Appendix H1
Drainage Study

FUSCOE ENGINEERING

DRAINAGE STUDY

JEFFERSON OCEANSIDE

PREPARED FOR

JPI DEVELOPMENT COMPANY
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SAN DIEGO, CA 92130

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PRELIMINARY DRAINAGE STUDY

JEFFERSON OCEANSIDE

OCEANSIDE, CA

APN#
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1. INTRODUCTION

The purpose of this preliminary drainage study is to present the preliminary drainage design for entitlement purposes for the Jefferson Oceanside Project (Project) and to demonstrate that the project will comply with the San Diego County Hydrology Manual (June 2003) Criteria, City of Oceanside Drainage Ordinance, FEMA and Army Corp and other applicable agencies.

1.1 Project Description

The project proposes entitlements for a mixed-use, transit-oriented development on 18.85 gross acre site located southwest of the existing North County Transit District (NCTD) Crouch Street Sprinter Station. The site is bordered by Oceanside Boulevard to the north, Crouch Street to the east and south, and office development and S. Oceanside Boulevard to the west. The proposed development will consist of 295 dwelling units and approximately 3,000 sf of retail space. The proposed project will also include the extension of existing S. Oceanside Boulevard east to Crouch Street.

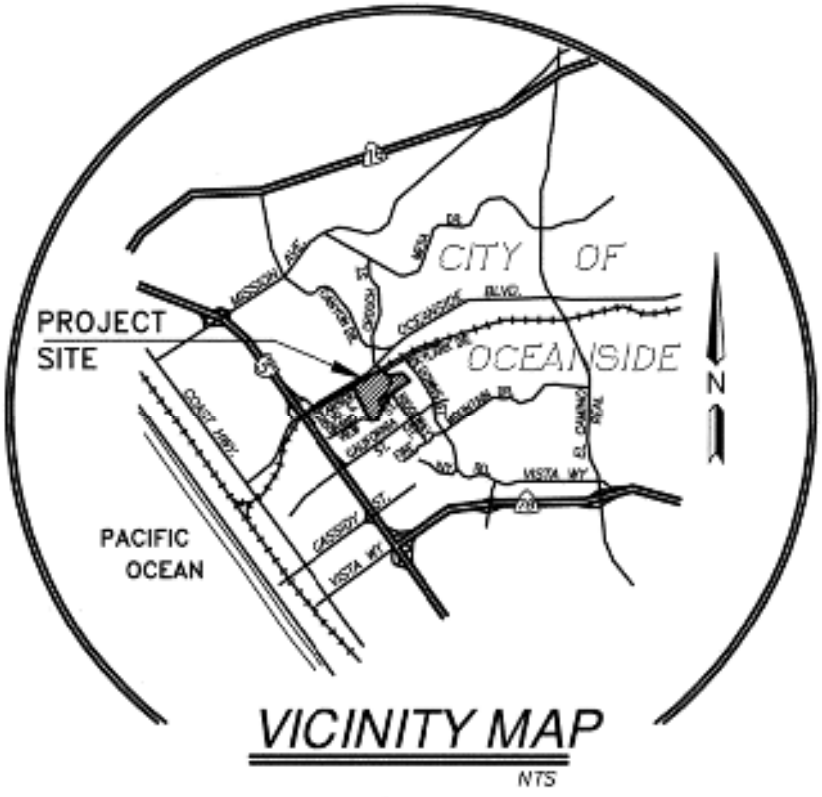

Figure 1. Vicinity Map

1.2 Existing Conditions

The project site in existing conditions is a vacant, previously graded lot south of the Loma Alta Creek and existing NCTD Crouch Street Sprinter Station. The site was previously graded in 1985 and slopes in the northwesterly direction, having an average slope of 2%. The southern portion of the site adjacent to Crouch Street is a historic landslide and consists of steep slopes. The project site is bisected by utility easements for overhead electrical and a 12-inch water main. An existing sewer easement is located at the western edge of the property. The site is accessed by an existing unnamed road west of Crouch Street, which also provides access to the NCTD Sprinter Station. A portion of the site along the northern property boundary is located within the FEMA 100-year Floodplain and Floodway. The existing storm drain system within the NCTD parking lot is owned by NCTD.

Stormwater runoff from the site consists primarily of sheet flow that drains north where it confluences and discharges to the Loma Alta Creek at two separate locations (Identified as Nodes 300 & 400).

