EXTENDING THE SERVICE LIFE OF CRITICAL FACILITIES

COST-EFFECTIVE REHABILITATION

USING INNOVATIVE APPROACHES

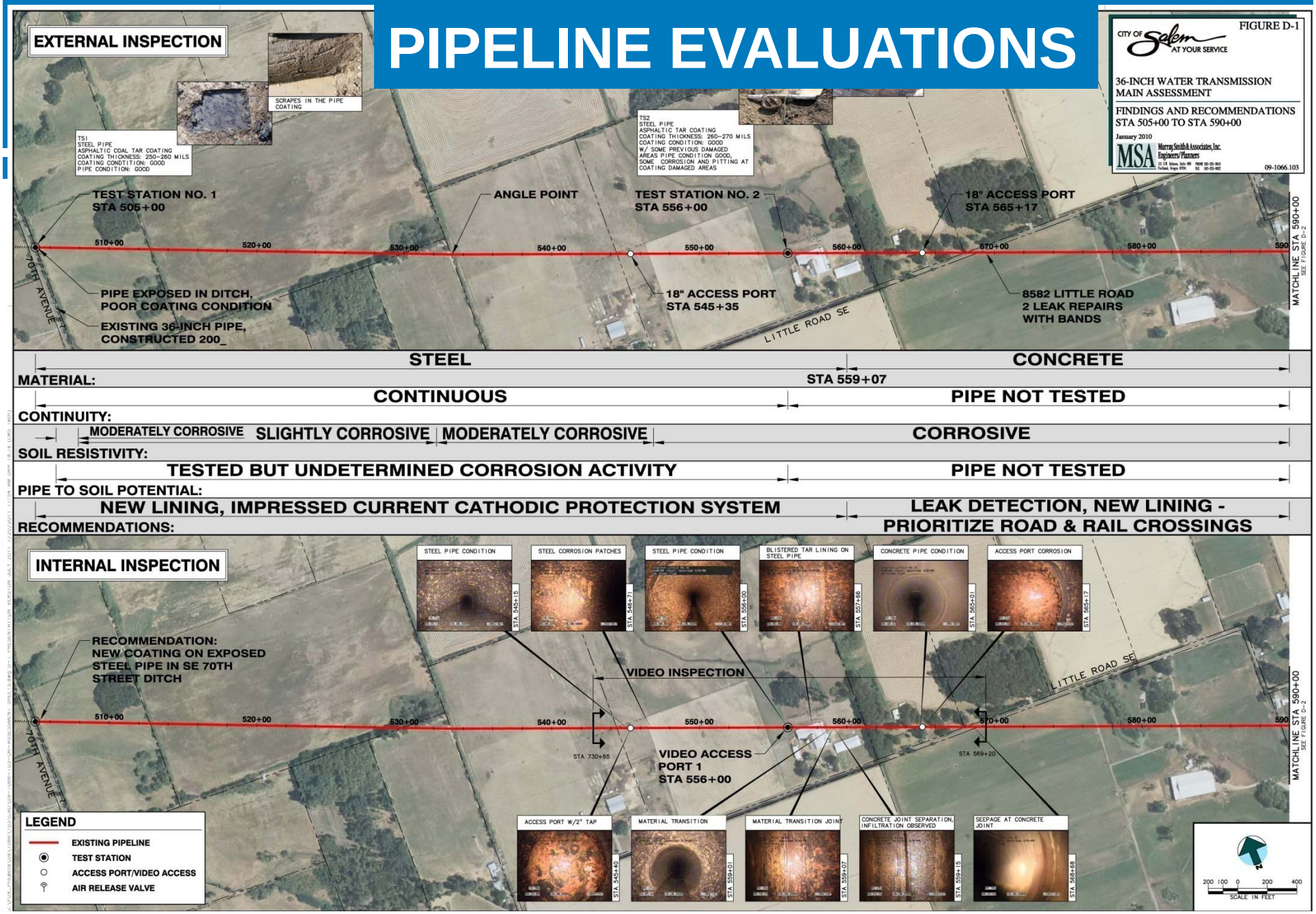
MSA

PRESENTATION OUTLINE

Extending the service life of critical (and costly) drinking water facilities

- Pipelines
- Reservoirs
- Pump Stations

PIPELINE EVALUATIONS



RESERVOIR UPGRADES

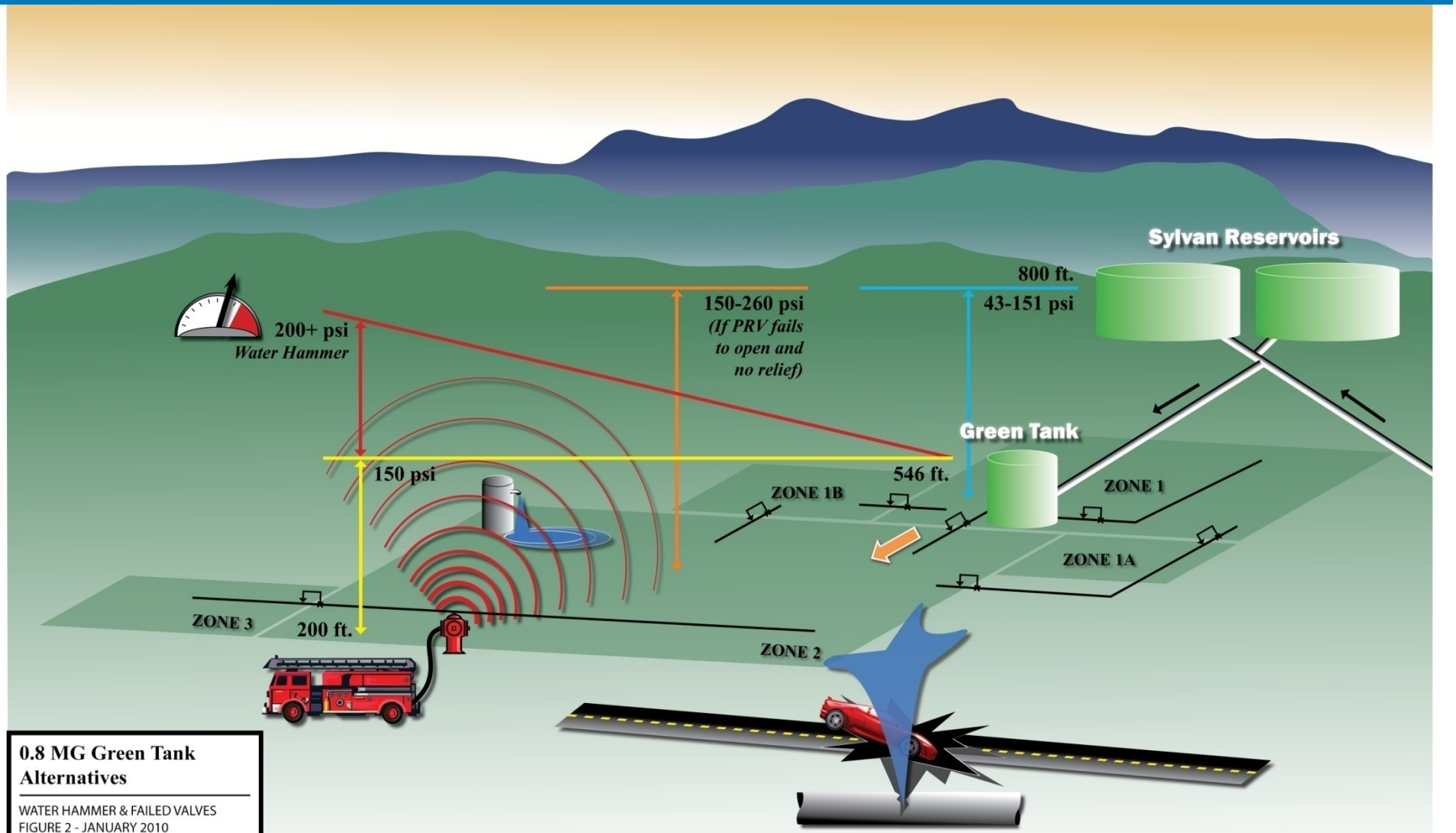
City of Corvallis
North Hills Reservoir Upgrades

