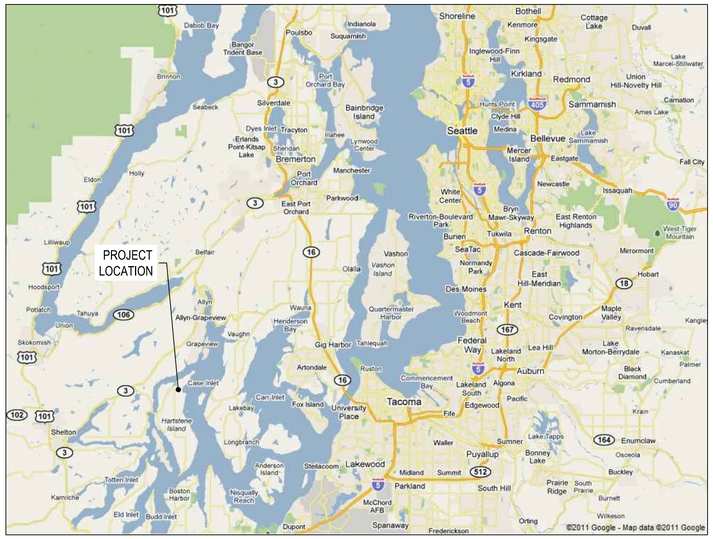
HARTSTENE POINTE WATER-SEWER DISTRICT

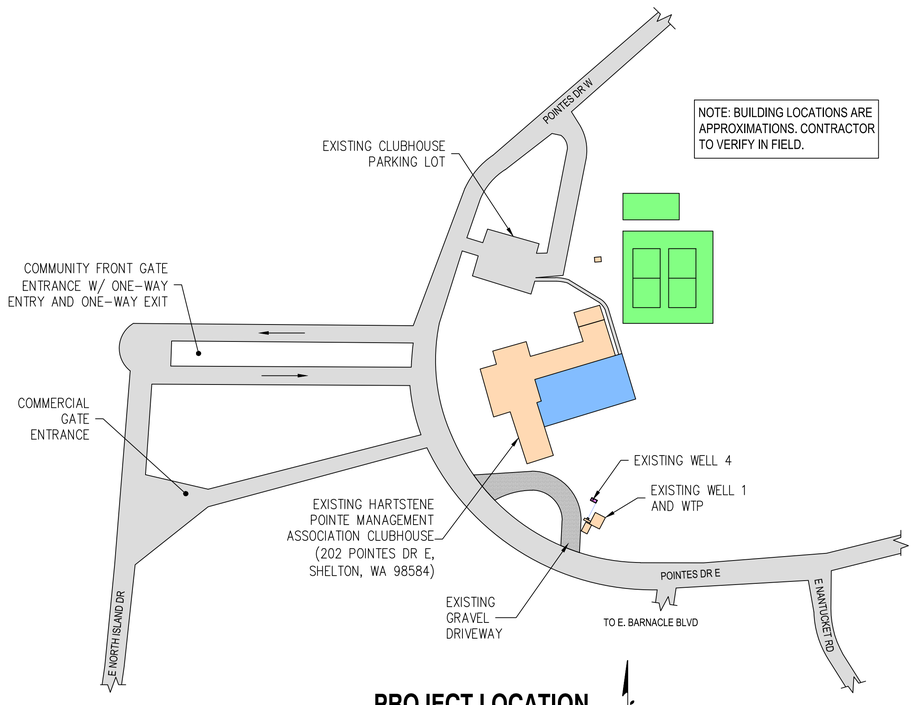
GROUNDWATER REPLACEMENT WELL 4

WINTER 2018

VOLUME II OF II



VICINITY MAP



PROJECT LOCATION

WELL 1 WTP AND WELL 4

RH2 ENGINEERS PLANNERS SCIENTISTS

RICHARD L. BALLARD — STATE OF WASHINGTON — 32878 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 01/30/18

DAN J. MAHLUM — STATE OF WASHINGTON — 37045 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 01/30/18

CHRISTOPHER MICHAEL CLEMENS — STATE OF WASHINGTON — 45317 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 01/30/18

REVISION DATE: Jan. 30, 18

Hartstene Pointe Water - Sewer District
Dedicated to Service

RWPS-D-COV.DWG

GENERAL CONSTRUCTION NOTES

ADDRESSES

WELL 1R SITE: NEAR 202 POINTES DRIVE E., SHELTON, WA 98584
OWNER: DISTRICT OFFICE – 772 E. CHESAPEAKE DRIVE, SHELTON, WA 98584 (WASTEWATER TREATMENT PLANT SITE)
ENGINEER: BOTHELL OFFICE – 22722 29TH DRIVE SE, SUITE 210, BOTHELL, WA 98021

CRITERIA

1. CONSTRUCTION OF SITE AND UTILITY IMPROVEMENTS SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION, LATEST EDITION, AS ISSUED BY WASHINGTON STATE DEPARTMENT OF TRANSPORTATION AND THE AMERICAN PUBLIC WORKS ASSOCIATION AND CURRENT AWWA SPECIFICATIONS.

2. ALL MATERIALS, WORKMANSHIP, DESIGN, AND CONSTRUCTION SHALL CONFORM WITH THE SPECIFICATIONS (VOLUME I OF II), THESE PLANS (VOLUME II OF II), AND BE IN ACCORDANCE WITH ALL PERMITTING CONDITIONS OF APPROVAL.

GENERAL CONSTRUCTION

1. SITE ACCESS AND TRAFFIC SPEED REQUIREMENTS
ACCESS TO THE WELL SITE REQUIRES ENTERING THE FRONT GATE TO THE HARTSTENE POINTE COMMUNITY. SEE OVERALL SITE MAP ON THE COVER SHEET FOR ENTRANCE AND SITE LOCATION. THE SPEED LIMIT IN THE COMMUNITY IS 15 MPH AND IS STRICTLY ENFORCED TO PROVIDE SAFETY FOR COMMUNITY MEMBERS AND GUESTS. ALTERNATIVE ACCESS FOR LARGE VEHICLES WILL BE PROVIDED THROUGH THE COMMUNITY'S COMMERCIAL GATE ENTRANCE, WHICH IS NEAR THE FRONT ENTRANCE. USE OF THIS GATE MUST BE SCHEDULED WITH THE DISTRICT WITH AT LEAST TWENTY–FOUR HOUR NOTICE.

2. APPROVED PLANS AND SPECIFICATIONS
A COPY OF THE APPROVED PLANS AND SPECIFICATIONS MUST BE ON–SITE WHENEVER CONSTRUCTION IS IN PROGRESS. CONTRACTOR IS RESPONSIBLE FOR OBTAINING ANY OTHER REQUIRED OR RELATED PERMITS, THAT HAVE NOT BEEN PROVIDED, PRIOR TO BEGINNING CONSTRUCTION.

3. PRE–CONSTRUCTION CONFERENCE
A PRE–CONSTRUCTION CONFERENCE WITH THE CONTRACTOR, DISTRICT, ENGINEER, AND APPLICABLE UTILITIES WILL BE REQUIRED PRIOR TO CONSTRUCTION. SCHEDULE WITH TWENTY–FOUR HOUR NOTICE TO THE DISTRICT.

4. CONSTRUCTION SAFETY
THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PREVENT NUISANCES WHILE PERFORMING CONSTRUCTION WORK ON THIS PROJECT.

5. DAILY CLEANUP
THE CONTRACTOR SHALL CLEANUP ALL AREAS AFFECTED BY CONSTRUCTION ACTIVITIES ON A DAILY BASIS TO THE SATISFACTION OF THE DISTRICT. THIS INCLUDES REMOVAL OF ALL DUST, MUD, ROCKS, ASPHALT DEBRIS, AND REFUSE FROM STREETS, SIDEWALKS, DRIVEWAYS, AND ANY OTHER AREAS AFFECTED BY THE CONSTRUCTION ACTIVITIES. FAILURE TO CLEANUP TO THE SATISFACTION OF THE DISTRICT WILL NECESSITATE A SHUTDOWN OF THE PROJECT UNTIL CLEANUP IS PROPERLY PERFORMED. ALL VEHICLES ARE TO BE CLEANED OF ALL EXCESS CONCRETE AND DIRT PRIOR TO LEAVING THE SITES.

6. EXISTING UTILITIES AND FACILITIES
A. BURIED UTILITY LOCATIONS: A SURVEY WAS NOT PERFORMED FOR THIS PROJECT. EXISTING BURIED UTILITIES TYPES, SIZES AND LOCATIONS INFORMATION IS LIMITED AND UNKNOWN BURIED UTILITIES MAY BE PRESENT. THE CONTRACTOR SHALL PROVIDE UTILITY LOCATE IN LOCATIONS OF PROPOSED INFRASTRUCTURE AND CAUTIOUSLY EXCAVATE TO DETERMINE THE TYPES, SIZES AND LOCATIONS OF EXISTING UTILITIES THAT MAY CONFLICT WITH THE PROPOSED IMPROVEMENTS AND TO PREVENT DAMAGE OR DISTURBANCE TO THE EXISTING UTILITIES. PROVIDE 48–HOUR NOTICE TO THE DISTRICT PRIOR TO PERFORMING EXCAVATION OR TRENCHING WORK. AS A BASIS FOR BID, THE CONTRACTOR SHALL ASSUME NO WORK IS NECESSARY TO REROUTE EXISTING UTILITIES SEE DWG NO. C01 FOR ADDITIONAL DETAILS.

B. UTILITY CONFLICTS: THE CONTRACTOR SHALL CONTACT A ONE–CALL UTILITY LOCATE SERVICE PRIOR TO CONSTRUCTION OF PROPOSED IMPROVEMENTS. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND THE UTILITY COMPANY WHEN A CONFLICT OCCURS OR WHEN A CONFLICT IS ANTICIPATED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACING OR REPAIRING ANY UTILITIES DAMAGED DURING CONSTRUCTION.

7. PERMITS
THE CONTRACTOR MUST OBTAIN ALL NECESSARY PERMITS, AND IS RESPONSIBLE FOR COMPLYING WITH THE PROVISIONS OF ALL PERMITS.

8. HYDROSTATIC PRESSURE TESTS
THE CONTRACTOR SHALL PRESSURE TEST ALL PROPOSED PIPING PER THE SPECIFICATIONS.

9. CONNECTION TO EXISTING WELL AND TREATMENT PLANT PIPING
THE CONTRACTOR SHALL CONNECT THE PROPOSED PIPING TO THE PROPOSED WELL PUMP DISCHARGE AND TREATMENT PLANT PIPING ONLY AFTER THE PROPOSED PIPING IS PRESSURE TESTED, FLUSHED, DISINFECTED AND SATISFACTORY BACTERIOLOGICAL SAMPLE RESULTS ARE OBTAINED IN ACCORDANCE WITH THE SPECIFICATIONS OF THE DISTRICT AND THE WASHINGTON STATE DEPARTMENT OF HEALTH (DOH). ALL TESTING SHALL BE DONE IN THE PRESENCE OF THE DISTRICT. ALL WATER THAT IS WASTED SHALL BE DE–CHLORINATED AND DISCHARGED TO THE EX. SANITARY SEWER.

10. CONTRACTOR EQUIPMENT AND MATERIALS STORAGE
LIMITED EQUIPMENT AND MATERIALS STORAGE IS AVAILABLE AT THE PROJECT SITE. THE DISTRICT'S EXISTING WASTEWATER TREATMENT PLANT (WWTP) SITE IS APPROX. 1 MILE NORTHEAST FROM THE PROJECT SITE AND HAS SPACE AVAILABLE FOR SOME EQUIPMENT AND MATERIALS STORAGE. THE WWTP IS SECURED BY A SITE PERIMETER FENCE WITH LOCKED VEHICLE AND MAN GATES. COORDINATE WITH THE DISTRICT DURING CONSTRUCTION TO DETERMINE EXTENT OF STORAGE NEEDED AND APPROVED LOCATION(S) FOR STORAGE. CONTRACTOR IS RESPONSIBLE FOR SECURITY OF THE STORED EQUIPMENT AND MATERIALS AND SHALL COORDINATE WITH THE DISTRICT REGARDING CONTRACTOR–PROVIDED SECURITY MEASURES.

11. CONTRACTOR VEHICLE PARKING
PARKING AT THE PROJECT SITE IS LIMITED TO 2 VEHICLES (CAR/PICKUP SIZE). ADDITIONAL PARKING IS AVAILABLE AT THE RV SITE NEAR THE DISTRICT'S EXISTING RESERVOIR SITE (APPROX. ½ MILE SOUTH FROM THE PROJECT SITES), AND AT THE DISTRICT'S EXISTING WWTP SITE. COORDINATE WITH THE DISTRICT DURING CONSTRUCTION TO DETERMINE THE EXTENT OF PARKING NEEDED AND APPROVED LOCATION(S) FOR PARKING. TEMPORARY PARKING AT THE PROJECT SITE BEYOND THE STATED ALLOWANCE REQUIRES DISTRICT APPROVAL. PARKING AT ALL LOCATIONS IS ONLY ALLOWED DURING WORKING HOURS. OBTAIN DISTRICT APPROVAL FOR OVERNIGHT OR WEEKEND PARKING.

12. MATERIALS DISPOSAL
THE CONTRACTOR IS RESPONSIBLE FOR PROPERLY DISPOSING OF ALL CONSTRUCTION WASTE MATERIALS AND EXISTING MATERIALS REMOVED AND NOT REQUESTED TO BE RETURNED TO THE DISTRICT.

13. SURFACE RESTORATION
THE CONTRACTOR SHALL RESTORE ANY SURFACE AREAS THAT ARE DISTURBED OR DAMAGED DURING CONSTRUCTION. RESTORE TO EXISTING OR BETTER CONDITION UNLESS OTHERWISE STATED IN THE PLANS OR SPECIFICATIONS.

14. PROTECTION OF EXISTING INFRASTRUCTURE
THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING INFRASTRUCTURE DURING CONSTRUCTION UNLESS NOTED IN THE PLANS OR SPECIFICATIONS TO BE REMOVED OR MODIFIED.

15. EROSION AND SEDIMENTATION CONTROL
THE CONTRACTOR SHALL IMPLEMENT EROSION AND SEDIMENTATION CONTROL AS NECESSARY TO PREVENT RUN–OFF FROM THE SITE. THE CONTRACTOR SHALL COVER ALL TEMPORARY BACKFILL MATERIAL STORAGE PILES AND PROTECT OPEN TRENCHES DURING WET CONDITIONS. DURING WET CONDITIONS ALL TRENCHES SHALL BE BACKFILLED PRIOR TO THE END OF THE WORKING DAY.

16. WATER OR POWER SHUTDOWN
EXISTING POWER MAY NOT BE SHUT DOWN FOR ANY PERIOD WITHOUT PRIOR APPROVAL FROM THE DISTRICT. A MINIMUM OF 72 HOURS NOTICE TO THE DISTRICT IS REQUIRED FOR ANY SHUT DOWN. THE CONTRACTOR SHALL NOT OPERATE EXISTING WATER OR POWER SYSTEM EQUIPMENT (VALVES, SWITCHES, ETC.).

17. WELL PROTECTION
ALL WELL PROTECTION AND IMPORT FILL MATERIAL SPECIFICATIONS AND STATE AND LOCAL REQUIREMENTS SHALL BE MET BY THE CONTRACTOR.

DRAWING INDEX

SECTION AND DETAIL REFERENCES

THE FOLLOWING CONVENTIONS HAVE BEEN USED WITHIN THESE DRAWINGS TO REFER THE READER BETWEEN THE DETAIL/SECTION AND THE PLAN FROM WHICH IT IS REFERENCED.

REFERENCE BUBBLES

ID / #XX — PLAN REFERENCE BUBBLE – REFERS READER BACK TO THE PLAN FROM WHICH THE DETAIL OR SECTION ORIGINATED.

ID / #XX — DETAIL/SECTION REFERENCE BUBBLE – REFERS READER TO THE DRAWING ON WHICH THE DETAIL OR SECTION IS LOCATED.

WHERE, ID = DETAIL/SECTION REFERENCE NUMBER.
#XX = DRAWING NUMBER ON WHICH DETAIL ORIGINATED OR RESIDES.

CALL 48 HOURS BEFORE YOU DIG
ONE CALL 1-800-424-5555

REPORT ALL SPILLS
DEPT. OF ECOLOGY 1-800-258-5990

CONTACT INFORMATION

CONTACT	COMPANY	PHONE
MONT JEFFREYS	DISTRICT, GENERAL MANAGER	(360) 427–2413
SEAN KANDA, P.E.	RH2 ENGINEERING, PROJECT ENGINEER	(425) 951–5460
CHRIS ROBERTS, P.E.	RH2 ENGINEERING, ELECTRICAL ENGINEER	(425) 951–5358
DANIELLE DORR	RH2 ENGINEERING, STAFF ENGINEER	(425) 951–5310

NOTE: PLAN 1 AND PLAN 2 BELOW SHOW WORK TO BE COMPLETED BY THE CONTRACTOR TO ISOLATE WELL 1 FROM THE EXISTING RAW WATER PIPING TO THE WTP. SEE DWG NO. M01 FOR PROPOSED PIPING IMPROVEMENTS TO CONNECT WELL 4 TO THE RAW WATER PIPING THAT REMAINS.

EXISTING WELL 1 MECHANICAL DEMOLITION PLAN 1

NOTE: THIS PHOTO PROVIDED FOR FURTHER CLARITY OF WHAT IS SHOWN IN PLAN 1.

EXISTING WELL 1 MECHANICAL DEMOLITION PLAN 2

RH2 ENGINEERING, INC.
www.rh2.com
Bothell, WA 1.800.720.8052
22722 29th Drive SE, Suite 210

ENGINEERS PLANNERS SCIENTISTS

LICENSED PROFESSIONAL ENGINEER — DANIEL J. HAMILTON — STATE OF WASHINGTON — SIGNED: 01/30/18

LICENSED PROFESSIONAL ENGINEER — BALLARD K. HAMILTON — STATE OF WASHINGTON — SIGNED: 01/30/18

Hartstene Pointe Water-Sewer District
Groundwater Replacement Well 4

Hartstene Pointe Water-Sewer District — Dedicated to Service

GENERAL INFORMATION AND EXISTING MECHANICAL DEMO PLAN

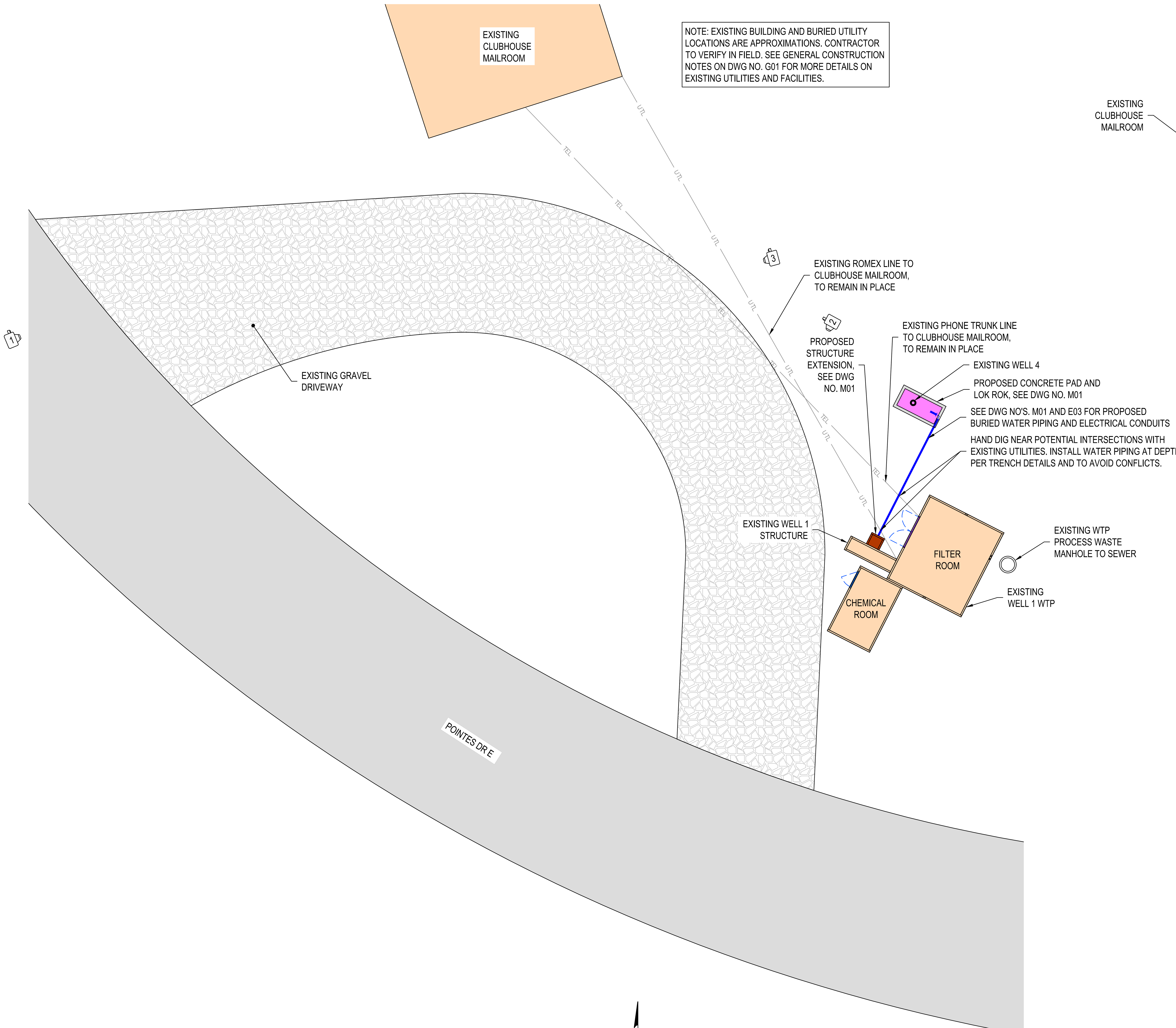
ENGINEER: DND
REVIEWED: DJM
SAVE DATE: Nov 22, 2017
PLOT DATE: Jan 30, 2018
CLIENT: HP
FILENAME: RWPS-D-COV.DWG
JOB NO.: 117-087

REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW

SCALE: SHOWN
0" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: G01
SHEET NO.: 1
9



PROPOSED SITE PLAN
1" = 10'

GRAVEL DRIVEWAY NORTH ENTRANCE 1

GRAVEL DRIVEWAY SOUTH ENTRANCE 2

GRAVEL DRIVEWAY NEAR WELL 4 3

SIGNED: 01/30/18

SIGNED: 01/30/18

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Hartstene Pointe Water-Sewer District
Groundwater Replacement Well 4

PROPOSED SITE PLAN

Hartstene Pointe Water - Sewer District — Dedicated to Service

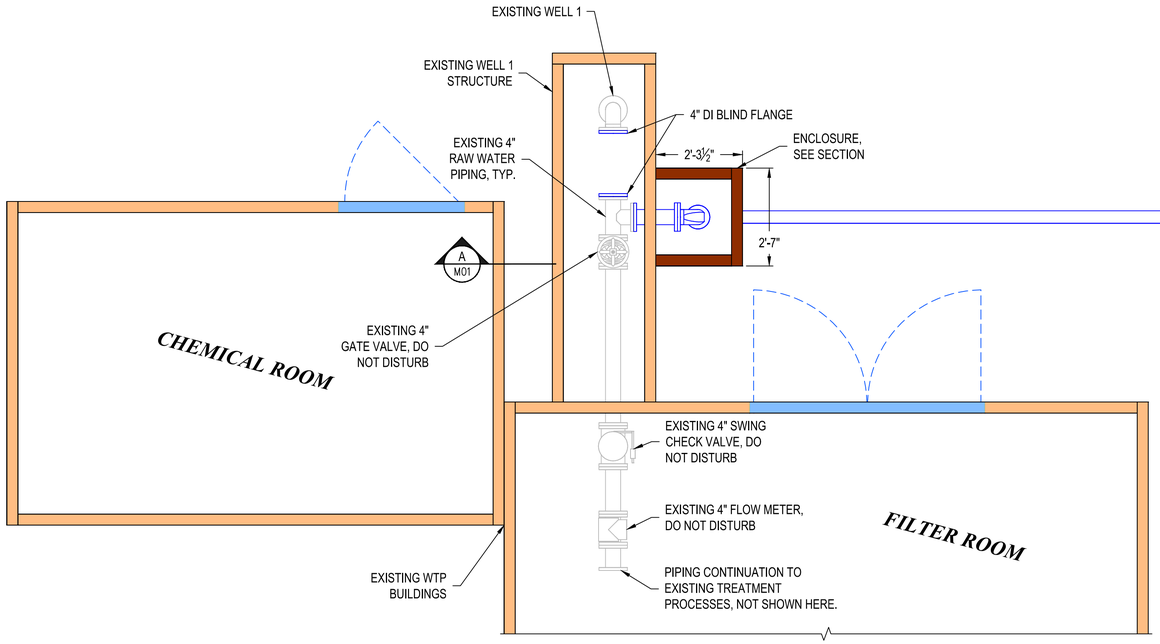
ENGINEER: DND	SAVE DATE: Nov 22, 2017	CLIENT: HP	JOB NO.: 117-087
REVIEWED: DJM	PLOT DATE: Jan 30, 2018	FILENAME: RWPS-D-CIV01.DWG	

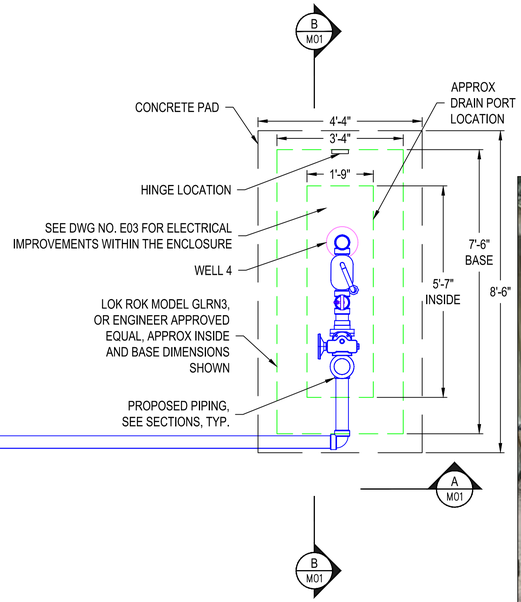
REVISIONS

NO.	DATE	DESCRIPTION	BY	REVIEW

SCALE: SHOWN
0" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: C01 | SHEET NO.: 2 / 9



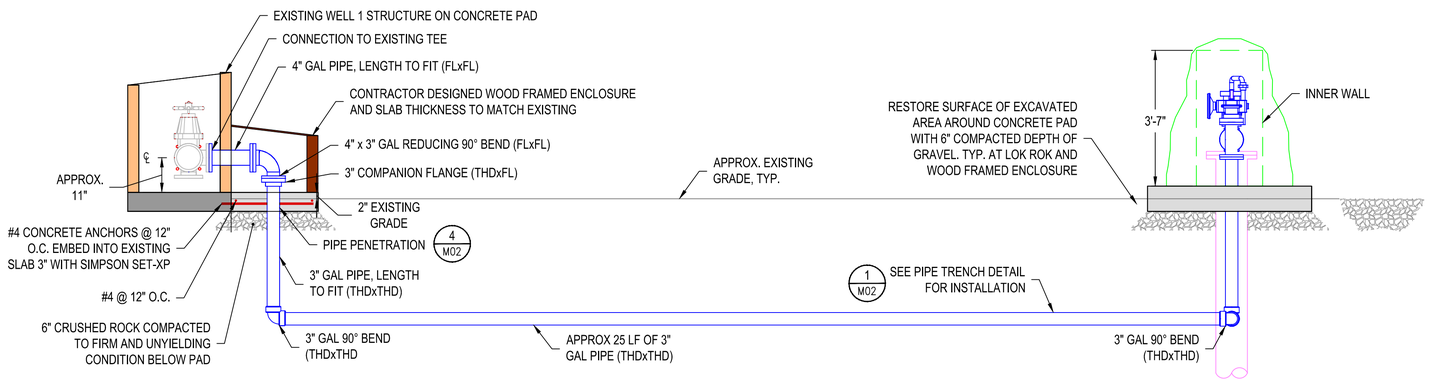


PROPOSED STRUCTURAL AND MECHANICAL PLAN

½" = 1'–0"

ABBREVIATIONS	
GAL	GALVANIZED
DI	DUCTILE IRON
THD	THREADED
FL	FLANGED

NOTE:
EXISTING GRADE SHOWN IS APPROXIMATE. CONTRACTOR TO VERIFY IN FIELD.



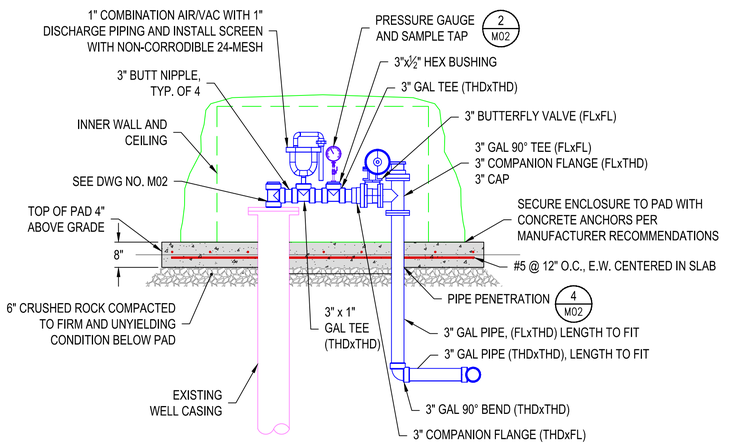
SECTION

½" = 1'–0"

A M01

NOTE:
CONTRACTOR TO VERIFY PIPING LAYOUT WITHIN STRUCTURE PRIOR TO ORDERING MATERIALS. NOTIFY ENGINEER IF CONFLICTS.

PROPOSED WELL 4 CONNECTION TO WELL 1 WTP



SECTION

½" = 1'–0"

B M01

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www.rh2.com
1.800.720.8052
Bothell, WA
22722 29th Drive SE, Suite 210

SIGNED: 01/30/18

SIGNED: 01/30/18

Hartstene Pointe Water-Sewer District
Groundwater Replacement Well 4

PROPOSED STRUCTURAL AND MECHANICAL PLAN

JOB NO.: 117-087
CLIENT: HP
FILENAME: RWPS-D-MEC01.DWG
SAVE DATE: Jan 9, 2018
PLOT DATE: Jan 30, 2018
ENGINEER: DND
REVIEWED: DJM

REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW

SCALE: SHOWN

0" 1" 2"

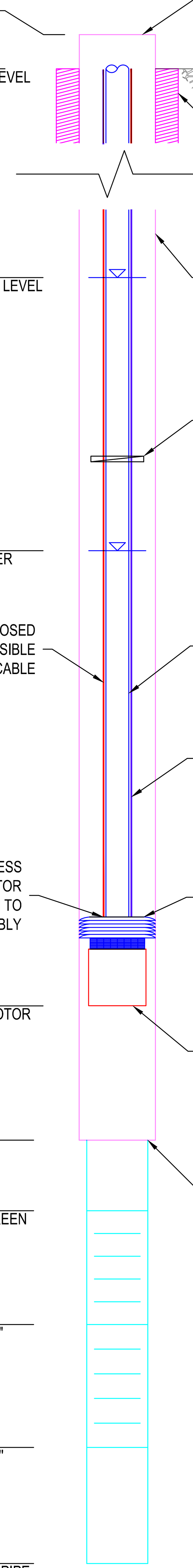
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: M01
SHEET NO.: 3 9

EXISTING WELL SOURCE INFORMATION: EXISTING WELL 4 (PREVIOUSLY WELL 1R) PROFILE DATA WAS OBTAINED FROM THE WELL 1R DRILLING AND TESTING EVALUATION TECHNICAL MEMORANDUM BY RH2 ENGINEERING, INC. (FEBRUARY 3, 2017).

NOTE: DEPTHS SHOWN ARE FEET (FT) BELOW EXISTING GROUND SURFACE (BGS) AT WELL CASING. EXISTING GROUND SURFACE AT WELL CASING IS ESTIMATED TO BE 115 FT ELEVATION.

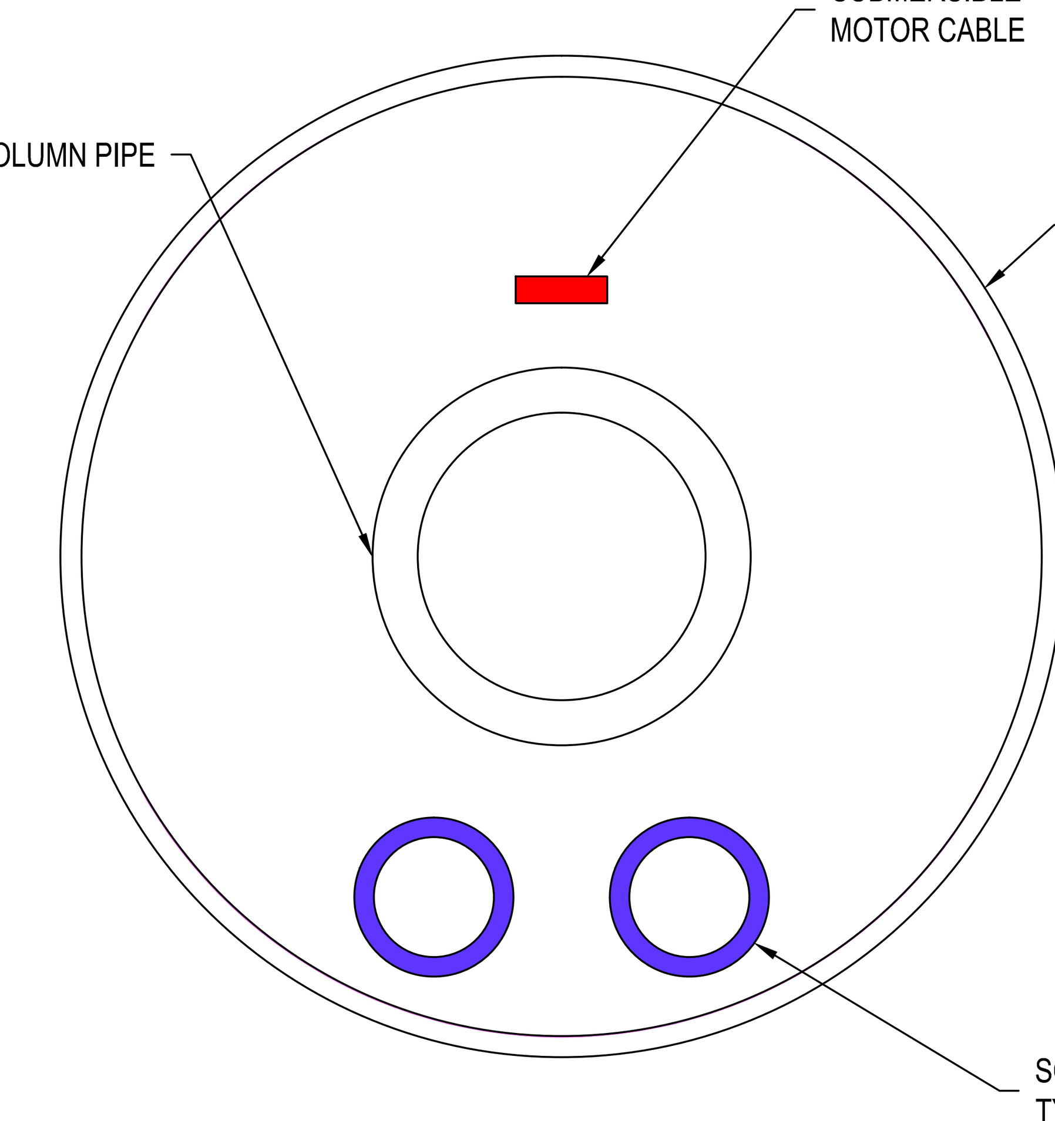
NOTE: PROVIDE AND INSTALL STAINLESS STEEL BANDS EVERY 20 FEET ALONG PUMP COLUMN. WRAP AROUND THE SOUNDING TUBES AND MOTOR CABLE FOR SUPPORT.



