11/30/24

LAKE HAVASU CITY, ARIZONA

ADDENDUM NO. 2

Booster Sta 4 Improvements Project
Project 108029

DATED: NOVEMBER 15, 2023

This Addendum No. 1 forms a part of the contract described above.

Item No. 1:

Changes have been made to the scope of the project in that the planned installation of the PRV station on Cherry Tree Blvd has been removed. Please replace all of the project plans with the revised plan set attached to this addendum that reflects those changes.

Item No. 2:

With the removal of the scope of work for installation of the PRV Station on Cherry Tree Blvd, Bid Item 5 description changes so it only relates to the connection work on Cherry Tree Lane. Please replace project specifications page 00310-02 of the original bid package with the page 00310-02 attached to this addendum.

Item No. 3:

The bid opening date of November 29th, 2023, as stated on the NIB and where appropriate in the specs, has been changed to December 13th, 2023. Contractor is notified of this change via this addendum.

Item No. 4:

There is now a **non-mandatory pre-bid meeting** to be held onsite on Thursday, November 30th at 1:30 pm. Contractor is notified of this change via this addendum.

Item No. 5:

The deadline for questions of November 17th, 2023, by 3:00 pm, as stated on the NIB and where appropriate in the specs, has been changed to December 1st, 2023. Contractor is notified of this change via this addendum.

LAKE HAVASU CITY, ARIZONA

PROJECT NO. 108029

BOOSTER STATION 4 IMPROVEMENTS

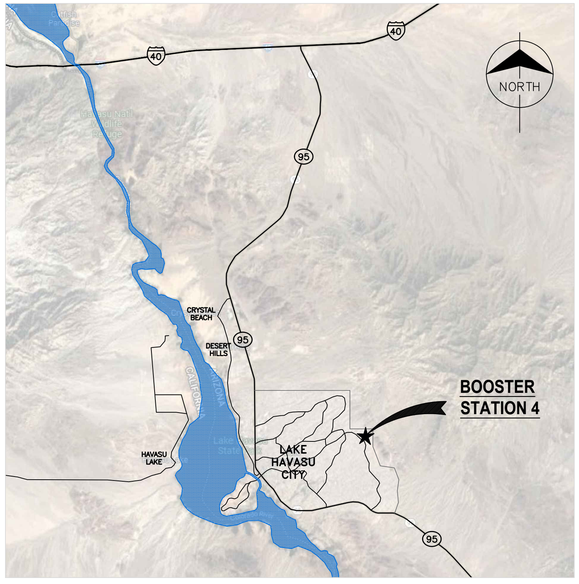
FINAL DESIGN DRAWINGS

NOVEMBER 2023

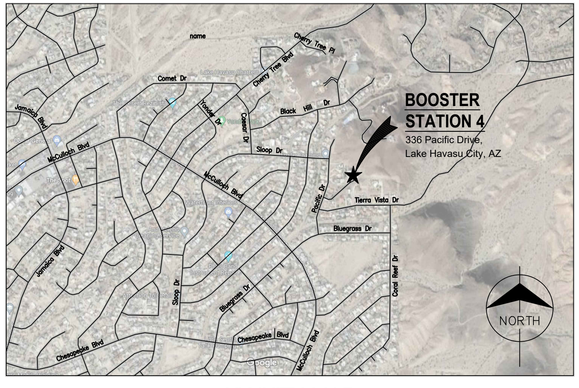
1

DRAWING INDEX

1



LOCATION MAP



VICINITY MAP

CITY COUNCIL

CAL SHEEHY	MAYOR
DAVID LANE	VICE MAYOR
JIM DOLAN	COUNCIL MEMBER
JENI COKE	COUNCIL MEMBER
NANCY CAMPBELL	COUNCIL MEMBER
MICHELE LIN	COUNCIL MEMBER
CAMERON MOSES	COUNCIL MEMBER

CITY MANAGER
JESS KNUDSON

CITY ENGINEER
GREG FROSLIE, P.E.

PROJECT MANAGER
JASON HART

UTILITY CONTACTS

LAKE HAVASU CITY (WASTEWATER)	(928) 855-3999
LAKE HAVASU CITY (WATER)	(928) 855-2618
SUDDEN LINK	(928) 855-9855
FRONTIER COMMUNICATION	(928) 453-0541
UNISOURCE ENERGY SERVICES (GAS)	(928) 505-7025
UNISOURCE ENERGY SERVICES (ELECTRIC)	(928) 505-7031

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202 E. Earll Drive Suite 110
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Phone (602)629-0206
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NO.	REVISIONS / SUBMISSIONS	DATE
1	UPDATED DRAWING INDEX AND DATE	

LAKE HAVASU CITY
BOOSTER STATION 4 IMPROVEMENTS

Designed by: GB
Drawn by: KWB
Checked by: RN
Date: 07-07-23
Dwg scale: AS NOTED

COVER SHEET

Registered Professional Engineer
CERTIFICATE NO.
28112
RAMESH NARASIMHAN
Date Signed 11/3/23
ARIZONA, U.S.A.
EXPIRATION DATE: 09/30/24

Sheet Number:

G-01

Sheet 1 of 26

GENERAL NOTES

GENERAL

1. THE CONTRACTOR SHALL BE RESPONSIBLE TO ENSURE THAT ALL IMPROVEMENTS ARE BUILT, CONSTRUCTED, AND/OR INSTALLED IN ACCORDANCE WITH THESE PROJECT PLANS AND THE TECHNICAL SPECIFICATIONS FOR THE WORK.
2. THE CONTRACTOR IS RESPONSIBLE FOR THE SURVEY, LAYOUT, AND STAKING OF THE PROPOSED IMPROVEMENTS FOR CONSTRUCTION PURPOSES.
3. IF THERE ARE ANY QUESTIONS REGARDING THE PLANS OR THE INTENT OF THE DESIGN, THE CONTRACTOR SHALL CONTACT THE ENGINEER AND DISCUSS THE ISSUE SO THAT IT IS CLARIFIED OR RESOLVED PRIOR TO THE START OF CONSTRUCTION.
4. THE CONTRACTOR SHALL TAKE THE NECESSARY STEPS AND PRECAUTIONS TO PROTECT AND SAFEGUARD ADJACENT IMPROVEMENTS AND PROPERTY FROM DAMAGE DUE TO CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS PROJECT.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFYING AND OBTAINING ANY PERMITS NEEDED TO COMPLETE THE PROJECT, POTENTIALLY INCLUDING AN AGENCY BUSINESS LICENSE, RIGHT OF WAY WORK PERMIT, WATER USAGE AGREEMENT, ETC., AND INCLUDE THE COSTS FOR THE SAME, IF ANY, IN THE PROJECT BID PRICES.
6. ALL PROJECT IMPROVEMENTS INCLUDING BUT NOT LIMITED TO MANHOLE FRAMES, VALVE BOXES, VAULTS, HANDHOLES, FIRE HYDRANTS, ETC., SHALL BE SET OR RESET TO FINISHED GRADE OF THE SURROUNDING GROUND OR PAVEMENT SURFACE WHETHER OR NOT SPECIFICALLY CALLED OUT ON THE PLANS OR IN THE SPECIFICATIONS.

UTILITIES

1. THE EXISTENCE AND LOCATION OF UNDERGROUND UTILITIES OR UTILITY STRUCTURES SHOWN ON THESE PLANS SHOULD BE VERIFIED BASED ON AN AZ 811 UTILITY MAPPING REQUEST.
2. THE LOCATION OF THE UTILITIES MAY OR MAY NOT BE ACCURATELY SHOWN ON THE UTILITY MAPPING PROVIDED AND ON THE PROJECT PLANS.
3. THERE MAY BE OTHER UTILITY LINES AND FACILITIES PRESENT THAT ARE IN SERVICE OR HAVE BEEN ABANDONED WITHIN THE PROJECT CORRIDOR OR AREA THAT ARE NOT SHOWN ON THE MAPPING AND ON THE PLANS.
4. THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING AZ811 (BLUE STAKE) PRIOR TO COMMENCING ANY DIGGING ACTIVITIES TO HAVE THE LOCATIONS OF THE UTILITIES MARKED IN THE FIELD AT THE PROJECT SITE. EXISTING PIPING, ELECTRICAL, AND UTILITIES ARE BASED ON EXISTING RECORDS. CONTRACTOR IS RESPONSIBLE FOR VERIFYING LOCATIONS OF ALL EXISTING PIPING, ELECTRICAL, AND UTILITIES AND AVOIDING DAMAGE TO THE SAME.
5. THE CONTRACTOR IS ALSO RESPONSIBLE FOR VISUALLY INSPECTING THE MARKED UTILITIES AT THE PROJECT SITE TO ASCERTAIN IF ANY POTENTIAL CONFLICTS EXIST BETWEEN THE PROPOSED IMPROVEMENTS UNDER THIS PROJECT AND THE EXISTING UTILITY FACILITIES.
6. THE CONTRACTOR SHALL 'POTHOLE' TO DETERMINE THE EXACT LOCATION AND DEPTH OF EXISTING UTILITY FACILITIES TO IDENTIFY ANY POTENTIAL CONFLICTS BETWEEN UTILITY FACILITIES AND THE PROPOSED IMPROVEMENTS AND, IF NEEDED, REVIEW THE INFORMATION WITH THE OWNER AND THE ENGINEER TO RESOLVE ANY POTENTIAL CONFLICT PRIOR TO CONSTRUCTION.
7. THE CONTRACTOR SHALL OBSERVE ALL POSSIBLE PRECAUTIONS WHEN WORKING IN CLOSE PROXIMITY TO EXISTING UTILITY LINES AND/OR STRUCTURES TO PROTECT THE SAME AND AVOID ANY DAMAGE TO THE UTILITY FACILITIES.
8. SHOULD ANY UTILITY FACILITY BE DAMAGED BY THE CONTRACTOR'S ACTIVITIES, THE CONTRACTOR SHALL CONTACT AND COORDINATE WITH THE UTILITY OWNER FOR THE REPAIR OF THE FACILITY AT NO ADDITIONAL COST TO THE PROJECT.

CONSTRUCTION JOBSITE SAFETY

1. THE CONTRACTOR ASSUMES SOLE AND COMPLETE RESPONSIBILITY FOR JOBSITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT INCLUDING SAFETY OF ALL PERSONS AND PROPERTY.
2. THIS SAFETY REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS.
3. NEITHER THE OWNER NOR THE ENGINEER WILL ENFORCE SAFETY MEASURES OR REGULATIONS.
4. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE DESIGN, CONSTRUCTION, AND MAINTENANCE OF ALL SAFETY DEVICES INCLUDING SHORING.
5. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE, AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS, AND REGULATIONS.
6. THE CONTRACTOR SHALL FOLLOW THE GUIDELINES AND REGULATIONS AS SET FORTH BY OSHA CONCERNING THE PROJECT WORK AND JOBSITE ACTIVITIES.
7. CONTRACTOR IS RESPONSIBLE FOR REVIEWING ALL PLANS FOR DEMOLITION ITEMS.
8. PROVIDE TEMPORARY THRUST RESTRAINT FOR EXISTING PIPING WHENEVER THE WORK REQUIRES. CONTRACTOR SHALL REPLACE OR RESTORE THE EXISTING RESTRAINT SYSTEM TO LIKE-NEW CONDITION.
9. DIMENSIONS AND ELEVATIONS FOR EQUIPMENT INSTALLATION TO BE DETERMINED BASED UPON EQUIPMENT MANUFACTURER SELECTED.
10. WHERE INDICATED, DIMENSIONS AND ELEVATIONS SHALL BE FIELD VERIFIED.
11. EXISTING EQUIPMENT TO BE REMOVED AND SALVAGED SHALL BE MARKED BY ENGINEER OR OWNER PRIOR TO WORK, UNLESS OTHERWISE NOTED ON THE CONTRACT DOCUMENTS.
12. ALTHOUGH SUCH WORK MAY NOT BE SPECIFICALLY INDICATED, FURNISH AND INSTALL SUPPLEMENTARY OR MISCELLANEOUS ITEMS, APPURTENANCES AND DEVICES INCIDENTAL TO, OR NECESSARY FOR A SOUND, SECURE AND COMPLETE INSTALLATION.
13. CONTRACTOR TO MAINTAIN ACCESS FOR EMERGENCY RESPONSE VEHICLES DURING CONSTRUCTION.
14. CONTRACTOR SHALL PROVIDE TEMPORARY SAFETY AND SECURITY FENCING AND SITE IMPROVEMENTS AS NEEDED AT NO EXTRA COST.
15. CONSTRUCTION DEBRIS SHALL BE REMOVED FROM THE SITE AND LEGALLY DISPOSED OF AT LEAST WEEKLY BY THE CONTRACTOR. KEEP SITE AREA CLEAN.
16. EXCAVATED SOIL IS TO BE USED TO FILL IN LOW SPOTS PRIOR TO BEING HAULED OFF SITE. CONTRACTOR SHALL ESTABLISH A SUITABLE STAGING AREA FOR STORAGE OF EXCAVATED SOIL.
17. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SECURITY AT THE SITE WHILE CONSTRUCTION IS IN PROGRESS. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING THE PUBLIC FROM ANY HAZARDS ARISING FROM CONSTRUCTION OPERATIONS AND PROTECTING EXISTING AND NEW IMPROVEMENTS FROM DAMAGE DUE TO ACCIDENT OR VANDALISM.
18. ALL MATERIALS WHICH MAY COME IN CONTACT WITH DRINKING WATER SHALL CONFORM TO NSF INTERNATIONAL STANDARD 60 AND 61.
19. REFER TO PROJECT SPECIFICATION FOR ANY SUPPLEMENT DETAILS REFERRED TO IN THE DRAWINGS.
20. MAINTAIN, RELOCATE, OR REPLACE EXISTING SURVEY MONUMENTS, CONTROL POINTS, AND STAKES WHICH ARE DISTURBED OR DESTROYED. PERFORM THE WORK TO PRODUCE THE SAME LEVEL OF ACCURACY AS THE ORIGINAL MONUMENT(S) IN A TIMELY MANNER, AND AT THE CONTRACTOR'S EXPENSE.
21. COORDINATES AND DIMENSIONS SHOWN FOR ROADWAY IMPROVEMENTS ARE TO FACE OF CURB OR EDGE OF PAVEMENT.
22. ELEVATIONS GIVEN ARE TO FINISH GRADE UNLESS OTHERWISE SHOWN. SLOPE UNIFORMLY BETWEEN CONTOURS AND SPOT ELEVATIONS SHOWN.
23. UNLESS SHOWN ON THE DRAWINGS, ALL DISTURBED AREAS NOT RECEIVING A HARD SURFACE OR GRAVEL SURFACE SHALL BE GRADED SMOOTH AND COMPACTED AS SPECIFIED.
24. CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTING AND MAINTAINING EROSION CONTROL DEVICES DURING CONSTRUCTION. EROSION CONTROL DEVICES, SILT FENCING, RUNOFF CONTAINMENT BERMS, AND STRAW BALES ARE THE MINIMUM REQUIRED.
25. CONTRACTOR SHALL TAKE ALL OTHER MEASURES TO POSITIVELY PRECLUDE EROSION MATERIALS FROM LEAVING THE SITE.
26. WHERE ALUMINUM IS TO BE EMBEDDED IN CONCRETE, THE ALUMINUM SHALL FIRST BE COATED WITH COAL TAR EPOXY.
27. BACKFILLING OF PIPING AND STRUCTURES SHALL NOT BE STARTED UNTIL INSTALLATION IS APPROVED BY THE OWNER.
28. UNLESS OTHERWISE NOTED, ALL PVC INSTALLED ABOVE GROUND SHALL BE PAINTED PER SPECIFICATION SECTION 09800.
29. THE CONTRACTOR SHALL ADJUST ALL EXISTING MANHOLES, VALVE BOXES, CLEANOUTS, BLIND FLANGED PIPING, AND FIRE HYDRANTS WITHIN WORK LIMITS REQUIRED TO MATCH PROPOSED FINAL GRADE.

GOVERNING BUILDING CODES:
2018 INTERNATIONAL BUILDING CODE
2017 NATIONAL ELECTRICAL CODE
2018 INTERNATIONAL PLUMBING CODE
2018 INTERNATIONAL FIRE CODE

ADEQ NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR DISINFECTION PER THE REQUIREMENTS OF BULLETIN NO. 10, CHAPTER 7.L.3 CONTRACTOR SHALL PROVIDE COPIES OF DISINFECTION TESTING RESULTS FROM AN ARIZONA STATE ACCREDITED LABORATORY TO SHOW THAT DISINFECTION HAS BEEN COMPLETED IN COMPLIANCE WITH ADEQ REQUIREMENTS.
2. NEW WATER SYSTEM COMPONENTS, INCLUDING PIPE, VALVES, FITTINGS, AND EQUIPMENT SHALL NOT BE PUT INTO SERVICE UNTIL DISINFECTION HAS BEEN COMPLETED IN ACCORDANCE WITH ENGINEERING BULLETIN NO. 8, AAC R9-8-266.B OR AWWA C652-92.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR PRESSURE AND LEAKAGE TESTING PER THE REQUIREMENTS OF BULLETIN NO. 10, CHAPTER 7.L.2, PRESSURE AND LEAKAGE TESTING. TESTS SHALL BE WITNESSED BY THE ENGINEER AND/OR OWNER AND COPIES OF THE TESTING RESULTS SHALL BE PROVIDED TO THE ENGINEER.
4. IN ACCORDANCE WITH ARIZONA ADMINISTRATIVE CODE 0618 (A.A.C). R18-5-504, ALL CONSTRUCTION MATERIALS SHALL BE LEAD FREE.