PUMP STATION UPGRADES

Lake Oswego
Waluga Pump Station
Upgrades

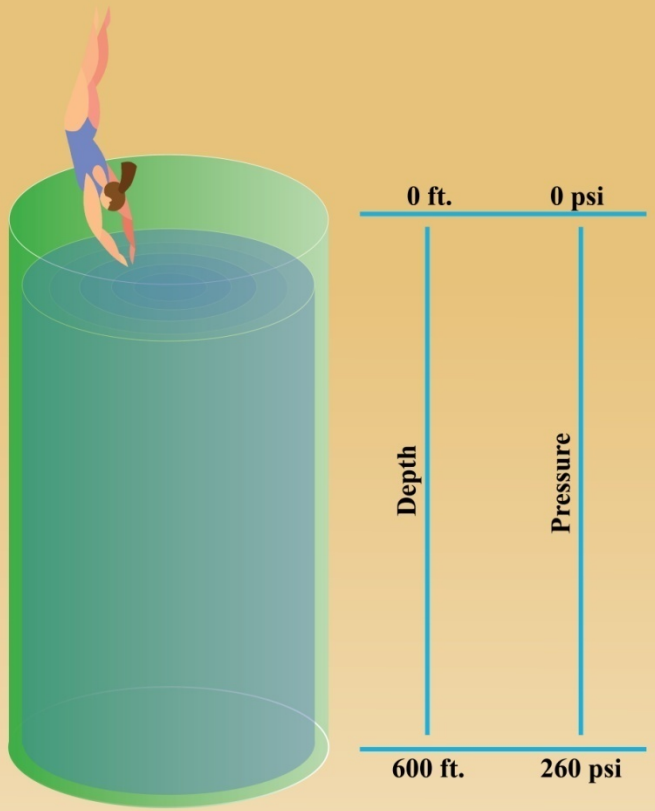
0.8 MG GREEN TANK ALTERNATIVES

WATER HAMMER AND FAILED VALVES



ZONE 2 RISK FACTORS & VULNERABILITIES

High Pressures at Lower Elevations



2.31 feet of water = 1 psi

0.8 MG Green Tank Alternatives

RISK FACTORS & VULNERABILITIES
FIGURE 1 - JANUARY 2010

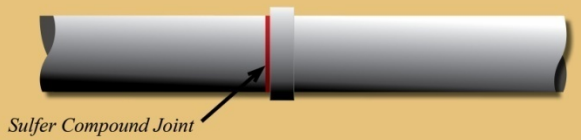
West Slope Water District

MSA Murray, Smith & Associates, Inc. Engineers/Planners

09-1081.400

Cast Iron Pipe

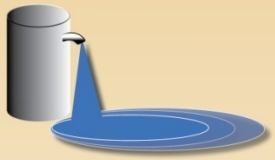
- World War II domestic lead shortage



- Sulfer compound joint substituted (Leadite)
- No give like lead when settling - Pressure points
- Brittle, aging pipe

System Components

- Standard Service Corporation stops rated at 100 psi *(Seeing 150 normal operating pressure in places)*
- Older individual PRVs may not be rated beyond 100 psi
- Some older homes at 100 psi with no PRV



Normal Operation at Limits/Vulnerable to:

- Pressure Spikes *(surge/water hammer)*
- Zone 2 feed valve failure(s) *(6 pressure)* reducing valves (*PRVs*) feed Zone 2

OPTIONS A & B

OPTION A:

Water Hammer

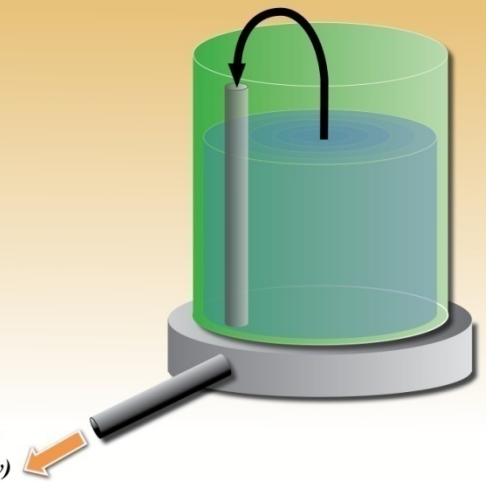
91st
4" valve at 1,800 gpm surge flow only
(short duration = surge flow)

Appleway
4" valve at 1,800 gpm surge flow only
(short duration = surge flow)

Water Hammer Surge

Failed Valve Pressure Relief

6,000 gpm in
from failed valve
(11,000 gpm worst-case scenario)
Automatic shut-off valve



6,000 gpm out via overflow
(longer duration = continuous flow)

6,000 gpm in =
6,000 gpm out
(checks)

OPTION B:

Water Hammer & Backup Pressure Relief

91st
8" valve at 3,100 gpm
sized for 1/2 pressure relief -
adequate for surge
(longer duration = continuous flow)

Appleway
8" valve at 3,100 gpm
sized for 1/2 pressure relief -
adequate for surge
(longer duration = continuous flow)

0.8 MG Green Tank Alternatives

OPTIONS A & B
FIGURE 3 - JANUARY 2010

West Slope Water District

MSA
Murray, Smith & Associates, Inc.
Engineers/Planners

09-1081.400

Failed Valve Pressure Relief

6,000 gpm in
from failed valve
(11,000 gpm worst-case scenario)
Automatic shut-off valve

7,000 gpm out via 12" PRV
(primary relief)

Backup Relief
3,100
+ 3,100
6,200 gpm out > 6,000 gpm in
(checks as backup)

7,000 gpm out >
6,000 gpm in
(checks)

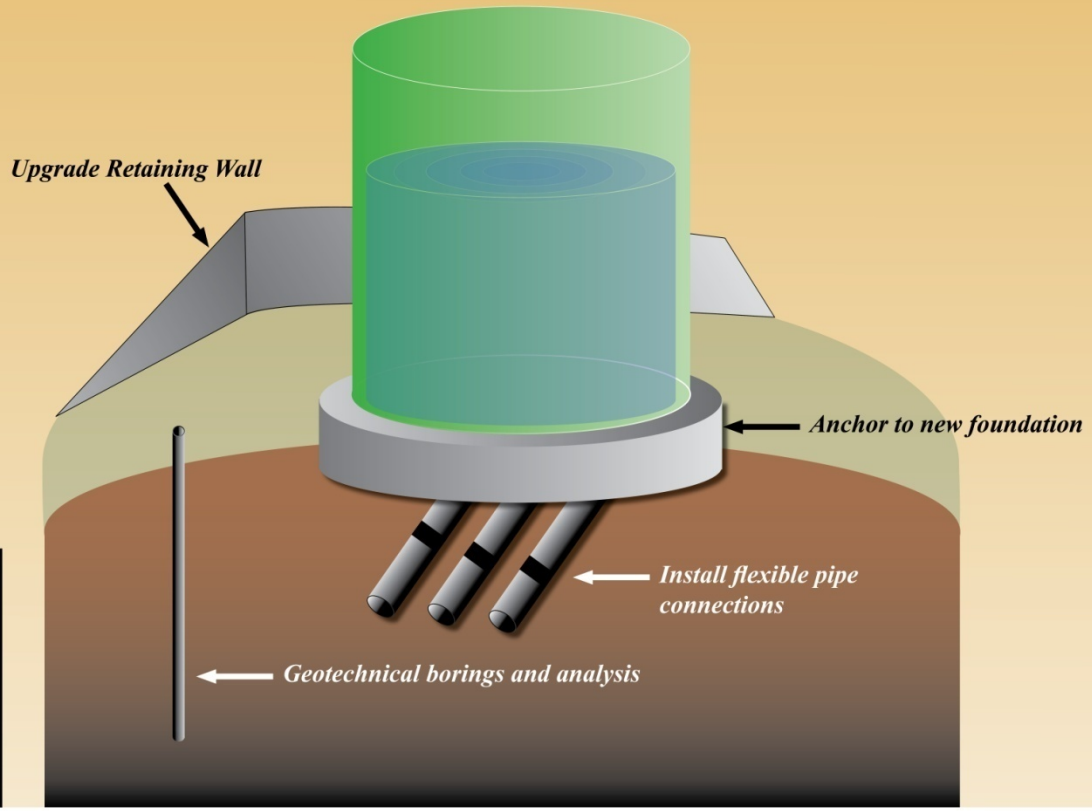
RISK MANAGEMENT

Option A

- **Manageable**
- **Nearly fool-proof**
- **Confirmed suitable site**
- **Seismic upgrades** *(Tank, piping, retaining wall)*
- **$ 860,000**

Option B

- **Manageable?**
- **Not as fool-proof** ***(mechanical valves)***
- **More risk** ***(Bart Johnson)***
- **Going backwards/compromising** ***(Dale Fletcher)***
- **Higher liability** ***(David Leibbrandt)***
- **$ 510,000**