NOTE: SEE SPECIFICATIONS FOR WORK REQUIRED TO BE PERFORMED BY A LICENSED WELL DRILLER

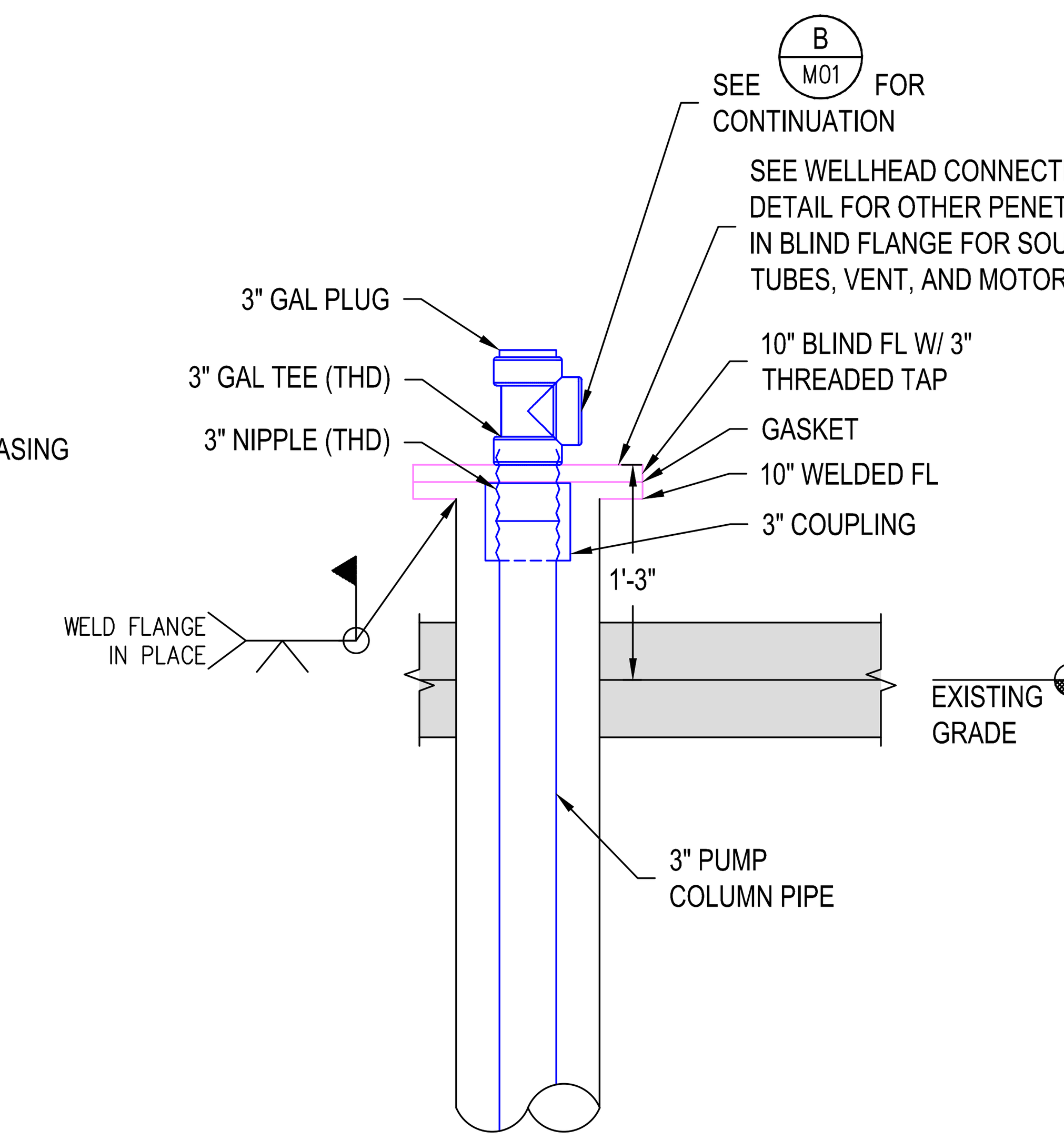
WELL PROFILE AND PROPOSED PUMP INSTALLATION

HORZ: 1" = 1'-0" VERT: ¼" =1'-0"



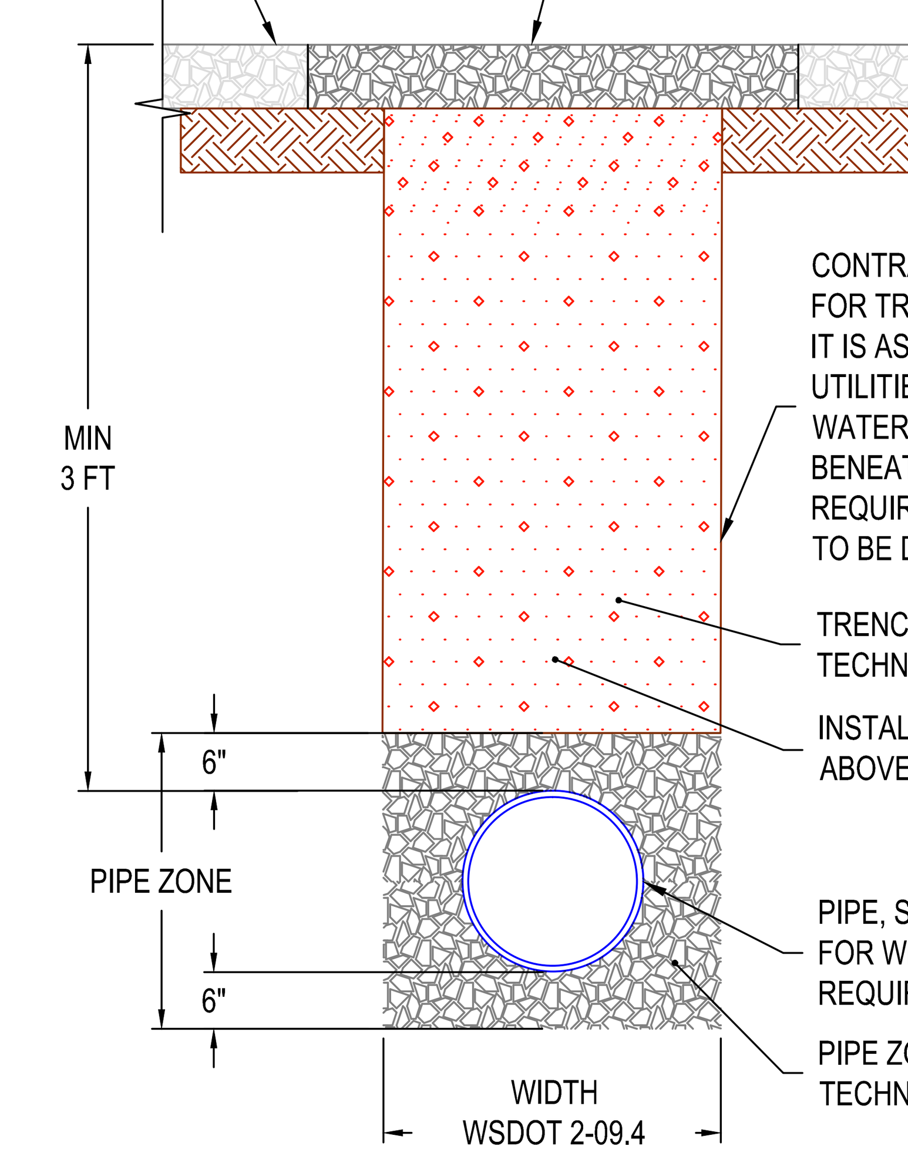
WELL PLAN

6"= 1'-0"



PROPOSED WELLHEAD PROFILE

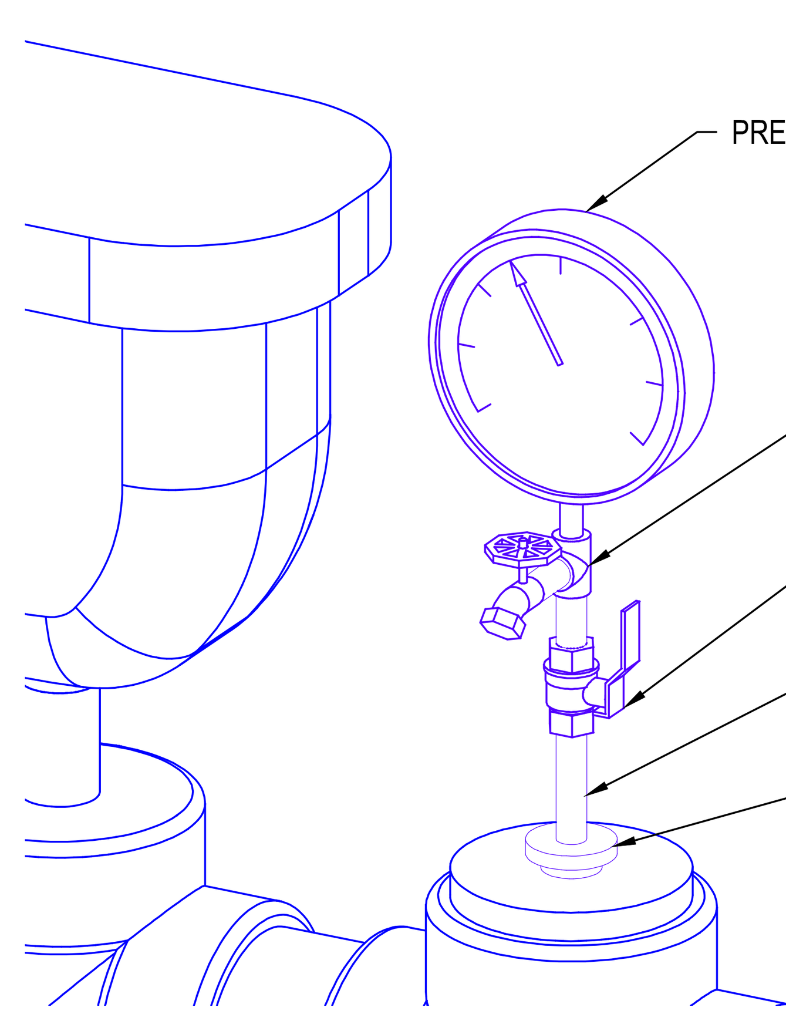
1" = 1'-0"



PIPE TRENCH DETAIL

1 M01

NOT TO SCALE

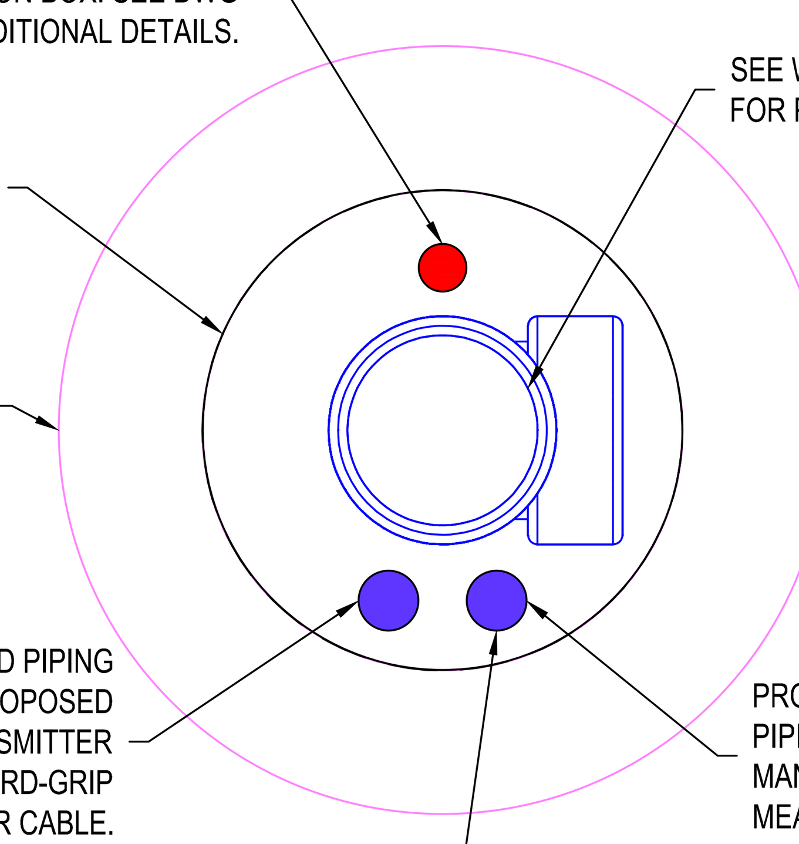


PRESSURE GAUGE AND SAMPLE TAP DETAIL

2 M01

NOT TO SCALE

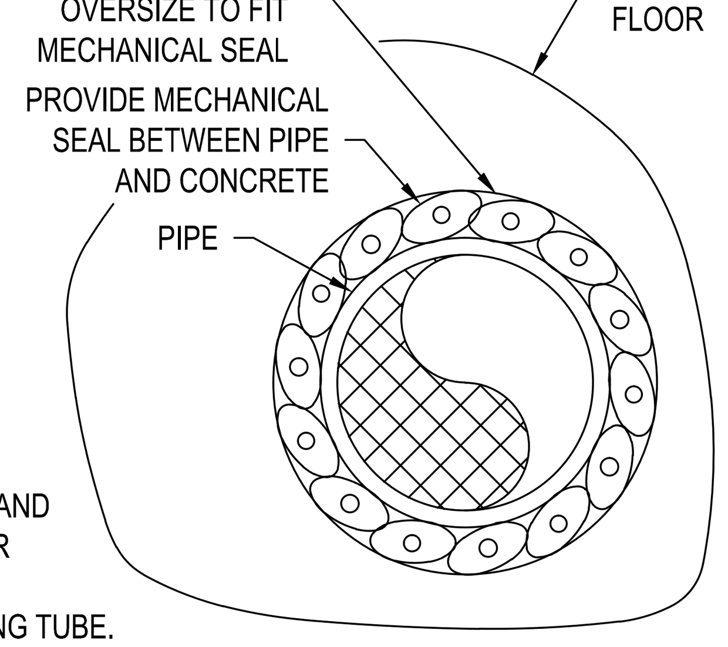
NOTE: WELL HEAD MODIFICATIONS AND CONNECTION ARE TO BE PERFORMED BY A LICENSED WELL DRILLER.



WELLHEAD CONNECTION DETAIL

3 M02

3" = 1'-0"



LINKSEAL MODEL	DIRECT BURY	WATER	WASTE WATER	CHEMICAL	AIR
	APPLICATION				
MODEL "C"	X	X			
MODEL "L"	X	X			
MODEL "S-316"			X	X	
MODEL "T"					X

* CONTRACTOR SHALL VERIFY LINKSEAL SUITABILITY FOR CHEMICAL APPLICATIONS WITH MANUFACTURER.

1) MECHANICAL SEALS SHALL BE LINKSEAL OR APPROVED EQUAL. MECHANICAL SEALS SHALL BE SELECTED BASED ON THE APPLICATION. SEE TABLE A FOR APPLICATION MATRIX.

PIPE PENETRATION

4 M01

NOT TO SCALE

RH2 ENGINEERS PLANNERS SCIENTISTS

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SIGNED: 01/30/18

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Hartstene Pointe Water-Sewer District

Groundwater Replacement Well 4

WELL PUMP INSTALLATION AND DETAILS

Hartstene Pointe Water - Sewer District — Dedicated to Service

ENGINEER: DND	SAVE DATE: Jan 9, 2018
CLIENT: HP	JOB NO.: 117-087
REVIEWED: DJM	PLOT DATE: Jan 30, 2018
FILENAME: RWPS-D-MEC01.DWG	

REVISIONS

NO.	DATE	DESCRIPTION	BY	REVIEW

SCALE: SHOWN

0" 1" 2"

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: M02

SHEET NO.: 4 / 9

ONE-LINE DIAGRAM SYMBOLS

- CIRCUIT BREAKER
  - XXX/YY – CB SIZE & NO. OF POLES
  - ET – ELECTRONIC TRIP
  - TM – THERMAL MAGNETIC BREAKER
  - MCP – MOTOR CIRCUIT PROTECTOR
  - SE – SERVICE ENTRANCE
  - GFI – GROUND FAULT INTERRUPTER
- FUSE
- FUSED DISCONNECT SWITCH
- PLUG–IN CONNECTION
- RTM — RUN TIME METER
- OC — MOTOR OPERATION COUNTER
- SSRVS — SSRVS – SOLID STATE REDUCED VOLTAGE STARTER
- VARIABLE FREQUENCY DRIVE
- MOTOR STARTER
- A B C D — MOTOR STARTER W/ OPERATOR DEVICES
  - A – HAND–OFF–AUTO
  - B – OPERATIONAL COUNTER
  - C – RUN TIME METER
  - D – RUN LIGHT
  - E – FAIL LIGHT
  - F – EMERGENCY STOP
- K — KIRK KEY INTERLOCK
- POWER TRANSFORMER
- CONTROL POWER TRANSFORMER
- TRANSFORMER
- CURRENT TRANSFORMER
- VOLTAGE TRANSFORMER
- CONTACTOR
- CAPACITOR
- ENGINE GENERATOR
- GENERATOR CONNECTION RECEPTACLE
- S/N — SOLID NEUTRAL
- TB — TERMINAL BLOCK
- SURGE PROTECTION DEVICE
- SPD — SURGE PROTECTION DEVICE (ALTERNATIVE)

GROUNDING SYSTEM SYMBOLS

- GROUND
- METAL PIPE GROUND
- CONNECTION POINT, EXOTHERMIC WELD. CADWELD OR APPROVED EQUAL.
- GROUND ROD SIZED PER N.E.C. USE EXOTHERMIC WELD CONNECTION AT THE GROUND ROD.
- PIGTAIL, BARE COPPER, LENGTH AS REQUIRED, 8' MINIMUM.
- CONNECTION POINT, MECHANICAL, COMPRESSION TYPE.

ELECTRICAL SITE PLAN SYMBOLS

- UTILITY POLE AND GUY WIRE
- HH — MANHOLE OR HANDHOLE
- P — BURIED POWER VAULT OR MANHOLE
- T — TELEPHONE VAULT OR PEDESTAL
- F — FIBER OPTICS VAULT OR PEDESTAL
- LUMINAIRE
- PAD–MOUNT TRANSFORMER

PANELBOARDS, SWITCHES, AND EQUIPMENT

- SERVICE ENTRANCE, SWITCHGEAR, MOTOR CONTROL CENTER, OR PANELBOARD
- SURFACE MOUNTED PANELBOARD
- FLUSHED MOUNTED PANELBOARD
- NXX — FIELD CONTROL STATION WITH NEMA REQUIREMENTS.
  - N1 – NEMA 1
  - N3R – NEMA 3R
  - N4 – NEMA 4
  - N4SS – NEMA 4 STAINLESS STEEL
  - N4F – NEMA 4 FIBERGLASS
  - N6 – NEMA 6
  - N12 – NEMA 12 GASKETED
- EQUIPMENT MOUNTING STAND
- HEATER, WATTAGE NOTED
- EQUIPMENT CONNECTION
- M — SINGLE PHASE MOTOR. HORSEPOWER AS NOTED
- HP — THREE PHASE MOTOR. HORSEPOWER AS NOTED
- HP — SINGLE PHASE MOTOR. HORSEPOWER AS NOTED
- ELECTRICAL PLUG
- DISCONNECT SWITCH
- F — FUSED DISCONNECT SWITCH
- COMBINATION MOTOR STARTER AND DISCONNECT SWITCH

RECEPTACLES AND JUNCTION BOX SYMBOLS

- J — CEILING JUNCTION BOX
- J — WALL JUNCTION BOX
- J — FLOOR JUNCTION BOX
- DUPLEX WALL RECEPTACLE , 120V
  - WP = WEATHERPROOF
  - G = GROUNDED
  - IG = ISOLATED GROUND
  - GFI = GROUND FAULT INTERRUPTER
- DOUBLE DUPLEX
- SINGLE RECEPTACLE, 120V
- SINGLE RECEPTACLE, 208V
- DUPLEX FLOOR RECEPTACLE, 120V
- SPECIAL PURPOSE WALL RECEPTACLE, RATING AS NOTED
- CLOCK
- TV — TELEVISION
- TELEPHONE
- TELEPHONE/DATA WITH CABLE
- TELEPHONE/DATA WITHOUT CABLE

SWITCH OUTLETS

- S — STANDARD SWITCH, 120VAC, 20 AMP
- S_3 / 3WAY — 3–WAY SWITCH, 120VAC, 20 AMP
- S_{HOA} / HOA — 3–POSITION SWITCH, 120VAC, 20 AMP, LABEL SWITCH POSITION HAND–OFF–MOTION OR PHOTO

S_{DEE}	SINGLE–POLE	S_P	PILOT–LIGHTED
S_2	DOUBLE–POLE	S_K	KEY–OPERATED
S_3	THREE WAY	S_{LV}	LOW VOLTAGE
S_4	FOUR WAY	S_M	MASTER
S_D	DIMMER		PUSHBUTTON

LIGHTING FIXTURES/DEVICES

- FLUORESCENT FIXTURE
- WALL/CEILING MOUNTED FIXTURE
- EMERGENCY LIGHT WITH SELF CONTAINED BATTERY
- SURFACE OR PENDANT MOUNTED FIXTURE
- RECESSED FIXTURE
- MD — MOTION DETECTOR
- PC — PHOTO CONTROL CELL

FIRE SYSTEM SYMBOLS

- H — HEAT DETECTOR
- S — SMOKE DETECTOR
- D — FIRE ALARM DISPATCH STROBE ALARM
- A — FIRE ALARM AUDIBLE/VISUAL ALARM
- F — FIRE ALARM MANUAL PULL STATION

ADDITIONAL SYMBOLS

- S — SOUND SYSTEM SPEAKER
- V — SOUND SYSTEM VOLUME CONTROL
- B — DOORBELL

VALVE SYMBOLS

- PILOT VALVE SOLENOID
- VALVE
- CHECK VALVE
- CONTROL VALVE

PID FORMAT

- SUPERSCRIPT
- XYZ / ABC — INSTRUMENT BUBBLE
- X=MEASURED OR INITIATING VARIABLE
- Y=READOUT OR FUNCTION
- Z=MODIFIER
- ABC=LOOP NUMBER

ISA STANDARDS FOR P&ID

	1st LETTER (MEASURED OR INITIATING VARIABLE)	2nd LETTER (READOUT OR FUNCTION)	3rd LETTER (MODIFIER)
A	ANALYSIS	ALARM	
B	BURNER (BATTERY)		
C	COMMUNICATION	CONTROL	(BACK)
D	DENSITY	(DELAY)	CLOSED
E	VOLTAGE		
F	FLOW		FAIL (FLOW)
G	GAS		GREEN BULB
H	HAND		HIGH
I	CURRENT (INTRUSION)	MANUAL	
J	POWER (EQUIPMENT)	INDICATE	
K	TIME	CONTROL STATION	
L	LEVEL	LIGHT	LOW
M	MOTION		MIDDLE
N	USERS CHOICE		
O	USERS CHOICE		OPEN
P	PRESSURE	(PUMP)	(PRESSURE)
Q	QUANTITY (EVENT)	TOTALIZE	
R	RADIATION (REQ'D)	RECORD	RED BULB
S	SPEED (SMOKE)	SWITCH	SOLENOID
T	TEMPERATURE	TRANSMITTER	(TRANSMITTER)
U	MULTI VARIABLE	MULTI FUNCTION	
V	VISCOSITY (pH)	VALVE	
W	WEIGHT		
X	UNCLASSIFIED		
Y	USERS CHOICE	RELAY (TRANSDUCER)	
Z	POSITION		

ABBREVIATIONS

- SPDT – SINGLE POLE, DOUBLE THROW
- SPST – SINGLE POLE, SINGLE THROW
- DPST – DOUBLE POLE, SINGLE THROW
- WP – WEATHER–PROOF
- GFI – GROUND FAULT INTERRUPT
- P – POWER
- C – CONTROL
- J – INSTRUMENTATION
- PC – POWER & CONTROL
- CJ – CONTROL & INSTRUMENTATION
- CKT. – CIRCUIT
- C.O. – CONDUIT ONLY
- N.L. – NIGHT LIGHT
- AL. – ALUMINUM
- CU. – COPPER

- HOA — HAND–OFF–AUTO SWITCH
- RTM — RUN TIME METER
- OC — OPERATION COUNTER
- MRIL — MOTOR RUN INDICATION LIGHT
- SFIL — SEAL FAIL INDICATION LIGHT
- SFTR — SEAL FAIL TRIP RESET
- OTIL — OVER TEMPERATURE INDICATION LIGHT
- MOIL — MOTOR OVERLOAD INDICATION LIGHT

INDICATE TYPE BY LETTER / INSTRUMENT METER

- V
- AH

- A – AMMETER
- AH – AMPERE–HOUR
- PF – POWER FACTOR
- V – VOLTMETER
- VA – VOLT AMMETER
- VAR – VARMETER
- VARH – VARHOUR METER
- W – WATTMETER
- WH – WATTHOUR METER

RACEWAY LEGEND

SITE PLAN LEGEND

- P — PROPOSED POWER
- TEL — PROPOSED TELEPHONE
- TELM — PROPOSED INSTRUMENTATION
- FO — PROPOSED FIBER OPTICS

BUILDING OR FACILITY PLAN LEGEND

- 480 VOLT EXPOSED RACEWAY
- 480 VOLT WIRING CONCEALED, UNDERGROUND, EMBEDDED, OR CONCRETE ENCASED RACEWAY
- 120/208/240 VOLT EXPOSED RACEWAY
- 120/208/240V WIRING CONCEALED, UNDERGROUND, EMBEDDED, OR CONCRETE ENCASED RACEWAY
- CONTROL OR INSTRUMENTATION EXPOSED RACEWAY
- CONTROL OR INSTRUMENTATION, UNDERGROUND, EMBEDDED, OR CONCRETE ENCASED RACEWAY
- HOME RUN TO PANELBOARD OR AS INDICATED
- CONDUIT RUN, BROKEN AND CONTINUED SAME SHEET OR AS NOTED
- FLEXIBLE CONDUIT
- CONDUIT RUN. HATCH MARKS INDICATE NUMBER OF CONDUCTORS
- ½" GRC, 2–#12 — CALLOUT INDICATING CONDUIT SIZE, NUMBER AND SIZE OF WIRE.
- XXX — CALLOUT INDICATING CONDUIT PER SCHEDULE
- CONDUIT BENT UP OR TOWARD
- CONDUIT BENT DOWN OR AWAY
- CAPPED CONDUIT

ONE-LINE DIAGRAM INFORMATION

- EXISTING EQUIPMENT AND CONDUIT
- PROPOSED EQUIPMENT AND CONDUIT
- GROUNDING EQUIPMENT AND CONDUCTORS
- CONDUIT, WIRING OR EQUIPMENT TO BE REMOVED

LADDER LOGIC SYMBOL LEGEND

INDICATOR LIGHT — INDICATOR LIGHT: A – AMBER, G – GREEN, B – BLUE, R – RED, C – CLEAR, W – WHITE	RELAY (XYZ 123) — RELAY: TR – TIMED RELAY, CR – CONTROL RELAY
LIMIT SWITCH — LIMIT SWITCH, NORMALLY OPEN	FLOAT SWITCH — FLOAT SWITCH, NORMALLY OPEN
LIMIT SWITCH — LIMIT SWITCH, NORMALLY CLOSED	FLOAT SWITCH — FLOAT SWITCH, NORMALLY CLOSED
TIME DELAY CONTACT — TIME DELAY CONTACT, NORMALLY OPEN, TIME TO CLOSE	PUSHBUTTON — PUSHBUTTON, NORMALLY CLOSED
TIME DELAY CONTACT — TIME DELAY CONTACT, NORMALLY CLOSED, TIME TO OPEN	PUSHBUTTON — PUSHBUTTON, NORMALLY OPEN
TIME DELAY CONTACT — TIME DELAY CONTACT, NORMALLY OPEN, TIME TO OPEN	THERMOSTAT — THERMO SWITCH, NORMALLY OPEN
TIME DELAY CONTACT — TIME DELAY CONTACT, NORMALLY CLOSED, TIME TO CLOSE	THERMOSTAT — THERMO SWITCH, NORMALLY CLOSED
RELAY CONTACT, NC / RELAY CONTACT, NO — RELAY CONTACT, INSTANTANEOUS CHANGE	FLOWSWITCH — FLOWSWITCH, NORMALLY OPEN
PRESSURE SWITCH — PRESSURE SWITCH, NORMALLY OPEN	FLOWSWITCH — FLOWSWITCH, NORMALLY CLOSED
PRESSURE SWITCH — PRESSURE SWITCH, NORMALLY CLOSED	2 POLE SWITCH
LADDER LOGIC LINETYPES: COMPONENT INSTALLED INSIDE ENCLOSURE; COMPONENT INSTALLED ON FRONT OF ENCLOSURE; FIELD CONNECTED COMPONENT	3 POLE SWITCH

P&ID BUBBLE IDENTIFICATION CHART

EXISTING	FUNCTION
	INSTRUMENT IDENTIFICATION BUBBLE
	FIELD MOUNTED DEVICE OR INSTRUMENT
	FRONT PANEL MOUNTED INSTRUMENT OR DEVICE (LOCAL PANEL)
	BACK PANEL MOUNTED INSTRUMENT OR DEVICE (LOCAL PANEL)
	FRONT PANEL MOUNTED INSTRUMENT OR DEVICE (LAB ROOM PANEL)
	OPERATOR INTERFACE DISPLAY (LOCAL PANEL)
	OPERATOR INTERFACE DISPLAY (LAB ROOM PANEL)

GENERAL NOTES

1. THIS IS A STANDARD LEGEND. NOT ALL OF THE INFORMATION SHOWN ON THIS PAGE WILL APPEAR IN THIS SET OF PLANS.

2. THESE DRAWINGS ARE DIAGRAMMATIC ONLY; EXACT LOCATIONS OF ELECTRICAL EQUIPMENT SHALL BE DETERMINED IN THE FIELD BY THE CONTRACTOR. THE INSTALLATION OF ALL EQUIPMENT SHOWN ON THESE DRAWINGS OR DESCRIBED IN THE SPECIFICATIONS SHALL CONFORM TO THE REQUIREMENTS SET FORTH IN THE LATEST EDITIONS OF ALL APPLICABLE CODES AND UTILITY COMPANY STANDARDS. CONTACT THE UTILITY COMPANY REPRESENTATIVES AND VERIFY THEIR REQUIREMENTS.

3. NOTIFY THE ENGINEER IMMEDIATELY IF CONFLICTS IN EQUIPMENT LOCATIONS ARE DISCOVERED OR IF PROBLEMS ARISE DUE TO FIELD CONDITIONS, LACK OF INFORMATION OR ANY OTHER REASON. NO PAYMENT WILL BE MADE FOR CHANGES WHICH HAVE NOT BEEN REVIEWED BY THE ENGINEER.

SIGNED: 01/30/18

SIGNED: 01/30/18

RH2 ENGINEERS PLANNERS SCIENTISTS
RH2 ENGINEERING, INC.
www.rh2.com 1.800.720.8052
22722 29th Drive SE, Suite 210

Hartstene Pointe Water-Sewer District
Groundwater Replacement Well 4
ELECTRICAL LEGEND

Hartstene Pointe Water-Sewer District — Dedicated to Service

NO.	DATE	DESCRIPTION	BY	REVIEW

REVISIONS

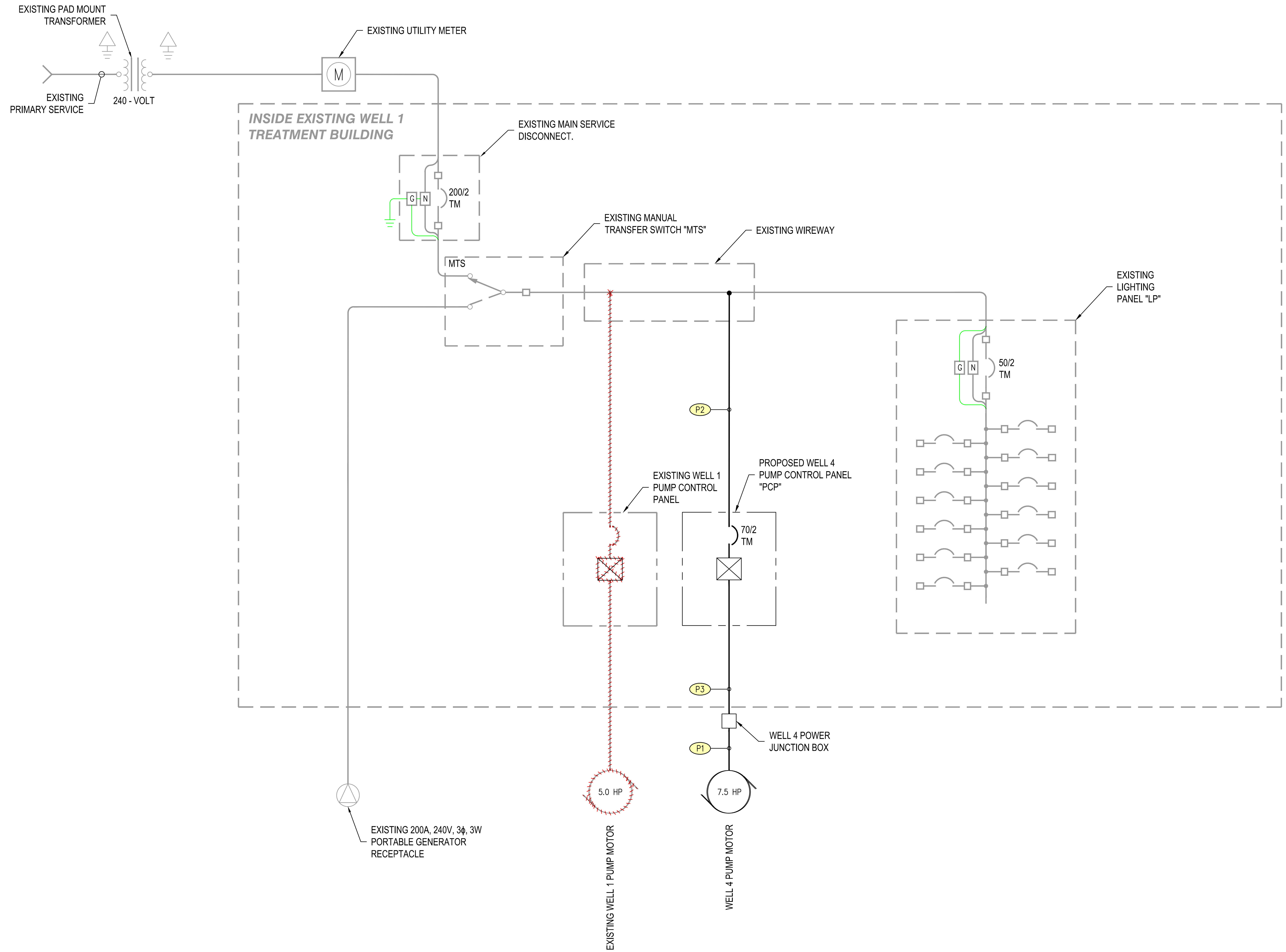
JOB NO.: 117-087 · CLIENT: HP · FILENAME: RWPS-D-ELEC01.DWG · SAVE DATE: Jan 9, 2018 · PLOT DATE: Jan 30, 2018 · ENGINEER: KES · REVIEWED: CMR

SCALE: SHOWN
0" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: E01 · SHEET NO.: 5 / 9

WELL 4 LOAD CALCULATIONS	
WELL 4 MOTOR (7.5 HORSEPOWER)	42.1A X 1.25 = 52.7 AMPS
WELL 4 BUILDING AND TREATMENT LOADS (13.9 KVA)	33.5A X 1.00 = 33.5 AMPS
WELL 4 TOTAL	86.2 AMPS

ELECTRICAL NOTES	
XX	1. SEE DWG NO. E03 FOR CONDUIT AND CONDUCTOR SCHEDULE.
X	2. SEE DWG NO. E03 FOR ELECTRICAL EQUIPMENT AND INSTRUMENTATION SCHEDULE.



ONE-LINE DIAGRAM

NOT TO SCALE

SIGNED: 01/30/18

SIGNED: 01/30/18

RH2 ENGINEERS PLANNERS SCIENTISTS

RH2 ENGINEERING, INC.

