

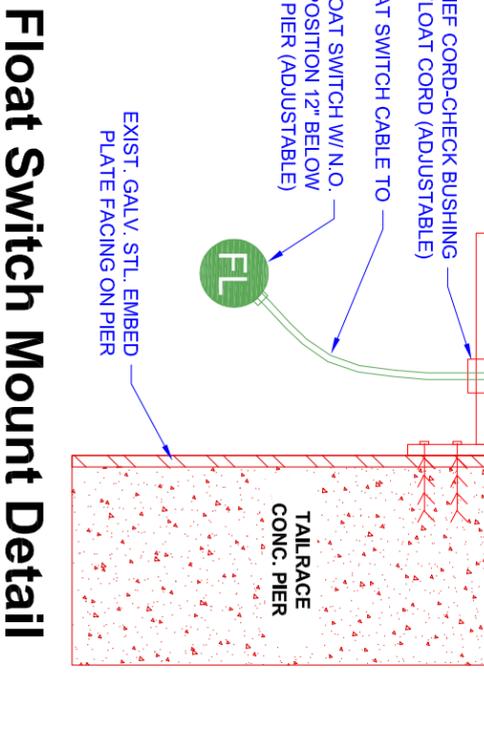
Outdoor Raceway Electrical & Instrumentation/Control Plan

scale: 1/8" = 1'-0" (approx.)

- 2 RUN I.M.T. CONDUIT OVER TO & DOWN GALV. STL. AERATOR SUPPORT COLUMN TO FLR. LEVEL
- 2 RUN I.M.T. CONDUIT ALONG SLAB TO RACEWAY INLET. THEN DROP 2" BELOW TOP OF RACEWAY WALL (SEE PLAN ABOVE)



- 6 RUN 3/4" PVC CONDUIT W/ (2) #12 FOR FLOAT SW. 2" BELOW TOP OF RACEWAY WALL - USE S.S. ONE-HOLE CONDUIT CLAMPS
- 7 RUN I.M.T. CONDUIT ATOP PIER TO RACEWAY DIVIDING WALL, THEN DROP 2" BELOW TOP OF WALL & TRANSITION TO PVC CONDUIT
- 7 RUN I.M.T. CONDUIT ATOP PIER TO RACEWAY DIVIDING WALL, THEN DROP 2" BELOW TOP OF WALL & TRANSITION TO PVC CONDUIT
- 3 3-SLOT S.S. FLOAT SWITCH MOUNTING BRACKET (USA Bluebook #47765, OR EQUAL) -- BOLT TO PIER FACE -- 3/2" BELOW TOP OF WALL W/ S.S. LAG BOLTS OR EXP. ANCHORS
- 3 NEW 110V FLOAT SWITCH W/ N.O. CONTACTS -- POSITION 12" BELOW TOP OF PIER (ADJUSTABLE)
- 3 NEW WEATHERPROOF FUSED BOX COVER UNIT ON 110V POWER TO ALARM PANEL
- 3 NEW J.B. & CONDULET TO WALL PENETRATION INTO PUMPHOUSE FOR 110V PANEL POWER FROM LP-17, & FOR 110V ALARM CIRCUITS TO PLC (SEE SHT. 7)
- 5 NEW RIVER-FLOODING ALARM PANEL (FOR FLOAT SWITCH IN TAILRACE)
- 6 NEW 3/4" I.M.C. CONDUIT W/ (2) #12 FOR 110V FLOAT SW. CIRCUIT