0.8 MG Green Tank Alternatives

RISK MANAGEMENT
FIGURE 4 - JANUARY 2010

West Slope Water District

MSA
Murray, Smith & Associates, Inc.
Engineers/Planners

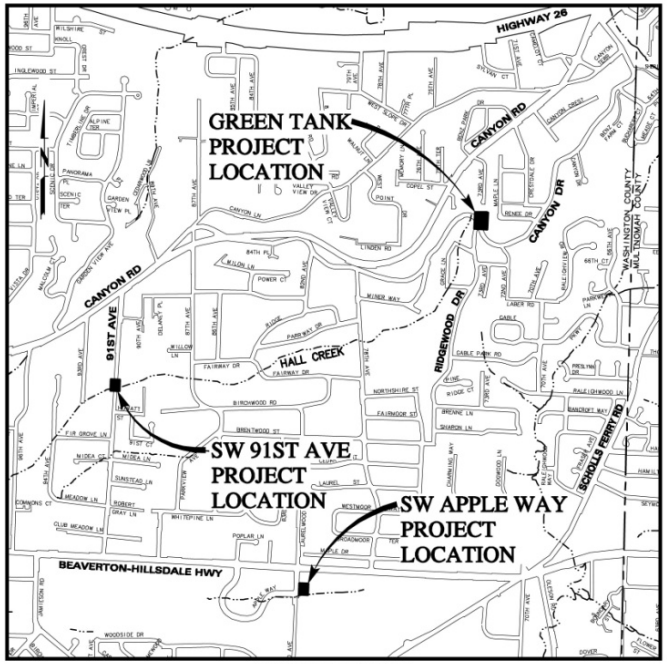
09-1081.400

WEST SLOPE WATER DISTRICT
WASHINGTON COUNTY, OREGON
0.8 MG GREEN TANK ALTERNATIVES
OPTION A

JANUARY 2010

30% - SUBMITTAL

INDEX OF DRAWINGS

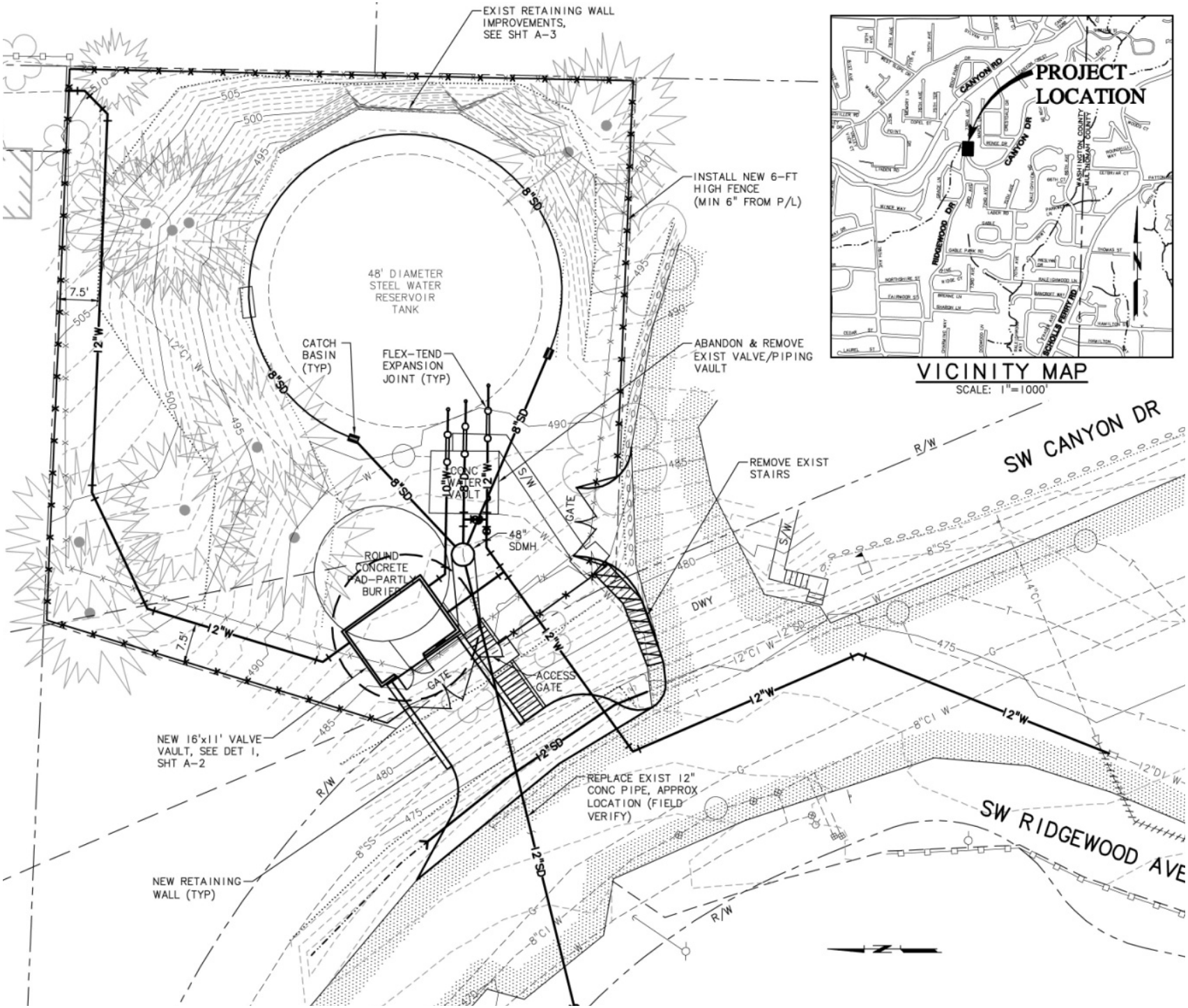


VICINITY MAP
SCALE: 1"=800'

MSA Murray, Smith & Associates, Inc.
Engineers/Planners
121 S.W. Salmon, Suite 900 PHONE 503-225-9010
Portland, Oregon 97204 FAX 503-225-9022

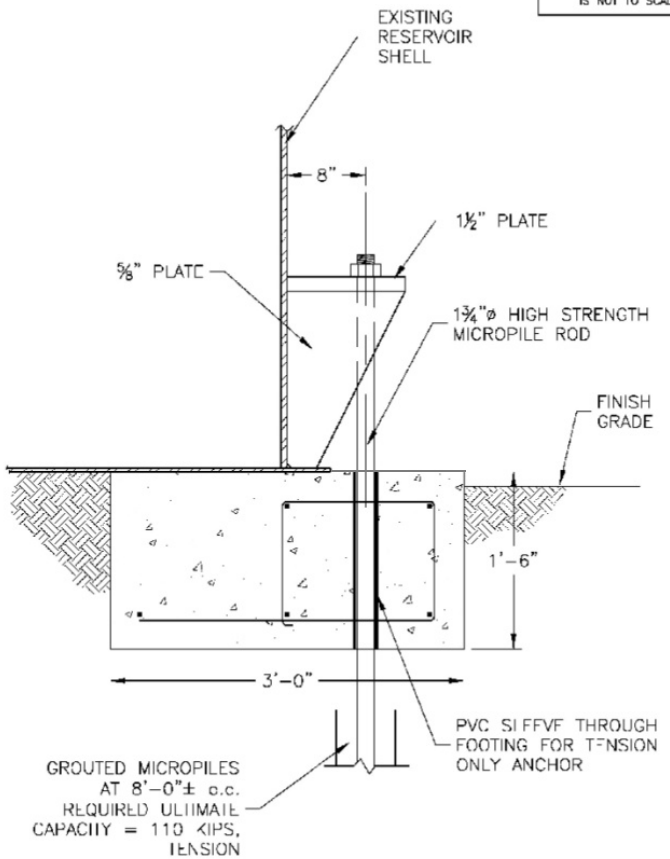
ELEVATIONS BASED ON WASHINGTON COUNTY DEPARTMENT OF PUBLIC WORKS BENCH MARK NO. 810, A 2-1/2" BRASS DISK IN CONCRETE CURB AT THE NORTHEAST CORNER OF CANYON ROAD AND LINDEN STREET INTERSECTION. THE ELEVATION IS 483.20 NAVD 88 DATUM. ALL ELEVATIONS SHOWN ARE TO NAVD 88 DATUM WHICH IS THE SAME DATUM AS THE WATER RESERVOIR SITE AT SYLVAN HILL ON S.W. 61ST DRIVE.

09-1081.202


EXIST RETAINING WALL IMPROVEMENTS, SEE SHT A-3
INSTALL NEW 6-FT HIGH FENCE (MIN 6" FROM P/L)
48' DIAMETER STEEL WATER RESERVOIR TANK
CATCH BASIN (TYP)
FLEX-TEND EXPANSION JOINT (TYP)
ABANDON & REMOVE EXIST VALVE/PIPING VAULT
CONC WATER VAULT
48" SDMH
ROUND CONCRETE PAD-PARTLY BURIED
REMOVE EXIST STAIRS
SW CANYON DR
R/W
S/W
GATE
ACCESS GATE
DWY
NEW 16'x11' VALVE VAULT, SEE DET 1, SHT A-2
REPLACE EXIST 12" CONC PIPE, APPROX LOCATION (FIELD VERIFY)
SW RIDGEWOOD AVE
NEW RETAINING WALL (TYP)
7.5'
12"W
8"SD
12"SD
8"SS
12"CI W
8"CI W
PROJECT LOCATION
CANYON RD
CANYON DR
RIDGEWOOD DR
BEAVERTON HILLSDALE HWY
VICINITY MAP
SCALE: 1"=1000'

PRELIMINARY – NOT FOR CONSTRUCTION

NOTICE
0 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE



ANCHOR AND FOUNDATION SECTION (1 / S1)
(TRANSVERSE) 1" = 1'–0"

PSE
Peterson Structural Engineers, Inc.
5319 S.W. Westgate Dr., Suite 215
Portland, Oregon 97221
(503) 292-1635

