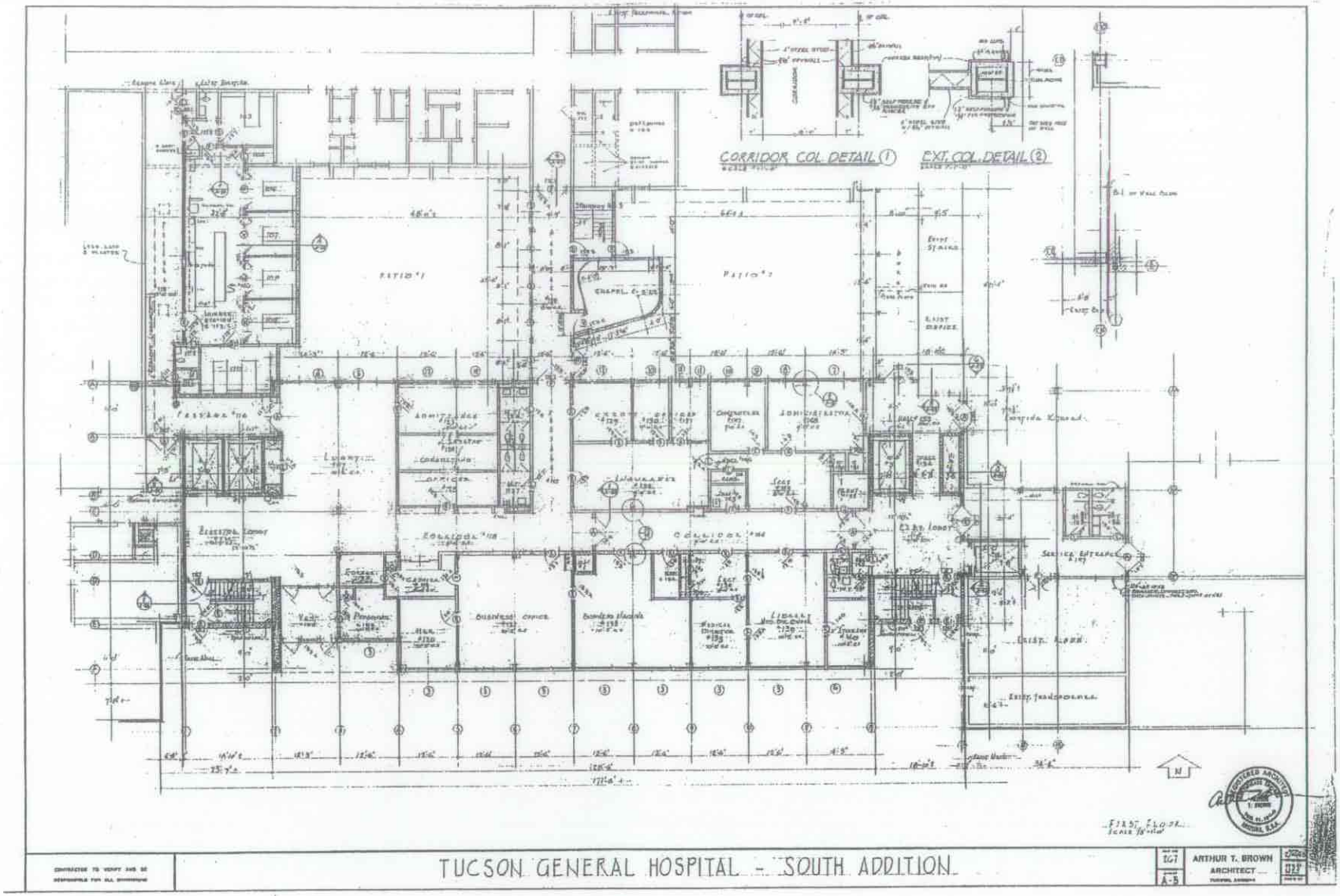
APPENDIX C

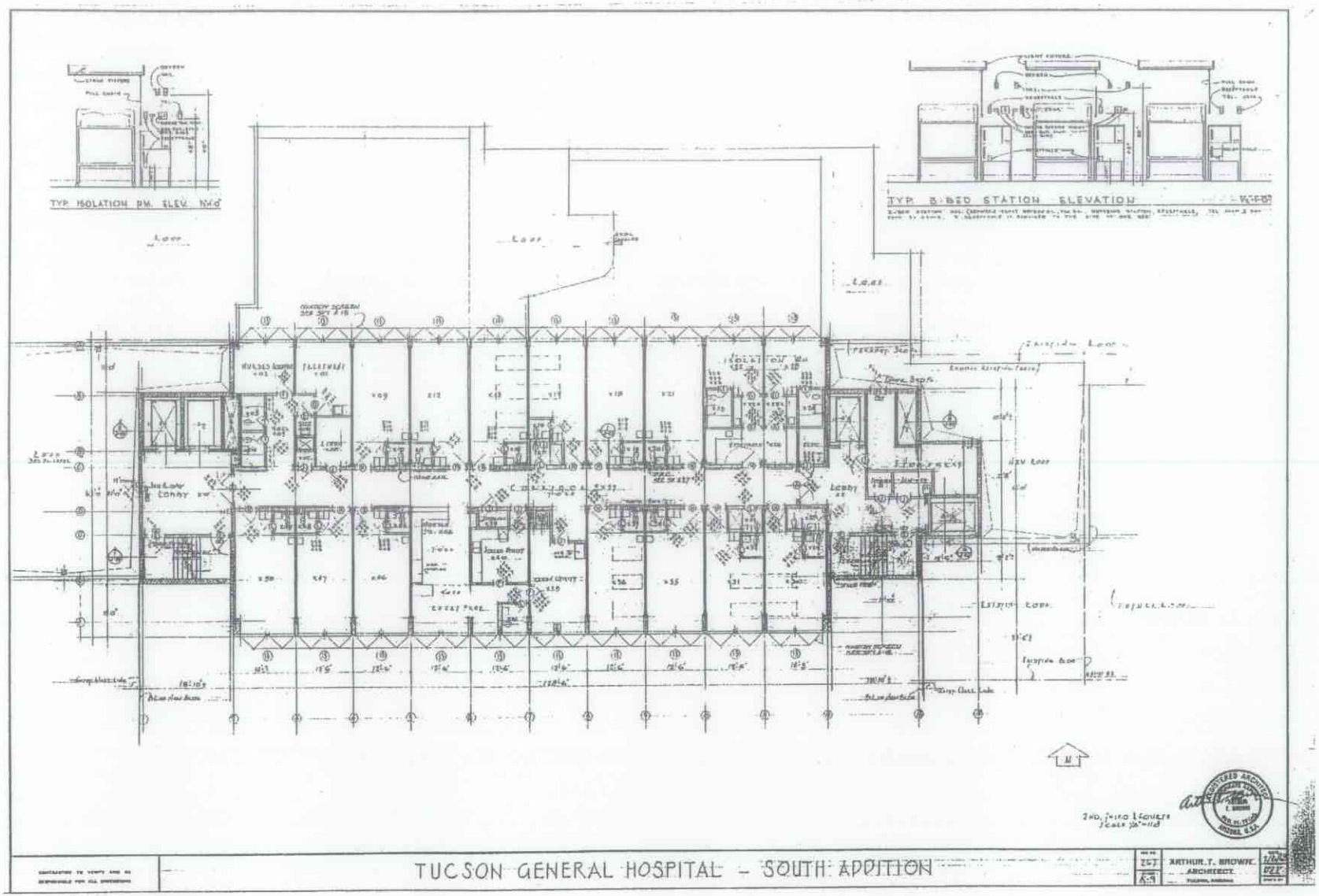
EXAMPLES OF ARTHUR T. BROWN DRAWINGS

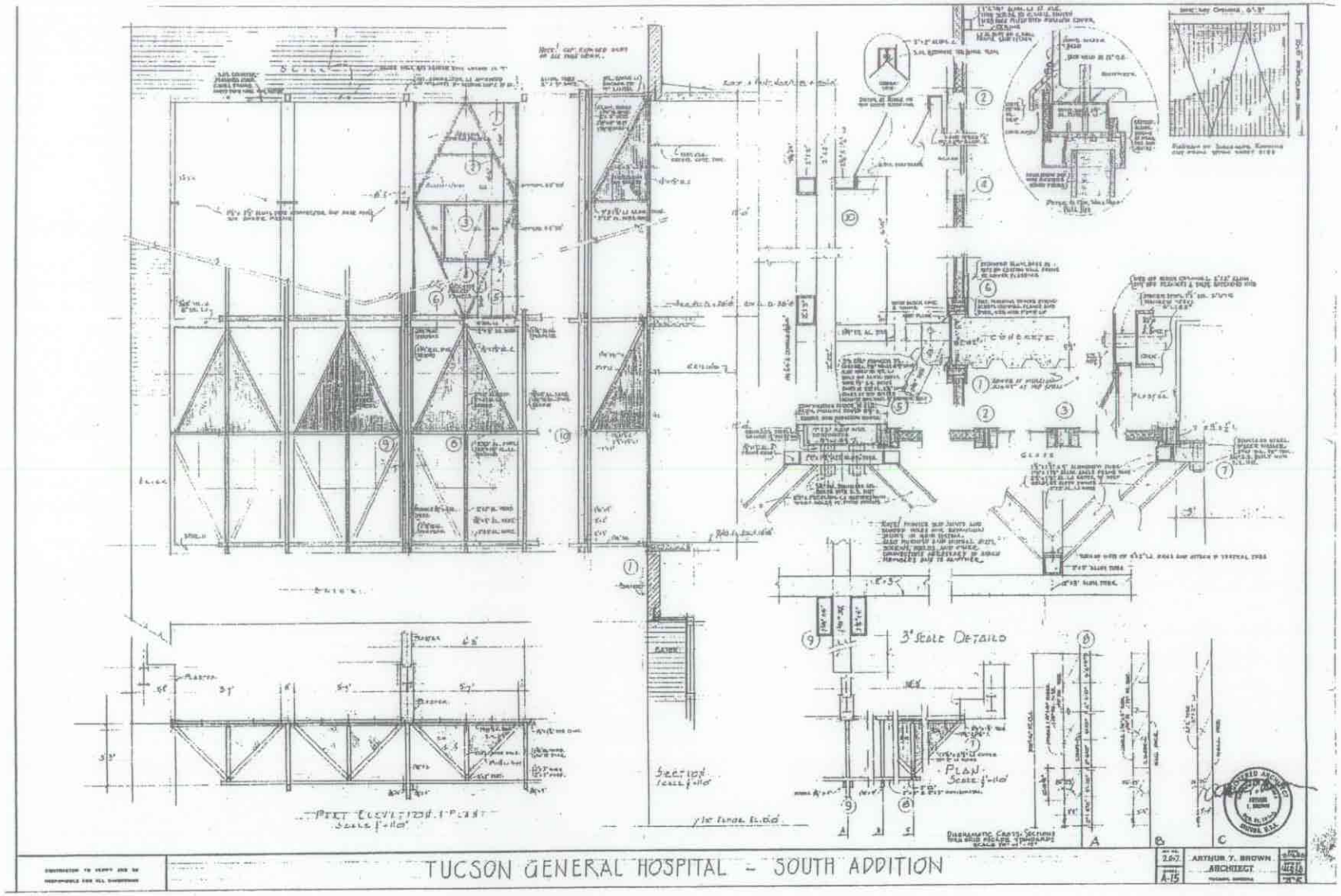


TUCSON GENERAL HOSPITAL - SOUTH ADDITION

ARTHUR T. BROWN ARCHITECT


CORRIDOR COL. DETAIL (1)
EXT. COL. DETAIL (2)
FIRST FLOOR
SCALE 1/8"=1'-0"
TUCSON GENERAL HOSPITAL - SOUTH ADDITION
ARTHUR T. BROWN
ARCHITECT
A-5


TYP. ISOLATION RM. ELEV.
TYP. 3-BED STATION ELEVATION
TUCSON GENERAL HOSPITAL - SOUTH ADDITION
ARTHUR T. BROWN
ARCHITECT


3" Scale Detail
Section
Plan
TUCSON GENERAL HOSPITAL - SOUTH ADDITION
ARTHUR T. BROWN
ARCHITECT
A-15