Hartstene Pointe Water-Sewer District

Groundwater Replacement Well 4

ELECTRICAL ONE-LINE DIAGRAM

JOB NO.: 117-087

CLIENT: HP

FILENAME: RWPS-D-ELEC01.DWG

SAVE DATE: Jan 9, 2018

PLOT DATE: Jan 30, 2018

ENGINEER: KES

REVIEWED: CMR

REVISIONS

NO.	DATE	DESCRIPTION	BY	REVIEW

SCALE: SHOWN

0" 1" 2"

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: E02

SHEET NO.: 6 of 9

POWER AND CONTROL CONDUIT AND CONDUCTOR SCHEDULE					
CIRCUIT	SOURCE	DESTINATION	TRADE SIZE	(QUANTITY) CONDUCTORS	NOTES
P1	WELL 4 POWER JUNCTION BOX	WELL 4 PUMP MOTOR	1"	MANUFACTURER CABLE	
P2	EXISTING WIREWAY	WELL 4 PUMP CONTROL PANEL	1"	(2) – #4, (1) – #6 GRD	
P3	WELL 4 PUMP CONTROL PANEL	WELL 4 POWER JUNCTION BOX	1"	(2) – #6, (1) – #10 GRD	
J1	EXISTING WELL 1 TELEMETRY PANEL "RTU–1"	LEVEL TRANSMITTER TERMINATION BOX	¾"	(1) – 2–CONDUCTOR SHIELDED CABLE	RELOCATE TERMINATION BOX FROM WELL 1
J2	LEVEL TRANSMITTER TERMINATION BOX	PRESSURE TRANSMITTER	1"	MANUFACTURER CABLE	RELOCATE CABLE AND TRANSMITTER FROM WELL 1

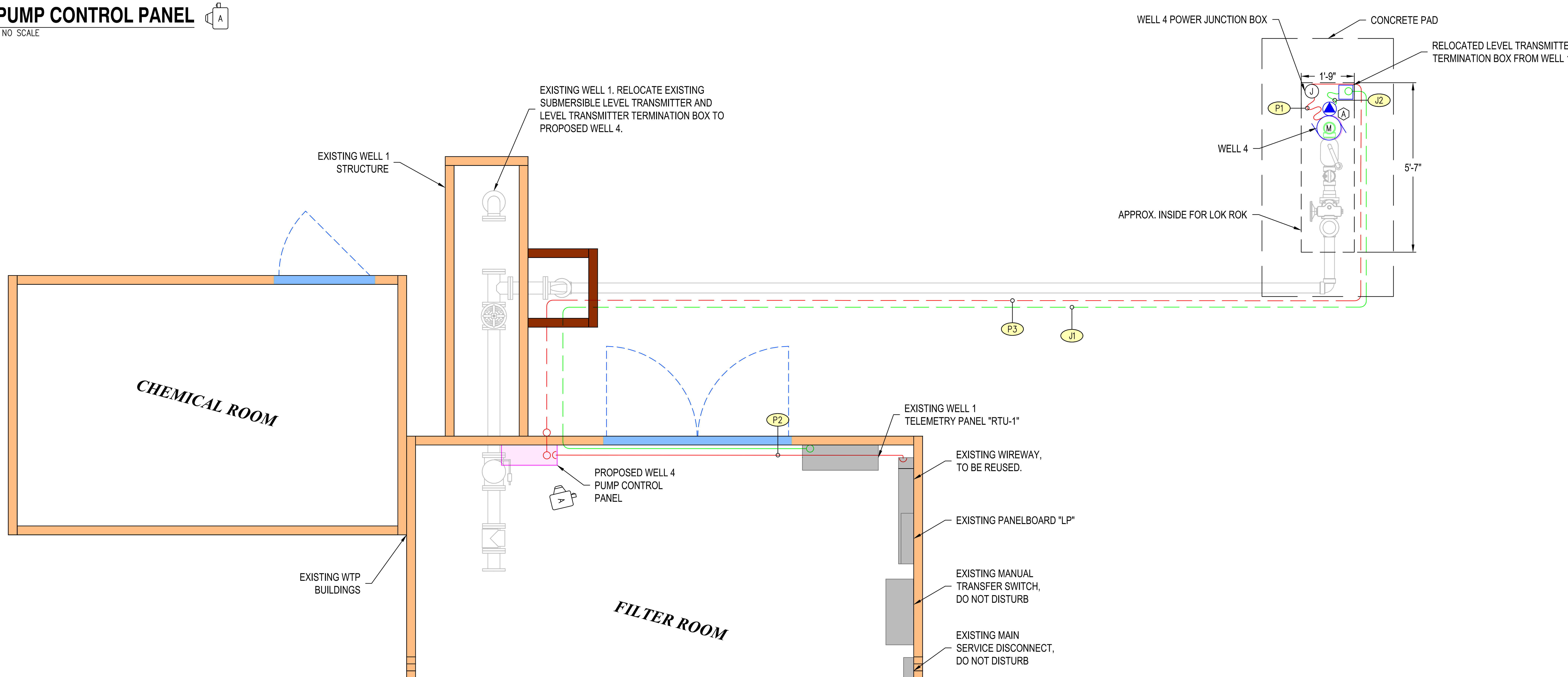
ELECTRICAL EQUIPMENT AND INSTRUMENTATION SCHEDULE			
ITEM	DESCRIPTION	MANUFACTURER	MODEL NO.
A	LEVEL TRANSMITTER	EXISTING	EXISTING

EXISTING WELL 1 PUMP CONTROL PANEL, TO BE REPLACED WITH PROPOSED WELL 4 PUMP CONTROL PANEL. REMOVE EXISTING CONTROL PANEL AND RETURN TO OWNER. INSTALL PROPOSED PANEL IN SAME LOCATION AS EXISTING PANEL.

EXISTING WELL 1 PUMP CONTROL PANEL (A)

NO SCALE

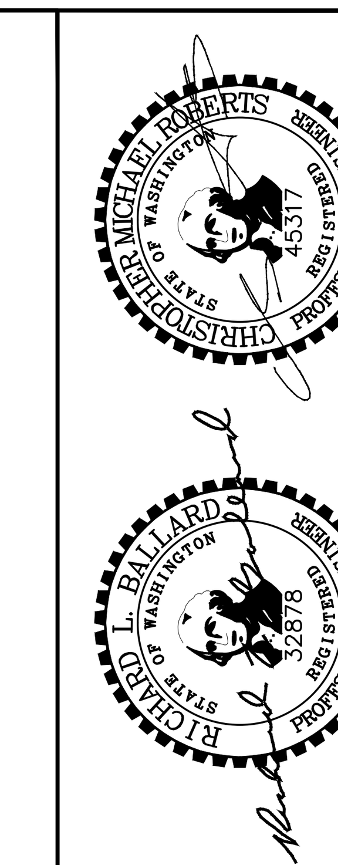
NOTE:
CONDUIT AND ELECTRICAL BOXES SHALL BE SEALED AT WELL HEAD TO PREVENT WATER AND INSECTS FROM ENTERING THE WELL.



ELECTRICAL PLAN

½" = 1'–0

NOTE:
REFER TO DWG NO'S. G01 AND C01 FOR EXISTING BURIED UTILITIES.



SIGNED: 01/30/18

SIGNED: 01/30/18

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22722 29th Drive SE, Suite 210

Hartstene Pointe Water-Sewer District
Groundwater Replacement Well 4

Hartstene Pointe Water - Sewer District — Dedicated to Service

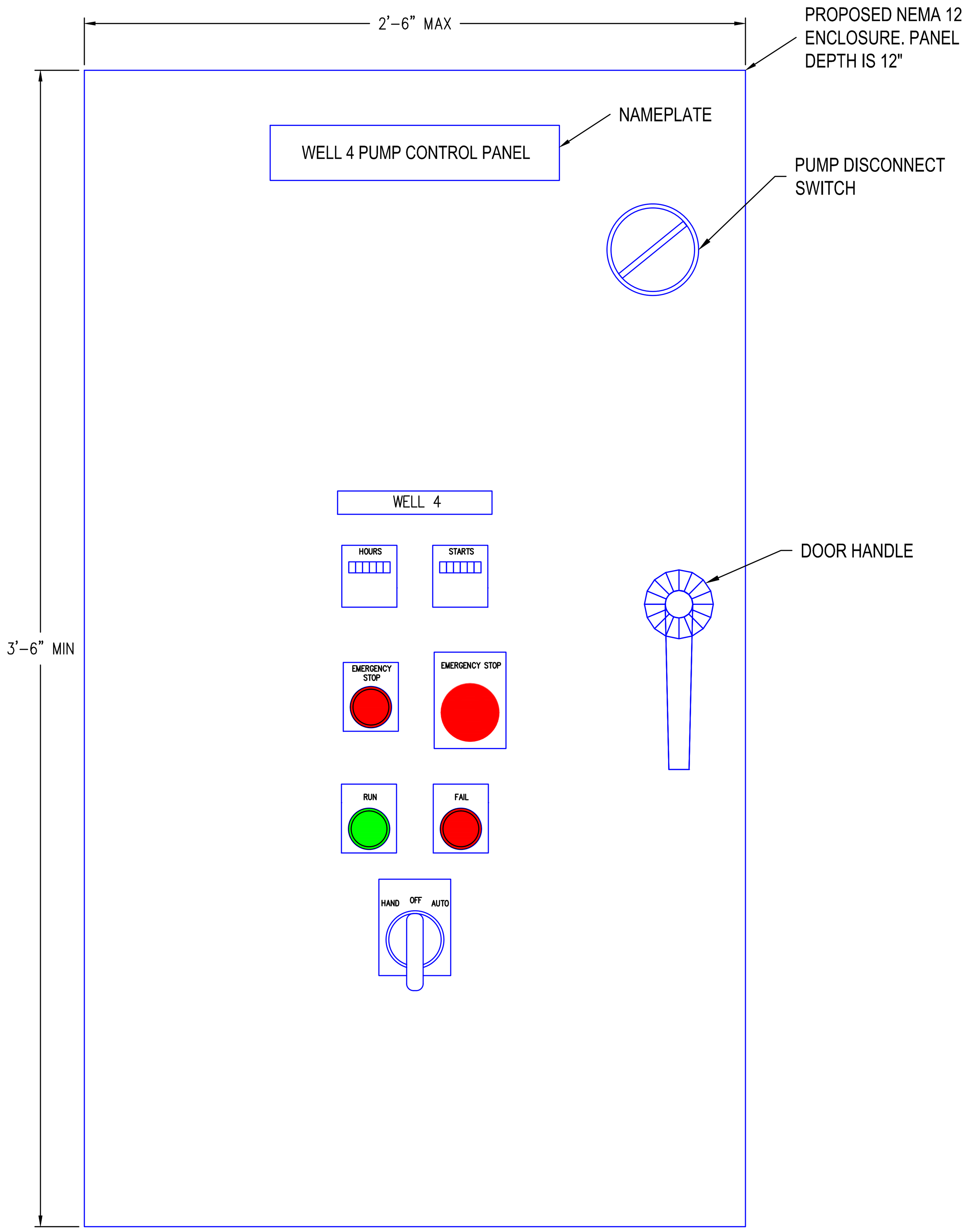
ELECTRICAL PLAN

ENGINEER: KES | REVIEWED: CMR | SAVE DATE: Jan 9, 2018 | PLOT DATE: Jan 30, 2018 | CLIENT: HP | FILENAME: RWPS-D-ELEC01.DWG | JOB NO.: 117-087

REVISIONS				
NO.	DATE	DESCRIPTION	BY	REVIEW

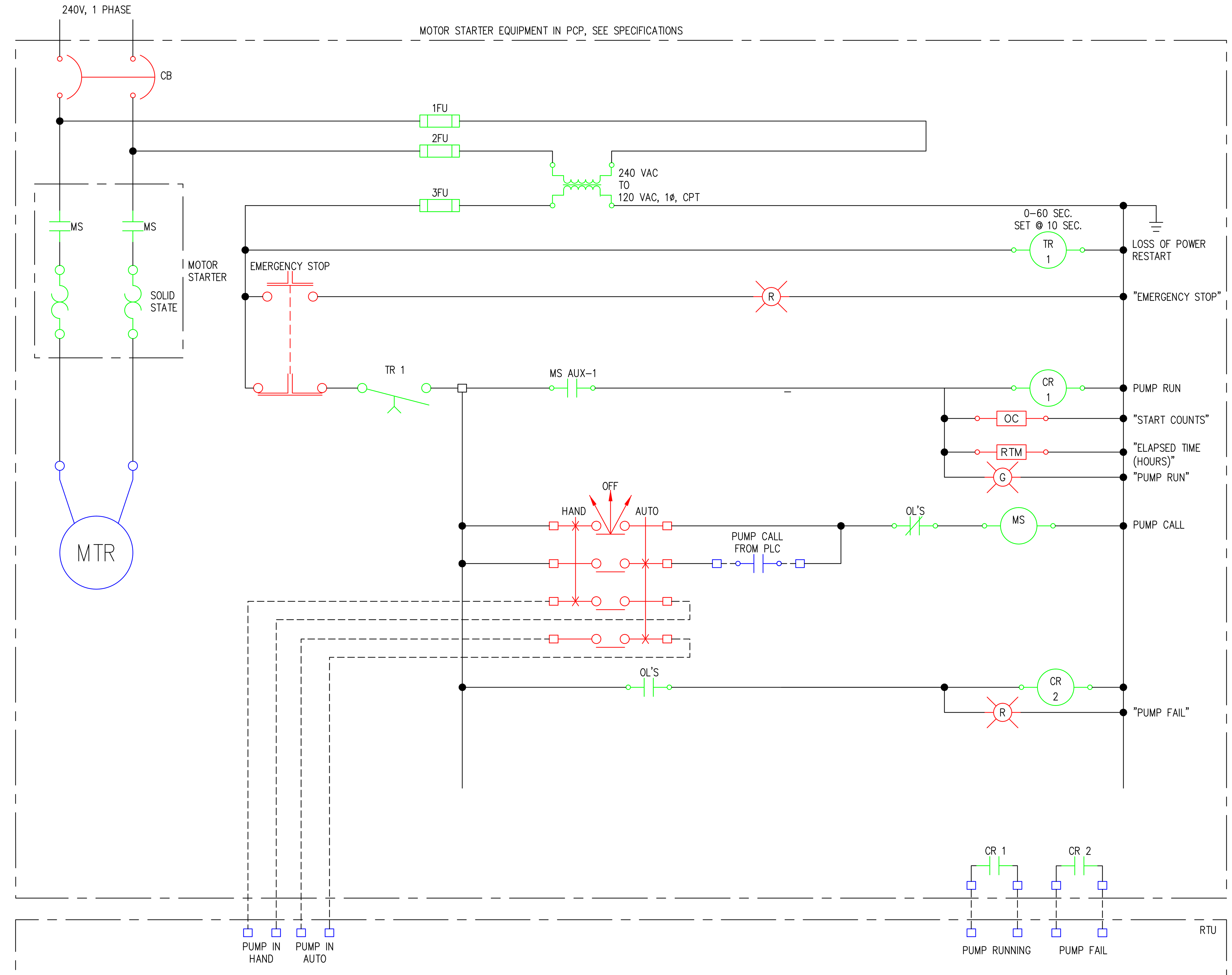
SCALE: SHOWN
0" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: E03 | SHEET NO.: 7 / 9



WELL 4 PUMP CONTROL PANEL LAYOUT

NOT TO SCALE



WELL PUMP CONTROL LOGIC IN WELL 4 PUMP CONTROL PANEL

NOT TO SCALE

SIGNED: 01/30/18

SIGNED: 01/30/18

RH2 ENGINEERS PLANNERS SCIENTISTS

RH2 ENGINEERING, INC.

Hartstene Pointe Water-Sewer District

Groundwater Replacement Well 4

WELL 4 PUMP CONTROL PANEL DETAILS

JOB NO.: 117-087

CLIENT: HP

FILENAME: RWPS-0-ELEC01.DWG

SAVE DATE: Jan 9, 2018

PLOT DATE: Jan 30, 2018

ENGINEER: KES

REVIEWED: CMR

REVISIONS

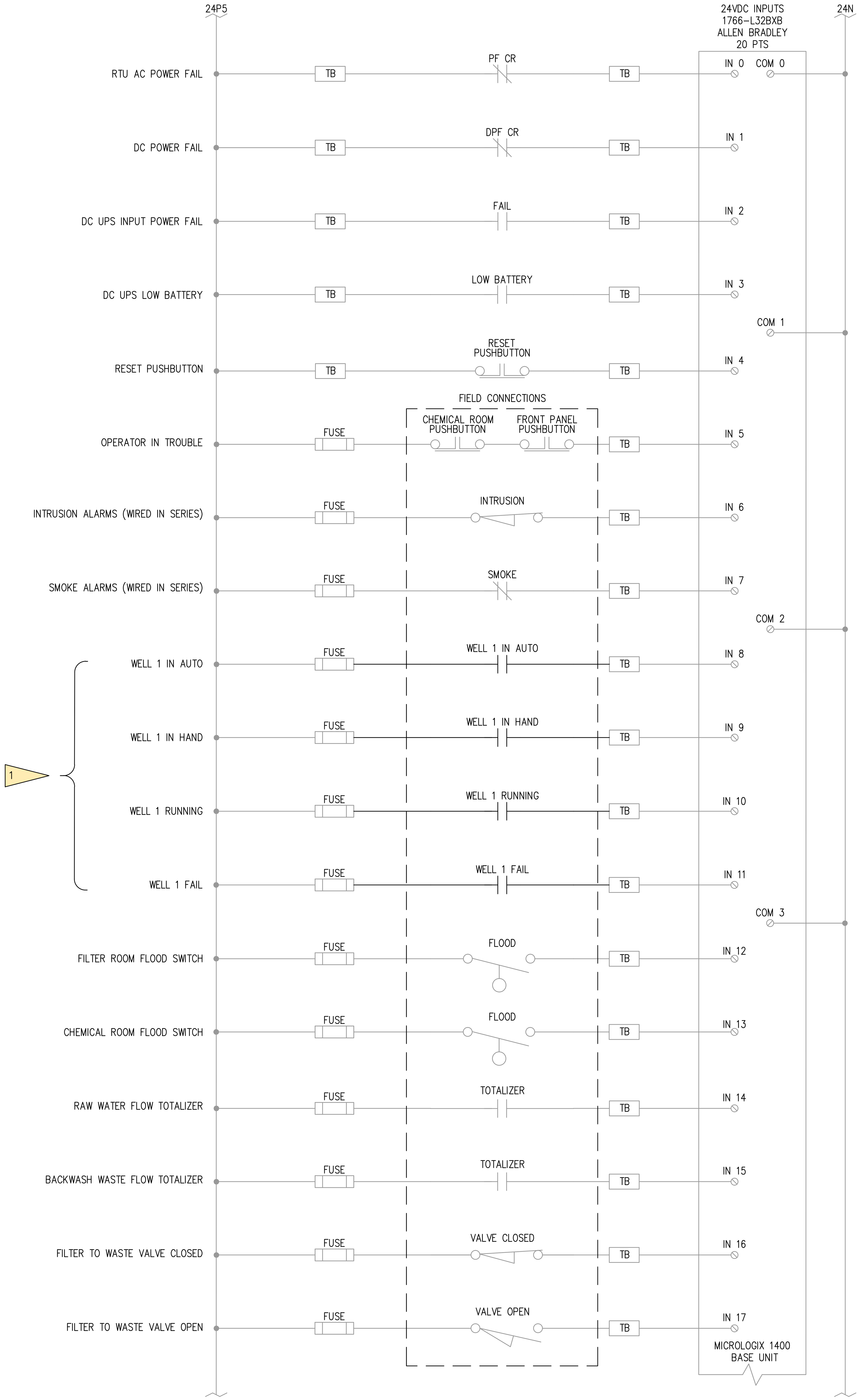
NO.	DATE	DESCRIPTION	BY	REVIEW

SCALE: SHOWN

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

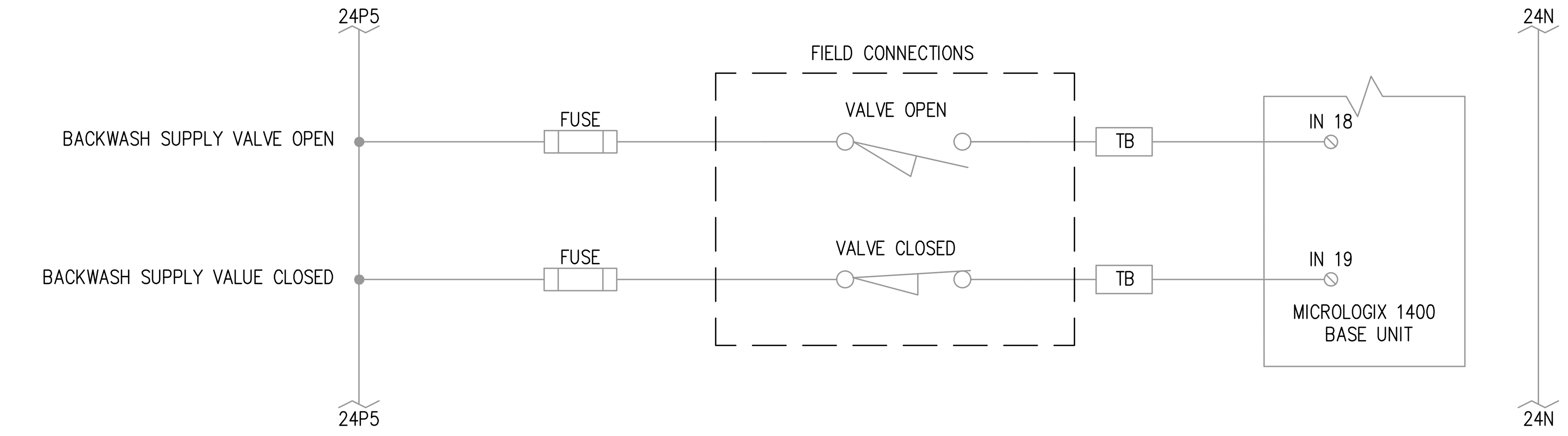
DWG NO.: E04

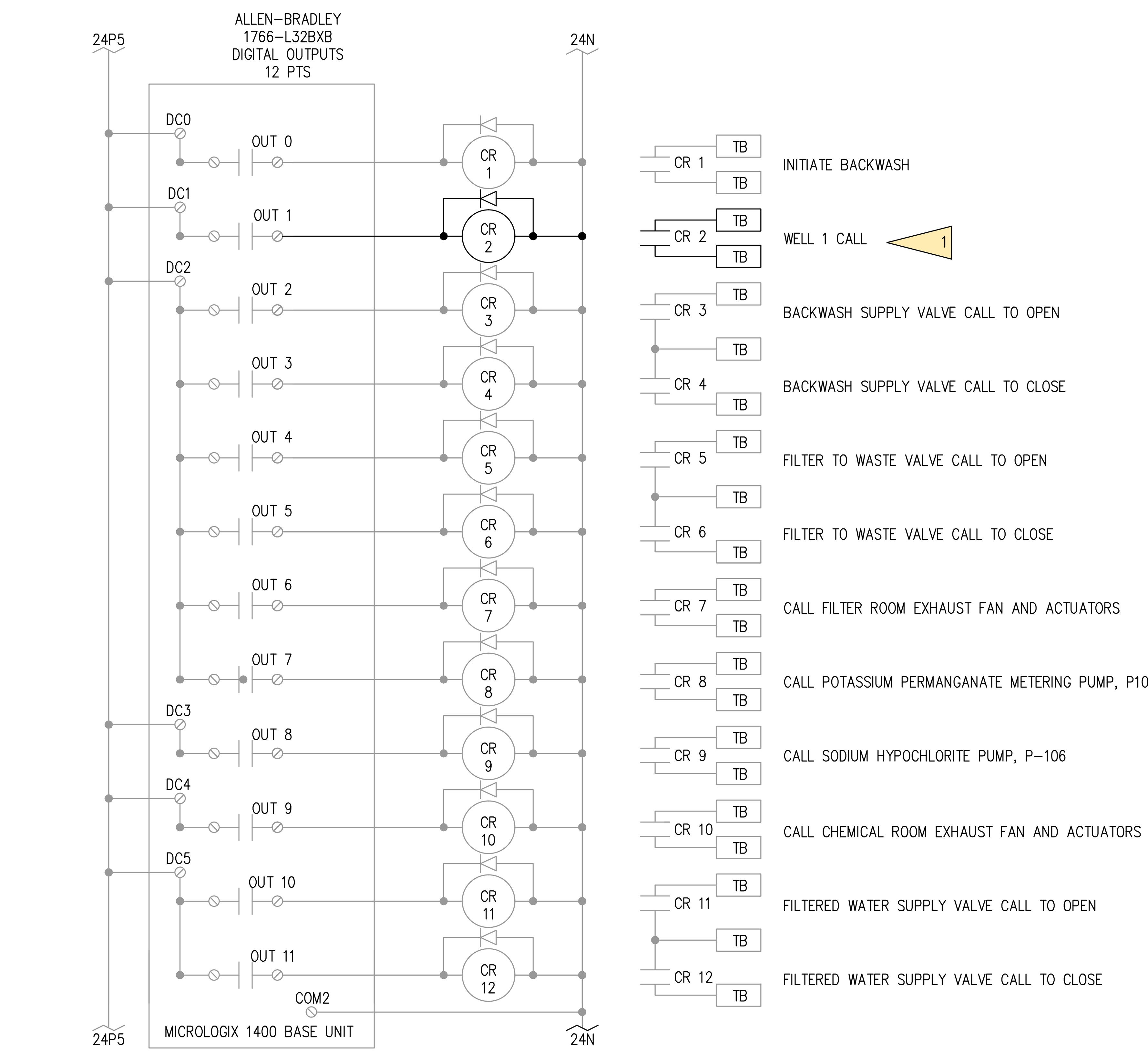
SHEET NO.: 8 / 9



DIGITAL INPUTS, BASE UNIT

NOT TO SCALE





ELECTRICAL NOTES	
1	1. DISCONNECT FIELD WIRING AT EXISTING WELL CONTROL PANEL AND RECONNECT FIELD WIRING AT PROPOSED WELL 4 CONTROL PANEL.

SIGNED: 01/30/18

SIGNED: 01/30/18

RH2 ENGINEERS PLANNERS SCIENTISTS

RH2 ENGINEERING, INC.
www.rh2.com 1.800.720.8052
22722 29th Drive SE, Suite 210

Hartstene Pointe Water-Sewer District
Groundwater Replacement Well 4

TELEMETRY PLANS

JOB NO.: 117-087
CLIENT: HP
FILENAME: RWPS-D-ELEC01.DWG
SAVE DATE: Jan 9, 2018
PLOT DATE: Jan 30, 2018
ENGINEER: KES
REVIEWED: CMR

REVISIONS

NO.	DATE	DESCRIPTION	BY	REVIEW

SCALE: SHOWN

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: E05
SHEET NO.: 9 / 9

Technical Specifications and Appendix (Volume I of II)

Groundwater Replacement Well 4 Project

C E R T I F I C A T I O N

These Technical Specifications and Appendix (Volume I of II) for the Groundwater Replacement Well 4 Project have been prepared under the direction of the following Registered Professional Engineers. The content of this document, as a means of professional service, is protected by 17 U.S.C. § 101, et seq. As such, it shall not be used, in whole or in part, for any other project or purpose without written authorization from RH2 Engineering.

Signed: 01/30/18

Project Engineer
Division 16 - Electrical

Signed: 01/30/18

Project Engineer

Signed: 01/30/18

Principal

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1.10 GENERAL

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

Sections in these specifications titled "*Related Sections*" shall be read as integral to the specification as if they were fully detailed within. All work and materials described in such sections shall be provided and performed by the Contractor.

1.11.01 Project Description

The Groundwater Replacement Well 4 project consists of equipping existing replacement well, Well 4, with a submersible turbine pump and motor; installing buried and above grade piping systems to connect the well to the existing Well 1 Water Treatment Plant (WTP); installing enclosures to house the above grade piping; mechanical disconnection of existing Well 1 pump discharge from the WTP; removal of existing infrastructure; and associated site, concrete and electrical improvements. The existing WTP has a capacity of 110 gpm and treatment processes include chemical addition and filtration for the removal of iron, manganese, and arsenic. This project does not include any modifications to the existing WTP other than connection of the Well 4 source and disconnection of the Well 1 source.

1.11.02 Reuse of Documents

Contractor and any Subcontractor or Supplier shall not:

1. Have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
2. Reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.
3. The prohibitions of this Paragraph will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

1.11.03 Electronic Data

1. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner to Contractor, or by Contractor to Owner, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
2. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 30 days,

after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 30-day acceptance period will be corrected by the transferring party.

3. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

1.13 Permits and Licenses

The Contractor shall acquire and pay for all other necessary permits which may include:

- Electrical Permit
- Disposal Permit
- Mason County Business License

Conform to the requirements of these permits and all other permits issued for this project.

1.15 Warranty

The Contractor shall warrant all work and products for a period of one (1) year following project acceptance. The date of project acceptance is defined as the date the final payment is sent to the Contractor from the Owner.

Warranty does not cover damage due to misuse by the Owner or conditions outside of the Owner or Contractor's control or exceptional events (force majeure) including war, strikes, floods (water exceeding normal high water mark), rainfall in excess of 100 year storm event, fire, earthquakes, high winds (over 85 mph for 3 seconds peak gust), freezes below 10 degrees Fahrenheit (Western Washington), governmental restrictions, vandalism, and power failures or surges. The Contractor has control over workmanship, third party subcontractors and parts and materials used to complete the project.

1.20 PRICE AND PAYMENT

1.29 Cost Increases for Materials

There will be no allowance for additional payment should the cost of any materials go up during the original contract timeframe, or during any approved contract time extensions. The Contractor is responsible for securing prices at the time of bid.

1.30 ADMINISTRATIVE

1.31 Responsibilities

1.31.1 Contractor's Responsibility

The work included in this contract is shown on the contract plans and described in these project specifications. All work incidental and necessary to the completion of the work described and shown shall be performed by the Contractor. In submitting a bid for this project, the Bidder warrants that they are an expert in this and related work, that they understand the

process and functions shown, and that various work and processes not shown but necessary for the successful operation of this project will be provided by the Contractor.

The General (or Prime) Contractor is fully responsible for providing his subcontractors and suppliers with all relevant portions of the plans and specifications necessary to bid and construct the improvements.

Damage to existing utilities or property shall be repaired or replaced by the Contractor at the discretion of the Owner.

The Contractor and each of the Subcontractors are responsible for coordinating the required inspections. There are specific requirements for inspection responsibilities and the advance notice that must be given to minimize construction delays. It is the Contractor's responsibility to be familiar with these requirements, include the coordination necessary in this estimate of project costs and schedule, and to comply with the requirements during construction. Failure to follow proper inspection and notification procedures may result in on-site work stoppages and removal or demolition of unapproved structures or systems, all at the Contractor's expense. See Testing, Startup, and Operation section below for details.

Do not start work on this project or on any public or private right-of-way or easement until clearance is given by the Owner. It will be the responsibility of the Contractor to comply with the requirements of any permit for the project. Do not hinder private property access without a 24-hour notice to the private property owner, and do not hinder access for more than an 8-hour period. Do not disrupt emergency aid access to private property.

The Contractor is solely responsible for all elements of site safety. Inspections performed by the Owner are only to monitor and record that project plans and specifications are being complied with and construction is consistent with the design intent.

The Contractor shall be responsible for managing, coordinating, and overseeing his subcontractors, suppliers, manufacturers' representatives, or any other persons performing Work. The Contractor shall have a competent representative, familiar with the project and work being performed, on-site at all times.

1.31.1.1 Construction Inspection Scheduling

Unless otherwise noted on the plans or within these specifications, 48-hour prior notice shall be given to the Owner and appropriate reviewing agency for all inspections required for the construction of the project. 48-hour notice is defined as two complete working day notice. Time is not counted on weekends and holidays (inspections required on a Monday or the day after a holiday shall be scheduled a minimum of 48 hours in advance not including the holiday hours or weekend hours.)

Contractor shall schedule and arrange for the following inspections and tests with the Owner.

- Native subgrade beneath proposed concrete pads
- Soils and crushed rock compaction
- Pressure testing
- Water quality testing

1.31.1.2 Contractor Conducted Progress Meetings

The Contractor shall schedule and hold regular on-site progress meetings at least weekly (during periods of active construction on site) and at other times as requested by the Owner or as required by progress of the work. The Contractor, Owner, and all Subcontractors active on the site must attend each meeting.

1.31.1.3 Contractor Provided Schedule and Non-working Day Approval

Contractor is responsible for providing an up to date construction schedule as requested by the Owner or as required by progress of the work. If the current schedule is still in-line with the previous schedule, the Contractor shall inform the Owner. Non-working day requests shall be received by the Owner upon Contractor's determination that a day is non-workable per this Contract. Owner may delay monthly progress payments if Contractor fails to submit updated schedule and non-working day requests.

1.31.2 Owner Inspector's Responsibility

The Owner may elect to have an inspector on site to monitor, observe and record construction progress. The Contractor maintains complete responsibility to verify construction is meeting the design intent and is being constructed in accordance with the plans and specifications. It is not the responsibility of the Owner's inspector to address neither means and methods issues on site nor direct safety issues on site. The Owner's inspector does not have the authority to stop work if unsafe conditions are observed.

1.33 Submittals

1.33.1 Submittal and Shop Drawings

Submittals are required for all items installed on this contract. Submittals shall be addressed to:

RH2 Engineering, Inc.
22722 29th Dr. SE, Suite 210
Bothell, WA 98021

Attn: Danielle Dorr

Email: ddorr@rh2.com

Submittals may be provided in electronic format (preferred) or hard copy. Owner reserves the right to require the Contractor to provide hard-copy submittals at no additional cost to the Owner. Where hard-copy submittals are provided, Contractor shall submit three (3) copies; one set will be returned to the Contractor after review.

Electronic submittal via email is acceptable, however the Contractor shall take responsibility to follow up with the Owner to verify that the submittal was received. The Owner assumes no responsibility for emails that do not make it to the recipient. In the case of electronic submittals, only one copy will be returned to the Contractor, either electronically or hard copy at the Owner's discretion.

Submittal data for each item shall contain sufficient information on each item to determine if it is in compliance with the contract requirements. Submittal cutsheets and datasheets shall be annotated by the Contractor and shall clearly indicate the equipment and materials that will be provided, including any options or additive items. No generic cutsheets or datasheets will be accepted.

Items that are installed in the work that have not been approved through the submittal process shall be removed and an approved product shall be furnished, all at the Contractor's expense.

Shop drawing review will be limited to general design requirements only, and shall not relieve the Contractor from responsibility for errors or omissions, or responsibility for consequences due to deviations from the contract documents. No changes may be made in any submittal after it has been reviewed except with written notice and approval from the Owner.

Shop drawings shall be submitted on 8½-inch by 11-inch, 11-inch by 17-inch, or 22-inch by 34-inch sheets and shall contain the following information:

- Project Name as it appears on the Document Cover.
- Prime Contractor and Applicable Subcontractor.
- RH2 Engineering.
- Owner's Name.
- Applicable Specification and Drawings Reference.
- A stamp showing that the Contractor has checked the equipment for conformance with the contract requirements, coordination with other work on the job, and dimensional suitability.
- A place for the Engineer to stamp.

Submittals that do not comply with these requirements may be returned to the Contractor for re-submittal. The Contractor shall revise and resubmit as necessary. Acceptable submittals will be reviewed as promptly as possible, and transmitted to the Contractor not later than 15 working days after receipt by the Engineer. Delays caused by the need for re-submittal shall not be a basis for an extension of contract time or delay damages.

Shop drawings and submittals shall contain the following information for all items:

A. Shop or equipment drawings, dimensions, and weights.

B. Catalog information.

C. Manufacturer's specifications.

D. Special handling instructions.

E. Maintenance requirements.

F. Wiring and control diagrams.

G. List of contract exceptions.

By approving and submitting shop drawings and samples, the Contractor warrants that they have determined and verified all field measurements, field construction criteria, materials,

catalog numbers, and similar data, and have checked and coordinated each shop drawing with the requirements of the work and of the contract documents.

The Owner will pay the costs and provide review services for a first and second review of each submittal item. Additional reviews shall be paid by Contractor by withholding the appropriate amounts from each payment estimate.

The Contractor is responsible for identifying the shop drawings and submittals required for this project. Specific submittal requirements are listed in each section of these specifications. Contractor shall keep a complete and up to date copy of all submittals and review responses at the job site readily available to the Owner for inspection.

1.33.2 Substitutions

Any product or construction method that does not meet these specifications will be considered a substitution. Substitutions must be approved prior to their installation or use on this project.

No guarantee is made that product model numbers included in the specifications or on the plans are current at the time of bidding. The bidder shall provide pricing in their proposal for current versions of discontinued models. If the bidder is uncertain of the correct replacement model, or feels there is a price discrepancy, the bidder shall request a substitution following the requirements of section 1.33.2.1 Prior to Bid Opening. Requests for price increases after award will not be accepted.

1.33.2.1 Prior to Bid Opening

Before opening bids, the Owner will consider written requests from product suppliers or prime bidders only for substitutions that fall under the description in the second paragraph of 1.33.2 Substitutions above. All requests for substitution must be received by Owner a minimum of 7 working days prior to bid opening. Requests shall be accompanied by drawings and specifications in sufficient detail to allow the Owner to determine whether or not the substitute proposed is equal to that specified. All requests shall include a listing of any significant variations in material or methods from those specified. If there are no variations, a statement to that fact shall be included in the request for approval. The determination as to whether or not a proposed substitute is acceptable shall rest solely with the Owner. Approval of substitutions will be only by addendum. The bidder shall include, in the proposal, all costs for any modifications required to adopt the substitute.

