ATTACHMENT E

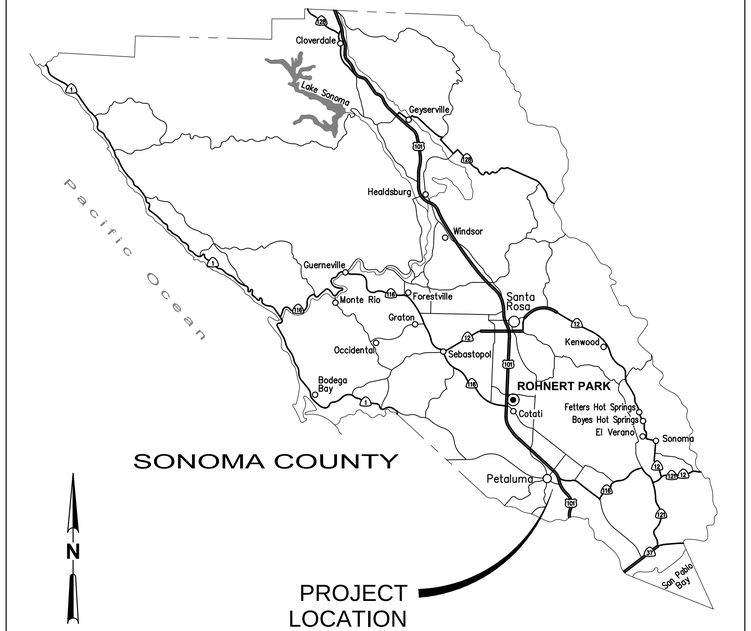
Attachment A
Conceptual Design Drawings

ATTACHMENT E

CITY OF PETALUMA
ELLIS CREEK WATER OUTFALL PROJECT
PROJECT # 11152197
Petaluma, CA
March 2021

Replace with City's C number

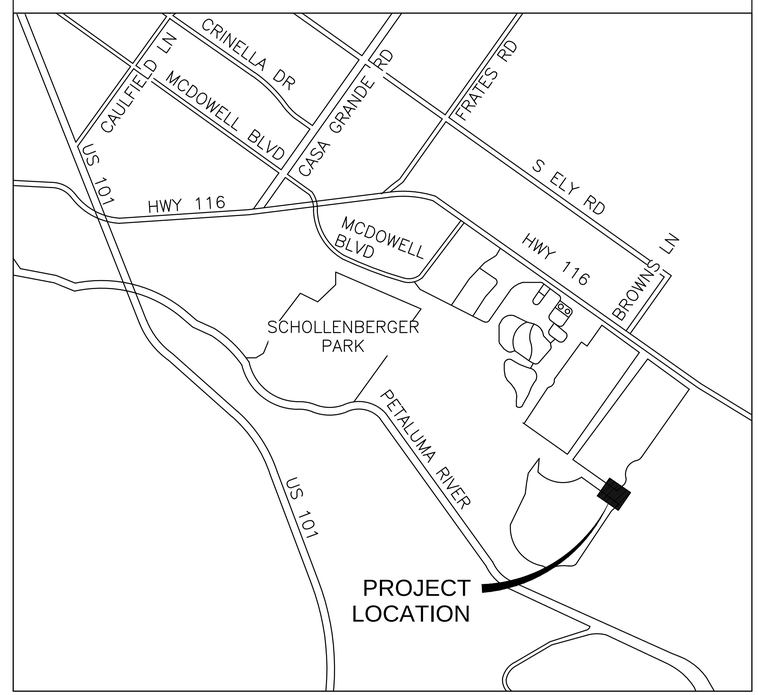
VICINITY MAP



PREPARED BY

GHD

LOCATION MAP



SHEET INDEX

PRELIMINARY

No.	Issue	Drawn	Approved	Date

10% SUBMITTAL FOR AGENCY REVIEW ONLY

Bar is one inch on original size sheet
0 — 1"

PRELIMINARY

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Drawn	PE	Designer	VF
Drafting Check	VF	Design Check	SD
Project Manager		Date	MARCH 2021
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client **CITY OF PETALUMA**
Project **ELLIS CREEK OUTFALL PROJECT**
Title **TITLE SHEET, VICINITY MAP, AND LOCATION MAP**
Project No. **11152197**
Original Size **ANSI D**
Sheet No. **G-001**
Sheet **1** of **5**

ATTACHMENT E

GENERAL NOTES

1. CONTRACTOR SHALL POSSESS A CLASS "A" LICENSE.
2. EXCAVATIONS OVER FIVE FEET (5') DEEP REQUIRE AN EXCAVATION PERMIT FROM THE STATE DEPARTMENT OF INDUSTRIAL SAFETY.
3. CONTRACTOR SHALL CALL "UNDERGROUND SERVICE ALERT" AT (800) 227-2600 AT LEAST ONE (1) WEEK PRIOR TO START OF CONSTRUCTION FOR LOCATING UNDERGROUND UTILITIES. NOTE THAT WATER SERVICES, SEWER LATERALS, AND OTHER UTILITIES MAY NOT BE FIELD MARKED NOR IDENTIFIED ON THE PLANS. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATION OF UNDERGROUND UTILITIES.
4. UNAUTHORIZED CHANGES AND USES: THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.
5. CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY: THAT THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND CONSTRUCTION CONTRACTOR FURTHER AGREES TO HOLD HARMLESS, INDEMNIFY AND DEFEND THE CITY OF PETALUMA, AND EACH OF THEIR OFFICERS, EMPLOYEES AND AGENTS.
6. ALL MATERIAL WORKMANSHIP AND CONSTRUCTION SHALL CONFORM TO THE CITY OF PETALUMA DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS AND CONFORM TO THE LATEST EDITION OF THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS AND STANDARD PLANS EXCEPT AS NOTED ON PLANS.
7. CONTRACTOR SHALL INDEPENDENTLY REVIEW GROUND & TOPOGRAPHY, AND ASSUME WHOLLY AND UNCONDITIONALLY THE RISK OF COMPLETING THE WORK SET OUT ON THESE PLANS, REGARDLESS OF ROCK, WATER TABLE, OR OTHER CONDITIONS WHICH CONTRACTOR MAY ENCOUNTER IN THE COURSE OF THE WORK.
8. ANY EXCESS MATERIALS SHALL BE CONSIDERED THE PROPERTY OF THE CONTRACTOR AND BE DISPOSED OF AWAY FROM THE JOB SITE IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.
9. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING EXISTING FACILITIES AND IMPROVEMENTS FROM DAMAGE RESULTING FROM HIS WORK. ANY DAMAGE SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE AND TO THE SATISFACTION OF THE CITY.
10. NO GUARANTEE IS INTENDED THAT ALL UNDERGROUND OBSTRUCTIONS ARE SHOWN ON THE PLANS. THOSE SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE AND THE CONTRACTOR IS CAUTIONED THAT THE CITY ASSUMES NO RESPONSIBILITY FOR ANY OBSTRUCTIONS EITHER SHOWN OR NOT SHOWN ON THESE PLANS.
11. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE THE CITY WITH A TRAFFIC CONTROL PLAN IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
12. THE CONTRACTOR SHALL MAINTAIN ACCESS TO ALL DRIVEWAYS DURING CONSTRUCTION. MAIL AND GARBAGE SERVICE SHALL BE MAINTAINED THROUGHOUT THE COURSE OF THIS PROJECT.
13. ALL CONSTRUCTION ACTIVITY SHALL CONFORM TO PROJECT MITIGATION MEASURES, AS APPLICABLE.
14. PROJECT SITE IS LOCATED ALONG (E) BUS ROUTES. BUS STOPS WITHIN THE PROJECT LIMITS SHALL BE MAINTAINED THROUGHOUT THE DURATION OF CONSTRUCTION.
15. CONTRACTOR SHALL NOTIFY PROPERTY OWNERS AT LEAST 72 HOURS IN ADVANCE OF DRIVEWAY CLOSURES FOR CONSTRUCTION OF C/G, DRIVEWAY APRONS AND DRIVEWAY TRANSITIONS. DRIVEWAY CLOSURES ARE LIMITED TO 48 HRS MAXIMUM. CONTRACTOR SHALL CLOSE ONLY ONE DRIVEWAY AT A TIME FOR PROPERTIES WITH MORE THAN ONE DRIVEWAY ACCESS, & SHALL PROVIDE ALTERNATE ACCESS WHERE POSSIBLE FOR SINGLE DRIVEWAY PROPERTIES.

