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Executive Summary

Town of Buffalo
Water Storage Tank, Level II Project

Prepared For:

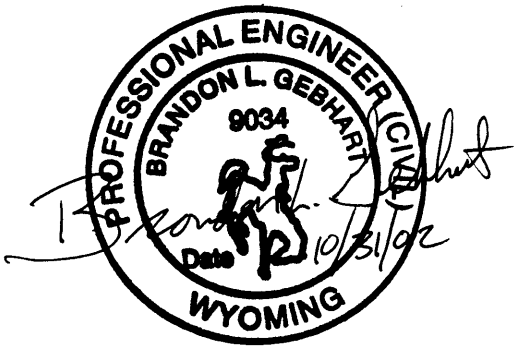
Wyoming Water Development Commission
Cheyenne, Wyoming

Prepared by:

States West Water Resources Corporation
Cheyenne, Wyoming

In association with:

WEST, Inc.
Cheyenne, Wyoming



October 2002

I. INTRODUCTION

This report summarizes the findings of a Level II water storage tank study for the Town of Buffalo. This study develops a preferred alternative for expanding the Town's current water storage capacity. The study was conducted for the Town of Buffalo under direction and funding of the Wyoming Water Development Commission (WWDC) by States West Water Resources Corporation in association with Western Ecosystems Technologies, Inc.

A. LEVEL II INVESTIGATION

In recent past years the Town of Buffalo has experienced difficulty in meeting peak daily demands without depleting the existing storage. The Town has also experienced difficulty in maintaining pressures and adequate fire flows in the north portions of town. New development in the north portion of Town has been served only with pump stations without adequate fire protection. The logical growth of the Town is in this area, and the need for additional storage has become evident.

To correct the storage deficiencies, a potential storage tank site was identified west of town. A land owner is willing to sell a parcel of land to the Town that has many benefits for the construction of a water storage tank. This parcel of land provides a site that meets elevation requirements and provides suitable terrain for the construction of a buried concrete tank. It was proposed to construct a buried concrete tank on this parcel of land.

Computer modeling of the Town's water distribution system was performed to determine the current and future needs of the Town. Current day demands were calculated from information form the Town's existing water storage tanks and water treatment plant. A previously developed model was updated to represent the actual operation of the distribution system. Population and demands were projected for a 20 year design period. These demands were imposed on the model to determine the future water storage needs of the Town.

The proposed tank was sized to provide adequate water storage for the 20 year design period. At the end of the 20 year design period, the total storage requirements were determined to be 3.75 million gallons. This storage was adequate to meet the emergency, peaking, and fire protection storage, required at the end of the 20 year design period. The additional storage recommended would be 2.5 million gallons.

Transmission mains were evaluated to supply the proposed tank and distribute stored water to needing areas of the Town and to service future development west and north of town.

II. CONCEPTUAL DESIGN

TANK

The proposed construction of a buried concrete tank was recommended. The concrete tank has an extremely long life with minimal maintenance requirements, and the capability to temper the water temperatures. A 2.5 million gallon tank would be required to meet the storage requirements at the end of the 20 year design period. A tank site, as shown on Figure I-1 – Proposed System, would allow a maximum water surface elevation of 5,015 feet, and the 25 feet tank height sets the tank bottom at an elevation of 4,995 feet.

The inlet and outlet piping for the proposed tank, as shown on Figure II-1, Proposed Tank Plan, is intended to improve circulation of water in the tank. The inlet piping discharges into the tank near the middle of the tank height. On the opposite side, three outlet pipes supply the transmission mains with water taken from the bottom of the tank. This eliminates possible stagnation caused by having one inflow and outflow line. This also allows the town to loop the transmission mains to increase serviceability. A by-pass connection would also be constructed between the 18-inch and 16-inch transmission mains to allow the tank to be taken out of service for maintenance or repair.

PIPING

The recommended tank location requires two water transmission mains. An 18-inch main west of town and a 16-inch main from the tank to the distribution system in the north part of town would supply water to and from the tank. Approximately 11,500 lineal feet of 18-inch pipe, as shown Figure II-2, Plan and Profile of 18" Main, and approximately 8,900 lineal feet of 16-inch pipe, as shown on Figure II-3, Plan and Profile of 16" Main, would be required to connect the tank to the Town's existing system. Approximately 1,600 feet of 10-inch piping would be required to service the North Ridge and Eagle Summit subdivisions.

Two road bores were anticipated for the construction of the supply piping. One road bore would be for the 18-inch transmission main crossing US Highway 16. The second road bore would be for the 10-inch Eagle Summit subdivision supply line crossing French Creek Road.

PRESSURE REDUCING STATIONS

The construction of three pressure reducing (PRV) stations, and converting an existing pump station into a pressure reducing station would be required for the proposed project. A typical pressure reducing station is shown on Figure I-2, PRV Station Typical Drawing. The components of the stations are indicated on the drawing.