no scale

Float Switch Mount Detail

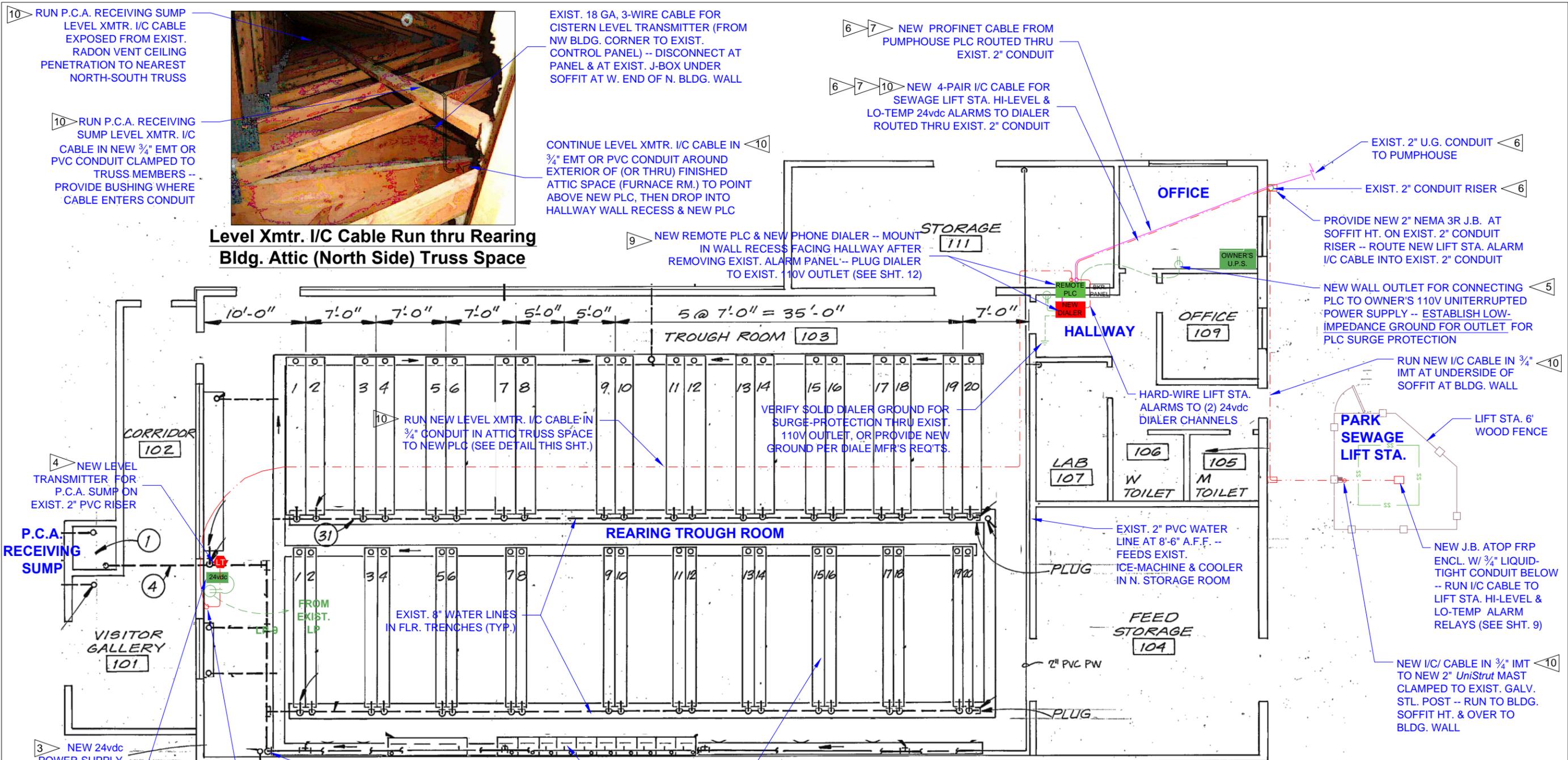
NOTES:

1. DRAWING BASE FROM 1985 CONSTRUCTION DRAWINGS, AND SHOULD BE CONSIDERED ONLY APPROXIMATE (1985 DRAWINGS AVAILABLE ON REQUEST).
2. FIELD VERIFY CONDUIT ROUTING & SUPPORT POINTS. USE I.M.C. METAL CONDUIT FROM ALARM PANEL TO TOP OF RACEWAY WALL & USE PVC CONDUIT ALONG RACEWAY WALL -- TRANSITION FROM PVC TO I.M.C. WHERE CONDUIT LAID ACROSS TOPS OF WALLS OR POTENTIAL WALKING AREAS. PROVIDE J.B.S & CONDULETS AT CONDUIT TRANSITIONS & AT CHANGES IN DIRECTION AS REQ'D.
3. PROVIDE DUAL 2" Unistrut PIECES TO TO SUPPORT PANEL (LENGTH AS REQ'D) & SECURE TO EXTERIOR WALL.
4. AFFIX WHITE/YELLOW STRIPED WEATHERPROOF METALLIC WARNING TAPE TO ALL CONDUIT WHERE LOCATED ON WALL TOPS OR OTHER POTENTIAL WALKING AREAS.
5. GROUND PANEL PER MFRS. & N.E.C. REQTS.
6. USE DIRECT-BURY-RATED 600V POWER CABLE FOR FROM ALARM PANEL TO FLOAT SWITCH J-BOX.
7. INSTALL SURFACE-MOUNT I.M.C. ATOP PIERS TO CLEAR EXIST. SLIDE GATE SLOTS & TO ALLOW EXIST. REMOVABLE GRATING PANELS & STOP PLANKS TO BE CONVENIENTLY REMOVED & REINSTALLED W/O REMOVING CONDUIT.