APPENDIX D

COPIES FROM ARTHUR T. BROWN'S RECORD OF COMMISSIONS

JOB #	OWNER	FILE #
463	Tucson General Hospital	

3838 N. Campbell Avenue

ADDRESS

Nursing Addition #2

OCCUPANCY/SUBJECT

NEW	ALT	OTHE
X		

YR BUILT	NOT BUILT	DEMOLISHED	BUILDING AREA	BUILDING COST	PSF
1963			See also: 1265	67,060	

BUILDING STYLE

ROOF STYLE

ROOF MATERIAL

SPECIAL DETAILS

Tucson General Hospital

OWNER

FILE #

3838 N Campbell Avenue

ADDRESS

South Addition

OCCUPANCY/SUBJECT

X

NEW | ALT | OTHE

NOT BUILT	DEMOLISHED	BUILDING AREA	BUILDING COST	PSF
			2,016,295	

9/20/69 Tucson Citizen
1/21/70 Tucson Citizen
1/18/70 AZ Daily Star (full page)
5/70 Builder / Architect
Sunshades
1/23/70 Tucson Citizen

lti-story

BUILDING STYLE

t

ROOF STYLE

lt-up

ROOF MATERIAL

rick

EXTERIOR WALLS

SPECIAL DETAILS

JOB #	OWNER	FILE #
569	Tucson General Hospital	

5835 N. Oracle Ave

ADDRESS

OCCUPANCY/SUBJECT	NEW	ALT	OTH
Remodeling Phases I and II (Wallpenwall)		✓	

YR BUILT	NOT BUILT	DEMOLISHED	BUILDING AREA	BUILDING COST	PSF
1969				33,150	

BUILDING STYLE

ROOF STYLE

ROOF MATERIAL

EXTERIOR WALLS

SPECIAL DETAILS

JOB #	OWNER	FILE #
1770	Tucson General Hospital	

3838 N. Campbell Avenue

ADDRESS

West Remodeling Phase IV

OCCUPANCY/SUBJECT

NEW	ALT	OTHE
	X	

YR BUILT	NOT BUILT	DEMOLISHED	BUILDING AREA	BUILDING COST	PSF
1970					

BUILDING STYLE

ROOF STYLE

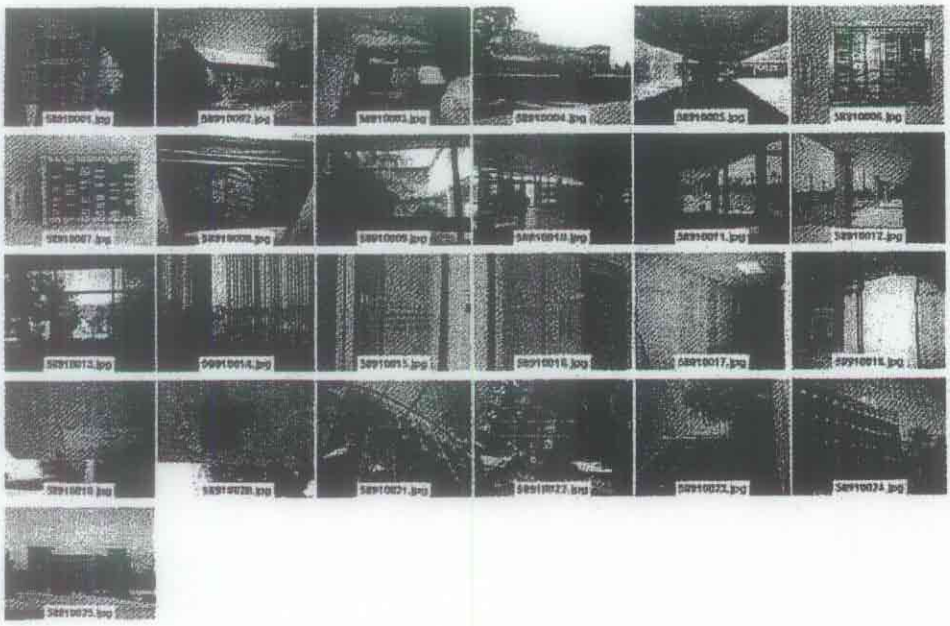
ROOF MATERIAL

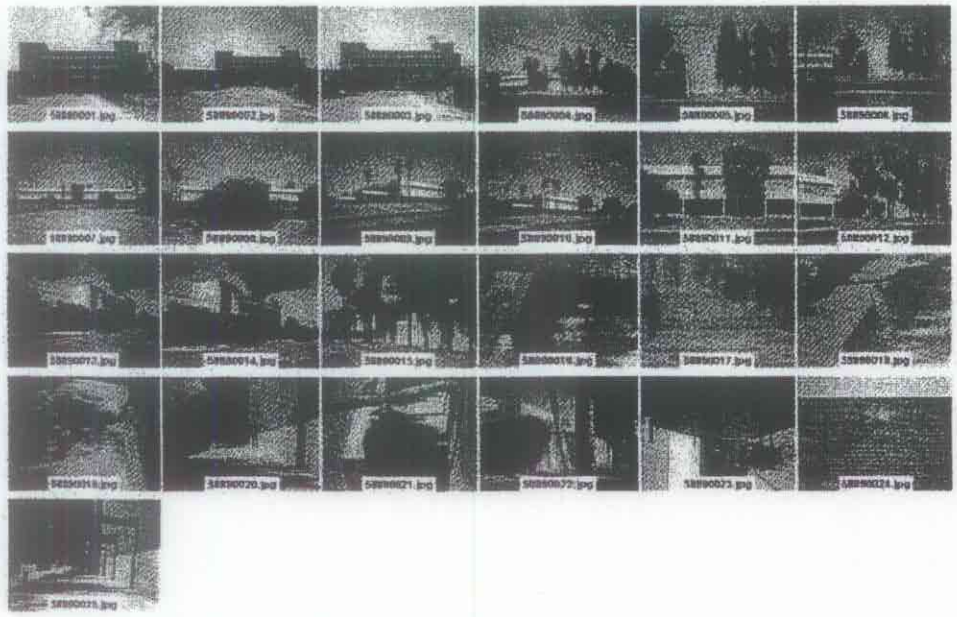
EXTERIOR WALLS

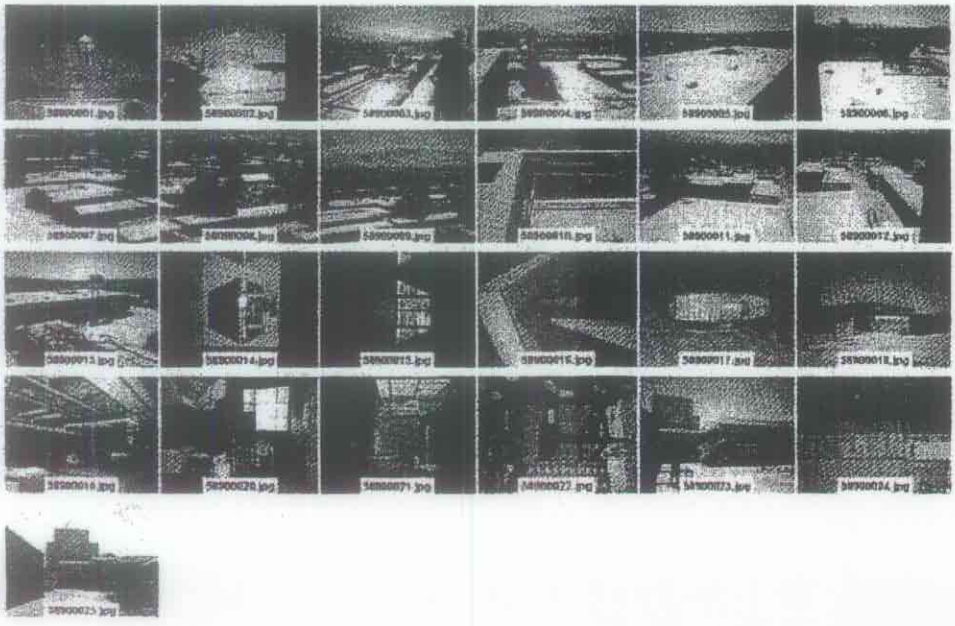
SPECIAL DETAILS

APPENDIX E

ADDITIONAL PHOTOGRAPHS (ON COMPACT DISK)