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NO.	REVISIONS / SUBMISSIONS	DATE

LAKE HAVASU CITY
BOOSTER STATION 4 IMPROVEMENTS

Designed by: GB
Drawn by: KMB
Checked by: RN
Date: 02-10-23
Dwg scale: AS NOTED

GENERAL NOTES

Registered Professional Engineer (Civil)
RAMESH NARASIMHAN
25012
Date Signed 11/10/23
ARIZONA, U.S.A.
EXPIRATION DATE: 09/30/24

Sheet Number:
G-02
Sheet 2 of 26

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ABBREVIATION	DESCRIPTION
&	AND
@	AT
℄	CENTERLINE
ø	DIAMETER
ABC	AGGREGATE BASE COURSE
AC	ASBESTOS CEMENT
ADD	ADDITION OR ADDITIONAL
ADEQ	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
ADJ	ADJUST OR ADJUSTABLE
AE	ANALYZER ELEMENT
AGGR	AGGREGATE
AL	ALIGNMENT
ALUM	ALUMINUM
ARV	AIR/VACUUM RELEASE VALVE
ASL	AIR SUPPLY LINE
ASPH	ASPHALT
ASTM	AMERICAN SOCIETY OF TESTING MATERIALS
AUTO	AUTOMATIC
AUX	AUXILIARY
AVG	AVERAGE
AWS	AMERICAN WELDING SOCIETY
BDL	BOOSTER PUMP DISCHARGE LINE
BF	BLIND FLANGE
BFP	BACKFLOW PREVENTER
BFV	BUTTERFLY VALVE
BLV	BALL CHECK VALVE
BM	BENCH MARK
BOF	BOTTOM OF FOOTING
BP	BOOSTER PUMP
BSL	BOOSTER PUMP SUCTION LINE
CCP	CONSTRUCTION CONTROL POINT
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CJ	CONSTRUCTION JOINT
CL	CENTER LINE
CLR	CLEAR
CLSM	CONCRETE LOW STRENGTH MATERIAL
CMU	CONCRETE MASONRY UNIT
CND	CONDUIT
CONC	CONCRETE
CONT	CONTINUOUS
CONST	CONSTRUCTION
CU	CUBIC
CV	CHECK VALVE
CY	CUBIC YARD
D	DEEP
DET	DETAIL
DIA	DIAMETER
DIM	DIMENSION
DI	DUCTILE IRON
DIP	DUCTILE IRON PIPE
DISCH	DISCHARGE
DPS	DIFFERENTIAL PRESSURE SWITCH
D/S	DOWNSTREAM
EA	EACH
EF	EACH FACE
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRONIC
EP	EDGE OF PAVEMENT
EQ	EQUALIZATION
EST	ESTIMATE
EW	EACH WAY
EXST	EXISTING
F	EDGE OF FILL AREA
FAB	FABRICATED
FCA	FLANGED COUPLING ADAPTER
FCV	FLOW CONTROL VALVE
FD	FLOOR DRAIN
FE	FLOW ELEMENT
FF	FINISH FLOOR
FG	FINISH GRADE
FIN	FINISH
FL	FLANGED
FRP	FIBERGLASS REINFORCED PLASTIC
FT	FEET
FTG	FOOTING
GAL	GALLON
GALV	GALVANIZED
GND EL	GROUND ELEVATION
GPM	GALLONS PER MINUTE
GSN	GENERAL STRUCTURAL NOTES
GV	GATE VALVE
H	HEIGHT
HDPE	HIGH DENSITY POLYETHYLENE
HORIZ	HORIZONTAL
HP	HORSE POWER
HPT	HYDROPNEUMATIC TANK
HWL	HIGH WATER LEVEL
I	MOMENT OF INERTIA
IBC	INTERNATIONAL BUILDING CODE
ICBO	INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IOP	INDEPENDENT OPERATING PRESSURE
INV	INVERT
IV	ISOLATION VALVE
KW	KILOWATT

ABBREVIATION	DESCRIPTION
LCP	LOCAL CONTROL PANEL
LF	LINEAR FEET
LHC	LAKE HAVASU CITY
LL	LOW LEVEL
LLV	LONG LEG VERTICAL
LOC	LOCATION (S)
LPHH	LEVEL PROBE HIGH HIGH
LS	LAND SURVEYOR
LT	LEFT OR LEVEL TRANSMITTER
MAX	MAXIMUM
MCJ	MASONRY CONTROL JOINT
MFR	MANUFACTURER
MG	MILLION GALLONS
MGD	MILLION GALLONS PER DAY
MH	MANHOLE
MIN	MINIMUM
MILS	MILLIMETER
MCF	MANUAL CLEANING FILTER
MJ	MECHANICAL JOINT
MOV	MOTOR OPERATED VALVE
MS	MECHANICAL STRAINER
MSD	MECHANICAL STRAINER DRAIN
NG	NATURAL GRADE
NO.	NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF	OVERFLOW
OS&Y	OUTSIDE SCREW & YOKE
PE	POLYETHYLENE
PDL	PREFILTER DRAIN LINE
PF	PREFILTER
PI	PRESSURE INDICATOR
PIL	PREFILTER INLET LINE
PLC	PROCESS LOGIC CONTROLLER
PLT	PRESSURE LEVEL TRANSMITTER
PMP	PUMP
PR	PIPE RESTRAINT
PRLV	PRESSURE RELIEF VALVE
PRV	PRESSURE REDUCING VALVE
PSH	HIGH PRESSURE SWITCH
PSI	POUNDS PER SQUARE INCH
PSV	PRESSURE SUSTAINING VALVE
PUE	PUBLIC UTILITY EASEMENT
PVC	POLYVINYL CHLORIDE
PWS	POTABLE WATER SUPPLY
RCP	REINFORCED CONCRETE PIPE
RED	REDUCER
REINF	REINFORCEMENT
RIO	REMOTE INPUT OUTPUT
RMJ	RESTRAINED MECHANICAL JOINT
RMJ	RESTRAINED MECHANICAL JOINT
RPP	REDUCED PRESSURE PRINCIPLE
REQD	REQUIRED
RRP	REGENERATION AND RINSE PUMP
RT	RIGHT
RW	RIGHT-OF-WAY
S	SLOPE
SCH	SCHEDULE
SD	SANITARY DRAIN
SHT	SHEET
SJ	SHRINKAGE JOINT
SPECS	SPECIFICATIONS
SQ	SQUARE
SS	STAINLESS STEEL
ST	STREET
STA	STATION
STD	STANDARD
STL	STEEL
SV	SOLENOID VALVE
SWL	SERVICE WATER LINE
T	THICKNESS
T&B	TOP AND BOTTOM
TBD	TO BE DETERMINED
TBM	TEMPORARY BENCH MARK
TCE	TEMPORARY CONSTRUCTION EASEMENT
THRU	THROUGH
TOC	TOP OF CURB
TOCS	TOP OF CONCRETE SLAB
TOF	TOP OF FOOTING
TOP	TOP OF PIPE
TOS	TOP OF SLAB
TOW	TOP OF WALL
TS	TUBE STEEL
TYP	TYPICAL
UGND	UNDERGROUND
UNO	UNLESS NOTED OTHERWISE
U/S	UPSTREAM
UV	ULTRAVIOLET
YD	YARDS

SYMBOLS

ELBOWS / FLANGED
- DOWN
- PLAN
- UP

ELBOWS / WELDED
- DOWN
- PLAN
- UP

REDUCERS / FLANGED

REDUCERS / WELDED

TEES / FLANGED
- DOWN
- PLAN
- UP

TEES / WELDED
- DOWN
- PLAN
- UP

VALVES / FLANGED
- BUTTERFLY
- CHECK
- GATE
- PLUG
- BALL VALVE

MECHANICAL JOINT
- END FITTINGS

90 DEGREE BENDS / PVC
- DOWN
- PLAN
- UP

TEES / PVC
- DOWN
- PLAN
- UP

- RESTRAINED EXPANSION JOINT (BELLOWS TYPE)
- DISMANTLING JOINT WITH RESTRAINING RODS
- FLANGED COUPLING ADAPTER WITH RESTRAINTS
- DIAPHRAGM VALVE, PROFILE
- PRESSURE SUSTAINING VALVE, PROFILE
- DIAPHRAGM VALVE, PLAN
- MAGNETIC FLOW METER
- PRESSURE RELIEF VALVE
- AIR RELIEF VALVE
- SAFETY POST (BOLLARD)
- SAMPLE TAP
- PRESSURE SWITCH LOW
- PRESSURE SWITCH HIGH
- FLOW SWITCH
- PRESSURE GAUGE
- EMERGENCY EYEWASH AND SHOWER

GENERAL SYMBOLS

- OBJECT LINE, EXISTING
- OBJECT LINES, NEW OR RELOCATED
- FUTURE
- CENTER LINE
- HIDDEN LINE
- SURFACE BREAK LINE
- MATCH LINE
- BASE LINE OR DATUM LINE
- ø DIAMETER OR ROUND
- EXISTING OBJECT TO BE REMOVED
- WATER SURFACE
- EARTH
- CONCRETE

MARKERS

- SECTION INDICATOR (# / CUT FND)
- DETAIL INDICATOR (# / CUT FND)
- SECTION CUT
- DETAIL SCALE — DETAIL TITLE
- SECTION SCALE — SECTION TITLE
- TYP # — TYPICAL DETAIL

(SECTIONS ARE LETTERED, DETAILS ARE NUMBERED)

EQUIPMENT TAG

RWI 1A
- EQUIPMENT TAG OR PIPE SYSTEM
- EQUIPMENT OR VALVE NUMBER

PIPE TAG

12" RWI 1
- PIPE SIZE
- PIPING SYSTEM
- PIPE MATERIAL

PIPE MATERIAL

1 – DUCTILE IRON
2 – STEEL
3 – C-900 PVC
4 – SCHEDULE 80 PVC
5 – SCHEDULE 80 CPVC
6 – COPPER
7 – STAINLESS STEEL
8 – SCH 80 BLACK STEEL
9 – CAST IRON
10 – PVC-SEWER PIPE

SHEET CATEGORY

G – GENERAL
C – CIVIL
S – STRUCTURAL
M – MECHANICAL PROCESS
E – ELECTRICAL
I – INSTRUMENTATION

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NO.	REVISIONS / SUBMISSIONS	DATE

LAKE HAVASU CITY

BOOSTER STATION 4 IMPROVEMENTS

Designed by: GB
Drawn by: KWB
Checked by: RN
Date: 02-10-23
Dwg scale: AS NOTED

ABBREVIATIONS AND SYMBOLS

Registered Professional Engineer
CERTIFICATE NO. 28112
RAMESH NARASIMHAN
ARIZONA, U.S.A.
EXPIRATION DATE: 09/30/24

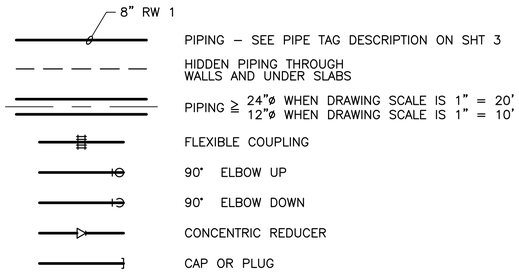
GENERAL SITE NOTES:

1. SOURCE OF TOPOGRAPHY SHOWN ON THE CIVIL PLANS IS A BASE MAP FROM RECORD DRAWINGS. EXISTING CONDITIONS MAY VARY FROM THOSE SHOWN ON THESE PLANS. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS AND ADJUST WORK PLAN ACCORDINGLY PRIOR TO BEGINNING CONSTRUCTION.
2. EXISTING TOPOGRAPHY, STRUCTURES, AND SITE FEATURES ARE SHOWN SCREENED AND/OR LIGHT–LINED. NEW FINISH GRADE, STRUCTURES, AND SITE FEATURES ARE SHOWN HEAVY–LINED.
3. HORIZONTAL DATUM: NAD 83, ARIZONA CENTRAL ZONE
   VERTICAL DATUM: NGVD 29
4. MAINTAIN, RELOCATE, OR REPLACE EXISTING SURVEY MONUMENTS, CONTROL POINTS, AND STAKES WHICH ARE DISTURBED OR DESTROYED. PERFORM THE WORK TO PRODUCE THE SAME LEVEL OF ACCURACY AS THE ORIGINAL MONUMENT(S) IN A TIMELY MANNER, AND AT THE CONTRACTOR'S EXPENSE.
5. COORDINATES AND DIMENSIONS SHOWN FOR ROADWAY IMPROVEMENTS ARE TO FACE OF CURB OR EDGE OF PAVEMENT.
6. ELEVATIONS GIVEN ARE TO FINISH GRADE UNLESS OTHERWISE SHOWN. SLOPE UNIFORMLY BETWEEN CONTOURS AND SPOT ELEVATIONS SHOWN.
7. UNLESS SHOWN ON THE GRADING & DRAINAGE DRAWINGS, ALL DISTURBED AREAS NOT RECEIVING A HARD SURFACE OR GRAVEL SURFACE SHALL BE GRADED SMOOTH AND COMPACTED AS SPECIFIED.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTING AND MAINTAINING EROSION CONTROL DEVICES DURING CONSTRUCTION. EROSION CONTROL INCLUDING DEVICES SILT FENCING, RUNOFF CONTAINMENT BERMS, AND STRAW BALES ARE THE MINIMUM REQUIRED.
9. CONTRACTOR SHALL TAKE ALL OTHER MEASURES TO POSITIVELY PRECLUDE EROSION MATERIALS FROM LEAVING THE SITE.

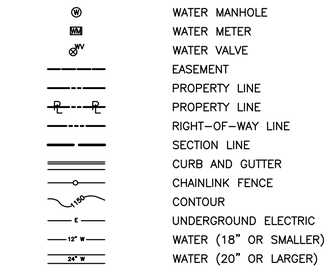
GENERAL YARD PIPING AND UTILITIES NOTES:

1. EXISTING UNDERGROUND UTILITIES OBTAINED FROM AS–BUILTS AND DRAWINGS PROVIDED BY CITY, UTILITIES MAPS, AND FROM FIELD SURVEY. CONTRACTOR SHALL FIELD VERIFY DEPTH AND LOCATION PRIOR TO EXCAVATION. PROTECT ALL EXISTING UTILITIES DURING CONSTRUCTION.
2. FOR PIPING FLOW STREAM IDENTIFICATION, SEE PIPING SCHEDULE.
3. EXISTING PIPING AND EQUIPMENT ARE SHOWN SCREENED AND/OR LIGHT–LINED. NEW PIPING AND EQUIPMENT ARE SHOWN HEAVY–LINED.
4. UNLESS OTHERWISE SHOWN, ALL PIPING SHALL HAVE A MINIMUM OF 4' COVER.
5. ALL PIPES SHALL HAVE A CONSTANT SLOPE BETWEEN INVERT ELEVATIONS UNLESS A FITTING IS SHOWN.
6. ALL NEW WATER PIPES MUST BE PROPERLY FLUSHED, PRESSURE TESTED, CHLORINATED AND BACTERIOLOGICALLY TESTED, AS SPECIFIED.
7. RESTORE DIRT AND/OR GRAVEL ROADS TO CONDITIONS THAT EXISTED BEFORE START OF CONSTRUCTION.
8. CONTRACTOR TO PROVIDE PIPE WARNING TAPE AND TRACER WIRE ON PVC PIPING ON THE SITE. SEE SPECS. TRACER WIRE SHALL BE TERMINATED IN THREADED PVC PIPE ADJACENT TO STRUCTURES. SEE TYPICAL DETAIL.

YARD PIPING LEGEND



CIVIL LEGEND



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CELEBRATING 25 YEARS

LAKE HAVASU CITY, ARIZONA • INCORPORATED 1978

NO.	REVISIONS / SUBMISSIONS	DATE

LAKE HAVASU CITY

BOOSTER STATION 4 IMPROVEMENTS

Designed by: GB	Checked by: RN
Drawn by: KWB	Date: 02-10-23
	Dwg scale: AS NOTED

CIVIL NOTES AND LEGEND

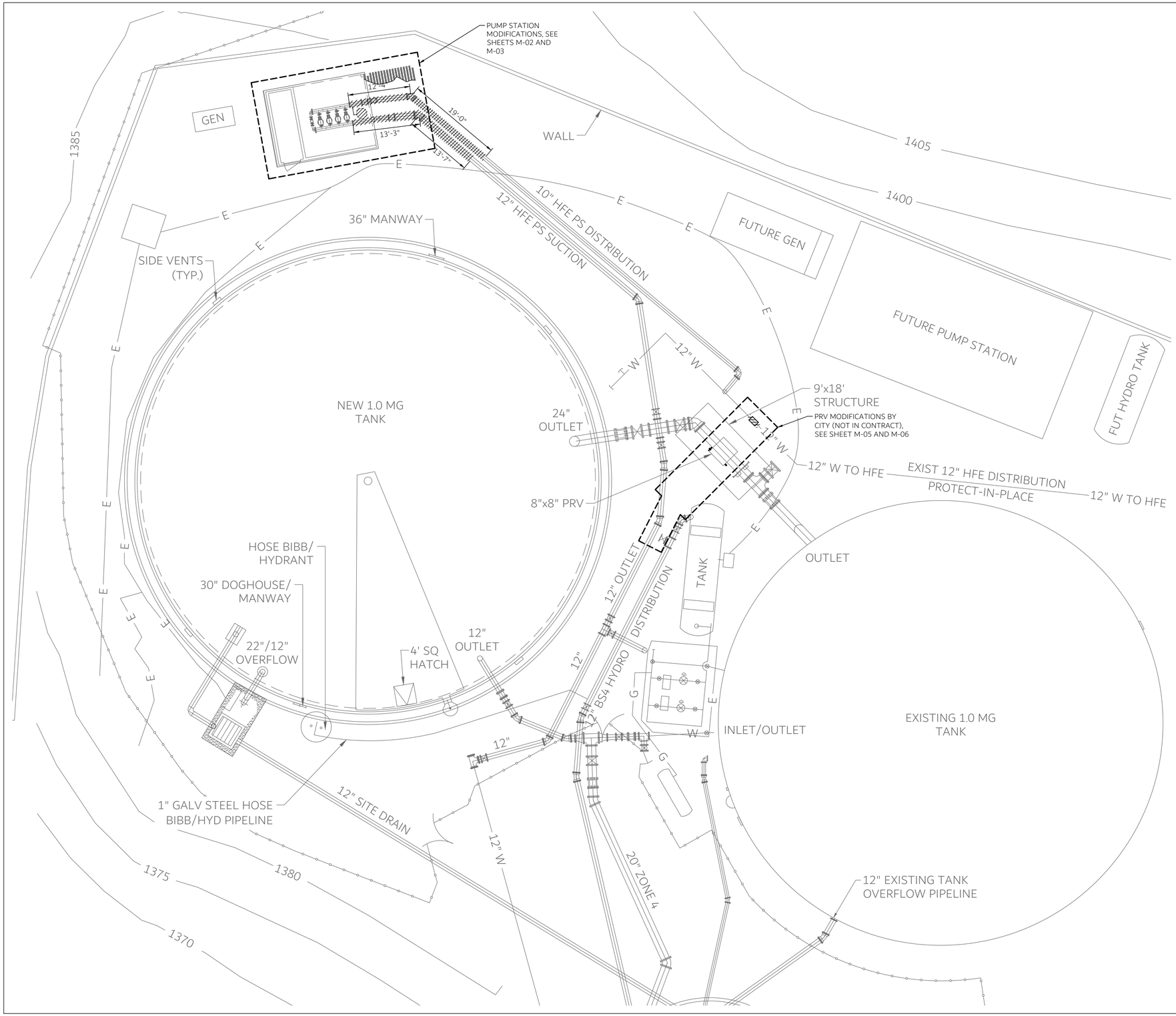
Registered Professional Engineer
CERTIFICATE NO.
28112
RAMESH NARASIMHAN
Date Signed 11/13/23
ARIZONA, U.S.A.

EXPIRATION DATE: 09/30/24

Sheet Number:

C-01

Sheet 4 of 26



NOTES:

NOTES:
1. WHEN NEW FACILITIES ARE OPERATING, DEMOLITION OF EXISTING EQUIPMENT CAN COMMENCE, IN COORDINATION WITH OWNER.
2. REMOVE EXISTING PIPE TO NEXT JOINT FOR CONNECTION.