River Flood Float Switch Panel & Conduit Routing

no scale





Level Xmtr. I/C Cable Run thru Rearing Bldg. Attic (North Side) Truss Space

10 RUN P.C.A. RECEIVING SUMP LEVEL XMTR. I/C CABLE EXPOSED FROM EXIST. RADON VENT CEILING PENETRATION TO NEAREST NORTH-SOUTH TRUSS

10 RUN P.C.A. RECEIVING SUMP LEVEL XMTR. I/C CABLE IN NEW 3/4" EMT OR PVC CONDUIT CLAMPED TO TRUSS MEMBERS -- PROVIDE BUSHING WHERE CABLE ENTERS CONDUIT

EXIST. 18 GA, 3-WIRE CABLE FOR CISTERN LEVEL TRANSMITTER (FROM NW BLDG. CORNER TO EXIST. CONTROL PANEL) -- DISCONNECT AT PANEL & AT EXIST. J-BOX UNDER SOFFIT AT W. END OF N. BLDG. WALL

CONTINUE LEVEL XMTR. I/C CABLE IN 3/4" EMT OR PVC CONDUIT AROUND EXTERIOR OF (OR THRU) FINISHED ATTIC SPACE (FURNACE RM.) TO POINT ABOVE NEW PLC, THEN DROP INTO HALLWAY WALL RECESS & NEW PLC

6 7 NEW PROFINET CABLE FROM PUMPHOUSE PLC ROUTED THRU EXIST. 2" CONDUIT

6 7 10 NEW 4-PAIR I/C CABLE FOR SEWAGE LIFT STA. HI-LEVEL & LO-TEMP 24vdc ALARMS TO DIALER ROUTED THRU EXIST. 2" CONDUIT

EXIST. 2" U.G. CONDUIT TO PUMPHOUSE

EXIST. 2" CONDUIT RISER

PROVIDE NEW 2" NEMA 3R J.B. AT SOFFIT HT. ON EXIST. 2" CONDUIT RISER -- ROUTE NEW LIFT STA. ALARM I/C CABLE INTO EXIST. 2" CONDUIT

NEW WALL OUTLET FOR CONNECTING PLC TO OWNER'S 110V UNINTERRUPTED POWER SUPPLY -- ESTABLISH LOW-IMPEDANCE GROUND FOR OUTLET FOR PLC SURGE PROTECTION

RUN NEW I/C CABLE IN 3/4" IMT AT UNDERSIDE OF SOFFIT AT BLDG. WALL

LIFT STA. 6' WOOD FENCE

NEW J.B. ATOP FRP ENCL. W/ 3/4" LIQUID-TIGHT CONDUIT BELOW -- RUN I/C CABLE TO LIFT STA. HI-LEVEL & LO-TEMP ALARM RELAYS (SEE SHT. 9)

NEW I/C CABLE IN 3/4" IMT TO NEW 2" UniStrut MAST CLAMPED TO EXIST. GALV. STL. POST -- RUN TO BLDG. SOFFIT HT. & OVER TO BLDG. WALL

4 NEW LEVEL TRANSMITTER FOR P.C.A. SUMP ON EXIST. 2" PVC RISER

P.C.A. RECEIVING SUMP

3 NEW 24vdc POWER SUPPLY W/ ENCL.-- FOR LEVEL XMTR.

10 RUN NEW LEVEL XMTR. I/C CABLE IN 3/4" CONDUIT IN ATTIC TRUSS SPACE TO NEW PLC (SEE DETAIL THIS SHT.)

VERIFY SOLID DIALER GROUND FOR SURGE PROTECTION THRU EXIST. 110V OUTLET, OR PROVIDE NEW GROUND PER DIALE MFR'S REQ'TS.

EXIST. 2" PVC WATER LINE AT 8'-6" A.F.F. -- FEEDS EXIST. ICE-MACHINE & COOLER IN N. STORAGE ROOM

PLUG

EXIST. 4" PIPE RISER FROM U.G. 4" WATERLINE TEE'D OFF EXIST. CISTERN LINE (SEE SHT. 4)

EXIST. REARING TROUGHS (TYP.)

