TECHNICAL MEMO

HOAG HOSPITAL IRVINE (HHI)
CAMPUS EXPANSION
SAMP ADDENDUM

PREPARED FOR

Irvine Ranch Water District
On Behalf of
LPA Design Studios

July 2020

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ASSOCIATES

HOAG HOSPITAL IRVINE (HHI) CAMPUS EXPANSION SAMP ADDENDUM

Prepared for

IRVINE RANCH WATER DISTRICT

ON BEHALF OF

LPA DESIGN STUDIOS
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Project No. 865-60-20-02

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HHI Campus Expansion SAMP Addendum

1.0 INTRODUCTION

Hoag Hospital Irvine (HHI) is an existing hospital/medical services campus located at 16200 Sand Canyon Avenue in the City of Irvine, CA. An expansion project for the campus is proposed that will renovate and expand the existing hospital and add parking structures and hospital support buildings to the campus. The expansion project will add 571,341 square feet[1] of buildings to the current campus. The additional square footage will impact the potable water demand, the recycled water demand, and the wastewater generation associated with the campus. Irvine Ranch Water District (IRWD) is the agency responsible for providing potable water, recycled water, and wastewater service to the HHI campus.

Because the IRWD existing utility master plans do not account for the proposed expansion to the HHI campus, the impact of the expansion on the utility systems is unknown. For this reason, IRWD requested completion of a Sub-Area Master Plan (SAMP) Addendum to evaluate the potential impacts of the HHI expansion project to the utility systems. The HHI Campus falls within IRWD Planning Area (PA) 13C[2]. The following HHI Campus Expansion SAMP Addendum develops the projected potable water demand, recycled water demand, and wastewater flow for the expanded campus, and uses IRWD's hydraulic models to evaluate the impacts of these demands/flows on the utility systems.

2.0 PROJECT DETAILS

The following sections describe the HHI Campus Expansion project and the projected demands/flows that result from the expansion.

2.1 Description of Project

The existing HHI Campus site is bordered by Sand Canyon Avenue to the northwest; Alton Parkway to the southwest; San Diego Creek Channel to the northeast; and an existing commercial property containing vacant land to the southeast. The proposed expansion areas are located throughout the site, primarily within existing paved parking areas. The location of the HHI Campus site can be seen on Figure 1.

According to the HHIX 3.0 Master Plan prepared by LPA (December 2019), the HHI Campus Expansion will be completed in incremental phases. The work in these phases consists of: three (3) new parking structures; three (3) new inpatient hospital additions; two (2) new hospital support facility buildings; an ancillary services expansion with pharmacy, pathology lab and intensive care unit (ICU); new central utility plant, new conference center; one (1) new tunnel connecting to the new hospital buildings, a lobby expansion, and a loading area expansion. The HHI Campus Expansion will add 571,341 square feet of buildings to the current campus, resulting in a final building area of 942,344 square feet (excluding new parking structures).

[1] Calculated based on information received from LPA per Condition Use Permit Modification
[2] Figure 2-2, IRWD Water Resources Master Plan

The proposed expansion plans within the campus were provided by LPA. The existing conditions and the final scenario are shown in Figures 2 and 3. The analysis performed as part of this study will consider the final expansion scenario (i.e. all phases complete).

Figure 1. HHI Expansion Project Location

Figure 2. HHI Campus – Existing Conditions

Figure 3. HHI Campus – Final Conditions

2.2 Flow Development

This section describes the development of water demand and sewer flow projections that were used in the utility system analysis.

2.2.1 Potable Water

Each building within the HHI Campus Expansion was assigned a usage classification that most closely matches one of the land use codes in the IRWD Water Resources Master Plan (WRMP). Using the associated unit water use factor found in Table 3-1 of the WRMP, potable water demand average day demand (ADD) was calculated for each building by multiplying the water use factor (gal/KSF/day) by the proposed building square footage. One exception is the three parking garages which did not match any of the land use classifications in the WRMP. A value of 1 gpm was assigned to each of the parking garages based on comparison of other land uses and the assumption that minimal water use (e.g. a hose bib for washing) would be installed. The exterior water demand for the proposed campus will be served by recycled water. As recycled water is not permitted for internal use in behavioral health type hospitals or clinics, it is assumed all interior water demand will be served by potable water.

The calculated ADD values were multiplied by 1.33 to estimate maximum day demand values (MDD) for IRWD Pressure Zone 3 (Figure 3-13 and Table 3-2, WRMP).

Table 1 at the end of this section provides a summary of the estimated potable water demands for each building in the proposed HHI Campus Expansion.

2.2.1.1 Fire Flow

Maximum fire flow requirements for the HHI Campus Expansion were estimated based on WRMP Table 6-3 and a total building area of 942,344 square feet. This corresponds to a requirement to supply a maximum fire flow of 8,000 gpm for a duration of 4 hours. According to Section 6.7.1 in the WRMP, "Per OCFA, fire flows can be reduced up to 50% for buildings equipped with approved automatic fire sprinkler systems". The HHI Campus Expansion will have an automatic fire sprinkler system, so fire flow requirements were reduced to 4,000 gpm for 4 hours.

2.2.2 Recycled Water

Estimated annual recycled water demand was provided by LPA at 4,950,000 gallons per year. This value was converted to ADD, estimated at 9.42 gpm or 94,932 gallons per week. Recycled water system demands were developed by estimating the number of 2-inch meters required to meet the annual demand through a typical weekly irrigation schedule as provided by IRWD Staff.

A weekly irrigation schedule of 1 hour of irrigation per night, 3 nights per week was assumed; this assumption is consistent with irrigation schedules used in the rest of the recycled water system as well as irrigation schedules used in other developer studies. The required flow to meet the 94,932 gallons per week average demand is 527.4 gpm.

IRWD provided the maximum delivery capacity of a 2-inch meter, which is most likely the size of the meters that will be equipped at the expanded HHI Campus, at 160 gpm. Based on the

assumptions above, three (3) 2-inch meters with a total capacity of 640 gpm are necessary to satisfy the peak recycled water demand of 527.4 gpm.

2.2.3 Wastewater

Wastewater flows were estimated by setting the wastewater flow generation equal to the potable water demands (1:1 ratio). This is reasonable given that outdoor water usage is accounted for in the recycled water demands. Potable water ADD (gpm) was equated wastewater Average Dry Weather Flow (ADWF, MGD). ADWF was multiplied by the IRWD design flow factor of 1.298, to estimate the Design ADWF.

Table 1 provides a summary of the estimated wastewater flow generation for each building in the proposed HHI Campus Expansion.

Table 1. Potable Water Demands and Wastewater Flow Estimates, Proposed HHI Campus Expansion

Building Name	Building Area (sq. ft.)	Occupancy/ Use	Assigned IRWD Land Use	Potable Water Demands		Wastewater Flows	
				ADD (gpm)	MDD (gpm)	ADWF (MGD)	Design ADWF (MGD)
Building 01	135,186	Hospital	Hospital	21.59	28.72	0.0311	0.0404
Building 01	10,200	Light Industrial	Light Industrial	0.50	0.66	0.0007	0.0009
Emergency - Building 04	13,500	Hospital	Hospital	2.16	2.87	0.0031	0.0040
Nursing - Building 02	90,908	Hospital	Hospital	14.52	19.31	0.0209	0.0271
East Wing Addition	127,000	Hospital	Hospital	20.28	26.98	0.0292	0.0379
North Hospital Addition	170,000	Hospital	Hospital	27.15	36.11	0.0391	0.0508
East Hospital Support Facility	65,000	General Office	General Office	3.25	4.32	0.0047	0.0061
West Hospital Support Facility	65,000	General Office	General Office	3.25	4.32	0.0047	0.0061
Central Utility Plant	47,550	Light Industrial	Light Industrial	2.31	3.07	0.0033	0.0043
West Wing Addition	80,000	Hospital	Hospital	12.78	16.99	0.0184	0.0239
Hospital Support Facility - Building 01	65,000	General Office	General Office	3.25	4.32	0.0047	0.0061

Hospital Support Facility - Building 02	65,000	General Office	General Office	3.25	4.32	0.0047	0.0061
Auditorium & Conference Center	8,000	Community Commercial	Community Commercial	0.97	1.29	0.0014	0.0018
West Parking Structure	-	-	-	1	1.33	0.0014	0.0019
East Parking Structure	-	-	-	1	1.33	0.0014	0.0019
East Parking Structure Addition	-	-	-	1	1.33	0.0014	0.0019
Total	**942,344**			118	157	0.1703	0.2210

2.3 Hydraulic Modeling Conditions

Table 2 presents the four base scenarios that were developed within the each of the hydraulic models to perform the utility analysis. For each scenario, the greater IRWD system conditions and the HHI Campus conditions are stated.

Table 2. Scenarios for HHI Campus Expansion Hydraulic Analysis

Scenario Name	IRWD System Conditions	HHI Campus Conditions
Existing Scenarios		
Existing Base	Existing Demands/Flows	Existing HHI Campus Demands/Flows
Existing HHI Campus Expansion	Existing Demands/Flows	HHI Campus Expansion Demands/Flows
Future Scenarios		
Future Base	Future Demands/Flows	Existing HHI Campus Demands/Flows
Future HHI Campus Expansion	Future Demands/Flows	HHI Campus Expansion Demands/Flows

For all three utility analyses (water, recycled water, sewer), the existing HHI demands/flows were left untouched in the existing base and future base scenarios. In the expanded HHI scenarios, existing HHI demands/flows were replaced with the calculated flows of the expanded HHI. For all utilities and scenarios, a 24-hour extended period simulation was run. Utility-specific scenarios are discussed in the following sections.

There are four buildings to the northwest of HHI along Sand Canyon Avenue; three of these buildings are office buildings and one is a hotel. These buildings are served from the same water and sewer pipes that serve the existing HHI buildings. These adjacent buildings are to remain and will not be a part of the expansion project. For all three utility analyses, the potable water demand, recycled water demand, and the wastewater flow generation for these buildings were left untouched in the respective model to account for all existing flows.

3.0 POTABLE WATER SYSTEM

This section discusses the existing potable water system and the criteria, analysis, and results of the hydraulic evaluation.

3.1 Existing Potable Water System

The existing HHI Campus is served by an inner loop which serves all the buildings in the campus area. This inner loop is connected to the rest of the system via a 10-inch connection to the 16-inch transmission main in Sand Canyon Avenue and a 10-inch connection to the 16-inch transmission main in Alton Parkway.

Figure 4 presents the HHI Campus potable water system and the hydraulic model junction and pipe IDs referenced in the results tables in the following sections. Junction IDs are highlighted in green and pipe IDs are highlighted in blue.

Figure 4. Potable Water Model Pipe and Junction IDs

3.2 Potable Water System Hydraulic Analysis

Each of the base scenarios discussed in Section 2.3 were developed into two new sub-scenarios under both existing and future conditions, as detailed in Table 3. Eight scenarios were analyzed for the potable water system hydraulic analysis, including four maximum day demand (MDD) scenarios and four fire flow (FF) scenarios.

