CITY OF ASHLAND
Water Treatment Plant

Talent Irrigation District (TID) Pipeline Repurposing Evaluation

REGISTERED PROFESSIONAL ENGINEER
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OREGON
SEPT 8, 2009
DAVID ROBERT KINZER
EXPIRES: 11/27/17

TECHNICAL MEMORANDUM

November 27, 2017

REGISTERED PROFESSIONAL ENGINEER
73454PE
OREGON
JULY 15, 2003
JAMES BLEDSOE
EXPIRATION DATE: 12-31-2017

KELLER associates
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217002/b/TID/17-253

Technical Memorandum

TO: Kevin Caldwell
Senior Project Manager
City of Ashland

FROM: James Bledsoe, PE
David Kinzer, PE

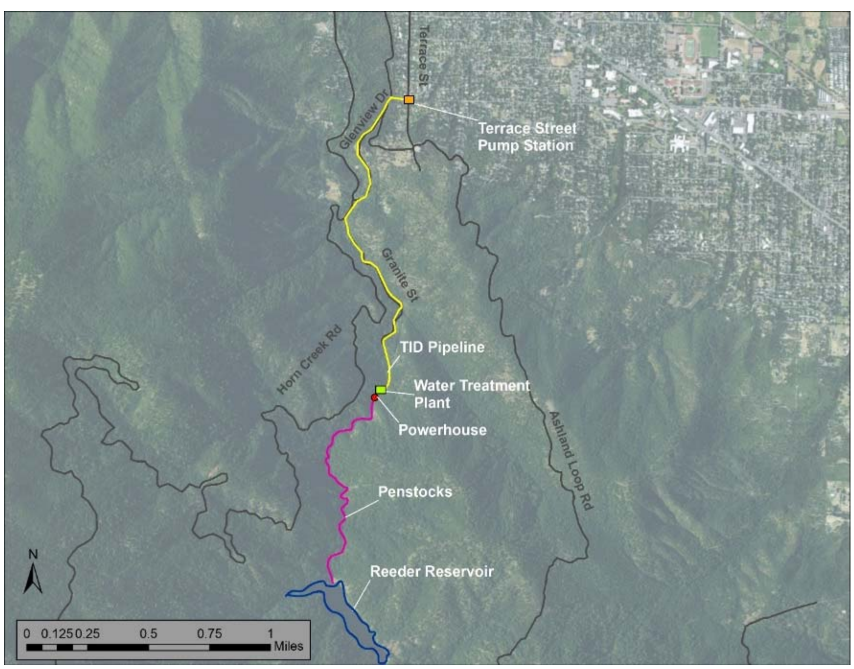
DATE: November 27, 2017

SUBJECT: Ashland Water Treatment Plant
Talent Irrigation District (TID) Pipeline Repurposing Evaluation

INTRODUCTION

The City of Ashland owns and operates a surface water treatment plant (WTP) located on Granite Street approximately 1.3 miles south of town (Figure 1). The WTP's primary source is the Reeder Reservoir on Ashland Creek. Water from the reservoir is conveyed via a 24-inch ductile iron pipe known as the Penstock. Prior to entering the plant, water in the Penstock passes through a power generation facility (powerhouse). The WTP also has the capability of accepting supplemental water from the City's Terrace Street Pump Station, which draws water from a Talent Irrigation District (TID) canal and pumps it to the plant (Figure 1). The waterline dedicated to this supplemental source is a 24-inch steel pipe referred to as the TID pipeline.

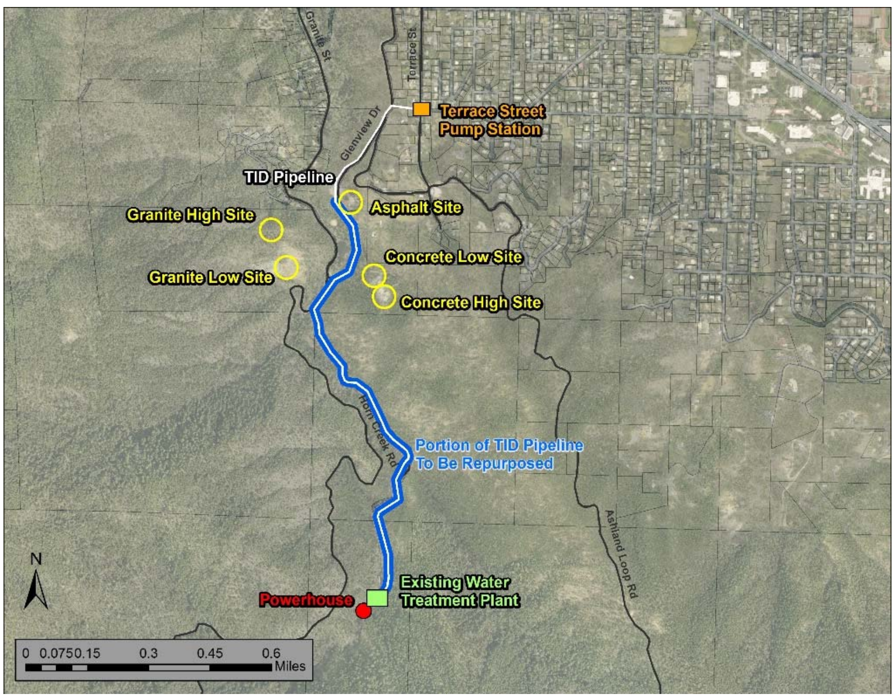
Figure 1: Existing WTP Location



The existing WTP – which is nearing the end of its useful design life – is located near the bottom of a canyon and is subject to periodic flooding. The City has contracted with Keller Associates (Keller) to evaluate a new plant higher on the canyon hillside to avoid flooding. At this time, three sites for the new WTP are being considered: 1) the Concrete Site, located on the east side of the canyon; 2) the Granite Site, located west of the canyon; and 3) the Asphalt Site, located on the south edge of town. Both the Concrete and Granite Sites have high- and low-plant options being considered (Figure 2). A recent siting study identified the Granite Low Site as the preferred location for the new WTP. As part of the siting study, several other sites were considered, and an alternative to connect to the penstock was also evaluated for the Concrete High Site and Granite High Site.

As part of the new WTP design efforts, Keller Associates evaluated repurposing a portion of the TID pipeline to serve as the new plant's raw water supply line from the Reeder Reservoir (Figure 2) for a short term basis (e.g. 5-10 years). This technical memorandum gives a brief background of the TID pipeline; summarizes Keller's evaluation, including observations, testing, and findings; considers potential required coordination with FERC regarding connecting to the Penstock pipeline; and provides recommendations for repurposing the TID pipeline.

Figure 2: New WTP Proposed Site Locations and TID Pipeline



TID PIPELINE BACKGROUND

The 24-inch, 10-gauge (Ga) steel TID pipeline – constructed in 1977 to provide supplemental water to the WTP in low-water years – spans approximately 8,000 feet, with a typical cover depth of about 3 feet. Record drawings (prepared by Marquess & Associates) are provided in Attachment A.

Flow in the TID pipeline is supplied by the Terrace Street Pump Station, which draws water from an irrigation canal and delivers it to the Tailrace of the existing water treatment plant. While the existing pumps are capable of delivering significantly more flow, flows in the pipeline range from 1 to 2 million gallons per day (MGD) and are limited by the water in the canal. Planned upgrades to the Terrace Street Pump Station – scheduled to be completed by the end of 2017 – will provide increased operational control, including variable frequency drives.

TID PIPELINE REPURPOSING EVALUATION

Keller Associates evaluated repurposing the segment of TID pipeline between the existing WTP and the new plant to supply raw water from Reeder Reservoir to the new plant and continued use of the pipeline as a secondary source of supply from the Terrace Pump Station to the new plant. This evaluation includes visual observations of the pipe, measurements to check the pipe thickness, checking for installation of thrust restraint, flow testing, and pressure testing. The following subsections present the findings of the observations and testing.

City staff report that the existing TID pipeline has had very few issues in the 40 years of operation. No failures were reported along the pipeline, and City staff noted the pipeline was fairly trouble free. The City has kept the pipe full from 2011 until present. It is uncertain how full the line may have been maintained in previous years, although leakage of the butterfly valve on the discharge end (near WTP) may have kept the line partially full.

Visual Observations

Visual observation of the pipeline was conducted by examining photos at locations where its thickness was tested, where it is exposed (near the WTP), and where the pipeline enters the Tailrace. Attachment B contains several photos of the pipeline that were taken at these locations. No major defects or corrosion were observed; considering the age of the pipe (installed about 40 years ago), it appeared to be in good condition overall.

Pipe Thickness Verification/Measurement

The City purchased an ultrasonic thickness gauge to take in-place measurements of the pipeline's thickness. This was completed for several reasons, including comparing the pipe's actual thickness to that shown on the record drawings, and to determine if a substantial amount of corrosion has occurred since the pipeline was constructed. Several locations along the pipeline were potholed, and the pipe's thickness was measured. A third-party testing agency (Professional Service Industries, Inc. [PSI]) was also onsite during a few of the potholes to measure the pipeline thickness and verify that the City's gauge was working and being used properly. A comparison of gauge measurements collected by the City and PSI, along with the pipe thickness indicated on record drawings, is provided in Table 1. Measurements made by the City and PSI vary slightly from one another; however, the overall averages only vary by a few thousands of an inch. It appears that the pipe installed matches the thickness indicated on the record drawings, and that little to no corrosion has taken place.

Table 1: TID Pipeline Thickness Measurements (inches)

	Record Drawings (1977)	Measured by City 4/5/2017 – 4/20/2017	Measured by PSI (4/5/2017)
	0.134 (10 Ga.)	0.135	0.135
		0.135	0.132
		0.144	0.135
		0.125	0.125
		0.135	
Average	0.134	0.135	0.132

Notes:

1. A map showing the City measured locations is shown in Attachment C.
2. PSI measurement results can be found in Attachment D.

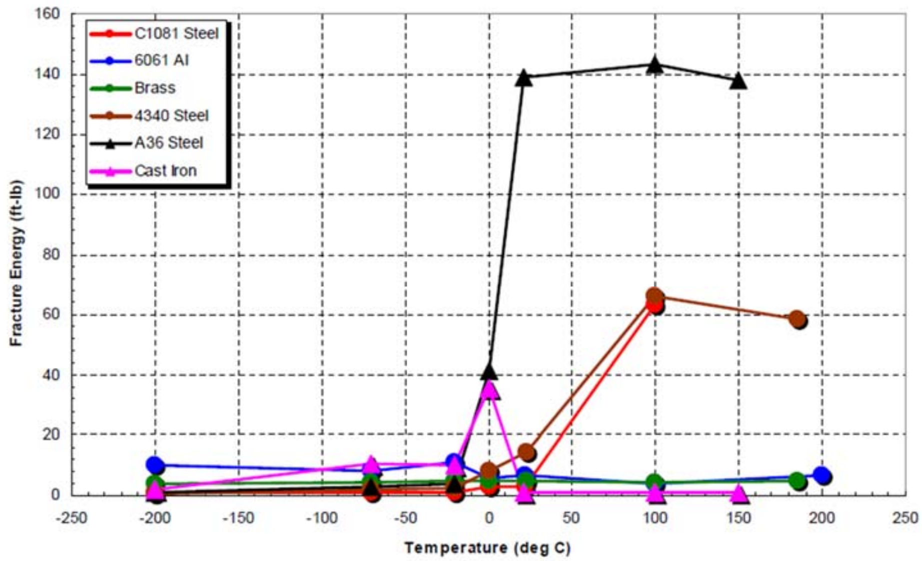
In addition to the ultrasonic in-place thickness measurements, the City collected two coupon samples from the pipeline; one near the WTP entrance gate on Granite Street, and one on Glenview Drive (near the access road to the Concrete Site). The thicknesses of the coupons were measured to be 0.144 inches (WTP Entrance Gate) and 0.135 inches (Glenview Drive). This further confirms that the pipe thickness matches what was called out on the record drawings, and that little to no corrosion has affected the pipe.

Charpy Impact Tests

Documentation on the properties of material used in the pipe fabrication is unclear. Changes in the pipe material over time are also unknown. Pipeline surges and potential movements from settlements or thrust have less detrimental impact on a pipe if it is ductile. The preferred material for this application is carbon steel. To verify the pipe was fabricated from a material with properties similar to carbon steel, two samples of the pipeline material were tested using the Charpy Impact Test.

The Charpy Impact Test is used to measure the toughness of a material, or amount of energy required to fracture a v-notched specimen at a range of temperatures. The results show the temperature at which a metal transitions from a ductile material to a brittle material. The test is performed by placing a metal specimen, with a v-notch cut into its center, in the path of a pendulum of known mass and length. The pendulum is allowed to fall and break through the metal specimen. The height of the pendulum on the follow-through of the swing is then compared to the height of the follow-through without any resistance. The results of the test are reported in foot-pounds (ft. lbs.). Figure 3 below shows a series of typical Charpy test results for various materials including steel, brass, aluminum and iron.

Figure 3: Typical Charpy Test Results



Charpy Tests were performed by PSI three times on each coupon sample; results are presented in Tables 2 and 3. Normally the Charpy Test is conducted over a large temperature range to develop a curve of how the metal's toughness varies with temperature. A large temperature change is not expected to occur in the TID pipeline. The temperature range for the pipeline in service will likely range from 45 degrees to 55 degrees Fahrenheit. The tests performed on the coupon samples were conducted at room temperature (70 degrees Fahrenheit) which is approximately the temperature of the pipeline in service. Using the data in Figure 3, the test results show that the pipeline was fabricated from alloy steel. See Attachment D for PSI test results.

Table 2: Charpy Impact Test for WTP Entrance Gate Coupon at 70° F

Test Number	Impact Strength (ft. lbs.)	Percent Shear
1	17	100
2	15	100
3	16	100
Average	16	100

Table 3: Charpy Impact Test for Glenview Drive Coupon at 70° F

Test Number	Impact Strength (ft. lbs.)	Percent Shear
1	15	100
2	16	100
3	17	100
Average	16	100

Another useful result of the Charpy Test is the failure mode. Brittle materials fail in Charpy Tests with only part of the face being sheared and the remainder with a brittle failure. The test results on the pipeline material shows all the specimens had 100 percent shear faces after the being broken during the test. The significance of the 100 percent shear failure is the material failed in a ductile mode.

Conclusions from the Charpy Tests indicate the pipeline material is an alloy steel with reasonable ductile properties, and the pipeline material is suitable for continued use.

Thrust Restraint

Several potholes were dug to check that bends on the pipeline are equipped with adequate thrust restraint (e.g., thrust blocks). Due to difficulties in locating the bends during potholing activities, the City elected to have a ground penetrating radar (GPR) consultant identify those locations equipped with thrust restraint. The GPR was used to check five locations along the pipeline known to have bends (Figure 3). The test locations along with their respective measured bends are included in Table 4 below. A thrust block – determined to be approximately 3'x 4' – was found at only one of these five locations. The thrust block that was found is located on Glenview Drive where the pipe turns approximately 55 degrees east and heads towards the Terrace Street Pump Station.

Those areas where no block thrust was observed correspond to sections with smaller angled bends. It is possible that joints could be welded to provide thrust restraint at these locations, but this was not verified. Because the pipe has operated for 40 years at these elevated pressures without the joints blowing apart, and given that the pressures will continue to be essentially the same with the new plant, existing thrust restraint should be adequate for continual use. If a penstock connection were to be considered resulting in pressures in the pipeline being raised 35 to 40 psi on a regular basis, then additional investigation of thrust restraint would be recommended. (It is worth noting that pressures in the TID pipeline have been maintained at 30 psi above static pressure for a period of approximately one month (Aug.-Sept. 2017) during pilot testing operations, and that no problems have been reported.)

Figure 4: GPR Testing of Thrust Restraint at Pipeline Bends

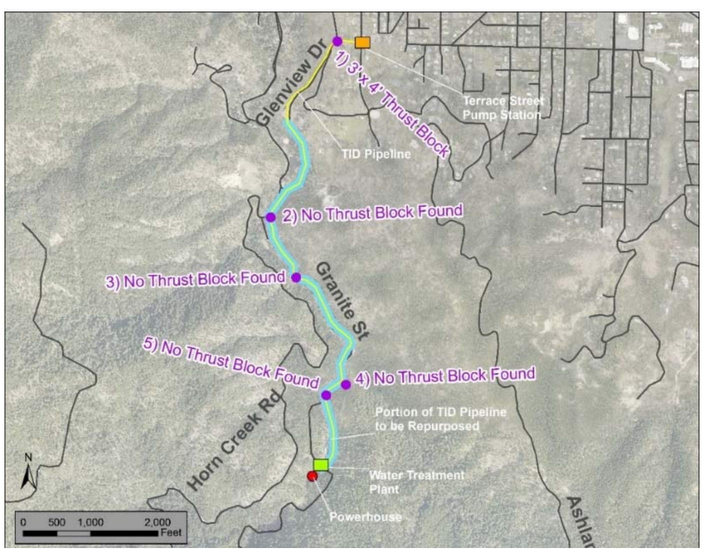


Table 4: Approximate TID Bending Angles

Location No.	Approximate Bend Angle (Degree)[1]	Thrust Block Found
1	55	Yes
2	52	No
3	40	No
4	65	No
5	33	No

Notes:
1. Calculated from record drawings

Flow Testing

Flow testing was performed on May 9 and 10, 2017, to check headloss in the TID pipeline from the Terrace Street Pump Station to the Tailrace at the powerhouse, and to check for abnormal hydraulic conditions (e.g., partially closed valves and large leaks). Pressure drops in the pipeline were monitored at the fire hydrant near the intersection of Granite Street and Glenview Drive. Test results are shown in Table 5. The results of the flow test show that at 1-2 MGD of flow there is very little headloss in the TID pipeline. Hydraulic modeling of the pipeline agree with the flow test results.