LAKE HAVASU CITY, ARIZONA • INCORPORATED 1978

NO.	REVISIONS / SUBMISSIONS	DATE

LAKE HAVASU CITY

BOOSTER STATION 4 IMPROVEMENTS

Designed by: GB	Drawn by: KWB	Checked by: RN	Date: 02-10-23	Dwg scale: AS NOTED	

DEMOLITION SITE PLAN

Registered Professional Engineer (Civil) 28112 RAMESH NARASIMHAN Date Signed 11/3/23 ARIZONA, U.S.A.

EXPIRATION DATE: 09/30/24

Sheet Number:

C-02

Sheet 5 of 26

CELEBRATING 25 YEARS

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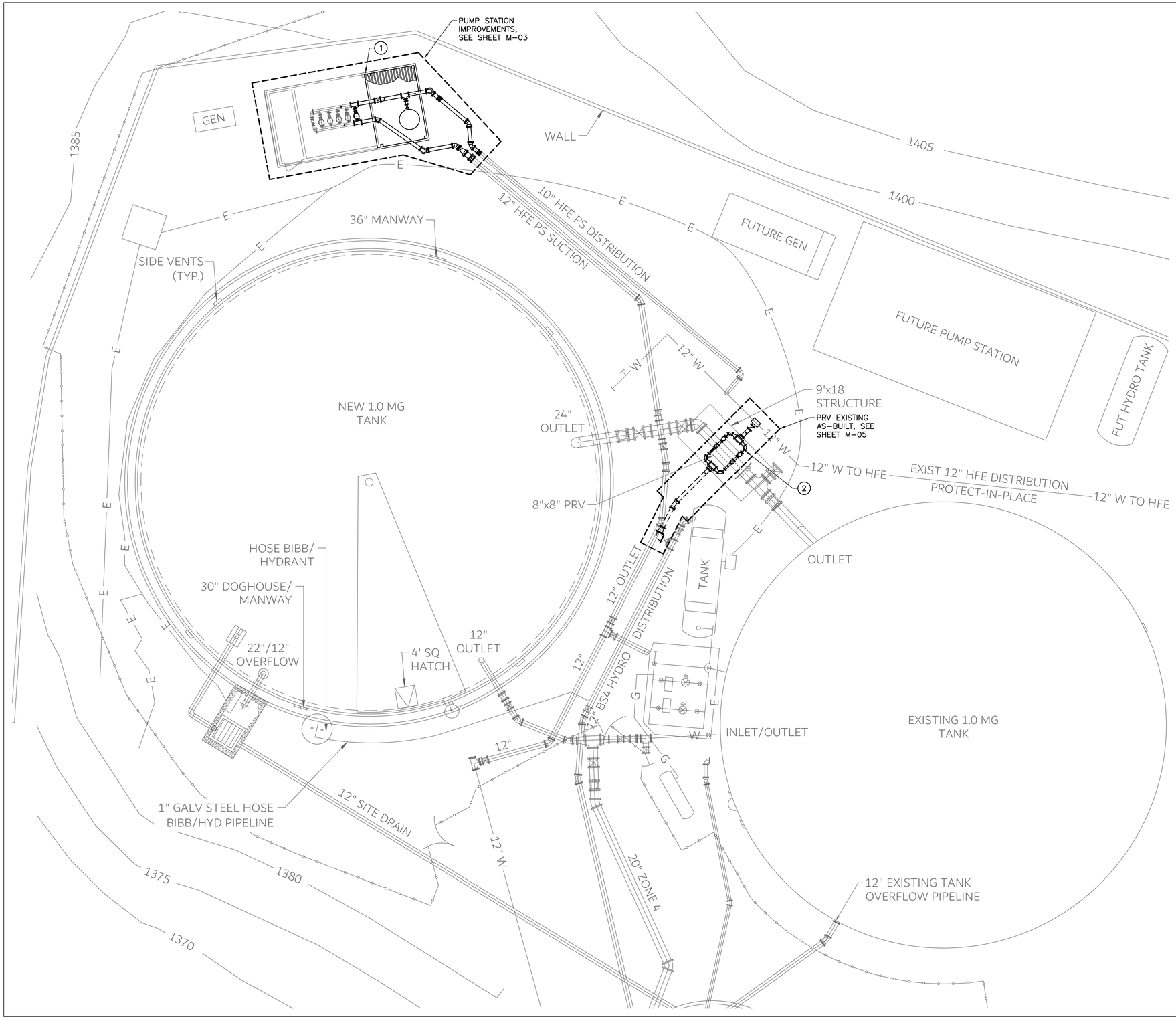

CONSTRUCTION KEY NOTES	
1	BOOSTER PUMP STATION SITE 4
2	HYDRO ZONE PRV STATION

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LAKE HAVASU CITY

BOOSTER STATION 4 IMPROVEMENTS

Designed by: GB	Drawn by: KWB	Checked by: RN	Date: 02-10-23	Dwg scale: AS NOTED

NEW FACILITIES SITE PLAN

Registered Professional Engineer (Civil) 28112 RAMESH NARASIMHAN Date Signed 11/3/23 ARIZONA, U.S.A.

EXPIRATION DATE: 09/30/24

Sheet Number:

C-03

Sheet 6 of 26

CELEBRATING 25 YEARS

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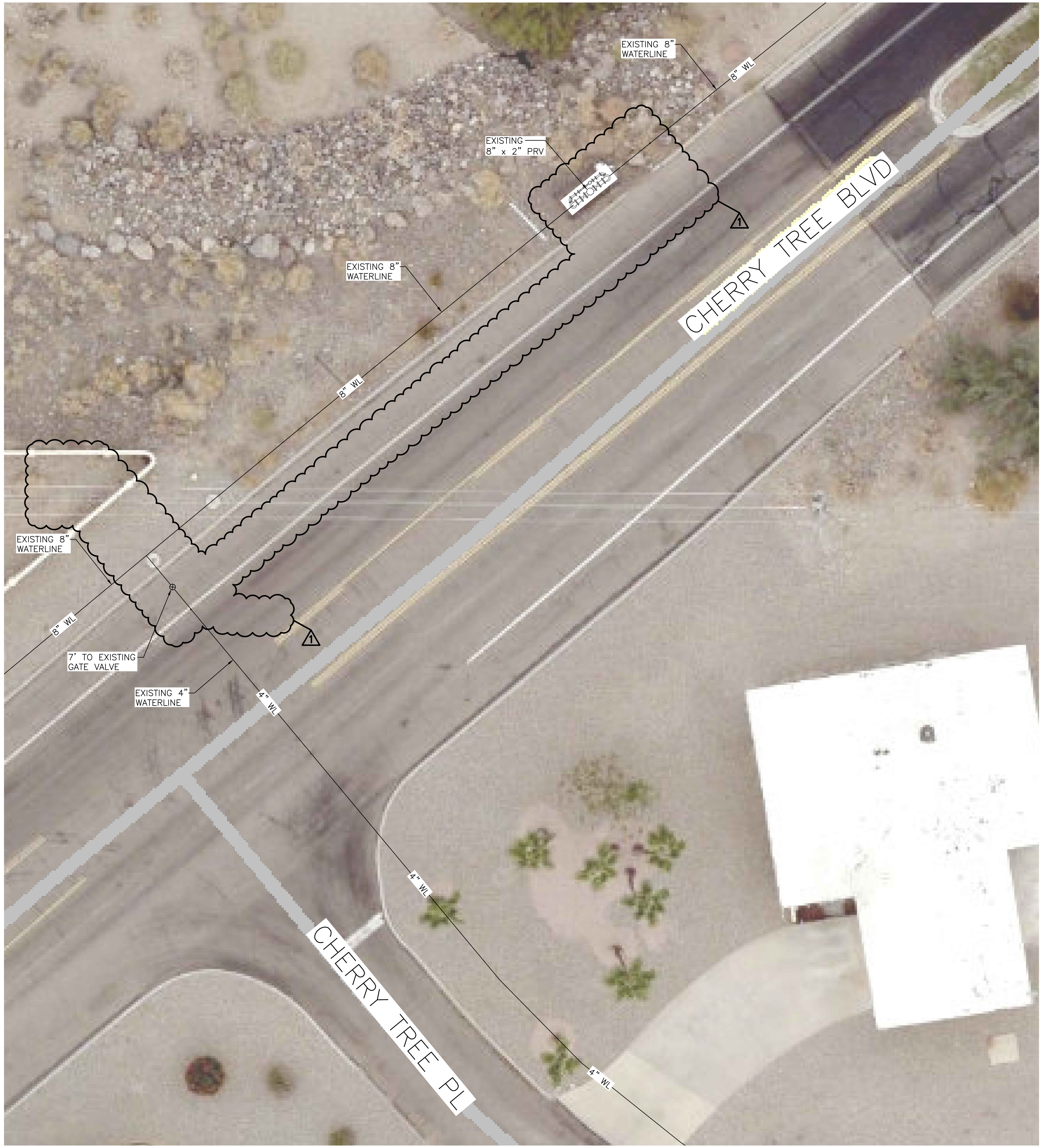

N

0' 10' 20'
SCALE: 1"=10'

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NO.	REVISIONS / SUBMISSIONS	DATE
1	REMOVED PRV MODIFICATIONS AND CALLOUTS	

LAKE HAVASU CITY

BOOSTER STATION 4 IMPROVEMENTS

Designed by:
Drawn by: KWB
Checked by: RN
Date: 02-10-23
Dwg scale: AS NOTED

CHERRY TREE BLVD PRV ADDITION

Registered Professional Engineer (Civil) Certificate No. 28112 RAMESH NARASIMHAN ARIZONA, U.S.A.

EXPIRATION DATE: 09/30/24

CELEBRATING 25 YEARS NCS DELTA

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Sheet Number:

C-04

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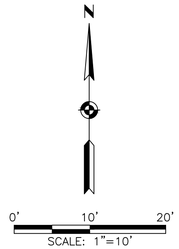
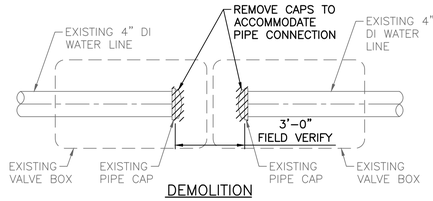
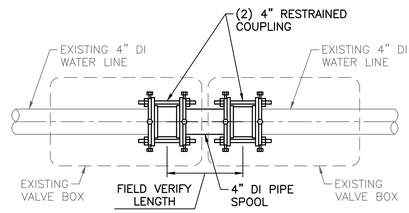




DEMOLITION



IMPROVEMENTS

DETAIL 1
SCALE: 1"=1'-0" C-05 C-05

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LAKE HAVASU CITY
BOOSTER STATION 4 IMPROVEMENTS

Designed by: GB	Drawn by: KWB	Checked by: RN	Date: 02-10-23	Dwg scale: AS NOTED	

CHERRY TREE PL PIPING MODIFICATION PLAN AND DETAIL

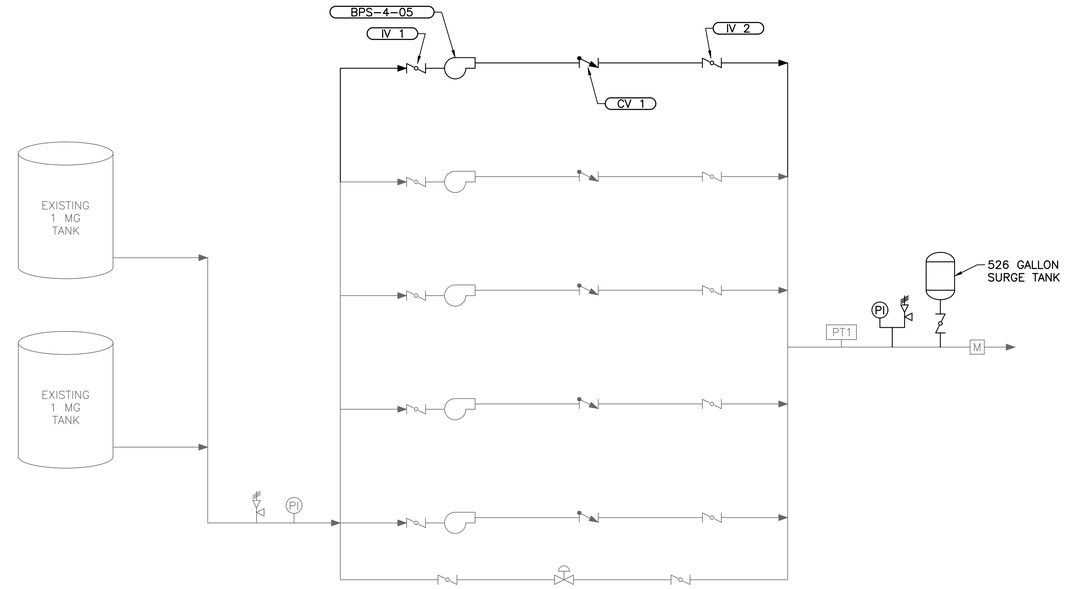
Registered Professional Engineer
28112
RAMESH NARASIMHAN
Date Signed 11/30/23
ARIZONA, U.S.A.

EXPIRATION DATE: 09/30/24

Sheet Number:

C-05

Sheet 8 of 26



FACILITY SCHEMATIC

SCHEMATIC SYMBOL LEGEND:

- AIR COMPRESSOR
- AIR/VAC VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- ### EQUIPMENT TAG NUMBER
- M MAGNETIC FLOW METER
- PI PRESSURE GAUGE
- PRESSURE REDUCING VALVE
- PSH PRESSURE SWITCH HIGH
- PSLL PRESSURE SWITCH LOW LOW
- PT PRESSURE TRANSMITTER
- PUMP
- LT TANK LEVEL TRANSMITTER

LAKE HAVASU CITY

BOOSTER STATION 4 IMPROVEMENTS

NO.	REVISIONS / SUBMISSIONS	DATE

Designed by: GB
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Checked by: RN
Date: 02-10-23
Dwg scale: AS NOTED

FACILITY SCHEMATIC

Registered Professional Engineer
28112
RAMESH NARASIMHAN
Date Signed 11/3/23
ARIZONA, U.S.A.

EXPIRATION DATE: 09/30/24

Sheet Number:

M-01

Sheet 9 of 26

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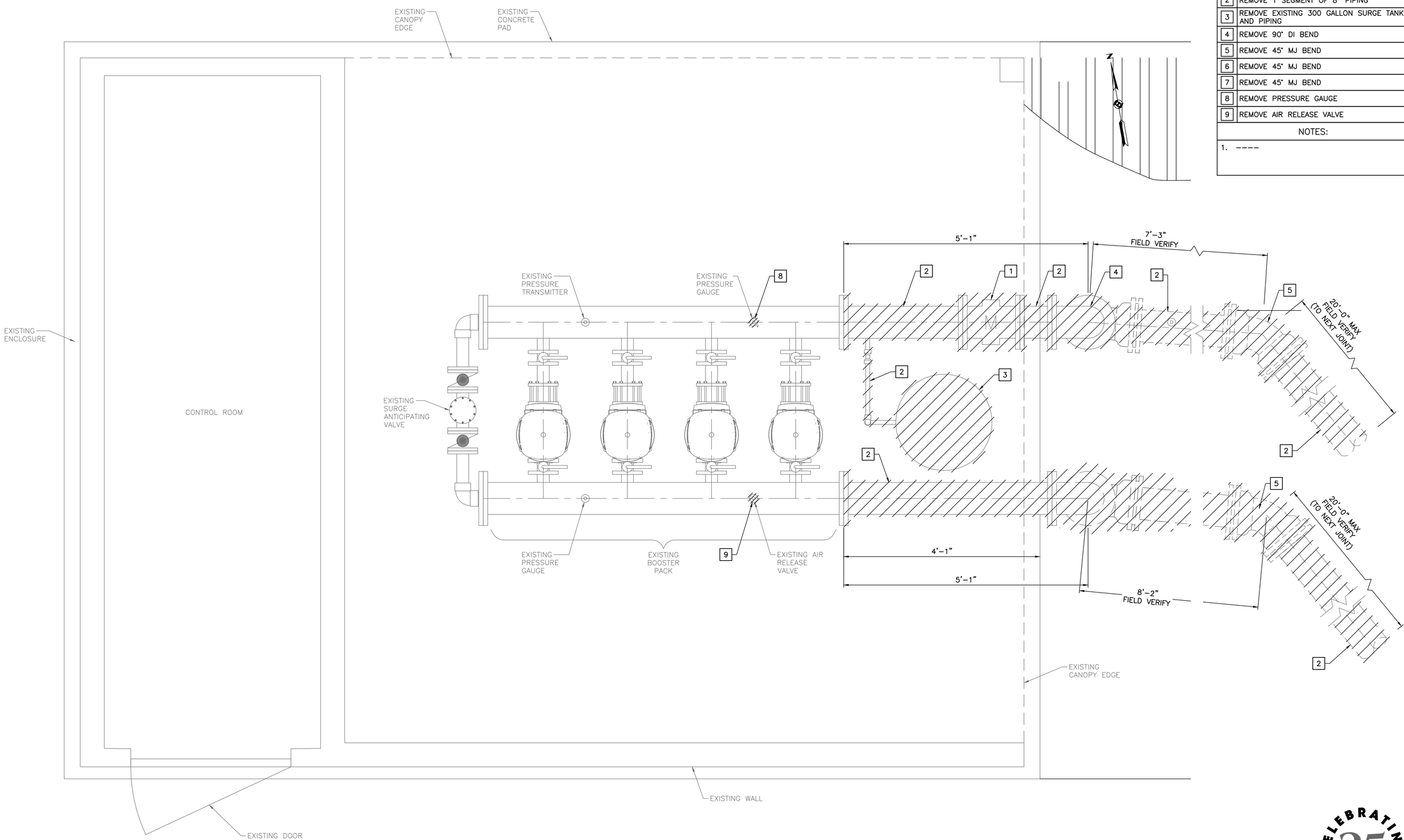

DEMOLITION KEY NOTES	
1	REMOVE AND REPLACE 8" FLOW METER
2	REMOVE 1 SEGMENT OF 8" PIPING
3	REMOVE EXISTING 300 GALLON SURGE TANK AND PIPING
4	REMOVE 90° DI BEND
5	REMOVE 45° MJ BEND
6	REMOVE 45° MJ BEND
7	REMOVE 45° MJ BEND
8	REMOVE PRESSURE GAUGE
9	REMOVE AIR RELEASE VALVE

NOTES:

1. ----

LAKE HAVASU CITY, ARIZONA • INCORPORATED 1978

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LAKE HAVASU CITY

BOOSTER STATION 4 IMPROVEMENTS

Designed by:	KWB
Drawn by:	RN
Checked by:	02-10-223
Date:	AS NOTED
Dwg scale:	

BOOSTER PUMP STATION DEMOLITION PLAN

Registered Professional Engineer
RAMESH NARASIMHAN
28112
Date Signed 11/3/23
ARIZONA, U.S.A.