1.40 QUALITY CONTROL

1.42 Reference Specifications

Work under this contract shall be performed in accordance with applicable sections of the current Standard Specifications for Road, Bridge and Municipal Construction, Washington State Chapter, American Public Works Association, and Washington State Department of Transportation, hereafter referred to as the Standard Specifications.

Certain other referenced standards used in this specification are from the latest editions of:

- IBC International Building Code

- UPC Uniform Plumbing Code
- IMC International Mechanical Code
- IFC International Fire Code
- NEC National Electrical Code
- AWWA American Water Works Association
- ANSI American National Standards Institute
- ASA American Standards Association
- ASTM American Society for Testing and Materials

1.50 CONSTRUCTION SUPPORT

1.51 Temporary Utilities

Sanitary facilities adequate for all workers shall comply with all codes and regulations.

Temporary electrical power is available from the existing water treatment plant facility. The Contractor is responsible for reviewing what is available and making all arrangements for the required construction power. The Contractor shall obtain approval of the arrangements by the Owner prior to implementing. Upon completion of the project, remove all temporary construction power equipment, material and wiring from the site that is the property of the Contractor.

Temporary water is available from the existing water treatment plant facility's piping to the distribution system. The Contractor is responsible for making all arrangements for the required construction water. The Contractor shall obtain approval of the arrangements by the Owner prior to implementing. Upon completion of the project, remove all temporary construction water equipment and materials.

1.52 Temporary Facilities

The Contractor is responsible for construction and location of all field offices, all necessary gates and barricades, fences, handrails, guard rails, and securities required by this contract, or by laws and regulations. There shall be shelters and dry facilities for the workers as required. The Contractor shall insure that all guards, marks, shields, protective clothing, rain gear, and other equipment required by law, ordinance, labor contracts, Occupational Safety and Health Administration (OSHA) regulations, and other regulations for the maintenance of health and safety be supplied. First aid kits and equipment as required by law shall also be supplied.

1.59 Site Control

The Contractor shall not perform work activities, store materials or equipment, move equipment through, or disturb in any way the areas outside the project site, which consists of the existing driveway, Well 4 location and the existing WTP facility unless approved by the Owner in writing.

1.70 EXECUTION AND CLOSEOUT

1.74 Cleaning and Waste Management

1.74.2.1 Site and Facility Cleanup

Clean up debris and unused material, and remove from the site and any buildings. If vehicle traffic causes ruts, repair asphalt (new or existing) in paved areas, in other areas back track with dozer or excavator and repair to proposed surface condition including necessary hydroseed, mulch, and landscaping. Eliminate weeds within the construction area prior to project closeout.

Buildings shall be broom clean and all foreign damage or markings removed or repaired.

Equipment shall be washed clean using appropriate methods.

Unpainted exposed concrete structures shall be cleaned to a consistent bare concrete surface finish. Remove extraneous substances such as efflorescence, leakage residue, and excess repair materials.

Remove existing equipment or materials identified in the contract documents. Dispose of all such existing equipment or materials unless the Owner requests items to be salvaged for their use. Owner has first right of salvage.

1.75 Testing, Startup, and Operation

1.75.01 Schedule

The placing of all improvements in service shall consist of three parts: "testing", "startup", and "operation". Not less than 20 working days before the anticipated time for beginning testing, the Contractor shall notify and submit to the Owner for approval, a complete plan for the following:

1. Schedules for tests:
    A. Pumps and motors
2. Detail schedule of procedures for startup.
3. Complete schedule of events to be accomplished during testing.
4. An outline of work remaining under the contract that will be carried out concurrently with the operation phases.

Failure to provide proper notification to the Owner may lead to liquidated damages if schedule cannot be maintained. If rescheduling is required because components are not ready for testing the notification requirements are reset and shall provide for 10 calendar days advance notice in order to reserve Engineer's and/or Owner Representatives' time.

1.75.02 Testing

The Contractor may periodically request preliminary testing for items that must be covered or tested before other work can proceed. In these cases, the work shall not be tested or covered up without timely notice to the Owner of its readiness for testing. Should any work be covered

up without notice, approval, or consent, it must, if required by the Owner, be uncovered for examination at the Contractor's expense. Where work is to be tested, all necessary equipment shall be set up and the work given a preliminary test so that any and all defects may be discovered and repaired prior to calling out the Owner for the test.

Final testing shall consist of individual tests and checks made on equipment intended to provide proof of performance of unit and proper operation of unit control together with necessary tests to show system operation in the presence of the Owner. Assure proper alignment, size, condition, capability, strength, proper adjustment, lubrication, pressure, hydraulic test, leakage test, and all other tests deemed necessary by the Owner to determine that all materials and equipment are of specified quality, properly situated, anchored, and in all respects, ready for use. Any certificates required by these specifications by the manufacturer's representatives shall be supplied to the Owner prior to startup.

All piping shall be tested as required by specifications and applicable codes. Tests on individual items of equipment, such as pipelines, structures, controls, and other items shall be as necessary to show proper system operation. During testing, the Contractor shall correct any defective work discovered. Startup shall not begin until all tests required by these specifications have been completed and approved by the Owner.

Not less than five working days before the anticipated time for beginning the testing, the Contractor shall provide a list of representatives that will be attending the testing. The Owner may request additional representatives at no additional cost if said representatives are identified in these specifications.

Qualified product representatives to be on site for the following equipment, at a minimum:

- Submersible Pump and Motor

Additional representatives required may be identified elsewhere in these specifications.

The Contractor shall conduct all testing and startup. Testing and startup shall not be a cause for claims for delay by the Contractor and all expenses for testing and startup shall be incidental to this contract. The Contractor shall make arrangements for all materials, supplies, and labor necessary to efficiently complete the testing, startup, and operation. At a minimum, the Contractor shall provide:

- Voltmeter
- Amp meter.

1.75.03 Scheduling of Owner Review for Testing

See Division 1.75.01 Schedule for scheduling and notification requirements.

In addition, the Contractor shall provide further notification two working days and two working hours (to confirm schedule) of the scheduled test to the Owner confirming that the Contractor has successfully completed all preliminary testing and that all equipment, tools, materials, labor, subcontractors, manufacturer's representatives, and all other items required for witnessed testing are available and fully functional. Failure to provide advance notification and confirmation, or meet any of the testing requirements shall constitute a failed test in accordance with the section Inspection and Tests of the General Conditions.

A detailed testing schedule shall be provided by the Contractor and updated as needed to be at least 48 hours ahead of actual testing at the project site. If testing requires downtime in order to perform repairs due to failed test, the Contractor shall pay the Owner in the amount of $200 per hour per Owner Representative on site (minimum of $400 per scheduled visit) for downtime lasting longer than 1 hour required to complete repairs to verify the complete construction is ready for startup and operation. This amount will be deducted from the appropriate bid item that relates to the finished construction and documented by the Owner at their discretion. The Contractor is required to have all systems pre-tested to their satisfaction prior to calling the Owner for formal testing.

1.75.04 Pump Testing

See Divisions 11.10.1 for pumps and 11.20.1 for motors.

1.75.06 Electrical and Control Systems Testing

See Division 16.95 for electrical system testing.

1.75.30 Startup

Startup shall consist of a simulated operation of all equipment and controls. The purpose of startup shall be to check that all equipment will function under operating conditions, and that all interlocking controls and sequences are properly set.

Technically qualified factory representatives shall be present for the startup phase. All Representatives shall be trained, qualified, and have experience in troubleshooting and fixing field issues. The startup shall continue until it is demonstrated that all functions, controls, and machinery are functioning correctly.

Authorized factory representatives shall be provided for the following items:

- Pumps and motors

1.79 Training and Documentation

The Contractor shall remove all tags and instructions that come packaged with or attached to equipment used on the project. Deliver all such documents to the Owner bound in a three ring binder or with the Operation and Maintenance Manual. Insert documents in sleeves if they cannot be punched. Scan all such documents to Adobe PDF format and provide with the Operation and Maintenance Manual.

1.79.1 Training

At the time that the pump and motor are ready to be put into operation, the Contractor is to conduct an operation and maintenance training meeting with the owner to explain in detail the operation and maintenance requirements. The training meeting may occur on the same date(s) as startup.

Operation of the pump and motor shall commence immediately after completion of testing, startup, and owner training and after satisfactory repairs and adjustments have been made.

1.79.2 Operation and Maintenance Manuals

Detailed requirements for specific equipment and systems may also be included in their respective specification sections.

The Contractor shall deliver to the Owner acceptable manufacturer's operating and maintenance instructions covering equipment and systems installed on the Project requiring operational and/or maintenance procedures and for any additional items indicated by the Owner, including coatings furnished under this contract.

The operating and maintenance instructions shall include, as a minimum, the following data for each coating and item of mechanical and electrical equipment:

Products

A. Equipment Identification including brand name, model number and serial numbers.

B. Date of manufacture and date of installation on job site.

C. Complete as-built elementary wiring and one-line diagrams.

D. Complete parts list, by generic title and identification number, complete with exploded views of each assembly.

Maintenance

A. Recommended spare parts.

B. Lubrication schedule including the applicable lubricant designation available from the Standard Oil Company of California.

C. Recommended preventive maintenance procedures and schedules. Schedule shall be provided for daily, weekly, monthly, quarterly, semi-annually and annually maintenance.

D. Disassembly and re-assembly instructions including parts identification and a complete parts breakdown for all equipment.

E. Weights of individual components of each item of equipment weighing over 50 pounds.

F. Name, location, and telephone number of the nearest suppliers and spare parts warehouses.

G. All manufacturers' warranties. Include name, address, and telephone number of the manufacturer's representative to be contacted for warranty, parts, or service information.

H. Cleaning, repair, and maintenance instructions for each coating system.

I. Provide videotapes, video CDs or DVDs utilized in the manufacturer's instruction program for the owner.

Operation

A. Recommended trouble-shooting and startup procedures.

B. Recommended step-by-step operating procedures.

C. Emergency operation modes, if applicable.

D. Normal shutdown procedures.

E. Long term shutdown (mothballing) procedures.

F. Equipment specifications and guaranteed performance data.

G. General manuals which describe several items not in the contract will not be accepted unless all references to irrelevant equipment are neatly eradicated or blocked out.

Provide 3 hard copies of O&M manuals. A duplicate CD copy shall also be provided, but shall not substitute the hard copies.

Each set of instructions shall be bound into multiple volumes; each volume to be complete with an index and bound in a suitable, hard-covered binder. Binders shall be of hardback construction with full-length metal hinge. Capacity shall be 3-inch to 5-inch as appropriate for the quantity of O&M documentation. More than one binder may be required for large projects. Binders shall be equal to Wilson-Jones WLJ344 series or WLJ369 series or Specialty Loose Leaf models 87784, 98085, 98086, or 98984.

Manuals shall be assembled and indexed so that information on each piece of equipment can be readily found.

Progress payments for the total contract work in excess of 90 percent completion may not be made until the operation and maintenance manual has been delivered and approved by the Owner, at their discretion.

The Contractor shall secure and deliver to the Owner all equipment warranties and other warranties and guarantees required for all equipment and processes. Delivery shall be done at one time covering all major and minor equipment warranties. Copies of the warranties shall be included in each O & M Manual.

See Division 1.15 for details regarding required warranties for specific components.

1.79.3 Construction Record Drawings

Progress payments for the total contract work in excess of 90 percent completion may not be made until the Contractor has delivered a complete set of acceptable "As-Constructed" records to the Engineer. Plans shall be made on clean, unmarked prints for this project in accordance with the following standards:

- Yellow markings or highlights = deleted items
- Red markings = new or modified items

The Contractor shall provide "as-built" information on all items and work shown on the plans showing details of the finished product including dimensions, locations, outlines, changes, manufacturers, etc. The information must be in sufficient detail to allow the Owner's personnel to locate, maintain, and operate the finished product and its various components.

See also electrical plan requirements in Division 16.05.

1.80 PERFORMANCE REQUIREMENTS

1.82 Pressure Ratings

Fittings, valves, pipe and fluid systems shall have pressure ratings equal to or greater than the pressures identified below, unless specifically called out otherwise in the plans or specifications:

Equipment Function	Working Pressure	Test Pressure
Well 4 Raw Water	40-55 psi	150 psi

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2.00 GENERAL

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

2.05 Common Work for Sitework

This division covers that work necessary for providing materials and performing all sitework as described in these specifications and as shown on the Plans.

Part 1 - General

Submittals

Submittal information shall be provided to the Owner for the following items:

- Erosion Control Fence Fabric
- Spill Control and Response Plan
- Letter for contaminant-free imported fill
- General Fill
- Pipe Bedding
- Trench Backfill
- Gravel

Other Items listed in this section or required by the Owner.

2.09 Special Inspections for Earth Work

Part 3 – Execution

Field Quality Control

Special inspections including visual and probing of subgrade and compaction effort are required for the following locations:

- Trench backfill (visual and probe)
- Native subgrade beneath concrete pads (visual and probe)
- Crushed rock fill beneath concrete pads (visual and probe)

Areas of native undisturbed subgrade shall be visually inspected by the Owner prior to placement of any material overtop. Contractor shall coordinate with the Owner a minimum of two (2) full working days prior to inspection being needed.

The Contractor shall schedule with Owner for visual and probe review of earthwork activity.

2.10 SITE PREPARATION

2.10.2 Clearing and Grubbing

Part 3- Execution

Construction

Do not remove organic material including plants, grasses, trees and native topsoil unless directed by the Plans. In instances where the Contractor is allowed to clear areas to facilitate construction but is not required to, any areas disturbed by construction shall be surface restored to existing or better condition including matching surface restoration with hydroseed or plantings as shown in adjacent areas required to be modified by the Plans. Where the Contractor is allowed to clear areas to facilitate construction, surface restoration shall be completed at no additional cost to the owner.

2.10.3 Well Protection

Part 1 – General

The proposed site is located within the Owner's Sanitary Control Area for their potable water supply Well 1 and Well 4. The Contractor shall be responsible for preventing accidental release of contaminants due to construction activities. The Contractor is responsible for aquifer water quality during the entire construction phase and should take all means necessary to protect the water quality. This shall include but is not limited to, the use of vegetable oil in construction hydraulic equipment, immediate spill containment and cleanup if it occurs during construction, installation and maintenance of temporary erosion and sedimentation control devices and all other work necessary to protect the water quality of the well.

The Owner has water quality records for the aquifer that indicate that it is not currently contaminated. The Contractor shall be responsible for maintaining this baseline aquifer water quality at the site during construction.

Submittals

At a minimum, the Contractor shall provide the following as part of a spill control and response plan. A draft of this plan is due at the pre-construction conference. The final approved version of the plan shall be due prior to construction activities commencing on the sites.

1. The contractor shall provide a designated person in charge of spill control and site maintenance. This person shall be on-site during operating hours and be responsible for supervising the use and storage of hazardous materials and shall take appropriate actions in the event of a release. This person shall also be available 24 hours per day in the event of a release during non-working hours.
2. Secondary containment of hazardous materials and refueling areas shall be provided (containment equal to the size of the primary container or the largest container for multiple containers in one containment device). Sanitary, refueling and hazardous material storage shall not be allowed within the 100-foot sanitary radius on the well site,

and the Contractor shall designate other areas for this in their plan. Prevent access by the public to hazardous materials left on any site during non-working hours.

3. Construction vehicles and stationary equipment that are found to be leaking fuel, hydraulic fluid, and/or other hazardous materials shall be removed from the well protection area or repaired in place as soon as possible and may remain on the site in the interim only if leakage is completely contained. Contractor shall keep spill containment and treatment materials on-site at all times. Depending on the frequency of occurrence, the contractor may be required to provide spill containment devices on equipment at all times (i.e. diapers).
4. Equipment and supplies adequate for the immediate clean-up of the worst case hazardous materials spill shall be stored on-site in close proximity to hazardous materials; and
5. All spills or leaks shall be immediately contained, reported and cleaned up as required by state and local regulations, DOE guidelines and as noted below. Upon detection of a leak, contractor shall immediately stop work and correct the leak, contain the spill, and remove the contaminated material from the site for proper disposal. The contractor shall over-excavate the contaminated site at least 2 feet in all directions to confirm that the spilled material has not penetrated further.

Part 3 – Execution

Field Quality Control

A water quality sample will be taken prior to construction and it will be the project baseline water quality sample. After the well is properly disinfected and flushed, a water quality sample will be taken by the Owner and the water quality must be equal to or better than the baseline sample.

2.10.5 Construction Access

Part 3 - Execution

Repair/Restoration

The Contractor is responsible for maintaining all construction accesses during construction and the cost of such maintenance shall be incidental to the bid price. Maintenance includes repairing settled and damaged areas, and providing dust control. Cost for maintenance due to rain, snow, wind, or other weather conditions shall be incidental to the bid price.

Cleaning

Wherever construction vehicle access routes intersect paved roads, provisions must be made by the Contractor to minimize the transport of sediment onto the paved road. The Contractor shall remove all dirt, mud, rocks, vegetation, or other deleterious material from all construction equipment prior to leaving the site. This may include spray washing, sweeping, or other physical methods as necessary to remove materials.

If sediment or other debris is transported onto a paved road surface, the road shall be cleaned thoroughly by the end of the work day. Debris shall be removed from roads by shoveling or sweeping. Street washing shall be allowed only after debris has been removed in this manner.

2.11 Earthwork Materials

2.11.1 Common Work for Earthwork Materials

Part 1 - General

Acceptance at Site

Owner shall review the site near the end of each pay period to determine the equivalent percentage of earthwork completed compared to the total earthwork lump sum price. Contractor shall be paid based on the percentage completed based on Owner's judgment of percent complete.

Part 2 - Products

Source Quality Control

All imported fill material shall be free of hydrocarbons (e.g. gasoline, diesel, oil, etc.), pesticides, herbicides and other hazardous volatile organic compounds (VOCs) and synthetic organic chemicals (SOCs), which are harmful in drinking water. The Contractor shall provide a letter from the fill supplier to the Owner that the fill is free of these contaminant chemicals.

Imported fills found not to be compliant with regulatory standards shall be hauled off site and disposed of properly, at the sole expense of the Contractor.

2.11.2 General Fill

Part 1 – General

Summary

All fill required for this project that is not specifically defined as another type shall be "General Fill".

References

Section 9-03.14(3) Common Borrow of the Standard Specifications.

Part 2 – Products

Components

General fill shall be soil free of organics, debris, and other deleterious materials with no individual particles having a maximum dimension larger than 5 inches. The moisture content of the material and weather conditions at the time of placement will be used to determine the suitability of native materials for backfill as general fill.

Part 3 – Execution

Installation/Construction

All general (or native) fill shall be compacted in uniform layers not exceeding 18 inches in loose thickness and compacted to at least 90 percent maximum dry density based on the ASTM D-1557 (modified) test procedure.

2.11.4 Pipe Bedding

Part 1 – General

Summary

All fill placed below and around buried utilities shall be "Pipe Bedding". The pipe bedding material has been selected to support the weight of the utility by distributing the load so that the completed utility and backfill system does not weigh more than the native material. In addition, the grain size has been selected so that the bedding will not migrate into the bottom of the trench. The Contractor must take particular care to maintain the integrity of the utility design by using the appropriate pipe bedding material where shown.

References

For Conduit and Galvanized Water Piping: Bedding shall conform with Section 9-03.13 "Backfill for Sand Drains" or as approved by the Inspector.

Part 3 – Execution

Installation/Construction

Bedding material shall surround the pipe and conduits to the limits shown on the Plans and provide uniform support along the entire length without allowing concentrated loading at joints or bells or that results in any bridging of the pipe. All bedding material shall bear on firm subgrade and be compacted to firm and unyielding condition.

2.11.5 Trench Backfill

Part 1 – General

Summary

All fill placed above the pipe bedding in a trench shall be "Trench Backfill". The trench backfill material has been selected to distribute surface loads over the utility. In addition, the grain size has been selected so that the trench backfill will not migrate into the pipe bedding or trench walls. The Contractor must take particular care to maintain the integrity of the utility design by using the appropriate trench backfill material where shown. The moisture content of the material and weather conditions at the time of placement will be used to determine the suitability of native materials for fill as trench backfill.

References

Trench backfill shall consist of materials conforming to Section 9-03.19 "Bank Run Gravel for Trench Backfill" of the Standard Specifications or as approved by the Owner.

Part 3 – Execution

Installation/Construction

Trench backfill (or native fill) shall be placed and compacted above the pipe bedding to finished grade elevations in unrestored areas or to subgrade elevations in restored areas.

Trench backfill (or native fill) shall be placed in uniform layers not to exceed 18 inches in loose thickness. Each lift is to be compacted to at least 90 percent of its maximum dry density based on the ASTM D-1557 (modified) test procedure.

2.11.7 Gravel Base Course

Part 1 – General

Summary

All fill placed under concrete slabs and to restore the existing site driveway shall be "Gravel Base Course" unless otherwise called out on the Plans.

References

Aggregate for gravel base course shall conform to Section 9-03.9(3) Crushed Surfacing Base Course of the Standard Specifications.

2.20 EARTH MOVING

2.23 Excavation

Part 1 – General

Summary

The Contractor shall excavate as necessary to construct the improvements shown.

Part 2 – Products

Materials

All excavated material below the organic layer can be re-used as backfill as long as it is properly protected from water saturation, meets the specification for the backfill purpose, and is approved by the Owner. Approval of material as backfill will be made the moment before placement of the material as backfill. Weather conditions may make previously approved material unsuitable for backfill requiring the material to be removed from the project site.

Excavated material that is not used as backfill shall be disposed off-site. All permits for the disposal of excavated material shall be obtained by the Contractor. A copy of all permits and the locations of each disposal site shall be submitted to the Owner.

Part 3 – Execution

Installation/Construction

Excavation shall include the digging, scraping, and removing existing native material, abandoned or interfering utilities, abandoned or interfering structures and any other obstacles necessary for the construction of the improvements shown on the Plans. Excavation includes utility excavation, structural excavation, and grading excavation.

Utility excavation shall be performed to the depths necessary to complete the utility construction work shown.

Structural excavation shall be performed to the limits necessary to complete the construction work shown.

Excavated material may be stockpiled on site at locations approved by the Owner.

Examination

The base of the excavation shall be evaluated by the Owner to determine if it is suitable for backfilling. The Owner will evaluate the stability of the base of excavation by determining if all significant organic soils or other unsuitable materials have been removed.

2.25 Erosion and Sedimentation Control

2.25.4 Stormwater Discharge

Part 3 – Execution

Field Quality Control

The Contractor shall be responsible for meeting all construction stormwater discharge water quality requirements including State of Washington (WAC 173-220-020), Construction Stormwater Permit requirements and local requirements regardless of weather conditions.

If the project is fined by the permitting authority, that stormwater fine shall be paid for by the Contractor at no additional cost to the Owner.

2.25.5 Filter Fabric Fence

Part 3 – Execution

Installation/Construction

When required to prevent downhill stormwater runoff to ditches or off site, a filter fabric fence shall be installed to allow the collection and passage of surface water to occur through the fabric before discharge off site. When joints are necessary, filter fabric shall be spliced together at a support post with a minimum overlap of six inches. Both ends of the fabric shall be securely fastened to the post. The filter fabric fence shall be installed to follow the contours of the existing grade where feasible. The fence posts shall be driven securely into the ground a minimum of 30 inches and spaced apart at a maximum of six feet. A wire mesh support fence shall be fastened securely to the uphill side of the posts using heavy-duty wire staples at least one inch long, tie wires, or wire rings. The wire shall extend into the trench a minimum of four inches and shall not extend more than 36 inches above the existing surface. An 8 inch by 12 inch trench shall be excavated on the uphill side of the fence for securely burying the lower edge of the fabric fence. At least 20 inches of the filter fabric fence shall continuously extend into the trench. The filter fabric fence shall extend above the existing grade 36 inches. The filter fabric placed in the trench shall be secured with backfill material of three-quarter inch washed rock. The backfill material shall be placed in the trench and on either side of the fence as shown on the construction Plans.

Field Quality Control

Filter fabric fence shall be inspected by the Contractor immediately after each rainfall and at least once daily during periods of prolonged rainfall. The Contractor shall repair or replace

sections of the filter fabric fence that are not filtering surface water. The filter fabric fence may be removed after the threat of off-site contamination has passed.

2.60 CONTAMINATED & WASTE MATERIALS HANDLING

2.60.2 Waste Material Control

Part 1 – General

Quality Assurance

Adhere to all requirements of federal, state, and local statutes and regulations dealing with pollution. Permit no public nuisances.

Use only dump sites that are approved by the regulatory agency having jurisdiction, and present proof of approval upon request.

Part 3 – Execution

Installation/Construction

The Contractor shall take precautions to warn, protect, and prevent the public from all hazards that exist on site due to any demolition or construction operations. Stockpiled debris shall be surrounded with yellow warning tape attached to lath, stakes, poles, or fencing to warn the public of any potential hazard.

Use water sprinkling, temporary enclosures, or other methods to limit dust and dirt from rising and scattering in the air. Surface water runoff that is contaminated with site debris, silt, or other material that adversely affects water quality shall be collected and cleaned prior to discharge. On site collection ponds may not be used to keep silt laden water from entering the storm water collection system.

Do not use water to control dust when its use may create hazardous or objectionable conditions such as ice formation, flooding, and pollution.

The Contractor shall minimize the amount of dust and other airborne particles caused by any demolition, excavation, stockpiling, or removal activities. Dust control measures shall be implemented by the Contractor prior to the beginning of work activities. Exposed soil may be wetted with water or covered to minimize dust creation. Water runoff from the wetting procedure shall be accumulated and cleaned prior to disposal. Water runoff accumulation shall be removed from the site prior to project completion.

Cleaning

At all times, keep the construction area clean and orderly and upon completion of the work, leave all parts of the work clean and free of rubbish and excess material of any kind. Leave equipment clean and free of stains or other marks or defects. Upon completion, restore site of all work or equipment and material storage areas to their original conditions. Remove all miscellaneous unused material resulting from work and dispose of it in a manner satisfactory to the Owner. The site, through the progress of construction, shall be kept as clean as possible and in a neat condition.

2.61 Contaminated Materials

2.61.2 Toxic Spill or Release Contact Requirements

Part 3 - Execution

Field Quality Control

During construction, if there is any toxic substance spill or release discharged into the environment, report the location, quantity, date and time of the spill or release to Washington State Emergency Management at 1 (800) 258-5990 and the Owner's representative. Spills shall be monitored, contained, and cleaned up to applicable codes at the Contractor's expense.

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3.00 GENERAL

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

3.05 Common Work for Concrete

Part 1 - General

This division covers that work necessary for furnishing and installing all concrete as described in these specifications and as shown on the Plans.

References

Materials shall conform to the following standards:

- Cement - ASTM C-150
- Coarse aggregate - ASTM C-33
- Fine aggregate - ASTM C-33

Submittals

Submittal information shall be provided to the Owner for the following items:

- Concrete mix design including aggregate gradation and substantiating strength data.
- Admixture Data
- Concrete anchors
- Rebar mill certifications
- Rebar placement shop drawings
- Grouts

Concrete mix designs shall be submitted to the engineer for approval a minimum of two weeks prior to placing any concrete. The mix design shall include the amounts of cement, fine and coarse aggregate, water and admixtures, as well as the water cement ratio, slump, concrete yield, aggregate gradation, and substantiating strength data in accordance with ACI 318, Chapter 5. Review of mix submittals by the engineer of record indicates only that information presented conforms generally with contract documents. Contractor or supplier maintains full responsibility for specified performance.

Part 2 - Products

Components

Nominal maximum size for aggregates is the smallest standard sieve opening through which the entire amount of aggregate is permitted to pass. Provide intermediate aggregate grades as required to achieve a well-graded mix.

All concrete surfaces exposed to weather or standing water shall be air entrained. Total air content shall be in accordance with IBC requirements unless specified otherwise herein. Air shall be measured at the truck, unless otherwise agreed to.

Water used in concrete shall be potable.

Fly ash may be substituted for up to 15 percent of the required cement, except where noted.

Mixes

Concrete shall be mixed, conveyed, and proportioned in accordance with IBC section 1905.

The concrete mix shall include the amount of cement, fine and coarse aggregate, including aggregate gradations, water, and admixtures as well as water cement ratio, slump, concrete yield, and sustaining strength data in accordance with these specifications, the requirements of the International Building Code Section 1905, and the requirements of ACI 318.

Part 3 - Execution

Inspection

See Statement of Special Inspections on the Drawings for special inspection requirements. Provide two (2) full working day notice to Owner prior to needing the required inspections.

The Contractor shall repair, replace or modify, as appropriate, any items noted in the Special Inspector's inspection.

3.10 FORMING AND ACCESSORIES

3.11 Formwork

3.11.13 Cast in Place Forming

Part 2 – Products

Materials

Unless otherwise directed, coat contact surface of forms with colorless, non-staining, mineral oil that is free from kerosene, or other approved suitable material, to permit satisfactory removal of forms without concrete damage.

Form construction for exposed surfaces shall be made of new plywood or steel without surface markings.

Part 3 - Execution

Installation/Construction

Concrete forms shall be sufficiently tight to prevent leakage of concrete or mortar and shall be properly braced or tied together to maintain desired position and shape until removed.

Conduits, pipes and sleeves of any material not harmful to concrete and within the limitations of ACI 318, Section 6.3 are permitted to be embedded in concrete with approval of the Engineer. Provide a ¾-inch chamfer or radius at all exposed corners and edges, unless specifically stated otherwise on the Plans.

Forms shall remain in place until the concrete has developed sufficient strength to withstand imposed loads without damage or deflection. Slab forms shall remain in place for a minimum of 24 hours after completion of the pour. The Contractor shall coordinate with the testing lab to verify concrete strength prior to form removal.

Do not allow water to flow through areas where forms are to be placed. During form construction and prior to placement of concrete, keep footings and floor slab areas free of standing water.

Field Quality Control

Variations from dimensions shall not exceed plus or minus ½-inch. Closer tolerances shall be achieved by the Contractor as necessary to accommodate equipment and other permanent materials.

3.15 Accessory Materials

3.15.19 Concrete Anchors

Part 1 - General

Quality Assurance

Installation of adhesive anchors shall be performed by personnel certified in accordance with the ACI/CRSI Adhesive Anchor Installer Certification Program. In lieu of certification the installer shall attend on-site training held by the adhesive manufacturer prior to the installation of adhesive anchors.

Part 2 - Products

Materials

Concrete Anchors shall be Hilti HIT 500-V3, Simpson SET-XP, or Powers PE1000+ Adhesive Anchors.

Threaded rod shall be stainless steel except in dry locations.

Part 3 - Execution

Installation

Install in accordance with Manufacturer's recommendations. Special Inspection in accordance with IBC, Section 17, must be provided. Provide a minimum of 48 hours' notice to Engineer prior to starting installation. Concrete anchors shall not be used to resist tension or fatigue loading without Owner's evaluation and approval.

Use threaded rod or reinforcing bar based on application and meeting Manufacturer's recommendations. Provide minimum embedment meeting Manufacturer's requirements and subject to Engineer approval. Holes shall be drilled with carbide-tipped drill bit. Holes shall be cleaned of dust and debris. Adhesive shall be inserted with a mixing nozzle.

3.20 REINFORCING

3.21 Reinforcing Steel

3.21.13 Reinforcing Steel

Part 1 - General

References

ACI – American Concrete Institute- latest edition

CRSI Manual of Standard Practice – latest edition

Part 2 - Products

Materials

Grade – ASTM A706, Grade 60

ASTM A615, Grade 60 shall be permitted if:

(a)The actual yield strength based on mill tests does not exceed fy by more than 18,000 psi; and,

(b) The ratio of actual tensile strength to the actual yield strength is not less than 1.25.

Detailing - ACI 318 and ACI 315

Lap requirements - As required by ACI 318

Tie wire - 16 gauge minimum

Bar supports shall conform to "Bar Support Specification" CRSI Manual of Standard Practice, MSP-1-80. Provide Class 1, plastic protected bar supports. Use pre-cast concrete blocks to support bars off ground. Bar supports in a water holding structure shall be non-metallic.

Part 3 - Execution

Installation

Reinforcing steel shall be detailed in accordance with ACI 315 and 318 and as shown on the Plans. Lap all reinforcements in as required by ACI 318.

Welding of reinforcing steel shall not be performed unless specifically approved by the Engineer. If approved, Contractor will arrange and pay for all required Special Inspections associated with welding of reinforcing steel.

Field Quality Control

Reinforcing steel shall be free of rust and loose scale at time of concrete placement. Bars with kinks, improper bends, or reduced cross-section due to any cause will not be used. Bars shall not be field bent. Bars may not be tack-welded or otherwise heated.

If, within the project warranty period, rust spots appear on the concrete due to failure to achieve proper clearance on the rebar or wire ties, the Contractor shall grind out and patch the areas using a method satisfactory to the engineer.

3.30 CAST-IN-PLACE CONCRETE

3.30.01 Common Work for Cast in Place Concrete

Part 1 - General

Delivery

Concrete shall be transported in a truck mixer to the jobsite and discharged within 1.5 hours after cement has been added to water or aggregates. Rejected concrete will be at Contractor's expense.

Part 2 - Products

Components

If allowed, curing materials shall conform to ASTM C-171 and liquid membrane-forming compounds shall conform to ASTM C-309. When concrete is to be coated or stained, use UV-dissipating form release and curing compounds.

Part 3 - Execution

Preparation

Do not place concrete during rain, sleet, or snow until water and freezing protection is provided.

Before beginning placement of concrete, remove hardened concrete and foreign materials from inner surface of mixing and conveying equipment. Before depositing concrete, remove debris from space to be occupied by the concrete. Secure reinforcement in position to prevent movement during concrete placement.

Installation

Placement shall be in accordance with IBC, Section 1905.

Place no concrete when air temperature is below or expected to be below 40 degrees during the 28-day curing period unless a low temperature concrete mix has been approved by the Owner. Provide adequate equipment for heating materials and protecting concrete during freezing or near freezing weather. Keep materials, reinforcement, forms, and ground in contact with concrete free from frost at time of placement. Heat mixing water as required. Use no materials containing ice.

Place no concrete when air temperature exceeds or is expected to exceed 85 degrees during the 28-day curing period unless a high temperature placement plan has been approved, and unless adequate precautions are taken to protect work. Cool ingredients prior to mixing. Flake ice or crushed ice of a size that will melt completely during mixing may be substituted for all or part of water. Cool forms and reinforcing prior to placing concrete.

Handle concrete from mixer, ready-mixed truck, or from transporting vehicle to place of final deposit by methods which prevent separation or loss of ingredients. Under no circumstances shall concrete that has partially hardened be deposited.

Consolidate slabs by utilizing vibrating screeds, roller pipe screeds, internal vibrators, or other approved methods. Have a spare vibrator available at jobsite during concrete placing operations.

After removal of forms, cut out and patch defects in concrete surfaces. Remove form tie cones. Cut or snap off form ties to a depth of ¾-inch. Chip out rock pockets, holes from form tie removal, and other defects to solid concrete. Repair defects in accordance with 3.01.30.71.

Curing

All concrete shall be water-cured in accordance with ACI 308.1 unless approved in advance by the Owner. If allowed, curing compound shall be applied immediately after finishing or form removal. When plastic or burlap covers are used to augment or protect curing, extend sheeting beyond the edges of the concrete and secure against wind lift. Inspect and adjust curing systems daily, including over weekends and holidays.

3.31 CONCRETE MATERIALS

3.31.02 Structural Concrete

Part 1 - General

Summary

All concrete as shown on the Plans and not called out otherwise. Use water reducers as required to achieve slump.

Performance Requirements

28-day compressive strength - 4500 psi minimum

Slump - Without plasticizers; 4 inches for floor. With plasticizers, maximum 9 inches or as desired for placement.

Part 2 - Products

Mixes

Water/cement ratio - 0.40

Nominal maximum aggregate size – ¾-inch (AASHTO Grading No. 67)

Entrained air ratio – 3.5 percent minimum to 6.5 percent maximum

3.35 SURFACE FINISHING

3.35.01 Common Work for Surface Finishing

Part 2 - Products

- Slabs – Light Brushed

Part 3 - Execution

Preparation

Do not place concrete which requires finishing until the materials, tools, and labor necessary for finishing the wet concrete are on the job and acceptable to the Owner. If rainfall is possible, tent the work area prior to the pour and maintain protection until the concrete is cured sufficiently to resist damage.

3.35.06 Light Brush Finish

Part 2 – Products

Finish

When concrete has appropriately set, finish with light soft broom finish. Brush perpendicular to slab slope.

Part 3 - Execution

Construction

Consolidate, strike off, and level concrete; but do not work further until ready for floating. Begin floating when water sheen has disappeared and surface has stiffened sufficiently to permit floating operations. Consolidate surface with power-driven floats. Hand floating may be used if area is small or inaccessible to power units.