BENCH LEVEL DATA

VERTICAL DATUM: NAVD 88

BASIS OF BEARING

HORIZONTAL DATUM: NAD83 (CSRC) 2017.5 EPOCH
COORDINATE SYSTEM: CALIFORNIA COORDINATE SYSTEM ZONE 2

SURVEY CONTROL POINTS

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
100	1840884.002	6396226.303	13.064	REBAR&CAP
101	1840587.371	6396488.296	13.442	MAG&TT MAG/TT 101
102	1840767.279	6396692.782	12.746	REBAR/CAP 102
103	1840696.735	6396527.703	13.668	FND MON 103
104	1840622.293	6396544.795	14.181	14.181 SET MAG&TT

1. FIELD SURVEY WAS COMPLETED BY TOWILL FROM DECEMBER 2 THROUGH DECEMBER 10, 2019.

LEGEND

- APPROXIMATE PARCEL BOUNDARY
- PERMANENT EASEMENT LINE
- CONTRACTOR ACCESS
- MINOR CONTOUR
- MAJOR CONTOUR
- (E) WOOD FENCE
- REMOVE OR ABANDON (E) UTILITY
- (E) STORM DRAIN
- (N) 1" WATER SERVICE WITH (E) METER BOX
- (E) 1" WATER SERVICE WITH (E) METER BOX
- (N) WATER MAIN
- (E) WATER MAIN
- CUT AND CAP (E) WATER MAIN
- (E) SANITARY SEWER
- (N) SANITARY SEWER (OPEN TRENCH)
- (E) SEWER LATERAL AND CLEANOUT
- (N) SEWER LATERAL AND CLEANOUT
- (E) PG&E GAS LINE
- (E) PG&E ELECTRICAL LINE
- (E) OVERHEAD COMMUNICATIONS LINE
- (E) TELEPHONE OR COMMUNICATIONS LINE
- (E) WATER MAIN, GATE VALVE AND TEE
- (N) WATER MAIN, GATE VALVE AND TEE
- (E) SEWER MAIN, MANHOLE AND CLEANOUT
- (N) SEWER MAIN, MANHOLE AND CLEANOUT WITH FLOW DIRECTION
- TEMPORARY BLOWOFF AND STRAIGHT TIE-IN
- (E) GATE VALVE
- (N) GATE VALVE
- (N) BLOW OFF
- (N) AIR RELEASE VALVE
- (N) FIRE HYDRANT WITH 4'x4' CONCRETE PAD
- (E) GAS VALVE
- SET CUT X SURVEY MONUMENT
- BRASS DISK SURVEY MONUMENT
- SURVEY CONTROL POINT
- POTHOLE LOCATION
- (E) CITY MONUMENT
- (N) CITY MONUMENT
- (E) STORM DRAIN MANHOLE
- (E) TREE
- (E) HMA / AC PAVEMENT
- (E) CONCRETE
- (N) CONCRETE
- (E) ROCK WALL
- (E) GRAVEL SURFACE
- (E) WATER METER
- (N) WATER METER
- (E) GAS METER
- (E) POWER POLE
- (E) ELECTRIC VAULT
- (E) FIRE HYDRANT
- (E) MAIL BOX
- (E) ELECTRICAL VAULT
- (E) TELEPHONE VAULT
- (E) ELECTRICAL MANHOLE
- (E) SEWER MANHOLE
- (N) SEWER MANHOLE
- (E) CATCH BASIN
- (E) DROP INLET
- (E) POWER POLE, JOINT POLE
- (E) SPRINKLER
- (E) SIGN
- (E) LIGHT POLE
- (E) UTILITY CABINET
- (E) STREET LIGHT
- (E) IRRIGATION VALVE
- (E) IRRIGATION VALVE
- DETAIL NUMBER
- SHEET NUMBER (- = THIS SHEET)
- SECTION TAG AND DIRECTION

ABBREVIATIONS

AB	AGGREGATE BASE, ABANDONED
ABAN	ABANDONED
AC	ASPHALTIC CONCRETE
	ASBESTOS CEMENT
ACP	ASBESTOS CONCRETE PIPE
AGG	AGGREGATE
APN	ASSESSORS PARCEL NUMBER
ARV	AIR RELEASE/VACUUM VALVE
AVE	AVENUE
BC	BEGINNING OF CURVE
BLDG	BUILDING
BO	BLOW-OFF
BSW	BACK OF SIDEWALK
COM	COMMUNICATION
C&G	CURB & GUTTER
CATV	CABLE TELEVISION
CB	CATCH BASIN
CDF	CONTROL DENSITY FILL
℄	CENTERLINE
CL	CLASS
CO, C/O	CLEANOUT
COL	COLUMN
CONC	CONCRETE
CT	COURT
D	DEMOLISH
DBL	DOUBLE
DEPT	DEPARTMENT
DI	DROP INLET
DIA, Ø	DIAMETER
DIP	DUCTILE IRON PIPE
DWG	DRAWING
DWY	DRIVEWAY
(E)	EAST, EXISTING
E	ELECTRICAL
EC	END OF CURVE
ELEC	ELECTRIC
EG	EXISTING GRADE
EJ	EXPANSION JOINT
EL, ELEV	ELEVATION
EP	EDGE OF PAVEMENT
EQ	EQUAL
EX, EXIST	EXISTING
FC	FACE OF CURB
FCA	FLANGE COUPLING ADAPTER
FEN	FENCE
FG	FINISH GRADE (UNPAVED)
FH	FIRE HYDRANT
FL	FLOWLINE
F/FLG	FACE OF, FLANGE
FND	FOUNDATION
FS	FINISHED SURFACE (AC OR CONCRETE)
G	GAS
GB	GRADE BREAK
GV	GATE VALVE
HDPE	HIGH DENSITY POLYETHYLENE
HMA	HOT MIX ASPHALT
HP	HIGH PRESSURE
HZ	HORIZONTAL
IC	INTERCONNECT
INV	INVERT
IRR	IRRIGATION
KV	KILOVOLT
L	LENGTH
LF	LINEAR FEET
LG	LIP OF GUTTER
LN	LANE
LT	LEFT OFFSET FROM CENTERLINE
MAX	MAXIMUM
MB	MAILBOX
ME	MATCH EXISTING
MH	MANHOLE
MHHW	MEAN HIGHER HIGH WATER
MI	MILE
MIN	MINIMUM, MINUTE
MON	MONUMENT
MUTCD	MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES
(N)	NEW, NORTH
(NE)	NORTHEAST
(NW)	NORTHWEST
No	NUMBER
NAVD	NORTH AMERICAN VERTICAL DATUM
NTS	NOT TO SCALE
P	PAVEMENT
PB	POINT OF BEGINNING
PC	POINT OF CURVATURE
PCC	PORTLAND CEMENT CONCRETE
PED	PEDESTRIAN
PG&E	PACIFIC GAS AND ELECTRIC
PI	POINT OF INTERSECTION
PL	PROPERTY LINE / POWER LINE
PP	POWER POLE
PRC	POINT OF REVERSE CURVATURE
PT	POINT
PT	POINT OF TANGENCY
P.U.E.	PUBLIC UTILITY EASEMENT
PVC	POLYVINYL CHLORIDE
R	RADIUS
RC	RELATIVE COMPACTION
RD	ROAD
RET	RETAINING
ROW	RIGHT-OF-WAY
RPM	RAISED PAVEMENT MARKER
RT	RIGHT OFFSET FROM CENTERLINE
R/W	RIGHT OF WAY
S	SLOPE, SEWER
(S)	SOUTH
SCH	SCHEDULE
SD	STORM DRAIN
SDMH	STORM DRAIN MANHOLE
SHT	SHEET
SL	STREET LIGHT
SLR	SEA LEVEL RISE
SS	SANITARY SEWER
SSCO	SANITARY SEWER CLEANOUT
SSMH	SANITARY SEWER MANHOLE
ST	STREET
STA	STATION
STD	STANDARD
SVC	SERVICE LATERAL
(SE)	SOUTHEAST
(SW)	SOUTHWEST
S/W	SIDEWALK
T, TEL	TELEPHONE
TB	TOP OF BANK
TC	TOP OF CURB
TG	TOP OF GRADE
TOC	TOP OF CONCRETE
TOE	TOE OF FEATURE
TOP	TOP OF PIPE
TOR	TOP OF RAMP
TOW	TOP OF WALL
TP	TOP OF CONCRETE PAD, TIE POINT
TYP	TYPICAL
UG	UNDERGROUND
UON	UNLESS OTHERWISE NOTED
VAR	VARIES
VERT, VT	VERTICAL
VLT	VAULT
(W)	WEST
W/	WITH
W	WATER
WM	WATER METER, WATER MAIN
WS	WATER SERVICE
WV	WATER VALVE