Table 3. Potable Water Scenarios for HHI Campus Expansion Hydraulic Analysis

Scenario Name	
Existing	*MDD (to assess Peak Hour Demand, PHD)*
	1. Base – MDD
	2. HHI Campus Expansion – MDD
	Fire Flow (to assess MDD + FF)
	3. Base – MDD + FF
	4. HHI Campus Expansion – MDD + FF
Future	*MDD (to assess Peak Hour Demand, PHD)*
	5. Base – MDD
	6. HHI Campus Expansion – MDD
	Fire Flow (to assess MDD + FF)
	7. Base – MDD + FF
	8. HHI Campus Expansion – MDD + FF

The most current IRWD InfoWater potable water model was used for the analysis. Potable water analyses were performed using model scenarios “EXISTING MDD” and “FUTURE MDD”.

3.2.1 MDD Scenarios

Calculated MDD values for each building were loaded into the model at the appropriate junction based on actual connection points. MDD values were peaked using the “DC_SPEC_PTS” diurnal pattern, which is consistent with other demands that match the land use type in this zone. The results of the peaking represent the peak hour demand (PHD) values during max day.

3.2.2 Fire Flow Scenarios

For the fire flow scenarios, fire flows were added to the MDD scenario demands. Fire flows were estimated at 4,000 gpm for 4 hours, and were applied to junction 124E_1140, labeled in red in Figure 4.

3.2.3 Potable Water System Evaluation Criteria

The model results for each of the scenarios were evaluated for deficiencies based on the IRWD potable water system hydraulic criteria, as presented in Table 4. Pipe results were analyzed against velocity criteria and junction results were analyzed against pressure criteria.

Table 4. IRWD Hydraulic Criteria – Potable Water System

Demand Condition	Pipe Velocity (fps)		Junction Pressure (psi)	
	Minimum	Maximum	Minimum	Maximum
Peak Hour Demand (during Max Day)	1	8	40	100
Maximum Day + Fire Flow	1	15	20	100

3.2.4 Potable Water System Hydraulic Results

Table 5 presents maximum pipe velocity results for each scenario. Pipes with velocities below the minimum criteria (1 fps) are highlighted in yellow. There were no pipes with velocities above the maximum criteria.

Table 6 and 7 present the minimum and maximum junction pressure results, respectively, for each scenario. All junctions meet the minimum and maximum pressure criteria.

3.3 Potable Water System Analysis Summary

The HHI Campus Expansion project is predicted to have a minor impact on the potable water system. There are several pipes in the existing PHD (during max day) scenarios that have velocity results that are under the 1 fps minimum velocity criteria. These deficiencies are not worsened by the expansion of HHI.

All of the pressures in the study area junctions are above the criteria of 40 psi during the PHD (during max day) scenario and above 20 psi during fire flow conditions.

3.4 Potable Water System Recommendations

No improvements are recommended for the IRWD potable water system based on addition of the HHI Campus Expansion.

Table 5 - Potable Water System Hydraulic Analysis Pipe Maximum Velocities

Street	Pipe ID	Length	Diameter	Max Velocity PHD (fps)				Max Velocity MDD + FF(fps)			
				Existing flow no HHI	Existing flow with HHI	Future flow no HHI	Future flow with HHI	Existing flow no HHI FF	Existing flow with HHI FF	Future flow no HHI FF	Future flow with HHI FF
Campus Loop											
Campus Loop	124E_1110	160	12	0.17	0.51	0.17	0.51	6.22	6.59	6.21	6.58
Campus Loop	124E_1215	107	10	0.13	0.25	0.13	0.25	0.98	1.12	1.00	1.13
Campus Loop	124E_1220	207	10	0.13	0.25	0.13	0.25	0.98	1.12	1.00	1.13
Campus Loop	124E_1225	33	10	0.04	0.12	0.04	0.12	1.43	1.53	1.42	1.52
Campus Loop	124E_1230	82	10	0.05	0.13	0.05	0.13	9.63	9.76	9.63	9.76
Campus Loop	124E_1235	300	10	0.05	0.32	0.05	0.32	9.63	9.94	9.63	9.94
Campus Loop	124E_1240	100	10	0.05	0.14	0.05	0.14	9.63	9.76	9.63	9.76
Campus Loop	124E_1245	187	10	0.07	0.13	0.07	0.13	2.21	2.41	2.21	2.41
Campus Loop	124E_1250	195	10	0.07	0.13	0.07	0.13	2.21	2.41	2.21	2.41
Campus Loop	124E_1255	36	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Campus Loop	124E_1260	206	10	0.07	0.05	0.07	0.05	2.21	2.24	2.21	2.24
Campus Loop	124E_1265	248	10	0.07	0.17	0.07	0.17	2.21	2.18	2.21	2.19
Campus Loop	124E_1270	18	10	0.13	0.49	0.13	0.49	7.45	7.83	7.44	7.83
Campus Loop	124E_1275	10	10	0.23	0.73	0.23	0.73	8.95	9.48	8.94	9.47
Campus Loop	124E_1280	121	10	0.13	0.51	0.13	0.51	7.45	7.86	7.44	7.86
Campus Loop	124E_1285	55	10	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Campus Loop	124E_1290	217	10	0.24	0.74	0.24	0.74	8.96	9.49	8.95	9.48
Campus Loop	124E_1450	458	10	0.14	0.60	0.14	0.60	7.72	8.19	7.73	8.20
Campus Loop	124E_1455	138	10	0.03	0.21	0.03	0.21	6.74	6.92	6.74	6.92
Campus Loop	124E_1460	165	10	0.05	0.11	0.05	0.11	6.72	6.82	6.73	6.82
Campus Loop	124E_1465	189	10	0.03	0.33	0.03	0.33	6.74	7.05	6.74	7.05
Campus Loop	124E_1470	228	10	0.03	0.22	0.03	0.22	6.74	6.94	6.74	6.94
Campus Loop	124E_1525	21	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Campus Loop	124E_1530	49	10	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
Campus Loop	124E_1535	128	10	0.10	0.19	0.10	0.19	1.50	1.60	1.49	1.59
Campus Loop	124E_1540	16	10	0.10	0.19	0.10	0.19	1.50	1.60	1.49	1.59
Campus Loop	124E_1545	221	10	0.10	0.21	0.10	0.21	1.50	1.62	1.49	1.61
Campus Loop	124E_1550	113	10	0.10	0.20	0.10	0.20	1.50	1.60	1.49	1.60
Campus Loop	124E_1555	40	10	0.10	0.20	0.10	0.20	1.50	1.60	1.49	1.60
Sand Canyon Ave											
Sand Canyon Ave	124E_1070	492	16	0.33	0.52	0.33	0.52	2.05	2.06	1.52	1.53
Sand Canyon Ave	124E_1080	109	16	0.33	0.52	0.33	0.52	2.05	2.06	1.52	1.53
Sand Canyon Ave	124N_1020	120	16	0.11	0.14	0.11	0.14	0.37	0.30	1.00	1.12
Sand Canyon Ave	124N_1025	423	16	0.33	0.52	0.33	0.52	2.05	2.06	1.52	1.53
Sand Canyon Ave	124N_1030	60	16	0.24	0.27	0.24	0.27	1.51	1.70	2.04	2.22
Sand Canyon Ave	124N_1035	955	16	0.16	0.19	0.16	0.19	1.42	1.59	1.88	2.05
Sand Canyon Ave	124N_1040	25	16	0.11	0.14	0.11	0.14	1.66	1.85	2.18	2.37
Barranca											
Barranca	123S_1135	262	12	0.43	0.55	0.43	0.55	1.91	1.92	1.42	1.44
Barranca	123S_1140	202	12	0.52	0.67	0.52	0.67	2.32	2.33	1.72	1.75
Barranca	123S_1145	42	12	0.43	0.55	0.43	0.55	1.91	1.92	1.42	1.44
Barranca	123S_1150	245	12	0.43	0.55	0.43	0.55	1.91	1.92	1.42	1.44
Barranca	123S_1155	80	12	0.43	0.55	0.43	0.55	1.91	1.92	1.42	1.44
Barranca	123S_1160	279	12	0.52	0.67	0.52	0.67	2.32	2.33	1.72	1.75
Barranca	124E_1480	366	12	0.59	0.93	0.59	0.93	3.64	3.66	2.70	2.72
Barranca	124E_1485	351	12	0.59	0.93	0.59	0.93	3.64	3.66	2.70	2.72
Barranca	124E_1490	264	12	0.59	0.93	0.59	0.93	3.64	3.66	2.70	2.72
Barranca	124E_1495	227	12	0.59	0.93	0.59	0.93	3.64	3.66	2.70	2.72
Barranca	124E_1500	342	12	0.59	0.93	0.59	0.93	3.64	3.66	2.70	2.72
Barranca	124E_1505	61	12	0.59	0.93	0.59	0.93	3.64	3.66	2.70	2.72
Barranca	139W_1215	230	12	0.53	0.67	0.53	0.67	2.32	2.34	1.73	1.75
Barranca	139W_1230	292	12	0.53	0.67	0.53	0.67	2.32	2.34	1.73	1.75
Barranca	139W_1235	260	12	0.53	0.67	0.53	0.67	2.32	2.34	1.73	1.75
Barranca	139W_1240	10	12	0.53	0.67	0.53	0.67	2.32	2.34	1.73	1.75
Alton Pkwy											
Alton Pkwy	124E_1100	62	12	0.19	0.24	0.19	0.24	0.65	0.54	1.77	1.99
Alton Pkwy	124E_1115	217	16	0.04	0.06	0.04	0.06	0.34	0.29	0.86	0.97
Alton Pkwy	124E_1120	109	16	0.11	0.14	0.11	0.14	0.37	0.30	1.00	1.12
Alton Pkwy	124E_1125	29	16	0.11	0.14	0.11	0.14	0.37	0.30	1.00	1.12
Alton Pkwy	124E_1130	237	16	0.04	0.06	0.04	0.06	0.34	0.29	0.86	0.97
Alton Pkwy	124E_1135	260	16	0.11	0.14	0.11	0.14	0.37	0.30	1.00	1.12
Alton Pkwy	124E_1140	108	16	0.11	0.14	0.11	0.14	0.37	0.30	1.00	1.12
Alton Pkwy	124E_1145	251	16	0.21	0.34	0.21	0.34	3.16	3.17	2.17	2.20
Alton Pkwy	124E_1150	139	16	0.22	0.36	0.22	0.36	3.39	3.40	2.32	2.35
Alton Pkwy	124E_1165	59	16	0.21	0.34	0.21	0.34	3.16	3.17	2.17	2.20
Alton Pkwy	124E_1170	242	16	0.21	0.34	0.21	0.34	3.16	3.17	2.17	2.20
Alton Pkwy	124E_1175	29	16	0.21	0.34	0.21	0.34	3.16	3.17	2.17	2.20
Alton Pkwy	124E_1180	92	16	0.22	0.36	0.22	0.36	3.39	3.40	2.32	2.35
Alton Pkwy	124E_1185	75	16	0.22	0.36	0.22	0.36	3.39	3.40	2.32	2.35
Alton Pkwy	124E_1190	583	16	0.22	0.36	0.22	0.36	3.39	3.40	2.32	2.35