Table 5: Flow Testing

	Test No.	Flow (MGD)	Pressure at Hydrant (psi)
5/9/2017	1	0	118
	2	1.03	117
	3	1.5	117
	4	2.0	117
5/10/2017	5	0	Gauge 1: 118 Gauge 2: 117
	6	1.48	Gauge 1: 117 Gauge 2: 117

Pressure Testing

The City attempted to conduct a pressure test of the TID pipeline on July 18th this year. The pipeline was cut and capped near the existing WTP by welding a blind flange with a 4-inch blow-off valve to mitigate concerns that a leaky butterfly valve would skew test results. A small 10 gpm pump at the Terrace Street pump Station was used to pressurize the line. After several hours of pumping at a rate of 10 gpm no rise in static pressure was observed.

Subsequent to the initial pressure test attempt, the City has been using a larger pump at the Terrace Street Pump Station to push TID canal water up to membrane pilot test units at the existing WTP through the TID pipeline. The larger pump for the pilot test pressurizes the TID line approximately 28 psi above static line pressure. Flow meters were also installed with the larger pump to record flow rates entering at the Terrace Street Pump Station site, and leaving the TID pipeline at the WTP site. During pilot test operations the City has observed a loss ranging from 5 to 25 gpm, but the loss is likely above 10 gpm based on the previous pressure test.

The TID pipeline has few isolation valves, and the existing ones are aged butterfly valves which are notorious for leaking; City staff has observed that one existing isolation valve near the existing WTP may leak in excess of 20-30 gpm. For these reasons, it is recommended that the City remain vigilant during pilot test operations to see if a single leak area manifests itself. Without an efficient manner of isolating smaller portions of the pipeline and with limited access points along the pipeline, leak detecting efforts may be ineffective and costly. When improvements to the TID pipeline are made associated with the planned new WTP, additional isolation valves will be installed along the pipeline. At this future time Keller recommends checking each segment for leaks to determine if the leak is occurring in a single location or throughout the entire pipeline. If a few locations can be identified that are responsible for the leak then fixing these areas may be worthwhile and cost effective. However, if the leak is throughout the pipeline, then Keller recommends a “do nothing” alternative remembering that the use of the TID pipeline to supply water to the new WTP is an interim (e.g. 5-10 year) solution, until the existing plant can be displaced and the newer 30-inch finished water line from the plant can be dedicated as the new supply line for the new WTP.

PENSTOCK CONNECTION PRESSURE, POWER, AND PERMITTING IMPLICATIONS

A Penstock connection was considered because of the greater potential to gravity flow water from the reservoir to the high site treatment plants, thus reducing the need for pumping. Analyzing this option revealed that a Penstock connection would still require some pumping to the storage tank. In addition, a much greater portion of the overall head would be lost due to the pressure reducing valves that would be needed to lower the pressure entering the TID pipeline from the penstock. Another result of the Penstock connection analysis was that there would be added project complexity due to additional required permitting through the Federal Energy Regulation Commission (FERC).

A connection to the Penstock pipeline would cause flow to the new WTP to bypass the powerhouse, resulting in a loss of power production. Although connecting to the Penstock may reduce or eliminate pumping at the new plant, the resulting costs saved would be insignificant compared to the loss of power production at the powerhouse. It is estimated that with an exclusive Penstock connection, approximately $116,000 of power production revenue would be lost on an annual basis (assuming a rate of $0.08/KW-hr and an average daily flow of 4 MGD), see Attachment E for calculations.

Connecting to the Penstock pipeline above the powerhouse for the high-plant options may require coordination with the Federal Energy Regulation Commission (FERC). Keller prepared a Technical Memorandum on April 19, 2017 (Attachment F), which summarizes the project and poses the questions to be asked of the FERC by the City. The two primary questions are:

1. Is there any regulatory fatal flaw associated with connecting to the existing Penstock to supply raw water to the new WTP?

2. If we installed a micro-hydro turbine near the Penstock connection, would this project be applicable for an “in-conduit exemption”? And does FERC envision any significant additional regulatory requirements for this?

City staff responsible for FERC licensing reached out but received no formal communication from FERC. Once it became apparent that a Penstock connection would not be pursued as a preferred alternative, no additional communication was pursued.

MITIGATION MEASURES

Several mitigating measures should be taken to reduce the likelihood of failures in the TID pipeline when it is repurposed as the raw water supply for the new WTP. First, the pipeline should be considered an interim solution (i.e. 5-10 years). As the new plant flows and capacity increase headloss in the pipeline will also increase. After the existing WTP is decommissioned, the City should then utilize the newer and larger 30-inch finished water line from the exiting WTP as the new raw water supply to the new WTP. Utilizing the 30-inch finished water line will reduce headloss to the new WTP allowing more volume to gravity flow through the plant. Transitioning to the 30-inch finished water line will also provide a level of redundancy in the raw water supply allowing the City to use the TID pipeline as backup if the 30-inch finished waterline is in need of repair or maintenance. Additionally, the City should maintain an inventory of spare pipe, parts, and tools to maintain the TID pipeline and make timely repairs should they be warranted. As the pipeline will serve as the raw water supply to the WTP, it is paramount that City crews be able to respond quickly to potential breaks, leaks, and other maintenance in a timely fashion.

CONCLUSION AND RECOMMENDATION

Based on the observed conditions and test results, the TID pipeline is adequate to serve as the raw water supply line to the new WTP, both from the existing WTP as well as the Terrace Street Pump Station. Keller recommends that no additional upgrades be made to the TID pipeline at this time recognizing that it is an interim (e.g. 5-10 years) solution. Keller recommends that the City leak test the line segments once new valves are installed in the TID line, keep a vigilant watch for leak developments along the pipeline during its use, and maintain an inventory of spare parts to fix unexpected breaks or needed repairs. As part of the additional leak testing effort, the City could fill the line and monitor pressures over an extended time. If there are larger leaks, there should be a noticeable decline in the rate of waterloss as the water level in the pipeline approaches and drops below the elevation of the leak – providing helpful information for targeting additional leak detection efforts.

The TID pipeline should be used as a short-term solution for supplying raw water to the new WTP. When the exiting WTP is abandoned it is recommended that the City transition to using the existing 30-inch finished water supply line from the existing WTP as the new WTP raw water supply line from Reeder Reservoir.

ATTACHMENTS

Attachment A – Record Drawings

Attachment B – Observation Photos

Attachment C – City Measured Thickness Locations

Attachment D – PSI Test Results

Attachment E – Power Loss Calculations

Attachment F – FERC Technical Memorandum

ATTACHMENT A

Record Drawings

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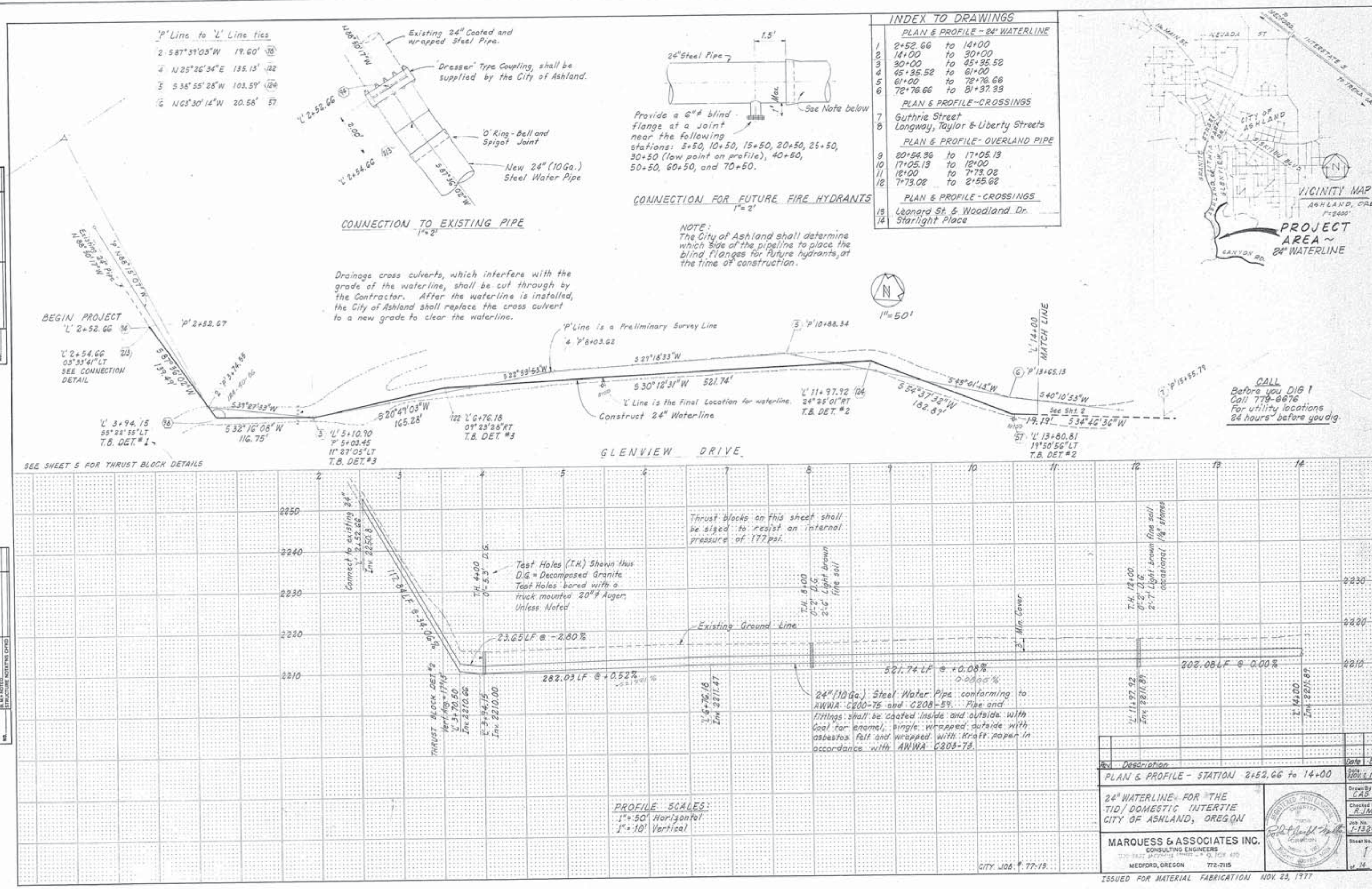
ASHLAND WATERLINE

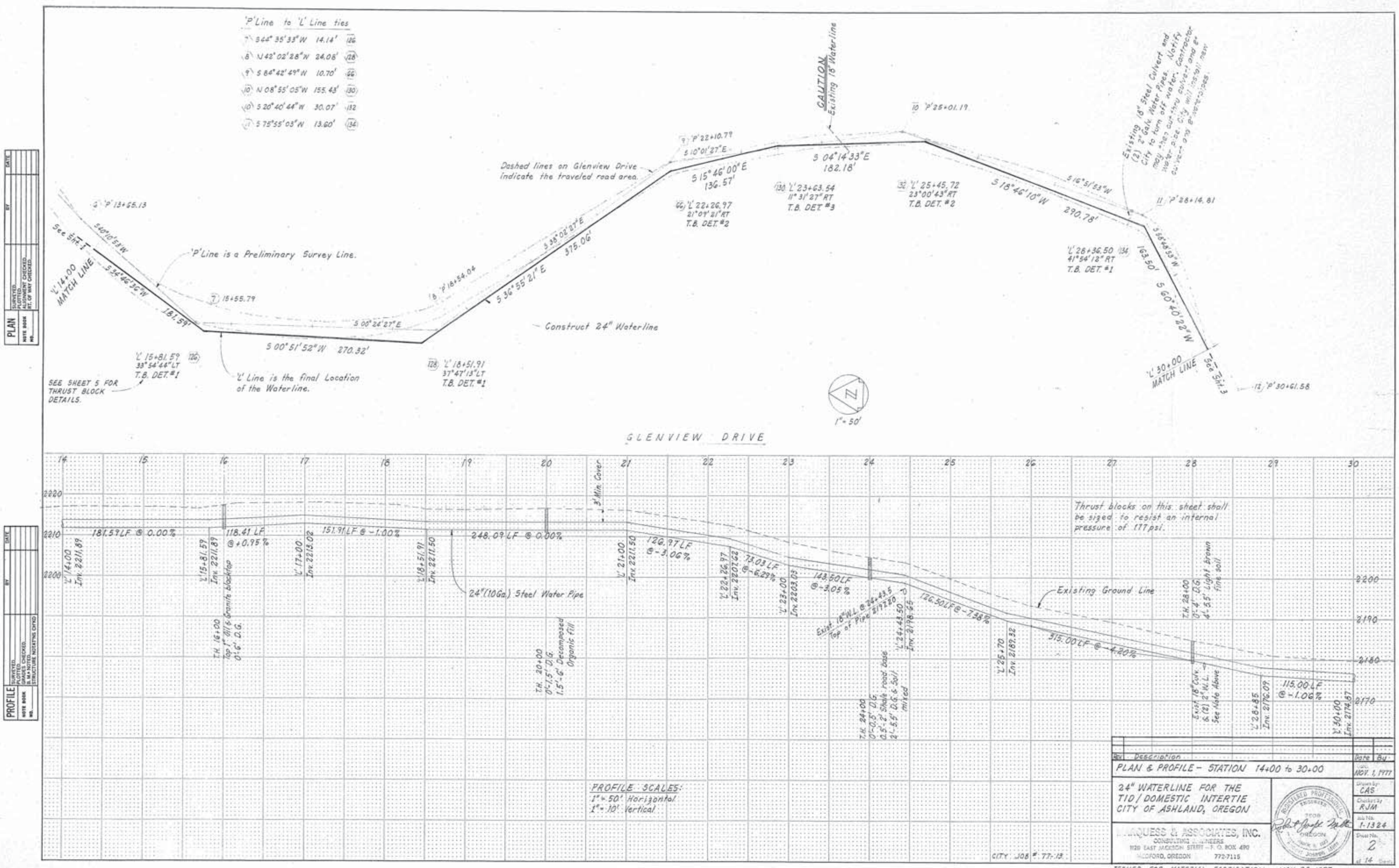
T.I.D. / DOMESTIC INTERTIE
AND
IRRIGATION CANAL CROSSINGS

DECEMBER 1977

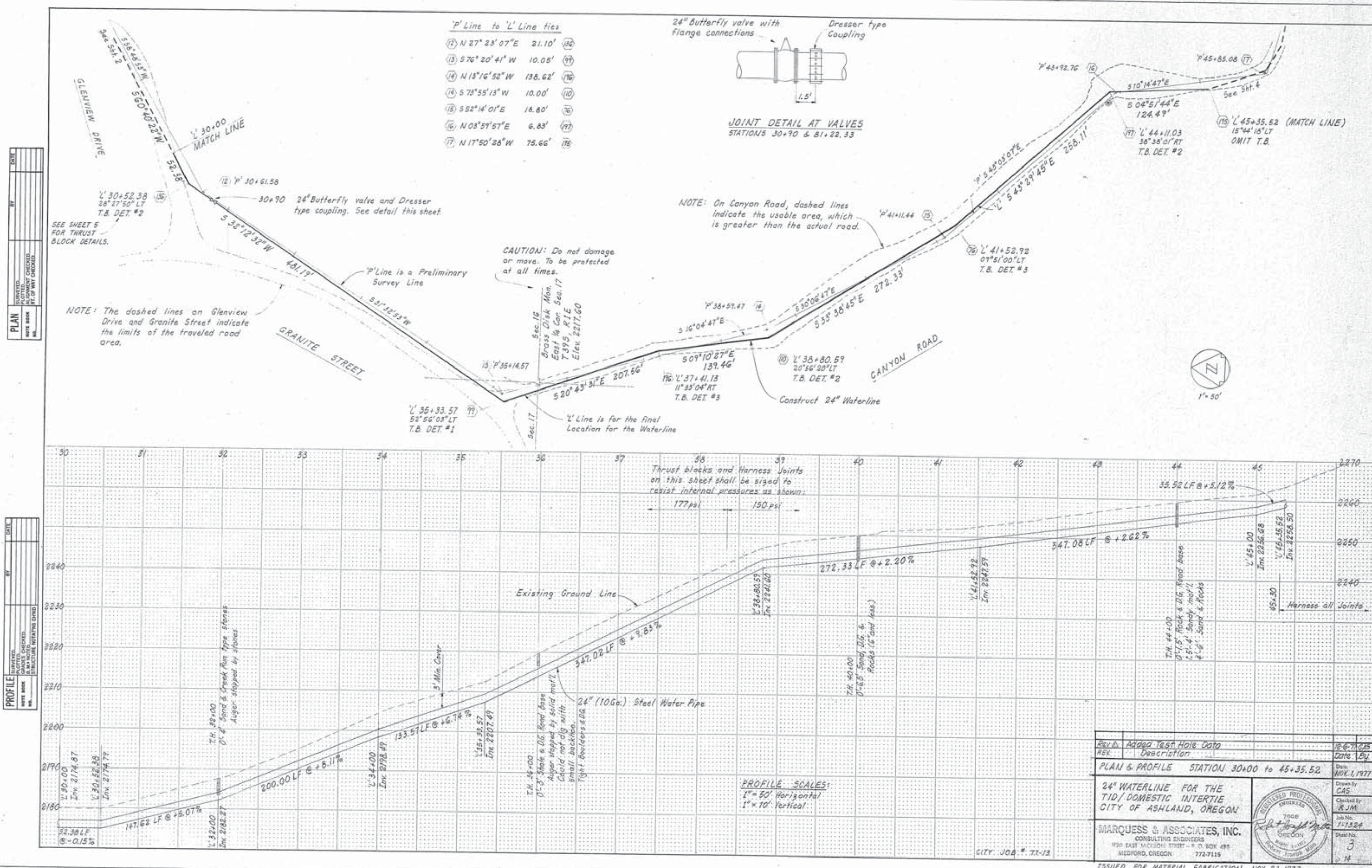
MARQUESS & ASSOCIATES INC.
CONSULTING ENGINEERS
1120 E. JACKSON STREET
MEDFORD ORE. 772-7115



