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ENGINEERS / SURVEYORS / PLANNERS

TECHNICAL MEMORANDUM

Date:	January 06, 2015	**BKF No.:**	20136004-20
To:	David Kelly **Golden State Warriors**		
From:	Sravan Paladugu, P.E. Ed Boscacci, P.E.		
Subject:	**Mission Bay Blocks 29-32 – Storm Water Memorandum**		

A. BACKGROUND

The Golden State Warriors organization (GSW) proposes to construct a multi-purpose event center and buildings for other uses on approximately 12-acres located in San Francisco, California (Project). The 12-acre Project site is made up of land referred to as Blocks 29, 30, 31, and 32 (Blocks 29-32) in the Mission Bay South Project Area, a redevelopment area located east of Higway-280 in San Francisco. The site is bounded by Terry A Francois Boulevard to the east, 3rd Street to the west, 16th Street to the south and South Street to the north and is currently vacant except for surface parking.

Prior to GSW acquisition of the Project site, Blocks 29-32 were planned to be developed as an office space. The office space was studied in the Mission Bay Environmental Impact Report prepared and approved in 1998 and would have included an adjusted square footage of one (1) million.

The purpose of this memorandum is to discuss drainage facilities currently existing at the Project site and to conceptually discuss storm water features required as part of the proposed development. The memorandum is prepared to supplement the City with the information required to prepare Project Environmental Impact Report (EIR).

B. Project Description

GSW proposes to construct a multi-purpose event center and ancillary structures including multiple office buildings, retail, restaurants, structure parking, plaza areas, and other amenities on Blocks 29-32. A summary of the various components of proposed Project are included in Table 1 and are discussed below.

Event Center

The proposed Event Center would have a seating capacity of 18,064 seats, encompass approximately 775,000 gross square feet in area. The Event Center would serve as the new home of the Golden State Warriors. The Event Center would host all the home games for the Golden State Warriors, as well as provide a year-round venue for a variety of other uses including concerts, family shows, conferences, conventions, cultural events and other sporting events.

The Event Center main floor would include a full length NBA basketball court for Warriors basketball games, which can also accommodate a stage for performances. Other supporting Event Center facilities

would include player/performer locker rooms, club and press areas, concessions, restrooms, a commissary, and a large marshalling area. The Warriors practice facility and support offices would also be integrated within the Event Center.

The practice facility would include two full-length NBA basketball courts with approximately 21,000 square feet of playing surface, a weight room and medical treatment facilities, locker rooms, and a players' lounge. The support offices would accommodate Warriors management, coaching and operations staff, administration, finance, marketing, broadcasting, merchandising, public relations, and ticket operations. The Event Center would be surrounded by large open plaza areas connected by ramps.

Office, Retail and Restaurant Uses

The Project would include two office buildings, each eleven (11) stories high, on the northwest and southwest corners of the site. The office buildings would encompass approximately 580,000 gross square foot in area. The Project would also include retail space occupying multiple areas of the site, including the lower floors of the office buildings, within or adjacent to certain plaza-facing areas of the Event Center.

The retail space would be approximately 125,000 square feet of which 62,500 square feet would be used for soft goods retail and the remaining for restaurants. Approximately 51,500 square feet of the restaurant space would be used for sit-down type restaurant and the other 11,000 square feet would be used for quick-serve type facilities.

Parking and Open Space

The Project would include 950 parking stalls in a parking structure with below-grade parking and at-grade/below-podium levels, all concealed from the public's view. The total parking and loading area is approximately 475,000 square feet.

The Project open space area would be approximately 180,000 square feet and would constitute of large plaza areas, terrace areas at various levels, landscaped areas and green roof areas. The open space at plaza level is approximately 140,000 square feet. The total landscape area is conservatively estimated to be approximately 30,000 square feet (i.e., 6% of the Project area required for storm water management). Green roof areas are proposed over the two office podiums that are approximately 40,000 square feet in area. The podiums would be at 90-feet above the street level.

Table 1 below provides a summary of the proposed land-uses, gross square footage, types of events, and number of days that the events are anticipated to occur. The employment and average event attendance figures are provided by GSW for the purpose of calculating water demand.