Field Quality Control

Check surface planeness during or after first floating. Cut down high spots and fill low spots to produce surface with tolerance of ¼-inch in 10 feet in any direction. Re-float to a uniform, smooth, sweat finish concrete.

3.60 GROUTING

3.62 Non-Shrink Grout

Part 1 - General

Summary

General Purpose Non-Shrink grout may be used for any grouting applications.

Storage and Handling

Stockpile grout to prevent contamination from foreign materials and store admixtures to prevent contamination or damage from excess temperature change.

Part 2 - Products

Materials

<u>General Purpose Non-Shrink Grout:</u>

General Purpose Non-shrink grout shall meet the compressive strength and nonshrink requirements of CRD-C 621, Grades B and C; Corp or Engineers Specification for

Non-shrink grout; and ASTM C 1107, Grades B and C. General Purpose Non-shrink grout shall be Masterflow 713 Plus or Embeco 636 Plus or approved equal.

Provide curing compounds as recommended by the grout manufacturer.

Water to be used in mixing the grout shall be potable.

Mixes

Comply with grout manufacturer's recommendations for mixing procedures.

Adjust water temperature to keep mixed grout temperature in the range of 45 degrees Fahrenheit (7 degrees Celsius) and 90 degrees Fahrenheit (32 degrees Celsius) minimum/maximum.

Use cold or iced water to extend working time in hot weather or in large placements.

Use warm water in cold conditions to achieve minimum as mixed temperatures.

Part 3 - Installation

Preparation

Mechanically remove unsound concrete within the limits of the grout placement.

Remove at least ¼-inch (6mm) of existing concrete facing and continue removal as required to expose sound aggregate.

Thoroughly clean the roughened surface of dirt, loose chips, and dust. Maintain substrate in a saturated condition for 24 hours prior to grouting. Surface should be saturated surface dry at time of grouting.

Clean baseplates and other metal surfaces to be grouted to obtain maximum adhesion. Remove loose rust and scale by grinding or sanding.

Comply with grout manufacturer's recommendations for form construction. Construct forms to be liquid tight.

Installation

Place grout mixture into prepared areas from one side to the other. Avoid placing grout from opposite sides in order to prevent voids. Work material firmly into the bottom and sides to assure good bond and to eliminate voids.

Ensure that foundation and baseplate are within maximum/minimum placement temperatures. Shade foundation from summer sunlight under hot conditions. Warm foundation when foundation temperature is below 45 degrees Fahrenheit (7 degrees Celsius).

Wet cure exposed shoulders for 48 hours followed by two coats of curing compound for best results. The minimal requirement is to wet cure until grout has reached final set, followed by two coats of curing compounds.

Division 4
Masonry – Not Used

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Division 5
Fabricated Metalwork and Structural Plastics – Not Used

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Division 6
Carpentry – Not Used

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Division 7
Thermal and Moisture Protection

7.00 GENERAL

This division covers furnishing all labor, materials, and equipment for providing a structure (this Division does not apply to the Hot Rok) which is completely weather-tight.

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

7.05 Common Work for Thermal and Moisture Protection

Part 1 - General

Submittals

Submittal information shall be provided to the Owner for the following items:

- Caulk

7.90 JOINT PROTECTION

7.92 General Joint Sealants

Part 1 – General

Submittals

Submit schedule for caulk used on the project for approval prior to application.

Part 2 – Products

Materials

Concrete and Masonry

DAP® Premium Polyurethane Concrete Sealant or equal.

Wood or Concrete Board Siding

DAP® ALEX PLUS® Acrylic Latex Caulk Plus Silicone or equal.

Other Surfaces

Contractor shall provide caulk appropriate to surface and reason for caulk application. Caulk shall be the most durable available (longest warranty) by DAP®, or equal.

Part 3 – Execution

Installation

Caulk all joints and spaces necessary to provide a completely weather-tight product.

Apply caulking in strict accordance with manufacturer's directions with regard to temperature at application and curing times, surface condition, moisture, and cleanliness.

Apply after surfacing prime and prior to final coatings if surface is to be coated. If surface will not be coated, provide color choices to the Owner for approval prior to application.

Clean all adjoining surfaces of excess sealant, smears, or marking due to application and leave joints with neat, uniformly-filled surfaces.

Division 8
Openings – Not Used

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9.00 GENERAL

This division covers work necessary for providing all materials, equipment, and labor to coat all items in accordance with these specifications.

Sections in these specifications titled *"Common Work for . . ."* shall apply to all following subsections whether directly referenced or not.

9.90 PAINTING AND COATING

9.90.00 Common Work for Painting and Coating

Part 1 – General

Scope

The work specified in this Section covers the furnishing and installation of protective coating, complete in place. Shop coating and/or factory applied finishes on manufactured or fabricated items are specified elsewhere. Regardless of the number of coats previously applied, at least two coats of paint shall be applied in the field to all coated surfaces unless otherwise specified herein.

Submittals

Before beginning any painting or coating, submit a list of coatings and manufacturers intended for use for review by the Owner. Include the application each coating is intended for, any surface preparation, number of coats, method of application, and coating thickness.

Provide Safety Data Sheets (SDS) for all materials to be used including solvents. Provide NSF certification for all finishes in potential contact with potable water. Submit this information in accordance with the requirements regarding shop drawings included herein.

Performance Requirements

The completed coating shall produce a minimum dry film thickness in accordance with the specifications

Storage and Handling

Bring all materials to the job site in the original sealed and labeled containers of the paint manufacturer. Materials shall be subject to inspection by the Owner. Store paint supplies as recommended by the manufacturer and as approved by the Owner.

Extra Materials

Dispose of all extra materials not desired by the Owner.

Waste Products

The Contractor shall be responsible for the collection, containment, transportation, and disposal of all waste products generated for this project. Cleaning and disposal shall comply with all federal, state, and local pollution control laws. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.

Part 2 – Products

Manufacturers

The following coating system manufacturers are approved:

1. Sherwin Williams

Part 3 – Execution

Examination

The Owner shall inspect and approve all surface preparations prior to application of any coating. Provide 24-hour notice prior to surface inspection needs.

Preparation

Prepare surfaces in accordance with the recommendations of the manufacturer of the coating to be applied to the surface, or the surface preparation requirements of these specifications, whichever are stricter.

Coatings shall only be applied during weather meeting the recommendations of the coating manufacturer. Air and surface temperatures, humidity, and all other environmental conditions shall be within limits prescribed by the manufacturer for the coating being applied, and work areas shall be reasonably free of airborne dust at the time of application and while coating is drying.

Materials shall be mixed, thinned, and applied according to the manufacturer's printed instructions. Dry Film Thickness (DFT) shall be as stated here in or applied based on coverage rates of square feet per gallon (sq. ft./gal).

Installation/Construction

Paint application shall be in strict accordance with manufacturer's printed instructions except that coating thickness specified herein shall govern. Finished coating on all items shall be clean, undamaged, and of uniform thickness and color.

Coating shall be done in a manner satisfactory to the Owner. The dry film thickness listed in the "Materials" section of this Division must be met, regardless of the applied film thickness or number of coats.

Carefully observe all safety precautions stated in the manufacturer's printed instructions. Provide adequate ventilation and lighting at all times.

The manufacturer's recommended drying time shall be construed to mean "under normal conditions". Where conditions are other than normal because of weather, confined spaces, or other reason, longer drying times may be necessary. The manufacturer's recommendation for recoating time intervals shall be strictly adhered to.

Field Quality Control

The prime Contractor shall be completely responsible for coating quality.

If the Owner finds anomalies and/or defects, the Contractor shall re-prep and recoat those areas per the coating manufacturer's instructions.

Acceptance of the completed coatings shall be based on the proper application and proper preparation of the coated surfaces, and a finished product that does not contain runs, drips, surface irregularities, overspray, color variations, scratches, pinholes, holidays, and other surface signs that detract from the overall performance and/or appearance of the finished project.

Repair/Restoration

Scratched, chipped, or otherwise damaged coatings, including factory coatings, shall be repaired before final acceptance will be given.

Cleaning

If any cleaning of equipment at the site is performed with solvents, such work shall be done over leak-proof linings. Preparation or coating materials may not be disposed of on site.

9.91 Painting and Coating Systems

Refer to 9.90.00 for coating application requirements.

9.91.13 Exterior Painting

9.91.13.10 - System 1: Wood - Exterior, Painted

Part 1 - General

Exterior wood surfaces.

Part 2 - Products

1. Sherwin Williams
    a. Primer: Exterior Latex Wood Primer (250 to 300 square feet per gallon)
    b. Intermediate Coat: A-100 Exterior Latex (1.5 Mil DFT)
    c. Finish Coat: A-100 Exterior Latex (1.5 Mil DFT)

Part 3 - Execution

Surface Preparation

1. Surface clean, dry, and free of contaminates.

9.91.23 Interior Painting

9.91.23.03 - System 2: Galvanized Metal Surface Repair

Part 1 - General

This Section applies to all galvanized surfaces which have received minor damage to the galvanized surface during construction and which require repair.

Part 2 - Products

1. Sherwin-Williams
    a. First Coat: Corothane 1 Galvapac 1K Zinc Primer B65G11 (2.5 to 3.5 Mil)

Part 3 - Execution

Surface Preparation

1. SSPC-SP3 Power tool cleaning

Division 10
Specialties

10.00 GENERAL

This division covers that work necessary for fabricating and installing all furnishings and accessories as described in these specifications and as shown on the Plans.

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

10.05 Common Work for Specialties

Part 1 - General

Submittals

Submittal information shall be provided to the Owner for the following items:

- Electrical and Control Equipment Signs

10.10 INFORMATION SPECIALTIES

10.14 Signs and Labels

10.14.1 Common Work for Signs and Labels

Part 2 - Products

Materials

Unless otherwise specified, text shall be white on a background color shown below.

Purpose	Plate Color
General	Black
Warning	Red
Electrical	Black

Part 3 - Execution

Installation

Install signs/markers directly on the devices in a location that does not interfere with the device operation or maintenance. If the device is too small or otherwise impractical to mount marker, locate marker as close as possible to the device on an adjacent surface.

10.14.8 Electrical and Control Equipment

Part 2 - Products

Materials

Name plates and service legends shall be phenolic-engraved, rigid, laminated plastic type with adhesive back. Letter height shall be $^{5}/_{16}$-inch unless specified otherwise on the Plans.

Labeling shall clearly identify the associate component. Color shall be black background with white letters.

Tags shall be securely attached. Adhesive backed tags shall also have at least two brass screws for positive fastening.

Part 3 – Execution

Installation

Provide engraved nameplates indicating load served, voltage, and phase for every circuit breaker, panel board, switchboard, motor control center, motor starter, disconnect switch, and fused switch.

All components provided under this specification, both field- and panel-mounted, shall be provided with permanently-mounted nametags. The Engineer shall have complete control over the hardware to be labeled and the labeling provided. Provide labels as directed.

Provide a name tag for each piece of equipment and for each circuit and/or control device associated with the equipment.

Provide a nameplate for each control center unit door.

Warning nameplates shall be provided on all panels and equipment which contain multiple power sources which may have energized circuits with the main disconnecting means in the off position. Lettering shall be white on red background.

Division 11
Equipment

11.00 GENERAL

This division covers that work necessary for providing and installing all equipment as described in these specifications and as shown on the plans.

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

11.05 Common Work for Equipment

Part 1 - General

Submittals

Submittal information shall be provided to the Owner for the following items:

- Pumps and Motors

11.10 Pumps

11.10.1 Common Work for Pumps

Part 1 - General

Summary

This section covers work necessary to provide the pumps, complete with motors and accessories, described herein and as shown on the Plans

Related Sections

- Division 1.75.1 Schedule
- Division 1.82 Pressure Ratings
- Division 11.20.1 Common Work for Pump Motors

References

- HI - Hydraulic Institute.
- ASTM - American Society for Testing and Materials.
- AISI - American Iron and Steel Institute.
- ANSI - American National Standards Institute.

Performance Requirements

Power required to operate the pump(s) shall not exceed the motor nameplate horsepower regardless of any flow and head tolerances listed in this specification.

The design and performance requirements listed for each pump must be met, with no exceptions. Pumps that do not meet all of the conditions will be rejected.

Pump parts in contact with potable water shall be lead free complying with either NSF 61 ANSI 372 tested or NSF 61 Annex G compliant. Submit lead free information with pump submittal information.

Submittals

Submittal information shall be provided for each individual pump.

Product Data:

- For Contractor proposed substitution, a minimum of 10 installations with similarly sized and configured pumps in equivalent fluid applications. Include location, contact name, and number.
- Specifications and data describing all pump parts, pieces, and components. Include information on materials of construction and proposed coating systems.
- Performance curves showing total dynamic head (TDH) in feet, efficiency and net-positive-suction head required (NPSHR) versus output in gallons per minute (GPM). All losses from the drive shaft, seal, coupling and other mechanical losses shall be included in the pump efficiency data presented. Catalog or software generated curves may be submitted for preliminary approval and ordering.
- Minimum required submergence (ft) between the flow ranges of 75 and 100 gpm.
- Complete list of all pump system components and accessories to be provided.

Shop Drawings:

- Provide detailed dimensional drawings showing outline dimensions, lengths, overall sizes, materials and weights for each pump unit and associated accessories.

Schedule:

- Provide delivery time (based on beginning at approval of drawings/submittal).

Licensed Well Driller:

- Department of Ecology license for well driller.

Closeout Submittals: Provide the following submittals prior to project closeout:

- Operations and Maintenance Manual
- Manufacturer Signed Warranties with pump serial numbers

Schedule

Provide delivery time in time from approval of shop drawings/submittal.

Quality Assurance

The pump manufacturer or pump supplier shall accept unit responsibility for the motor/pump assembly.

Ensure that pumps selected are locally serviceable and replacement parts are readily available.

Delivery, Storage, and Handling

Pumps shall be delivered, stored, and handled in accordance with manufacturer recommendations.

Warranty

All pumping equipment described in this section and provided under this contract shall be warranted against defects in materials and workmanship for a period of one years after date of project acceptance.

Extra Materials

Provide any special tools required for pump or motor maintenance.

Part 2 - Products

Manufacturers

The following manufacturers are approved for use on this project. No substitutions for different pump brands will be accepted.

- Goulds

Components

For pumps in domestic water applications, all pump components, coatings, and lubricants shall be compatible for use in potable drinking water in accordance with U.S. Food and Drug Administration (FDA) or National Sanitation Federation (NSF) rules and regulations.

All pump system components are to come from the pump supplier/pump manufacturer and shall include:

- Motor with flow sleeve
- Bowl assembly
- Check Valve
- Column assembly
- Couplings
- Submersible power cable
- All other necessary appurtenances for complete unit assembly.

Accessories

All pumps are to include an engraved non-corrosive metal nameplate on the exterior of the pump head or body (duplicate attached to pump support flange or shipped loose if submersible), readily accessible without requiring any disassembly. The nameplate shall include, at a minimum, the following information:

- Pump Manufacturer
- Pump Model Number

- Pump Serial Number
- Impeller Number
- Impeller Trim
- Number of Stages
- Design TDH (feet)
- Design Flow (gpm)
- Supplier Name and Phone Number
- Date of Manufacture

Part 3 - Execution

Preparation

Domestic water pumps shall be disinfected per AWWA A-100 prior to installation. After disinfecting, immediately flush and rinse the pumps with clean water to remove the high chlorine concentration solution. This includes the impellers and interior of bowls and casings.

Installation/Construction

Install pump units in accordance with manufacturer's specifications and direction. Installation shall be supervised and approved by manufacturer's representative prior to operating or field testing units.

Adjust pump assemblies so that driving units are properly aligned, plumb, and level with the driven units and all interconnecting shafts and couplings. Flexible couplings shall not be used to compensate for any misalignment.

Connect discharge piping to the pump in a manner which prevents strain on pump connection(s).

Field Quality Control

See Division 1.75.1 Scheduling for scheduling and notification requirements.

The pump supplier, installer or a qualified and authorized representative of the pump manufacturer shall conduct and/or supervise the field testing. Prior to acceptance of installed pumps, demonstrate proper operation of pumps at capacities stated. Upon completion of pump installation and testing, provide written certification that equipment is installed correctly and fully warranted.

Contractor shall be responsible for calibration, startup, and initial performance to meet specifications herein. A field test shall be made to give an indication of the performance of the new pump when it is operating under actual field conditions and to establish the acceptance of the pump furnished and installed. The field test shall be performed in the presence of the Engineer after the piping and controls have been installed.

During field testing, water will be pumped through the treatment plant and discharged out of the existing filter-to-waste line (discharges to the on-site sewer manhole), which is on the effluent of the filter system. The filter-to-waste line has a butterfly valve for throttling to imitate normal filter effluent operating pressures (where the effluent goes directly to the distribution system).

A performance test similar to those described in the latest edition of Hydraulic Institute's (HI) Pump Tests (ANSI/HI 11.6 Submersible) shall be performed, submitted to the Engineer and approved for each pump.

The field test shall be performed to the accuracy obtainable with the testing equipment installed as a part of the piping and instrumentation. If sufficient field devices are not available, the Contractor shall provide testing gauges and meters as needed. At a minimum, the following are needed:

- Well water level probe
- Discharge pressure gauge
- Flow meter (an electromagnetic flow meter is installed on the existing raw water pipe within the WTP)
- Electric current (Amp) meter(s), per phase, to measure voltage and amps

Submersible pump field tests shall adhere to the tolerances of HI 11.6.5.4 Grade 2U (less than 134 hp).

Testing shall be completed under the observation of the Owner and Engineer. At that time, the following data shall be collected for each pump:

- TDH vs. Flow at a minimum of three points. Additional points may be required at the discretion of the Engineer.
- Overall Efficiency

Upon completion of pump installation and testing, pump supplier, installer, or manufacturer shall provide written certification that equipment is fully warranted installed. Certification shall be provided that pumps meet all requirements set forth in these specifications and submittal literature. The pump installer shall also provide a written report of all test conditions and results.

Repair

Repair and retest units failing any field test. If unit fails second field test, unit will be rejected and supplier shall furnish a unit that will perform as specified.

11.11 Domestic and Irrigation Water Pumps

Part 1 - General

Performance Requirements

The head-capacity curve shall have a steady rise in head from maximum to minimum flow. Curves which have intermediate high or low points will be rejected.

Part 3 – Execution

Installers

All modifications to the existing well casing and, if necessary, the sanitary seal shall be performed by a Department of Ecology licensed well driller. Contractor shall provide license information prior to starting work. Contractor shall also provide all required coordination, inspection, and documentation with the Department of Ecology and the local health department as required for well modifications.

11.11.3 Submersible Turbine

Part 1 - General

Performance Requirements

Pump for Well 4 - submersible turbine deep well type. See Components for pump make and model specified. Data points provided below for additional project information.

Design head point 1 – 200 feet TDH

Design flow point 1 – 100 gpm

Design head point 2 – 250 feet TDH

Design flow point 2 – 75 gpm

Fluid – raw well water for potable supply at 55 degrees Fahrenheit

Size limitation - 10-inch nominal diameter steel casing

Minimum pump efficiency at design head point 1 – 70 percent

Minimum pump efficiency at design head point 2 – 70 percent

Minimum shut-off head - 290 feet

Taking into account motor efficiency the overall pump and motor system efficiency shall not require a motor rating capacity of greater than 7.5 hp.

Part 2 - Products

Manufacturers

See 11.10.1 Common Work for pumps for listed manufacturer. Model shall be equal to 95L07 6-inch Stainless Steel Submersible Pump, 60 Hz and 3,450 rpm with peak efficiency at 90 gpm and a manufacturer's listed operating range of 25 to 130 gpm.

Components

Pump Surface Connection

Modify the top of the casing as shown in the Plans. Provide transition from pump column piping to above-grade discharge piping as shown in the Plans including connections and transitions for sounding tubes and submersible motor cable. During the submittal process, the Contractor may propose alternative designs for casing modifications and piping

transition. Alternative designs will be reviewed by the Engineer and then approved or denied.

Fasteners

All fasteners shall be 304 stainless steel.

Column

Pump column: 3-inch nominal diameter Schedule 40 steel pipe connected with threaded couplings. Column pipe shall NOT be coated or galvanized.

Check Valves

Two (2) submersible pump check valves shall be installed along the pump column as shown in the Plans. During the submittal process identify if the manufacturer recommends or requires additional check valves. One shall be the pumps built-in positive sealing, 304 stainless steel check valve. The second shall be a pump column check valve equal to Flomatic Corporation.

Bowl and Impeller Assemblies

Pump bowls shall be constructed from stainless steel Bearings shall be replaceable and silicon carbide material for handling abrasives and for wear resistance. Shaft shall be 431 stainless steel four-sided design. Wear rings shall be an Engineered polymer equal to Technopolymer PPO.

Impellers shall be fabricated from 304 stainless steel with an enclosed design, and both statically and dynamically balanced.

Provide a 304 stainless steel cable guard to surround and protect the submersible motor cable where installed along the bowls.

Suction Strainer

Provide a 304 stainless steel strainer to restrict debris from entering the pump.

Water Level Indication Sounding Tubes

Provide and install sounding tubes as shown in the Plans. Sounding tubes shall be 1-¼" Schedule 80, ASTM D-1785 and ASTM F-480, flush-thread PVC and perforated along the entire length of the tubes. Install permanent well level transmitter in one. The other will be used as a well casing vent and for manual sounding.

Submersible Motor and Flow Sleeve

See 11.22.2 Submersible Turbine Electric Motors for motor, flow sleeve and submersible motor cable. Pump shall have 304 cast stainless steel motor adapter.

11.20 PUMP MOTORS

11.20.1 Common Work for Pump Motors

Part 1 - General

Related Sections

- Division 11.10.1 Common Work for Pumps

References

- HI - Hydraulic Institute.
- ASTM - American Society for Testing and Materials.
- AISI - American Iron and Steel Institute.
- ANSI - American National Standards Institute.
- IEEE – Institute of Electrical and Electronics Engineers

Submittals

Submittal information shall be provided for each individual motor.

Product Data:

Specifications and data describing all motor parts, pieces, and components. Include information on materials of construction.

Motor data including type, torque, RPM, no-load current, full-load amps, service and power factors, and motor efficiency at full-load.

Complete list of all motor components and accessories to be provided. All motor system components are to come from the pump or pump motor manufacturer.

Shop Drawings:

Detailed dimensional drawings showing outline dimensions, lengths, overall sizes, materials, and weights for each motor and associated accessories.

Provide catalog data for each motor showing the following information:

- Horsepower vs. Load
- Power factor vs. Load
- Efficiency vs. Load or Wire-to-Water Efficiency vs. Load

Closeout Submittals: Provide the following submittals prior to project closeout:

- Operations and Maintenance Manual
- Manufacturer signed warranties with serial numbers.

Quality Assurance

Ensure that motors selected are locally serviceable and replacement parts are readily available.

Delivery, Storage, and Handling

Motors shall be delivered, stored, and handled in accordance with manufacturer recommendations. Store in a dry, enclosed environment and in an upright position.

Warranty

All equipment described in this section and provided under this contract shall be warranted against defects in materials and workmanship for a period of one year after date of project acceptance. A combined pump-motor warranty will be acceptable in lieu of separate warranties.

Maintenance

Provide any special tools required for motor maintenance.

Part 2 - Products

Manufactured Units

Motors shall operate on a single-phase, 230 volt, 60-cycle power supply at a maximum speed of 3,450 revolutions per minute (rpm). Motors shall be designed for a continuous cycle.

Motors shall be sized such that power draw anywhere along the 100% speed pump curve shall not exceed the nameplate size. Power draw shall not encroach into the service factor. Motor shall have a service factor of 1.15. Motor size selection shall include all losses, including motor and pump bearings.

Motors shall be dynamically balanced at the factory and shall have maximum vibration amplitude of 0.001-inch peak-to-peak.

Accessories

All motors are to include an engraved non-corrosive metal nameplate on the exterior of the motor (duplicate shipped separately if submersible), readily accessible without requiring any disassembly. The nameplate shall include, at a minimum, the following information:

- Manufacturer
- Model Number
- Serial Number
- Nominal Power (hp)
- Voltage
- Phase
- Cycles (Hz)
- Full load amps

- Speed (rpm)
- Efficiency
- Date of Manufacture

Part 3 - Execution

Examination

Contractor shall determine if special lifting equipment is necessary for installation of the motors.

Installation/Construction

Install units in accordance with manufacturer's specifications and direction.

Field Quality Control

Contractor shall be responsible for calibration, startup, and initial performance to meet specifications herein. A field test shall be made to give an indication of the performance of the new motor when it is operating under actual field conditions and to establish the acceptance of the motor furnished and installed. The field test shall be observed by the Engineer after the piping and controls have been installed. Testing shall be completed in accordance with the requirements provided above.

The Contractor shall provide calibrated and certified measuring devices to measure voltage, current, and power factor for each pump motor after they have been installed.

The following data shall be collected for each motor:

- Motor current (amp) draw vs. Flow.

Repair and retest units failing field test. If unit fails second field test, unit will be rejected and supplier shall furnish a unit that will perform as specified.

11.22 Submerged Motors

11.22.2 Submersible Turbine Electric Motors

Part 1 - General

Related Section

- Division 11.20.1 Common work for pump motors

Part 2 - Products

Manufacturers

The motor shall be made a Franklin Electric 6" Sand Fighter Submersible Motor, or Engineer approved equal and compatible with the proposed pump (see 11.11.3 Submersible Turbine). The motor shall be new and unused, furnished by a manufacturer with a principal operation and an established system of aftermarket service in the United States.

Manufactured Units

The motor shall be water filled, oil lubricated motors are not acceptable. Motor shall be of the squirrel cage induction type suitable for "Across the Line" and "Reduced Voltage" starting under design conditions. It shall be capable of continuous operation at nameplate rating submerged under water at a maximum water temperature of 86 degrees Fahrenheit. Its maximum operating horsepower shall not exceed the nameplate horsepower.

Motor end frames shall be cast iron with manufacturer epoxy coating. Motor body shall have a 301 stainless steel shell for corrosion resistance. Fasteners shall be 300 and 400 series stainless steel.

The motor rotor assembly shall be dynamically balanced. The rotor shaft shall be made of stainless steel.

The motor shall be equipped with a water lubricated, self-aligning, Kingsbury type, thrust bearings. The motor shall be equipped with a continuous duty, plate type, axial upthrust bearing (standard) to provide for continuous upthrust. The downthrust and upthrust bearings shall be mounted at the motor to ensure rotor stability. The motor shall be equipped with two replaceable radial sleeve bearings, one at each end of the rotor.

The motor shall be equipped with a sealing system to prevent intrusion of sand, abrasives and other water-borne contaminants.

Pump motor coupling shall be of stainless steel and shall be capable of transmitting the total torque of the unit regardless of the direction of rotation.

The motor shall be capable of connecting to the pump motor adapter.

A single phase power control box specifically designed for the motor and provided by the motor manufacturer shall be provided and installed in the Pump Control Panel as shown in the Plans.

Provide and install a flow inducer sleeve for the motor. Flow inducer sleeve shall be provided by motor manufacturer, be designed specifically for the motor and be compatible with the pump. Shop mount or provide instructions for field mounting. Sleeve shall be stainless steel or coated steel. The flow inducer sleeve shall allow the pumping rate to be between 45 and 100 gpm.

A submersible motor cable rated and sized for the application shall be provided and installed. The submersible motor cable assembly shall be factory spliced and hypot tested after splicing to a flat cable assembly. The cable shall be protected by both an inside and outside cable guard where it passes over the strainer and pump bowls. Cable shall be stranded copper, number of conductors as required by motor size and code, with a ground wire per the latest NEMA and NEC standards. Each conductor shall be insulated and all conductors shall be sealed in a PVC sheath or other Engineer approved material. Provide an unspliced cable run from the motor to the junction box. The Contractor shall be responsible for cable sizing to allow the pump to start with the 230 volt power supply available.

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Division 12
Furnishings – Not Used

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Division 13
Special Construction – Not Used

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Division 14
Conveying Systems – Not Used

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15.00 GENERAL

This division covers the work necessary for furnishing and installing mechanical appurtenances and accessories as described in these Specifications and shown on the Plans.

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

15.05 Common Work for Mechanical

Part 1 - General

Summary

Provide the necessary piping, plumbing, fittings, and appurtenances to make all piping systems complete, tested, and ready for operation as specified herein and as shown on the Plans. Some fittings that are necessary for the complete piping system installation and operation may not have been shown. Provide fittings, pipe, and appurtenances necessary, whether shown on the Plans or not, to make all piping systems complete, tested and ready for operation.

Related Sections

- Division 1.82 Pressure Ratings

References

All products in contact with drinking water to be NSF 61 rated and have low-lead (less than 0.25%) content in compliance with NSF/ANSI 372.

Submittals

Submittal information shall be provided to the Owner for the following items:

- Galvanized pipe and fittings
- Brass/bronze pipe and fittings
- Dielectric components
- Isolation valve
- Air valve
- Pressure gauge
- Other mechanical components listed in this division or required by the Engineer

Part 2 – Products

Materials

All valves, specialties, appurtenances, and other such mechanical and plumbing components that are of similar purpose shall be of a single manufacturer and model line. Do not "mix and match" unless specifically stated otherwise or allowed by the Engineer. The intention of

this requirement is to maintain consistency across all components installed on the project for function, maintenance, aesthetics, and details of installation.

15.10 BURIED PIPE INSTALLATION

Part 1 – General

Site Conditions

Existing soils are unclassified except where specifically identified on the plans or specification.

Part 3 - Execution

Preparation

Contractor shall hand dig ahead of pipe-laying a sufficient distance at known utility crossings and where noted on the plans to allow room to make vertical adjustments as necessary to avoid existing utilities. Should the Contractor fail to hand dig identified utility crossings, any subsequent adjustments necessary shall not be cause for cost or time claim.

Provide the results of hand digging to the Owner no less than two working days in advance of utility installation. Contractor shall provide a written record of size, materials, and locations for found utilities to an accuracy of 0.5 foot horizontal and 0.1 foot vertical (relative to existing grade and infrastructure). Failure to record locations clearly and legibly will result in non-payment.

Installation

Install pipes to the depth shown on the trench detail.

Keep openings in pipe closed during the progress of work. Install plugs to prevent water and debris from entering pipe. No payment will be made to clean pipes.

15.11 Open Trench Pipe Installation

15.11.11 Water Pipe Installation

Part 1 - General

Scheduling

Connections to existing piping shall be made only after contacting the Engineer or Owner 48 hours prior (not including weekends or holidays). Connections shall not be performed on Owner recognized holidays.

Part 3 - Execution

Installation

Install pipes in accordance with the manufacturer's recommendations. Use types and sizes of pipes as specified herein and/or as shown on the Plans. Where small pipe sizes are omitted from the Plans and not mentioned in the Specifications, use sizes corresponding to code requirements and as required by equipment and plumbing fixtures and appurtenances. Properly size any undesignated pipe sizes for the functions to be performed.

Carefully lay pipe at proper lines and grades. Follow the piping runs shown on the Plans as closely as possible, except for minor adjustments to avoid architectural and structural features. Make major relocations, if required, in a manner acceptable to the Engineer.

Keep openings in pipes closed during progress of work.

Pipe passing through concrete slabs shall be made watertight.

Trench shall be excavated to a sufficient width to allow for pipe installation, compaction equipment, and shoring when necessary. Refer to the Trench Detail on the Plans.

Hoe-packs, sheepsfoots, and vibratory rollers shall not be used within 12-inches above the pipe.

Field Quality Control

No permanent connections to the existing piping and water treatment plant shall be made until the new piping has been tested and approved by the Engineer. No temporary connections of the untested, unapproved new piping to the existing water treatment plant shall be made without the installation of a double check valve assembly between the new piping and the existing piping.

15.13 Above Grade Mechanical Installation

15.13 Above Grade Pipe Installation

15.13.11 Process Piping Installation

Part 1 - General

Installation and Testing

A. Pipe shall be installed in accordance with good trade practice and in strict accordance with the manufacturer's instructions. The methods employed in handling and placing of pipe, fittings and equipment shall be such as to ensure that after installation and testing they are in good condition.

References

A. Use materials and installation methods in accordance with the latest edition of the Uniform Plumbing Code and local codes and regulations that are applicable. Install process piping in accordance with all applicable sections of AWWA, ANSI, and ASTM.

15.18 Buried Piping Inspection and Testing

15.18.02 Buried Water Piping Inspection and Testing

Part 3 - Execution

Preparation

The Contractor shall provide all required personnel and equipment and complete all tests required to demonstrate the integrity of the finished installation for the approval of the Owner and all agencies having jurisdiction.

The pipeline trench shall be backfilled sufficiently to prevent movement of the pipe under pressure.

All hose, piping, and equipment necessary for performing the test shall be furnished and operated by the Contractor.

Tests/Inspection

Pipe Flushing

Piping, valves and other components shall be flushed clean. Flushing shall allow 4 complete exchanges of water and remove any obvious debris.

Hydrostatic Pressure Testing

All water mains and appurtenances shall be tested under a hydrostatic test pressure equal to that specified under Division 1.82 of these Specifications. The Owner has the right to require more stringent test criteria than stated in this Specification or in the pressure rating section if it is determined that field conditions warrant such measures.

The mains shall be filled with water and allowed to stand under pressure for a minimum of 24 hours to allow air to escape and/or allow the lining of the pipe to absorb water. The Owner will furnish the water necessary to fill the pipelines for testing purposes at a time of day when sufficient quantities of water are available for normal system operation. The Contractor is responsible for the proper disposal of any waste, including water.

Any visible leakage detected shall be corrected by the Contractor to the satisfaction of the Owner regardless of the allowable leakage specified above. Should the test section fail to meet the specified pressure test successfully, the Contractor shall locate and repair the defects and then retest the pipeline at his own expense.

Prior to calling out the Owner or Engineer to witness the pressure test, the Contractor shall have all equipment completely set up and ready for operation, and shall have successfully performed the test to assure that the pipe is in a satisfactory condition. The Owner shall witness the test; if the test does not pass inspection for any reason, additional trips required to witness another test shall be done at the Contractor's expense.

Before applying the specified test pressure, air shall be expelled completely from the pipe and valves.

The test shall be accomplished by pumping the main up to the required pressure; stop the pump for a minimum of 15 minutes up to a maximum of 60 minutes as directed by the engineer, and then pump the main up to the test pressure again. During the test, the section being tested shall be observed to detect any visible leakage. A clean container shall be used for holding water for pumping pressure on the main being tested. This makeup water shall be sterilized by the addition of chlorine to a concentration of 50 mg/l (ppm).

For approval, pressure is not allowed to drop more than 5 psi during the test.

Cleaning

After preliminary purging of the system, chlorinate piping system in accordance with American Water Works Association (AWWA) C651 for flushing and disinfecting water mains, and in accordance with all other pertinent rules and regulations. Operate each valve

during chlorination period to insure contact. Upon completion of sterilizing, thoroughly flush the piping system, allowing 4 complete exchanges of contents. Do not discharge chlorinated material to storm or surface water systems. Contractor can discharge to sewer system. Contractor shall verify time of flushing with the District to prevent excess flows to the sewer system. Contractor shall neutralize the chlorine residual prior to discharging to the sewer system.

After final flushing and before the piping system is connected to or placed in service, the Contractor shall request that the Owner arrange to have samples collected for bacteriological testing. A copy of the test results shall be delivered to the Contractor for review. The Contractor shall not connect the piping system pipe to the existing well or existing treatment plant piping prior to acceptance of the bacteriological test(s) by the Engineer.

15.18.03 Valve Testing

Part 3 - Execution

Testing

Test all valve bonnets for tightness. Test operation of all valves at least once from closed-to-open-to-closed positions while valve is under normal operating pressure.

15.20 PIPE AND FITTINGS

15.21 Common Work for Pipe and Fittings

Part 2 - Products

Components

Under no circumstance shall the fasteners be of lesser strength or higher corrosive potential than the materials being connected. In the event that dissimilar metals are adjacent (for example: stainless steel flange connecting to ductile iron flange) a dielectric insulation kit shall be used.

Fasteners for pipe and fittings: Per AWWA standards unless otherwise specified. All relevant subsections of AWWA C100, C200, and C500. All bolts and studs shall be long enough so that no less than two threads extend beyond the face of the nut. Non-submerged flange bolts to be ASTM A307 Grade A, zinc plated.

Finishes

For conditions other than submerged, all nuts and bolts shall be zinc plated, and suitable for above and below grade locations as required.

Part 3 - Execution

Construction

All piping and related equipment to be joined together shall be connected as shown on the Plans, Specifications, as recommended by the manufacturer or as required by standard industry practices if not otherwise specified.