WSWD RESERVOIR ANCHORAGE

CLIENT INFO:
TROY BOWERS
MURRAY, SMITH, & ASSOCIATES, INC.
121 SW SALMON ST., SUITE 900
PORTLAND, OREGON 97204

PROJECT SITE:
SW CANYON DRIVE
PORTLAND, OR. 97225

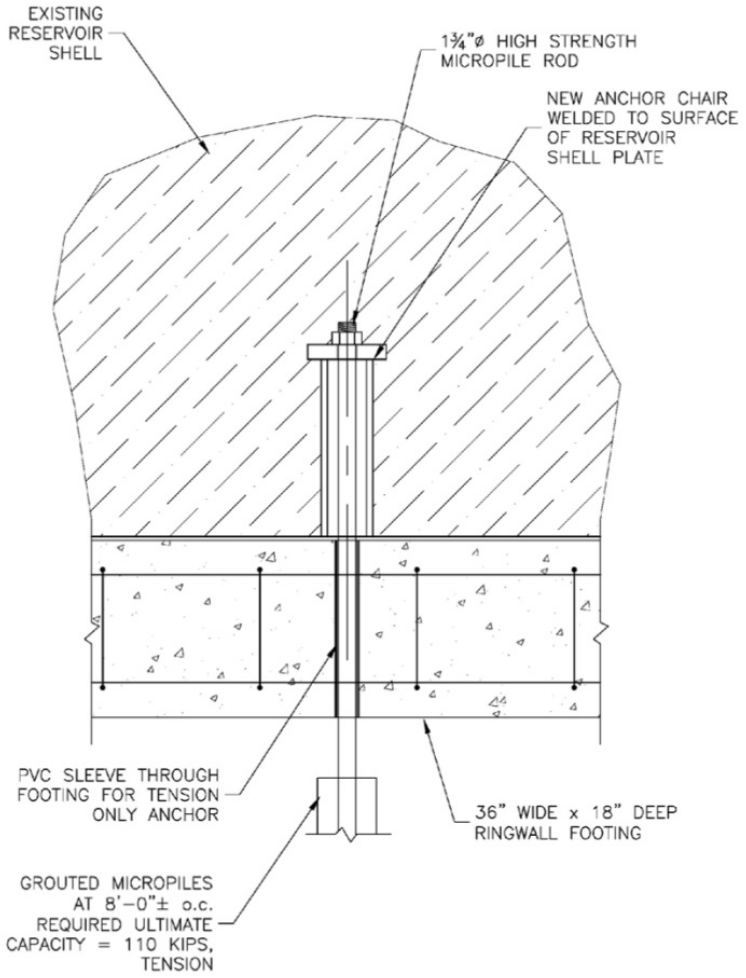
09-049-02
SHEET CONTENT: ANCHOR CHAIR AND FOUNDATION DETAILS

JOB No. 09-049
DRAWN EGH CHECKED EWBP
DATE 1/20/10
REVISIONS

SHEET S1 OF 2

PRELIMINARY – NOT FOR CONSTRUCTION

NOTICE
0 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE



ANCHOR AND FOUNDATION SECTION (1 / S2)
(LONGITUDINAL) 1" = 1'–0"

PSE
Peterson Structural Engineers, Inc.
5319 S.W. Westgate Dr., Suite 215
Portland, Oregon 97221
(503) 292-1635

WSWD RESERVOIR ANCHORAGE

CLIENT INFO:
TROY BOWERS
MURRAY, SMITH, & ASSOCIATES, INC.
121 SW SALMON ST., SUITE 900
PORTLAND, OREGON 97204

PROJECT SITE:
SW CANYON DRIVE
PORTLAND, OR. 97225

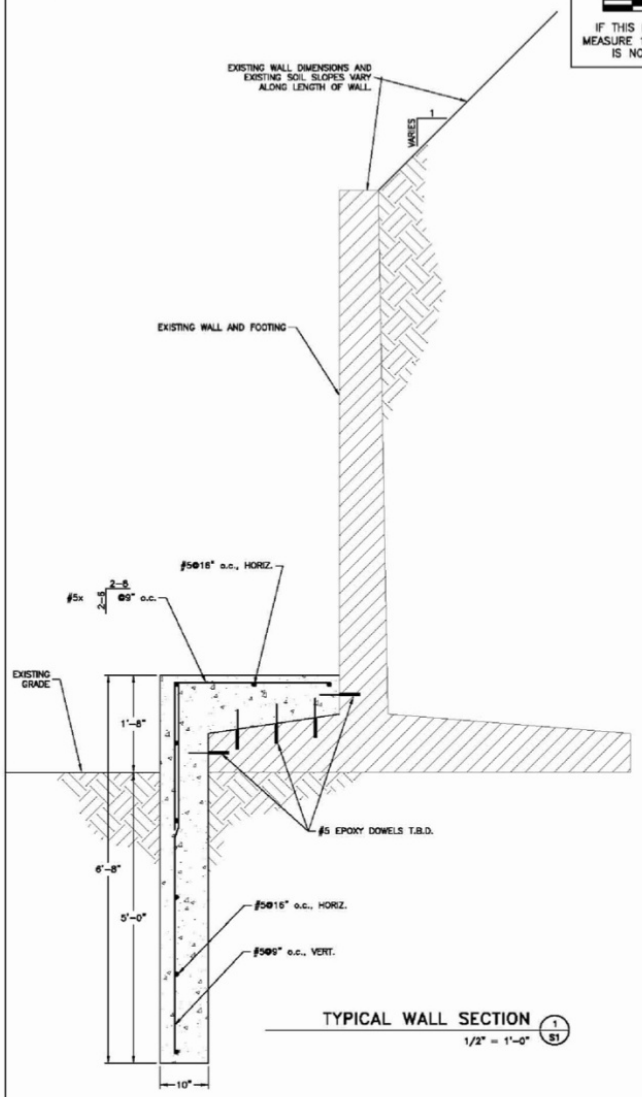
09-049-02
SHEET CONTENT: ANCHOR CHAIR AND FOUNDATION DETAILS

JOB No. 09-049
DRAWN EGH CHECKED EWBP
DATE 1/20/10
REVISIONS

SHEET S2 OF 2

PRELIMINARY – NOT FOR CONSTRUCTION

NOTICE
0 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE



TYPICAL WALL SECTION (1/S1)
1/2" = 1'-0"

Peterson Structural Engineers, Inc.
5319 S.W. Westgate Dr., Suite 215
Portland, Oregon 97221
(503) 292-1655

WSWD WALL REPAIR

CLIENT INFO:
TROY BOWERS
MURRAY, SMITH, & ASSOCIATES, INC.
121 SW SALMON ST., SUITE 900
PORTLAND, OREGON 97204

PROJECT SITE:
SW CANYON DRIVE
PORTLAND, OR. 97225

09-049-01

SHEET CONTENT: TYPICAL WALL SECTION

JOB No. 09-049

DRAWN MWP CHECKED EWBP

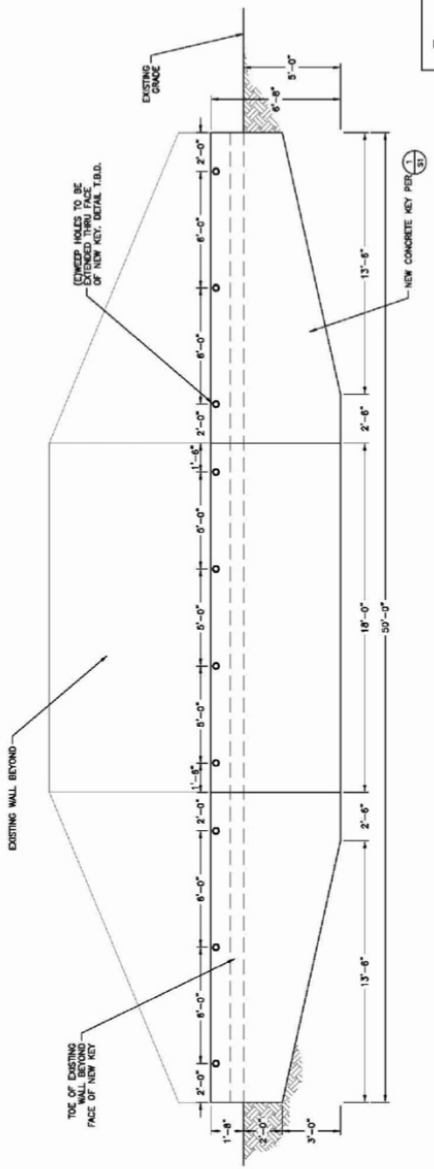
DATE 1/5/10

REVISIONS

SHEET S1 OF 2

PRELIMINARY – NOT FOR CONSTRUCTION

NOTICE
0 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE



UNFOLDED WALL ELEVATION (1/S2)
3/16" = 1'-0"

Peterson Structural Engineers, Inc.
5319 S.W. Westgate Dr., Suite 215
Portland, Oregon 97221
(503) 292-1655

