

Appendix L – Drainage Feasibility Study

MEMORANDUM

Date: Decemeber 02, 2020

BKF Job Number: 20191093

Deliver To: City of Walnut Creek & Contra Costa County Public Works Department

From: Michael Steele, BKF Engineers

Subject: Spieker Senior Continuing Care Community San Carlos Drainage Feasibility

This memorandum has been prepared for the City of Walnut Creek and Contra Costa Public Works Department to document the feasibility of installing a stormwater outfall from the Spieker Senior Continuing Care Community to an existing public storm drainage facility. Per the most recent Design Review submittal, comment 15d by the City of Walnut Creek (See Appendix A) requests: *“Evaluation of ... options will need to include determination of necessary easements, ensure utility separation, evaluate impacts of outfall to canal, and include design of outfall to mitigate impacts and address long-term maintenance concerns”*. Analysis of these items is detailed below.

Project Description

The Spieker Senior Continuing Care Community (SSCCC) project is located at located at 850 Seven Hills Ranch Drive in Walnut Creek, California. The development is a self-contained continuing care retirement community (CCRC) offering continuing care contracts that provide housing, resident services, and long-term care. The project site contains approximately 30.4 total acres, situated in unincorporated Contra Costa County at the easterly end of Seven Hills Ranch Drive. The parcel will ultimately be zoned as P-1 (Planned Unit).

Background

In the existing condition stormwater from the north eastern corner of the site, noted as existing DMA 6 & 7 in Appendix B, sheets flows to the adjacent North San Carlos Drive on City of Walnut Creek private property. The original design for discharge of stormwater in this area included the use of level spreaders, which were proposed to mimic the existing drainage patterns of stormwater leaving the SCCC site. After review of the design by the City of Walnut Creek as well as Contra Costa Public Works, it was requested that any captured stormwater be conveyed via piping to an existing public storm drainage facility. The following information is a summary of the design of the storm drain outfall in response to this request from the city and county (See Appendix C).

Existing Conditions on North San Carlos Drive

Based an aerial image and a supplemental survey of the area performed by BKF Engineers on October 29, 2020 it is assumed that once the stormwater reaches North San Carlos Drive it ponds in the existing low point of the Driveway before flowing northwest in a gully adjacent to the Contra Costa Water District (CCWD) property. The runoff then crosses under the Contra Costa Canal within a culvert and ultimately discharges into Walnut Creek just downstream of the Contra Costa Canal connection to Walnut Creek (See Appendix D).

The survey of North San Carlos Drive conducted in October 2020 collected information on the existing infrastructure within the area. Specifically, locations and invert elevations of existing sanitary sewer and storm drains were documented in order to determine the feasibility of installing an outfall in this location. See Appendix E showing this information.

Design Approach

The design criteria involved in designing the storm outfall is documented in the sub sections below. Discussion of the overall proposed solution can be found within the "Proposed Solution" section of this memorandum.

CCWD noted in their Conceptual Cost Estimate dated October 13, 2020 (See Appendix F) that the existing 8" VCP water main needs to be increased to 16" to serve the SSCCC development. For this reason the water main shown in Appendix E is a proposed 16" main and not the existing 8" water main and the CCWD design criteria for utility locations have been included in this report.

Horizontal Separation

In the CCWD Conceptual Cost Estimate (See Appendix F), the horizontal separation required for all new water mains is described. A summary of the horizontal separation requirements is below:

- Water mains running parallel with sewer must maintain a minimum 10 feet horizontal separation
- Water mains running parallel with storm must maintain a minimum 4 feet horizontal separation

Contra Costa Central Sanitary District (Central San) requires a horizontal clearance of 3 feet from sewer mains to utilities other than domestic water. See Section 4-03C of the Central San Standard Specifications.

Vertical Clearance

In the CCWD Conceptual Cost Estimate (See Appendix F), the vertical separation required for all new water mains is described. A summary of the vertical separation requirements is below:

- New water mains must maintain 3 feet of cover
- New water mains must maintain 1 foot minimum vertical clearance from other utilities

Central San also requires a minimum vertical clearance of 1 foot from all utilities, see Section 4-03C of the Central San Standard Specifications.

A minimum of 1 foot vertical clearance was used for all utility crossings including storm-storm crossings.

Size, Slope, & Material

The City of Walnut Creek's Minimum Drainage Design Standards (See Appendix G) details the requirements for the size, slope, and material of closed conduit systems. The criteria are as follows:

- The minimum size of a closed conduit shall be 15 inches
- The minimum slope shall not be less than 0.005 of a foot per foot length
- All pipes intended for use within a public easement or street right-of-way shall be reinforced concrete, unless specifically approved by the City Engineer

Comment 15d from the City of Walnut Creek's most recent Design Review (See Appendix A) specifically states that the City prefers PVC over RCP. The typical dimensions of PVC pipe have been used instead of RCP when determining wall-to-wall clearance both horizontal and vertical.

Storm Drain Cover Requirements

The City of Walnut Creek's Minimum Drainage Design Standards does not state a requirement for depth of storm drains. However, the design standards do require that the hydraulic grade line in any storm drainage facility be at least 18 inches below the top of any catch basin, grate, or manhole. Caltrans Highway Design Manual Chapter 5 Section C5.17, sites the minimum allowable cover for PVC pipe as being 1 foot from the bottom of the pavement section. These two criteria have been taken into account when designing the storm drain outfall.

Proposed Solution

The stormwater generated onsite will be directed to bioretention areas via curb and gutter flow, curb cuts, and storm drains. Once treated, the water will then be directed to an onsite detention basin that will provide additional storage as well as help to control the peak flow leaving the site. The detention basin will be compliant with the Contra Costa County Flood Control District's Detention Basin Design Guidelines. After the detention basin, the proposed storm drain outfall will cross into the North San Carlos right-of-way just east of the Emergency Vehicle Access (EVA) and will continue along North San Carlos until ultimately discharging into the City of Walnut Creek's 4 foot by 4 foot box culvert draining across North San Carlos Drive (See Appendix E). The constraints along the outfall required the storm drain proposed to be 15", which has a maximum capacity that is less than what is required. See below for more information on the constraints.