Two pressure reducing stations are proposed on the 16 – inch transmission main and one station is proposed on the 18 – inch transmission main. The pump station currently servicing the North Ridge Subdivision would be converted to a pressure reducing station

and the existing pump station serving the Eagle Summit subdivision would be eliminated entirely.

FLOW METER

Monitoring flows to the proposed tank would provide a way for the Town to track its water usage. Installing a flow meter on the 18-inch transmission would allow the Town to monitor flows to the proposed tank. Installation of this flow meter near PRV Station #3 would allow it to be connected to the SCADA system to be installed in that station.

SCADA

The town currently uses a Supervisory Control and Data Acquisition (SCADA) system to monitor and control certain components in the distribution system. Incorporation of certain elements in the proposed project would be beneficial to the Town. Four components of the proposed system of greatest benefit are the proposed tank, PRV Station #2, PRV Station #3 and the proposed flow meter. The SCADA system of the proposed system would be compatible with the Town's existing SCADA system.

The proposed SCADA system would allow the town to remotely monitor and adjust the settings of these system components.

III. COST ESTIMATES

Cost estimates to construct the proposed facilities have been developed using the WWDC standard format. A summary of costs for each component of the recommended improvements is outlined below:

Cost of Project Components					
Item No.	Item	Unit	Est. Quantity	Unit Price	Total
1	Mobilization	LS	1	$300,000.00	$300,000.00
2	10" PVC Pipe and Fittings	LF	1600	$33.60	$53,760.00
3	16' PVC Pipe and Fittings	LF	8900	$47.25	$420,525.00
4	18" PVC Pipe and Fittings	LF	11500	$52.50	$603,750.00
5	Concrete Tank Complete	LS	1	$1,589,443.00	$1,589,443.00
6	PRV Station #1	LS	1	$35,031.50	$35,031.50
7	PRV Station #2	LS	1	$42,106.50	$42,106.50
8	PRV Station #3	LS	1	$34,260.00	$34,260.00
9	Pump Station to PRV Sta.	LS	1	$7,527.50	$7,527.50
10	18" Flow Meter	LS	1	$25,000.00	$25,000.00
11	Road Bores	LF	320	$275.00	$88,000.00

Construction Cost Subtotal #1	$3,199,403.50
Engineering Costs = CCS #1 x 10%	$319,940.35
Subtotal #2	$3,519,343.85
Contingency = Subtotal #2 x 15%	$527,901.58
Construction Cost Total	$4,047,245.43
Preparation of Final Design and Specifications	$242,834.73
Permitting and Mitigation	$2,000.00
Legal Fees	$2,000.00
Acquisition of Access and Rights of Way	$10,000.00
Project Cost Total	$4,304,080.15
Use	$4,305,000.00

IV. ENVIRONMENTAL REPORT

To satisfy funding requirements, an environmental report is required. Work is currently underway to satisfy these requirements. Gregg Johnson of Western Ecosystems Technologies, Inc. is currently preparing the environmental report.

V. ECONOMIC ANALYSIS

This project qualifies as a new construction project with the WWDC. New construction projects are presently funded with 50% grant and 50% loan. An SRF loan with an interest rate of 2.5% for a 20 year period is recommended to fund the 50% of the construction costs. With these funding conditions, the annual payment for the Town of Buffalo would be as follows:

Total Project Estimated Cost	$ 4,305,000
50% Loan Amount	$ 2,152,500
Annual Payment @ 2.5% for 20 years	$ 138,076.69

PROPOSED TANK SITE

PROPOSED 16" PVC PIPE

PROPOSED PRV STATION #1

PROPOSED 10"

EXISTING PUMP STATION TO BE REMOVED

CONNECT TO EXISTING 12" X 12" TEE

PROPOSED 16" TO 18" CONNECTION

PROPOSED PRV STATION #2

PROPOSED 10"

CHANGE EXISTING PUMP STATION TO PRV STATION

PROPOSED 18" PVC PIPE

PROPOSED PRV STATION #3

CONNECT TO EXISTING 18"

BUFFALO WATER TREATMENT PLANT

Fairground

Gravel Pit

Drive-in Theater

Golf Course

Sewage Disposal Pond

BUFFALO WASTEWATER TREATMENT PLANT

Trailer Park

Radio Tower

Willow Grove Cemetery

Buckingham Subdivision

Old Military Reservation Boundary

Moeller Ditch

Pipeline

Johnson County Cross Ditch

Clear Creek

Crown Road

T51N R82W
T50N R82W

SCALE
2000' 0 2000' 4000'