NOTE:
SOME ABBREVIATIONS MAY BE USED IN COMBINATION.

PRELIMINARY

No.	Issue	Drawn	Approved	Date

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Drawn **PE**	Designer **VF**
Drafting Check **VF**	Design Check **SD**
Project Manager	Date **MARCH 2021**
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Client **CITY OF PETALUMA**
Project **ELLIS CREEK OUTFALL PROJECT**
Title **GENERAL NOTES, ABBREVIATIONS, AND LEGEND**
Project No. **11152197**
Original Size **ANSI D**
Sheet No. **G-002**
Sheet **2** of **5**

Plot Date: 5 March 2021 - 6:03 PM Plotted By: Aaron Foscato
Filename: \\ghdnet\ghd\US\Santa Rosa\Projects\111\11152197 Petaluma Environmental Support Services\06-CAD\Sheets\11152197-G002.dwg

ATTACHMENT E

1 - DETAIL
SCALE: 1"=60'

2 - DETAIL
SCALE: 1"=60'

EXISTING SITE PLAN
SCALE:1"=160'

N

SHEET KEYNOTES

1. TREATMENT WETLANDS POND NO. 10
2. CHLORINE CONTACT BASIN
3. CHEMICAL STORAGE FACILITY
4. BISULFITE STORAGE BUILDING
5. STORAGE SHED
6. TRANSFORMER
7. JUNCTION BOX NO. 1
8. JUNCTION BOX NO. 2
9. 6' BARBED WIRE FENCE
11. DEMOLISH AND REMOVE EXISTING OUTFALL STRUCTURE, INCLUDING ALL LANTERNS, SIGNAGE, GAUGES, BRACING, AND FASTENERS. CUT OFF PILINGS 1'-0" BELOW THE MUDLINE.
12. DEMOLISH AND REMOVE ALL EXISTING PIPING WITHIN THE PETALUMA RIVER AND ABOVE THE MUDLINE, INCLUDING DUCKBILL CHECK VALVES, 24" WELDED STEEL PIPING, ECCENTRIC REDUCERS, 42" TRUE WYE, AND 42"WELDED STEEL PIPING.
13. ABANDON (E) 42" OUTFALL PIPING IN PLACE, OR REMOVE WHERE IN CONFLICT WITH NEW CONSTRUCTION.
14. SIDE CAST SEDIMENT BY SUCTION DREDGE, AS REQUIRED TO EXPOSE STRUCTURE.
15. EXISTING EMERGENCY HDPE OUTFALL. REMOVE PIPE AND OUTFALL STRUCTURE.

EX. OUTFALL STRUCTURE
SCALE: NTS

0 160' 320'

PRELIMINARY

No.	Issue	Drawn	Approved	Date

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Drafting Check	VF	Design Check	SD
Project Manager		Date	MARCH 2021
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Client CITY OF PETALUMA
Project ELLIS CREEK OUTFALL PROJECT
Title EXISTING SITE AND DEMOLITION PLAN

