Appendix M
Utilities and Service Systems Information

Appendix M-1
Water Supply Assessment

WATER SUPPLY ASSESSMENT

PROVIDENCE SAINT JOHN'S HEALTH CENTER

PHASE II PROJECT

CITY OF SANTA MONICA

June 2019

TODD GROUNDWATER

2490 Mariner Square Loop, Suite 215
Alameda, CA 94501
510.747.6920
www.toddgroundwater.com

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1. INTRODUCTION

The City of Santa Monica (City is the lead agency preparing an Environmental Impact Report (EIR) for the Providence Saint John's Health Center Phase II Project (the proposed project). As part of the EIR and environmental guidelines, the City is also preparing a Water Supply Assessment to confirm there is sufficient water supply to meet the proposed project demands. The proposed project consists of ten new buildings with uses including residential, health related services, commercial uses, restaurants, and open spaces. The general layout of the new project is shown in **Figure 1**. The project area currently includes existing buildings/improvements that are proposed to be demolished/removed as part of the Phase II Master Plan (City – NOP, 2017).

The California Water Code section 10910 (also termed Senate Bill 610 or SB610) requires that a water supply assessment (WSA) be provided to cities and counties for projects (of a specified type and size) that are subject to the California Environmental Quality Act (CEQA). The City recognizes the Providence Saint John's Health Center as subject to CEQA and SB610. Agencies (e.g., cities and counties) are mandated to identify the public water system that might provide the project's water supply and then to request a WSA, which includes a discussion with regard to whether the public water system's total projected water supplies (available in normal, single dry, and multiple dry years during a 20-year projection) will meet the projected water demand associated with the proposed project in addition to the public water system's existing and planned future uses. The City will provide water to the project for domestic, fire and irrigation services.

The City of Santa Monica has taken additional action beyond state mandates to ensure sustainability of its water resources. In 2014, the City adopted a Sustainable Water Master Plan (SWMP) with the goal of achieving water supply self-sufficiency in 2020 by eliminating reliance on imported water from the Metropolitan Water District (MWD). The SWMP establishes a framework to achieve self-sufficiency through a combination of water demand reduction strategies and increased development of local to water supplies. Water reduction is achieved through implementation of various water conservation and efficiency programs designed to permanently reduce residential and commercial water use. Development of new sustainable local water supplies comes from (i) alternative water sources such as captured rainwater and municipal wastewater for non-potable uses, (ii) increased efficiency of the City's water treatment systems, and (iii) additional pumping from existing wells and new wells in the local groundwater basin.

The City's Water Neutrality Ordinance (Ordinance Number 2545) went into effect on July 1, 2017, capping water use for new developments to the average five-year historical use for that individual parcel. If the projected annual water use for the development is greater than existing parcel's annual average over the past five years, the increased amount must be offset by water-efficient retrofits of existing building somewhere else in the City or an in-lieu water offset fee.

Foundational documents for preparation of the WSA include the Sustainable Water Master Plan 2018 Update (Black and Veatch, 2018), the 2015 Urban Water Management Plan (SA Associates, 2016), and the Fire and Domestic Water Study prepared for the project (KPFF, 2018). The SWMP 2018 Update reflects changes in water use and new conservation policies since the adoption of the 2014 SWMP. The 2015 UWMP (SA Associates, 2016) projects water demand to 2040 considering all water sources (including imported water), estimating only a slight increase in demand given the water neutrality ordinance.

The purpose of this WSA is to document the City's existing and future water supplies for its service area and compare them to the area's future water demand including that of the proposed project. This comparison, conducted for both normal and drought conditions, is the basis for an assessment of water supply sufficiency in accordance with the requirements of California Water Code section 10910 (Senate Bill 610).

1.1. ACKNOWLEDGEMENTS

This assessment was prepared by Maureen Reilly, Senior Engineer and Iris Priestaf, President, on behalf of the City of Santa Monica. Ms. Reilly and Dr. Priestaf have completed numerous WSAs for clients throughout California. We appreciate the valuable assistance provided by ESA.

2. PROJECT WATER DEMAND

This section addresses water demands for the existing project area and for the proposed project. The campus of Providence Saint John's Health Center is in Santa Monica's Mid-City Neighborhood. The proposed project, as shown in Phase II Master Plan, includes the demolition of existing buildings and parking lots and the development of new medical-related, commercial, and housing uses, shown in **Figure 1** (from the City's NOP, 2017):

- Child and Family Development Center – up to 34,500 sf (25,500 sf Counseling Center and 73-person day care)
- Multifamily Housing – 10 residential units and 800 sf commercial use
- West Ambulatory Care South Campus – 123,000 sf (and 17,479 sf parking)
- Education & Conference Center, East Ambulatory Care – up to 199,300 sf (155,000 sf for medical offices, and a 250-seat auditorium)
- Visitor Housing – 38,000 sf (34 units)
- West Ambulatory Care North Campus – up to 118,000 sf (117,500 sf planned medical offices)
- East Ambulatory Care North Campus – up to 90,000 sf (78,500 sf planned for medical offices)
- 20th Street Medical Building – up to 50,000 sf
- Mullin Plaza Café – 1,500 sf
- Saint John's Café – 900 sf
- Parking - 875,717 sf

2.1. EXISTING WATER USE

The project site includes the John Wayne Cancer Institute (JWCI), Child and Family Development Center (CFDC), Saint John's Foundation Building, and two temporary MRI Buildings as well as vacant apartment building. **Table 1** shows the recent historical water use for the project site, as metered by the City of Santa Monica. Average historical use (accounting for periods when the buildings were fully occupied from 2008-2018) is approximately 8.3 AFY. The meter data from the City are included in Appendix A.

2.2. ESTIMATED FUTURE WATER DEMAND

The proposed project involves demolition of existing buildings and surface parking lots and construction of new buildings for medical uses, housing, an education and conference center, and parking. The future water demand on the site has been estimated using water demand factors, expected sewer flow, and peaking rates in the Fire and Domestic Water Study Report (KPFF, 2018). The proposed buildings, uses, and factors used to calculate peak usage are shown in **Table 2**. At the completion of the project, peak water demand is expected to be 488,000 gallons per day or an expected average annual demand of 215 AFY. The peak demand for firefighting purposes is much higher; however, only day-to-day consumptive demand is assessed here. The proposed project will be implemented gradually, with buildout occurring by 2041.

2.3. ESTIMATED FUTURE RECYCLED WATER USE

The Santa Monica Urban Runoff Return Flow (SMURRF) plant treats dry weather urban runoff. Water treated at the SMURRF plant is recycled and mainly delivered to dedicated irrigation connections. There are currently twenty recipients of the SMURRF's recycled water and there are currently no plans to connect the proposed project with the SMURRF plant.

2.4. TOTAL FUTURE PROJECT DEMAND

Tables 1 and 2 show the existing and future water demand for the proposed project, respectively. With the project, the water demand on the site would increase by 206.7 AFY net, based on the water demand estimate provided by KPFF (215 AFY) less the 8.3 AFY of recent historical water demand. As previously stated, the City's Water Neutrality Ordinance (Ordinance Number 2545), requires new developments to offset all increases in average 5-year historical water uses at a ratio of 1:1, except for 100% affordable housing projects which must offset water demand at a ratio of 0.5:1. The water offsets shall be achieved with on-site water efficiency measures. If on-site efficiency measures cannot be reasonably achieved on-site, the applicant may achieve off-set requirements by payment of in-lieu fees or performing/undertaking the requirements at an off-site location.

3. CITY OF SANTA MONICA WATER DEMAND

This section summarizes water demands for the City of Santa Monica, the provider of water to the Providence Saint John's Health Center Phase II Project. The first part describes the factors affecting total water demand, including climate, population and employment, plus the mix of customer types, such as residential, commercial, agricultural and industrial. The second part documents water demands not only under normal climatic conditions, but also during drought.

3.1. CLIMATE

Climate has a significant influence on water demand on a seasonal and annual basis. This influence increases with the portion of water demand for outside uses, specifically landscape irrigation.

Table 3 summarizes representative climate data for the City, including average monthly and annual rainfall and evapotranspiration (ETO), measured by the Santa Monica California Irrigation Management Information System Station (CIMIS). The City has a Mediterranean climate, characterized by dry summers and wet winters with year-round moderate-to-warm temperatures. Reflecting this pattern, water demand in the City is greater in the summer than in the winter. Climate change may affect future water supply availability for the City of Santa Monica by reducing water availability, changing local precipitation patterns, and increasing water demands.

3.2. POPULATION

City population, a key factor in water demand, is analyzed in the 2015 UWMP. **Table 4** reproduces the UWMP population value for the City's water service area for 2016 with projections to 2040. Over the next 24 years, the City is expecting small to moderate growth, a net increase of three percent by 2040. **Table 4** also shows the population reported in the SWMP. The SWMP was adopted more recently than the UWMP and shows a slightly higher population increase of ten percent by 2040.

3.3. CURRENT WATER USE SECTORS AND WATER DEMAND

The City provides water to approximately 19,000 metered service connections. **Table 5** documents the historical water demand for the City's service area by water use sectors between 2010 and 2015 from the UWMP (SA Associates, 2016). The water use sectors (customer types) are listed on the left. Water loss is typical in all water distribution systems due to small leaks, firefighting activities, and system testing and maintenance activities.

The total potable water use in 2015 was 11,941 AFY, which is approximately 14 percent less than the previous year 2014. This reflects the success of the City's water conservation efforts over the years; most of the water savings were for single family residences and

landscape irrigation. Approximately 63 percent of the potable water consumption in 2015 was by single-family and multi-family residential customers.

3.4. PROJECTED WATER DEMAND

Table 6 summarizes projected water demands for the City's service area from 2020 to 2040 from both the UWMP and the SWMP. Overall, the projections indicate decreasing water demands to 2040 for each water use sector. From the UWMP, **Table 6a**, the projected water use is based on a consumption rate of 150 gallons per capita per day (gpcd) for 2020 and then gradually decreases to 130 gpcd in 2040 in accordance with the Water Conservation Act of 2009 (SBx7-7), based on State mandated conservation. **Table 6b,** from the most recent SWMP, accounts for the estimated higher population growth but also includes aggressive conservation by the City.

Both sources project around an 11 percent increase in water demand by 2040. While full City buildout is slated for 2042, the UWMP projects water supply and demand only to 2040; this is consistent with requirements of California's Urban Water Management Planning Act. The Project is expected to be built out in 2041. It can be expected that in 2041, the total water consumption values in Table 6a and 6b would be less than one percent higher in 2041 compared to 2040, representing a nominal increase at most.

3.5. WATER DEMAND IN NORMAL AND DROUGHT PERIODS

The Los Angeles region has experienced major droughts over the last few decades and recently experienced a severe drought (2013-2015). Water conservation is critical to Southern California's water sustainability. In response to the July 2014 California State Board emergency regulations, the City implemented their Water Shortage Response Plan. In response to the worsening drought, Governor Brown issued an Executive Order on April 1, 2015 mandating a 25 percent Statewide reduction in potable urban water through February 2016. Because of the City's ongoing water conservation efforts, they were able to reduce water demand. From 2014 to 2016, the City reduced total potable water demand by 12 percent, even as the population increased by 1 percent (Black & Veatch, 2018).

3.6. WATER CONSERVATION

The City takes water conservation very seriously and both the UWMP and SWMP planning documents highlight these efforts by the City.

On the State level, the Water Conservation Act of 2009 (SBx7-7) called for a 20 percent reduction in urban water use by the year 2020. The water code was amended to require 2015 and 2020 water use targets to be developed in the 2010 UWMPs and updated in the 2015 UWMPs. Per the 2015 UWMP, Santa Monica set a 2020 compliance target for per capita water consumption of 123 gallons per capita daily (gpcd) (SA Associates 2016).

On a City level, Santa Monica has actively pushed to conserve water for decades. Santa Monica passed its "No Water Waste" Ordinance initially in 1993, and still actively enforces water waste. The Water Efficient Landscape and Irrigation Standards were established in 2008 and continue to be updated. The City's Water Shortage Response Plan (adopted June 9, 2009) was instrumental in the last drought. On January 29, 2014, the City increased the voluntary reduction in water use from 10% to 20%. A Stage 2 Water Supply Shortage was declared August 12, 2014 and shifted the City's reduction in water use of 20 percent from voluntary to mandatory and enforce other water savings. These mandatory water demand reductions are still in place.

The City has also been a signatory to the California Water Efficiency Partnership (formerly the California Urban Water Conservation Council) memorandum of understanding (MOU) since 1991. The City has actively implemented the organization's best management practices (BMP) for more than 27 years, including the current BMPs:

- ***BMP 1****: Utility Operations*
- ***BMP 2****: Public Education & Outreach*
- ***BMP 3****: Residential Programs*
- ***BMP 4****: Commercial, Institutional, and Industrial Programs*
- ***BMP 5****: Landscape Programs*

More recent efforts include the new Water Conservation Unit (WCU), which was launched in spring 2015. The WCU is tasked with implementing and overseeing the City's water conservation programs. The WCU is also charged with "permanently establishing water conservation as the new normal in the City." The WCU has implemented several new programs including Water Use Allowances (WUAs), WUA Exceedance Citations, Enhanced Water Waste Patrols, Water School, Water Use Consultations and specialized trainings, enhanced rebate programs, customer outreach, and more (Black & Veatch, 2017). Public outreach is a continued focus of the City and WCU, including the publication of "The Water Issue" with the Santa Monica Daily Press, which provided information about the City's water infrastructure, a guide to efficient landscaping, and the need for water conservation (SMDP, 2015).

The centerpiece of the City's water sustainability plan is the Water Neutrality Ordinance. The Ordinance, effective July 1, 2017, caps water use for new developments to the average five-year historical use for that individual parcel. The City plans to keep demand at current levels to ensure their local water supply can continue to meet total City water needs (City Fact Sheet, 2017).

4. CITY OF SANTA MONICA WATER SUPPLY

The City of Santa Monica receives potable water from three major sources: imported water from the Metropolitan Water District of Southern California (MWD), groundwater from production wells within the City, and recycled urban runoff. The historical water supplies from these sources are shown in **Table 7**. MWD imports water from both the State Water Project and the Colorado River Aqueduct, groundwater is extracted within the City, and recycled urban runoff is produced at the Santa Monica Urban Runoff Return Flow (SMURRF) plant. As discussed in Section 2.0, the project is not likely to receive recycled return flow as a supply source. The total water demand of the project is anticipated to be met with the current portfolio of supply discussed in the following section.

4.1. IMPORTED WATER

MWD receives water from the Colorado River and the Sacramento-San Joaquin Delta through the State Water Project. MWD then sells water to its 26-member agencies, including the City of Santa Monica. Due to groundwater quality concerns, a large portion of the City's supply came from imported water between the mid-1990s and 2010. **Table 7** shows the imported water supply to the City from 2010 to 2016.

Over the past seven years, the mix of water supply sources has changed. Groundwater production has increased as part of the City's plan to rely on local water supply sources. As more groundwater wells have come back online, the City has relied less on imported water and more on local groundwater. In 2010, the City water supply was 74 percent imported water and in 2016, imported water was reduced to 20 percent of the total supply. According to the UWMP, the long-term reliability of imported water is uncertain because of the increased demands for imported water from the State Water Project and the Colorado River coupled with decreased supply of these sources during dry times (SA Associates, 2016). To address the uncertainty of the long-term reliability of imported water, the City adopted the SWMP to achieve the goal of water self-sufficiency by 2023.

4.2. GROUNDWATER

The City obtains its groundwater supply from the Santa Monica Groundwater Basin (SMGB). The SMGB, DWR basin number 4-11.01, is in the northwest portion of the Coastal Plain of Los Angeles Groundwater Basin. It is bounded by impermeable rocks of the Santa Monica Mountains on the north and by the Ballona escarpment on the south. The subbasin extends from the Pacific Ocean on the west to the Inglewood fault on the east. Groundwater recharge is mainly through percolation of precipitation falling on the land surface and by runoff along the front of the Santa Monica Mountains. The built-out environment and fine-grained surface soils reduce the available percolation to the aquifer. However, in the 1980s the City had a small managed recharge and recovery project in the Charnock subbasin. There are no plans to recharge in the SMGB (Black and Veatch, 2018).

Extensive faulting within the SMGB separates it into five subbasins, **Figure 2**. These basins include the Arcadia Subbasin, the Crestal Subbasin, the Charnock Subbasin, the Olympic Subbasin and the Coastal Subbasin. Of these, the City currently extracts groundwater from the Arcadia, Charnock and Olympic subbasins. The City is in the process of assessing for the presence and quality of groundwater in the Coastal Subbasin by drilling several exploratory borings. The City has no plans to explore the Crestal Subbasin in the immediate future. The sustainable yield of the four main subbasins:

- **Charnock Subbasin** – Contains the largest wellfield, located approximately 5,000 feet southeast of the southeastern boundary of the City. The wellfield has five active wells, with a total of 20 wells throughout its history. Richard Slade provided a recent estimate of 6,410 to 8,080 AFY as a sustainable yield (2017).
- **Olympic Subbasin** - The Olympic Wellfield is located along and around Olympic Boulevard, with two active wells and seven total. A recent study for the City (Richard Slade and Associates, 2018) estimated the sustainable yield to be in the range of 2,360-3,145 AFY for the Olympic Subbasin. The City is considering expansion of its groundwater production in the Olympic subbasin with additional wells. A new well (Santa Monica 8) is currently in the regulatory permitting process, and the City plans to have this well in production in 2020.
- **Arcadia Subbasin** - The Arcadia Wellfield is located at the Arcadia Water Treatment Plant (AWTP), just outside of the eastern edge of the City. The wellfield has three active wells and ten. The estimated sustainable yield is in the range of 870 to 920 AFY (Slade 2018).
- **Coastal Subbasin -** The Coastal subbasin underlies the southern portion of the City. This subbasin has not been utilized as a groundwater source to date. Beginning in fall 2017 and continuing through the winter, the City drilled three deep exploratory borings to begin the process of gathering the necessary data to define the sustainable yield in the Coastal subbasin. As a result of the drilling program, the City completed a new water supply well in the Coastal subbasin. The City is in the process of permitting this well and has plans for at least two more in the near future. Based on new data, the sustainable yield of this subbasin is estimated to be on the order of 1,160 to 1,450 AFY.

Figure 3 show the historical groundwater pumping for the City from the three main subbasins (Santa Monica, 2018MTBE was detected in wells in the Charnock Subbasin in 1997. By 2010, the Charnock and Arcadia Water Treatment Units came online to treat MTBE from groundwater to drinking water standards (City of Santa Monica, 2018).

In 2016, total groundwater use totaled 78 percent of total supply, whereas in 2010, groundwater was 25 percent of supply. This shift in groundwater production reflects the changing nature of the mix of supply. Until the City achieves full sustainability, continued use of imported water will be necessary. However, it is expected that the amount of imported water will steadily decrease between now and 2023.

In addition to providing a majority of the existing potable water supply, local groundwater offers the potential for future development of additional supplies including conjunctive use with imported water. Groundwater management is a key component to long term sustainability. The City is currently preparing their Groundwater Sustainability Plan (GSP) for the basin as required under the Suitability Groundwater Management Act (SGMA) and must closely review sustainable yield and current levels of pumping to ensure long term sustainability. The City's continued efforts with their GSP will provide critical information on the future reliability of the groundwater aquifer.

4.3. Recycled Urban Runoff and Other Non-Potable Supplies

The City also relies on recycled dry weather urban runoff treated at its Santa Monica Urban Runoff Return Flow (SMURRF) plant. The City commissioned the SMURRF in 2001 with the primary objectives of the facility to eliminate contamination of Santa Monica Bay caused by urban runoff and to provide cost-effective treatment for producing high quality water for reuse in landscape irrigation and indoor plumbing (SA Associates, 2016).

Total water supplied by the SMURRF plant is shown in **Table 7**. SMURRF deliveries account for one percent of total City water supply. With a maximum production capacity of 560 AFY, the SMURRF has been operated at an average of 21 percent capacity over the past five years and has increased its production each year since 2011. The City plans to increase its supply from non-potable sources through its Sustainable Water Infrastructure Project (SWIP). SWIP will include upgrades to the SMURRF, a new shallow brackish and saline groundwater extraction well at the beach, a new stormwater and sewer treatment facility, and two new stormwater harvesting tanks (City of Santa Monica, 2018).

The SMURRF program was also designed to increase public awareness of storm water and water supply. The plant is located next to the Santa Monica Pier, a main tourist destination, where visitors can view and learn about the facility. The twenty customers of SMURRF water are mainly landscape irrigation customers and two commercial/ institutional users receiving recycled water for indoor use through a dual-plumbed system (SA Associates, 2016).

4.4. Water Supply in Normal and Drought Periods

The California Water Code requires a WSA to include discussion of how supply will meet demand during normal, single dry, and multiple dry years during a 20-year projection. The City's 2015 UWMP provides discussion of water supply and demand in normal and drought periods, included herein by reference. The 2015 UWMP analyzes water supplies considering all water sources, including imported water from MWD and does not take into account the City's goal to achieve self-sufficiency by 2023. Based on the City's 2015 UWMP, **Table 8** summarizes water supply and demand for the City in a normal year, while **Tables 9** and **10** show supply and demand in single-year and multi-year dry conditions.

Review of **Tables 8, 9,** and **10** shows that the water supply is expected to remain similar in normal and drought periods. Given that MWD expects to meet demands, and groundwater

and recycled water are available in dry years, the City can expect to meet future demands for both single and multiple dry years through 2040 (SA Associates, 2016). The project would reach its full water demand by 2041. In 2041, the available water supply shown in Tables 8, 9 and 10 would be the same as shown for 2040. However, under the normal year, single dry year and multiple dry year scenarios, the demand would be expected to increase by less than one percent, which would result in available water surplus' generally ranging from approximately 6,500 AF per year under multiple dry year conditions to approximately 7,000 AF per year under normal conditions. Thus, review of Tables 8, 9, and 10 indicate that the City will have sufficient water supply in 2040 and beyond in 2041 for the entire project (206.7 AFY) and other planned water demand across the City.

5. COMPARISON OF SUPPLY AND DEMAND

Both of the City of Santa Monica's long-term water plans—the UWMP and SWMP Update—include projections indicating that future per capita water demand will decrease due to increased water conservation efforts. Both conclude that the City will meet future demands with the existing mix of supplies. The City has the flexibility to use imported water and groundwater and can balance the supply sources as needed to ensure water self-sufficiency.

The net water demand increase for the proposed project is 206.7 AFY, based on the estimates provided by KPFF (215 AFY) less the 8.3 AFY of recent historical water demand. While this is within the projected increase in City water demand within the UWMP, the new development still represents an increase over existing demand. However, the project would be subject to the City's Water Neutrality Ordinance and therefore, would be required to offset its net increase in water use on-site, off-site or a combination of both. Furthermore, at this time, specific water conservation features to be incorporated into the proposed project are not yet known. As part of the Development Agreement negotiations between the City and the project applicant, water conservation features that go beyond the City's water efficiency requirements may be included. The analysis provided therein is conservative as it does not account for additional water savings that could result from these water conservation features.

As documented in **Tables 8, 9, and 10**, the City of Santa Monica has sufficient water supply for existing and projected water demands, including the demand of the proposed project, for normal, single dry, and multiple dry years during a 20-year projection.

6. REFERENCES

Black and Veatch, City of Santa Monica, Sustainable Water Master Plan Update, December 2018.

City of Santa Monica, Ordinance Number 2545, An Ordinance of The City Council of The City of Santa Monica Amending Santa Monica Municipal Code Section 7.16.050 To Require That New Development Off-Set Water Use On-Site or Off-Site, Or Alternatively, Pay the City an In-Lieu Fee to Fund Retrofitting of Plumbing Fixtures Off-Site, May 23, 2017.

City of Santa Monica, Water Neutrality Ordinance FAQ, https://www.smgov.net/uploadedFiles/Departments/OSE/Categories/Water/Water%20Neutrality%20FAQ%20v3.pdf, May 2017.

City of Santa Monica, Notice of Preparation (NOP)/Notice of Public Scoping Meeting, 2017.

For A Draft Environmental Impact Report for The Providence Saint John's Health Center Phase II Project, April 10, 2017.

City of Santa Monica, Sustainable Water Infrastructure Project (SWIP), https://www.smgov.net/Departments/PublicWorks/Projects.aspx?ID=a39eda36-6a92-49cd-b9eb-76652f3d83ab, Last Accessed: September 12, 2018.

KPFF, Fire and Domestic Water Study: Providence Saint John's Health Center Phase II Project, April 2018.

Kwok, Rachel, City of Santa Monica, Environmental Planner, personal communication, July 11, 2018.

Richard Slade and Associates, Preliminary Study of the Sustainable Yield Of The Santa Monica Groundwater Subbasins - Los Angeles County, California, July 2017.

SA Associates, City of Santa Monica 2015 Urban Water Management Plan, June 2016.

SA Associates, City of Santa Monica 2010 Urban Water Management Plan, 2010.

Santa Monica Daily Press, "The Water Issue", https://www.smgov.net/uploadedFiles/Departments/OSE/Categories/Water/SMDP_WATER_ISSUE_2015.pdf, 2015.

Tables and Figures

Table 1. Recent Historical Water Demand

		City Meters[1]
Building Name	**Building Type**	**Est Historical Demand[1] (AFY)**
John Wayne Cancer Institute (JWCI)	Medical Clinic and Laboratories	3.7
	Medical Offices	0.0
Child and Family Development Center (CFDC)	Office	2.1
	Day Care & Medical Clinics	0.0
	Maintenance & Storage	0.0
Saint John's Foundation Building	Office	1.8
Temporary MRI Modular Buildings	Medical	0.2
10 Unit Apartment Building	(Vacant) Housing[2]	0.5
TOTAL		**8.3**

1. Source: City of Santa Monica meter readings on site - based on an average of buildings when fully functional over 2008-2018

2. Apartment building is currently vacant

afy - acre feet per year

Table 2. Estimation of Average Future Water Demand

Water Demand	Building Use	Size	Units	Average Daily Sewer Flow Rate[1]	Peak Daily Demand (gpd)[2]	Avg Daily Demand[3] (gpd)	Avg Demand[4] (afy)
Child and Family Development Center	S1 – Counseling Center	25,500	sf	120/1000 gr sq ft	8,798	3,519	4
	S1 – School: Nursery Day Care	73	persons	9/person	1,889	756	1
Multifamily Housing	S2 –Residential:	10	units	150/dwelling Unit	4,313	1,725	2
	S2 –Commercial Use	800	sf	50/1000 gr sq ft	115	46	0
	S2- Parking	23,987	sf	20/1000 gr sq ft	1,380	552	1
West Ambulatory Care South Campus	S3- Medical Lab	58,000	sf	250/1000 gr sq ft	41,688	16,675	19
	S3- Medical Office/Clinic	65,000	sf	250/1000 gr sq ft	46,719	18,688	21
	S1/S3- Parking	17,479	sf	20/1000 gr sq ft	17,479	6,992	8
Education & Conference Center, East Ambulatory Care	S4 –Auditorium	250	seats	3/seats	2,156	862	1
	S4 – Office	12,196	sf	120/1000 gr sq ft	12,196	4,878	5
	S4 –Medical Office/Clinic	155,000	sf	250/1000 gr sq ft	111,406	44,562	50
	S4/S5 - Parking	118,265	sf	20/1000 gr sq ft	26,590	10,636	12
Visitor Housing	S5 –Residential: Apt. 1 bed/2	34	units	150/dwelling Unit	14,663	5,865	7
West Ambulatory Care North Campus	2C –Medical Office/Clinic	117,500	sf	250/100	84,454	33,782	38
	2C- Parking	462,429	sf	20/1000 gr sq ft	6,800	2,720	3
East Ambulatory Care North Campus	2D/E –Medical Office/Clinic	78,500	sf	250/100 gr sq ft	56,422	22,569	25
	2D-Parking	115,729	sf	20/1000 gr sq ft	6,655	2,662	3
Mullin Plaza Café	Neighborhood Commercial Use	4,500	sf	50/1000 gr sq ft	647	259	0
Saint John's Café							
20th Street Medical Building	2I- Medical Office/ Clinic	50,000	sf	250/1000 gr sq ft	35,938	14,375	16
	2I- Parking	137,828	sf	20/1000 gr sq ft	7,925	3,170	4
TOTAL					**488,233**	**195,293**	**215**

1 Average Daily Sewer Flow factors from LA County

2 Calculated sewer generation based on LA county factors and then applied a 1.15 ratio to estimate peak demand

3 Estimated a 2.5 factor to estimate peak water demand from average demand

4 Actual future estimated demand likely to be less than calculated as factors are based onLA County (which are more conservative than Santa Monica)

Table 3. Climate Data

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Rainfall (in)	3.47	4.29	1.67	0.68	0.43	0.13	0.06	0.06	0.20	0.35	0.86	2.03	**14.22**
Average ETo (in)	2.31	2.48	3.79	4.76	5.14	5.20	5.66	5.64	4.40	3.49	2.56	2.21	**48.87**

Source: CIMIS Station 99, Santa Monica average from 1993-2017

Table 4. Population Projections

Population	2016	2020	2025	2030	2035	2040	Percent Increase
UWMP Population	93,420	93,868	94,431	94,998	95,568	96,141	3%
SWMP Population	93,282	95,315	97,429	102,726	103,038	103,440	11%

Source: 2015 UWMP Table 5.5 (2020 - 2040) and Table 1.4 (2016)

2018 SWMP Table 4-1 and Figure 4-1

Table 5. Historical Water Demand by Water Use Sectors (AFY)

Water Use Sector	Actual Water Demand (AFY)							
	2010	2011	2012	2013	2014	2015	2016	2017
Single-Family Residential	2,931	2,798	3,116	3,141	3,216	2,546	2,656	2,642
Multi-Family Residential	5,100	5,517	5,525	5,539	5,445	4,972	4,971	4,990
Commercial/Institutional	3,003	3,152	3,595	3,780	3,784	3,413	3,388	3,428
Landscape Irrigation	538	531	494	553	590	416	448	433
Recycled Water			93	96	134	81	89	98
System Losses/Fire Service	1,286	1,086	28	3	2	2	4	5
TOTAL WATER CONSUMPTION	**12,858**	**13,084**	**12,851**	**13,112**	**13,171**	**11,430**	**11,556**	**11,596**

Sources: 2010-2011
(UWMP Table 4-4)

Source: 2012-2017 SWMP 2018 (Table 2-1)

Table 6a. UWMP Projected Water Demand by Water Use Sectors (AFY)

Customer Type	Projected Water Demand (AFY)				
	2020	2025	2030	2035	2040
Single-Family Residential	2,677	2,693	2,709	2,726	2,742
Multi-Family Residential	5,096	5,126	5,157	5,188	5,219
Commercial/Institutional	3,000	3,018	3,037	3,055	3,073
Industrial					
Landscape Irrigation	538	541	544	548	551
Non-Revenue Water	1,622	1,632	1,641	1,651	1,661
TOTAL WATER CONSUMPTION	**12,933**	**13,010**	**13,088**	**13,168**	**13,246**

Source: UWMP Table 4-7

Table 6b. SWMP Projected Water Demand (AFY)

Customer Type	Projected Water Demand (AFY)				
	2020	2025	2030	2035	2040
Potable Water Demand	11,744	12,005	12,657	12,696	12,745
Non-Revenue Water	587	600	633	635	637
TOTAL WATER CONSUMPTION	**12,331**	**12,605**	**13,290**	**13,331**	**13,382**

Source: 2020-2040 SWMP Table 4-1

Notes: Non-Revenue Water is estimated in the SWMP as 5.2%

Table 7. Historical Water Supply Sources (AFY)

Water Supply Sources	2010	2011	2012	2013	2014	2015	2016	7 Year Average
Imported Water	**9,812**	**6,389**	**6,549**	**5,842**	**5,108**	**3,298**	**2,876**	**5,696**
Groundwater	**3,319**	**7,932**	**8,363**	**9,867**	**10,682**	**10,695**	**11,001**	**8,837**
ARCADIA	*290*	*447*	*450*	*434*	*714*	*620*	*698*	*522*
CHARNOCK	*593*	*5,168*	*5,277*	*7,824*	*8,377*	*8,114*	*8,311*	*6,238*
OLYMPIC	*2,436*	*2,317*	*2,636*	*1,609*	*1,591*	*1,961*	*1,992*	*2,077*
SMURRF	**91**	**79**	**86**	**96**	**134**	**186**	**197**	**124**
TOTAL	**13,222**	**14,400**	**14,998**	**15,805**	**15,924**	**14,179**	**14,074**	**14,657**

Source: SWMP Table 4-3

Table 8. Normal Year Supply and Demand Comparison (AFY)

Water Sources	2020	2025	2030	2035	2040
Available Supply (AF)					
Imported Water	7,409	7,409	7,409	7,409	7,409
Groundwater	12,500	12,500	12,500	12,500	12,500
Recycled Dry Weather Urban	560	560	560	560	560
Total Supply	**20,469**	**20,469**	**20,469**	**20,469**	**20,469**
Demand (AF)					
Normal Year Demand	**12,933**	**13,010**	**13,089**	**13,167**	**13,246**
Supply/Demand Comparison					
Supply/Demand Difference	**7,536**	**7,459**	**7,380**	**7,302**	**7,223**

Source: UWMP Tables 5.3

Table 9. Single Dry Year Supply and Demand Comparison (AFY)

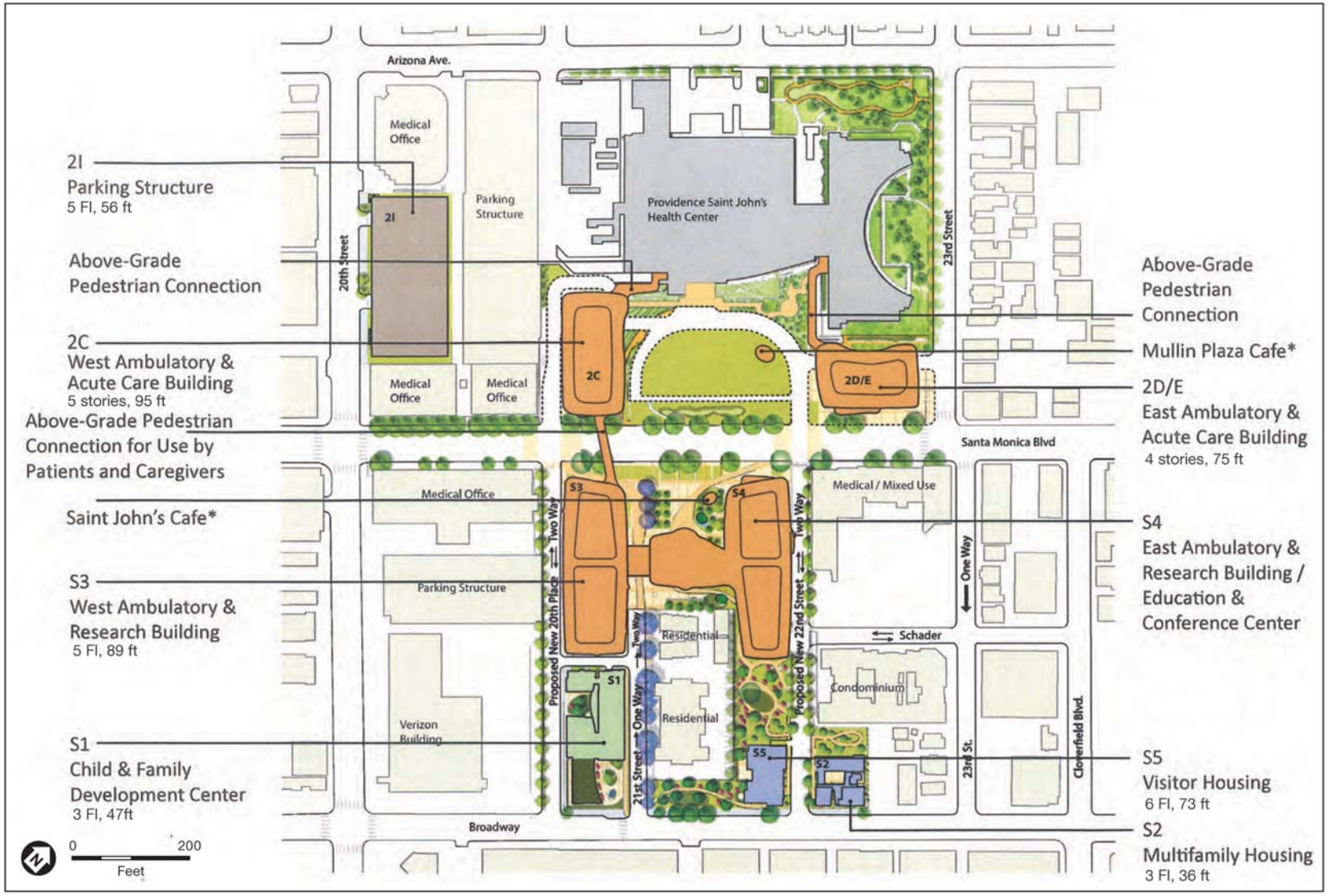
Water Sources	2020	2025	2030	2035	2040
Available Supply (AF)					
Total Supply	**20,469**	**20,469**	**20,469**	**20,469**	**20,469**
Normal Year Supply	20,366	20,366	20,366	20,366	20,366
% of Normal Year	100%	100%	100%	100%	100%
Demand (AF)					
Total Dry Demand	**14,097**	**14,181**	**14,267**	**14,352**	**14,438**
Normal Year Demand	12,933	13,010	13,089	13,167	13,246
% of Normal Year	109%	109%	109%	109%	109%
Supply/Demand Comparison					
Supply/Demand Difference	**6,372**	**6,288**	**6,202**	**6,117**	**6,031**

Source: (2020 - 2040) UWMP Table 5.4

Table 10. Multiple Dry Year Supply and Demand Comparison (AFY)

Water Sources	2020	2025	2030	2035	2040
First year					
Supply totals	19,906	19,906	19,906	19,906	19,906
Demand totals	12,902	12,980	13,058	13,136	13,215
Difference	**7,004**	**6,926**	**6,848**	**6,770**	**6,691**
Second year					
Supply totals	19,906	19,906	19,906	19,906	19,906
Demand totals	12,918	12,995	13,073	13,152	13,231
Difference	**6,988**	**6,911**	**6,833**	**6,754**	**6,675**
Third year					
Supply totals	19,906	19,906	19,906	19,906	19,906
Demand totals	12,933	13,011	13,089	13,168	13,247
Difference	**6,973**	**6,895**	**6,817**	**6,738**	**6,659**

Source: UWMP Tables 5.5, 5.6, 5.7, 5.8, and 5.9



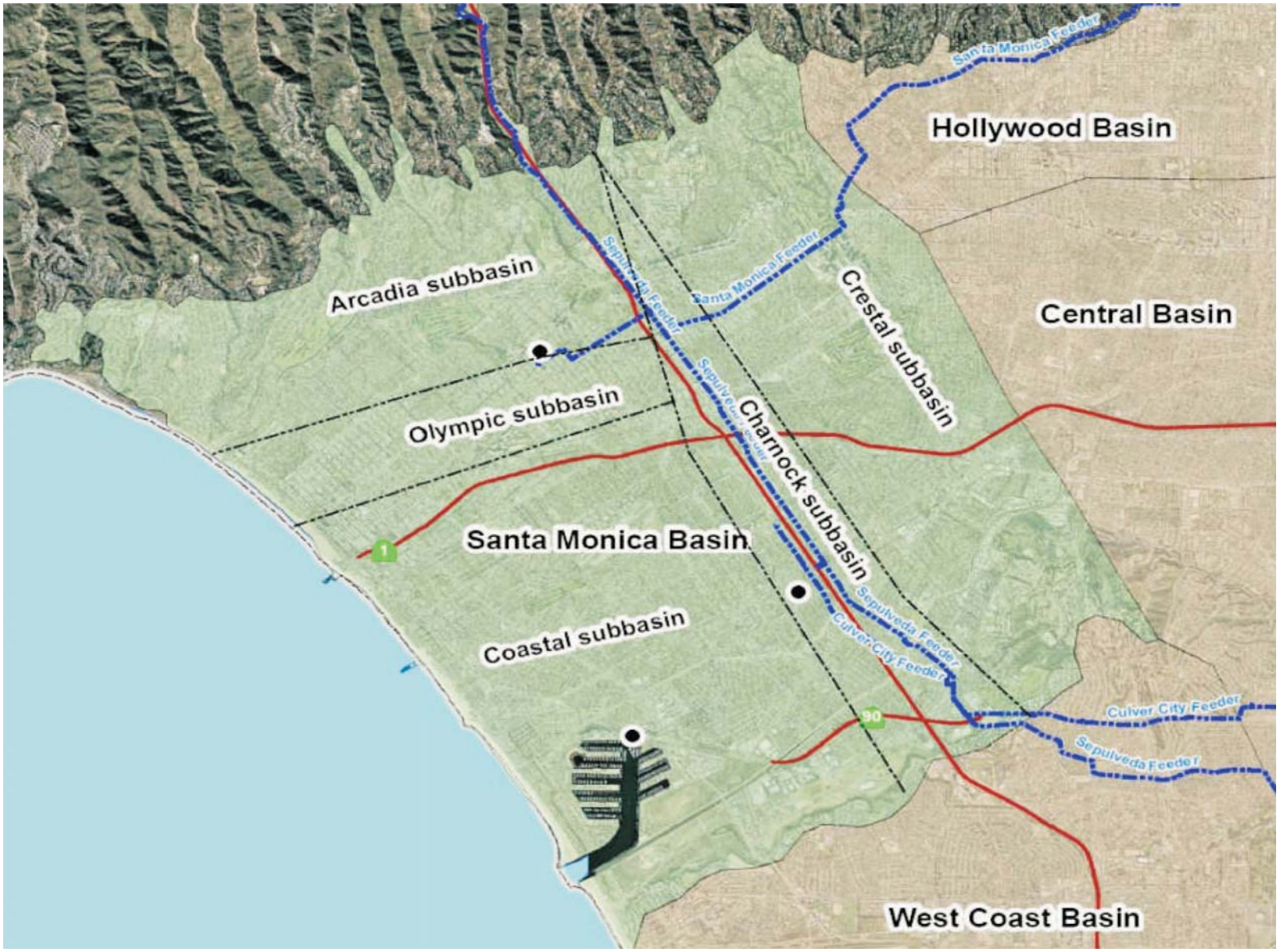
SOURCE: Perkins Eastman, 2017

ESA

July 2018

TODD GROUNDWATER

Figure 1
Proposed Project



Source: SA Associates, 2010

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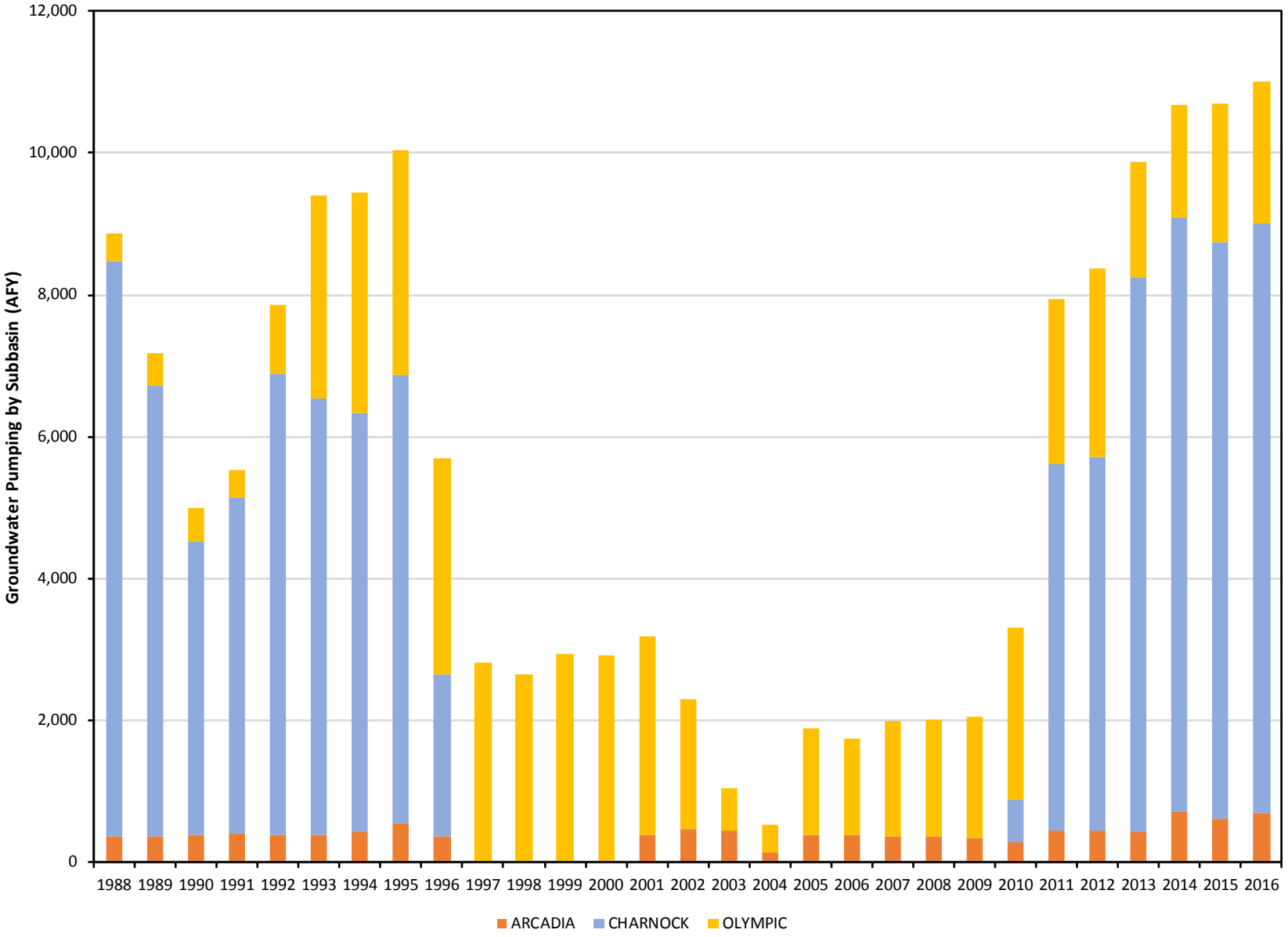
TODD GROUNDWATER

Figure 2
Santa Monica Groundwater Subbasins



July 2018

TODD GROUNDWATER

Figure 3
City of Santa Monica Groundwater Use by Subbasin

Appendix A

Phase II North Campus Site 2I- Existing CFDC at 1339 29th Street (Comm)

meter_number	category_description	current_read_date	last_read_date	usage_hcf	usage_gallons
635134	COMMERCIAL	3/26/2018	1/24/2018	99	74,052
635134	COMMERCIAL	1/24/2018	11/27/2017	86	64,328
635134	COMMERCIAL	11/27/2017	9/26/2017	165	123,420
635134	COMMERCIAL	5/25/2017	3/28/2017	112	83,776
635134	COMMERCIAL	3/28/2017	3/15/2017	22	16,456
635134	COMMERCIAL	3/15/2017	1/10/2017	120	89,760
635134	COMMERCIAL	5/18/2015	3/18/2015	302	225,896
635134	COMMERCIAL	3/18/2015	1/15/2015	367	274,516
635134	COMMERCIAL	1/15/2015	11/17/2014	174	130,152
635134	COMMERCIAL	11/17/2014	9/23/2014	382	285,736
635134	COMMERCIAL	9/23/2014	7/21/2014	605	452,540
635134	COMMERCIAL	7/21/2014	5/23/2014	535	400,180
635134	COMMERCIAL	5/23/2014	3/24/2014	244	182,512
635134	COMMERCIAL	3/24/2014	1/22/2014	235	175,780
635134	COMMERCIAL	1/22/2014	11/18/2013	151	112,948
635134	COMMERCIAL	11/18/2013	9/17/2013	189	141,372
635134	COMMERCIAL	9/17/2013	7/15/2013	282	210,936
635134	COMMERCIAL	7/15/2013	5/13/2013	236	176,528
635134	COMMERCIAL	5/13/2013	3/11/2013	267	199,716
635134	COMMERCIAL	3/11/2013	1/8/2013	179	133,892
635134	COMMERCIAL	1/8/2013	11/7/2012	64	47,872
635134	COMMERCIAL	11/7/2012	9/12/2012	109	81,532
635134	COMMERCIAL	9/12/2012	7/18/2012	109	81,532
635134	COMMERCIAL	7/18/2012	5/15/2012	129	96,492
635134	COMMERCIAL	5/15/2012	3/13/2012	89	66,572
635134	COMMERCIAL	3/13/2012	1/11/2012	116	86,768
635134	COMMERCIAL	1/11/2012	11/14/2011	92	68,816
635134	COMMERCIAL	11/14/2011	9/13/2011	593	443,564
635134	COMMERCIAL	9/13/2011	7/14/2011	166	124,168
635134	COMMERCIAL	7/14/2011	5/17/2011	177	132,396
635134	COMMERCIAL	5/17/2011	3/15/2011	147	109,956
635134	COMMERCIAL	3/15/2011	1/11/2011	138	103,224
635134	COMMERCIAL	1/11/2011	11/10/2010	107	80,036
635134	COMMERCIAL	11/10/2010	9/8/2010	237	177,276
635134	COMMERCIAL	9/8/2010	7/13/2010	197	147,356
635134	COMMERCIAL	7/13/2010	5/12/2010	263	196,724
635134	COMMERCIAL	5/12/2010	3/10/2010	89	66,572
635134	COMMERCIAL	3/10/2010	1/12/2010	121	90,508
635134	COMMERCIAL	1/12/2010	11/12/2009	125	93,500
635134	COMMERCIAL	11/12/2009	9/15/2009	148	110,704
635134	COMMERCIAL	9/15/2009	7/13/2009	155	115,940
635134	COMMERCIAL	7/13/2009	5/12/2009	141	105,468
635134	COMMERCIAL	5/12/2009	3/11/2009	142	106,216
635134	COMMERCIAL	3/11/2009	1/8/2009	109	81,532
635134	COMMERCIAL	1/8/2009	11/10/2008	84	62,832
635134	COMMERCIAL	1/8/2009	11/10/2008	-84	-62,832
635134	COMMERCIAL	1/8/2009	11/10/2008	84	62,832
635134	COMMERCIAL	11/10/2008	9/10/2008	140	104,720
635134	COMMERCIAL	9/10/2008	7/14/2008	137	102,476
635134	COMMERCIAL	7/14/2008	5/14/2008	152	113,696
635134	COMMERCIAL	5/14/2008	3/19/2008	189	141,372
635134	COMMERCIAL	3/19/2008	1/17/2008	142	106,216