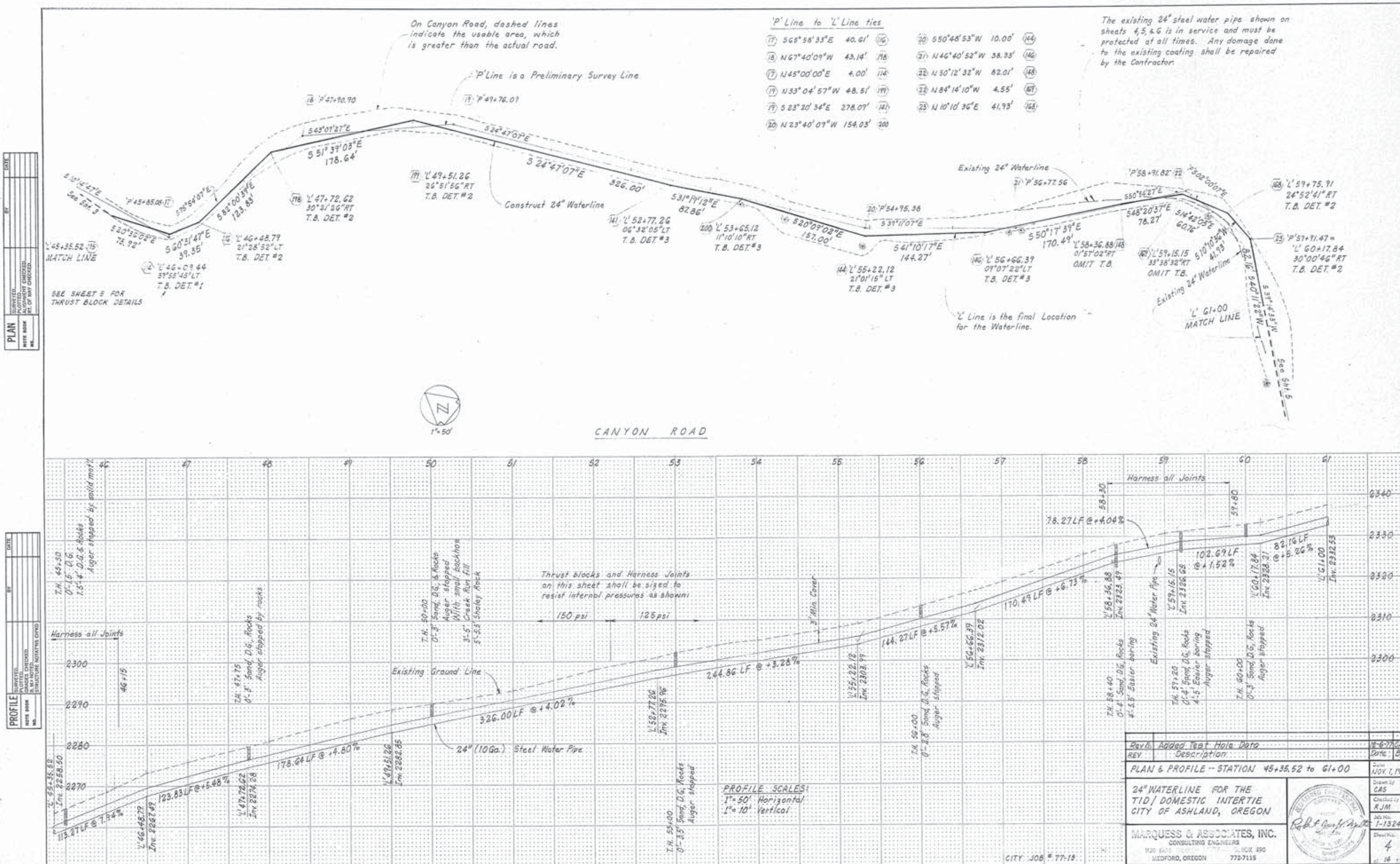
'P' Line to 'L' Line ties
2 S 87°39'03"W 19.60' 98
4 N 25°26'34"E 135.13' 122
5 S 36°55'28"W 103.59' 124
6 N 65°30'14"W 20.58' 57
Existing 24" Coated and wrapped Steel Pipe.
'Dresser' Type Coupling, shall be supplied by the City of Ashland.
'O' Ring - Bell and Spigot Joint
New 24" (10 Ga.) Steel Water Pipe
CONNECTION TO EXISTING PIPE
1"=2'
24" Steel Pipe
1.5'
See Note below
Provide a 6" blind flange at a joint near the following stations: 5+50, 10+50, 15+50, 20+50, 25+50, 30+50 (low point on profile), 40+50, 50+50, 60+50, and 70+50.
CONNECTION FOR FUTURE FIRE HYDRANTS
1"=2'
NOTE: The City of Ashland shall determine which side of the pipeline to place the blind flanges for future hydrants, at the time of construction.
INDEX TO DRAWINGS
PLAN & PROFILE - 24" WATERLINE
1 2+52.66 to 14+00
2 14+00 to 30+00
3 30+00 to 45+35.52
4 45+35.52 to 61+00
5 61+00 to 72+76.66
6 72+76.66 to 81+37.33
PLAN & PROFILE - CROSSINGS
7 Guthrie Street
8 Longway, Taylor & Liberty Streets
PLAN & PROFILE - OVERLAND PIPE
9 20+54.36 to 17+05.13
10 17+05.13 to 12+00
11 12+00 to 7+73.02
12 7+73.02 to 2+55.62
PLAN & PROFILE - CROSSINGS
13 Leonard St. & Woodland Dr.
14 Starlight Place
VICINITY MAP
ASHLAND, ORE
PROJECT AREA ~ 24" WATERLINE
NEVADA ST.
INTERSTATE 5
CITY OF ASHLAND
CANYON RD.
Drainage cross culverts, which interfere with the grade of the waterline, shall be cut through by the Contractor. After the waterline is installed, the City of Ashland shall replace the cross culvert to a new grade to clear the waterline.
1"=50'
BEGIN PROJECT 'L' 2+52.66
'P' 2+52.67
'L' 2+54.66 03°33'41"LT SEE CONNECTION DETAIL
'L' 3+94.15 55°22'55"LT T.B. DET. #1
'P' Line is a Preliminary Survey Line
'L' Line is the Final Location for waterline.
Construct 24" Waterline
S 30°12'31"W 521.74'
S 20°49'03"W 165.28'
S 32°16'06"W 116.75'
S 54°37'32"W 182.87'
'L' 5+10.90 'P' 5+03.45 11°27'05"LT T.B. DET. #3
'L' 6+76.18 09°23'28"RT T.B. DET. #3
'L' 11+97.92 24°25'01"RT T.B. DET. #2
'L' 13+80.81 19°50'56"LT T.B. DET. #2
'L' 14+00 MATCH LINE
See Sht. 2
CALL Before you DIG ! Call 779-6676 For utility locations 24 hours before you dig.
GLENVIEW DRIVE
SEE SHEET 5 FOR THRUST BLOCK DETAILS
Thrust blocks on this sheet shall be sized to resist an internal pressure of 177 psi.
Test Holes (T.H.) Shown thus D.G. = Decomposed Granite Test Holes bored with a truck mounted 20" Auger. Unless Noted
Existing Ground Line
112.84 LF @ -34.06%
23.65 LF @ -2.80%
282.03 LF @ +0.52%
521.74 LF @ +0.08%
202.08 LF @ 0.00%
3' Min. Cover
24" (10 Ga.) Steel Water Pipe conforming to AWWA C200-75 and C208-59. Pipe and fittings shall be coated inside and outside with Coal tar enamel, single wrapped outside with asbestos felt and wrapped with Kraft paper in accordance with AWWA C203-73.
PROFILE SCALES: 1"=50' Horizontal 1"=10' Vertical
PLAN & PROFILE - STATION 2+52.66 to 14+00
24" WATERLINE FOR THE TID/DOMESTIC INTERTIE CITY OF ASHLAND, OREGON
MARQUESS & ASSOCIATES INC. CONSULTING ENGINEERS MEDFORD, OREGON 772-7115
CITY JOB # 77-19
Job No. 1-1324
Sheet No. 1 of 14 Sheets
ISSUED FOR MATERIAL FABRICATION NOV. 23, 1977

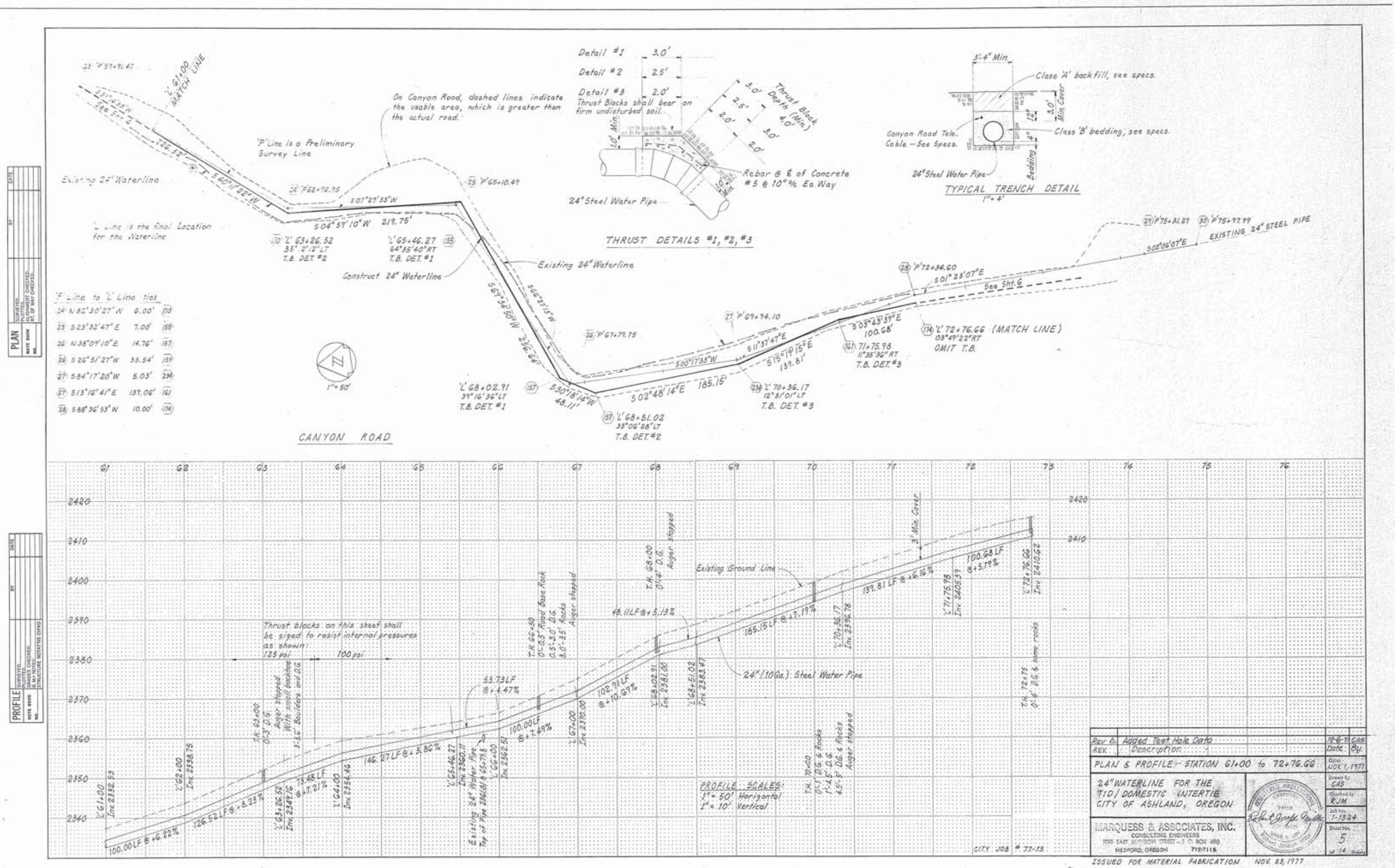


'P' Line to 'L' Line ties
7 S44° 35' 33"W 14.14' 126
8 N42° 02' 28"W 24.08' 128
9 S 84° 42' 49"W 10.70' 66
10 N 08° 55' 05"W 155.43' 130
10 S 20° 40' 44"W 30.07' 132
11 S 75° 55' 03"W 13.60' 134
CAUTION
Existing 18" Waterline
Existing 18" Steel Culvert and (2) 2" Galv. Water Pipes. Notify City to turn off water. Contractor may then cut thru culvert and 2" water pipe. City will install new culvert and 2" water pipes.
Dashed lines on Glenview Drive indicate the traveled road area.
'P' Line is a Preliminary Survey Line.
'L' Line is the final Location of the Waterline.
Construct 24" Waterline
'L' 14+00 MATCH LINE
See Sht. 1
'L' 30+00 MATCH LINE
See Sht. 3
SEE SHEET 5 FOR THRUST BLOCK DETAILS.
GLENVIEW DRIVE
1" = 50'
Thrust blocks on this sheet shall be sized to resist an internal pressure of 177 psi.
24" (10Ga.) Steel Water Pipe
Existing Ground Line
3' Min. Cover
PROFILE SCALES:
1" = 50' Horizontal
1" = 10' Vertical
PLAN & PROFILE - STATION 14+00 to 30+00
24" WATERLINE FOR THE TID / DOMESTIC INTERTIE CITY OF ASHLAND, OREGON
MARQUESS & ASSOCIATES, INC.
CONSULTING ENGINEERS
1120 EAST JACKSON STREET - P. O. BOX 490
MEDFORD, OREGON 772-7115
NOV. 1, 1977
CAS
RJM
1-1324
2
of 14
CITY JOB # 77-13
ISSUED FOR MATERIAL FABRICATION NOV. 23, 1977
PLAN
PROFILE