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Table 1: Blocks 29-32 Summary of Proposed Land Uses

Project Component	Floor Area (GSF)	Capacity /No. of Seats	Event Type	No. of Events Per Year	Full-time Employees	Event Employees	Average Attendance
Event Center	775,000	18,064	Pre-season games	3	n/a	1000	11,000
			Regular season games	41	n/a	1000	17,000
			Playoffs (Maximum possible)	16	n/a	1000	18,000
			Total non-Warriors games	161			
			- Concerts	30	n/a	775	12,500
				15	n/a	675	3,000
			- Family Shows	55	n/a	675	5,000
			- Other Sporting Events	30	n/a	675	7,000
			- Conventions/ Corporate Events	31	n/a	675	9,000
Practice Facility & Training Areas (1)	21,000		Practice/training	50	Part of management staff below	30	n/a
Event Management & Team Operations (1)	40,000		Ongoing team/arena operations (Mon-Fri)	240	255	n/a	n/a
Kitchen (1)	32,260			221	n/a	Part of event staff above	n/a
GSW Office Space (1)	25,000			240	Part of management staff above	n/a	n/a
Office Buildings	580,000			260	2,101	n/a	n/a
Retail	62,500			n/a	372	n/a	
Restaurants	62,500			n/a		n/a	
Parking	475,000	950					
Landscape Area (2)	70,000						
Open Space (3)	110,000						

Notes:
(1) The 775,000 GSF noted for the Event Center includes the square footage identified for these uses.
(2) Includes landscape area at all levels (i.e., approximately 30,000 Sq.Ft. of landscape at plaza level and 40,000 Sq.Ft. at all other levels for storm water management.
(3) Open Space excludes 30,000 Sq.Ft. of landscaped area from roughly 140,000 Sq.Ft. (i.e., 3.2 acres) of open space at plaza level.

C. Existing Facilities

Offsite Facilities

The Project site will be served by the existing Mission Bay storm drain infrastructure. Existing facilities include two separated storm sewer systems within the site perimeter streets that discharge runoff by gravity to pump stations, which, in turn, pump runoff to the Bay. For up to a 5-year storm event, the storm drain infrastructure was master planned to convey half of the project to the north to existing Storm Drain Pump Station No. 1 (SDPS-1). The remaining half of the Project will be conveyed to the south to Storm Drain Pump Station No. 5 (SDPS-5), currently under construction. SDPS-1 is located to north east of the Project within Park P22 and is currently operational. SDPS-5 is located to the south of Project across from 16th Street within park P23. Construction of SDPS-5 is currently underway and is anticipated to be completed by May 2015. The storm drain facilities and pump stations that will be serving the Project are illustrated on the attached Figure A.

Runoff in excess of the 5-year storm event will be conveyed as surface flow within the streets to an overflow weirs located to the north and south of the site.

Storm Drain Pump Station No. 1 (SDPS-1) has been designed to handle stormwater flows generated from the planned build-out of the tributary drainage area (referred to as "Drainage Basin B", as defined in the Mission Bay South of Channel Storm Drainage plan, Freyer & Laureta, February 2003). There are five *high-flow* or *wet weather* pumps at SDPS-1, each with a design flow rate of 5,562 gallons per minute. Albion Partners conducted flow measurements on high flow pumps 3 and 4 on behalf of the Mission Bay Development Group at SDPS-1 on December 17, 2014 to confirm that SDPS-1 is operating at or above design flow rates. The results of this test indicate that high flow pumps 3 and 4 meet or exceed the design pumping rate. Note that high flow pumps 1 and 5 were undergoing routine maintenance and were not available for testing. High flow pump 2 was not tested.

Onsite Facilities

Approximately 50% of the Project site is paved and is currently used as a surface parking lot. The remaining site is undeveloped and consists of ground cover. Runoff from portions of paved and unpaved areas drain to perimeter streets but a majority of the runoff is contained is a low lying area within the site. There is no storm drain existing onsite.

D. Storm Water Requirements

The 2010 San Francisco Stormwater Design Guidelines (Guidelines) developed by the San Francisco Public Utilities Commission (SFPUC) and the Port of San Francisco (Port) require new development and redevelopment disturbing 5,000 square feet or more of the ground surface to manage stormwater on-site. For developments in areas with separate sewer areas, such as Mission Bay, the Guidelines require capture and treatment of rainfall from a design storm of 0.75 inches per day. This requirement is consistent with the San Francisco's Green Building Ordinance and is equivalent to LEED Sustainable Site credit entitled "Stormwater Design: Quality Control" (SS 6.2).

To meet the requirements, the Guidelines recommend using Low Impact Design (LID) strategies such as living roofs, swales, biotreatment basins, rainwater harvesting and rain gardens. The Guidelines protect

San Francisco's environment by reducing pollution in stormwater runoff in areas of new development and redevelopment.