Phase II South Campus Site S4- Existing JWCI at 2200 Santa Monica Blvd. (Comm)

meter_number	category_description	current_read_date	last_read_date	usage_hcf	usage_gallons
10243239 & 10243239	COMMERCIAL	3/26/2018	1/24/2018	203	151,844
10243239 & 10243239	COMMERCIAL	1/24/2018	11/27/2017	222	166,056
10243239 & 10243239	COMMERCIAL	11/27/2017	9/26/2017	238	178,024
10243239 & 10243239	COMMERCIAL	7/26/2017	5/25/2017	276	206,448
10243239 & 10243239	COMMERCIAL	5/25/2017	3/28/2017	247	184,756
10243239 & 10243239	COMMERCIAL	3/28/2017	3/15/2017	48	35,904
10243239 & 10243239	COMMERCIAL	3/15/2017	1/10/2017	214	160,072
10243239 & 10243239	COMMERCIAL	3/14/2016	1/13/2016	318	237,864
10243239 & 10243239	COMMERCIAL	5/19/2015	3/18/2015	338	252,824
10243239 & 10243239	COMMERCIAL	3/18/2015	1/15/2015	320	239,360
10243239 & 10243239	COMMERCIAL	1/15/2015	11/18/2014	322	240,856
10243239 & 10243239	COMMERCIAL	11/18/2014	9/23/2014	386	288,728
10243239 & 10243239	COMMERCIAL	9/23/2014	7/21/2014	335	250,580
10243239 & 10243239	COMMERCIAL	7/21/2014	5/22/2014	324	242,352
10243239 & 10243239	COMMERCIAL	5/22/2014	3/25/2014	233	174,284
10243239 & 10243239	COMMERCIAL	3/25/2014	1/22/2014	268	200,464
10243239 & 10243239	COMMERCIAL	1/22/2014	11/19/2013	309	231,132
10243239 & 10243239	COMMERCIAL	11/19/2013	9/16/2013	476	356,048
10243239 & 10243239	COMMERCIAL	9/16/2013	7/15/2013	469	350,812
10243239 & 10243239	COMMERCIAL	7/15/2013	5/14/2013	644	481,712
10243239 & 10243239	COMMERCIAL	5/14/2013	3/11/2013	570	426,360
10243239 & 10243239	COMMERCIAL	3/11/2013	1/7/2013	290	216,920
10243239 & 10243239	COMMERCIAL	1/7/2013	11/8/2012	350	261,800
10243239 & 10243239	COMMERCIAL	11/8/2012	9/12/2012	410	306,680
10243239 & 10243239	COMMERCIAL	9/12/2012	7/17/2012	345	258,060
10243239 & 10243239	COMMERCIAL	7/17/2012	5/14/2012	468	350,064
10243239 & 10243239	COMMERCIAL	5/14/2012	3/13/2012	462	345,576
10243239 & 10243239	COMMERCIAL	3/13/2012	1/11/2012	458	342,584
10243239 & 10243239	COMMERCIAL	1/11/2012	11/14/2011	380	284,240
10243239 & 10243239	COMMERCIAL	11/14/2011	9/13/2011	427	319,396
10243239 & 10243239	COMMERCIAL	9/13/2011	7/13/2011	328	245,344
10243239 & 10243239	COMMERCIAL	7/13/2011	5/16/2011	256	191,488
10243239 & 10243239	COMMERCIAL	5/16/2011	3/15/2011	221	165,308
10243239 & 10243239	COMMERCIAL	3/15/2011	1/10/2011	235	175,780
10243239 & 10243239	COMMERCIAL	1/10/2011	11/9/2010	263	196,724
10243239 & 10243239	COMMERCIAL	11/9/2010	9/8/2010	254	189,992
10243239 & 10243239	COMMERCIAL	9/8/2010	7/12/2010	263	196,724
10243239 & 10243239	COMMERCIAL	7/12/2010	5/11/2010	240	179,520
10243239 & 10243239	COMMERCIAL	5/11/2010	3/10/2010	309	231,132
10243239 & 10243239	COMMERCIAL	3/10/2010	1/11/2010	296	221,408
10243239 & 10243239	COMMERCIAL	1/11/2010	11/11/2009	312	233,376
10243239 & 10243239	COMMERCIAL	11/11/2009	9/14/2009	247	184,756
10243239 & 10243239	COMMERCIAL	9/14/2009	7/13/2009	336	251,328
10243239 & 10243239	COMMERCIAL	7/13/2009	5/11/2009	296	221,408
10243239 & 10243239	COMMERCIAL	5/11/2009	3/10/2009	276	206,448
10243239 & 10243239	COMMERCIAL	3/10/2009	1/7/2009	309	231,132
10243239 & 10243239	COMMERCIAL	1/7/2009	11/10/2008	275	205,700
10243239 & 10243239	COMMERCIAL	1/7/2009	11/10/2008	-275	-205,700
10243239 & 10243239	COMMERCIAL	1/7/2009	11/10/2008	275	205,700
10243239 & 10243239	COMMERCIAL	11/10/2008	9/10/2008	283	211,684
10243239 & 10243239	COMMERCIAL	9/10/2008	7/14/2008	267	199,716
10243239 & 10243239	COMMERCIAL	7/14/2008	5/14/2008	353	264,044
10243239 & 10243239	COMMERCIAL	5/14/2008	3/18/2008	287	214,676
10243239 & 10243239	COMMERCIAL	3/18/2008	1/16/2008	324	242,352

Phase II South Campus Site S3- 2042 Santa Monica Blvd MRI (Comm)

meter_number	category_description	current_read_date	last_read_date	usage_hcf	usage_gallons
4071048	COMMERCIAL	3/26/2018	1/24/2018	0	0
4071048	COMMERCIAL	1/24/2018	11/27/2017	1	748
4071048	COMMERCIAL	11/27/2017	9/26/2017	0	0
4071048	COMMERCIAL	7/26/2017	5/25/2017	1	748
4071048	COMMERCIAL	1/24/2017	11/23/2016	0	0
4071048	COMMERCIAL	11/23/2016	9/22/2016	1	748
4071048	COMMERCIAL	7/25/2016	5/25/2016	0	0
4071048	COMMERCIAL	5/25/2016	3/24/2016	1	748
4071048	COMMERCIAL	3/24/2016	1/25/2016	0	0
4071048	COMMERCIAL	11/25/2015	9/28/2015	0	0
4071048	COMMERCIAL	3/30/2015	2/2/2015	1	748
4071048	COMMERCIAL	2/2/2015	12/3/2014	0	0
4071048	COMMERCIAL	12/3/2014	10/2/2014	2	1,496
4071048	COMMERCIAL	10/2/2014	8/5/2014	1	748
4071048	COMMERCIAL	8/5/2014	6/5/2014	2	1,496
4071048	COMMERCIAL	6/5/2014	4/8/2014	1	748
4071048	COMMERCIAL	4/8/2014	2/10/2014	0	0
4071048	COMMERCIAL	2/10/2014	12/11/2013	1	748
4071048	COMMERCIAL	12/11/2013	10/14/2013	10	7,480
4071048	COMMERCIAL	10/14/2013	8/12/2013	1	748
4071048	COMMERCIAL	8/12/2013	6/10/2013	1	748
4071048	COMMERCIAL	6/10/2013	4/11/2013	1	748
4071048	COMMERCIAL	4/11/2013	2/12/2013	2	1,496
4071048	COMMERCIAL	2/12/2013	12/12/2012	1	748
4071048	COMMERCIAL	12/12/2012	10/15/2012	1	748
4071048	COMMERCIAL	10/15/2012	8/16/2012	3	2,244
4071048	COMMERCIAL	8/16/2012	6/18/2012	7	5,236
4071048	COMMERCIAL	6/18/2012	4/18/2012	1	748
4071048	COMMERCIAL	4/18/2012	2/21/2012	1	748
4071048	COMMERCIAL	2/21/2012	12/20/2011	5	3,740
4071048	COMMERCIAL	12/20/2011	10/24/2011	1	748
4071048	COMMERCIAL	10/24/2011	8/23/2011	0	0
4071048	COMMERCIAL	8/23/2011	6/27/2011	0	0
4071048	COMMERCIAL	6/27/2011	4/26/2011	1	748
4071048	COMMERCIAL	4/26/2011	2/28/2011	0	0
4071048	COMMERCIAL	2/28/2011	12/28/2010	1	748
4071048	COMMERCIAL	12/28/2010	11/1/2010	1	748
4071048	COMMERCIAL	11/1/2010	8/31/2010	1	748
4071048	COMMERCIAL	8/31/2010	6/29/2010	0	0
4071048	COMMERCIAL	6/29/2010	5/3/2010	1	748
4071048	COMMERCIAL	5/3/2010	3/2/2010	1	748
4071048	COMMERCIAL	3/2/2010	1/5/2010	6	4,488
4071048	COMMERCIAL	1/5/2010	11/2/2009	15	11,220
4071048	COMMERCIAL	11/2/2009	9/3/2009	50	37,400
4071048	COMMERCIAL	9/3/2009	7/8/2009	12	8,976
4071048	COMMERCIAL	7/8/2009	5/7/2009	10	7,480
4071048	COMMERCIAL	5/7/2009	3/12/2009	13	9,724
4071048	COMMERCIAL	3/12/2009	1/12/2009	9	6,732
4071048	COMMERCIAL	1/12/2009	11/11/2008	8	5,984
4071048	COMMERCIAL	11/11/2008	9/15/2008	8	5,984
4071048	COMMERCIAL	9/15/2008	7/17/2008	7	5,236
4071048	COMMERCIAL	7/17/2008	5/19/2008	6	4,488
4071048	COMMERCIAL	5/19/2008	3/20/2008	8	5,984
4071048	COMMERCIAL	3/20/2008	1/22/2008	7	5,236

Phase II South Campus Site S4- Vacant Housing/Landscape (1414 21st St.)

meter_number	category_description	current_read_date	last_read_date	usage_hcf	usage_gallons
87225762	LANDSCAPE COMMERCIAL	3/26/2018	1/24/2018	3	2,244
87225762	LANDSCAPE COMMERCIAL	1/24/2018	11/27/2017	5	3,740
87225762	LANDSCAPE COMMERCIAL	11/27/2017	9/26/2017	6	4,488
87225762	LANDSCAPE COMMERCIAL	7/26/2017	5/25/2017	8	5,984
87225762	LANDSCAPE COMMERCIAL	5/25/2017	3/27/2017	7	5,236
87225762	LANDSCAPE COMMERCIAL	1/24/2017	11/23/2016	2	1,496
87225762	LANDSCAPE COMMERCIAL	7/25/2016	5/25/2016	32	23,936
87225762	LANDSCAPE COMMERCIAL	5/25/2016	3/24/2016	9	6,732
87225762	LANDSCAPE COMMERCIAL	3/24/2016	1/25/2016	8	5,984
87225762	LANDSCAPE COMMERCIAL	11/25/2015	9/28/2015	0	0
87225762	LANDSCAPE COMMERCIAL	9/28/2015	7/29/2015	17	12,716
87225762	LANDSCAPE COMMERCIAL	5/29/2015	3/30/2015	21	15,708
87225762	LANDSCAPE COMMERCIAL	3/30/2015	2/2/2015	18	13,464
87225762	LANDSCAPE COMMERCIAL	2/2/2015	12/3/2014	12	8,976
87225762	LANDSCAPE COMMERCIAL	12/3/2014	10/2/2014	19	14,212
87225762	LANDSCAPE COMMERCIAL	10/2/2014	8/5/2014	22	16,456
87225762	LANDSCAPE COMMERCIAL	8/5/2014	6/5/2014	23	17,204
87225762	LANDSCAPE COMMERCIAL	6/5/2014	4/8/2014	20	14,960
87225762	LANDSCAPE COMMERCIAL	4/8/2014	2/10/2014	14	10,472
87225762	LANDSCAPE COMMERCIAL	2/10/2014	12/11/2013	22	16,456
87225762	LANDSCAPE COMMERCIAL	12/11/2013	10/14/2013	15	11,220
87225762	LANDSCAPE COMMERCIAL	10/14/2013	8/12/2013	24	17,952
87225762	LANDSCAPE COMMERCIAL	8/12/2013	6/10/2013	26	19,448
87225762	LANDSCAPE COMMERCIAL	6/10/2013	4/11/2013	20	14,960
87225762	LANDSCAPE COMMERCIAL	4/11/2013	2/12/2013	10	7,480
87225762	LANDSCAPE COMMERCIAL	2/12/2013	12/12/2012	4	2,992
87225762	LANDSCAPE COMMERCIAL	12/12/2012	10/15/2012	31	23,188
87225762	LANDSCAPE COMMERCIAL	10/15/2012	8/16/2012	25	18,700
87225762	LANDSCAPE COMMERCIAL	8/16/2012	6/18/2012	20	14,960
87225762	LANDSCAPE COMMERCIAL	6/18/2012	4/18/2012	28	20,944
87225762	LANDSCAPE COMMERCIAL	4/18/2012	2/21/2012	22	16,456
87225762	LANDSCAPE COMMERCIAL	2/21/2012	12/20/2011	16	11,968
87225762	LANDSCAPE COMMERCIAL	12/20/2011	10/24/2011	14	10,472
87225762	LANDSCAPE COMMERCIAL	10/24/2011	8/23/2011	25	18,700
87225762	LANDSCAPE COMMERCIAL	8/23/2011	6/27/2011	30	22,440
87225762	LANDSCAPE COMMERCIAL	6/27/2011	4/26/2011	35	26,180
87225762	LANDSCAPE COMMERCIAL	4/26/2011	2/28/2011	12	8,976
87225762	LANDSCAPE COMMERCIAL	2/28/2011	12/28/2010	15	11,220
87225762	LANDSCAPE COMMERCIAL	12/28/2010	11/1/2010	27	20,196
87225762	LANDSCAPE COMMERCIAL	8/31/2010	6/29/2010	30	22,440
87225762	LANDSCAPE COMMERCIAL	6/29/2010	5/3/2010	26	19,448
87225762	LANDSCAPE COMMERCIAL	5/3/2010	3/2/2010	17	12,716
87225762	LANDSCAPE COMMERCIAL	3/2/2010	1/5/2010	15	11,220
87225762	LANDSCAPE COMMERCIAL	1/5/2010	11/2/2009	27	20,196
87225762	LANDSCAPE COMMERCIAL	11/2/2009	9/3/2009	28	20,944
87225762	LANDSCAPE COMMERCIAL	9/3/2009	7/8/2009	28	20,944
87225762	LANDSCAPE COMMERCIAL	7/8/2009	5/7/2009	36	26,928
87225762	LANDSCAPE COMMERCIAL	5/7/2009	3/12/2009	29	21,692
87225762	LANDSCAPE COMMERCIAL	3/12/2009	1/12/2009	45	33,660
87225762	LANDSCAPE COMMERCIAL	1/12/2009	11/11/2008	21	15,708
87225762	LANDSCAPE COMMERCIAL	11/11/2008	9/15/2008	41	30,668
87225762	LANDSCAPE COMMERCIAL	9/15/2008	7/17/2008	195	145,860
87225762	LANDSCAPE COMMERCIAL	7/17/2008	5/19/2008	592	442,816
87225762	LANDSCAPE COMMERCIAL	5/19/2008	3/20/2008	566	423,368
87225762	LANDSCAPE COMMERCIAL	3/20/2008	1/22/2008	30	22,440

Phase II North Campus Site 2D/E- Existing Foundation Building (Comm)

meter_number	category_description	current_read_date	last_read_date	usage_hcf	usage_gallons
16166617 & 18350999	COMMERCIAL	5/8/2018	3/8/2018	179	133,892
16166617 & 18350999	COMMERCIAL	3/8/2018	1/10/2018	169	126,412
16166617 & 18350999	COMMERCIAL	1/10/2018	11/8/2017	97	72,556
16166617 & 18350999	COMMERCIAL	11/8/2017	9/7/2017	99	74,052
16166617 & 18350999	COMMERCIAL	9/7/2017	7/10/2017	83	62,084
16166617 & 18350999	COMMERCIAL	1/4/2017	11/7/2016	134	100,232
16166617 & 18350999	COMMERCIAL	11/7/2016	9/6/2016	137	102,476
16166617 & 18350999	COMMERCIAL	9/6/2016	7/7/2016	109	81,532
16166617 & 18350999	COMMERCIAL	7/7/2016	5/9/2016	33	24,684
16166617 & 18350999	COMMERCIAL	3/8/2016	1/6/2016	5	3,740
16166617 & 18350999	COMMERCIAL	1/6/2016	11/5/2015	3	2,244
16166617 & 18350999	COMMERCIAL	1/16/2015	1/7/2015	0	0
16166617 & 18350999	COMMERCIAL	1/7/2015	11/10/2014	5	3,740
16166617 & 18350999	COMMERCIAL	11/10/2014	9/9/2014	8	5,984
16166617 & 18350999	COMMERCIAL	9/9/2014	7/14/2014	7	5,236
16166617 & 18350999	COMMERCIAL	7/14/2014	5/14/2014	11	8,228
16166617 & 18350999	COMMERCIAL	5/14/2014	3/13/2014	13	9,724
16166617 & 18350999	COMMERCIAL	3/13/2014	1/14/2014	10	7,480
16166617 & 18350999	COMMERCIAL	1/14/2014	11/12/2013	17	12,716
16166617 & 18350999	COMMERCIAL	11/12/2013	9/11/2013	21	15,708
16166617 & 18350999	COMMERCIAL	9/11/2013	7/10/2013	28	20,944
16166617 & 18350999	COMMERCIAL	7/10/2013	5/15/2013	13	9,724
16166617 & 18350999	COMMERCIAL	5/15/2013	3/18/2013	12	8,976
16166617 & 18350999	COMMERCIAL	3/18/2013	1/15/2013	9	6,732
16166617 & 18350999	COMMERCIAL	1/15/2013	11/13/2012	6	4,488
16166617 & 18350999	COMMERCIAL	11/13/2012	9/17/2012	13	9,724
16166617 & 18350999	COMMERCIAL	9/17/2012	7/19/2012	9	6,732
16166617 & 18350999	COMMERCIAL	7/19/2012	5/21/2012	10	7,480
16166617 & 18350999	COMMERCIAL	5/21/2012	3/20/2012	8	5,984
16166617 & 18350999	COMMERCIAL	3/20/2012	1/23/2012	6	4,488
16166617 & 18350999	COMMERCIAL	1/23/2012	11/21/2011	7	5,236
16166617 & 18350999	COMMERCIAL	11/21/2011	9/26/2011	5	3,740
16166617 & 18350999	COMMERCIAL	9/26/2011	7/26/2011	5	3,740
16166617 & 18350999	COMMERCIAL	7/26/2011	5/25/2011	27	20,196
16166617 & 18350999	COMMERCIAL	5/25/2011	3/29/2011	8	5,984
16166617 & 18350999	COMMERCIAL	3/29/2011	1/31/2011	6	4,488
16166617 & 18350999	COMMERCIAL	1/31/2011	12/2/2010	17	12,716
16166617 & 18350999	COMMERCIAL	12/2/2010	9/29/2010	18	13,464
16166617 & 18350999	COMMERCIAL	9/29/2010	8/3/2010	19	14,212
16166617 & 18350999	COMMERCIAL	8/3/2010	6/3/2010	10	7,480
16166617 & 18350999	COMMERCIAL	6/3/2010	4/5/2010	14	10,472
16166617 & 18350999	COMMERCIAL	4/5/2010	2/2/2010	7	5,236
16166617 & 18350999	COMMERCIAL	2/2/2010	12/7/2009	10	7,480
16166617 & 18350999	COMMERCIAL	12/7/2009	10/6/2009	7	5,236
16166617 & 18350999	COMMERCIAL	10/6/2009	8/5/2009	33	24,684
16166617 & 18350999	COMMERCIAL	8/5/2009	6/9/2009	24	17,952
16166617 & 18350999	COMMERCIAL	6/9/2009	4/13/2009	25	18,700
16166617 & 18350999	COMMERCIAL	4/13/2009	2/10/2009	8	5,984
16166617 & 18350999	COMMERCIAL	2/10/2009	12/15/2008	7	5,236
16166617 & 18350999	COMMERCIAL	12/15/2008	10/14/2008	10	7,480
16166617 & 18350999	COMMERCIAL	10/14/2008	8/14/2008	13	9,724
16166617 & 18350999	COMMERCIAL	8/14/2008	6/18/2008	8	5,984
16166617 & 18350999	COMMERCIAL	6/18/2008	4/21/2008	14	10,472
16166617 & 18350999	COMMERCIAL	4/21/2008	2/21/2008	11	8,228

Phase II North Campus Site 2I- Existing CFDC at 1339 29th Street (Comm)

meter_number	category_descripti	current_read_date	last_read_date	usage_hcf	usage_gallons
635134	COMMERCIAL	3/26/2018	1/24/2018	99	74,052
635134	COMMERCIAL	1/24/2018	11/27/2017	86	64,328
635134	COMMERCIAL	11/27/2017	9/26/2017	165	123,420
635134	COMMERCIAL	5/25/2017	3/28/2017	112	83,776
635134	COMMERCIAL	3/28/2017	3/15/2017	22	16,456
635134	COMMERCIAL	3/15/2017	1/10/2017	120	89,760
635134	COMMERCIAL	5/18/2015	3/18/2015	302	225,896
635134	COMMERCIAL	3/18/2015	1/15/2015	367	274,516
635134	COMMERCIAL	1/15/2015	11/17/2014	174	130,152
635134	COMMERCIAL	11/17/2014	9/23/2014	382	285,736
635134	COMMERCIAL	9/23/2014	7/21/2014	605	452,540
635134	COMMERCIAL	7/21/2014	5/23/2014	535	400,180
635134	COMMERCIAL	5/23/2014	3/24/2014	244	182,512
635134	COMMERCIAL	3/24/2014	1/22/2014	235	175,780
635134	COMMERCIAL	1/22/2014	11/18/2013	151	112,948
635134	COMMERCIAL	11/18/2013	9/17/2013	189	141,372
635134	COMMERCIAL	9/17/2013	7/15/2013	282	210,936
635134	COMMERCIAL	7/15/2013	5/13/2013	236	176,528
635134	COMMERCIAL	5/13/2013	3/11/2013	267	199,716
635134	COMMERCIAL	3/11/2013	1/8/2013	179	133,892
635134	COMMERCIAL	1/8/2013	11/7/2012	64	47,872
635134	COMMERCIAL	11/7/2012	9/12/2012	109	81,532
635134	COMMERCIAL	9/12/2012	7/18/2012	109	81,532
635134	COMMERCIAL	7/18/2012	5/15/2012	129	96,492
635134	COMMERCIAL	5/15/2012	3/13/2012	89	66,572
635134	COMMERCIAL	3/13/2012	1/11/2012	116	86,768
635134	COMMERCIAL	1/11/2012	11/14/2011	92	68,816
635134	COMMERCIAL	11/14/2011	9/13/2011	593	443,564
635134	COMMERCIAL	9/13/2011	7/14/2011	166	124,168
635134	COMMERCIAL	7/14/2011	5/17/2011	177	132,396
635134	COMMERCIAL	5/17/2011	3/15/2011	147	109,956
635134	COMMERCIAL	3/15/2011	1/11/2011	138	103,224
635134	COMMERCIAL	1/11/2011	11/10/2010	107	80,036
635134	COMMERCIAL	11/10/2010	9/8/2010	237	177,276
635134	COMMERCIAL	9/8/2010	7/13/2010	197	147,356
635134	COMMERCIAL	7/13/2010	5/12/2010	263	196,724
635134	COMMERCIAL	5/12/2010	3/10/2010	89	66,572
635134	COMMERCIAL	3/10/2010	1/12/2010	121	90,508
635134	COMMERCIAL	1/12/2010	11/12/2009	125	93,500
635134	COMMERCIAL	11/12/2009	9/15/2009	148	110,704
635134	COMMERCIAL	9/15/2009	7/13/2009	155	115,940
635134	COMMERCIAL	7/13/2009	5/12/2009	141	105,468
635134	COMMERCIAL	5/12/2009	3/11/2009	142	106,216
635134	COMMERCIAL	3/11/2009	1/8/2009	109	81,532
635134	COMMERCIAL	1/8/2009	11/10/2008	84	62,832
635134	COMMERCIAL	1/8/2009	11/10/2008	-84	-62,832
635134	COMMERCIAL	1/8/2009	11/10/2008	84	62,832
635134	COMMERCIAL	11/10/2008	9/10/2008	140	104,720
635134	COMMERCIAL	9/10/2008	7/14/2008	137	102,476
635134	COMMERCIAL	7/14/2008	5/14/2008	152	113,696
635134	COMMERCIAL	5/14/2008	3/19/2008	189	141,372
635134	COMMERCIAL	3/19/2008	1/17/2008	142	106,216
9142781	FIRE	5/14/2008	3/19/2008	0	0
9142781	FIRE	3/19/2008	1/17/2008	0	0

Appendix M-2
Fire and Domestic Water Supply Study

FIRE AND DOMESTIC WATER STUDY

Providence Saint John's Health Center Phase II Project

2121 Santa Monica Blvd
Santa Monica, CA 90404
KPFF Job # 114230

August 2018

CLIENT:

Perkins Eastman
5510 Lincoln Blvd, Suite 250
Los Angeles, CA 90094
(310) 829-2249

PREPARED BY:

KPFF Consulting Engineers
700 South Flower Street Suite 2100
Los Angeles, California 90017
(213) 418-0201

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Summary

Fire flow tests were conducted by the City of Santa Monica to determine the available flow and pressure in the public water lines serving the Saint John's Health Center property. Based on preliminary estimates for fire and domestic demand, the public water mains are adequate to service the proposed Phase II development. Fire flow requirements were determined in accordance with Appendix B of the California Fire Code, which has been adopted by the City of Santa Monica Municipal Code per Section 8.40.010. Domestic water demand was determined by using a 1:1.15 ratio between the most conservative projected sewage generation and the projected water demand. The conservative sewage values that determine the water demand are extracted from "Appendix C –Sewage Generation Factors" from the City of Los Angeles Sewerage Facilities Charge Guide. The total estimated peak water demand for the proposed buildings is approximately 488,000 GPD.

Proposed Infrastructure Improvements

Due to the addition of the proposed developments for this phase of the Health Center project, a northern portion of the water main on 21st St. is proposed to be relocated west to 20th Place and then connect back to the existing water main on 21st St. Alternatively, another option is to protect the water main in place. Additionally, there will be new water laterals that connect the proposed buildings to the existing public water mains.

Existing Conditions

There are nine public water lines adjacent to the site:

- 8-inch lines are located on 20th Street, Arizona Avenue, Broadway, and 23rd Street.
- 12-inch lines are located on Santa Monica Boulevard, Broadway, and 21st Street.
- 24-inch lines are located on Arizona Avenue and Broadway.

The site is currently being serviced by water service laterals connected to the 8-inch lines on Arizona Avenue, 23rd Street, and 20th Street, and the 12-inch lines on Santa Monica Boulevard, 21st Street, and Broadway. The location of these existing water lines can be seen on the exhibit in Appendix D.

Fire Flow Test Results

The City of Santa Monica conducted fire flow tests using four hydrants located on 20th Street, Santa Monica Boulevard, 21st Street, and Broadway, respectively. The fire hydrant locations, as well as the results of the flow test are shown in Appendix A; these locations were suggested by City staff in order to account for the entire project area. There are 17 fire hydrants adjacent to the site that are available for fire services. These hydrants would provide additional capacity beyond that demonstrated in the fire flow test results. Four hydrants are on the north side of Arizona Avenue, one on the west side of 20th Street, two on the west side of 23rd Street, three on the north side of Santa Monica Boulevard, two on the south side of Santa Monica Boulevard, two on the west side of 21st Street, and three on the south side of Broadway. These hydrants are also shown in Appendix A. The domestic water and fire water would be sourced from the same public water mains; the flow from the hydrants was used to calculate the available flow in the public water mains. The proposed buildings will be fully sprinklered and thus a 50% reduction in the required fire flow is allowed per the California Fire Code.

Fire Hydrant 831 Test Results

As shown in Appendix D, fire hydrant 831 (FH 831) is projected to serve proposed buildings S5 and S2. Per the fire flow test results, the total available flow for FH 831 is 2,353 gpm at 82 psi, or 5,711 gpm at 20 psi. Detailed calculations of the total available flow can be found in Appendix E. As mentioned in the summary, a 1:1.15 ratio between the most conservative projected sewage generation and water demand was used to calculate the water demand of

the proposed S5 and S2 buildings. Sewage generation was calculated by using the sewage generation factors provided by the City of Los Angeles Sewerage Facilities Charge Guide. Previously approved domestic fire and water studies conducted within the City of Santa Monica utilize the City of Los Angeles Sewerage Facilities Charge guide to calculate the water demand, therefore this accepted methodology was adopted for this report. Refer to Appendix C for sewage generation factors. The aforementioned methodology was also used to calculate the domestic water demand for proposed buildings and parking serviced by fire hydrants 629, 823, and 830. This calculation takes into account a peaking factor of 2.5 and a water to sewer ratio of 1.15. As calculated in Table 1, the peak domestic water demand for the proposed buildings and parking serviced by fire hydrant 831 is estimated to be 20,471 gpd, or 14.22 gpm.

Table 1: FH 831 Proposed Domestic Water/Fire Water Demand Summary

Water Demand Category	Construction Type	Area or Unit	Average Daily Sewer Flow Rate*	Water-Sewer Ratio	Peak Daily Demand (gpd)	Peak Daily Demand (gpm)	Required Fire Flow Demand (gpm)**	Available Flow (at 20 psi)
S2 – Residential: Apt. – 2 bedroom	Type V-A	10 units ***	150/dwelling Unit	1.15	4,313	2.99	875	5,711
S2 – Commercial Use	Type V-A	800 sf	50/1000 Gr. Sq. ft.		115	0.08	750	
S2 - Parking	Type V-A	23,987 sf	20/1000 Gr. Sq. ft.		1,380	0.96	1,375	
S5 – Residential: Apt. 1 bed/2 bath	Type 1-A/1-B	34 units	150/dwelling Unit	1.15	14,663	10.18	1,000	
				Total	**20,471**	**14.22**		

*Sewage Generation Factors from City of Los Angeles Sewerage Facilities Charge Guide, Residential and Commercial Categories (see Appendix C).

**Values in this column are a 50% reduction of values found in Table B105.1(2) of Appendix B in the California Fire Code due to the fully sprinklered condition of the building.

*** Unit sized assumed to be 1,000 sf

A preliminary calculation using the 2016 California Fire Code (CFC) for Type I and Type V construction showed a required fire flow demand of 1,375 gpm at 20 PSI. Based on the flow report, and the project demands, the existing available water flow and pressure is adequate to serve the proposed development.

Buildings S5 and S2 are proposed to be fully sprinklered, therefore the CFC allows 25% of values provided in Table B105.1(2) in Appendix B of the California Fire Code. In the interest of conservative analysis, the values shown in the table are 50% of the values provided in Table B105.1(2). Appendix B of the fire code can be found in Appendix B of this report.

Based on Appendix C of the California Fire Code, for fire flow demand less than 1,750 gpm, 1 hydrant is required to service the building. The existing hydrant is adequate to serve the aforementioned buildings. Appendix C of the fire code can be found in Appendix B of this report.

Fire Hydrant 823 Test Results

Proposed structures 2C, 2D/E, and S4 are served by fire hydrant 823 (FH 823), as shown in Appendix D. The total available flow for FH 823 is 2,468 gpm at 85 psi, or 5,447 gpm at 20 psi, as shown in Appendix E. Similar to the methodology used to determine the domestic water demand for the above FH 831 section, the domestic water demand for proposed structures 2C, 2D/E and S4 is estimated based on square footage and anticipated average sewage generation factors corresponding to the building occupancy types. As calculated in Table 2, the domestic water demand is estimated to be approximately 306,679 gpd, or 212.97 gpm.

Table 2: FH 823 Proposed Domestic Water/Fire Water Demand Summary								
Water Demand Category	Construction Type	Area or Unit	Average Daily Sewer Flow Rate*	Water-Sewer Ratio	Peak Daily Demand (gpd)	Peak Daily Demand (gpm)	Required Fire Flow Demand** (gpm)	Available Flow (at 20 psi)
S4 – Auditorium	Type 1-A	250 seats	3/seats	1.15	2,156	1.50	2,375	5,447
S4 – Office	Type 1-A	35,350 sf	120/1000 Gr. Sq. ft.		12,196	8.47		
S4 – Medical Office/Clinic	Type 1-A	155,000 sf	250/1000 Gr. Sq. ft.		111,406	77.37		
S4/S5 - Parking	Type 1-A	462,429 sf	20/1000 Gr. Sq. ft.		26,590	18.47	3,000	
2C – Medical Office/Clinic	Type 1-A	117,500 sf	250/100 Gr. Sq. ft.		84,454	58.65	1,875	
2C - Parking	Type 1-A	118,265 sf	20/1000 Gr. Sq. ft.		6,800	4.72	1,875	
2D/E – Medical Office/Clinic	Type 1-A	78,500sf	250/100 Gr. Sq. ft.	1.15	56,422	39.18	1,500	
2D/E - Parking	Type 1-A	115,729 sf	20/1000 Gr. Sq. ft.		6,655	4.62	1,875	
Total					**403,555**	**280.25**		

*Sewage Generation Factors from City of Los Angeles Sewerage Facilities Charge Guide, Residential and Commercial Categories (see Appendix C).

**Values in this column are a 50% reduction of values found in Table B105.1(2) of Appendix B in the California Fire Code due to the fully sprinklered condition of the building.

A preliminary calculation using the 2016 California Fire Code for Type I-A construction showed a required fire flow demand of at least 3,000 gpm at 20 PSI. Based on the flow report, and the project demands, the existing available water flow and pressure is adequate to serve the proposed development.

Buildings 2C and 2D/E are proposed to be fully sprinklered, therefore the CFC allows 25% of values provided in Table B105.1(2) in Appendix B of the California Fire Code. In the interest of conservative analysis, the values shown in the table are 50% of the values provided in Table B105.1(2). Appendix B of the fire code can be found in Appendix B of this report.

Based on Appendix C of the California Fire Code, for fire flow demand of 3,000 gpm, 3 hydrants are required to service this area. It may be possible to utilize the other hydrants on Santa Monica Blvd that are in proximity of 2C and for additional capacity. However, if coverage of the building is not achieved through the existing hydrants, additional hydrants will be required.

Fire Hydrant 830 Test Results

Fire hydrant 830 (FH 830) is proposed to service building areas S1 and S3, as shown in Appendix D. The total available flow for FH 830 is 1,921 gpm at 85 psi, or 4,240 gpm at 20 psi, as shown in Appendix E. The domestic water demand for areas S1 and S3 were calculated using the values found in Table 3. The calculated projected water demand is estimated to be approximately 116,572 gpd or 80.95 gpm.

Table 3: FH 830 Proposed Domestic Water/Fire Water Demand Summary

Water Demand Category	Construction Type	Area or Unit	Average Daily Sewer Flow Rate*	Water - Sewer Ratio	Peak Daily Demand (gpd)	Peak Daily Demand (gpm)	Required Fire Flow Demand (gpm)**	Available Flow (at 20 psi)
S1 – Counseling Center	Type 1-A	25,500 sf	120/1000 Gr. Sq. ft.	1.15	8,798	6.11	1,000	4,240
S1 – School: Nursery Day Care	Type 1-A	73 persons	9/person		1,889	1.31		
S3- Medical Lab	Type 1-A	58,000 sf	250/1000 Gr. Sq. ft.		41,688	28.95	1,875	
S3- Medical Office/Clinic	Type 1-A	65,000 sf	250/1000 Gr. Sq. ft.		46,719	32.44		
S1/S3 - Parking	Type 1-A	303,973 sf	20/1000 Gr. Sq. ft.		17,479	12.14	3,000	
				Total	**116,572**	**80.95**		

*Sewage Generation Factors from City of Los Angeles Sewerage Facilities Charge Guide, Residential and Commercial Categories (see Appendix C).

** Values in this column are a 50% reduction of values found in Table B105.1(2) of Appendix B in the California Fire Code due to the fully sprinklered condition of the building.

A preliminary calculation using the 2016 California Fire Code for Type I-A construction showed the required fire flow demand to be at least 3,000 gpm at 20 PSI. Based on the flow report, and the project demands, the existing available water flow and pressure is adequate to serve the proposed development.

Buildings S1 and S3 are proposed to be fully sprinklered, therefore the CFC allows 25% of values provided in Table B105.1(2) in Appendix B of the California Fire Code. In the interest of conservative analysis, the values shown in the table are 50% of the values provided in Table B105.1(2). Appendix B of the fire code can be found in Appendix B of this report.

Based on Appendix C of the California Fire Code, for fire flow demand of 3,000 gpm, 3 hydrants are required to service this area. 1 hydrant currently exists to service the two buildings. Two additional hydrants will be required to adequately service the proposed buildings. The two additional hydrants may be located along the proposed 20th Place for the additional capacity.

Fire Hydrant 629 Test Results

Fire hydrant 629 (FH 629) serves building 2I, as shown in Appendix D. The total available flow for this fire hydrant, as shown in Appendix E, is 2,717 gpm at 80 psi, or 7,149 gpm at 20 psi. The domestic water demand for building 2I is estimated based on building usage types and corresponding sewage generation factors provided by the City of Los Angeles Sewerage Facilities Charge Guide. As summarized in Table 4, the domestic water demand for building 2I is estimated to be approximately 44,510 gpd, or 30.91 gpm.

Table 4: FH 629 Proposed Domestic Water/Fire Water Demand Summary

Water Demand Category	Construction Type	Area or Unit	Average Daily Sewer Flow Rate*	Water-Sewer Ratio	Peak Daily Demand (gpd)	Peak Daily Demand (gpm)	Required Fire Flow Demand (gpm)**	Available Flow (at 20 psi)
2I- Medical Office/ Clinic	Type 1-A	50,000 sf	250/1000 Gr. Sq. ft.	1.15	35,938	24.96	1,250	7,149
2I- Neighborhood Commercial Use	Type 1-A	4,500 sf	50/1000 Gr. Sq. ft.		647	0.45	1,500	
2I- Parking	Type 1-A	137,828 sf	20/1000 Gr. Sq. ft.		7,925	5.50	2,000	
				Total	**44,510**	**30.91**		

*Sewage Generation Factors from City of Los Angeles Sewerage Facilities Charge Guide, Residential and Commercial Categories (see Appendix C).
**Values in this column are a 50% reduction of values found in Table B105.1(2) of Appendix B in the California Fire Code due to the fully sprinklered condition of the building.

A preliminary calculation using the 2016 California Fire Code for Type IA construction showed the required fire flow demand to be at least 2,750 gpm at 20 PSI (2,750 gpm is a combination of the different uses within 2I). Based on the flow report, and the project demands, the existing available water flow and pressure is adequate to serve the proposed development.

Buildings 2I is proposed to be fully sprinklered, therefore the CFC allows 25% of values provided in Table B105.1 (2) in Appendix B of the California Fire Code. In the interest of conservative analysis, the values shown in the table are 50% of the values provided in Table B105.1(2). Appendix B of the fire code can be found in Appendix B of this report.

Based on Appendix C of the California Fire Code, for fire flow demand of 3,000 gpm, 3 hydrants are required to service this area. In the existing condition, 1 hydrant exists to service the building. Two additional hydrants will be required to adequately service the proposed building.

Water Line Relocation

In addition to the analysis of the capacity of existing water infrastructure, the existing water line locations must be considered as well when determining the feasibility of a proposed development. To accommodate for the proposed subterranean parking structure, the relocation of water infrastructure may be required. The proposed Phase II project includes subterranean parking on Providence Saint John's South Campus, including under the northern portion of 21st Street is proposed for vacation. This parking area conflicts with the northern half of the 12" water line on 21st Street, as shown in Appendix F.

700 South Flower Street, Suite 2100 Los Angeles, CA 90017 213.418.0201 kpff.com

APPENDIX A

FIRE HYDRANT LOCATIONS AND FLOW RESULTS

CITY OF
Santa Monica®
WATER DIVISION

FIRE HYDRANT FORM

CIVIL ENG. TEST No. 938

WORK ORDER No. _____

INSPECTION No. 25441

DATE: 8-1-17

BY: Saul Perez

LOCATION: 2121 Santa Monica Blvd. Part 1

	EMP #	FIRE HYD #	OUTLET SIZE	STATIC PRESS	PITOT PRESS	FLOW (GPM)
F.H. NO. 1	18759	629	4"	80	40	2717
F.H. NO. 2	20987	823	4"	85	33	2468
F.H. NO. 3						

EMPLOYEE # 18941

MINUTES FLOWED 4 min

STATIC 86

RESIDUAL 70

LOCATION 2121 Santa Monica Blvd.

LABOR/ EMPLOYEES One hour per employee 18941,18759,20987,19953 and 22248

COMMENTS: Static and residual taken under normal conditions

CITY OF
Santa Monica©
WATER DIVISION

FIRE HYDRANT FORM

CIVIL ENG. TEST No. 938

WORK ORDER No. _____

INSPECTION No. 25441

DATE: 8-1-17

BY: Saul Perez

LOCATION: 2121 Santa Monica Blvd. Part 2

	EMP #	FIRE HYD #	OUTLET SIZE	STATIC PRESS	PITOT PRESS	FLOW (GPM)
F.H. NO. 1	19953	830	4"	85	20	1921
F.H. NO. 2	22248	831	4"	82	30	2353
F.H. NO. 3						

EMPLOYEE # 18941

MINUTES FLOWED 4 min

STATIC 86

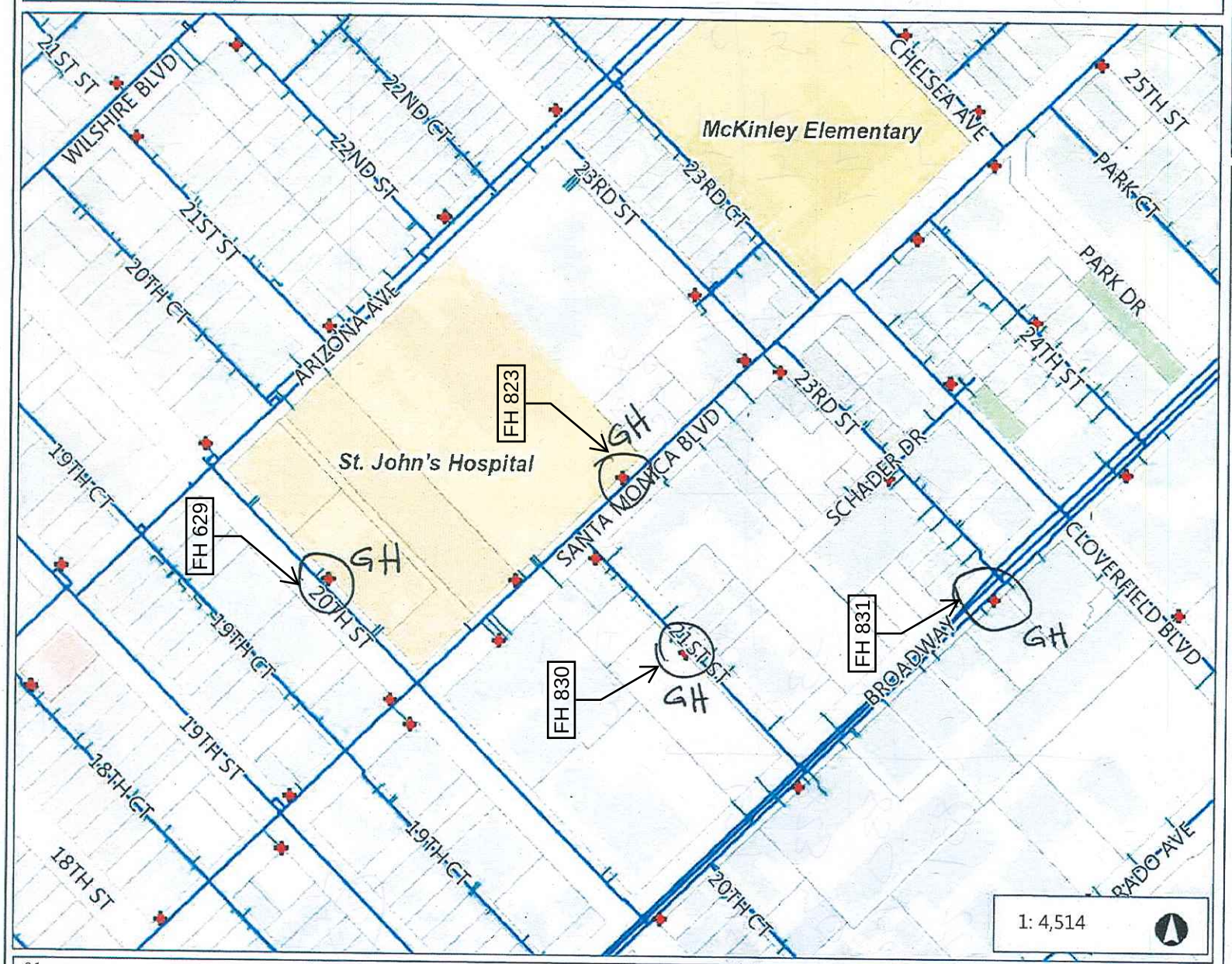
RESIDUAL 70

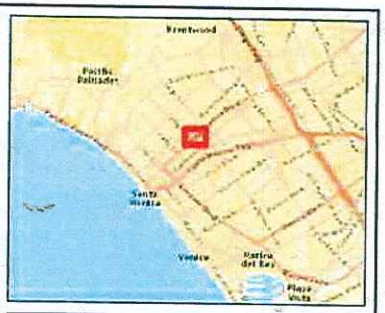
LOCATION 2121 Santa Monica Blvd.

LABOR/ EMPLOYEES One hour per employee 18941,18759,20987,19953 and 22248

COMMENTS: Static and residual taken under normal conditions

HFT 938 - 2121 Santa Monica Blvd





- Parcel
- wHydrant
  - Hydrant
  - Private Hydrant
  - Underground Hydrant
  - Fire Riser
  - Private Underground
- wLateralLine
  - <all other values>
  - Air Release
  - Blowoff
  - Domestic
  - Fire
  - Hydrant
  - Multimeter
  - Sampling Station
- wPressurizedMain
- CSMENT.DBO.expo_stations
- CSMENT.DBO.expo_line
- City Boundary

0.1 0 0.07 0.1

Miles

700 South Flower Street, Suite 2100 Los Angeles, CA 90017 213.418.0201 kpff.com

APPENDIX B

APPENDIX B & APPENDIX C OF THE CALIFORNIA FIRE CODE

August 2018 KPFF Job #114230

CALIFORNIA FIRE CODE – MATRIX ADOPTION TABLE
APPENDIX B – FIRE-FLOW REQUIREMENTS FOR BUILDINGS

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the user.
See Chapter 1 for state agency authority and building applications.)

Adopting Agency	BSC	BSC-CG	SFM		HCD			DSA		OSHPD				BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
			T-24	T-19*	1	2	1/AC	AC	SS	1	2	3	4								
Adopt Entire Chapter																					
Adopt Entire Chapter as amended (amended sections listed below)			X																		
Adopt only those sections that are listed below																					
[California Code of Regulations, Title 19, Division 1]																					
Chapter / Section																					
B105.2			X																		

* The *California Code of Regulations* (CCR), Title 19, Division 1 provisions that are found in the *California Fire Code* are a reprint from the current CCR, Title 19, Division 1 text for the code user's convenience only. The scope, applicability and appeals procedures of CCR, Title 19, Division I remain the same.

APPENDIX B
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

SECTION B101
GENERAL

B101.1 Scope. The procedure for determining fire-flow requirements for buildings or portions of buildings hereafter constructed shall be in accordance with this appendix. This appendix does not apply to structures other than buildings.

SECTION B102
DEFINITIONS

B102.1 Definitions. For the purpose of this appendix, certain terms are defined as follows:

FIRE-FLOW. The flow rate of a water supply, measured at 20 pounds per square inch (psi) (138 kPa) residual pressure, that is available for fire fighting.

FIRE-FLOW CALCULATION AREA. The floor area, in square feet (m^2), used to determine the required fire flow.

SECTION B103
MODIFICATIONS

B103.1 Decreases. The fire chief is authorized to reduce the fire-flow requirements for isolated buildings or a group of buildings in rural areas or small communities where the development of full fire-flow requirements is impractical.

B103.2 Increases. The fire chief is authorized to increase the fire-flow requirements where conditions indicate an unusual susceptibility to group fires or conflagrations. An increase shall not be more than twice that required for the building under consideration.

B103.3 Areas without water supply systems. For information regarding water supplies for fire-fighting purposes in rural and suburban areas in which adequate and reliable water supply systems do not exist, the fire code official is authorized to utilize NFPA 1142 or the *California Wildland-Urban Interface Code.*

SECTION B104
FIRE-FLOW CALCULATION AREA

B104.1 General. The fire-flow calculation area shall be the total floor area of all floor levels within the exterior walls, and under the horizontal projections of the roof of a building, except as modified in Section B104.3.

B104.2 Area separation. Portions of buildings which are separated by fire walls without openings, constructed in accordance with the *California Building Code,* are allowed to be considered as separate fire-flow calculation areas.

B104.3 Type IA and Type IB construction. The fire-flow calculation area of buildings constructed of Type IA and Type IB construction shall be the area of the three largest successive floors.

Exception: Fire-flow calculation area for open parking garages shall be determined by the area of the largest floor.

SECTION B105
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

B105.1 One- and two-family dwellings, Group R-3 and R-4 buildings and townhouses. The minimum fire-flow and flow duration requirements for one- and two-family dwellings, Group R-3 and R-4 buildings and townhouses shall be as specified in Tables B105.1(1) and B105.1(2).

TABLE B105.1(1)
REQUIRED FIRE-FLOW FOR ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

FIRE-FLOW CALCULATION AREA (square feet)	AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE-FLOW (gallons per minute)	FLOW DURATION (hours)
0-3,600	No automatic sprinkler system	1,000	1
3,601 and greater	No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2) at the required fire-flow rate
0-3,600	Section 903.3.1.3 of the *California Fire Code* or Section *313.3* of the *California Residential Code*	500	1/2
3,601 and greater	Section 903.3.1.3 of the *California Fire Code* or Section *313.3* of the *California Residential Code*	1/2 value in Table B105.1(2)	1

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m.

TABLE B105.1(2)
REFERENCE TABLE FOR TABLES B105.1(1) AND B105.2

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute)[b]	FLOW DURATION (hours)
Type IA and IB[a]	Type IIA and IIIA[a]	Type IV and V-A[a]	Type IIB and IIIB[a]	Type V-B[a]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. Types of construction are based on the *California Building Code*.

b. Measured at 20 psi residual pressure.

TABLE B105.2
REQUIRED FIRE-FLOW FOR BUILDINGS OTHER THAN ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE-FLOW (gallons per minute)	FLOW DURATION (hours)
No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2)
Section 903.3.1.1 of the *California Fire Code*	25% of the value in Table B105.1(2)[a]	Duration in Table B105.1(2) at the reduced flow rate
Section 903.3.1.2 of the *California Fire Code*	25% of the value in Table B105.1(2)[b]	Duration in Table B105.1(2) at the reduced flow rate

For SI: 1 gallon per minute = 3.785 L/m.

a. The reduced fire-flow shall be not less than 1,000 gallons per minute.

b. The reduced fire-flow shall be not less than 1,500 gallons per minute.

B105.2 Buildings other than one- and two-family dwellings, Group R-3 and R-4 buildings and townhouses. The minimum fire-flow and flow duration for buildings other than one- and two-family dwellings, Group R-3 and R-4 buildings and townhouses shall be as specified in Tables B105.2 and B105.1(2).

➡ > **Exception:** *[SFM] Group B, S-2 and U occupancies having a floor area not exceeding 1,000 square feet, primarily constructed of noncombustible exterior walls with wood or steel roof framing, having a Class A roof assembly, with uses limited to the following or similar uses:*

1. *California State Parks buildings of an accessory nature (restrooms).*
2. *Safety roadside rest areas, (SRRA), public restrooms.*
3. *Truck inspection facilities, (TIF), CHP office space and vehicle inspection bays.*
4. *Sand/salt storage buildings, storage of sand and salt.*

B105.3 Water supply for buildings equipped with an automatic sprinkler system. For buildings equipped with an approved automatic sprinkler system, the water supply shall be capable of providing the greater of:

1. The automatic sprinkler system demand, including hose stream allowance.
2. The required fire-flow.

SECTION B106
REFERENCED STANDARDS

ICC	IWUIC—15	International Wildland-Urban Interface Code	B103.3
NFPA	1142—12	Standard on Water Supplies for Suburban and Rural Fire Fighting	B103.3

CALIFORNIA FIRE CODE – MATRIX ADOPTION TABLE
APPENDIX C – FIRE HYDRANT LOCATIONS AND DISTRIBUTION

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the user.
See Chapter 1 for state agency authority and building applications.)

Adopting Agency	BSC	BSC-CG	SFM		HCD			DSA		OSHPD				BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
			T-24	T-19*	1	2	1/AC	AC	SS	1	2	3	4								
Adopt Entire Chapter																					
Adopt Entire Chapter as amended (amended sections listed below)			X																		
Adopt only those sections that are listed below																					
[California Code of Regulations, Title 19, Division 1]																					
Chapter / Section																					
C101.1			X																		

* The *California Code of Regulations* (CCR), Title 19, Division 1 provisions that are found in the *California Fire Code* are a reprint from the current CCR, Title 19, Division 1 text for the code user's convenience only. The scope, applicability and appeals procedures of CCR, Title 19, Division I remain the same.

APPENDIX C
FIRE HYDRANT LOCATIONS AND DISTRIBUTION

SECTION C101
GENERAL

C101.1 Scope. In addition to the requirements of Section 507.5.1 of the *California Fire Code*, fire hydrants shall be provided in accordance with this appendix for the protection of buildings, or portions of buildings, hereafter constructed or moved into the jurisdiction.

Exception: *[SFM] Group B, S-2 and U occupancies having a floor area not exceeding 1,000 square feet, primarily constructed of noncombustible exterior walls with wood or steel roof framing, having a Class A roof assembly, with uses limited to the following or similar uses:*

1. *California State Parks buildings of an accessory nature (restrooms).*
2. *Safety roadside rest areas, (SRRA), public restrooms.*
3. *Truck inspection facilities, (TIF), California Highway Patrol (CHP) office space and vehicle inspection bays.*
4. *Sand/salt storage buildings, storage of sand and salt.*

SECTION C102
NUMBER OF FIRE HYDRANTS

C102.1 Minimum number of fire hydrants for a building. The number of fire hydrants available to a building shall be not less than the minimum specified in Table C102.1.

SECTION C103
FIRE HYDRANT SPACING

C103.1 Hydrant spacing. Fire apparatus access roads and public streets providing required access to buildings in accordance with Section 503 of the *California Fire Code* shall be provided with one or more fire hydrants, as determined by Section C102.1. Where more than one fire hydrant is required, the distance between required fire hydrants shall be in accordance with Sections C103.2 and C103.3.

C103.2 Average spacing. The average spacing between fire hydrants shall be in accordance with Table C102.1.

Exception: The average spacing shall be permitted to be increased by 10 percent where existing fire hydrants provide all or a portion of the required number of fire hydrants.

C103.3 Maximum spacing. The maximum spacing between fire hydrants shall be in accordance with Table C102.1.

SECTION C104
CONSIDERATION OF EXISTING FIRE HYDRANTS

C104.1 Existing fire hydrants. Existing fire hydrants on public streets are allowed to be considered as available to meet the requirements of Sections C102 and C103. Existing fire hydrants on adjacent properties are allowed to be considered as available to meet the requirements of Sections C102 and C103 provided that a fire apparatus access road extends between properties and that an easement is established to prevent obstruction of such roads.