Healing Garden
Design Concept

UMC North Medical Park

Healing Garden Design Concept

The Healing Garden concept for the UMC North Medical Park is based upon the needs of the people who will spend time at this facility: the patients, their families, as well as the caregivers and staff. Their lives, whether as a resident for treatment, in visitation to a loved one or as an employee, will be centered upon this medical park and its campus for a critical period of time in their lives. This is a sometimes-awkward combination of people, thrown together in an unfamiliar environment, with a common goal to overcome a difficult disease. There are many universal necessities for each of this group who may discover their world revolves around the companionship they establish during their stay: they will each need spaces for solitude, opportunities for solace, moments for repose, time for rejuvenation and access to appropriate activity. One of the greatest sources of these needs is found in the vitality and serenity of nature. The healing and calming power of nature has been documented throughout time. The opportunity to re-energize with nature and revitalize with activity will be found within the Healing Garden located in the core of the Medical Park campus.

The Healing Garden will provide a variety of experiences, but a continuous shaded pathway will flow along its entire length and provide a strolling garden with access to each building. Secondary pathways off the core path will present further areas to explore; some may have elements of sculpture placed for moments of discovery and to provide destinations to anticipate in the future. Plant materials will be selected from the "Official Regulatory List for: Arizona Department of Water Resources, Tucson Active Management Area, City of Tucson and Pima County Low Water Use/ Drought Tolerant Plant List". Occasional areas of oasis-style plant materials, up to but not exceeding an area equal to 2.5% of the site, may be placed at selected focal points in high traffic areas. To provide relief from the desert summer days, or respite to accommodate those with lower energy levels, there will be several sitting areas of varied sizes cooled by either canopy trees, ramadas, micro-misters or a combination thereof. Decorative signage may be used for inspirational or directive information.

In general, the Healing Garden will include a selection of plant material with an emphasis on elements to stir the visual, olfactory and tactile senses. Blooming plants will be arranged in striking colorful combinations contrasted by the textures of bold accent plants. Acceptable levels of fragrant plant materials will be investigated to add this additional level of interaction. Plants can release subtle yet distinguished scents either through the surrounding air, or after the petals or leaves are gently crushed. Some plants have fuzzy or smooth surfaces and serrated or scalloped edges. Others have wispy soft blossoms or stiff, almost plastic in texture.

Several specialized garden concepts may be incorporated to enhance the Healing Garden as the medical park expands to its full potential. Possible ideas include a Seasonal Garden, which would emphasize changes coinciding with the four seasons of the year. The noting of the seasons would engender a sense of anticipation and provide a timeline of progression, hopefully towards recovery. A Butterfly/ Birding Garden would be well stocked with plant materials selected specifically to continually attract and sustain these flying creatures. Placing this garden near treatment areas with viewing windows, or providing a glassed gazebo within the garden would present a great diversion during the tedious process of chemotherapy. A Xeriscape Garden would be a statement of both the tenacity of desert plant materials and the beauty of low-water cacti, accents and desert bloomers.

Included in the medical park will be a series of Private Gardens scattered throughout the campus. These gardens will be available to provide families or individuals moments of solitude for personal

contemplation, private conversation or rejuvenation. Signage to indicate occupation of the garden will be considered.

Landscaping will also be placed to fulfill code and screening needs. Existing protected native plants will be preserved in place or transplanted as required. A few of the existing non-native plants may be transplanted on-site or remain in place if their locations are compatible with the garden theme in that area. Others, such as the olive trees that are on the City of Tucson Prohibited Plant List or ones incompatible with design parameters, will be eliminated. Perimeter vegetative screening will be provided per code and to buffer neighbors and gardens from taller buildings or utilitarian uses. Plants that attract negative elements such as bees will not be selected. Off-site drainage will be retained for harvesting in a series of retention swales and mounds scattered within the garden area.

The Healing Garden is meant to provide a myriad of opportunities and means towards healing. Sometimes, to find a place to contemplate the past with what must be left behind or what has been overcome, or to contemplate the future and its fears and rewards still to come, to find that place is to find the strength needed to carry on. For family and friends who wish only to support, yet feel awkward in how to provide it, these gardens will provide the means. The beauty and vivacity of nature, and the spontaneity and joy of play are the universal languages that transcend all barriers.