Table 6 - Potable Water System Hydraulic Analysis Junction Minimum Pressures

Street	Junction ID	Elevation	Min Pressure During PHD (psi)				Min Pressure for Fire Flow (psi)			
			Existing flow no HHI	Existing flow with HHI	Future flow no HHI	Future flow with HHI	Existing flow no HHI FF	Existing flow with HHI FF	Future flow no HHI FF	Future flow with HHI FF
Campus Loop										
Campus Loop	124E_1110	154.60	91.57	90.50	77.78	76.73	71.71	70.86	61.83	60.95
Campus Loop	124E_1140*	152.87	92.32	91.25	78.53	77.47	71.35	70.47	61.47	60.56
Campus Loop	124E_1150	154.00	91.83	90.77	78.04	76.99	74.13	73.37	64.25	63.46
Campus Loop	124E_1160	152.45	92.50	91.43	78.72	77.66	72.61	71.75	62.73	61.84
Campus Loop	124E_1180	152.24	92.59	91.53	78.81	77.75	74.01	73.19	64.13	63.28
Campus Loop	124E_1195	148.35	94.28	93.25	80.50	79.47	83.33	83.17	73.45	73.25
Campus Loop	124E_1215	152.55	92.45	91.40	78.67	77.62	77.28	76.66	67.40	66.76
Campus Loop	124E_1220	152.60	92.43	91.38	78.65	77.60	77.77	77.19	67.89	67.28
Campus Loop	124E_1225	152.79	92.35	91.29	78.57	77.52	77.83	77.27	67.95	67.36
Campus Loop	124E_1240	153.09	92.22	91.17	78.44	77.39	78.68	78.22	68.80	68.31
Campus Loop	124E_1250	152.77	92.36	91.31	78.58	77.53	78.94	78.49	69.06	68.58
Campus Loop	124E_1255	151.55	92.89	91.84	79.11	78.06	79.47	79.02	69.59	69.11
Campus Loop	124E_1260	152.62	92.42	91.37	78.64	77.59	78.52	78.02	68.64	68.11
Campus Loop	124E_1270	154.78	91.49	90.43	77.71	76.65	77.03	76.44	67.15	66.53
Campus Loop	124E_1275	152.91	92.30	91.24	78.52	77.47	78.37	77.86	68.49	67.96
Campus Loop	124E_1280	155.79	91.05	89.99	77.27	76.22	76.92	76.37	67.04	66.46
Campus Loop	124E_1285	153.45	92.06	91.01	78.28	77.24	78.45	77.98	68.57	68.07
Campus Loop	124E_1295	153.45	92.06	91.01	78.28	77.24	78.44	77.96	68.56	68.05
Campus Loop	124E_1300	153.56	92.02	90.96	78.23	77.18	78.05	77.53	68.17	67.62
Campus Loop	124E_1305	155.32	91.25	90.20	77.47	76.42	76.97	76.39	67.09	66.48
Campus Loop	124E_1315	154.38	91.66	90.60	77.88	76.83	77.71	77.19	67.83	67.28
Campus Loop	124E_1320	155.27	91.28	90.22	77.49	76.44	76.99	76.41	67.11	66.50
Campus Loop	124E_1325	153.47	92.06	91.00	78.27	77.23	78.37	77.89	68.49	67.98
Campus Loop	124E_1335	153.58	92.01	90.95	78.23	77.18	78.31	77.83	68.43	67.92
Campus Loop	124E_1360	153.70	91.96	90.90	78.17	77.12	78.22	77.73	68.34	67.82
Campus Loop	124E_1370	154.09	91.79	90.73	78.00	76.96	78.05	77.56	68.17	67.65
Campus Loop	124E_1400	154.82	91.47	90.42	77.69	76.64	77.69	77.19	67.81	67.28
Campus Loop	124E_1405	155.21	91.30	90.25	77.52	76.47	77.51	77.01	67.63	67.10
Campus Loop	124E_1410	155.80	91.05	89.99	77.26	76.21	77.26	76.76	67.38	66.85
Campus Loop	WY_HH1	154.38	91.66	90.60	77.88	76.82	72.61	71.79	62.73	61.88
Campus Loop	WY_HH2	154.26	91.71	90.65	77.93	76.87	73.08	72.28	63.20	62.37
Campus Loop	WY_HH3	153.43	92.07	91.01	78.29	77.23	75.36	74.66	65.48	64.75
Sand Canyon Ave										
Sand Canyon Ave	124E_1265	150.68	93.28	92.26	79.49	78.48	83.31	83.24	73.34	73.24
Sand Canyon Ave	124E_1345	148.76	94.11	93.11	80.33	79.33	84.31	84.24	74.27	74.17
Sand Canyon Ave	124N_1880	146.30	95.16	94.14	81.38	80.36	85.21	85.18	75.45	75.39
Sand Canyon Ave	124N_1930	146.82	94.94	93.91	81.16	80.13	84.99	84.96	75.23	75.18
Sand Canyon Ave	124N_1960	146.44	95.10	94.08	81.32	80.30	85.15	85.11	75.39	75.34
Sand Canyon Ave	124N_2555	148.79	94.09	93.06	80.31	79.28	83.95	83.88	74.07	73.97
Sand Canyon Ave	124N_2570	148.71	94.12	93.10	80.34	79.32	83.97	83.90	74.08	73.98
Sand Canyon Ave	124N_2580	149.97	93.58	92.56	79.80	78.79	83.58	83.50	73.62	73.52
Barranca										
Barranca	123S_1050	161	88.77	87.89	74.99	74.11	81.52	81.48	70.33	70.27
Barranca	124E_1365	148	94.37	93.37	80.59	79.59	84.67	84.60	74.58	74.49
Barranca	124E_1425	152	92.85	91.87	79.07	78.10	83.70	83.63	73.37	73.27
Barranca	124E_1460	153	92.41	91.45	78.62	77.67	83.61	83.56	73.12	73.03
Barranca	124E_1530	155	91.50	90.56	77.72	76.79	83.12	83.08	72.44	72.36
Barranca	124E_1585	158	90.07	89.16	76.28	75.38	82.24	82.20	71.31	71.24
Alton Pkwy										
Alton Pkwy	124E_1030	147	95.02	94.00	81.24	80.22	85.07	85.04	75.27	75.22
Alton Pkwy	124E_1040	147	95.01	93.99	81.23	80.21	85.06	85.03	75.26	75.20
Alton Pkwy	124E_1055	147	95.00	93.98	81.22	80.20	85.05	85.02	75.24	75.18
Alton Pkwy	124E_1080	148	94.44	93.42	80.66	79.64	84.49	84.46	74.65	74.59
Alton Pkwy	124E_1095	149	94.21	93.18	80.43	79.41	84.26	84.23	74.41	74.34
Alton Pkwy	124E_1135	150	93.69	92.66	79.90	78.88	83.74	83.70	73.87	73.79
Alton Pkwy	124E_1190	151	93.08	92.06	79.30	78.28	83.13	83.10	73.25	73.17
Alton Pkwy	124E_1290	156	90.83	89.81	77.05	76.03	81.42	81.39	71.26	71.19
Alton Pkwy	124E_1310	157	90.53	89.51	76.75	75.73	81.19	81.16	71.00	70.93
Alton Pkwy	124E_1330	158	89.98	88.96	76.20	75.19	80.73	80.70	70.50	70.43
Alton Pkwy	124N_1880	146	95.16	94.14	81.38	80.36	85.21	85.18	75.45	75.39
Alton Pkwy	124N_1885	146	95.17	94.15	81.39	80.37	85.22	85.19	75.45	75.40

*4,000 gpm of Fire flow loaded onto junction 124E_1140

Table 7 - Potable Water System Hydraulic Analysis Junction Maximum Pressures

Street	Junction ID	Elevation	Max Pressure During PHD (psi)				Max Pressure for Fire Flow (psi)			
			Existing flow no HHI	Existing flow with HHI	Future flow no HHI	Future flow with HHI	Existing flow no HHI FF	Existing flow with HHI FF	Future flow no HHI FF	Future flow with HHI FF
Campus Loop										
Campus Loop	124E_1110	154.60	92.61	92.41	82.99	81.45	71.87	71.59	62.03	61.74
Campus Loop	124E_1140*	152.87	93.36	93.16	83.74	82.20	71.51	71.22	61.67	61.37
Campus Loop	124E_1150	154.00	92.87	92.67	83.25	81.71	74.28	74.03	64.44	64.18
Campus Loop	124E_1160	152.45	93.54	93.34	83.92	82.38	72.76	72.48	62.92	62.63
Campus Loop	124E_1180	152.24	93.63	93.43	84.01	82.47	74.16	73.89	64.32	64.04
Campus Loop	124E_1195	148.35	95.32	95.13	85.70	84.16	83.41	83.36	73.56	73.50
Campus Loop	124E_1215	152.55	93.50	93.30	83.88	82.34	77.43	77.23	67.59	67.38
Campus Loop	124E_1220	152.60	93.48	93.28	83.86	82.31	77.91	77.72	68.07	67.87
Campus Loop	124E_1225	152.79	93.40	93.20	83.78	82.23	77.97	77.79	68.13	67.94
Campus Loop	124E_1240	153.09	93.27	93.07	83.65	82.10	78.82	78.67	68.98	68.81
Campus Loop	124E_1250	152.77	93.41	93.21	83.78	82.24	79.07	78.93	69.23	69.07
Campus Loop	124E_1255	151.55	93.93	93.74	84.31	82.77	79.60	79.46	69.76	69.60
Campus Loop	124E_1260	152.62	93.47	93.27	83.85	82.31	78.66	78.50	68.83	68.65
Campus Loop	124E_1270	154.78	92.53	92.33	82.91	81.37	77.18	76.99	67.34	67.14
Campus Loop	124E_1275	152.91	93.34	93.15	83.72	82.18	78.52	78.36	68.69	68.51
Campus Loop	124E_1280	155.79	92.10	91.90	82.48	80.93	77.08	76.90	67.24	67.05
Campus Loop	124E_1285	153.45	93.11	92.91	83.49	81.95	78.59	78.43	68.75	68.58
Campus Loop	124E_1295	153.45	93.11	92.91	83.49	81.95	78.58	78.43	68.74	68.57
Campus Loop	124E_1300	153.56	93.06	92.86	83.44	81.90	78.21	78.04	68.37	68.19
Campus Loop	124E_1305	155.32	92.30	92.10	82.68	81.14	77.12	76.93	67.28	67.08
Campus Loop	124E_1315	154.38	92.71	92.51	83.09	81.54	77.87	77.70	68.03	67.85
Campus Loop	124E_1320	155.27	92.32	92.12	82.70	81.16	77.14	76.95	67.30	67.10
Campus Loop	124E_1325	153.47	93.10	92.90	83.48	81.94	78.52	78.36	68.68	68.51
Campus Loop	124E_1335	153.58	93.05	92.86	83.43	81.89	78.46	78.30	68.62	68.45
Campus Loop	124E_1360	153.70	93.00	92.80	83.38	81.84	78.37	78.21	68.53	68.36
Campus Loop	124E_1370	154.09	92.83	92.63	83.21	81.67	78.20	78.04	68.36	68.19
Campus Loop	124E_1400	154.82	92.52	92.32	82.90	81.35	77.84	77.68	68.00	67.83
Campus Loop	124E_1405	155.21	92.35	92.15	82.73	81.18	77.66	77.50	67.82	67.65
Campus Loop	124E_1410	155.80	92.09	91.89	82.47	80.93	77.41	77.25	67.57	67.40
Campus Loop	WY_HH1	154.38	92.71	92.51	83.09	81.54	72.76	72.50	62.93	62.65
Campus Loop	WY_HH2	154.26	92.76	92.56	83.14	81.59	73.24	72.97	63.40	63.13
Campus Loop	WY_HH3	153.43	93.12	92.92	83.50	81.95	75.51	75.28	65.67	65.43
Sand Canyon Ave										
Sand Canyon Ave	124E_1265	150.68	94.31	94.12	84.69	83.15	83.38	83.35	73.44	73.41
Sand Canyon Ave	124E_1345	148.76	95.14	94.95	85.52	83.99	84.39	84.37	74.38	74.34
Sand Canyon Ave	124N_1880	146.30	96.21	96.01	86.59	85.05	85.25	85.24	75.52	75.50
Sand Canyon Ave	124N_1930	146.82	95.98	95.79	86.36	84.82	85.02	85.01	75.30	75.28
Sand Canyon Ave	124N_1960	146.44	96.15	95.95	86.53	84.99	85.18	85.17	75.45	75.44
Sand Canyon Ave	124N_2555	148.79	95.13	94.94	85.51	83.97	84.01	83.99	74.17	74.13
Sand Canyon Ave	124N_2570	148.71	95.16	94.97	85.54	84.00	84.04	84.01	74.18	74.15
Sand Canyon Ave	124N_2580	149.97	94.62	94.43	85.00	83.46	83.64	83.62	73.73	73.69
Barranca										
Barranca	123S_1050	161	89.71	89.54	80.09	78.57	81.76	81.74	70.55	70.52
Barranca	124E_1365	148	95.40	95.21	85.78	84.24	84.75	84.73	74.69	74.66
Barranca	124E_1425	152	93.86	93.67	84.24	82.70	83.81	83.77	73.49	73.46
Barranca	124E_1460	153	93.40	93.21	83.78	82.25	83.74	83.71	73.25	73.23
Barranca	124E_1530	155	92.48	92.30	82.86	81.33	83.29	83.26	72.60	72.57
Barranca	124E_1585	158	91.03	90.85	81.41	79.88	82.44	82.42	71.50	71.46
Alton Pkwy										
Alton Pkwy	124E_1030	147	96.07	95.88	86.45	84.91	85.12	85.11	75.36	75.34
Alton Pkwy	124E_1040	147	96.06	95.86	86.44	84.90	85.10	85.09	75.34	75.32
Alton Pkwy	124E_1055	147	96.05	95.85	86.43	84.89	85.10	85.09	75.33	75.31
Alton Pkwy	124E_1080	148	95.49	95.30	85.87	84.33	84.54	84.53	74.76	74.73
Alton Pkwy	124E_1095	149	95.26	95.06	85.64	84.10	84.31	84.30	74.52	74.49
Alton Pkwy	124E_1135	150	94.73	94.54	85.11	83.57	83.79	83.78	73.98	73.96
Alton Pkwy	124E_1190	151	94.13	93.94	84.51	82.97	83.19	83.17	73.37	73.34
Alton Pkwy	124E_1290	156	91.87	91.68	82.25	80.71	81.49	81.47	71.38	71.36
Alton Pkwy	124E_1310	157	91.57	91.38	81.95	80.41	81.26	81.25	71.12	71.10
Alton Pkwy	124E_1330	158	91.03	90.83	81.41	79.87	80.80	80.79	70.62	70.59
Alton Pkwy	124N_1880	146	96.21	96.01	86.59	85.05	85.25	85.24	75.52	75.50
Alton Pkwy	124N_1885	146	96.22	96.02	86.60	85.06	85.26	85.25	75.52	75.50