'P' Line to 'L' Line ties
N 27° 23' 07"E 21.10'
S 76° 20' 41" W 10.05'
N 13°16' 52" W 138.62'
S 73°55' 13" W 10.00'
S 52°14' 01"E 18.80'
N 03°59' 57"E 6.83'
N 17°50' 28"W 75.66'
24" Butterfly valve with flange connections
Dresser type Coupling
1.5'
JOINT DETAIL AT VALVES
STATIONS 30+90 & 81+22.33
GLENVIEW DRIVE
See Sht. 2
S 58°48'53"W
S 60°40'22"W
52.38'
'L' 30+00 MATCH LINE
'L' 30+52.38
28°27'50" LT
T.B. DET. #2
SEE SHEET 5 FOR THRUST BLOCK DETAILS.
'P' 30+61.58
30+90 24" Butterfly valve and Dresser type coupling. See detail this sheet.
S 32°12'32"W
481.19'
'P' Line is a Preliminary Survey Line
S 31°32'53"W
NOTE: The dashed lines on Glenview Drive and Granite Street indicate the limits of the traveled road area.
GRANITE STREET
CAUTION: Do not damage or move. To be protected at all times.
Sec. 16
Brass Disk Mon.
East ¼ Cor. Sec. 17
T 39S, R 1E
Elev. 2217.60
Sec. 17
'P' 35+14.57
'L' 35+33.57
52°56'03" LT
T.B. DET. #1
'L' Line is for the final Location for the Waterline
S 20°43'31"E 207.56'
'L' 37+41.13
11°33'04" RT
T.B. DET. #3
S 09°10'27"E
139.46'
S 16°04'47"E
'P' 38+59.47
S 30°06'47"E
S 33°38'45"E 272.33'
'L' 38+80.59
20°56'20" LT
T.B. DET. #2
Construct 24" Waterline
CANYON ROAD
NOTE: On Canyon Road, dashed lines indicate the usable area, which is greater than the actual road.
'P' 41+11.44
'L' 41+52.92
07°51'00" LT
T.B. DET. #3
'P' S 48°03'07"E
'L' S 43°29'45"E 256.11'
'P' 43+92.76
S 10°14'47"E
S 04°51'44"E
124.49'
'L' 44+11.03
38°38'01" RT
T.B. DET. #2
'P' 45+85.08
See Sht. 4
'L' 45+35.52 (MATCH LINE)
15°44'18" LT
OMIT T.B.
1" = 50'
PLAN
NOTE BOOK NO.
SURVEYED
PLOTTED
ALIGNMENT CHECKED
RT. OF WAY CHECKED
BY
DATE
Thrust blocks and Harness Joints on this sheet shall be sized to resist internal pressures as shown:
177 psi
150 psi
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
2270
2260
2250
2240
2230
2220
2210
2200
2190
2180
'L' 30+00
Inv. 2174.87
'L' 30+52.38
Inv. 2174.79
52.38 LF @ -0.15%
147.62 LF @ +5.07%
'L' 32+00
Inv. 2182.27
T.H. 32+00
0'-4' Sand & Creek Run type stones
Auger stopped by stones
200.00 LF @ +8.11%
'L' 34+00
Inv. 2198.49
133.57 LF @ +6.74%
3' Min. Cover
'L' 35+33.57
Inv. 2207.49
T.H. 36+00
0'-3' Shale & D.G. Road Base
Auger stopped by solid mat'l.
Could not dig with small backhoe.
Tight Boulders & D.G.
24" (10Ga.) Steel Water Pipe
347.02 LF @ +9.83%
Existing Ground Line
'L' 38+80.59
Inv. 2241.60
272.33 LF @ +2.20%
T.H. 40+00
0'-6.5' Sand, D.G. & Rocks (6" and less)
'L' 41+52.92
Inv. 2247.59
347.08 LF @ +2.62%
T.H. 44+00
0'-1.5' Rock & D.G. Road base
1.5'-4' Sandy mat'l.
4'-6' Sand & Rocks
35.52 LF @ +5.12%
'L' 45+00
Inv. 2256.08
'L' 45+35.52
Inv. 2258.50
65.30
Harness all Joints
PROFILE SCALES:
1" = 50' Horizontal
1" = 10' Vertical
PROFILE
NOTE BOOK NO.
SURVEYED
PLOTTED
GRADES CHECKED
B.M.s NOTED
STRUCTURE NOTATIONS CHK'D
BY
DATE
Rev. Added Test Hole Data 10-6-77 CAS
REV. Description Date By
PLAN & PROFILE STATION 30+00 to 45+35.52
24" WATERLINE FOR THE TID/DOMESTIC INTERTIE CITY OF ASHLAND, OREGON
Date NOV. 1, 1977
Drawn by CAS
Checked by RJM
Job No. 1-1324
Sheet No. 3 of 14
MARQUESS & ASSOCIATES, INC.
CONSULTING ENGINEERS
1120 EAST McANDREWS STREET - P. O. BOX 490
MEDFORD, OREGON 772-7115
CITY JOB #: 77-13
ISSUED FOR MATERIAL FABRICATION NOV 23, 1977


On Canyon Road, dashed lines indicate the usable area, which is greater than the actual road.
'P' Line is a Preliminary Survey Line
'P' Line to 'L' Line ties
The existing 24" steel water pipe shown on sheets 4, 5, & 6 is in service and must be protected at all times. Any damage done to the existing coating shall be repaired by the Contractor.
Construct 24" Waterline
Existing 24" Waterline
'L' Line is the final Location for the Waterline.
SEE SHEET 8 FOR THRUST BLOCK DETAILS
'L' 45+35.52 MATCH LINE
'L' 61+00 MATCH LINE
CANYON ROAD
PLAN
PROFILE
Harness all Joints
Thrust blocks and Harness Joints on this sheet shall be sized to resist internal pressures as shown:
150 psi
125 psi
Existing Ground Line
24" (10Ga.) Steel Water Pipe
PROFILE SCALES:
1"= 50' Horizontal
1"= 10' Vertical
CITY JOB # 77-13
Rev. A Added Test Hole Data
PLAN & PROFILE - STATION 45+35.52 to 61+00
24" WATERLINE FOR THE TID/DOMESTIC INTERTIE CITY OF ASHLAND, OREGON
MARQUESS & ASSOCIATES, INC. CONSULTING ENGINEERS
MEDFORD, OREGON 772-7115
NOV. 1, 1977
CAS
RJM
1-1324
4
ISSUED FOR MATERIAL FABRICATION NOV. 23, 1977


'L' 61+00 MATCH LINE
'P' Line is a Preliminary Survey Line
On Canyon Road, dashed lines indicate the usable area, which is greater than the actual road.
Existing 24" Waterline
'L' Line is the final Location for the Waterline
'L' 63+26.52 35°2'12"LT T.B. DET. #2
'L' 65+46.27 64°35'40"RT T.B. DET. #1
Construct 24" Waterline
Existing 24" Waterline
'P' Line to 'L' Line ties
24 N82°30'27"W 6.00'
25 S23°32'47"E 7.00'
26 N38°09'10"E 14.76'
26 S26°51'27"W 33.54'
27 S84°17'20"W 5.03'
27 S13°16'41"E 139.06'
28 S88°36'53"W 10.00'
1" = 50'
CANYON ROAD
Detail #1 3.0'
Detail #2 2.5'
Detail #3 2.0'
Thrust Blocks shall bear on firm undisturbed soil.
Thrust Block Depth (Min.)
Rebar @ ℄ of Concrete #5 @ 10" o/c Ea. Way
24" Steel Water Pipe
THRUST DETAILS #1, #2, #3
Class 'A' back fill, see specs.
Class 'B' bedding, see specs.
Canyon Road Tele. Cable - See Specs.
24" Steel Water Pipe
TYPICAL TRENCH DETAIL
1" = 4'
'L' 68+02.91 39°16'36"LT T.B. DET. #1
'L' 68+51.02 33°06'28"LT T.B. DET. #2
'L' 70+36.17 12°31'01"LT T.B. DET. #3
71+75.98 11°35'36"RT T.B. DET. #3
'L' 72+76.66 (MATCH LINE) 03°49'22"RT OMIT T.B.
See Sht. 6
EXISTING 24" STEEL PIPE
Thrust blocks on this sheet shall be sized to resist internal pressures as shown: 125 psi 100 psi
Existing Ground Line
24" (10 Ga.) Steel Water Pipe
3' Min. Cover
PROFILE SCALES: 1" = 50' Horizontal 1" = 10' Vertical
Rev. Added Test Hole Data 12-6-77 CAS
PLAN & PROFILE - STATION 61+00 to 72+76.66
24" WATERLINE FOR THE TID / DOMESTIC INTERTIE CITY OF ASHLAND, OREGON
MARQUESS & ASSOCIATES, INC. CONSULTING ENGINEERS MEDFORD, OREGON
Date NOV. 1, 1977
Drawn by CAS
Checked by RJM
Job No. 1-1324
Sheet No. 5 of 14 Sheets
CITY JOB # 77-13
ISSUED FOR MATERIAL FABRICATION NOV. 23, 1977
PLAN
PROFILE

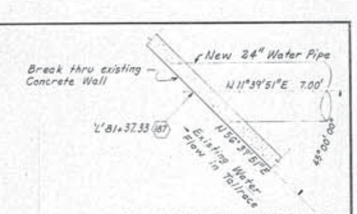
'P' Line to 'L' Line ties

(27)	N 12°36'24" W	80.33'	(178)	(33)	S 41°37'59" W	9.16' (212)
(29)	S 06°21'50" W	48.32'	(203)	(34)	S 55°18'33" W	10.00' (211)
(29)	S 04°30'22" E	66.75'	(202)	(35)	N 14°33'18" W	4.25' (215)
(31)	S 87°07'31" W	2.00'	(177)	(35)	N 65°44'50" W	16.03' (214)
(31)	S 05°05'02" W	40.23'	(208)	(35)	N 49°33'21" W	30.75' (188)
(32)	S 20°41'35" W	19.81'	(209)	(35)	N 39°21'49" W	34.67' (187)
(32)	S 15°58'55" W	63.21'	(210)			
(32)	S 18°23'56" W	106.69'	(207)			

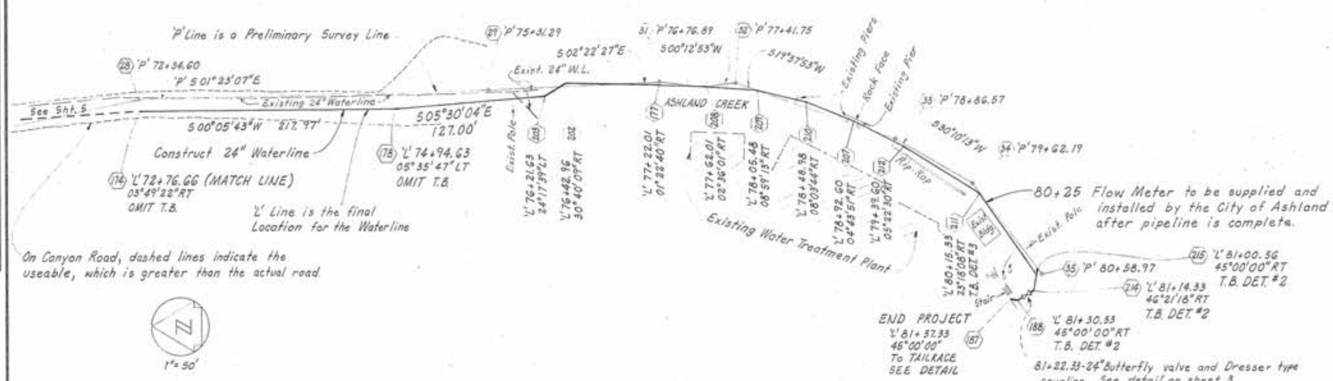
'L' Line Bearing and Distance

(203)	S 29°47'43" E	21.33'	(202)	(207)	S 26°37'55" W	47.00'	(212)
(202)	S 00°52'26" W	79.05'	(177)	(212)	S 32°00'25" W	75.73'	(211)
(177)	S 02°15'06" W	40.00'	(208)	(211)	S 55°16'33" W	85.23'	(215)
(208)	S 04°51'07" W	43.47'	(209)	(215)	N 79°41'37" W	13.77'	(214)
(209)	S 15°50'20" W	43.50'	(210)	(214)	N 33°20'09" W	16.00'	(188)
(210)	S 21°54'04" W	43.62'	(207)	(188)	N 11°39'51" E	7.00'	(187)

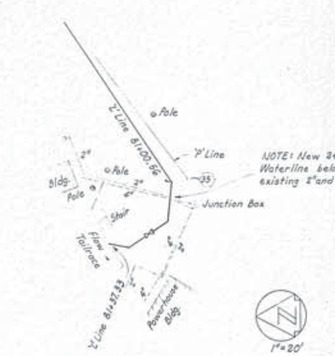
A portion of the pipeline along the creek, sta. 'L' 77+70± to 'L' 79+30±, shall be installed above the existing ground line, to the alignment and grade shown. The Contractor shall provide temporary supports and shoring to adequately support the pipe. After the pipeline is in place the City of Ashland shall improve the existing concrete piers as necessary, and shall construct additional concrete support piers as required. The maximum allowable unsupported span for the pipe is 29 feet.



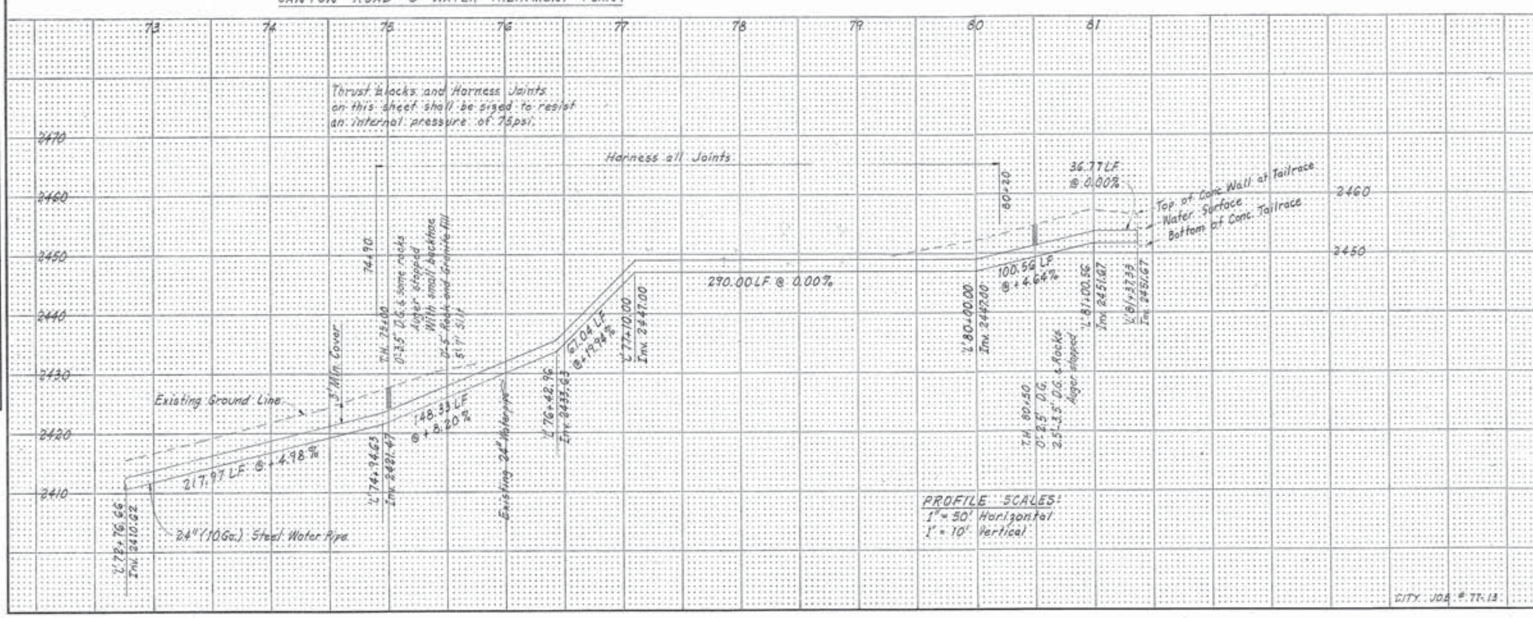
PLAN DETAIL AT TAILRACE
1" = 2'



CANYON ROAD & WATER TREATMENT PLANT



ENLARGED PLAN OF EXISTING LINES @ TAILRACE



PLAN	
NOTE BOOK No.	SURVEYED / ALIGNMENT CHECKED / RT. OF WAY CHECKED
BY	
DATE	

PROFILE	
NOTE BOOK No.	SURVEYED / PLOTTED / GRADES CHECKED / B. M.'s NOTED / STRUCTURE NOTATIONS CHKD
BY	
DATE	

Rev.	Description	Date	By
1	Added exist. W.T.P. Utilities & Test Hole Data	12-15-77	CAS

PLAN & PROFILE – STATION 72+76.66 to 81+37.33

24" WATERLINE FOR THE TID / DOMESTIC INTERTIE CITY OF ASHLAND, OREGON

MARQUESS & ASSOCIATES, INC.
CONSULTING ENGINEERS
1120 EAST JACKSON STREET – P. O. BOX 490
MEDFORD, OREGON 772-7115

Date	NOV. 1, 1977
Drawn By	CAS
Checked by	RJM
Job No.	1-1324
Sheet No.	6 of 14

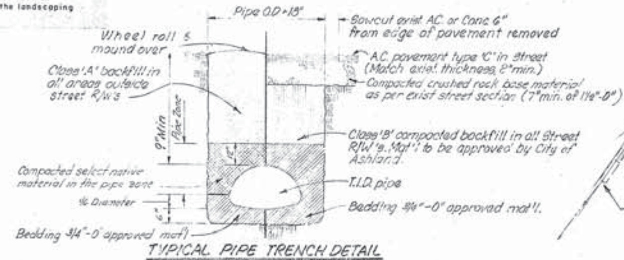
CITY JOB # 77-13

ISSUED FOR MATERIAL FABRICATION NOV. 23, 1977

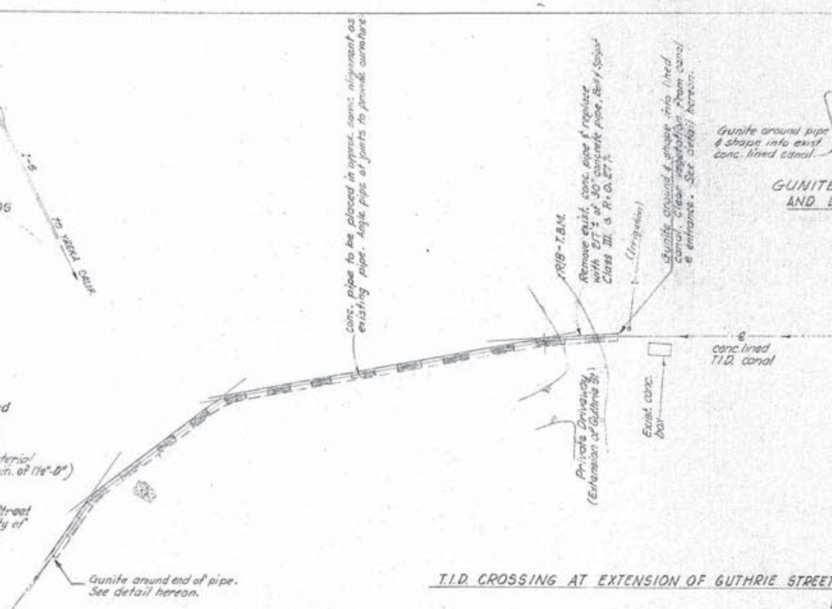
GENERAL NOTES

1. All work and materials shall conform to the provisions of "Std. Specs for Public Works Constr." A.P.W.A., Ore. Chapter.
2. All corrugated metal pipe shall be smooth bore unless otherwise noted. Smooth bore shall mean a full asphalt lining on the pipe interior which completely fills the corrugations making a smooth cylinder bore.
3. Class 'B' backfill shall be compacted by pressure jetting and shall have a relative compaction at optimum density of 95% as determined by AASHO Designation T-99. Separate payment for backfill compaction will not be made.
4. Crushed rock base material shall be compacted to 95% of maximum density as determined by Oregon State Highway Dept. "Std. Method for Calculating Max. Densities for Compaction of Granular Mat'l's.".
5. Excess and undesirable material shall be disposed of at the City of Ashland's direction.
6. Every reasonable effort has been made to locate existing underground pipes and utilities on the plans, but no guarantee is made of the completeness or accuracy of these locations. It shall be the Contractor's responsibility to locate and protect all existing underground pipes, utilities and structures in the field when marked by the City of Ashland.
7. The Contractor shall comply with all safety and traffic control regulations during construction. The Contractor shall be responsible for providing for the safe flow of traffic and emergency vehicles, including adequate signs, barricades, flagmen, etc.
8. A.C. pavement or concrete to be replaced shall be sawcut to clean, straight and vertical edge.
9. In areas of existing landscaping, the Class 'A' backfill shall be water settled by pressure jetting to the satisfaction of the City of Ashland before the landscaping is restored.