Because, the Project is located in an area served by separate storm sewer system, the Project is required to implement LID strategies consistent with the SFPUC Guidelines.

E. Project Strom Water Management

The Project is required to treat 100% of the storm water runoff through LID treatment areas. These treatment areas will be located throughout the site and storm water runoff will be distributed to them through gravity storm drain pipes and pump systems.

Treatment areas for the site will consist of biotreatment areas including flow-through planters and biotreatment areas. These treatment areas will be used to treat storm water runoff from sidewalks, roof areas, plazas, etc. Biotreatment areas require an approximately 3' deep section of biotreatment soil mix (sand/compost mix) overlaying a gravel/drain rock layer where soils and rock layers must meet SFPUC guidelines. The biotreatment soil mix allows for the proper infiltration rate, yet drains within a 48-hour period to avoid attracting mosquitoes. No mechanical treatment devices are proposed for this project, as these devices are not considered LID or biological treatment options to regulatory agencies.

Living roofs can have shallower sections than the biotreatment areas. Depending on the type of vegetation selected for the living roof, the section could have approximately 6 inches of planting soil. Berms can also be created on the living roof which would result in a deeper soil section, of approximately 3'.

The attached Figure B show place holders for these features to approximate the required sizes. There are several combinations of green roof and biotreatment areas that can meet the stormwater treatment requirements.

F. Proposed Facilities

Runoff from the podium building, sidewalk and onsite entry plazas will drain to pumps that will discharge into stormwater treatment areas located on the plaza and living roof areas. The roof of the buildings will also drain to these planters for treatment. The planter sub drains and overflows will be hard piped to points of connection located along the edge of the building/garage on 16th Street, South Street and Terry A Francois Boulevard. These points of connection will be connected to the public storm drain system in the adjacent streets via storm drain laterals ranging in size from 10 to 12 inches.

The offsite improvements include sidewalk, curb and gutter on all four adjacent streets. New catch basins will be installed at the low points of the street gutters and storm drain laterals will connect the catch basins to the adjacent storm drain mains. The storm drain lines in 16th Street and the south end of Terry A Francois Boulevard will drain to Mission Bay Stormwater Pump Station #5 located to the south east of the site. The storm drain lines in South Street and the north end of Terry A Francois Boulevard will drain to existing SDPS-1 located to the north east of the site.

G. Major Storm Events

The storm drain system and pump station are designed to handle runoff from a 5-year storm event. During larger events such as a 100-year storm event, runoff is conveyed through the streets to a controlled overflow to the Bay. The overland flow analysis was studied in the "Revised Summary Drainage Study for the South of Channel Watershed for Mission Bay Project", dated December 1, 2000. Based on December 2000 study, overland flow from drainage basin, where the Project is located (i.e., "Drainage Basin B"), currently enters the Bay via an existing overflow near Mission Bay Boulevard North (North Overflow). Overland flow in Project perimeter streets, except 16th Street, is conveyed to this North Overflow. Overland flow in 16th Street is conveyed to overflow located to the south of Project near park P24. Refer to attached Figure D for the location of the overland flow release.

The Project will be sufficiently flood proofed to prevent 100-year overland flow in perimeter streets from entering below grade structures or inundating utilities and equipment. Flood proofing will include using protective measures to prevent storm runoff from inundating and/or damaging equipment such as furnaces, boilers, air conditioning compressors, air ducts, electrical system components, electrical wiring, dry conduits, electrical and gas meters, utility rooms, septic tanks, control panels, HVAC systems and fuel systems.

H. Conclusion

The existing separated storm sewer system surrounding the Project site is designed to convey runoff from 5-year event under build-out condition of the drainage area. The Project will increase runoff volume and flow compared to existing condition as there will be a significant increase in impervious area. This increase is consistent with the impervious area considered in the Storm Drain Master Plan for the site. The Project is not anticipated to impact offsite facilities because the offsite facilities are designed for build-out condition.

The existing subsurface storm drain infrastructure are master planned to drain half of the project to the north to Storm Drain Pump Station 1 (SDPS-1) and the remaining half of the Project southerly towards Storm Drain Pump Station 5 (SDPS-5). The proposed Project will maintain the planned drainage area split. As such, the Project will not impact planned drainage path.

The storm drain system and pump station are designed to handle runoff from a 5-year storm event. During larger events such as a 100-year storm event, runoff is conveyed in streets and directly discharged to the Bay at a controlled overflow. The overflow serving the site will be located as shown on Figure D. All Project perimeter streets are anticipated to covey 100-year flow above surface. The Project will be sufficiently flood proofed to prevent the 100-year overland flow in perimeter streets from entering below grade structures or inundating utilities and equipment.