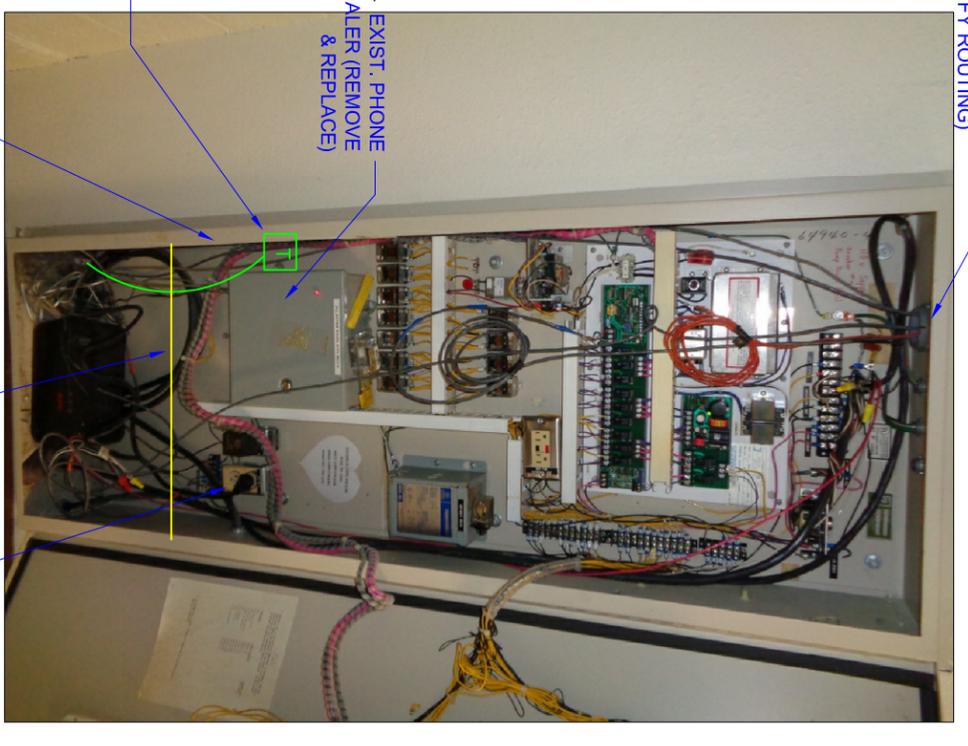
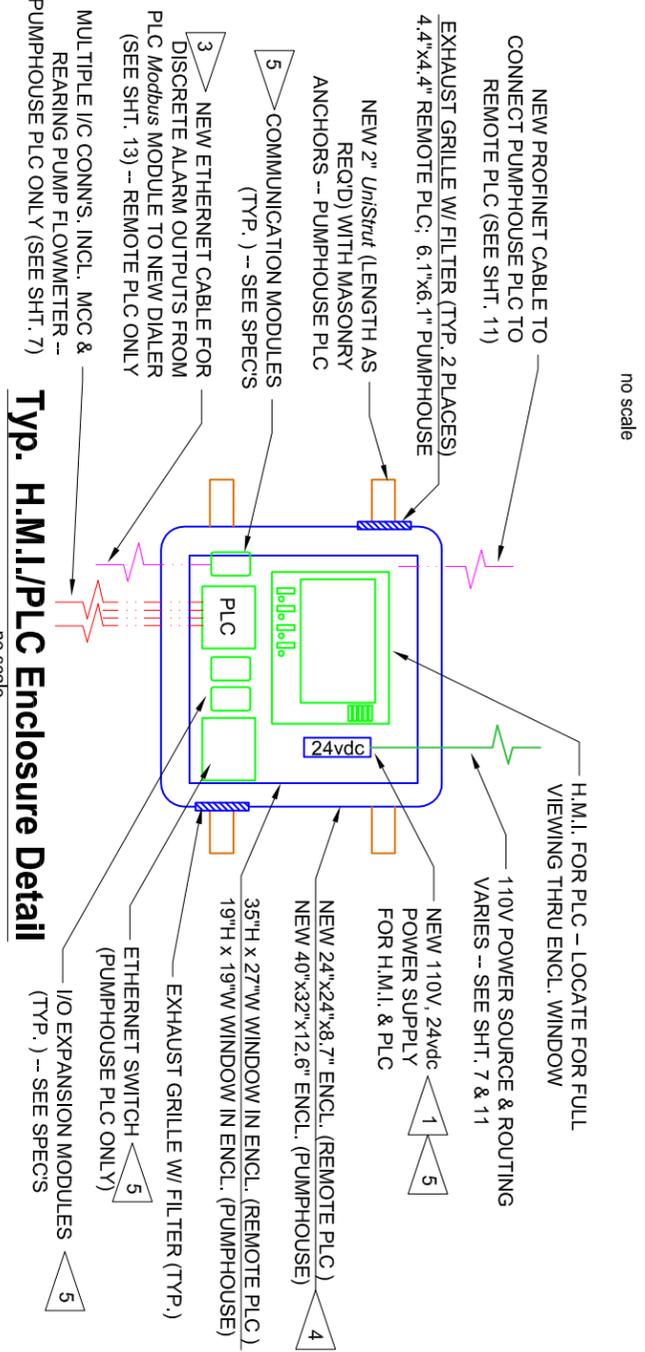