CITY OF ASHLAND
VICINITY MAP

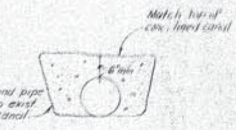


TYPICAL PIPE TRENCH DETAIL
NO SCALE

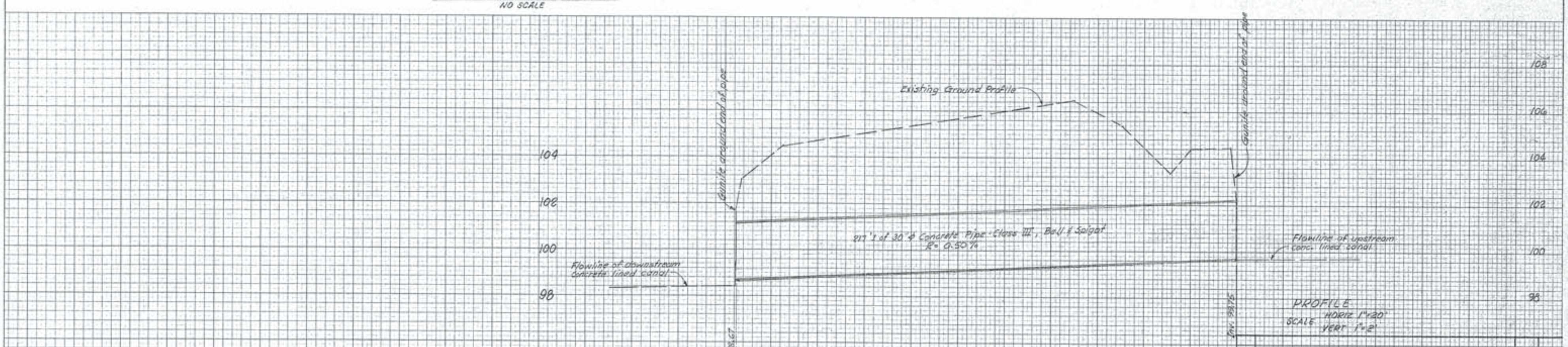


T.I.D. CROSSING AT EXTENSION OF GUTHRIE STREET

T.B.M. Top of R/B prop. cor. Assumed Elev. 100.00



GUNITED BANK AT UPSTREAM AND DOWNSTREAM END
Scale: 1"=4'



PROFILE
SCALE HORIZ. 1"=20' VERT. 1"=2'

Rev.	Description	Date	By
	Plan & Profile - Guthrie Street		

TALENT IRRIGATION DISTRICT
ASHLAND CANAL CROSSINGS
& OVERLAND PIPELINE

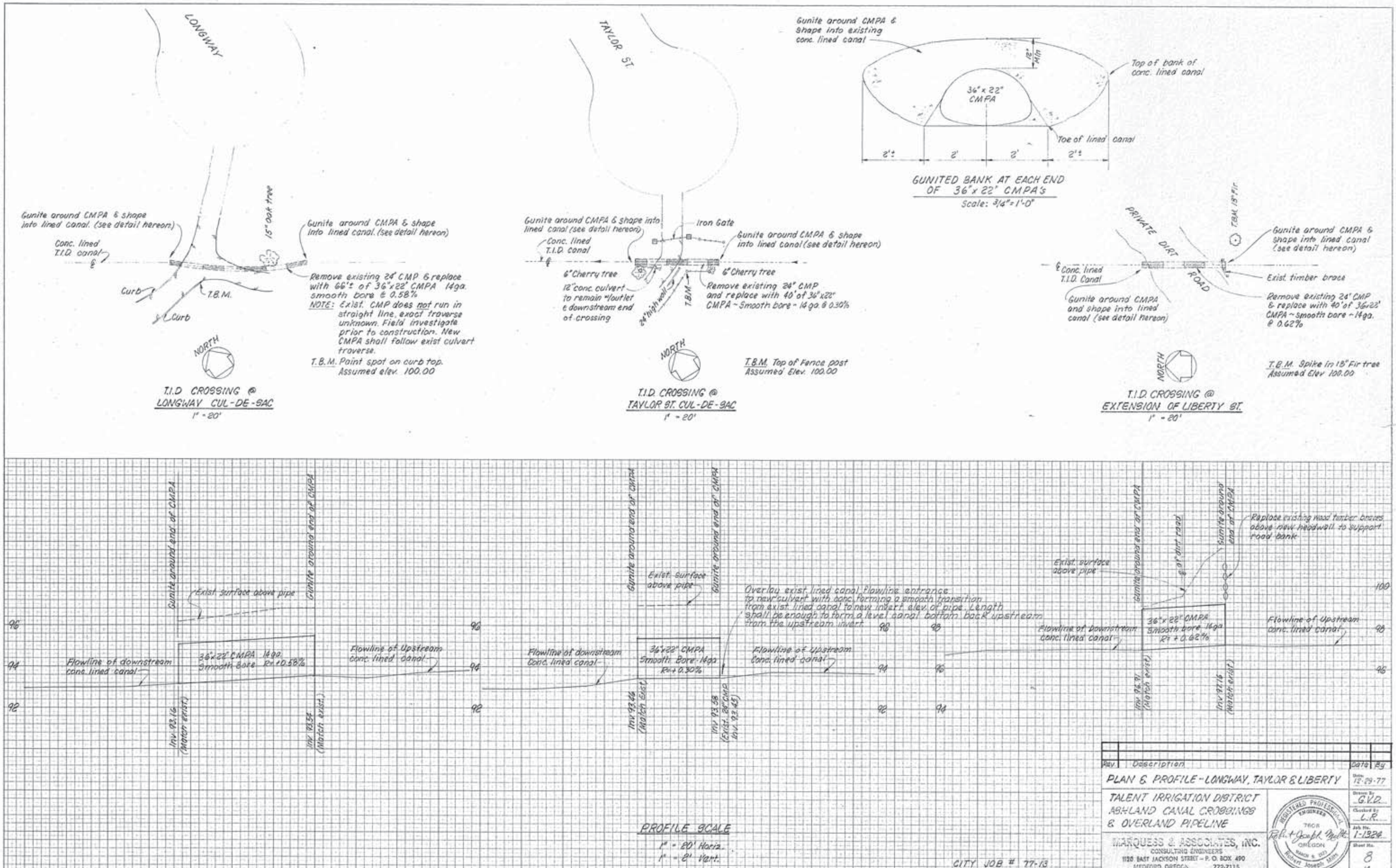
MARQUESS & ASSOCIATES, INC.
CONSULTING ENGINEERS
1120 EAST JACKSON STREET - P. O. BOX 490
MEDFORD, OREGON 772-7115

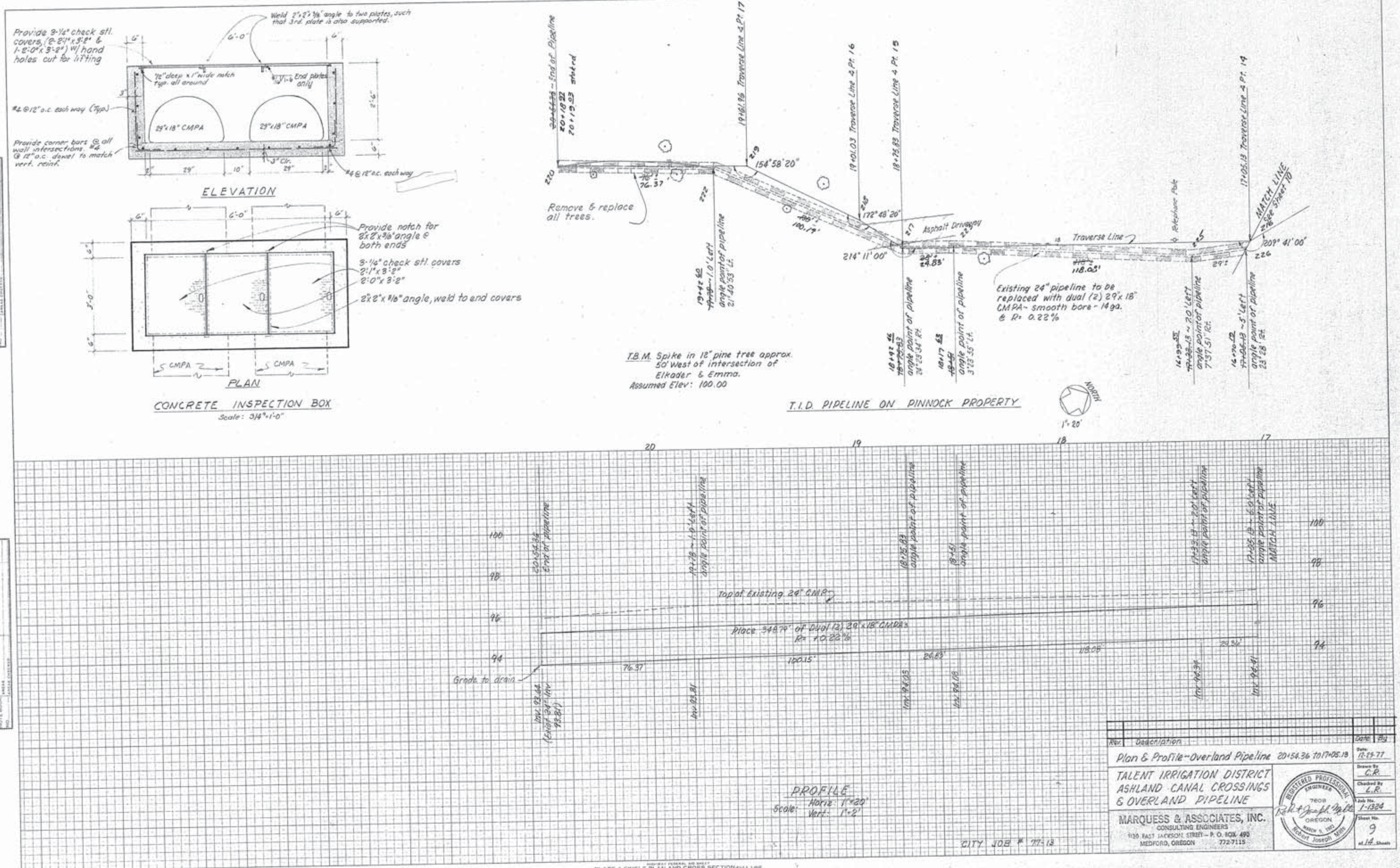
REGISTERED PROFESSIONAL ENGINEER 7608 OREGON Robert Joseph Mills

Date: 12-29-77
Drawn By: C.R.
Checked By: L.R.
Job No. 1-1324
Sheet No. 7 of 16 Sheets

CITY JOB # 77-13

PLATE 4-SINGLE PLAN AND CROSS SECTION-FULL LINE


LONGWAY
Gunite around CMPA & shape into lined canal. (see detail hereon)
Conc. lined T.I.D. canal
15" oak tree
Gunite around CMPA & shape into lined canal. (see detail hereon)
Curb
T.B.M.
Curb
Remove existing 24" CMP & replace with 66'± of 36"x22" CMPA 14ga. smooth bore @ 0.58%
NOTE: Exist. CMP does not run in straight line, exact traverse unknown. Field investigate prior to construction. New CMPA shall follow exist culvert traverse.
T.B.M. Paint spot on curb top. Assumed elev. 100.00
NORTH
T.I.D CROSSING @ LONGWAY CUL-DE-SAC
1" = 20'
TAYLOR ST.
Gunite around CMPA & shape into lined canal (see detail hereon)
Iron Gate
Conc. lined T.I.D. Canal
Gunite around CMPA & shape into lined canal (see detail hereon)
6" Cherry tree
6" Cherry tree
12" conc. culvert to remain w/outlet & downstream end of crossing
24" high wall
T.B.M.
Remove existing 24" CMP and replace with 40' of 36"x22" CMPA ~ Smooth bore - 14 ga. @ 0.30%
NORTH
T.B.M. Top of Fence post Assumed Elev. 100.00
T.I.D CROSSING @ TAYLOR ST. CUL-DE-SAC
1" = 20'
Gunite around CMPA & shape into existing conc. lined canal
12" Min
Top of bank of conc. lined canal
36" x 22" CMPA
Toe of lined canal
2'± 2' 2' 2'±
GUNITED BANK AT EACH END OF 36" x 22" CMPA's
Scale: 3/4" = 1'-0"
PRIVATE DIRT ROAD
T.B.M. 18" Fir
Gunite around CMPA & shape into lined canal (see detail hereon)
Conc. lined T.I.D. Canal
Exist. timber brace
Gunite around CMPA and shape into lined canal (see detail hereon)
Remove existing 24" CMP & replace with 40' of 36"x22" CMPA ~ smooth bore - 14ga. @ 0.62%
NORTH
T.B.M. Spike in 18" Fir tree Assumed Elev 100.00
T.I.D. CROSSING @ EXTENSION OF LIBERTY ST.
1" = 20'
Gunite around end of CMPA
Gunite around end of CMPA
Exist. surface above pipe
36"x22" CMPA 14ga. Smooth Bore R+ 0.58%
Flowline of downstream conc. lined canal
Flowline of Upstream conc. lined canal
Inv 93.16 (Match exist.)
Inv 93.54 (Match exist.)
96 94 92
Gunite around end of CMPA
Gunite around end of CMPA
Exist. surface above pipe
36"x22" CMPA Smooth Bore 14ga R+ 0.30%
Flowline of downstream conc. lined canal
Flowline of Upstream conc. lined canal
Inv 93.46 (Match Exist.)
Inv 93.58 (Exist. 24" CMP Inv. 93.45)
Overlay exist. lined canal flowline entrance to new culvert with conc. forming a smooth transition from exist. lined canal to new invert elev. of pipe. Length shall be enough to form a level canal bottom back upstream from the upstream invert.
Gunite around end of CMPA
8" dirt road
Gunite around end of CMPA
Exist. surface above pipe
Replace existing wood timber braces above new headwall to support road bank
36"x22" CMPA Smooth bore 14ga R+ 0.62%
Flowline of Downstream conc. lined canal
Flowline of Upstream conc. lined canal
Inv 96.71 (Match exist.)
Inv 97.16 (Match exist.)
100 98 96
PROFILE SCALE
1" = 20' Horiz.
1" = 8' Vert.
CITY JOB # 77-13
Rev. Description Date By
PLAN & PROFILE - LONGWAY, TAYLOR & LIBERTY
TALENT IRRIGATION DISTRICT
ASHLAND CANAL CROSSINGS
& OVERLAND PIPELINE
MARQUESS & ASSOCIATES, INC.
CONSULTING ENGINEERS
1120 EAST JACKSON STREET - P. O. BOX 490
MEDFORD, OREGON 772-7115
REGISTERED PROFESSIONAL ENGINEER 7608 OREGON
Date 12-29-77
Drawn By G.V.D.
Checked By L.R.
Job No. 1-1324
Sheet No. 8
of 14 Sheets
ORIGINAL SURVEY
FINAL SURVEY
PLATE 4-SINGLE PLAN AND CROSS SECTION