SECTION C105
REFERENCED STANDARDS

ICC	IFC—15	International Fire Code	C101.1, C103.1, Table C102.1
ICC	IRC—15	International Residential Code	Table C102.1

TABLE C102.1
REQUIRED NUMBER AND SPACING OF FIRE HYDRANTS

FIRE-FLOW REQUIREMENT (gpm)	MINIMUM NUMBER OF HYDRANTS	AVERAGE SPACING BETWEEN HYDRANTS[a, b, c, f, g] (feet)	MAXIMUM DISTANCE FROM ANY POINT ON STREET OR ROAD FRONTAGE TO A HYDRANT[d, f, g]
1,750 or less	1	500	250
2,000-2,250	2	450	225
2,500	3	450	225
3,000	3	400	225
3,500-4,000	4	350	210
4,500-5,000	5	300	180
5,500	6	300	180
6,000	6	250	150
6,500-7,000	7	250	150
7,500 or more	8 or more[e]	200	120

For SI: 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m.

a. Reduce by 100 feet for dead-end streets or roads.

b. Where streets are provided with median dividers that cannot be crossed by fire fighters pulling hose lines, or where arterial streets are provided with four or more traffic lanes and have a traffic count of more than 30,000 vehicles per day, hydrant spacing shall average 500 feet on each side of the street and be arranged on an alternating basis.

c. Where new water mains are extended along streets where hydrants are not needed for protection of structures or similar fire problems, fire hydrants shall be provided at spacing not to exceed 1,000 feet to provide for transportation hazards.

d. Reduce by 50 feet for dead-end streets or roads.

e. One hydrant for each 1,000 gallons per minute or fraction thereof.

f. A 50-percent spacing increase shall be permitted where the building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1 of the *California Fire Code*.

g. A 25-percent spacing increase shall be permitted where the building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.2 or 903.3.1.3 of the *California Fire Code* or Section P2904 of the *California Residential Code*.

700 South Flower Street, Suite 2100 Los Angeles, CA 90017 213.418.0201 kpff.com

APPENDIX C

SEWAGE GENERATION FACTORS

SEWERAGE FACILITIES CHARGE
SEWAGE GENERATION FACTOR FOR
RESIDENTIAL AND COMMERCIAL CATEGORIES

EFFECTIVE DATE: April 6, 2012

Line No.	FACILITY DESCRIPTION	PROPOSED SGF IN GPD	BOD (mg/l)	SS (mg/l)
1	Acupuncture Office/Clinic	120/1,000 Gr SF	265	275
2	Arcade - Video Games	50/1,000 Gr SF	265	275
3	Auditorium (a)	3/Seat	265	275
4	Auto Parking (a)	20/1,000 Gr SF	265	275
5	Auto Mfg., Service Maintenance (b)	Actual	1,260	1,165
6	Bakery	280/1,000 Gr SF	3,020	2,540
7	Bank: Headquarters	120/1,000 Gr SF	265	275
8	Bank: Branch	50/1,000 Gr SF	265	275
9	Ballroom	350/1,000 Gr SF	265	275
10	Banquet Room	350/1,000 Gr SF	265	275
11	Bar: Cocktail, Fixed Set (a) (c)	15/Seat	265	275
12	Bar: Juice, No Baking Facilities (d)	720/1,000 Gr SF	265	275
13	Bar: Juice, with Baking Facilities (d)	720/1,000 Gr SF	265	275
14	Bar: Cocktail, Public Table Area (c)	720/1,000 Gr SF	265	275
15	Barber Shop	120/1,000 Gr SF	265	275
16	Barber Shop (s)	15/Stall	265	275
17	Beauty Parlor	425/1,000 Gr SF	265	275
18	Beauty Parlor (s)	50/Stall	265	275
19	Bldg. Const/Field Office (e)	120/Office	265	275
20	Bowling Alley: Alley, Lanes & Lobby Area	50/1,000 Gr SF	265	275
21	Bowling Facility: Arcade/Bar/Restaurant/Dancing	Total	Average	Average
22	Cafeteria: Fixed Seat	30/Seat	1,000	600
23	Car Wash: Automatic (b)	Actual	265	285
24	Car Wash: Coin Operated Bays (b)	Actual	265	285
25	Car Wash: Hand Wash (b)	Actual	265	285
26	Car Wash: Counter & Sales Area	50/1,000 Gr SF	265	275
27	Chapel: Fixed Seat	3/Seat	265	275
28	Chiropractic Office	120/1,000 Gr SF	265	275
29	Church: Fixed Seat	3/Seat	265	275
30	Church School: Day Care/Elem	9/Occupant	265	275
31	Church School: One Day Use (s)	9/Occupant	265	275
32	Cocktail Lounge: Fixed Seat (f)	15/Seat	265	275
33	Coffee House: No Food Preparation (d)	720/1,000 Gr SF	265	275
34	Coffee House: Pastry Baking Only (d)	720/1,000 Gr SF	265	275
35	Coffee House: Serves Prepared Food (d)	25/Seat	1,000	600
36	Cold Storage: No Sales (g)	30/1,000 Gr SF	265	275
37	Cold Storage: Retail Sales (g)	50/1,000 Gr SF	265	275
38	Comfort Station: Public	80/Fixture	265	275
39	Commercial Use (a)	50/1,000 Gr SF	265	275

SEWERAGE FACILITIES CHARGE
SEWAGE GENERATION FACTOR FOR
RESIDENTIAL AND COMMERCIAL CATEGORIES

EFFECTIVE DATE: April 6, 2012

Line No.	FACILITY DESCRIPTION	PROPOSED SGF IN GPD	BOD (mg/l)	SS (mg/l)
40	Community Center	3/Occupant	265	275
41	Conference Room of Office Bldg.	120/1,000 Gr SF	265	275
42	Counseling Center (h)	120/1,000 Gr SF	265	275
43	Credit Union	120/1,000 Gr SF	265	275
44	Dairy	Average Flow	1,510	325
45	Dairy: Barn	Average Flow	1,510	325
46	Dairy: Retail Area	50/1,000 Gr SF	265	275
47	Dancing Area (of Bars or Nightclub) (c)	350/1,000 Gr SF	265	275
48	Dance Studio (i)	50/1,000 Gr SF	265	275
49	Dental Office/Clinic	250/1,000 Gr SF	265	275
50	Doughnut Shop	280/1,000 Gr SF	1,000	600
51	Drug Rehabilitation Center (h)	120/1,000 Gr SF	265	275
52	Equipment Booth	30/1,000 Gr SF	265	275
53	Film Processing (Retail)	50/1,000 Gr SF	265	275
54	Film Processing (Industrial)	Actual	265	275
55	Food Processing Plant (b)	Actual	2,210	1,450
56	Gas Station: Self Service	100/W.C.	265	275
57	Gas Station: Four Bays Max	430/Station	1,950	1,175
58	Golf Course Facility: Lobby/Office/Restaurant/Bar	Total	700	450
59	Gymnasium: Basketball, Volleyball (k)	200/1,000 Gr SF	265	275
60	Hanger (Aircraft)	50/1,000 Gr SF	265	275
61	Health Club/Spa (k)	650/1,000 Gr SF	265	275
62	Homeless Shelter	70/Bed	265	275
63	Hospital	70/Bed	820	1,230
64	Hospital: Convalescent (a)	70/Bed	265	275
65	Hospital: Animal	300/1,000 Gr SF	820	1,230
66	Hospital: Psychiatric	70/Bed	265	275
67	Hospital: Surgical (a)	360/Bed	265	275
68	Hotel: Use Guest Rooms Only (a)	120/Room	265	275
69	Jail	85/Inmate	265	275
70	Kennel: Dog Kennel/Open	100/1,000 Gr SF	265	275
71	Laboratory: Commercial	250/1,000 Gr SF	265	275
72	Laboratory: Industrial	Actual	265	275
73	Laundromat	185/Machine	550	370
74	Library: Public Area	50/1,000 Gr SF	265	275
75	Library: Stacks, Storage	30/1,000 Gr SF	265	275
76	Lobby of Retail Area (l)	50/1,000 Gr SF	265	275
77	Lodge Hall	3/Seat	265	275
78	Lounge (l)	50/1,000 Gr SF	265	275

SEWERAGE FACILITIES CHARGE
SEWAGE GENERATION FACTOR FOR
RESIDENTIAL AND COMMERCIAL CATEGORIES

EFFECTIVE DATE: April 6, 2012

Line No.	FACILITY DESCRIPTION	PROPOSED SGF IN GPD	BOD (mg/l)	SS (mg/l)
79	Machine Shop (No Industrial Waste Permit Required) (b)	50/1,000 Gr SF	265	275
80	Machine Shop (Industrial)	Actual	265	275
81	Mfg or Industrial Facility (No IW Permit Required) (b)	50/1,000 Gr SF	265	275
82	Mfg or Industrial Facility (Industrial)	Actual	265	275
83	Massage Parlor	250/1,000 Gr SF	265	275
84	Medical Building (a)	225/1,000 Gr SF	265	275
85	Medical: Lab in Hospital	250/1,000 Gr SF	340	275
86	Medical Office/Clinic	250/1,000 Gr SF	265	275
87	Mini-Mall (No Food)	50/1,000 Gr SF	265	275
88	Mortuary: Chapel	3/Seat	265	275
89	Mortuary: Embalming	300/1,000 Gr SF	800	800
90	Mortuary: Living Area	50/1,000 Gr SF	265	275
91	Motel: Use Guest Room Only (a)	120/Room	265	275
92	Museum: All Area	30/1,000 Gr SF	265	275
93	Museum: Office Over 15%	120/1,000 Gr SF	265	275
94	Museum: Sales Area	50/1,000 Gr SF	265	275
95	Office Building (a)	120/1,000 Gr SF	265	275
96	Office Bldg w/Cooling Tower	170/1,000 Gr SF	265	275
97	Plating Plant (No IW Permit Required) (b)	50/1,000 Gr SF	265	275
98	Plating Plant (Industrial) (b)	Actual	265	275
99	Pool Hall (No Alcohol)	50/1,000 Gr SF	265	275
100	Post Office: Full Service (m)	120/1,000 Gr SF	265	275
101	Post Office: Private Mail Box Rental	50/1,000 Gr SF	265	275
102	Prisons	175/Inmate	265	275
103	Residential Dorm: College or Residential (n)	70/Student	265	275
104	Residential: Boarding House	70/Bed	265	275
105	Residential: Apt - Bachelor (a)	75/DU	265	275
106	Residential: Apt - 1 BDR (a) (o)	110/DU	265	275
107	Residential: Apt - 2 BDR (a) (o)	150/DU	265	275
108	Residential: Apt - 3 BDR (a) (o)	190/DU	265	275
109	Residential: Apt - >3 BDR (o)	40/BDR	265	275
110	Residential: Condo - 1 BDR (o)	110/DU	265	275
111	Residential: Condo - 2 BDR (o)	150/DU	265	275
112	Residential: Condo - 3 BDR (o)	190/DU	265	275
113	Residential: Condo - >3 BDR (o)	40/BDR	265	275
114	Residential: Duplex/Townhouse - 1 BR (o)	110/DU	265	275
115	Residential: Duplex/Townhouse - 2 BR (o)	150/DU	265	275
116	Residential: Duplex/Townhouse - 3 BR (o)	190/DU	265	275
117	Residential: Duplex/Townhouse - >3 BR (o)	40/BDR	265	275

SEWERAGE FACILITIES CHARGE
SEWAGE GENERATION FACTOR FOR
RESIDENTIAL AND COMMERCIAL CATEGORIES

EFFECTIVE DATE: April 6, 2012

Line No.	FACILITY DESCRIPTION	PROPOSED SGF IN GPD	BOD (mg/l)	SS (mg/l)
118	Residential: SFD - 1 BR (o)	140/DU	265	275
119	Residential: SFD - 2 BR (o)	185/DU	265	275
120	Residential: SFD - 3 BR (o)	230/DU	265	275
121	Residential: SFD - >3 BR (o)	45/BDR	265	275
122	Residential Room Addition: Bedroom (o)	45/BDR	265	275
123	Residential Room Conversion: Into a Bedroom (o)	45/BDR	265	275
124	Residential: Mobile Home	Same as Apt	265	275
125	Residential: Artist (2/3 Area)	75/DU	265	275
126	Residential: Artist Residence	75/DU	265	275
127	Residential: Guest Home w/ Kitchen	Same as Apt	265	275
128	Residential: Guest Home w/o Kitchen	45/BDR	265	275
129	Rest Home	70/Bed	555	490
130	Restaurant: Drive-In	50/Stall	1000	600
131	Restaurant: Drive-In Seating Area	25/Seat	1000	600
132	Restaurant: Fast Food Indoor Seat	25/Seat	1000	600
133	Restaurant: Fast Food Outdoor Seat	25/Seat	1000	600
134	Restaurant: Full Service Indoor Seat (a)	30/Seat	1000	600
135	Restaurant: Full Service Outdoor Seat	30/Seat	1000	600
136	Restaurant: Take Out	300/1,000 Gr SF	1000	600
137	Retail Area (greater than 100,000 SF)	50/1,000 Gr SF	265	275
138	Retail Area (less than 100,000 SF)	25/1,000 Gr SF	265	275
139	Rifle Range: Shooting Stalls/Lanes, Lobby	50/1,000 Gr SF	265	275
140	Rifle Range Facility: Bar/Restaurant	Total	Average	Average
141	School: Arts/Dancing/Music (i)	11/Student	265	275
142	School: Elementary/Jr. High (a) (p)	9/Student	265	275
143	School: High School (a) (p)	11/Student	265	275
144	School: Kindergarten (s)	9/Student	265	275
145	School: Martial Arts (i)	9/Student	265	275
146	School: Nursery-Day Care (p)	9/Child	265	275
147	School: Special Class (p)	9/Student	265	275
148	School: Trade or Vocational (p)	11/Student	265	275
149	School: Training (p)	11/Student	265	275
150	School: University/College (a) (p)	16/Student	265	275
151	School: Dormitory (a) (n)	70/Student	265	275
152	School: Stadium, Pavilion	3/Seat	265	275
153	Spa/Jacuzzi (Commercial with backwash filters)	Total	265	275
154	Storage: Building/Warehouse	30/1,000 Gr SF	265	275
155	Storage: Self-Storage Bldg	30/1,000 Gr SF	265	275
156	Store: Ice Cream/Yogurt	25/1,000 Gr SF	1000	600

SEWERAGE FACILITIES CHARGE
SEWAGE GENERATION FACTOR FOR
RESIDENTIAL AND COMMERCIAL CATEGORIES

EFFECTIVE DATE: April 6, 2012

Line No.	FACILITY DESCRIPTION	PROPOSED SGF IN GPD	BOD (mg/l)	SS (mg/l)
157	Store: Retail (l)	50/1,000 Gr SF	265	275
158	Studio: Film/TV - Audience Viewing Room (q)	3/Seat	265	275
159	Studio: Film/TV - Regular Use Indoor Filming Area (q)	50/1,000 Gr SF	265	275
160	Studio: Film/TV - Ind. Use Film Process/Machine Shop (q)	50/1,000 Gr SF	265	275
161	Studio: Film/TV - Ind. Use Film Process/Machine Shop	Total	265	275
162	Studio: Recording	50/1,000 Gr SF	265	275
163	Swimming Pool (Commercial with backwash filters)	Total	265	275
164	Tanning Salon: Independent, No Shower (r)	50/1,000 Gr SF	265	275
165	Tanning Salon: Within a Health Spa/Club	640/1,000 Gr SF	265	275
166	Theater: Drive-In	6/Vehicle	265	275
167	Theater: Live/Music/Opera	3/Seat	265	275
168	Theater: Cinema	3/Seat	265	275
169	Tract: Commercial/Residential	1/Acre	265	275
170	Trailer: Const/Field Office (e)	120/Office	265	275
171	Veterinary Clinic/Office	250/1,000 Gr SF	265	275
172	Warehouse	30/1,000 Gr SF	265	275
173	Warehouse w/ Office	Total	265	275
174	Waste Dump: Recreational	400/Station	2650	2750
175	Wine Tasting Room: Kitchen	200/1,000 Gr SF	265	275
176	Wine Tasting Room: All Area	50/1,000 Gr SF	265	275

FOOTNOTES TO SGFs TABLE

(a) SFC rates for these facilities have historically been published in SFC ordinances.

(b) Bureau of Sanitation will determine the flow based on the information given by applicants for facilities with industrial discharge. The flow will be redetermined by Sanitation inspectors annually based on water bills. If the actual flow exceeds the previous year's determined flow, the applicants will be charged for the difference.
If this type of facility is exempt from an industrial discharge permit, only the domestic SFC will be assessed.

(c) The SFC for a bar shall be the sum of SFC's for all areas based on the SGF for each area (ex. fixed seat area, public table area, dancing area).

(d) The determination of SGF for juice bars and coffee houses previously depended on the extent of the actual food preparation in house, not by the types of food provided. Food is assumed to be prepared offsite and as such, the three prior subcategories have been consolidated.

1) SGF for no pastry baking and no food preparation is 720 gpd/1000 gr.sq.ft.
2) SGF for pastry baking only and no food preparation is 720 gpd/1000 gr.sq.ft.
3) SGF for complete food preparation is 25 gpd/seat, the same as a fast food restaurant.

Juice bars and coffee houses do not serve any alcoholic drinks.

(e) Building construction includes trailers, field offices, etc.

(f) Cocktail lounge usually does not serve prepared food.

(g) Cold storage facilities are categorized as follow:

1) No Sales - the cold storage facility is used only for temporary storage, no selling is involved. For example, cold storage facilities at the harbor temporarily store seafood until it is distributed.
2) Cold storage w/ retail sales - the primary function of this facility is to support the wholesale/retail operation of a store, such as supermarket freezers, refrigerators, etc.

(h) Counseling centers include marriage counseling centers, alcohol/drug rehabilitation /dependency centers, nutrition centers, diet centers, etc.

(i) Part-time basis schools or dance studios should be charged as retail area - 50 gpd /1000 gr.sq.ft. Full-time basis schools should be charged by the number of students.

(j) Domestic waste is estimated at 50 gpd/1,000 square feet in addition to total process flow.

(k) Bureau of Sanitation will determine if an industrial permit is needed for health spas. The first year flow is based on 650 gpd/1000 gr.sq.ft., and the Sanitation inspectors will redetermine the flow annually based on water bill from the previous year. The applicants are responsible for paying the difference of SFC.

Health club/spa includes lobby area, workout floors, aerobic rooms, swimming pools, Jacuzzi, sauna, locker rooms, showers, and restrooms. If a health club/spa has a gymnasium type of facility, this portion should be charged separately at the gymnasium SFC rate.

Gymnasiums include basketball court, volleyball court, and any other large open space with low occupancy density.

(l) Lobby of retail includes lounges, holding rooms, or waiting area, etc.

(m) Full service post offices include U.S. Postal Service, UPS, Federal Express, DHL, and etc.

(n) The SGF for a college dormitory based on student capacity also includes the SGF for the dormitory cafeterias.

(o) A bedroom is defined as an enclosed subdivision with 50 sq.ft. or more floor area in a residential building commonly used for sleeping purpose, and is partitioned off to form a habitable room.

(p) The SGF for schools based on the student capacity, covers the following facilities:

1) classrooms and lecture halls
2) professors' offices
3) administration offices
4) laboratories for classes or research
5) libraries
6) bookstores
7) student/professor lounges
8) school cafeterias
9) warehouses and storage areas
10) auditoriums
11) gymnasiums
12) restrooms

It does not include water used by schools for swimming pools. When a school files an application for addition of any of the foregoing facilities, the student population will be reassessed and the total gpd for the new facility will be based on the number of students increased since the last SFC was paid or when the City implemented the SFC for the first time. The SFC for any school facility (ex. stadium, dormitory, etc.) not listed above, will be based on the designated SGF for that category.

(q) The SFC for a TV or motion picture studio shall be the sum of SFC's for different facilities in the studio, based on the SGF for each facility. A studio may include one or more of the following facilities: audience viewing room, filming room, film processing, storage area, etc.

(r) No independent tanning salons with shower were encountered during 1996 survey.

(s) Alternative basis of charge for City’s consideration. The prior square footage basis is also presented should the City decide to continue charging on that basis.

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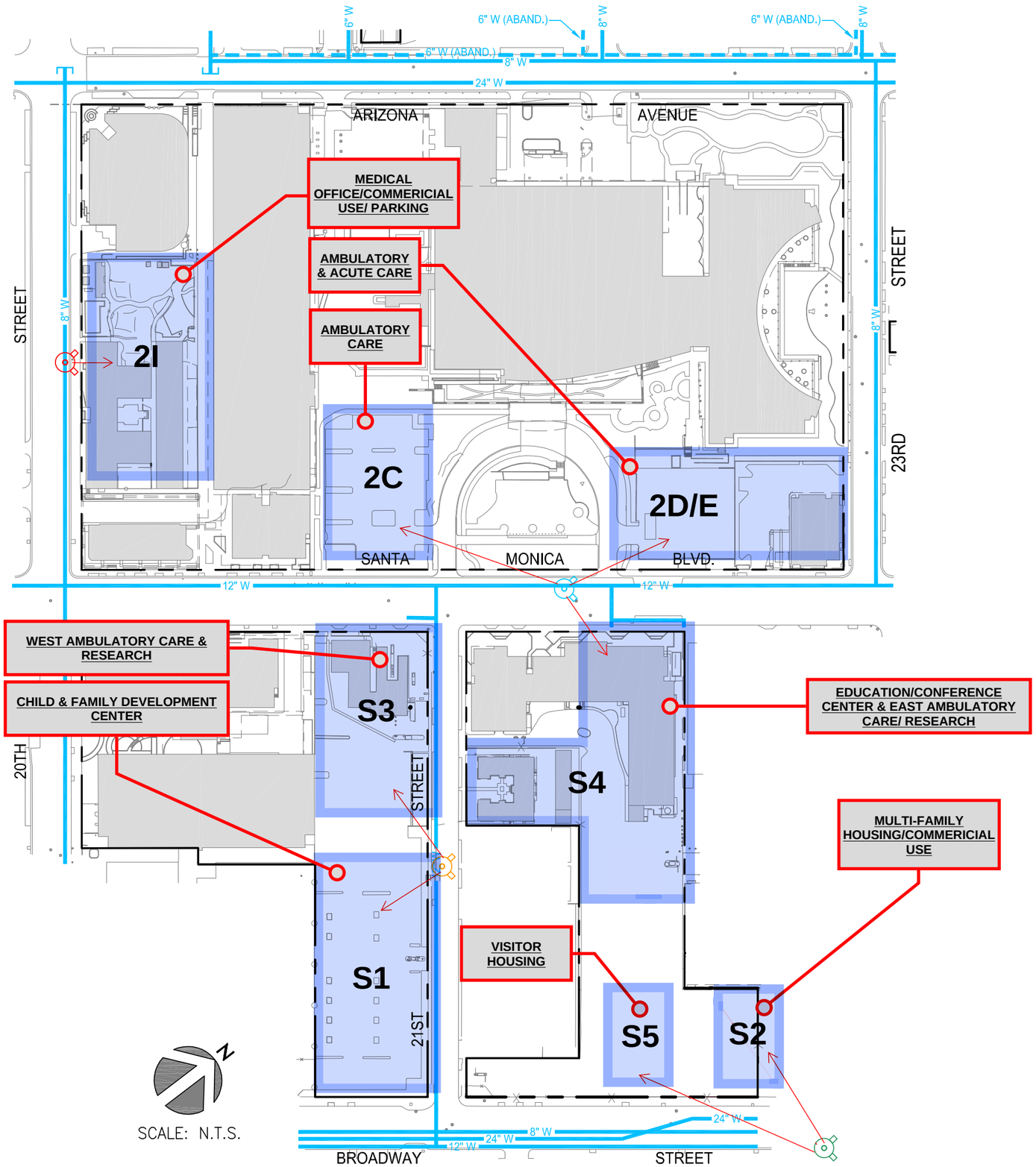
APPENDIX D

PROJECT LAYOUT



LEGEND

EXISTING WATER LINE

FIRE HYDRANT 629

FIRE HYDRANT 823

FIRE HYDRANT 830

FIRE HYDRANT 831

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APPENDIX E

DETAILED CALCULATIONS OF TOTAL AVAILABLE FLOW

Fire Hydrant 629:

$Q_r = Q_f \times (H_r/H_f)^{0.54}$

Static pressure = 80 PSI

Residual pressure = 70 PSI

Q_r = Rated capacity at 20 PSI

Q_f = Total test flow = 2717 gpm

H_r = Static pressure minus 20 PSI

H_f = Static pressure minus residual pressure

$Q_r = 2717 \times ((80-20)/(80-70))^{0.54} = 7149$ gpm

Fire Hydrant 830:

$Q_r = Q_f \times (H_r/H_f)^{0.54}$

Static pressure = 85 PSI

Residual pressure = 70 PSI

Q_r = Rated capacity at 20 PSI

Q_f = Total test flow = 1921 gpm

H_r = Static pressure minus 20 PSI

H_f = Static pressure minus residual pressure

$Q_r = 1921 \times ((85-20)/(85-70))^{0.54} = 4240$ gpm

Fire Hydrant 823:

$Q_r = Q_f \times (H_r/H_f)^{0.54}$

Static pressure = 85 PSI

Residual pressure = 70 PSI

Q_r = Rated capacity at 20 PSI

Q_f = Total test flow = 2468 gpm

H_r = Static pressure minus 20 PSI

H_f = Static pressure minus residual pressure

$Q_r = 2468 \times ((85-20)/(85-70))^{0.54} = 5447$ gpm

Fire Hydrant 831:

$Q_r = Q_f \times (H_r/H_f)^{0.54}$

Static pressure = 82 PSI

Residual pressure = 70 PSI

Q_r = Rated capacity at 20 PSI

Q_f = Total test flow = 2353 gpm

H_r = Static pressure minus 20 PSI

H_f = Static pressure minus residual pressure

$Q_r = 2353 \times ((82-20)/(82-70))^{0.54} = 5711$ gpm

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APPENDIX F

WATER LINE RELOCATION OPTIONS

WATER SERVICE

LEGEND:

OPTION 1 WATER LINE ROUTING: — W —

OPTION 2 WATER LINE ROUTING: — W —

PROPOSED OPTION 1 LATERAL: ——

PROPOSED OPTION 2 LATERAL: ——

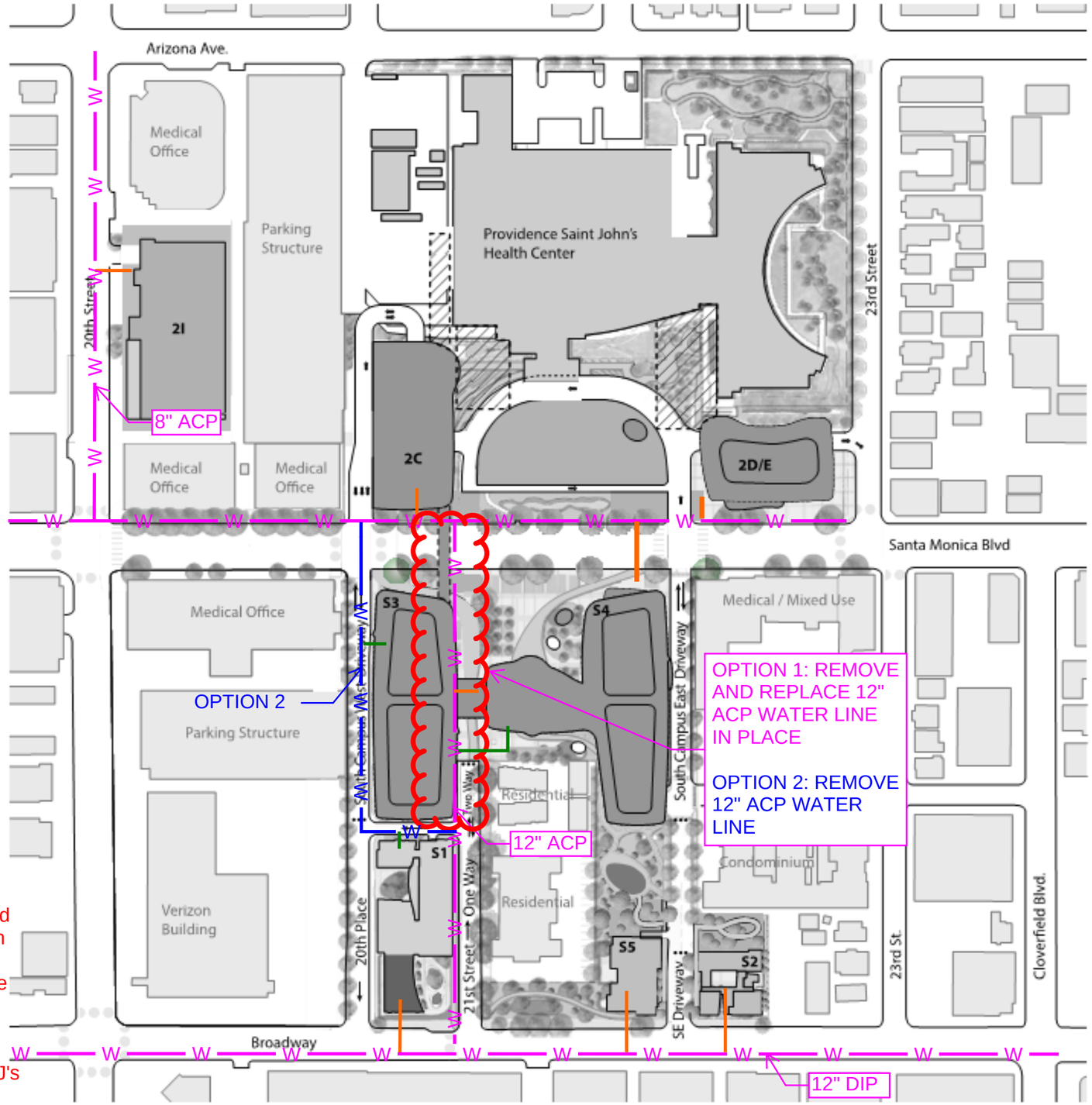
NOTE: LOCATION OF EXISTING AND PROPOSED SERVICES ARE APPROXIMATE LOCATIONS AND ARE SCHEMATIC. PLEASE CONSULT ASBUILTS AND SURVEY FOR MORE ACCURATE LOCATION.

OPTION 1 EXPLANATION

Option 1 for the proposed Providence St. John's Campus consists of removing and replacing the existing 12" ACP in 21st street and routing the new water line at the ceiling of the proposed subterranean parking of S4. Buildings S4 and S3 can be serviced by this line or by the line on Santa Monica Blvd. S1 can be serviced by the existing line in 21st Street or the existing line in Broadway Avenue. Lateral locations are subject to change.

OPTION 2 EXPLANATION

Option 2 for the proposed Providence St. John's Campus consists of the removal of the existing 12" ACP water line in the north half of 21st Street to accommodate for the proposed subterranean parking of Building S4. The line will be capped at the extent of the removal. In addition to cutting and capping the existing line, a new water main is proposed between S1 and S3 where it will then turn North along the proposed South Campus West Driveway. The line would connect to the existing main in Santa Monica Blvd. Building S1 and S3 could be serviced by the proposed main in South Campus West Driveway. Buildings S5 and S2 will connect to the existing water main in Broadway Avenue. Building S4 will connect to the existing water main in Santa Monica Blvd. The existing residential buildings (not part of PSJ's property) would connect to the remaining water line in the southern portion of 21st Street.



03-28-2018

Appendix M-3
Sanitary Sewer Study

Sanitary Sewer Study

Providence Saint John's Phase II Project

2121 Santa Monica Blvd

Santa Monica, CA 90404

KPFF Job# 114230

April 2019

Client:

Perkins Eastman
5510 Lincoln Blvd, Suite 250
Los Angeles, CA 90094

Prepared by:

KPFF Consulting Engineers
700 South Flower St, Suite 2100
Los Angeles, CA 90017
(213) 418-0201

Table of Contents

Summary

Flow monitoring of nine public sewer manholes adjacent to the site has been conducted by ADS Environmental Services over a 14 day period. Refer to Appendix D for comprehensive Flow Monitoring report. After a review of the data collected and analysis of the project demands, two out of the nine manholes, MH02 and MH05 were further investigated to determine if the existing sewer system could adequately accept the proposed flow from the proposed development. ADS monitored MH02 from the North and East and labeled them as MH02N and MH02E, which corresponds to the 12" line in 20th street and the 12" line in Santa Monica Blvd. MH05 corresponds to the 12" line in Broadway. The proposed development layout and manholes are labeled in Appendix A, Exhibit 1 and Exhibit 2, respectively.

The existing slope of the 12" lines in 20th street, Santa Monica Blvd and Broadway were extracted from provided As-builts and applied to determine the existing and proposed capacity of each line. Corresponding As-builts can be found in Appendix E. The 12" line in 20th street has an existing slope of 1.36% and a just full capacity of 2,327,209 gpd. The 12" line in Santa Monica Blvd has an existing slope of 0.72% and a just full capacity of 1,693,293 gpd. The 12" line in Broadway has an existing slope of 0.7% and a just full capacity of 1,669,610 gpd. Calculations can be found in Appendix C.

Multiple buildings on the proposed Saint John's campus are being demolished, therefore they will no longer be contributing flow to the existing sewer lines. This removal of flow must be accounted for when determining the proposed capacity of each line. While there is an existing residential building that will be demolished, it has not been included below because it was vacant at the time of monitoring. Exhibit 2 in Appendix A shows the layout of the buildings to be demolished and the main lines they discharge to. The amount of sewage demand that each building produces is shown in Table 1, below.

Table 1 – Existing Buildings to be Demolished

Building Name	Building Type	Quantity	Sewage Generation Factor (GPD)	Average Daily Sewage Demand (GPD)	Accepting MH	Discharge Sewer
John Wayne Cancer Institute (JWCI)	Medical Clinic and Laboratories	40,412 SF	250/1,000 SF	10,103	MH05	18" on 21st St.
	Medical Offices	10,643 SF	250/1,000 SF	2,661	MH05	
Child and Family Development Center (CFDC)	Office	8,059 SF	120/1,000 SF	967	MH02E	12" on Santa Monica Blvd.
	Day Care & Medical Clinics	74 Children	9/ Child	666	MH02E	
	Maintenance & Storage	585 SF	30/1,000 SF	18	MH02E	
Saint John's Foundation Building	Office	10,800 SF	120/1,000 SF	1,296	MH05	18" on Santa Monica Blvd.
MRI Building	Medical	2,675 SF	250/1,000 SF	669	MH05	18" on 21st St.
Total				**16,380**		

In order to determine the sewage demand from the proposed buildings, the LA "Sewerage Facilities Charge Sewage Generation Factor for Residential and Commercial Categories" table was used. Because some of the Development Agreement Vested Uses allow for a range of activities with varying sewage generation factors, two sewage generation scenarios were developed. The most significant difference between the two tables are the assumptions pertaining to the Hospital/Health Care uses within Buildings 2C and 2D/E. Option 1 assumes that Buildings 2C and 2D/E are both inpatient facilities with ground floor commercial uses while Option 2 assumes that Buildings 2C and 2D/E are ambulatory/outpatient facilities.

In the built out condition, the existing 12" sewer line in 20th street is proposed to accept flow from Building 2I. With the additional flow and depth from 2I, the 12" sewer line is projected to flow at 42% in both scenarios.

The existing 12" sewer line in Santa Monica Blvd is proposed to accept the flow from Buildings 2C, Mullin Plaza, and SJ Cafe. It also currently accepts flow from the Child and Family Development Center, which will be demolished. With the additional flow and depth from 2C, Mullin Plaza, and SJ Cafe, as well as the removed flow from the aforementioned demolished buildings, the 12" sewer line is projected to flow at 76.5% full in the first option and 80.5% full in the second option. However, ADS has confirmed that during the 14-day monitoring period of the 12" line in Santa Monica Blvd, MH02E, there was a spike in both the velocity and depth data. This occurred on May 3rd just before 3 pm for a duration of less than 30 minutes and can be found on page 37 of the flow monitoring report in the Hydrograph Report of

San02E. This event data is reflected as the recorded existing max depth and flow for MH02E. However, if this event is an outlier, the more representative existing max depth and flow are approximately 5.75" and 0.39 MGD. In the case that the event on May 3rd is indeed an outlier, the existing pipe will flow at 52.9% full with the additional proposed flow rather than 76.5 % full. In the second option, the existing pipe will flow at 56.9% full with the additional proposed flow rather than 80.5% full.

The existing 12" sewer line in Broadway is proposed to accept the flow from Building 2D/E, S1, S2, S3, S4 and S5. It also accepts flow from the John Wayne Cancer Institute, the Saint John's Foundation building, an MRI Building, and an Existing Residential Building, which are all being demolished. With the flow and depth from the aforementioned buildings, the existing line is projected to flow at 56.3% full in the first option and 58.3% full in the second option.

Table 4 compares the existing sewer demands vs the proposed demands and presents the increase in the flow and depth of the existing sewer lines. Supporting calculations for flow and accompanying depth can be found in Appendix C.

In addition to the analysis of the final built out condition of the project, a phasing analysis has been considered to determine the incremental changes in sewage flows as buildings are demolished and constructed. Tables 5 and 6 explore two phasing options. The first phasing option, Baseline Original, considers constructing Building S1, S2, and S3 first, while the second phasing option, Baseline Alternate, considers constructing Buildings 2C and S2 first. Flow and depth calculations for each stage in the proposed phasing can be found in Appendix C.

Proposed Infrastructure Improvements

As part of the S3 development, the northern portion of the existing 18" sewer in 21st Street (portion of 21st Street that will be vacated) will be removed. As part of the S3 development, a new sewer line is proposed in the proposed 20th Place/South Campus West Driveway running from Broadway to Santa Monica Boulevard (to accept the flow from Building S1 and S3). This work will take place during the construction of 20th Place and South Campus West Driveway and will be completed prior to issuance of the Certificate of Occupancy for the S1 building or S3 building, whichever is earlier. Additionally, there will be new sewer laterals that connect the proposed buildings to the existing public sewers.
This preliminary sewer study has been reviewed by the City, and comments have been provided to Saint John's to incorporate into their preliminary design.

Potential Additional Upgrades Related to Building S3 or S4

Prior to the issuance of a building permit for the earlier of the S3 building or the S4 building, Saint John's will prepare an updated sewer study to be reviewed and approved by the City. Such study will determine if future project flows (during dry and wet weather conditions) will cause the City's 12-inch and 21-inch sewer lines on Broadway to exceed the hydraulic planning criteria on page 47 in the City's

2017 Sanitary Sewer System Master Plan (shown below). If the study indicates exceedances of the hydraulic planning criteria due to project flows, Saint John's will perform sewer upgrades prior to issuance of a Certificate of Occupancy for the earlier of the S3 or S4 building. The primary criteria used to establish adequately-sized sewer piping is if the Peak Wet Weather Flow (PWWF) depth to diameter ratio is less than 0.75, and if the minimum velocity is 2 ft/s.

Hydraulic Planning Criteria

Evaluation of a sanitary sewer collection system during dry and wet weather conditions involves evaluation of both capacity and general operational issues. The capacity of the system is primarily controlled by population and significant commercial/industrial dischargers. Operational issues that may lead to inadequate level of service system performance include roots, fats, oils and grease. The hydraulic model is an important utility management tool to assist in identifying locations of capacity constraints or velocity concerns that may exist in the existing system, or are projected to arise under future dry or weather flows. The primary design criteria to be used to evaluate potential pipe capacity or operational problem areas are shown in Table 4-3.

Table 4-3. Pipe Design Criteria

Parameter	Value
Minimum Velocity	2 feet per second
Manning's Roughness Coefficient (N)	0.013
Force Main Velocity	3-5 fps
Minimum Pipe Size	8-inch
PWWF Depth/ Diameter (d/D)	< 0.75 d/D

The City, based on its review of this preliminary sewer study, has indicated that necessary sewer upgrades may include, but are not limited to:

(a) installing a new adequately-sized sewer line(s) along Broadway and 20th Street to convey sewer flows generated by S3 (and S4, if applicable) to the Colorado Avenue 24-inch Vylon sewer line, or

(b) upsizing the existing 12-inch sewer on Broadway to 18-inch from 21st Street to 20th Street and re-activating and placing in service the existing 12-inch VCP line (currently abandoned) along 20th Street from Broadway to Colorado Avenue to divert sewer flows from the Broadway 21-inch VCP sewer line to the Colorado Avenue 21-inch Vylon sewer line.

<u>Potential Additional Upgrades Related to Building S4</u>

The S4 building is proposed to connect to the existing 18" sewer on Santa Monica Boulevard; however, during the design phase it may be determined that it is infeasible to route the sewage from the southern portion of Building S4 to the north to connect to the existing sewer line in Santa Monica Boulevard. In

this case, prior to issuance of Certificate of Occupancy for Site S4, a new adequately-sized sewer line will be constructed and run south from Building S4 to Broadway along the South Campus East Driveway and South East Driveway. The adequately-sized sewer line will not exceed the hydraulic planning criteria on page 47 in the City's 2017 Sanitary Sewer System Master Plan (shown above). The primary criteria used to establish adequately-sized sewer piping is if the PWWF depth to diameter ratio is less than 0.75, and if the minimum velocity is 2 ft/s.

The City, based on its review of this preliminary sewer study, has indicated that, prior to issuance of a Certificate of Occupancy for the S4 building, additional sewer upgrades may be necessary and may include, but are not limited to:

(a) If not already completed as part of the S3 development, installing a new adequately-sized sewer line(s) along Broadway and 20th Street to convey sewer flows generated by S4 to the Colorado Avenue 24-inch Vylon sewer line (if Saint John's sewer discharge to Broadway from Site S4 to a maximum of 21,200 GPD, the extent of any upgrades may be reduced or eliminated) or;

(b) If not already completed as part of the S3 development, upsizing the existing 12-inch sewer on Broadway to 18-inch from 21st Street to 20th Street, restricting sewer discharge to Broadway from Site S4 to a maximum of 21,200 GPD, and re-activating and placing in service the existing 12-inch VCP line (currently abandoned) along 20th Street from Broadway to Colorado Avenue to divert sewer flows from the Broadway 21-inch VCP sewer line to the Colorado Avenue 21-inch Vylon sewer line.

<u>Potential Additional Upgrades Related to Building 2C</u>

Prior to the issuance of the building permit for the 2C building, additional sewer monitoring will be required to determine if future project flows (during dry and wet weather conditions) will cause the City's 12-inch line on Santa Monica Boulevard to exceed the hydraulic planning criteria on page 47 in the City's 2017 Sanitary Sewer Master Plan (included above). The primary criteria used to establish adequately-sized sewer piping is if the PWWF depth to diameter ratio is less than 0.75, and if the minimum velocity is 2 ft/s.

The City, based on its review of this preliminary sewer study, has indicated that, prior to issuance of a Certificate of Occupancy for the 2C building, additional sewer upgrades may be necessary and may include, but are not limited to:

(a) upsizing the existing 12-inch sewer line on Santa Monica Boulevard from the 2C connection to 20th Street
(b) upsizing the existing 21-inch sewer line along 20th Street, from Santa Monica Boulevard to Broadway.

Flow Monitoring Results Summary

20th Street 12" sewer main

Data recorded from 4/20/17 to 5/3/17
Minimum depth = 1.79 in.
Maximum depth = 4.21 in.
Average depth = 2.75 in.

Santa Monica Boulevard 12" sewer main

Data recorded from 4/20/17 to 5/3/17
Minimum depth = 1.14 in.
Maximum depth = 8.58 in.
Average depth = 2.84 in.

Broadway 12" sewer main

Data recorded from 4/20/17 to 5/3/17
Minimum depth = 1.32 in.
Maximum depth = 4.95 in.
Average depth = 2.20 in.

For complete flow monitoring results see report "Providence Saint John's Health Center, Flow Monitoring Report, April 20, 2017 – May 3, 2017" by ADS Environmental Services found in Appendix D.

Sewage Demand from Proposed Buildings

In order to determine the sewage demand for the Phase II project, sewage generation factors (SGFs) provided in the LA "Sewerage Facilities Charge Sewage Generation Factor for Residential and Commercial Categories" table that resemble the Development Agreement Vested Uses of the buildings were used. In some instances, the Development Agreement Vested Use category was not found in the LA SGF table so the given description in the attached "Blue Chart", which can be found in Appendix F, was used to find an appropriate SGF.

Because some of the Development Agreement Vested Uses allow for a range of activities with varying sewage generation factors, two sewage generation scenarios were developed. As discussed in detail below, the most significant difference between the two tables are the assumptions pertaining to the Hospital/Health Care uses within Buildings 2C and 2D/E. Table 2 assumes that Buildings 2C and 2D/E are both inpatient facilities with ground floor commercial uses while Table 3 assumes that Buildings 2C and 2D/E are ambulatory/outpatient facilities.

Table 2 – Estimated Sewage Demand from Proposed Buildings: Option 1

Building/Parking	Area /Dwelling Units	Units	LA SGF Use[1]	SGF[1]	Avg Flow (GPD)	Accepting MH[2]	Discharge Sewer
2C - Building	80	beds	Hospital	70/bed	5,600.00	MH02E	12" on Santa Monica Blvd.
2C - Building	5,500	sf	Commercial Use	50/1000 Gr.Sq.ft.	275.00	MH02E	
2C- Parking	118,265	sf	Auto Parking	20/1000 Gr. Sq. ft.	2,365.30	MH02E	
Mullin Café	1,500	sf	Restaurant	300/1000 Gr.Sq.ft.	450.00	MH02E	
SJ Café	900	sf	Restaurant	300/1000 Gr.Sq.ft.	270.00	MH02E	
						Total to MH02E (GPD)	8,960
2I - Building	50,000	sf	Medical Office/ Clinic	250/1000 Gr. Sq. ft.	12,500.00	MH02N	12" on 20th St.
2I - Building	4,500	sf	Commercial Use	50/1000 Gr.Sq.ft.	225.00	MH02N	
2I - Parking	137,828	sf	Auto Parking	20/1000 Gr. Sq. ft.	2,756.56	MH02N	
						Total to MH02N (GPD)	15,482
2D/E - Building	36	beds	Hospital	70/bed	2,520.00	MH05	18" on Santa Monica Blvd.
2D/E - Building	3,000	sf	Commercial Use	50/1000 Gr.Sq.ft.	150.00	MH05	
2D/E - Parking	115,729	sf	Auto Parking	20/1000 Gr. Sq. ft.	2,314.58	MH05	
S1- Building	25,500	sf	Counseling Center	120/1000 Gr. Sq. ft.	3,060.00	MH05	Relocated line in 20th Pl.
S1- Building	73	person	School: Nursery Day Care	9/person	657.00	MH05	
S1/S3- Parking	303,973	sf	Auto Parking	20/1000 Gr. Sq. ft.	6,079.46	MH05	
S2 - Building	10	units	Residential: Apt. - 2 Bedroom	150/dwelling Unit	1,500.00	MH05	12" on Broadway
S2- Building	800	sf	Commercial Use	50/1000 Gr.Sq.ft.	40.00	MH05	
S2 - Parking	23,987	sf	Auto Parking	20/1000 Gr. Sq. ft.	479.74	MH05	
S3 - Building[1]	58,000	sf	Medical: Lab in Hospital	250/1000 Gr. Sq. ft.	14,500.00	MH05	Relocated line in 20th Pl.
S3 - Building	65,000	sf	Medical Office/ Clinic	250/1000 Gr. Sq. ft.	16,250.00	MH05	
S4 - Building	250	seats	Auditorium	3/seat	750.00	MH05	18" on Santa Monica Blvd
S4 - Building	133,300	sf	Medical Office/ Clinic	250/1000 Gr.Sq.ft	33,325.00	MH05	
S4 - Building	3,350	sf	Restaurant	300/1000 Gr.Sq.ft.	1,005.00	MH05	
S4 - Building	3,350	sf	Commercial Use	50/1000 Gr.Sq.ft.	167.50	MH05	
S4 - Building	50,350	sf	Office	120/1000 Gr.Sq.ft.	6,042.00	MH05	
S4/S5 - Parking	462,429	sf	Auto Parking	20/1000 Gr. Sq. ft.	9,248.58	MH05	
S5 - Building	4	units	Residential: Apt - 1 Bed/2Ba	150/dwelling Unit	600.00	MH05	12" on Broadway
S5 - Building	18	units	Residential: 1 Bed no kitchen	45/BDR	810.00	MH05	
S5 - Building	12	units	Residential: Apt - 1 Bed/1Ba	110/dwelling Unit	1,320.00	MH05	
						Total to MH05 (GPD)	100,819

[1]Use and Sewage Generation Factors from City of Los Angeles Sewerage Facilites Charge Guide, Residential and Commercial Categories. Document can be found in Appendix B.

[2] MH Designation can be found in Appendix A.

Building 2C has vested uses of Hospital/Health Care, Restaurant or Neighborhood Commercial, Pedestrian Connection, and Parking. The *Hospital* SGF of 70 GPD/Bed was used for the Hospital/Health Care vested use based on the assumption this square footage would be use for inpatient beds, the *Commercial* SGF of 50 GPD/1,000 Gr SF was used for the Restaurant or Neighborhood Commercial vested use, and no SGF was used for the Pedestrian Connection since there will not be any sewage generated from this use.

Both Mullin Café and Saint John's Café will be designated as Restaurant or Neighborhood Commercial vested use. In order to be conservative, the *Restaurant* SGF of 300 GPD/ 1,000 Gr SF was used for both of these buildings.

Building 2I has vested uses of Medical Office, Restaurant or Neighborhood Commercial, and Parking. The *Medical Office/Clinic* SGF of 250 GPD/ 1,000 Gr SF was used for the Medical Office vested use and the *Commercial* SGF of 50 GPD/1,000 Gr SF was used for the Restaurant of Neighborhood Commercial vested use.

Building 2D/E has vested uses of Hospital/Health Care, Restaurant or Neighborhood Commercial, Pedestrian Connection, and Parking. The *Hospital* SGF of 70 GPD/Bed was used for the Hospital/Health Care vested use, the *Commercial* SGF of 50 GPD/1,000 Gr SF was used for the Restaurant or Neighborhood Commercial vested use, and no SGF was used for the Pedestrian Connection since there will not be any sewage generated from this use.

Building S1 has vested uses of Child & Family Development Center, Day Care, and Parking. The *Counseling Center* SGF of 120 GPD/ 1,000 Gr SF was used for the Child & Family Development Center vested use based on the description of the vested use and the *School: Nursery Day Care* SGF of 9 GPD/person was used for the Day Care vested use.

Building S2 has vested uses of Multifamily Housing, Restaurant or Neighborhood Commercial Uses, and Parking. The *Residential: Apt. – 2 Bedroom* SGF of 150 GPD/dwelling unit was used for the Multifamily Housing vested use based on the description of the vested use, and the *Commercial* SGF of 50 GPD/1,000 Gr SF was used for the Restaurant or Neighborhood Commercial vested use.

Building S3 has vested uses of Hospital/Health Care, Medical Research Facilities, Restaurant or Neighborhood Commercial, and Parking. The *Medical Office/Clinic* SGF of 250 GPD/1,000 Gr SF was used for the Hospital/Health Care vested use based on the description of the vested use, and the *Medical: Lab in Hospital* SGF of 250 GPD/1,000 Gr SF was used for the Medical Research Facilities vested use. The report assumes that the entire building will be in medical use with (a) the maximum allowable floor area for the Hospital/Health Care vested use in Building S3 (65,000 square feet) assumed and (b) the remainder of the building as Medical Research Facilities. The exact breakdown between these two uses does not matter from a sewer demand perspective because both uses have the same sewer generation factor. If any of the building's ground floor square footage is used for the Restaurant or Neighborhood

Commercial use rather than medical use, the building's sewer demand would likely be lower than projected.

Building S4 has vested uses of Education & Conference Center, Hospital/Health Care, Health & Wellness Center, Medical Research Facilities, Restaurant or Neighborhood Commercial Use, and Parking. The *Auditorium* SGF of 3 GPD/seat was used for the approximately 8,650 square-foot auditorium included in the Education & Conference Center vested use, the *Office Building* SGF of 120 GPD/1,000 Gr SF was used for the remaining 50,350 square feet of Education & Conference Center vested use, the *Medical Office/Clinic* SGF of 250 GPD/1,000 Gr SF was used for both the Hospital/Health Care and Health & Wellness Center vested uses, and the Restaurant or Neighborhood Commercial vested use was split into the *Restaurant* SGF of 300 GPD/1,000 Gr SF and *Commercial* SGF of 50 GPD/1,000 Gr SF.

Building S5 has vested uses of Visitor Housing and Parking. The Visitor Housing vested use was broken down into *Residential: Apt. – 1Bed/2Ba*, *Residential: Apt. – 1Bed no kitchen*, and *Residential: Apt. – 1Bed/1Ba* based on the description of the vested use.

The parking on all Phase II sites was assigned the *Auto Parking* SGF of 20 GPD/1,000 Gr SF. The parking SGF could account for any runoff from floor drains that may be within the structure.