EXPIRATION DATE: 09/30/24

Sheet Number:

M-02

Sheet 10 of 26

CELEBRATING 25 YEARS

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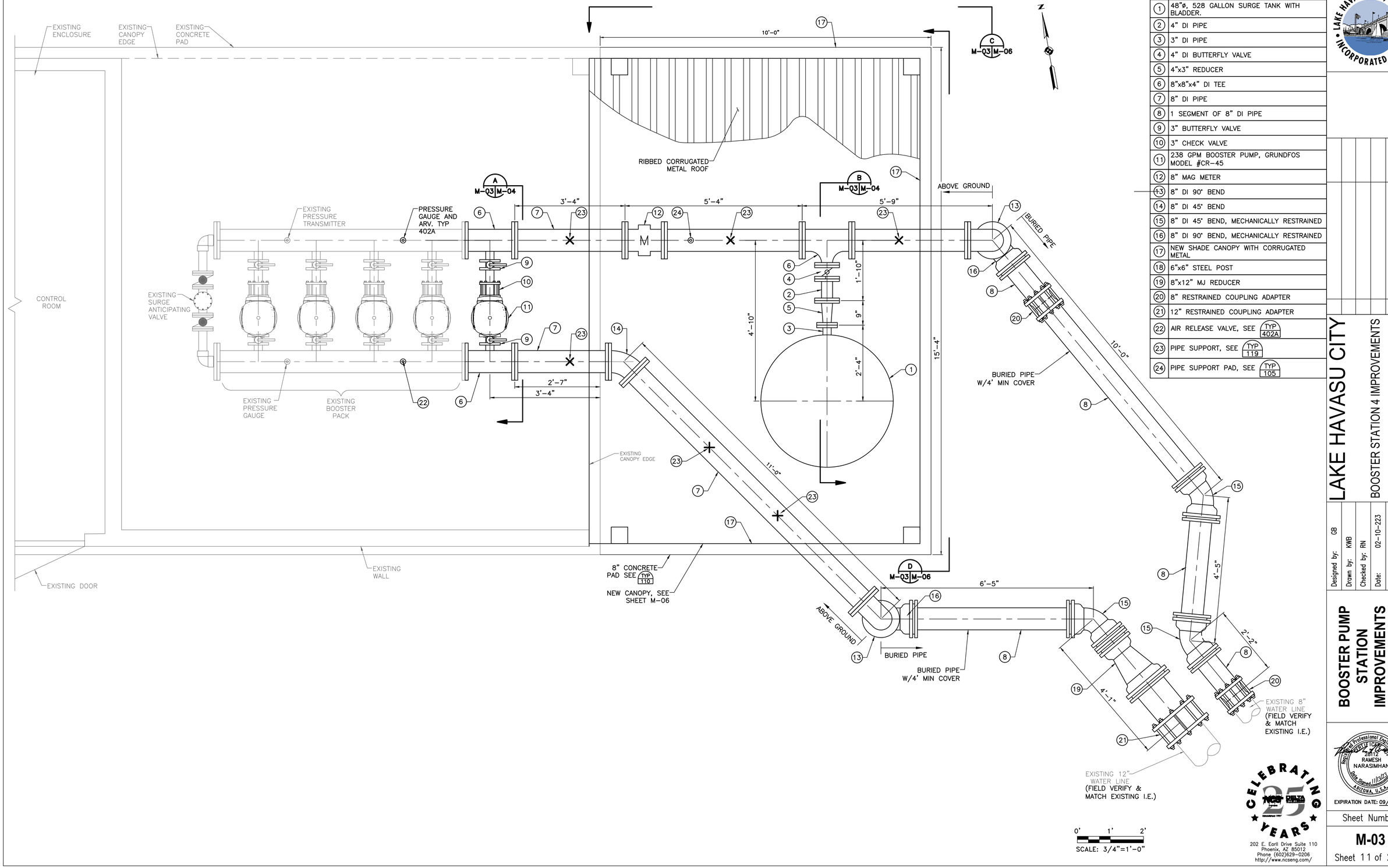

CONSTRUCTION KEY NOTES	
1	48"ø, 528 GALLON SURGE TANK WITH BLADDER.
2	4" DI PIPE
3	3" DI PIPE
4	4" DI BUTTERFLY VALVE
5	4"x3" REDUCER
6	8"x8"x4" DI TEE
7	8" DI PIPE
8	1 SEGMENT OF 8" DI PIPE
9	3" BUTTERFLY VALVE
10	3" CHECK VALVE
11	238 GPM BOOSTER PUMP, GRUNDFOS MODEL #CR-45
12	8" MAG METER
13	8" DI 90° BEND
14	8" DI 45° BEND
15	8" DI 45° BEND, MECHANICALLY RESTRAINED
16	8" DI 90° BEND, MECHANICALLY RESTRAINED
17	NEW SHADE CANOPY WITH CORRUGATED METAL
18	6"x6" STEEL POST
19	8"x12" MJ REDUCER
20	8" RESTRAINED COUPLING ADAPTER
21	12" RESTRAINED COUPLING ADAPTER
22	AIR RELEASE VALVE, SEE TYP 402A
23	PIPE SUPPORT, SEE TYP 119
24	PIPE SUPPORT PAD, SEE TYP 105

LAKE HAVASU CITY, ARIZONA • INCORPORATED 1978

NO.	REVISIONS / SUBMISSIONS	DATE

LAKE HAVASU CITY
BOOSTER STATION 4 IMPROVEMENTS

Designed by:	GB
Drawn by:	KWB
Checked by:	RN
Date:	02-10-223
Dwg scale:	AS NOTED

BOOSTER PUMP STATION IMPROVEMENTS PLAN

Registered Professional Engineer
RAMESH NARASIMHAN
28112
Date Signed 11/3/23
ARIZONA, U.S.A.

EXPIRATION DATE: 09/30/24

Sheet Number:

M-03

Sheet 11 of 26

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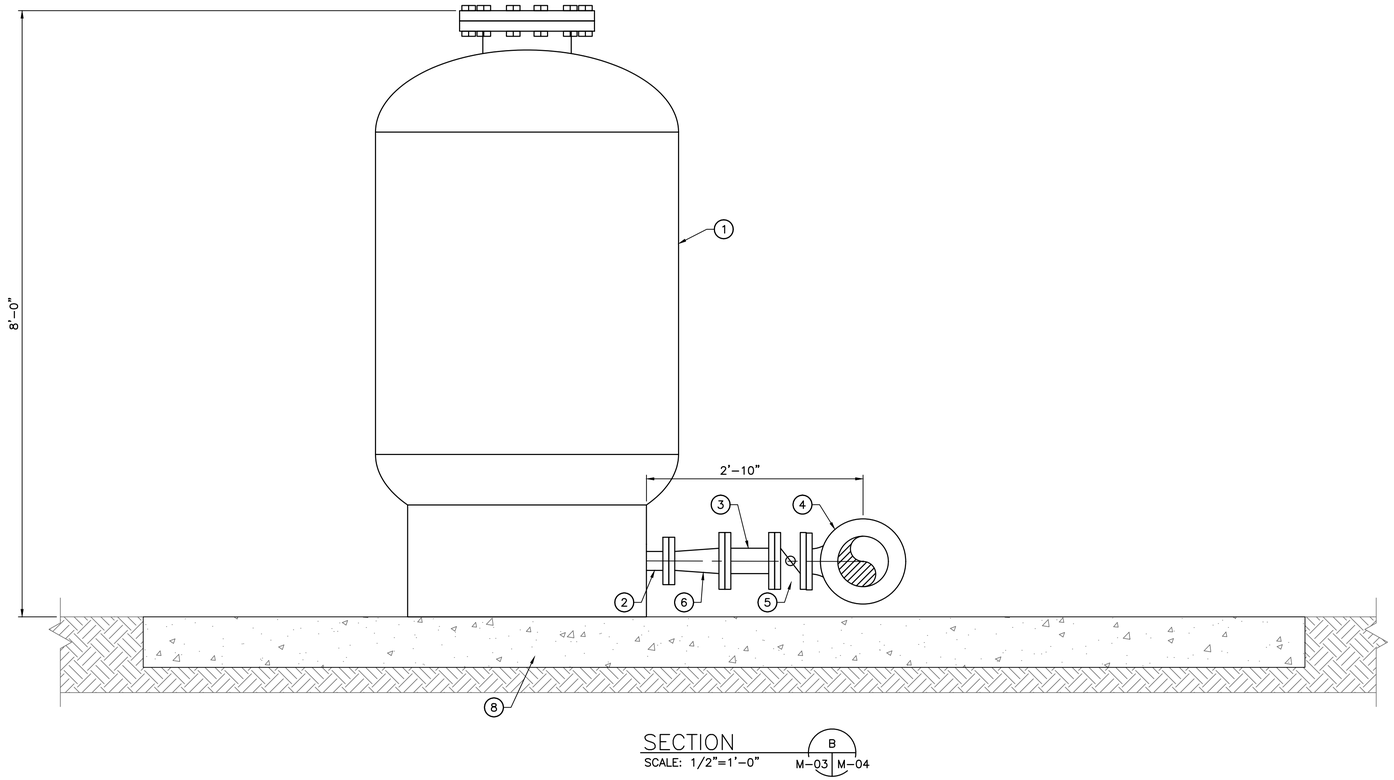
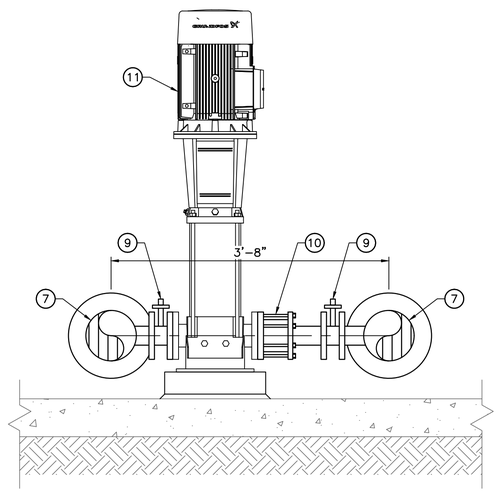


SECTION
SCALE: 1/2"=1'-0"
B | M-03 | M-04



SECTION
SCALE: 1/2"=1'-0"
A | M-03 | M-04

0' 1' 2'
SCALE: 3/4"=1'-0"

CONSTRUCTION KEY NOTES	
1	48"ø, 528 GALLON SURGE TANK WITH BLADDER.
2	3" DI PIPE
3	4" DI PIPE
4	8"x8"x4" DI TEE
5	4" DI BUTTERFLY VALVE
6	4"x3" REDUCER
7	8"x4" DI TEE
8	10'x15-4"x8" CONCRETE PAD, SEE TYP 110
9	3" BUTTERFLY VALVE
10	3" CHECK VALVE
11	238 GPM BOOSTER PUMP, GRUNDFOS MODEL #CR-45

NOTES:

1. ----

LAKE HAVASU CITY, ARIZONA • INCORPORATED 1978

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LAKE HAVASU CITY
BOOSTER STATION 4 IMPROVEMENTS

Designed by: GB	Drawn by: KWB	Checked by: RN	Date: 02-10-23	Dwg scale: AS NOTED

BOOSTER PUMP STATION SECTIONS

Registered Professional Engineer (Civil)
26112
RAMESH NARASIMHAN
Date Signed 11/3/23
ARIZONA, U.S.A.

EXPIRATION DATE: 09/30/24

Sheet Number:

M-04

Sheet 12 of 26

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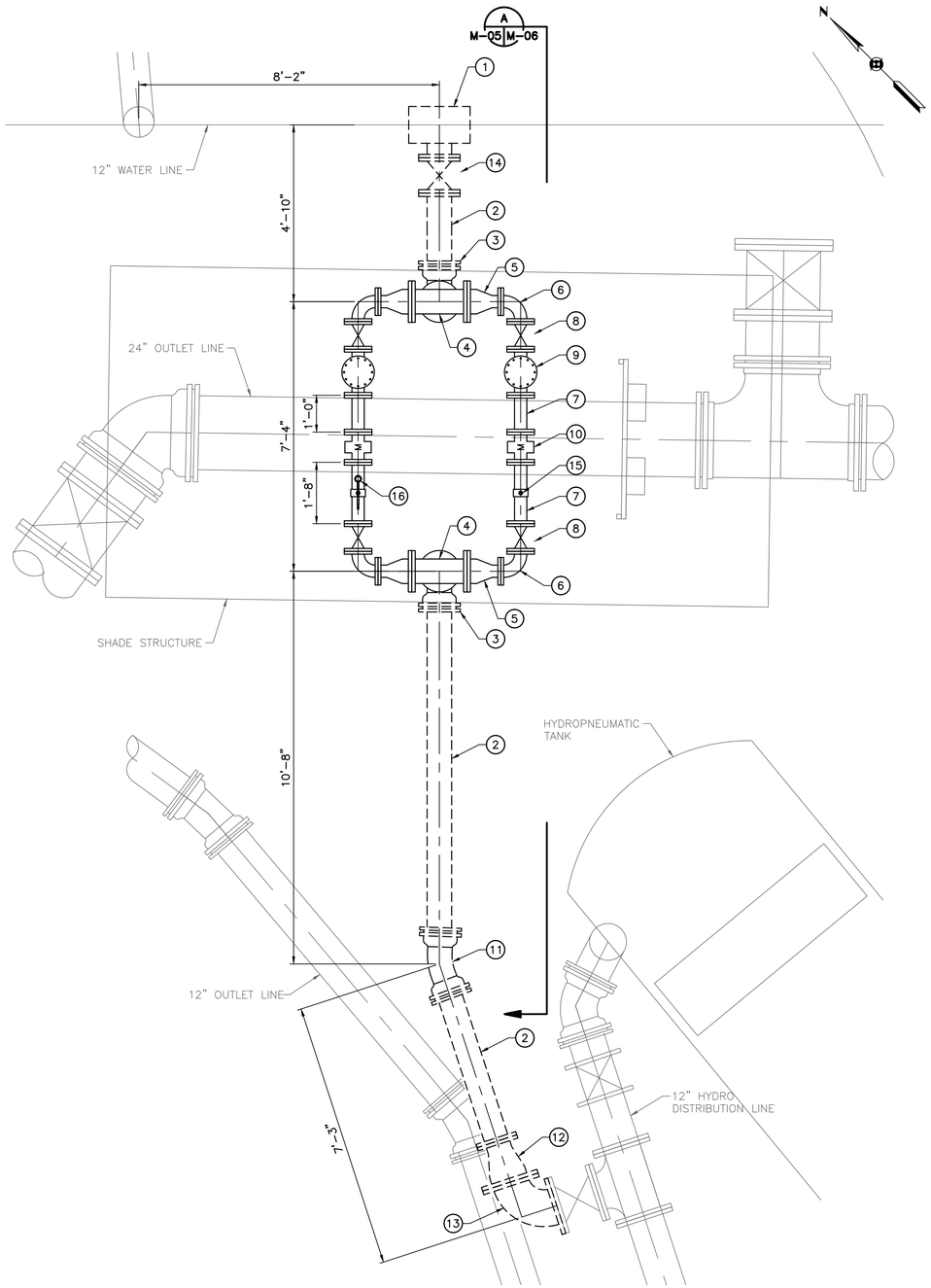

HYDRO ZONE PRV PLAN
SCALE: 1/2"=1'-0"

KEY NOTES	
1	12"x8" HOT TAP SLEEVE
2	8" DI PIPE
3	8" DI 90° BEND, MECHANICAL RESTRAINED
4	8" DI TEE
5	8"x4" DI REDUCER
6	4" DI 90° ELBOW
7	4" DI PIPE
8	4" DI GATE VALVE
9	4" DI PRESSURE REDUCING VALVE
10	4" DI FLOW METER
11	8" 22.5° BEND, MECHANICALLY RESTRAINED
12	12"x8" REDUCER, MECHANICALLY RESTRAINED
13	12" 90° BEND, MECHANICALLY RESTRAINED
14	8" DI GATE VALVE
15	4" PRESSURE TRANSDUCER WITH GAUGE
16	PRESSURE GAUGE

FOR RECORD DRAWING PURPOSES

NOT IN CONTRACT

0' 2' 4'
SCALE: 1/2"=1'-0"

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LAKE HAVASU CITY

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Designed by: GB	Drawn by: KWB	Checked by: RN	Date: 02-10-23	Dwg scale: AS NOTED

PRV STATION PLANS

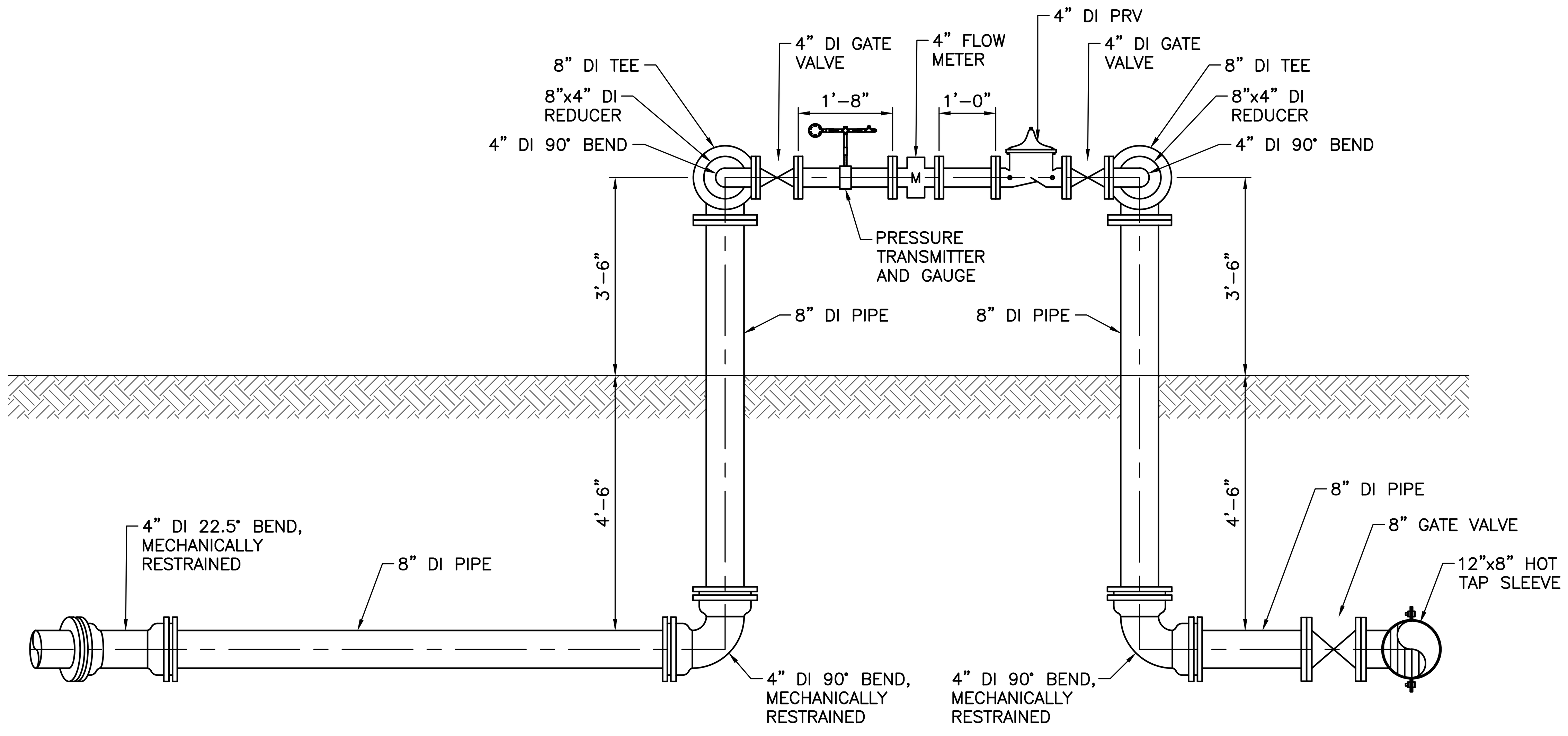
Registered Professional Engineer (Civil)
RAMESH NARASIMHAN
Date Signed 11/2/23
ARIZONA, U.S.A.