N

REV	DESCRIPTION OF REVISION	BY	DATE
1	PRELIMINARY DESIGN	BLG	9/02

STATES WEST WATER RESOURCES CORPORATION
1904 E. 15th STREET
CHEYENNE, WYOMING 82001
(307) 634-7848
FAX: (307) 634-7851

WARNING
IF THIS BAR DOES NOT MEASURE 1/2" THEN DRAWING IS NOT TO SCALE

DESIGNED	BLG
DRAWN	BLG
CHECKED	VEA
PEER REVIEWED	VEA
PROJECT MANAGER	BLG
DATE	9/02

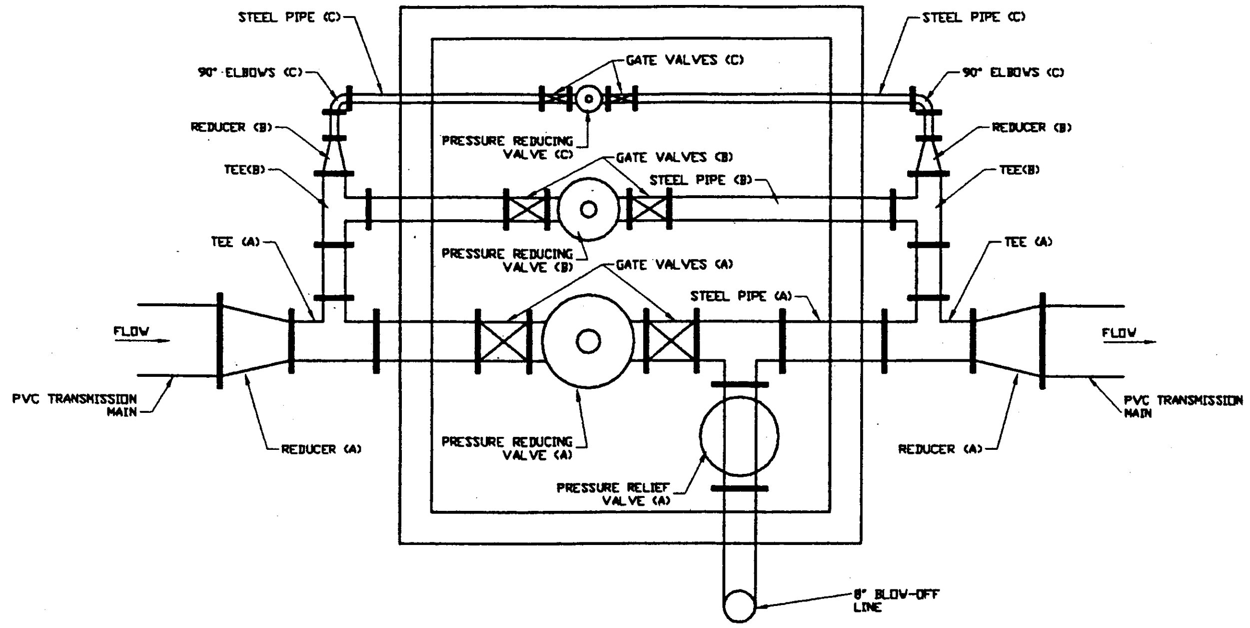
BUFFALO TANK, LEVEL II

PROPOSED PROJECT

REVISION 1
PROJECT 409
DRAWING I-1

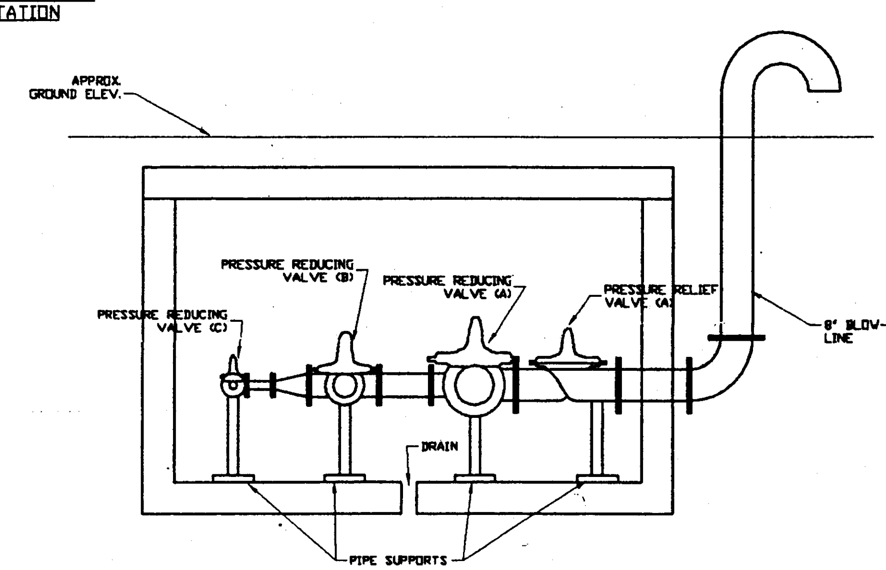
FILE NAME: BUFFRASER | OPER: BLG | PROJ # 409 | LOC: BUFFALO, WY
SCALE: 1000 | DATE: 9/02 | TASK # 118 | PROJ: LEVEL II