Table 3 – Estimated Sewage Demand from Proposed Buildings: Option 2

Building/Parking	Area /Dwelling Units	Units	LA SGF Use[1]	SGF[1]	Avg Flow (GPD)	Accepting MH[2]	Discharge Sewer
2C - Building	117,500	sf	Medical Office/ Clinic	250/1000 Gr. Sq. ft.	29,375.00	MH02E	12" on Santa Monica Blvd
2C- Parking	118,265	sf	Auto Parking	20/1000 Gr. Sq. ft.	2,365.30	MH02E	
Mullin Café	1,500	sf	Restaurant	300/1000 Gr.Sq.ft.	450.00	MH02E	
SJ Café	900	sf	Restaurant	300/1000 Gr.Sq.ft.	270.00	MH02E	
						Total to MH02E (GPD)	32,460
2I - Building	50,000	sf	Medical Office/ Clinic	250/1000 Gr. Sq. ft.	12,500.00	MH02N	12" on 20th St.
2I - Building	4,500	sf	Commercial Use	50/1000 Gr.Sq.ft.	225.00	MH02N	
2I - Parking	137,828	sf	Auto Parking	20/1000 Gr. Sq. ft.	2,756.56	MH02N	
						Total to MH02N (GPD)	15,482
2D/E - Building	78,500	sf	Medical Office/ Clinic	250/1000 Gr. Sq. ft.	19,625.00	MH05	18" on Santa Monica Blvd
2D/E - Parking	115,729	sf	Auto Parking	20/1000 Gr. Sq. ft.	2,314.58	MH05	
S1- Building	25,500	sf	Counseling Center	120/1000 Gr. Sq. ft.	3,060.00	MH05	Relocated line on 20th Pl.
S1- Building	73	person	School: Nursery Day Care	9/person	657.00	MH05	
S1/S3- Parking	303,973	sf	Auto Parking	20/1000 Gr. Sq. ft.	6,079.46	MH05	
S2 - Building	10	units	Residential: Apt. - 2 Bedroom	150/dwelling Unit	1,500.00	MH05	12" on Broadway
S2- Building	800	sf	Commercial Use	50/1000 Gr.Sq.ft.	40.00	MH05	
S2 - Parking	23,987	sf	Auto Parking	20/1000 Gr. Sq. ft.	479.74	MH05	
S3 - Building[1]	58,000	sf	Medical: Lab in Hospital	250/1000 Gr. Sq. ft.	14,500.00	MH05	Relocated line on 20th Pl.
S3 - Building	65,000	sf	Medical Office/ Clinic	250/1000 Gr. Sq. ft.	16,250.00	MH05	
S4 - Building	250	seats	Auditorium	3/seat	750.00	MH05	18" on Santa Monica Blvd
S4 - Building	155,000	sf	Medical Office/ Clinic	250/1000 Gr.Sq.ft	38,750.00	MH05	
S4 - Building	35,350	sf	Office	120/1000 Gr.Sq.ft.	4,242.00	MH05	
S4/S5 - Parking	462,429	sf	Auto Parking	20/1000 Gr. Sq. ft.	9,248.58	MH05	
S5 - Building	34	units	Residential: Apt - 1 Bed/2Ba	150/dwelling Unit	5,100.00	MH05	12" on Broadway
						Total to MH05 (GPD)	122,596

Table 3 generally provides the most conservative sewer generation assumptions for each Phase II building and therefore provides a "worst case scenario" of sewage generation for Phase II.

Building 2C has vested uses of Hospital/Health Care, Restaurant or Neighborhood Commercial, Pedestrian Connection, and Parking. The *Medical Office/Clinic* SGF of 250 GPD/1,000 Gr SF was used for the Hospital/Health Care vested use based on the assumption that 2C would be an ambulatory/outpatient facility. In addition, while there is a possibility of ground floor commercial use, the entire building was assumed to be in Hospital/Health Care use to provide a conservative sewer demand. As with the assumption for this building in Table 2, no SGF was used for the Pedestrian Connection since there will not be any sewage generated from this use.

Building 2D/E has vested uses of Hospital/Health Care, Restaurant or Neighborhood Commercial, Pedestrian Connection, and Parking. The *Medical Office/Clinic* SGF of 250 GPD/1,000 Gr SF was used for the Hospital/Health Care vested use based on the assumption that 2C would be an ambulatory/outpatient facility. In addition, while there is a possibility of ground floor commercial use, the entire building was assumed to be in Hospital/Health Care use to provide a Medical conservative sewer demand. As with the assumption for this building in Table 2, no SGF was used for the Pedestrian Connection since there will not be any sewage generated from this use.

Building S4 has vested uses of Education & Conference Center, Hospital/Health Care, Health & Wellness Center, Medical Research Facilities, Restaurant or Neighborhood Commercial Use, and Parking. However, Table 3 assumes that the entire Building S4, except for the 250 seats for the auditorium portion of the Education & Conference Center use (*Auditorium* SGF of 3 GPD/seat) and 35,350 sf of Education & Conference Center vested use that is proposed for smaller education/training conference rooms and administrative space (*Office Building* SGF of 120 GPD/1,000 Gr SF), is in Hospital/Health Care use with the *Medical Office/Clinic* SGF of 250 GPD/1,000 Gr SF. This assumption is conservative since up to 6,700 sf of ground floor commercial use is anticipated and the Education & Conference Center use, may require more square footage but not more seats.

For Building S5, while there is a possibility of units with no kitchen or only 1 bathroom, 1 bedroom/2bathroom units were assumed in this table for the entire building to allow for a more conservative sewer demand.

Any proposed building that is not explicitly mentioned above has used the same assumptions as in Table 2.

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Sewer Depth Capacity Analysis

Table 4 – Capacity Depth Existing vs Proposed

Test Site	Pipe Size	Recorded Existing Peak Daily Sewage Demand (GPD)	Existing Depth (inches)	Existing Percent Full %	Proposed Building Daily Sewage Demand Option 1 (Gross) (GPD)[4]	Proposed Building Daily Sewage Demand Option 2 (Gross) (GPD)[4]	Demolished Buildings Daily Sewage Demand (GPD)	Total Proposed Daily Sewage Demand Option 1 (Net) (GPD)	Total Proposed Daily Sewage Demand Option 2 (Net) (GPD)	Additional Depth from Proposed Development Option 1[3] (inches)	Additional Depth from Proposed Development Option 2[3] (inches)	Total Proposed Depth Option 1 (inches)	Total Proposed Depth Option 2 (inches)	Percent Full Option 1 %	Percent Full Option 2 %	Proposed Buildings Being Served
Manhole 2E Santa Monica Blvd at 20th St. [1]	12 in	1,039,000	8.58	71.5%	8,960	32,460	1,651	7,309	30,809	0.6	1.08	9.18	9.66	76.5%	80.5%	2C, Mullin Café, Saint Johns Cafe
Manhole 2E Santa Monica Blvd at 20th St. (w/out outlier)[2]	12in	390,000	5.75	47.9%	8,960	32,460	1,651	7,309	30,809	0.6	1.08	6.35	6.83	52.9 %	56.9%	2C, Mullin Café, Saint Johns Cafe
Manhole 2N 20th St. at Santa Monica Boulevard	12 in	826,000	4.21	35.1%	15,482	15,482	0	15,482	15,482	0.84	D0.84	5.05	5.05	42.1%	42.1%	2I
Manhole 5 Broadway 200 FT north of 20th St.	12 in	997,000	4.95	41.3%	100,819	122,596	14,729	86,090	107,867	1.8	2.04	6.75	6.99	56.3%	58.3%	2D/E, S1, S2, S3, S4, S5

[1] The existing depth and flow in this row are the recorded maximum flows that are within the ADS flow monitoring report. However, they are potential outliers and may not be representative of the actual max flows. This event occurred on May 3rd, 2017, just before 3 pm for less than 30 min. It was the only event of its kind to occur during the 14 day monitoring period.

[2] If the above measurement is an outlier and not representative of the MH flows, the following depth and flow should be taken as the existing maximum depth and flow for MH02E. Existing Depth and Flow are obtained from Page 37 of the ADS Providence Saint John's Health Center Flow Monitoring Report April 20, 2017 – May 3, 2017 found in Appendix D.

[3] Additional Proposed Depth calculations can be found in Appendix C.

Table 4 above assesses the depth of the public sewers during peak sewage generation in the existing condition vs the proposed condition. This study is based on the City of Santa Monica dry weather design criteria which states that the depth to diameter ratio (d/D) for a 12" pipe cannot be greater than 0.5. Based on this criteria only Manhole 2N will have sufficient capacity for the proposed development sewage generation. Manholes 2E and 5 will be 75.5%/80.5% and 56.3%/58.3% full, respectively under the two analysis options. The City will corroborate this analysis with a wet-weather analysis using their hydraulic model of the City sewer network and using a wet weather design criteria as outlined on page 5 of this report. The City has reviewed this preliminary sewer study and, based on its review of this preliminary sewer study and these results, has indicated that sewer upgrades may be required. For a description of these potential sewer upgrades, please refer to the Proposed Infrastructure Improvements section beginning on page 4.

The table below summarizes the total gross and net sewage generation for each of the two options.

Option	Gross Sewage Generation	Net Sewage Generation
Option 1	125,261 GPD	108,881 GPD
Option 2	170,538 GPD	154,158 GPD

Baseline Original Phasing

The proposed development of Saint John's Health Center will be constructed in multiple phases. The Baseline Original option for this phased buildout is constructing buildings S1, S2 and S3 first. The remaining buildings would be constructed in the stages as shown in Table 5. The table shows how the sewer lines would be affected after each subsequent stage has been completed.

As shown in the table below, during the first two stages the pipes along Broadway and Santa Monica Blvd would be less than 69.5% full. The pipe along Santa Monica Blvd would be 76.5% full in Option 1 and 80.5% full in Option 2 after Stage C if the recorded spike at manhole 2E is considered or 52.9% full in Option 1 and 56.9% in Option 2 if the spike is not considered. For all other pipes, the capacity does not exceed 58.3% throughout all of the stages. Supporting calculations can be found in Appendix C.

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Table 5 – Baseline Original Phasing

Test Site	Pipe Size	Recorded Existing Peak Daily Sewage Demand (GPD)	Existing Depth (inches)	Existing Percent Full %	Proposed Building Cumulative Daily Sewage Demand Option 1 (Gross) (GPD)[4,5]	Proposed Building Cumulative Daily Sewage Demand Option 2 (Gross) (GPD)[4,5]	Demolished Buildings Cumulative Daily Sewage Demand (GPD)[5]	Total Proposed Daily Sewage Demand Option 1 (Net) (GPD)	Total Proposed Daily Sewage Demand Option 2 (Net) (GPD)	Additional Depth from Proposed Development Option 1 (inches)[3]	Additional Depth from Proposed Development Option 2 (inches)[3]	Total Proposed Depth Option 1 (inches)	Total Proposed Depth Option 2 (inches)	Percent Full Option 1 %	Percent Full Option 2 %	Proposed Buildings Being Served
Stage A – Buildings S1/S2/S3																
Manhole 5 Broadway 200 FT north of 20th St.	12 in	997,000	4.95	41.3%	42,566	42,566	669	41,897	41,897	1.32	1.32	6.27	6.27	52.3%	52.3%	2D/E, S1, S2, S3, S4, S5
Stage B – Building 2I[6]																
Manhole 2N 20th St. at Santa Monica Blvd	12 in	826,000	4.21	35.1%	15,482	15,482	0	15,482	15,482	0.84	0.84	5.05	5.05	42.1%	42.1%	2I
Manhole 2E Santa Monica Blvd at 20th St. [1,7]	12 in	1,039,000	8.58	71.5%	0	0	1,651	-1,651	-1,651	-0.24	-0.24	8.34	8.34	69.5%	69.5%	2C, Mullin Café, Saint John's Cafe
Manhole 2E Santa Monica Blvd at 20th St. (w/out outlier)[2,7]	12in	390,000	5.75	47.9%	0	0	1,651	-1,651	-1,651	-0.24	-0.24	5.51	5.51	45.9%	45.9%	2C, Mullin Café, Saint John's Cafe
Stage C – Building 2C																
Manhole 2E Santa Monica Blvd at 20th St. [1]	12 in	1,039,000	8.58	71.5%	8,240	31,740	1,651	6,589	30,089	0.6	1.08	9.18	9.66	76.5%	80.5%	2C, Mullin Café, Saint John's Cafe
Manhole 2E Santa Monica Blvd at 20th St. (w/out outlier)[2]	12in	390,000	5.75	47.9%	8,240	31,740	1,651	6,589	30,089	0.6	1.08	6.35	6.83	52.9%	56.9%	2C, Mullin Café, Saint John's Cafe
Stage D – Buildings S4 and S5																
Manhole 5 Broadway 200 FT north of 20th St.	12 in	997,000	4.95	41.3%	95,834	100,657	13,433	82,401	87,224	1.8	1.8	6.75	6.75	56.3%	56.3%	2D/E, S1, S2, S3, S4, S5
Stage E – Buildings 2D/E, Mullin & SJ Cafe																
Manhole 5 Broadway 200 FT north of 20th St.	12 in	997,000	4.95	41.3%	100,819	122,596	14,729	86,090	107,867	1.8	2.04	6.75	6.99	56.3%	58.3%	2D/E, S1, S2, S3, S4, S5
Manhole 2E Santa Monica Blvd at 20th St. [1]	12 in	1,039,000	8.58	71.5%	8,960	32,460	1,651	7,309	30,809	0.6	1.08	9.18	9.66	76.5%	80.5%	2C, Mullin Café, Saint John's Cafe
Manhole 2E Santa Monica Blvd at 20th St. (w/out outlier)[2]	12in	390,000	5.75	47.9%	8,960	32,460	1,651	7,309	30,809	0.6	1.08	6.35	6.83	52.9%	56.9%	2C, Mullin Café, Saint John's Cafe

[1] The existing depth and flow in this row are the recorded maximum flows that are within the ADS flow monitoring report. However, they are potential outliers and may not be representative of the actual max flows. This event occurred on May 3rd, 2017, just before 3 pm for less than 30 min. It was the only event of its kind to occur during the 14 day monitoring period.

[2] If the above measurement is an outlier and not representative of the MH flows, the following depth and flow should be taken as the existing maximum depth and flow for MH02E. Existing Depth and Flow are obtained from Page 37 of the ADS Providence Saint John's Health Center Flow Monitoring Report April 20, 2017 – May 3, 2017 found in Appendix D.

[3] Additional Proposed Depth calculations can be found in Appendix C.

[4] Proposed Daily Sewage Demand calculations can be found in Appendix B.

[5] Throughout each stage, the flow values of the buildings being constructed/demolished in that stage get added to the corresponding manhole values from the previous stages.

[6] Building 2I adds flow to manhole 2N. The building being demolished in its place originally adds flow to manhole 2E.

[7] The values for total proposed and additional depth are negative because in this stage only a demolished building is affecting the manhole, therefore flow and depth is being removed.

Baseline Alternate Phasing

As mentioned above, the proposed development of Saint John's Health Center will be constructed in multiple phases. A second option for this phased buildout is constructing buildings 2C and S2 first and then constructing the remaining buildings in the stages as shown in Table 6. The table demonstrates how the existing sewer lines would be affected after each subsequent stage has been completed.

As shown in the table below, since no existing buildings will be demolished during the first phase of construction the pipe along Santa Monica Blvd would be 76.5% full in Option 1 and 80.5% full in Option 2 if the recorded spike at manhole 2E is considered or 52.9% full in Option 1 and 56.9% full in Option 2 if the spike is not considered. This sewer demand would continue until the existing buildings are demolished as part of Stage B; this stage would remove existing demand from the sewer but the demand is not significant enough to affect the level in the sewer. Supporting calculations can be found in Appendix C.

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Table 6 – Baseline Alternate Phasing

Test Site	Pipe Size	Recorded Existing Peak Daily Sewage Demand (GPD)	Existing Depth (inches)	Existing Percent Full %	Proposed Building Cumulative Daily Sewage Demand Option 1 (Gross) (GPD)[4]	Proposed Building Cumulative Daily Sewage Demand Option 2 (Gross) (GPD)[4]	Demolished Buildings Cumulative Daily Sewage Demand (GPD)[4]	Total Proposed Daily Sewage Demand Option 1 (Net) (GPD)	Total Proposed Daily Sewage Demand Option 2 (Net) (GPD)	Additional Depth from Proposed Development Option 1 (inches)[3]	Additional Depth from Proposed Development Option 2 (inches)[3]	Total Proposed Depth Option 1 (inches)	Total Proposed Depth Option 2 (inches)	Percent Full Option 1 %	Percent Full Option 2 %	Proposed Buildings Served
Stage C – Building 2C and S2																
Manhole 2E Santa Monica Blvd at 20th St.[1]	12 in	1,039,000	8.58	71.5%	8,240	31,740	0	8,240	31,740	0.6	1.08	9.18	9.66	76.50%	80.50%	2C, Mullin Café, Saint John's Cafe
Manhole 2E Santa Monica Blvd at 20th St. (w/out outlier)[2]	12in	390,000	5.75	47.9%	8,240	31,740	0	8,240	31,740	0.6	1.08	6.35	6.83	52.90%	56.90%	2C, Mullin Café, Saint John's Cafe
Manhole 5 Broadway 200 FT north of 20th St.	12 in	997,000	4.95	41.3%	2,020	2,020	0	2,020	2,020	0.36	0.36	5.31	5.31	44.30%	44.30%	2D/E, S1, S2, S3, S4, S5
Stage A – Buildings S1 and S3																
Manhole 5 Broadway 200 FT north of 20th St.	12 in	997,000	4.95	41.3%	42,566	42,566	669	41,897	41,897	1.32	1.32	6.27	6.27	52.30%	52.30%	2D/E, S1, S2, S3, S4, S5
Stage B – Building 2I[5]																
Manhole 2N 20th St. at Santa Monica Blvd	12 in	826,000	4.21	35.1%	15,482	15,482	0	15,482	15,482	0.84	0.84	5.05	5.05	42.10%	42.10%	2I
Manhole 2E Santa Monica Blvd at 20th St.[1]	12 in	1,039,000	8.58	71.5%	8,240	31,740	1,651	6,589	30,089	0.6	1.08	9.18	9.66	76.5%	80.5%	2C, Mullin Café, Saint John's Cafe
Manhole 2E Santa Monica Blvd at 20th St. (w/out outlier)[2]	12in	390,000	5.75	47.9%	8,240	31,740	1,651	6,589	30,089	0.6	1.08	6.35	6.83	52.9%	56.9%	2C, Mullin Café, Saint John's Cafe
Stage D – Buildings S4 and S5																
Manhole 5 Broadway 200 FT north of 20th St.	12 in	997,000	4.95	41.3%	97,854	102,677	13,433	84,421	89,244	1.8	2.04	6.63	6.99	55.30%	58.25%	2D/E, S1, S2, S3, S4, S5
Stage E – Buildings 2D/E, Mullin & SJ Cafe																
Manhole 5 Broadway 200 FT north of 20th St.	12 in	997,000	4.95	41.3%	100,819	122,596	14,729	86,090	107,867	1.8	2.16	6.75	7.11	56.30%	59.25%	2D/E, S1, S2, S3, S4, S5
Manhole 2E Santa Monica Blvd at 20th St.[1]	12 in	1,039,000	8.58	71.5%	8,960	32,460	1,651	7,309	30,809	0.6	1.08	9.18	9.66	76.5%	80.5%	2C, Mullin Café, Saint John's Cafe
Manhole 2E Santa Monica Blvd at 20th St. (w/out outlier)[2]	12in	390,000	5.75	47.9%	8,960	32,460	1,651	7,309	30,809	0.6	1.08	6.35	6.83	52.9%	56.9%	2C, Mullin Café, Saint John's Cafe

[1] The existing depth and flow in this row are the recorded maximum flows that are within the ADS flow monitoring report. However, they are potential outliers and may not be representative of the actual max flows. This event occurred on May 3rd, 2017, just before 3 pm for less than 30 min. It was the only event of its kind to occur during the 14 day monitoring period.

[2] If the above measurement is an outlier and not representative of the MH flows, the following depth and flow should be taken as the existing maximum depth and flow for MH02E. Existing Depth and Flow are obtained from Page 37 of the ADS Providence Saint John's Health Center Flow Monitoring Report April 20, 2017 – May 3, 2017 found in Appendix D.

[3] Additional Proposed Depth calculations can be found in Appendix C.

[4] Throughout each stage, the flow values of the buildings being constructed/demolished in that stage get added to the corresponding manhole values from the previous stages.

[5] Building 2I adds flow to manhole 2N. The building being demolished in its place originally adds flow to manhole 2E.

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APPENDIX A

EXHIBIT 1

EXHIBIT 2

SEWER SERVICE

LEGEND:

EXISTING SEWER LINE — SS

PROPOSED RELOCATION OF SEWER LINE: — SS

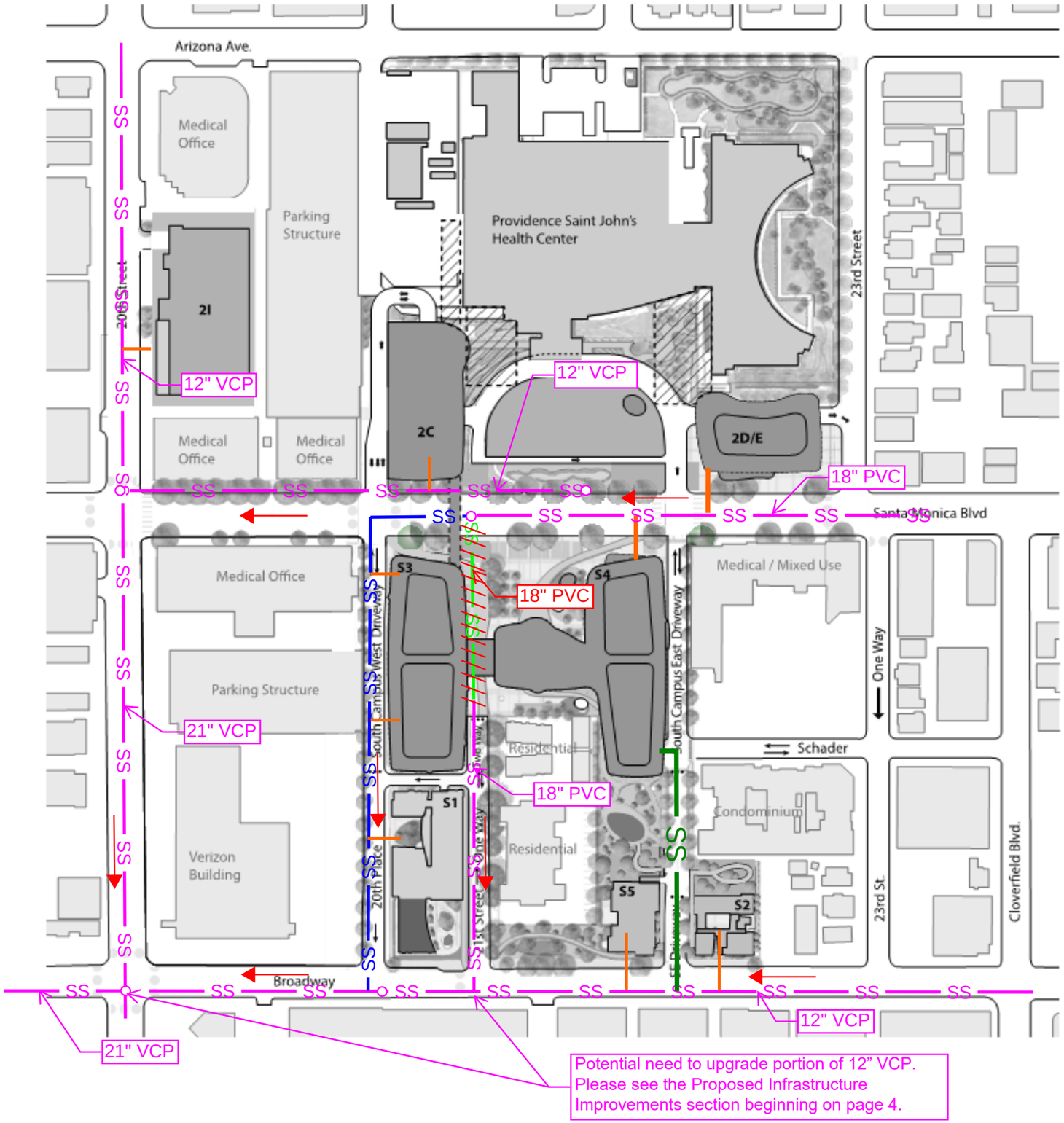
POSSIBLE LATERAL LOCATIONS:

SEWER LINE TO BE REMOVED: ////// SS ///

POSSIBLE S4 ROUTING: — SS

NOTE: LOCATION OF EXISTING AND PROPOSED SERVICES ARE APPROXIMATE LOCATIONS AND ARE SCHEMATIC. PLEASE CONSULT ASBUILTS AND SURVEY FOR MORE ACCURATE LOCATION.

The project consists of the removal of the existing 18" PVC sewer line in the north half of 21st Street to accommodate for the proposed subterranean parking of Building S4 . The line will be capped at the extent of the removal. To accept the flow from Building S1 and S3 a new sewer line is proposed in the proposed 20th Place and South Campus West Driveway. The line will connect to an existing Manhole in Santa Monica Blvd, run West along Santa Monica Blvd and turn south along the proposed 20th Place to connect to an existing 12" VCP in Broadway Avenue. The proposed line is essentially parallel to the existing 18" PVC line in 21st Street. It is believed that if the existing 18" PVC flows adequately that the proposed adjacent parallel line in 20th Place should do the same. During design, it may become infeasible to route the sewage from the south most portion of Building S4 to the North to connect to the existing sewer line in Santa Monica Blvd. If this becomes the case, a sewer line is proposed to run from the south of S4, along SE Driveway and connect into the existing sewer main in Broadway. Prior to the issuance of a building permit for Buildings S3, S4, and 2C, additional sewer monitoring will be required to determine whether additional upgrades are needed. Please see the Proposed Infrastructure Improvements section beginning on page 4.



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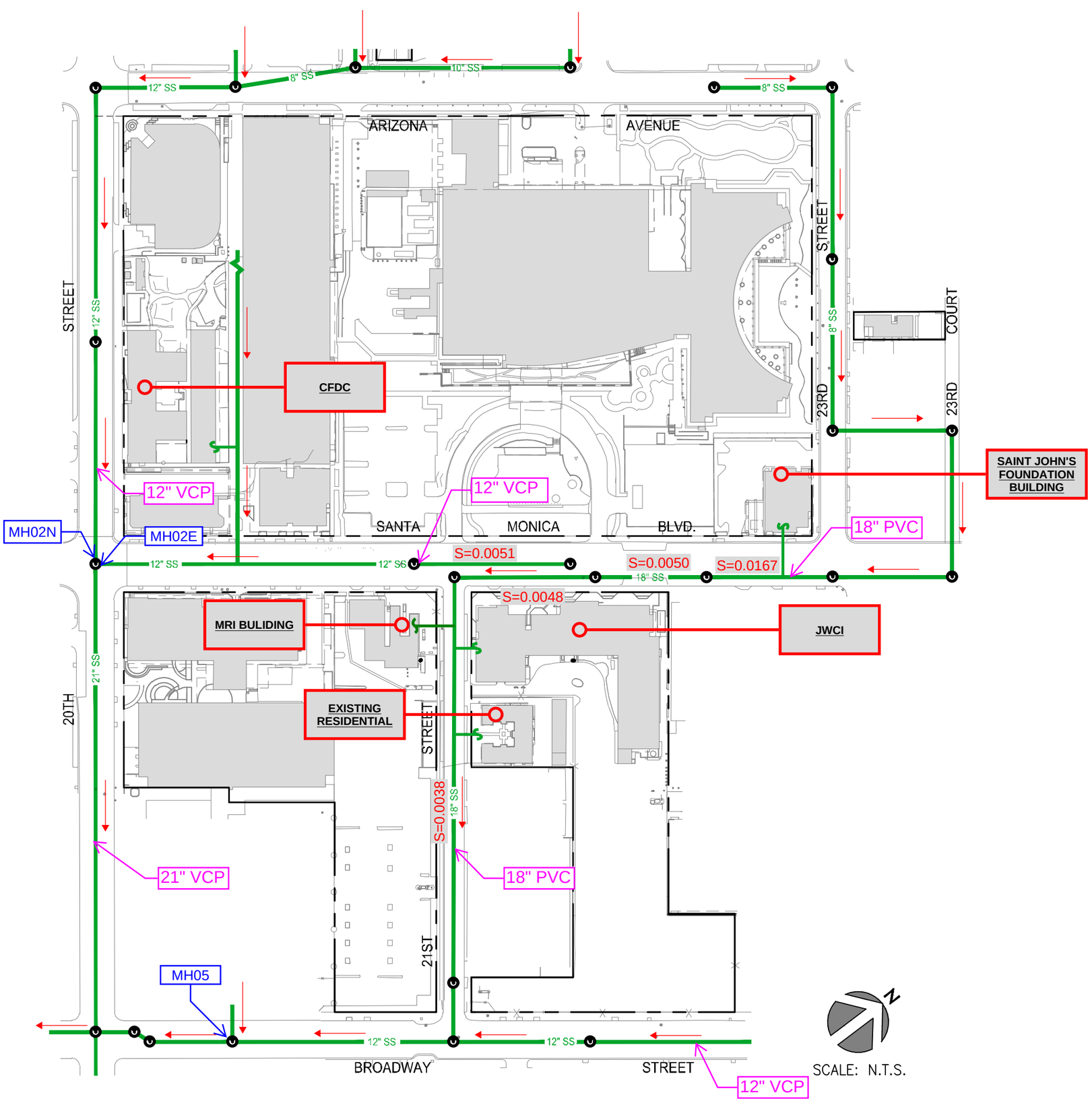

EXHIBIT 2
DEMOLISHED BUILDINGS SEWAGE DEMAND
DATE: 08/2018

LEGEND:

EXISTING SEWER LINE — SS —

MANHOLE STRUCTURE:

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APPENDIX B

SEWAGE GENERATION FACTORS

SEWERAGE FACILITIES CHARGE
SEWAGE GENERATION FACTOR FOR
RESIDENTIAL AND COMMERCIAL CATEGORIES

EFFECTIVE DATE: April 6, 2012

Line No.	**FACILITY DESCRIPTION**	**PROPOSED SGF IN GPD**	**BOD (mg/l)**	**SS (mg/l)**
1	Acupuncture Office/Clinic	120/1,000 Gr SF	265	275
2	Arcade - Video Games	50/1,000 Gr SF	265	275
3	Auditorium (a)	3/Seat	265	275
4	Auto Parking (a)	20/1,000 Gr SF	265	275
5	Auto Mfg., Service Maintenance (b)	Actual	1,260	1,165
6	Bakery	280/1,000 Gr SF	3,020	2,540
7	Bank: Headquarters	120/1,000 Gr SF	265	275
8	Bank: Branch	50/1,000 Gr SF	265	275
9	Ballroom	350/1,000 Gr SF	265	275
10	Banquet Room	350/1,000 Gr SF	265	275
11	Bar: Cocktail, Fixed Set (a) (c)	15/Seat	265	275
12	Bar: Juice, No Baking Facilities (d)	720/1,000 Gr SF	265	275
13	Bar: Juice, with Baking Facilities (d)	720/1,000 Gr SF	265	275
14	Bar: Cocktail, Public Table Area (c)	720/1,000 Gr SF	265	275
15	Barber Shop	120/1,000 Gr SF	265	275
16	Barber Shop (s)	15/Stall	265	275
17	Beauty Parlor	425/1,000 Gr SF	265	275
18	Beauty Parlor (s)	50/Stall	265	275
19	Bldg. Const/Field Office (e)	120/Office	265	275
20	Bowling Alley: Alley, Lanes & Lobby Area	50/1,000 Gr SF	265	275
21	Bowling Facility: Arcade/Bar/Restaurant/Dancing	Total	Average	Average
22	Cafeteria: Fixed Seat	30/Seat	1,000	600
23	Car Wash: Automatic (b)	Actual	265	285
24	Car Wash: Coin Operated Bays (b)	Actual	265	285
25	Car Wash: Hand Wash (b)	Actual	265	285
26	Car Wash: Counter & Sales Area	50/1,000 Gr SF	265	275
27	Chapel: Fixed Seat	3/Seat	265	275
28	Chiropractic Office	120/1,000 Gr SF	265	275
29	Church: Fixed Seat	3/Seat	265	275
30	Church School: Day Care/Elem	9/Occupant	265	275
31	Church School: One Day Use (s)	9/Occupant	265	275
32	Cocktail Lounge: Fixed Seat (f)	15/Seat	265	275
33	Coffee House: No Food Preparation (d)	720/1,000 Gr SF	265	275
34	Coffee House: Pastry Baking Only (d)	720/1,000 Gr SF	265	275
35	Coffee House: Serves Prepared Food (d)	25/Seat	1,000	600
36	Cold Storage: No Sales (g)	30/1,000 Gr SF	265	275
37	Cold Storage: Retail Sales (g)	50/1,000 Gr SF	265	275
38	Comfort Station: Public	80/Fixture	265	275
39	Commercial Use (a)	50/1,000 Gr SF	265	275

SEWERAGE FACILITIES CHARGE
SEWAGE GENERATION FACTOR FOR
RESIDENTIAL AND COMMERCIAL CATEGORIES

EFFECTIVE DATE: April 6, 2012

Line No.	FACILITY DESCRIPTION	PROPOSED SGF IN GPD	BOD (mg/l)	SS (mg/l)
40	Community Center	3/Occupant	265	275
41	Conference Room of Office Bldg.	120/1,000 Gr SF	265	275
42	Counseling Center (h)	120/1,000 Gr SF	265	275
43	Credit Union	120/1,000 Gr SF	265	275
44	Dairy	Average Flow	1,510	325
45	Dairy: Barn	Average Flow	1,510	325
46	Dairy: Retail Area	50/1,000 Gr SF	265	275
47	Dancing Area (of Bars or Nightclub) (c)	350/1,000 Gr SF	265	275
48	Dance Studio (i)	50/1,000 Gr SF	265	275
49	Dental Office/Clinic	250/1,000 Gr SF	265	275
50	Doughnut Shop	280/1,000 Gr SF	1,000	600
51	Drug Rehabilitation Center (h)	120/1,000 Gr SF	265	275
52	Equipment Booth	30/1,000 Gr SF	265	275
53	Film Processing (Retail)	50/1,000 Gr SF	265	275
54	Film Processing (Industrial)	Actual	265	275
55	Food Processing Plant (b)	Actual	2,210	1,450
56	Gas Station: Self Service	100/W.C.	265	275
57	Gas Station: Four Bays Max	430/Station	1,950	1,175
58	Golf Course Facility: Lobby/Office/Restaurant/Bar	Total	700	450
59	Gymnasium: Basketball, Volleyball (k)	200/1,000 Gr SF	265	275
60	Hanger (Aircraft)	50/1,000 Gr SF	265	275
61	Health Club/Spa (k)	650/1,000 Gr SF	265	275
62	Homeless Shelter	70/Bed	265	275
63	Hospital	70/Bed	820	1,230
64	Hospital: Convalescent (a)	70/Bed	265	275
65	Hospital: Animal	300/1,000 Gr SF	820	1,230
66	Hospital: Psychiatric	70/Bed	265	275
67	Hospital: Surgical (a)	360/Bed	265	275
68	Hotel: Use Guest Rooms Only (a)	120/Room	265	275
69	Jail	85/Inmate	265	275
70	Kennel: Dog Kennel/Open	100/1,000 Gr SF	265	275
71	Laboratory: Commercial	250/1,000 Gr SF	265	275
72	Laboratory: Industrial	Actual	265	275
73	Laundromat	185/Machine	550	370
74	Library: Public Area	50/1,000 Gr SF	265	275
75	Library: Stacks, Storage	30/1,000 Gr SF	265	275
76	Lobby of Retail Area (l)	50/1,000 Gr SF	265	275
77	Lodge Hall	3/Seat	265	275
78	Lounge (l)	50/1,000 Gr SF	265	275

SEWERAGE FACILITIES CHARGE
SEWAGE GENERATION FACTOR FOR
RESIDENTIAL AND COMMERCIAL CATEGORIES

EFFECTIVE DATE: April 6, 2012

Line No.	FACILITY DESCRIPTION	PROPOSED SGF IN GPD	BOD (mg/l)	SS (mg/l)
79	Machine Shop (No Industrial Waste Permit Required) (b)	50/1,000 Gr SF	265	275
80	Machine Shop (Industrial)	Actual	265	275
81	Mfg or Industrial Facility (No IW Permit Required) (b)	50/1,000 Gr SF	265	275
82	Mfg or Industrial Facility (Industrial)	Actual	265	275
83	Massage Parlor	250/1,000 Gr SF	265	275
84	Medical Building (a)	225/1,000 Gr SF	265	275
85	Medical: Lab in Hospital	250/1,000 Gr SF	340	275
86	Medical Office/Clinic	250/1,000 Gr SF	265	275
87	Mini-Mall (No Food)	50/1,000 Gr SF	265	275
88	Mortuary: Chapel	3/Seat	265	275
89	Mortuary: Embalming	300/1,000 Gr SF	800	800
90	Mortuary: Living Area	50/1,000 Gr SF	265	275
91	Motel: Use Guest Room Only (a)	120/Room	265	275
92	Museum: All Area	30/1,000 Gr SF	265	275
93	Museum: Office Over 15%	120/1,000 Gr SF	265	275
94	Museum: Sales Area	50/1,000 Gr SF	265	275
95	Office Building (a)	120/1,000 Gr SF	265	275
96	Office Bldg w/Cooling Tower	170/1,000 Gr SF	265	275
97	Plating Plant (No IW Permit Required) (b)	50/1,000 Gr SF	265	275
98	Plating Plant (Industrial) (b)	Actual	265	275
99	Pool Hall (No Alcohol)	50/1,000 Gr SF	265	275
100	Post Office: Full Service (m)	120/1,000 Gr SF	265	275
101	Post Office: Private Mail Box Rental	50/1,000 Gr SF	265	275
102	Prisons	175/Inmate	265	275
103	Residential Dorm: College or Residential (n)	70/Student	265	275
104	Residential: Boarding House	70/Bed	265	275
105	Residential: Apt - Bachelor (a)	75/DU	265	275
106	Residential: Apt - 1 BDR (a) (o)	110/DU	265	275
107	Residential: Apt - 2 BDR (a) (o)	150/DU	265	275
108	Residential: Apt - 3 BDR (a) (o)	190/DU	265	275
109	Residential: Apt - >3 BDR (o)	40/BDR	265	275
110	Residential: Condo - 1 BDR (o)	110/DU	265	275
111	Residential: Condo - 2 BDR (o)	150/DU	265	275
112	Residential: Condo - 3 BDR (o)	190/DU	265	275
113	Residential: Condo - >3 BDR (o)	40/BDR	265	275
114	Residential: Duplex/Townhouse - 1 BR (o)	110/DU	265	275
115	Residential: Duplex/Townhouse - 2 BR (o)	150/DU	265	275
116	Residential: Duplex/Townhouse - 3 BR (o)	190/DU	265	275
117	Residential: Duplex/Townhouse - >3 BR (o)	40/BDR	265	275

SEWERAGE FACILITIES CHARGE
SEWAGE GENERATION FACTOR FOR
RESIDENTIAL AND COMMERCIAL CATEGORIES

EFFECTIVE DATE: April 6, 2012

Line No.	FACILITY DESCRIPTION	PROPOSED SGF IN GPD	BOD (mg/l)	SS (mg/l)
118	Residential: SFD - 1 BR (o)	140/DU	265	275
119	Residential: SFD - 2 BR (o)	185/DU	265	275
120	Residential: SFD - 3 BR (o)	230/DU	265	275
121	Residential: SFD - >3 BR (o)	45/BDR	265	275
122	Residential Room Addition: Bedroom (o)	45/BDR	265	275
123	Residential Room Conversion: Into a Bedroom (o)	45/BDR	265	275
124	Residential: Mobile Home	Same as Apt	265	275
125	Residential: Artist (2/3 Area)	75/DU	265	275
126	Residential: Artist Residence	75/DU	265	275
127	Residential: Guest Home w/ Kitchen	Same as Apt	265	275
128	Residential: Guest Home w/o Kitchen	45/BDR	265	275
129	Rest Home	70/Bed	555	490
130	Restaurant: Drive-In	50/Stall	1000	600
131	Restaurant: Drive-In Seating Area	25/Seat	1000	600
132	Restaurant: Fast Food Indoor Seat	25/Seat	1000	600
133	Restaurant: Fast Food Outdoor Seat	25/Seat	1000	600
134	Restaurant: Full Service Indoor Seat (a)	30/Seat	1000	600
135	Restaurant: Full Service Outdoor Seat	30/Seat	1000	600
136	Restaurant: Take Out	300/1,000 Gr SF	1000	600
137	Retail Area (greater than 100,000 SF)	50/1,000 Gr SF	265	275
138	Retail Area (less than 100,000 SF)	25/1,000 Gr SF	265	275
139	Rifle Range: Shooting Stalls/Lanes, Lobby	50/1,000 Gr SF	265	275
140	Rifle Range Facility: Bar/Restaurant	Total	Average	Average
141	School: Arts/Dancing/Music (i)	11/Student	265	275
142	School: Elementary/Jr. High (a) (p)	9/Student	265	275
143	School: High School (a) (p)	11/Student	265	275
144	School: Kindergarten (s)	9/Student	265	275
145	School: Martial Arts (i)	9/Student	265	275
146	School: Nursery-Day Care (p)	9/Child	265	275
147	School: Special Class (p)	9/Student	265	275
148	School: Trade or Vocational (p)	11/Student	265	275
149	School: Training (p)	11/Student	265	275
150	School: University/College (a) (p)	16/Student	265	275
151	School: Dormitory (a) (n)	70/Student	265	275
152	School: Stadium, Pavilion	3/Seat	265	275
153	Spa/Jacuzzi (Commercial with backwash filters)	Total	265	275
154	Storage: Building/Warehouse	30/1,000 Gr SF	265	275
155	Storage: Self-Storage Bldg	30/1,000 Gr SF	265	275
156	Store: Ice Cream/Yogurt	25/1,000 Gr SF	1000	600

SEWERAGE FACILITIES CHARGE
SEWAGE GENERATION FACTOR FOR
RESIDENTIAL AND COMMERCIAL CATEGORIES

EFFECTIVE DATE: April 6, 2012

Line No.	FACILITY DESCRIPTION	PROPOSED SGF IN GPD	BOD (mg/l)	SS (mg/l)
157	Store: Retail (l)	50/1,000 Gr SF	265	275
158	Studio: Film/TV - Audience Viewing Room (q)	3/Seat	265	275
159	Studio: Film/TV - Regular Use Indoor Filming Area (q)	50/1,000 Gr SF	265	275
160	Studio: Film/TV - Ind. Use Film Process/Machine Shop (q)	50/1,000 Gr SF	265	275
161	Studio: Film/TV - Ind. Use Film Process/Machine Shop	Total	265	275
162	Studio: Recording	50/1,000 Gr SF	265	275
163	Swimming Pool (Commercial with backwash filters)	Total	265	275
164	Tanning Salon: Independent, No Shower (r)	50/1,000 Gr SF	265	275
165	Tanning Salon: Within a Health Spa/Club	640/1,000 Gr SF	265	275
166	Theater: Drive-In	6/Vehicle	265	275
167	Theater: Live/Music/Opera	3/Seat	265	275
168	Theater: Cinema	3/Seat	265	275
169	Tract: Commercial/Residential	1/Acre	265	275
170	Trailer: Const/Field Office (e)	120/Office	265	275
171	Veterinary Clinic/Office	250/1,000 Gr SF	265	275
172	Warehouse	30/1,000 Gr SF	265	275
173	Warehouse w/ Office	Total	265	275
174	Waste Dump: Recreational	400/Station	2650	2750
175	Wine Tasting Room: Kitchen	200/1,000 Gr SF	265	275
176	Wine Tasting Room: All Area	50/1,000 Gr SF	265	275

FOOTNOTES TO SGFs TABLE

(a) SFC rates for these facilities have historically been published in SFC ordinances.

(b) Bureau of Sanitation will determine the flow based on the information given by applicants for facilities with industrial discharge. The flow will be redetermined by Sanitation inspectors annually based on water bills. If the actual flow exceeds the previous year's determined flow, the applicants will be charged for the difference.
If this type of facility is exempt from an industrial discharge permit, only the domestic SFC will be assessed.

(c) The SFC for a bar shall be the sum of SFC's for all areas based on the SGF for each area (ex. fixed seat area, public table area, dancing area).

(d) The determination of SGF for juice bars and coffee houses previously depended on the extent of the actual food preparation in house, not by the types of food provided. Food is assumed to be prepared offsite and as such, the three prior subcategories have been consolidated.

1) SGF for no pastry baking and no food preparation is 720 gpd/1000 gr.sq.ft.
2) SGF for pastry baking only and no food preparation is 720 gpd/1000 gr.sq.ft.
3) SGF for complete food preparation is 25 gpd/seat, the same as a fast food restaurant.

Juice bars and coffee houses do not serve any alcoholic drinks.

(e) Building construction includes trailers, field offices, etc.

(f) Cocktail lounge usually does not serve prepared food.

(g) Cold storage facilities are categorized as follow:

1) No Sales - the cold storage facility is used only for temporary storage, no selling is involved. For example, cold storage facilities at the harbor temporarily store seafood until it is distributed.
2) Cold storage w/ retail sales - the primary function of this facility is to support the wholesale/retail operation of a store, such as supermarket freezers, refrigerators, etc.

(h) Counseling centers include marriage counseling centers, alcohol/drug rehabilitation /dependency centers, nutrition centers, diet centers, etc.

(i) Part-time basis schools or dance studios should be charged as retail area - 50 gpd /1000 gr.sq.ft. Full-time basis schools should be charged by the number of students.

(j) Domestic waste is estimated at 50 gpd/1,000 square feet in addition to total process flow.

(k) Bureau of Sanitation will determine if an industrial permit is needed for health spas. The first year flow is based on 650 gpd/1000 gr.sq.ft., and the Sanitation inspectors will redetermine the flow annually based on water bill from the previous year. The applicants are responsible for paying the difference of SFC.

Health club/spa includes lobby area, workout floors, aerobic rooms, swimming pools, Jacuzzi, sauna, locker rooms, showers, and restrooms. If a health club/spa has a gymnasium type of facility, this portion should be charged separately at the gymnasium SFC rate.

Gymnasiums include basketball court, volleyball court, and any other large open space with low occupancy density.

(l) Lobby of retail includes lounges, holding rooms, or waiting area, etc.

(m) Full service post offices include U.S. Postal Service, UPS, Federal Express, DHL, and etc.

(n) The SGF for a college dormitory based on student capacity also includes the SGF for the dormitory cafeterias.

(o) A bedroom is defined as an enclosed subdivision with 50 sq.ft. or more floor area in a residential building commonly used for sleeping purpose, and is partitioned off to form a habitable room.

(p) The SGF for schools based on the student capacity, covers the following facilities:

1) classrooms and lecture halls
2) professors' offices
3) administration offices
4) laboratories for classes or research
5) libraries
6) bookstores
7) student/professor lounges
8) school cafeterias
9) warehouses and storage areas
10) auditoriums
11) gymnasiums
12) restrooms

It does not include water used by schools for swimming pools. When a school files an application for addition of any of the foregoing facilities, the student population will be reassessed and the total gpd for the new facility will be based on the number of students increased since the last SFC was paid or when the City implemented the SFC for the first time. The SFC for any school facility (ex. stadium, dormitory, etc.) not listed above, will be based on the designated SGF for that category.

(q) The SFC for a TV or motion picture studio shall be the sum of SFC's for different facilities in the studio, based on the SGF for each facility. A studio may include one or more of the following facilities: audience viewing room, filming room, film processing, storage area, etc.

(r) No independent tanning salons with shower were encountered during 1996 survey.

(s) Alternative basis of charge for City’s consideration. The prior square footage basis is also presented should the City decide to continue charging on that basis.