15.22 Metal Pipe and Fittings

15.22.05 Galvanized Steel or Iron Pipe Fittings

Part 1 - General

Design Requirements

Galvanized steel or iron pipe and fittings shall conform to ASTM A53/A53M. Hot dip galvanizing shall be completed in conformance with ASTM A123/A123M. Piping shall be sized as shown on the Plans and capable of the hydrostatic working and testing pressures as indicated in the pressure section above.

Gasket material for flanges shall be neoprene, buna-n, chlorinated butyl, or cloth-inserted rubber. Gaskets shall be a minimum ⅛-inch thick.

Part 2 - Products

Components

Wrap pipe and fittings where buried below grade. Provide dielectric couplings and bonding, or other means, where dissimilar metals in contact.

15.22.08 Brass/Bronze Pipe and Fittings

Part 1 - General

References

Brass to be low-lead content in compliance with NSF/ANSI 372 to have no more than 0.25 percent lead content.

Brass nipples: ASTM B687

Brass fittings: ANSI/ASME B16.15 (threaded) Class 125 lb. (up to 200 psi water), 250 lb. (up to 400 psi water); B16.18 (soldered).

Part 2 - Products

Materials

Brass pipe, nipples, and fittings to have threaded ends.

15.30 Valves

15.31 Common Work for Valves

Part 1 – General

Design and Performance Requirements

Valves noted on the Plans or in other parts of the Specifications shall meet the requirements herein. Valves shall be designed for the intended service.

Valve suppliers shall review the design and certify that the valve provided in the submittal is appropriate for the application and will operate as shown and described. Any discrepancies

from the design and the valves shall be brought to the Engineer's attention during the bidding process. Valves that do not operate as specified and per normal industry standards shall be replaced or modified so that they operate within the design parameters at the Contractor's expense.

Pressure rating shall be per Division 1.82 unless shown otherwise.

Part 2 – Products

Components

If shear pins are installed with any valve, the manufacturer shall certify the shear pin(s) to fail between 95 to 99 percent of the operator shaft failure torque.

Exposed valves shall be equipped with a handwheel, unless otherwise noted on Plans.

Part 3 - Execution

Installation

Install valves in strict accordance with the manufacturer's instructions and as shown on the Plans. Verify alignment and adjustments after installation.

15.32 Isolation Valves

15.32.03 Butterfly Valves Class 150

Part 1 – General

Design Requirements

Butterfly valves shall be tight-closing rubber seat type with a minimum 150 psi working pressure rating. Valves 3-inch and larger must meet full requirements of AWWA Standard C504. Valves smaller than 3-inch shall be high performance valves specifically designed for shutoff and throttling control of liquids and gas. Valve components shall withstand an operator input torque of 300 foot-pounds without damage.

Part 2 – Products

Manufacturers

- Dezurik BAW, no equals

Manufactured Units

Three-inch valve bodies shall be ductile iron. Provide valve disc constructed of ductile iron ASTM 536, Grade 65-45-12. The disc seating edge shall be solid stainless steel. Sprayed mating seat surfaces are not acceptable. The seat shall be of acrylonitrile-butadiene or EPDM for water; or as appropriate for other services. Valve bearings shall be sleeve-type and corrosion-resistant. Valve bearings shall be of traveling nut type and shall open left.

Supply valves with the valve operator on the side of the valve shown on the Plans.

Provide fusion bonded epoxy or two-part liquid epoxy coating to all internal and external surfaces.

Part 3 – Execution

Installation

Install per manufacturer's instructions. Do not operate the valve under test pressure. Bleed off pressure to normal operating pressure rating prior to operating the valve.

15.35 Air Valves

15.35.02 Air Valves – Clean Water

15.35.02.01 Combination Air and Vacuum Valves – Clean Water

Part 2 – Products

Manufacturers

Combination air and vacuum valves shall be Val-Matic model 201C.2, no equals.

Manufactured Units

Provide air valve's body and cover fabricated from cast iron. Provide internal parts, including float, seat, needle, linkage, level pins, retaining rings and screws fabricated from stainless steel. Size as shown on the Plans.

Part 3 – Execution

Installation

As shown on the Plans, valves shall be attached to water main via pipe and as necessary, fittings. Outlet shall be provided with threaded return bends and pipe to direct air away from any mechanical or electrical components. Install union downstream of both bends.

15.40 PIPING SPECIALTIES

15.40.04 Dielectric Fittings and Adapters

Part 3 - Execution

Installation

Provide dielectric adapters between dissimilar types of metal pipes, valves and fittings (e.g. copper to stainless steel). Flange isolating kits shall be used when dissimilar metal flanged pipe is connected. The following connections do NOT require dielectric isolators.

Metal	Connecting to
Bronze/brass	Copper or ductile iron
Ductile iron	Mild steel, bronze or brass

15.60 PRESSURE AND LEVEL MEASUREMENT

15.60.01 Common Work for Pressure and Level Measurement

Part 1 – General

Design Requirements

Pressure and level measurement devices shall be scaled and rated for the application.

Part 3 – Execution

Installation

All devices shall be installed to be field serviceable without taking the facility out of service. Readouts shall be positioned to be easily read from a standing position and central to the room, unless otherwise allowed by the Engineer.

15.61 Pressure Gauges

Part 1 – General

References

- ASTM B40.1 Grade 2A

Performance Requirements

Gauge accuracy shall be ± 0.5 percent of full scale.

Submittals

Provide catalog sheets showing dimensions, pressure range, accuracy and optional accessories.

Part 2 – Products

Manufacturers

Marsh, 3D Instruments or approved equal.

Materials

Gauges shall be analog, stem mount type with 4½-inch scale face, glycerin filled and completely suitable for measuring potable water. Connection shall be ¼-inch threaded. Wetted parts shall be brass, bronze or stainless steel. The full scale pressure range for each gauge location shall be as follows.

The full scale pressure range for each gauge shall be determined during the submittal process. The full scale pressure range shall be approximately 40% to 70% over the operational range. See Division 1.82 for operating pressures.

For pressure gauges used in applications other than clean water, provide a diaphragm protector suitable for the contact fluid. Diaphragm equal to Marsh 13040, stainless steel with flushing port.

Part 3 - Execution

Installation

Install gauges as shown on the Plans. Support gauges adequately.

15.70 PLUMBING

15.75.16 Brass Ball Valves

Part 1 – General

Performance Requirements

Ball valves rated for the pressure requirements in Division 1.82., minimum. Valve to be "full-port" style.

Part 2 – Products

Manufactured Unit

Ends to be threaded, unless specifically shown otherwise on the plans. Include ¼ turn lever handle. If available space does not allow handle to operate without interference, replace with tee handle.

15.75.21 Unions

Part 2 – Products

Manufactured Units

As shown on the Plans, unions shall be water tight, capable of pressure forces of the pipe it is connected to, and allow a minimum of ¼-inch of play for installation and maintenance flexibility. Unions shall be threaded to match the pipe it connects and match the pipe material.

Division 16
Electrical

16.00 GENERAL

The Contractor shall provide all labor, material, tools, equipment and services required to complete the furnishing, installation, wiring, connection, calibration, adjustment, testing and operation of all electrical equipment, devices and components as indicated and implied by the plans and specifications.

Sections in these specifications titled "*Common Work for*. . ." shall apply to all following sections whether directly referenced or not.

The Contractor shall reference Section 1.33.2 regarding substitutes and "or-equals.

16.05 Common Work for Electrical

Part 1 - General

Summary

Plans are diagrammatic and indicate general arrangements of systems and equipment, except when specifically dimensioned or detailed. The intention of the plans is to show size, capacity, approximated location, direction and general relationship of one work phase to another, but not exact detail or arrangement.

Permits and Fees

The Contractor shall coordinate and provide all permits, licenses, approvals, inspections by the authority having jurisdiction and other arrangements for work on this project and all fees shall be paid for by the Contractor. The Contractor shall include these fees in the bid price.

Related Sections

See the following sections for items that may be provided and/or installed with other electrical equipment.

1. 10.14.8 Signs for electrical equipment
2. 11.20 Pump motors

Codes and Standards

Provide all electrical work in accordance with latest edition of National Electrical Code, National Electrical Safety Code, Washington State Electrical Code, and local ordinances. If any conflict occurs between government adopted code rules and these specifications, the codes are to govern. All electrical products shall bear a label from a certified testing laboratory recognized by the State of Washington. Recognized labels in the State of Washington are UL, ETL, and CSA-US.

Definitions

Dry Locations: All those indoor areas which do not fall within the definitions below for wet, damp, or corrosive locations and which are not otherwise designated on the Plans.

Wet Locations: All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Plans.

Damp Locations: All spaces wholly or partially underground, or having a wall or ceiling forming part of a channel or tank unless otherwise designated on the Plans.

Corrosive Locations: Areas where chlorine gas under pressure, sulfuric acid, or liquid polymer are stored or processed. These areas are identified on the Plans.

The words "plans" and "drawings" are used interchangeably in this specification and in all cases shall be interpreted to mean "Plans".

The word "provide" shall be interpreted to mean furnish and install.

Submittals

Provide submittals of each item specified in this division to engineer for approval in accordance with the submittals' sections of these specifications. Submittals for motor control centers, motor control panels, control panels, instrumentation panels, and pump control panels shall include as a minimum a wiring diagram or connection schematic and an interconnection diagram.

Wiring Diagram or Connection Schematic

1. This plan or plans shall include all of the devices in a system and show their physical relationship to each other including terminals and interconnecting wiring in assembly. This diagram shall be in a form showing interconnecting wiring only by terminal designations (wireless diagram).

Interconnection Diagram

1. This diagram shall show all external connections between terminals of equipment and outside points, such as motors and auxiliary devices. References shall be shown to all connection diagrams which interface to the interconnection diagrams. Interconnection diagrams shall be of the continuous line type. Bundled wires shall be shown on a single line with the direction of entry/exit of the individual wires clearly shown. All devices and equipment shall be identified. Terminal blocks shall be shown as actually installed and identified in the equipment complete with individual terminal identification. All jumpers, shielding and grounding termination details not shown on the equipment connection diagrams shall be shown on the interconnection diagrams. Spare wires and cables shall be shown.

Submittal information shall be provided to the Owner for the following items:

1. Underground Marking Tape
2. Pump Control Panel
3. Circuit Breakers
4. Conduit and Fittings
5. Outlet and Junction Boxes
6. Wire and Cables
7. Switches and Receptacles
8. Other Electrical Components listed in this division and/or required by the Engineer.

Project Conditions

Contractor shall keep all power shutdown periods to a minimum. Carry out shutdowns only after a shutdown schedule has been submitted and approved by both the Owner and the Engineer.

Construction Power: See Division 1.51

Part 2 - Products

Source Quality Control

Provide adequate space and fit for the electrical installation, including, but not limited to, determination of access-ways and doorways, shipping sections, wall and floor space, and space occupied by mechanical equipment. Provide electrical equipment that fits in the areas shown on the plans. All equipment shall be readily accessible for maintenance, shall have electrical clearances in accordance with NEC and shall be installed in locations which will provide adequate cooling.

Do not use equipment exceeding dimensions indicated or equipment or arrangements that reduce required clearances or exceed specified maximum dimensions unless approved by the Engineer.

Identification of Listed Products

1. Electrical equipment and materials shall be listed for the purpose for which they are to be used, by an independent testing laboratory. When a product is not available with a testing laboratory listing for the purpose for which it is to serve, the inspection authority may require the product to undergo a special inspection at the manufacturer's place of assembly. All costs and expenses incurred for such inspections shall be included in the original contract price.

Materials

Use equipment, materials and wiring methods suitable for the types of locations in which they will be located, as defined in Definitions above.

All materials and equipment specified herein shall, within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

Components

Fasteners for securing to walls, floors, and the like shall meet the requirements of Division 05.05.23.

NEMA Rating

Unless otherwise noted, provide enclosures as follows:

1. Class 1, Division 1 &2 Locations: NEMA Type 7
2. Indoors unclassified Locations: NEMA Type 12
3. Corrosive Locations: NEMA Type 4X

4. Outdoors and/or Wet Locations: NEMA Type 4
5. Electrical rooms: NEMA Type 1

Accessories

Wire Identification

1. Identify each wire or cable at each termination and in each pull box using numbered and lettered wire markers. All electrically common conductors shall have the same number. Each electrically different conductor shall be uniquely numbered. Identify panelboard circuits using the panelboard identification and circuit number. Identify motor control circuits using the equipment identification number assigned to the control unit by the motor control center manufacturer and the motor control unit terminal number. Identify other circuits as approved by the Engineer. Identify each wire or cable in each pull box with plastic sleeves having permanent markings. Conductors between terminals of different numbers shall have both terminal numbers shown at each conductor end. The terminal number closest to the end of the wire shall be the same as the terminal number.

Finishes

Refer to each electrical equipment section of these Specifications for painting requirements of equipment enclosures.

Part 3 - Execution

Installation

General

1. Complete the wiring, connection, adjustment, calibration, testing and operation of mechanical equipment having electrical motors and/or built-in or furnished electrical components in accordance with electrical code, UL listing requirements and manufacturer's instructions. Install electrical components that are furnished with mechanical equipment.
2. Provide the size, type and rating of motor control devices, equipment and wiring necessary to match the ratings of motors furnished with mechanical equipment.
3. Complete the procurement, installation, wiring, connection, calibration, adjustment, testing and operation of all electrical devices, components accessories and equipment which is not shown or specified but which is nonetheless required to make the systems shown and specified properly functional.

Workmanship

1. Assign a qualified representative who shall supervise the electrical construction work from beginning to completion and final acceptance.
2. Provide all labor using qualified craftsmen, who have had experience on similar projects.
3. Ensure that all equipment and materials fit properly in their installations.

Field Services

1. Provide field services of qualified technicians to supervise and check out the installation of the equipment, to supervise and check out interconnecting wiring, to conduct start-up and operation of the equipment, and to correct any problems which occur during testing and start-up.

Installing Equipment

1. Provide the required inserts, bolts and anchors, and securely attach all equipment and materials to their supports.
2. Install all floor-mounted equipment on 3½-inch high reinforced concrete pads.
3. Install all equipment and junction boxes to permit easy access for normal maintenance.

Cutting, Drilling and Welding

1. Provide any cutting, drilling, and welding that is required for the electrical construction work.
2. Structural members shall not be cut or drilled, except when approved by the Engineer. Use a core drill wherever it is necessary to drill through concrete or masonry. Perform patch work with the same materials as the surrounding area and finish to match.

Metal Panels

1. Mount all metal panels, which are mounted on, or abutting concrete walls in damp locations or any outside walls ¼-inch from the wall, and paint the back side of the panels with a high build epoxy primer with the exception of stainless steel panels. Film thickness shall be 10 Mils minimum.

Seismic Requirements

1. See Division 1.81

Load Balance

1. Balance electrical load between phases as nearly as possible on panelboards, motor control centers, and other equipment where balancing is required.
2. When loads must be reconnected to different circuits to balance phase loads, maintain accurate record of changes made, and provide circuit directory that lists final circuit arrangement.

Field Quality Control

Minor Deviations

1. The electrical plans are diagrammatic in nature and the location of devices, fixtures and equipment is approximate unless dimensioned. On the basis of this, the right is reserved by the owner to provide for minor adjustments and deviations from the locations shown on the Plans without any extra cost. Deviations from the Plans and/or specifications required by code shall also be done, subsequent to Owner's approval, without extra cost.

2. Plans indicate the general location and number of the electrical equipment items. When raceway, boxes, and ground connections are shown, they are shown diagrammatically only and indicate the general character and approximate location. Layout does not necessarily show the total number of raceways or boxes for the circuits required. Furnish, install, and place in satisfactory condition all raceways, boxes, conductors and connections, and all of the materials required for the electrical systems shown or noted in the contract documents complete, fully operational, and fully tested upon the completion of the project.

Project Record Plans

1. A set of Plans shall be maintained at the job site showing any deviations in the electrical systems from the original design. A set of electrical Plans, marked in red to indicate the routing of concealed conduit runs and any deviations from the original design, shall be submitted to the Engineer for review at the completion of the project prior to final acceptance.
2. After testing and acceptance of the project the Contractor shall furnish in the O&M manuals an accurate connection schematic and interconnection diagram for every service entrance panel, pump control panel, motor control center, and instrumentation panel provided this project.

Cleanup and Equipment Protection

Equipment Protection

1. Exercise care at all times after installation of equipment, motor control centers, control panels, etc., to keep out foreign matter, dust debris, and moisture. Use protective sheet metal covers, canvas, heat lamps, etc., as needed to ensure equipment protection.

Cleaning Equipment

1. Thoroughly clean all soiled surfaces of installed equipment and materials upon completion of the project. Clean out and vacuum all construction debris from the bottom of all equipment enclosures.

Painting

1. Repaint any electrical equipment or materials scratched or marred in shipment or installation, using paint furnished by the equipment manufacturer.

Final Cleanup

1. Upon completion of the electrical work, remove all surplus materials, rubbish, and debris that accumulated during the construction work. Leave the entire area neat, clean and acceptable to the Owner.
2. Lamps and fluorescent tubes shall be cleaned and defective units replaced at the time of final acceptance.

16.10 ELECTRICAL SITE WORK

16.10.1 Common Work for Electrical Site Work

Part 1 – General

Description of Work

The work included in this section consists of furnishing and installing conduit, fittings, handholes, pull vaults, warning tape, cables, wires, and related items, complete as specified herein and as indicated on the plans for a complete and functional underground electrical system. Special vaults, grounding, trench backfill requirements may be specified with the particular equipment or electrical system involved.

Part 2 – Products

General

Materials and equipment shall conform to the respective specifications and standards; and to be the specifications herein. Electrical rating shall be as indicated on plans.

Raceways and conduit shall be provided per Section 16.70.

Wire and cable shall be provided per Section 16.60.

Part 3 – Execution

Construction

Provide all excavation, trenching, backfill and surface restoration required for the electrical work.

Trenching shall be to depths as required by Code, particular installation, or as shown on the Plans. Trench width and length as required by the installation or as shown. Trench bottom shall be free of debris and graded smooth. Where trench bottom is rock or rocky, or contains debris larger than 1 inch or material with sharp edges, over excavate 3 inches and fill with 3 inches of sand. Separation between new electrical utilities and other utilities shall be 12 inches minimum, except gas line separation shall be 12 inches both vertical and horizontal. Perform crossing of concrete or asphalt only after surface material has been saw cut to required width and removed.

Backfill around raceways shall be 3 inches of pea gravel or sand for systems of 600 volt or less. Provide red marker tape over raceways below grade. Place backfill material to obtain a minimum degree of compaction of 95 percent of maximum density at optimum moisture content. Moisten backfill material as required to obtain proper compaction. Do not use broken pavement, concrete, sod, roots or debris for backfill.

16.10.2 Underground Marking Tape (Detectable Type)

Part 2 – Products

Manufacturers

Tape shall be Brady "Detectable Identoline – Buried Underground Tape", or equal.

Materials

Underground marking tape shall be for location and early warning protection of buried power and communication lines. Tape shall be detectable by a pipe/cable locator or metal detector from above the undisturbed ground. Tape shall be nominally 2 inches wide with a type B721 aluminum foil core laminated between two layers of 5 Mil thickness polyester plastic. The plastic color shall be red for electrical lines and orange for telephone lines.

Part 3 – Execution

Installation

Unless noted otherwise on plans, approved underground marking tape shall be installed in the trench twelve inches above and directly over the conduit or raceway.

16.15 ELECTRICAL GROUNDING

16.15.1 Common Work for Electrical Grounding

Part 1 - General

References

Service and equipment grounding shall be per Article 250 of the National Electrical Code (NEC).

Performance Requirements

Verify that a low-resistance ground path is provided for all circuits so an accidental contact to ground of any live conductor will instantly trip the circuit.

Part 2 - Products

Components

The grounding systems shall consist of equipment grounding conductors as shown on the Plans.

Part 3 - Execution

General Grounding Installation

Provide a ground wire in every conduit carrying a circuit of over 110 volts to ground.

Motor Grounding Installation

Extend equipment ground bus via grounding conductor installed in motor feeder raceway. Connect to motor frame.

When using nonmetallic flexible tubing install an equipment grounding conductor connected at both ends to noncurrent-carrying grounding bus.

Ground Connections

Above grade ground connections shall be exothermic weld, mechanical, or compression-type connectors; or brazing.

Below grade ground connections shall be exothermic weld.

Install all ground connections is strict accordance with connector manufacturer's recommendations and methods.

16.30 BASIC PANEL EQUIPMENT AND DEVICES

16.31 Operating and Indicating Devices

Part 1 - General

Operating and indicating devices minimum rating shall be NEMA 13. Operator devices mounted in outdoor panels, corrosive areas or where exposed to moisture shall be NEMA 4X.

16.31.2 Run Time Meters

Manufacturers

HECON GO series or equal.

Manufactured Units

Hour meter (elapsed time meters) shall be 2-inch by 1-inch nominal size, rectangular case type for flush panel mounting. The meter face shall be of the style that most closely resembles the panel indicating instruments if provided and shall have black trim with white or aluminized face. The meters shall have a 6-digit non-resettable register with the last digit indicating tenths of an hour.

16.31.3 Start Count Meters

Manufacturers

HECON GO series, Redington Model 3400-2010 or equal.

Manufactured Units

Start counters shall be 2-inch by 1-inch nominal size, rectangular case type for flush panel mounting. The meter face shall be of the style that most closely resembles the panel indicating instruments if provided and shall have black trim with white or aluminized face. The meters shall have a 6-digit resettable register.

16.31.4 Indicating Lights

Manufacturers

Heavy-Duty, Watertight, and Corrosion-Resistant Type: Eaton/Cutler-Hammer, Type E34; Square D Co., Type SK; Allen Bradley, Type 800H; General Electric Co., Type CR 104P.

Manufactured Units

Indicating lights shall be NEMA type 4/4X/13, corrosion resistant, water-tight, oil-tight, full voltage, push-to-test, high visibility 28 chips LED type. Pilot lights shall be rated for the proper operating voltage. Appropriate lens caps shall be provided as shown on plans.

16.31.5 Selector Switch

Manufacturers

Heavy-Duty, Watertight, and Corrosion-Resistant Type: Eaton/Cutler-Hammer, Type E34; Square D Co., Type SK; Allen Bradley, Type 800H; General Electric Co., Type CR 104P.

Manufactured Units

Selector switches shall be NEMA type 4/4X/13, corrosion-resistant/watertight/oil-tight, type selector switches with contacts rated for 10 amperes continuous at proper operating voltage. Operators shall be black knob type. Units shall have the number of positions and contact arrangements and spring return function (if any) as shown on Plans. Units shall be single-hole mounting, accommodating panel thicknesses from 1/16-inch minimums to 1/4-inch maximum.

16.31.6 Pushbuttons

Manufacturers

Heavy-Duty, Watertight, and Corrosion-Resistant Type: Eaton/Cutler-Hammer, Type E34; Square D Co., Type SK; Allen Bradley, Type 800H; General Electric Co., Type CR 104P.

Manufactured Units

Pushbuttons shall be NEMA type 4/4X/13, corrosion-resistant/watertight/oil-tight, type push buttons with momentary contacts rated for 10-ampere continuous at proper operating voltage. Button color shall be as specified in control panels and shall have a full guard. Pushbutton contact arrangements shall be as shown on Plans. Size of pushbuttons as indicated on the Plans.

Special Functions

Pushbutton for "emergency help" applications shall have maintained contacts and red mushroom head operators.

16.32 Panel Relays

Part 1 – General

General

Relays shall be provided as necessary to perform switching functions required of control panels and other control circuits as shown on the Plans and described in the technical specifications. Appropriate relay type and associated contacts shall be selected based on the application from the control wiring diagrams or the functional description. Where timing relays and control relays require additional contacts, provide auxiliary control relays properly sized for the application.

All contacts and relays shall be NEMA rated and UL recognized.

The electrical life expectancy for the relay shall be over 500,000 operations at 120V AC, 10 amp; (over 200,000 operations at 120V AC, 10 amp for SPDT, 3PDT, and 4PDT). The mechanical life expectancy for the relay shall be over 50,000,000 operations.

Part 2 – Products

16.32.1 Control Relays

Manufacturers

Square D Class 8501, Type K or R;

Allen Bradley 700 Type HA or HB;

IDEC RH Series; or equal.

Manufactured Units

Relays for general purpose use shall be DPDT or 3PDT, 10 amp contacts with the appropriate coil voltage for the application. Relays shall be plug-in type with matching socket. All relays shall have LED indicators to signal when the coil is energized. Relay coils shall be rated for continuous duty.

16.32.3 Time Delay Relays

Manufacturers

Allen Bradley 700 Type HR;

IDEC GE1, RTE or GT3 Series; or equal

Manufactured Units

Time delay relays shall be multi-function, multi-range with plug-in base, pin style terminations timing and timed out LED indicators, and calibrated scales. Relays shall have minimum 0.5 seconds to 60 minutes, 8 selectable timing ranges, 5 amp contacts. Select coil voltage for the application. Units shall be sealed to prevent entry of contamination in the form of dust, dirt or moisture.

Appropriate relay shall be selected based on application from the control wiring diagrams.

Minimum accuracy (plus or minus) shall be as follows:

1. Repeat accuracy – ½ percent.
2. Timing change over full voltage range – ½ percent change over full temperature range.
3. Scale tolerance – 5 percent.

16.35 Control Panel Accessories

16.35.1 Terminal Blocks

Part 2 – Products

Manufactured Units

Terminal blocks shall be one-piece, molded, plastic blocks with screw-type terminals and barriers rated for 300 volts. Terminals shall be double-sided and supplied with removable covers to prevent accidental contact with live circuits. Terminals shall have permanent, legible identification, clearly visible with the protection cover removed.

Part 3 – Execution

Installation

All wires between panel-mounted equipment and other equipment shall be terminated at terminal blocks. Switches shall be terminated at the terminal blocks with crimp-type, pre-insulated, ring-tongue lugs. Lugs shall be of the appropriate size for their terminal block screws and for the number and size of the wires terminated. All wires shall be labeled with the circuit number and common function.

16.35.2 Nameplates

Part 2 – Products

Manufactured Units

Standard nameplates shall be made of 1/16-inch thick machine engraved laminated phenolic having black letters not less than 3/16-inch high on white background. 1-inch high lettering shall be used for the large nameplates required for the control panels and motor control centers.

Part 3 – Execution

Installation

Nameplates shall be provided on all electrical devices including but not limited to motor control equipment, MCC cubicles, control stations, junction boxes, panels, motors, instruments, switches, indicating lights, meters, and all electrical equipment enclosures. Each motor control center compartment and control panel shall have a nameplate designated the equipment and its identifying number and size or rating. Data shall be as shown on the Plans and reviewed via the submittal process. Nameplates shall have name, number and/or function as is applicable for clear identification.

Provide one large nameplate for each motor control center and/or control panel identifying the equipment as indicated on the Plans.

Nameplates on steel panels shall be secured with stainless steel drive screws. Where it is proposed that nameplates will be secured with pressure sensitive tape or bonding cement, the process and samples shall be submitted to the Engineer for acceptance.

Nameplates shall be provided for identifying all operator interface (lights, switches, etc.) and other devices that are located outside or inside the panels.

Nameplates shall be provided for identifying all relays and devices that are located inside the panels.

Special Functions

Provide warning nameplates on all panels and equipment, which contain multiple power sources. Lettering shall be white on red background.

16.40 LOW VOLTAGE MOTOR CONTROL EQUIPMENT

16.41.2 Standard Motor Starter Units

Part 1 - General

Design Requirements

Each unit shall consist of a motor circuit protector and a magnetic starter. The combination shall have an interrupting rating of not less than 42,000 amperes symmetrical at 240 volts. Each unit shall have a control terminal board and other components as shown on Plans.

Starters shall be of NEMA, not IEC design. That is, starters shall have molded coils, replaceable contacts, and metal mounting plate. Starters shall have provisions for accepting up to seven (7) auxiliary contacts and one (1) overload alarm contact.

All starters shall be size 1 or larger and no intermediate sizes (such as 1 ¾) will be acceptable.

Pilot devices shall be per Division 16.30 Basic Panel Device and Equipment.

Part 2 – Products

Manufactured Units

Overload protection is to be provided by a solid-state overload relay that shall be self-powered. Each overload shall be adjustable over a full 2:1 FLA adjustment range. A tamper proof cover shall be provided. The standard overload shall provide Class 20. The overload relay must provide phase loss protection. The overload must be ambient insensitive. The overload relay must have a trip-free, normally-closed contact with a visible trip indication and N.O. isolated alarm contact. The overload shall have a method of being manually tripped for test purposes. Size the overload heaters to protect the motor actually installed with allowance for power factor correction, if applicable.

Terminal blocks shall be mounted within the unit and located near the front for accessibility. They shall not be located at the rear of the vertical wireway. Power terminal blocks shall be provided. On non plug-in (frame mounted) units, terminal blocks need not be pull-apart style. On plug-in units, control terminal blocks shall be pull-apart style.

Starter units shall contain the number of auxiliary contacts, unit-mounted devices, indicating lights, control relays, and other devices as shown on the Plans.

16.55 SWITCHES AND PROTECTIVE DEVICES

16.55.1 Common Work for Switches and Protective Devices

Part 1 - General

Design Requirements

1. Overcurrent devices shall be NEMA rated.

Extra Materials

Provide one fuse for each ungrounded conductor and a minimum of one spare fuse per phase of each ampacity and voltage used on the project. Deliver fuses to Owner at the completion of the project.

Part 3 – Execution

Installation

Overcurrent protection devices and safety switches shall be centered 60 inches above the finished floor unless noted otherwise on the Plans.

16.55.13 Fuses

Part 1 - General

Design Requirements

Fuses shall be of the type and amperage indicated on the Plans. The voltage rating shall be appropriate for the application indicated. The fuse types indicated on the Plans imply a certain set of fuse characteristics. No substitutions of fuse types will be allowed without Engineer approval.

Part 2 - Products

Manufacturers

Fuses shall be Bussman, Gould Shawmut, Littlefuse, Reliance, or equal.

Materials

Fuses in motor circuits which are indicated but not sized, shall be provided with Manufacturer's recommended size based on the actual motor installed. In-line or integrally-mounted fuse clips shall be provided on all control power or low-voltage transformers.

16.55.16 Molded Case Circuit Breakers

Part 1 - General

Design Requirements

Breakers shall have the interrupting rating and trip rating indicated on the Plans. All breakers shall be calibrated for operation in an ambient temperature of 40 degrees Celsius.

Part 2 - Products

Manufactured Units

Molded case circuit breakers shall be quick-make and quick-break type with wiping type contacts. Each breaker shall be provided with arc chutes and individual trip mechanisms on each pole consisting of both thermal and magnetic trip elements. Two and three pole breakers shall be common trip. Molded case circuit breakers shall be trip-free. Each breaker shall have trip indication independent of the "ON" or "OFF" positions.

16.55.17 Instantaneous Magnetic Trip Breakers

Part 1 - General

Design Requirements

The magnetic trips shall be adjustable and accessible from the front of all these breakers.

Part 2 - Products

Manufactured Units

Breakers in motor circuits which are indicated but not sized, shall be provided with Manufacturer's recommended size based on the actual motor installed. Where indicated on the Plans and in the combination motor starter/motor control center schedule, furnish instantaneous magnetic trip only circuit breakers for motor short circuit protection.

16.55.18 Disconnect Switches

Part 1 - General

Design Requirements

Furnish and install disconnect switches conforming to NEMA KS 1, type HD, sized for the ampere and voltage as shown on the plans and as required by the National Electrical Code and nameplate requirements of the equipment served.

Part 2 - Products

Manufactured Units

The switches shall be 600 volt type and horsepower rated. Auxiliary contacts shall be provided as indicated on the Plans.

Part 3 – Execution

Installation

Provide additional disconnects if required by Code.

16.60 CONDUCTORS

16.61 Low Voltage Wire and Cable

Part 1 - General

Design Requirements

This section is for power and control conductors for 600 volts or less.

All conductors shall be copper. Wire or cable not shown on the Plans or specified, but required, shall be of the type and size required for the application and in conformance with the applicable code.

Part 2 - Products

Materials

Conductors

1. Stranded copper wire shall be 600 volt Type THW, THWN, or THHW, Class B stranding, sizes #14 AWG, #12 AWG, and #10 AWG only. Use of THHN insulation shall not be allowed. Aluminum conductors shall not be allowed.

Stranded copper wire shall be 600 volt Type XHHW, Class B stranding, sizes #8 AWG and larger. Aluminum conductors shall not be allowed.

Splices

1. For Lighting Systems and Power Outlets: Wire nuts shall be twist-on type insulated connectors utilizing an outer insulating cover and a means for connecting and holding the conductors firmly.
2. All Equipment: Crimp type connectors shall be insulated type, suitable for the size and material of the wires and the number of wires to be spliced and for use with either solid or stranded conductors.
3. Division 16 Equipment and Power Conductors: Bolted pressure connectors shall be suitable for the size and material of the conductors to be spliced.
4. All Equipment: Epoxy splice kits shall include epoxy resin, hardener, mold, and shall be suitable for use in wet and hazardous locations.

Terminations

1. Crimp type terminals shall be self-insulating sleeve type, with ring or rectangular type tongue, suitable for the size and material of the wire to be terminated, and for use with either solid or stranded conductors.
2. Terminal lugs shall be split bolt or bolted split sleeve type in which the bolt or set screw does not bear directly on the conductor.
3. Wire Markers shall be plastic sleeve type. Wire numbers shall be permanently imprinted on the markers.

Finishes

Color Coding: Provide color coding for all circuit conductors. Insulation color shall be white for neutrals and green for grounding conductors. An isolated ground conductor shall be identified with an orange tracer in the green body. Ungrounded conductor colors shall be as follows:

1. 120/208 Volt, 3 Phase: Red, black and blue.
2. 277/480 Volt, 3 Phase: Yellow, brown and orange.
3. 120/240 Volt, 1 Phase: Red and black.

Part 3 – Execution

Location (Installment) Schedule

Provide the following conductors for the following applications:

1. Use stranded copper conductors for all power and control circuits unless noted otherwise on plans or below. Size as noted on the plans.
2. Size #14 AWG wire or smaller shall not be allowed on power circuits.

Installation

Conductor Splices

1. Splices: Install all conductors without splices unless necessary for installation, as determined by the Engineer. Splices when permitted shall be completed using an approved splice kit intended for the type o conductor and the application. The splice shall be in accordance with the splice kit manufacturer's instructions.
2. Underground Splices: All underground outdoor splices when approved by Engineer shall be completed in an accessible pullbox or handhole using an approved watertight epoxy resin splice kit rated for the application up to 600 volts. Splices will not be allowed to be direct buried.

Conductor Identification

1. Except for interior lighting and receptacle circuits, identify each wire or cable at each termination and in each pullbox, junction box, handhole, and manhole using numbered and lettered wire markers. All electrically common conductors shall have the same number. Each electrically different conductor shall be uniquely numbered. Identify panelboard circuits using the panelboard identification and circuit number. Identify motor control circuits using the equipment identification number assigned to the control unit by the motor control center manufacturer and the motor control unit terminal number. Identify other circuits as shown in the circuit schedule as favorably by the Engineer.
2. Conductors between terminals of different numbers shall have both terminal numbers shown at each conductor end. The terminal number closest to the end of the wire shall be the same as the terminal number.

Testing

Insulation Resistance Tests: For all circuits 150 volts to ground or more and for all motors circuits over ½ horsepower, test cables per NETA Paragraph 7.3.1. The insulation resistance shall be 20 megohms or more. Submit results to Engineer for review.

16.63 Signal Cable

Part 2 - Products

Materials

Twisted Shielded Pairs (TSP)

1. Cable shall conform to IEEE 383, UL 13, and UL 83 and shall be type PLTC cable suitable for direct burial. Each TSP shall consist of two #16 AWG, 7-strand copper conductors per ASTM B8 with 15 Mils PVC insulation and individual conductor jacket of nylon. Conductors shall be twisted with 2-inch or shorter lay, with 100 percent foil shielding and tinned copper drain wires. The cable shall have an overall PVC jacket with a thickness of 35 mils. The insulation system shall be rated at 90 degrees Celsius and for operation at 600 volts.

Part 3 - Execution

Installation

Cable Installation

1. Cables shall be continuous from initiation to termination without splices.
2. Cable shielding shall be grounded at one end of the cable only. Bonding shall be to a single ground point only. Bonding from cable to cable in multiple run installations shall not be permitted.
3. Install instrumentation cables in separate raceway systems with voltages not to exceed 30 volts DC.

Conductor Identification

1. Except for interior lighting and receptacle circuits, identify each wire or cable at each termination and in each pullbox, junction box, handhole, and manhole using numbered and lettered wire markers. All electrically common conductors shall have the same number. Each electrically different conductor shall be uniquely numbered. Identify panelboard circuits using the panelboard identification and circuit number. Identify motor control circuits using the equipment identification number assigned to the control unit by the motor control center manufacturer and the motor control unit terminal number. Identify other circuits as shown in the circuit schedule as determined by the Engineer.
2. Conductors between terminals of different numbers shall have both terminal numbers shown at each conductor end. The terminal number closest to the end of the wire shall be the same as the terminal number.