The existing 8" sewer main in North San Carlos Drive will remain, so the proposed water main and storm outfall were designed to accommodate this alignment. The horizontal separation required by CCWD has been met along the entire length of the proposed water main. The minimum horizontal clearance between the existing 8" sewer main and the 15" PVC storm outfall is 5 feet, which is greater than the 3 feet clearance that Central San requires. Additionally the storm drain was designed to cross both the existing sewer and proposed water mains at an angle greater than 45 degrees (See Appendix E).

The vertical alignment was determined based on a combination of the existing crossing utilities as well as the design criteria above. The determining factors for the vertical alignment is the 48 inch Ygnacio Canal culvert crossing North San Carlos Drive and the invert of the ultimate discharge point in the 4 by 4 box culvert. Both culvert's inverts and locations along the proposed storm alignment can be seen in Appendix E. Based on our site visit, the 48 inch culvert is assumed to be RCP pipe and the thickness of the pipe walls have been shown accordingly.

A connection into the public storm drain system at the 4 by 4 box culvert can be made at an invert of 96.18 feet, 0.1 feet above the existing bottom of the box culvert. Using this minimum invert elevation and ensuring the vertical clearance is 1 foot or greater at the 48 inch RCP Ygnacio Canal culvert further upstream, the result is a 15 inch PVC conduit at a slope of 0.002 feet per foot length (See Appendix E). This is less than the 0.005 city requirement. BKF determined that 1 foot of clearance is a conservative initial design for a storm to storm crossing. This clearance can be adjusted to provide a greater slope if necessary. A 15 inch PVC pipe sloping at 0.002 feet per foot length flowing full results in a pipe velocity of 2.35 feet per second (See

Appendix H). This pipe velocity falls slightly below the Urban Drainage Design Manual's recommendation of 3 feet per second as a self-cleaning velocity. However, the final design of the storm outfall will include access hole spacing in accordance with the Urban Drainage Design Manual to ensure adequate access for cleaning the outfall, as well as a detailed maintenance plan for the storm drain.

The minimum cover along the outfall, resulting from the infrastructure described above, is 2.4 feet from the existing pavement surface on North San Carlos Drive. This depth is greater than the 1 foot required by Caltrans. The utilization of onsite storage to limit the peak flow within the outfall to the capacity of the 15 inch PVC pipe will ensure that the hydraulic grade line requirement of 18 inches is also met.

Easements & Entitlements

Per the City of Walnut Creek Minimum Drainage Design Standards (See Appendix G) the proposed outfall shall have an easement width no smaller than the outside diameter of the conduit plus three feet on each side, with a minimum of 10 feet. Therefore the dedicated easement shall be 10 feet centered on the 15 inch PVC outfall.

The easement will cross multiple properties and easement rights will need to be negotiated will all before the outfall can be approved. The properties and their owners are:

- Lands of City of Walnut Creek – Parcel B, 6826 or 221
- Lands of United States of America (Bureau of Reclamation) – 1487 or 164
- Lands of Contra Costa Water District – Parcel J, 7667 or 916

Impacts on Existing Infrastructure

The impacts of the stormwater outfall will be minimal to the existing infrastructure. In the existing condition stormwater drains to Walnut Creek via sheet flow within North San Carlos Drive, then a gully directs stormwater until it is piped under the Contra Costa Canal. The City and County requirements listed above necessitate the proposed outfall to reroute the stormwater slightly upstream of the existing connection point. However, due to the flow capacity of a 15 inch PVC pipe at 0.002 feet per foot of length the peak flow will be limited to 2.9 cubic feet per second (cfs).

BKF defers to the City and County to determine if the additional flow to culvert present capacity issues within their system. Further downstream of the proposed outfall connection point, where the existing condition currently flows, the installation of the proposed outfall as it's detailed in this memorandum will result in less peak flow. The detention on site and the size of the outfall will limit stormwater peak flow offsite to 2.9 cfs for all recurrence intervals.

Conclusion

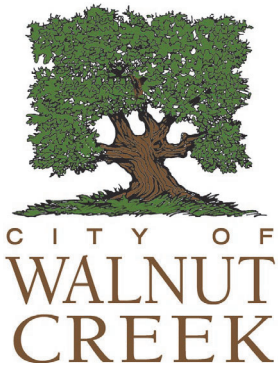
Based on the Topographic survey performed by BKF Engineers in October 2020, the City of Walnut Creek's Minimum Drainage Design Standards, Contra Costa County Flood Control District documents, and Contra Costa Water District and Central Contra Costa Sanitary District standard specifications BKF believes that the proposed outfall detailed here is a feasible alternative to the previous design approach of discharging treated stormwater using level spreaders.

Appendices

- Appendix A – City of Walnut Creek Design Review Comments
- Appendix B – Existing Drainage Management Areas
- Appendix C – Site Vicinity Map with Proposed Outfall Location
- Appendix D – Existing Drainage Pattern of North San Carlos Drive
- Appendix E – Proposed Outfall Plan & Profile with Existing Utilities
- Appendix F – Contra Costa Water District Conceptual Cost Estimate
- Appendix G – City of Walnut Creek Drainage Design Standards
- Appendix H – Proposed Outfall Flow Capacity Calculations

APPENDIX A

City of Walnut Creek Design Review Comments



October 30, 2020

Sean Tully
Contra Costa County
Department of Conservation and Development
30 Muir Road
Martinez, CA 94553

Delivered via e-mail

Re: Spieker Senior Continuing Care Community Project (GP20-0001) – second round

Dear Mr. Tully:

Thank you again for the opportunity to review the above noted application located within the City of Walnut Creek's Sphere of Influence. We continue to have a particular interest in this project due to its large size and the fact that it is proposed to be accessed via the City's roadway network, and, as always, appreciate your collaborative approach. Our comments on the second-round submittal for this project are as follows:

Planning/Land Use

1. The City's general plan land use classification for the subject property is Single Family Low (SFL, 1.1 - 3.0 du/ac), and we acknowledge that the applicant is proposing an amendment to the County's general plan. As such, we continue to request that special attention be paid to the potential impacts on the City's municipal services, including roads, parks, and police.
2. Pursuant to Action 18.5.3 in Chapter 4 of the Walnut Creek General Plan, all utilities will need to be placed underground (this will be required by the City for all utilities located in within the City of Walnut Creek), as acknowledged by the applicant in their response letter dated October 8, 2020.
3. We continue to ask that if any impact or development fees collected from this project for the purpose of constructing or maintaining parks facilities (such as Quimby Act fees), that they be passed on to the City of Walnut Creek, as there are no County park facilities in the area, and the project's future residents would most likely use nearby City of Walnut Creek park and open space facilities (including the adjacent Heather Farm Park). Additionally, we acknowledge the applicant's commitment "to voluntarily contribute an appropriate sum of money prior to occupancy, to be determined as part of the Kinross Drive extension process, to be transferred to the City of Walnut Creek for general

recreational facility purposes in accordance with permission authorized under County Code”, as stated in their response letter dated October 8, 2020

4. In light of the size of the project and the site’s proximity to the Contra Costa Canal and the Iron Horse Trails, we continue to recommend that the project include secure indoor bicycle parking for the project’s employees and residents (in addition to the proposed locker and shower facilities for employees), and convenient outdoor bicycle parking for visitors.
5. We continue to request that the project provide pedestrian and bicycle connections between the Iron Horse Trail and the Seven Hills Ranch Road EVA, and between the Contra Costa Canal Trail and the N San Carlos Drive EVA. These connections will serve employees and visitors, in addition to the senior residents (who may use tricycles or other similar vehicles, as well as bicycles).
6. The CEQA review for this project should analyze the potential aesthetic impacts resulting from the proposed three and four-story buildings located atop a prominent hill. We continue to request that this analysis include multiple photo-simulations illustrating views of the project from the surrounding neighborhoods, the Contra Costa Canal Trail, and Heather Farm Park.

Public Works - Traffic Engineering

7. Please provide a comparison of trip generation rates for LU 255 (which was used in the traffic analysis), as compared to a combination of Senior Living, Congregate Care, Assisted Living, and other land uses contained within the ITE 10th ed., as the project description does break down the project into more specific uses and employee shift information. The more conservative trip generation estimate should be applied to this project.
8. The technical appendix attachment listing the VMT calculations indicates assumptions based on Spieker Property estimates. Does this breakdown match the breakdown for employees/residents that would have project characteristics for locations where data was collected for LU 255 trip generation?
9. Similar to the trip generation assumptions, please break down parking demand analysis by more specific land uses to better match the project description.
10. LOS Analysis comments:
 - a. Generally: City staff has a preference not to apply PHF for cumulative conditions, and to apply a consistent PHF across all intersection approaches (especially one where traffic volumes are heavy commute condition rather than very peaky conditions such as near a school)
 - b. YVR/San Carlos: NB and SB San Carlos approaches are split phase. Please revise analysis.
 - c. YVR/La Casa Via: Signal does not operate any special phasing on the NB approach, please revise analysis accordingly.
 - d. YVR/Tampico: Overall LOS does not appear to be realistic. What model did the analyst use as a basis for the analysis? Was it City-provided? Please confirm.

11. Provide pedestrian connections at the Seven Hills Ranch Rd/Homestead Ave intersection
12. Provide complete the pedestrian connection to Heather Farm Park

Public Works – Engineering

13. Pedestrian facilities. Sheet L5. The pedestrian path at the northerly EVA is shown extending off-site on CCWD property. Revise plans to show continuation of the pedestrian path (min 5-ft wide) to the sidewalk at the bridge with connecting to the Contra Costa Trail to ensure a safe pedestrian route for residents. Coordinate with affected property owners, City included, for necessary easements/improvements.
14. As noted by CCCFPD Comment No. 5, if EVAs are on private roads, EVA easements (EVAEs) will be required. This requirement would extend off the project site as both EVAs daylight onto private roads/property over which EVAEs will be required until reaching a public roadway. These off-site EVAEs would likewise be required to meet CCCFPD standards noted in items 2 and 3 their letter. Revise the tentative map to show these EVAEs and the improvement plans to show the necessary off-site improvements and note the necessary for adjacent property owner consent. The response to comment was that “minor enhancements beyond the Site boundary may be possible to achieved the requested 20-ft width.” Please revise the plans to show the necessary improvements and easements for both proposed EVAs, including structural section. The FIRE-5 response notes that the southerly EVA is optional; if the EVAE is proposed and shown on the tentative map as such, it needs to meet CCCFPD standards until accessing a public road.
15. Preliminary Hydrology and Water Quality Report. While City staff will defer to County staff including County Flood Control for Hydrologic and Hydraulic modeling, City staff finds the report insufficient to address project impacts. City staff concerns include:
 - a. The use of 6” ponding depth and the permeable rock section of C.3 facilities for flood control and peak flow mitigation purposes is currently not accepted by County Flood Control.
 - b. The project is noted to be exempt from hydromodification requirements due to runoff draining to a hardened channel. The Hydromodification management Map in Appendix C had not been accepted by the Water Board, who recently raised comments specifically regarding the Walnut Creek. As such, the exemption is not valid.
 - c. Analyze each outfall separately. Outfall 1 is actually two outfalls, as is Outfall 5. For DMA 9 Outfall 1, address impact to drainage channel; while post-project drainage area reduced from pre-project, the flow path is being modified; a portion is being piped (to create access road from Kinross) and remainder is being routed through an interceptor channel. Provide detail of interceptor channel and provide a cross section through the bioretention basin as highlighted below, showing basin, retaining walls and interceptor channel. Note that bioretention surface needs to be level but interceptor channel needs to slope to convey runoff from 36” pipe. Analysis should clearly address impacts to offsite existing natural drainage channel upstream of 84” CMP culvert and delineate location of drainage channel relative to Seven Hills Ranch property and adjacent private property and show drainage easements if any.