*4,000 gpm of Fire flow loaded onto junction 124E_1140

4.0 RECYCLED WATER SYSTEM

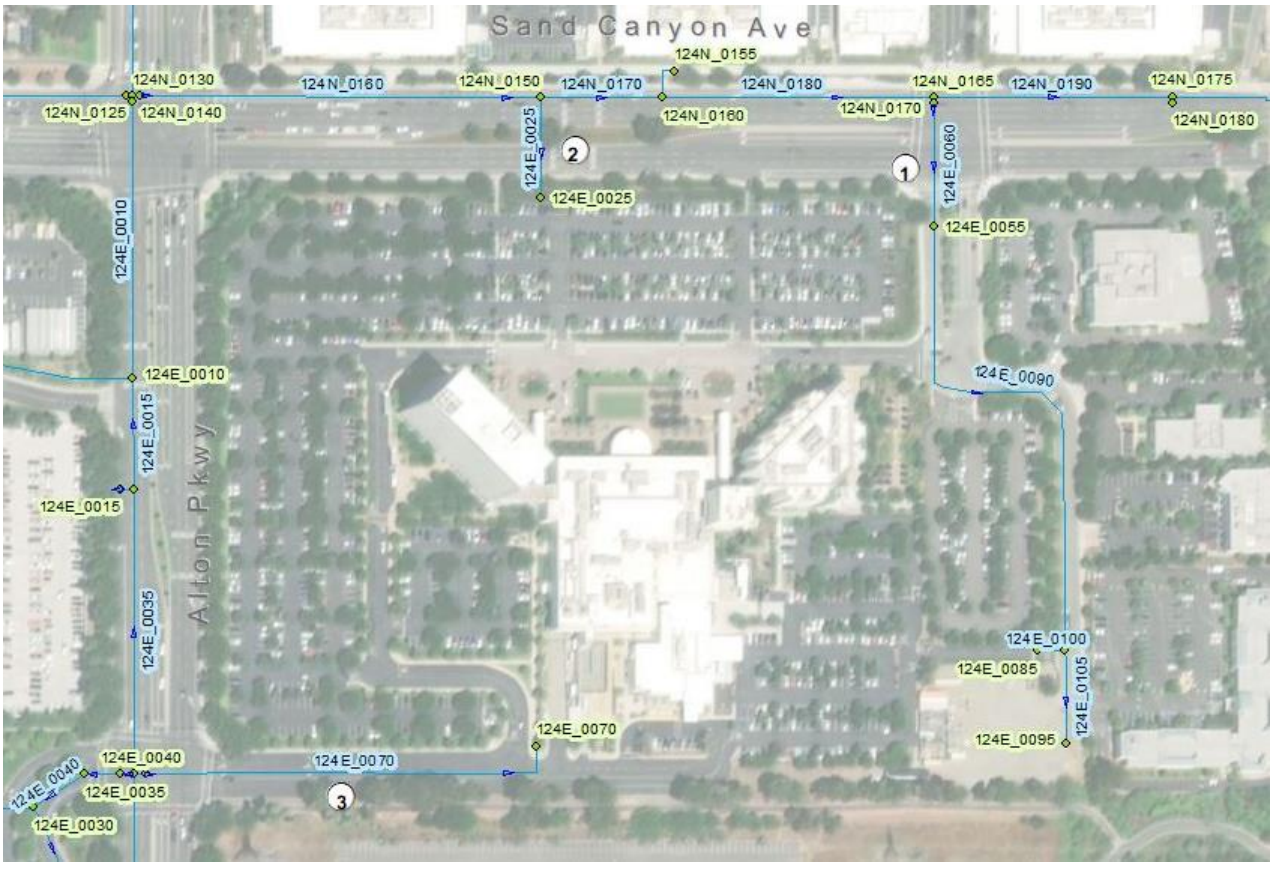
This section discusses the existing recycled water system and the criteria, analysis, and results of the hydraulic evaluation.

4.1 Existing Recycled Water System

The HHI Campus is currently being served through three connections to the recycled water system. The 4" connection to the southwest side of the hospital connects to an 8-inch line in Alton Parkway. The connections to the northwest side of the Campus connects to a 12-inch pipe in Sand Canyon Avenue. The model shows this 12-inch pipe is served by the same zone that serves the connection to the southwest side of the HHI Campus. However, the two northwest connections are effectively served by the lower zone that serves the residential area directly northwest of the HHI Campus. Discussions with IRWD staff confirmed that this is accurate to the configuration of zones in the field. This means that different parts of the HHI Campus are served by different zones and therefore may experience different hydraulic conditions including pressure and available flow.

Figure 5 presents the HHI Campus recycled water system, the three connection points, and the hydraulic model junction and pipe IDs which are referenced in the tables in the following sections. Junction IDs are highlighted in green and pipe IDs are highlighted in blue.

Figure 5. Recycled Water Model Pipe and Junction IDs



4.2 Recycled Water System Hydraulic Analysis

Four scenarios were analyzed for the recycled water system hydraulic analysis, as discussed in Section 2.3. The most current IRWD InfoWater recycled water model was used for the analysis. Recycled water analyses were performed using model scenarios "EXISTING_MDD" and "FUTURE_MDD".

As discussed previously, three (3) 2-inch meters with a total capacity of 640 gpm are necessary to satisfy the peak recycled water demand. In the existing and future HHI Expansion scenarios, the current HHI Campus demand was removed from the each of the three recycled water connection points and replaced with 160 gpm.

4.2.1 Recycled Water System Evaluation Criteria

The model results for each of the scenarios were evaluated for deficiencies based on IRWD recycled water system hydraulic criteria, as presented in Table 8. The WRMP states that the minimum pressure in a recycled water system must be greater than 60 psi to adequately supply irrigation system while the maximum service pressure must be below 150 psi. The WRMP states that the maximum velocity in pipelines must be between 3-5 fps during average day demand conditions and under 8 fps during peak hour demand conditions. Because this study only evaluates the recycled water peak hour demand scenarios, the effective velocity criteria is between 3-8 fps.

Table 8. IRWD Hydraulic Criteria – Recycled Water System

Demand Condition	Pipe Velocity (fps)		Junction Pressure (psi)	
	Minimum	Maximum	Minimum	Maximum
Peak Hour Demand (during Max Day)	3	8	60	150

4.2.2 Recycled Water System Hydraulic Results

Table 9 presents the maximum pipe velocity results for each scenario. Pipes with velocities below the minimum criteria (3 fps) are highlighted in yellow. There were no pipes with velocities above the maximum criteria.

Table 10 presents the maximum and minimum junction pressure results for each scenario. Junctions with pressures below the minimum requirement are highlighted in red. There were no junctions with pressures above the maximum requirement.

4.3 Recycled Water System Analysis Summary

There is an increase in pipe velocities when comparing the base and the HHI Expansion scenarios that is directly related to the proximity to the HHI Campus. This increase is mostly attributable to the difference in methodologies for calculating and assigning peak flows between the two scenarios. However, despite the increase in flows, there are no velocities violating the maximum velocity criteria of 8 fps. There are many pipes around the project area that violate the minimum

velocity criteria of 3 fps in all four scenarios (existing and future base; and existing and future HHI Expansion). In the HHI Expansion scenarios, the number of those deficiencies are in fact reduced.

The junctions in the vicinity of the HHI Campus vary in minimum and maximum pressure depending on which zone they are served by. All junctions being served from the transmission main in Sand Canyon Avenue are a part of the lower zone and consequently have lower minimum pressures. There are 16 low pressure deficiencies in the existing scenario with existing HHI demands and 18 low pressure deficiencies in the existing scenario with the HHI Expansion demands. There are 9 deficiencies in the future scenario with existing HHI demands and 18 deficiencies in the future scenario with the HHI Expansion demands. Initially looking at number of deficiencies only can misrepresent the impact that the HHI Expansion will have on the system. The increased demands decrease the average pressure of those junctions in Sand Canyon Avenue by 2.43 psi in the existing scenario and 2.69 psi in the future scenario. The increase in the total number of low pressure deficiencies is due to the fact that the scenarios with existing HHI demands have a number of junctions that are less than 2 psi above the 60 psi minimum pressure criteria. In the scenarios with HHI Expansion demands, those pressures only drop by slightly more than 2 psi, which is enough to make them deficient.