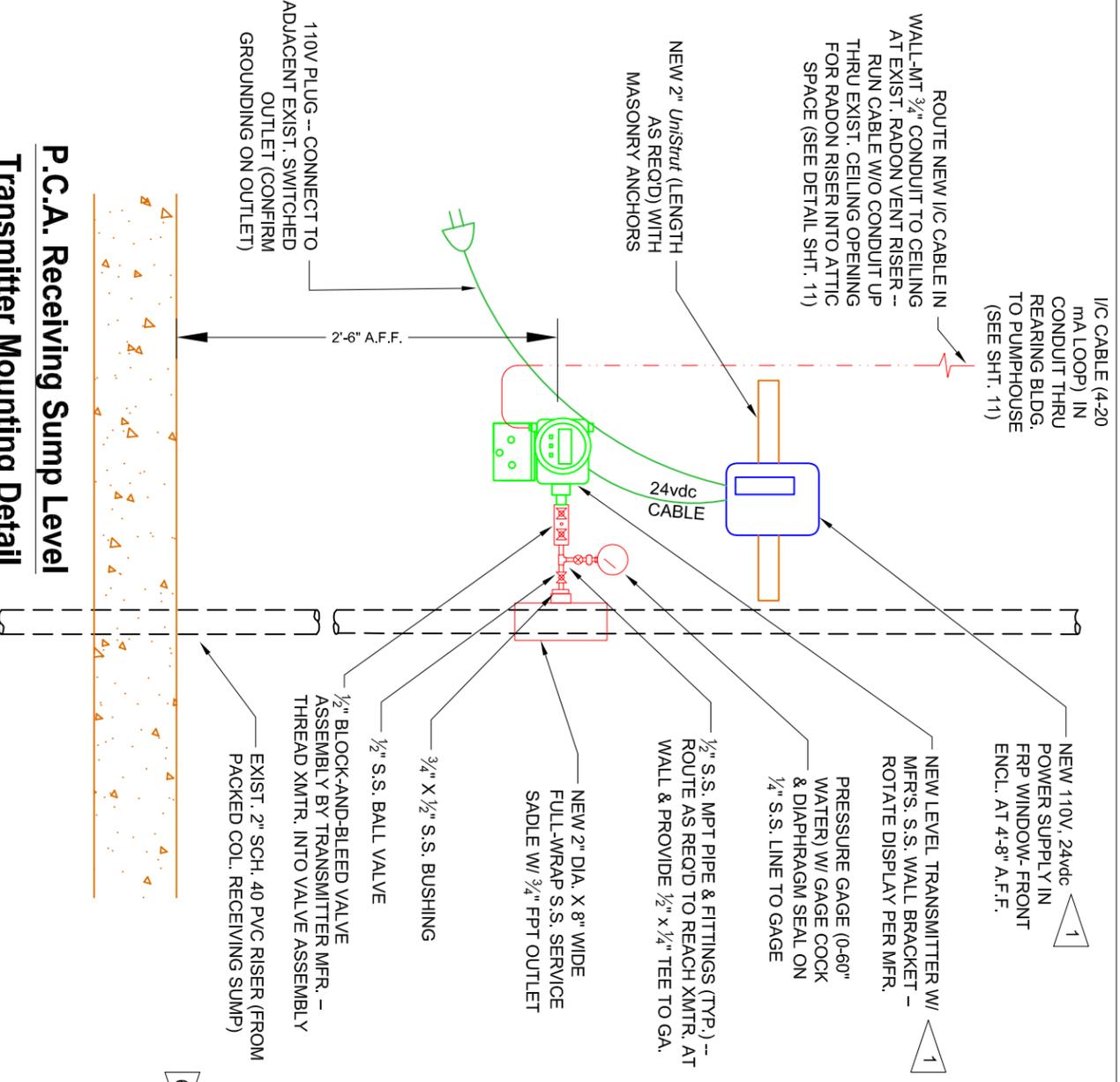
EGG HATCHING RACKS (TYP.)