SEND TO: BRANDON L. OEBHART, P.E.
PHONE (307) 634-7848



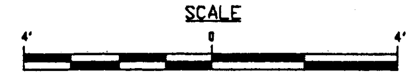
TYPICAL PLAN VIEW
PRV STATION

	PRV VAULT #1		PRV VAULT #2		PRV VAULT #3		PUMP STATION TO PRV VAULT	
	QUANT.	SIZE	QUANT.	SIZE	QUANT.	SIZE	QUANT.	SIZE
PRESSURE REDUCING VALVE (A)	1	10"	1	10"	1	12"	1	6"
PRESSURE REDUCING VALVE (B)	1	6"	1	6"	0	N/A	0	N/A
PRESSURE REDUCING VALVE (C)	1	2"	0	N/A	0	N/A	0	N/A
PRESSURE RELIEF VALVE (A)	1	8"	1	8"	0	N/A	0	N/A
GATE VALVES (A)	2	10"	2	10"	2	12"	2	6"
GATE VALVES (B)	2	6"	2	6"	0	N/A	0	N/A
GATE VALVES (C)	2	2"	0	N/A	0	N/A	0	N/A
STEEL PIPE (A)	5 L.F.	10"	5 L.F.	10"	5 L.F.	10"	5 L.F.	6"
STEEL PIPE (B)	10 L.F.	6"	10 L.F.	6"	0	N/A	0	N/A
STEEL PIPE (C)	11 L.F.	2"	0	N/A	0	N/A	0	N/A
TEE'S (A)	2	10" X 10" X 6"	2	10" X 10" X 6"	0	N/A	0	N/A
TEE'S (B)	2	6" X 6" X 6"	0	N/A	0	N/A	0	N/A
REDUCERS (A)	2	16" X 10"	2	16" X 10"	2	18" X 12"	2	N/A
REDUCERS (B)	2	6" X 2"	0	N/A	0	N/A	0	N/A
90° ELBOWS (C)	2	2"	2	6"	0	N/A	0	N/A
VAULT	1	8.5' X 10'	1	6.5' X 10'	1	4' X 5.5'	1	N/A