Project No. 11152197

Original Size ANSI D | Sheet No. C-101 | Sheet 3 of 5

Plot Date: 5 March 2021 - 6:05 PM Plotted By: Aaron Foscato

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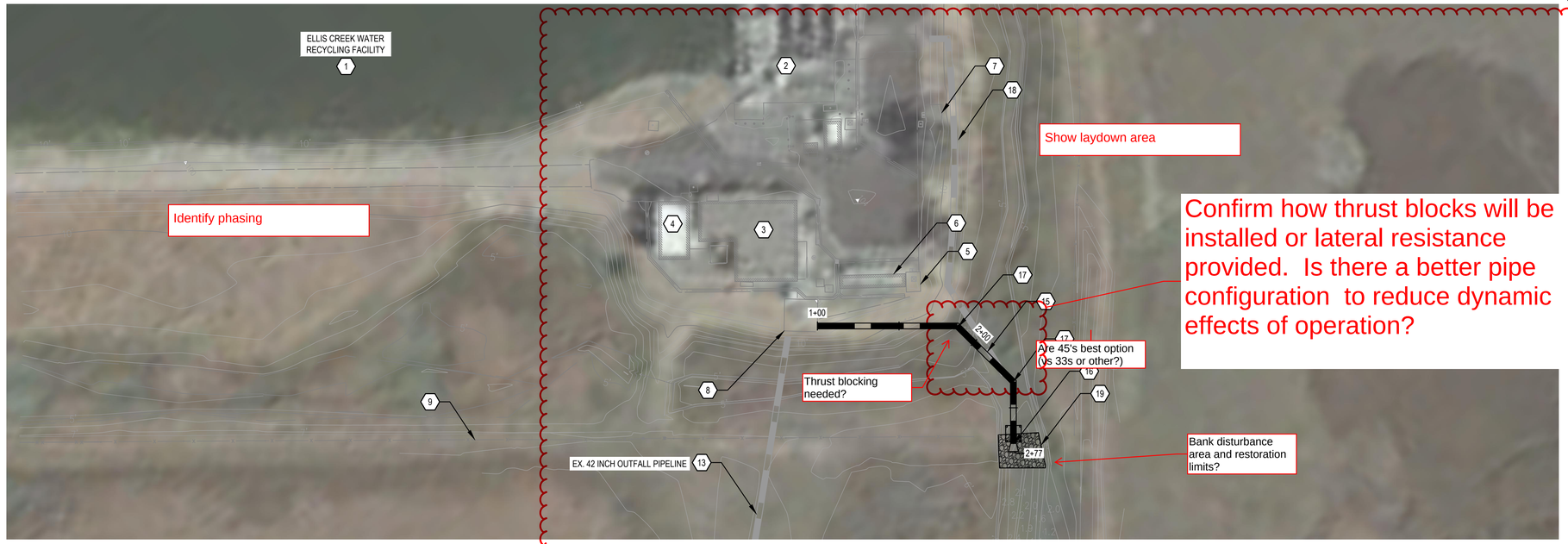
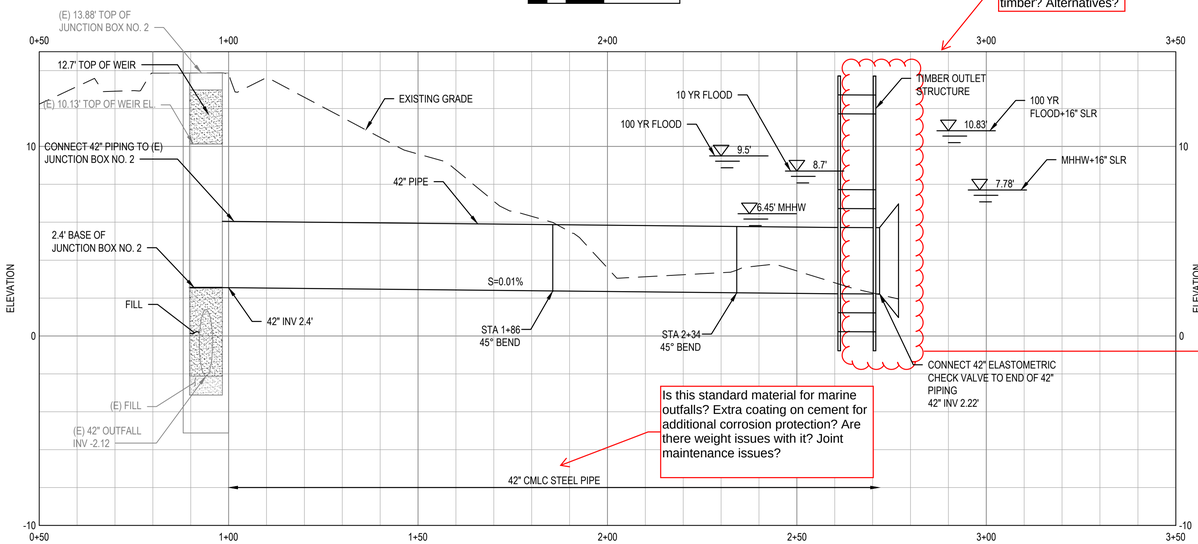
ATTACHMENT E



Confirm how thrust blocks will be installed or lateral resistance provided. Is there a better pipe configuration to reduce dynamic effects of operation?

SITE PLAN

0 20' 40' 80'



Will this be treated timber? Alternatives?

Is this standard material for marine outfalls? Extra coating on cement for additional corrosion protection? Are there weight issues with it? Joint maintenance issues?

Recommend no timber

SITE PROFILE

0 20' 40' 80'
HORIZONTAL SCALE
0 4' 8'
VERTICAL SCALE

SHEET KEYNOTES

1. TREATMENT WETLANDS POND NO. 10
2. CHLORINE CONTACT BASIN
3. CHEMICAL STORAGE FACILITY
4. BISULFITE STORAGE BUILDING
5. STORAGE SHED
6. TRANSFORMER
7. JUNCTION BOX NO. 1
8. JUNCTION BOX NO. 2
9. 6' BARBED WIRE FENCE
13. ABANDON (E) 42" OUTFALL PIPING IN PLACE, OR REMOVE WHERE IN CONFLICT WITH NEW CONSTRUCTION.
15. 42" PIPE.
16. 42" ELASTOMETRIC CHECK VALVE.
17. 45 DEGREE BEND.
18. REMOVE (E) EMERGENCY OUTFALL PIPING AND STRUCTURE.
19. INSTALL RIP RAP.
20. TIMBER OUTLET STRUCTURE.

Any environmental notes or lines that need to be shown on this drawing as design progresses?

PRELIMINARY

No.	Issue	Drawn	Approved	Date

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Drawn	PE	Designer	VF
Drafting Check	VF	Design Check	SD
Project Manager		Date	MARCH 2021
		Scale	AS SHOWN

Client CITY OF PETALUMA
Project ELLIS CREEK OUTFALL PROJECT
Title OUTFALL IMPROVEMENT PLAN AND PROFILE
Project No. 11152197
Original Size ANSI D
Sheet No. C-102
Sheet 4 of 5

Plot Date: 5 March 2021 - 6:18 PM Plotted By: Aaron Foscato
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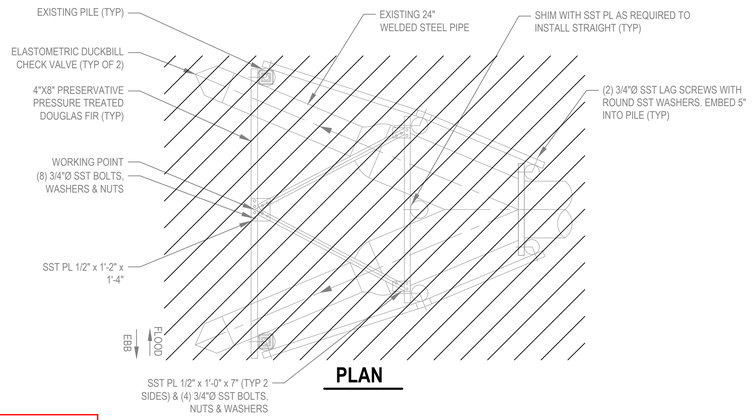
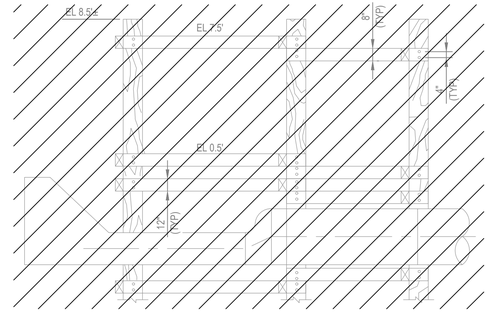
ATTACHMENT E