EXPIRATION DATE: 09/30/24

Sheet Number:

M-05

Sheet 13 of 26



SECTION A M-05 M-06
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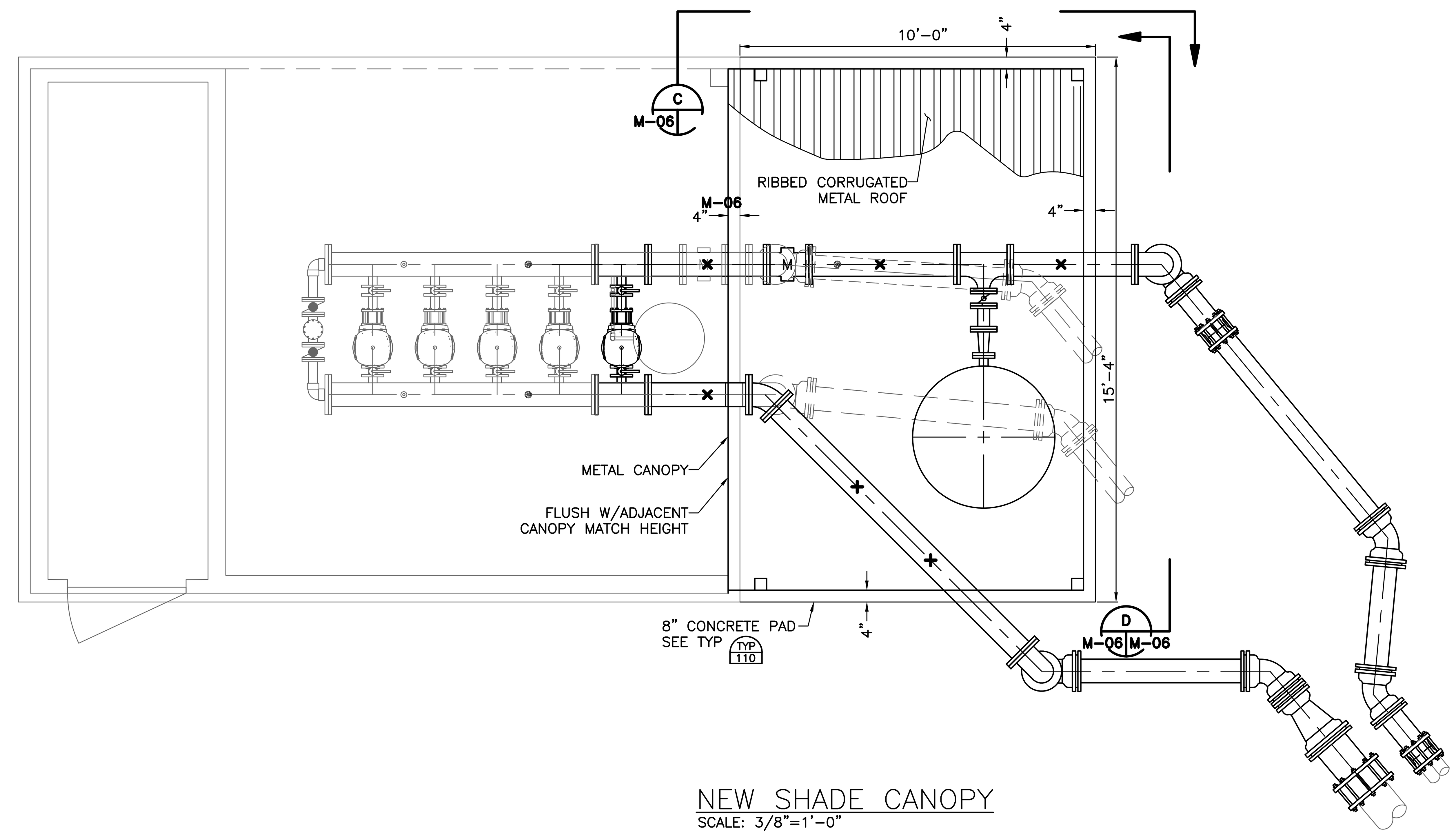
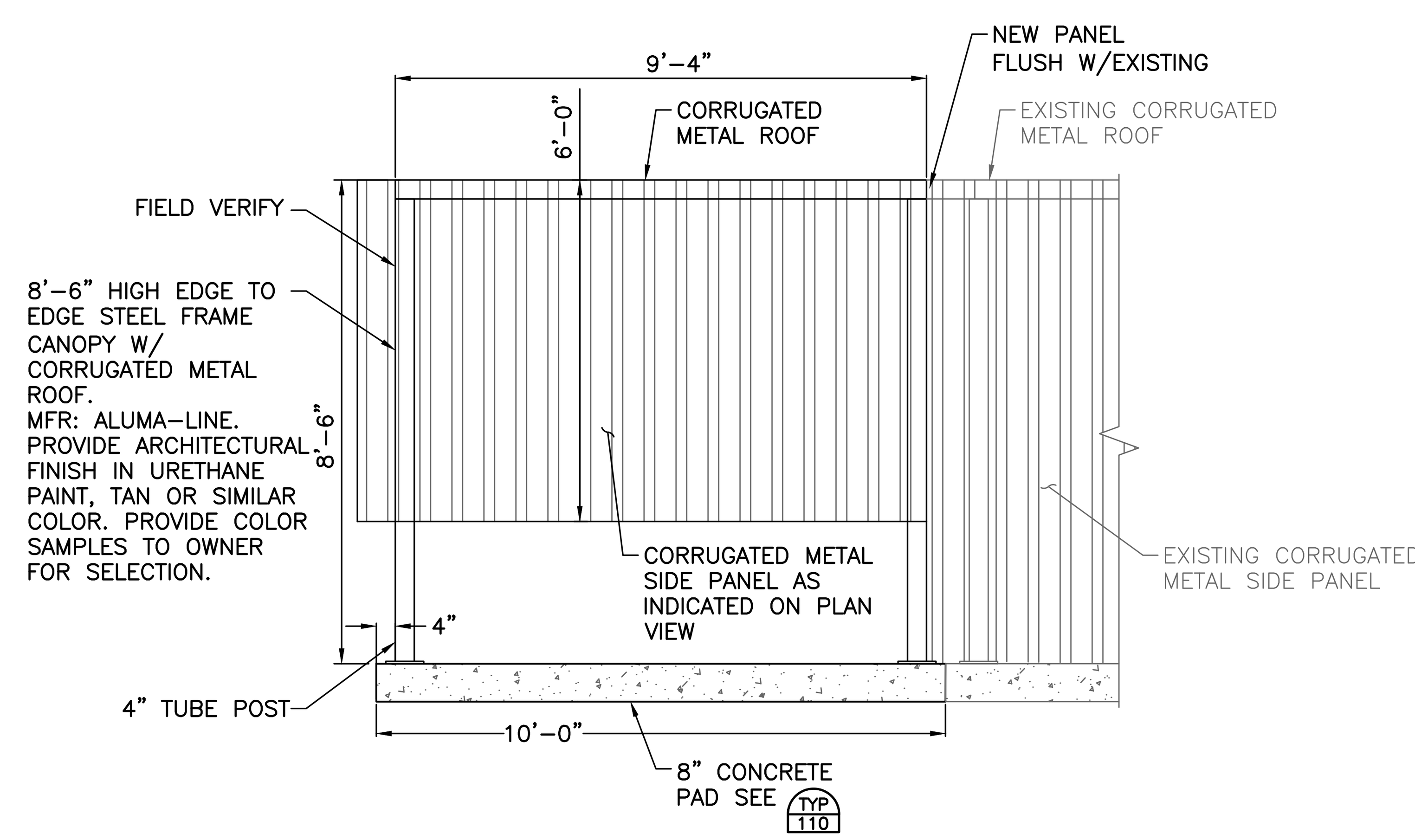


NEW SHADE CANOPY
SCALE: 3/8"=1'-0"



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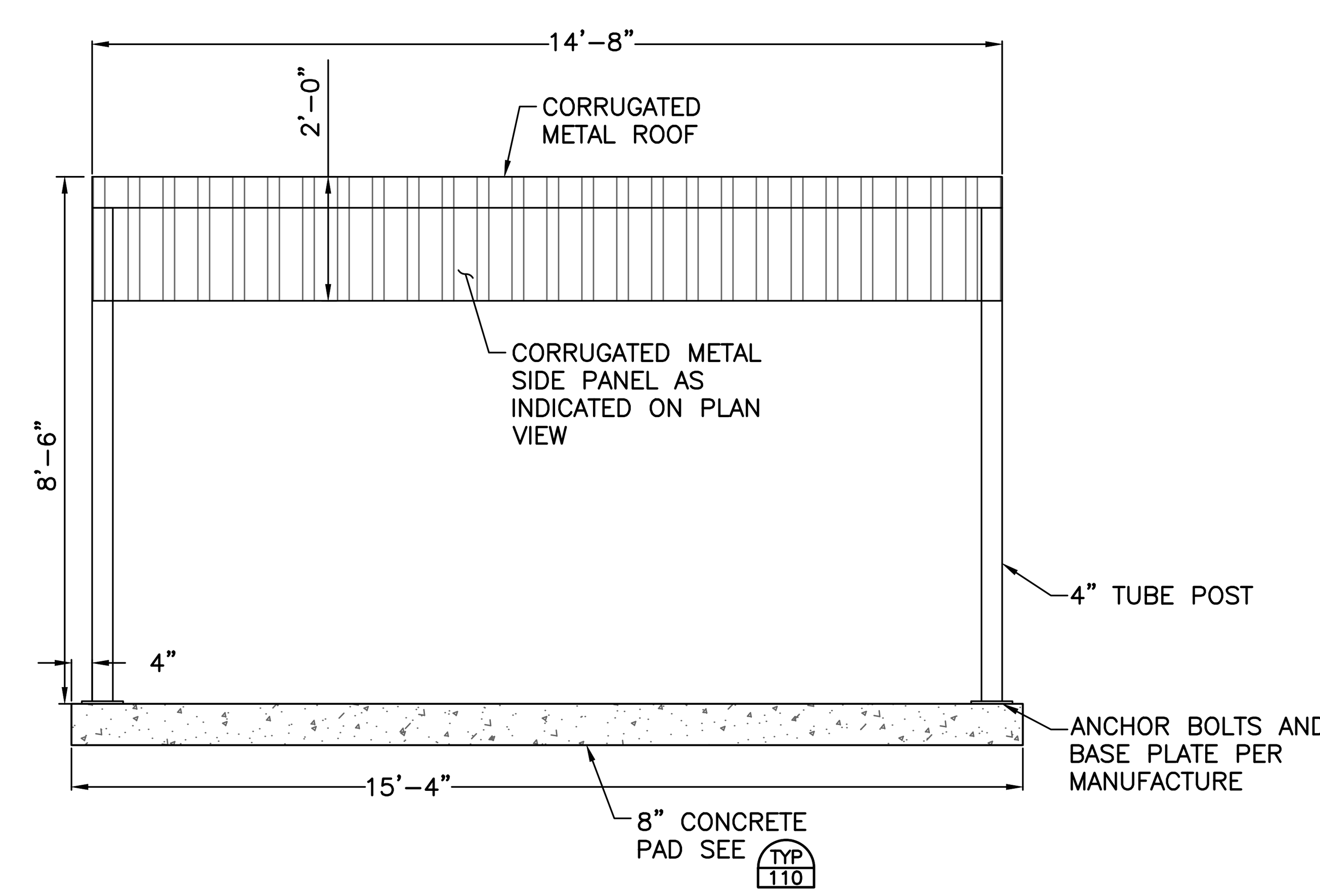
SCALE: 3/8"=1'-0"



SECTION D M-06 M-06
SCALE: 3/8"=1'-0"

FOR RECORD DRAWING PURPOSES

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LAKE HAVASU CITY
BOOSTER STATION 4 IMPROVEMENTS

Designed by: GB
Drawn by: KWB
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Date: 02-10-23
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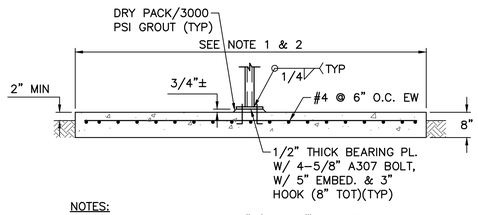
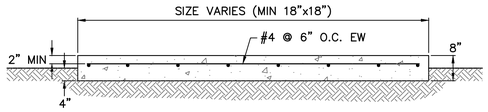
PRV STATION SECTION AND DETAILS

Registered Professional Engineer, Certificate No. 28112, RAMESH NARASIMHAN, Civil, Arizona, U.S.A.
EXPIRATION DATE: 09/30/24

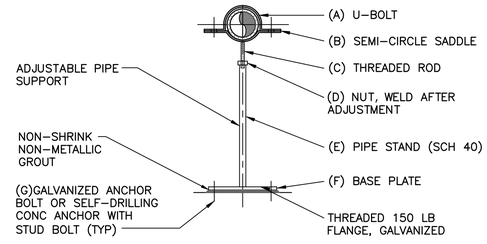


NOTES:
1. WIDTH=PIPE DIAMETER +6" (MIN 18") UNLESS NOTED
2. OTHERWISE. LENGTH=MIN 18" UNLESS NOTED OTHERWISE.

PIPE SUPPORT PAD
NTS — TYP 105



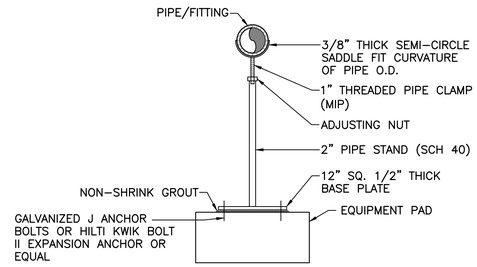
EQUIPMENT PAD
SCALE: NTS — TYP 110



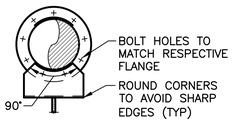
PIPE SIZE	A	B	C, D	E	F	G
2"–4"	1/2"	2"x1/4"	1"	1 1/2" ø	6"x6"x3/8"	4–1/2" DIA
6"–10"	5/8"	2"x1/4"	1 1/2"	2" ø	6"x6"x3/4"	4–1/2" DIA
12"–18"	3/4"	3"x3/8"	2"	3" ø	10"x10"x3/8"	4–5/8" DIA

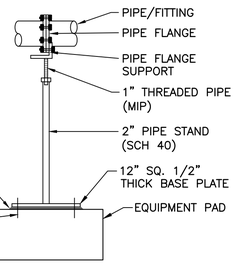
NOTE:
1. ALL ADJUSTABLE PIPE SUPPORTS SHALL BE CARBON STEEL.
2. PROVIDE 5" EMBEDMENT FOR ALL ANCHOR BOLTS AND ANCHORS INTO CONCRETE SLAB.

ADJUSTABLE PIPE SUPPORT
SCALE: 1"=1'-0" — TYP 118

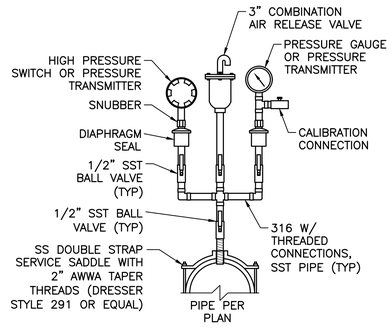


ADJUSTABLE PIPE SADDLE SUPPORT
SCALE: NTS — TYP 119

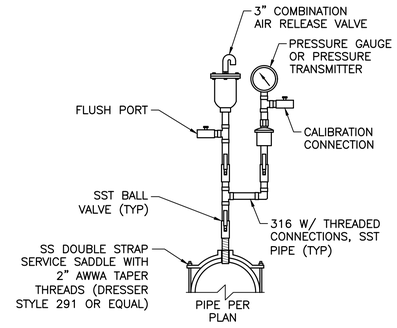




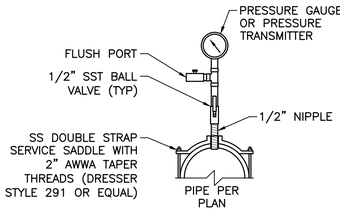
ADJUSTABLE PIPE FLANGE SUPPORT BOLTED TO FLANGE
SCALE: 1"=1'-0" — TYP 120



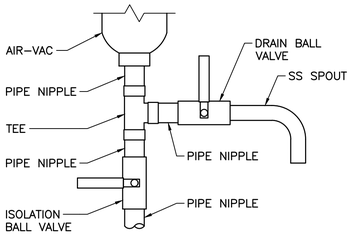
HIGH PRESSURE SWITCH-AIR RELEASE VALVE-PRESSURE GUAGE, TAP
SCALE: NTS — TYP 402



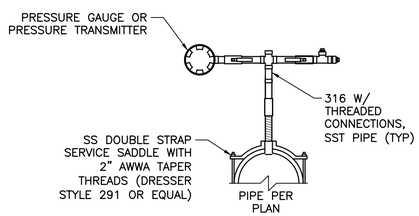
AIR RELEASE VALVE PRESSURE GUAGE, TAP
SCALE: NTS — TYP 402A



PRESSURE GAUGE
SCALE: NTS — TYP 402B



AIR-VAC CONNECTION DETAIL
SCALE: NTS — TYP 403



PRESSURE GAUGE AND TRANSMITTER
SCALE: NTS

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CELEBRATING 25 YEARS

LAKE HAVASU CITY, ARIZONA • INCORPORATED 1978

NO.	REVISIONS / SUBMISSIONS	DATE

LAKE HAVASU CITY
BOOSTER STATION 4 IMPROVEMENTS

Designed by: GB	Drawn by: KWB	Checked by: RN	Date: 02-10-23	Dwg scale: NOT TO SCALE

TYPICAL MECHANICAL DETAILS-1

Registered Professional Engineer, Civil
28112
RAMESH NARASIMHAN
Date Signed 11/30/23
ARIZONA, U.S.A.