The eastern portion of the site (identified as the 300 series) consists primarily of sheet flow that drains north to an existing headwall located within the easement at the center of the site. Stormwater is then conveyed north in the existing 36-inch public storm drain and discharges to the existing triple box culvert (Loma Alta Creek) located north of the project site. There is also an 18-inch RCP public storm drain pipe that discharges runoff from the offsite Sprinter Station parking lot north of the site to the existing triple box culvert.

Drainage from the existing unnamed roadway located north of the site (identified as node 300) flows west to a curb inlet located at the end of the unnamed road. The existing curb inlet drains to the existing 36-inch public storm identified above.

The western portion of the site (identified as the 400 series) sheet flows northwest to an existing concrete lined channel located at the east end of S. Oceanside Blvd. Off-site drainage from the neighborhoods located to the south of the project (also included in the 400 series) drains northwest where it confluences with onsite runoff in the existing concrete lined channel that discharges to the Loma Alta Creek (identified as Node 400). Node 400 also includes additional runoff from S. Oceanside Blvd. and Union Plaza Ct. The 400 series also includes runoff from the slope which is conveyed to the bottom of the slope via terrace ditches.

1.3 Proposed Conditions

The proposed mixed-use, transit-oriented development will consist of 295 dwelling units, approximately 3,000 SF of commercial/office and commercial/retail space, and associated amenity spaces. The existing access road from Crouch Street will be extended and connect to S. Oceanside Boulevard west of the property boundary. S. Oceanside Boulevard will become a dedicated public street with right-of-way widths as noted on the plans. The extension of S. Oceanside Blvd. will also include the addition of public storm drain, water, & sewer improvements.

The project is located within the FEMA 100-year Floodplain and Floodway (Zone AE), per FEMA FIRM Map Number 06073C0753J (refer to Appendix 5). The proposed building finished floor elevations have been set a minimum of 2 feet above the 100-year flood base elevations per County of San Diego Hydrology requirements. A Conditional Letter of Map Revision (CLOMR) will be required to be processed with FEMA. Refer to Appendix 6 for previous FEMA Letter of Map Revisions (LOMR).

The project will maintain existing drainage patterns to the maximum extent practical. As in existing conditions, stormwater runoff from the proposed development will ultimately discharge to the Loma Alta Creek located north of the property boundary and will maintain the two discharge points.

The east half of the site identified as series 300 consists of drainage from portions of the existing unimproved slope to the south of the site and onsite drainage. Offsite drainage from the southern unimproved slopes sheet flows north where it will be collected along the southern boundary of the project in a series of inlets. Offsite stormwater will be conveyed north through the site via private storm drain and discharge to the proposed 18-inch RCP public storm drain system located within S. Oceanside Blvd.

Onsite drainage within series 300 consists of sheet flow and mild concentrated flows that drain north/northwest, having an average slope of 1-2%. Onsite storm water runoff is conveyed to a series of inlets that collect and convey storm water runoff through proprietary treatment control BMPs. Stormwater from the proprietary treatment control BMP's drain to a central onsite underground detention system for hydromodification and 100-year peak flow attenuation. Storm water is then conveyed north via a 24-inch RCP pipe to the proposed public storm drain system. The public storm drain continues north/northwest and discharges to the existing curb inlet located on the north side of S. Oceanside Blvd.

The north half of S. Oceanside Blvd., also included in series 300, maintains existing drainage patterns and drains west to an existing curb inlet where it is collected and confluences with drainage from the proposed project. Stormwater is then conveyed north in the existing 36-inch public storm drain and discharges to the existing triple box culvert (Loma Alta Creek) located north of the project site.

Off-site drainage from the neighborhoods and existing slopes located to the south of the project (identified as series 400) maintain existing drainage patterns as outlined in Section 1.2. Runoff from the areas to the south of the project will be collected along the southern boundary of the project in a series of inlets. Offsite stormwater will be conveyed north through the site via private storm drain and discharge to the proposed public storm drain system located within S. Oceanside Blvd.