- d. For DMA #, Outfall 5 (drainage at N San Carlos EVA), please note that the City will accept and actually prefers PVC over RCP. Also, please provide response/clarification of CCWD comment No. 2 (no response provided in RTC) that “No drainage from the project site shall be allowed to go onto CCWD or Reclamation property”, particularly with regard to Options 1 and 2. Both options will require review and approval by the City and CCWD. Option 1 will require crossing the Contra Costa Canal and thus require review and approval from the BOR. Evaluation of both options will need to include determination of necessary easements, ensure utility separation, evaluate impacts of outfall to canal, and include design of outfall to mitigate impacts and address long-term maintenance concerns.

Police

16. The proposed project will likely result in a large number of calls for service due to medical and other emergencies, and due to its location, it is likely that the Walnut Creek Police Department will sometimes be called upon to be the first responder. We continue to request an analysis of the impacts of this project to the resources of the City of Walnut Creek’s Police Department, paying particular attention to potential requests for mutual aid when the Contra Costa County Sherriff’s Office is unable to respond to calls for service in a timely manner.

Thank you for again considering our comments in your review of this application. Please don’t hesitate to contact me directly if you would like to discuss any aspect of this letter further or if you have any questions.

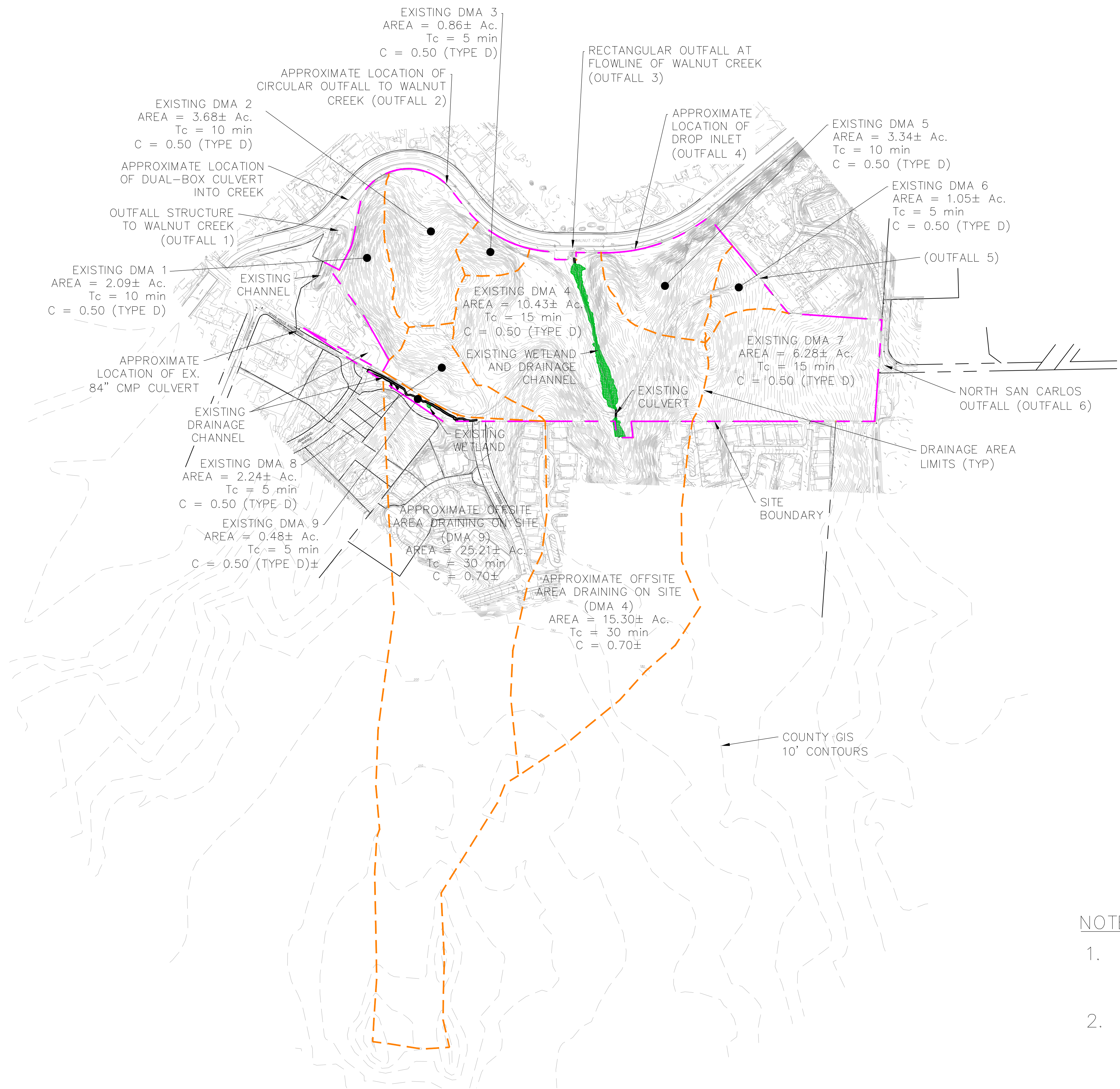
Sincerely,

Andrew M. Smith
Senior Planner
(925) 943-5899 x2213
asmith@walnut-creek.org

Cc: Steve Mattas, City Attorney
Claire Lai, Assistant City Attorney
Teri Killgore, Assistant City Manager
Ethan Bindernagel, Planning Manager
Smadar Boardman, Traffic Engineer
Cathleen Terentieff, Senior Civil Engineer
Lt. Holley Connors, Walnut Creek Police Department