TYPICAL PLAN VIEW
PRV STATION

SCALE



REV	DESCRIPTION OF REVISION	BY	DATE
1	PRELIMINARY DESIGN	BLG	9/02

STATES WEST WATER RESOURCES CORPORATION
1904 E. 15th STREET
CHEYENNE, WYOMING 82001
(307) 634-7848
FAX: (307) 634-7851

WARNING
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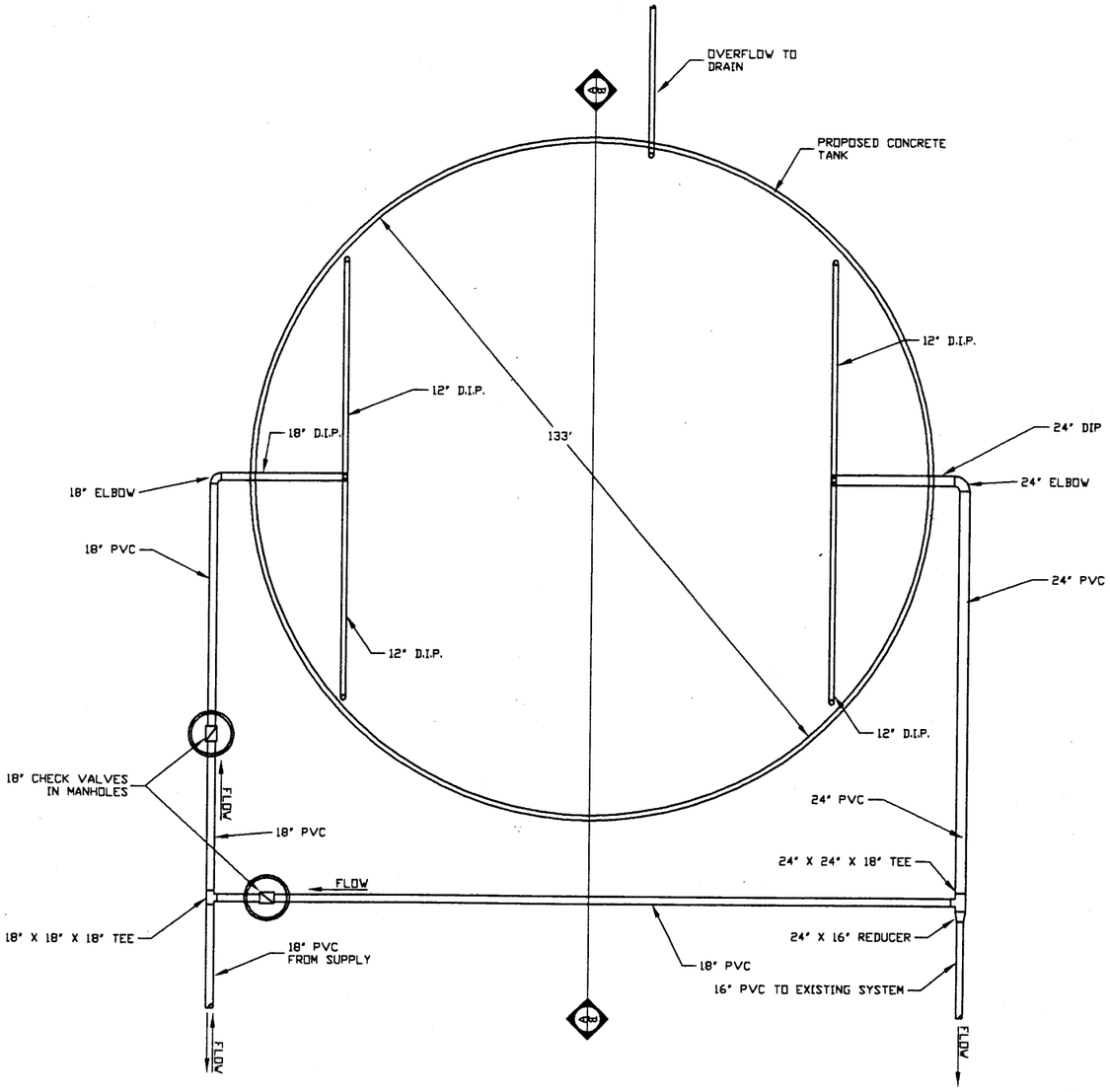
DESIGNED BLG
DRAWN BLG
CHECKED VEA
PEER REVIEWED VEA
PROJECT MANAGER BLG
DATE 9/02

BUFFALO TANK, LEVEL II

PRV STATION
TYPICAL DRAWING

REVISION 1
PROJECT 408
DRAWING I-2

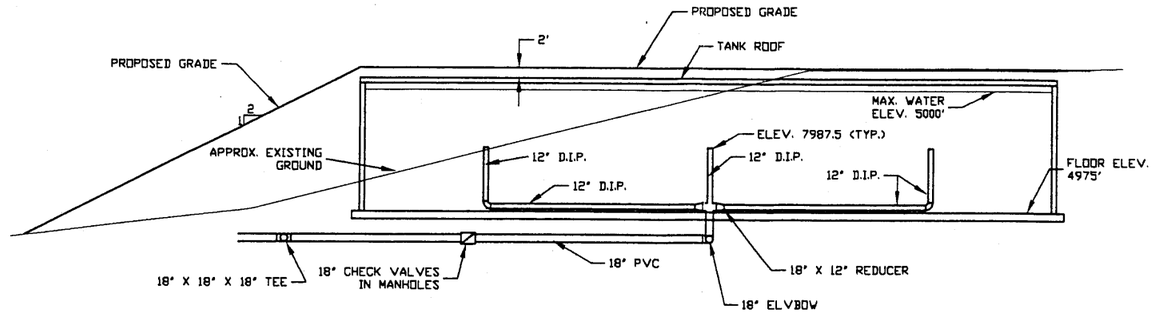
FILE NAME: PRVDETAIL | OPER. BLG | PROJ. # 408 | LOC. BUFFALO, WY | SEND TO BRANDON L. GEBHART, P.E.
SCALE: 1" = 48 | DATE 9/02 | TASK # 145 | PROJ. BUFFALO LEVEL II | PHONE (307) 634-7848



PROPOSED TANK PLAN

SCALE

30' 0 30'



SECTION A-A

SCALE

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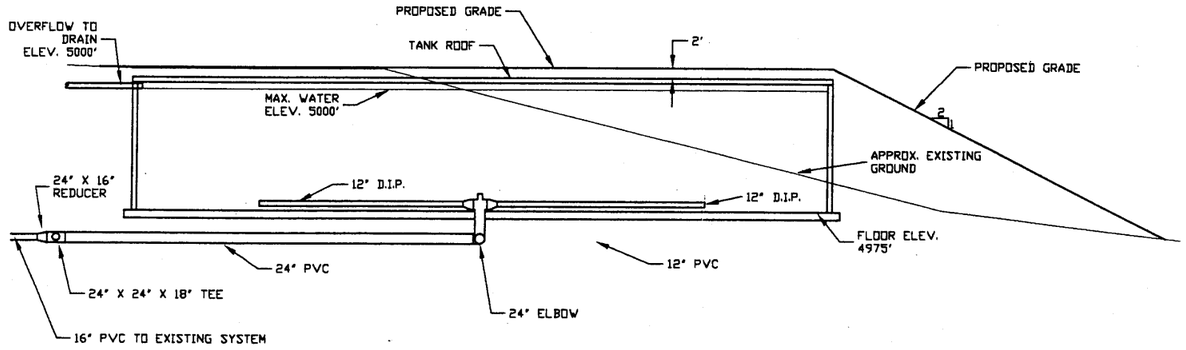