PLAN



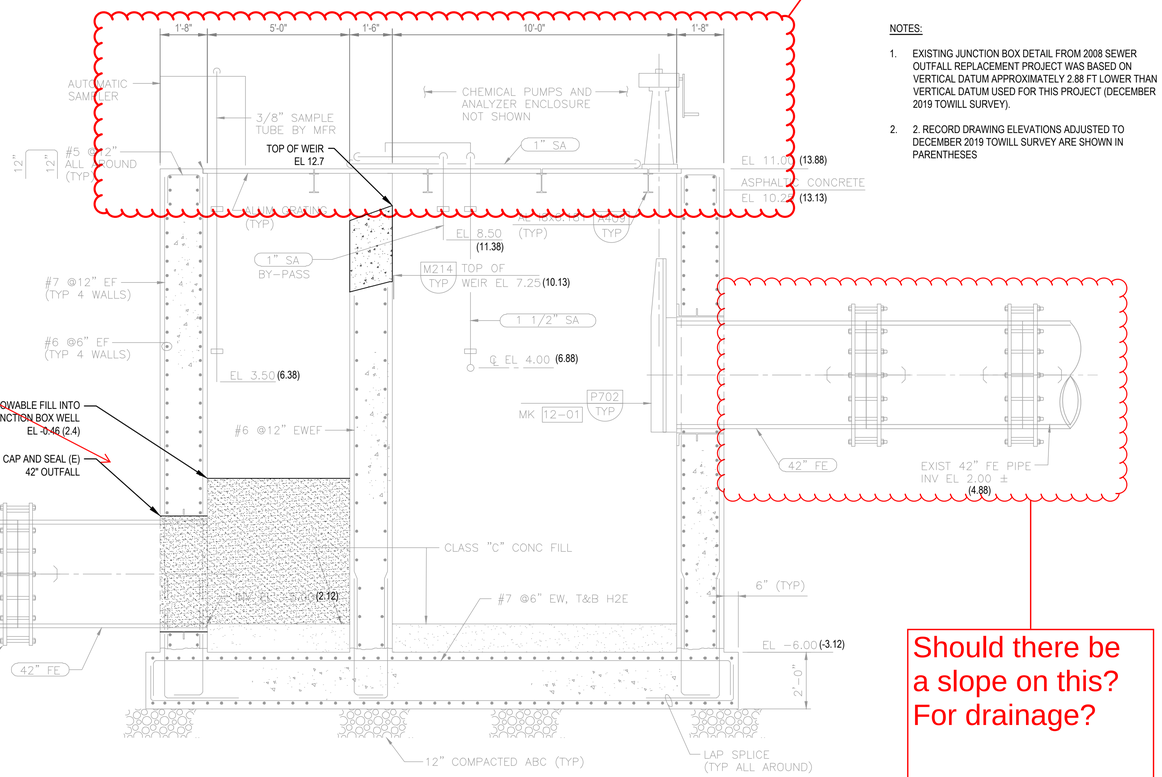
ELEVATION

Are provisions provided for Operations to clean this out?

Has condition been check to see if there is any repair needed on existing structure and appurtenances?

1 - EXISTING OUTFALL STRUCTURE PLAN AND SECTION DEMOLITION

SCALE: NTS

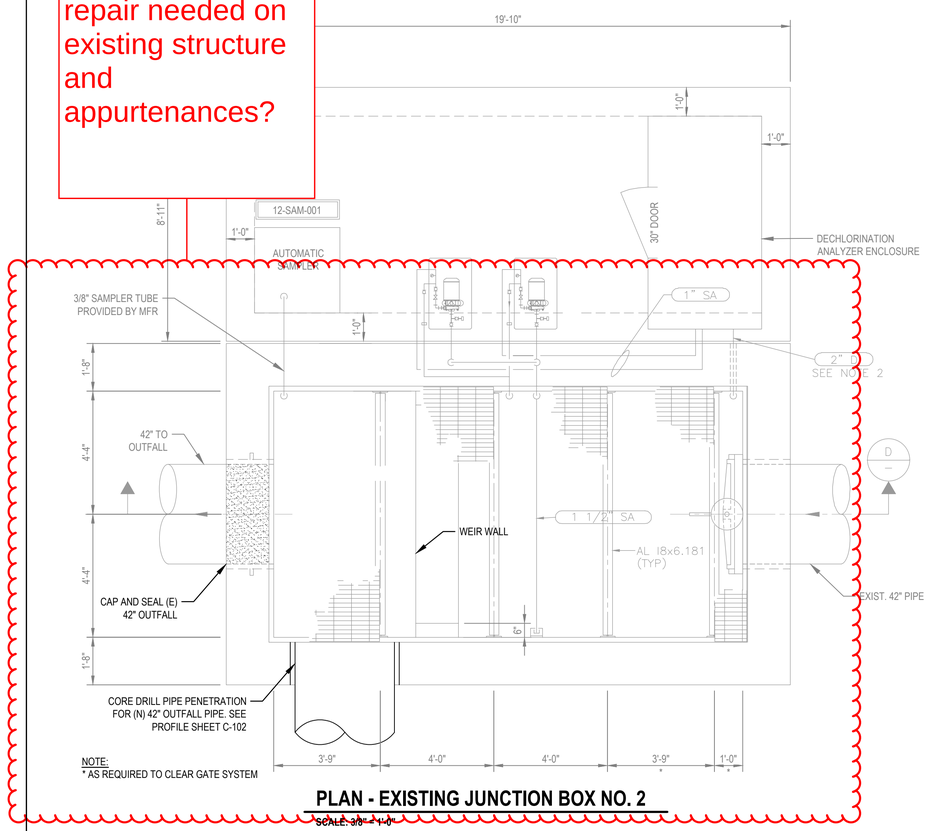


NOTES:

1. EXISTING JUNCTION BOX DETAIL FROM 2008 SEWER OUTFALL REPLACEMENT PROJECT WAS BASED ON VERTICAL DATUM APPROXIMATELY 2.88 FT LOWER THAN VERTICAL DATUM USED FOR THIS PROJECT (DECEMBER 2019 TOWILL SURVEY).
2. 2. RECORD DRAWING ELEVATIONS ADJUSTED TO DECEMBER 2019 TOWILL SURVEY ARE SHOWN IN PARENTHESES

Flowable fill ok for high flow conditions? Additional weight to box ok, or uneven settlement?

Estimate showed flowable fill.



NOTE:
* AS REQUIRED TO CLEAR GATE SYSTEM

PLAN - EXISTING JUNCTION BOX NO. 2

SCALE: 3/8" = 1'-0"

SECTION - EXISTING JUNCTION BOX NO. 2

SCALE: 3/8" = 1'-0"

2 - JUNCTION BOX NO.2 PLAN AND SECTION

SCALE: 3/8" = 1'-0"

Should there be a slope on this? For drainage?

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0 1"

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Drawn PE	Designer VF	Client	CITY OF PETALUMA
Drafting Check VF	Design Check SD	Project	ELLIS CREEK OUTFALL PROJECT
Project Manager	Date MARCH 2021	Title	OUTFALL AND JUNCTION STRUCTURE DETAILS
This document shall not be used for construction unless signed and sealed for construction.	Scale AS SHOWN	Project No.	11152197
		Original Size ANSI D	Sheet No. C-103
			Sheet 5 of 5

Plot Date: 5 March 2021 - 6:36 PM
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ATTACHMENT E

Attachment B
Engineers Opinion of Probable Construction Cost

ATTACHMENT E

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST — **GHD, Inc.**

Project:	Petaluma WRF	Prepared By:	VRF
Building, Area:	Outfall Replacement Project	Date:	3/5/2021
Estimate Type:	10% Conceptual Design	GHD Proj. No.:	11152197
		Current at ENR:	
		Escalated to ENR:	
		Months to Start of Construction:	18