Junctions that are a part of the upper zone meet all minimum and maximum pressure criteria.

4.4 Recycled Water System Recommendations

As described above, the HHI expansion demands increase the number of junctions that are below the minimum pressure requirement and that are therefore deficient by IRWD criteria. However, the HHI expansion demands are reducing the pressure by only slightly more than 2 psi. Therefore, no improvements are recommended for the IRWD recycled water system based on addition of the HHI Campus Expansion.

Table 9 - Recycled Water System Hydraulic Analysis Pipe Maximum Velocities							
				Max Velocity MDD (fps)			
Street	Pipe ID	Length	Diameter	Existing flow no HHI	Existing flow with HHI	Future flow no HHI	Future flow with HHI
Connection 1 Lateral	124E_0060	179	4	2.33	6.18	2.33	6.18
Connection 2 Lateral	124E_0025	146	4	0.13	4.20	0.13	4.20
Connection 3 Lateral	124E_0070	602	4	0.70	4.72	0.70	4.72
Sand Canyon Rd	124N_0150	10	12	0.56	1.41	0.56	1.41
Sand Canyon Rd	124N_0160	580	12	0.56	1.41	0.56	1.41
Sand Canyon Rd	124N_0170	175	12	0.48	0.89	0.48	0.89
Sand Canyon Rd	124N_0180	392	12	0.48	0.89	0.48	0.89
Sand Canyon Rd	124N_0190	345	12	0.22	0.22	0.22	0.22
Sand Canyon Rd	124N_0200	550	12	0.22	0.22	0.22	0.22
Sand Canyon Rd	124N_0210	61	12	0.22	0.22	0.22	0.22
Sand Canyon Rd	124N_0211	8	12	0.22	0.22	0.22	0.22
Sand Canyon Rd	123W_0070	1,507	12	0.22	0.22	0.22	0.22
Sand Canyon Rd	123S_0010	1,121	12	0.00	0.00	0.00	0.00
Alton Pkwy	102E_0015	1,304	12	2.85	3.29	2.80	3.20
Alton Pkwy	102E_0065	14	12	2.66	3.12	2.63	3.04
Alton Pkwy	102E_0120	1,438	12	1.98	2.47	1.98	2.40
Alton Pkwy	124N_0035	1,044	12	1.94	2.43	1.94	2.36
Alton Pkwy	124N_0060	247	12	1.70	2.22	1.71	2.15
Alton Pkwy	124N_0100	1,504	12	0.56	1.41	0.56	1.41
Alton Pkwy	124N_0145	8	6	0.00	0.00	0.00	0.00
Alton Pkwy	124E_0010	401	8	0.00	0.00	0.00	0.00
Alton Pkwy	124E_0015	159	8	0.17	0.17	0.17	0.17
Alton Pkwy	124E_0035	412	8	0.23	0.23	0.23	0.23
Alton Pkwy	124E_0080	701	8	0.71	1.66	0.71	1.66
Alton Pkwy	124E_0115	904	8	1.63	2.49	1.63	2.49
Laguna Canyon Rd	124E_0130	14	8	2.89	3.62	2.96	3.68
Laguna Canyon Rd	124E_0141	38	24	0.38	0.45	0.40	0.47
Laguna Canyon Rd	124E_0121	1,515	24	3.44	3.44	2.49	2.49
Laguna Canyon Rd	124E_0150	328	24	3.44	3.44	2.49	2.49
Laguna Canyon Rd	123S_0050	2,791	24	3.44	3.44	2.49	2.49

Table 10 - Recycled Water System Hydraulic Analysis Junction Pressures

Street	Junction ID	Elevation	Min Pressure During PHD (psi)				Max Pressure During PHD (psi)			
			Existing flow no HHI	Existing flow with HHI	Future flow no HHI	Future flow with HHI	Existing flow no HHI	Existing flow with HHI	Future flow no HHI	Future flow with HHI
Campus Loop										
Connection 1	124E_0055	148.75	58.50	52.86	59.48	53.54	76.39	76.38	63.30	63.29
Connection 1	124E_0085	153.19	56.50	50.88	57.49	51.56	74.47	74.45	61.35	61.34
Connection 1	124E_0090	154.14	56.09	50.47	57.08	51.14	74.05	74.04	60.94	60.93
Connection 1	124E_0095	154.59	55.89	50.27	56.88	50.94	73.86	73.85	60.74	60.73
Connection 1	124N_0170	147.93	59.65	58.08	60.58	58.76	76.75	76.73	63.98	63.96
Connection 2	124E_0025	150.77	58.44	55.54	59.37	56.22	75.51	75.50	62.75	62.74
Connection 3	124E_0070	154.50	119.06	113.31	120.14	112.10	127.96	127.94	124.24	124.24
Connection 3	124E_0050	151.25	120.63	120.61	121.75	120.57	129.37	129.35	125.84	125.84
Sand Canyon Ave	123W_0090	158.84	54.90	53.33	55.83	54.01	72.02	72.00	59.24	59.23
Sand Canyon Ave	123W_0100	166.99	51.37	49.80	52.30	50.48	68.49	68.47	55.71	55.69
Sand Canyon Ave	123W_0105	167.08	48.28	48.28	40.38	40.27	68.87	68.85	53.66	53.66
Sand Canyon Ave	124N_0130	146.11	60.50	59.12	61.42	59.80	77.53	77.52	64.79	64.77
Sand Canyon Ave	124N_0140	146.15	60.48	59.10	61.41	59.78	77.52	77.50	64.77	64.76
Sand Canyon Ave	124N_0150	147.97	59.66	58.14	60.59	58.82	76.73	76.71	63.97	63.95
Sand Canyon Ave	124N_0160	148.89	59.25	57.72	60.18	58.39	76.33	76.32	63.57	63.55
Sand Canyon Ave	124N_0165	147.69	59.76	58.19	60.69	58.86	76.85	76.84	64.08	64.07
Sand Canyon Ave	124N_0175	149.21	59.09	57.52	60.02	58.20	76.19	76.18	63.42	63.41
Sand Canyon Ave	124N_0185	149.30	59.05	57.48	59.98	58.16	76.15	76.14	63.38	63.37
Sand Canyon Ave	124N_0195	148.80	59.27	57.70	60.20	58.38	76.37	76.35	63.59	63.58
Sand Canyon Ave	124N_0200	148.80	59.27	57.70	60.20	58.38	76.37	76.35	63.59	63.58
Alton Pkwy	124E_0010	147.76	122.14	122.12	123.25	122.08	130.88	130.86	127.34	127.34
Alton Pkwy	124E_0020	148.57	121.79	121.77	122.90	121.73	130.53	130.51	126.99	126.99
Alton Pkwy	124E_0045	150.69	120.87	120.85	121.99	120.82	129.61	129.59	126.08	126.08
Alton Pkwy	124E_0075	156.90	118.26	118.23	119.40	118.58	126.92	126.90	123.48	123.48
Alton Pkwy	124E_0110	165.07	115.15	115.13	116.41	116.27	123.38	123.36	120.48	120.48
Alton Pkwy	124N_0135	146.17	122.83	122.80	123.94	122.77	131.57	131.55	128.03	128.03

5.0 SEWER COLLECTION SYSTEM

This section discusses the existing sewer collection system and the criteria, analysis, and results of the hydraulic evaluation.

5.1 Sewer Collection System Hydraulic Analysis

The existing and proposed HHI Campus configurations are served via four connections to the collection system; two that discharge into a 15-inch gravity main in Alton Parkway and two that discharge into a 21-inch gravity main in Sand Canyon Avenue. Both gravity mains flow west and combine at the intersection of Alton and Sand Canyon. From there, the flow travels southwest down Sand Canyon Avenue via a 24-inch gravity main for about 750 feet to the 405 freeway where it is discharged into the large gravity main identified as the San Diego Creek Interceptor (SDCI). The SDCI conveys flows by gravity northwest alongside the 405 freeway to Culver Drive, where it takes a short detour north before crossing underneath the 405 freeway and crossing San Diego Creek by siphon. Flows are then transported a short distanced before being discharged at Michelson Water Recycling Plant.

Figure 6 presents the HHI Campus sewer collection system, the four connection points, and the hydraulic model junction IDs which are referenced in the tables in the following sections. Note that pipe IDs are a concatenation of the upstream and downstream junction IDs.

Figure 6. Wastewater Model Pipe and Junction IDs

5.2 Sewer Collection System Hydraulic Analysis

Four scenarios were analyzed for the collection system hydraulic analysis, as discussed in Section 2.3. The most current IRWD InfoSWMM hydraulic model was utilized for the analysis. As directed by IRWD Staff, the "EXISTING_PDWF" and "FUTURE_IRWD" model scenarios were utilized to assess the impact of the additional sewer loading on the IRWD collection system.

Peak dry weather flow (PDWF) was simulated in the hydraulic model by the application of a diurnal pattern to the calculated design ADWFs. The "COMMERCIAL" diurnal pattern with a peak of 1.87 was applied to all loads.

The connections points for all 16 proposed buildings were identified through discussion with IRWD and LPA. Flows for each connection point were then summed up and applied to the appropriate manhole/junction. Connection 2 contained multiple manholes so the total flow for that connection was distributed over all four manholes.

5.2.1 Sewer Collection System Evaluation Criteria

The model results for each scenario were evaluated for deficiencies based on the IRWD design criteria, as presented in Table 11. Pipes are evaluated using a depth of flow (d) to pipe diameter (D) ratio for each pipe (d/D).

Table 11. IRWD Hydraulic Criteria – Sewer Collection System

Limits of d/D for Sewer Pipes	Pipe Size (in)		
	≤ 12-inches	= 15-inches	≥ 18-inches
Priority 1	> 0.82	> 0.82	> 0.82
Priority 2	0.75 – 0.82	0.75 – 0.82	0.75 – 0.82
Priority 3	0.67 – 0.75	0.67 – 0.75	-
Priority 4	0.50 – 0.67	-	-
Design Requirement	≤ 0.50	≤ 0.67	≤ 0.75

5.2.2 Sewer Collection System Hydraulic Results

Table 12 presents the PDWF d/D results for all gravity mains in each scenario; pipes are ordered from upstream to downstream. Results for the siphon used to cross underneath San Diego Creek were excluded from the table as siphons have a different set of hydraulic criteria than gravity mains. Gravity mains with PDWF d/D results above the d/D criteria are highlighted in red.

5.3 Sewer Collection System Analysis Summary

As seen in Table 12, there is a minor increase in flows between existing HHI scenarios and the HHI Expansion scenarios. During both future scenarios, there are two large trunk main segments that have PDWF d/D values that slightly exceed the criteria (d/D ≤ 0.75). These deficiencies are

observed in both future scenarios (base and HHI Expansion), and they are not caused or significantly worsened by the HHI Campus Expansion project. Both d/D deficiencies are considered Priority 2 deficiencies by definition; however, they are just slightly over the d/D criteria and do not represent an immediate risk to the collection system.

5.4 Sewer Collection System Recommendations

No improvements are recommended for the IRWD sewer collection system based on addition of the HHI Campus Expansion.