SECTION B-B

SCALE

30' 0 30'

1	PRELIMINARY DESIGN	BLG	9/02
REV	DESCRIPTION OF REVISION	BY	DATE

FILE NAME: TANK
SCALE: 1" = 30'
OPER. BLG
DATE 9/02
PROJ. # 409
TASK # 116
LOC. BUFFALO, WY
PROJ. LEVEL II
SEND TO: BRANDON L. GERHART, P.E.
PHONE (307) 634-7848

STATES WEST WATER RESOURCES CORPORATION
1904 E. 15th STREET
CHEYENNE, WYOMING 82001
(307) 634-7848
FAX: (307) 634-7851

WARNING
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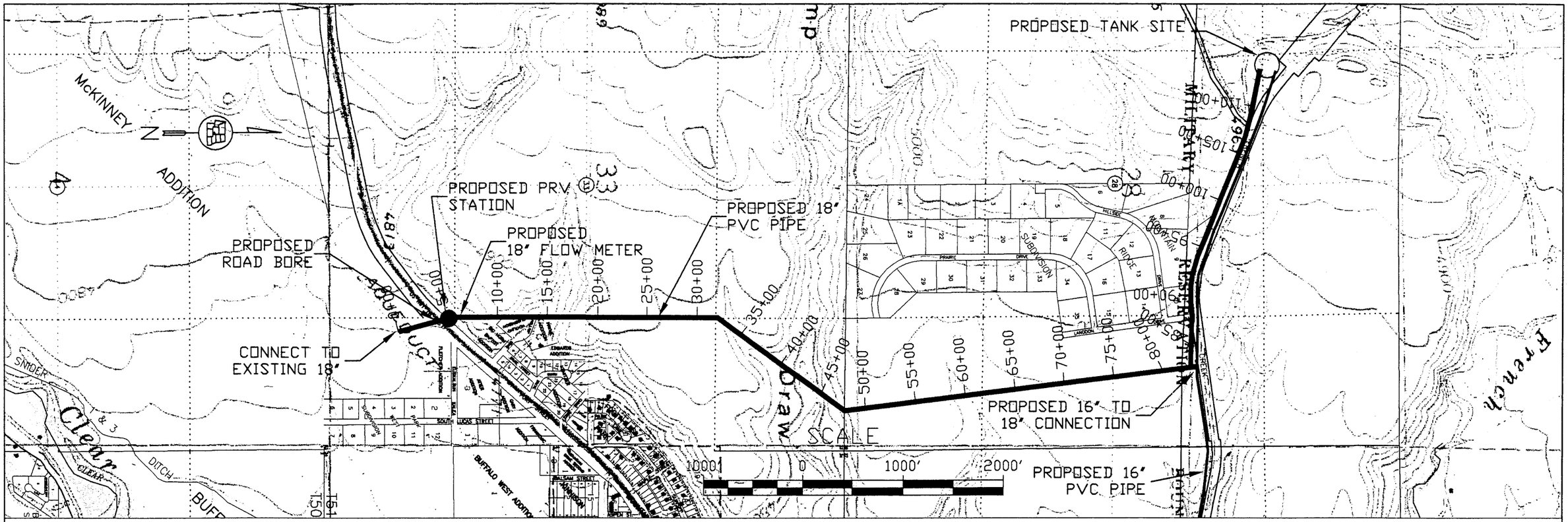
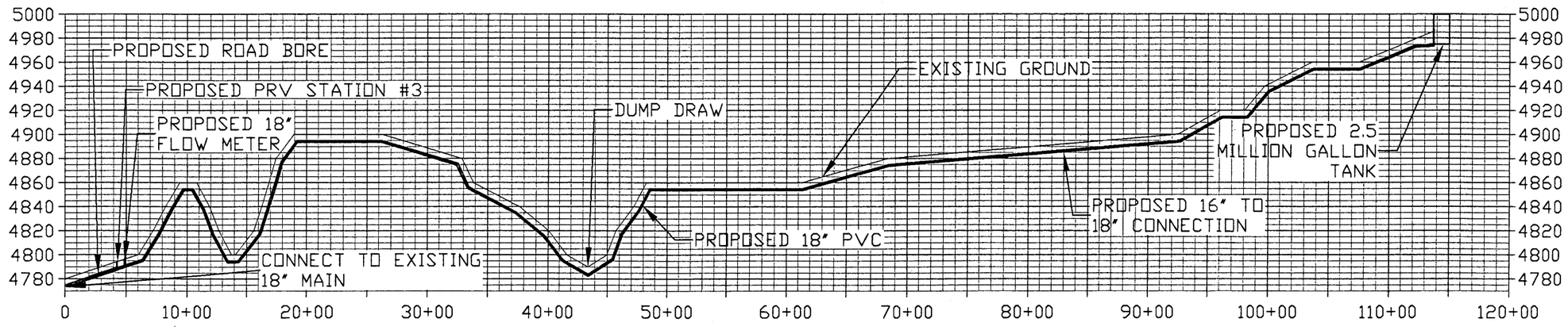
DESIGNED	BLG
DRAWN	BLG
CHECKED	VEA
PEER REVIEWED	VEA
PROJECT MANAGER	VLG
DATE	9/02