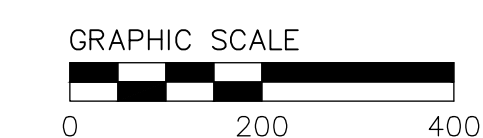
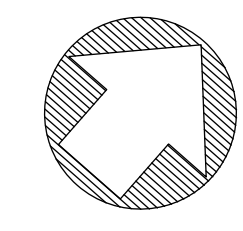
APPENDIX B

Existing Drainage Management Areas



NOTE:

1. OFFSITE DRAINAGE AREAS DELINEATED FROM COUNTY GIS 10' CONTOURS, DATED 05-09-2017.
2. ONSITE DRAINAGE AREAS DELINEATED FROM SITE SURVEY PERFORMED ON 07-14-2020.



APPENDIX C

Site Vicinity Map with Proposed Outfall Location



EXHIBIT – SITE VICINITY MAP



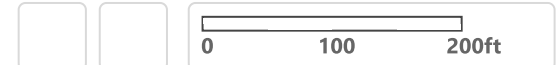
APPENDIX D

Existing Drainage Pattern of North San Carlos Drive



I want to...

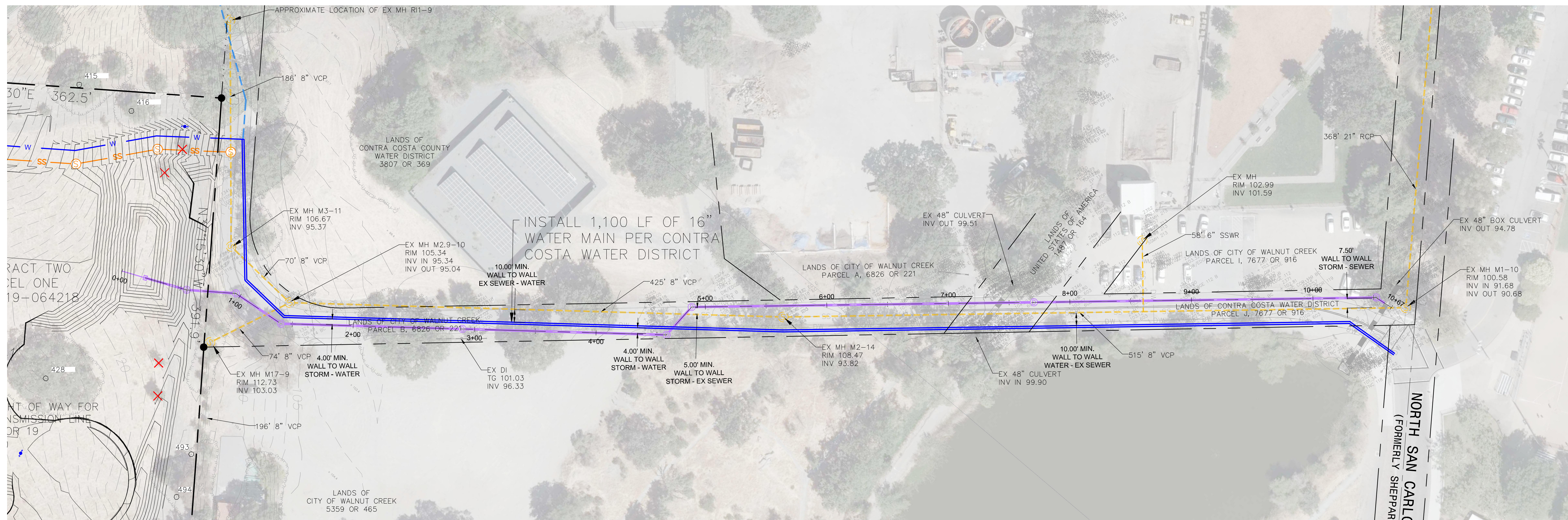
Tools



EXISTING DRAINAGE CONDITIONS

APPENDIX E

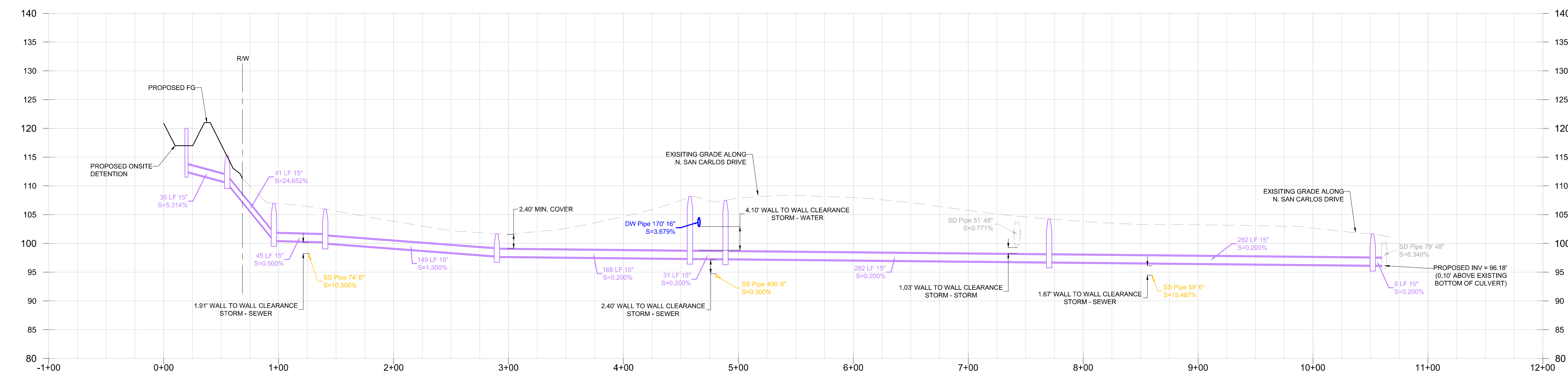
Proposed Outfall Plan & Profile with Existing Utilities