Item No.	Description	Qty	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-Contractor $/Unit	Sub-Contractor Total	Total
1	*Mobilization*				*$0.00*		*$110,000.00*		*$4,500.00*	*$ 114,500.00*
	Mobilization	1	LS	$0.00	$0.00	$45,000.00	$45,000.00	$0.00	$0.00	$ 45,000.00
	Demobilization	1	LS	$0.00	$0.00	$45,000.00	$45,000.00	$0.00	$0.00	$ 45,000.00
	Construction Layout Survey	500	LF	$0.00	$0.00	$0.00	$0.00	$4.00	$2,000.00	$ 2,000.00
	Environmental Site Survey	625	LF	$0.00	$0.00	$0.00	$0.00	$4.00	$2,500.00	$ 2,500.00
	Bond and Pollution Liability Insurance	1	EA	$0.00	$0.00	$20,000.00	$20,000.00	$0.00	$0.00	$ 20,000.00
2	*Water Pollution Prevention*				*$10,000.00*		*$30,000.00*		*$0.00*	*$ 40,000.00*
	Water Pollution Prevention	1	LS	$10,000.00	$10,000.00	$30,000.00	$30,000.00	$0.00	$0.00	$ 40,000.00
3	*Demolition*				*$119,591.98*		*$50,492.75*		*$0.00*	*$ 170,084.73*
	Existing Outfall Structure Demo & Removal	1	LS	$5,000.00	$5,000.00	$30,000.00	$30,000.00	$0.00	$0.00	$ 35,000.00
	Cofferdam (barge installation)	625	SF			5.00	$9,375.00	$0.00	$0.00	$ 28,125.00
	Abandon Existing Outfall Pipe with flowable fill	1112	CY			0.00	$11,117.75	$0.00	$0.00	$ 100,059.73
	Remove Emergency Outfall	230	LF			0.00	$0.00	$0.00	$0.00	$ 6,900.00
4	*Trenching*				*4,851.77*		*$26,989.58*		*$90,000.00*	*$ 141,841.35*
	Excavation	208	BCY	$1.40	$291.25	$12.00	$2,496.39	$0.00	$0.00	$ 2,787.63
	Shoring	1183	SF	$20.77	$24,560.53	$4.22	$4,990.15	$0.00	$0.00	$ 29,550.68
	Disposal (Native Soil)	260	LCY	$0.00	$0.00	$75.00	$19,503.04	$0.00	$0.00	$ 19,503.04
	Dewatering	60	DAY	$0.00	$0.00	$0.00	$0.00	$1,500.00	$90,000.00	$ 90,000.00
5	*Trench Backfill*				*$5,604.41*		*$8,165.28*		*$0.00*	*$ 13,769.69*
	Hauling Pipe Bedding to Site	68	TN	$18.00	$1,232.00	$25.00	$1,711.11	$0.00	$0.00	$ 2,943.11
	Hauling Imported Fill to Site	186	TN	$18.00	$3,341.68	$25.00	$4,641.22	$0.00	$0.00	$ 7,982.91
	Hauling Imported Rock to Site	38	TN	$18.00	$687.50	$25.00	$954.86	$0.00	$0.00	$ 1,642.36
	Pipe Bedding Compaction	41	LCY	$2.00	$81.48	$5.00	$203.70	$0.00	$0.00	$ 285.19
	Imported Fill Compaction	111	LCY	$2.00	$221.01	$5.00	$552.53	$0.00	$0.00	$ 773.54
	Imported Rock Compaction	20	LCY	$2.00	$40.74	$5.00	$101.85	$0.00	$0.00	$ 142.59
6	*Piping*				*$69,915.00*		*$22,300.00*		*$0.00*	*$ 92,215.00*
	42" Steel, Cement Mortar Lined & Coated	170	LF	$185.00	$31,450.00	$60.00	$10,200.00	$0.00	$0.00	$ 41,650.00
	42" Steel, 45 Deg. Bend	2	EA	$8,600.00	$17,200.00	$1,050.00	$2,100.00	$0.00	$0.00	$ 19,300.00
	42" Rubber Duckbill Check Valve	1	EA	$21,265.00	$21,265.00	$0.00	$0.00	$0.00	$0.00	$ 21,265.00
	Pipe Testing	1	EA	$0.00	$0.00	$10,000.00	$10,000.00	$0.00	$0.00	$ 10,000.00
7	*Point of Connection*				*$ 11,600.28*		*$12,500.00*	*$0.00*	*$0.00*	*$ 24,100.28*
	Connection to Junction Box 2	1	EA	$1,600.28	$ 1,600.28	$5,000.00	$5,000.00	$0.00	$0.00	$ 6,600.28
	Close existing 42" connection	1	EA	$5,000.00	$ 5,000.00	$2,500.00	$2,500.00	$0.00	$0.00	$ 7,500.00
	Modifications to Junction Box Weir	1	EA	$5,000.00	$ 5,000.00	$5,000.00	$5,000.00	$0.00	$0.00	$ 10,000.00
8	*Outfall Structure*				*$36,500.00*		*$27,000.00*		*$0.00*	*$ 63,500.00*
	New Outfall Structure	1	LS	$20,000.00	$20,000.00	$20,000.00	$20,000.00	$0.00	$0.00	$ 40,000.00
	Cofferdam (shore installation)	400	SF	$30.00	$12,000.00	$10.00	$4,000.00	$0.00	$0.00	$ 16,000.00
	Rip Rap	150	SY	$30.00	$4,500.00	$20.00	$3,000.00	$0.00	$0.00	$ 7,500.00
	Subtotals				$278,063		$287,448		$94,500	$660,011
	Division1 Costs	@	10%		$27,806		$28,745		$9,450	$66,001
	Subtotals				$305,870		$316,192		$103,950	$726,012
	Taxes - Material Costs	@	8.75%		$26,763.61					$26,764
	Subtotals				$332,633		$316,192		$103,950	$752,776
	Taxes - Labor Costs	@	0%				$0			$0
	Subtotals				$332,633		$316,192		$103,950	$752,776
	Contractor Markup for Sub	@	15%						$15,593	$15,593
	Subtotals				$332,633		$316,192		$119,543	$768,368
	Contractor OH&P	@	15%		$49,895.01		$47,429			$97,324
	Subtotals				$382,528		$363,621		$119,543	$865,692
	Estimate Contingency	@	30%							$259,708
	Subtotals									$1,125,400
	Escalate to Start of Construction	@	5%							$85,451
	Estimated Bid Cost									$1,210,851
	Total Estimate									$1,211,000

Does full volume need to be filled?

Beneficial Re-use?

Estimate Accuracy	
30%	-20%

Estimated Range of Probable Cost		
30%	Total Estimate	-20%
$1,816,500	$1,211,000	$968,800

ATTACHMENT E

Memorandum

March 5, 2021

To	Ken Eichstaedt, City of Petaluma	
Copy to	Josh Minshall, City of Petaluma	
From	Sandie Dudley, PE; Vincent Fiedler	Tel +1 925-849-1004
Subject	Ellis Creek WRF Outfall Relocation Project Conceptual Design and Cost Estimate DRAFT	Job no. 11152197

1 Introduction

GHD was engaged by the City of Petaluma (City) to develop a conceptual (10%) design and planning level opinion of construction costs for the Ellis Creek Water Recycling Facility (WRF) Outfall Relocation Project (Project) in Petaluma, California. The conceptual design and construction costs address construction of a new outfall pipe and structure, modifications to existing facilities to accommodate the new outfall, demolition and removal of the existing permanent outfall structure within the Petaluma River, abandonment of the existing outfall pipe, and demolition and removal of the emergency outfall within the tidal slough adjacent to the WRF.

Do plants only have one outfall? Timing of demo of temp outfall (redun-dancy)

This memorandum documents assumptions made to support the conceptual design of these facilities based on available information for the surrounding area and other studies currently being conducted. Project specific site investigations are required to inform further detailed design efforts. This memorandum identifies additional consideration required by the City to fully address all factors impacting the design of this project including survey, geotechnical investigations, sea level rise (SLR) assessment, erosion mitigation of tidal sloughs, required agency approvals, design schedule, permitting schedule, and construction schedule.

2 Background

The City operates an existing outfall at the WRF located approximately within the Petaluma River. The existing outfall pipe extends approximately 3,100 feet between the WRF and the Petaluma River. The City is authorized to discharge secondary-treated municipal wastewater effluent to the Petaluma River during the discharge season from October 21st through April 30th. The existing 42-inch-diameter outfall pipe has a capacity to discharge up to 14 million gallons per day (MGD). Average daily discharge since 2016 has been 7.0 MGD; maximum discharge rate has been 13.9 MGD.