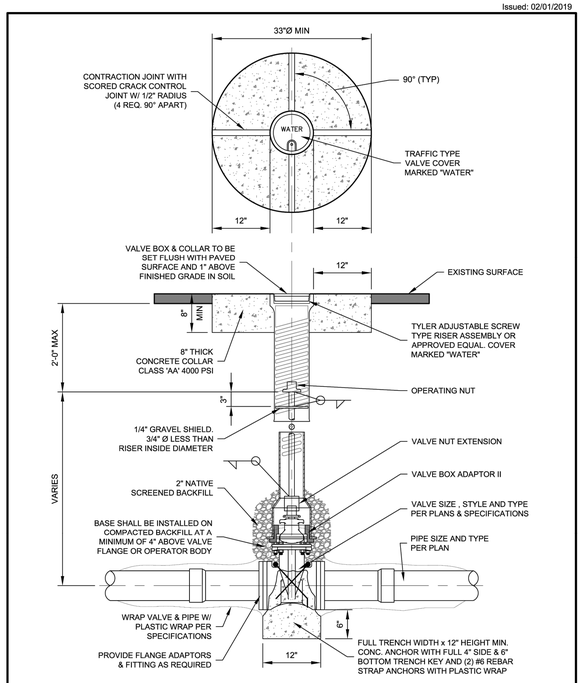
EXPIRATION DATE: 09/30/24

Sheet Number:

M-07

Sheet 15 of 26

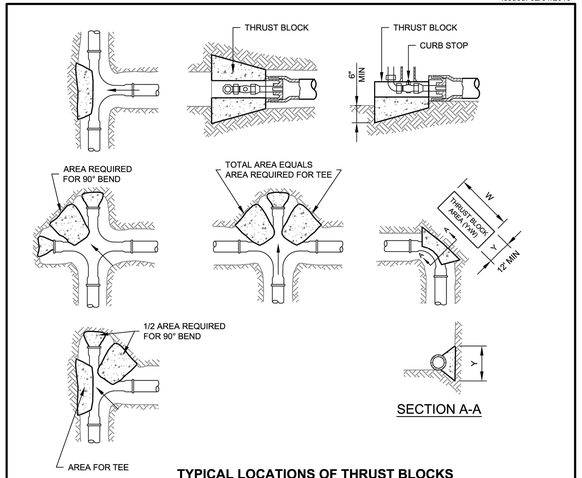
Issued: 02/01/2019



LAKE HAVASU CITY	**Standard Details** **Water Improvements**	**Valve / Valve Riser**	**Scale:** N.T.S. **Detail No.** **300**

A:\City Operations and Development\Engineering\Programs\Standards\Developing Public Works Standards\LHC Standard Details\LHC Series 300 Water\DWG\DETAIL 300.dwg

Issued: 02/01/2019



TYPICAL LOCATIONS OF THRUST BLOCKS

NOTES:

1. TABLE IS BASED ON 2,000 P.S.I. TEST PRESSURE AND 3,000 LBS/SQ FT. SOIL. IF CONDITIONS ARE FOUND TO INDICATE SOIL BEARING IS LESS, THE AREAS SHALL BE INCREASED ACCORDINGLY.
2. AREAS FOR PIPES LARGER THAN 16" SHALL BE CALCULATED FOR EACH PROJECT.
3. FORM ALL NON-BEARING VERTICAL SURFACES.
4. THRUST BLOCKS ARE TO EXTEND TO UNDISTURBED GROUND. CONCRETE TO BE CLASS 'AA' 4000 PSI. FORM AS REQUIRED TO KEEP CLEAR OF JOINTS
5. ALL DI PIPE AND FITTINGS TO BE DOUBLE POLY WRAPPED BEFORE THRUST BLOCK INSTALLATION.

MINIMUM TRUST BLOCK AREA REQUIRED (YxW) (SQ. FT.)		
PIPE SIZE	WATER PIPE	
	TEE, DEAD END, 90° BEND	45° & 22 1/2° BENDS
4" OR LESS	3	3
6"	4	3
8"	6	3
10"	10	5
12"	14	7
16"	24	12

LAKE HAVASU CITY	**Standard Details** **Water Improvements**	**Thrust Blocks For Water Lines**	**Scale:** N.T.S. **Detail No.** **317**

A:\City Operations and Development\Engineering\Programs\Standards\Developing Public Works Standards\LHC Standard Details\LHC Series 300 Water\DWG\DETAIL 317.dwg

LAKE HAVASU CITY, ARIZONA • INCORPORATED 1978

NO.	REVISIONS / SUBMISSIONS	DATE

LAKE HAVASU CITY
BOOSTER STATION 4 IMPROVEMENTS

Designed by:	GB
Drawn by:	KWB
Checked by:	RN
Date:	02-10-23
Dwg scale:	NOT TO SCALE

TYPICAL MECHANICAL DETAILS-2

Registered Professional Engineer
26112
RAMESH NARASIMHAN
Date Signed 11/3/23
ARIZONA, U.S.A.

EXPIRATION DATE: 09/30/24

Sheet Number:

M-08

Sheet 16 of 26

CELEBRATING 25 YEARS

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Phoenix, AZ 85012
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SCHEMATIC DIAGRAM SYMBOLS

(CR)	CONTROL RELAY	HAND AUTO XO	2 POSITION SELECTOR SWITCH POSITION LEGEND: X=CLOSED O=OPEN
(TD)	TIME DELAY RELAY	OFF HAND AUTO XOO	3 POSITION SELECTOR SWITCH HAND – OFF – AUTO POSITION LEGEND: X=CLOSED O=OPEN
(AR)	ALARM RELAY		NORMALLY CLOSED PUSH BUTTON
(ETM)	ELAPSED TIME METER		LOCKOUT STOP PUSH BUTTON
(M)	MOTOR STARTER OR CONTACTOR COIL		NORMALLY OPEN PUSH BUTTON
(PC)	PHOTO CELL		EMERGENCY STOP PUSH BUTTON (MAINTAINED)
(R)	BEACON ALARM LIGHT LETTER INDICATES COLOR R=RED, A=AMBER, B=BLUE, G=GREEN	AMPS	DISCONNECT SWITCH SHOWN WITH RATING AND NUMBER OF POLES
(R)	PILOT LIGHT LETTER INDICATES COLOR R=RED, A=AMBER, B=BLUE, G=GREEN		LIMIT OR POSITION SWITCH
	OUTPUT DV/DT FILTER	PSH	PRESSURE SWITCH HIGH
	HEATING ELEMENT	PSL	PRESSURE SWITCH LOW
	TRANSFORMER		FLOW SWITCH
CT	CURRENT TRANSFORMER		LEVEL FLOAT SWITCH
	GROUND CONNECTION	T ICTO	TIMER RELAY CONTACT INSTANTANEOUS CLOSE TIME DELAY OPEN
	GENERATOR	T NOTC	TIMER RELAY CONTACT NORMALLY OPEN TIME DELAY CLOSE
HORN	HORN		TEMPERATURE SWITCH
5	FULL VOLTAGE NON–REVERSING (FVNR) MOTOR STARTER OR CONTACTOR NUMBER DESIGNATES NEMA SIZE		FUSE
	NORMALLY OPEN CONTACT	AMPS	FUSEHOLDER OR FUSEBLOCK
	NORMALLY CLOSED CONTACT		THERMAL OVERLOAD RELAY
DI	RTU OR PLC CONTACT		TERMINAL BLOCK
			DEVICE LOCATED AT REMOTE LOCATION
			CONDUIT SEALOFF

POWER SINGLE LINE DIAGRAM SYMBOLS

	JUNCTION BOX WITH POWER DISTRIBUTION BLOCK OR LUGS	AMPS POLES	CIRCUIT BREAKER, SHOWN WITH TRIP RATING AND NUMBER OF POLES
	CONDUIT SEALOFF	AMPS MCP POLES	MOTOR CIRCUIT PROTECTOR WITH TRIP RATING AND NUMBER OF POLES
	LTC CONNECTION	AMPS POLES	DISCONNECT SWITCH SHOWN WITH RATING AND NUMBER OF POLES
	MC CONNECTION	MMR	MOTOR MANAGEMENT RELAY
	BOND TO METALLIC WATER PIPE	SPD	SURGE PROTECTIVE DEVICE
UM	UTILITY METER	SSS	SOLID STATE STARTER
HP	MOTOR, NUMBER DESIGNATES NEMA HORSEPOWER SIZE	VFD	VARIABLE FREQUENCY DRIVE
	FUSE	HF	HARMONIC FILTER
AMPS	FUSEHOLDER OR FUSEBLOCK	EOL	ELECTRONIC OVERLOAD RELAY
			GROUND CONNECTION
	GENERATOR		TRANSFORMER
			CONTACTOR

SITE PLAN SYMBOLS

	TELEPHONE OUTLET		FIELD DEVICE
$	SINGLE POLE SWITCH		GROUND ROD
$3	3 WAY SWITCH		DUPLEX RECEPTACLE
$4	4–WAY SWITCH		ANTENNA MAST
$M	MANUAL MOTOR STARTER		CONDUIT SEALOFF
	SPECIAL PURPOSE OR WELDING OUTLET		DISCONNECT SWITCH
S	SMOKE DETECTOR	M	MOTOR
T	THERMOSTAT		CONDUIT TURN UP
			CONDUIT TURN DOWN

CIRCUIT SCHEDULE LEGEND

AAA–BC
- SEQUENCE NUMBER
- TYPE C=CONTROL P=POWER
- DEVICE SERVED

ELECTRICAL ABBREVIATIONS

A	AMPERE
AFD	ADJUSTABLE FREQUENCY DRIVE
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AI	ANALOG INPUT
AIC	AMPS INTERRUPTING CAPACITY
AO	ANALOG OUTPUT
AS	AIR SUPPLY
ATS	AUTOMATIC TRANSFER SWITCH
BC	BYPASS CONTACTOR
C	CONDUIT
CB	CIRCUIT BREAKER
CCW	COUNTER CLOCKWISE
CL2	CHLORINE
CON	CONTACTOR
CPB	CONTROL PULLBOX
CU	COPPER, BARE
CV	CONTROL VALVE
CW	CLOCKWISE
DCS	DISTRIBUTED CONTROL SYSTEM
DI	DISCRETE INPUT
DO	DISCRETE OUTPUT
DP	DISTRIBUTION PANEL
DV/DT	DIFFERENTIAL VOLTAGE/TIME
DWG	DRAWING
ETM	ELAPSED TIME METER
EOL	ELECTRONIC OVERLOAD
EXIST	EXISTING
FA	FOUL AIR
FC	FAIL CLOSED
FE	FLOW ELEMENT
FLA	FULL LOAD AMPS
FS	FLOW SWITCH
FVNR	FULL VOLTAGE NON–REVERSING
FW	FINISHED WATER
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFP	GROUND FAULT PROTECTION
GND	GROUND
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GRS	GALVANIZED RIGID STEEL
H, HI	HIGH
H2S	HYDROGEN SULFIDE
HMI	HUMAN MACHINE INTERFACE
HOA	HAND–OFF–AUTO
HOR	HAND–OFF–REMOTE
I	CURRENT
IC	INSTRUMENTATION CABLE
ICR	INTERMITTENT CYCLE REACTOR
IO	INPUT/OUTPUT
ISC	SHORT CIRCUIT CURRENT
JB	JUNCTION BOX
L, LO	LOW
LAN	LOCAL AREA NETWORK
LC	LOOP CONTROLLER
LCL	LEVEL CONTROL, LOW
LCP	LOCAL CONTROL PANEL
LOS	LOCK–OUT–STOP
LOR	LOCAL/OFF/REMOTE
LS	LEVEL (i.e.: FLOAT) SWITCH
LTC	LIQUIDTIGHT FLEXIBLE METAL CONDUIT
M	MOTOR
MA	MANUAL/AUTO
mA	MILLIAMP
MAX	MAXIMUM
MC	MANUFACTURER'S CABLE
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MFR(S)	MANUFACTURER(S)
MGD	MILLION GALLONS PER DAY
MGL	MILLIGRAMS PER LITER
MH	MANHOLE
MIN	MINIMUM
MOV	MOTOR OPERATED VALVE
MMR	MOTOR MANAGEMENT RELAY
MTU	MASTER TELEMETRY UNIT
NEC	NATIONAL ELECTRICAL CODE
NECA	NATIONAL ELECTRICAL CONTRACTOR ASSOCIATION
N.C.	NORMALLY CLOSED
N.O.	NORMALLY OPEN
NIC	NOT IN CONTRACT
NOTC	NORMALLY OPEN TIMED CLOSED
NPW	NON–POTABLE WATER
NS	NITROGEN SUPPLY
NTS	NOT TO SCALE
NTU	TURBIDITY
OF	OVERFLOW
OIT	OPERATOR INTERFACE TERMINAL
OL	OVERLOAD
OLR	OVERLOAD RELAY
OO	ON/OFF (MAINTAINED)
OR	OFF–REMOTE
OSC	OPEN/STOP/CLOSE
P	PHASE
PB	PULL BOX
PCP	PROCESS CONTROL PANEL
PCV	PRESSURE CONTROL VALVE
PFR	PHASE/POWER FAILURE RELAY
PI	PULSE INPUT
PLC	PROGRAMMABLE LOGIC CONTROLLER
PLI	PLANT INFLUENT
PMP	PUMP
PNL	PANEL
PO	PULSE OUTPUT
PPB	POWER PULLBOX
PPG	POUNDS PER GALLON
PPH	POUNDS PER HOUR
PPM	PARTS PER MILLION
PR	PAIR
PRES	PRESSURE
PS	PRESSURE SWITCH
PSH	PRESSURE SWITCH, HIGH
PSI	POUNDS PER SQUARE INCH
PV	PROCESS VARIABLE
RAS	RETURN ACTIVATED SLUDGE
RW	RAW WATER
RF	RADIO FREQUENCY
RIO	REMOTE INPUT OUTPUT
RS	RAW SEWAGE
RSP	RAW SEWAGE PUMP
RST	RESET
RTD	RESISTANCE TEMPERATURE DETECTOR
RTU	REMOTE TELEMETRY UNIT
RWT	REFLECTED WAVE TRAP
SCA	SHORT CIRCUIT AMPS
SCCR	SHORT CIRCUIT CURRENT RATING
SEQ	SERVICE ENTRANCE EQUIPMENT
SES	SERVICE ENTRANCE SECTION
SLC	SINGLE LOOP CONTROLLER
SLOS	START–LOCK–OUT–STOP
SMC	SUBMERSIBLE MANUFACTURER CABLE
SO2	SULFUR DIOXIDE
SP	SET POINT
SPC	SPARE CONDUIT
SPR	SPARE
SS	START/STOP
SSS	SOLID STATE STARTER (SOFT START)
ST	SHUNT TRIP
TC	TELEPHONE CABLE
TS	TEMPERATURE SWITCH
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
TYP	TYPICAL
UG	UNDERGROUND
UL	UNDERWRITERS LABORATORIES
UM	UTILITY METER
UNO	UNLESS NOTED OTHERWISE
V	VOLT
VFD	VARIABLE FREQUENCY DRIVE
W	WATT, WIRE
WAS	WASTE ACTIVATED SLUDGE
WP	WEATHERPROOF
XFMR	TRANSFORMER
XMR	TRANSFORMER
XMTR	TRANSMITTER
ZS	POSITION (i.e.. LIMIT) SWITCH

ELECTRICAL LINETYPES

- EXPOSED CONDUIT
- EXISTING EXPOSED CONDUIT
- UNDERGROUND CONDUIT
- EXISTING UNDERGROUND CONDUIT
- BARE COPPER GROUND CONDUCTOR
- EXISTING OR FUTURE
- NEW ELECTRICAL EQUIPMENT
- DEMOLITION
- DETAIL VIEW OR MATCHING
- CAPPED CONDUIT STUB OUT

PXXX
CXXX

GROUPED CONDUIT AND CIRCUIT IDENTIFICATION TAGS. REFER TO THE POWER SINGLE–LINE, SCHEMATIC CONNECTION DIAGRAMS AND CIRCUIT SCHEDULE FOR CONDUIT SIZES AND CONTENTS.

P=POWER
C=CONTROL

GENERAL NOTES

1. THE COMPLETED INSTALLATION SHALL COMPLY WITH LATEST REVISION OF APPLICABLE FEDERAL, STATE, AND LOCAL CODES, ORDINANCES, AND REGULATIONS. THE CONTRACTOR SHALL OBTAIN NECESSARY PERMITS AND INSPECTIONS REQUIRED BY THE AUTHORITIES HAVING JURISDICTION. ALL WORK SHALL BE COMPLETED IN A NEAT, WORKMANLIKE MANNER IN ACCORDANCE WITH THE LATEST NECA STANDARDS OF INSTALLATION UNDER COMPETENT SUPERVISION. INSTALL GROUNDING PER NEC.
2. VISIT THE SITE PRIOR TO BIDDING TO BECOME FAMILIAR WITH EXISTING CONDITIONS AND OTHER FACTORS, WHICH MAY AFFECT THE EXECUTION OF THE WORK. INCLUDE ALL RELATED COSTS IN THE INITIAL BID PROPOSAL.
3. THE CONTRACTOR SHALL COORDINATE WORK WITH THE UTILITIES PROVIDING SERVICES ON THIS PROJECT, AND SHALL COMPLY WITH ALL THEIR INSTALLATION REQUIREMENTS.
4. ALL MATERIALS SHALL BE NEW AND OF THE BEST QUALITY, MANUFACTURED IN ACCORDANCE WITH THE LATEST REVISION OF NEMA, ANSI, UL, OR OTHER APPLICABLE STANDARDS. THE USE OF MANUFACTURERS' NAMES, MODELS, AND NUMBERS IS INTENDED TO ESTABLISH STYLE, QUALITY, APPEARANCE, USEFULNESS, AND BID PRICE.
5. PROTECT ALL ELECTRICAL MATERIAL AND EQUIPMENT INSTALLED AGAINST DAMAGE BY OTHER TRADES, WEATHER CONDITIONS, OR ANY OTHER PREVENTABLE CAUSES. EQUIPMENT DAMAGED DURING SHIPPING OR CONSTRUCTION, PRIOR TO ACCEPTANCE BY THE ENGINEER OR THE OWNER, WILL BE REJECTED AS DEFECTIVE.
6. LEAVE THE SITE CLEAN. REMOVE ALL DEBRIS, EMPTY CARTONS, TOOLS, CONDUIT, WIRE SCRAPS AND ALL MISCELLANEOUS SPARE EQUIPMENT AND MATERIALS USED IN THE WORK DURING CONSTRUCTION. ALL COMPONENTS SHALL BE FREE OF DUST, GRIT AND FOREIGN MATERIALS, LEFT AS NEW BEFORE FINAL ACCEPTANCE OF WORK. DAMAGED PAINT AND FINISHES SHALL BE TOUCHED UP OR REPAINTED WITH MATCHING COLOR PAINT AND FINISH.
7. CIRCUIT CONDUCTORS #6 AWG OR SMALLER SHALL BE THWN STRANDED COPPER. #4 AWG THROUGH #2 AWG SHALL BE XHHW STRANDED COPPER. #1 AWG OR LARGER SHALL BE XHHW–2 STRANDED COPPER. MINIMUM POWER CONDUCTOR SIZE SHALL BE #12 AWG WITH #12 AWG GROUND.
8. UNDERGROUND CONDUITS SHALL BE SCHEDULE 40 PVC. MINIMUM CONDUIT DEPTH SHALL BE 24 INCHES. MINIMUM UNDERGROUND CONDUIT SIZE SHALL BE 1 INCH.
9. CONDUITS SHALL BE MARKED AT EACH END WITH MATCHING NUMBERED BRASS TAGS. SPARE CONDUITS SHALL HAVE A PULL STRING INSTALLED, SECURED, AND CAPPED.
10. EXPOSED CONDUITS SHALL BE GALVANIZED RIGID STEEL (GRS). MINIMUM SIZE 3/4 INCH, UNLESS OTHERWISE NOTED ON THE PLANS.
11. SAFETY SWITCHES, ELECTRICAL DISTRIBUTION EQUIPMENT, CONTROL PANELS, AND OTHER ELECTRICAL DEVICES SHALL BE UL LISTED, AND RATED FOR HEAVY DUTY SERVICE.
12. WIRING DEVICES SHALL BE SPECIFICATION GRADE.
13. THE CONTRACTOR IS RESPONSIBLE FOR MANAGING, SCHEDULING, DOCUMENTING, AND PERFORMING THE WORK SO THAT A COMPLETE ELECTRICAL, INSTRUMENTATION AND CONTROL SYSTEM FOR THE FACILITY IS PROVIDED. ACCURATE SHOP AND RECORD DRAWINGS, AND O&M MANUALS SHALL BE SUBMITTED PRIOR TO FINAL ACCEPTANCE OF THE WORK.
14. TYPICAL DETAILS SHALL APPLY IN ALL CASES, WHETHER SPECIFICALLY REFERRED TO OR NOT.