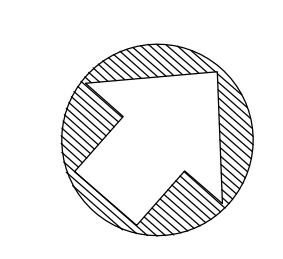
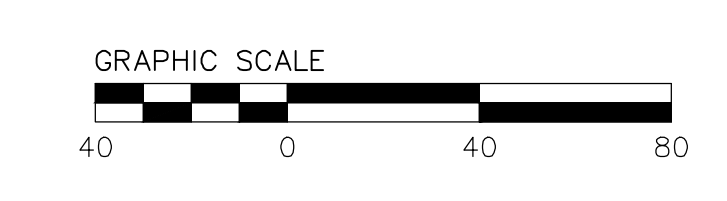
LEGEND

EXISTING	PROPOSED
	SS
	W

SANITARY SEWER
 WATER
 STORM



PROPOSED STORM PROFILE
 1" = 40' (HORIZONTAL)
 1" = 8' (VERTICAL)



APPENDIX F

Contra Costa Water District Conceptual Cost Estimate



BOARD OF DIRECTORS

Lisa M. Borba, AICP

PRESIDENT

Connstance Holdaway

VICE PRESIDENT

Ernesto A. Avila, P.E.

Bette Boatman

John A. Burgh

October 13, 2020

Michael Steele

BKF

1646 N. California Street, Ste 400

Walnut Creek, CA 94595

GENERAL MANAGER

Stephen J. Welch, P.E., S.E.

Subject: Conceptual Cost Estimate for the Water Infrastructure Requirements for the Speiker Senior Care Community, Walnut Creek; WO 52130300

Dear Mr. Steele:

The Contra Costa Water District (District) appreciates the opportunity to provide a conceptual review and estimate of water infrastructure needed to support the subject project. The proposed estimate does not include the required connection/capacity fees and the costs associated with installation of the domestic services, fire services, irrigation service, and hydrants as this is currently unknown at this time. Attached is a summary of the likely design and implementation costs and list of project components based on the information that was provided to the District. (Attachment 1)

Conceptual cost estimates are prepared based on the information provided by the requestor and assumptions made by the District, including the following: layout, building pad elevations, anticipated water demands, pipeline alignment, permit costs, and utility locations. In addition to these general assumptions, your attention is directed to the notes listed at the bottom of the attached estimate, which describe specific assumptions made about the project.

The requested water infrastructure needed to service the proposed project will include the following:

- Approximately 1,100 LF of 16-inch main from the Zone II, 24-inch main located in N. San Carlos Drive to the subject property;
- Approximately 5,650 LF of 12-inch on-site main throughout the proposed development;
- Approximately 1,000 LF of 12-inch main to loop the on-site water system with re-zoned portion of distribution system

To provide service to the proposed development a new 16-inch water main would need to be extended from the existing Zone II 24-inch main in N. San Carlos Drive, approximately 1,100LF to the development property line. Approximately 5,650 LF of 12-inch main would be extended throughout the development to provide the various undefined water service to proposed development. In addition, the District is evaluating re-zoning the west side of the Contra Costa County Flood Control Channel to a higher pressure zone. Should the re-zoning be completed, the District will require water service to this development to connect to this new zone, to form a looped system so that reliability and water quality objectives can be met. This estimate assumes that approximately 1,000 LF of 12-inch main will be require to complete the looped system. The District will require an easement for all its facilities that aren't located within the public right-of-way. Since an easement is required, the property owner will be responsible to sign and have notarized a standard District Easement Agreement and provide a plat and legal description of each easement area, prepared by a licensed surveyor.

The State Water Resource Control Board (SWRCB) mandates certain separation requirements for water mains that are parallel to and/or crossing sewer and storm drains. Grading and/or utility plans should be developed to comply with all separation criteria mandated in SWRCB Section 64572. New water mains MUST cross over sewer and storm drains with a minimum of 1-foot vertical clearance while maintaining a minimum of 3 feet of cover. In addition, if the new water main is running parallel with either a sewer or a storm drain, the water main MUST maintain a minimum distance of 10 feet from a sewer and a minimum distance of 4 feet from a storm drain. All efforts to maintain these regulatory requirements as well as public health will be prioritized above construction costs in determining an acceptable alternative.

An independent contractor possessing a valid Class-A or C-34 license will be required to complete the Zone II main extension as well as the on-site work for the internal water mains. District forces will be responsible for the tie-in to the existing main. The District will design the project's water infrastructure and assign an inspector to oversee its construction. A payment bond and a performance bond equal to the District's estimated cost of installation would be required and keep in place for one year after the project is complete and accepted by the District.

By providing this review and estimate, the District makes absolutely no warranty whatsoever, whether expressed or implied, that the District will be able to install and supply water for this project, or that the District supports or endorses the further development of this project. The District recommends the applicant fully investigate all City requirements and resolves any issues that may impact the installation of proposed water services prior to submitting the project to the District for design.

Should you decide to continue the pursuit of receiving water from the District, you will be required to file an Application for Service (Attachment 2) and a \$40,000 project deposit to initiate design. If you have any questions, please call me at (925) 688-8014.