The Project will meet the requirements set forth in the 2010 San Francisco Stormwater Design Guidelines by incorporating LID measures. The onsite storm drains will be sized to carry peak runoff from a 5-year design storm.

I. Attachments

Figure A: Blocks 29-32 Existing Offsite Facilities
Figure B: Blocks 29-32 Storm Water Management Plan
Figure C: Blocks 29-32 Storm Water Management Plan
Figure D: Overland Release Path

J. References

San Francisco Public Utilities Commission, 2010. San Francisco Stormwater Design Guidelines.

San Francisco Green Building Requirements, 2011. Administrative Bulletin Title: Implementation of Green Building Regulations, dated January 1, 2011

US Green Building Council, 2009. 2009 LEED Reference Guide For Green Building Design and Construction.

Catellus Development Corp., "Revised Summary Drainage Study for the South of Channel Watershed of the Mission Bay Project", dated December 1, 2000.

FIGURES

1	RINCON–THIRD ST TO TFB	3/12/03
2	RINCON ST	1/20/04
3	ADDED WATERSHEDS	5/4/04
4	ADDED AERIAL PHOTO	5/10/04
5	UPDATED	8/17/07
△	REVISION DESCRIPTION	DATE

CREATED: FEBRUARY 25, 2003

LEGEND

- WATERSHED BOUNDARY
- EXISTING PIPE
- CONSTRUCTED PIPE
- FUTURE PIPE
- DIRECTION OF FLOW
- CONSTRUCTED PERMANENT PUMP STATION
- PROPOSED PERMANENT PUMP STATION
- EXISTING PUMP STATION
- CONSTRUCTED TEMPORARY PUMP STATION
- SDPS — STORM DRAINAGE PUMP STATION
- MH — MANHOLE
- MANHOLE (NOT ALL MH'S
- PUMP STATION #3 WATERSHED AREA
- PUMP STATION #6 WATERSHED AREA
- PUMP STATION #4 WATERSHED AREA
- PUMP STATION #1 WATERSHED AREA
- PUMP STATION #5 WATERSHED AREA

TERRY A. FRANCOIS BLVD
FOURTH STREET
DRAINAGE BASIN D SDPS
CHANNEL
STREET
THIRD STREET
SWL 337 (SF PORT)
TERRY A. FRANCOIS BLVD
←PIER 48
←PIER 50
30"X45" CS
EL DORADO STREET
FOURTH STREET
MISSION ROCK STREET
LONG BRIDGE STREET
RINCON
2–2'X4' BOXES
TRASH PUMP IN MH PUMP TO DETENTION BASIN SDPS#62
DETENTION BASIN
NORTH COMMON BLVD
TRASH PUMP IN MH PUMP TO THIRD STREET
SOUTH COMMON BLVD
TO CHANNEL
SDPS#4
MISSION BAY BLVD
TEMP SDPS#1
CONSTRUCTED TRAP CHANNEL
OWENS STREET
SEVENTH STREET
13TH STREET
14TH STREET
15TH STREET
16TH STREET
MARIPOSA STREET
TEMP SDPS#3
COMBINED SEWER
SDPS#5
SDPS#1
ILLINOIS STREET
MISSISSIPPI STREET
SCALE 1" = 200'
NORTH