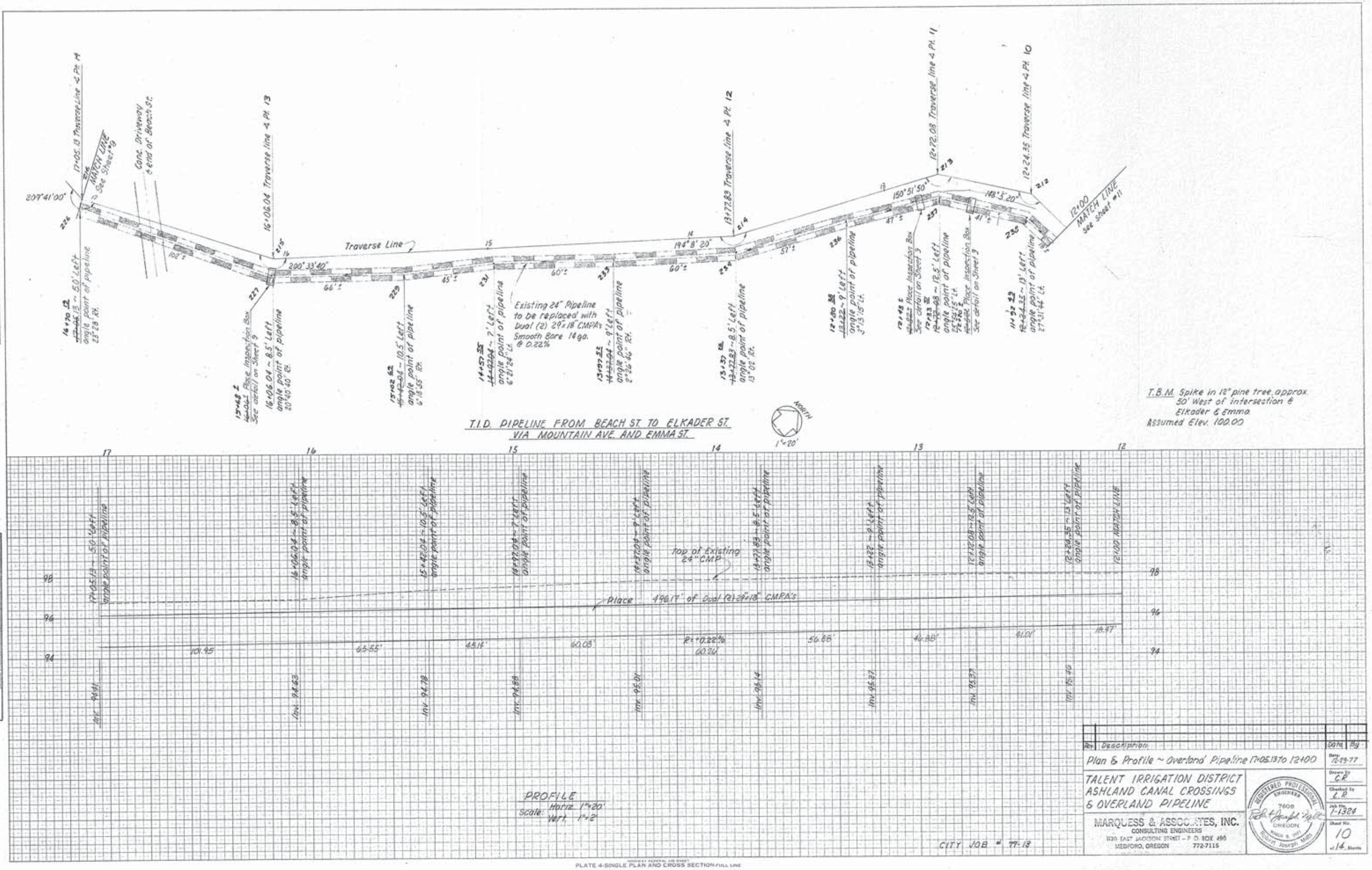


Rev.	Description	Date	By
	Plan & Profile-Overland Pipeline 20+54.36 to 17+05.13	12-29-77	

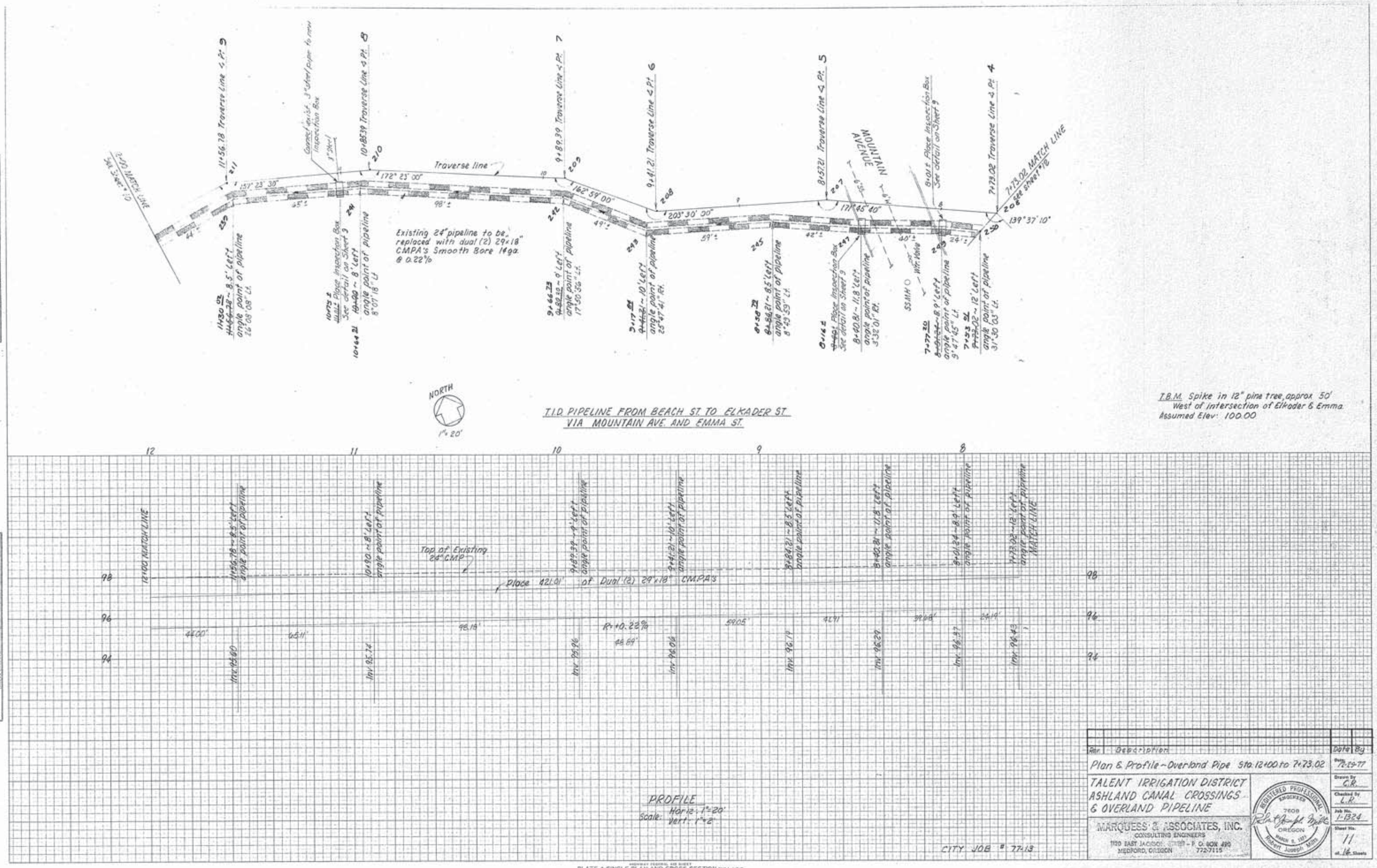
TALENT IRRIGATION DISTRICT
ASHLAND CANAL CROSSINGS
& OVERLAND PIPELINE

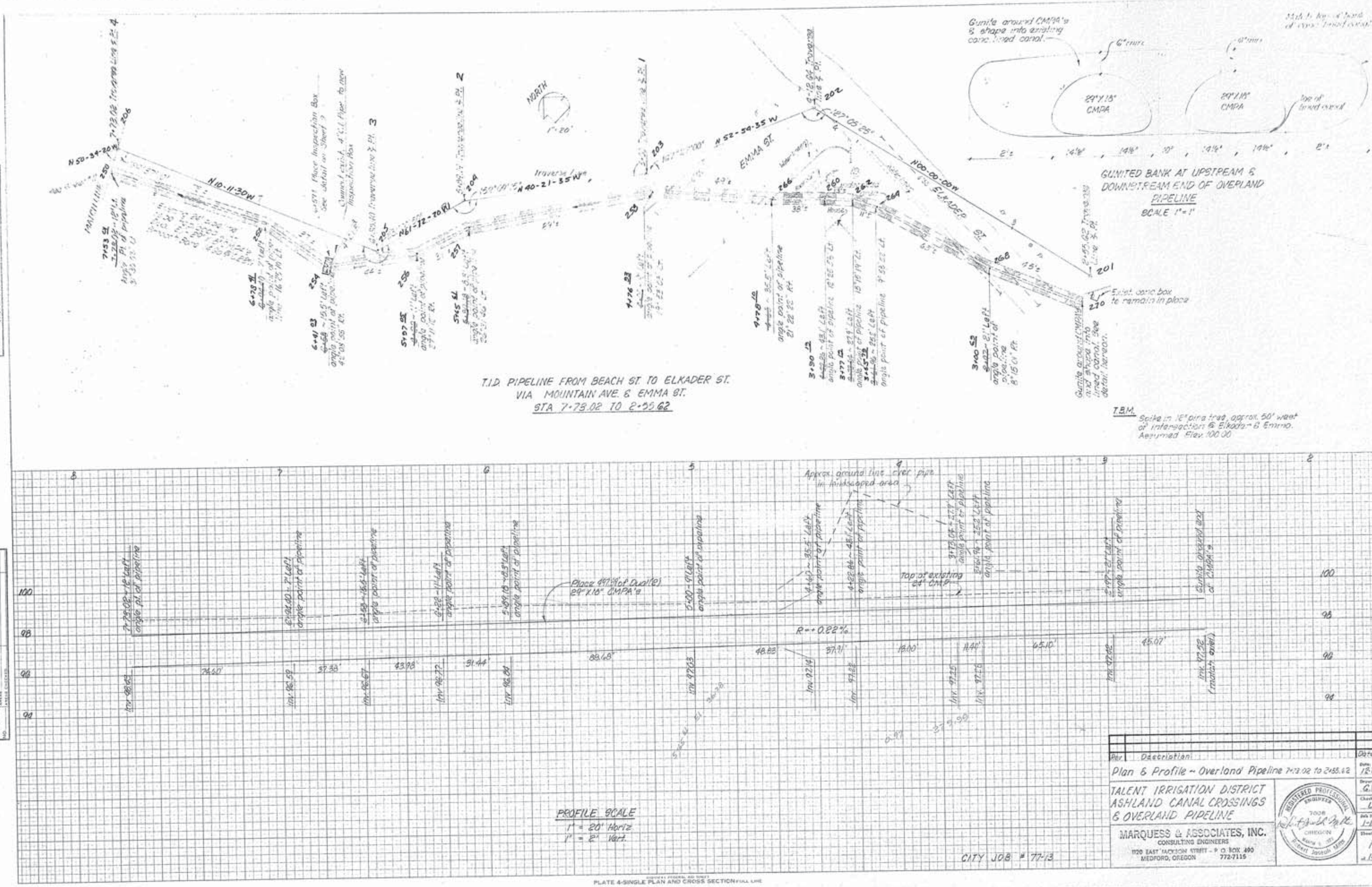
MARQUESS & ASSOCIATES, INC.
CONSULTING ENGINEERS
1130 EAST JACKSON STREET – P. O. BOX 490
MEDFORD, OREGON 772-7115

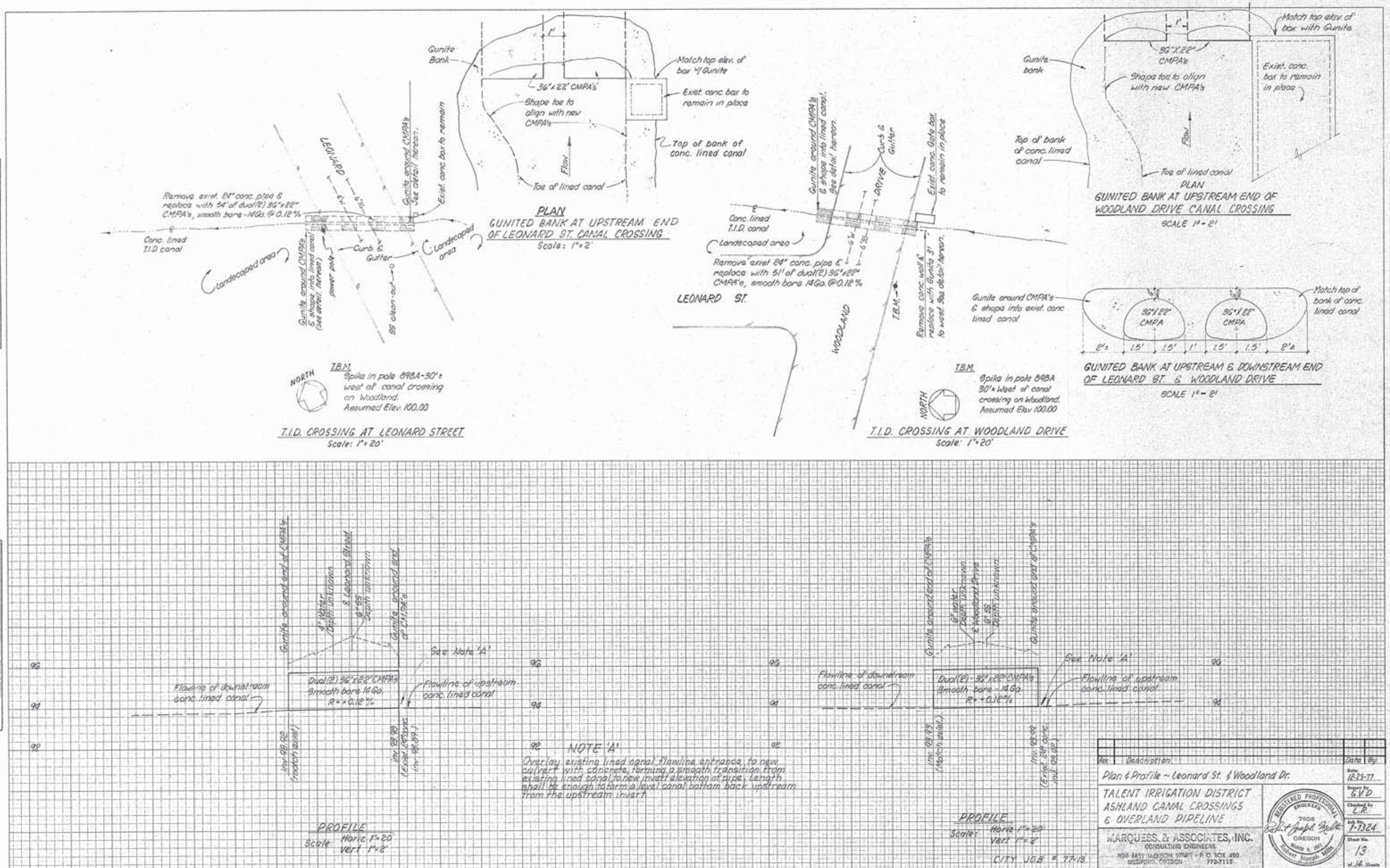
Drawn by C.R. — Checked by L.R. — Job No. 1-1324 — Sheet No. 9 of 14 Sheets

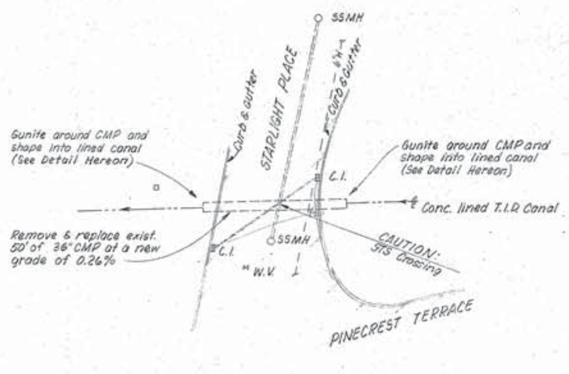


T.I.D. PIPELINE FROM BEACH ST. TO ELKADER ST.
VIA MOUNTAIN AVE. AND EMMA ST.
Traverse Line
MATCH LINE See Sheet #9
12+00 MATCH LINE See Sheet #11
Conc. Driveway
¢ end of Beach St.
17+05.13 Traverse Line ¢ Pt. 14
16+06.04 Traverse line ¢ Pt. 13
13+77.83 Traverse line ¢ Pt. 12
12+72.08 Traverse line ¢ Pt. 11
12+24.35 Traverse line ¢ Pt. 10
209°41'00"
200°33'40"
194°8'20"
150°51'50"
148°3'20"
Existing 24" Pipeline to be replaced with Dual (2) 29x18 CMPA's Smooth Bore 14 ga. @ 0.22%
angle point of pipeline
Place Inspection Box See detail on Sheet 9
T.B.M. Spike in 12" pine tree, approx. 50' West of intersection ¢ Elkader & Emma
Assumed Elev. 100.00
NORTH
Top of Existing 24" CMP
Place 496.17' of Dual (2) 29x18 CMPA's
R=+0.22%
PROFILE
Scale: Horiz. 1"=20' Vert. 1"=2'
12+00 MATCH LINE
Plan & Profile ~ Overland Pipeline 17+05.13 to 12+00
TALENT IRRIGATION DISTRICT
ASHLAND CANAL CROSSINGS
& OVERLAND PIPELINE
MARQUESS & ASSOCIATES, INC.
CONSULTING ENGINEERS
1120 EAST JACKSON STREET – P. O. BOX 490
MEDFORD, OREGON 772-7115
REGISTERED PROFESSIONAL ENGINEER
7608
OREGON
Date 12-29-77
Drawn by G.R.
Checked by L.R.
Job No. 7-1324
Sheet No. 10 of 14 Sheets
CITY JOB # 77-13
PLATE 4-SINGLE PLAN AND CROSS SECTION-FULL LINE
FINAL SURVEY
ORIGINAL SURVEY