Sincerely,

C. Sweeney

Cindy Sweeney
Engineering Services Coordinator

CS:

Attachments: 1) Conceptual Cost Estimate for Project Number 52130300
2) Application for Service

File: 52130300

Attachment 1

Conceptual Cost Estimate for Spieker Senior Care Community, WO 52130300

Description	Estimated Cost
Install approximately 1,100lf of 16" PVC main from Zone II including labor, overhead, and materials.	\$358,000
Install approximately 5,650lf of 12" PVC main on-site including labor, overhead, and materials.	\$1,130,000
Install approximately 1,000lf of 12" PVC main including labor, overhead, and materials to loop water system to higher zone facilities.	\$200,000
City permit and inspection	\$10,000
USBR permitting to cross Contra Costa Canal with 16-inch main extension	\$20,000
Utility investigation	\$10,000
District Design	\$40,000
District Construction Administration	\$20,000
Total Estimated Cost (rounded to the nearest \$5K) (Actual cost may vary +/- 30%)	\$1,790,000

NOTES:

Assumptions:

1. Applicant will provide all necessary land rights, rights-of-ways, or easements required for this water distribution system, the cost of which have not been included in this estimate. Any required land rights will be identified in the "Developer Redline" drawings during Preliminary Design.
2. Assumes all work can be completed during normal business hours.

APPENDIX G

City of Walnut Creek Drainage Design Standards

MINIMUM DRAINAGE DESIGN STANDARDS

1. Onsite Requirements.

- a. All portions of a development shall be protected from flood hazard, inundation, sheet overflow and ponding of storm waters. All finished floors shall be above the water surface of a one-hundred-year frequency storm runoff as shown on the Federal Flood Insurance Program Flood Insurance Rate Map.
- b. All surface waters occurring within a development, as well as all surface waters flowing into and/or through the development, shall be collected and conveyed through the development without damage to any improvement, building site or dwelling which may be constructed within the development.
- c. Storm drainage facilities within a development shall be designed and constructed in compliance with the requirements of this section and any other City codes and standards to adequately convey, with freeboard, the storm water runoff from the maximum potential development of the drainage basin watershed.
- d. The developer shall dedicate to the City, or other public agency, an easement for construction, maintenance and operation of all storm drainage and access facilities required to convey drainage water originating in a public street, easement or open space to a public storm drainage facility.

2. Offsite Development Requirements.

- a. All surface waters flowing from a development in any form or manner shall be conveyed, without watershed diversion or damage to any improvement, building or dwelling, to a natural watercourse having a definable bed and banks, or to an existing public storm drainage facility having adequate capacity to its point of discharge into a natural watercourse. The City may require that flows from a development be regulated to not exceed the capacity of watercourses downstream to contain the amount of flow from the fully developed drainage basin watershed area.
- b. Storm drainage facilities outside a development shall be designed and constructed in compliance with the requirements of this Section and with City standard plans and specifications and design standards of the City, to adequately convey, with freeboard, the storm water runoff from the maximum potential development of the drainage basin watershed.
- c. Where surface waters must be conveyed beyond the boundaries of a development to discharge into a natural watercourse or into an existing adequate public storm drainage facility, the developer shall comply with either subsection (d), or (e) of this Section, prior approving a final or parcel map or issuance of a site development or building permit.

- d. The developer shall submit the following:
 - i. A copy of a recorded conveyance from the adjacent property owner(s), in a form and content acceptable to the City, granting a storm drainage easement to the developer to construct, maintain and operate all necessary storm drainage and access facilities, and
 - ii. A copy of a recorded offer of dedication from the adjacent property owner(s), in a form and content acceptable to the City, offering to dedicate to the City or other public agency sufficient land rights for construction, maintenance and operation of all necessary storm drainage and access facilities. The documents shall be obtained from all property owner(s) between the boundaries of the development and the point at which the surface waters will be discharged into a natural watercourse having definable bed and banks or an existing adequate public storm drainage facility.
- e. The developer shall present written evidence which proves to the satisfaction of the City that it is not feasible to obtain an easement from the adjacent property owners. The City, in its sole discretion, may then authorize the institution of condemnation proceedings to acquire the easement at the developer's expense.

3. Runoff quantity determination. Runoff quantities shall be determined by methods consistent with current engineering practices for the frequency of the average recurrence interval according to Section 5.

4. Drainage facilities - Definition. As used in this division, the terms "storm drainage facility" and "drainage facility" shall include, but not be limited to, channels, ditches, conduits, pipes, culverts, detention basins and all appurtenances.

5. Drainage facilities - Minimum capacities. Storm drainage facilities directly affecting a development shall have the following minimum capacities:

- a. Major drainage facilities serving a watershed area four (4) square miles or greater shall have adequate capacity to contain, with sufficient freeboard, a 50-year frequency of average recurrence interval runoff and contain without freeboard a 100-year average recurrence interval runoff.
- b. Secondary drainage facilities serving a watershed area one (1) square mile or greater but less than four (4) square miles shall have adequate capacity to contain, with freeboard, a 25-year frequency of average recurrence interval runoff.
- c. Minor drainage facilities serving a watershed area less than one (1) square mile shall have adequate capacity to contain, with freeboard, a 10-year frequency of average recurrence interval runoff.

6. Closed conduits - Minimum size. Closed conduits, including street-crossing culverts,

shall be of a size adequate to carry the design flow, but shall not be smaller than fifteen (15) inches inside diameter.

7. Closed conduits - Minimum slope. Minimum flow line gradients for closed conduits shall not be less than five one-thousandths (0.005) of a foot per foot of length.

8. Closed conduits - Outlet velocity. Where the outlet velocity is high enough to create erosion at the outfall channel, suitable protective works shall be constructed to dissipate the flow. At a minimum, the outlet end of a closed conduit shall be protected by a cutoff wall and the placement of loose riprap. The protective works shall be those specified by a licensed engineer and shall be based on engineering calculations of allowable flow velocities.

9. Closed conduits - Material. All pipe or culverts intended for use within a public easement or street right-of-way shall be reinforced concrete unless specifically approved by the City Engineer. If approved, corrugated steel and aluminum pipe shall be bituminous coated. Additional protective coating or paving of metal pipes may be required for severe service conditions. The class or gauge of pipe or culvert proposed at each location shall be shown on the improvement plans. Private pipes or culverts may be of any approved type and strength to meet field conditions designed by the developer's engineer and approved by the City Engineer.