CELEBRATING 25 YEARS

LAKE HAVASU CITY, ARIZONA • INCORPORATED 1978

NO.	REVISIONS / SUBMISSIONS	DATE

LAKE HAVASU CITY
BOOSTER STATION 4 IMPROVEMENTS

Designed by: DLN
Drawn by: JHA
Checked by: AGA
Date: 11/13/23
Dwg scale: AS NOTED

ELECTRICAL NOTES, SYBMOLS, AND LEGEND

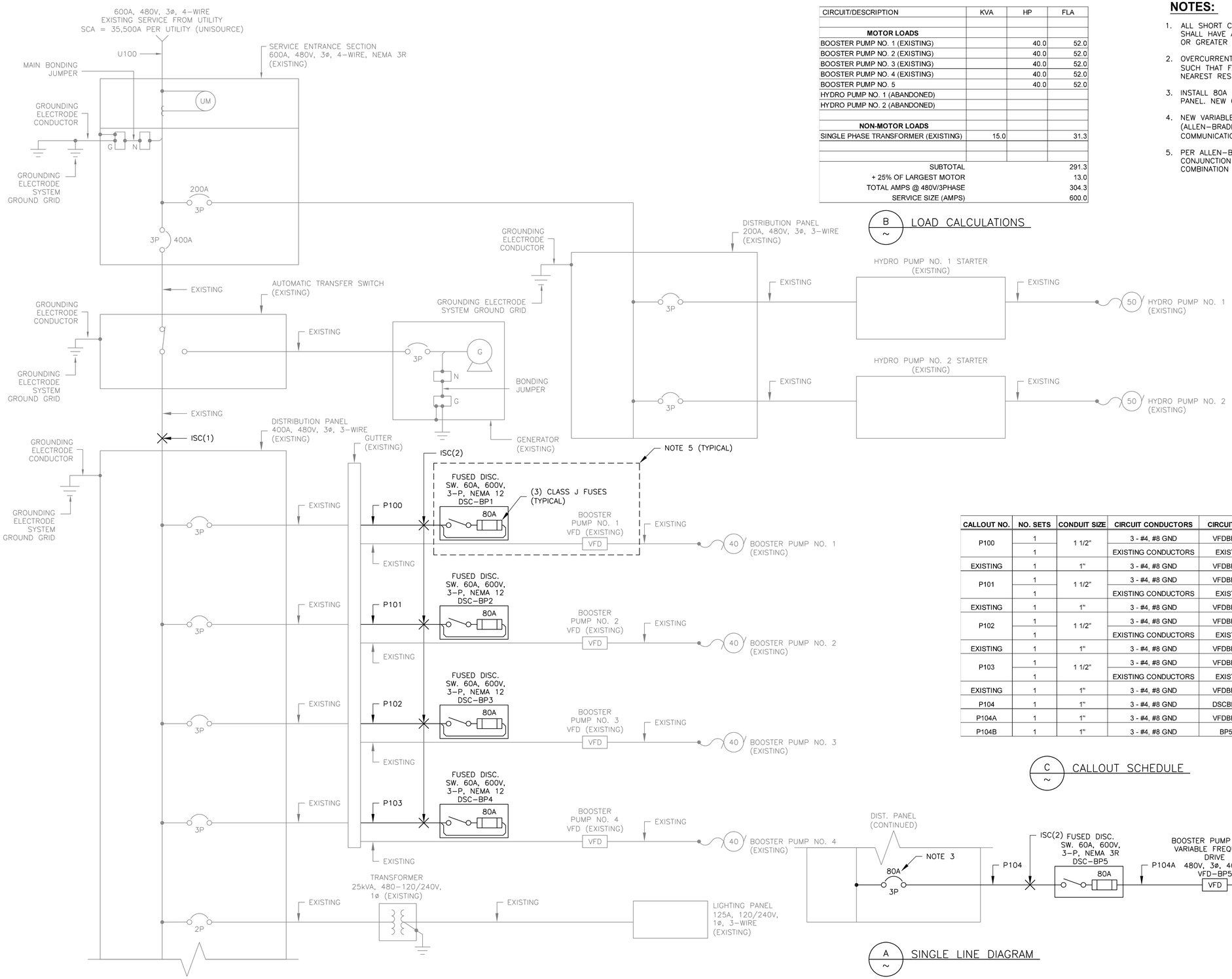
Registered Professional Engineer (Electrical)
74459
AARON G. ARMENTA
Date Signed 12/31/23
ARIZONA, U.S.A.

EXPIRATION DATE: 12/31/24

Sheet Number:

E-01

Sheet 17 of 24



CIRCUIT/DESCRIPTION	KVA	HP	FLA
MOTOR LOADS			
BOOSTER PUMP NO. 1 (EXISTING)		40.0	52.0
BOOSTER PUMP NO. 2 (EXISTING)		40.0	52.0
BOOSTER PUMP NO. 3 (EXISTING)		40.0	52.0
BOOSTER PUMP NO. 4 (EXISTING)		40.0	52.0
BOOSTER PUMP NO. 5		40.0	52.0
HYDRO PUMP NO. 1 (ABANDONED)			
HYDRO PUMP NO. 2 (ABANDONED)			
NON-MOTOR LOADS			
SINGLE PHASE TRANSFORMER (EXISTING)	15.0		31.3
SUBTOTAL			291.3
+ 25% OF LARGEST MOTOR			13.0
TOTAL AMPS @ 480V/3PHASE			304.3
SERVICE SIZE (AMPS)			600.0

B ~ LOAD CALCULATIONS

NOTES:

1. ALL SHORT CIRCUIT INTERRUPTING AND PROTECTING DEVICES SHALL HAVE A SHORT CIRCUIT INTERRUPTING RATING EQUAL TO OR GREATER THAN THE ASSOCIATED AVAILABLE FAULT CURRENT.
2. OVERCURRENT PROTECTIVE DEVICES ARE TO BE COORDINATED SUCH THAT FAULTS ARE LOCALIZED/ISOLATED TO THEIR NEAREST RESPECTIVE OCPD.
3. INSTALL 80A CIRCUIT BREAKER IN EXISTING DISTRIBUTION PANEL. NEW CIRCUIT BREAKER SHALL MATCH EXISTING.
4. NEW VARIABLE FREQUENCY DRIVE SHALL MATCH EXISTING (ALLEN-BRADLEY POWER FLEX 753 WITH ETHERNET/IP COMMUNICATIONS MODULE).
5. PER ALLEN-BRADLEY, SPECIFIED VARIABLE FREQUENCY DRIVE IN CONJUNCTION WITH CLASS J FUSES PROVIDE AN SCCR RATED COMBINATION OF 65kA.

CALLOUT NO.	NO. SETS	CONDUIT SIZE	CIRCUIT CONDUCTORS	CIRCUIT NO.'s
P100	1	1 1/2"	3 - #4, #8 GND	VFDBP1-P1
	1		EXISTING CONDUCTORS	EXISTING
EXISTING	1	1"	3 - #4, #8 GND	VFDBP1-P1
P101	1	1 1/2"	3 - #4, #8 GND	VFDBP2-P1
	1		EXISTING CONDUCTORS	EXISTING
EXISTING	1	1"	3 - #4, #8 GND	VFDBP2-P1
P102	1	1 1/2"	3 - #4, #8 GND	VFDBP3-P1
	1		EXISTING CONDUCTORS	EXISTING
EXISTING	1	1"	3 - #4, #8 GND	VFDBP3-P1
P103	1	1 1/2"	3 - #4, #8 GND	VFDBP4-P1
	1		EXISTING CONDUCTORS	EXISTING
EXISTING	1	1"	3 - #4, #8 GND	VFDBP4-P1
P104	1	1"	3 - #4, #8 GND	DSCBP5-P1
P104A	1	1"	3 - #4, #8 GND	VFDBP5-P1
P104B	1	1"	3 - #4, #8 GND	BP5-P1

C ~ CALLOUT SCHEDULE

A ~ SINGLE LINE DIAGRAM

LAKE HAVASU CITY, ARIZONA • INCORPORATED 1978

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LAKE HAVASU CITY

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SINGLE LINE DIAGRAM

Registered Professional Engineer (Electrical)
74459
AARON G. ARMENTA
Date Signed 11/13/23
ARIZONA, U.S.A.
EXPIRATION DATE: 12/31/24

Sheet Number:

E-02

Sheet 18 of 24

CELEBRATING 25 YEARS
NCS Engineers DELTA SYSTEMS Established 1997

SHEET NO.	CIRCUIT	CONDUCTORS
E-05	VFDBP5-C1	CAT6 ETHERNET CABLE

A ~ MASTER CIRCUIT SCHEDULE

SHORT CIRCUIT CALCULATIONS

DEFINITIONS		FORMULAS	
ISC =	SHORT CIRCUIT CURRENT (AMPS)	3 PH: f =	$\frac{1.732 \times L \times Isc}{N \times C \times V_{L\text{-}L}}$
N =	NUMBER OF CONDUCTORS/PHASE		
L =	LENGTH OF CONDUCTOR (FEET)		
C =	CONSTANT FROM TABLE OF "C"	1 PH: f =	$\frac{2 \times L \times Isc}{N \times C \times V_{L\text{-}L}}$
Isc =	AVAILABLE SHORT-CIRCUIT AMPS		
$V_{L\text{-}L}$ =	LINE TO LINE VOLTAGE (VOLTS)		
V_P =	PRIMARY VOLTAGE	1 PH XFMR: f =	$\frac{Isc \times V_P \times \%Z}{100{,}000 \times KVA}$
V_s =	SECONDARY VOLTAGE		
%Z =	TRANSFORMER % IMPEDANCE		

ISC(1)

$$f1 = \frac{1.732 \times 50 \times 35{,}500}{2 \times 16673 \times 480} = 0.1921$$

$$M = \frac{1}{1 + 0.1921} = 0.8389$$

ISC(1) = 35,500 x 0.8389 = 29,781 A

ISC(2)

$$f2 = \frac{1.732 \times 20 \times 29{,}781}{1 \times 3825 \times 480} = 0.5619$$

$$M = \frac{1}{1 + 0.5619} = 0.6402$$

ISC(2) = 29,781 x 0.6402 = 19,066 A

B ~ SHORT CIRCUIT CALCULATIONS

LAKE HAVASU CITY

BOOSTER STATION 4 IMPROVEMENTS

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ELECTRICAL SCHEDULES

Registered Professional Engineer (Electrical)
74459
AARON G. ARMENTA
Date Signed 11/13/23
ARIZONA, U.S.A.

EXPIRATION DATE: 12/31/24

Sheet Number:

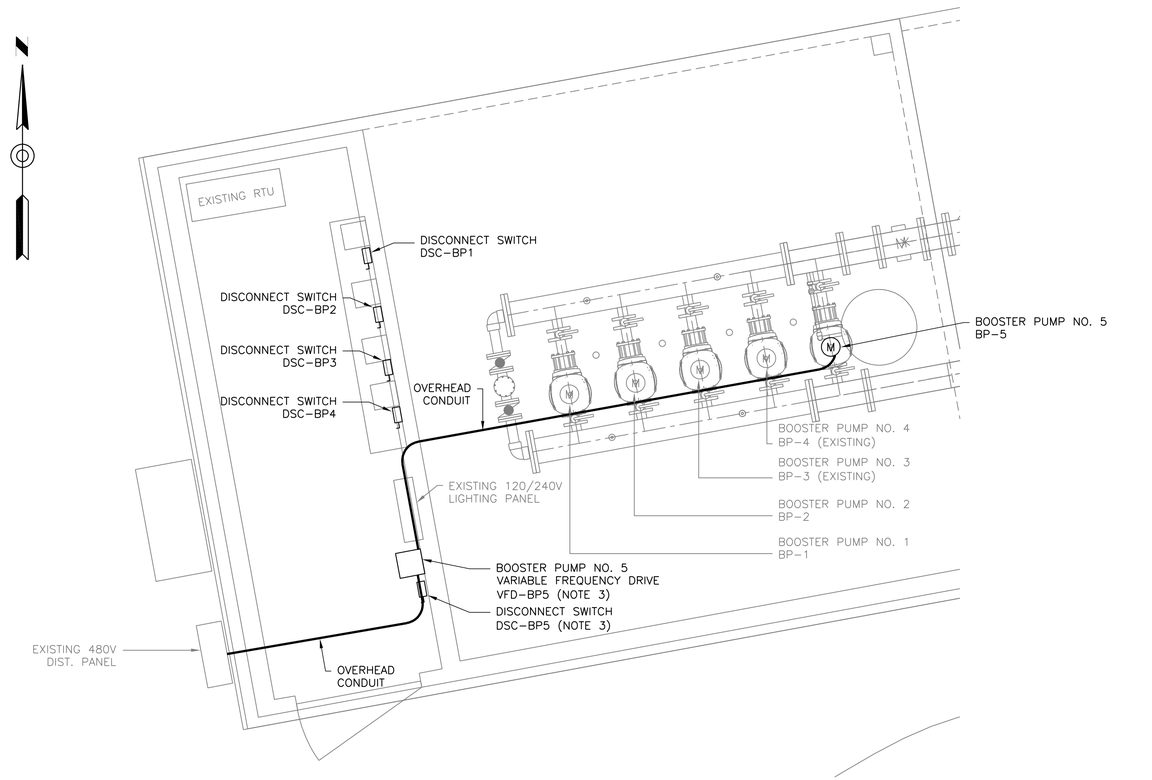
E-03

Sheet 19 of 24

CELEBRATING 25 YEARS
NCS Engineers DELTA SYSTEMS Established 1997

NOTES:

1. CONDUIT ROUTING SHOWN IS SCHEMATIC IN NATURE ACTUAL CONDUIT ROUTING SHALL BE FIELD DETERMINED. REFER TO CONDUIT BLOCK DIAGRAM FOR CONDUIT INFORMATION/REQUIREMENTS INCLUDING TO/FROM INFO, CONTENTS, TAG #'S, SIZES ETC.
2. ETHERNET COMMUNICATION CABLES BETWEEN VARIABLE FREQUENCY DRIVE AND RTU SHALL BE ROUTED THROUGH WIREWAYS (I.E. PANDUIT; NOT SHOWN) MOUNTED ON PLYWOOD WALLS. REFER TO CONDUIT BLOCK DIAGRAM FOR ADDITIONAL DETAILS.
3. EXISTING SWITCH AND RECEPTACLE SHALL BE RELOCATED AS DIRECTED BY OWNER TO PROVIDE ADEQUATE SPACE FOR NEW VARIABLE FREQUENCY DRIVE AND ASSOCIATED DISCONNECT SWITCH.



A ~ BOOSTER PUMP STATION 4 ELECTRICAL PLAN

2 1.5 1 0.5 0 1 2

SCALE: 1/2" = 1'-0"

LAKE HAVASU CITY, ARIZONA • INCORPORATED 1978

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LAKE HAVASU CITY

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ELECTRICAL SITE PLAN

Registered Professional Engineer (Electrical)
74459
AARON G. ARMENTA
Date Signed 12/31/24
ARIZONA, U.S.A.

EXPIRATION DATE: 12/31/24

Sheet Number:

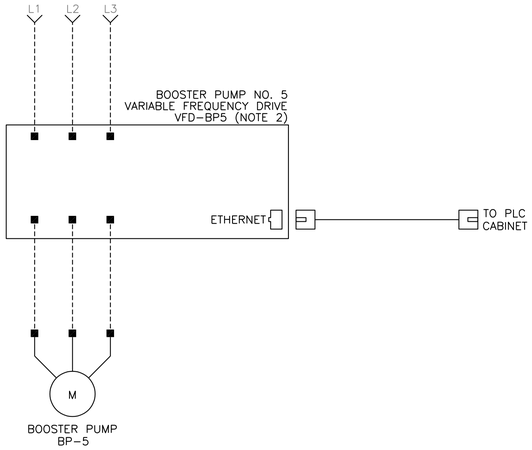
E-04

Sheet 20 of 24

CELEBRATING 25 YEARS
NCS Engineers DELTA SYSTEMS Established 1997

NOTES:

1. REFER TO SHEET E-03 FOR MASTER CIRCUIT SCHEDULE.
2. ENSURE ALL ELECTRICAL CONNECTIONS ON VARIABLE FREQUENCY DRIVES ARE PROPERLY COVERED TO PREVENT SHOCK HAZARD.



A ~ BOOSTER PUMP VARIABLE FREQUENCY DRIVE (VFD-BP5) SCHEMATIC DIAGRAM
SCHEMATIC

B ~ BOOSTER PUMP VARIABLE FREQUENCY DRIVE (VFD-BP5) CONNECTION DIAGRAM
CONNECTION

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SCHEMATIC & CONNECTION DIAGRAMS

Registered Professional Engineer (Electrical)
74459
AARON G.
ARMENTA
Date Signed 11/30/23
ARIZONA, U.S.A.