Table 12 - Sewer Collection System Hydraulic Analysis Pipe d/D Results

Location	Pipe Data						Existing System, No HHI Flows		Existing System, With HHI Flows		Future System, No HHI Flows		Future System, With HHI Flows	
Street	Pipe ID	US MH	DS MH	Diameter	Length	Slope	Peak Flow (cfs)	Peak Flow d/D	Peak Flow (cfs)	Peak Flow d/D	Peak Flow (cfs)	Peak Flow d/D	Peak Flow (cfs)	Peak Flow d/D
Connection 1	STCO124E127MH124E002	CO124E127	MH124E002	10	64	0.00391	0.004378	0.047811	0.144647	0.259591	0.004378	0.047811	0.14462	0.259564
Sand Canyon Ave	CLMH124E002MH124E003	MH124E002	MH124E003	21	518	0.00160	0.589504	0.255377	0.729585	0.291382	0.634291	0.264979	0.774019	0.29983
Connection 2	CLMH124E013MH124E012	MH124E013	MH124E012	12	182	0.01093	0	0.0001	0.049145	0.098543	0	0.0001	0.049145	0.098543
Connection 2	CLMH124E012MH124E011	MH124E012	MH124E011	12	178	0.02567	0.09214	0.10879	0.098291	0.124437	0.09214	0.10879	0.098291	0.124437
Connection 2	CLMH124E046MH124E011	MH124E046	MH124E011	8	86	0.09882	0.018477	0.089781	0.049145	0.15142	0.018477	0.089781	0.049145	0.15142
Connection 2	CLMH124E011MH124E003	MH124E011	MH124E003	12	280	0.00496	0.110616	0.173599	0.196582	0.231543	0.110616	0.173599	0.196582	0.231543
Sand Canyon Ave	CLMH124E003MH124E004	MH124E003	MH124E004	21	577	0.00149	0.69945	0.26116	0.925699	0.301964	0.744299	0.269216	0.970132	0.309466
Connection 4	STCO124E129MH124E007	CO124E129	MH124E007	8	118	0.00407	0	0.00015	0.065536	0.233984	0	0.00015	0.065536	0.233984
Alton Pkwy	CLMH124E007MH124E006	MH124E007	MH124E006	15	435	0.00395	0.19811	0.180234	0.263646	0.208119	0.19811	0.180234	0.263646	0.208119
Connection 3	STCO124E128MH124E006	CO124E128	MH124E006	10	105	0.00800	0	0.00012	0.011365	0.06605	0	0.00012	0.011365	0.06605
Alton Pkwy	CLMH124E006MH124E114	MH124E006	MH124E114	15	106	0.00398	0.19811	0.18715	0.275012	0.219717	0.19811	0.18715	0.275012	0.219717
Alton Pkwy	CLMH124E114MH124E004	MH124E114	MH124E004	15	322	0.00401	0.19811	0.179695	0.275012	0.211899	0.19811	0.179695	0.275012	0.211899
Sand Canyon Ave	CLMH124E004MH124E005	MH124E004	MH124E005	24	518	0.00120	0.897491	0.271568	1.200467	0.314147	0.942365	0.278923	1.245108	0.32042
Sand Canyon Ave	CLMH124E005MH124W008	MH124E005	MH124W008	24	161	0.00118	0.897465	0.245949	1.200446	0.283472	0.942374	0.259077	1.245094	0.291869
Sand Canyon Ave	CLMH124W008MH124W007	MH124W008	MH124W007	24	40	0.00125	0.897464	0.235133	1.200445	0.269505	0.942525	0.258351	1.245183	0.281753
Sand Canyon Ave	CLMH124W007MH124W006	MH124W007	MH124W006	24	26	0.00189	0.897469	0.213452	1.200452	0.246439	0.942854	0.249755	1.245495	0.263937
San Diego Creek Interceptor	CLMH124W006MH124W005	MH124W006	MH124W005	36	588	0.00524	6.064098	0.298838	6.359433	0.306295	12.405478	0.438457	12.709187	0.444456
San Diego Creek Interceptor	CLMH124W005MH124W004	MH124W005	MH124W004	36	563	0.00522	6.063768	0.299066	6.359035	0.30653	12.405457	0.438835	12.709153	0.44484
San Diego Creek Interceptor	CLMH124W004MH124W003	MH124W004	MH124W003	36	468	0.00519	6.063577	0.299502	6.358827	0.306975	12.405454	0.439539	12.709145	0.445554
San Diego Creek Interceptor	CLMH124W003MH124W002	MH124W003	MH124W002	36	466	0.00515	6.063397	0.300127	6.358618	0.307613	12.405451	0.440544	12.709136	0.446578
San Diego Creek Interceptor	CLMH124W002MH124W001	MH124W002	MH124W001	36	437	0.00522	6.063252	0.299122	6.358454	0.306587	12.405451	0.438944	12.709132	0.444949
San Diego Creek Interceptor	CLMH124W001MH102S006	MH124W001	MH102S006	36	428	0.00526	6.06312	0.298536	6.358308	0.30598	12.40545	0.438013	12.709131	0.444003
San Diego Creek Interceptor	CLMH102S006MH102S005	MH102S006	MH102S005	36	624	0.00522	6.062732	0.299005	6.35779	0.306464	12.405404	0.438779	12.709072	0.444782
San Diego Creek Interceptor	CLMH102S005MH102S004	MH102S005	MH102S004	36	618	0.00526	6.062369	0.298489	6.357306	0.305925	12.405364	0.437967	12.709015	0.443957
San Diego Creek Interceptor	CLMH102S004MH102S003	MH102S004	MH102S003	36	618	0.00739	6.062071	0.273511	6.356927	0.280227	12.405332	0.398496	12.708971	0.403814
San Diego Creek Interceptor	CLMH102S003MH102S002	MH102S003	MH102S002	48	312	0.00221	6.062102	0.235979	6.356976	0.241828	12.405344	0.342758	12.708987	0.347149
San Diego Creek Interceptor	CLMH102S002MH102S001	MH102S002	MH102S001	48	246	0.00220	6.061944	0.234831	6.356788	0.240545	12.405349	0.337555	12.708993	0.341642
San Diego Creek Interceptor	CLMH102S001MH102W005	MH102S001	MH102W005	33	240	0.02645	6.061942	0.222923	6.356786	0.228251	12.40535	0.321054	12.708996	0.325136
San Diego Creek Interceptor	CLMH102W005MH102W004	MH102W005	MH102W004	42	404	0.00300	9.757223	0.347147	10.073553	0.35298	18.647575	0.49065	18.935001	0.494857
San Diego Creek Interceptor	CLMH102W004MH102W003	MH102W004	MH102W003	42	419	0.00334	9.756943	0.342386	10.072947	0.348132	18.647816	0.496016	18.935959	0.500716
San Diego Creek Interceptor	CLMH102W003MH102W002	MH102W003	MH102W002	42	493	0.00274	9.757924	0.358329	10.074165	0.364544	18.648914	0.516418	18.937889	0.521232
San Diego Creek Interceptor	CLMH102W002MH101N080	MH102W002	MH101N080	42	493	0.00288	9.758826	0.3507	10.074878	0.356843	18.650173	0.508052	18.939558	0.51285
San Diego Creek Interceptor	CLMH101N080MH101N079	MH101N080	MH101N079	42	514	0.00276	9.757069	0.351536	10.071	0.357413	18.650183	0.507776	18.939779	0.512569
San Diego Creek Interceptor	CLMH101N079MH101N078	MH101N079	MH101N078	42	514	0.00276	9.756528	0.351526	10.069966	0.357393	18.649956	0.506563	18.939207	0.511219
San Diego Creek Interceptor	CLMH101N078MH088E008	MH101N078	MH088E008	42	503	0.00288	9.756047	0.349433	10.069101	0.355263	18.648855	0.494469	18.935547	0.498709
San Diego Creek Interceptor	CLMH088E008MH088E007	MH088E008	MH088E007	42	409	0.00455	9.755887	0.320552	10.068874	0.325882	18.648872	0.455406	18.935579	0.459362
San Diego Creek Interceptor	CLMH088E007MH088E006	MH088E007	MH088E006	42	406	0.00458	9.757549	0.328726	10.070415	0.33443	18.651001	0.476483	18.938135	0.480904
San Diego Creek Interceptor	CLMH088E006MH088E005	MH088E006	MH088E005	42	363	0.00267	9.761654	0.35179	10.074185	0.357718	18.65534	0.509976	18.942163	0.514761
San Diego Creek Interceptor	CLMH088E005MH088E004	MH088E005	MH088E004	42	362	0.00268	9.763782	0.351702	10.075207	0.357505	18.657576	0.509478	18.944727	0.514262
San Diego Creek Interceptor	CLMH088E004MH088E077	MH088E004	MH088E077	42	319	0.00270	9.763881	0.354183	10.075406	0.360294	18.657701	0.512492	18.945055	0.51726
San Diego Creek Interceptor	CLMH088E077MH088E003	MH088E077	MH088E003	42	77	0.00156	9.772575	0.354539	10.083776	0.360617	18.667135	0.512341	18.954512	0.517085
San Diego Creek Interceptor	CLMH088E003MH088E002	MH088E003	MH088E002	42	395	0.00271	9.772309	0.351757	10.083302	0.357557	18.667223	0.507141	18.954756	0.511772
San Diego Creek Interceptor	CLMH088E002MH088E001	MH088E002	MH088E001	42	398	0.00271	9.772264	0.35171	10.083249	0.35751	18.666864	0.496686	18.953604	0.500914
San Diego Creek Interceptor	CLMH088E001MH088N002	MH088E001	MH088N002	36	396	0.00737	9.772196	0.350684	10.083159	0.356592	18.666874	0.502587	18.953674	0.507164
San Diego Creek Interceptor	CLMH088N002MH088N001	MH088N002	MH088N001	36	448	0.00962	9.773011	0.327004	10.083882	0.332397	18.667765	0.465236	18.954594	0.469335
San Diego Creek Interceptor	CLMH088N001MH088N475	MH088N001	MH088N475	36	158	0.00981	9.77307	0.325351	10.083992	0.3307	18.667894	0.462638	18.954975	0.466712
San Diego Creek Interceptor	CLMH088N475MH088W087	MH088N475	MH088W087	36	288	0.00910	9.773471	0.33182	10.084428	0.337336	18.668379	0.472784	18.955694	0.476967
San Diego Creek Interceptor	CLMH088W087MH088W086	MH088W087	MH088W086	36	549	0.00960	9.773949	0.327209	10.084709	0.332605	18.6689	0.465549	18.955875	0.469652
San Diego Creek Interceptor	CLMH088W086MH088W085	MH088W086	MH088W085	36	253	0.02083	9.773955	0.26795	10.084732	0.272296	18.668892	0.383313	18.955849	0.386833
San Diego Creek Interceptor	CLMH088W085MH088W084	MH088W085	MH088W084	36	374	0.01045	9.774745	0.320495	10.085485	0.326036	18.669544	0.463099	18.956167	0.467353
San Diego Creek Interceptor	CLMH088W084MH060S001	MH088W084	MH060S001	36	242	0.00748	9.855313	0.350936	10.165895	0.356794	18.754244	0.501864	19.041393	0.506413
San Diego Creek Interceptor	CLMH060S001MH060E007	MH060S001	MH060E007	36	242	0.00612	9.85537	0.377015	10.165995	0.383643	18.754314	0.54885	19.041576	0.554021
San Diego Creek Interceptor	CLMH060E007MH060E008	MH060E007	MH060E008	42	480	0.00298	9.856203	0.34963	10.166477	0.355371	18.755316	0.493597	19.042141	0.497816
San Diego Creek Interceptor	CLMH060E008DS060E009	MH060E008	DS060E009	42	111	0.01964	9.856287	0.222033	10.166648	0.225466	18.755518	0.307836	19.042728	0.310259
San Diego Creek Interceptor	CLDS060E009MH060E018	DS060E009	MH060E018	45	495	0.00400	14.885962	0.376318	15.161672	0.380064	24.780373	0.500828	25.051687	0.504072
San Diego Creek Interceptor	CLMH060E018MH060E019	MH060E018	MH060E019	45	656	0.00405	14.885422	0.374934	15.160987	0.378658	24.779451	0.498808	25.050468	0.502023
San Diego Creek Interceptor	CLMH060E019MH060E020	MH060E019	MH060E020	45	655	0.00406	14.884885	0.374773	15.16035	0.378493	24.778582	0.498575	25.049145	0.50178
San Diego Creek Interceptor	CLMH060E020MH060E021	MH060E020	MH060E021	45	665	0.00400	14.884314	0.376296	15.159719	0.380038	24.777601	0.500792	25.047722	0.504023
San Diego Creek Interceptor	CLMH060E021DS060E097	MH060E021	DS060E097	45	197	0.00376	14.88441	0.382742	15.159801	0.386581	24.777514	0.507773	25.047512	0.512005
San Diego Creek Interceptor	CLDS060E097MH060E022	DS060E097	MH060E022	45	112	0.00054	14.884359	0.473806	15.159739	0.478698	24.776869	0.642478	25.047419	0.647095
San Diego Creek Interceptor	CLMH060E022MH060S043	MH060E022	MH060S043	45	668	0.00156	14.884985	0.446622	15.160228	0.45128	24.777988	0.609915	25.052967	0.613832
San Diego Creek Interceptor	CLMH060S043MH060S044	MH060S043	MH060S044	51	670	0.00184	14.884754	0.427194	15.159747	0.43148	25.124374	0.571987	25.374182	0.57532
San Diego Creek Interceptor	CLMH060S044MH060S201	MH060S044	MH060S201	51	300	0.00200	18.185108	0.543341	18.413324	0.547067	28.974888	0.677055	29.42474	0.680516
San Diego Creek Interceptor	CLMH060S201MH060W002	MH060S201	MH060W002	51	370	0.00197	33.339142	0.601547	33.65694	0.604926	43.528748	0.723241	43.859528	0.726795
San Diego Creek Interceptor	CLMH060W002MH060W001	MH060W002	MH060W001	51	673	0.00186	32.083515	0.600674	32.360981	0.603956	41.854729	0.71308	42.146294	0.716571
San Diego Creek Interceptor	CLMH060W001MH059N029	MH060W001	MH059N029	51	199	0.00060	32.148937	0.585305	32.431927	0.588328	41.935181	0.687707	42.23251	0.690815
San Diego Creek Interceptor	CLMH059N029MH059N027	MH059N029	MH059N027	51	258	0.00163	32.2201	0.557259	32.507954	0.560067	42.014507	0.651145	42.325748	0.653829
San Diego Creek Interceptor	CLMH059N027MH059N025	MH059N027	MH059N025	51	298	0.00164	32.083973	0.524567	32.36758	0.527002	41.892071	0.605722	42.187386	0.608027
San Diego Creek Interceptor	CLMH059N023MH059N009	MH059N023	MH059N009	51	29	0.00069	33.61982	0.597464	35.638889	0.601794	45.688499	0.762366	45.53756	0.764733
San Diego Creek Interceptor	CLMH059N009MH059N021	MH059N009	MH059N021	51	812	0.00176	32.706848	0.60019	32.952263	0.602614	45.154495	0.758235	45.281651	0.759673
San Diego Creek Interceptor	CLMH059N021MH059E036	MH059N021	MH059E036	51	708	0.00184	32.571297	0.590978	32.656467	0.592051	45.149929	0.73712	45.267075	0.738501
San Diego Creek Interceptor	CLMH059E036JS059E084	MH059E036	JS059E084	51	455	0.00171	32.485165	0.570608	32.636658	0.569539	45.104206	0.699416	45.170528	0.701829
San Diego Creek Interceptor	CLJS059E084MH059S027	JS059E084	MH059S027	54	84	0.00273	32.387863	0.519294	32.425716	0.517925	44.911888	0.63223	45.0928	0.634053
San Diego Creek Interceptor	CLMH059S027PA059S092	MH059S027	PA059S092	54	840	0.00180	32.520695	0.455927	32.415379	0.454686	45.050289	0.551793	45.271442	0.553298
San Diego Creek Interceptor	CLPA059S092JCT-16	PA059S092	JCT-16	54	10	0.01200	41.251373	0.374695	41.09129	0.37404	59.14497	0.456328	59.352917	0.45704