10. Storm drainage catch basins and manholes. Catch basins and manholes shall be according to the City Standard Plans, Contra Costa County Standard Plans, or other design approved by the City Engineer. Pipes shall not enter through a corner of the catch basin. Catch basins shall be placed not more than 1,000 feet apart or where gutter capacity may be exceeded. Gutter capacity is considered exceeded if water encroaches into the travel lane of the street. The maximum distance between manholes shall be 500 feet, or as required by the City Engineer. Catch basins shall be located at intersections to remove the curb flow before it reaches the pedestrian crossings. Catch basins at sag vertical curves shall have capacity for 50-year average recurrence interval runoff.

Unless specifically permitted by the City Engineer, structures shall be installed at all junctions.

11. Closed conduits - Alignment. All storm drainage conduits shall be straight between structures except that one vertical or one horizontal deflection of not more than five (5) degrees will be permitted in pipe sizes of thirty (30) inches or more, provided that one structure shall be installed at the downstream or upstream end of a curve of approved radius. Structures shall be installed at deflections of more than five (5) degrees in the horizontal or vertical alignment of the conduit.

12. Closed conduits - Streets and Watercourses. Water within street areas shall be placed in closed conduits when the design depth of flow extends into the travel lane of the street. Storm water in natural or improved earth channels shall be placed in closed conduits or concrete lined channels when required by the City Engineer.

13. Drainage Facilities - Freeboard. The hydraulic grade line in any storm drainage facility shall be at least eighteen (18) inches below the top of any catch basin grate or manhole cover.

14. Easements - General Requirements. Easements shall provide sufficient land rights for construction, maintenance and operation of drainage and access facilities. All easements shall be provided with access, usable by vehicular maintenance equipment, to a public street.

15. Closed conduits - Minimum Widths of Easements. Minimum widths of easements shall be equal to the outside diameter or width of the conduit plus three (3) feet on each side, with a minimum of ten (10) feet. Additional width may be required for drainage structures. If an easement is offered for dedication to provide for the future construction of a drainage system, the easement width may include an additional width for construction purposes.

16. Structures and Encroachments Within Easements. No permanent structures of any kind other than drainage structures may be constructed within any storm drainage easement. Encroachments may be permitted if an Encroachment Permit Agreement is approved by the City Engineer and recorded at the expense of the applicant. Public utilities may be installed within easements upon approval by the City.

17. Private Drainage Systems. Earth and concrete lined ditches, yard drains, pipes carrying water originating on private property and other similar drainage systems are considered private systems and easements for these systems shall not be offered or granted to the City. The property owner shall be responsible for the maintenance of private systems.

18. Subdrains. Subdrain facilities shall be provided where specified by the soil engineer controlling the work and other areas where deemed necessary by the City. Facilities will be required to convey the subdrainage to an approved point of discharge. The property owner shall be responsible for the maintenance of subdrain facilities.

19. Structure Setback Lines - General Requirements. In general, structure setbacks for unimproved channels shall comply with Contra Costa County Ordinance 89-28, Section 914-14 as amended unless specifically approved by the City Engineer. The City Engineer shall determine setbacks from improved channels based on the type of improvement and the maintenance access requirements.

20. Structures and Encroachments Within Structure Setback Areas. No permanent structures of any kind other than drainage structures may be constructed within, under or over any structure setback area described in this chapter. Fencing and landscaping, including trees and shrubs, are excluded from this restriction. The structure setback line shall be verified prior to the issuance of a building permit.

21. Protection of Natural Watercourses. The City, at its sole discretion, may determine that a natural watercourse, or a substantial portion of a natural watercourse, is a scenic attraction or possesses significant riparian habitat, and may require that the watercourse, or portion of the watercourse, be protected in its natural state. The watercourse or portion required to be protected shall be referred to as a "scenic easement".

22. Watercourse Capacity and Stability Analysis. Before a protected watercourse may be utilized for discharge of drainage flowing through or from a development, the watercourse's

capacity and stability shall be substantiated through hydraulic calculations performed by a licensed engineer. Design flow volumes in excess of the watercourse's reasonable capacity shall be conveyed around the protected watercourse or shall be detained in adequate detention basins. Flow velocities which cause erosion shall be mitigated using environmentally-sensitive techniques approved by the City.

23. Vegetation Removal. Vegetation removal within a protected watercourse shall be restricted to the removal of downed trees, trees that are precariously undercut and trees that have the potential of creating a major obstruction within the floodway. Removal work shall be done in an environmentally-sensitive manner, so as to minimize damage to remaining trees, undergrowth and other riparian vegetation. Trees requiring removal of dead or diseased limbs shall be trimmed under the supervision of a tree specialist. A Tree Removal Permit shall be required for removal of trees protected by the Tree Preservation Ordinance.

APPENDIX H

Proposed Outfall Flow Capacity Calculations

Spieker Senior Continuing Care Center

North San Carlos Outfall

Set units: m mm ft in [\[Hide this line\]](#)

Inputs

Pipe diameter, d_0	15	in	X
Manning roughness, n	0.013		X
Pressure slope (possibly ? equal to pipe slope), S_0	0.002	rise/run	X
Percent of (or ratio to) full depth (100% or 1 if flowing full)	1.0	fraction	X

Results

Flow, Q	2.8886	cfs
Velocity, v	2.3539	ft/sec
Velocity head, h_v	0.0861	ft H2O
Flow area	1.2272	ft ²
Wetted perimeter	3.9270	ft
Hydraulic radius	0.3125	ft
Top width, T	0.0000	ft
Froude number, F	0.00	
Shear stress (tractive force), τ	0.0390	psf

Printable version (reload/refresh to restore)