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APPENDIX C

ADDITIONAL PROPOSED DEPTH CALCULATIONS

Capacity of Existing 12" Line in 20th Street (S = 1.36%)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.01360	ft/ft
Normal Depth	1.00	ft
Diameter	1.00	ft

Results

Discharge	2327208.95	gal/day
Flow Area	0.79	ft²
Wetted Perimeter	3.14	ft
Hydraulic Radius	0.25	ft
Top Width	0.00	ft
Critical Depth	0.81	ft
Percent Full	100.0	%
Critical Slope	0.01390	ft/ft
Velocity	4.58	ft/s
Velocity Head	0.33	ft
Specific Energy	1.33	ft
Froude Number	0.00	
Maximum Discharge	3.87	ft³/s
Discharge Full	3.60	ft³/s
Slope Full	0.01360	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Capacity of Existing 12" Line in 20th Street (S = 1.36%)

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.00	ft
Critical Depth	0.81	ft
Channel Slope	0.01360	ft/ft
Critical Slope	0.01390	ft/ft

Existing Capacity of 12" line in Santa Monica Blvd (S=0.72%)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00720	ft/ft
Normal Depth	1.00	ft
Diameter	1.00	ft

Results

Discharge	1693293.23	gal/day
Flow Area	0.79	ft²
Wetted Perimeter	3.14	ft
Hydraulic Radius	0.25	ft
Top Width	0.00	ft
Critical Depth	0.69	ft
Percent Full	100.0	%
Critical Slope	0.01051	ft/ft
Velocity	3.34	ft/s
Velocity Head	0.17	ft
Specific Energy	1.17	ft
Froude Number	0.00	
Maximum Discharge	2.82	ft³/s
Discharge Full	2.62	ft³/s
Slope Full	0.00720	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Existing Capacity of 12" line in Santa Monica Blvd (S=0.72%)

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.00	ft
Critical Depth	0.69	ft
Channel Slope	0.00720	ft/ft
Critical Slope	0.01051	ft/ft

Existing Capacity of 12" Line in Broadway (S=0.7%)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00700	ft/ft
Normal Depth	1.00	ft
Diameter	1.00	ft

Results

Discharge	1669609.64	gal/day
Flow Area	0.79	ft²
Wetted Perimeter	3.14	ft
Hydraulic Radius	0.25	ft
Top Width	0.00	ft
Critical Depth	0.69	ft
Percent Full	100.0	%
Critical Slope	0.01042	ft/ft
Velocity	3.29	ft/s
Velocity Head	0.17	ft
Specific Energy	1.17	ft
Froude Number	0.00	
Maximum Discharge	2.78	ft³/s
Discharge Full	2.58	ft³/s
Slope Full	0.00700	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Existing Capacity of 12" Line in Broadway (S=0.7%)

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.00	ft
Critical Depth	0.69	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.01042	ft/ft

Proposed Flow to MH2E - Option 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00720	ft/ft
Diameter	1.00	ft
Discharge	1323.00	gal/day

Results

Normal Depth	0.02	ft
Flow Area	0.00	ft²
Wetted Perimeter	0.29	ft
Hydraulic Radius	0.01	ft
Top Width	0.29	ft
Critical Depth	0.02	ft
Percent Full	2.2	%
Critical Slope	0.01466	ft/ft
Velocity	0.49	ft/s
Velocity Head	0.00	ft
Specific Energy	0.03	ft
Froude Number	0.72	
Maximum Discharge	2.82	ft³/s
Discharge Full	2.62	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	2.16	%
Downstream Velocity	Infinity	ft/s

Proposed Flow to MH2E - Option 1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.02	ft
Critical Depth	0.02	ft
Channel Slope	0.00720	ft/ft
Critical Slope	0.01466	ft/ft

Proposed Flow to MH 2E - Option 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00720	ft/ft
Diameter	1.00	ft
Discharge	24823.00	gal/day

Results

Normal Depth	0.08	ft
Flow Area	0.03	ft²
Wetted Perimeter	0.59	ft
Hydraulic Radius	0.05	ft
Top Width	0.56	ft
Critical Depth	0.08	ft
Percent Full	8.4	%
Critical Slope	0.00935	ft/ft
Velocity	1.21	ft/s
Velocity Head	0.02	ft
Specific Energy	0.11	ft
Froude Number	0.89	
Maximum Discharge	2.82	ft³/s
Discharge Full	2.62	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	8.44	%
Downstream Velocity	Infinity	ft/s

Proposed Flow to MH 2E - Option 2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.08	ft
Critical Depth	0.08	ft
Channel Slope	0.00720	ft/ft
Critical Slope	0.00935	ft/ft

Proposed Flow to MH 2N - Option 1 & 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00500	ft/ft
Diameter	1.00	ft
Discharge	15482.00	gal/day

Results

Normal Depth	0.07	ft
Flow Area	0.03	ft²
Wetted Perimeter	0.55	ft
Hydraulic Radius	0.05	ft
Top Width	0.52	ft
Critical Depth	0.06	ft
Percent Full	7.4	%
Critical Slope	0.00984	ft/ft
Velocity	0.92	ft/s
Velocity Head	0.01	ft
Specific Energy	0.09	ft
Froude Number	0.73	
Maximum Discharge	2.35	ft³/s
Discharge Full	2.18	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	7.35	%
Downstream Velocity	Infinity	ft/s

Proposed Flow to MH 2N - Option 1 & 2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.07	ft
Critical Depth	0.06	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00984	ft/ft

Proposed Flow to MH5 - Option 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00700	ft/ft
Diameter	1.00	ft
Discharge	84591.00	gal/day

Results

Normal Depth	0.15	ft
Flow Area	0.08	ft²
Wetted Perimeter	0.80	ft
Hydraulic Radius	0.09	ft
Top Width	0.72	ft
Critical Depth	0.15	ft
Percent Full	15.3	%
Critical Slope	0.00810	ft/ft
Velocity	1.72	ft/s
Velocity Head	0.05	ft
Specific Energy	0.20	ft
Froude Number	0.93	
Maximum Discharge	2.78	ft³/s
Discharge Full	2.58	ft³/s
Slope Full	0.00002	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	15.31	%
Downstream Velocity	Infinity	ft/s

Proposed Flow to MH5 - Option 1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.15	ft
Critical Depth	0.15	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00810	ft/ft

Proposed Flow to MH5 - Option 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00700	ft/ft
Diameter	1.00	ft
Discharge	106368.00	gal/day

Results

Normal Depth	0.17	ft
Flow Area	0.09	ft²
Wetted Perimeter	0.85	ft
Hydraulic Radius	0.10	ft
Top Width	0.75	ft
Critical Depth	0.17	ft
Percent Full	17.1	%
Critical Slope	0.00793	ft/ft
Velocity	1.84	ft/s
Velocity Head	0.05	ft
Specific Energy	0.22	ft
Froude Number	0.94	
Maximum Discharge	2.78	ft³/s
Discharge Full	2.58	ft³/s
Slope Full	0.00003	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	17.10	%
Downstream Velocity	Infinity	ft/s

Proposed Flow to MH5 - Option 2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.17	ft
Critical Depth	0.17	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00793	ft/ft

Baseline Phasing - Stage A - MH5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00700	ft/ft
Diameter	1.00	ft
Discharge	41897.00	gal/day

Results

Normal Depth	0.11	ft
Flow Area	0.05	ft²
Wetted Perimeter	0.67	ft
Hydraulic Radius	0.07	ft
Top Width	0.62	ft
Critical Depth	0.10	ft
Percent Full	10.9	%
Critical Slope	0.00878	ft/ft
Velocity	1.39	ft/s
Velocity Head	0.03	ft
Specific Energy	0.14	ft
Froude Number	0.90	
Maximum Discharge	2.78	ft³/s
Discharge Full	2.58	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	10.92	%
Downstream Velocity	Infinity	ft/s

Baseline Phasing - Stage A - MH5

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.11	ft
Critical Depth	0.10	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00878	ft/ft

Baseline Phasing - Stage B - MH 2E

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00720	ft/ft
Diameter	1.00	ft
Discharge	7637.00	gal/day

Results

Normal Depth	0.05	ft
Flow Area	0.01	ft²
Wetted Perimeter	0.44	ft
Hydraulic Radius	0.03	ft
Top Width	0.43	ft
Critical Depth	0.04	ft
Percent Full	4.9	%
Critical Slope	0.01094	ft/ft
Velocity	0.84	ft/s
Velocity Head	0.01	ft
Specific Energy	0.06	ft
Froude Number	0.82	
Maximum Discharge	2.82	ft³/s
Discharge Full	2.62	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	4.86	%
Downstream Velocity	Infinity	ft/s

Baseline Phasing - Stage B - MH 2E

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.05	ft
Critical Depth	0.04	ft
Channel Slope	0.00720	ft/ft
Critical Slope	0.01094	ft/ft

Baseline Phasing - Stage B - MH 2N

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00500	ft/ft
Diameter	1.00	ft
Discharge	15482.00	gal/day

Results

Normal Depth	0.07	ft
Flow Area	0.03	ft²
Wetted Perimeter	0.55	ft
Hydraulic Radius	0.05	ft
Top Width	0.52	ft
Critical Depth	0.06	ft
Percent Full	7.4	%
Critical Slope	0.00984	ft/ft
Velocity	0.92	ft/s
Velocity Head	0.01	ft
Specific Energy	0.09	ft
Froude Number	0.73	
Maximum Discharge	2.35	ft³/s
Discharge Full	2.18	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	7.35	%
Downstream Velocity	Infinity	ft/s

Baseline Phasing - Stage B - MH 2N

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.07	ft
Critical Depth	0.06	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00984	ft/ft

Baseline Phasing - Stage C - MH2E - Option 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00720	ft/ft
Diameter	1.00	ft
Discharge	603.00	gal/day

Results

Normal Depth	0.01	ft
Flow Area	0.00	ft²
Wetted Perimeter	0.25	ft
Hydraulic Radius	0.01	ft
Top Width	0.24	ft
Critical Depth	0.01	ft
Percent Full	1.5	%
Critical Slope	0.01604	ft/ft
Velocity	0.38	ft/s
Velocity Head	0.00	ft
Specific Energy	0.02	ft
Froude Number	0.68	
Maximum Discharge	2.82	ft³/s
Discharge Full	2.62	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	1.50	%
Downstream Velocity	Infinity	ft/s

Baseline Phasing - Stage C - MH2E - Option 1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.01	ft
Critical Depth	0.01	ft
Channel Slope	0.00720	ft/ft
Critical Slope	0.01604	ft/ft

Baseline Phasing - Stage C - MH2E - Option 2E

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00720	ft/ft
Diameter	1.00	ft
Discharge	24103.00	gal/day

Results

Normal Depth	0.08	ft
Flow Area	0.03	ft²
Wetted Perimeter	0.59	ft
Hydraulic Radius	0.05	ft
Top Width	0.55	ft
Critical Depth	0.08	ft
Percent Full	8.3	%
Critical Slope	0.00938	ft/ft
Velocity	1.20	ft/s
Velocity Head	0.02	ft
Specific Energy	0.11	ft
Froude Number	0.89	
Maximum Discharge	2.82	ft³/s
Discharge Full	2.62	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	8.32	%
Downstream Velocity	Infinity	ft/s

Baseline Phasing - Stage C - MH2E - Option 2E

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.08	ft
Critical Depth	0.08	ft
Channel Slope	0.00720	ft/ft
Critical Slope	0.00938	ft/ft

Baseline Original - Stage D Option 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00700	ft/ft
Diameter	1.00	ft
Discharge	80901.00	gal/day

Results

Normal Depth	0.15	ft
Flow Area	0.07	ft²
Wetted Perimeter	0.79	ft
Hydraulic Radius	0.09	ft
Top Width	0.71	ft
Critical Depth	0.14	ft
Percent Full	15.0	%
Critical Slope	0.00818	ft/ft
Velocity	1.70	ft/s
Velocity Head	0.04	ft
Specific Energy	0.19	ft
Froude Number	0.93	
Maximum Discharge	2.78	ft³/s
Discharge Full	2.58	ft³/s
Slope Full	0.00002	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	14.98	%
Downstream Velocity	Infinity	ft/s

Baseline Original - Stage D Option 1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.15	ft
Critical Depth	0.14	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00818	ft/ft

Baseline Original - Stage D - 5 - Option 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00700	ft/ft
Diameter	1.00	ft
Discharge	85724.00	gal/day

Results

Normal Depth	0.15	ft
Flow Area	0.08	ft²
Wetted Perimeter	0.81	ft
Hydraulic Radius	0.10	ft
Top Width	0.72	ft
Critical Depth	0.15	ft
Percent Full	15.4	%
Critical Slope	0.00808	ft/ft
Velocity	1.73	ft/s
Velocity Head	0.05	ft
Specific Energy	0.20	ft
Froude Number	0.93	
Maximum Discharge	2.78	ft³/s
Discharge Full	2.58	ft³/s
Slope Full	0.00002	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	15.40	%
Downstream Velocity	Infinity	ft/s

Baseline Original - Stage D - 5 - Option 2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.15	ft
Critical Depth	0.15	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00808	ft/ft

Baseline Phasing - Stage E - MH 2E - Option 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00720	ft/ft
Diameter	1.00	ft
Discharge	1323.00	gal/day

Results

Normal Depth	0.02	ft
Flow Area	0.00	ft²
Wetted Perimeter	0.29	ft
Hydraulic Radius	0.01	ft
Top Width	0.29	ft
Critical Depth	0.02	ft
Percent Full	2.2	%
Critical Slope	0.01466	ft/ft
Velocity	0.49	ft/s
Velocity Head	0.00	ft
Specific Energy	0.03	ft
Froude Number	0.72	
Maximum Discharge	2.82	ft³/s
Discharge Full	2.62	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	2.16	%
Downstream Velocity	Infinity	ft/s

Baseline Phasing - Stage E - MH 2E - Option 1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.02	ft
Critical Depth	0.02	ft
Channel Slope	0.00720	ft/ft
Critical Slope	0.01466	ft/ft

Baseline Phasing - Stage E - MH2E - Option 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00720	ft/ft
Diameter	1.00	ft
Discharge	24823.00	gal/day

Results

Normal Depth	0.08	ft
Flow Area	0.03	ft²
Wetted Perimeter	0.59	ft
Hydraulic Radius	0.05	ft
Top Width	0.56	ft
Critical Depth	0.08	ft
Percent Full	8.4	%
Critical Slope	0.00935	ft/ft
Velocity	1.21	ft/s
Velocity Head	0.02	ft
Specific Energy	0.11	ft
Froude Number	0.89	
Maximum Discharge	2.82	ft³/s
Discharge Full	2.62	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	8.44	%
Downstream Velocity	Infinity	ft/s

Baseline Phasing - Stage E - MH2E - Option 2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.08	ft
Critical Depth	0.08	ft
Channel Slope	0.00720	ft/ft
Critical Slope	0.00935	ft/ft

Baseline Original - Stage E - MH5 - Option 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00700	ft/ft
Diameter	1.00	ft
Discharge	84591.00	gal/day

Results

Normal Depth	0.15	ft
Flow Area	0.08	ft²
Wetted Perimeter	0.80	ft
Hydraulic Radius	0.09	ft
Top Width	0.72	ft
Critical Depth	0.15	ft
Percent Full	15.3	%
Critical Slope	0.00810	ft/ft
Velocity	1.72	ft/s
Velocity Head	0.05	ft
Specific Energy	0.20	ft
Froude Number	0.93	
Maximum Discharge	2.78	ft³/s
Discharge Full	2.58	ft³/s
Slope Full	0.00002	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	15.31	%
Downstream Velocity	Infinity	ft/s

Baseline Original - Stage E - MH5 - Option 1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.15	ft
Critical Depth	0.15	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00810	ft/ft

Baseline Original - Stage E - MH5 -Option 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00700	ft/ft
Diameter	1.00	ft
Discharge	106369.00	gal/day

Results

Normal Depth	0.17	ft
Flow Area	0.09	ft²
Wetted Perimeter	0.85	ft
Hydraulic Radius	0.10	ft
Top Width	0.75	ft
Critical Depth	0.17	ft
Percent Full	17.1	%
Critical Slope	0.00793	ft/ft
Velocity	1.84	ft/s
Velocity Head	0.05	ft
Specific Energy	0.22	ft
Froude Number	0.94	
Maximum Discharge	2.78	ft³/s
Discharge Full	2.58	ft³/s
Slope Full	0.00003	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	17.10	%
Downstream Velocity	Infinity	ft/s

Baseline Original - Stage E - MH5 -Option 2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.17	ft
Critical Depth	0.17	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00793	ft/ft

Alternate Phasing - Stage C - MH2E- Option 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00720	ft/ft
Diameter	1.00	ft
Discharge	8240.00	gal/day

Results

Normal Depth	0.05	ft
Flow Area	0.01	ft²
Wetted Perimeter	0.45	ft
Hydraulic Radius	0.03	ft
Top Width	0.44	ft
Critical Depth	0.05	ft
Percent Full	5.0	%
Critical Slope	0.01069	ft/ft
Velocity	0.86	ft/s
Velocity Head	0.01	ft
Specific Energy	0.06	ft
Froude Number	0.82	
Maximum Discharge	2.82	ft³/s
Discharge Full	2.62	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	5.03	%
Downstream Velocity	Infinity	ft/s

Alternate Phasing - Stage C - MH2E- Option 1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.05	ft
Critical Depth	0.05	ft
Channel Slope	0.00720	ft/ft
Critical Slope	0.01069	ft/ft

Alternate Phasing - Stage C - MH 2E - Option 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00720	ft/ft
Diameter	1.00	ft
Discharge	31740.00	gal/day

Results

Normal Depth	0.09	ft
Flow Area	0.04	ft²
Wetted Perimeter	0.63	ft
Hydraulic Radius	0.06	ft
Top Width	0.59	ft
Critical Depth	0.09	ft
Percent Full	9.5	%
Critical Slope	0.00904	ft/ft
Velocity	1.30	ft/s
Velocity Head	0.03	ft
Specific Energy	0.12	ft
Froude Number	0.90	
Maximum Discharge	2.82	ft³/s
Discharge Full	2.62	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	9.48	%
Downstream Velocity	Infinity	ft/s

Alternate Phasing - Stage C - MH 2E - Option 2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.09	ft
Critical Depth	0.09	ft
Channel Slope	0.00720	ft/ft
Critical Slope	0.00904	ft/ft

Alternate Phasing - Stage C - MH5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00700	ft/ft
Diameter	1.00	ft
Discharge	2020.00	gal/day

Results

Normal Depth	0.03	ft
Flow Area	0.01	ft²
Wetted Perimeter	0.33	ft
Hydraulic Radius	0.02	ft
Top Width	0.32	ft
Critical Depth	0.02	ft
Percent Full	2.6	%
Critical Slope	0.01325	ft/ft
Velocity	0.56	ft/s
Velocity Head	0.00	ft
Specific Energy	0.03	ft
Froude Number	0.74	
Maximum Discharge	2.78	ft³/s
Discharge Full	2.58	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	2.62	%
Downstream Velocity	Infinity	ft/s

Alternate Phasing - Stage C - MH5

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.03	ft
Critical Depth	0.02	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.01325	ft/ft

Alternate Phasing- Stage A - MH 5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00700	ft/ft
Diameter	1.00	ft
Discharge	41897.00	gal/day

Results

Normal Depth	0.11	ft
Flow Area	0.05	ft²
Wetted Perimeter	0.67	ft
Hydraulic Radius	0.07	ft
Top Width	0.62	ft
Critical Depth	0.10	ft
Percent Full	10.9	%
Critical Slope	0.00878	ft/ft
Velocity	1.39	ft/s
Velocity Head	0.03	ft
Specific Energy	0.14	ft
Froude Number	0.90	
Maximum Discharge	2.78	ft³/s
Discharge Full	2.58	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	10.92	%
Downstream Velocity	Infinity	ft/s

Alternate Phasing- Stage A - MH 5

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.11	ft
Critical Depth	0.10	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00878	ft/ft

Alternate Phasing - Stage B - MH 2E - Option 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00720	ft/ft
Diameter	1.00	ft
Discharge	603.00	gal/day

Results

Normal Depth	0.01	ft
Flow Area	0.00	ft²
Wetted Perimeter	0.25	ft
Hydraulic Radius	0.01	ft
Top Width	0.24	ft
Critical Depth	0.01	ft
Percent Full	1.5	%
Critical Slope	0.01604	ft/ft
Velocity	0.38	ft/s
Velocity Head	0.00	ft
Specific Energy	0.02	ft
Froude Number	0.68	
Maximum Discharge	2.82	ft³/s
Discharge Full	2.62	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	1.50	%
Downstream Velocity	Infinity	ft/s

Alternate Phasing - Stage B - MH 2E - Option 1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.01	ft
Critical Depth	0.01	ft
Channel Slope	0.00720	ft/ft
Critical Slope	0.01604	ft/ft

Alternate Phasing - Stage B - MH 2E - Option 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00720	ft/ft
Diameter	1.00	ft
Discharge	24103.00	gal/day

Results

Normal Depth	0.08	ft
Flow Area	0.03	ft²
Wetted Perimeter	0.59	ft
Hydraulic Radius	0.05	ft
Top Width	0.55	ft
Critical Depth	0.08	ft
Percent Full	8.3	%
Critical Slope	0.00938	ft/ft
Velocity	1.20	ft/s
Velocity Head	0.02	ft
Specific Energy	0.11	ft
Froude Number	0.89	
Maximum Discharge	2.82	ft³/s
Discharge Full	2.62	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	8.32	%
Downstream Velocity	Infinity	ft/s

Alternate Phasing - Stage B - MH 2E - Option 2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.08	ft
Critical Depth	0.08	ft
Channel Slope	0.00720	ft/ft
Critical Slope	0.00938	ft/ft

Alternate Phasing - Stage B - MH2N

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00500	ft/ft
Diameter	1.00	ft
Discharge	15482.00	gal/day

Results

Normal Depth	0.07	ft
Flow Area	0.03	ft²
Wetted Perimeter	0.55	ft
Hydraulic Radius	0.05	ft
Top Width	0.52	ft
Critical Depth	0.06	ft
Percent Full	7.4	%
Critical Slope	0.00984	ft/ft
Velocity	0.92	ft/s
Velocity Head	0.01	ft
Specific Energy	0.09	ft
Froude Number	0.73	
Maximum Discharge	2.35	ft³/s
Discharge Full	2.18	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	7.35	%
Downstream Velocity	Infinity	ft/s

Alternate Phasing - Stage B - MH2N

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.07	ft
Critical Depth	0.06	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00984	ft/ft

Baseline Alternate - Stage D - MH5 - Option 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00700	ft/ft
Diameter	1.00	ft
Discharge	80901.00	gal/day

Results

Normal Depth	0.15	ft
Flow Area	0.07	ft²
Wetted Perimeter	0.79	ft
Hydraulic Radius	0.09	ft
Top Width	0.71	ft
Critical Depth	0.14	ft
Percent Full	15.0	%
Critical Slope	0.00818	ft/ft
Velocity	1.70	ft/s
Velocity Head	0.04	ft
Specific Energy	0.19	ft
Froude Number	0.93	
Maximum Discharge	2.78	ft³/s
Discharge Full	2.58	ft³/s
Slope Full	0.00002	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	14.98	%
Downstream Velocity	Infinity	ft/s

Baseline Alternate - Stage D - MH5 - Option 1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.15	ft
Critical Depth	0.14	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00818	ft/ft

Baseline Alternate - Stage D - MH5 - Option 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00700	ft/ft
Diameter	1.00	ft
Discharge	85724.00	gal/day

Results

Normal Depth	0.15	ft
Flow Area	0.08	ft²
Wetted Perimeter	0.81	ft
Hydraulic Radius	0.10	ft
Top Width	0.72	ft
Critical Depth	0.15	ft
Percent Full	15.4	%
Critical Slope	0.00808	ft/ft
Velocity	1.73	ft/s
Velocity Head	0.05	ft
Specific Energy	0.20	ft
Froude Number	0.93	
Maximum Discharge	2.78	ft³/s
Discharge Full	2.58	ft³/s
Slope Full	0.00002	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	15.40	%
Downstream Velocity	Infinity	ft/s

Baseline Alternate - Stage D - MH5 - Option 2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.15	ft
Critical Depth	0.15	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00808	ft/ft

Alternate Phasing - Stage E - MH 2E - Option 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00720	ft/ft
Diameter	1.00	ft
Discharge	1323.00	gal/day

Results

Normal Depth	0.02	ft
Flow Area	0.00	ft²
Wetted Perimeter	0.29	ft
Hydraulic Radius	0.01	ft
Top Width	0.29	ft
Critical Depth	0.02	ft
Percent Full	2.2	%
Critical Slope	0.01466	ft/ft
Velocity	0.49	ft/s
Velocity Head	0.00	ft
Specific Energy	0.03	ft
Froude Number	0.72	
Maximum Discharge	2.82	ft³/s
Discharge Full	2.62	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	2.16	%
Downstream Velocity	Infinity	ft/s

Alternate Phasing - Stage E - MH 2E - Option 1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.02	ft
Critical Depth	0.02	ft
Channel Slope	0.00720	ft/ft
Critical Slope	0.01466	ft/ft

Alternate Phasing - Stage E - MH 2E - Option 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00720	ft/ft
Diameter	1.00	ft
Discharge	24823.00	gal/day

Results

Normal Depth	0.08	ft
Flow Area	0.03	ft²
Wetted Perimeter	0.59	ft
Hydraulic Radius	0.05	ft
Top Width	0.56	ft
Critical Depth	0.08	ft
Percent Full	8.4	%
Critical Slope	0.00935	ft/ft
Velocity	1.21	ft/s
Velocity Head	0.02	ft
Specific Energy	0.11	ft
Froude Number	0.89	
Maximum Discharge	2.82	ft³/s
Discharge Full	2.62	ft³/s
Slope Full	0.00000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	8.44	%
Downstream Velocity	Infinity	ft/s

Alternate Phasing - Stage E - MH 2E - Option 2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.08	ft
Critical Depth	0.08	ft
Channel Slope	0.00720	ft/ft
Critical Slope	0.00935	ft/ft

Baseline Alternate - Stage E - MH5 - Option 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00700	ft/ft
Diameter	1.00	ft
Discharge	84591.00	gal/day

Results

Normal Depth	0.15	ft
Flow Area	0.08	ft²
Wetted Perimeter	0.80	ft
Hydraulic Radius	0.09	ft
Top Width	0.72	ft
Critical Depth	0.15	ft
Percent Full	15.3	%
Critical Slope	0.00810	ft/ft
Velocity	1.72	ft/s
Velocity Head	0.05	ft
Specific Energy	0.20	ft
Froude Number	0.93	
Maximum Discharge	2.78	ft³/s
Discharge Full	2.58	ft³/s
Slope Full	0.00002	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	15.31	%
Downstream Velocity	Infinity	ft/s

Baseline Alternate - Stage E - MH5 - Option 1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.15	ft
Critical Depth	0.15	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00810	ft/ft

Baseline Alternate - Stage E - MH5 - Option 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.00700	ft/ft
Diameter	1.00	ft
Discharge	106369.00	gal/day

Results

Normal Depth	0.17	ft
Flow Area	0.09	ft²
Wetted Perimeter	0.85	ft
Hydraulic Radius	0.10	ft
Top Width	0.75	ft
Critical Depth	0.17	ft
Percent Full	17.1	%
Critical Slope	0.00793	ft/ft
Velocity	1.84	ft/s
Velocity Head	0.05	ft
Specific Energy	0.22	ft
Froude Number	0.94	
Maximum Discharge	2.78	ft³/s
Discharge Full	2.58	ft³/s
Slope Full	0.00003	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	17.10	%
Downstream Velocity	Infinity	ft/s

Baseline Alternate - Stage E - MH5 - Option 2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.17	ft
Critical Depth	0.17	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00793	ft/ft

700 South Flower Street, Suite 2100 Los Angeles, CA 90017 213.418.0201 kpff.com

APPENDIX D

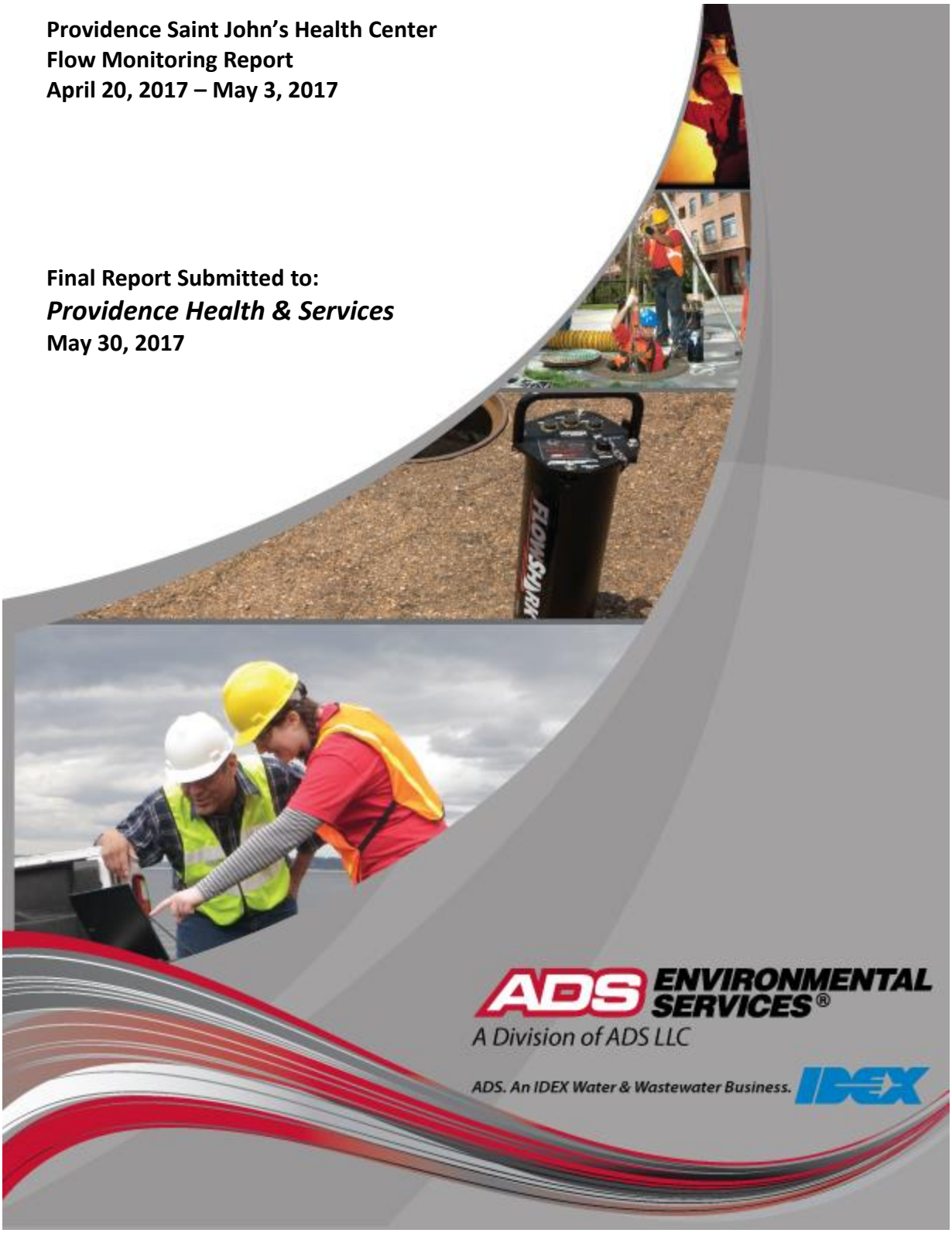
PROVIDENCE SAINT JOHN'S HEALTH CENTER

FLOW MONITORING REPORT, APRIL 20, 2017 – MAY 3, 2017

PREPARED BY ADS

Providence Saint John's Health Center
Flow Monitoring Report
April 20, 2017 – May 3, 2017

Final Report Submitted to:
Providence Health & Services
May 30, 2017



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Providence Saint John's Health Center Sewer Flow Study 2017
Santa Monica, CA

April 20, 2017 - May 03, 2017

Prepared for:

Ms. Karen Weylandt
Providence Health & Services
4400 NE Halsey, Building 2, Suite 190
Portland, OR 97213

Prepared by:

ADS, LLC
15201 Springdale Street
Huntington Beach, CA 92649

Letter of Transmittal

ADS LLC

May 30, 2017

Ms. Karen Weylandt
Providence Health & Services
4400 N.E. Halsey, Building 2, Suite 190
Portland, OR 97213

SUBJECT: Providence Saint John's Health Center Sewer Flow Monitoring Report 2017

Dear Ms. Weylandt,

ADS is pleased to submit the Final Report for the Providence Saint John's Health Center Sewer Flow Monitoring Temporary Study. The metering was contracted for a fourteen (14) day period at nine (9) locations. The study period is April 20, 2017 - May 03, 2017. The report contains a depth, velocity, and quantity hydrograph as well as a daily long table for the metering period in pdf format. An Excel file containing 5-minute depth, quantity, and velocity entities has been provided previously.

In addition, we would be happy to further explain any details about the report that may seem unclear. Should you have any questions or comments, you may contact the Project Manager, Paul Mitchell at (714) 379-9778 ext 223.

Thank you for choosing ADS products and services to meet your flow monitoring needs.

Sincerely,
ADS ENVIRONMENTAL SERVICES

Abel Jaramillo
Data Analyst I

15201 Springdale Street Â· Huntington Beach, CA 92649 Â· Phone: 714-379-9778

Scope and Methodology

Introduction

Providence Health & Services entered into an agreement with ADS Environmental Services to conduct flow monitoring at (9) nine metering locations in the Santa Monica,CA Sanitary Sewer Collection System. The study was contracted for a fourteen (14) day period. The objective of this study was to measure depth, velocity, and quantify flows. Data obtained will be used for development planning purposes.

Project Scope

The scope of this study involved using a flow monitor to quantify wastewater flows at the designated locations for the 14-day time period. Specifically, the study included the following key components.

- Investigate the proposed flow-monitoring site for adequate hydraulic conditions.
- Flow monitor installation.
- Flow monitor confirmations and data collections.
- Flow data analysis.

Equipment installation was accomplished on April 19, 2017. The monitoring period began on April 20, 2017 and was completed on May 03, 2017 . At the conclusion of the study period, the equipment was removed.

Flow Monitoring Equipment

The ***ADS FlowShark Triton*** monitor was selected for this project. This flow monitor is an area velocity flow monitor that uses both the Continuity and Manning's equations to measure flow.

The ADS FlowShark Triton monitor consists of data acquisition sensors and a battery-powered microcomputer. The microcomputer includes a processor unit, data storage, and an on-board clock to control and synchronize the sensor recordings. The monitor was programmed to acquire and store depth of flow and velocity readings at 5-minute intervals.

The FS Triton monitor features cross-checking using multiple technologies in each sensor for continuous running of comparisons and tolerances. The FS Triton monitor can support two (2) sets of sensors. The sensor option used for this project was: **The Peak Combo Sensor.** This sensor is installed at the bottom of the pipe and includes three types of data acquisition technologies.

The ***up looking ultrasonic depth*** uses sound waves from two independent transceivers to measure the distance from the sensor upward toward the flow surface; applying the speed of sound in the water and the temperature measured by sensor to calculate depth.

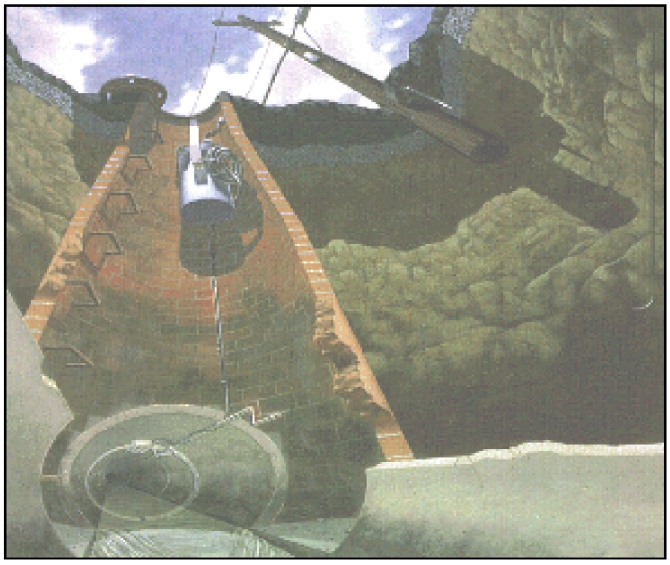
The ***pressure depth*** is calculated by using a piezo-resistive crystal to determine the difference between hydrostatic and atmospheric pressure. The pressure sensor is temperature compensated and vented to the atmosphere through a desiccant filled breather tube.

To obtain ***peak velocity,*** the sensor sends an ultrasonic signal at an angle upward through the widest cross-section of the oncoming flow. The signal is reflected by suspended particles, air bubbles, or organic matter with a frequency shift proportional to the velocity of the reflecting objects. The reflected signal is received by the sensor and processed using digital spectrum analysis to determine the peak flow velocity.

Installation

Installation of flow monitoring equipment typically proceeds in four steps. First, the site is investigated for safety and to determine physical and hydraulic suitability for the flow monitoring equipment. Second, the equipment is physically installed at the selected location. Third, the monitor is tested to assure proper operation of the velocity and depth of flow sensors and verify that the monitor clock is operational and synchronized to the master computer clock. Fourth, the depth and velocity sensors are confirmed and line confirmations are performed.

In pipes up to 42 inches in diameter, the sensors are mounted on expandable stainless steel rings, inserted at least a foot upstream into influent pipes and tightened against the inside walls of the pipes. Influent pipe installations reduce the influences of turbulence and backwater often caused by changes in channel geometry in manholes.



Data Collection, Confirmation, and Quality Assurance

Data collects were done remotely via wireless connect on a weekly basis via ADS Field Representatives. Weekly, during the monitoring period, field crews visit each monitoring location to verify proper monitor operation and document field conditions. The following quality assurance steps are taken to assure the integrity of the collected data:

Measure power supplies: monitors were powered by dry cell battery packs. Voltages were recorded and battery packs replaced, as necessary. Separate batteries provided back-up power to memory allowing primary batteries to be replaced without loss of data.

Clock synchronization: Field crews synchronized monitor clocks to master clocks.

Confirm depth and velocity readings: Field crews descended into meter manholes to manually measure depths and velocities and compare them meter readings to confirm that they agreed. They also measured silt levels, if any, in the inverts of the pipes. Silt areas were subtracted from flow areas to compute true areas of flow.

Confirm average velocities through cross-sectional velocity profiles: Since ADS velocity sensors measure peak velocity, field crews collected cross-sectional velocity profiles in order to develop a relationship between peak and average velocity in lines that meet the hydraulic criteria.

Upload and Review Data: Data collected from the monitors were uploaded and reviewed by a Data Analyst for completeness, outliers and deviations in the flow patterns, which indicate system anomalies or equipment failure.

Flow Quantification Methods

There are two main equations used to measure open channel flow: the ***Continuity Equation*** and the ***Manning Equation.*** The Continuity Equation, which is considered

the most accurate, can be used if both depth of flow and velocity are available. In cases where velocity measurements are not available or not practical to obtain, the Manning Equation can be used to estimate velocity from the depth data based on certain physical characteristics of the pipe (i.e. the slope and roughness of the pipe being measured). However, the Manning equation assumes uniform, steady flow hydraulic conditions with non-varying roughness, which are typically invalid assumptions in most sanitary sewers. The Continuity Equation was used exclusively for this study.

Continuity Equation

The Continuity Equation states that the flow quantity (Q) is equal to the wetted area (A) multiplied by the average velocity (V) of the flow.

$$Q = A * V$$

This equation is applicable in a variety of conditions including backwater, surcharge, and reverse flow.

Data Analysis and Presentation

Data Analysis

A flow monitor is typically programmed to collect data at 5-minute intervals throughout the monitoring period. The monitor stores raw data consisting of (1) the ultrasonic depth, (2) the peak velocity and (3) the pressure depth. The data is imported into ADS's proprietary software and is examined by a data analyst to verify its integrity. The data analyst also reviews the daily field reports and site visit records to identify conditions that would affect the collected data.

Velocity profiles and the line confirmation data developed by the field personnel are reviewed by the data analyst to identify inconsistencies and verify data integrity. Velocity profiles are reviewed and an average to peak velocity ratio is calculated for the site. This ratio is used in converting the peak velocity measured by the sensor to the average velocity used in the Continuity equation. The data analyst selects which depth sensor entity will be used to calculate the final depth information. Silt levels present at each site visit are reviewed and representative silt levels established.

Occasionally the velocity sensor's performance may be compromised resulting in invalid readings sporadically during the monitoring period. This is generally caused by excessive debris (silt) blocking the sensor's crystals, shallow flows (~< 2") that may drop below the top of the sensor or very clear flows lacking the particles needed to measure rate. In order to use the Continuity equation to quantify the flow during these periods, a Data Analyst and/or Engineer will use the site's historical pipe curve (depth vs. velocity) data along with valid field confirmations to reconstitute and replace the false velocity recordings with expected velocity readings for a given historical depth along the curve.

Selections for the above parameters can be constant or can change during the monitoring period. While the data analysis process is described in a linear manner, it often requires an iterative approach to accurately complete.

Data Presentation

This type of flow monitoring project generates a large volume of data. To facilitate review of the data, results have been provided in graphical and tabular formats. The flow data is presented graphically in the form of scattergraphs and hydrographs. These tables show the flow rate for each day, along with the daily minimum and maximums, the times they were observed, the total daily flow, and total flow for the month (or monitoring period). The following explanation of terms may aid in interpretation of the tables and hydrographs.

DEPTH - Final calculated depth measurement (in inches)

QUANTITY - Final calculated flow rate (in MGD)

VELOCITY - Final calculated flow velocity (in feet per second)

REPORT TOTAL - Total volume of flow recorded for the indicated time period (in MG)

Site Commentary

Site Information

20th01	
Pipe Dimensions	12.25 "
Silt Level	0.00"

Overview

Site 20th01 functioned under normal conditions during the period Thursday, April 20, 2017 to Wednesday, May 03, 2017 . No surcharge conditions were experienced at this location (See Observation Table Below For More Details).

Review of the Scattergraph shows that free flow conditions were maintained throughout the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted and support the relative accuracy of the flow monitor at this location.

Observations

Average flow depth, velocity, and quantity data observed during Thursday, April 20, 2017 to Wednesday, May 03, 2017 , along with observed minimum and maximum data, are provided in the following table. The values presented are based on 5-minute data. In regards to depth, this site flows at approximately 18.5% full during the typical average depth of 2.27 inches.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	2.27	4.61	0.321
Minimum	1.46	2.70	0.094
Maximum	3.82	6.00	0.821
Time of Minimum	5/1/2017 04:00	5/1/2017 04:05	5/1/2017 04:05
Time of Maximum	4/21/2017 09:35	4/21/2017 13:30	4/21/2017 09:35

Data Quality

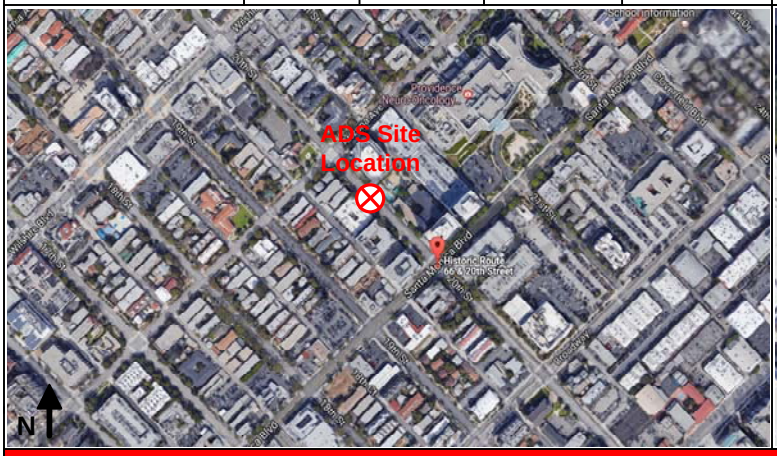
Data uptime observed during the Thursday, April 20, 2017 to the Wednesday, May 03, 2017 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

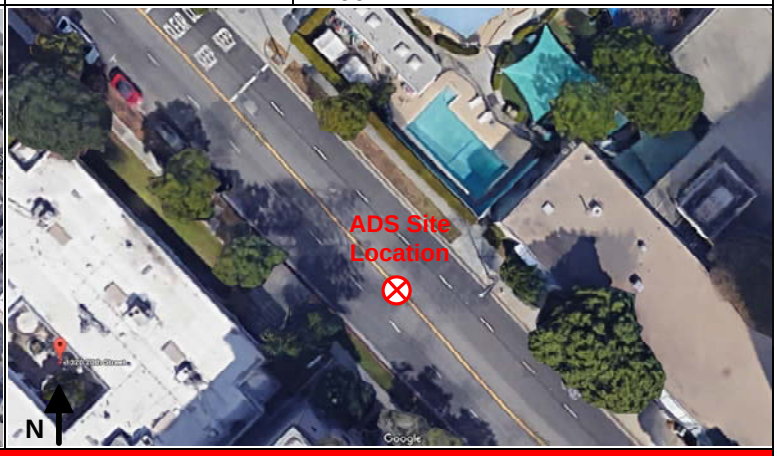
Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

ADS Site Report

Quality Form

Project Name: Santa Monica KPFF TFM 2017	**City:** Santa Monica	**Agency:** Santa Monica	**FM Initials:** SK
Site Name: 20th01	**Install Date:** 4/19/17	**Monitor Type**	Peak Doppler
Address/Location: 1320 20th St.		**Monitor Model**	Triton
		Data Acquisition	Manual Collect
		Manhole ID	
Access: Drive	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Height:**	12.25 "
		Pipe Width:	12.00 "





Investigation Information:

Date/Time of Investigation:	3/21/17
Site Hydraulics:	Good straight through flow
Upstream Input: (L/S, P/S)	--
Upstream Manhole:	Not investigated
Downstream Manhole:	Not investigated
Depth of Flow:	1.50 " +/- 0.13"
Range (Air DOF):	+/-
Peak Velocity:	3.72 fps
Silt:	0.00 Inches

Manhole Information:

Manhole Depth:	12'
Manhole Material / Condition	Precast/OK
Pipe Material / Condition:	VCP/Good

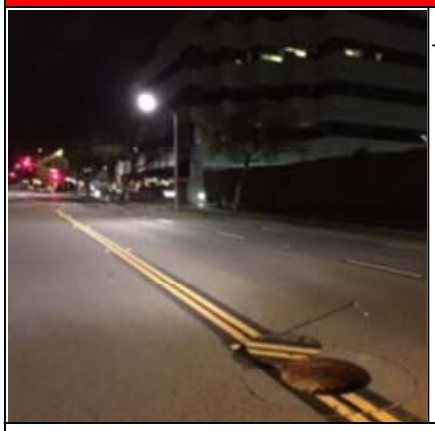
Land Use:	Residential [ ]	Commercial [X]	Industrial [ ]	Trunk [ ]

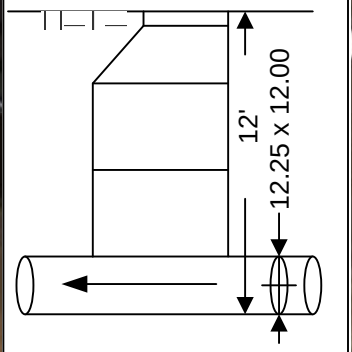
Oxygen: 20.9 **H2S:** 0 **LEL:** 0 **CO:** 0

Safety Notes:

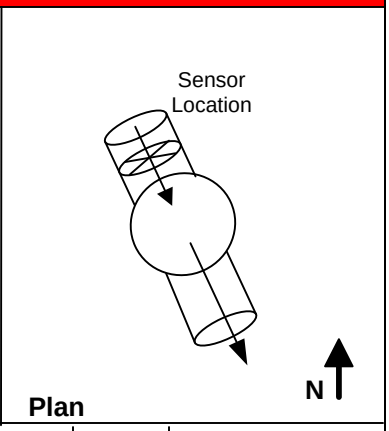
2 man crew required and one blower is to be operated at all times.

Other Information:





Cross Section



Plan

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Standard	Trunk	[ ]	[x]	[ ]	
Sensors Devices:	Ultrasonic / Pressure/Velocity	Lift / Pump Station	[ ]	[X]	[ ]	
Surcharge Height:	0	WWTP	[ ]	[X]	[ ]	
Rain Gauge Zone:		Other	[ ]	[X]	[ ]	

Additional Site Information / Comments:

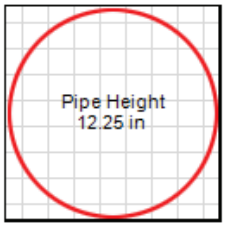
Standard Traffic Control with No Safety Concerns

SCATTERGRAPH REPORT

20th01

Flow Monitor

20th01

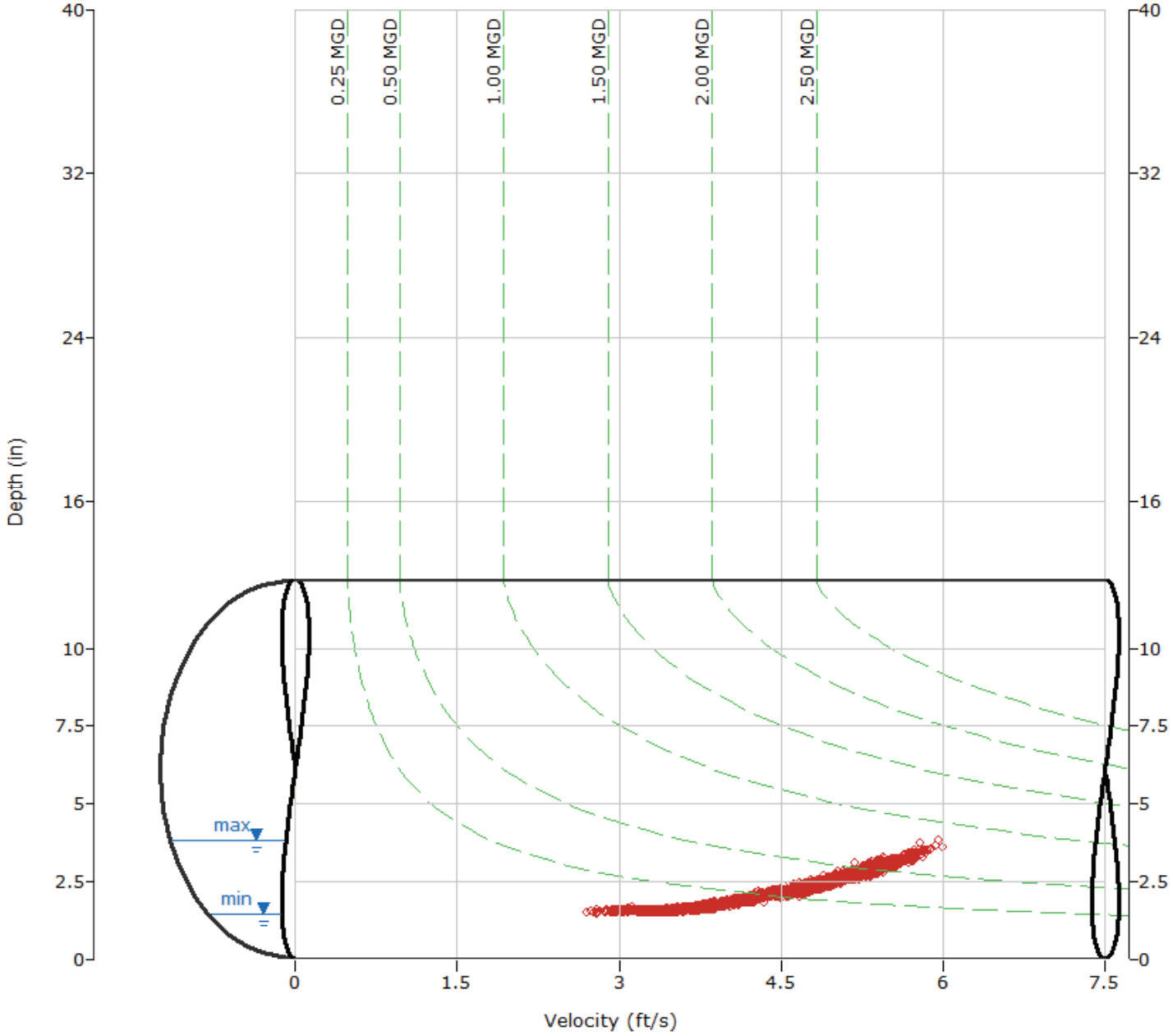


Report Period

4/20/2017
To
5/3/2017

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



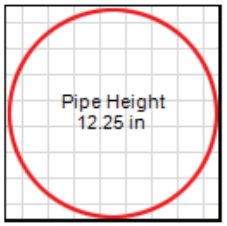
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

20th01

Flow Monitor

20th01

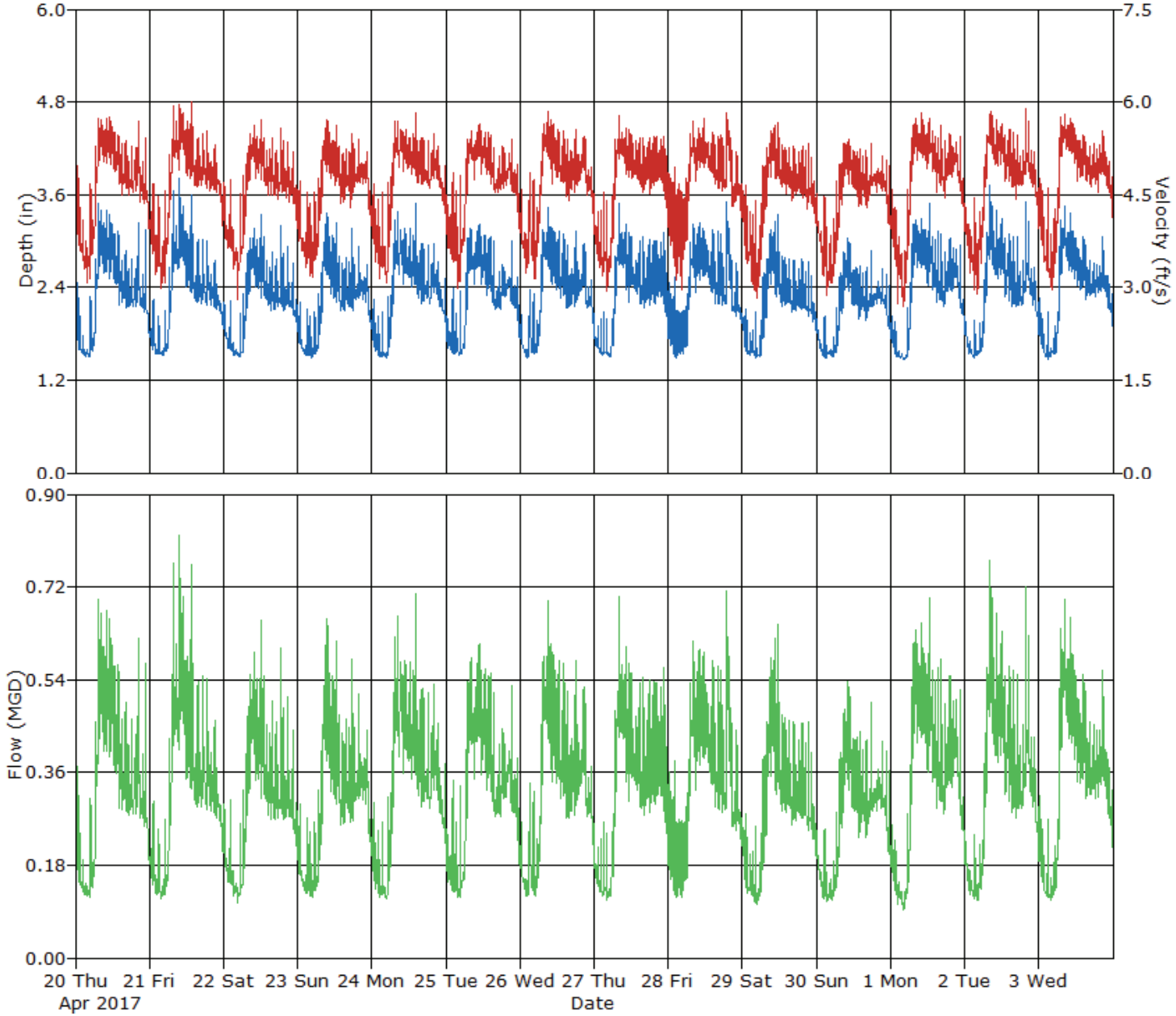


Report Period

4/20/2017
To
5/3/2017

Legend

- Depth
- Velocity
- Quantity



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
04/20/2017	03:20	1.50	07:30	3.48	2.32	03:50	3.08	10:55	5.75	4.64	04:40	0.119	07:30	0.695	0.334	0.334	
04/21/2017	04:50	1.52	09:35	3.82	2.30	03:50	2.98	13:30	6.00	4.65	03:50	0.115	09:35	0.821	0.331	0.331	
04/22/2017	05:15	1.50	12:25	3.35	2.20	04:40	2.80	12:25	5.70	4.53	04:40	0.107	12:25	0.655	0.299	0.299	
04/23/2017	04:25	1.49	09:35	3.35	2.20	04:45	3.16	09:35	5.72	4.52	04:45	0.118	09:35	0.658	0.300	0.300	
04/24/2017	04:50	1.48	14:05	3.48	2.30	04:55	3.08	14:05	5.83	4.64	04:45	0.114	14:05	0.707	0.329	0.329	
04/25/2017	04:25	1.53	10:50	3.21	2.27	03:55	2.98	10:50	5.64	4.63	03:55	0.116	10:50	0.610	0.321	0.321	
04/26/2017	02:10	1.49	09:20	3.42	2.29	04:35	3.15	09:20	5.84	4.64	02:00	0.120	09:20	0.692	0.326	0.326	
04/27/2017	05:15	1.50	08:10	3.49	2.31	04:15	2.94	08:10	5.78	4.64	04:15	0.112	08:10	0.702	0.332	0.332	
04/28/2017	02:30	1.48	19:00	3.50	2.36	04:20	2.96	19:00	5.82	4.73	04:20	0.117	19:00	0.712	0.345	0.345	
04/29/2017	04:10	1.49	11:20	3.34	2.15	04:40	2.82	11:20	5.65	4.45	04:55	0.105	11:20	0.648	0.285	0.285	
04/30/2017	03:15	1.49	10:00	3.04	2.12	03:30	2.88	10:45	5.38	4.41	03:30	0.109	10:00	0.536	0.275	0.275	
05/01/2017	04:00	1.46	12:50	3.49	2.34	04:05	2.70	09:55	5.82	4.66	04:05	0.094	12:50	0.698	0.343	0.343	
05/02/2017	03:05	1.49	08:05	3.73	2.32	04:00	2.89	19:55	5.89	4.66	04:30	0.112	08:05	0.773	0.336	0.336	
05/03/2017	02:55	1.47	08:25	3.45	2.35	04:25	2.97	08:25	5.81	4.70	03:45	0.112	08:25	0.695	0.345	0.345	

Report Summary For The Period 04/20/2017 00:00 - 05/03/2017 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)
Total			4.501
Avg	2.27	4.61	0.321

Site Commentary

Site Information

Broad05	
Pipe Dimensions	12 "
Silt Level	0.00"

Overview

Site Broad05 functioned under normal conditions during the period Thursday, April 20, 2017 to Wednesday, May 03, 2017 . This line exhibits the presence of an hydraulic jump with some waves when operating between 1.5 and 2.5 inches in depth. This condition is experienced when flow transitions from supercritical to subcritical flow. No surcharge conditions were experienced at this location (See Observation Table For More Details).