WSWD WALL REPAIR

CLIENT INFO:
TROY BOWERS
MURRAY, SMITH, & ASSOCIATES, INC.
121 SW SALMON ST., SUITE 900
PORTLAND, OREGON 97204

PROJECT SITE:
SW CANYON DRIVE
PORTLAND, OR. 97225

09-049-01

SHEET CONTENT: WALL ELEVATION

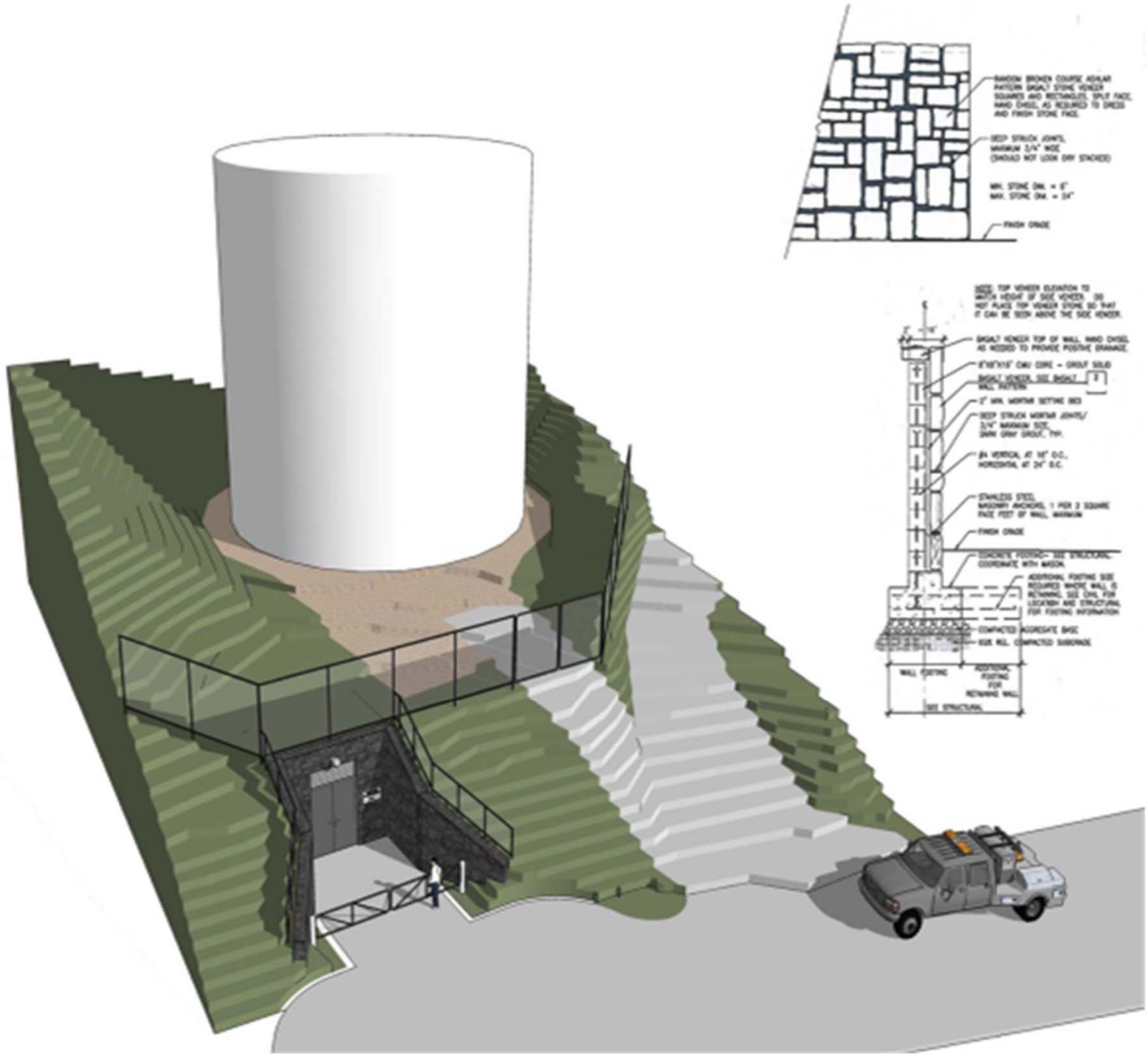
JOB No. 09-049

DRAWN MWP CHECKED EWBP

DATE 1/5/10

REVISIONS

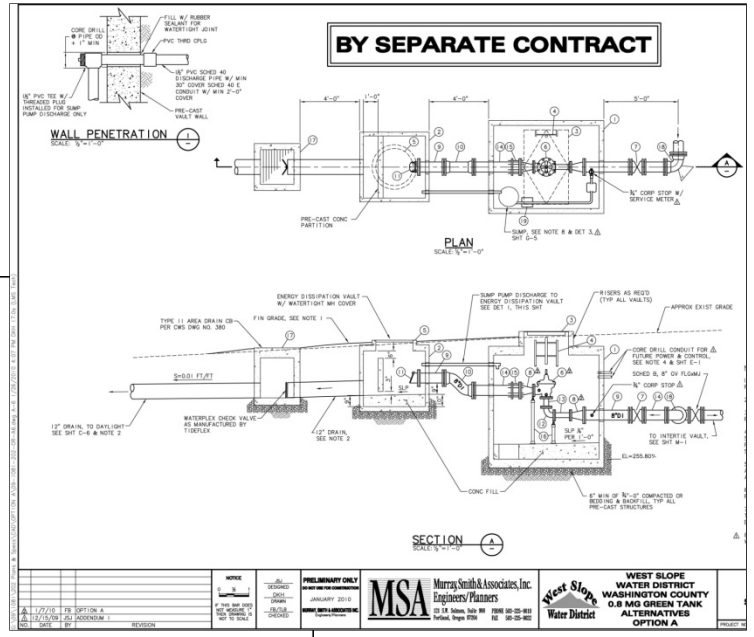
SHEET S2 OF 2

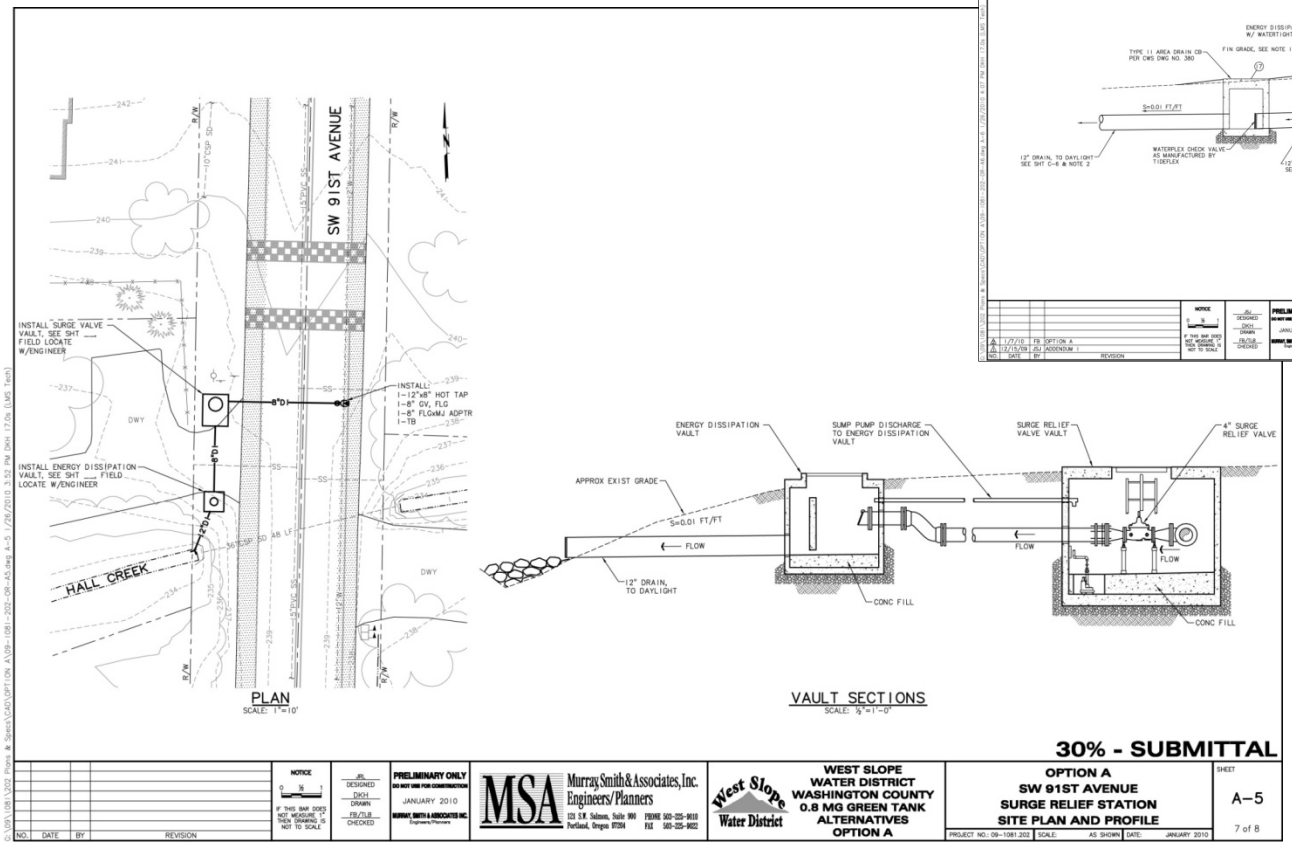

RANDOM BROKEN COURSE ASHLAR PATTERN BASALT STONE VENEER SQUARES AND RECTANGLES, SPLIT FACE, HAND DRESS, AS REQUIRED TO DRESS AND FINISH STONE FACE.
DEEP STRUCK JOINTS, MAXIMUM 3/4" WIDE (SHOULD NOT LOOK DRY STACKED)
MIN. STONE DIM. = 6"
MAX. STONE DIM. = 24"
FINISH GRADE
SIZE TOP VENEER ELEVATION TO MATCH HEIGHT OF SIDE VENEER. DO NOT PLACE TOP VENEER STONE SO THAT IT CAN BE SEEN ABOVE THE SIDE VENEER.
BASALT VENEER TOP OF WALL HAND DRESS AS NEEDED TO PROVIDE POSITIVE DRAINAGE.
8"X8"X16" CMU CORE = GROUT SOLID
BASALT VENEER SEE BASALT WALL PATTERN
2" MIN. MORTAR SETTING BED
DEEP STRUCK MORTAR JOINTS/ 3/4" MAXIMUM SIZE, DARK GRAY GROUT, TYP.
#4 VERTICAL AT 16" O.C., HORIZONTAL AT 24" O.C.
STAINLESS STEEL MASONRY ANCHORS, 1 PER 3 SQUARE FACE FEET OF WALL MAXIMUM
FINISH GRADE
CONCRETE FOOTING - SEE STRUCTURAL, COORDINATE WITH MASON.
ADDITIONAL FOOTING SIZE REQUIRED WHERE WALL IS RETAINING, SEE CIVIL FOR LOCATION AND STRUCTURAL FOR FOOTING INFORMATION
COMPACTED AGGREGATE BASE
SUB ASL COMPACTED SUBGRADE
WALL FOOTING
ADDITIONAL FOOTING FOR RETAINING WALL
SEE STRUCTURAL