Testing

Insulation Resistance Tests: Perform insulation resistance on all circuits. Make these tests before any equipment has been connected. Test the insulation with a 500 Vdc insulation resistance tester with a scale reading 100 mega ohms. The insulation resistance shall be 20 mega ohms or more. Submit results to Engineer for review.

16.70 RACEWAYS, BOXES AND FITTINGS

16.71 Raceways

Part 1 – General

Design Requirements

Conduit sizes not noted on Plans shall be in accordance with NEC requirements for the quantities and sizes of wire installed therein.

Part 2 – Products

Components

Conduit and Fittings

1. Galvanized Rigid Steel (GRS): Rigid conduit shall be steel, hot dipped galvanized inside and out. The GRS must meet USA Standards Institute C80-1 Underwriters Laboratories Standard UL6, and carry a UL label. Use cast threaded hub fittings and junction boxes for all rigid conduit except in locations not permitted by the NEC.
2. PVC Coated Rigid Steel Conduit(PVC-GRS): PVC coated conduit shall meet the GRS standard above plus have a 40 MilPVC factory applied PVC coating.
3. Nonmetallic Conduit: Nonmetallic Conduit shall be rigid PVC, Schedule 40 (PVC-40) or 80(PVC-80). PVC conduit installed above grade shall be Schedule 80 extra heavy wall 90 degree C. UL listed for aboveground use and UV resistant. Conduit shall be gray in color. Fittings shall be of the same material as the raceway and installed with solvent per the Manufacturer's instructions. Conduit, fittings and solvent shall all be manufactured by the same Manufacturer.
4. Flexible Metal Conduit(Flex-LT): Flexible conduit shall be interlocking single strip, hot dipped galvanized and shall have a polyvinyl chloride jacket extruded over the outside to form a flexible watertight raceway. Flexible conduit shall be American Brass Company Sealtite Type VA, General Electric Type UA or equal.

Conduit & Cable Supports

1. Conduit Supports: Hot dipped galvanized framing channel shall be used to support groups of conduit. Individual conduit supports shall be one-hole galvanized malleable iron pipe straps used with galvanized clamp backs and nesting backs where required. Conduit support for PVC or PVC coated rigid steel shall be one hole PVC or epoxy coated clamps or PVC conduit wall hangers.
2. Ceiling Hangers: Ceiling hangers shall be adjustable galvanized carbon steel rod hangers. Unless otherwise specified, hanger rods shall be ½-inch all-thread rod and shall meet ASTM A193. Hanger rods in corrosive areas and those exposed to weather or moisture shall be stainless steel.

Conduit Sealants

1. Moisture Barrier Types: Sealant shall be a non-toxic, non-shrink, non-hardening, putty type hand applied material providing an effective barrier under submerged conditions.

2. Fire Retardant Types: Fire stop material shall be a reusable, non-toxic, asbestos-free, expanding, putty type material with a 3-hour rating in accordance with UL 1479. Provide products indicated by the manufacturer to be suitable for the type and size of penetration.

Part 3 - Installation

Raceway Applications

Galvanized Rigid Steel (GRS) conduit shall be used in all locations unless noted otherwise below or on the Plans.

ABOVE GRADE CONDUITS (non-corrosive areas) shall be:

1. GRS for power and control wiring.
2. GRS for instrumentation and telecommunications wiring.
3. GRS for motor leads from VFDs.

ABOVE GRADE CONDUITS (wet or corrosive areas, NFPA 70 hazardous areas) shall be:

1. PVC-GRS for power and control wiring.
2. PVC-GRS for instrumentation and telecommunications wiring.
3. PVC-GRS for motor leads from VFD's.

CONCEALED ABOVE GRADE CONDUITS shall be:

1. GRS for all wire and cable types in wood stud frame walls.
2. PVC-40 for power and control wiring in concrete block or brick walls.
3. PVC-40 for instrumentation and telecommunications wiring in CMU or brick walls.
4. GRS for motor leads from VFD's in CMU or brick walls.

BELOW GRADE CONDUITS IN DIRECT EARTH (not under slabs-on-grade) shall be:

1. PVC-40 for power and control wiring.
   a) Sweeps and risers for transition of PVC from below grade to above grade shall be PVC-GRS.
2. PVC-GRS for instrumentation and telecommunications wiring.
3. PVC-GRS for motor leads from VFD's.

UNDER SLABS-ON-GRADE CONDUIT shall be:

1. PVC-40 for power and control wiring
   a) Sweeps and risers for transition of PVC from below grade to above grade shall be PVC-GRS.
2. PVC-GRS for instrumentation and telecommunications wiring.
3. PVC-GRS for motor leads from VFD's.

CONCRETE-ENCASED CONDUITS shall be:

1. PVC-40 for power and control wiring
   a) Sweeps and risers for transition of PVC from below grade to above grade shall be PVC-GRS.
2. PVC-40 for instrumentation and telecommunications wiring.
   a) Sweeps and risers for transition of PVC from concrete-encasement to above grade shall be PVC-GRS.
3. PVC-GRS for motor leads from VFD's.

ALL CONNECTIONS TO VIBRATING EQUIPMENT OR MOTORS shall be:

1. Liquidtight flexible metallic conduit for indoor, non-corrosive areas and all motor leads from VFD's.
2. Connection to equipment outdoors or in corrosive areas shall be with non-metallic liquidtight flexible conduit (except for motor leads from VFD's shall be flexible metallic.)

Installation

Size of Raceways:

1. Raceway sizes as shown on the Plans, if not shown on the Plans, then size in accordance with NFPA 70.
2. Unless specifically indicated otherwise, the minimum raceway size shall be:
   a) Conduit: ¾-inch
   b) Wireway: 4-inch by 4-inch

All raceways shall contain a separate grounding conductor.

Spare conduits shall contain one $^{3}/_{16}$-inch diameter nylon pull rope.

Conduit routing is shown diagrammatic on the Plans. Contractor is responsible for routing the conduits in a neat manner, parallel and perpendicular to walls and ceilings.

Location of conduit ends are shown approximately. Contractor is responsible for ending conduits in location that will not conflict with electrical equipment. Route conduit ends to facilitate ease of equipment maintenance. Conduits extending from the floor to a device shall be located as close as possible to avoid creating a hazard.

Conduit shall not be routed on exterior of structures except as specifically indicated on the plans.

Where water cannot drain to openings, provide drain fittings in the low spots of the conduit run.

Securely fasten raceways at intervals and locations required by NEC, or the type of raceway employed.

Provide all required openings in walls, floors and ceilings for conduit penetration.

1. Do not install one (1) inch and larger raceways in or through structural members (beams, slabs, etc.) unless approved by Engineer.

2. New Construction: Avoid cutting openings, where possible, by setting sleeves or frames in masonry and concrete, and by requesting openings in advance.
3. Existing Construction: Core drill openings in masonry and concrete. Avoid structural members and rebar.

Conduit Encasement or Embedment in the earth shall be separated from the earth by at least 3-inches of concrete unless otherwise shown on the Plans. Plastic conduit spacers shall be located five feet on centers. The spacers shall be secured to the conduits by wire ties. The conduits shall be watertight.

Analog signal conduits shall be separated from power or control conduits. The separation shall be a minimum of 12 inches for metallic conduits and 24 inches for nonmetallic conduits.

Install explosion-proof seal-offs in hazardous areas shown on the Plans and as required by the N.E.C.

Plastic raceway joints shall be solvent cemented in accordance with recommendations of raceway manufacturer.

All conduit openings not encased in a panel shall be sealed with duct seal.

16.72 BOXES AND ENCLOSURES

16.72.2 Outlet and Junction Boxes

Part 1 – General

Design Requirements

In corrosive areas, all junction boxes shall be NEMA 4X.

Outlet boxes and switch boxes shall be designed for mounting flush wiring devices.

Outlet boxes shall not be less than 4-inch square and 1 ½-inch deep. Ceiling boxes shall withstand a vertical force of 200 pounds for five minutes. Wall boxes shall withstand a vertical downward force of 50 pounds for five minutes.

Part 2 – Products

Materials

Use cast boxes with threaded hubs for all rigid and intermediate conduits. Steel boxes may be used with rigid and intermediate conduits where cast boxes are not allowed by the N.E.C. All boxes shall be of proper size to accommodate devices, connectors, and number of wires present in the box. Boxes shall be readily accessible.

Cast box bodies and cover shall be cast or malleable iron with a minimum wall thickness of ⅛-inch at every point, and not less than ¼-inch at tapped holes for rigid conduit. Bosses are not acceptable. Mounting lugs shall be provided at the back or bottom corners of the body. Covers shall be secured to the box body with No. 6 or larger brass or bronze flathead screws. Boxes shall be provided with neoprene cover gaskets. Outlet boxes shall be of the FS types. Boxes shall conform to FS W-C-586C and UL 514.

Sheet metal boxes shall conform to UL 50, with a hot-dipped galvanized finish conforming to ASTM A123. Boxes and box extension rings shall be provided with knockouts. Boxes shall be formed in one piece from carbon-steel sheets.

Non-metallic boxes shall be hot-compressed fiberglass, one-piece, molded with reinforcing of polyester material, with a minimum wall thickness of ⅛-inch.

Finishes

Where only cast aluminum is available for certain types of fixture boxes, an epoxy finish shall be provided.

16.72.3 Watertight Enclosures

Part 2 – Products

Manufacturers

The watertight enclosure shall be equal to Hoffman.

Materials

Watertight enclosures for vault electrical outlets shall be molded from fiberglass reinforced polyester material. A hinged cover shall be gasketed and opened with quick release latches. The conduit penetrations shall be sealed watertight.

Part 3 – Execution

Installation

An epoxy plug shall be installed in the conduit to prevent the migration of water into the conduit. The enclosure shall be NEMA rated and installed per all applicable codes.

16.75 WIRING DEVICES

16.75.1 Common Work for Wiring Devices

Part 3 - Execution

Installation

Wiring Devices

1. Position of Outlets: All outlets shall be centered with regard to building lines, furring and trim, symmetrically arranged in the room or outside the structure. Device outlets shall be set plumb and shall extend flush to the finished surface of the wall, ceiling or floor without projecting beyond the same.
2. Unless otherwise noted, wall mounted outlet devices shall generally be 24-inches above the floor, 18 inches in architecturally treated areas, above process piping near process valve boards. Switches shall be 48 inches above the finished floor unless otherwise noted.

Installation of Wall Plates

1. Interior Dry Locations: Install plates so that all four edges are in continuous contact with the finished wall surfaces. Plaster filled will not be permitted. Do not use oversize plates or sectional plates.
2. Exterior and/or Wet Locations: Install plates with gaskets on wiring devices in such a manner as to provide a rain tight weatherproof installation. For receptacle devices, these plates shall maintain the weatherproof rating with an attachment plug inserted and be rated extra-duty. Cover type shall match box type.

Testing

After installation of receptacles, circuits shall be energized and each receptacle tested for proper ground continuity, reversed polarity, and/or open neutral condition.

GFI receptacles shall be tested with the circuits energized. Devices shall be tested with a portable GFI receptacle tester capable of circulating 7.5 milliamperes of current, when plugged in, between the "hot" line and "ground" to produce tripping of the receptacle. Resetting and tripping shall be checked at least twice at each GFI receptacle.

Submit results of all field testing to the Engineer for review.

16.75.2 Receptacles

Part 1 – General

Design Requirements

Receptacles shall be heavy duty, high abuse, grounding type conforming to NEMA configurations, NEMA WD1 and UL 514 Standards.

Part 2 – Products

Materials

Single and Duplex Receptacles:

1. Indoor Clean Areas: Receptacles shall be duplex, 20 amp, NEMA 5-20R, and shall accept NEMA 5-15P and 5-15P plug caps. Receptacles shall be Hubbel 5362, General Electric 4108-2, or equal. Color shall be brown in industrial areas and ivory or white in office and laboratory areas.
2. Outdoor, Process or Corrosive Areas: Receptacles shall be duplex, 20 amp, NEMA 5-20R, and shall accept NEMA 5-15P and 5-20P plug caps. Receptacle and plug caps shall be corrosion resistant, marine duty with yellow polycarbonate weatherproof lift covers. Receptacles shall be Hubbell 53CM62/53CM21 or equal.

GFI Receptacles:

1. Device shall be rated 20 amp, 2-pole, 3-wire, 120 volt, conforming to NEMA WD1.10 configuration. Device shall have a test and reset push buttons. GFI device shall be Hubbell 5362 or equal.

16.75.5 Plates

Part 1 – General

Design Requirements

Plates shall be of the style and color to match the wiring devices, and of the required number of gangs. Plates shall conform to NEMA WD1, UL 514, and ANSI C73. In noncorrosive indoor areas, device plates shall be made of sheet steel, zinc electroplated with chrome finish.

Device plates in corrosive or outdoor areas shall be corrosion-resistant/marine-duty type with weather protective double doors. Device plates for explosion-proof equipment shall be factory provided with the equipment.

Part 2 – Products

Manufacturers

As manufactured by Crouse-Hinds, Appleton, or equal.

Components

Device plates shall be provided with engraved laminated phenolic nameplates with 1/8-inch white characters on black background. Nameplates for switches shall identify panel and circuit number and area served. Nameplates for receptacles shall identify circuit and voltage if other than 120 volts, single phase.

16.95 TESTING

16.95.1 Common Work for Testing

Part 1 - General

Submittals

Test reports shall be submitted to the Engineer prior to final acceptance in accordance with Division 1.33 of these specifications.

Scheduling and Coordination

The Contractor shall inform the Engineer in advance of testing in accordance with the requirements listed in Division 1 of these specifications.

Prior to scheduling the testing, the Contractor shall have satisfied himself that the project area is properly cleaned up; all patching and painting deemed necessary properly completed; and all systems, equipment and controls are functioning as intended.

Part 2 - Products

Source Quality Control

Submit reports of factory tests and adjustments performed by equipment manufacturers to the Engineer prior to field testing and adjustment of equipment. These reports shall identify the equipment and show dates, results of test, measured values and final adjustment settings. Provide factory tests and adjustments for equipment where factory tests are specified in the

equipment specifications. The Engineer may inspect the fabricated equipment at the factory before shipment to job site. Provide the Engineer with sufficient prior notice so that an inspection can be arranged at the factory.

Part 3 – Execution

Site Testing

Test all circuits for continuity, freedom from ground, and proper operation during progress of the work.

Insulation Resistance, Continuity, and Rotation: Perform routine insulation resistance, continuity and rotation tests for all distribution and utilization equipment prior and in addition to tests performed by the testing laboratory specified herein.

Electric Motors: Perform voltage, current and resistance tests on all motors ½ horsepower and larger installed this project. Insulation resistance readings shall be taken with a 500 volt megger for 30 seconds with the circuit conductors connected to the motor. Verify that an overload condition does not exist.

Conduct special test as required for service and/or system ground.

Field Quality Control

General: Conduct final test in the presence of Owner and/or their authorized representative. Contractor shall provide all testing instrumentation and labor required to demonstrate satisfactory operation of systems, equipment and controls.

Operational Tests: Operational test all circuits to demonstrate that the circuits and equipment have been properly installed, adjusted and are ready for full-time service. Demonstrate the proper functioning of circuits in all modes of operation, and including alarm conditions, and demonstrate satisfactory interfacing with the data acquisition and alarm systems.

16.95.3 Conductor Test Report

Conductor Test Report Page 1 of 1														
PROJECT:								OWNER:						
Contractor Co. Name: Tested by:								Phone Number: Test Date:						
Race-way Label (1)	V (2)	C (3)	Operating Load Voltage						Insulation Resistance - OHMS					
			VAB	VCB	VCA	VAN	VBN	VCN	A-B	B-C	C-A	A-G	B-G	C-G
A														
B														
C														
D														
E														
F														
G														

1. Refer to raceway and wire schedule and one-line diagram for description of feeder identified by label shown on this report
2. Visual Inspection – Check when completed
3. Continuity Test – Check when completed

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Division 17
Automatic Control – Not Used

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Division 18
Measurement and Payment

18.0 GENERAL

It is the intention of these specifications that performance of work under bid items shall result in complete construction, in proper operating condition, of improvements identified in these written specifications and accompanying plans. Work and material not specifically listed in the proposal, but required according to the plans and specifications and general practice, shall be included in Contractor's bid price.

Bid Item 1 – Mobilization, Demobilization, Site Preparation, and Cleanup

Lump sum price covers complete cost of furnishing, installing, complete and in-place, all work and materials necessary to: move and organize equipment and personnel onto the job site; secure job site; provide and maintain necessary support facilities; obtain all necessary permits and licenses; prepare site for construction operations; maintain site and surrounding areas during construction; move all personnel and equipment off site after contract completion; provide as-constructed data; cleanup site prior to final acceptance; and accomplish all other items of work not specifically listed in other bid items. Payment shall be lump sum. No more than 70 percent of bid amount for this item will be paid before final payment request, and this bid amount may not be more than 15 percent of value of total contract.

Bid Item 2 – Site Work and Utilities

Lump sum price shown shall cover the complete cost of providing all site and utility work relating to construction of the improvements, as shown on the Plans and specified herein, and not covered by other bid items. Work includes, but is not limited to: site excavation, trenching, backfill, and compaction; temporary erosion and sedimentation control; control of water; removal and disposal of unsuitable and excess materials; pipe bedding; gravel; site restoration; and all other work necessary for a complete installation of all site work and underground utilities. Payment shall be lump sum.

Bid Item 3 – Structural, Mechanical, and Well Pump and Motor

Lump sum price shown shall cover the complete cost of providing all labor, materials and equipment necessary for the structural, mechanical, and well pump and motor work shown on the Plans and detailed in the contract specifications, including, but not limited to: concrete slabs; enclosure; wooden structure; submersible pump, motor and appurtenances; piping to connect to existing system; operations and maintenance (O&M) manual(s) for installed equipment; and testing and startup. Payment shall be lump sum.

Bid Item 4 – Electrical

The lump sum price shown shall cover the complete cost of providing all labor, materials, and equipment necessary for the electrical work shown on the Plans, and detailed in the contract specifications. Payment shall be lump sum.

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APPENDIX A

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Memorandum

Client: Hartstene Pointe Water-Sewer District

Project: Groundwater Replacement Well 1R

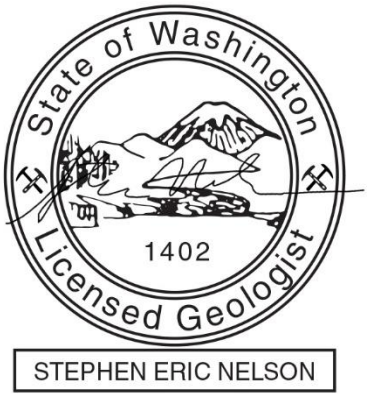
Project File: HP 116.098.01.101 **Project Manager:** Edwin Halim, PE

Composed by: Steve Nelson, LHG

Reviewed by: Rick Ballard, PE

Subject: Well 1R Drilling and Testing

Date: February 3, 2017



2/3/2017

2/3/2017

INTRODUCTION

Project Description

This technical memorandum documents the well construction and testing activities for the Hartstene Pointe Sewer-Water District (District) Groundwater Replacement Well 1R (Well 1R), and provides recommendations for equipping and operating Well 1R. The District intends to use Well 1R to replace the existing Well 1 for year-round withdrawal of groundwater for potable and other municipal uses.

The District currently owns and operates Well Nos. 1, 2, and 3. Well 1 is completed at a depth of 143 to 158 feet below ground surface (bgs) in a sand and gravel aquifer, and has reportedly exhibited diminishing well yield. The District intends to replace Well 1 in order to continue full use of its associated instantaneous water right (G2-01016C) of 110 gallons per minute (gpm) and an annual withdrawal right of 44 acre-feet (af). Well 1 was completed at a depth 143 to 158 feet using an 8-inch-diameter wire-wrapped screen with 0.080- to 0.100-inch (80-to 100-slot) openings positioned within a sand and gravel aquifer that also reportedly

contained some fine-grained sediment. Well 2 and Well 3 are completed at depths of approximately 140 to 180 feet bgs.

Location

Well 1R is just south of the District office at the northern end of Harstine Point in Mason County. Replacement Well 1R was constructed approximately 50 feet from Well 1 on District property at NE ¼ ¼ NE ¼, Section 19, Township 21N, Range 01W, WM. Surrounding land uses include suburban residential property. The site is relatively flat and the surrounding area slopes slightly toward the south. Refer to **Figure 1** for the location of Well 1R.

Regional Geologic and Groundwater Conditions

Hartstine Point is underlain by a sequence of glacially consolidated sand, gravel, and silt layers to a depth of several hundred feet. Groundwater in the glacial-deposit aquifers below Harstine Island originates from infiltration of precipitation on the island. A sea-level aquifer used as a source of domestic and municipal potable supply is regionally extensive in Mason County. A sequence of permeable sand and gravel layers exist within 20 to 50 feet of sea-level elevation, and the groundwater elevation at wells completed in this aquifer is similar to mean sea level. The sea-level aquifer exhibits confined conditions, and is generally overlain by low permeability silt and clay.

The static water level at Well 1 at the time of drilling in 1964 was 112 feet. Static water level in Well 1 and Well 2 in October 2016 was approximately 113 and 115 feet bgs, respectively.

Well Drilling and Well Completion Details

In May 2016, the District obtained site approval from the Mason County Department of Health to locate the replacement well at the proposed drilling site.

Tacoma Pump and Drilling, Inc. (TPD), of Graham, Washington, completed the well drilling project in October 2016 using an air-rotary drilling rig to advance and install a temporary 16-inch-diameter steel sanitary casing to a depth of 25 feet bgs, and to advance a 10-inch-diameter boring and install a 10-inch-diameter casing to a depth of 175 feet bgs. Samples of drill cuttings were retrieved from the discharge at 5-foot intervals and logged for composition and color. Representative samples from depths of 150, 155, and 160 feet bgs were submitted to HWA GeoSciences, Inc., of Bothell, Washington, for particle-size analysis by American Society for Testing and Materials (ASTM) Method D-422. Results of testing are attached.

The drilling encountered layers of fine-grained sand, silt, clay, and gravel to a depth of 151 feet bgs, medium to coarse sand and gravel from 151 to 161 feet bgs, and fine silty sand to 175 feet bgs. Perched groundwater was initially encountered during drilling at a depth of approximately 34 feet bgs, and groundwater in the boring was typically measured at a depth of 115 feet bgs during the construction and testing of Well 1R.

RH2 designed a well screen assembly based on the results of soil logging and soil laboratory analysis. The well assembly consists of 5 feet of 8-inch-diameter blank steel sump/tailpipe, a lower portion of well screen consisting of 5 feet of 8-inch-diameter 0.060-inch slot stainless

steel wire-wrapped screen, an upper portion of well screen consisting of 5 feet of 8-inch-diameter 0.040-inch slot stainless steel wire-wrapped screen, and 3 feet of 8-inch diameter blank steel riser. The 10-foot-length of screen was placed at 160 to 150 feet bgs. Pea gravel and bentonite chips were placed in the bottom of the boring from 175 to 160 feet bgs to provide a firm base for the well assembly. A neoprene K-packer was placed on the riser 2.5 feet above the top of the upper portion of the well screen, the assembly was lowered to the base of the boring, and the 10-inch casing was pulled back to expose the lower and upper portions and well screen to the sand and gravel aquifer. The drilling log and a schematic drawing of well completion are attached.

Well 1R was developed using airlift and surging methods along the full length of both screen portions, and removing accumulated sediment with a sand bailer.

The temporary 16-inch casing was removed and a 25-foot-deep, 16-inch-diameter bentonite sanitary seal was placed around the 10-inch steel casing. The casing was capped with a welded steel plate and a 2-inch-diameter threaded cap.

Pumping Tests Results

TPD installed a 10 horsepower (hp) submersible pump to a depth of 140 feet bgs, and used a portable electric generator to power the pump. TPD constructed a 6-inch-diameter discharge line equipped with an in line flow meter near the well head and routed the discharge into a nearby stormwater ditch that discharged into the District stormwater system. On October 19, 2016, TPD activated the pump at a rate of 45 gpm before step-rate testing, and the water discharging from Well 1R was slightly cloudy, but cleared after 15 minutes. No color or odor was observed in the well discharge during subsequent testing. The groundwater level during this initial test declined from 116 feet below the top of the well casing (BTOC) to 124.5 feet BTOC within a few minutes of pump activation, and then remained steady for approximately 30 minutes. Based on the indication that the groundwater would rapidly stabilize, and that there was sufficient available drawdown in the well to sustain a higher pumping rate, step-rate testing was not warranted and constant-rate testing was scheduled for the following day.

On October 20, 2016, TPD activated the pump at a rate of 100 gpm and operated the pump for 25 hours at this rate. Water levels in Well 1R were measured and recorded continuously using an automatic pressure transducer and datalogger. Water levels in Well 1R, Well 1, and Well 2 were measured periodically using an electric water level meter.

The water level in Well 1R declined by approximately 11.5 feet during the constant-rate test. The water level was affected by concurrent operation of Well 2; groundwater levels decreased by 0.2 feet during Well 2 operation. Groundwater level at Well 1R recovered within minutes after pumping stopped. Continuous water level monitoring during the 5 days after testing indicates that the groundwater level at Well 1R is affected by tidal cycle, primarily during the period of maximum tide swings. The tidal influence ranges between 0 and 0.2 feet. The water level at Well 1R could experience up to 0.5 feet of rapid change during a coincident period of Well 2 operation and maximum tidal change (**Figure 2**).

Specific capacity of Well 1R for the constant-rate test is approximately 8.7 gpm per foot of drawdown, based on a pumping rate of 100 gpm and a drawdown of 11.5 feet.

The groundwater level at Well 1 declined by approximately 2 feet during the constant-rate test. Well 1 is approximately 40 feet from Well 1R. Well 2 was intermittently pumping during the Well 1R constant-rate test. Water levels at Well 2 fluctuated between 115 and 137 feet BTOC during the constant-rate testing, but the decline was due to Well 2 operation. It is reasonable to assume that groundwater level at Well 2 declined by less than 1 additional foot of drawdown during constant-rate testing at Well 1R. Well 2 is approximately 300 feet from Well 1R.

Water Quality

Water samples were collected at the end of the constant-rate test and submitted to Centric Analytical Labs, of Port Orchard, Washington, for analysis. Testing results indicate good quality water with a few notable constituents. In summary, water at Well 1R contains:

- Detectable metal concentrations of barium, chromium, and zinc that are below their respective maximum contaminant levels (MCLs).
- Arsenic concentrations of 0.15 milligrams per liter (mg/L), which exceeds the 0.010 mg/L primary MCL for arsenic.
- Iron concentrations of 0.23 mg/L, which are close to the 0.30 mg/L secondary MCL for iron.
- Manganese concentrations of 0.27 mg/L, which exceeds the 0.050 mg/L secondary MCL for manganese.
- Detectable inorganic compound concentrations of chloride, sulfate, and conductivity that are below their respective MCLs.
- No detectable concentrations of synthetic organic compounds (SOCs), volatile organic compounds (VOCs), or radionuclides.

ANALYSIS

Well Efficiency

The well was designed with a theoretical capacity to efficiently transmit water at rate of 200 gpm. The well would be operated at a rate of 100 gpm or less; therefore, well losses affecting drawdown at the well will be insignificant.

Aquifer Analysis

The 24-hour pumping test results indicated a specific capacity value of approximately 8.7 gpm per foot of drawdown. Assuming that the conditions observed during the constant-rate testing indicated steady-state conditions, and using the Theim method, the observed drawdown of 2 feet at Well 1 and 11.5 feet at Well 1R, respectively for a 100 gpm pumping rate, the estimated transmissivity of the sea-level aquifer is approximately 9,000 gallons per day per foot.

Conclusions and Recommendations

The drilling and testing results indicate that Hartstene Pointe groundwater wells are completed in the same sea-level aquifer at a depth of approximately 150 to 170 feet, and that groundwater levels are similar to sea level. Groundwater withdrawn from the aquifer derives from the infiltration of precipitation on the island. The aquifer appears to have a small tidal influence

at Well 1R and likely at Well 1 and Well 2.

Well 1R is capable of pumping at a steady rate of 100 gpm and resulting in a drawdown of approximately 12 feet, or from a static level of 110 feet bgs to 122 feet bgs, which is 28 feet higher than the uppermost well screen. Well 1R has sufficient available drawdown to sustain groundwater withdrawal at a rate of 100 gpm.

The well should be equipped with a pump capable of lifting 100 gpm from a depth of 150 feet. The pump should be set with its intake no shallower than 145 feet bgs. RH2 recommends operating the pump at a lower rate than 100 gpm to reduce the velocity of groundwater entering the well. It is better to operate the well at lower rates for longer duration. The pump operation should be coordinated with Well 2 operation to minimize interference and balance the total withdrawal from the sea level aquifer.

Water quality is good, with a few notable constituents, arsenic and manganese, at concentrations that will require treatment.

Attachments:

Figure 1 – Site Map
Figure 2 – Constant-rate Testing – Well 1R
Particle-size Analysis Results – HWA Geosciences, Inc.
Water Well Report
Laboratory Reports

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ATTACHMENTS

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Figure 1
Hartstene Pointe Site Map

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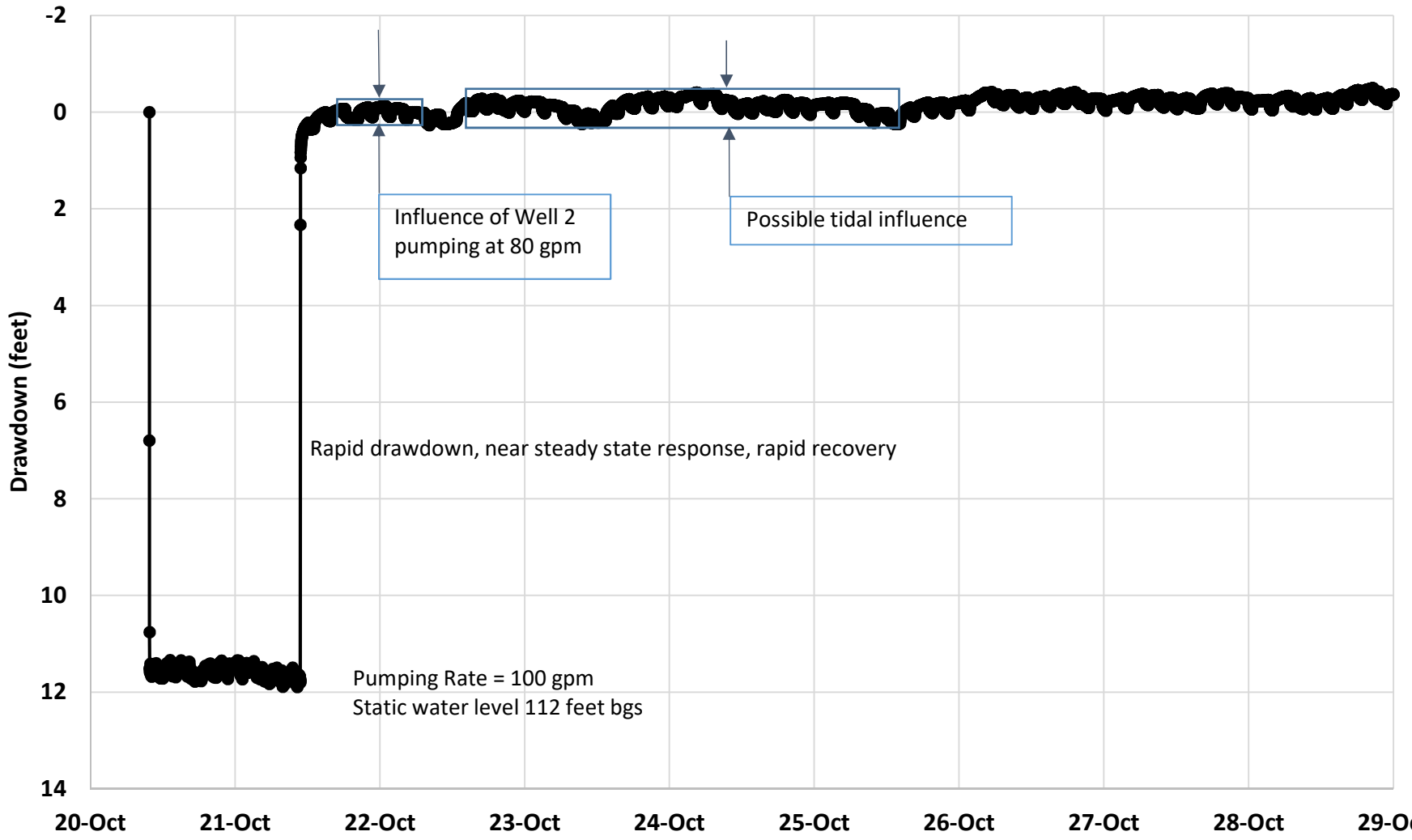
Figure 2
Constant Rate Testing - Well 1R
Hartstene Pointe WSD



RH2 Engineering, Inc.

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HWA GEOSCIENCES INC.
Geotechnical & Pavement Engineering • Hydrogeology • Geoenvironmental • Inspection and Testing

October 10, 2016
HWA Project No. 2012-013 Task 2200

RH2 Engineering, Inc.
22722 29th Drive SE, Suite 210
Bothell, Washington 98021

Attention: Mr. Steve Nelson, L.G., L.H.G.

Subject: **Soil Laboratory Testing Report**
Particle Size Analysis
Hartstene Pointe Well 1R
Client Project No. 116-098 01

Dear Mr. Nelson;

As requested, HWA GeoSciences Inc. (HWA) performed laboratory testing for the above referenced project. Herein we present the results of our laboratory analyses, which are summarized on the attached figure. The laboratory testing program was performed in general accordance with your instructions and appropriate ASTM Standards as outlined below.

SAMPLE INFORMATION: The subject samples were delivered to our laboratory on October 5, 2016 by RH2 personnel. The samples were delivered in re-sealable plastic bags and were designated with project name and depth of sampling. The soil was classified for engineering purposes based on manual-visual methods, the soil descriptions for the samples are shown on Figure 1.

MOISTURE CONTENT OF SOIL: The moisture content of the soil samples (percent by dry mass) was determined in general accordance with ASTM D 2216. The results are shown on the attached Figure 1.

PARTICLE SIZE ANALYSIS OF SOILS: The samples were tested to determine the particle size distribution in general accordance with ASTM D422, by wet sieve analysis only. The results are summarized on the attached Particle Size Analysis of Soils report, Figure 1, which also provides information regarding the classification of the samples and their moisture content at the time of testing.

21312 30th Drive SE
Suite 110
Bothell, WA 98021-7010
Tel: 425.774.0106
Fax: 425.774.2714
www.hwageo.com

CLOSURE: Experience has shown that test values on soil and other natural materials vary with each representative sample. As such, HWA has no knowledge as to the extent and quantity of material the tested samples may represent. HWA also makes no warranty as to how representative either the samples tested or the test results obtained are to actual field conditions. It is a well-established fact that sampling methods present varying degrees of disturbance that affect sample representativeness.

No copy should be made of this report except in its entirety.

We appreciate the opportunity to provide laboratory testing services on this project. Should you have any questions or comments, or if we may be of further service, please call.