6.0 NATURAL TREATMENT SYSTEMS

Water quality treatment for the project will be defined via an approved Water Quality Management Plan (WQMP) which will be implemented across multiple phases. WQMP documents are currently in progress and not yet submitted or approved.

7.0 EASEMENTS

It is anticipated several new IRWD easements will be required for this project, yet to be determined. Several sections of the existing sewer system are planned to be privatized as part of the project, which will eliminate the need for some easements. Easement applications are currently in progress and not yet submitted or approved.

8.0 PROJECT SCHEDULE

The project construction will be undertaken in multiple phases over the course of the next five years, starting December 2020. Phase 1 includes construction of the SE Campus loop and east parking structure. Phase 2 includes construction of the east wing inpatient addition and west parking structure. Phase 3 includes construction of the new east and west hospital support buildings. Phase 4 includes construction of the new North Campus hospital. Phase 5 includes interior renovation of the existing hospital. Future phases include construction of the west wing inpatient addition, ancillary services, and conference center. Project phasing is shown in Attachment A. Phase 1 is expected to be completed in 12 months (anticipated January 2021). Phase 2 through 5 completion dates have not yet been defined.

As the potable water, recycled water, and wastewater analyses concluded that no IRWD improvements are required, a development phasing study is not required.

9.0 PROJECT COSTS

As confirmed in this analysis, there are no recommend potable water, recycled water, or sewer pipeline improvements required for the HHI Campus Expansion; therefore, project costs for offsite facility improvements are zero.

ATTACHMENT A

Phasing Plan

Phasing Plan / Existing

- **A** Ancillary Hospital
- **B** Hospital Nursing Tower
- **C** Hospital Emergency Department
- **D** Medical Office Building