Michael
Willis
Architects


SPEED
25
PLi SYSTEMS
earth stabilization systems
503.649.8111

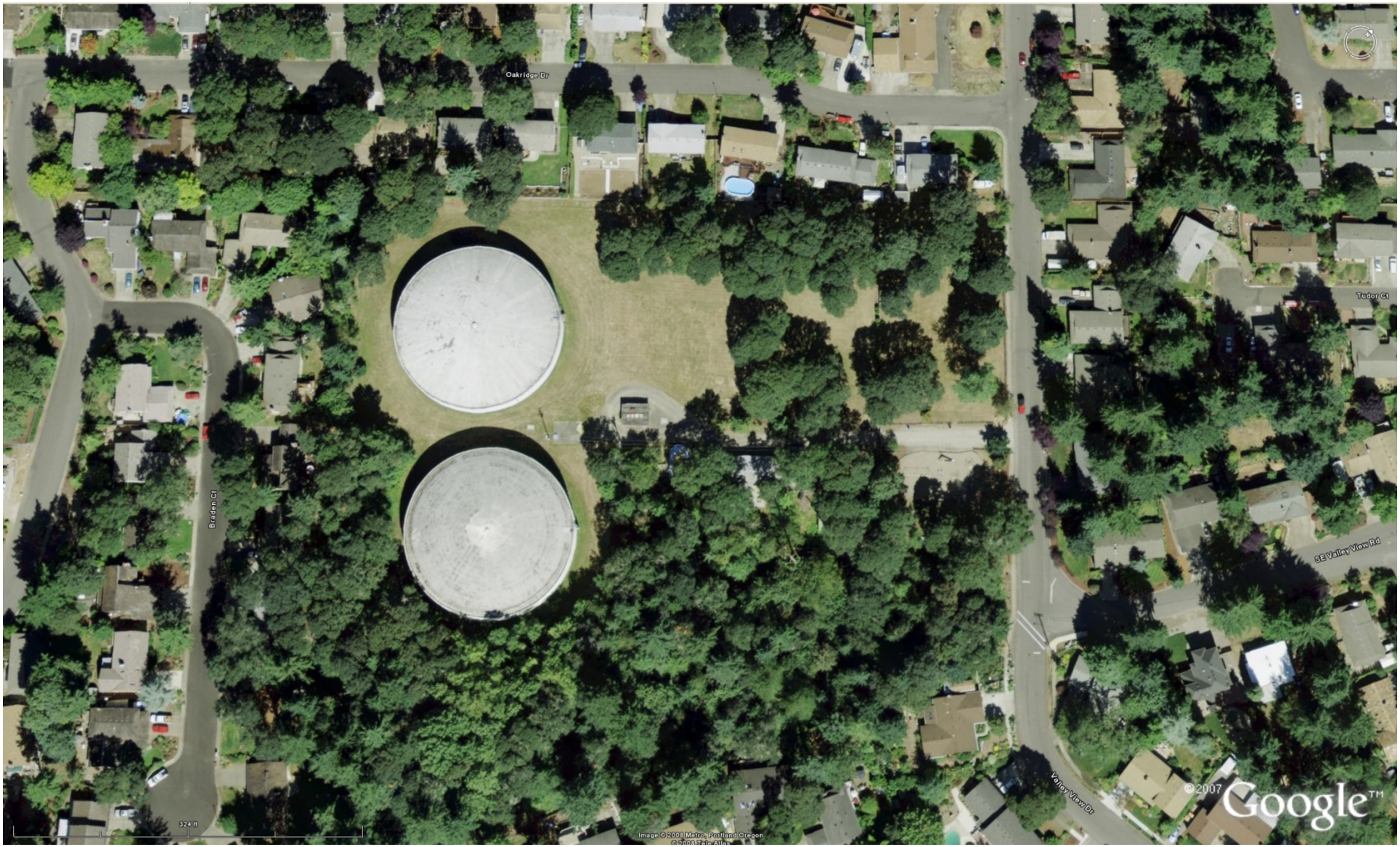
SURGE/PRESSURE RELIEF VALVE STATIONS





VALLEY VIEW PUMP STATION MODIFICATIONS AND IMPROVEMENTS

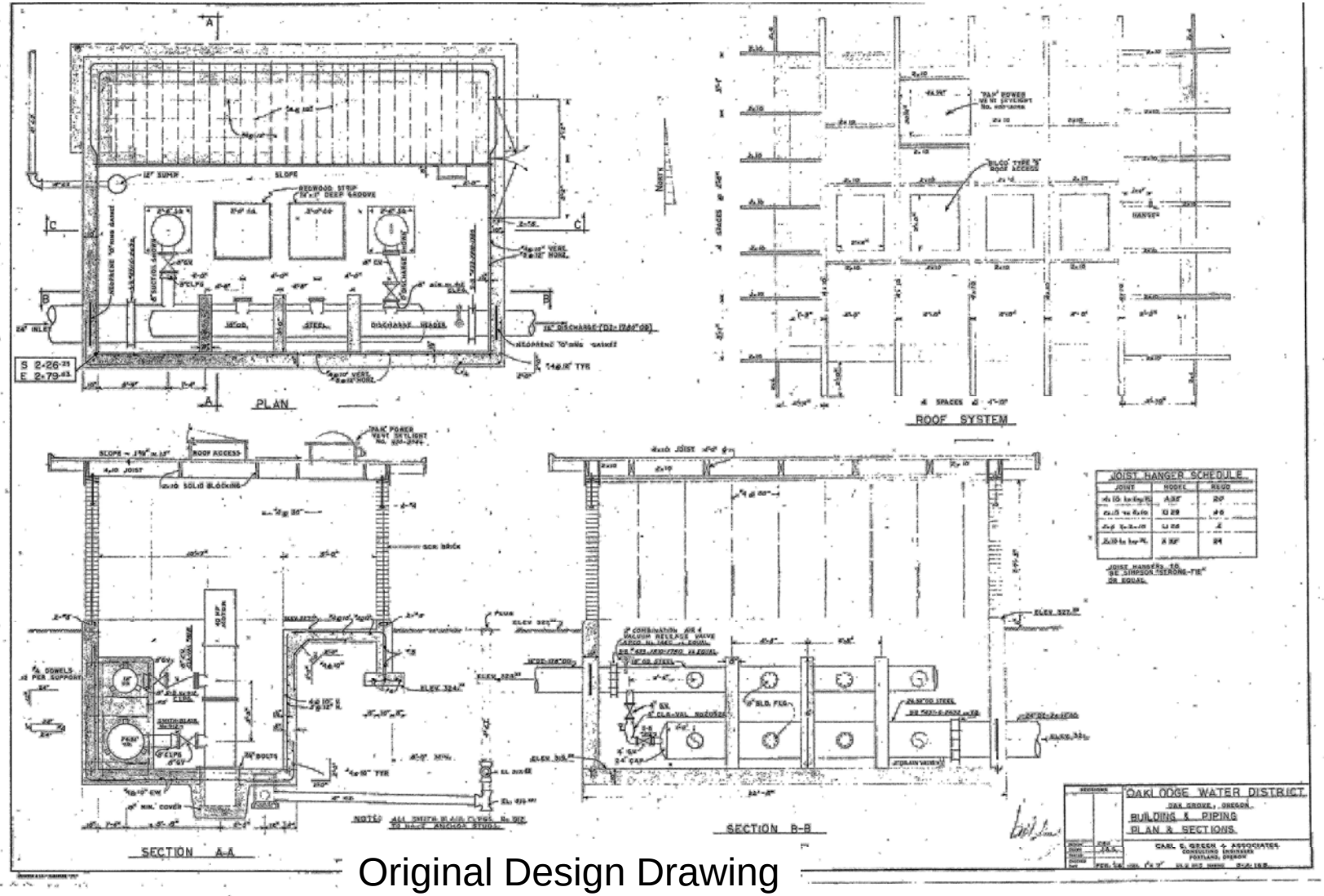
VALLEY VIEW PUMP STATION MODIFICATIONS AND IMPROVEMENTS



PROJECT BACKGROUND

- Pump station built in 1966 initially equipped with two identical 40 hp vertical turbine pumps, room for two more
- Subsequently two more pumps installed, dissimilar in size and capacity
- The District's 2008 Water Master Plan recommended replacing the Valley View Pump Station with a new pump station equipped with three pumps providing similar capacity
- MSA selected by District in 2008 to determine if existing pump station can be upgraded within existing footprint and complete design of pump station improvements

PROJECT BACKGROUND



Original Design Drawing

PROJECT BACKGROUND

Existing Pump and Mechanical

PROJECT BACKGROUND

Existing Pump and Mechanical

WHEN TO CONSIDER UPGRADING EXISTING PUMP STATION FACILITIES

TIME FOR PUMP STATION UPGRADES WHEN:

- Pumping capacity of existing pump station unable to keep up with growing system demands
- Original pumps, electrical system and other pumping equipment becomes outdated, inefficient, and requires high maintenance
- Pump station building requires a large amount of maintenance and repairs, has become an “eyesore” to nearby residences

REUSE OF EXISTING FACILITIES IS DESIRABLE WHEN:

- The existing pump station is located in established neighborhoods with little opportunity to relocate without major public impacts and costs
- Existing pump station building is found to be structural sound
- To be sustainable is desirable: reuse of existing facilities