EXPIRATION DATE: 12/31/24

Sheet Number:
E-05
Sheet 21 of 24

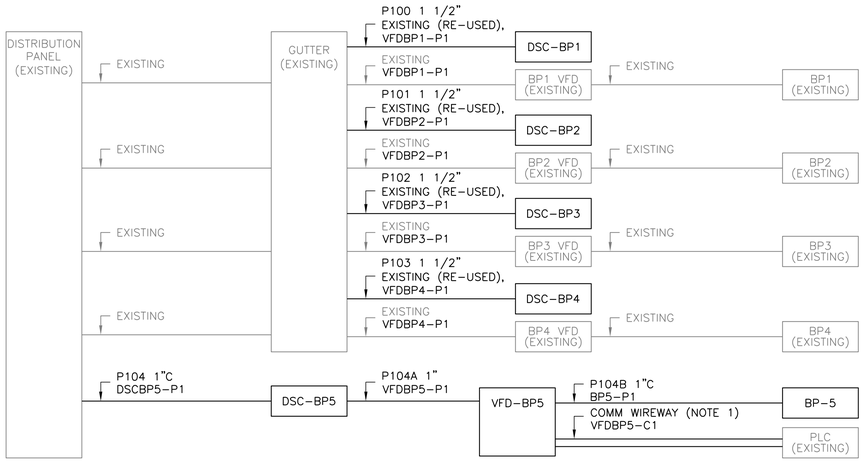
CELEBRATING 25 YEARS
NCS DELTA SYSTEMS
Established 1997

NOTES:

1. ETHERNET WIRING BETWEEN NEW VFD AND RTU PANEL SHALL BE ROUTED IN WIREWAY (I.E. PANDUIT) WHERE POSSIBLE.

LEGEND:

C100 1"C ← CONDUIT NUMBER & SIZE
RTU100-1 ← CIRCUIT NUMBER(S)



A ~ BOOSTER STATION 4 CONDUIT BLOCK DIAGRAM

LAKE HAVASU CITY, ARIZONA • INCORPORATED 1978

NO.	REVISIONS / SUBMISSIONS	DATE

LAKE HAVASU CITY
BOOSTER STATION 4 IMPROVEMENTS

Designed by: DLN
Drawn by: JHA
Checked by: AGA
Date: 11/13/23
Dwg scale: AS NOTED

CONDUIT BLOCK DIAGRAM

Registered Professional Engineer (Electrical)
74459
AARON G. ARMENTA
Date Signed 12/31/23
ARIZONA, U.S.A.
EXPIRATION DATE: 12/31/24

CELEBRATING 25 YEARS
NCS DELTA SYSTEMS
Established 1997

Sheet Number:

E-06

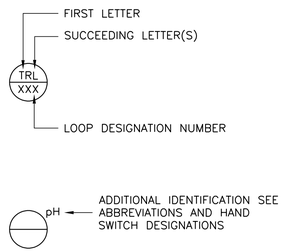
ISA INSTRUMENT IDENTIFICATION TABLE

FIRST LETTERS			SUCCEEDING LETTERS		
MEASURED OR INITIATING VARIABLE		MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYZER		ALARM		AUTO
B	BURNER, COMBUSTION				
C	CONDUCTIVITY			CONTROL	CLOSED
D	DENSITY	DIFFERENTIAL			
E	VOLTAGE		ELEMENT		
F	FLOW	RATIO			
G	GAUGE		GLASS, VIEWING DEVICE		
H	HAND				HIGH
I	CURRENT		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHED.	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	MOTION				MIDDLE
N	INTRUSION				NORMAL
O	TORQUE		ORIFICE, RESTRICTION		OPEN
P	PRESSURE		POINT CONNECTION		STOP
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD, OR PRINT		RUN OR REMOTE
S	SPEED, FREQUENCY	SAFETY		SWITCH	START
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION			VALVE, LOUVER	
W	WEIGHT		WELL		
X	MOTOR	X-AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE, OR PRESENCE	Y-AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION	Z-AXIS		DRIVER, ACTUATOR, FINAL CONTROL ELEMENT	

P&ID ABBREVIATIONS

A	AMPERE
AFD	ADJUSTABLE FREQUENCY DRIVE
AI	ANALOG INPUT
AIC	AMPS INTERRUPTING CAPACITY
ARV	AIR RELIEF VALVE
AO	ANALOG OUTPUT
AS	AIR SUPPLY
ATS	AUTOMATIC TRANSFER SWITCH
AUTO	AUTOMATIC
CB	CIRCUIT BREAKER
CL2	CHLORINE
CON	CONTACTOR
CU	COPPER
CV	CONTROL VALVE
DCS	DISTRIBUTED CONTROL SYSTEM
DI	DISCRETE INPUT
DO	DISSOLVED OXYGEN, DISCRETE OUTPUT
DP	DIFFERENTIAL PRESSURE
DWG	DRAWING
EGO	EMERGENCY GAS OFF
ETM	ELAPSED TIME METER
ETMf	ELAPSED TIME METER (FAST SPEED)
ETMs	ELAPSED TIME METER (SLOW SPEED)
EOL	ELECTRONIC OVERLOAD
EXIST	EXISTING
FA	FOUL AIR
FC	FAIL CLOSED
FE	FINAL EFFLUENT
FR	FORWARD-REVERSE
FS	FLOAT SWITCH
FVNR	FULL VOLTAGE NON-REVERSING
FW	FINISHED WATER
GND	GROUND
GAL	GALLONS
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
H, HI	HIGH
H2S	HYDROGEN SULFIDE
HMI	HUMAN MACHINE INTERFACE
HOA	HAND-OFF-AUTO
I	CURRENT
IO	INPUT/OUTPUT
IOE	INTERNAL-OFF-EXTERNAL
JB	JUNCTION BOX
L, LO	LOW
LAN	LOCAL AREA NETWORK
LC	LOOP CONTROLLER
LCP	LOCAL CONTROL PANEL
LOS	LOCK-OFF-STOP
LR	LOCAL/REMOTE
LS	LEVEL (i.e.. FLOAT) SWITCH
M	MOTOR
MA	MANUAL/AUTO
mA	MILLIAMP
MC	MANUFACTURE CABLE
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MFR(S)	MANUFACTURER(S)
MGD	MILLION GALLONS PER DAY
MGL	MILLIGRAMS PER LITER
MH	MANHOLE
MLR	MIXED LIQUOR RETURN
MO	MOISTURE
MOD	MODULATED
MTU	MASTER TELEMETRY UNIT
NPW	NON-POTABLE WATER
NS	NITROGEN SUPPLY
NTU	TURBIDITY
O/C	OPEN / CLOSE
OCA	OPEN-CLOSE-AUTO
OCR	OPEN-CLOSE-REMOTE
OIT	OPERATOR INTERFACE TERMINAL
OL	OVERLOAD
OO	ON/OFF (MAINTAINED)
OOA	ON-OFF-AUTO
OOR	ON-OFF-REMOTE
OSC	OPEN-STOP-CLOSE
PAH	PRESSURE ALARM HIGH
PER	PERMISSIVE
PLC	PROGRAMMABLE LOGIC CONTROLLER
PNL	PANEL
PO	PULSE OUTPUT
POS	POSITION
POT	POTENTIOMETER
PPG	POUNDS PER GALLON
PPH	POUNDS PER HOUR
PPM	PARTS PER MILLION
PR	PAIR
PRES	PRESSURE
PS	PRESSURE SWITCH
PSI	POUNDS PER SQUARE INCH
PV	PROCESS VARIABLE
RAS	RETURN ACTIVATED SLUDGE
RAW	RAW WATER
REM	REMOTE
RF	RADIO FREQUENCY
RIO	REMOTE INPUT OUTPUT
RS	RAW SEWAGE
RSP	RAW SEWAGE PUMP
RST	RESET
RTD	RESISTANCE TEMPERATURE DETECTOR
RTU	REMOTE TELEMETRY UNIT
RUNf	RUN (FAST SPEED)
RUNs	RUN (SLOW SPEED)
SB	SLUDGE BLANKET
SEQ	SERVICE ENTRANCE EQUIPMENT
SES	SERVICE ENTRANCE SECTION
SLC	SINGLE LOOP CONTROLLER
SLOS	START-LOCK-OFF-STOP
SO2	SULFUR DIOXIDE
SOV	SOLENOID OPERATED VALVE
SP	SET POINT
SPD	SPEED
SPR	SPARE
SS	START/STOP (MAINTAINED)
SSS	SOLID STATE STARTER (SOFT START)
STR	MOTOR STARTER
TAH	TEMPERATURE ALARM HIGH
T/M	TEMPERATURE AND/OR MOISTURE
TEMP	TEMPERATURE
TS	TEMPERATURE SWITCH
TSS	TOTAL SUSPENDED SOLIDS
UG	UNDERGROUND
USD	UP/STOP/DOWN
V	VOLT
VFD	VARIABLE FREQUENCY DRIVE
W	WATER
WAS	WASTE ACTIVATED SLUDGE
WW	WASTEWATER
XMTR	TRANSMITTER
ZS	POSITION (i.e. LIMIT) SWITCH

TAG NUMBERS AND DESIGNATIONS



HAND SWITCH DESIGNATIONS

ES	EMERGENCY STOP
HOA	HAND-OFF-AUTO
HOR	HAND-OFF-REMOTE
HORA	HAND-OFF-REMOTE-AUTO
JOA	JOG-OFF-AUTO
LOR	LOCAL-OFF-REMOTE
LR	LOCAL-REMOTE
OC	OPEN-CLOSE
OO	ON-OFF
S/S	START STOP PUSH BUTTONS

LINE SYMBOLS

- MAJOR PROCESS PIPING OR FLOW CHANNEL
- EXISTING PROCESS PIPING
- SECONDARY PROCESS PIPING
- EXISTING SECONDARY PROCESS PIPING
- EXISTING PIPING AND EQUIPMENT
- FUTURE PIPING AND EQUIPMENT
- ELECTRICAL SIGNAL
- HYDRAULIC SIGNAL
- PNEUMATIC SIGNAL
- ELECTRICAL DIRECTION ARROW
- SIGNAL CONNECTION POINT
- FLOW ARROW FOR PROCESS PIPING
- PROCESS OR SIGNAL LINE GOING TO ANOTHER SHEET (MATCH LETTERS) — I-3 /A
- PROCESS OR SIGNAL LINE FROM ANOTHER SHEET (MATCH LETTERS) — I-2 /A
- PROCESS LINES CROSSING (NOT CONNECTED)
- INTERNAL SYSTEM SIGNAL LINK (SOFTWARE OR DATA LINK)

P&ID VALVE SYMBOLS

- GATE OR GENERIC VALVE
- 3-WAY VALVE
- 4-WAY VALVE
- ANGLE VALVE
- BUTTERFLY VALVE
- PLUG VALVE
- ECCENTRIC PLUG VALVE
- BALL VALVE
- CHECK VALVE
- SWING CHECK VALVE
- STOP CHECK VALVE
- BALL CHECK VALVE
- PINCH VALVE
- DIAPHRAGM VALVE
- DIAPHRAGM VALVE (ALTERNATE)
- GLOBE VALVE
- HAND VALVE
- KNIFE VALVE
- MOTORIZED VALVE ACTUATOR
- SOLENOID VALVE 2-WAY
- SOLENOID VALVE 3-WAY
- PUMP CONTROL VALVE
- FLOW CONTROL VALVE
- PRESSURE RELIEF VALVE
- VACUUM RELIEF VALVE
- PRESSURE REGULATOR WITH REMOTE PROCESS CONNECTION
- PRESSURE REGULATOR SELF CONTAINED
- AIR RELEASE VALVE

P&ID EQUIPMENT AND PROCESS SYMBOLS

- METERING PUMP WITH MANUAL STROKE CONTROL
- ROTARY LUBE PUMP
- SUBMERSIBLE MIXER
- AERATOR
- SUBMERSIBLE PUMP
- DIESEL GENERATOR
- CENTRIFUGAL PUMP
- BLOWER
- LIFT PUMP
- MOTOR OR MOTOR ACTUATOR
- PNEUMATIC ACTUATOR
- SOLENOID
- VERTICAL TURBINE PUMP
- CHLORINE TANK (CL_2)
- WEIGHT SCALE
- AIR COMPRESSOR
- SLUICE GATE
- SAMPLER
- PROPELLER FLOWMETER ELEMENT
- MAGNETIC FLOWMETER ELEMENT
- CL2 FLOWMETER
- INSERTION TYPE MASS FLOW METER
- MASS FLOW METER ANNUBAR TYPE
- DRAIN
- OUTLET SILENCER
- INLET SILENCER
- ROTAMETER
- AIR RELIEF VALVE
- EJECTOR
- DIAPHRAGM SEAL
- DIFFUSER
- DIAPHRAGM
- Y-TYPE STRAINER
- IPS CORPORATION STOP
- PVC DIFFUSER WITH IPS CORPORATION STOP

SENSING, INDICATION, AND CONTROL SYMBOLS

- LE — ULTRASONIC LEVEL TRANSDUCER
- LS — FLOAT SWITCH
- BEACON — BEACON R=RED, A=AMBER, B=BLUE, G=GREEN
- YL / G — STOP INDICATING LIGHT
- HS — HOA HAND SWITCH
- AIT — ORP ORP ANALYZER
- AIT — pH pH ANALYZER
- AE — ANALYZER ELEMENT
- AE — DO DO SENSOR
- AE — ORP ORP SENSOR
- AE — pH pH SENSOR
- AIT — DO DO ANALYZER
- AE — CL2 RESIDUAL CL2 CHLORINE SENSOR
- AIT — CL2 RESIDUAL CL2 CHLORINE ANALYZER

P&ID INTERFACE SYMBOLS

- AAA / BBB / X — PILOT LIGHT X= LENS COLOR, R=RED, G=GREEN, A=AMBER B=BLUE
- AAA / BBB / CCC — FIELD DEVICE
- AAA / BBB / CCC — PANEL DEVICE
- AAA / BBB / CCC — DEVICE MOUNTED IN SUBPANEL
- BBB / CCC — REMOTE I/O TERMINAL
- BBB / CCC — HMI OR OIT FUNCTION
- I / X — INTERLOCK DEVICE OR RELAY X=NOTE REF.
- I/I — DUAL CHANNEL CURRENT ISOLATOR
- DISCRETE INPUT
- DISCRETE OUTPUT
- ANALOG INPUT
- ANALOG OUTPUT
- PULSE INPUT

NOTE:

REFER TO ISA INSTRUMENT IDENTIFICATION TABLE FOR DEFINITION OF LETTERS BBB INSIDE THE BUBBLES. CCC REPRESENTS LOOP ID (IF USED). SEE ABBREVIATIONS LIST FOR SUPERSCRIPT AAA.

LAKE HAVASU CITY, ARIZONA • INCORPORATED 1978

NO.	REVISIONS / SUBMISSIONS	DATE

LAKE HAVASU CITY
BOOSTER STATION 4 IMPROVEMENTS

Designed by: DLN
Drawn by: JHA
Checked by: AGA
Date: 11/13/23
Dwg scale: AS NOTED

P&ID SYBMOLS AND LEGEND

Registered Professional Engineer (Electrical)
74459
AARON G. ARMENTA
Date Signed 1/31/24
ARIZONA, U.S.A.

EXPIRATION DATE: 12/31/24

Sheet Number:

I-01

Sheet 23 of 24

CELEBRATING 25 YEARS
NCS ENGINEERS DELTA SYSTEMS Established 1997

SCADA (EXISTING)

ELECTRICAL BUILDING (EXISTING)

PLC (EXISTING)

BOOSTER PUMP NO. 5 RUN COMMAND — YC 105
BOOSTER PUMP NO. 5 RUN STATUS — YIR 105
BOOSTER PUMP NO. 5 AUTO STATUS — YIA 105
BOOSTER PUMP NO. 5 VFD FAULT — YA 105
BOOSTER PUMP NO. 5 SPEED CONTROL — SC 105
BOOSTER PUMP NO. 5 SPEED INDICATION — SI 105

BOOSTER STATION DISCHARGE PRESSURE INDICATION — PI

ETHERNET

480VAC

BOOSTER PUMP NO. 1 VARIABLE FREQUENCY DRIVE (EXISTING)

BOOSTER PUMP NO. 2 VARIABLE FREQUENCY DRIVE (EXISTING)

BOOSTER PUMP NO. 3 VARIABLE FREQUENCY DRIVE (EXISTING)

BOOSTER PUMP NO. 4 VARIABLE FREQUENCY DRIVE (EXISTING)

BOOSTER PUMP NO. 5 VARIABLE FREQUENCY DRIVE VFD-BP5

BLADDER TANK

PIT

PI

FILL LINE

RESERVOIR (EXISTING)

RESERVOIR (EXISTING)

M

BOOSTER PUMP NO. 1 (EXISTING)

BOOSTER PUMP NO. 2 (EXISTING)

BOOSTER PUMP NO. 3 (EXISTING)

BOOSTER PUMP NO. 4 (EXISTING)

BOOSTER PUMP NO. 5 BP-5

TO DISTRIBUTION

NOTES:

1. ONLY EXISTING I/O AND PROCESS INFORMATION PERTAINING TO THE SCOPE OF THIS PROJECT HAS BEEN REFLECTED ON THIS P&ID.

LAKE HAVASU CITY, ARIZONA • INCORPORATED 1978

NO.	REVISIONS / SUBMISSIONS	DATE

LAKE HAVASU CITY

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Sheet Number:

I-02

Sheet 24 of 24

CELEBRATING 25 YEARS

NCS Engineers DELTA SYSTEMS Established 1997

SECTION 0310

BID SCHEDULE - BOOSTER STATION 4 IMPROVEMENTS, B24-PW-108029-500433

ITEM NO.	DESCRIPTION	EST QTY	UNIT OF MEASURE	UNIT PRICE (*1) (WORD)	UNIT PRICE (FIGURE)	ITEM TOTAL (*2) COSTS
BASE BID						
1	Mobilization/Demobilization, Bonds, Permitting and Insurance	1	L.S.		$	$
2	All demolition work including piping, mechanical, electrical and civil work at BPS 4	1	L.S.		$	$
3	All mechanical work including piping, pumps, valves, meters, tanks, and appurtenances at BPS 4	1	L.S.		$	$
4	All civil/site, fencing, grading and concrete works at BPS 4	1	L.S.		$	$
5	All work associated with Cherry Tree Lane Connection	1	L.S.		$	$
6	Metal Shade Canopy	1	L.S.		$	$
7	Painting and Coating	1	L.S.		$	$
8	All electrical and instrumentation work	1	L.S.		$	$
9	Force Account	1	L.S.	Fifty Thousand Dollars	$50,000.00	$50,000.00
	TOTAL BID(*3) + FORCE ACCOUNT				$	$

Above line items and totals shall include all work shown on the plans and specified herein, including taxes, insurance and bonding.

*1 The "Unit Price" column shall indicate unit or lump sum prices for each bid item and shall be indicated in written and numerical form.

*2 The "Item Total Costs" column shall indicate the extension of the unit prices, which is obtained by multiplying the "Estimated Quantity" column by the "Unit Price" column.

*3 The "Bid Total" amount shall be the sum of all costs listed in the "Item Total Costs" column.