Review of the Scattergraph shows that free flow conditions were maintained throughout the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted and support the relative accuracy of the flow monitor at this location.

Observations

Average flow depth, velocity, and quantity data observed during Thursday, April 20, 2017 to Wednesday, May 03, 2017 , along with observed minimum and maximum data, are provided in the following table. The values presented are based on 5-minute data. In regards to depth, this site flows at approximately 18.3% full during the typical average depth of 2.20 inches.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	2.20	3.29	0.221
Minimum	1.32	1.34	0.058
Maximum	4.95	5.10	0.997
Time of Minimum	4/26/2017 09:30	4/27/2017 02:45	4/30/2017 04:25
Time of Maximum	5/2/2017 11:50	5/2/2017 11:50	5/2/2017 11:50

Data Quality

Data uptime observed during the Thursday, April 20, 2017 to the Wednesday, May 03, 2017 monitoring period is provided in the table below. Based upon the quality

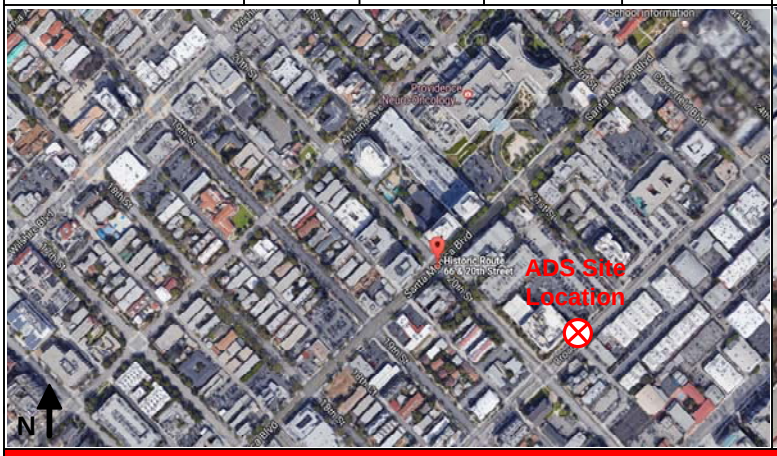
and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

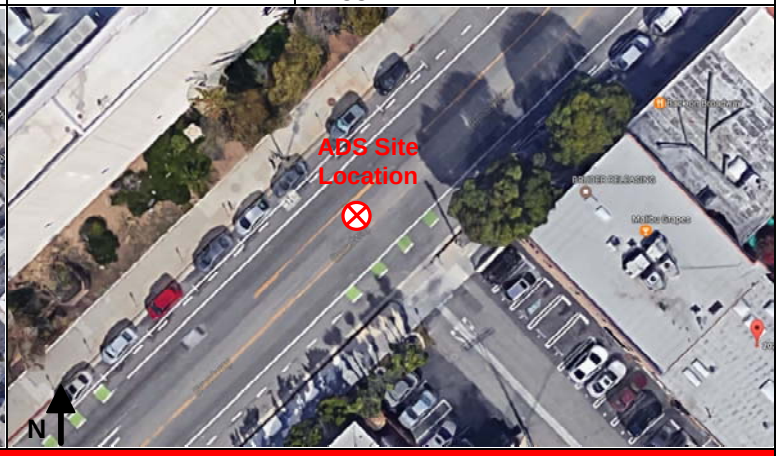
Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

ADS Site Report

Quality Form

Project Name: Santa Monica KPFF TFM 2017	**City:** Santa Monica	**Agency:** Santa Monica	**FM Initials:** SK
Site Name: Broad05	**Install Date:** 4/19/17	**Monitor Type**	Peak Doppler
Address/Location: 2020 Broadway		**Monitor Model**	Triton
		Data Acquisition	Manual Collect
		Manhole ID	
Access: Drive	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Height:**	12.00 "
		Pipe Width:	11.88 "





Investigation Information:

Date/Time of Investigation:	3/21/17
Site Hydraulics:	Fast straight through flow
Upstream Input: (L/S, P/S)	--
Upstream Manhole:	Not investigated
Downstream Manhole:	Not investigated
Depth of Flow:	2.25 " +/- 0.13"
Range (Air DOF):	+/-
Peak Velocity:	3.85 fps
Silt:	0.00 Inches

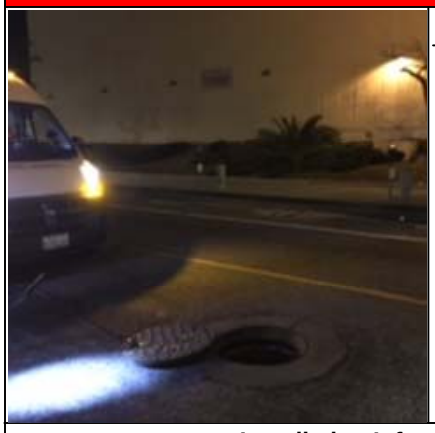
Manhole Information:

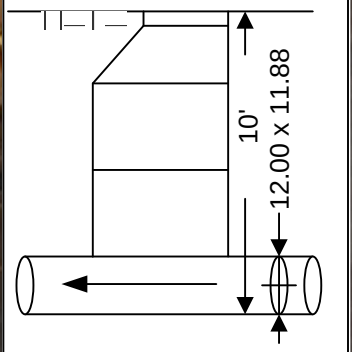
Manhole Depth:	10'			
Manhole Material / Condition	Brick/OK			
Pipe Material / Condition:	VCP/Good			
Land Use:	Residential [ ]	Commercial [X]	Industrial [ ]	Trunk [ ]
Oxygen: 20.9	**H2S:** 0	**LEL:** 0	**CO:** 0	

Safety Notes:

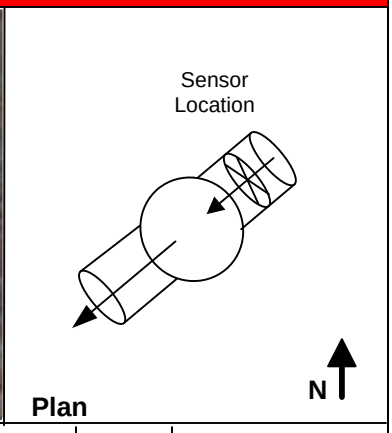
2 man crew required and one blower is to be operated at all times.

Other Information:





Cross Section



Plan

Installation Information	
Installation Type:	Standard
Sensors Devices:	Ultrasonic / Pressure/Velocity
Surcharge Height:	0
Rain Gauge Zone:	

Backup	Yes	No	?	Distance
Trunk	[ ]	[x]	[ ]	
Lift / Pump Station	[ ]	[X]	[ ]	
WWTP	[ ]	[X]	[ ]	
Other	[ ]	[X]	[ ]	

Additional Site Information / Comments:

Standard Traffic Control with No Safety Concerns

SCATTERGRAPH REPORT

Broad05

Flow Monitor

Broad05

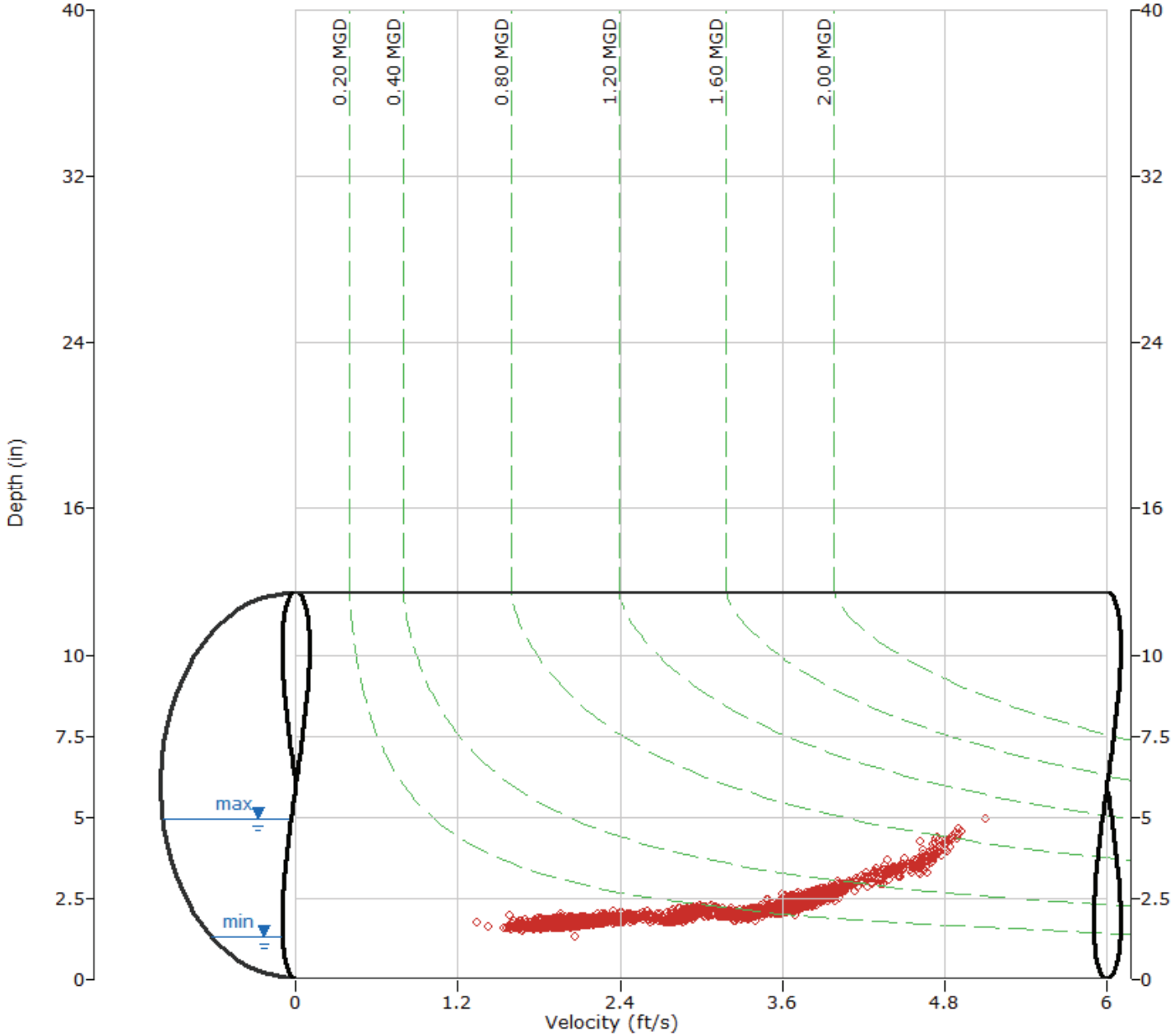
Pipe Height
12.00 in

Report Period

4/20/2017
To
5/3/2017

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



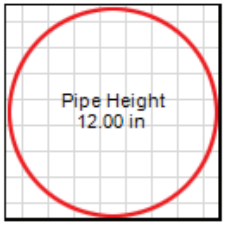
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

Broad05

Flow Monitor

Broad05

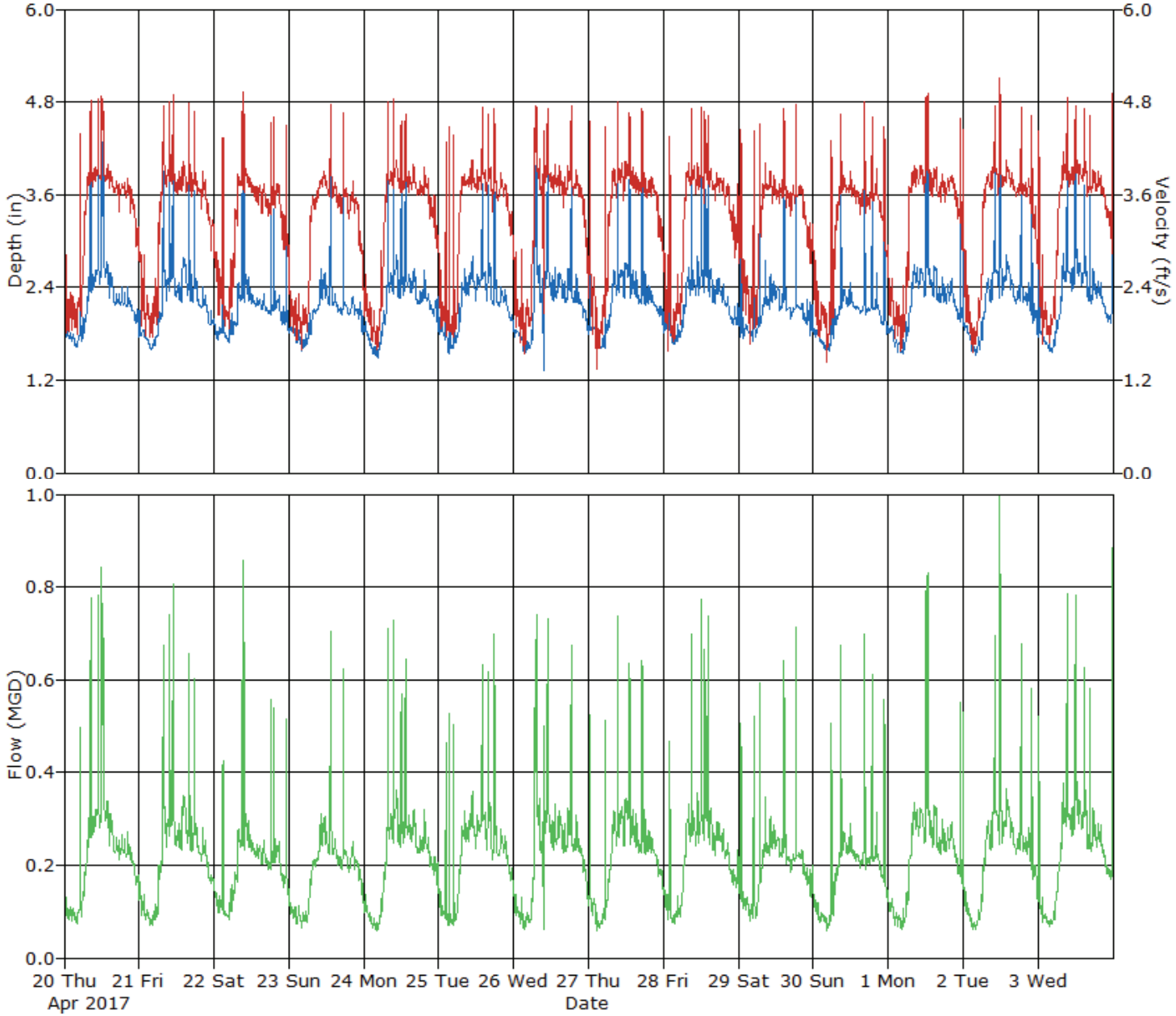


Report Period

4/20/2017
To
5/3/2017

Legend

- Depth
- Velocity
- Quantity



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 04/20/2017 00:00 - 05/03/2017 23:59

Broad05, Pipe Height: 12.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
04/20/2017	03:45	1.63	12:00	4.51	2.25	04:10	1.79	12:00	4.88	3.37	04:10	0.074	12:00	0.842	0.235	0.235	
04/21/2017	03:55	1.60	10:50	4.35	2.22	03:35	1.75	10:50	4.90	3.32	03:35	0.071	10:50	0.805	0.226	0.226	
04/22/2017	04:40	1.68	09:30	4.53	2.14	04:50	1.87	09:30	4.93	3.28	04:50	0.081	09:30	0.857	0.208	0.208	
04/23/2017	04:15	1.58	13:30	4.02	2.08	04:10	1.60	13:30	4.77	3.14	04:10	0.063	13:30	0.704	0.192	0.192	
04/24/2017	04:25	1.49	09:30	4.07	2.21	04:20	1.60	09:30	4.84	3.26	04:20	0.059	09:30	0.727	0.222	0.222	
04/25/2017	03:10	1.54	17:50	4.02	2.25	04:35	1.75	13:55	4.73	3.34	03:10	0.069	17:50	0.697	0.229	0.229	
04/26/2017	09:30	1.32	07:30	4.19	2.24	03:20	1.54	18:30	4.75	3.31	03:20	0.060	07:30	0.740	0.231	0.231	
04/27/2017	03:55	1.61	09:15	4.13	2.24	02:45	1.34	09:15	4.80	3.33	02:45	0.060	09:15	0.736	0.229	0.229	
04/28/2017	03:30	1.66	12:05	4.34	2.25	01:15	1.58	12:05	4.73	3.32	03:30	0.073	12:05	0.774	0.229	0.229	
04/29/2017	04:50	1.70	18:25	4.05	2.13	03:45	1.66	18:25	4.77	3.26	03:45	0.078	18:25	0.712	0.205	0.205	
04/30/2017	05:05	1.57	16:25	3.98	2.06	04:25	1.42	16:25	4.81	3.15	04:25	0.058	16:25	0.700	0.191	0.191	
05/01/2017	04:50	1.54	12:40	4.44	2.23	03:55	1.58	12:40	4.90	3.30	04:15	0.062	12:40	0.829	0.227	0.227	
05/02/2017	04:05	1.53	11:50	4.95	2.24	03:05	1.56	11:50	5.10	3.31	03:05	0.061	11:50	0.997	0.229	0.229	
05/03/2017	04:40	1.56	23:45	4.65	2.28	01:30	1.67	23:45	4.90	3.36	03:35	0.068	23:45	0.883	0.240	0.239	

Report Summary For The Period 04/20/2017 00:00 - 05/03/2017 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)
Total			3.091
Avg	2.20	3.29	0.221

Site Commentary

Site Information

Broad06E	
Pipe Dimensions	12.13 "
Silt Level	0.00"

Overview

Site Broad06E functioned under normal conditions during the period Thursday, April 20, 2017 to Wednesday, May 03, 2017 . No surcharge conditions were experienced at this location (See Observation Table For More Details).

Review of the Scattergraph shows that free flow conditions were maintained throughout the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted and support the relative accuracy of the flow monitor at this location.

Observations

Average flow depth, velocity, and quantity data observed during Thursday, April 20, 2017 to Wednesday, May 03, 2017 , along with observed minimum and maximum data, are provided in the following table. The values presented are based on 5-minute data. In regards to depth, this site flows at approximately 23.1% full during the typical average depth of 2.80 inches.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	2.80	0.44	0.042
Minimum	1.82	0.16	0.009
Maximum	4.46	1.11	0.190
Time of Minimum	4/20/2017 03:55	4/21/2017 03:30	4/21/2017 03:30
Time of Maximum	4/22/2017 09:25	4/22/2017 09:25	4/22/2017 09:25

Data Quality

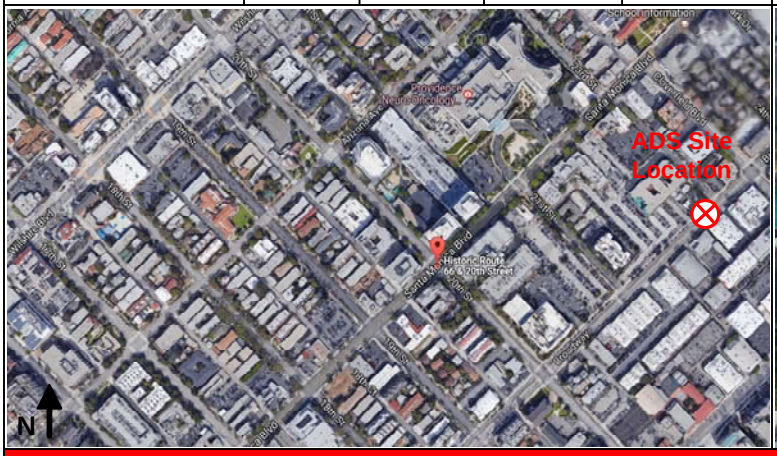
Data uptime observed during the Thursday, April 20, 2017 to the Wednesday, May 03, 2017 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

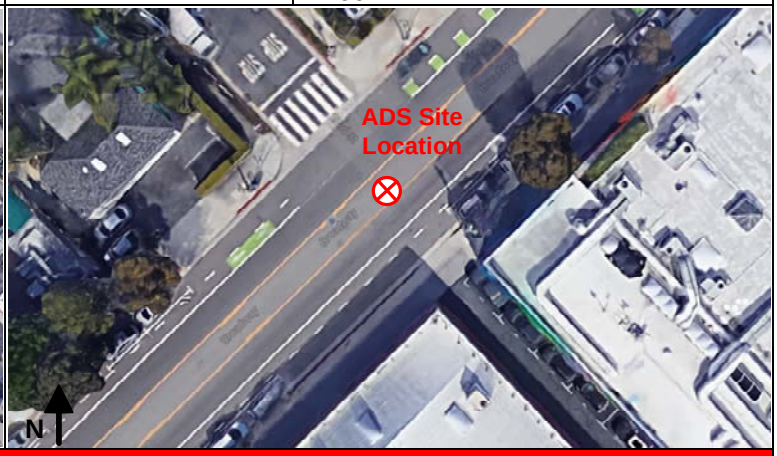
Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

ADS Site Report

Quality Form

Project Name: Santa Monica KPFF TFM 2017	**City:** Santa Monica	**Agency:** Santa Monica	**FM Initials:** SK
Site Name: Broad06E	**Install Date:** 4/19/17	**Monitor Type**	Peak Doppler
Address/Location: 2230 Broadway		**Monitor Model**	Triton
		Data Acquisition	Manual Collect
		Manhole ID	
Access: Drive	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Height:**	12.13 "
		Pipe Width:	12.00 "





Investigation Information:

Date/Time of Investigation:	3/21/17
Site Hydraulics:	Low flow and slow velocity during install
Upstream Input: (L/S, P/S)	--
Upstream Manhole:	Not investigated
Downstream Manhole:	Not investigated
Depth of Flow:	2.00 " +/- 0.13"
Range (Air DOF):	+/-
Peak Velocity:	.21 fps
Silt:	0.00 Inches

Manhole Information:

Manhole Depth:	8'
Manhole Material / Condition	Precast/OK
Pipe Material / Condition:	VCP/Good

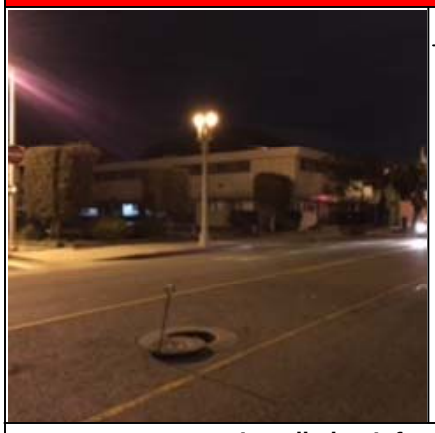
Land Use:	Residential	Commercial	Industrial	Trunk
	[ ]	[X]	[ ]	[ ]

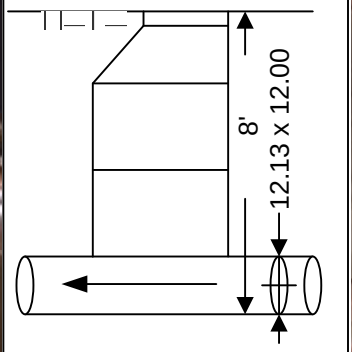
Oxygen: 20.9 **H2S:** 0 **LEL:** 0 **CO:** 0

Safety Notes:

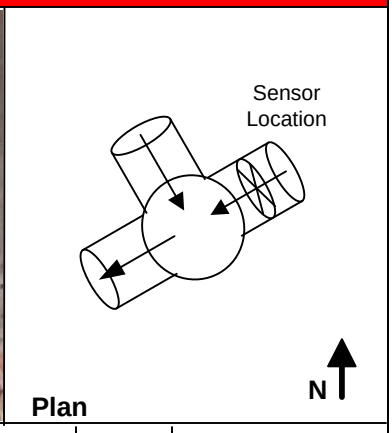
2 man crew required and one blower is to be operated at all times.

Other Information:





Cross Section



Plan

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Standard	Trunk	[ ]	[x]	[ ]	
Sensors Devices:	Ultrasonic / Pressure/Velocity	Lift / Pump Station	[ ]	[X]	[ ]	
Surcharge Height:	0	WWTP	[ ]	[X]	[ ]	
Rain Gauge Zone:		Other	[ ]	[X]	[ ]	

Additional Site Information / Comments:

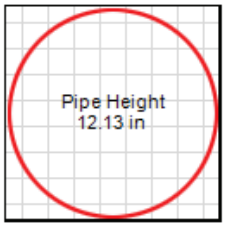
Standard Traffic Control with No Safety Concerns

SCATTERGRAPH REPORT

Broad06E

Flow Monitor

Broad06E

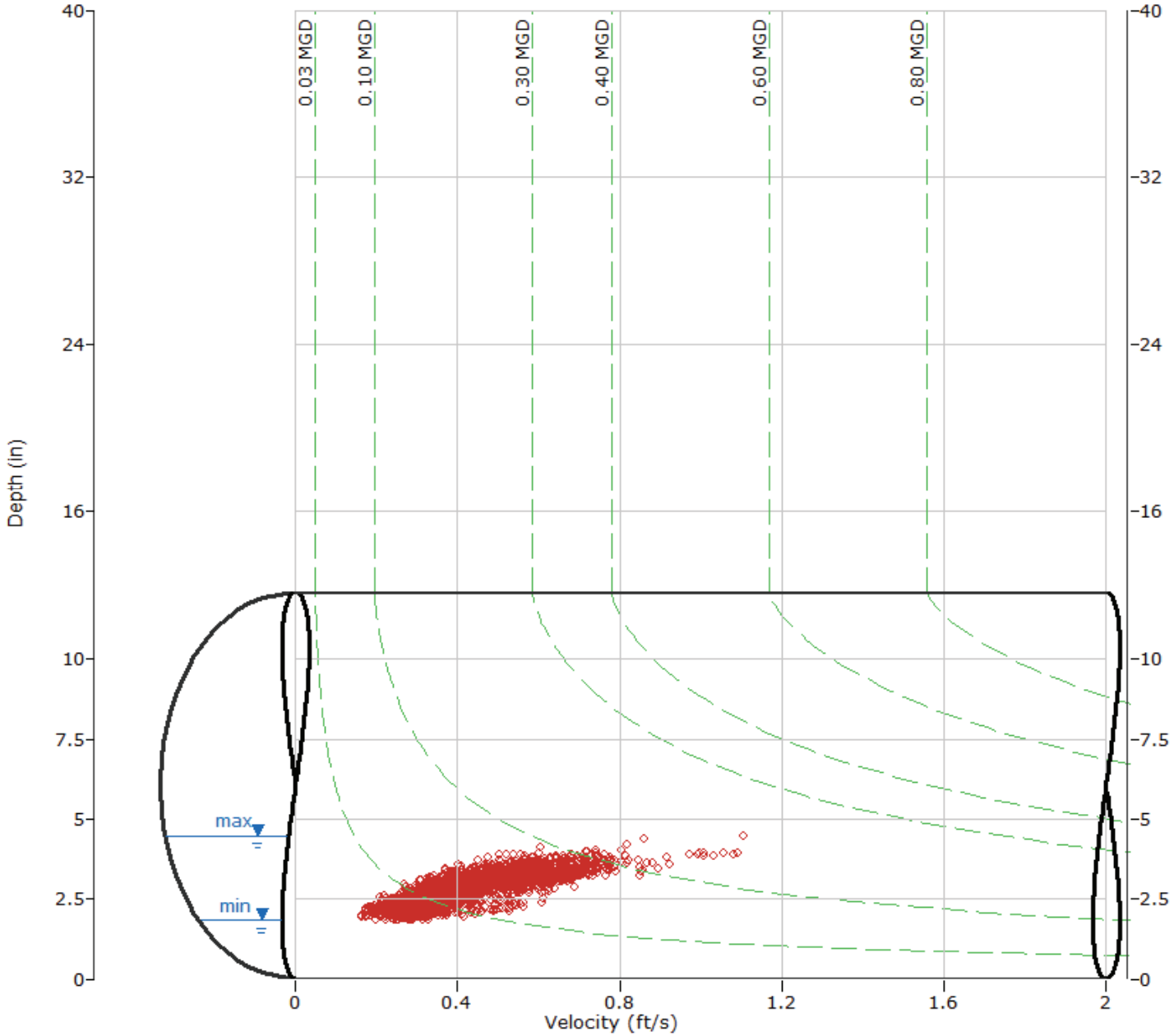


Report Period

4/20/2017
To
5/3/2017

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



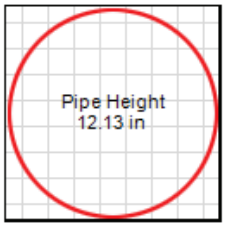
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

Broad06E

Flow Monitor

Broad06E

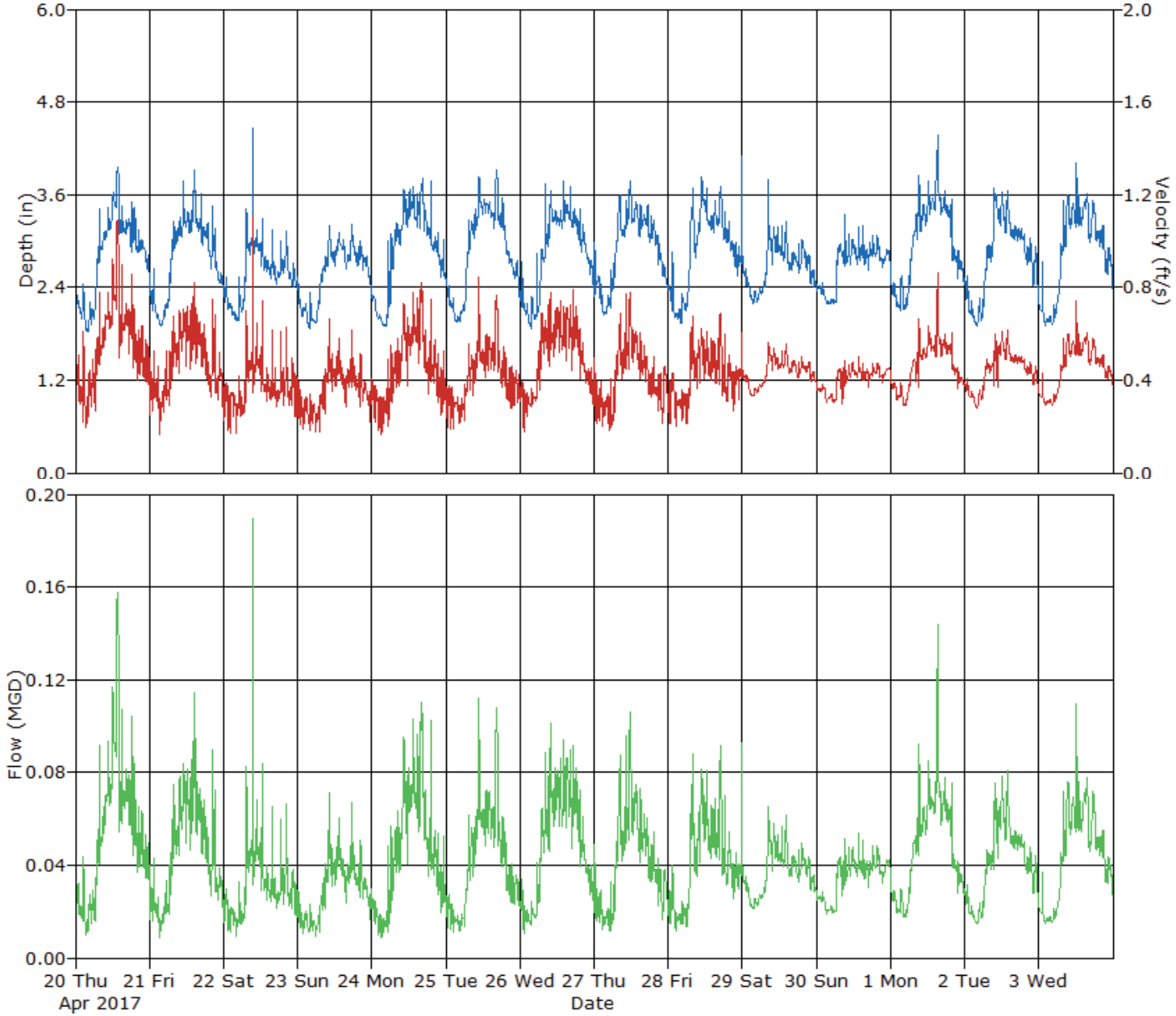


Report Period

4/20/2017
To
5/3/2017

Legend

- Depth
- Velocity
- Quantity



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
04/20/2017	03:55	1.82	13:45	3.95	2.83	03:35	0.20	13:35	1.09	0.55	03:35	0.010	13:35	0.158	0.054	0.054	
04/21/2017	03:55	1.91	14:35	3.92	2.79	03:30	0.16	14:25	0.82	0.47	03:30	0.009	14:45	0.114	0.045	0.045	
04/22/2017	04:35	1.97	09:25	4.46	2.58	04:05	0.17	09:25	1.11	0.37	04:05	0.009	09:25	0.190	0.031	0.031	
04/23/2017	03:50	1.87	17:40	3.22	2.58	07:05	0.18	10:05	0.66	0.36	05:45	0.009	10:05	0.071	0.030	0.030	
04/24/2017	04:30	1.90	16:35	3.81	2.87	03:00	0.17	16:00	0.82	0.46	03:00	0.009	16:00	0.110	0.046	0.046	
04/25/2017	04:40	1.95	16:20	3.91	2.87	02:35	0.19	10:35	0.85	0.42	02:35	0.011	10:35	0.112	0.042	0.042	
04/26/2017	03:30	1.86	14:10	3.78	2.85	01:40	0.18	17:10	0.79	0.50	01:40	0.011	10:05	0.101	0.049	0.049	
04/27/2017	03:20	2.04	11:35	3.78	2.91	05:05	0.18	11:35	0.78	0.41	05:05	0.012	11:35	0.106	0.041	0.041	
04/28/2017	04:15	1.94	23:50	4.11	2.89	02:45	0.20	17:10	0.69	0.43	02:45	0.011	23:50	0.093	0.042	0.042	
04/29/2017	03:35	2.19	08:30	3.80	2.68	03:35	0.33	08:35	0.56	0.43	03:35	0.021	08:30	0.065	0.037	0.037	
04/30/2017	03:25	2.18	09:15	3.35	2.69	08:20	0.30	13:45	0.50	0.40	03:25	0.019	13:45	0.054	0.035	0.035	
05/01/2017	03:00	2.11	15:15	4.37	2.98	04:25	0.29	15:15	0.86	0.46	04:25	0.017	15:15	0.144	0.048	0.048	
05/02/2017	04:00	1.91	09:35	3.69	2.79	04:10	0.28	13:55	0.62	0.44	04:10	0.015	13:55	0.081	0.042	0.042	
05/03/2017	02:05	1.90	12:10	4.01	2.86	02:05	0.29	12:10	0.74	0.45	02:05	0.015	12:10	0.109	0.045	0.045	

Report Summary For The Period 04/20/2017 00:00 - 05/03/2017 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)
Total			0.588
Avg	2.80	0.44	0.042

Site Commentary

Site Information

Broad06N	
Pipe Dimensions	5 "
Silt Level	0.00"

Overview

Site Broad06N functioned under normal conditions during the period Thursday, April 20, 2017 to Wednesday, May 03, 2017 . No surcharge conditions were experienced at this location (See Observation Table For More Details).

Review of the Scattergraph shows that free flow conditions were maintained throughout the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted and support the relative accuracy of the flow monitor at this location. Confidence in data accuracy is lower than typical, due to low flow conditions and the small pipe.

Observations

Average flow depth, velocity, and quantity data observed during Thursday, April 20, 2017 to Wednesday, May 03, 2017 , along with observed minimum and maximum data, are provided in the following table. The values presented are based on 5-minute data. In regards to depth, this site flows at approximately 17.2% full during the typical average depth of 0.86 inches.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	0.86	0.44	0.005
Minimum	0.30	0.14	0.000
Maximum	1.70	1.29	0.036
Time of Minimum	4/21/2017 03:20	5/3/2017 17:10	4/30/2017 04:25
Time of Maximum	4/21/2017 09:25	4/21/2017 09:25	4/21/2017 09:25

Data Quality

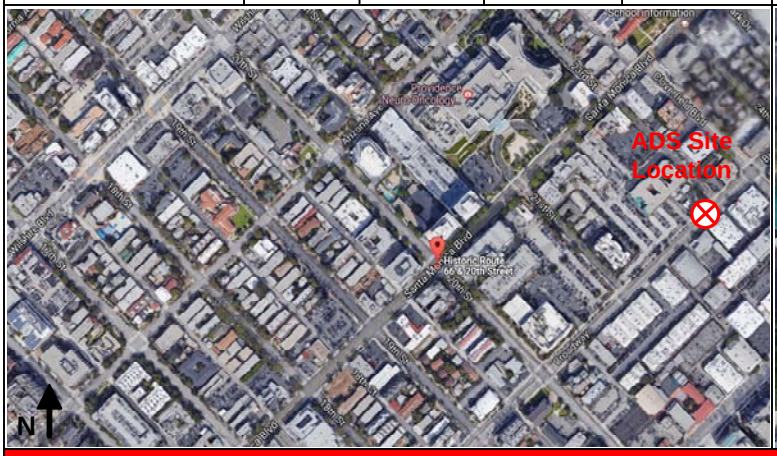
Data uptime observed during the Thursday, April 20, 2017 to the Wednesday, May 03, 2017 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

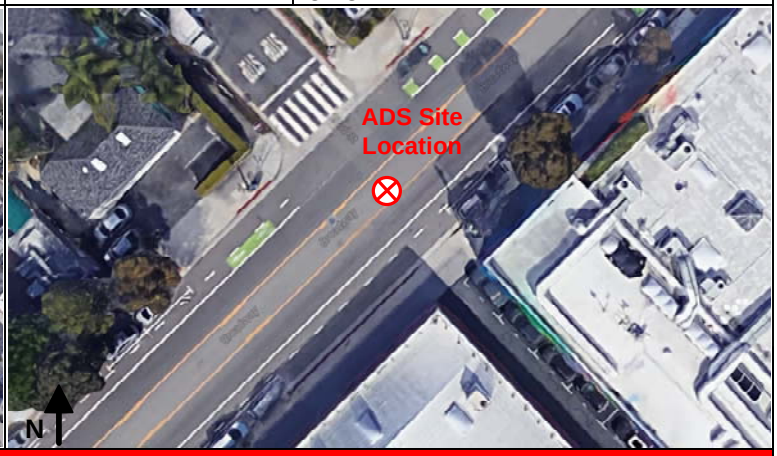
Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

ADS Site Report

Quality Form

Project Name: Santa Monica KPFF TFM 2017	**City:** Santa Monica	**Agency:** Santa Monica	**FM Initials:** SK
Site Name: Broad06N	**Install Date:** 4/19/17	**Monitor Type**	Peak Doppler
Address/Location: 2230 Broadway		**Monitor Model**	Triton
		Data Acquisition	Manual Collect
		Manhole ID	
Access: Drive	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Height:**	5.00 "
		Pipe Width:	5.25 "





Investigation Information:

Date/Time of Investigation:	3/21/17
Site Hydraulics:	Low flow during install
Upstream Input: (L/S, P/S)	--
Upstream Manhole:	Not investigated
Downstream Manhole:	Not investigated
Depth of Flow:	.63 " +/- 0.13"
Range (Air DOF):	+/-
Peak Velocity:	.09 fps
Silt:	0.00 Inches

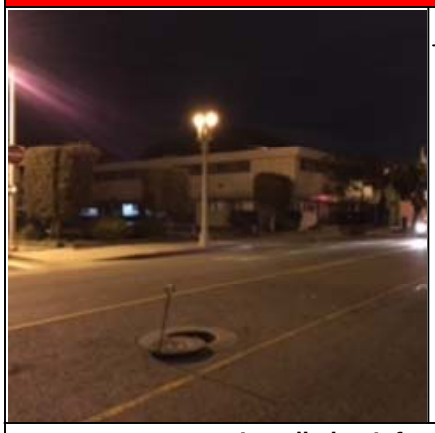
Manhole Information:

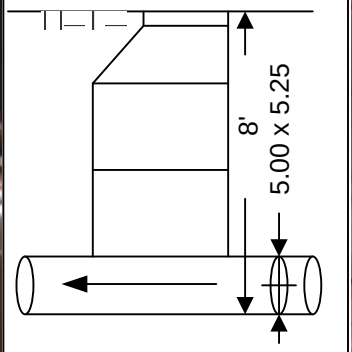
Manhole Depth:	8'			
Manhole Material / Condition	Precast/OK			
Pipe Material / Condition:	VCP/Good			
Land Use:	Residential [ ]	Commercial [X]	Industrial [ ]	Trunk [ ]
Oxygen: 20.9	**H2S:** 0	**LEL:** 0	**CO:** 0	

Safety Notes:

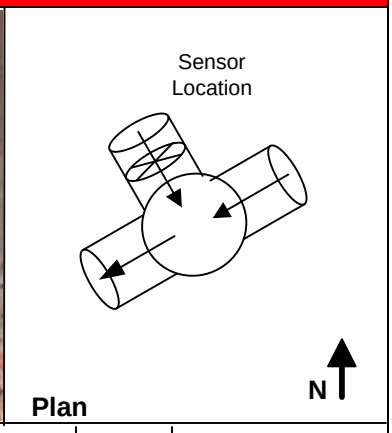
2 man crew required and one blower is to be operated at all times.

Other Information:





Cross Section



Plan

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Standard	Trunk	[ ]	[x]	[ ]	
Sensors Devices:	Ultrasonic / Pressure/Velocity	Lift / Pump Station	[ ]	[X]	[ ]	
Surcharge Height:	0	WWTP	[ ]	[X]	[ ]	
Rain Gauge Zone:		Other	[ ]	[X]	[ ]	

Additional Site Information / Comments:

Standard Traffic Control with No Safety Concerns

SCATTERGRAPH REPORT

Broad06N

Flow Monitor

Broad06N

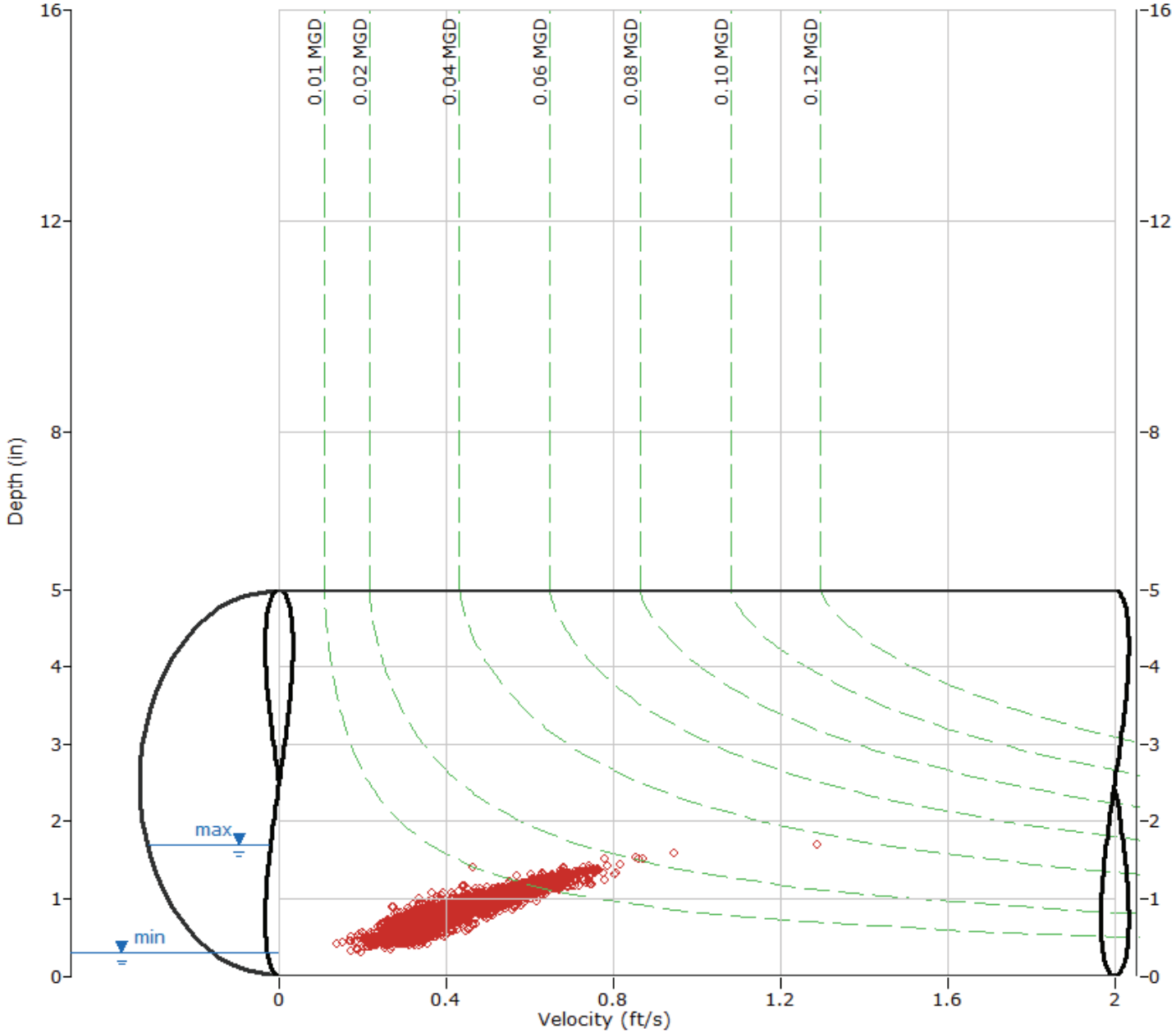
Pipe Height
5.00 in

Report Period

4/20/2017
To
5/3/2017

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



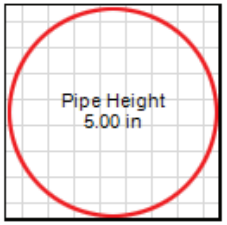
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

Broad06N

Flow Monitor

Broad06N

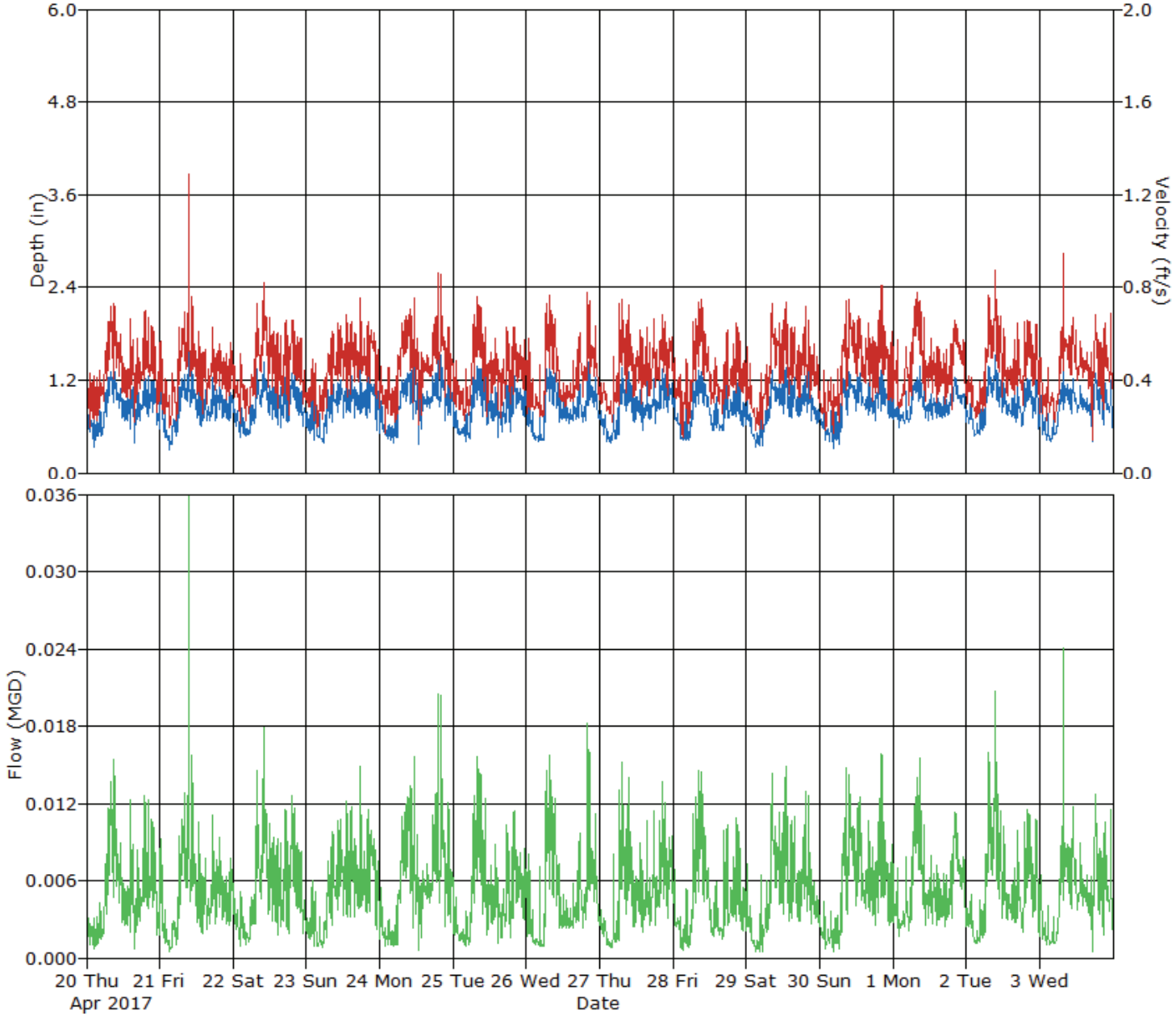


Report Period

4/20/2017
To
5/3/2017

Legend

- Depth
- Velocity
- Quantity



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 04/20/2017 00:00 - 05/03/2017 23:59

Broad06N, Pipe Height: 5.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
04/20/2017	02:30	0.34	09:05	1.39	0.84	01:05	0.19	09:05	0.73	0.43	02:30	0.001	09:05	0.015	0.005	0.005	
04/21/2017	03:20	0.30	09:25	1.70	0.84	03:20	0.20	09:25	1.29	0.43	03:20	0.000	09:25	0.036	0.005	0.005	
04/22/2017	02:10	0.45	10:10	1.43	0.87	02:10	0.22	10:10	0.82	0.45	02:10	0.001	10:10	0.018	0.005	0.005	
04/23/2017	05:45	0.39	17:45	1.32	0.86	03:40	0.19	17:45	0.76	0.45	05:25	0.001	17:45	0.015	0.005	0.005	
04/24/2017	12:55	0.37	20:10	1.52	0.89	01:45	0.17	19:10	0.86	0.46	12:55	0.001	19:10	0.020	0.006	0.006	
04/25/2017	04:25	0.41	07:50	1.37	0.85	03:45	0.23	07:50	0.76	0.44	04:25	0.001	07:50	0.016	0.005	0.005	
04/26/2017	04:05	0.41	20:05	1.50	0.85	04:35	0.24	20:05	0.78	0.42	05:30	0.001	20:05	0.018	0.005	0.005	
04/27/2017	03:40	0.39	07:25	1.37	0.85	04:15	0.22	07:30	0.75	0.45	04:15	0.001	07:30	0.015	0.005	0.005	
04/28/2017	05:10	0.42	16:45	1.40	0.80	03:10	0.15	09:20	0.75	0.41	03:10	0.001	08:35	0.015	0.004	0.004	
04/29/2017	03:05	0.34	12:55	1.35	0.84	03:05	0.19	12:55	0.74	0.43	03:05	0.001	12:55	0.015	0.005	0.005	
04/30/2017	04:25	0.32	08:45	1.34	0.88	04:25	0.17	20:15	0.81	0.46	04:25	0.000	20:15	0.016	0.006	0.006	
05/01/2017	01:55	0.58	08:40	1.38	0.89	19:15	0.27	07:45	0.78	0.47	01:55	0.002	08:40	0.015	0.006	0.006	
05/02/2017	02:45	0.49	09:40	1.52	0.88	03:10	0.24	09:40	0.87	0.45	03:15	0.001	09:40	0.021	0.005	0.005	
05/03/2017	03:45	0.41	07:55	1.59	0.85	17:10	0.14	07:55	0.95	0.45	17:10	0.001	07:55	0.024	0.005	0.005	

Report Summary For The Period 04/20/2017 00:00 - 05/03/2017 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)
Total			0.073
Avg	0.86	0.44	0.005

Site Commentary

Site Information

SAN02E	
Pipe Dimensions	12 "
Silt Level	0.00"

Overview

Site SAN02E functioned under normal conditions during the period Thursday, April 20, 2017 to Wednesday, May 03, 2017 . No surcharge conditions were experienced at this location (See Observation Table For More Details).