BENEFITS IN UPGRADING EXISTING PUMP STATIONS

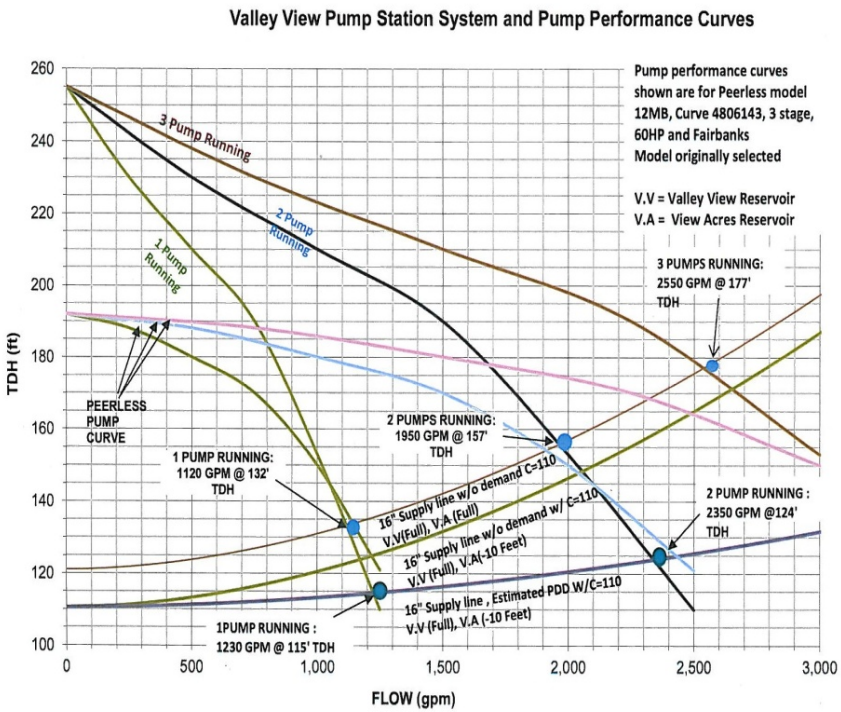
- Minimizing or Potentially Eliminating Planning Review
- Minimizing Overall Permit Requirements
- Environmental Benefits by Reuse of Existing Building and Other Components
- Provide Opportunity to Improve Existing Building Architectural Features
- Eliminating the Need for Property Acquisition
- Potential Credit/Incentives From Oregon Energy Trust
- Reuse/Upgrade of Facilities Typically Provide Overall Project Cost Savings

CHALLENGES IN PUMP STATION DESIGN UTILIZING EXISTING FACILITIES

- Following design issues need to be evaluated if reusing pump station envelope:
- Code Space Limitations Due to Existing Building and Site Constraints
- Extent of Existing Plant and Yard Piping Improvements Required Due to Increased Pumping Capacities and Pressures
- Heating and Ventilation Improvements Required Due to Larger Pump Motors and Motor Control Equipment
- Staged Pump Replacement Work such that Pump Station is Operational During all Phases of Construction
- Evaluate Existing Building to Determine if Structural Sound for Wall Cutouts and Other Building Structure Improvements

PROJECT MAIN OBJECTIVE AND SCOPE

- Replace flat roof with new pitched roof. Structural evaluation showed that the existing pump station masonry walls are adequate for a 4 and 12 pitch roof
- Select three identical 1,000 gpm high efficiency pumps for a 2,000 gpm firm capacity and room for future fourth pump replacing existing four dissimilar pumps
- Install an emergency generator system with an automatic transfer switch
- Improve pump mechanical equipment access



KEY DESIGN ELEMENTS

- Redo pump and control valve layout to improve pump equipment access
- Metal grate floor over lower level
- Utilized GPR to verify existing wall reinforcement placement to confirm if walls can support new pitched roof
- Staged construction sequence to minimize pump shutdowns
- Improve ventilation without cutting openings in walls

PROJECT DESIGN AND DELIVERY

OAK LODGE WATER DISTRICT
CLACKAMAS COUNTY, OREGON
VALLEY VIEW PUMP STATION MODIFICATIONS AND IMPROVEMENTS

VOLUME 2 OF 2 - DRAWINGS
DECEMBER 2008

INDEX OF DRAWINGS

MSA Murray, Smith & Associates, Inc.
Engineers/Planners
121 S.W. Salmon, Suite 900 PHONE 503-225-9010
Portland, Oregon 97204 FAX 503-225-9022

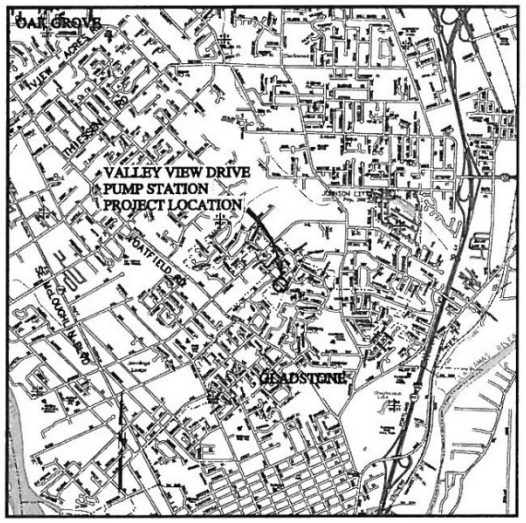
OAK LODGE WATER DISTRICT
14496 SE RIVER ROAD
MILWAUKIE, OREGON 97267
(503) 654-7765

RECORD DRAWINGS

THIS DRAWING IS FOR RECORD PURPOSES ONLY, AND HAS BEEN PREPARED BASED IN PART ON INFORMATION PROVIDED BY OTHERS RELATIVE TO REPORTED CONSTRUCTED CONDITIONS. WHILE THIS INFORMATION IS BELIEVED TO BE RELIABLE, MURRAY, SMITH & ASSOCIATES, INC. MAKES NO ASSURANCES, STATED OR IMPLIED, AS TO THE ACCURACY OF THIS DRAWING. THOSE RELYING ON THIS RECORD DRAWING FOR ANY PURPOSE ARE ADVISED TO OBTAIN INDEPENDENT VERIFICATION OF ITS ACCURACY. CONTRACT MODIFICATION INFORMATION, FABRICATOR'S SHOP DRAWINGS AND OTHER PROJECT SUBMITTAL INFORMATION PROVIDED BY THE CONTRACTOR WHICH FURTHER CLARIFY DETAILS OF CONSTRUCTION MAY BE ON FILE. SEE ORIGINAL CONTRACT DRAWINGS FOR ENGINEER'S SEAL AND SIGNATURES.

VERSION 4.0 12-9-97

ATTENTION: OREGON LAW REQUIRES THE CONTRACTOR TO FOLLOW THE RULES ADOPTED BY THE OREGON UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH IN OAR 952-001-0010 THROUGH OAR 952-001-0090. THE CONTRACTOR MAY OBTAIN COPIES OF THE RULES BY CALLING THE UTILITY NOTIFICATION CENTER. (NOTE: THE TELEPHONE NUMBER FOR THE OREGON UTILITY NOTIFICATION CENTER IS 503-246-6699.)