Onsite drainage for the west half of the project is also included in series 400 and is broken into two drainage areas for storm water treatment purposes. Onsite drainage for both areas consists of sheet flow and mild concentrated flows that drain north/northwest, having an average slope of 1-2%. The

west half of series 400 drains to a proposed biofiltration planter for stormwater treatment and 100-yr peak flow attenuation. The east half of series 400 drains to a series of inlets that collect and convey storm water runoff through proprietary treatment control BMPS. Stormwater from the proprietary treatment control BMP's drain to a central onsite underground detention system for hydromodification and 100-year peak flow attenuation. Storm water is then conveyed north via 24-inch RCP to the proposed public storm drain system.

The proposed extension of S. Oceanside Blvd. is located primarily within series 400. The majority of S. Oceanside Blvd. drains west towards the northwest corner of the project where it is collected by two proposed curb inlets located on the north and south side of S. Oceanside Blvd. Additional runoff from S. Oceanside Blvd. and Union Plaza Ct. from west of the project is also conveyed to these curb inlets.

The areas outlined above that are tributary to the 400 series node are all conveyed to S. Oceanside Blvd. to the northwest corner of the project/property boundary where they ultimately confluence within the proposed public storm drain system. All proposed storm drain in the public right of way will have a diameter of 18-inch or greater. The project proposes to remove a portion of the existing concrete lined channel located within the proposed right-of-way and construct a proposed 2-ft x 4-ft box culvert and headwall. The channel is located within the flood way and therefore any changes require FEMA and Army Corp approval. The proposed box culvert will convey runoff from the 400 series node and discharge to Loma Alta Creek.

The project will not result in increased 100-yr peak flow rates in the proposed condition after mitigation of the 100-year runoff. As shown in section 3.1 of this report, the Proposed-Mitigated 100-yr peak discharge is 86.89 cfs which is less than the Existing 100-yr discharge of 96.66 cfs. This was accomplished by running stage storage analysis on both HMP 1 and HMP 2. The proposed project is not anticipated to negatively affect the downstream facilities compared to existing conditions. The project proposes work within the floodplain and floodway and a Hydraulic Analysis demonstrating the project impacts has been prepared by Chang Consultants, dated 2/15/2022, see Appendix 11.

2. METHODOLOGY

2.1 Rational Method

Runoff was calculated using the Modified Rational Method equation below:

$Q = C \times I \times A$

Where:
Q = Flow rate in cubic feet per second (cfs)
C = Runoff coefficient
I = Rainfall Intensity in inches per hour (in/hr)
A = Drainage basin area in acres, (ac)

Modified Rational Method calculations were performed using the Advanced Engineering Software AES 2014) computer program. To perform the hydrology routing, the total watershed area was divided into sub-areas which discharge at designated nodes. The procedure for the sub-area summation model is as follows:

(1) Subdivide the watershed into an initial sub-area (generally 1 lot) and subsequent sub- areas, which are generally less than 10 acres in size. Assign upstream and downstream node numbers to each sub-area.

(2) Estimate an initial T_c by using the appropriate nomograph or overland flow velocity estimation. The minimum T_c considered is 5.0 minutes.

(3) Using the initial T_c, determine the corresponding values of I. Then Q = CIA.

(4) Using Q, estimate the travel time between this node and the next by Manning's equation as applied to particular channel or conduit linking the two nodes. Then, repeat the calculation for Q based on the revised intensity (which is a function of the revised time of concentration)

The nodes are joined together by links, which may be street gutter flows, drainage swales, drainage ditches, pipe flow, or various channel flows. The AES 2014 computer software sub-area menu is as follows:

SUBAREA HYDROLOGIC PROCESS

1. Confluence analysis at node.
2. Initial sub-area analysis (including time of concentration calculation).
3. Pipe flow travel time (computer estimated).
4. Pipe flow travel time (user specified).
5. Trapezoidal channel travel time.
6. Street flow analysis through sub-area.
7. User-specified information at node.
8. Addition of sub-area runoff to main line.
9. V-gutter flow through area.
10. Copy main stream data to memory bank
11. Confluence main stream data with a memory bank

12. Clear a memory bank

At the confluence point of two or more basins, the following procedure is used to combine peak flow rates to account for differences in the basin's times of concentration. This adjustment is based on the assumption that each basin's hydrographs are triangular in shape.