N

100 feet

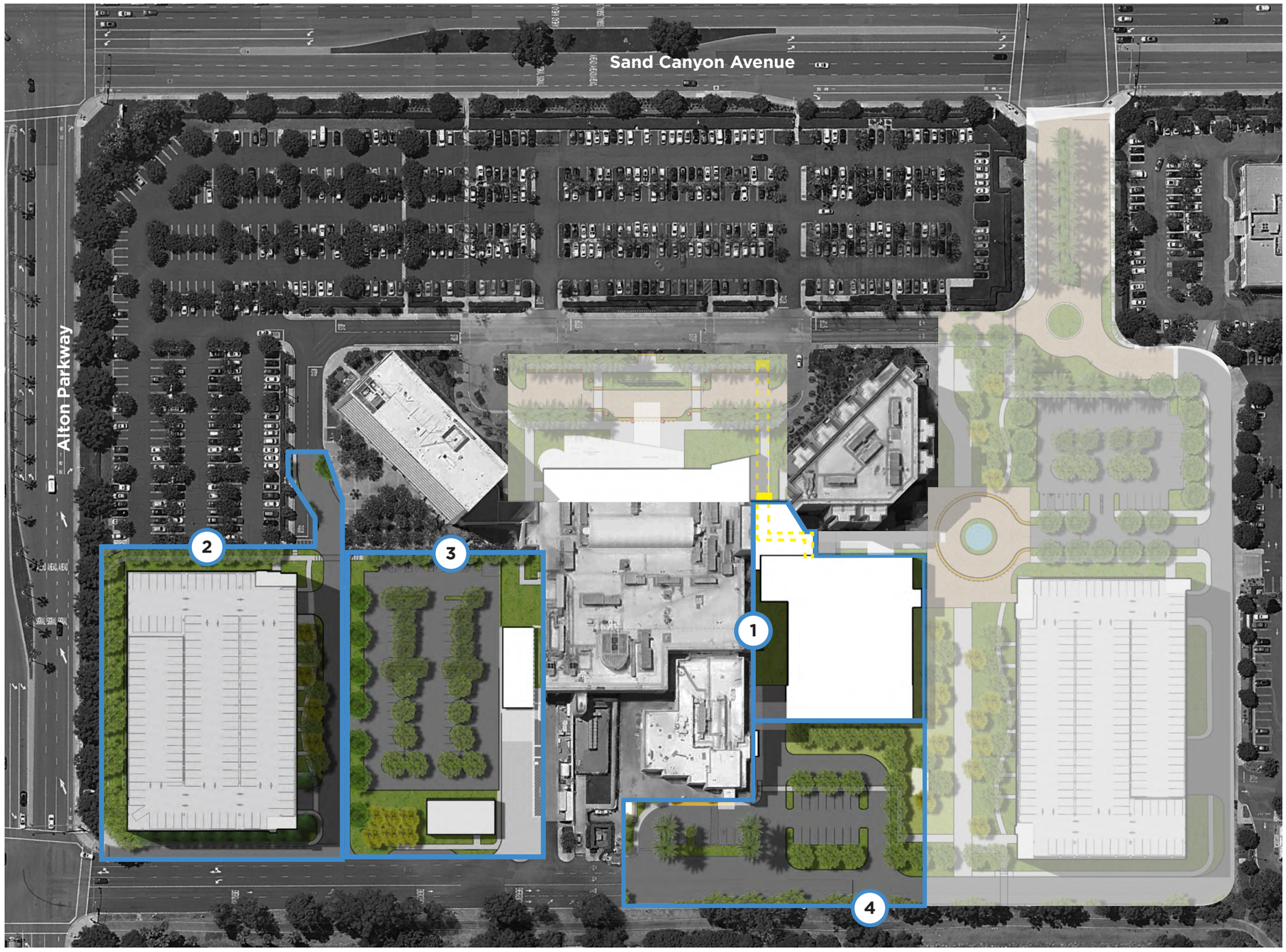
Phasing Plan / Phase 1

1. East Parking Structure
2. HHI Entrance & East Drop-Off
3. Front Entrance Remodel & Partial East Tunnel

N

100 feet

Phasing Plan / Phase 2

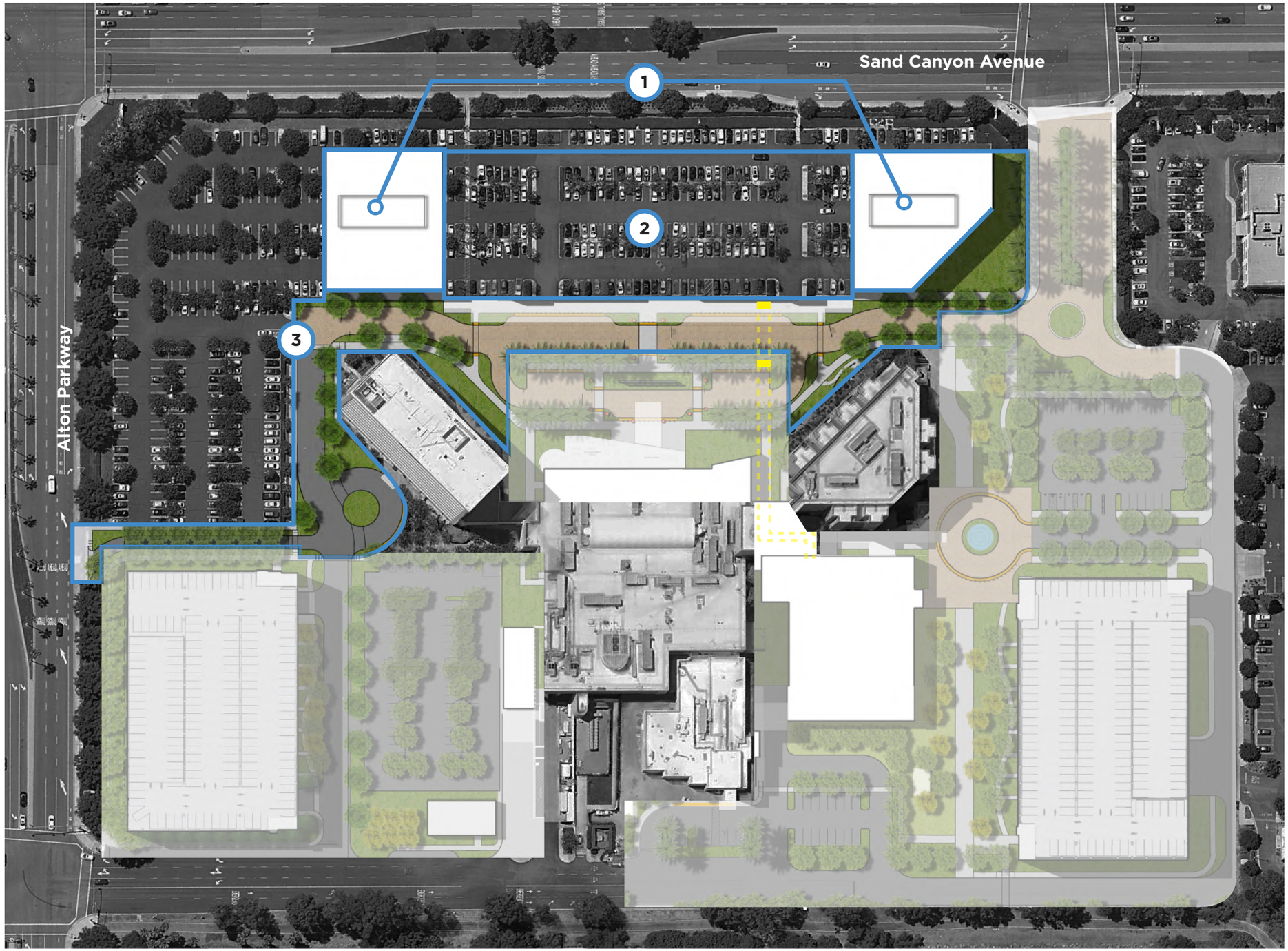


1. East Wing Addition & Tunnel Extension
2. West Parking Structure & Loop Road Alignment
3. Change to Receiving Loading Dock Expansion & Site Infrastructure
4. Emergency Derpartment Site Work

N

100 feet

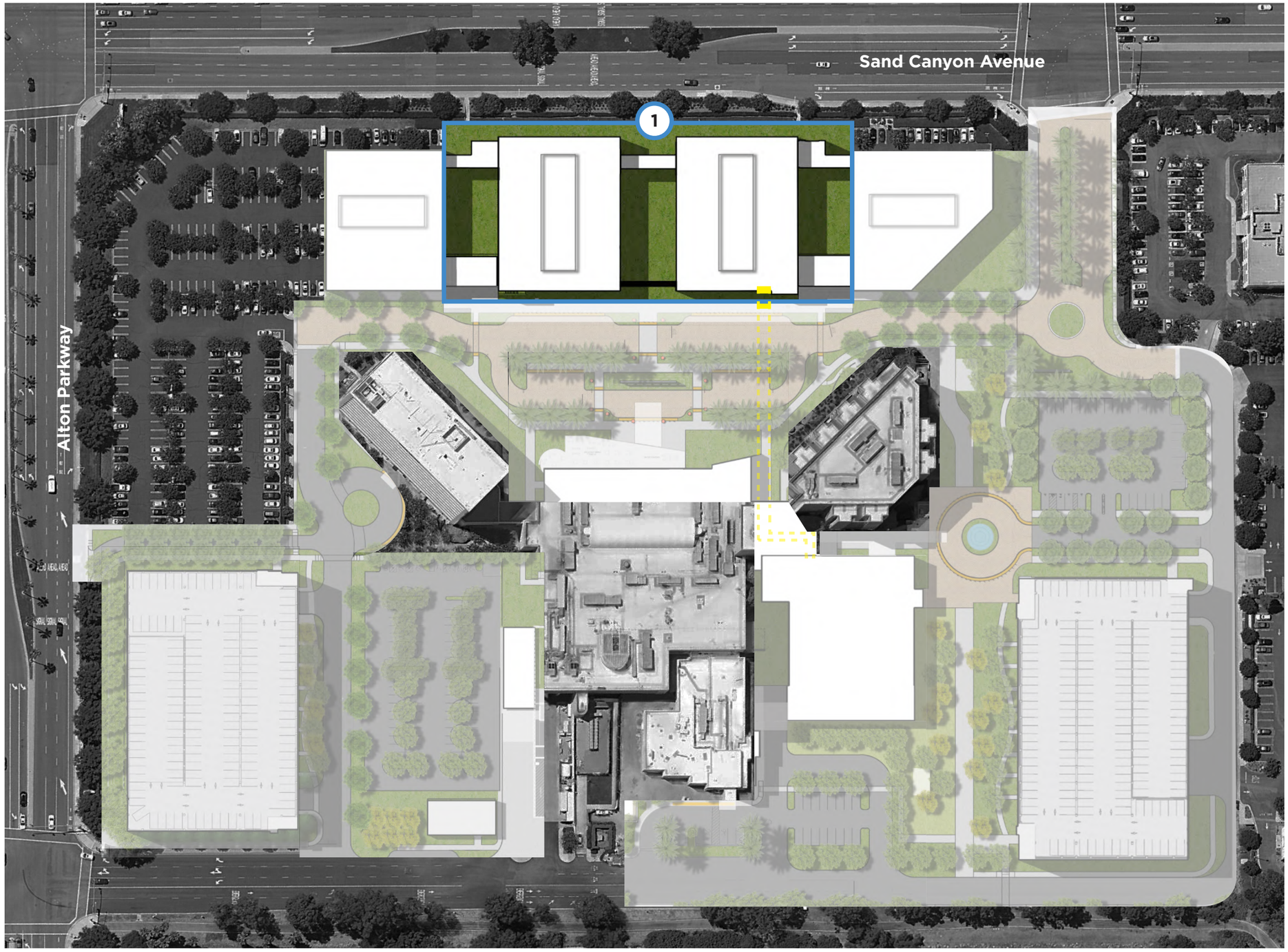
Phasing Plan / Phase 3



1. **West and East Hospital Service Facilities**
2. **Construction Lay Down Area and Separate Construction Entrance**
3. **Complete Loop Road & Extend Partial Tunnel**

100 feet

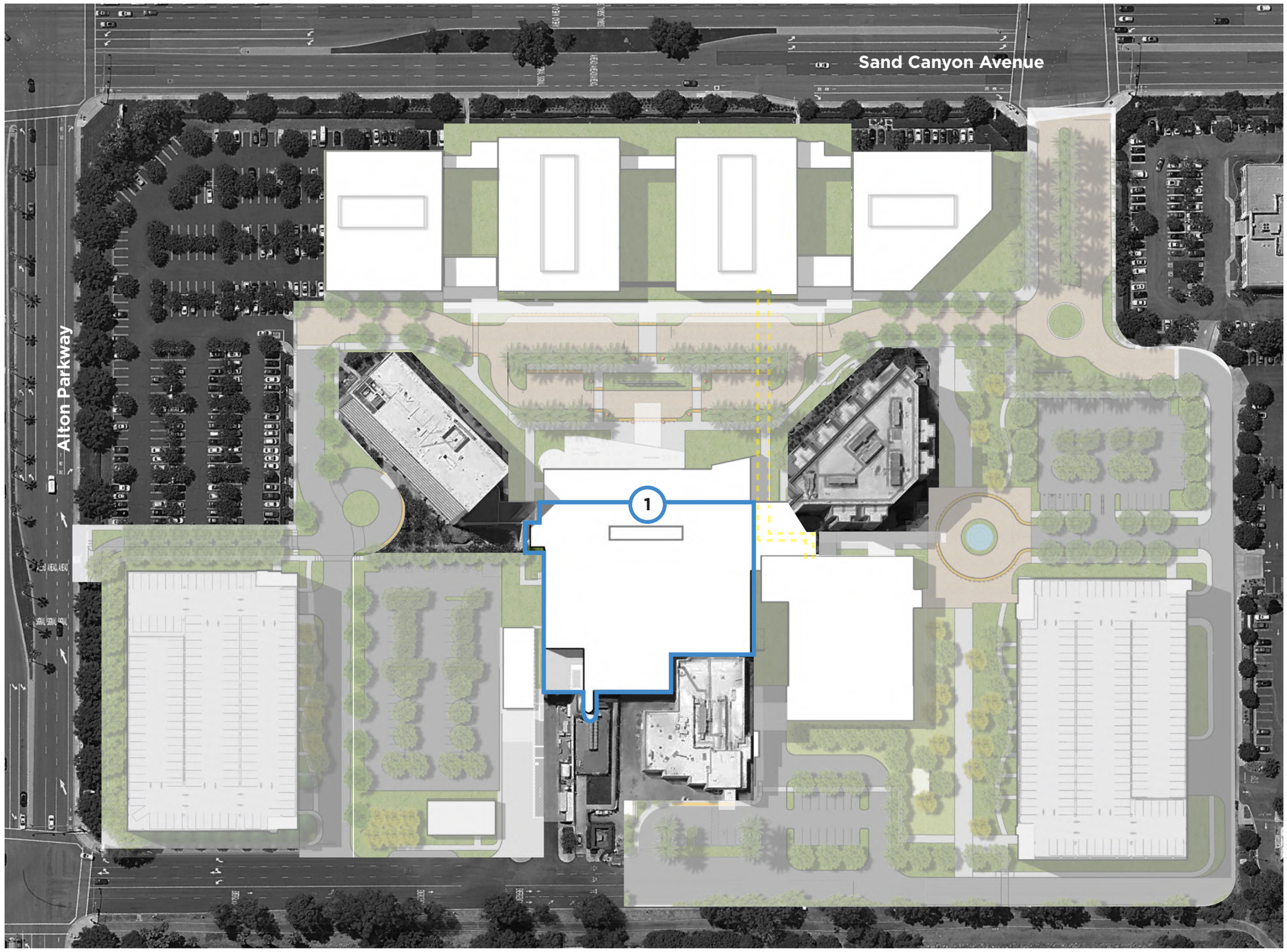
Phasing Plan / Phase 4



1 **New Hospital & Tunnel Completion**

100 feet

Phasing Plan / Phase 5



1 **Interior Renovation of Existing Hospital**

100 feet

Phasing Plan / Future Phases

1. **East Parking Structure Expansion**
2. **Future Hospital Service Facilities & Conference Center**
3. **West Hospital Addition**

100 feet