BUFFALO TANK, LEVEL II

PROPOSED TANK PLAN

REVISION 1
PROJECT 409
DRAWING II-1





PROFILE OF PROPOSED TANK SUPPLY LINE

SCALE

HORIZ. 1000' 0 1000' 2000'

VERT. 100' 0 100' 200'

REV	DESCRIPTION OF REVISION	BY	DATE
1	PRELIMINARY DESIGN	BLG	9/02

FILE NAME: PAPSUPPLY | OPER: ??? | PROJ.# 405
SCALE: 1" = 1000' | DATE: ??? | TASK # 145
LOC: BUFFALO, WY
PROJ: BUFFALO TANK LEVEL II
SEND TO BRANDON L. DEBHART, P.E.
PHONE (307) 634-7848

STATES WEST WATER RESOURCES CORPORATION
1904 E. 15th STREET
CHEYENNE, WYOMING 82001
(307) 634-7848
FAX: (307) 634-7851

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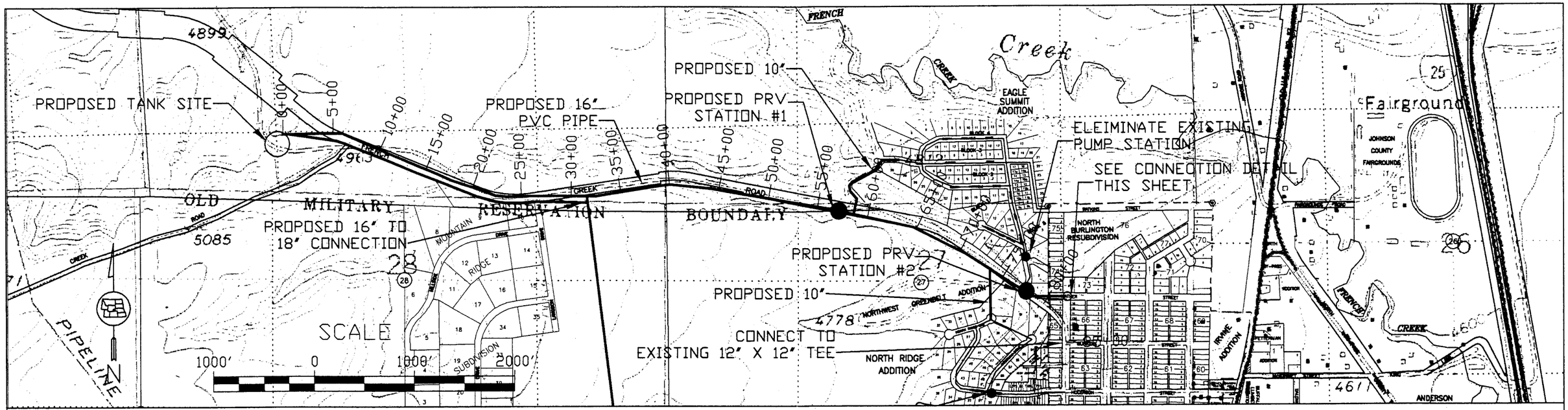
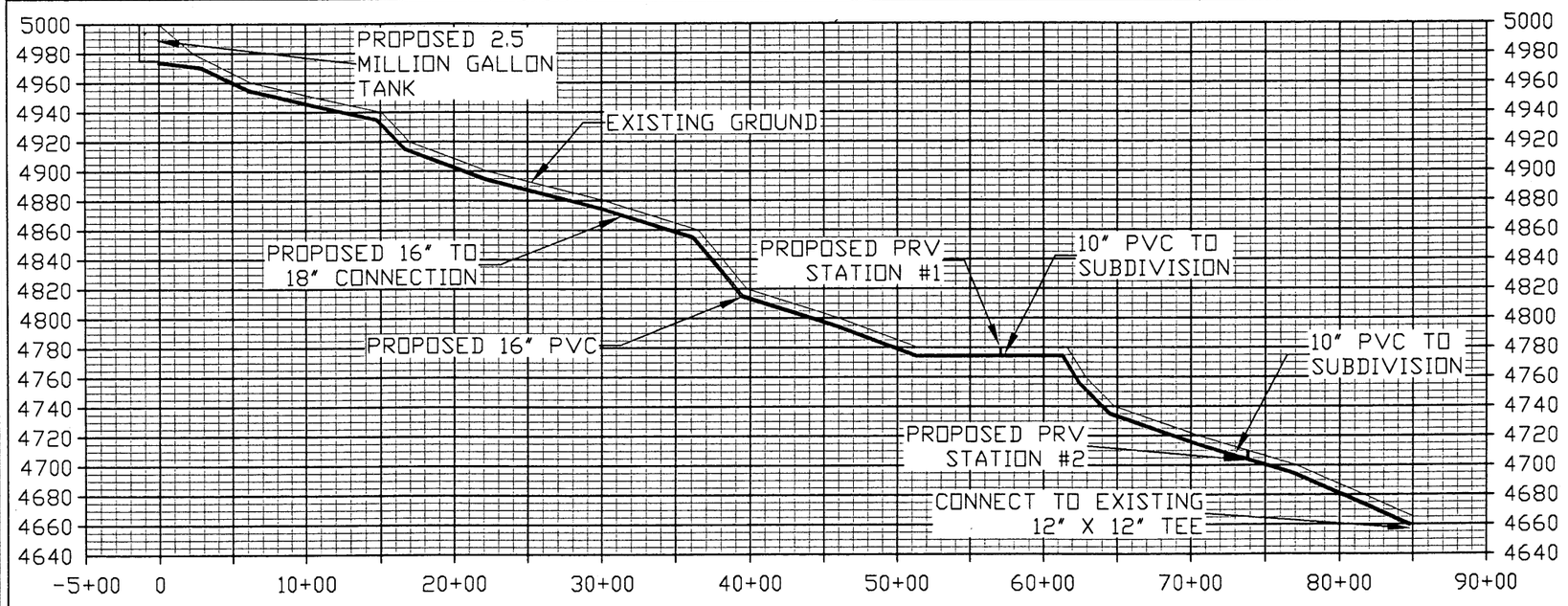
DESIGNED	BLG
DRAWN	BLG
CHECKED	VEA
PEER REVIEWED	VEA
PROJECT MANAGER	BLG
DATE	9/02

BUFFALO TANK, LEVEL II

PLAN AND PROFILE PROPOSED 18" MAIN