Sincerely,

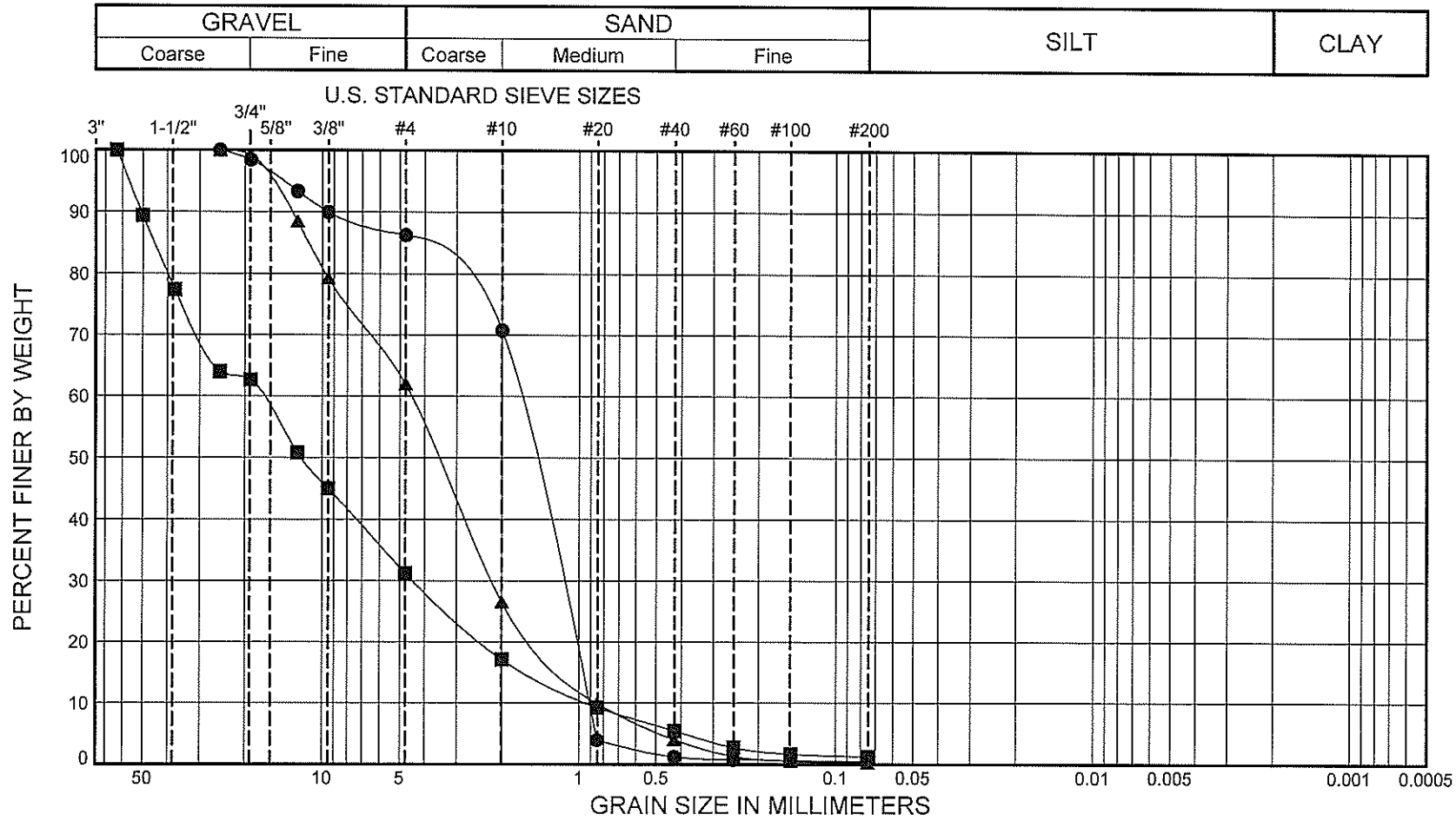
HWA GEOSCIENCES INC.

Jessica Herrera
Materials Laboratory Supervisor

Steven E. Greene, L.G., L.E.G.
Principal Engineering Geologist
Vice President

Attachments:

Figure 1 Particle Size Analysis of Soils



SYMBOL	SAMPLE		DEPTH (ft)	CLASSIFICATION OF SOIL- ASTM D2487 Group Symbol and Name	% MC	LL	PL	PI	Gravel %	Sand %	Fines %
●	150		150.0 - 150.0	(SP) Dark gray, poorly graded SAND	7				13.7	85.8	0.5
■	155		155.0 - 155.0	(GW) Dark olive brown, well graded GRAVEL with sand	5				68.8	30.0	1.2
▲	160		160.0 - 160.0	(SP) Dark gray, poorly graded SAND with gravel	7				38.1	61.7	0.2

HWA GEOSCIENCES INC.

Laboratory Testing for RH2
Hartstene Pointe Well 1R
RH2 Project No. 116-098 01

PARTICLE-SIZE ANALYSIS
OF SOILS
METHOD ASTM D422

PROJECT NO.: 2012-013 T2200 FIGURE: 1

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission *("x" in circle)*

(•) Construction

( ) Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

CURRENT
Notice of Intent No. WE25633

Unique Ecology Well ID Tag No. BIB-339

Water Right Permit No. _____

Property Owner Name Harstene Pointe Water @ Sewer

Well Street Address 200 E Pointes Dr E

City Shelton County Mason

Location SW 1/4-1/4 SW 1/4 Sec 19 Twn 21 R 1 EWM or WWM ☐ circle ☑ one

Lat/Long (s, t, r Still **REQUIRED**) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. 12119-50-00202

PROPOSED USE: ☐ Domestic ☐ Industrial ☑ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other _____

TYPE OF WORK: Owner's number of well (if more than one) _____

☑ New well ☐ Reconditioned ☐ Deepened *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Cable ☑ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 10 inches, drilled 175 ft.

Depth of completed well 166.5 ft.

CONSTRUCTION DETAILS

Casing Installed: ☑ Welded 10 " Diam. from +1.5 ft. to 149.1 ft.
☐ Liner installed _____ " Diam. from _____ ft. to _____ ft.
☐ Threaded _____ " Diam. from _____ ft. to _____ ft.

Perforations: ☐ Yes ☑ No

Type of perforator used _____

SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: ☑ Yes ☐ No ☑ K-Pac Location 147.9

Manufacturer's Name Alloy Machine Works

Type S.S. Pipe Size. Model No. _____

Diam. 8 Slot size .040/.060 from 151 ft. to 161.4 ft.

Diam. 8 Slot size Sump from 161.4 ft. to 166.5 ft.

Gravel/Filter packed: ☐ Yes ☑ No ☐ Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: ☑ Yes ☐ No To what depth? 25 ft.

Material used in seal Bentonite Chips

Did any strata contain unusable water? ☐ Yes ☑ No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.

Static level 113 ft. below top of well Date 10-12-16

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☐ No If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest 50 gal./min. with stem set at 145 ft. for 4 hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? ☐ Yes ☑ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Brown silty fine sand with trace medium gravel.	0	7
Damp brown medium sand with trace fine	7	11
gravel.		
Damp grey silty medium sand with trace fine	11	16
gravel.		
Grey clayey medium gravel	16	21
Blue grey clay with trace fine gravel.	21	34
Wet grey silty fine sand. Water.	34	42
Tan clay	42	46
Dense brown clay.	46	49
Dense blue clay.	49	51
Tan silty medium to course sand and gravel	51	87
Brown medim silty sand.	87	95
Brown medium silty sand with trace fine gravel.	95	104
Tan, brown silty clay.	104	107
Blue clay, trace fine gravel.	107	116
Light brown fine sandy clay, with medium gravel.	116	127
Light brown silty medium to course snd and gravel.	127	148
Very loose fine brown silty sand.	148	150
Grey clay lens.	150	151
Water bearing medium to course sand and gravel,	151	161
cobbles.		
Tighter brown medium silty sand.	161	166
Olive silty fine sand, trace fine gravel. Cobbles.	166	168
Grey fine silty sand.	168	175
Job #		

Start Date 10-3-16 Completed Date 10-12-16

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☐ Driller ☐ Engineer ☐ Trainee Name (Print) Matt Call

Driller/Engineer/Trainee Signature Matt Call

Driller or trainee License No. 2467

Drilling Company Tacoma Pump & Drilling Co., Inc.

Address 30316 Mountain Highway

City, State, Zip Graham, WA 98338

Contractor's Registration No. TACOMPD203PF Date 10-17-16

If TRAINEE,
Driller's Licensed No. _____
Driller's Signature _____

Ecology is an Equal Opportunity Employer.

CENTRIC ANALYTICAL LABS
1786 SE Mile Hill Drive
Port Orchard, WA 98366
Office (360) 443-7845
www.centricanalytical.com

TOC-ALK TEST PANEL
Report of Analysis

Date Collected: 10/21/16	System Group Type: (A) B Other:
Water System ID Number: 31569O	System Name: Hartstene Point Water Sewer District
Lab # - Sample #: 225 -- 14116	County: Mason
Location Where Sample Collected: New source well ID – BIB339	Source Number(s): S01 R New Source BIB 339
Sample Purpose: ☐ RC – Routine/Compliance (satisfies monitoring requirements) ☐ C – Confirmation (confirmation of chemical result)* ☑ I – Investigative (does not satisfy monitoring requirements) ☐ O – Other (specify - does not satisfy monitoring requirements)	Date Received: 10/21/16 Date Analyzed: 10/31/16 Date Reported: 01/24/17 COMMENTS:
Sample Composition: ☑ S - Single Source ☐ B - Blended (list source numbers in 'Source Numbers' field) ☐ C - Composite (list source numbers in 'Source Numbers' field) ☐ D - Distribution sample	Sample Type: ☑ Untreated (raw) ☐ Treated ☐ Unknown or Other Sample Collected by: Mont Jeffreys Phone Number:
Send Report to: gm@hpwatersewer.com	Bill to: Hartstene Point Water Sewer District 772 E Chesapeke Dr. Shelton, WA 98584

EPA REGULATED AND STATE REGULATED OR REQUIRED

DOH #	Analyte	Results	Units	SRL	MCL	METHOD / Analyst's initials
0421	Total Organic Carbon (TOC)	0.94	mg/L	0.7	--	SM 5310 C/094
0403	Alkalinity-Lab	NA	mg/L	5	--	

NOTES:

***Confirmation:** Include the original lab number, sample number, and collection date of original sample in either lab or sampler comments section.

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, please contact your regional DOH office to determine follow-up actions.

NA (Not Analyzed): in the results column indicates this compound was not included in the current analysis.

ND (Not Detected): in the results column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

mg/L: milligrams per liter or parts per million.

< (0.00X): indicates the compound was not detected in the sample at or above the concentration indicated.

--: No existing value

Lab Qualifiers and Comments:** **TOC Sample Subcontracted by Eurofins Eaton Analytical (WA DOH#094)

CENTRIC ANALYTICAL LABS
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Port Orchard, WA 98366
Office (360) 443-7845
www.centricanalytical.com

IOC TEST PANEL
Complete Inorganics
Report of Analysis

Date Collected: 10/21/16	System Group Type: (A) B Other:
Water System ID Number: 31569O	System Name: Hartstene Pointe Water Sewer District
Lab Number / Sample Number: 225/14116	County: Mason
Location Where Sample Collected: New source well ID – BIB339	Source Number(s): S01 R New Source BIB339
Sample Purpose: ☐ RC – Routine/Compliance (satisfies monitoring requirements) ☐ C – Confirmation (confirmation of chemical result)* ☑ I – Investigative (does not satisfy monitoring requirements) ☐ O – Other (specify - does not satisfy monitoring requirements)	Date Received: 10/21/16 Date Analyzed: 10/21/16 Date Reported: 11/04/16 COMMENTS:
Sample Composition: ☑ S - Single Source ☐ B - Blended (list source numbers in 'Source Numbers' field) ☐ C - Composite (list source numbers in 'Source Numbers' field) ☐ D - Distribution sample	Sample Type: ☑ Untreated (raw) ☐ Treated ☐ Unknown or Other Sample Collected by: Mont Jeffreys Phone Number: (877) 408-4060
Send Report to: gm@hpwatersewer.com	Bill to: Hartstene Pointe Water Sewer District 772 E Chesapeke Dr. Shelton, WA 98584

EPA REGULATED AND STATE REGULATED OR REQUIRED

DOH #	ANALYTE	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS MCL? (X if Yes)	Method/Analyst's initials
0004	Arsenic	**0.015**	mg/L	0.001	0.010	0.010	**X**	EPA 200.8/JCS
0005	Barium	0.012	mg/L	0.1	2	2		EPA 200.8/ JCS
0006	Cadmium	<0.001	mg/L	0.001	0.005	0.005		EPA 200.8/ JCS
0007	Chromium	0.002	mg/L	0.007	0.1	0.1		EPA 200.8/ JCS
0011	Mercury	<0.0001	mg/L	0.0002	0.002	0.002		EPA 200.8/ JCS
0012	Selenium	<0.001	mg/L	0.002	0.05	0.05		EPA 200.8/ JCS
0110	Beryllium	<0.0001	mg/L	0.0003	0.004	0.004		EPA 200.8/ JCS
0112	Antimony	<0.001	mg/L	0.003	0.006	0.006		EPA 200.8/ JCS
0113	Thallium	<0.001	mg/L	0.001	0.002	0.002		EPA 200.8/ JCS
0116	Cyanide	<0.005	mg/L	0.05	0.2	0.2		SM 4500-CN^- E/ JCS
0019	Fluoride	<0.50	mg/L	0.2	2.0	4.0		SM 4500-F^- C/ JCS
0114	Nitrite-N	<0.005	mg/L	0.1	0.5	1.0		SM 4500-NO_2^- B/ JCS
0020	Nitrate-N	<0.20	mg/L	0.5	5.0	10.0		Systea/ JCS
0161	Total Nitrate/Nitrite	<0.20	mg/L	0.5	5.0	10.0		Systea/ JCS
0008	Iron	0.23	mg/L	0.1	--	0.3[1]		EPA 200.8/ JCS
0010	Manganese	**0.27**	mg/L	0.01	--	0.05[1]	**X**	EPA 200.8/ JCS
0013	Silver	<0.001	mg/L	0.1	--	0.1[1]		EPA 200.8/ JCS

DOH #	ANALYTE	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS MCL? (X if Yes)	Method/Analyst's initials
0021	Chloride	2.4	mg/L	20	--	250[1]		SM 4500-Cl^- E/ JCS
0022	Sulfate	1.0	mg/L	50	--	250[1]		SM 4500-SO_4^{2-} E/ JCS
0024	Zinc	0.006	mg/L	0.2	--	5[1]		EPA 200.8/ JCS
0014	Sodium	9.0	mg/L	5	--	--		EPA 200.8/ JCS
0015	Hardness	82	mg/L	10	--	--		EPA 200.8/ JCS
0016	Conductivity	201	µmhos/cm	70	--	700[1]		SM 2510 B/ JCS
0017	Turbidity	0.3	NTU	0.1	--	--		EPA 180.1/ JCS
0018	Color	5.0	color units	15	--	15[1]		SM 2120 B/ JCS
0026	TDS-Total Dissolved Solids	NA	mg/L	100	--	500[1]		SM 2540 C/ JCS
0111	Nickel	<0.001	mg/L	0.005	--	--		EPA 200.8/ JCS
0009	Lead	<0.001	mg/L	0.001	--	--		EPA 200.8/ JCS
0023	Copper	<0.001	mg/L	0.02	--	--		EPA 200.8/ JCS

NOTES:

***Confirmation:** Include the original lab number, sample number, and collection date of original sample in either lab or sampler comments section.

SRL (State Reporting Level): The minimum reporting level established by the Washington State Department of Health (DOH).

Trigger Level: DOH drinking water response level. Systems with compounds detected at concentrations in excess of this level may be required to take additional samples or monitor more frequently. Please contact your DOH drinking water regional office for further information.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, please contact your regional DOH office to determine follow-up actions.

NA (Not Analyzed): In the results column, indicates this compound was not included in the current analysis.

ND (Not Detected): In the results column, indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< (0.00X): The compound was not detected in the sample at or above the concentration indicated (usually the lab method reporting limit).

mg/L: milligrams per liter or parts per million.

NTU: nephelometric turbidity units (a measure of water clarity).

µmhos/cm: Micro ohms per centimeter (a measure of the ability of the water to conduct electricity). One micro ohm per centimeter is equivalent to one micro siemen per centimeter (uS/cm).

--: No existing trigger or MCL value.

1: Secondary MCL (Established for aesthetic purposes, not health based).

Lab Qualifiers & Comments:

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Port Orchard, WA 98366
Office (360) 443-7845
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RADIONUCLIDES

Report of Analysis

Date Collected: 10/21/16	System Group Type: (A) B Other:
Water System ID Number: 31569O	System Name: Hartstene Point Water Sewer District
Lab # - Sample #: 225 -- 14116	County: Mason
Location Where Sample Collected: New source well ID – BIB339	Source Number(s): S01 R New Source BIB 339
Sample Purpose: ☐ RC – Routine/Compliance (satisfies monitoring requirements) ☐ C – Confirmation (confirmation of chemical result)* ☑ I – Investigative (does not satisfy monitoring requirements) ☐ O – Other (specify - does not satisfy monitoring requirements)	Date Received: 10/21/16 Date Analyzed: 11/30/16 Date Reported: 01/30/17 COMMENTS:
Sample Composition: ☑ S - Single Source ☐ B - Blended (list source numbers in 'Source Numbers' field) ☐ C - Composite (list source numbers in 'Source Numbers' field) ☐ D - Distribution sample	Sample Type: ☑ Untreated (raw) ☐ Treated ☐ Unknown or Other Sample Collected by: Mont Jeffreys Phone Number:
Send Report to: Mont Jeffries gm@hpwatersewer.com	Bill to: Hartstene Point Water Sewer District 772 E Chesapeke Dr. Shelton, WA 98584

EPA REGULATED AND STATE REGULATED OR REQUIRED

DOH #	ANALYTES	LAB MDA	RESULTS	UNITS	SRL	TRIGGER	MCL	METHOD / Analyst's initials
0165	Gross alpha**	2	ND	pCi/L	3	--	--	EPA 900.0/216
0166	Radium 228	0.61	ND	pCi/L	1	--	--	EPA 904.0/216

NOTES:

***Confirmation:** Include the original lab number, sample number, and collection date of original sample in either lab or sampler comments section.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, please contact your regional DOH office to determine follow-up actions.

MDA: Minimum Detectable Amount.

SRL (State Reporting Level): The minimum reporting level established by the Washington State Department of Health (DOH).

NA (Not Analyzed): In the results column, indicates this compound was not included in the current analysis.

ND (Not Detected): In the results column, indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

pCi/L: picocuries per liter (a measure of radioactivity).

µg/L: micrograms per liters or parts per billion.

< (0.00X): The compound was not detected in the sample at or above the concentration indicated (usually the lab method reporting limit).

--: No existing value

** Gross alpha quantifies all emitters of alpha radiation including radium 226 and uranium. **If gross alpha activity plus radium 228 activity is less than or equal to 5 pCi/L**, it may be assumed that the alpha activity is entirely due to radium 226 (i.e., radium 226 would not need to be quantified). The alpha activity is then added to the radium 228 activity (i.e., beta activity) for MCL determinations. If the sum of the alpha activity plus the radium 228 activity is greater than 5 pCi/L, radium 226 activity must be quantified for water system compliance with the combined radium 226 + 228 MCL.

*** The **uranium MCL is given in mass terms (µg/L).** When uranium is determined by mass methods, it must be converted to activity levels (pCi/L) for calculation of the MCL (the MCL for gross alpha activity minus uranium activity is 15 pCi/L). A conversion factor of 0.67 pCi/l per µg/L should be used. Uranium must be quantified when the gross alpha activity exceeds 15 pCi/L.

**** If radon is not quantified, include the result for gross alpha activity minus uranium activity. If radon is quantified, include the result for gross alpha activity minus radon and uranium activity. Please note DOH does not currently require a system to quantify radon activity in drinking water.

Lab Qualifiers and Comments: Radium 228 & Gross Alpha Sample Subcontracted by ALS Global (WA DOH ID: 216)

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Office (360) 443-7845
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HERB1 TEST PANEL
(SOC – Herbicides)
Report of Analysis

Date Collected: 10/21/16	System Group Type: (A) B Other:
Water System ID Number: 31569O	System Name: Hartstene Point Water Sewer District
Lab Number / Sample Number: 225 / 14116	County: Mason
Location Where Sample Collected: New Source Well ID – BIB339	Source Number(s): S01 R New Source BIB339
Sample Purpose: ☐ RC – Routine/Compliance (satisfies monitoring requirements) ☐ C – Confirmation (confirmation of chemical result)* ☑ I – Investigative (does not satisfy monitoring requirements) ☐ O – Other (specify – does not satisfy monitoring requirements)	Date Received: 10/21/16 Date Analyzed: 11/06/16 Date Reported: 11/21/16 COMMENTS:
Sample Composition: ☑ S - Single Source ☐ B - Blended (list sources in 'Source Numbers' field) ☐ C - Composite (list sources in 'Source Numbers' field) ☐ D - Distribution sample	Sample Type: ☑ Untreated (raw) ☐ Treated ☐ Unknown or Other Sample Collected by: Mont Jeffreys Phone Number:
Send Report to: Mont Jeffreys gm@hpwatersewer.com	Bill to: Hartstene Point Water Sewer District 772 E Chesapeake Dr. Shelton, WA 98584

EPA REGULATED AND STATE REGULATED OR REQUIRED

DOH #	ANALYTE	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS MCL? (X if Yes)	METHOD / Analyst's initials
0037	2,4 - D	ND	µg/L	0.1	0.1	70		EPA 515.4/094
0038	2,4,5- TP (Silvex)	ND	µg/L	0.2	0.2	50		EPA 515.4/094
0134	Pentachlorophenol	ND	µg/L	0.04	0.04	1		EPA 515.4/094
0137	Dalapon	ND	µg/L	1	1	200		EPA 515.4/094
0139	Dinoseb	ND	µg/L	0.2	0.2	7		EPA 515.4/094
0140	Picloram	ND	µg/L	0.1	0.1	500		EPA 515.4/094
0225	DCPA (Acid Metabolites)	ND	µg/L	0.1	0.1	--	--	EPA 515.4/094
0138	Dicamba	ND	µg/L	0.2	0.2	--	--	EPA 515.4/094
0135	2,4 DB	ND	µg/L	1	1	--	--	EPA 515.4/094
0223	Acifluorfen	ND	µg/L	2	2	--	--	EPA 515.4/094
0224	Chloramben	ND	µg/L	0.2	0.2	--	--	EPA 515.4/094
0226	3,5 - Dichlorobenzoic Acid	ND	µg/L	0.5	0.5	--	--	EPA 515.4/094

NOTES:

***Confirmation:** Include the original lab number, sample number, and collection date of original sample in either lab or sampler comments section.

SRL (State Reporting Level): The minimum reporting level established by the Washington State Department of Health (DOH).

Trigger Level: DOH drinking water response level. Systems with compounds detected at concentrations in excess of this level may be required to take additional samples or monitor more frequently. Please contact your DOH drinking water regional office for further information.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, please contact your regional DOH office to determine follow-up actions.

NA (Not Analyzed): In the results column, indicates this compound was not included in the current analysis.

ND (Not Detected): In the results column, indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< (0.00X): The compound was not detected in the sample at or above the concentration indicated (usually the lab method reporting limit).

µg/L: micrograms per liter.

--: No existing value.

Lab Qualifiers and Comments: Herbicide Sample Subcontracted by Eurofins Eaton Analytical (WA DOH#094)

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1786 SE Mile Hill Drive
Port Orchard, WA 98366
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PEST1 TEST PANEL
(SOC - General Pesticides)
Report of Analysis

Date Collected: 10/21/16	System Group Type: (A) B Other:
Water System ID Number: 31569O	System Name: Hartstene Point Water Sewer District
Lab Number / Sample Number: 225 / 14116	County: Mason
Location Where Sample Collected: New Source Well ID – BIB339	Source Number(s): S01 R New Source BIB339
Sample Purpose: ☐ RC – Routine/Compliance (satisfies monitoring requirements) ☐ C – Confirmation (confirmation of chemical result)* ☑ I – Investigative (does not satisfy monitoring requirements) ☐ O – Other (specify – does not satisfy monitoring requirements)	Date Received: 10/21/16 Date Analyzed: 11/07/16 Date Reported: 11/21/16 COMMENTS:
Sample Composition: ☑ S - Single Source ☐ B - Blended (list sources in 'Source Numbers' field) ☐ C - Composite (list sources in 'Source Numbers' field) ☐ D - Distribution sample	Sample Type: ☑ Untreated (raw) ☐ Treated ☐ Unknown or Other Sample Collected by: Mont Jeffreys Phone Number:
Send Report to: Mont Jeffreys gm@hpwatersewer.com	Bill to: Hartstene Point Water Sewer District 772 E Chesapeake Dr. Shelton, WA 98584

EPA REGULATED AND STATE REGULATED OR REQUIRED

DOH #	ANALYTE	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS MCL? (X if Yes)	METHOD/Analyst initials
0033	Endrin	ND	µg/L	0.01	0.01	2		EPA 525.2/094
0034	Lindane (BHC - gamma)	ND	µg/L	0.02	0.02	0.2		EPA 525.2/094
0035	Methoxychlor	ND	µg/L	0.1	0.1	40		EPA 525.2/094
0036	Toxaphene	ND	µg/L	1	1	3		EPA 525.2/094
0117	Alachlor	ND	µg/L	0.2	0.2	2		EPA 525.2/094
0119	Atrazine	ND	µg/L	0.1	0.1	3		EPA 525.2/094
0120	Benzo (a) pyrene	ND	µg/L	0.02	0.02	0.2		EPA 525.2/094
0122	Chlordane (total)	ND	µg/L	0.2	0.2	2		EPA 525.2/094
0124	Di (2-ethylhexyl) adipate	ND	µg/L	0.6	0.6	400		EPA 525.2/094
0125	Di (2-ethylhexyl) phthalate	ND	µg/L	0.6	0.6	6		EPA 525.2/094
0126	Heptachlor	ND	µg/L	0.04	0.04	0.4		EPA 525.2/094
0127	Heptachlor epoxide	ND	µg/L	0.02	0.02	0.2		EPA 525.2/094
0128	Hexachlorobenzene	ND	µg/L	0.1	0.1	1		EPA 525.2/094
0129	Hexachlorocyclopentadiene	ND	µg/L	0.1	0.1	50		EPA 525.2/094
0133	Simazine	ND	µg/L	0.07	0.07	4		EPA 525.2/094
0121	Butachlor	ND	µg/L	0.4	0.4	--		EPA 525.2/094
0123	Dieldrin	ND	µg/L	0.1	0.1	--		EPA 525.2/094
0130	Metolachlor	ND	µg/L	1	1	--		EPA 525.2/094
0131	Metribuzin	ND	µg/L	0.2	0.2	--		EPA 525.2/094
0132	Propachlor	ND	µg/L	0.1	0.1	--		EPA 525.2/094
0254	Fluorene	ND	µg/L	0.2	0.2	--		EPA 525.2/094
0173	Arochlor 1221[1]	ND	µg/L	20	20	--		EPA 525.2/094
0174	Arochlor 1232[1]	ND	µg/L	0.5	0.5	--		EPA 525.2/094

0175	Arochlor 1242[1]	ND	µg/L	0.3	0.3	--		EPA 525.2/094
0176	Arochlor 1248[1]	ND	µg/L	0.1	0.1	--		EPA 525.2/094
0177	Arochlor 1254[1]	ND	µg/L	0.1	0.1	--		EPA 525.2/094
0178	Arochlor 1260[1]	ND	µg/L	0.2	0.2	--		EPA 525.2/094
0179	Bromacil	ND	µg/L	0.2	0.2	---		EPA 525.2/094
0180	Arochlor 1016[1]	ND	µg/L	0.08	0.08	--		EPA 525.2/094
0401	PCB (as Decachlorobiphenyl)	ND	µg/L	--	--	--		EPA 525.2/094

NOTES:

***Confirmation:** Include the original lab number, sample number, and collection date of original sample in either lab or sampler comments section.

SRL (State Reporting Level): The minimum reporting level established by the Washington State Department of Health (DOH).

Trigger Level: DOH drinking water response level. Systems with compounds detected at concentrations in excess of this level may be required to take additional samples or monitor more frequently. Please contact your DOH drinking water regional office for further information.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, please contact your regional DOH office to determine follow-up actions.

NA (Not Analyzed): In the results column, indicates this compound was not included in the current analysis.

ND (Not Detected): In the results column, indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< (0.00X): The compound was not detected in the sample at or above the concentration indicated (usually the lab method reporting limit).

µg/L: micrograms per liter or parts per billion.

1: If detected using Method 505 or 508A, sample must be reanalyze using Method 508A to quantify PCBs (as decachlorobiphenyl).

--: No existing value.

Lab Qualifiers and Comments: Pesticide Sample Subcontracted by Eurofins Eaton Analytical (WA DOH#094)

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Port Orchard, WA 98366
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VOC1 TEST PANEL
(VOC - Volatile Organic Compounds)
Report of Analysis

Date Collected: 10/21/16	System Group Type: (A) B Other:
Water System ID Number: 31569O	System Name: Hartstene Point Water Sewer District
Lab # - Sample #: 225 -- 14116	County: Mason
Location Where Sample Collected: New Source Well ID – BIB339	Source Number(s): S01 R New Source BIB339
Sample Purpose: ☐ RC – Routine/Compliance (satisfies monitoring requirements) ☐ C – Confirmation (confirmation of chemical result) * ☑ I – Investigative (does not satisfy monitoring requirements) ☐ O – Other (specify – does not satisfy monitoring requirements)	Date Received: 10/21/16 Date Analyzed: 11/02/16 Date Reported: 11/21/16 Sampler Comments:
Sample Composition: ☑ S - Single Source ☐ B - Blended (list sources in 'Source Number(s)' field) ☐ C - Composite (list sources in 'Source Number(s)' field) ☐ D - Distribution sample	Sample Type: ☑ Untreated (raw) ☐ Treated ☐ Unknown Sample Collected by: Mont Jeffreys Phone Number:
Send Report to: Mont Jeffreys gm@hpwatersewer.com	Bill to: Hartstene Point Water Sewer District 772 E Chesapeake Dr. Shelton, WA 98584

EPA REGULATED AND STATE REGULATED OR REQUIRED

DOH #	ANALYTE	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS MCL? (X if Yes)	METHOD/Analyst initials
0045	Vinyl chloride	ND	µg/L	0.5	0.5	2		EPA 525.2/017
0046	1,1 Dichloroethylene	ND	µg/L	0.5	0.5	7		EPA 525.2/017
0047	1,1,1 Trichloroethane	ND	µg/L	0.5	0.5	200		EPA 525.2/017
0048	Carbon tetrachloride	ND	µg/L	0.5	0.5	5		EPA 525.2/017
0049	Benzene	ND	µg/L	0.5	0.5	5		EPA 525.2/017
0050	1,2 Dichloroethane	ND	µg/L	0.5	0.5	5		EPA 525.2/017
0051	Trichloroethylene	ND	µg/L	0.5	0.5	5		EPA 525.2/017
0052	1,4 Dichlorobenzene *(para-Dichlorobenzene)*	ND	µg/L	0.5	0.5	75		EPA 525.2/017
0056	Methylene chloride *(Dichloromethane)*	ND	µg/L	0.5	0.5	5		EPA 525.2/017
0057	trans- 1,2 Dichloroethylene	ND	µg/L	0.5	0.5	100		EPA 525.2/017
0060	cis- 1,2 Dichloroethylene	ND	µg/L	0.5	0.5	70		EPA 525.2/017
0063	1,2 Dichloropropane	ND	µg/L	0.5	0.5	5		EPA 525.2/017
0066	Toluene	ND	µg/L	0.5	0.5	1000		EPA 525.2/017
0067	1,1,2 Trichloroethane	ND	µg/L	0.5	0.5	5		EPA 525.2/017
0068	Tetrachloroethylene	ND	µg/L	0.5	0.5	5		EPA 525.2/017
0071	Chlorobenzene *(monochlorobenzene)*	ND	µg/L	0.5	0.5	100		EPA 525.2/017
0073	Ethylbenzene	ND	µg/L	0.5	0.5	700		EPA 525.2/017
0076	Styrene	ND	µg/L	0.5	0.5	100		EPA 525.2/017
0084	1,2 Dichlorobenzene *(ortho-Dichlorobenzene)*	ND	µg/L	0.5	0.5	600		EPA 525.2/017

DOH #	ANALYTE	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS MCL? (X if Yes)	METHOD/Analyst initials
0095	1,2,4 Trichlorobenzene	ND	µg/L	0.5	0.5	70		EPA 525.2/017
0160	Total xylenes	ND	µg/L	0.5	0.5	10,000		EPA 525.2/017
0074	m/p Xylenes (MCL for total)	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0075	o- Xylene (MCL for total)	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0027	Chloroform	ND	µg/L	0.5	--	--		EPA 525.2/017
0053	Chloromethane	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0054	Bromomethane	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0058	1,1 Dichloroethane	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0072	1,1,1,2 Tetrachloroethane	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0078	Bromobenzene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0079	1,2,3 Trichloropropane	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0081	o- Chlorotoluene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0085	Trichlorofluoromethane	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0086	Bromochloromethane	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0089	1,3,5 Trimethylbenzene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0091	1,2,4 Trimethylbenzene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0092	sec-Butylbenzene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0093	p-Isopropyltoluene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0094	n-Butylbenzene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0096	Naphthalene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0427	EDB (screening)[1]	ND	µg/L	0.5	0.5	0.05		EPA 525.2/017
0428	DBCP (screening)[1]	ND	µg/L	0.5	0.5	0.2		EPA 525.2/017
0104	Dichlorodifluoromethane	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0154	1,3 Dichloropropene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0055	Chloroethane	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0059	2,2 Dichloropropane	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0062	1,1 Dichloropropene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0064	Dibromomethane	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0065	cis- 1,3 Dichloropropene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0069	trans- 1,3 Dichloropropene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0070	1,3 Dichloropropane	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0080	1,1,2,2 Tetrachloroethane	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0082	p- Chlorotoluene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0083	m- Dichlorobenzene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0087	Isopropylbenzene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0088	n- Propylbenzene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0090	tert- Butylbenzene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0097	Hexachlorobutadiene	ND	µg/L	0.5	0.5	--		EPA 525.2/017
0098	1,2,3 Trichlorobenzene	ND	µg/L	0.5	0.5	--		EPA 525.2/017

NOTES:

***Confirmation:** Include the original lab number, sample number, and collection date of original sample in either lab or sampler comments section.

SRL (State Reporting Level): The minimum reporting level established by the Washington State Department of Health (DOH).

Trigger Level: DOH drinking water response level. Systems with compounds detected at concentrations in excess of this level may be required to take additional samples or monitor more frequently. Please contact your DOH drinking water regional office for further information.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, please contact your regional DOH office to determine follow-up actions.

NA (Not Analyzed): In the results column, indicates this compound was not included in the current analysis.

ND (Not Detected): In the results column, indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< (0.00X): The compound was not detected in the sample at or above the concentration indicated (usually the lab method reporting limit).

1: Analysis for EDB and DBCP is screening only. Detections of EDB and DBCP are confirmed using the fumigant test panel.

µg/L: micrograms per liter or parts per billion.

--: No existing trigger or MCL value.

Lab Qualifiers & Comments: VOC Sample Subcontracted by ALS Global (WA DOH#017)

CENTRIC ANALYTICAL LABS

COLIFORM BACTERIA ANALYSIS

Date Sample Collected	Time Sample Collected	County
10 / 21 / 16 (Month / Day / Year)	10 : 40 ☑ AM ☐ PM	Mason

Type of Water System (check only one box)

☑ Group A ☐ Group B ☐ Other_____

Group A and Group B Systems – Provide from Water Facilities Inventory (WFI):

ID# 3 1 5 6 9 O

System Name: Hartstene Pointe Water Sewer District

Contact Person: Mont Jeffreys

Day Phone: (360) 427-2413	Cell Phone: (360) 545-7411
Eve. Phone: (360) 545-7411	FAX: ( )

Send results to: (Print full name, address and zip code)

Hartstene Pointe Water Sewer District

772 E Chesapeake Dr.

Shelton WA 98584

SAMPLE INFORMATION

Sample collected by (name): Mont Jeffreys

Specific location where sample collected:	Special instructions or comments:
New Well 1R	W # BIB 339

Type of Sample (must check only **one** box of #1 through #4 listed below)

1. ☐ Routine Distribution Sample

Chlorinated: Yes_____ No_____

Chlorine Residual: Total____ Free____

2. Repeat Sample (after unsat. routine)

☐ Distribution System

☐ Source Groundwater Rule (GWR) (Population of 1,000 or less)

Unsatisfactory routine lab number:

___ ___ ___ - ___ ___ ___ ___ ___

Unsatisfactory routine collect date:

_____/_____/_____

Chlorinated: Yes_____ No_____

Chlorine Residual: Total____ Free____

3. Raw Water Source Sample

☐ *E. coli* – GWR source sample

☐ Fecal –Surface, GWI, some springs

☐ Other

S		

Public systems must provide source number from WFI

4. ☑ Sample Collected for Information Only

Investigative W Construction / Repairs _____ Other _____

LAB USE ONLY **DRINKING WATER RESULTS** LAB USE ONLY

☐ **Unsatisfactory** Total Coliform Present **and**

☐ *E.coli* present ☐ *E.coli* absent

☐ Fecal coliform present ☐ Fecal coliform absent

☒ **Satisfactory**

Replacement Sample Required:

☐ Sample too old (>30 hours) ☐ TNTC ☐ _____

☐ Improper Container ☐ Turbid culture

Bacterial Density Results: Plate Count_____/ml. *E.coli*_____/100ml.

Total Coliform_____/100ml. Fecal Coliform_____/100ml.

Method Code: MICR- SM 9223B	Date and Time Received: 1400 10/21/16
Date Analyzed: 10/22/16	Date Reported: 10/24/16
Sample Number (DOH number plus five digits) 225 . 14116	Lab Use Only: 17.1

DOH Form #331-319 (revised 10/13)