During an inspection in September 2016, the City discovered longitudinal cracks along the top and bottom of the pipe, separating pipe joints, and sections of pipe that have been flattened into an oval shape. To address this structural integrity issue, the City is proposing to construct a new outfall pipeline and outfall structure in the tidal slough within and adjacent to the southern corner of the existing WRF. An emergency contingency outfall bypass was installed at this location in 2017, but it has not been used except for testing.

The City is proposing to divert all future wastewater effluent discharges to the tidal slough located in the southeast corner of the WRF via a new outfall pipeline and outfall structure. The new outfall

pipe would connect to Junction Box #2 (JB2), with JB2 remaining in service. The outfall pipe would be 42-inch nominal diameter and installed into the adjacent tidal slough. A new outfall structure would also be constructed in the tidal slough. Effluent would discharge from the new pipe into the tidal slough which flows into the Petaluma River just downstream of the existing outfall location.

3 Existing Data

The following documents provided by the City for the project site and adjacent area were used in the development of the conceptual design.

- Topographic Survey of Petaluma Outfall (Towill, December 2019)
- Sewer Outfall Replacement Project Drawings (Carollo, June 2008)
- Integrated Geotechnical Study Lakeville Highway WRF – Parcel A (Fugro, April 2005)
- Wastewater Treatment Plant Upgrade, Record Drawings (Metcalf & Eddy, February 1982)
- Water Pollution Control Facilities 1972, As-Built Drawings (YTO, May 1973)

The following documents related to environmental permitting and sea level rise at the WRF were also evaluated as part of design:

- Wetland Delineation (2018)
- Biological Resources Report (2018)
- Special-status Plant Habitat Memo (2019)
- Cultural Resources Report (2018)
- Sea Level Rise Analysis (not yet finalized)

Geotechnical conditions follow up; what is known and what is not

Ground surface elevations used in the SLR analysis are based on the 2019 Towill survey. It was noted that the topographic survey provided by Towill and the Carollo Outfall Replacement drawings do not appear to use the same vertical survey datum. Based on top of structure elevation for JB2 and the surrounding area, the topographic survey surface is approximately 2.88 ft higher than that used in the Carollo drawings. GHD was unable to obtain confirmation of the vertical data used in the Carollo drawings; however, this discrepancy was investigated by staff evaluating SLR as well and reconciled by adding 2.88 ft to the Carollo surface elevations. For this conceptual design, JB2 elevations provided in the Carollo drawings were increased 2.88 ft. Prior to detailed design, additional survey will be needed to confirm JB2 bottom elevation and pipe inverts.

4 WRF Outfall Conceptual Design Overview

Provide statement if system needs redundancy and if so, what the redundancy is

The WRF Outfall Conceptual Design drawings are provided as Attachment A. The new outfall pipe will exit the southeast wall of JB2 and continue along the northern bank parallel to the slough that runs south of the WRF. The alignment will then turn south by way of two 45-degree bends and discharge into the slough that runs east of the WRF, downstream of the confluence with the southern slough.

Effect of 45s on pumps and discharge velocity? Maint issue?

Hydraulic analysis of the new outfall and its interaction with plant hydraulics as well as consideration of projected SLR indicate that a 42” pipe will provide adequate capacity to meet permitted discharge flows. The existing JB2 weir wall elevation is sufficient to allow discharge during current mean higher-high water (MHHW) elevation; however, it will not be sufficient to address the current 100-year flood elevation nor most MHHW elevations with anticipated SLR. For this evaluation, it is assumed that the weir will need to be raised to an elevation of 12.7-ft in order to address most future SLR scenarios, the details of which will be further discussed in subsequent sections. A lower weir height may be acceptable, depending on the City’s risk tolerance. Supplemental survey will be required to confirm interior structure elevations, pipe invert elevations, and hydraulic calculations during final design.

Updated SLR #s

Cost/benefit(risk)?

The proposed location of the new outfall discharge was selected to allow a lower invert elevation with minimal modification to the slough and a discharge orientation designed to parallel the slough banks to reduce the risk of severe bank erosion, though additional slope protection measures are

needed. The new outfall pipe will terminate in a duckbill check valve with a timber outlet structure rising above the anticipated 100-year flood elevation. Placement of riprap within the slough at the location of the discharge is assumed in the design to prevent bank erosion at the point of discharge. Further investigations will be required during final design to confirm rip rap sizing and placement.

Pipe material is assumed to be concrete mortar lined and coated (CMLC) steel pipe though the City may consider using an alternative material based on geotechnical investigation performed for final design. The new outfall pipe will be approximately 265 LF. Based on available geotechnical information for the WRF, it is assumed that specially designed trench will be sufficient to support the pipe and that deep foundation will not be required. A geotechnical investigation of the proposed alignment will need to be conducted to confirm pipe trench sections and need for foundation.

Still true for thrust blocking?

The existing outfall structure in the Petaluma River will be demolished and removed. The pilings will be cut 1-ft below the mudline. The existing 42-inch outfall piping will be abandoned in place o removed where in conflict with new construction at JB2. Approximately 3,100 LF of existing 4 is assumed to the be abandoned in-place and filled with grout. The City may decide to use alt means of abandonment that would be less costly and allow for use of the existing pipe later. Additionally, the existing emergency outfall pipe and discharge structure will be removed from the slough.

Why 1'? Will this be exposed under future conditions?

What options?

The slough will require dewatering for both installation of the outfall structure and the slope protection. Coffer dams would be installed upstream and downstream of the work area, then water would be pumped out between the two dams. Depending on the quantity of water, it may be pumped to Pond 10 or below the downstream coffer dam. Coffer dams will also be required to remove and abandon portion of the existing outfall structure and pipeline in the Petaluma River.

The same coffer dams?

5 Sea Level Rise Assessment Considerations

The conceptual design considers projected sea level rise in the project area. Under a separate task, GHD prepared an SLR vulnerability assessment for the City in October 2020 which provided a range of future SLR projections for the WRF. This assessment was based on ground surface elevations from the 2019 Towill survey. GHD calculated the SLR impact on the WRF in 2070 to be:

- A 17% exceedance probability estimates a 2.2-ft SLR.
- A 0.5% exceedance probability estimates a 3.3-ft SLR.
- A worst-case scenario, extreme risk aversion probability estimates 5.2-ft SLR.

Confirm

GHD also performed a hydrodynamic modelling study for the Petaluma River and found the current MHHW water surface elevation (WSE) to be approximately 6.5ft EL and the 100-year flood WSE to be approximately 9.5 ft EL.

Adding the SLR values to MHHW and 100-year Flood WSE calculates the following WSE:

Probability	SLR (ft)	MHHW EL+ SLR (ft)	100-year Flood El. + SLR (ft)
17% Exceedance Probability	2.2	8.65	11.7
0.5% Exceedance Probability	3.3	9.75	12.8
Extreme Risk Aversion (worst case scenario)	5.2	11.65	14.7

The WSE information and proposed outfall design were used to calculate the required weir height to allow discharge during the current and future MHHW and 100-yr scenarios. The results of this analysis are presented in the table below.