Figure A

Source: Freyer & Laureta, Inc., 2003

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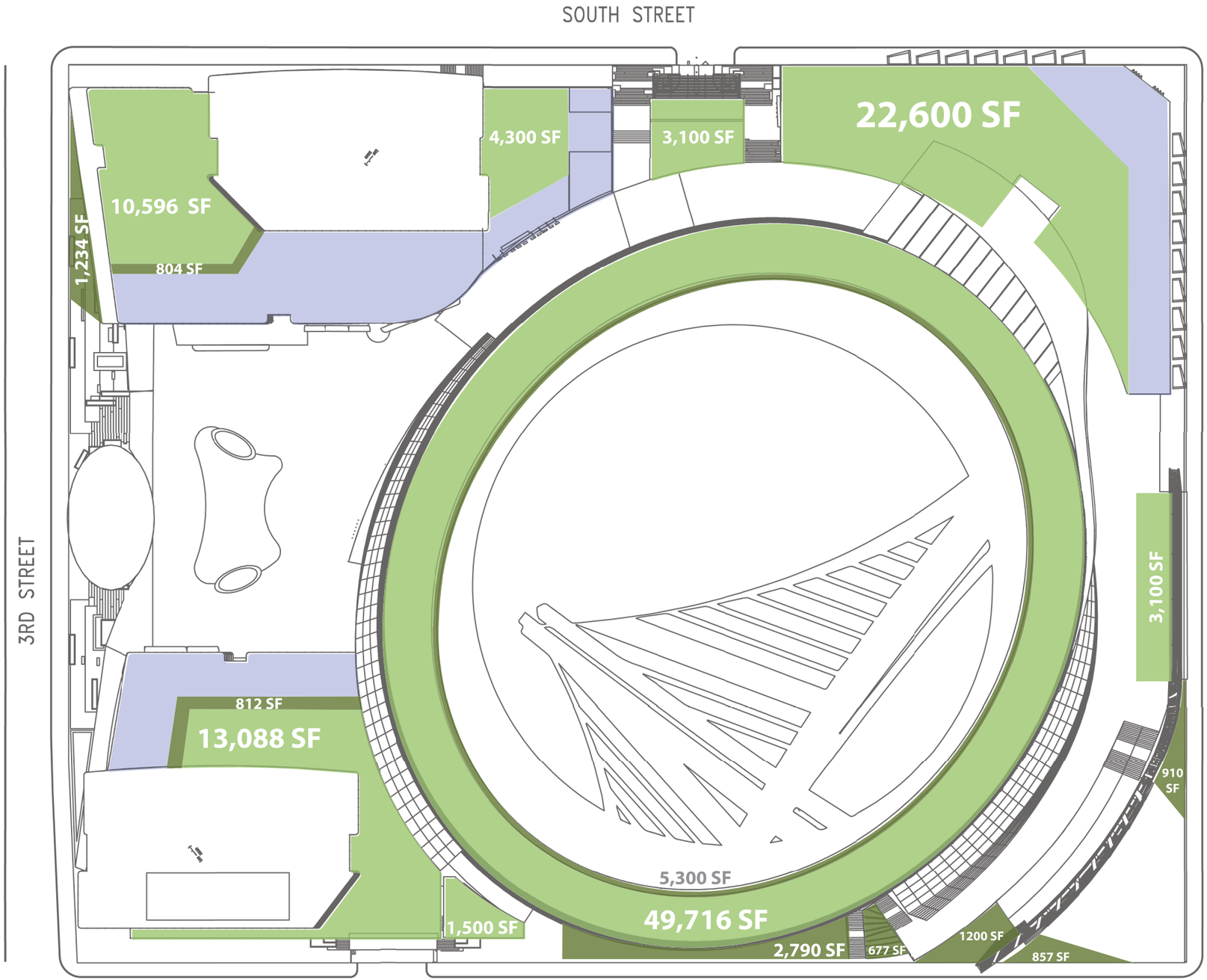
GREEN ROOFS AND FILTRATION BASINS