ADAPT NEW I/C CABLE TO MFR'S. M12 PLUG REQ'TS FOR LEVEL TRANSMITTER; RUN NEW LEVEL XMTR. I/C CABLE IN WALL-MT 3/4" CONDUIT TO CEILING AT EXIST. RADON VENT RISER -- CONTINUE CABLE W/O CONDUIT UP THRU EXIST. CEILING OPENING, THEN RUN IN ATTIC TRUSS SPACE (SEE DETAIL THIS SHT.)

- NOTES:
- DRAWING BASE FROM 1999 CONSTRUCTION DRAWINGS, AND SHOULD BE CONSIDERED ONLY APPROXIMATE.
 - EXIST. 120/240V BREAKER PANEL LAYOUT, LIGHT FIXTURES, 120/240V & CONTROL WIRING NOT SHOWN -- CONTRACTOR TO FIELD VERIFY AS REQ'D. FOR THE WORK (1999 ELECTRICAL DRWG'S. AVAILABLE ON REQUEST).
 - MOUNT POWER SUPPLY ENCLOSURE TO WALL AT 4'-0" A.F.F. USING DUAL 2" UniStrut PIECES (LENGTH AS REQ'D.) WITH S.S. FASTENERS; PLUG NEW 24vdc POWER SUPPLY TO ADJACENT EXIST. 120V WALL PLUG.
 - INSTALL NEW LEVEL TRANSMITTER ON EXIST. 2" PVC RISER FOR PACKED COLUMN AERATOR (P.C.A.) RECEIVING SUMP SIGHT-GLASS, & SUPPORT TRANSMITTER WITH MFR'S WALL SHELF & 2" UniStrut SPACER IF REQ'D -- SEE DETAIL SHEET 12.
 - HARD-WIRE 110V POWER (IN 3/4" EMT) FOR 24vdc POWER SUPPLY FOR PLC/HMI INTO ATTIC TRUSS SPACE, OVER TO OFFICE DIVIDING WALL, & DOWN THRU WALL TO NEW WALL OUTLET IN NORTH OFFICE -- MOUNT OUTLET 2' AFF; OUTLET TO BE SINGLE NEMA 10-30R CONFIGURATION W/ S.S. WALL PLATE; PROVIDE 12'L 18 GA. GROUNDED EXTENSION CORD W/ 10-30P MALE PLUG BY STD. GROUNDED MALE PLUG (FOR CONNECTING PLC THRU OUTLET TO OWNER'S UNINTERRUPTED 110V POWER SUPPLY)
 - REMOVE EXIST. POWER & ALARM CABLES FROM EXIST. 2" CONDUIT, & ROUTE NEW PROFINET CABLE FROM PUMPHOUSE PLC TO NEW REMOTE (REARING BLDG.) PLC;
 - EXIST. 2" CONDUIT FROM OUTSIDE BLDG. RISER TO EXIST. CONTROL PANEL LOCATION, ROUTED THRU BLDG. ATTIC TRUSS SPACE -- ROUTING NOT VERIFIED & TO BE CONFIRMED BY CONTRACTOR.
 - PROVIDE WALL PENETRATIONS AS REQ'D FOR NEW CONDUIT RUNS (SEAL WITH DOW Great Foam, OR EQUAL); JOG NEW CONDUIT ALIGNMENTS AS REQ'D. TO CLEAR EXIST. PLUMBING, CONDUIT & EQUIPMENT; PROVIDE J.B.'S & CONDULETS AS REQ'D. & JOIN TO EXIST. CONDUIT RUNS/TERMINATIONS WHERE REUSED.
 - REMOVE EXIST. U.S. Filter RECESSED CONTROL/ALARM PANEL & EXIST. PHONE DIALER; FRAME OUT & SHEETROCK & FINISH WALL RECESS AFTER EXIST. EQUIP. REMOVAL; MOUNT NEW PLC AT 5'-0" AFF IN FINISHED RECESS & MOUNT NEW PHONE DIALER DIRECTLY BELOW PLC (SEE SHT. 12).
 - PROVIDE 4-PAIR I/C CABLE WITH (3) UNUSED PAIRS FOR LEVEL TRANSMITTER, & (2) UNUSED PAIRS FOR SEWAGE STA. ALARMS.

Rearing Bldg. Electrical & Instrumentation/Control Plan

scale: 1" = 10'-0" (approx.)



Exist. (Office Hallway) Pump Control/Alarm Panel to be Removed

- no scale
- NOTES:**
- GROUND EQUIPMENT & 24VDC POWER SUPPLIES PER MFRS. & N.E.C. REQ'TS. INCLUDING PLC MFRS & DIALER MFRS SURGE PROTECTION REQ'TS.
 - ORIENT LEVEL TRANSMITTER TO CLEAR ADJACENT EXIST. PIPING & CONDUIT, & POSITION DISPLAY FOR CONVENIENT READABILITY.
 - DISCRETE OUTPUTS TO DIALER VIA ETHERNET SERIAL CONNECTION -- SEE SHT. 13.
 - ENCLOSURES TO BE FIBERGLASS NEMA 4X WITH WINDOW FRONT; INSTALL FILTERED GRILLES FOR VENTING PER ENCL. MFR. REQ'TS.
 - PROVIDE DIN RAIL BOSSES IN PANELS, & DIN RAIL-MOUNT COMPONENTS WITH GROUNDING PER MFRS REQ'TS.
 - FIR OUT, FULLY SHEETROCK (3/8" GYP. BD), PERFA-TAPE, & PAINT (2 COATS LATEX TO MATCH EXIST.) WALL RECESS AFTER REMOVAL OF EXISTING PANELS & EQUIPMENT; CLOSE OFF LOWER 16" OF RECESS TO BRING NEW SHEETROCK SURFACE FLUSH WITH HALLWAY WALLS.
 - INSTALL NEW R11 PHONE JACK (WITH WALL PLATE) ON EXIST. TEL-LINE INSIDE FINISHED WALL RECESS; CONNECT NEW DIALER TO PHONE JACK.
 - RETAIN EXIST. 110V DUPLEX OUTLET (MOVING AS REQ'D) & PROVIDE NEW S.S. WALL PLATE INSIDE FINISHED WALL RECESS; PROVIDE 110V GROUNDED PLUG ON NEW DIALER & PLUG INTO OUTLET & CONFIRM LOW-IMPEDANCE GROUND THRU EXIST. OUTLET (OR PROVIDE ALTERNATE GROUND MEETING DIALER MFRS. REQ'TS.
 - SURFACE-MOUNT NEW PLC ENCLOSURE INSIDE FINISHED WALL RECESS AT 5'-0" A.F.F. WITH NEW ALARM DIALER DIRECTLY BELOW -- MOUNT WITH MFRS MOUNTING TABS OR 1 1/2" UniStrut PIECES IF REQ'D.