T.I.D PIPELINE FROM BEACH ST. TO ELKADER ST.
VIA MOUNTAIN AVE. AND EMMA ST.
NORTH
1"=20'
T.B.M. Spike in 12" pine tree, approx 50' West of intersection of Elkader & Emma. Assumed Elev: 100.00
Existing 24" pipeline to be replaced with dual (2) 29×18" CMPA's Smooth Bore 14 ga. @ 0.22%
Traverse line
MOUNTAIN AVENUE
11+56.78 Traverse Line ∠ Pt. 9
10+85.39 Traverse Line ∠ Pt. 8
9+89.39 Traverse Line ∠ Pt. 7
9+41.21 Traverse Line ∠ Pt. 6
8+57.21 Traverse Line ∠ Pt. 5
7+73.02 Traverse Line ∠ Pt. 4
7+73.02 MATCH LINE See Sheet 16
12+00 MATCH LINE See Sheet 10
angle point of pipeline
Top of Existing 24" CMP
Place 421.01' of Dual (2) 29×18" CMPA'S
12+00 MATCH LINE
PROFILE
Scale: Horiz.: 1"=20' Vert.: 1"=2'
CITY JOB # 77-13
Plan & Profile - Overland Pipe Sta. 12+00 to 7+73.02
TALENT IRRIGATION DISTRICT
ASHLAND CANAL CROSSINGS
& OVERLAND PIPELINE
MARQUESS & ASSOCIATES, INC.
CONSULTING ENGINEERS
MEDFORD, OREGON
Drawn by C.R.
Checked by L.R.
Job No. 1-1324
Sheet No. 11 of 16 Sheets
PLATE 4-SINGLE PLAN AND CROSS SECTION FULL LINE

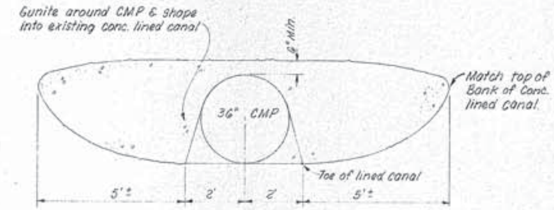

T.I.D. PIPELINE FROM BEACH ST. TO ELKADER ST.
VIA MOUNTAIN AVE. & EMMA ST.
STA 7+73.02 TO 2+55.62
GUNITED BANK AT UPSTREAM & DOWNSTREAM END OF OVERLAND PIPELINE
SCALE 1"=1'
Gunite around CMPA's & shape into existing conc. lined canal.
29"x18" CMPA
T.B.M.
Spike in 18" pine tree, approx. 50' west of intersection & Elkader & Emma. Assumed Elev. 100.00
N10-11-30W
N61-32-20W
N40-21-35W
N52-54-35W
N00-00-00W
EMMA ST.
ELKADER ST.
NORTH
1"=20'
Exist. conc box to remain in place
Gunite around CMPA's and shape into lined canal. See detail hereon.
Approx. ground line over pipe in landscaped area
Place 497.9' of Dual (2) 29"x18" CMPA's
Top of existing 24" CMP
R=+0.22%
PROFILE SCALE
1" = 20' Horiz.
1" = 2' Vert.
CITY JOB # 77-13
Plan & Profile ~ Overland Pipeline 7+73.02 to 2+55.62
TALENT IRRIGATION DISTRICT
ASHLAND CANAL CROSSINGS
& OVERLAND PIPELINE
MARQUESS & ASSOCIATES, INC.
CONSULTING ENGINEERS
1120 EAST JACKSON STREET - P.O. BOX 490
MEDFORD, OREGON 772-7115
Date 12-29-77
Drawn by C.V.D.
Checked by L.R.
Job No. 1-1324
Sheet No. 12 of 16 Sheets
PLATE 4-SINGLE PLAN AND CROSS SECTION FULL LINE


PLAN
GUNITED BANK AT UPSTREAM END OF LEONARD ST. CANAL CROSSING
Scale: 1"=2'
Gunite Bank
Match top elev. of box w/ Gunite
36"x22" CMPA's
Exist. conc. box to remain in place
Shape toe to align with new CMPA's
Top of bank of conc. lined canal
Flow
Toe of lined canal
Remove exist. 24" conc. pipe & replace with 54' of dual(2) 36"x22" CMPA's, smooth bore -14Ga. @ 0.12%
Conc. lined T.I.D canal
Landscaped area
Gunite around CMPA's & shape into lined canal (see detail hereon)
power pole
Curb & Gutter
SS clean-out
LEONARD
Gunite around CMPA's See detail hereon.
Exist. conc box to remain
T.B.M.
Spike in pole 898A-30'± west of canal crossing on Woodland. Assumed Elev. 100.00
NORTH
T.I.D. CROSSING AT LEONARD STREET
Scale: 1"=20'
Conc. lined T.I.D. canal
Remove exist 24" conc. pipe & replace with 51' of dual(2) 36"x22" CMPA's, smooth bore 14Ga. @ 0.12%
Gunite around CMPA's & shape into lined canal, See detail hereon.
DRIVE
Curb & Gutter
Exist. conc. Gate box to remain in place
Remove conc. wall & replace with Gunite 3' to west. See detail hereon.
LEONARD ST.
WOODLAND
T.B.M.
Spike in pole 848A 30'± West of canal crossing on Woodland. Assumed Elev 100.00
T.I.D. CROSSING AT WOODLAND DRIVE
Scale: 1"=20'
PLAN
GUNITED BANK AT UPSTREAM END OF WOODLAND DRIVE CANAL CROSSING
SCALE 1"=2'
Gunite bank
36"X22" CMPA's
Shape toe to align with new CMPA's
Match top elev. of box with Gunite
Exist. conc. box to remain in place
Top of bank of conc. lined canal
Toe of lined canal
Gunite around CMPA's & shape into exist. conc lined canal
36"x22" CMPA
Match top of bank of conc. lined canal
2'± 1.5' 1.5' 1' 1.5' 1.5' 2'±
GUNITED BANK AT UPSTREAM & DOWNSTREAM END OF LEONARD ST. & WOODLAND DRIVE
SCALE 1"=2'
Gunite around end of CMPA's
4" Water Depth unknown
℄ Leonard Street
6" SS Depth unknown
Gunite around end of CMPA's
See Note 'A'
Flowline of downstream conc. lined canal
Dual(2) 36"x22" CMPA's Smooth bore 14Ga. R=+0.12%
Flowline of upstream conc. lined canal
Inv. 98.92 (match exist.)
Inv. 98.98 (Exist. 24" conc. inv. 98.89)
PROFILE
Scale: Horiz. 1"=20' Vert. 1"=2'
NOTE 'A'
Overlay existing lined canal flowline entrance to new culvert with concrete, forming a smooth transition from existing lined canal to new invert elevation of pipe. Length shall be enough to form a level canal bottom back upstream from the upstream invert.
Gunite around end of CMPA's
6" Water Depth unknown
℄ Woodland Drive
6" SS Depth unknown
Flowline of downstream conc. lined canal
Dual(2) 36"x22" CMPA's Smooth bore 14Ga. R=+0.12%
Flowline of upstream conc. lined canal
Inv. 98.93 (Match exist.)
Inv. 98.99 (Exist. 24" conc. inv. 98.98)
PROFILE
Scale: Horiz. 1"=20' Vert. 1"=2'
CITY JOB # 77-13
Plan & Profile ~ Leonard St. & Woodland Dr.
TALENT IRRIGATION DISTRICT
ASHLAND CANAL CROSSINGS
& OVERLAND PIPELINE
MARQUESS & ASSOCIATES, INC.
CONSULTING ENGINEERS
Date 12-29-77
Drawn By G.V.D
Checked By C.R.
Job No. 7-7324
Sheet No. 13 of 14 Sheets
PLATE 4-SINGLE PLAN AND CROSS SECTION-FULL LINE

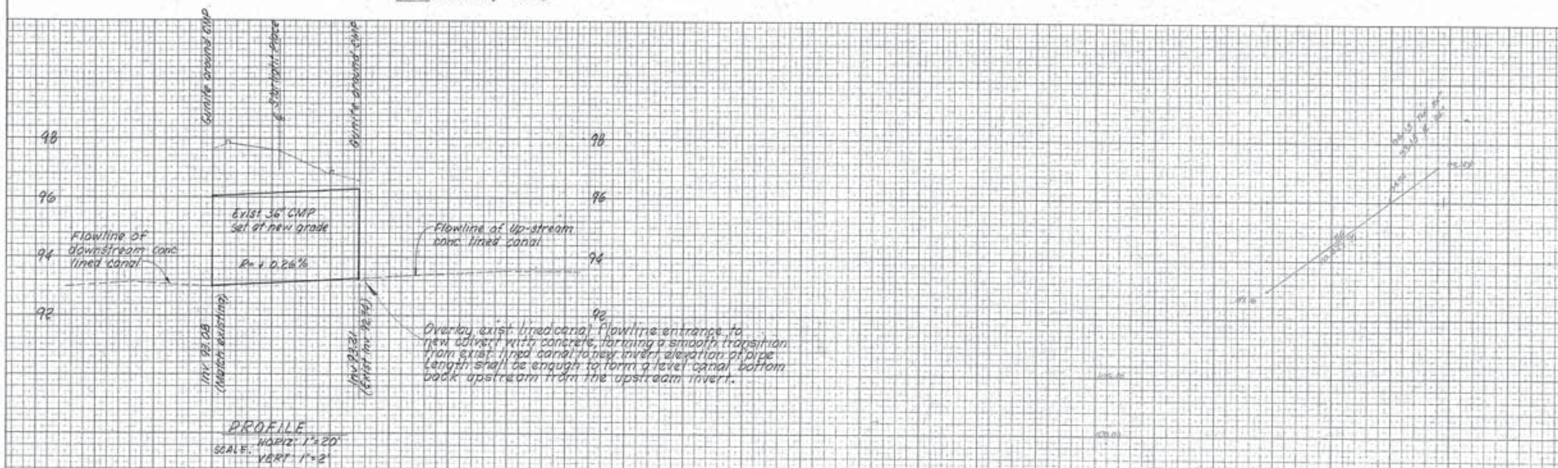


T.I.D CROSSING AT STARLIGHT PLACE

T.B.M. T.K. in lead top curb @ Pump house
ELEV. (assumed) 100.00



ELEVATION
GUNITED BANK AT EACH END OF STARLIGHT PLACE CANAL CROSSING
Scale: 1/2"= 1'-0"



PROFILE
SCALE: HORIZ. 1"= 20'
VERT. 1"= 2'

CITY JOB # 77-13

Rev.	Description	Date	By
	Plan & Profile ~ Starlight Place Crossing	Date: 12-29-77	

TALENT IRRIGATION DISTRICT
ASHLAND CANAL CROSSINGS
& OVERLAND PIPELINE

MARQUESS & ASSOCIATES, INC.
CONSULTING ENGINEERS
1120 EAST JACKSON STREET – P.O. BOX 490
MEDFORD, OREGON 772-7115

Drawn By: C.R.
Checked By: L.R.
Job No.: 7-1324
Sheet No.: 14 of 14 Sheets

REGISTERED PROFESSIONAL ENGINEER 7608 OREGON Joseph Mills

PLATE 4-SINGLE PLAN AND CROSS SECTION FULL LINE

FINAL SURVEY		BY	DATE
	SURVEYED		
	PLOTTED		
NOTE BOOK	TEMPLATE		
	AREAS		
NO.	AREAS CHECKED		

ORIGINAL SURVEY		BY	DATE
	SURVEYED		
	PLOTTED		
NOTE BOOK	TEMPLATE		
	AREAS		
NO.	AREAS CHECKED		

ATTACHMENT B

Observation Photos

KELLER associates

Get there!

217002/b/TID/17-253

TID Pipeline Coupon Collected on Glenview Drive (Near Access Road to Concrete Pit Site)

TID Pipeline Coupon Collected Near WTP Entrance Gate (Granite Street)

TID Pipeline Coupon Collected Near WTP Entrance Gate (Granite Street)

Pipe Joint Near Existing WTP

Tailrace Exit

Tailrace Exit

Tailrace Exit

Tailrace Exit

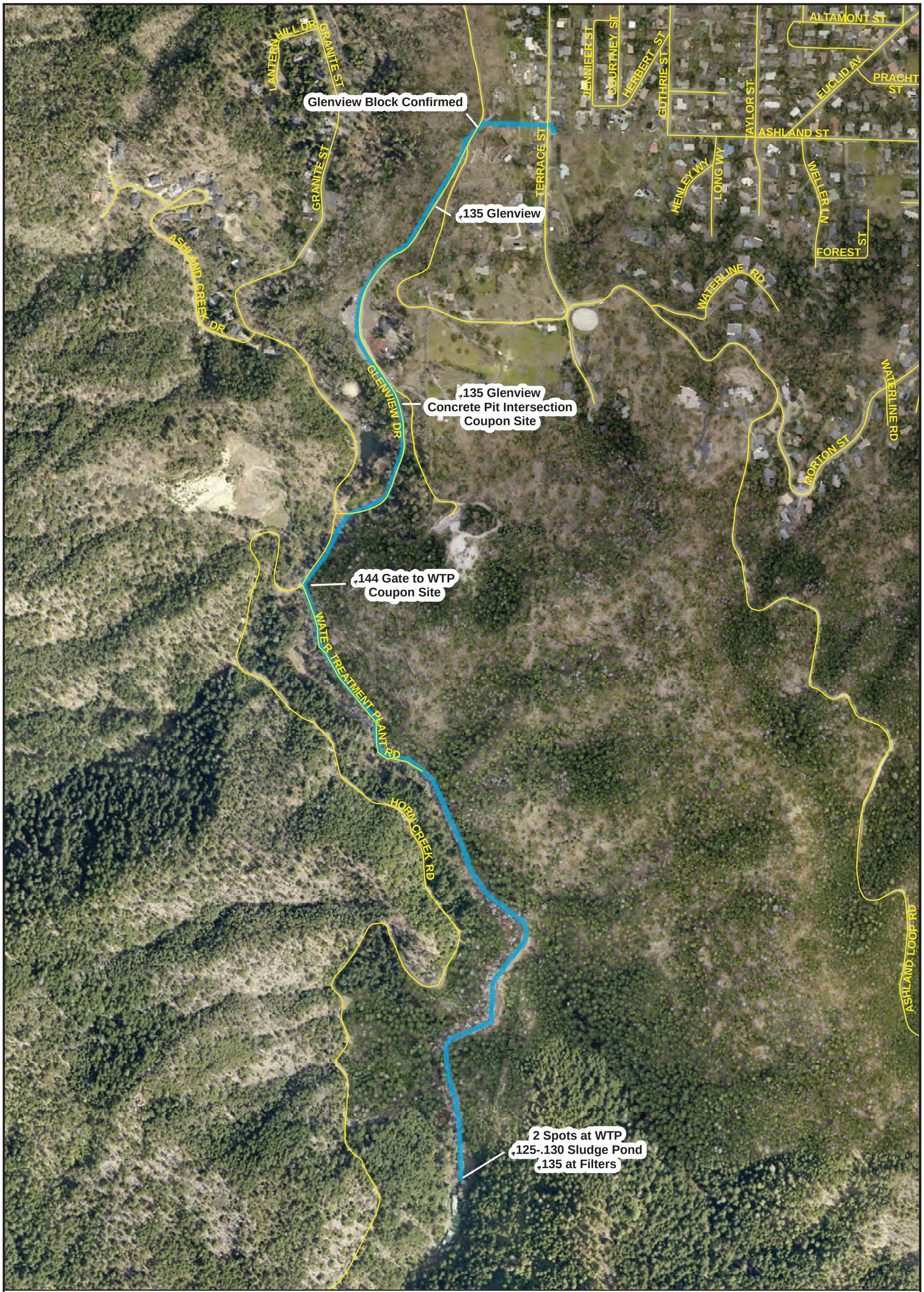
ATTACHMENT C

City Measured Thickness Locations

KELLER associates

Get there!