Review of the Scattergraph shows that free flow conditions were maintained throughout the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted and support the relative accuracy of the flow monitor at this location.

Observations

Average flow depth, velocity, and quantity data observed during Thursday, April 20, 2017 to Wednesday, May 03, 2017 , along with observed minimum and maximum data, are provided in the following table. The values presented are based on 5-minute data. In regards to depth, this site flows at approximately 23.7% full during the typical average depth of 2.84 inches.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	2.84	0.55	0.061
Minimum	1.14	0.12	0.003
Maximum	8.58	2.68	1.039
Time of Minimum	5/2/2017 04:25	4/30/2017 04:50	4/30/2017 04:50
Time of Maximum	5/3/2017 14:50	5/3/2017 14:50	5/3/2017 14:50

Data Quality

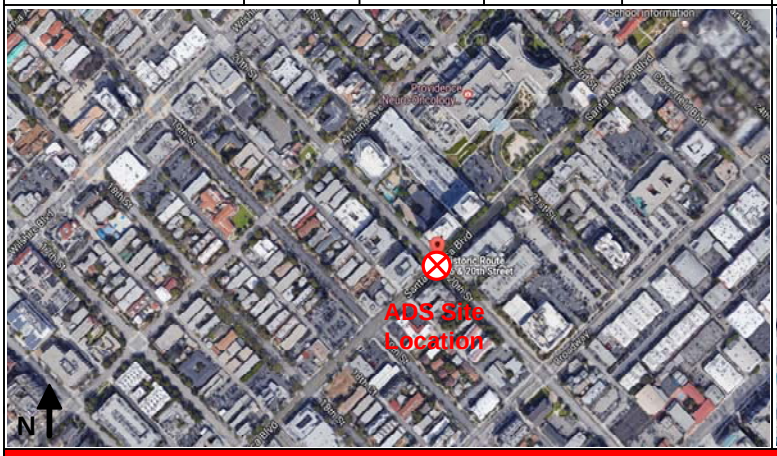
Data uptime observed during the Thursday, April 20, 2017 to the Wednesday, May 03, 2017 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

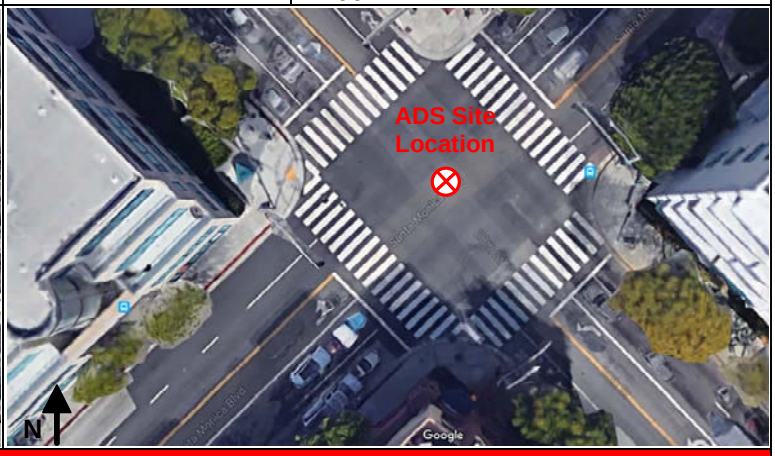
Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

ADS Site Report

Quality Form

Project Name: Santa Monica KPFF TFM 2017	**City:** Santa Monica	**Agency:** Santa Monica	**FM Initials:** SK
Site Name: San02E	**Install Date:** 4/19/17	**Monitor Type**	Peak Doppler
Address/Location: 20th & Santa Monica Blvd.		**Monitor Model**	Triton
		Data Acquisition	Manual Collect
		Manhole ID	
Access: Drive	**Type of System:** Sanitary X / Storm / Combined	**Pipe Height:**	12.00 "
		Pipe Width:	12.00 "





Investigation Information:

Date/Time of Investigation:	3/21/17
Site Hydraulics:	Low straight through flow
Upstream Input: (L/S, P/S)	--
Upstream Manhole:	Not investigated
Downstream Manhole:	Not investigated
Depth of Flow:	3.25 " +/- 0.13"
Range (Air DOF):	+/-
Peak Velocity:	1.05 fps
Silt:	0.00 Inches

Manhole Information:

Manhole Depth:	12'
Manhole Material / Condition	Precast/OK
Pipe Material / Condition:	VCP/Good

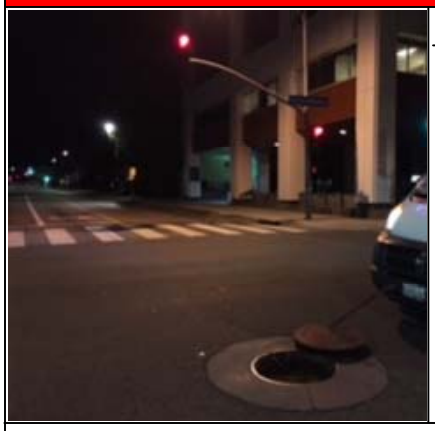
Land Use:	Residential	Commercial	Industrial	Trunk
		X		

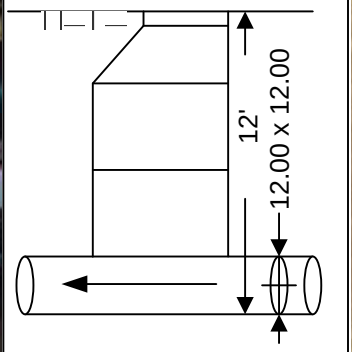
Oxygen: 20.9 **H2S:** 0 **LEL:** 0 **CO:** 0

Safety Notes:

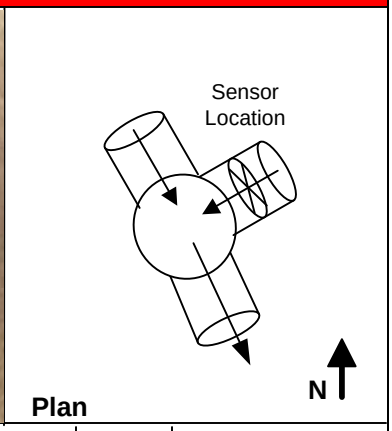
2 man crew required and one blower is to be operated at all times.

Other Information:





Cross Section



Plan

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Standard	Trunk		x		
Sensors Devices:	Ultrasonic / Pressure/Velocity	Lift / Pump Station		X		
Surcharge Height:	0	WWTP		X		
Rain Gauge Zone:		Other		X		

Additional Site Information / Comments:

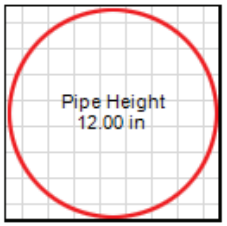
Standard Traffic Control with No Safety Concerns

SCATTERGRAPH REPORT

SAN02E

Flow Monitor

SAN02E

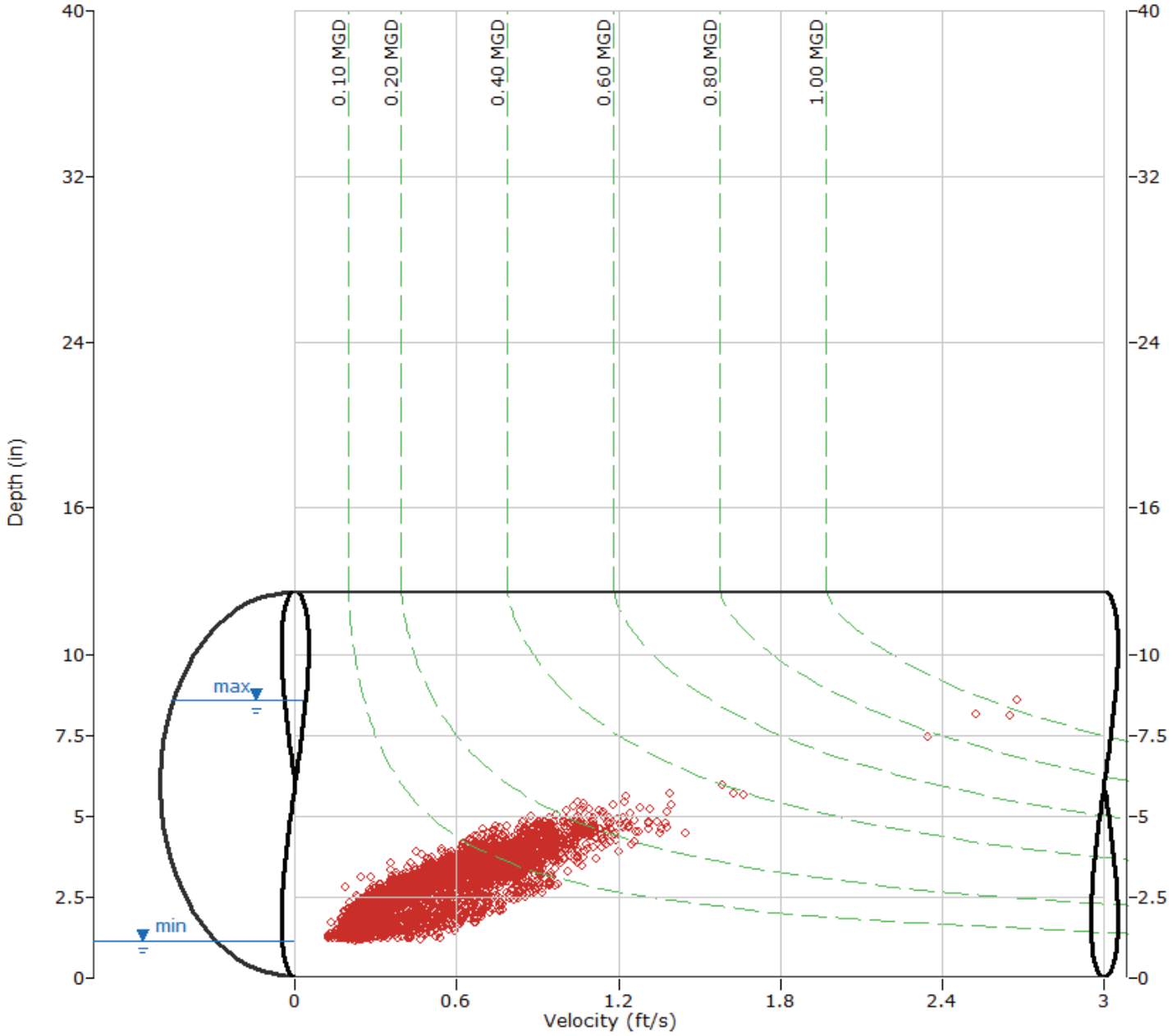


Report Period

4/20/2017
To
5/3/2017

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

SAN02E

Flow Monitor

SAN02E

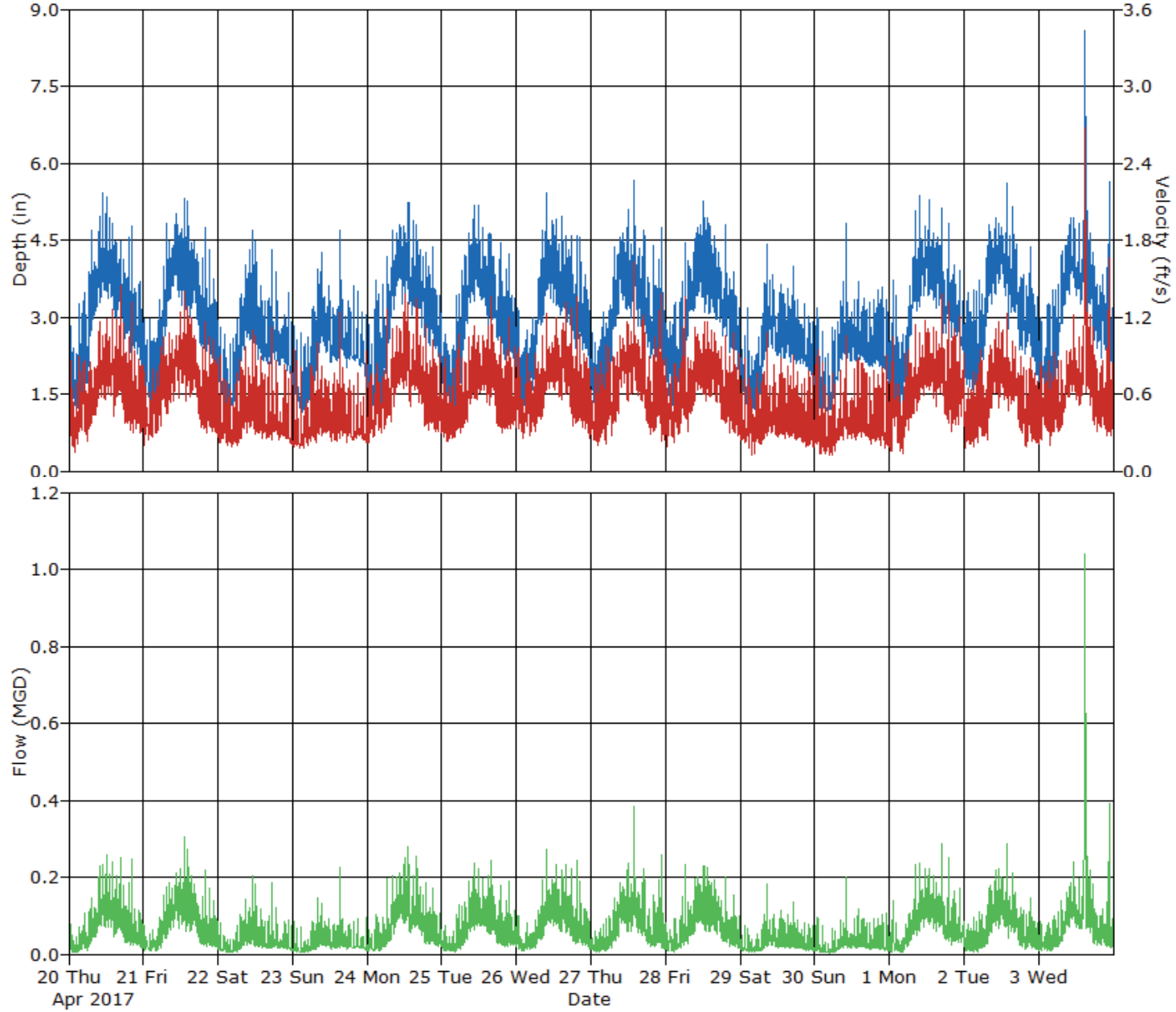
Pipe Height
12.00 in

Report Period

4/20/2017
To
5/3/2017

Legend

- Depth
- Velocity
- Quantity



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
04/20/2017	02:55	1.22	11:00	5.42	3.04	02:10	0.15	16:35	1.45	0.61	02:10	0.004	12:05	0.258	0.072	0.072	
04/21/2017	02:35	1.22	13:10	5.32	3.07	00:20	0.20	13:10	1.40	0.63	02:35	0.007	13:10	0.303	0.075	0.075	
04/22/2017	03:50	1.21	11:00	4.70	2.40	04:25	0.19	17:30	1.12	0.40	04:45	0.006	11:00	0.202	0.034	0.034	
04/23/2017	03:20	1.15	15:20	4.69	2.31	03:35	0.18	15:20	1.24	0.37	03:35	0.005	15:20	0.227	0.029	0.029	
04/24/2017	02:25	1.25	13:10	5.23	3.04	00:25	0.22	12:25	1.38	0.64	02:25	0.008	13:10	0.280	0.075	0.075	
04/25/2017	04:10	1.20	11:40	5.18	2.97	02:15	0.23	15:45	1.36	0.60	04:10	0.007	15:45	0.245	0.069	0.069	
04/26/2017	02:00	1.25	09:50	5.42	3.02	23:30	0.26	19:40	1.36	0.64	02:00	0.008	09:50	0.272	0.073	0.073	
04/27/2017	02:40	1.18	13:50	5.67	2.94	02:10	0.20	13:50	1.63	0.62	02:40	0.006	13:50	0.384	0.070	0.070	
04/28/2017	02:45	1.26	12:10	5.27	3.09	00:40	0.19	06:25	1.35	0.63	02:45	0.006	06:25	0.232	0.074	0.074	
04/29/2017	03:00	1.16	08:35	4.42	2.28	03:45	0.13	08:35	1.07	0.38	03:45	0.004	08:35	0.182	0.029	0.029	
04/30/2017	03:35	1.17	10:05	4.82	2.23	04:50	0.12	10:05	1.06	0.36	04:50	0.003	10:05	0.201	0.027	0.027	
05/01/2017	03:40	1.22	09:55	5.38	3.12	04:20	0.13	16:50	1.38	0.64	04:20	0.004	16:50	0.285	0.076	0.076	
05/02/2017	04:25	1.14	13:50	5.61	3.13	00:40	0.17	13:50	1.23	0.55	04:25	0.006	13:50	0.285	0.067	0.067	
05/03/2017	02:40	1.39	14:50	8.58	3.19	03:30	0.20	14:50	2.68	0.65	03:30	0.008	14:50	1.039	0.086	0.086	

Report Summary For The Period 04/20/2017 00:00 - 05/03/2017 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)
Total			0.855
Avg	2.84	0.55	0.061

Site Commentary

Site Information

SAN02N	
Pipe Dimensions	12 "
Silt Level	0.00"

Overview

Site SAN02N functioned under normal conditions during the period Thursday, April 20, 2017 to Wednesday, May 03, 2017 . This line exhibits the presence of an hydraulic jump when operating between 2.0 and 2.7 inches in depth. This condition is experienced when flow transitions from supercritical to subcritical flow. No surcharge conditions were experienced at this location (See Observation Table For More Details).

Review of the Scattergraph shows that free flow conditions were maintained throughout the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted and support the relative accuracy of the flow monitor at this location.

Observations

Average flow depth, velocity, and quantity data observed during Thursday, April 20, 2017 to Wednesday, May 03, 2017 , along with observed minimum and maximum data, are provided in the following table. The values presented are based on 5-minute data. In regards to depth, this site flows at approximately 22.9% full during the typical average depth of 2.75 inches.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	2.75	3.86	0.353
Minimum	1.79	1.44	0.073
Maximum	4.21	5.42	0.826
Time of Minimum	5/1/2017 04:05	4/30/2017 04:00	4/29/2017 04:15
Time of Maximum	4/21/2017 09:35	4/24/2017 14:05	4/21/2017 09:35

Data Quality

Data uptime observed during the Thursday, April 20, 2017 to the Wednesday, May 03, 2017 monitoring period is provided in the table below. Based upon the quality

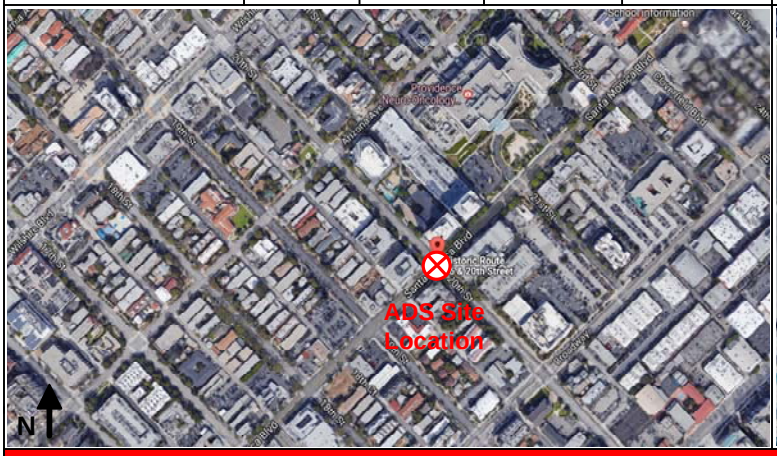
and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

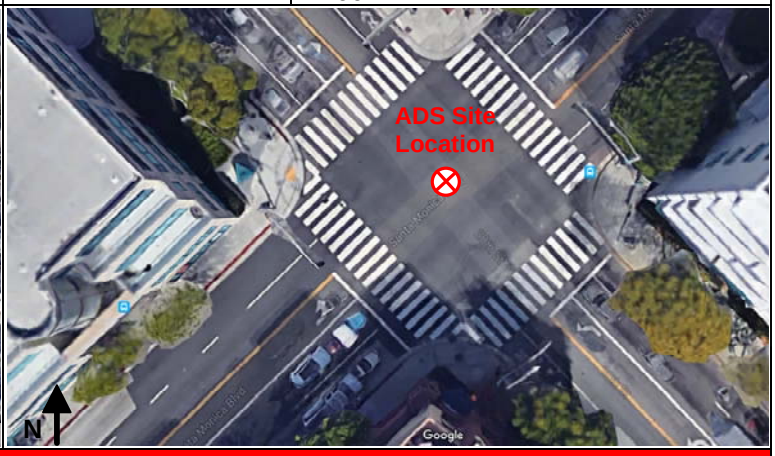
Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

ADS Site Report

Quality Form

Project Name: Santa Monica KPFF TFM 2017	**City:** Santa Monica	**Agency:** Santa Monica	**FM Initials:** SK
Site Name: San02N	**Install Date:** 4/19/17	**Monitor Type**	Peak Doppler
Address/Location: 20th & Santa Monica Blvd.		**Monitor Model**	Triton
		Data Acquisition	Manual Collect
		Manhole ID	
Access: Drive	**Type of System:** Sanitary X / Storm / Combined	**Pipe Height:**	12.00 "
		Pipe Width:	12.00 "





Investigation Information:

Date/Time of Investigation:	3/21/17
Site Hydraulics:	Good straight through flow
Upstream Input: (L/S, P/S)	--
Upstream Manhole:	Not investigated
Downstream Manhole:	Not investigated
Depth of Flow:	2.38 " +/- 0.13"
Range (Air DOF):	+/-
Peak Velocity:	3.51 fps
Silt:	0.00 Inches

Manhole Information:

Manhole Depth:	12'
Manhole Material / Condition	Precast/OK
Pipe Material / Condition:	VCP/Good

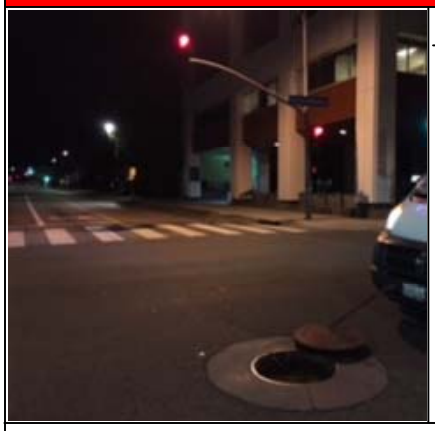
Land Use:	Residential	Commercial	Industrial	Trunk
		X		

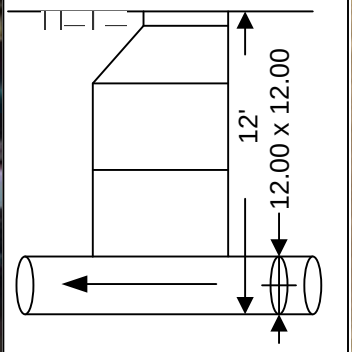
Oxygen: 20.9	**H2S:** 0	**LEL:** 0	**CO:** 0

Safety Notes:

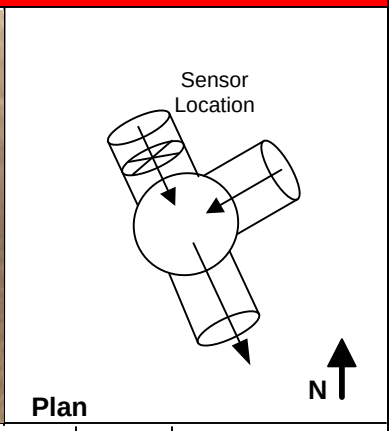
2 man crew required and one blower is to be operated at all times.

Other Information:





Cross Section



Plan

Installation Information	
Installation Type:	Standard
Sensors Devices:	Ultrasonic / Pressure/Velocity
Surcharge Height:	0
Rain Gauge Zone:	

Backup	Yes	No	?	Distance
Trunk		x		
Lift / Pump Station		X		
WWTP		X		
Other		X		

Additional Site Information / Comments:

Standard Traffic Control with No Safety Concerns

SCATTERGRAPH REPORT

SAN02N

Flow Monitor

SAN02N

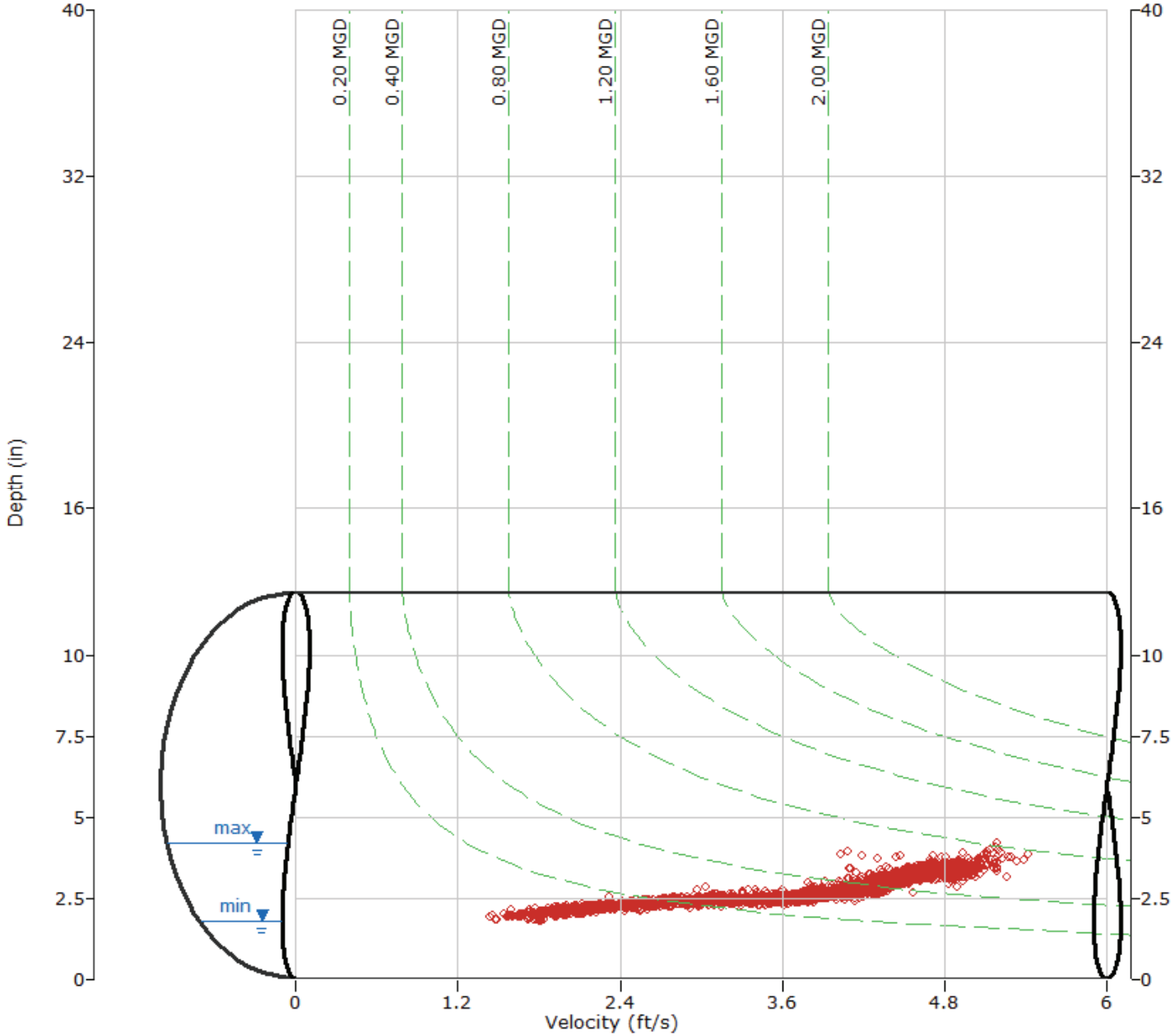
Pipe Height
12.00 in

Report Period

4/20/2017
To
5/3/2017

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

SAN02N

Flow Monitor

SAN02N

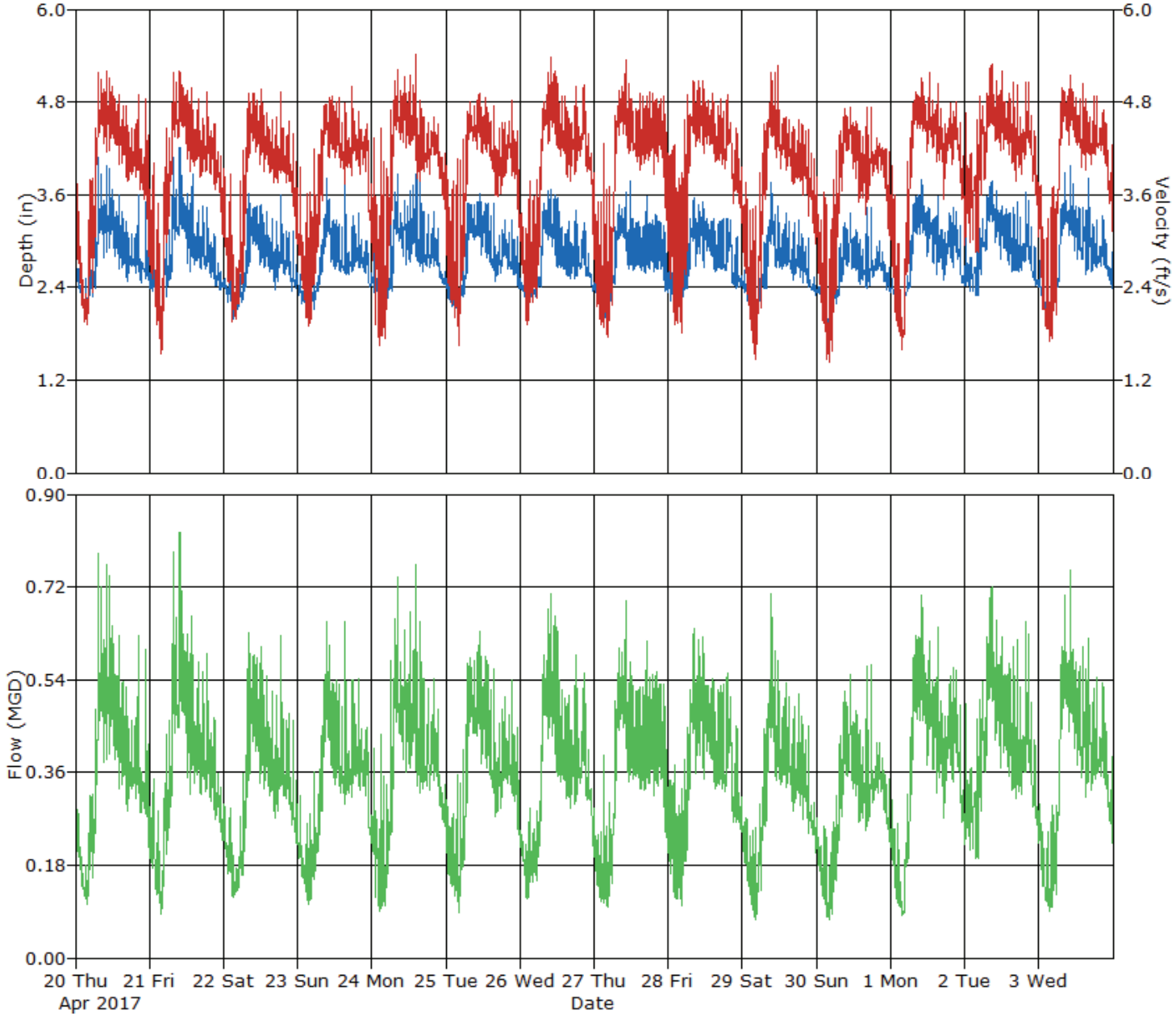
Pipe Height
12.00 in

Report Period

4/20/2017
To
5/3/2017

Legend

- Depth
- Velocity
- Quantity



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
04/20/2017	03:50	1.94	07:30	4.07	2.81	03:55	1.92	10:10	5.20	3.87	03:55	0.104	07:30	0.786	0.366	0.366	
04/21/2017	03:50	2.01	09:35	4.21	2.80	03:50	1.55	09:35	5.19	3.88	03:50	0.086	09:35	0.826	0.365	0.365	
04/22/2017	03:20	1.99	08:00	3.61	2.68	02:50	1.95	12:25	4.96	3.73	03:20	0.118	08:00	0.631	0.328	0.328	
04/23/2017	03:20	1.98	09:35	3.82	2.69	03:20	1.91	17:45	4.99	3.81	03:20	0.104	09:35	0.654	0.335	0.335	
04/24/2017	02:40	1.97	14:50	3.95	2.78	02:35	1.65	14:05	5.42	3.89	02:40	0.090	14:05	0.764	0.362	0.362	
04/25/2017	04:10	1.95	10:50	3.62	2.77	04:10	1.65	10:50	4.91	3.84	04:10	0.089	10:50	0.634	0.352	0.352	
04/26/2017	02:50	2.09	09:55	3.67	2.74	02:15	1.92	09:55	5.38	3.91	02:10	0.115	09:55	0.707	0.354	0.354	
04/27/2017	03:25	2.01	11:45	3.78	2.76	04:20	1.75	10:30	5.34	3.91	04:20	0.099	10:30	0.693	0.359	0.359	
04/28/2017	04:20	2.02	08:35	3.56	2.77	04:20	1.81	07:55	5.08	3.98	04:20	0.102	08:35	0.639	0.365	0.365	
04/29/2017	04:10	1.84	09:30	3.76	2.61	04:15	1.48	11:20	5.26	3.68	04:15	0.073	09:30	0.706	0.313	0.313	
04/30/2017	04:00	1.90	17:45	3.44	2.56	04:00	1.44	16:30	4.74	3.61	04:00	0.074	17:45	0.569	0.298	0.298	
05/01/2017	04:05	1.79	09:50	3.79	2.81	03:35	1.60	12:50	5.19	3.89	03:35	0.082	09:50	0.703	0.372	0.372	
05/02/2017	03:45	2.30	08:50	3.77	2.90	03:45	2.85	08:50	5.29	4.20	03:45	0.194	08:50	0.721	0.406	0.406	
05/03/2017	03:30	1.92	10:15	3.97	2.79	03:20	1.71	10:15	5.14	3.90	03:20	0.091	10:15	0.752	0.367	0.366	

Report Summary For The Period 04/20/2017 00:00 - 05/03/2017 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)
Total			4.942
Avg	2.75	3.86	0.353

Site Commentary

Site Information

SAN03	
Pipe Dimensions	12 "
Silt Level	0.00"

Overview

Site SAN03 functioned under normal conditions during the period Thursday, April 20, 2017 to Wednesday, May 03, 2017 . The hydraulic conditions in this stretch of pipe are near the lower detection limit of an area velocity type meter. Depth in this line is typically low and stagnant. No surcharge conditions were experienced at this location (See Observation Table For More Details).

Review of the Scattergraph shows that free flow conditions were maintained throughout the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted and support the relative accuracy of the flow monitor at this location. Confidence in data accuracy is lower than typical, due to hydraulic conditions.

Observations

Average flow depth, velocity, and quantity data observed during Thursday, April 20, 2017 to Wednesday, May 03, 2017 , along with observed minimum and maximum data, are provided in the following table. The values presented are based on 5-minute data. In regards to depth, this site flows at approximately 9.0% full during the typical average depth of 1.08 inches.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	1.08	0.00	0.000
Minimum	1.05	0.00	0.000
Maximum	4.80	0.44	0.060
Time of Minimum	4/20/2017 00:00	4/20/2017 00:00	4/20/2017 00:00
Time of Maximum	5/3/2017 14:50	5/3/2017 15:00	5/3/2017 15:00

Data Quality

Data uptime observed during the Thursday, April 20, 2017 to the Wednesday, May 03, 2017 monitoring period is provided in the table below. Based upon the quality

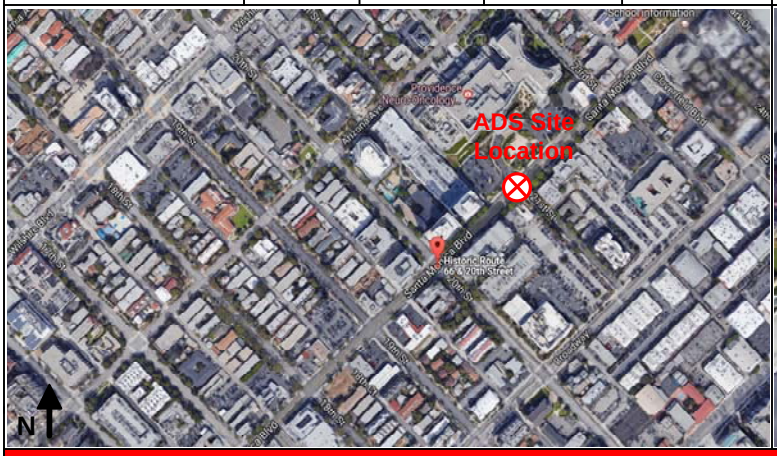
and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

ADS Site Report

Quality Form

Project Name: Santa Monica KPFF TFM 2017	**City:** Santa Monica	**Agency:** Santa Monica	**FM Initials:** SK
Site Name: San03	**Install Date:** 4/19/17	**Monitor Type**	Peak Doppler
Address/Location: Santa Monica Blvd & 21st St.		**Monitor Model**	Triton
		Data Acquisition	Manual Collect
		Manhole ID	
Access: Drive	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Height:**	12.00 "
		Pipe Width:	12.00 "



Investigation Information:

Date/Time of Investigation:	3/21/17
Site Hydraulics:	No flow present during install and heavy root intrusion
Upstream Input: (L/S, P/S)	--
Upstream Manhole:	Not investigated
Downstream Manhole:	Not investigated
Depth of Flow:	0.00 " +/- 0.13"
Range (Air DOF):	+/-
Peak Velocity:	0.00 fps
Silt:	0.00 Inches

Manhole Information:

Manhole Depth:	8'
Manhole Material / Condition	Brick/OK
Pipe Material / Condition:	VCP/Good

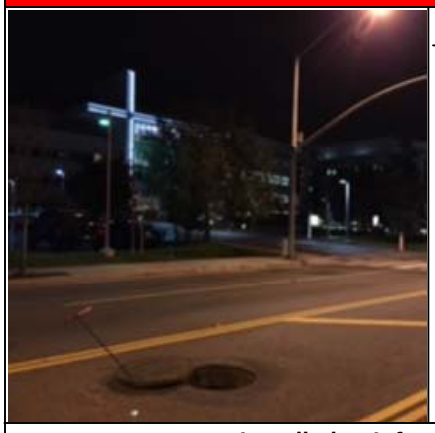
Land Use:	Residential [ ]	Commercial [X]	Industrial [ ]	Trunk [ ]

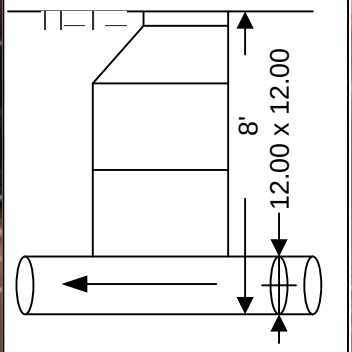
Oxygen: 20.9	**H2S:** 0	**LEL:** 0	**CO:** 0

Safety Notes:

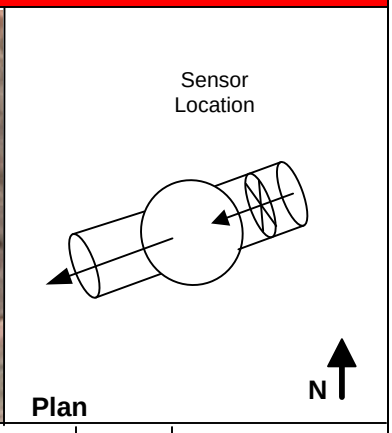
2 man crew required and one blower is to be operated at all times.

Other Information:





Cross Section



Plan

Installation Information	
Installation Type:	Standard
Sensors Devices:	Ultrasonic / Pressure/Velocity
Surcharge Height:	0
Rain Gauge Zone:	

Backup	Yes	No	?	Distance
Trunk	[ ]	[x]	[ ]	
Lift / Pump Station	[ ]	[X]	[ ]	
WWTP	[ ]	[X]	[ ]	
Other	[ ]	[X]	[ ]	

Additional Site Information / Comments:

Standard Traffic Control with No Safety Concerns

SCATTERGRAPH REPORT

SAN03

Flow Monitor

SAN03

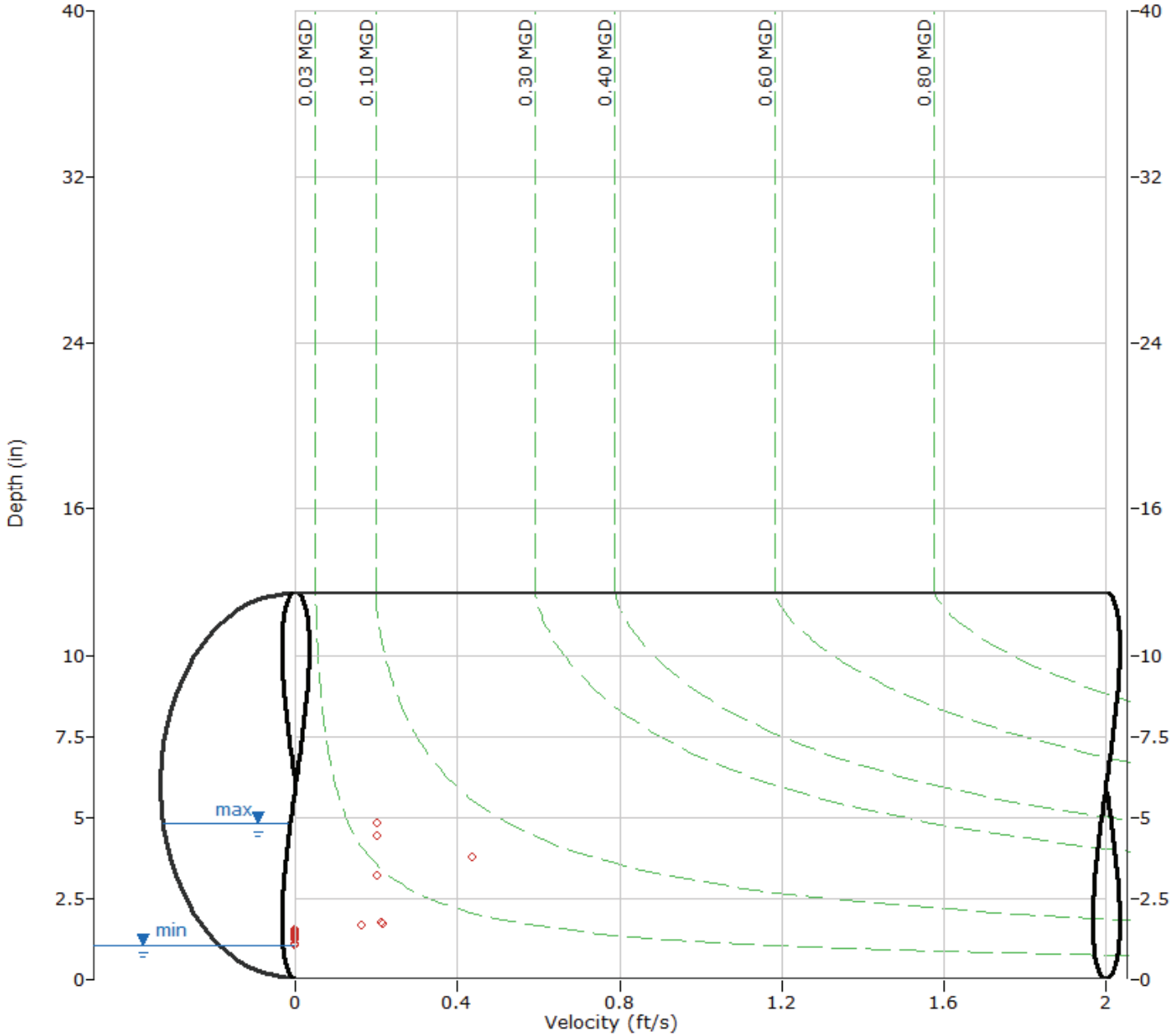
Pipe Height
12.00 in

Report Period

4/20/2017
To
5/3/2017

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



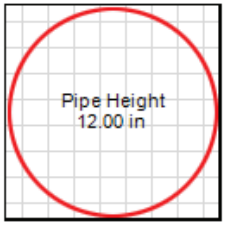
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

SAN03

Flow Monitor

SAN03

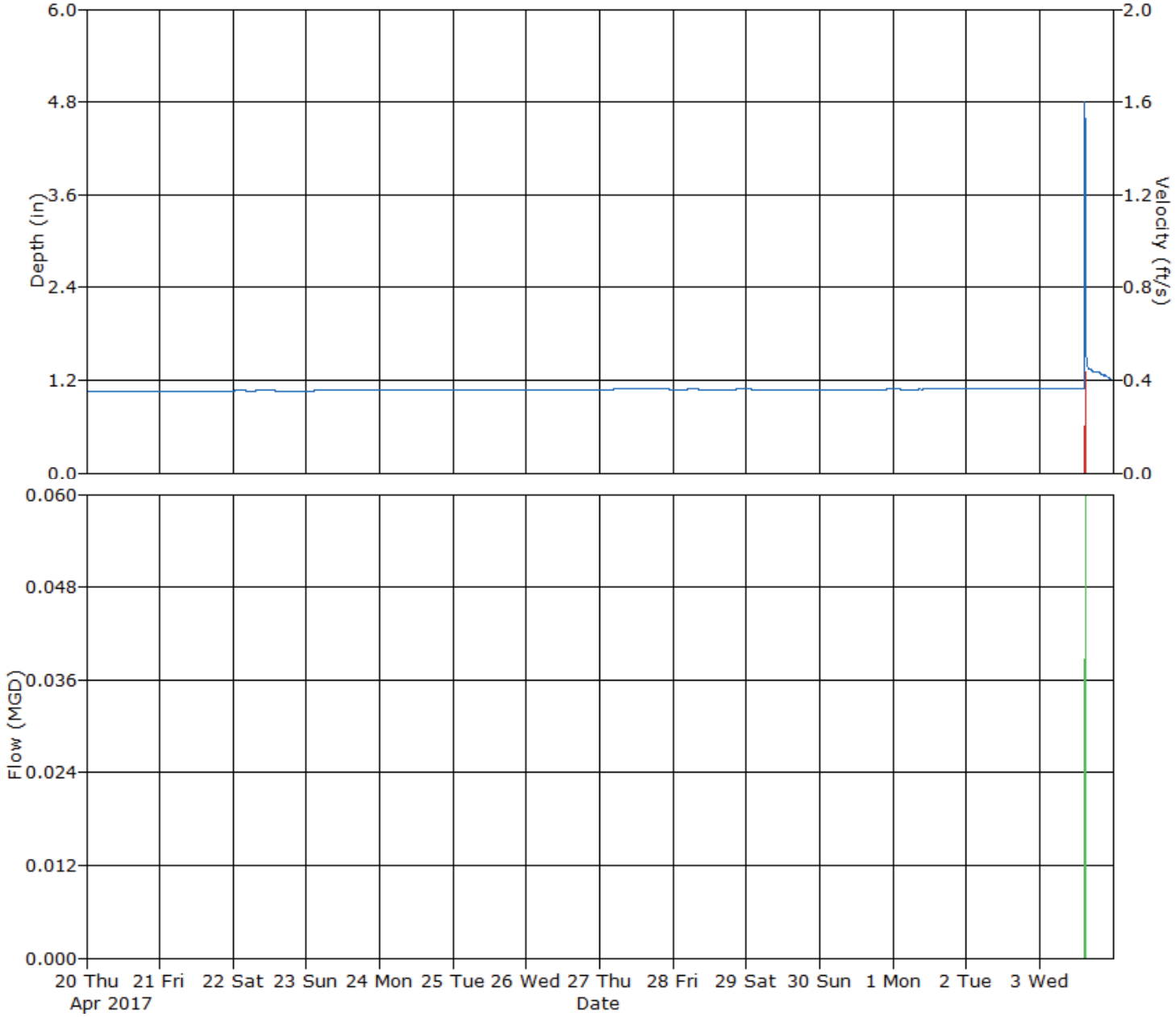


Report Period

4/20/2017
To
5/3/2017

Legend

- Depth
- Velocity
- Quantity



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 04/20/2017 00:00 - 05/03/2017 23:59

SAN03, Pipe Height: 12.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
04/20/2017	00:00	1.05	23:20	1.06	1.05	00:00	0.00	00:00	0.00	0.00	00:00	0.000	00:00	0.000	0.000	0.000	
04/21/2017	17:10	1.05	23:25	1.06	1.06	00:00	0.00	00:00	0.00	0.00	00:00	0.000	00:00	0.000	0.000	0.000	
04/22/2017	00:05	1.06	02:00	1.07	1.06	00:00	0.00	00:00	0.00	0.00	00:00	0.000	00:00	0.000	0.000	0.000	
04/23/2017	01:20	1.06	23:55	1.07	1.06	00:00	0.00	00:00	0.00	0.00	00:00	0.000	00:00	0.000	0.000	0.000	
04/24/2017	00:00	1.07	14:30	1.07	1.07	00:00	0.00	00:00	0.00	0.00	00:00	0.000	00:00	0.000	0.000	0.000	
04/25/2017	12:40	1.07	23:00	1.07	1.07	00:00	0.00	00:00	0.00	0.00	00:00	0.000	00:00	0.000	0.000	0.000	
04/26/2017	02:55	1.07	19:15	1.07	1.07	00:00	0.00	00:00	0.00	0.00	00:00	0.000	00:00	0.000	0.000	0.000	
04/27/2017	04:20	1.07	07:20	1.09	1.09	00:00	0.00	00:00	0.00	0.00	00:00	0.000	00:00	0.000	0.000	0.000	
04/28/2017	16:00	1.07	23:00	1.09	1.08	00:00	0.00	00:00	0.00	0.00	00:00	0.000	00:00	0.000	0.000	0.000	
04/29/2017	22:35	1.08	01:05	1.09	1.08	00:00	0.00	00:00	0.00	0.00	00:00	0.000	00:00	0.000	0.000	0.000	
04/30/2017	11:45	1.07	23:55	1.08	1.08	00:00	0.00	00:00	0.00	0.00	00:00	0.000	00:00	0.000	0.000	0.000	
05/01/2017	04:00	1.08	15:45	1.09	1.08	00:00	0.00	00:00	0.00	0.00	00:00	0.000	00:00	0.000	0.000	0.000	
05/02/2017	01:30	1.08	23:55	1.10	1.09	00:00	0.00	00:00	0.00	0.00	00:00	0.000	00:00	0.000	0.000	0.000	
05/03/2017	14:40	1.08	14:50	4.80	1.21	00:00	0.00	15:00	0.44	0.01	00:00	0.000	15:00	0.060	0.001	0.001	

Report Summary For The Period 04/20/2017 00:00 - 05/03/2017 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)
Total			0.001
Avg	1.08	0.00	0.000

Site Commentary

Site Information

San04E	
Pipe Dimensions	14.38 "
Silt Level	0.00"

Overview

Site San04E functioned under normal conditions during the period Thursday, April 20, 2017 to Wednesday, May 03, 2017 . No surcharge conditions were experienced at this location (See Observation Table For More Details).

Review of the Scattergraph shows that this line was impacted by debris. Free flow conditions were maintained throughout most of the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted and support the relative accuracy of the flow monitor at this location.