REVISION 1
PROJECT ???
DRAWING II-2





PROFILE OF PROPOSED TANK TRANSMISSION LINE

SCALE

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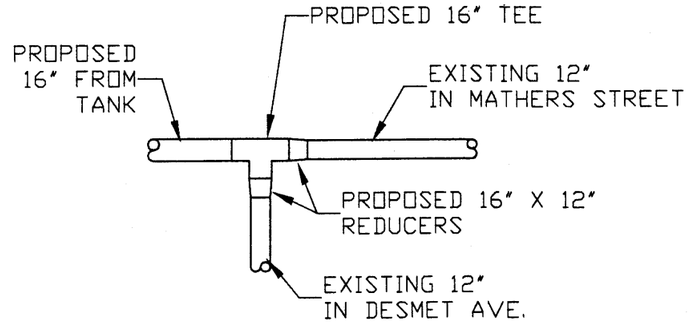
VERT. 100' 0 100' 200'



PROPOSED CONNECTION

NO SCALE

REV	DESCRIPTION OF REVISION	BY	DATE
1	PRELIMINARY DESIGN	BLG	9/02

STATES WEST WATER RESOURCES CORPORATION
1904 E. 15th STREET
CHEYENNE, WYOMING 82001
(307) 634-7848
FAX: (307) 634-7851

WARNING

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DESIGNED	BLG
DRAWN	BLG
CHECKED	VEA
PEER REVIEWED	VEA
PROJECT MANAGER	BLG
DATE	9/02

BUFFALO TANK, LEVEL II

PLAN AND PROFILE PROPOSED 16" MAIN

REVISION 1
PROJECT 408
DRAWING II-3

FILE NAME: P&PTRANS | OPER. BLG | PROJ. # 408
SCALE: 1000' | DATE 9/02 | TASK # 145
LOC. BUFFALO, WY
PROJ. LEVEL II
SEND TO BRANDON L. GEBHART
PHONE (307) 634-7846