discrete (D) or analog (A)	PLC Input (I) or output (O)	signal source (inputs) or destination (Outputs)	signal source component location	condition	(comments)	alarm output to dialer	dialer alarm condition
REARING PUMPS:							
D	I	Rearing Pump #1 (lead) VFD	PLC HMI	Start Rearing Pump #1	operator-initiated Rearing Pump SYSTEM start		
D	I	Rearing Pump #1 (lead) VFD	PLC HMI	Stop Rearing Pump #1	operator-initiated Rearing Pump SYSTEM stop		
A (4-20mA)	I	Rearing Bldg. Receiving Sump Level Transmitter	Rearing Packed Column Sump	Rearing Sump Water Level to be Maintained	water level to maintain to keep indoor troughs operating (adjustable); also display level on PLC	X	Rearing Packed Column Low Water Level
D	O	Rearing Bldg. Receiving Sump Level Transmitter	Rearing Packed Column Sump	Rearing Sump Water Low	alarm	X	Rearing Packed Column High Water Level
D	O	Rearing Bldg. Receiving Sump Level Transmitter	Rearing Packed Column Sump	Receiving Sump Water Level High	alarm	X	
A (4-20mA)	O	Rearing Pump #1 (lead) VFD	MCC	VFD speed*			
A (4-20mA)	I	Rearing Pump #1 (lead) VFD	MCC	VFD feedback speed			
D	I	Rearing Pump #1 (lead) VFD	MCC	Drive Fault	alarm	X	Rearing Pump #1 VFD Fault
D	I	Rearing Pump #1 VFD Harmonic Filter Contacts	MCC	VFD Harmonic Filter Over-temperature	alarm; plus directly disables Rearing Pump #1 VFD	X	Rearing Pump #1 VFD Harmonic Filter Hi-temp
D	O	Rearing Pump #2 (Follower) SoftStart	MCC	Start Rearing Pump #2	*If Pump #1 reaches 100% rpm, THEN start Pump #2		
D	O	Rearing Pump #2 (Follower) SoftStart	MCC	Stop Rearing Pump #2	*If Pump #1 drops to 60% rpm (adjustable), THEN stop Pump #2		
D	I	Rearing Pump #2 (Follower) SoftStart	MCC	Fault	alarm	X	Rearing Pump #2 Starter Failure
A (4-20mA)	I	New Raceway Pumps Flowmeter	flowmeter on discharge header	Combined Rearing Pumps flow♦	to display GPM on PLC	X	Rearing Pump Flow Loss
RACEWAY PUMPS: [note: Existing Raceway Pumps being called in reverse numerical order to compensate for past running hours & equalize future wear.]							
D	I	Raceway Pump #4 (Lead) VFD	PLC HMI	Start Raceway Pump #4	operator-initiated Raceway Pump SYSTEM start		
D	I	Raceway Pump #4 (Lead) VFD	PLC HMI	Stop Raceway Pump #4	operator-initiated Raceway Pump SYSTEM stop		
A (4-20mA)	I	Operator-selectable GPM Output	PLC HMI	desired total flow to outdoor Raceways	operator-selected parameter		
A (4-20mA)	O	Raceway Pump #4 (Lead) VFD	MCC	VFD speed*			
A (4-20mA)	I	Raceway Pump #4 (Lead) VFD	MCC	VFD feedback speed			
D	I	Raceway Pump #4 (Lead) VFD	MCC	Drive Fault	alarm	X	Raceway Pump #1 VFD Fault
D	I	Raceway Pump #4 (Lead) VFD	MCC	VFD Harmonic Filter Over-temperature	alarm; plus directly disables Raceway Pump #4 VFD	X	Raceway Pump #1 VFD Harmonic Filter Hi-temp
D	O	Raceway Pump #3 (Follower) SoftStart	MCC	Start Raceway Pump #3	*If Pump #4 reaches 100% rpm, THEN start Pump #3		
D	O	Raceway Pump #3 (Follower) SoftStart	MCC	Stop Raceway Pump #3	*If Pump #4 drops to 60% rpm (adjustable), THEN stop Pump #3		
D	I	Raceway Pump #3 (Follower) SoftStart	MCC	Fault	alarm	X	Raceway Pump #3 Starter Failure