Observations

Average flow depth, velocity, and quantity data observed during Thursday, April 20, 2017 to Wednesday, May 03, 2017 , along with observed minimum and maximum data, are provided in the following table. The values presented are based on 5-minute data. In regards to depth, this site flows at approximately 16.3% full during the typical average depth of 2.35 inches.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	2.35	0.76	0.065
Minimum	1.29	0.22	0.010
Maximum	4.87	1.25	0.177
Time of Minimum	4/20/2017 03:35	5/3/2017 00:10	4/21/2017 04:20
Time of Maximum	5/2/2017 11:45	4/23/2017 11:20	4/23/2017 11:20

Data Quality

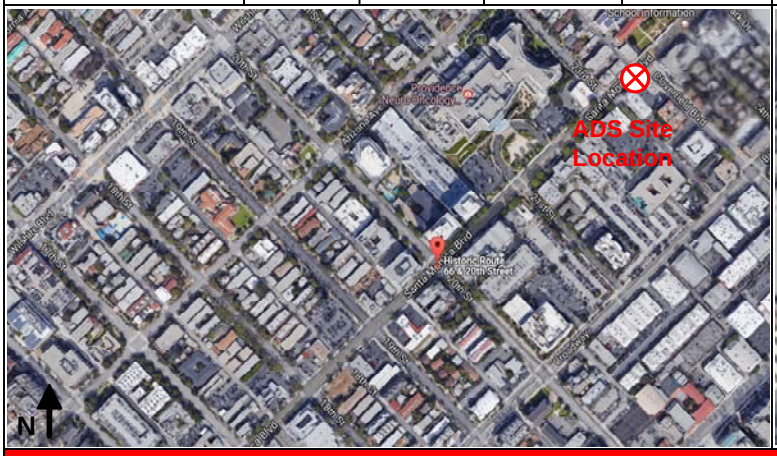
Data uptime observed during the Thursday, April 20, 2017 to the Wednesday, May 03, 2017 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

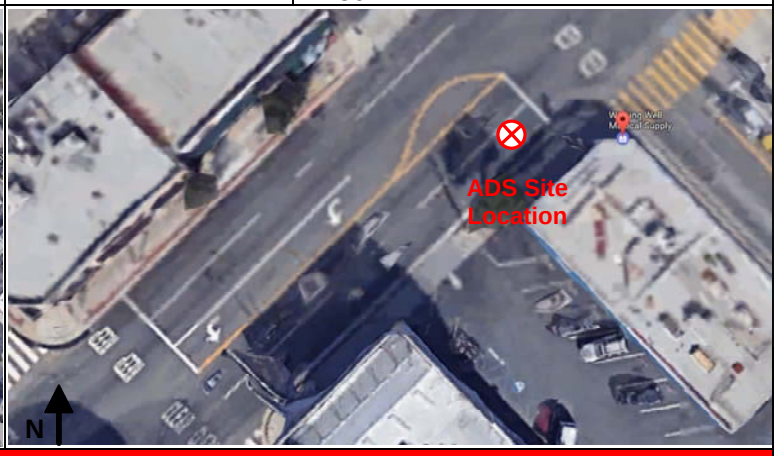
Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

ADS Site Report

Quality Form

Project Name: Santa Monica KPFF TFM 2017	**City:** Santa Monica	**Agency:** Santa Monica	**FM Initials:** SK
Site Name: San04E	**Install Date:** 4/19/17	**Monitor Type**	Peak Doppler
Address/Location: 2314 Santa Monica Blvd		**Monitor Model**	Triton
		Data Acquisition	Manual Collect
		Manhole ID	
Access: Drive	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Height:**	14.38 "
		Pipe Width:	14.50 "





Investigation Information:

Date/Time of Investigation:	3/21/17
Site Hydraulics:	Good straight through flow
Upstream Input: (L/S, P/S)	--
Upstream Manhole:	Not investigated
Downstream Manhole:	Not investigated
Depth of Flow:	2.75 " +/- 0.13"
Range (Air DOF):	+/-
Peak Velocity:	1.01 fps
Silt:	0.00 Inches

Manhole Information:

Manhole Depth:	10'
Manhole Material / Condition	Precast/OK
Pipe Material / Condition:	VCP/Good

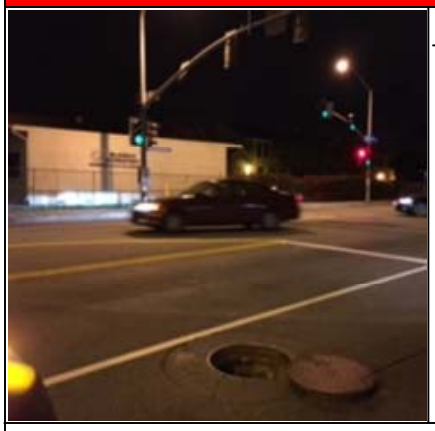
Land Use:	Residential	Commercial	Industrial	Trunk
	[ ]	[X]	[ ]	[ ]

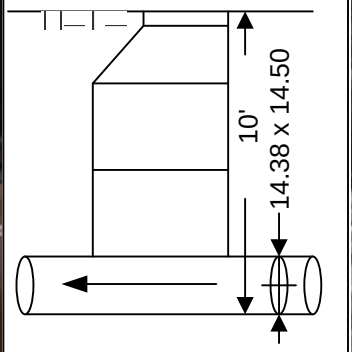
Oxygen: 20.9	**H2S:** 0	**LEL:** 0	**CO:** 0

Safety Notes:

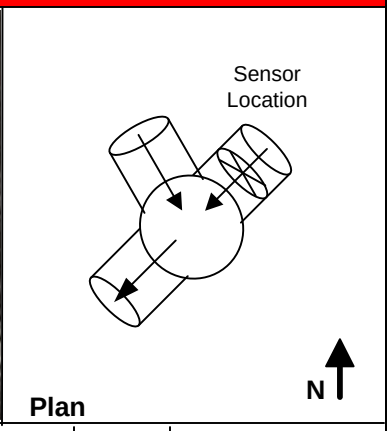
2 man crew required and one blower is to be operated at all times.

Other Information:





Cross Section



Plan

Installation Information	
Installation Type:	Standard
Sensors Devices:	Ultrasonic / Pressure/Velocity
Surcharge Height:	0
Rain Gauge Zone:	

Backup	Yes	No	?	Distance
Trunk	[ ]	[x]	[ ]	
Lift / Pump Station	[ ]	[X]	[ ]	
WWTP	[ ]	[X]	[ ]	
Other	[ ]	[X]	[ ]	

Additional Site Information / Comments:

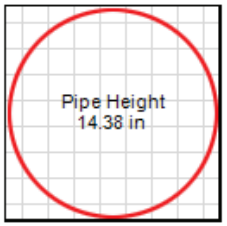
Standard Traffic Control with No Safety Concerns

SCATTERGRAPH REPORT

San04E

Flow Monitor

San04E

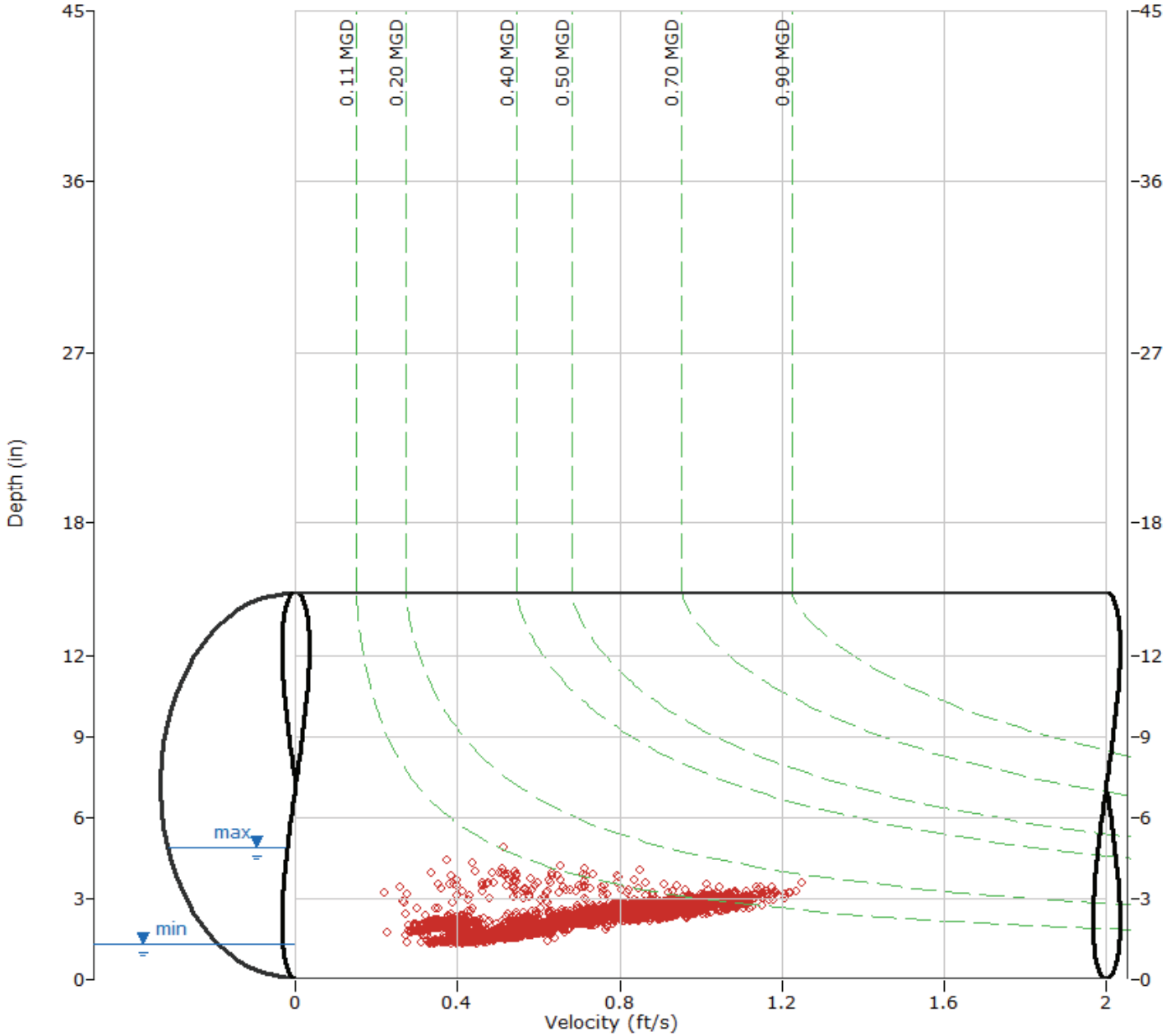


Report Period

4/20/2017
To
5/3/2017

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



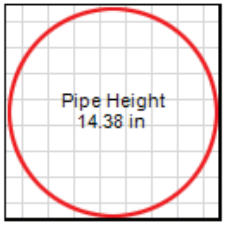
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

San04E

Flow Monitor

San04E

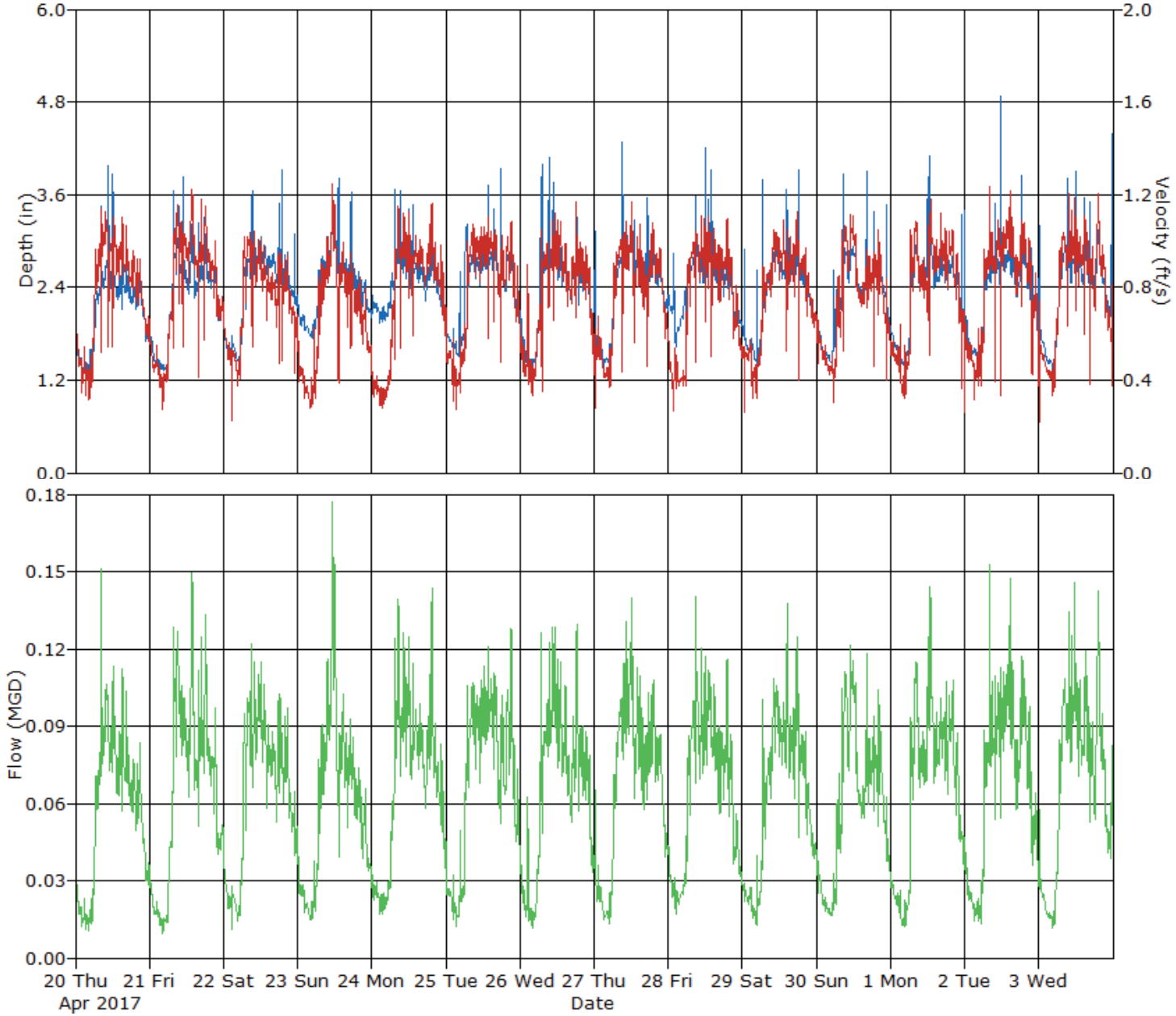


Report Period

4/20/2017
To
5/3/2017

Legend

- Depth
- Velocity
- Quantity



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 04/20/2017 00:00 - 05/03/2017 23:59

San04E, Pipe Height: 14.38 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
04/20/2017	03:35	1.29	10:45	3.97	2.14	04:25	0.31	08:25	1.14	0.77	04:25	0.011	08:25	0.151	0.057	0.057	
04/21/2017	04:25	1.32	10:45	3.83	2.26	04:20	0.27	13:45	1.22	0.79	04:20	0.010	13:50	0.149	0.064	0.064	
04/22/2017	04:45	1.45	19:05	3.91	2.40	02:45	0.23	10:05	1.04	0.74	02:45	0.011	09:05	0.122	0.064	0.064	
04/23/2017	05:00	1.74	13:25	3.81	2.43	04:10	0.28	11:20	1.25	0.68	04:10	0.015	11:20	0.177	0.061	0.061	
04/24/2017	23:45	1.93	07:35	3.68	2.47	03:25	0.28	19:30	1.16	0.76	03:25	0.017	19:30	0.144	0.067	0.067	
04/25/2017	04:05	1.51	17:45	3.93	2.42	03:15	0.27	13:40	1.10	0.79	03:15	0.012	21:05	0.128	0.069	0.069	
04/26/2017	04:05	1.36	09:25	4.08	2.36	04:05	0.33	18:05	1.17	0.77	04:05	0.012	18:25	0.130	0.066	0.066	
04/27/2017	03:15	1.38	09:10	4.27	2.39	00:15	0.28	12:15	1.17	0.77	04:55	0.013	12:15	0.139	0.067	0.067	
04/28/2017	02:35	1.63	12:00	4.20	2.41	01:55	0.27	10:45	1.11	0.76	02:35	0.017	08:55	0.141	0.065	0.065	
04/29/2017	04:40	1.40	18:20	3.92	2.31	00:45	0.26	17:40	1.13	0.77	04:40	0.013	14:45	0.138	0.063	0.063	
04/30/2017	04:45	1.43	16:20	3.89	2.28	05:40	0.30	10:55	1.11	0.74	05:00	0.017	10:55	0.122	0.060	0.060	
05/01/2017	04:05	1.40	12:30	4.11	2.34	23:50	0.26	13:00	1.18	0.78	04:25	0.012	12:35	0.144	0.066	0.066	
05/02/2017	05:15	1.38	11:45	4.87	2.36	03:05	0.32	08:00	1.24	0.81	05:15	0.013	08:00	0.153	0.068	0.068	
05/03/2017	04:30	1.33	23:40	4.39	2.37	00:10	0.22	19:10	1.21	0.78	04:25	0.012	11:40	0.146	0.067	0.067	

Report Summary For The Period 04/20/2017 00:00 - 05/03/2017 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)
Total			0.904
Avg	2.35	0.76	0.065

Site Commentary

Site Information

San04N	
Pipe Dimensions	9.38 "
Silt Level	0.00"

Overview

Site San04N functioned under normal conditions during the period Thursday, April 20, 2017 to Wednesday, May 03, 2017 . No surcharge conditions were experienced at this location (See Observation Table For More Details).

Review of the Scattergraph shows that free flow conditions were maintained throughout the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted and support the relative accuracy of the flow monitor at this location.

Observations

Average flow depth, velocity, and quantity data observed during Thursday, April 20, 2017 to Wednesday, May 03, 2017 , along with observed minimum and maximum data, are provided in the following table. The values presented are based on 5-minute data. In regards to depth, this site flows at approximately 22.7% full during the typical average depth of 2.13 inches.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	2.13	1.26	0.084
Minimum	0.99	0.24	0.006
Maximum	6.58	4.44	0.894
Time of Minimum	5/2/2017 03:40	5/2/2017 02:25	5/2/2017 02:25
Time of Maximum	5/3/2017 23:35	4/22/2017 09:00	4/27/2017 09:10

Data Quality

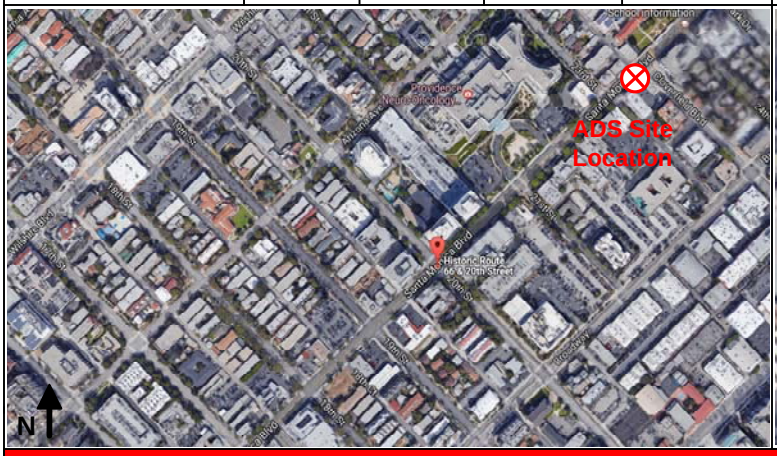
Data uptime observed during the Thursday, April 20, 2017 to the Wednesday, May 03, 2017 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

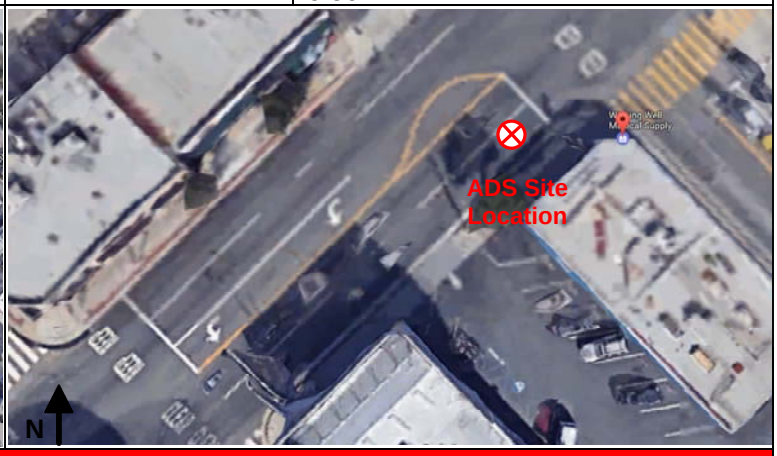
Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

ADS Site Report

Quality Form

Project Name: Santa Monica KPFF TFM 2017	**City:** Santa Monica	**Agency:** Santa Monica	**FM Initials:** SK
Site Name: San04N	**Install Date:** 4/19/17	**Monitor Type**	Peak Doppler
Address/Location: 2314 Santa Monica Blvd		**Monitor Model**	Triton
		Data Acquisition	Manual Collect
		Manhole ID	
Access: Drive	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Height:**	9.38 "
		Pipe Width:	9.50 "





Investigation Information:

Date/Time of Investigation:	3/21/17
Site Hydraulics:	Good straight through flow
Upstream Input: (L/S, P/S)	--
Upstream Manhole:	Not investigated
Downstream Manhole:	Not investigated
Depth of Flow:	2.38 " +/- 0.13"
Range (Air DOF):	+/-
Peak Velocity:	2.38 fps
Silt:	0.00 Inches

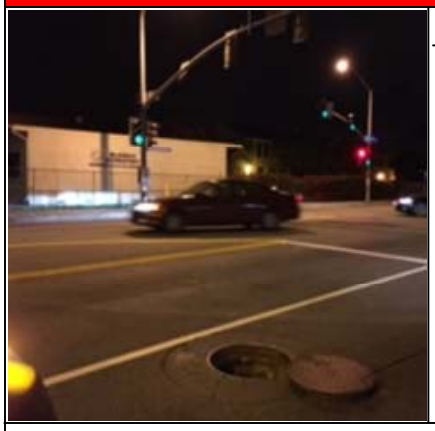
Manhole Information:

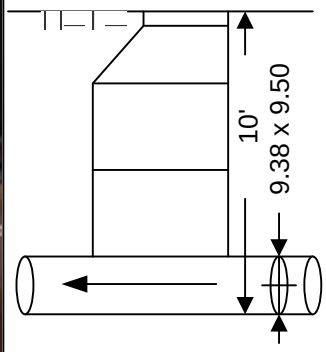
Manhole Depth:	10'			
Manhole Material / Condition	Precast/OK			
Pipe Material / Condition:	VCP/Good			
Land Use:	Residential [ ]	Commercial [X]	Industrial [ ]	Trunk [ ]
Oxygen: 20.9	**H2S:** 0	**LEL:** 0	**CO:** 0	

Safety Notes:

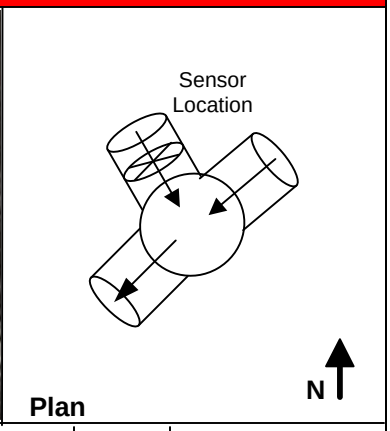
2 man crew required and one blower is to be operated at all times.

Other Information:





Cross Section



Plan

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Standard	Trunk	[ ]	[x]	[ ]	
Sensors Devices:	Ultrasonic / Pressure/Velocity	Lift / Pump Station	[ ]	[X]	[ ]	
Surcharge Height:	0	WWTP	[ ]	[X]	[ ]	
Rain Gauge Zone:		Other	[ ]	[X]	[ ]	

Additional Site Information / Comments:

Standard Traffic Control with No Safety Concerns

SCATTERGRAPH REPORT

San04N

Flow Monitor

San04N

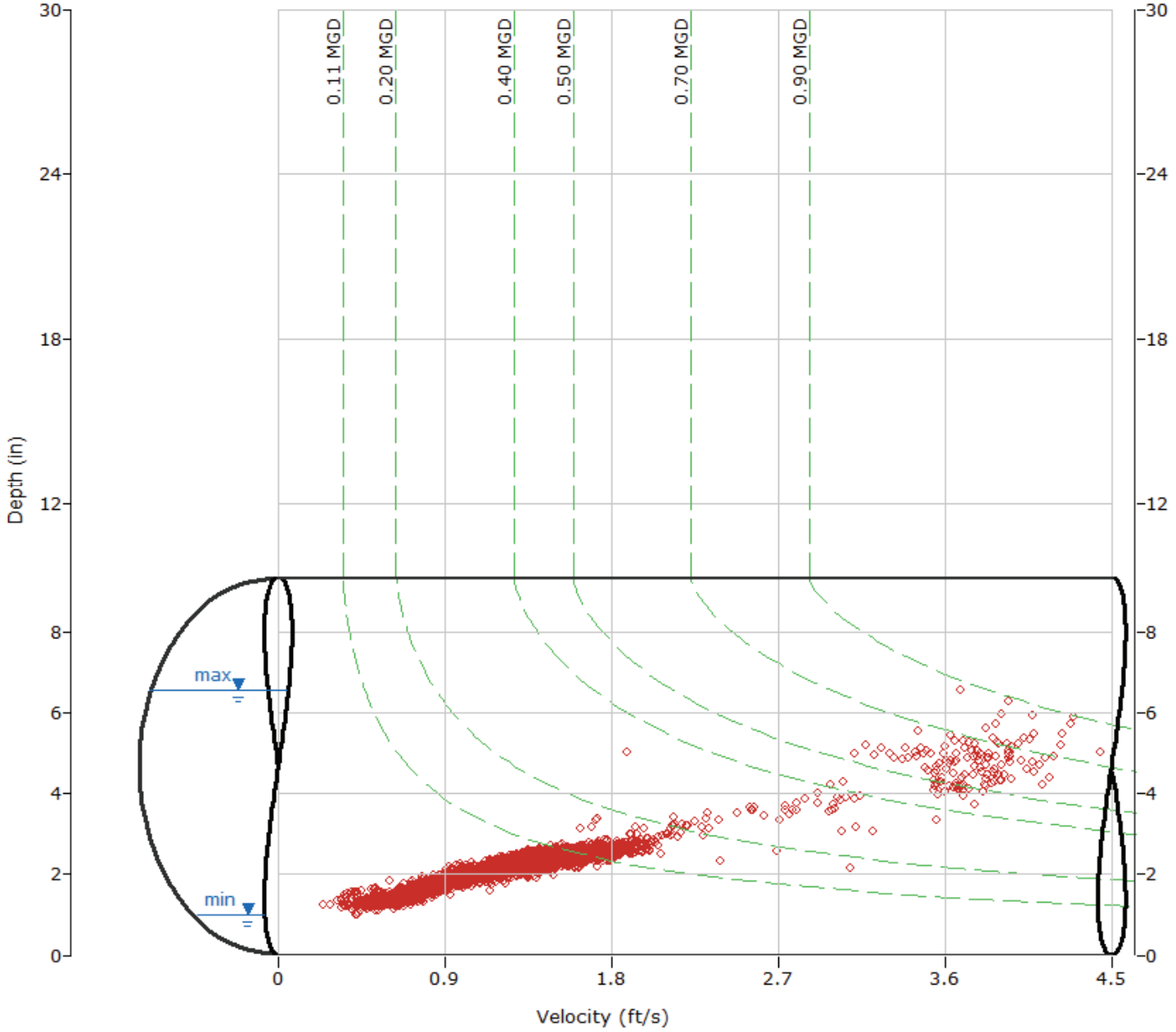
Pipe Height
9.38 in

Report Period

4/20/2017
To
5/3/2017

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



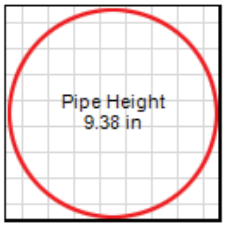
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

San04N

Flow Monitor

San04N

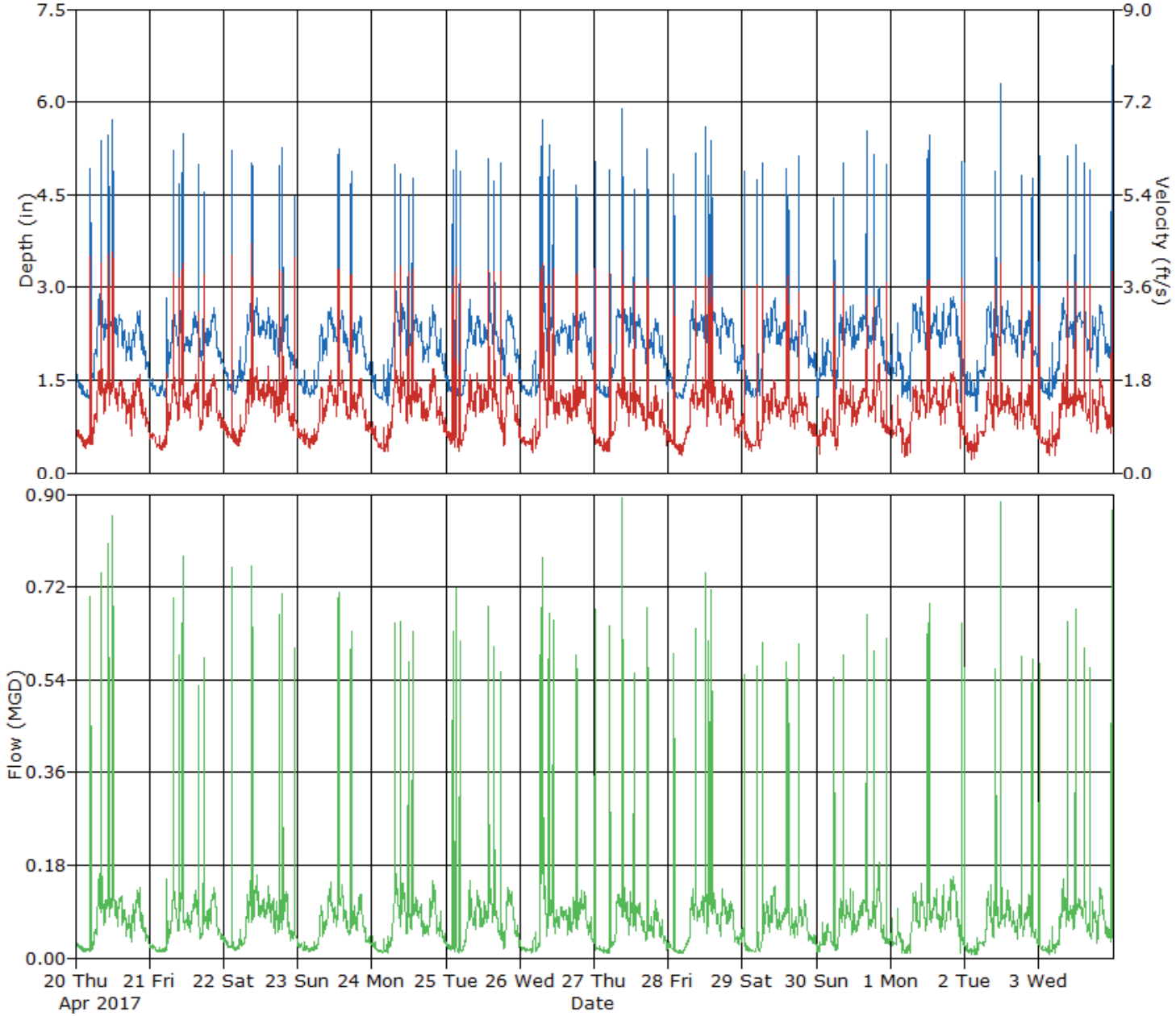


Report Period

4/20/2017
To
5/3/2017

Legend

- Depth
- Velocity
- Quantity



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
04/20/2017	04:40	1.19	11:55	5.71	2.15	03:35	0.47	11:55	4.28	1.38	03:35	0.011	11:55	0.857	0.096	0.096	
04/21/2017	04:55	1.23	10:45	5.49	2.09	03:50	0.43	10:45	4.08	1.29	03:50	0.011	10:45	0.779	0.084	0.084	
04/22/2017	03:35	1.26	19:05	5.26	2.14	04:40	0.54	09:00	4.44	1.36	04:15	0.014	09:00	0.760	0.091	0.091	
04/23/2017	03:55	1.22	13:25	5.24	1.99	03:50	0.48	13:10	3.96	1.22	03:50	0.012	13:25	0.710	0.072	0.072	
04/24/2017	05:25	1.10	07:30	4.98	2.05	05:10	0.41	09:25	4.01	1.27	05:10	0.009	09:25	0.654	0.080	0.080	
04/25/2017	03:05	1.23	03:15	5.22	2.12	04:20	0.42	03:15	4.00	1.31	04:20	0.010	03:15	0.717	0.087	0.087	
04/26/2017	03:55	1.23	07:25	5.71	2.19	04:10	0.40	07:20	4.06	1.31	03:55	0.011	07:25	0.776	0.095	0.095	
04/27/2017	05:00	1.21	09:10	5.90	2.10	03:05	0.42	09:10	4.30	1.19	03:05	0.010	09:10	0.894	0.080	0.080	
04/28/2017	02:55	1.21	12:00	5.61	2.14	04:15	0.35	14:05	3.86	1.22	04:15	0.009	12:00	0.748	0.082	0.082	
04/29/2017	03:55	1.22	18:20	5.12	2.13	02:45	0.42	14:45	3.82	1.19	02:45	0.011	06:40	0.612	0.080	0.080	
04/30/2017	00:30	1.22	16:20	5.54	2.18	00:55	0.37	05:40	3.71	1.24	00:55	0.012	16:20	0.667	0.082	0.082	
05/01/2017	22:40	1.14	12:30	5.45	2.24	04:30	0.32	23:05	3.77	1.29	06:15	0.009	12:30	0.688	0.089	0.089	
05/02/2017	03:40	0.99	11:45	6.30	2.11	02:25	0.24	11:40	4.07	1.17	02:25	0.006	11:45	0.885	0.077	0.077	
05/03/2017	03:30	1.18	23:35	6.58	2.18	03:25	0.34	23:40	3.91	1.22	03:25	0.008	23:35	0.868	0.086	0.086	

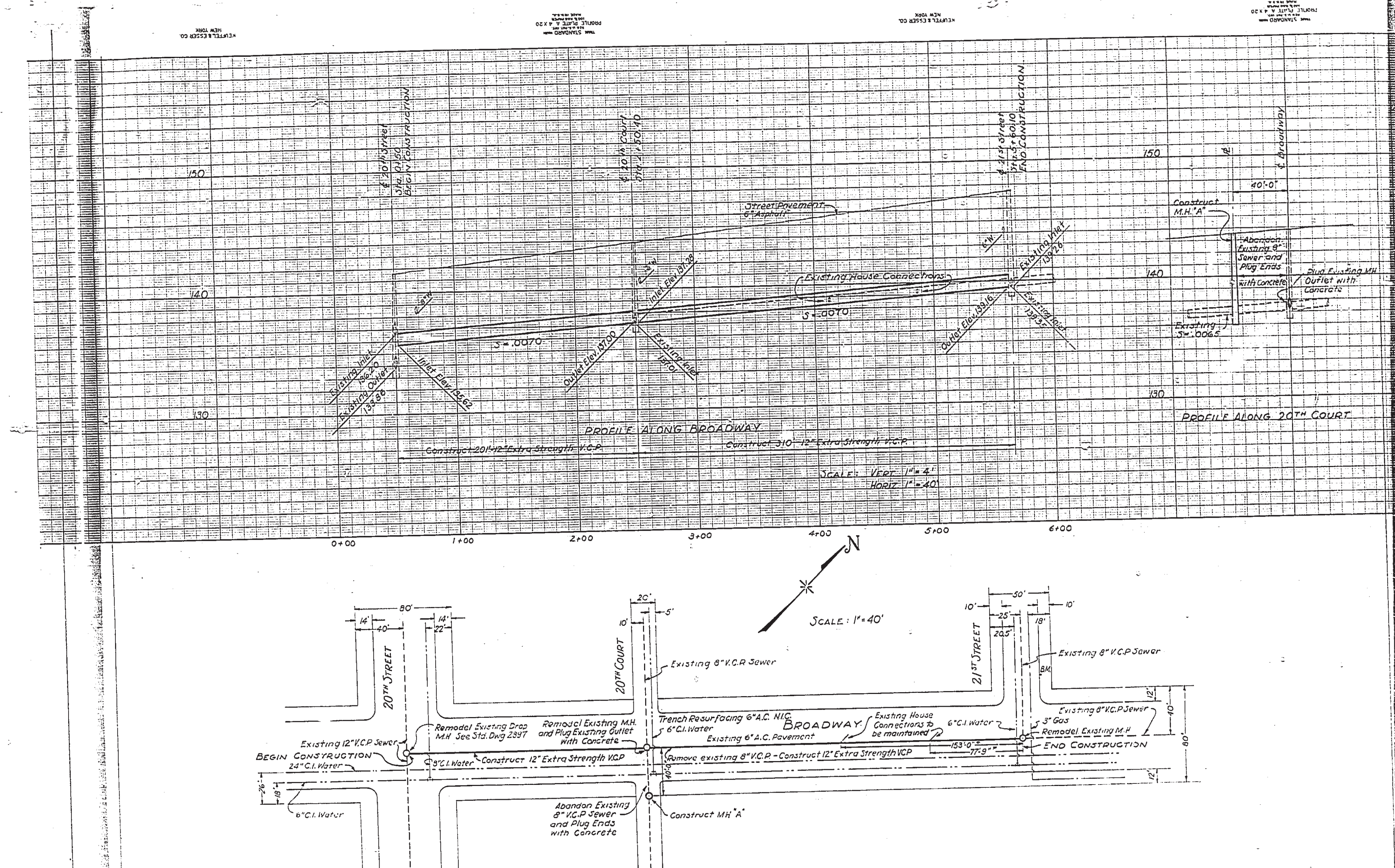
Report Summary For The Period 04/20/2017 00:00 - 05/03/2017 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)
Total			1.180
Avg	2.13	1.26	0.084

700 South Flower Street, Suite 2100 Los Angeles, CA 90017 213.418.0201 kpff.com

APPENDIX E

AsBuilt Drawings



Notes.

* 1. Dimensions to existing house connections approximate.
2. Construct Manhole as per Std. Dwg 2397
3. Bench Mark: Bolt in lead 12' N.W. of North corner 21st and Broadway. Elev. 148.33
4. Sewer shall be constructed in accordance with Standard Specifications, City of Santa Monica, Dept. of Engineering, Dated July 1951.

Ordinance No. 748 (Commissioners' Series) effective May 5, 1940 established "Sea Level Datum of the First Order Level Net of the U. S. C. & G. S." as the Official Datum Plane of the City of Santa Monica. Elevations shown hereon are referred to said Official Datum Plane.

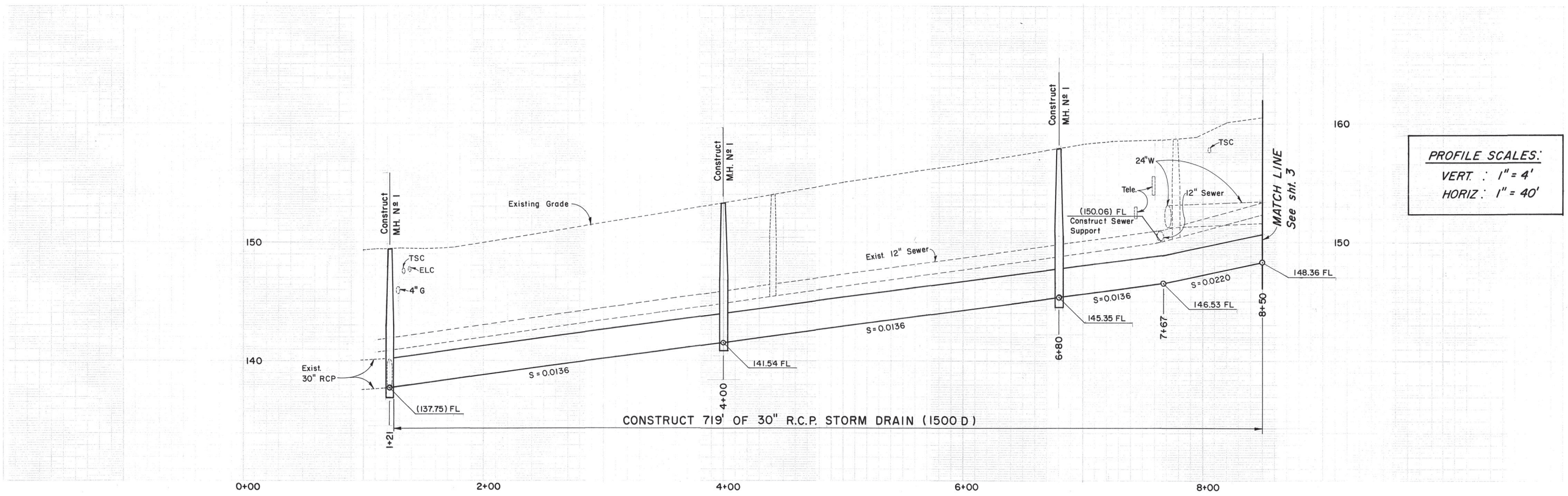
DEPARTMENT OF ENGINEERING
CITY OF SANTA MONICA

PLAN AND PROFILE
SANITARY SEWER IN BROADWAY
20TH STREET TO 21ST STREET

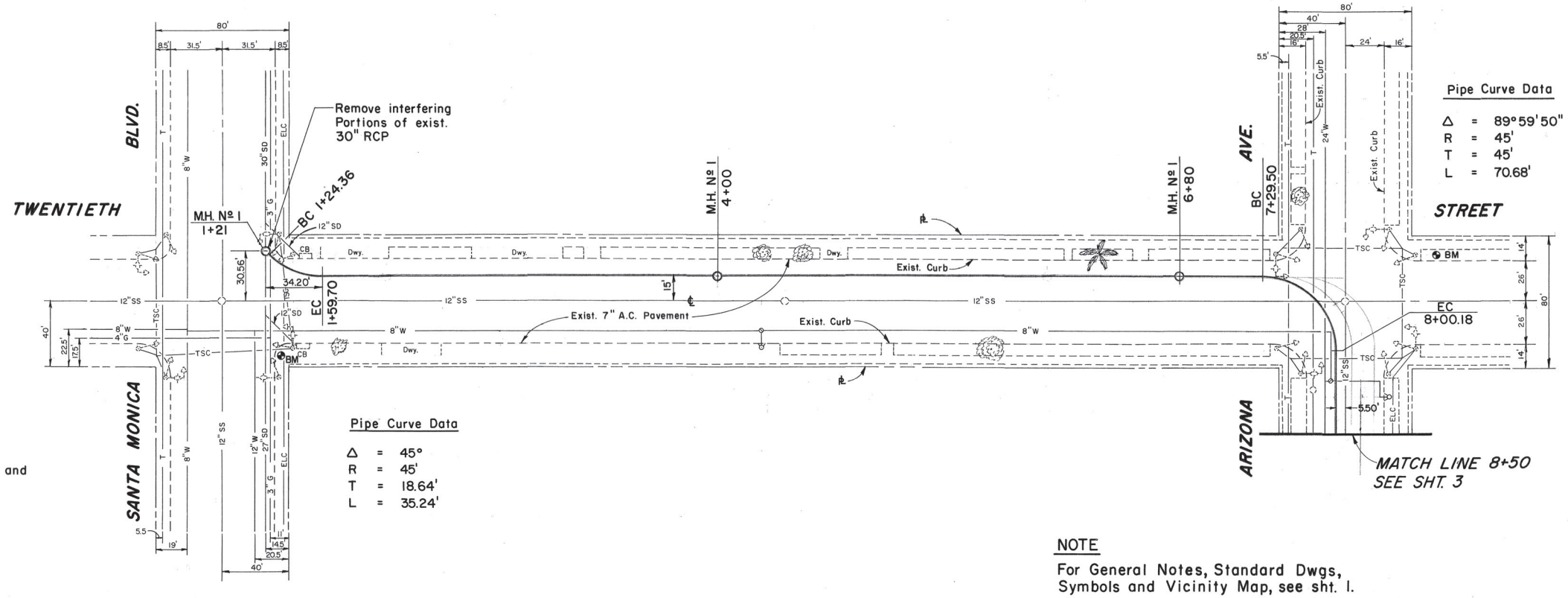
SUBMITTED BY [signature]	REFERENCE F.B. 375	DRAWING NO. 2512
APPROVED Oct 26 19__ [signature] CITY ENGINEER	DRAWN BY JJC	SHEET 1
REGISTERED CIVIL ENGINEER No. 6420	CHECKED R.I.W.	OF 1 SHTS.

2512

KENNEDY-PHILIPPS MICROFILM SYSTEMS Co. Thousand Oaks, Calif. Phone 805 A/c 497-1016



PROFILE SCALES:
VERT. : 1" = 4'
HORIZ.: 1" = 40'



Pipe Curve Data

Δ = 45°
R = 45'
T = 18.64'
L = 35.24'

Pipe Curve Data

Δ = 89°59'50"
R = 45'
T = 45'
L = 70.68'

Bench Marks

PK in Id. in North curb return of 20th St. and Santa Monica Blvd. 3' NW of NW curb of Santa Monica Blvd., 2.3' NE of NE curb of 20th St.

Elev. 149.78

PK in Id. in the SW curb of 20th St. 30' NW of NW curb of Arizona Ave.

Elev. 160.32

NOTE

For General Notes, Standard Dwgs, Symbols and Vicinity Map, see sht. 1.

DRAWING NO. 5283
SHEET 2 OF 3 SHT'S.

1399

R.& B. Contractors
Thousand Oaks, California
Owner: International

BOULEVARD

TWENTY-THIRD ST.
TWENTY-FIRST ST.
TWENTIETH ST.
NINETEENTH ST.
EIGHTEENTH ST.
SEVENTEENTH ST.
SIXTEENTH ST.
FIFTEENTH ST.
FOURTEENTH ST.
TWENTY-SECOND ST.

635-24" Storm Sewer
376-27" Storm Sewer
414-30" Storm Sewer
346-33" Storm Sewer
326-36" Storm Sewer
400-36" Storm Sewer
424-42" Storm Sewer
214-42" Storm Sewer

SANTA MONICA BOULEVARD

Manhole

Inv. Elev. 144.44
24"-R=.63%
Inv. Elev. 139.00
27"-R=.60%
Fl. Elev. 135.74
30"-R=.63%
Inv. Elev. 134.13
33"-R=.72%
Fl. Elev. 131.35
33"-R=1.09%
Fl. Elev. 125.22
Inv. Elev. 124.18
24"-R=1.11%
Fl. Elev. 120.45
54"-R=.9%
Fl. Elev. 116.85
57"-R=.86%
Inv. Elev. 113.20
54"-R=1.20%
Fl. Elev. 111.35
Fl. Elev. 109.2

140
150
160

700 South Flower Street, Suite 2100 Los Angeles, CA 90017 213.418.0201 kpff.com

APPENDIX F

DEVELOPMENT AGREEMENT VESTED USE

"BLUE CHART"

PHASE TWO BUILDINGS				
Building Name		**Types of DA Vested Uses in Building**	**Floor Area/ Units per Use***	**Max. Building Floor Area**
S1	Child & Family Development Center	Child & Family Development Center • Mental Health Therapy Rooms • Consultation Rooms • Administration and Support (Approximately 3,200 sf)	25,500 sf (Current assumption is 25,500 sf)	**34,500 sf**
		Day Care • Multi-Purpose Rooms • Five Classrooms • Administration and Support (Approximately 1,200 sf)	15,000 sf (Current assumption is 9,000 sf)	
		Up to 5 levels of subterranean parking		
S2	Multifamily Housing	Multifamily Housing Ten 2 bedroom, 1 bath units	10 units	10 units plus **800 sf** commercial
		Neighborhood Commercial Uses	800 sf (Current assumption is 800 sf)	
		Up to 2 levels of subterranean parking		
S3	West Ambulatory Care & Research Building - South Campus	Hospital/Health Care • Clinic Space • Administration and Support (Approx. 3,500 sf)	65,000 sf (Current assumption is 61,500 sf)	**123,000 sf**
		Medical Research Facilities (JWCI) • Research/Lab (e.g. Molecular Biology and Genomics/gene sequencing, Immunology/cell processing) • Administrative and Support (Approx. 7,868 sf)	115,000 sf (Current assumption is 59,000 sf)	
		Restaurant or Neighborhood Commercial Uses or Health Related Services	5,000 sf (Current assumption is 2,500 sf)	
		Up to 5 levels of subterranean parking		

PHASE TWO BUILDINGS				
Building Name		**Types of DA Vested Uses in Building**	**Floor Area/ Units per Use***	**Max. Building Floor Area**
S4	Education & Conference Center and East Ambulatory Care & Research Building - South Campus	Education & Conference Center (See detailed description of use below) • Auditorium (approximately 250 seats) • Eight Education Rooms Administrative and Support (Approx. 2,300 sf)	60,000 sf (Current assumption is 59,000 sf)	**199,000 sf**
		Hospital/Health Care • Sport Medicine Clinic & Physical Therapy (Outpatient) (Approx. 26,000 sf) • Joint Replacement & Sports Medicine (Outpatient) (Approx. 26,000 sf) • Ambulatory Surgery Center (Surgery Pre-op & Sterile Processing and Surgery (Approx. 43,000 sf) • Longer appointment times than traditional clinic space • Administrative and Support (Approx. 10,000 sf)	120,000 sf (Current assumption is 105,000 sf)	
		Health & Wellness Center • Exercise and Fitness Rooms • Therapy Rooms (Outpatient) Common Area (Approximately 1,750)	35,000 sf (Current assumption is 28,300 sf)	
		Medical Research Facilities • Potential expansion for Research/Lab (e.g. Molecular Biology and Genomics/gene sequencing, Immunology/cell processing)	50,000 sf (Current assumption is 0 sf)	
		Health-Related Services Restaurant or Neighborhood Commercial Uses	10,000 sf (Current assumption is 6,700 sf)	
		Up to 5 levels of subterranean parking		

PHASE TWO BUILDINGS				
Building Name		**Types of DA Vested Uses in Building**	**Floor Area/ Units per Use***	**Max. Building Floor Area**
S5	Visitor Housing	Visitor Housing (See detailed description of use below) • Approx. 34 units, including a mix of one-bedroom units, singles, and suites • Approx. 12 of the units have private kitchens • Approx. 2,500 sf of common area, including kitchen	30-34 units (Current assumption is 34 units)	**38,000 sf**
		Up to 5 levels of subterranean parking		
	Saint John's Café	Restaurant or Neighborhood Commercial Uses	900 sf	**900 sf**
2C	West Ambulatory & Acute Care Building - North Campus	Hospital/Health Care If Ambulatory (Outpatient): • Imaging (serving both patients that are already on-site as well as patients arriving from off-site for imaging services) • Clinics (e.g. Cardiovascular) • Support (Approximately 5,000 sf) If Inpatient: • Approximately 80 beds • Med surg units and ICU • Support (Approximately 6,000 sf)	117,500 sf (Current assumption is 108,500 sf above-grade 3,500 below-grade)	**123,350 sf** above-grade **6,150 sf** below-grade
		Health-Related Services Restaurant or Neighborhood Commercial Uses	5,500 sf	
		Pedestrian Connection	12,000 sf (9,350 sf above-grade, 2,650 sf below-grade)	
		Up to 4 levels of subterranean parking		

PHASE TWO BUILDINGS			
Building Name	**Types of DA Vested Uses in Building**	**Floor Area/ Units per Use***	**Max. Building Floor Area**
2D/E East Ambulatory & Acute Care Building - North Campus	Hospital/Health Care If Ambulatory (Outpatient): • Clinic (e.g. Women's & Pediatrics) • Short Stay/Observation Units (stays up to 23 hours) • Support (Approximately 4,000 sf) If Inpatient: • Approximately 36 beds (assuming three levels of ICU) • ICU • Support (Approximately 5,000 sf)	78,500 sf (Current assumption is 59,500 sf above-grade 16,000 sf below-grade)	**65,800 sf** above-grade **16,400** sf below-grade
	Health-Related Services Restaurant or Neighborhood Commercial Uses	3,000 sf	
	Pedestrian Connection	3,700 sf (3,300 sf above-grade, 400 sf below-grade)	
	Up to 4 levels of subterranean parking		

PHASE TWO BUILDINGS				
Building Name		**Types of DA Vested Uses in Building**	**Floor Area/ Units per Use***	**Max. Building Floor Area**
2I	Medical Office Building	Medical Office	50,000 sf	**73,300 sf**
		Health-Related Services Restaurant or Neighborhood Commercial Uses	4,500 sf	
		Parking (at grade)	18,800 sf	
		Up to 4 levels of subterranean parking		
	Mullin Plaza Café	Restaurant or Neighborhood Commercial Uses	1,500 sf	1,500 sf
			Phase Two Total	**660,150 sf** above-grade **22,550 sf** below-grade (15,700 sf is Pedestrian Connection/non-program space)

*For some buildings, the sum of the maximum floor areas for the Vested Uses within the building exceed the overall building floor area in order to allow flexibility with respect to the location and amount of certain Vested Uses. The current assumption about the use of the building is noted in the Floor Area/Units per Use column in red.

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