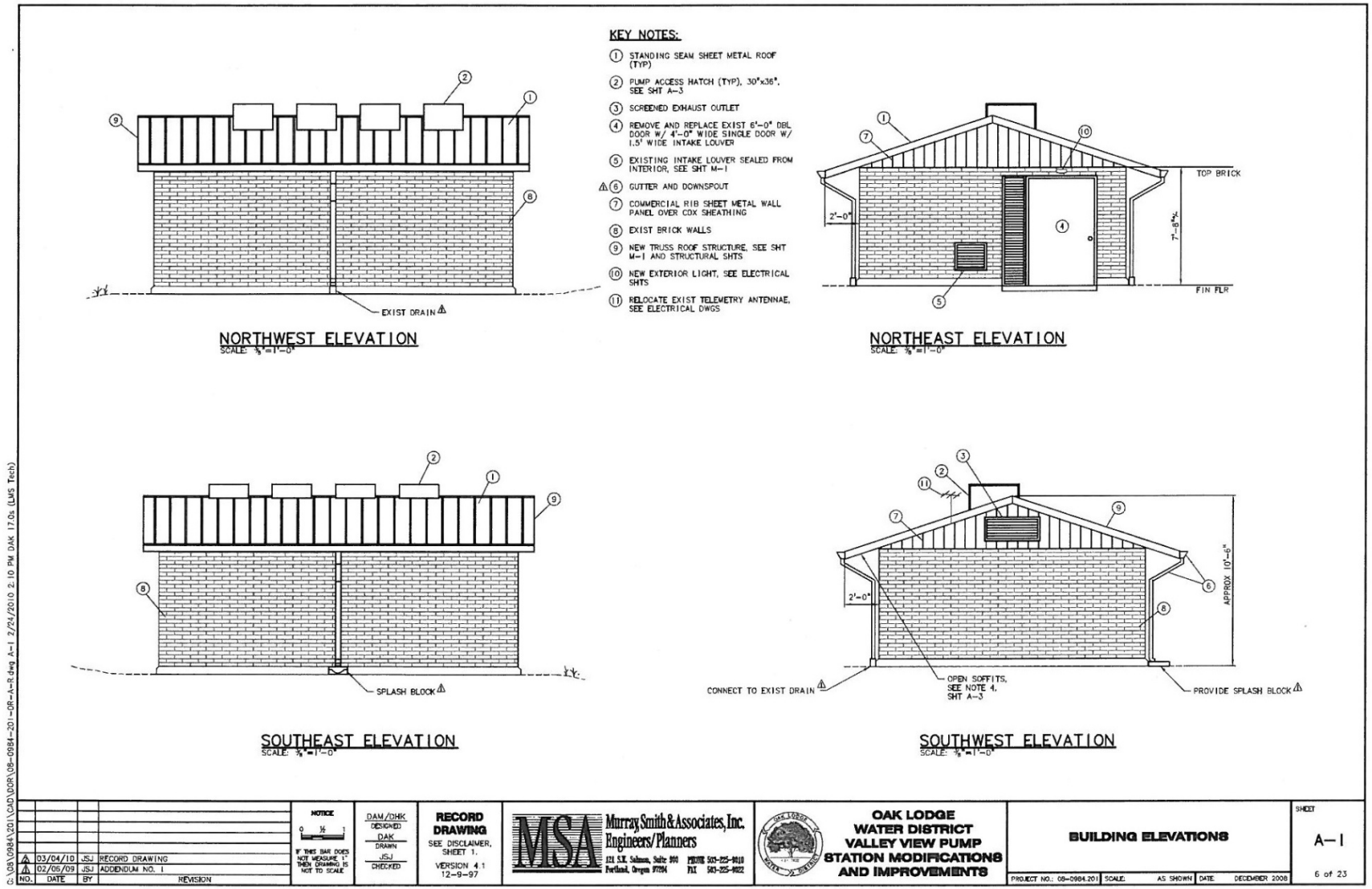


VICINITY MAP
SCALE: 1"=1500'

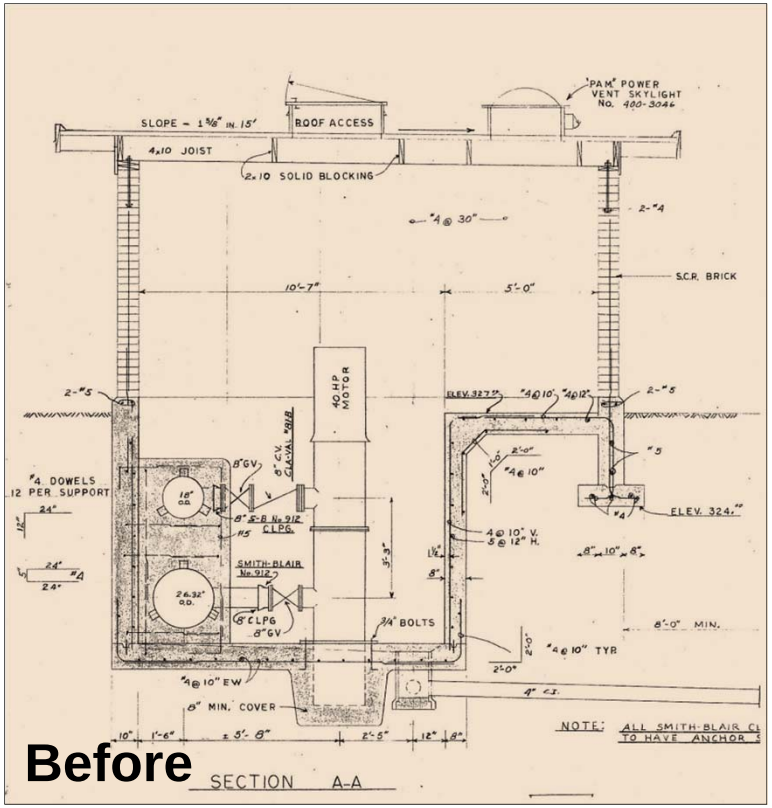
08-0984.201

G:\08\0984\201\CAD\DGR\08-0984-201-GR-G-1-Rdwg Cover 2/23/2010 4:52 PM DAK 17.0p (LMS Tech)

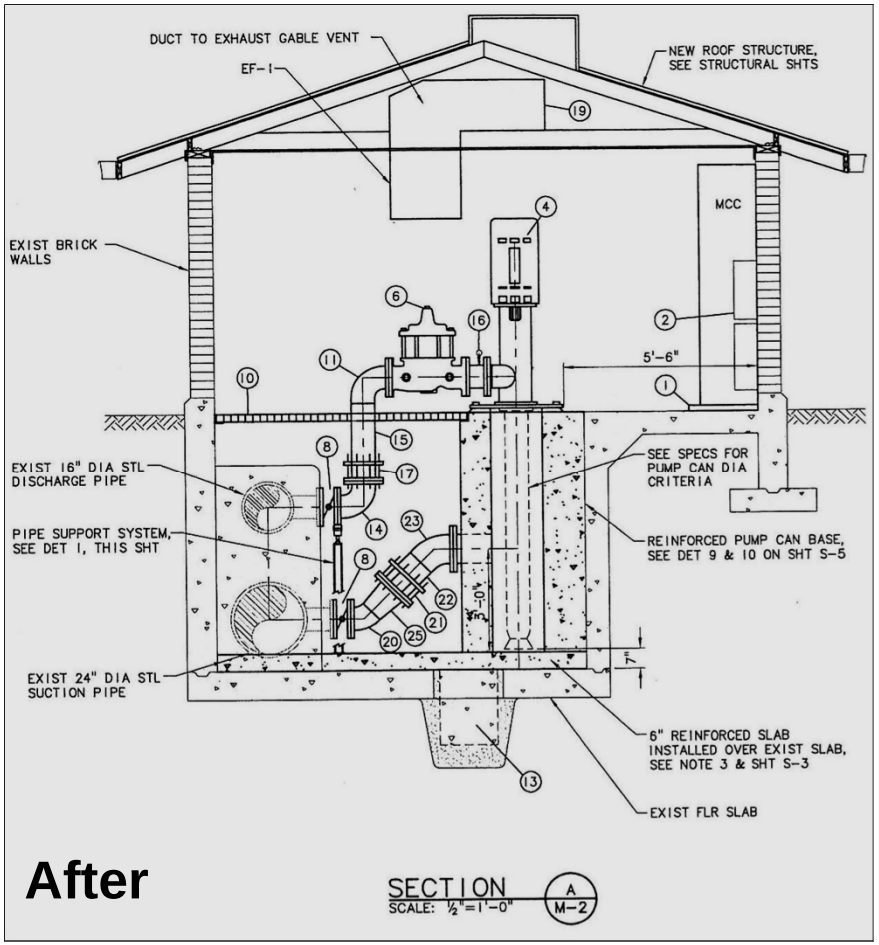
PROJECT DESIGN AND DELIVERY



IMPROVING EXISTING PUMP EQUIPMENT LAYOUT



Before



After

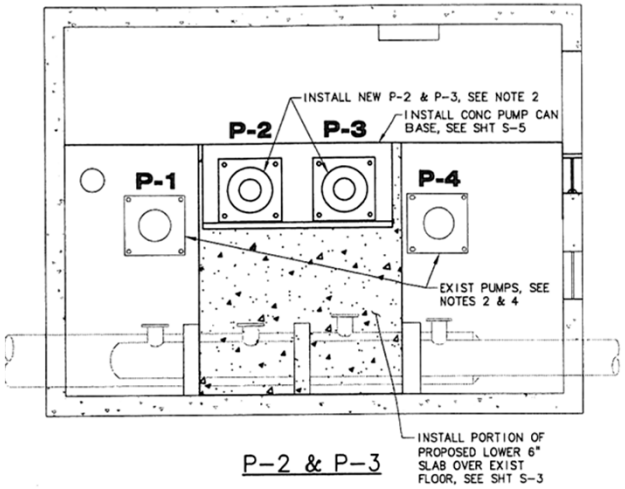
EXITING FLAT ROOF REMOVAL AND WALL TO NEW ROOF ANCHORAGE IMPROVEMENTS

DIFFICULT PUMP AND PUMP CONTROL VALVE ACCESS IMPROVEMENTS

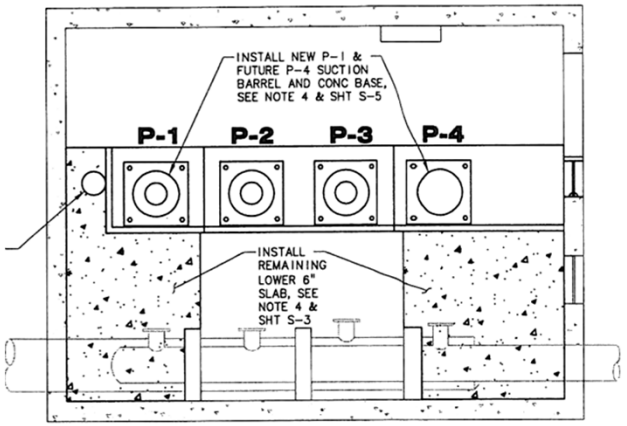
NEW IMPROVED PUMP LAYOUT AND GRATED FLOOR

REUSING EXISTING SUCTION AND DISCHARGE HEADERS

STAGED PUMP REPLACEMENT



P-2 & P-3



P-1 & FUTURE P-4

PUMP REPLACEMENT SEQUENCE
SCALE: ⅜"=1'-0"

VALLEY VIEW PUMP STATION MODIFICATIONS AND IMPROVEMENTS, OAK LODGE WATER DISTRICT

Before

After

QUESTIONS?