LEGEND

- OCCUPIABLE ROOF
- EXTENSIVE GREEN ROOF
- FILTRATION BASIN



NOTE:
THERE IS A 4' WIDE GREEN FILTRATION STRIP ON THE ARENA

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2014.11.12 | Figure B

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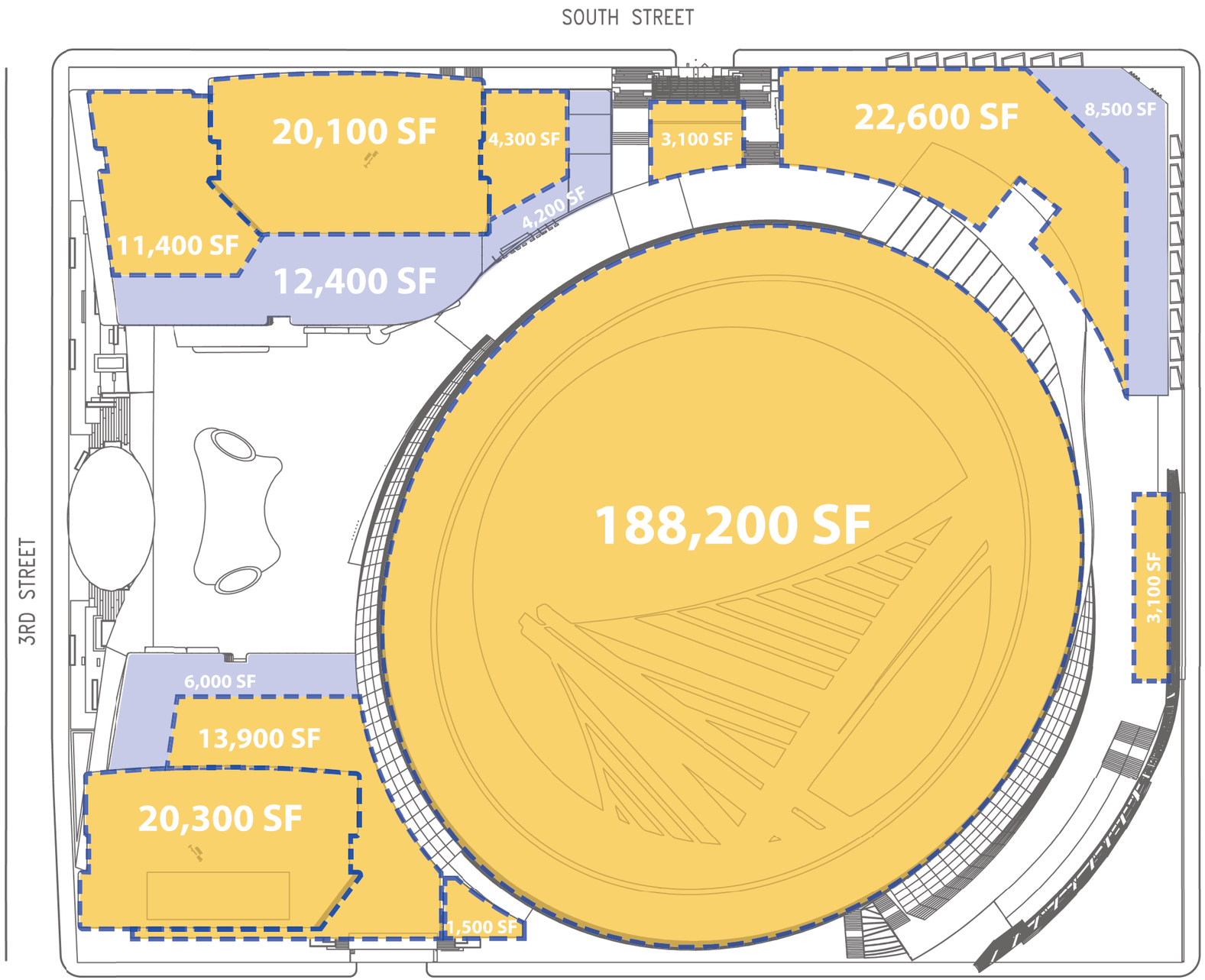
SELF TREATING ROOFS & OCCUPIABLE ROOFS

LEGEND

OCCUPIABLE ROOF

TREATED ON ROOF



TOTAL SITE:
475,600 SF

TOTAL GROUND PLAIN:
156,500 SF

TOTAL OCCUPIABLE ROOF (WATER SENT TO PODIUM LEVEL):
31,100 SF

REQUIRED FILTRATION BASIN FOR OCCUPIABLE ROOF:
1,244 SF

REQUIRED FILTRATION BASIN FOR PODIUM:
6,260 SF

TOTAL AT GRADE FILTRATION BASIN:
7,688 SF

Golden State Warriors

2014.11.12 | Figure C

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LEGEND

④ WATERSHED DESIGNATION

© WATERSHED SUBAREA DESIGNATION

100.7 FINAL ELEVATION (50 YEAR SETTLEMENT) AS SHOWN ON GRADING PLAN DATED 4/26/00

* NO GRADING PLANNED AT THESE LOCATIONS EXISTING GRADES SHOWN.

* * ELEVATIONS FOR FUTURE GRADING WITHIN UCSF CAMPUS PER UCSF GRADING PLANS

⊕ LOW POINT

OVERLAND RELEASE

S=0.004 SLOPE

STREET FLOW SECTION

MAXIMUM PONDING PRIOR TO RELEASE

FLOW DIRECTION

OVERLAND FLOW FROM THE WEST RELEASED TO CHANNEL HERE.

ELEVATED FREEWAY DRAINED SEPARATELY BY CAL-TRANS. FREEWAY AREA NOT TRIBUTARY TO MISSION BAY WATERSHEDS. AREA'S INDICATED ARE NET.

GRAPHIC SCALE

(IN FEET)
1 inch = 200 ft.

OVERLAND FLOW - FINAL GRADES

Source: Catellus Development Corporation, 2000

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