Scenario	WSE (ft)	Min Required Weir Elevation (ft)
Current Conditions MHHW	6.45	7.4
17% Exceedance Prob. MHHW	8.65	9.6
0.5% Exceedance Prob. MHHW	9.75	10.7
Extreme Risk MHHW	11.65	12.6
Current Conditions 100-yr	9.50	10.45
17% Exceedance Prob. 100-yr	11.7	12.65
0.5% Exceedance Prob. 100-yr	12.8	13.75
Extreme Risk 100-yr	14.7	15.65

The JB2 effluent weir, adjusted to the 2019 Towill survey, is approximately 10.13-ft EL which is sufficient to address only the current MHHW and the 17% Exceedance Probability MHHW + SLR scenarios. Though the existing weir can be raised, JB2 is unable to exceed a WSE of 12.99-ft EL without impacting upstream WRF treatment ponds. The top of JB2 elevation of 13.88-ft is an additional limiting factor. A proposed weir elevation of 12.7-ft was selected to address all the MHHW scenarios and the most likely SLR 100-yr scenario while providing a minimum 1-ft freeboard within JB2.

For the scenarios not addressed by raising the weir elevation, there are several water infiltration protective measures to guard the WRF treatment processes against high WSE in the Petaluma River. These include a protective 14-ft EL perimeter berm surrounding the WRF, a slide gate on the JB2 influent pipe, and a duckbill check valve will be installed at the end of the new outfall pipe. These three measures should help keep high WSE from inundating the plant if the WSE remains below 14-ft EL.

The City will need to confirm the design risk scenario and WSE prior to final design. The City should evaluate the JB2 weir and structure if the predicted rate or magnitude of SLR increases from the values used for this design.

Is the only aspect affected by SLR overflow into the WRF?

6 Slough Erosion Mitigation

The tidal slough adjacent to the WRF is at risk of significant erosion once the new outfall is installed and starts discharging. Slope protection improvements, likely rip rap, will need to be installed along the bed and banks of the slough immediately downstream of the proposed outfall structure to protect the slopes from erosion during discharges.

Will need options. Natural, recycled etc.

GHD recommends performing an erosion mitigation analysis to determine the erosion severity from outfall discharges and design mitigation measures to reduce slough bank erosion. GHD has several engineers with erosion mitigation experience from other outfall projects. It is recommended this analysis occur during preliminary design.

7 Required Agency Approvals

As construction of the relocated outfall may impact jurisdictional waters, and special-status species and their habitat, the following permitting and consultation requirements are expected:

- US Army Corps of Engineers Section 404 permit
  - United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) Permit Section 7 Consultation

- Regional Board 401 Water Quality Certification
- California Department of Fish and Wildlife 1602 Streambed Alteration Agreement
- San Francisco Bay Conservation and Development Commission (BCDC) Administrative Permit.

At this time GHD does not anticipate a Section 2081 Incidental Take Permit from CDFW will be needed. However, this has not been ruled out completely. Overall, 8 to 10 months should be allowed for the permitting and negotiation process.

8 Additional Investigations, Design, and Permit Schedule

Additional site investigations will be required to inform final design of the new outfall; however, permitting requirements detailed above will likely dictate the earliest the project can be constructed.

Project specific field survey and geotechnical investigations will be required to inform final design of the new outfall as shown in the conceptual design drawings. Geotechnical borings will need to be located along the proposed alignment to confirm pipe foundation and trench requirements as well as inform erosion mitigation analysis at the outfall discharge. It is understood the City has a geotechnical consultant under contract that would be able to perform the necessary investigations by way of task order. Depending on availably of drilling equipment it is estimated that it would be possible to complete a geotechnical subsurface investigation and draft geotechnical report within 2 months.

Field survey to confirm JS2 interior elevations and cross sections of the sloughs along the proposed outfall alignment and discharge area may be completed concurrently with the geotechnical investigation.

Design of the new outfall and demolition and abandonment of the existing facilities is estimated to take 2 to 3 months following the receipt of the draft geotechnical report. This schedule assumes one 90% design submittal and a final submittal. Should the City proceed with final design as a task order to an existing consultant contract the investigations and design duration would be 4 to 5 months.

Don't we need 60% for permits?

estimated approval process for the environmental permits listed in the previous section ranges from 8 to 10 months. Some permitting requires multiple biological surveys within the calendar year of construction. In the anticipation of possible construction in 2021, the City authorized initial surveys to proceed so as not to cause a delay in construction. Portions of the permitting process may begin in advance of and proceed concurrently with final design; however, some permitting processes require complete design documents for review and approval.

9 Preliminary Construction Schedule and Constraints

GHD estimates a 3-month time frame to complete the Project's construction; however, due to various permitting and operational restrictions, the work will likely need to be phased over two construction seasons, with construction of the new outfall occurring the first season and demolition and abandonment of the existing outfall occurring in the second season.

The anticipated construction includes the following tasks:

- Installation of new outfall pipe and structure
- Modifications to slough bed
- Modifications to existing JB2
- Removal of existing emergency outfall
- Demolition of existing outfall structure in Petaluma River
- Abandonment of existing outfall piping

A summary of known scheduling constraints are as follows:

- Due to the presence of Rail species in the project area, construction must be limited to October through January. Depending on the findings of bird surveys, the window may be pushed up to include September.
- The existing outfall structure will need to be removed between September 1 to October 15 during an appropriate in-water work window to protect special-status species.
- Construction activities in wetland areas will be limited to the dry season from June 1st to October 15th.
- Per City staff, the WRF has storage capacity within its treatment ponds to take the existing outfall and JB2 off-line for approximately 7-10 days during dry weather conditions.

Does temp need to be removed first? May be a risk.

Based on the above task list and constraints, it is assumed that the contractor will install the new outfall pipe and structure, including modifications to JB2, and remove the existing emergency outfall in the initial October through December construction period. The contractor will return the following September to remove the existing outfall structure from the Petaluma River and abandon the existing 3,100 LF of pipeline traversing the wetlands between the WRF and the river.

Factoring the design and permitting schedule into the above constraints it is not likely that this project will bid in time to go to construction in September 2021. For the purposes of estimating probably construction costs, it is assumed that Phase 1 of construction would begin in September 2022 and Phase 2 will be completed in September 2023.

Provide statement on phasing needed

10 Construction Cost Estimate

GHD has prepared a planning level opinion of probable construction cost for the project included as Attachment B. The opinion of probable construction cost is AACE International Recommended Practice Class 4 and organized in a bid schedule format based on available bid results for similar recent projects.

The total opinion of probable cost comes to $1,211,000. This includes a 30% contingency, as the Project is in conceptual design. The contingency will reduce as the design progresses towards 100%. Escalation to the City's estimated start date of construction, assumed to be September 2022, is included.

11 Summary

Based on evaluation of the available existing site information, the construction of a new outfall pipe and structure in the slough southwest of the WRF is feasible as presented in the conceptual design drawings provided. The associated opinion of probable construction cost for this conceptual design is estimated to be $1,211,000.

This conceptual design addresses the best available information regarding SLR at the site through the year 2070. The City will need to confirm the risk scenario and WSE to be used in final design.

Project specific field survey and geotechnical investigations will be required to inform final design of the new outfall as shown in the conceptual design drawings. These site investigations and final design are anticipated to 4 to 5 months to complete once the City decides to move forward with the project. Permitting efforts for construction are anticipated to take 8 to 10 months.

Environmental and permitting constraints limiting construction activities to the months of September through December will drive overall construction schedule. Construction activities are estimated to take 3 months divided into two phases over two construction seasons. Phase 1 is assumed to take place in Fall 2022 and include installation of the new outfall and removal of the existing emergency

outfall. Phase 2 is assumed to take place in September 2023 and will include demolition and abandonment of the existing outfall.