(1). If the collection streams have the same times of concentration, then the Q values are directly summed,

$$Q_p = Q_a + Q_b;\ T_p = T_a = T_b$$

(2). If the collection streams have different times of concentration, the smaller of the tributary Q values may be adjusted as follows:

(i). The most frequent case is where the collection stream with the longer time of concentration has the larger Q. The smaller Q value is adjusted by a ratio of rainfall intensities.

$$Q_p = Q_b + Q_a\,(I_b/I_a);\ T_p = T_a$$

(ii). In some cases, the collection stream with the shorter time of concentration has the larger Q. Then the smaller Q is adjusted by a ratio of the T values.

$$Q_p = Q_b + Q_a\,(T_b/T_a);\ T_p = T_b$$

2.2 Computing Detention Pond Routing

Detention pond routing is the process of passing a flood hydrograph through a storage reservoir or detention pond. This process changes the pattern of flow with respect to time but conserves volume. The purpose of detention pond routing is usually to reduce the peak flow to a predetermined level, or to delay the peak. The routing procedure used by Hydraflow Hydrographs Extension is known as the Storage Indication method and begins with a stage- storage-discharge relationship, an inflow hydrograph, and the following equation:

$$I - O = \frac{ds}{dt}$$

Where:

I = inflow

O =

outflow

ds/dt = change in storage

2.3 Runoff Coefficient

The runoff coefficient for the project was calculated using Table 3-1: Runoff Coefficients for Urban Areas, of the 2003 San Diego County Hydrology Manual, and the corresponding percentage of impervious surface for each tributary area. The site contains Hydrologic Soil Group D soils and has a runoff coefficient of 0.35.

2.4 Rainfall Intensity

Rainfall intensity was determined by using AES software, which utilizes Figure 3-2: Rainfall Intensity-Duration Design Chart of the San Diego County Hydrology Manual, see Appendix 10.

2.5 Tributary Areas

Drainage basins are delineated on the Existing and Proposed Hydrology Condition Maps in Appendix 1.

2.6 Stage Storage

Hydraflow Hydrograph by Autodesk was used to perform stage storage detention basin routing of the underground detention systems (HMP 1 and HMP 2). The two underground detention systems were modeled to determine the volume capacity and peak flow attenuations of the basins during a 100-year storm event. See Appendix 7 for basin routing calculations.

The underground detention system outflows obtained from Hydraflow were used in the AES mitigated conditions to analyze the total cumulative flow at Nodes 300 & 400. 100-year storm attenuation was performed for HMP 1 and HMP 2.

3. CALCULATIONS/RESULTS

3.1 Peak Flow Comparison

The summary tables below present the comparison between pre- and post-development flows for each point of compliance. The proposed flow rates do not reflect the stage storage analysis for the underground detention system. The onsite underground detention system and biofiltration planter were oversized for water quality and hydromodification by approximately 20-30% to attenuate the 100-yr storm event. Stage storage calculations will be provided when construction drawings are prepared.

PRE-DEVELOPMENT CONDITIONS HYDROLOGY SUMMARY		
NODE	AREA (AC)	EXISTING 100-YEAR DISCHARGE (CFS)
300	6.59	11.64
400	50.07	78.39
TOTAL	61.58	90.03

POST-DEVELOPMENT CONDITIONS HYDROLOGY SUMMARY		
		100-YEAR DISCHARGE (CFS)
NODE	AREA (AC)	PROPOSED – UNMITIGATED
300	6.53	15.61
400	49.64	81.05
TOTAL	61.05	96.66

POST-DEVELOPMENT CONDITIONS HYDROLOGY SUMMARY		
		100-YEAR DISCHARGE (CFS)
NODE	AREA (AC)	PROPOSED – MITIGATED
300	6.53	9.39
400	49.64	77.50
TOTAL	61.05	86.89

3.2 Public Storm Drain

A hydraulic analysis using FlowMaster was performed to size the proposed public storm drain box culvert in S. Oceanside Blvd. See Appendix 4 for the results.

4. CONCLUSION

The project will match existing drainage patterns to the maximum extent feasible and will utilize the existing discharge points to Loma Alta Creek. The project will result in a decrease in 100-year peak flow rates after mitigating the 100-year runoff compared to existing conditions. This was accomplished by running stage storage analysis on both HMP 1 and HMP 2. The proposed project is not anticipated to have any adverse effect on the downstream facilities, including Loma Alta Creek, compared to that of existing conditions. The building finished floor elevations will be set at a minimum 2ft above the FEMA 100-year water surface elevation. A Conditional Letter of Map Revision (CLOMR) will be required to be processed with FEMA.