217002/b/TID/17-253



TID Pipeline Inspection Points

Legend

- Streets
- 24" TID

0 250 500 1,000 Feet

1 inch = 500 feet

N

ATTACHMENT D

PSI Test Results

217002/b/TID/17-253

6032 N. Cutter Circle, Suite 480
Portland, OR 97217
phone: 503.289.1778
fax: 503.289.1918
intertek.com/building
psiusa.com

REPORT OF UT THICKNESS INSPECTION

TESTED FOR: Kellar & Associates	**PSI PROJECT NO.:** 06891070-1
PROJECT: City of Ashland Public Work	**DATE:** 04/05/2017

Client Order Number: N/A	Lab Number: On Site	Location: Ashland, Oregon
Test Method Standard:	Acceptance Standard: Customer Info	Scanning Method: Contact

UT UNIT

- ____ A-Scan
- X Direct Readout
- ___ A-Scan and Direct Readout

Manufacturer: Danatronics
Model: ECH-09
Serial No.: 05050196

CALIBRATION BLOCK

ID Number: ____
Size: .1"-.5"
Material Type: CS

SEARCH UNIT

- ____ Single Element
- X Dual Element

Size: .37"
Frequency: 5 mhz
Serial No: DK 537

Measurements (inches)

A	.135				
B	.125				
C	.135				
D	.132				
E					
F					
G					
H					
J					
K					
L					
M					
N					
O					
P					
Q					
R					

(Interior) Location Diagram, Photo or Sketch
See remarks & other photos

Technician: Steve Martin Level: II

Technician: Steve Martin Level: II

REMARKS: Thickness Locations: 1. 800 as shown on map on trial
2. Sludge pond
3. Filters
4. Boulders

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psiusa.com

May,11 2017

Project 06891070
Report 06891070-2
***Revised 6/30/17**

Mr. David Kinzer
Keller Associates, Inc
131 SW 5th Ave, suite A
Meridian, Id 83642

Dear Mr. Kinzer:

RE: Charpy Impact Test performed on two (2) steel pipe samples, submitted on 5/9/17, pursuant to your request.

Item: 2 Test Samples from a pipe **PROJECT:** City of Ashland Public Work

Test method: ASTM A370

Charpy Impact Test

*Entrance to concrete pit .135”
V-Notch, 2.5mm x 10mm at +70°F, ASTM A-370, Type A

Test Number	Impact Strength, ft. lbs.	Lateral Expansion, Mils	Percent Shear
1.	17	54	100
2.	15	56	100
3.	16	54	100
Average	16	55	100

Charpy Impact Test

WTP entry gate @ granite st. .144”
V-Notch, 2.5mm x 10mm at +70°F, ASTM A-370, Type A

Test Number	Impact Strength, ft. lbs.	Lateral Expansion, Mils	Percent Shear
1.	15	49	100
2.	16	54	100
3.	17	60	100
Average	16	54	100

We appreciate the opportunity to be of service to you. Should you have any questions regarding the contents of the report or if we may be of further assistance in any way, please contact us at (503) 289-1778, e-mail steve.moore@psiusa.com.

Sincerely,

Steve Moore
Mechanical Supervisor,
Mechanical Testing & NDE Services

sm:db

s:\groups\689\Projects\2017\06891070\0511-2.doc

ATTACHMENT E

Power Loss Calculations

KELLER associates

Get there!

217002/b/TID/17-253

Ashland

WTP and Power House Flows & Estimated Power Loss from a Penstock Connection

Year	MONTH	DAYS	Monthly Totals: GENERATOR INFLUENT MG	Monthly Totals: PLANT INFLUENT MG	Monthly Totals: ASH CREEK BY-PASS MG	Monthly Daily Averages: GENERATOR INFLUENT MG	Monthly Daily Averages: GPM	Monthly Daily Averages: PLANT INFLUENT MG	Monthly Daily Averages: ASH CREEK BY-PASS MG	Flow (MGD) WTP	Flow (gpm)	Head ft	Head psi	Kw*Hr	Cost
2016	JAN	31	714.4	54.1	660.3	23.0	16,004	1.7	21.3	1.7	1,212	330.5	143.1	44,943	$ 3,600
	FEB	29	729.3	50.0	679.3	25.1	17,464	1.7	23.4	1.7	1,198	316.2	136.9	39,757	$ 3,200
	MAR	31	1099.7	55.2	1044.5	35.5	24,635	1.8	33.7	1.8	1,235	230.9	100.0	32,008	$ 2,600
	APR	30	638.0	70.1	567.9	21.3	14,769	2.3	18.9	2.3	1,623	341.7	147.9	60,224	$ 4,900
	MAY	31	556.9	98.2	458.7	18.0	12,475	3.2	14.8	3.2	2,199	360.6	156.1	88,974	$ 7,200
	JUN	30	425.0	132.0	293.0	14.2	9,838	4.4	9.8	4.4	3,054	378.9	164.0	125,642	$ 10,100
	JUL	31	203.7	144.3	59.4	6.6	4,563	4.7	1.9	4.7	3,233	404.0	174.9	146,559	$ 11,800
	AUG	31	179.1	160.2	18.9	5.8	4,012	5.2	0.6	5.2	3,589	405.7	175.6	163,356	$ 13,100
	SEP	30	142.9	126.1	16.8	4.8	3,308	4.2	0.6	4.2	2,920	407.6	176.4	129,207	$ 10,400
	OCT	31	278.5	77.6	200.9	9.0	6,239	2.5	6.5	2.5	1,739	397.7	172.2	77,590	$ 6,300
	NOV	30	273.4	58.4	214.9	9.1	6,329	1.9	7.2	1.9	1,353	397.3	172.0	58,352	$ 4,700
	DEC	31	442.2	58.0	384.2	14.3	9,906	1.9	12.4	1.9	1,300	378.4	163.8	55,203	$ 4,500
2015	JAN	31	125.0	58.3	66.7	4.0	2,800	1.9	2.2	1.9	1,306	408.8	177.0	59,894	$ 4,800
	FEB	28	84.0	52.7	31.3	3.0	2,083	1.9	1.1	1.9	1,307	410.1	177.5	54,332	$ 4,400
	MAR	31	93.0	59.5	33.5	3.0	2,083	1.9	1.1	1.9	1,333	410.1	177.5	61,331	$ 5,000
	APR	30	110.0	67.9	42.1	3.7	2,546	2.3	1.4	2.3	1,572	409.3	177.2	69,845	$ 5,600
	MAY	31	132.5	97.6	34.9	4.3	2,968	3.1	1.1	3.1	2,186	408.4	176.8	100,157	$ 8,100
	JUN	30	160.2	129.6	30.6	5.3	3,708	4.3	1.0	4.3	3,000	406.5	176.0	132,444	$ 10,600
	JUL	31	149.6	125.1	24.4	4.8	3,351	4.0	0.8	4.0	2,803	407.5	176.4	128,149	$ 10,300
	AUG	31	116.0	104.8	11.3	3.7	2,599	3.4	0.4	3.4	2,347	409.2	177.1	107,734	$ 8,700
	SEP	30	113.0	101.8	11.3	3.8	2,616	3.4	0.4	3.4	2,356	409.1	177.1	104,650	$ 8,400
	OCT	31	113.4	89.0	24.5	3.7	2,540	2.9	0.8	2.9	1,993	409.3	177.2	91,511	$ 7,400
	NOV	30	127.2	58.6	68.6	4.2	2,944	2.0	2.3	2.0	1,357	408.4	176.8	60,176	$ 4,900
	DEC	31	367.6	54.5	313.0	11.9	8,235	1.8	10.1	1.8	1,221	388.2	168.0	53,187	$ 4,300
2014	JAN	31	102.8	56.0	46.8	3.3	2,303	1.8	1.5	1.8	1,254	409.7	177.4	57,669	$ 4,700
	FEB	28	111.6	51.1	60.5	4.0	2,768	1.8	2.2	1.8	1,266	408.8	177.0	52,454	$ 4,200
	MAR	31	276.8	60.3	216.5	8.9	6,201	1.9	7.0	1.9	1,351	397.9	172.2	60,331	$ 4,900
	APR	30	218.2	72.0	146.0	7.3	5,051	2.4	4.9	2.4	1,666	402.3	174.2	72,757	$ 5,900
	MAY	31	198.3	102.8	96.2	6.4	4,442	3.3	3.1	3.3	2,303	404.4	175.1	104,481	$ 8,400
	JUN	30	132.3	124.2	8.1	4.4	3,063	4.1	0.3	4.1	2,874	408.2	176.7	127,362	$ 10,200
	JUL	31	95.3	144.8	-49.6	3.1	2,135	4.7	-1.6	3.1	2,133	410.0	177.5	98,119	$ 7,900
	AUG	31	80.2	136.7	-56.5	2.6	1,797	4.4	-1.8	2.6	1,796	410.6	177.7	82,748	$ 6,700
	SEP	30	71.4	107.1	-35.7	2.4	1,653	3.6	-1.2	2.4	1,653	410.8	177.8	73,714	$ 5,900
	OCT	31	106.4	88.4	18.0	3.4	2,384	2.9	0.6	2.9	1,980	409.6	177.3	90,992	$ 7,300
	NOV	30	153.4	58.6	94.8	5.1	3,551	2.0	3.2	2.0	1,356	407.0	176.2	59,928	$ 4,800
	DEC	31	212.8	54.4	158.5	6.9	4,767	1.8	5.1	1.8	1,218	403.3	174.6	55,114	$ 4,500
2013	JAN	31	278.5	57.3	221.2	9.0	6,239	1.8	7.1	1.8	1,283	397.7	172.2	57,248	$ 4,600
	FEB	28	289.0	48.2	240.8	10.3	7,168	1.7	8.6	1.7	1,196	393.6	170.4	47,705	$ 3,900
	MAR	31	278.5	55.2	223.3	9.0	6,239	1.8	7.2	1.8	1,236	397.7	172.2	55,139	$ 4,500
	APR	30	360.0	70.5	289.5	12.0	8,333	2.4	9.7	2.4	1,632	387.6	167.8	68,692	$ 5,500
	MAY	31	372.0	114.6	257.4	12.0	8,333	3.7	8.3	3.7	2,568	387.6	167.8	111,684	$ 9,000
	JUN	30	262.5	140.8	121.7	8.8	6,076	4.7	4.1	4.7	3,259	398.4	172.5	140,967	$ 11,300
	JUL	31	203.0	176.5	26.5	6.5	4,547	5.7	0.9	5.7	3,954	404.0	174.9	179,247	$ 14,400
	AUG	31	161.7	164.4	23.4	5.2	3,622	5.3	0.8	5.3	3,683	406.8	176.1	168,067	$ 13,500
	SEP	30	112.8	124.6	28.5	3.8	2,611	4.2	1.0	4.2	2,883	409.2	177.1	128,088	$ 10,300
	OCT	31	154.0	114.4	39.7	5.0	3,450	3.7	1.3	3.7	2,562	407.2	176.3	117,037	$ 9,400
	NOV	30	49.0	97.6	27.5	1.6	1,134	3.3	0.9	3.3	2,259	411.4	178.1	100,904	$ 8,100
	DEC	31	119.3	67.2	52.1	3.8	2,672	2.2	1.7	2.2	1,506	409.0	177.1	69,123	$ 5,600

$HP = (h_a * Q * SG) / 3956$	
h_a =	added head in feet
Q =	flow in gpm
SG =	Specific Gravity (water =1)

Conversion Factors

HP to KW - multiply by:

0.7457

Assumptions

Turbine Efficiency	80%	
KW-hr	$ 0.08	
% Pumping @ Concrete High	15%	
Reeder Elevation	2,876	ft
Power Plant Elevation	2,464	ft
Penstock Pipe:		
Assume C=	120	
Assume L =	4,750	ft
Diameter =	24	inches

Typical Monthly Production Loss at 3 and 4 MGD

														Month	Annual	20 Year
Typical Month @ 3 MGD	30				8.1	5,595			3	2,083	400.3	173.3	90,555	$ 7,300	$ 87,600	$ 1,752,000
Typical Month @ 4 MGD	30				8.1	5,595			4	2,778	400.3	173.3	120,740	$ 9,700	$ 116,400	$ 2,328,000
Typical Month @ 4 MGD With 54% of the flow from Penstock	30				6.7	4,653			4	2,778	403.7	174.8	66,205	$ 5,300	$ 63,600	$ 1,272,000

ATTACHMENT F

FERC Technical Memorandum

KELLER
associates
Get there!

217002/b/TID/17-253

Get there!
KELLER associates

Technical Memorandum

REGISTERED PROFESSIONAL ENGINEER 65179 OREGON 11/14/2000 BRYAN D. BLACK
EXPIRATION DATE: 12/31/17

TO: Kevin Caldwell, Project Manager
City of Ashland

FROM: Bryan Black, PE
REVIEWED: James Bledsoe, PE

DATE: April 19, 2017

SUBJECT: New Water Treatment Plant – FERC Coordination

The City of Ashland is in the preliminary engineering development phase of a new water treatment plant (WTP). This technical memorandum describes one alternative being considered for raw water supply to the new WTP along with critical points of discussion with the Federal Energy Regulatory Commission (FERC).

The existing water supply system is shown in **Figure 1**, along with potential new facilities. With this alternative, raw water would be obtained by connecting to the existing penstock upstream from the powerhouse. Connecting upstream from the powerhouse provides greater water pressure and may allow raw water to be supplied through the new WTP without additional pumping. This alternative also allows the City to repurpose the existing Talent Irrigation District (TID) raw water supply line, conveying water from the penstock upstream of the powerhouse to the new WTP. We can envision circumstances when both WTPs would be operational.

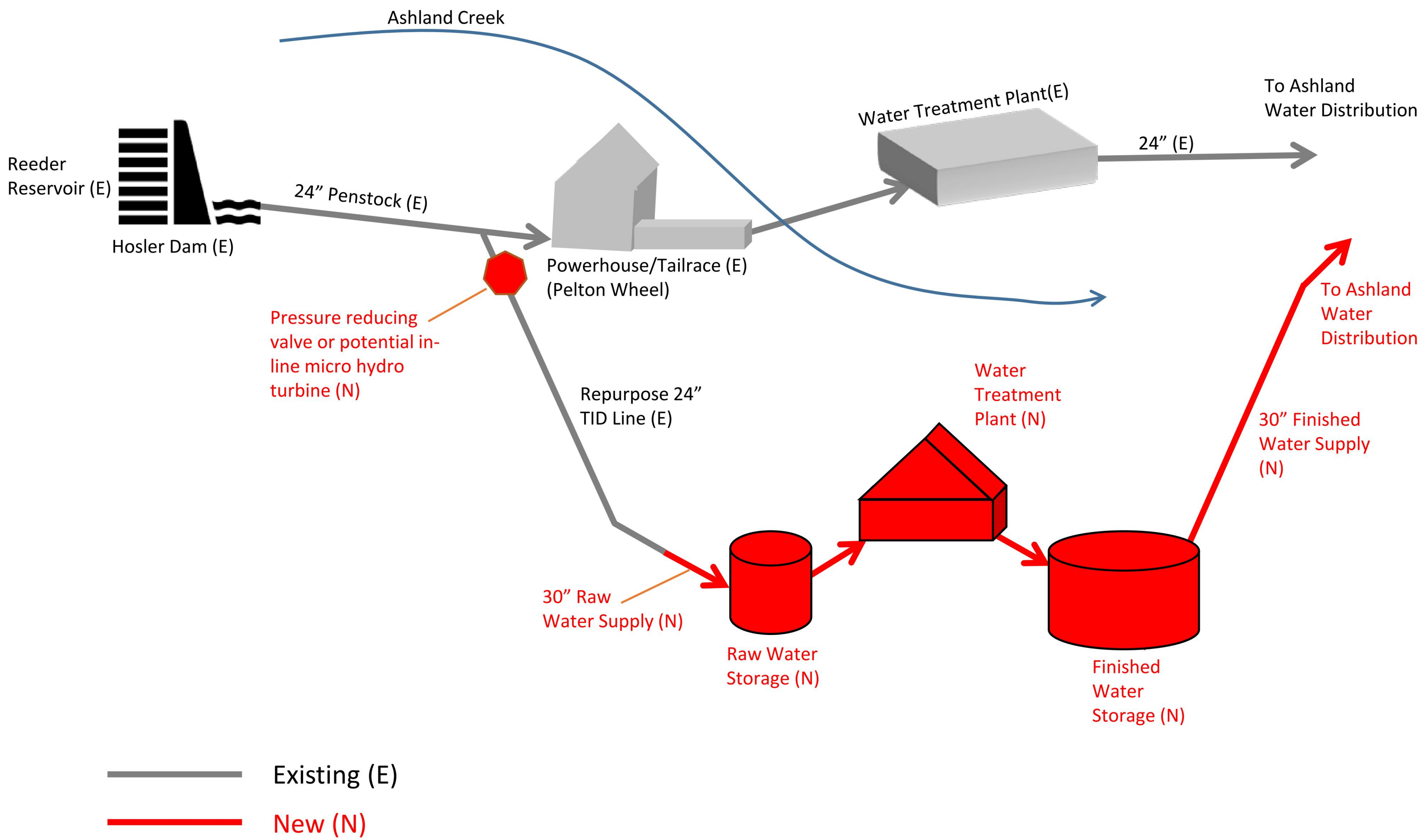
Some pressure and flow control will likely be required at the location shown for "potential in-line micro-hydro turbine." This could be accomplished either with the turbine or a valve.

As we begin planning for this project, the questions we have for FERC include:

1. Is there any regulatory fatal flaw associated with connecting to the existing penstock to supply raw water to the new WTP?
2. If we installed a micro-hydro turbine at the location shown, would this project be applicable for an "in-conduit exemption"? And does FERC envision any significant additional regulatory requirements for this?

Existing System Background

The existing penstock is the sole source of raw water supply from Reeder Reservoir to the existing WTP. The powerhouse was built in the early 20th century. The penstock is approximately 5,000 feet in length and 24 inches in diameter; it was originally installed in 1928, then replaced with 24-inch ductile iron pipe in 2006.



Get there! KELLER associates	CITY OF ASHLAND WTP & RESERVOIR PROJECT	Existing Water Supply and Potential New Facilities	PROJECT NO: 217002 FIGURE NO: 1