D	O	Raceway Pump #2 (Follower) SoftStart	MCC	Start Raceway Pump #2	*If Pump #3 running AND Pump #4 reaches 100% rpm, THEN start Pump #2		
D	O	Raceway Pump #2 (Follower) SoftStart	MCC	Stop Raceway Pump #2	*If Pump #4 drops to 60% rpm (adjustable), THEN stop Pump #2		
D	I	Raceway Pump #2 (Follower) SoftStart	MCC	Fault	alarm	X	Raceway Pump #2 Starter Failure
D	O	Raceway Pump #1 (Follower) SoftStart	MCC	Start Raceway Pump #1	*If Pump #3 running AND Pump #2 running AND Pump #4 reaches 100% rpm, THEN start Pump #1		
D	O	Raceway Pump #1 (Follower) SoftStart	MCC	Stop Raceway Pump #1	*If Pump #4 drops to 60% rpm (adjustable), THEN stop Pump #1		
D	I	Raceway Pump #1 (Follower) SoftStart	MCC	Fault	alarm	X	Raceway Pump #1 Starter Failure
ALL PUMPS:							
D	I	Wet Well Float Switch Hi-level	wet well	Low Wet Well Level	stops ALL pumps	X	Pumphouse Wet Well Low Water Level
D	I	Wet Well Float Switch Lo-level	wet well	High Wet Well Level	alarm	X	Pumphouse Wet Well High Water Level
OTHER MISC.							
D	I	Outdoor Raceway float switch 110V alarm panel	float switch in R/W #13 tail-race	Missouri River level back-flooding raceways	alarm (for fish disease deterrence)	X	River Flooding into Raceways
hard-wired 24vdc Dialer alarms (not thru PLC)							
D	(n/a)	Sewage Lift Sta. Control Panel HI-level Contacts	Park Sewage Lift Sta. Control Panel	Sewage Lift Station Wet Well High Level	wire externally from Sewage Lift Sta. control panel directly to Alarm Dialer	X	Park Sewage Lift Station High Wet Well Level
D	(n/a)	Sewage Lift Sta. Control Panel Lo-temp Contacts	Park Sewage Lift Sta. Control Panel	Sewage Lift Station Low Temperature	wire externally from Sewage Lift Sta. control panel directly to Alarm Dialer	X	Park Sewage Lift Station Freeze Warning
Additional PLC/HMI & Logic Req's:							
<ul style="list-style-type: none"> Remove (Rearing Bldg.) PLC to Fully Mirror Pumphouse PLC Status and Control Capability via its HMI. VFD Pumps (Rearing #1 or Raceway #4) can be Removed from Service by Selectively "Disabling" without Alarms (thru HMI). SoftStart Pumps (Rearing #2 or Raceway #1, #2, #3) can be Removed from Service by Selectively "Disabling" without Alarms (thru HMI). Call-up Order of "Follower" SoftStart Raceway Pumps 1, #2 or #3 can be Manually Selected by Operator (thru HMI). Rearing Pump Flow (in US Gal/min) to be Viewable on HMI(s). Rearing Pump #1 and Raceway Pump #4 VFDs Communicate with Pumphouse PLC via PROFIBET. All Alarm Conditions listed above to be Viewable on HMI(s). Individual VFD Pumps (Rearing #1 or Raceway #4) On/Off Status and RPM to be Viewable on HMI(s). Individual SoftStart Pumps (Rearing #2 or Raceway #1, #2, #3) On/Off Status to be Viewable on HMI(s). Rearing Bldg. Packed Column Receiving Sump Water Level (in inches) to be Viewable on HMI(s). Rearing Bldg. Packed Column Receiving Sump Water Level 4-20mA Analog is Routed to Remote P.L.C. then Carried via PROFIBET to Pumphouse PLC. Rearing Pump #2 and Raceway Pumps #1, #2 & #3 Communicate with Pumphouse PLC via Hard-wired Connections. 							

Giant Springs Trout Hatchery
Pump & Control Project
CONTROL LOGIC I/O LIST

designed: Alden G. Beard. P.E.
date: May 24, 2019
revised:

