J-477

Return To
Name:
Address:
City, State, Zip:

GALLATIN CITY-COUNTY HEALTH DEPARTMENT
ENVIRONMENTAL HEALTH SERVICES
SUBDIVISION PLAT OR CERTIFICATE OF SURVEY
LOCAL HEALTH OFFICER APPROVAL
(Section 50-2-116(1)(i), Montana Codes Annotated)

TO: Gallatin County Clerk and Recorder
311 W. Main
Bozeman, Montana

THIS IS TO CERTIFY THAT the plans and supplemental information relating to the subdivision known as: **COUNTRYSIDE ESTATES**

Located in the NW¼ Section 9 and in the NW¼ Section 10 T1S R4E, P.M.M., Gallatin County, Montana

Consisting of sixty-seven (67) lots having been reviewed by the Gallatin City-County Health Department, Environmental Health Services, and,

THAT the approval of the Plat of said subdivision is made with the understanding that the following conditions shall be met:

THAT IN ADDITION to the requirements described on the MDEQ Certificate of Subdivision Plat Approval for COUNTRYSIDE ESTATES, E.Q.# 06-2669 dated March 16, 2007, any onsite wastewater treatment system siting, design and construction must comply with the Gallatin County Regulations for Wastewater Treatment Systems, and,

THAT when a new well is drilled, the top of the well casing shall be sealed with a screened, vented sanitary well seal which, when installed, creates a watertight seal to prevent the entrance of water or foreign material into the well.

2281781
Page: 1 of 2
10/17/2007 11:20A
Charlotte Mills-Gallatin Co MTMISC 14.00

THAT a GCCHD wastewater treatment permit for construction of the public wastewater system will not be issued until the MGWPCS permit for the system has been approved by MDEQ, and,

Pursuant to Section 76-4-122(2)(a), MCA, a person must obtain the approval of both the State under Title 76, Chapter 4, MCA, and the local board of health under section 50-2-116(1)(i) MCA, before filing a subdivision plat with the county clerk and recorder.

YOU ARE REQUESTED to record this Local Health Officer Approval by attaching it to the Plat filed in your office as required by law.

DATED this 21st day of March, 2007.

REVIEWED AND APPROVED BY:

Tim Roark, RS
Environmental Health Services Director
Gallatin City-County Health Department

Notary:

State of Montana §

County of Gallatin §

This instrument was acknowledged before me on March 22, 2007 by Tim Roark RS, Environmental Health Services Director, Gallatin City-County Health Department.

THERESA SEVAREID NOTARIAL SEAL STATE OF MONTANA

Signature of notorial officer

Notary Public for the State of Montana
Residing at Belgrade
My commission expires: June 20, 2010

cc: *Ryan Urbanec PE, C&H Engineering, 1091 Stoneridge Drive, Bozeman, MT 59718*
Subdivision Program, MDEQ Permitting & Compliance Div., P.O. Box 200901, Helena, MT
David Graham, 257 Eze Street, Belgrade, MT 59714
Belgrade Planning Department, 91 East Central, Belgrade, MT 59714

J-477

STATE OF MONTANA
DEPARTMENT OF ENVIRONMENTAL QUALITY
CERTIFICATE OF SUBDIVISION PLAT APPROVAL
(Section 76-4-101 through 76-4-131, MCA 1995)

TO: County Clerk and Recorder
Gallatin County
Bozeman, Montana

E.Q. #06-2669

THIS IS TO CERTIFY THAT the plans and supplemental information relating to the subdivision known as **Countryside Estates**

located in the NE 1/4, Sec. 9 and in the NW 1/4, Sec. 10, T.1S., R.4E. of P.M.M., Gallatin County, Montana

consisting of 67 lots have been reviewed by personnel of the Permitting and Compliance Division, and,

THAT the documents and data required by ARM Chapter 17 Section 36 have been submitted and found to be in compliance therewith, and,

THAT the approval of the Plat is made with the understanding that the following conditions shall be met:

THAT the lot sizes as indicated on the Plat to be filed with the county clerk and recorder will not be further altered without approval, and,

THAT Lots 1-6 Block 2, 1–12 Block 3, Lots 1-12 Block 4, Lots 1–6 Block 5, Lots 1-12 Block 6, Lots 1-8, Block 7 and Lots 1-6, Block 8 shall be used for one single-family dwelling, Lot MF-1 in Block 2 shall be used for a 9 unit condominium, Lots C1 – C4, Block 1 will be commercial lots, (office use only, with less than 10 employees maximum, serving less than 25 persons per day for 60 days in a calendar year (130 gpd)), and,

THAT individual water systems on Lots 1-6 Block 2, 1–12 Block 3, Lots 1-12 Block 4, Lots 1–6 Block 5, Lots 1-12 Block 6, Lots 1-8, Block 7 and Lots 1-6, Block 8 will consist of a well drilled to a minimum depth of 25 feet constructed in accordance with the criteria established in Title 17, Chapter 36, Sub-Chapters 1, 3, and 6 ARM and the most current standards of the Department of Environmental Quality, and,

THAT data provided indicates an acceptable water source at a depth of approximately 80 feet feet, and, wells located in Block 5 will be drilled to a minimum depth of 100 ft., and,

THAT the multi-user water system on Lot MF-1, Block 2 will consist of a well drilled to a minimum depth of 25 feet constructed in accordance with the criteria established in Title 17, Chapter 36, Sub-Chapters 1, 3, and 6 ARM and the most current standards of the Department of Environmental Quality, and,

THAT the multi-user water system on Lot MF-1, Block 1 will consist of a well with submersible pump, above ground well house with 3 Wellrite WR260-03, 85 gallon, pneumatic pressure tanks, and appurtenances, and,

THAT the multi-user water system on Lot MF-1 will be sized to provide a peak instantaneous flow of 15 gpm (maximum day flow of 2,700 gpd) to the 9 unit condominium, no additional connections are allowed, and,

THAT data provided indicates an acceptable water source at a depth of approximately 80 feet feet, and,

THAT protection of the multi-user well will be maintained through a Declaration of Well Control Zone agreement, (attached), and,

THAT the multi-user water system, public wastewater treatment system and stormwater runoff controls will be constructed in accordance with the approved plan sheet MFW and specifications submitted by Per Hjalmarsson, P.E./C&H Engineering and Surveying Inc., registration number 8867PE, and,

THAT when the existing fire protection water supply system and irrigation well are in need of extensive repairs or replacement, it shall be replaced by a well drilled to a minimum depth of 25 feet constructed in accordance with the criteria established in Title 17, Chapter 36, Sub-Chapters 1, 3, and 6 ARM and the most current standards of the Department of Environmental Quality, and,

THAT the public sewage treatment system shall consist of individual 1,500 gallon septic tanks with an effluent filter on Lots 1-6 Block 2, Lots 1–12 Block 3, Lots 1-12 Block 4, Lots 1–6 Block 5, Lots 1-12 Block 6, Lots 1-8, Block 7 and Lots 1-6, Block 8, a 7,000 gallon septic tank with effluent filter on Lot MF-1 Block 2, and a 1,000 gallon septic tank with effluent filter and 500 gallon dosing tank on each of commercial Lots C1 - C4 Block 1, and,

THAT approximately 6,200 lineal feet of 8-inch diameter SDR 35 PVC gravity sewer main, will convey the septic tank effluent to a 72-inch diameter lift station with submersible pumps, followed by approximately 2,410 lineal feet of 4-inch diameter SDR-21 PVC force main, two 30,000-gallon recirculation tanks, 9 AX-100 Advantex commercial filter pods, and a 10,000 gallon dose tank and suction pump vault with 4 pumps, and,

THAT the public pressure dosed, gravelless sub-surface drainfield is sized based on an application rate of 0.3 gpd per square feet and shall have 100 laterals with infiltrators, 172 feet in length, with a center manifold. The drainfield is sized to treat a total flow of 30,920 gpd, and,

THAT the conditions of approval of the Advantex Filter System for Level II treatment requires an Operation & Maintenance (O&M) contract, in accordance with ARM 17.30.718(8) and the service-related obligations listed in DEQ-4, Appendix D, in perpetuity, with an authorized Dealer/Representative, and,

THAT the O&M contract shall include a bi-annual on-site inspection of all major components of the wastewater treatment system for the first two(2) years after use of the system begins, and annually thereafter, in accordance with ARM 17.30.718(8)(a), and,

THAT based on the Orenco's Standard AdvanTex Systems Operations and Maintenance manual, no water-softener treatment system backwash water should be discharged into their system, and,

THAT annual sampling in accordance with ARM 17.30.718(8)(b) is required for the life of the system and shall be for the following parameters: nitrate; nitrite, ammonia, TKN, BOD, TSS, fecal coliform, specific conductance and temperature. Effluent sampling shall be conducted after all treatment is complete but before discharge into the absorption system. All water analysis shall be conducted according to the EPA approved method by an independent laboratory, except for temperature, which shall be measured on-site. The results shall be reported to the Department in the month following the sample collections, and,

THAT the bottom of the drainfield shall be at least four feet above the water table, and,

THAT no sewage treatment system shall be constructed within 100 feet of the maximum highwater level of a 100 year flood of any stream, lake, watercourse, or irrigation ditch, nor within 100 feet of any domestic water supply source, and,

THAT the stormwater runoff controls shall consist of retention and detention ponds, culverts, catch basins, roadside curbs, curb cuts, and swales, and,

THAT water supply systems, sewage treatment systems and storm drainage systems will be located as shown on the approved plans, and,

THAT the multi-user water system, will be constructed in accordance with the Montana Public Works Standard Specifications, latest edition, and approved plan sheet MFW and specifications received by the department on February 21, 2007 submitted by Per Hjalmarsson, P.E./C&H Engineering and Surveying Inc., registration number 8867PE, and,

THAT the public wastewater treatment system will be constructed in accordance with the Montana Public Works Standard Specifications, latest edition, and approved plan sheets C1-C16 and SS1-SS9 and specifications received by the department on February 21 and March 16, 2007 submitted by Per Hjalmarsson, P.E./C&H Engineering and Surveying Inc., registration number 8867PE, and Mark A. Chandler, P.E./C&H Engineering and Surveying Inc., registration number 9518ES and

THAT the stormwater runoff controls will be constructed in accordance with the approved plan sheets SW1-SW5 and specifications received by the department on March 5, 2007, submitted by Mark A. Chandler, P.E./C&H Engineering and Surveying Inc., registration number 9518ES, and,

THAT all sanitary facilities must be located as shown on the attached lot layout, and,

THAT the developer and/or owner of record shall provide each purchaser of property with a copy of the Plat, approved location of water supply and sewage treatment system as shown on the attached lot layout, and a copy of this document, and,

THAT instruments of transfer for this property shall contain reference to these conditions, and,

THAT plans and specifications for any proposed sewage treatment systems will be reviewed and approved by the county health department and will comply with local regulations and ARM, Title 17, Chapter 36, Subchapters 3 and 9, before construction is started, and,

THAT construction will be completed within three years of the approval date. If more than three years elapse before completing construction, plans and specifications must be resubmitted and approved before construction begins. This three-year expiration period does not extend any compliance schedule requirements associated with a Department enforcement action against a public water or sewage system, and,

THAT within 90 days after construction is completed upon a public water system, wastewater system, or storm drainage system, or upon an extension of or addition to such a system, the professional engineer shall certify to the Department that the construction, alteration or extension was completed in accordance with the plans and specifications approved by the Department, and,

THAT project certification shall be accompanied by a complete set of "as-built" drawings bearing the signature and seal of the professional engineer, and,

THAT departure from any criteria set forth in the approved plans and specifications and Title 17, Chapter 36, Sub-Chapters 1, 3, and 6 ARM when erecting a structure and appurtenant facilities in said subdivision without Department approval, is grounds for injunction by the Department of Environmental Quality.

Pursuant to Section 76-4-122 (2)(a), MCA, a person must obtain the approval of both the State under Title 76, Chapter 4, MCA, and local board of health under section 50-2-116(1)(i), before filing a subdivision plat with the county clerk and recorder.

YOU ARE REQUESTED to record this certificate by attaching it to the Plat filed in your office as required by law.

DATED this 16th day of March, 2007

RICHARD OPPER
DIRECTOR

By: Deanne Fisher for
Steve Kilbreath, Supervisor
Subdivision Section
Public Water and Subdivisions Bureau
Permitting and Compliance Division
Department of Environmental Quality

Owner's Name: David Graham

DECLARATION OF WELL CONTROL ZONE (aka WELL ISOLATION ZONE)

THIS DECLARATION made on this _____ day of _____, 200__, by _____, hereinafter referred to as DECLARANT.

W I T N E S S E T H ;

WHEREAS, the DECLARANT is the owner of the privately owned tracts of real property situated within the 100-foot radius described on the hereto attached Exhibit A (this should be a meets and bounds description), and

WHEREAS, a well will be drilled upon the real property of _____, situated in the center of the 100-foot radius describe on Exhibit A, hereto attached, and

WHEREAS, the DECLARANT, in order to protect the quality and purity of water from said well, are willing to impose certain restrictions upon the said area to run with the real property and to be binding on all parties having or acquiring any right, title, or interest in and to the said area, NOW THEREFORE,

DECLARANT hereby declares that all of the property within a 100-foot radius of the well, hereinafter referred to as the WELL CONTROL ZONE, shall be held, sold, and conveyed SUBJECT to the following restrictions:

- No septic system, wastewater disposal system, sewer lines, holding tanks, sewage lift station, French drain, or class V injection well, and any structure used to convey or retain industrial, storm or sanitary waste shall be located within the WELL CONTROL ZONE.
- No hazardous substances as defined by 75-10-602 MCA, gasoline, liquid fuels, petroleum products, or solvents shall be stored within the WELL CONTROL ZONE.
- No stormwater injection well, grass infiltration swale, or other stormwater disposal mechanism shall be located within the WELL CONTROL ZONE.
- No livestock shall be confined, fed, watered, or maintained within the WELL CONTROL ZONE.
- No private well shall be constructed within the WELL CONTROL ZONE.
- Activities, which may threaten the quality of water in the WELL CONTROL ZONE, are prohibited.
- Maintenance of land shall be accomplished only by mechanical means.

These restrictions shall terminate and be of no further force and effect in the event the aforementioned well is discontinued as a source of water and abandoned in accordance with the laws and regulations of the Montana Department of Natural Resources and Conservation.

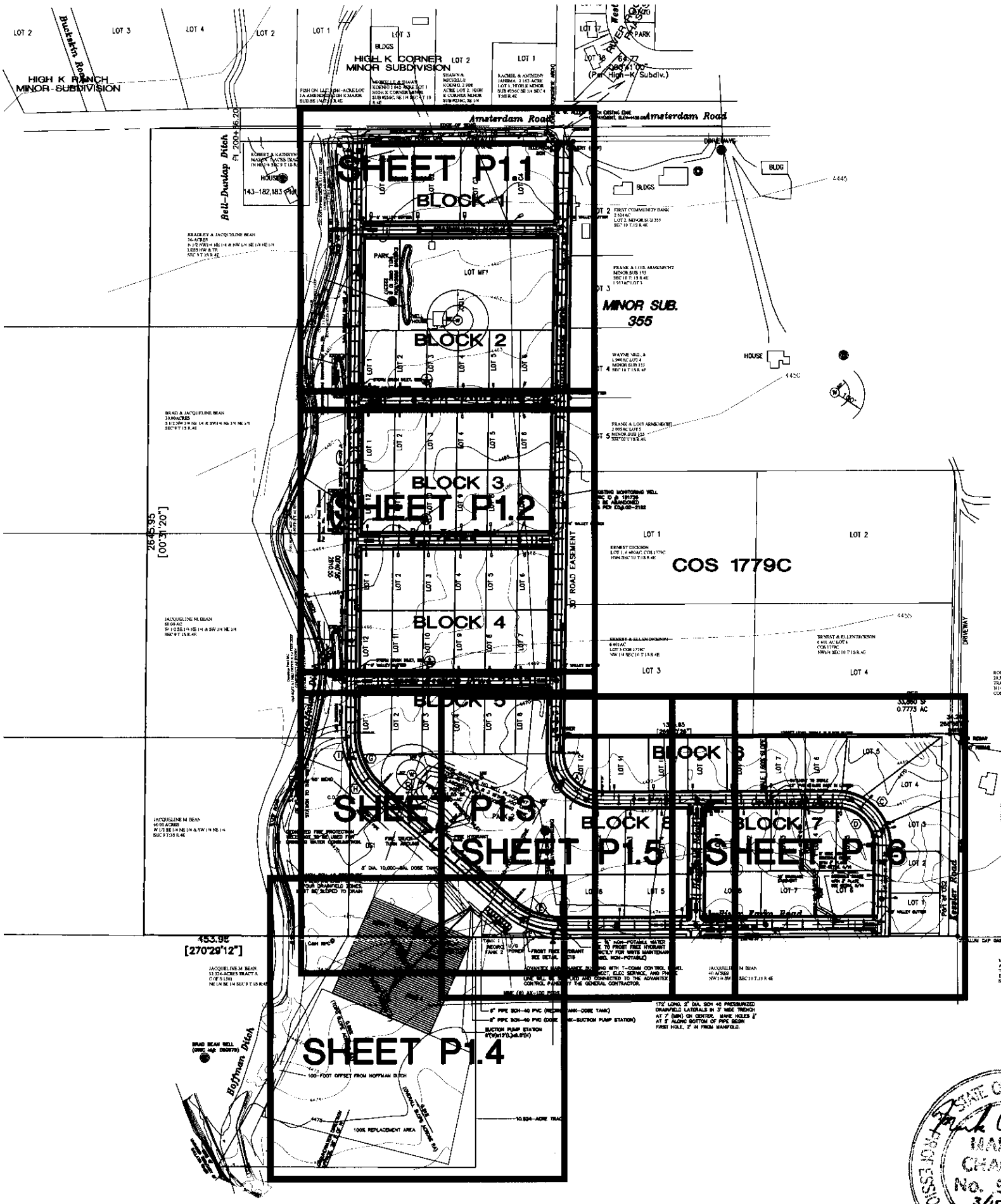
STATE OF MONTANA

County of

On this _____ day of _____, 200__, before me, the undersigned, a Notary Public of the state of Montana, personally appeared _____ known to me to be the persons whose names are subscribed to the within instrument, and acknowledged to me that they executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my Notarial Seal the day and year in this certificate first above written.

NOTARY PUBLIC for the state of Montana
Residing at
My Commission expires:



N

Scale In Feet
400 0 400
120 0 120
Scale In Meters

LEGEND

- TH #x — TEST HOLE LOCATION
- PT #x — PERC TEST LOCATION
- SEPTIC TANK (1000-GAL MIN)
- SEPTIC/DOSE TANK (1500-GAL MIN ON COMMERCIAL LOTS)
- ADVANTEX 9-POD AX-100 WASTEWATER TREATMENT SYSTEM
- 48-INCH MANHOLE
- 72-INCH LIFTSTATION
- 48" CATCH BASIN INLETS
- —s— 8" SANITARY SEWER MAIN LINE PVC SCH 40
- ------- 4 OR 6" PRESSURIZED PVC SCH 40
- 15" CULVERT
- EXISTING WELL
- PROPOSED WELL

AREA TABULATION

AREA OF RESIDENTIAL LOTS =	1,327,758 SQ FT	30.4810 ACRES
AREA OF MULTI-FAMILY LOT =	150,137 SQ FT	3.4467 ACRES
AREA OF COMMERCIAL LOTS =	155,679 SQ FT	3.5739 ACRES
AREA OF PARK =	239,589 SQ FT	5.5002 ACRES
AREA OF OPEN SPACE =	204,986 SQ FT	4.7058 ACRES
AREA OF ROAD =	552,920 SQ FT	12.6932 ACRES
TOTAL AREA =	2,631,069 SQ FT	60.4008 ACRES

UTILITY EASEMENTS

20' FRONT AT ALL STREETS
10' REAR
10 INTERIOR LOT LINES (5' EACH SIDE)

STATE OF MONTANA
MARK A. CHANDLER
No. 9915ES
3/15/2007
REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR

APPROVED
Montana Department of
Environmental Quality
Permitting and Compliance Division
3.16.07
Reviewer Date

EQ#06.2669 #04901P1

RECEIVED
MAR 16 2007
EQ PUBLIC WATER
& SUBDIVISIONS BUREAU

P1.0

Drawing Date: 3/14/07

COUNTRYSIDE ESTATES
OVERALL PLAN
GALLATIN COUNTY, MONTANA

REVISION: o 01/11/07
ENGINEER: MAC
DRAWN: CMS

C&H Engineering and Surveying inc.
1091 Stonebridge Drive • Bozeman, MT 59718
Phone (406) 587-1115 • Fax (406) 587-9768
www.chengineers.com • info@chengineers.com

Sheet 1 of 7

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Amsterdam Road

EDGE OF ROAD
BOTTOM OF DITCH
TOP OF DITCH
OVERHEAD POWER LINE
NE Cor. Sec. 9
S89°42'00"E
670.42
4459
4458
4460
4462
4461
C&R RPC
TELEPHONE BOX
CULVERT
ARROWHE
STREET/STOP
CURB CUT
SWALE
6' VALLEY GUTTER
75' CROWN TRANSITION
Detention Pond #3
2250 SQFT AT MID DEPTH X 1.5 FEET DEEP
CONSTRUCT AS SHOWN
3:1 SIDE SLOPE
BOTTOM ELEVATION 4456.5
Detention Pond #2
STA: 2+85.08
OFFSET: 15.47 L
Detention Pond #1
5750 SQFT AT MID DEPTH X 3.0 FEET DEEP
CONSTRUCT AS SHOWN
3:1 SIDE SLOPE
BOTTOM ELEVATION 4458.00
Retention Pond #1
5750 SQFT AT MID DEPTH X 3.0 FEET DEEP
CONSTRUCT AS SHOWN
3:1 SIDE SLOPE
BOTTOM ELEVATION 4458.82
Retention Pond Easement Per Doc. No.
LOT C1
LOT C2
LOT C3
LOT C4
100'
W
BLOCK 1
7,000-GAL SEPTIC TANK
INSTALL A MIN OF 3 BOLLARDS
AROUND TANK TO PREVENT TRAFFIC
PARK
EXISTING IRRIGATION WELL GWIC ID #: 222317
4" SS LINES
2" SERVICE LINE TO BUILDING
PROPOSED BUILDING PAD FOR
9-UNIT MULTI-FAMILY BUILDING
LOT MF1
(9 UNITS)
WELL HOUSE
50'
BLOCK 2
LOT 1
LOT 2
LOT 3
LOT 4
LOT 5
LOT 6
4" SCH-40 PRESSURE PIPE
8" SDR-35 PVC SS
270°41'41"
43.00
180°41'41"
125.00
090°00'00"
43.00
STORM DRAIN INLET, SEE C15
STA: 2+17.5
OFFSET: 28.70 L
STA: 0+28.00
OFFSET: 16.50 L
STA: 0+28.00
OFFSET: 16.50 R
STA: 6+54.68
OFFSET: 28.28
STA: 6+42.86
OFFSET: 16.50 L
STA: 6+41.65
OFFSET: 16.50 R
Baker Street
Countryside Lane
(30' DEDICATED THIS PLAT)
ARROWHEAD
ROAD

N

Scale In Feet
100 0 100
30 0 30
Scale In Meters

LEGEND

TH #x	TEST HOLE LOCATION
PT #x	PERC TEST LOCATION
	SEPTIC TANK (1000-GAL MIN)
	SEPTIC/DOSE TANK (1500-GAL MIN ON COMMERCIAL LOTS)
	ADVANTEX 9-POD AX-100 WASTEWATER TREATMENT SYSTEM
MH	48-INCH MANHOLE
LS	72-INCH LIFTSTATION
	48" CATCH BASIN INLETS
—s—	8" SANITARY SEWER MAIN LINE PVC SCH 40
-------	4 OR 6" PRESSURIZED PVC SCH 40
	15" CULVERT
	EXISTING WELL
W	PROPOSED WELL

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TOTAL AREA =	2,631,069 SQ FT	60.4008 ACRES

STATE OF MONTANA
MARK A. CHANDLER
No. 9918ES
3/15/2007
REGISTERED
PROFESSIONAL ENGINEER AND LAND SURVEYOR

UTILITY EASEMENTS

20' FRONT AT ALL STREETS
10' REAR
10 INTERIOR LOT LINES (5' EACH SIDE)

APPROVED
Montana Department of
Environmental Quality
Permitting and Compliance Division
DR 3.16.07
Reviewer Date

04901P1

RECEIVED
MAR 16 2007
MT DEQ PUBLIC WATER & SUBDIVISIONS BUREAU

Drawing Date: 01/11/07

P1.1

COUNTRYSIDE ESTATES
OVERALL PLAN
GALLATIN COUNTY, MONTANA

REVISION: o 01/11/07
ENGINEER: MAC
DRAWN: GMS

C&R Engineering and Surveying Inc.
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Sheet 2 of 7

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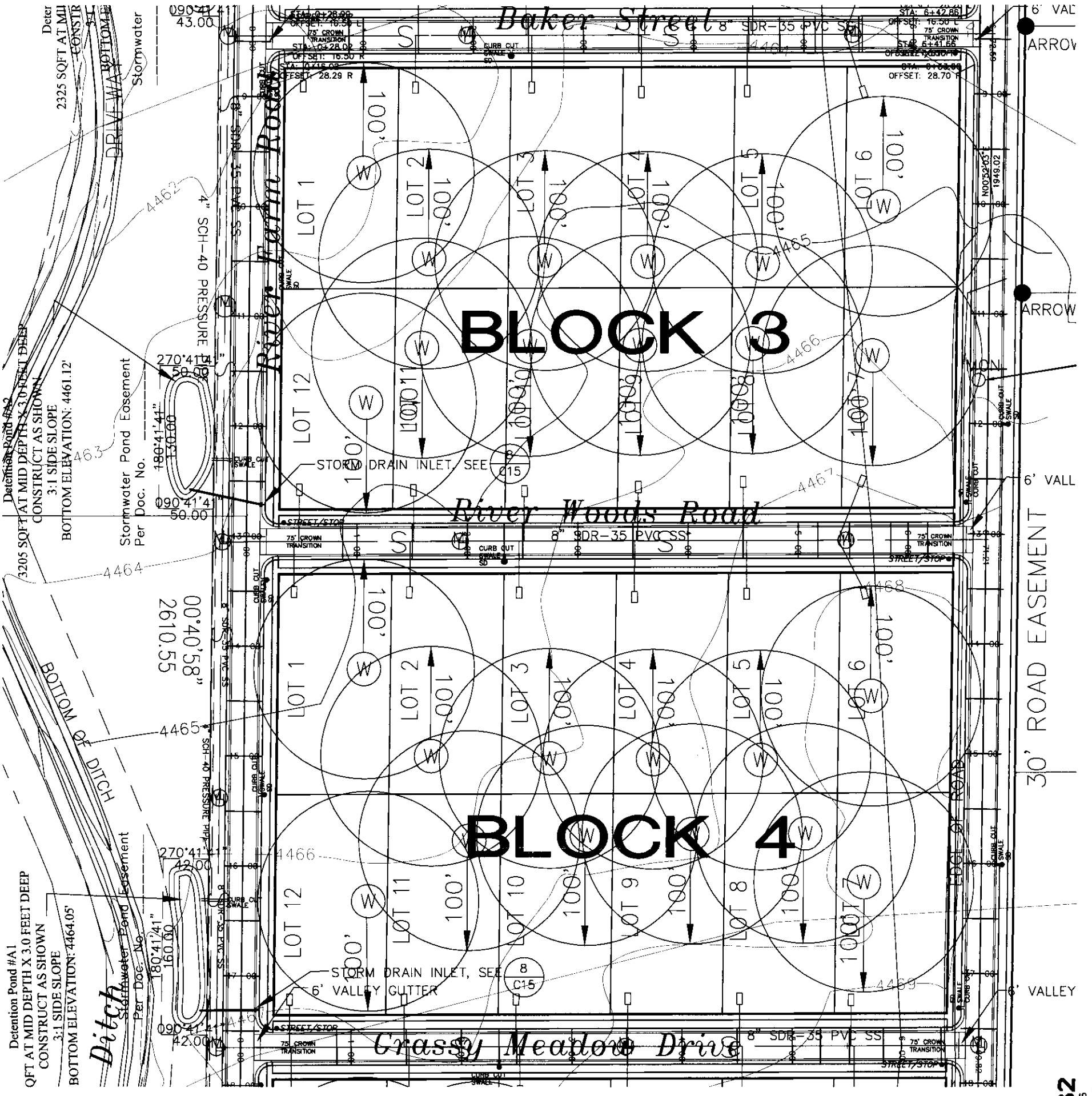

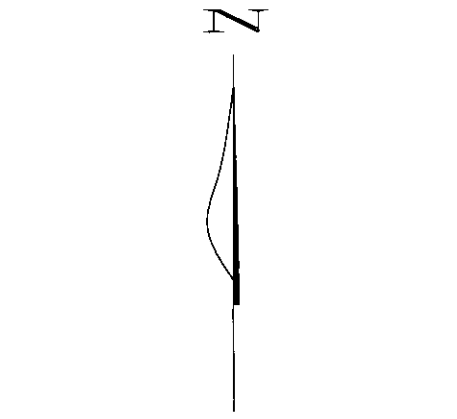

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STATE OF MONTANA — MARK A. CHANDLER — No. 9315ES — 3/15/2007 — REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR

UTILITY EASEMENTS

20' FRONT AT ALL STREETS
10' REAR
10 INTERIOR LOT LINES (5' EACH SIDE)

APPROVED
Montana Department of
Environmental Quality
Permitting and Compliance Division
3.16.07
Reviewer — Date

2281782
Page: 8 of 115
10/17/2007 11:20A
Charlotte Mills-Gallatin Co MTMISC 805.00

RECEIVED
MAR 16 2007
MT DEQ PUBLIC WATER & SUBDIVISIONS BUREAU
Date: 3/16/07

COUNTRYSIDE ESTATES
OVERALL PLAN
GALLATIN COUNTY, MONTANA

REVISION: ○ 01/11/07
ENGINEER: MAC
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Sheet 8 of 7

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BLOCK 5

Grassy Meadow Drive

Hoffman Ditch

LOT 1 | LOT 2 | LOT 3 | LOT 4 | LOT 5 | LOT 6

8" SDR-35 PVC SS

4" SCH-40 PRESSURE PIPE

2,440 FEET OF 4" PRESSURIZED SEWER LINE FROM LIFT STATION TO THE WWTS

45° BEND

C.O.

PIPE FIRE POND
20,261.55 SF
0.4650-AC

THERE SHALL BE NO WELL PLACEMENT ON BLOCK 5, LOTS 2 & 3 WITHIN 100' OF THE REPLACEMENT AREA'S 500' MIXING ZONE

PARK 2

SCREENED INLET

SWALE

DEDICATED FIRE PROTECTION WELL. NOT TO BE USED FOR DRINKING WATER CONSUMPTION.

FIRE TRUCK TURN AROUND

FIRE HYDRANT (71.23')

EXISTING IRRIGATION WELL OWLC ID # 222316

500-FOOT MIXING ZONE

8' DIA. 10,000-GAL DOSE TANK

6-INCH SCH 40 PRESSURE PIPE(S) TO EACH OF THE FOUR DRAINFIELD ZONES, MUST BE SLOPED TO DRAIN

TH # 5
PT #TEST HOLE 5

ZONE 1 | ZONE 2 | ZONE 3

(SLOPE ACROSS DF 0.64%)
(SLOPE ACROSS DF 0.87%)
670.37
210°01'33"

C&H RPC

RECIRC TANK 1
RECIRC TANK 2
U/G POWER
FROST FREE H
SEE DETAIL 6

ADVANTEX MAINT

OS1

N

Scale In Feet
100 0 100
30 0 30
Scale In Meters

LEGEND

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STATE OF MONTANA — MARK A. CHANDLER — No. 9816ES — REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR — 3/15/2007

UTILITY EASEMENTS

20' FRONT AT ALL STREETS
10' REAR
10 INTERIOR LOT LINES (5' EACH SIDE)

APPROVED
Montana Department of Environmental Quality
Permitting and Compliance Division
Reviewer 3.16.07 Date

#04901P1

P1.3

Drawing Date: 01/10/07

COUNTRYSIDE ESTATES
OVERALL PLAN

GALLATIN COUNTY, MONTANA

RECEIVED
MAR 16 2007
MT DEQ PUBLIC WATER & SUBDIVISIONS BUREAU

REVISION: ○ 01/11/07
ENGINEER: MAC
DRAWN: CMS

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Sheet 4 of 7

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PIPE(S) TO EACH OF THE FOUR DRAINFIELD ZONES, MUST BE SLOPED TO DRAIN

TH # 5
PT #TEST HOLE 5
(SLOPE ACROSS DF) 0.64%
ZONE 1
ZONE 2
ZONE 3
ZONE 4
TH #1001
PT #TEST HOLE 1001
(SLOPE ACROSS DF) 0.81%
(SLOPE ACROSS DF) 0.98%
670.37
270°01'33"
C&H RPC
4471
4472
4473
4474
4475
RECIRC TANK 1
RECIRC TANK 2
U/G POWER
FROST FREE HYD
SEE DETAIL 6/C1
ADVANTEX MAINTENA
MOUNTED INSIDE. EL
LINE WILL BE SUPPL
CONTROL PANEL BY
NINE (9) AX-100 PODS
TH #1002
PT #TEST HOLE 1002
6" PIPE SCH-40 PVC (RECIRC TAI
8" PIPE SCH-40 PVC (DOSE TANK
SUCTION PUMP STATION
6'(W)x12'(L)x6.5'(H)
(TOPO SLOPE ACROSS RA) 0.88%
TH #1003
PT #TEST HOLE 1003
100-FOOT OFFSET FROM HOFFMAN DITCH
TH #1004
PT #TEST HOLE 1004
PT #: TEST HOLE #6
MW# (6)
TH # 6
(OVERALL SLOPE ACROSS RA) 0.81%
GROUNDWATER DIRECTION APPROX. 28° E OF N
100% REPLACEMENT AREA
10.824-ACRE TRACT

N

Scale In Feet
100 0 100
30 0 30
Scale In Meters

LEGEND

- TH #x — TEST HOLE LOCATION
- PT #x — PERC TEST LOCATION
- SEPTIC TANK (1000-GAL MIN)
- SEPTIC/DOSE TANK (1500-GAL MIN ON COMMERCIAL LOTS)
- ADVANTEX 9-POD AX-100 WASTEWATER TREATMENT SYSTEM
- 48-INCH MANHOLE
- 72-INCH LIFTSTATION
- 48" CATCH BASIN INLETS
- —s— 8" SANITARY SEWER MAIN LINE PVC SCH 40
- ------ 4 OR 6" PRESSURIZED PVC SCH 40
- 15" CULVERT
- EXISTING WELL
- PROPOSED WELL

AREA TABULATION

AREA OF RESIDENTIAL LOTS =	1,327,758 SQ FT	30.4810 ACRES
AREA OF MULTI-FAMILY LOT =	150,137 SQ FT	3.4467 ACRES
AREA OF COMMERCIAL LOTS =	155,679 SQ FT	3.5739 ACRES
AREA OF PARK =	239,589 SQ FT	5.5002 ACRES
AREA OF OPEN SPACE =	204,986 SQ FT	4.7058 ACRES
AREA OF ROAD =	552,920 SQ FT	12.6932 ACRES
TOTAL AREA =	2,631,069 SQ FT	60.4008 ACRES

UTILITY EASEMENTS

20' FRONT AT ALL STREETS
10' REAR
10 INTERIOR LOT LINES (5' EACH SIDE)

STATE OF MONTANA — MARK A. CHANDLER — No. 9816S — 3/15/2007 — REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR

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DF 3.16.07
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Drawing No. 01

COUNTRYSIDE ESTATES
OVERALL PLAN
GALLATIN COUNTY, MONTANA

REVISION: 01/11/07
ENGINEER: MAC
DRAWN: CMS

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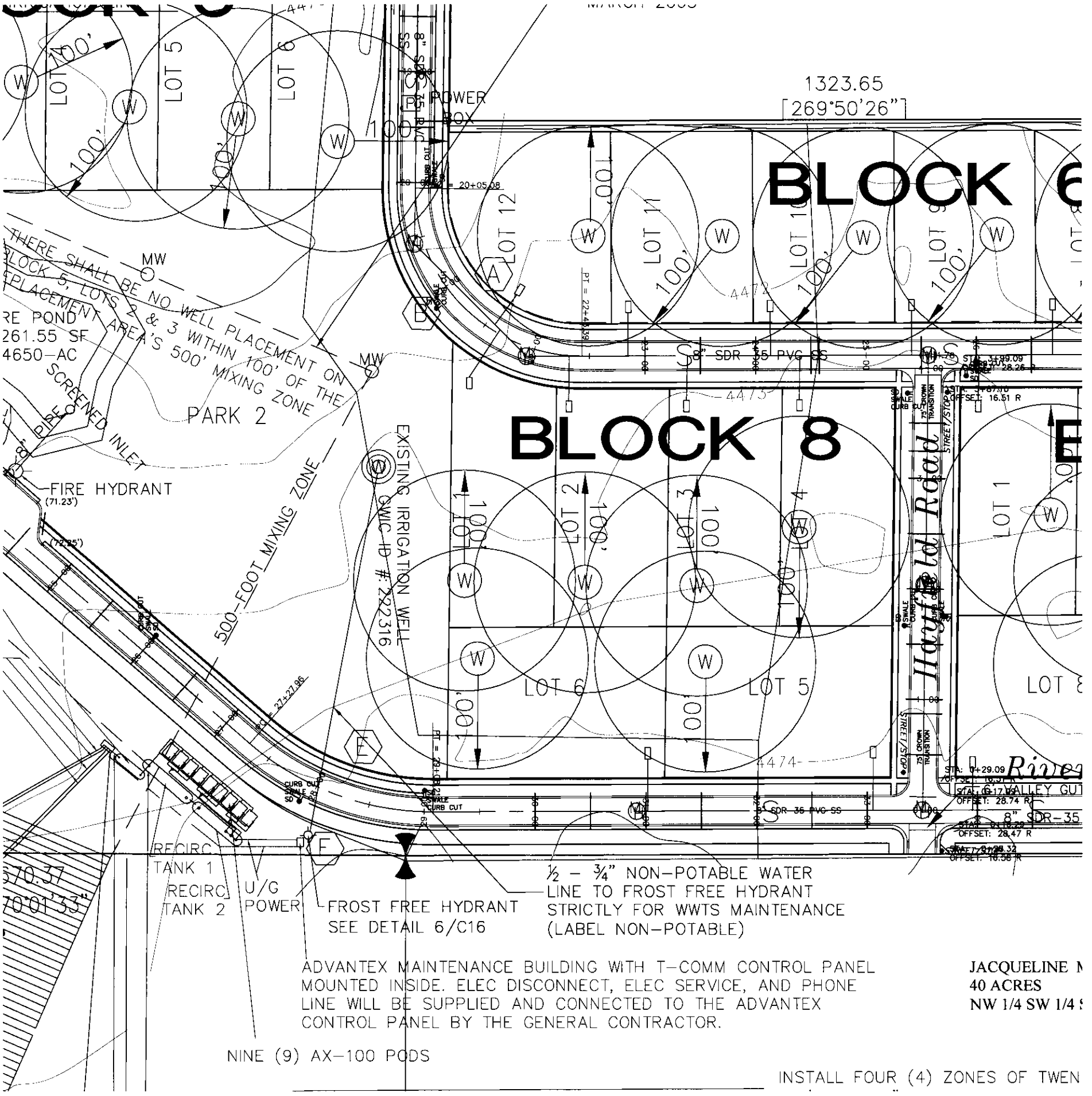

N

Scale In Feet

100 0 100

30 0 30

Scale In Meters

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UTILITY EASEMENTS

20' FRONT AT ALL STREETS
10' REAR
10 INTERIOR LOT LINES (5' EACH SIDE)

STATE OF MONTANA — MARK A. CHAMBLER — No. 9016LS — 3/15/2007 — REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR

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Montana Department of Environmental Quality
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Page: 11 of 115
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COUNTRYSIDE ESTATES
OVERALL PLAN
GALLATIN COUNTY, MONTANA

REVISION: o 01/11/07
ENGINEER: MAC
DRAWN: CMS

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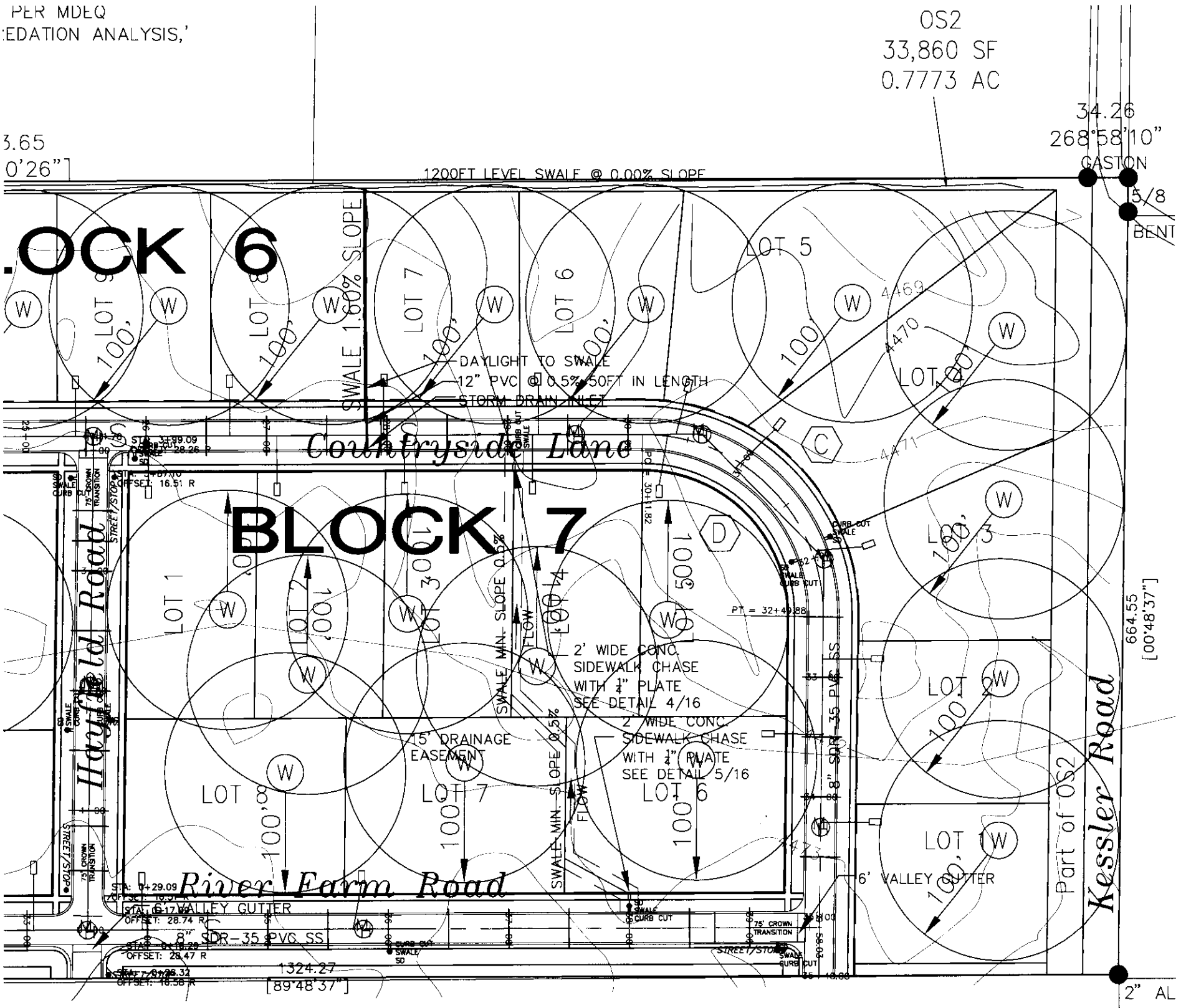
PER MDEQ
EDATION ANALYSIS,'



NEL
E

JACQUELINE M. BEAN
40 ACRES
NW 1/4 SW 1/4 SEC 10 T:1S R:4E

N

Scale In Feet
100 0 100
30 0 30
Scale In Meters

LEGEND

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STATE OF MONTANA — MARK A. CHANDLER — No. 5555ES — REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR — 3/15/2007

UTILITY EASEMENTS

20' FRONT AT ALL STREETS
10' REAR
10 INTERIOR LOT LINES (5' EACH SIDE)

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Permitting and Compliance Division
DP 3.16.07
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COUNTRYSIDE ESTATES
OVERALL PLAN

GALLATIN COUNTY, MONTANA

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REVISION: 01/11/07
ENGINEER: MAC
DRAWN: CMS

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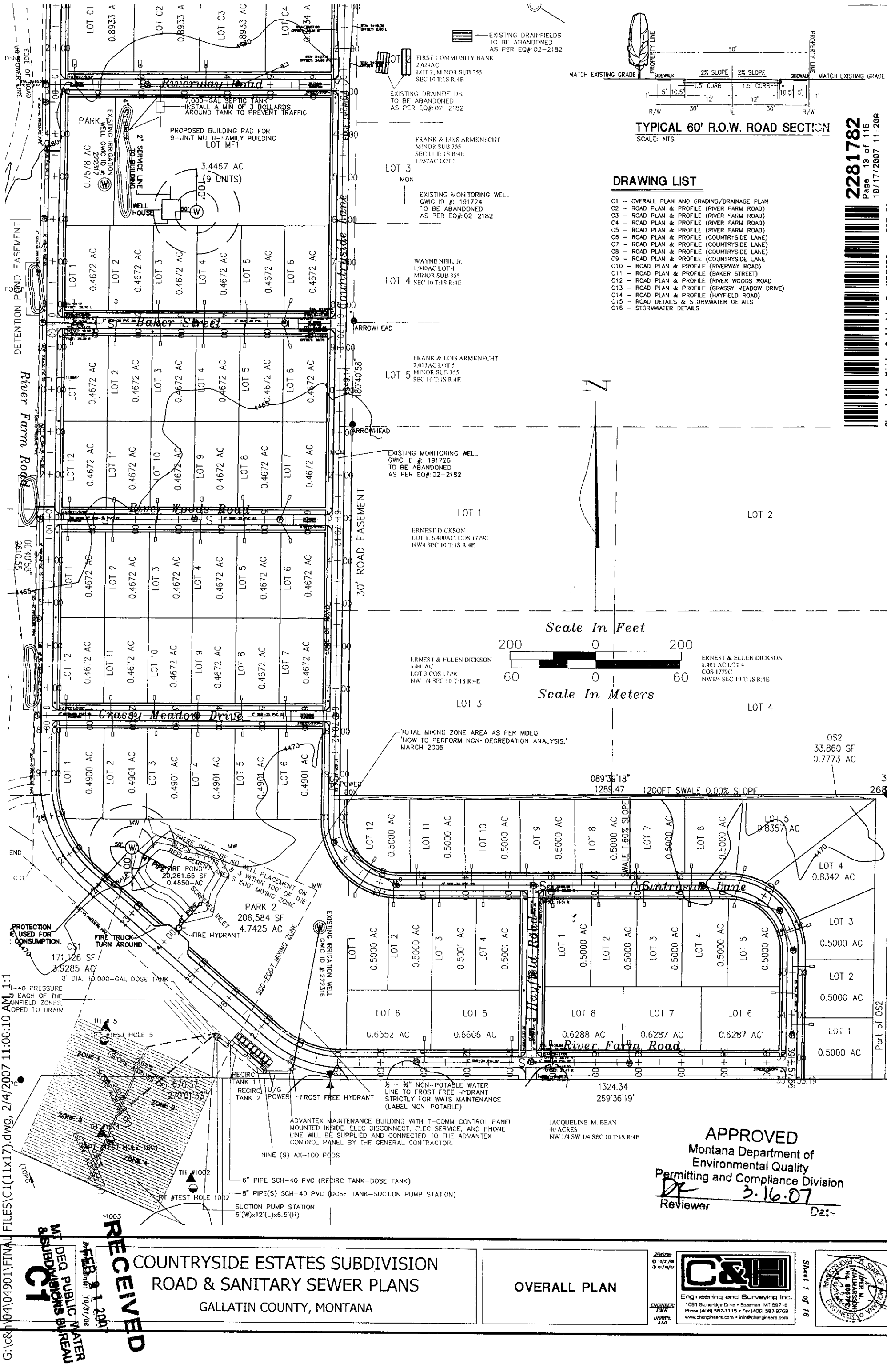

DRAWING LIST

C1 - OVERALL PLAN AND GRADING/DRAINAGE PLAN
C2 - ROAD PLAN & PROFILE (RIVER FARM ROAD)
C3 - ROAD PLAN & PROFILE (RIVER FARM ROAD)
C4 - ROAD PLAN & PROFILE (RIVER FARM ROAD)
C5 - ROAD PLAN & PROFILE (RIVER FARM ROAD)
C6 - ROAD PLAN & PROFILE (COUNTRYSIDE LANE)
C7 - ROAD PLAN & PROFILE (COUNTRYSIDE LANE)
C8 - ROAD PLAN & PROFILE (COUNTRYSIDE LANE)
C9 - ROAD PLAN & PROFILE (COUNTRYSIDE LANE
C10 - ROAD PLAN & PROFILE (RIVERWAY ROAD)
C11 - ROAD PLAN & PROFILE (BAKER STREET)
C12 - ROAD PLAN & PROFILE (RIVER WOODS ROAD
C13 - ROAD PLAN & PROFILE (GRASSY MEADOW DRIVE)
C14 - ROAD PLAN & PROFILE (HAYFIELD ROAD)
C15 - ROAD DETAILS & STORMWATER DETAILS
C16 - STORMWATER DETAILS

APPROVED
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Permitting and Compliance Division
DF 3.16.07
Reviewer Date

COUNTRYSIDE ESTATES SUBDIVISION
ROAD & SANITARY SEWER PLANS
GALLATIN COUNTY, MONTANA

OVERALL PLAN

C1

REVISION
① 10/31/06
② 01/10/07

ENGINEER: PWH
DRAWN: ALD

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STATE OF MONTANA — PETER W. HJALMARSSON — No. 8867PE — REGISTERED PROFESSIONAL ENGINEER

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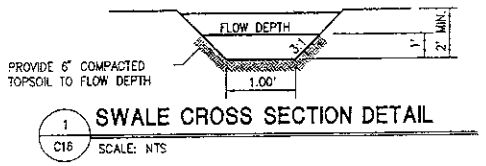
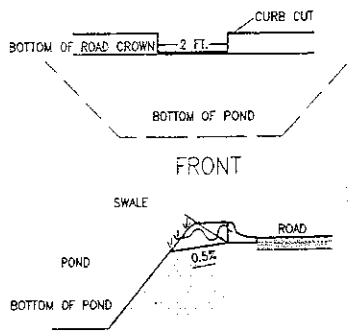


1 / C16 SWALE CROSS SECTION DETAIL

SCALE: NTS



2 / C16 CURBCUT SWALE DETAIL

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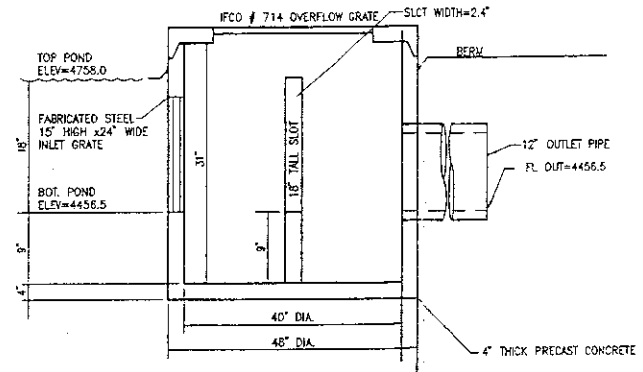

3 / C16 OUTLET CONTROL STRUCTURE

SCALE: NTS

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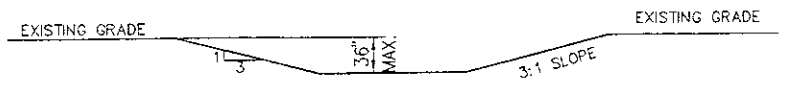
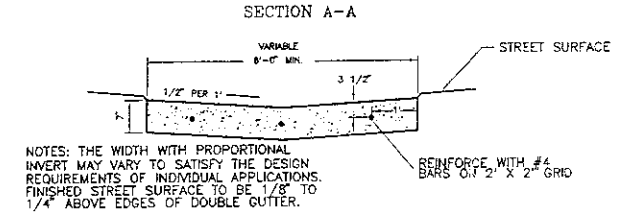
Date: 3.16.07
Reviewer



4 / C16 TYPICAL RETENTION POND DETAIL

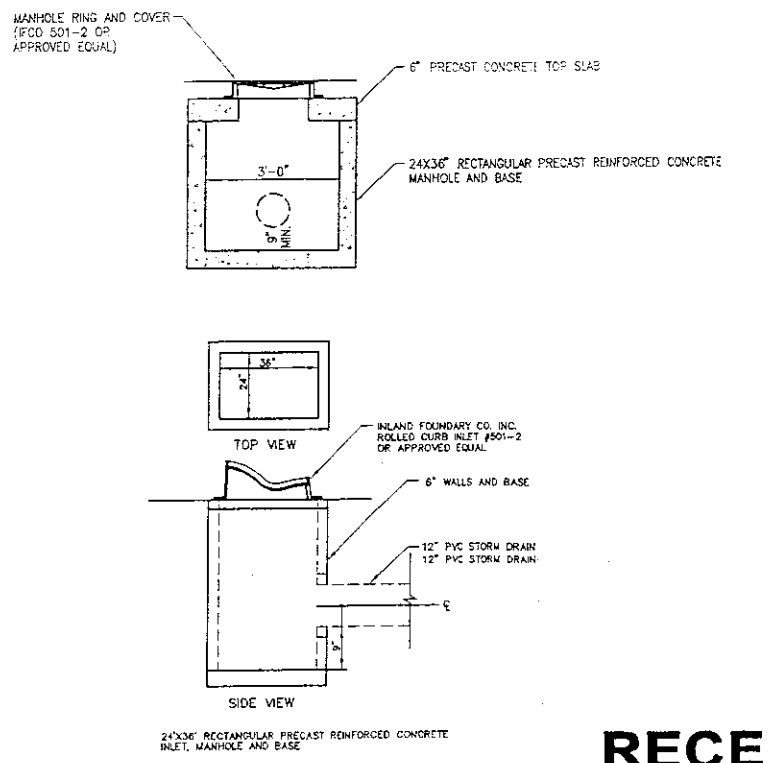
SCALE: NTS



5 / C16 STREET INTERSECTION DOUBLE GUTTER DETAIL

SCALE: NTS

C.O.B. STD. DWG. NO. 02525-1



6 / C16 CURB INLET DETAIL

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JOB NO.

DESIGNED: PMH
DRAWN: KRU

DETAILS

COUNTRYSIDE ESTATES
ROAD DETAILS
GALLATIN COUNTY, MONTANA

Drawing Date:
February 1, 2006

C16

#04901 C16

ROAD PLAN, SANITARY SEWER MAIN PLAN AND PROFILE (RIVER FARM ROAD)

1 / C2 SCALE: (1"=100'-0" HORIZONTAL) (1"=10'-0" VERTICAL)

DATUM ELEV 4445.00

4450 4460 4470 4480

4457.1 / 4458.75 — 0+00
4457.2 / 4458.62
4457.9 / 4458.14 — 1+00
4458.5 / 4458.41
4458.8 / 4458.67 — 2+00
4459.2 / 4458.94
4459.6 / 4459.20 — 3+00
4459.8 / 4459.47
4459.9 / 4459.73 — 4+00
4459.7 / 4460.00
4460.2 / 4460.29 — 5+00
4460.5 / 4460.57
4460.9 / 4460.86 — 6+00
4461.0 / 4461.14
4461.3 / 4461.43 — 7+00
4461.7 / 4461.71
4462.1 / 4462.00 — 8+00
4462.2 / 4462.26
4461.8 / 4462.51 — 9+00
4462.0 / 4462.77
4462.2 / 4463.03 — 10+00
4462.5 / 4463.29
4463.2 / 4463.54 — 11+00
4463.8 / 4463.80
4464.1 / 4464.06 — 12+00
4464.3 / 4464.31

15" Culvert
75' CROWN TRANSITION
-0.95%
PVI STA = 0+50
PVI ELEV = 4458.14
0-44.86 = Edge of Pavement (AMSTERDAM ROAD)
℄ ELEVATION = 4458.75
MATCH EXISTING ROAD

Scale In Feet: 100 0 100
Scale In Meters: 30 0 30

2+56.05 - 13.5' LT. BEGIN RADIUS TBC ELEV = 4459.23
2+71.05 - 28.76' LT. END RADIUS TBC ELEV = 4459.83
2+86.56 - 28.22' RT. BEGIN RADIUS TBC ELEV = 4459.83
3+13.06 - 13.5' RT. END RADIUS TBC ELEV = 4459.53

2+85.04 - NEW SSMH-2
RIM=4459.00
FL E=4448.90
FL S=4448.70
2+85.04 = 0 - 24.00 (RIVERWAY ROAD) FM
℄ ELEVATION = 4458.85
3+26.40 NEW 72 INCH (ID) SS LIFT STATION
RIM=4458.87
FL N=4448.55
FL OUT=4452.37
FL S=4448.55

6.5' MIN COVER
PVI STA = 4+00
PVI ELEV = 4460.00
36.96 LF 8" SDR-35 PVC SS @ -0.41%
268.67 LF 8" SDR-35 PVC SS @ 0.41%
0.57%
CONTRACTOR TO SLOPE AS NEEDED 2410 LF 4" ASTM 2241
242.05 LF 8" SDR-35 PVC SS @ 0.42%
0.57%
EXISTING GRADE
PROPOSED GRADE
6.5' MIN COVER
242.17 LF 8" SDR-35 PVC SS @ 0.40%
210.25 LF 8" SDR-35 PVC SS @ 0.40%
0.51%

5+99.07 - NEW SSMH-3
RIM=4460.87
FL S=4449.84
FL N=4449.64

PVI STA = 7+50
PVI ELEV = 4462.00

8+16.13 - 13.5' LT. BEGIN RADIUS TBC ELEV = 4462.33
8+31.13 - 28.76' LT. END RADIUS TBC ELEV = 4462.93
8+58.14 - 28.24' RT. BEGIN RADIUS TBC ELEV = 4462.93
8+73.11 - 13.5' RT. END RADIUS TBC ELEV = 4462.63

8+45.12 - NEW SSMH-4
RIM=4462.49
FL S=4451.05
FL E=4451.05
FL N=4450.85
8+45.12 = 0 - 24.00 (BAKER STREET) FM
℄ ELEVATION = 4462.49

10+91.33 - NEW SSMH
RIM=4463.64
FL S=4452.23
FL N=4452.03
ROAD=4463.64

MATCHLINE - SHEET C3 — 1 / C3

N

GH K MAJOR :4E

SUB #256 R:4E

STREET/STOP
C&H RPC
75' CROWN TRANSITION
STA: 2+85.08
OFFSET: 16.47 R
EDGE OF ROAD
POWER LINE
4" SDR-40 PRESSURE PIPE
8" SDR-35 PVC SS
460
PARK
WELL OWNER ID #: 222317
0.7578 AC
LOT C1
DETENTION POND EASEMENT
DEEP
4" SCH-40 PRESSURE PIPE
8" SDR-35 PVC SS
STA: 0+17
OFFSET: 28.70 L
STA: 0+28.00
OFFSET: 16.50 L
75' CROWN TRANSITION
STA: 0+28.02
OFFSET: 16.50 R
STA: 0+16.02
OFFSET: 28.29 R
11.9861'
LOT 1
0.4672 AC
LOT 12
0.4672 AC
River Farm Road

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COUNTRYSIDE ESTATES SUBDIVISION
ROAD & SANITARY SEWER PLANS
GALLATIN COUNTY, MONTANA

RIVER FARM ROAD
SANITARY SEWER
ROAD PLAN &
PROFILE SHEETS

Drawing Date: 10/31/06
REVISION: ① 10/31/06 ② 01/10/07
ENGINEER: PMB
DRAWN: ALO

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PER H. HJALMARSSON No. 8457PE REGISTERED PROFESSIONAL ENGINEER STATE OF MONTANA

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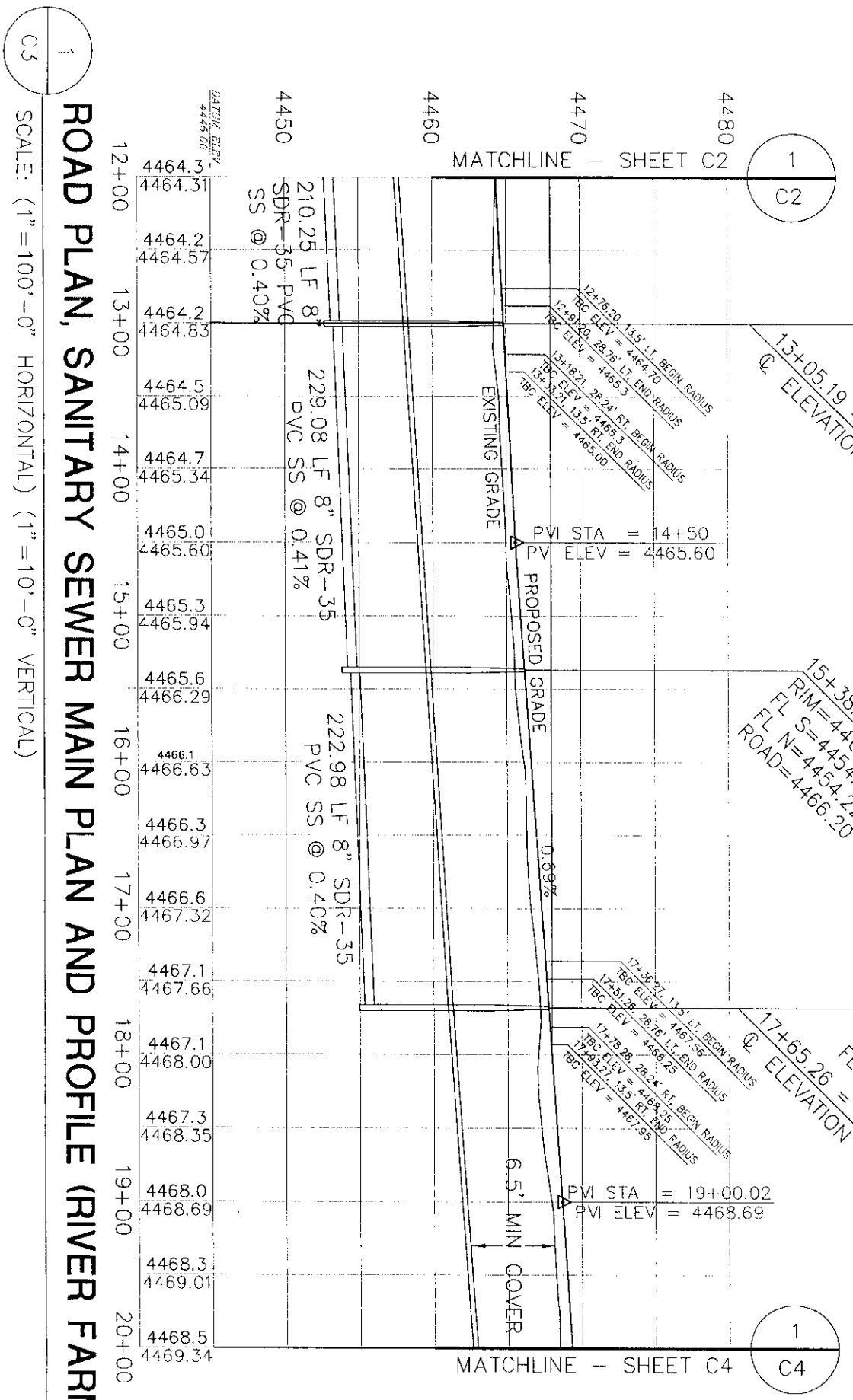
ROAD PLAN, SANITARY SEWER MAIN PLAN AND PROFILE (RIVER FARM ROAD)

SCALE: (1"=100'-0" HORIZONTAL) (1"=10'-0" VERTICAL)



#04901

C3

Drawing Date: 10/31/06

COUNTRYSIDE ESTATES SUBDIVISION
ROAD & SANITARY SEWER PLANS
GALLATIN COUNTY, MONTANA

RIVER FARM ROAD
SANITARY SEWER
ROAD PLAN &
PROFILE SHEETS

REVISION
@ 10/31/06
@ 01/16/07

ENGINEER: PMH
DRAWN: ALD

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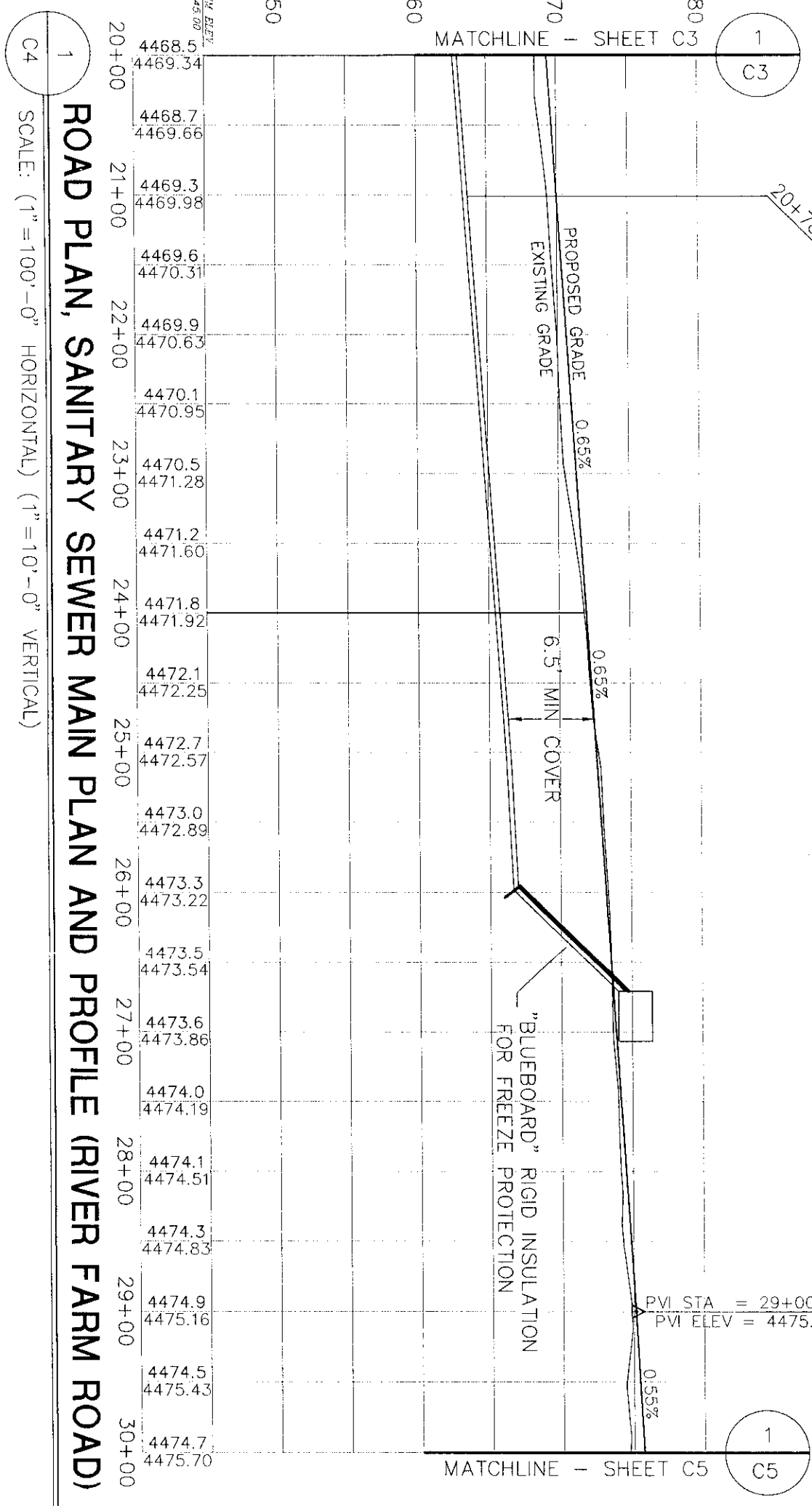

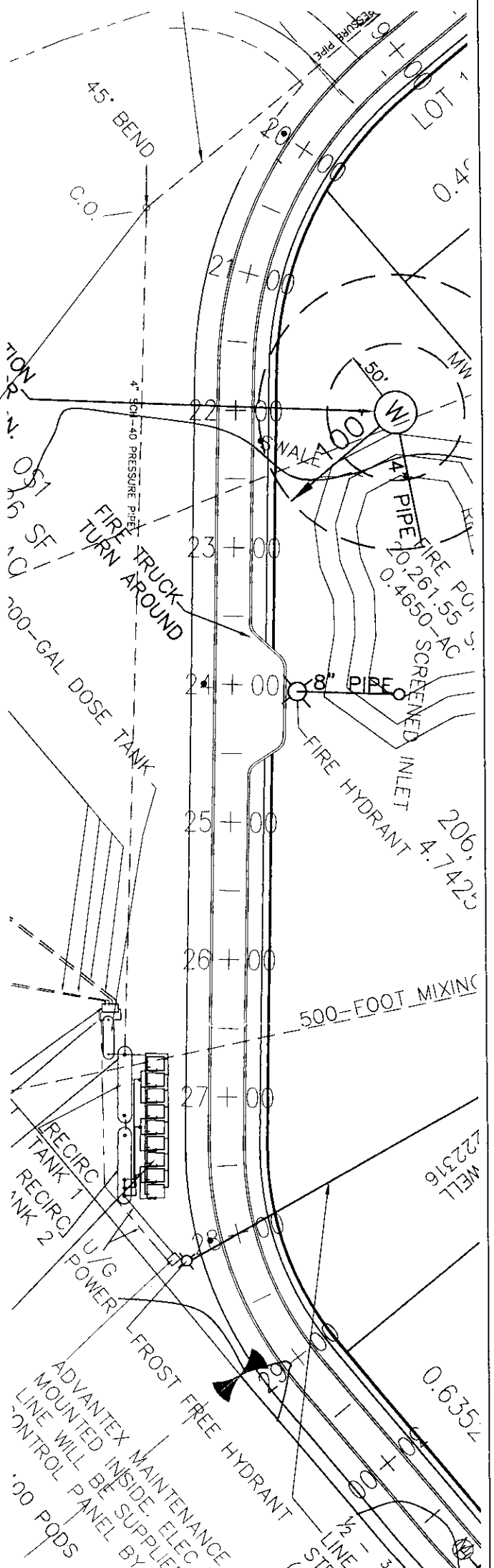

Scale In Meters
30 0 30

Scale In Feet
100 0 100

#04901

C4

Drawing Date: 10/31/06

COUNTRYSIDE ESTATES SUBDIVISION
ROAD & SANITARY SEWER PLANS
GALLATIN COUNTY, MONTANA

RIVER FARM ROAD
SANITARY SEWER
ROAD PLAN &
PROFILE SHEETS

REVISION:
@ 10/31/06
@ 01/10/07

ENGINEER: PMH
DRAWN: ALO

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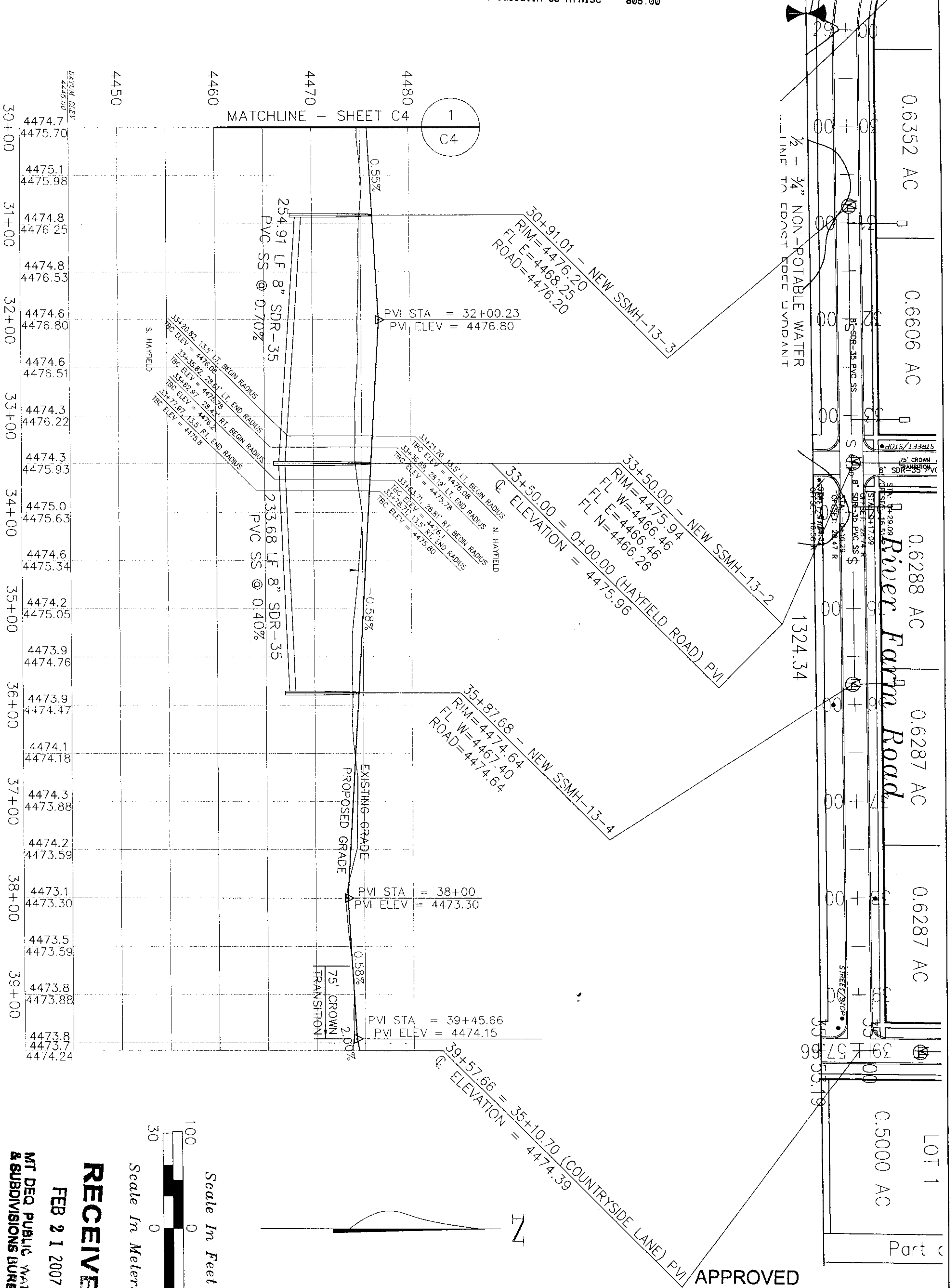

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C5

Drawing Date: 10/31/06

COUNTRYSIDE ESTATES SUBDIVISION
ROAD & SANITARY SEWER PLANS
GALLATIN COUNTY, MONTANA

RIVER FARM ROAD
SANITARY SEWER
ROAD PLAN &
PROFILE SHEETS

REVISION: ① 10/31/06 ① 01/10/07
ENGINEER: PMH
DRAWN: ALO

C&H Engineering and Surveying Inc.
1091 Stoneridge Drive • Bozeman, MT 59718
Phone (406) 587-1115 • Fax (406) 587-8768
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Sheet 5 of 16

2281782
Page: 19 of 115
10/17/2007 11:20A
Charlotte Mills-Gallatin Co MTMISC 805.00

ROAD PLAN, SANITARY SEWER MAIN PLAN & PROFILE (COUNTRYSIDE LANE)

SCALE: (1"=100'-0" HORIZONTAL) (1"=10'-0" VERTICAL)

Scale In Meters 30 0 30

Scale In Feet 100 0 100

N

ACHEL & ANTHONY
ANSMA 1.162-ACRE
OT 1, HIGH K MINOR
UB #256C SE 1/4 SEC 4
:1S R:4E

(Per

(CONCRETE ARCH) CULVERT

R. W. ALLEN

dam Road

STREET/STOP

BENT REBAR

E Cor. Sec. 33

PIPE W/ ARROWHEAD

TELEPHONE BOX

24" CULVERT (CSP)

1 + 00

LOT C4

0.4634 AC

STA: 1+57.60
OFFSET: 33.51 R

STA: 1+46.39
OFFSET: 0.00 L

STA: 2+27.19
OFFSET: 24.50 R

STA: 2+34.05
OFFSET: 0.00 R

LOT

EXIS
TO
AS

75' CROWN TRANSITION

STREET/STOP

EDGE OF ROAD

NK
BOLLARDS
EVENT TRAFFIC

FOR
ILDING

Countryside Lane

LOT

LOT

LOT

0.4672 AC

LOT 6

0.4672 AC

STA: 6+54.86
OFFSET: 28.70 R

STA: 6+42.86
OFFSET: 16.50 L

75' CROWN TRANSITION

STA: 6+41.66
OFFSET: 16.50 R

STA: 6+53.66
OFFSET: 28.70 R

VC

ARROWHEAD

1049.14'

180°40'58"

0.4672 AC

LOT 6

0.4672 AC

0+00 4458.3 4458.28
1+00 4458.4 4458.53
2+00 4458.6 4458.80
3+00 4459.4 4459.47
4+00 4459.8 4459.81
5+00 4460.2 4460.14
6+00 4460.5 4460.48
7+00 4460.9 4460.82
8+00 4461.2 4461.15
9+00 4461.7 4461.49
10+00 4462.1 4461.83
4462.5 4462.16
4462.8 4462.50
4463.1 4462.83
4463.5 4463.17
4463.9 4463.51
4464.3 4463.84
4464.6 4464.18
4464.8 4464.43
4464.9 4464.68

4450 4460 4470

DATUM ELEV 4445.00

-0+09.31, 18.75' WEST, BEGIN CURB, TBC ELEV = 4458.35

-1.26%

PVI STA = 0+00
PVI ELEV = 4458.28

-0+10.92, 18.75' EAST, BEGIN CURB, TBC ELEV = 4458.18

0.51%

PVI STA = 0+47.21
PVI ELEV = 4458.52

1+55.00, 18.75' WEST, BEGIN TRANS. TO 24', TBC ELEV = 4458.22

0.53%

PVI STA = 1+00
PVI ELEV = 4458.80

1+45.94, 18.75' EAST, BEGIN TRANS. TO 24', TBC ELEV = 4459.15

0.67%

2+25.09, 13.5' WEST, END TRANS. TBC ELEV = 4459.63

2+57.07, 13.5' LT. BEGIN RADIUS, TBC ELEV = 4459.85

2+72.06, 28.16' LT. END RADIUS, TBC ELEV = 4460.53

2+99.07, 28.82' RT. BEGIN RADIUS, TBC ELEV = 4460.53

3+14.06, 13.55' RT. END RADIUS, TBC ELEV = 4460.23

PVI STA = 2+00
PVI ELEV = 4459.47

2+33.44, 13.5' EAST, END TRANS. TO 24', TBC ELEV = 4459.69

℄ ELEVATION = 4460.04

2+85.04 = 6+70.42 (RIVER WAY)

0.67%

EXISTING GRADE
PROPOSED GRADE

8+17.24, 13.5' LT. BEGIN RADIUS, TBC ELEV = 4463.62

8+32.15, 28.34' LT. END RADIUS, TBC ELEV = 4464.29

8+59.17, 29.06' RT. BEGIN RADIUS, TBC ELEV = 4464.29

8+74.15, 13.5' RT. END RADIUS, TBC ELEV = 4463.99

PVI STA = 9+00
PVI ELEV = 4464.18

8+45.11 = 6+70.42 (BAKER STREET)
℄ ELEVATION = 4463.81

MATCHLINE - SHEET C7

1 / C6

1 / C7

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Permitting and Compliance Division
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Reviewer
3.16.07
Date

#0490

C6

Drawing Date: 10/31/06

COUNTRYSIDE ESTATES SUBDIVISION
ROAD & SANITARY SEWER PLANS
GALLATIN COUNTY, MONTANA

COUNTRYSIDE LANE
SANITARY SEWER
ROAD PLAN &
PROFILE SHEETS

REVISION:
① 10/31/06
② 01/10/07

ENGINEER: PMH
DRAWN: AJO

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STATE OF MONTANA
PETER M. J. HJALMARSSON
No. 9867PE
REGISTERED PROFESSIONAL ENGINEER

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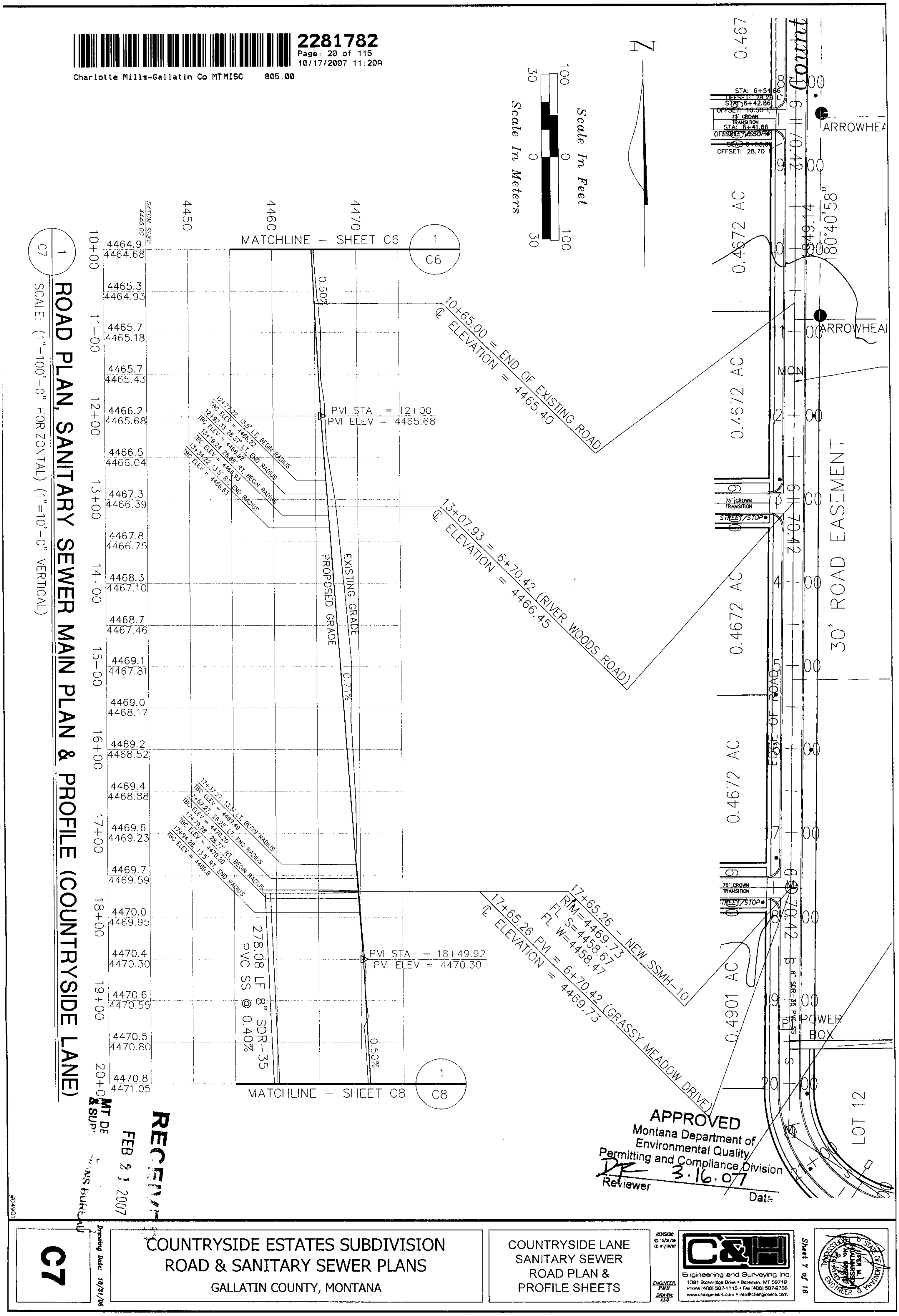
ROAD PLAN, SANITARY SEWER MAIN PLAN & PROFILE (COUNTRYSIDE LANE)
SCALE: (1"=100'-0" HORIZONTAL) (1"=10'-0" VERTICAL)
MATCHLINE - SHEET C6
MATCHLINE - SHEET C8
Scale In Feet
Scale In Meters
10+65.00 = END OF EXISTING ROAD
℄ ELEVATION = 4465.40
13+07.93 = 6+70.42 (RIVER WOODS ROAD)
℄ ELEVATION = 4466.45
17+65.26 - NEW SSMH-10
RIM=4469.73
FL S=4458.67
FL W=4458.47
17+65.26 PVI = 6+70.42 (GRASSY MEADOW DRIVE)
℄ ELEVATION = 4469.73
PVI STA = 12+00
PVI ELEV = 4465.68
PVI STA = 18+49.92
PVI ELEV = 4470.30
PROPOSED GRADE
EXISTING GRADE
0.50%
0.71%
278.08 LF 8" SDR-35 PVC SS @ 0.40%
30' ROAD EASEMENT
EDGE OF ROAD
POWER BOX
LOT 12
ARROWHEAD
MON
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Montana Department of Environmental Quality
Permitting and Compliance Division
3.16.07
Reviewer
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GALLATIN COUNTY, MONTANA
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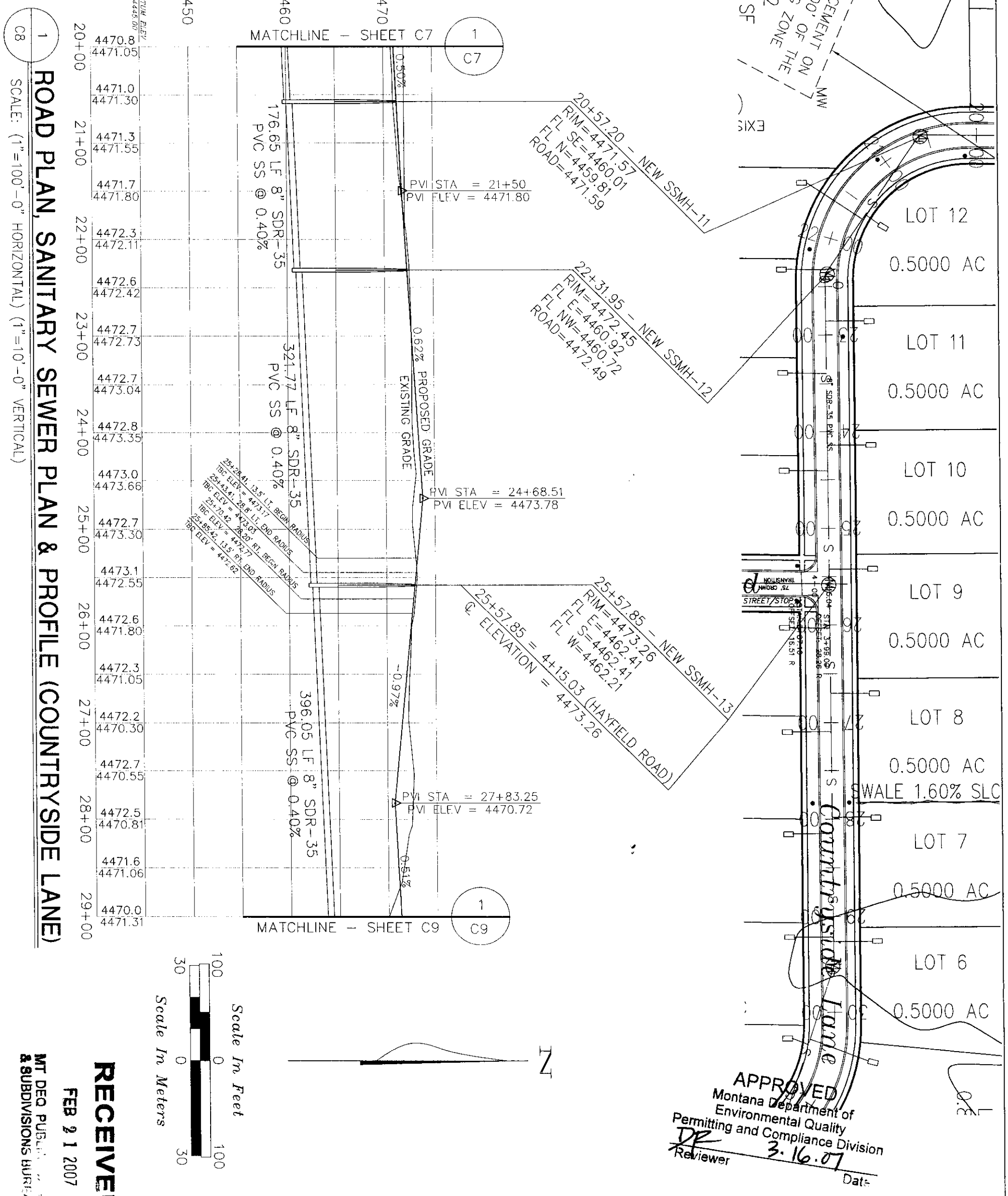
C7

ROAD PLAN, SANITARY SEWER PLAN & PROFILE (COUNTRYSIDE LANE)

SCALE: (1"=100'-0" HORIZONTAL) (1"=10'-0" VERTICAL)



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C8

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COUNTRYSIDE ESTATES SUBDIVISION
ROAD & SANITARY SEWER PLANS
GALLATIN COUNTY, MONTANA

COUNTRYSIDE LANE
SANITARY SEWER
ROAD PLAN &
PROFILE SHEETS

REVISION:
① 10/31/06
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ENGINEER: PMR
DRAWN: ALO

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STATE OF MONTANA
PETER M. WILLIAMSSON
No. 9000
REGISTERED PROFESSIONAL ENGINEER

2281782
Page: 22 of 115
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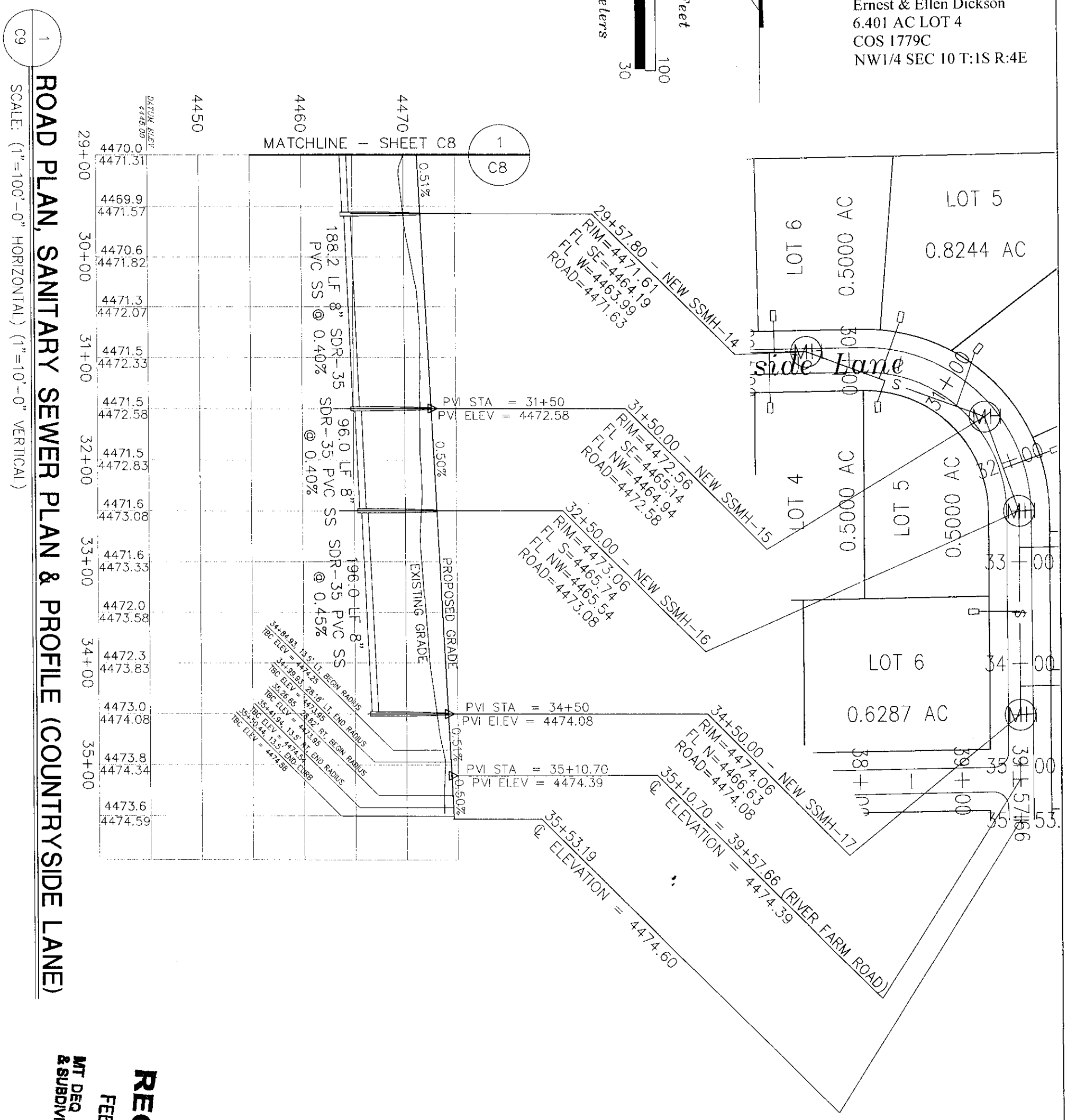
ROAD PLAN, SANITARY SEWER PLAN & PROFILE (COUNTRYSIDE LANE)

SCALE: (1"=100'-0" HORIZONTAL) (1"=10'-0" VERTICAL)



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C9

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COUNTRYSIDE ESTATES SUBDIVISION
ROAD & SANITARY SEWER PLANS
GALLATIN COUNTY, MONTANA

COUNTRYSIDE LANE
SANITARY SEWER
ROAD PLAN &
PROFILE SHEETS

REVISION:
@ 10/31/06
@ 01/10/07

ENGINEER: PMH
DRAWN: ALD

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Sheet 9 of 16

STATE OF MONTANA – PAUL M. HARLAMSSON – No. 8867PE – REGISTERED PROFESSIONAL ENGINEER

2281782
Page: 23 of 115
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Charlotte Mills-Gallatin Co MTMISC 805.00

Scale In Meters 30 0 30 — Scale In Feet 100 0 100

N

1 C10

ROAD PLAN, SANITARY SEWER MAIN PLAN & PROFILE (RIVERWAY ROAD)

SCALE: (1"=100'-0" HORIZONTAL) (1"=10'-0" VERTICAL)

DATUM ELEV 4445.00

4450 4460

0+00 1+00 2+00 3+00 4+00 5+00 6+00

4459.7 / 4458.85

PVI STA = 0+00
PVI ELEV = 4458.85

-2.00%

PVI STA = 0+12
PVI ELEV = 4458.61

75' CROWN TRANSITION

1.01%

4460.0 / 4458.99

4460.0 / 4459.50

PVI STA = 1+00.20
PVI ELEV = 4459.50

223.91 LF 8" SDR-35 PVC SS @ 0.5%

4460.2 / 4459.77

4460.4 / 4460.04

4460.4 / 4460.31

206.35 LF 8" SDR-35 PVC SS @ 0.97%

4460.4 / 4460.58

4460.5 / 4460.85

0.54%

PROPOSED GRADE

4460.5 / 4461.12

EXISTING GRADE

4460.3 / 4461.39

PVI STA = 4+99.85
PVI ELEV = 4461.65

4460.4 / 4461.65

-1.17%

4460.6 / 4461.07

4460.5 / 4460.48

75' CROWN TRANSITION

4460.3 / 4459.90

4460.1

PVI STA = 6+58.42
PVI ELEV = 4459.80

2.00%

0+00.00 = 2+85.04 (RIVER FARM ROAD) PVI
ELEVATION = 4458.85

0-24.00 - NEW SSMH-2
RIM=4459.00
FL E=4448.90
FL S=4448.70

2+03.91 - NEW SSMH-1-1
RIM=4460.05
FL E=4450.42
FL W=4450.22
ROAD=4460.05

4+14.26 - NEW SSMH-1-2
RIM=4461.18
FL W=4452.23
ROAD=4461.18

6+70.42 = 8+45.04 (COUNTRYSIDE ROAD) PVI
ELEVATION = 4460.04

PROPOSED BUILDING PAD FOR 9-UNIT MULTI-FAMILY BUILDING

7,000-GAL SEPTIC TANK
INSTALL A MIN OF 3 BOLLARDS AROUND TANK TO PREVENT TRAFFIC

EDGE OF ROAD

4" SCH-40 PRESSURE PIPE

STA: 2+85.04
OFFSET: 15.47 R

STREET/STOP

75' CROWN TRANSITION

PARK

EXISTING WELL

4" S LINES

2"

LOT 0.893

LOT 0.893

LOT 0.893

LOT

Riverway Road

STA: 0+57.60
OFFSET: 33.51 R

STA: 2+27.18
OFFSET: 24.50 R

STA: 2+34.08
OFFSET: 0.00 R

STA: 1+46.39
OFFSET: 0.00 L

EXIST TO B AS P

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C10

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COUNTRYSIDE ESTATES SUBDIVISION
ROAD & SANITARY SEWER PLANS
GALLATIN COUNTY, MONTANA

RIVERWAY ROAD
SANITARY SEWER
ROAD PLAN &
PROFILE SHEETS

REVISION
1 10/31/06
2 01/10/07

ENGINEER: PMR
DRAWN: ALO

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STATE OF MONTANA — REGISTERED — PAUL M. LAWLAWSON — No. 9807PE — PROFESSIONAL ENGINEER

1 C11

ROAD PLAN, SANITARY SEWER MAIN PLAN & PROFILE (BAKER STREET)

SCALE: (1"=100'-0" HORIZONTAL) (1"=10'-0" VERTICAL).

Scale In Meters 30 0 30 100

Scale In Feet 100 0 100

N

DATUM ELEV 4455.00

4460 4470

0+00 1+00 2+00 3+00 4+00 5+00 6+00

4461.9 / 4462.28
4462.0 / 4462.30
4462.2 / 4462.64
4462.4 / 4462.97
4462.9 / 4463.31
4463.6 / 4463.65
4464.1 / 4463.99
4464.0 / 4464.33
4464.0 / 4464.87
4463.9 / 4465.01
4463.9 / 4465.34
4463.9 / 4465.00
4464.2 / 4464.34
4464.3 / 4463.68
4464.3

PVI STA = -0+00.02
PVI ELEV = 4462.28

PVI STA = 0+11.99
PVI ELEV = 4462.04

PVI STA = 5+15.64
PVI ELEV = 4465.45

PVI STA = 6+58.44
PVI ELEV = 4463.57

2.00%
-2.00%
0.68%
-1.32%
2.00%

75' CROWN TRANSITION

354.85 LF 8" SDR-35 PVC SS @ 0.50%

202.60 LF 8" SDR-35 PVC SS @ 0.41%

EXISTING GRADE

PROPOSED GRADE

0-24.00 — NEW SSMH-4
RIM=4462.27
FL S=4451.05
FL E=4451.05
FL N=4450.85

0+00.00 = 8+45.12 (RIVER FARM ROAD) PVI
℄ ELEVATION = 4462.49

3+34.85 — NEW SSMH-4-1
RIM=4464.17
FL E=4453.02
FL W=4452.82
ROAD=4464.19

5+41.45 — NEW SSMH-4-2
RIM=4465.12
FL W=4453.85
ROAD=4465.24

6+70.42 = 8+45.11 (COUNTRYSIDE ROAD) PVI
℄ ELEVATION = 4463.81

DETENTION POND EA

River

Baker Street

Countr

LOT 1 0.4672 AC
LOT 2 0.4672 AC
LOT 3 0.4672 AC
LOT 4 0.4672 AC
LOT 5 0.4672 AC
LOT 6 0.4672 AC

8" SDR-35 PVC SS

STA: 0+17.86 OFFSET: 28.70 L
STA: 6+54.86 OFFSET: 28.70 L
STA: 0+28.02 OFFSET: 16.50 R
STA: 6+42.86 OFFSET: 16.50 L
STA: 6+54.66 OFFSET: 28.29 R

75' CROWN TRANSITION

949.14
80°40'58"

ARROWHEAD

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COUNTRYSIDE ESTATES SUBDIVISION
ROAD & SANITARY SEWER PLANS
GALLATIN COUNTY, MONTANA

BAKER STREET
SANITARY SEWER
ROAD PLAN &
PROFILE SHEETS

REVISION
10/31/06
01/16/07

ENGINEER: PMB
DRAWN: ALG

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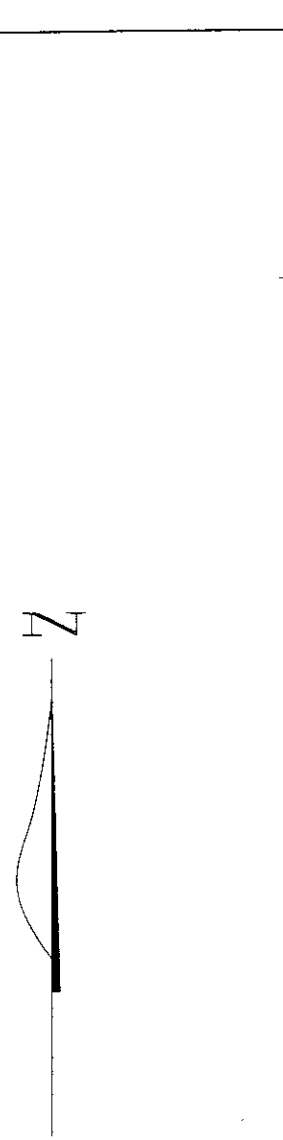
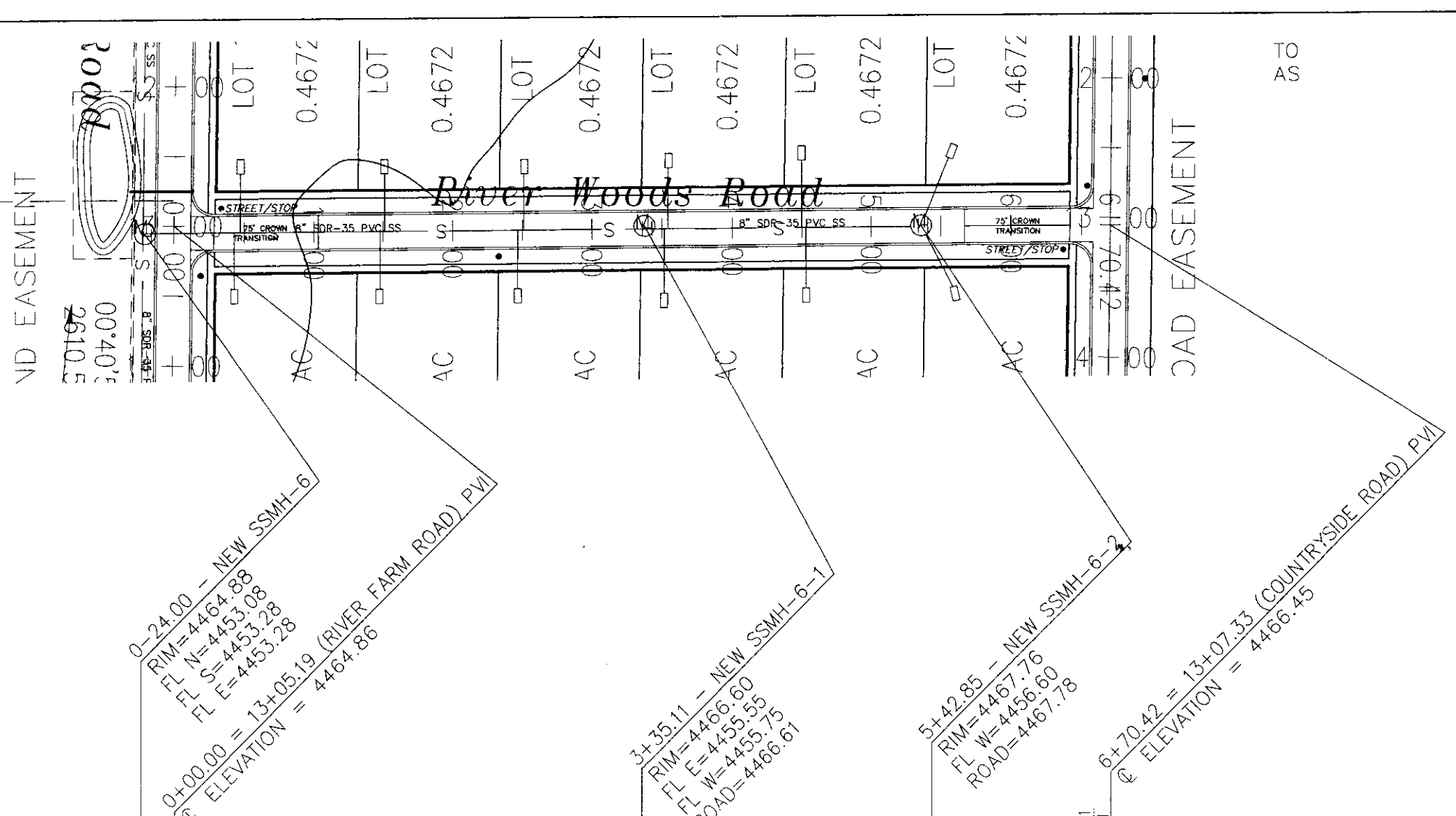
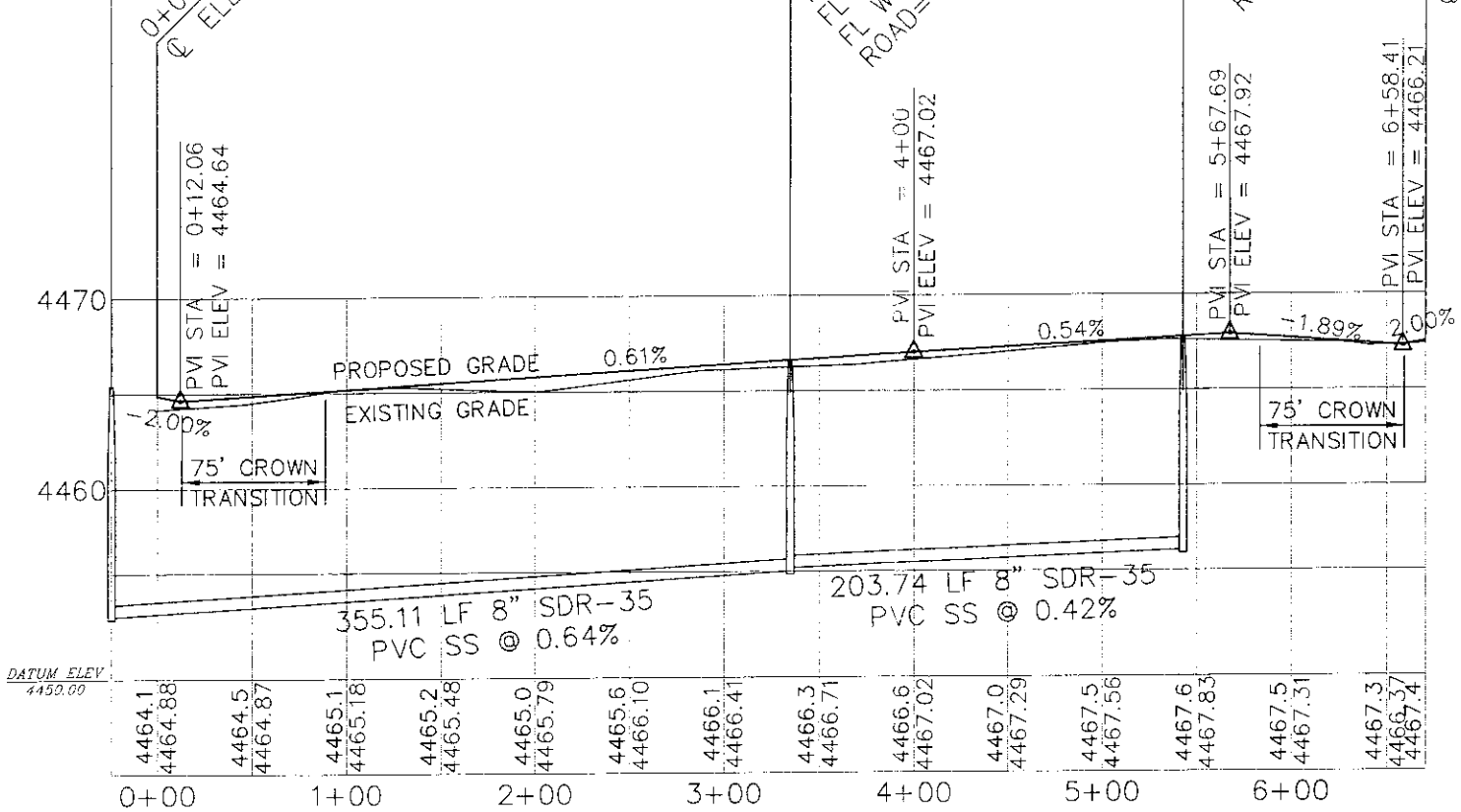
Sheet 11 of 16

STATE OF MONTANA
PETER M. HALMARSSON
No. 9866 PE
REGISTERED PROFESSIONAL ENGINEER



Scale In Feet
100 0 100
30 0 30
Scale In Meters





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1 / C12 ROAD PLAN, SANITARY SEWER MAIN PLAN & PROFILE (RIVER WOODS ROAD)
SCALE: (1"=100'-0" HORIZONTAL) (1"=10'-0" VERTICAL)

#04901

PER M. HOLMARSSON No. 8867PE REGISTERED PROFESSIONAL ENGINEER STATE OF MONTANA

Sheet 12 of 16

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ENGINEER: PWH
DRAWN: ALO

RIVER WOODS ROAD
SANITARY SEWER
ROAD PLAN &
PROFILE SHEETS

COUNTRYSIDE ESTATES SUBDIVISION
ROAD & SANITARY SEWER PLANS
GALLATIN COUNTY, MONTANA

Drawing Date: 10/31/06

C12

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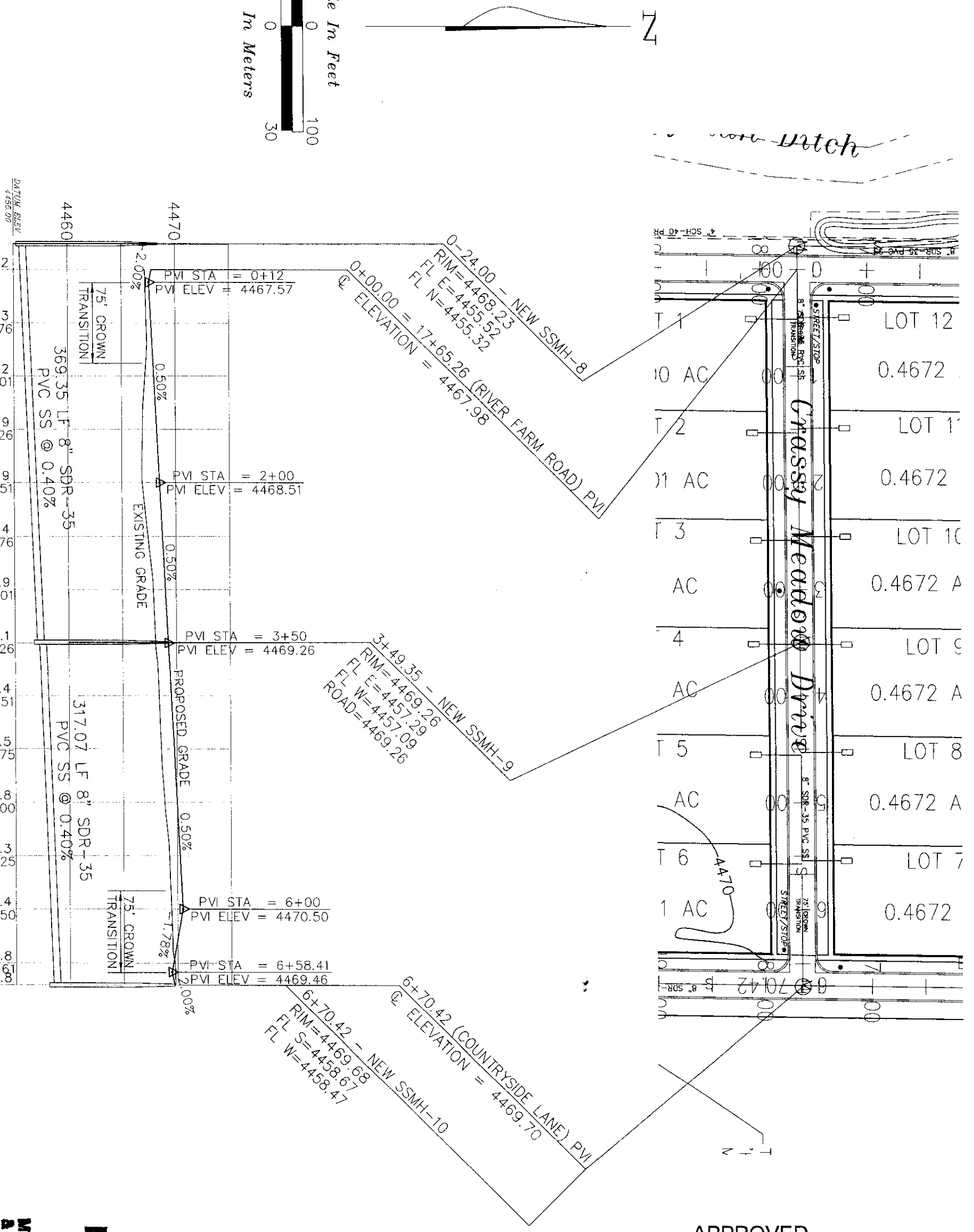
1 C13

ROAD PLAN, SANITARY SEWER MAIN PLAN & PROFILE (GRASSY MEADOW DRIVE)

SCALE: (1"=100'-0" HORIZONTAL) (1"=10'-0" VERTICAL)

Scale In Meters 30 0 30 — Scale In Feet 100 0 100



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C13

Drawing Date: 10/31/06

COUNTRYSIDE ESTATES SUBDIVISION
ROAD & SANITARY SEWER PLANS
GALLATIN COUNTY, MONTANA

GRASSY MEADOW DRIVE
SANITARY SEWER
ROAD PLAN &
PROFILE SHEETS

REVISION: ① 10/31/06 ② 01/10/07
ENGINEER: PWH
DRAWN: ALG

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PETER M. H. MARSSON No. 9867PE STATE OF MONTANA REGISTERED PROFESSIONAL ENGINEER

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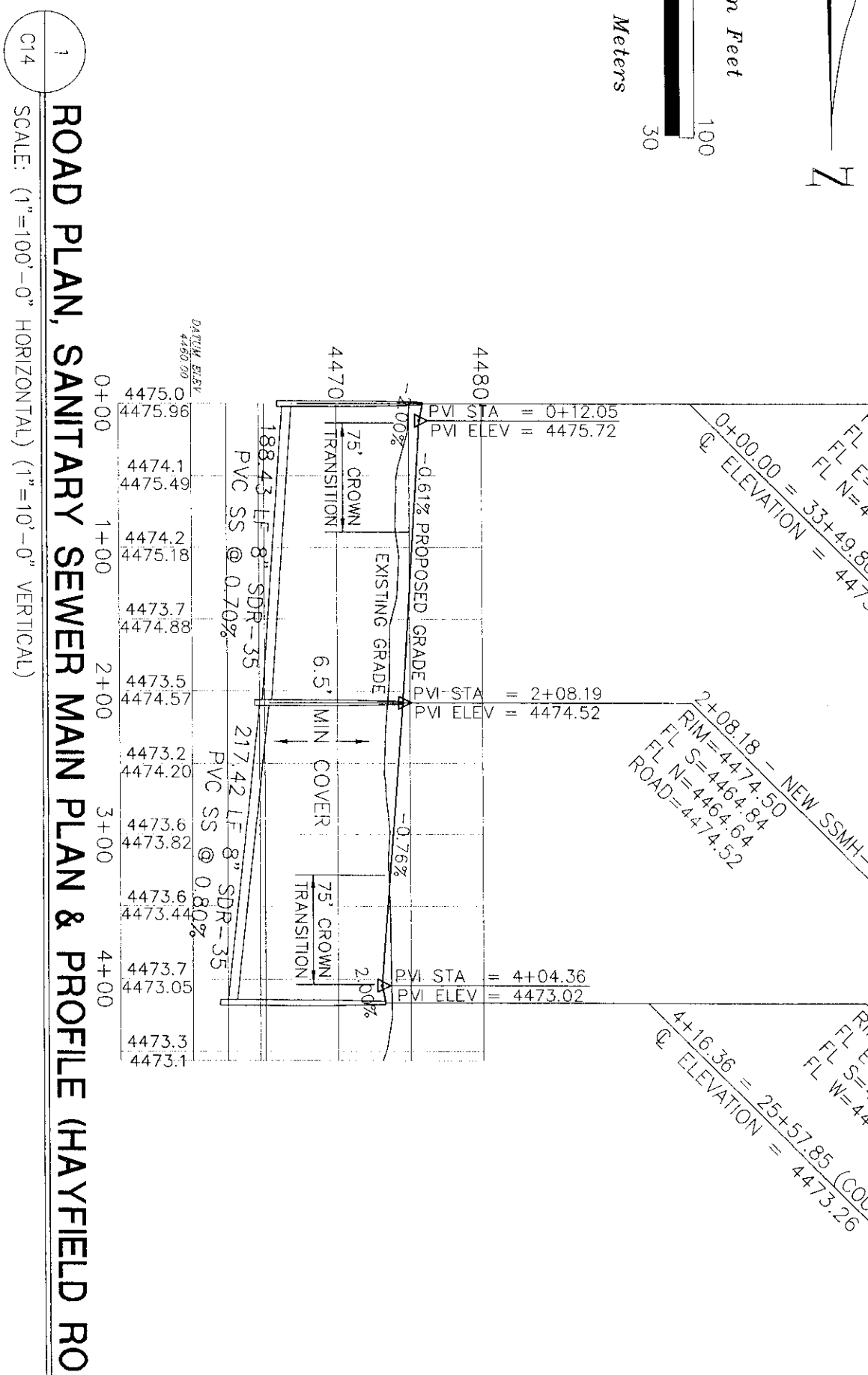
ROAD PLAN, SANITARY SEWER MAIN PLAN & PROFILE (HAYFIELD ROAD)

1 / C14

SCALE: (1"=100'-0" HORIZONTAL) (1"=10'-0" VERTICAL)



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Drawing Date: 10/31/06

COUNTRYSIDE ESTATES SUBDIVISION
ROAD & SANITARY SEWER PLANS
GALLATIN COUNTY, MONTANA

HAYFIELD ROAD
SANITARY SEWER
ROAD PLAN &
PROFILE SHEETS

REVISION:
@ 10/31/06
@ 01/16/07

ENGINEER: PNB
DRAWN: ALO

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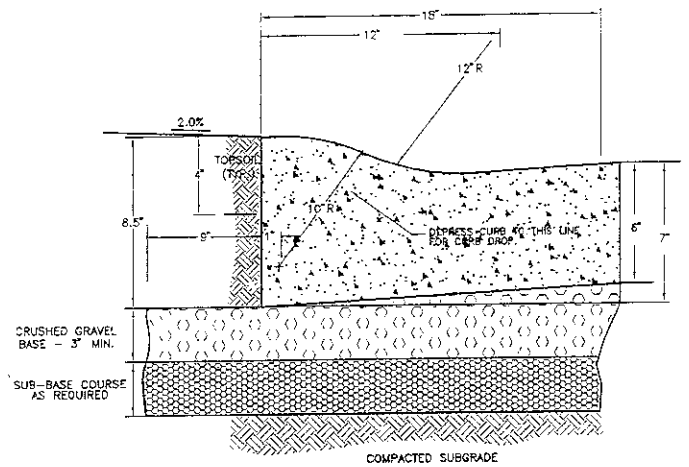
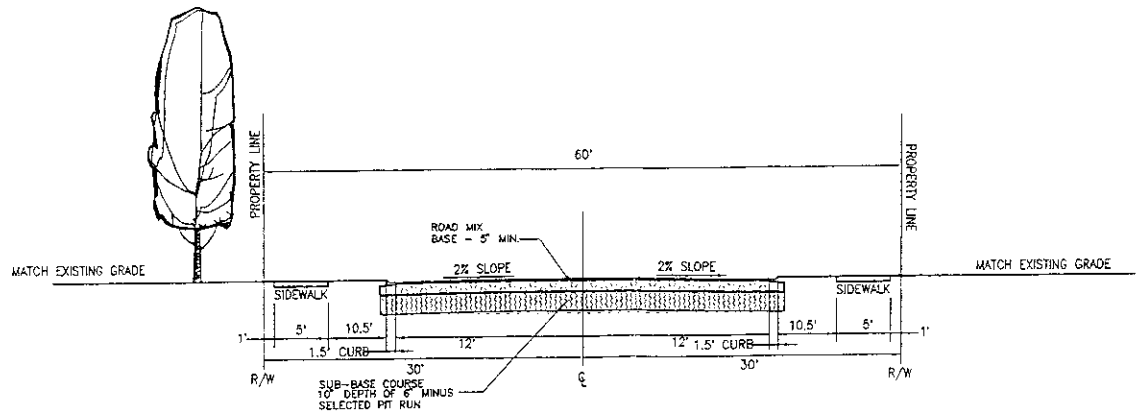
STATE OF MONTANA
PETER M. NIELSEN
PETER M. NIELSEN
No. 9807PE
REGISTERED PROFESSIONAL ENGINEER

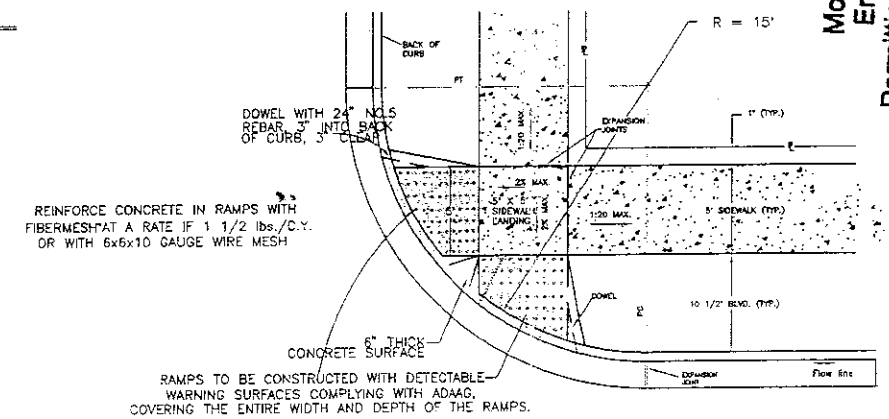


NOTES:
1. Subgrade or base course compaction shall conform to section 02230 (M.P.W. Specs., 1996 ed.)
2. Contraction joints shall be placed at 10' intervals and shall have a minimum depth of 3/4" and minimum width of 1/8".
3. 1/2" expansion joint material shall be placed at all P.C.s, P.T.s, curb returns and at not more than 300' intervals. The expansion material shall extend through the full depth of the curb and gutter.
4. No curb and gutter shall be placed without a final form inspection by the City Engineer or his representative.
5. Concrete shall be Class M-4000.
6. Crushed gravel base shall meet the requirements of Section 02235 (MPW SPECS, 1996 ed.) For curb and gutter replacement projects, washed rock may be used for the gravel base.

1 / C15 CONCRETE CURB AND GUTTER DETAIL
SCALE: NTS

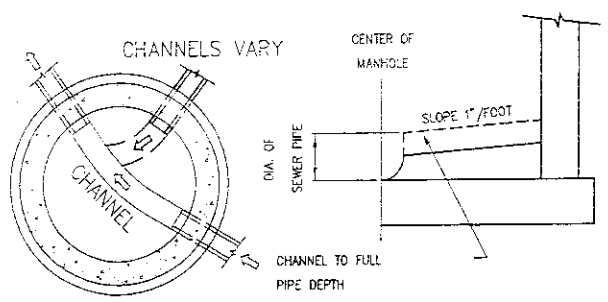


2 / C15 TYPICAL 60' R.O.W. ROAD SECTION
SCALE: NTS



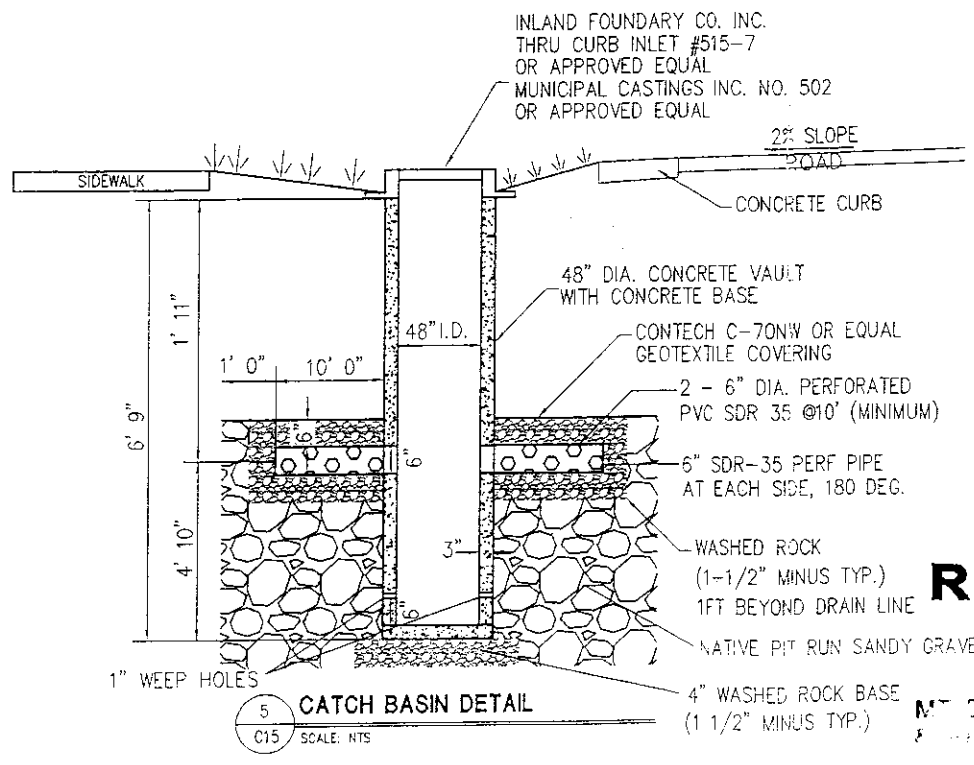
CONSTRUCTION NOTES:
1. Standard applies to new construction with max. curb R=15', and min. 5.5' boulevards.
2. Ramp and curb can be poured monolithically.
3. Ramp width shall be 5' minimum.
4. Sidewalk cross-slopes shall not exceed 2%.
5. 40' radii is to be used on all intersections with Arterial or Collector streets.
6. 40' radii will be to edge of asphalt, curb will stop at right of way/property line.

3 / C15 PEDESTRIAN RAMP
SCALE: NTS



SECTION A-A'
NTS

4 / C15 MANHOLE DETAIL
SCALE: NTS



5 / C15 CATCH BASIN DETAIL
SCALE: NTS

APPROVED
Montana Department of Environmental Quality
Permitting and Compliance Division
3.16.07
Date
Reviewer

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MAR 16 2007
MT DEQ PUBLIC WATER & WASTEWATER BUREAU

#04901 DE

PER M. HJALMARSSON
No. 8857PE
REGISTERED PROFESSIONAL ENGINEER
STATE OF MONTANA

Sheet 15 of 16

Engineering and Surveying Inc.
1511 Stanbridge Drive • Bozeman, MT 59718
Phone (406) 587-1115 • Fax (406) 587-9788
www.cheingineers.com • info@cheingineers.com

ENGINEER: PW H
DRAWN: MW

DETAILS

COUNTRYSIDE ESTATES
ROAD DETAILS
GALLATIN COUNTY, MONTANA

Drawing Date:
February 1, 2006

C15

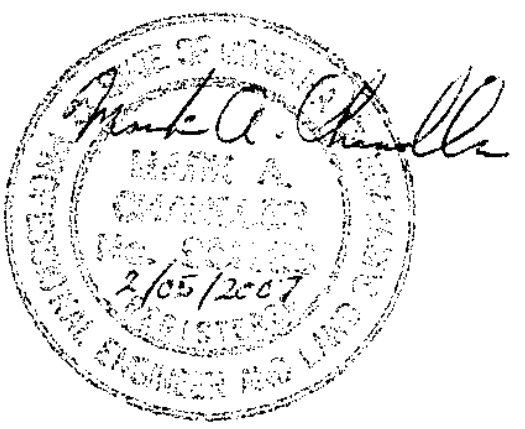
CONSTRUCTION SPECIFICATIONS
STORM WATER FACILITIES
COUNTRYSIDE ESTATES SUBDIVISION
GALLATIN COUNTY, MT

OWNER:
David Graham, Graham Development, LLC
257 Eze Street
Belgrade, MT 59714
(406) 580-8312

Prepared By:
C&H Engineering and Surveying, Inc.
1091 Stoneridge Drive, Bozeman, MT 59718
Phone: (406) 587-1115

Project #: 04901

FEBRUARY 2, 2007



CONSTRUCTION SPECIFICATIONS

This project will be constructed in accordance with *Montana Public Works Standard Specifications*, Fifth Edition, March 2003 and *Montana Department of Environmental Quality - DEQ Circular- 8, Montana Standards for Subdivision Storm Drainage*, 2002 Edition.

The following Sections of Construction Specifications and Standard Drawings listed are according to said Montana Public Works Standard Specifications and *Montana Department of Environmental Quality - DEQ Circular- 8, Montana Standards for Subdivision Storm Drainage*, 2002 Edition, are made a part of the Construction Specifications and Bid Form by reference only (see below). All or part of the corresponding MPWSS section may apply. Site specific specifications are also enclosed in Sections 02640. A full set of Construction Specifications is on file for inspection at the office of the Engineer, C&H Engineering and Surveying, Inc. 1091 Stoneridge Drive, Bozeman, MT 59718 (406) 587-1115.

BIDDING REQUIREMENTS, CONTRACT FORMS AND CONDITIONS OF THE CONTRACT

MPWSS SECTION 00100	Invitation to Bid
MPWSS SECTION 00200	Instructions to Bidders
MPWSS SECTION 00300	Bid Form
MPWSS SECTION 00500	Agreement Form
MPWSS SECTION 00700	General Conditions for Public Works Projects EJCDC 00700
MPWSS SECTION 00810	Supplementary Conditions to the General Conditions

MISCELLANEOUS FORMS (for guidance only)

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FORM C-510	Notice of Award
FORM C-550	Notice to Proceed
FORM C-610	Performance Bond
FORM C-615	Payment Bond
FORM C-620	Contractor's Application for Payment
FORM C-940	Work Change Directive
FORM C-941	Change Order
FORM C-942	Field Order

DIVISION 1 - GENERAL REQUIREMENTS

MPWSS SECTION 01010	Summary of Work
MPWSS SECTION 01041	Project Coordination
MPWSS SECTION 01050	Field Engineering
MPWSS SECTION 01090	References
MPWSS SECTION 01300	Submittals
MPWSS SECTION 01400	Contractor Quality Control and Owner Quality Assurance

MPWSS SECTION 01500	Construction and Temporary Facilities
MPWSS SECTION 01570	Construction Traffic Control
MPWSS SECTION 01700	Contract Closeout

DIVISION 2 - SITE WORK

MPWSS SECTIONS 02100 – SITE PREPARATION

MPWSS SECTION 02110	Geotextiles
MPWSS SECTION 02112	Removal of Existing Pavement, Concrete Curb, Sidewalk, Driveway and/or Structures
MPWSS SECTION 02113	Adjusting Existing Manholes, Lampholes, Inlets, Water Valve Boxes, Water Services, and Fire hydrants to Grade
MPWSS SECTION 02114	Relocating or Removing Utility Poles, Street Signs and Mailboxes

MPWSS SECTIONS 02200 - EARTHWORK

MPWSS SECTION 02221	Trench excavation and backfill for pipelines & appurtenant structures

MPWSS SECTIONS 02700 – SEWERAGE AND DRAINAGE

MPWSS SECTION 02720	Storm Drain Systems

MPWSS SECTIONS 02900 - LANDSCAPING

MPWSS SECTION 02910	Seeding
MPWSS SECTION 02920	Hydraulic Seeding

DIVISION 3 - CONCRETE

MPWSS SECTIONS 03200 – CONCRETE REINFORCEMENT

MPWSS SECTION 03210	Reinforcing Steel
MPWSS SECTION 03310	Structural Concrete

DIVISION 2 - SITE SPECIFIC SPECIFICATIONS

SECTION 02640 – STORM WATER FACILITIES CONSTRUCTION SPECIFICATIONS

APPENDIX A

LIST OF STANDARD DRAWINGS FROM MPWSS

02213-1	Manhole Adjustment
02213-2	Water Valve Adjustment
02221-1	Typical Utility Trench Detail
02221-2	Pipe Bedding Alternative
02529-1	Double Gutter Detail for Street Intersections
02720-1	30" Standard Storm Drain Inlet
02720-2	24" Standard Riser Inlet

SECTION 02640
Storm Water Facilities Construction Specifications

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes subsurface and surface preparation for installation of the Storm Water Facilities in Countryside Estates Subdivision.
B. Installation to be performed only by skilled workers, with satisfactory record of performance on pipe, chamber, or pond/landscaping construction projects of comparable size and quality.

1.2 REFERENCES

A. General Requirements – MPWSS Section 01400 Contractor Quality Control and Owner Quality Assurance requirements.
B. Earthwork – MPWSS Section 02221 – Trench Excavation and Backfill for pipelines & appurtenance structures, as needed.
C. Sewerage and Drainage – MPWSS Section 02720 – Storm Water Drain Systems, as needed.
D. Landscaping – MPWSS Section 02910 – Seeding

1.3 DRAWINGS

Refer to Drawings SW-1 through SW-5, Drawings C15 through C16.

PART 2 – INSTALLATION – EXECUTION

2.1 GENERAL

A. Prior to any subsurface excavation always call the BIG SKY UNDERGROUND UTILITIES LOCATE at 1-800-424-5555.
B. Installation of the Retention Pond A1 for the Countryside Estates Multi-family Lot shall be as shown on drawing SW2.
C. Retention Pond A1 shall occupy the western edge of the Countryside Estates Multi-family Lot. See Drawing SW1 for overall layout of Countryside Estates Subdivision.
D. Installation of Detention Pond 3 for the Countryside Estates Commercial Lots shall be as shown on drawing SW2, with an outlet control structure at the east end of the pond.
E. Detention Pond 3 shall occupy the northern edge of the Countryside Estates Commercial Lots. See Drawing SW1 for overall layout and dimensions of Commercial Lot Detention Pond.
F. Install a swale for the Countryside Estates Residential Lots that shall be a minimum of 1,200 feet long, as shown on drawings SW1, SW4 and SW5
G. The swale shall be located in Open Space 2, which is along the northern edge of Lots 5 - 12 of Block 6 in the Countryside Estates Subdivision. See Drawing SW5 for overall layout of the 1,200-foot long level swale.

H. The swale shall be at least 1,200 feet long by one foot wide at the bottom by one foot deep, with 3:1 side slopes.
I. Storm Drain Inlets, Outlet Control Structures, valley gutters, and similar storm drain facilities shall be installed in the locations and at the grades shown on the plans in accordance with Montana Public Works Standard Specifications.

2.2 POND AND SWALE CONSTRUCTION

A. Excavate the topsoil first, and store this material in a separate location.
B. Excavate the pond to the shape and size shown on the plans, removing enough material to provide for the placement of 4 to 6 inches of topsoil over the final pond or swale to reach the finish grade of the pond and maintaining a 3:1 side slope around the entire perimeter of the pond.
C. Provide seeding in accordance Montana Public Works Standard Section 2910 – Seeding, and the approved Gallatin County Weed Management Plan.

PART 3 – MEASUREMENT AND PAYMENT

A. Pond excavation and backfill is measured by the cubic yard.
B. Seeding is measured by the square yard (square meter) and paid for at the price bid including topsoil salvage and/or importing, topsoil placement, seedbed preparation, and seeding, complete in place and accepted by the Engineer.
C. Payment indicated to include complete compensation for all labor, equipment, materials and incidentals required for the completion of the work.
D. Separate measurement and payment is made for trench excavation and backfill, where applicable. Include all costs for this item in the unit price bid.
E. The upper limit of the trench excavation and backfill item is defined as top of subgrade.

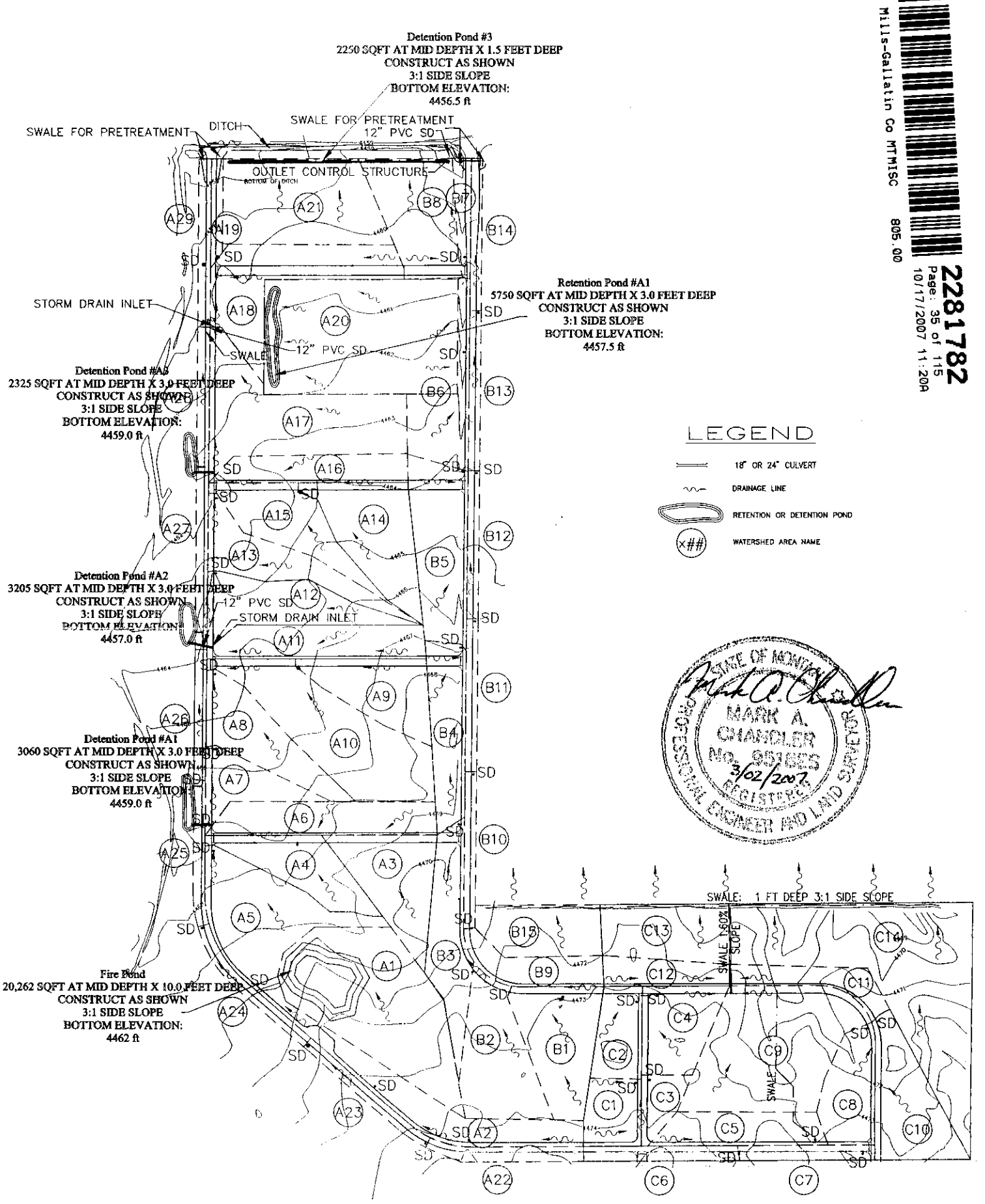
COUNTRYSIDE ESTATES SUBDIVISION

STORM WATER PLAN

WITH MAJOR/MINOR WATERSHED DELINEATION

LOCATED IN THE NE 1/4, SEC. 9 AND IN THE NW 1/4, SEC. 10
T. 1 S., R. 4 E. OF P.M.M., GALLATIN COUNTY, MONTANA

TABULATED AREAS	
W.S.	AREA SQ FT
A1	126,811
A2	62,780
A3	53,444
A4	43,281
A5	74,813
A6	49,507
A7	49,507
A8	47,906
A9	46,691
A10	95,602
A11	47,763
A12	50,383
A13	43,314
A14	60,845
A15	46,910
A16	35,509
A17	98,542
A18	69,112
A19	7,965
A20	150,119
A21	43,435
A22	13,701
A23	13,760
A24	12,282
A25	13,568
A26	8,383
A27	14,279
A28	13,029
A29	13,033
B1	58,337
B2	60,471
B3	46,981
B4	42,103
B5	63,705
B6	37,773
B7	11,919
B8	59,002
B9	2,799
B10	11,043
B11	11,987
B12	11,536
B13	12,331
B14	11,515
B15	40,450
C1	25,454
C2	27,911
C3	15,735
C4	41,203
C5	36,373
C6	37,516
C7	14,186
C8	37,516
C9	116,431
C10	55,781
C11	25,042
C12	22,252
C13	47,067
C14	17,098
TOTAL	2,629,000



(A) 1,411,640 SQ FT

(B) 565,780 SQ FT

(C) 651,960 SQ FT

STATE OF MONTANA
MARK A. CHANDLER
No. 9913ES
REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR
3/02/2007

RECEIVED
MAR 05 2007
MT DEQ PUBLIC WATER & SUBDIVISIONS BUREAU

APPROVED EQ#06-2669
Montana Department of
Environmental Quality
Permitting and Compliance Division
Reviewer
3.16.07
Date

Scale In Feet: 150 0 150
Scale In Meters: 45 0 45

SW1

Drawing Date: 1/11/07

COUNTRYSIDE ESTATES DRAINAGE PLAN
GALLATIN COUNTY, MONTANA

STORMWATER COLLECTION

REVISION:

ENGINEER: PMB
DRAWN: CMS

C&H Engineering and Surveying Inc.
1091 Stonebridge Drive • Bozeman, MT 59716
Phone (406) 587-1115 • Fax (406) 587-9768
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Sheet 1 of 5

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Page: 36 of 115
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DITCH
EDGE OF ROAD
BOTTOM OF DITCH
TOP OF DITCH
OVERHEAD POWER LINE
SWALE FOR PRETREATMENT
SWALE FOR PRETREATMENT
089°42'00" 4459
4459
NE Cor. Sec.
R. W. ALLEN
Amsterdam Road
MATCH OF PA
BENT REB.
RIPE
ARRC
CULVERT
C&H RPC
Detention Pond #3
2250 SQFT AT MID DEPTH X 1.5 FEET DEEP
CONSTRUCT AS SHOWN
3:1 SIDE SLOPE
BOTTOM ELEVATION:
4456.5 ft
OUTLET CONTROL STRUCTURE
TELEPHONE BOX
24"
CURB CUT
CURB CUT
CURB CUT
CURB CUT
A21
A29
A19
A22
B7
B14
BLOCK 1
4460
B8
6' VALLEY GUTTER
Riverway Road
A18
4461
Retention Pond #A1
5750 SQFT AT MID DEPTH X 3.0 FEET DEEP
CONSTRUCT AS SHOWN
3:1 SIDE SLOPE
BOTTOM ELEVATION:
4457.5 ft
4460
STORM DRAIN INLET
A20
4462
B13
A28
BLOCK 2
Detention Pond #A3
2325 SQFT AT MID DEPTH X 3.0 FEET DEEP
CONSTRUCT AS SHOWN
3:1 SIDE SLOPE
BOTTOM ELEVATION:
4459.0 ft
4463
B6
A17
STORM DRAIN INLET, SEE C15
A16
6' VALLEY GUTTER
6' VALLEY GUTTER
4464
12" PVC SD
Baker Street
Countryside Lane
ARROWH
EDGE OF ROAD
UG POWER LINE
SWALE
CURB CUT
SD

LEGEND
RETENTION OR DETENTION POND
DRAINAGE LINE
STORMWATER CATCH BASIN
PROPOSED WELL
EXISTING WELL
18" OR 24" CULVERT

Scale In Feet
12 0 0 40

N

STATE OF MONTANA
MARK A. CHANDLER
No. 9918ES
3/02/2007
REGISTERED
PROFESSIONAL ENGINEER AND LAND SURVEYOR

APPROVED
Montana Department of
Environmental Quality
Permitting and Compliance Division
DJR
Reviewer
3.16.07
Date

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& wastewater BUREAU

SW2

Drawing Date: 1/11/07

COUNTRYSIDE ESTATES
DRAINAGE PLAN
GALLATIN COUNTY, MONTANA

STORMWATER COLLECTION

BOYSON
ENGINEER: PMB
DRAWN: CMS

C&H Engineering and Surveying Inc.
1091 Stoneridge Drive • Bozeman, MT 59718
Phone (406) 587-1115 • Fax (406) 587-9768
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Page: 37 of 115
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Baker Street

River Farm Road

River Woods Road

Grassy Meadow Drive

30' ROAD EASEMENT

EDGE OF ROAD

DRIVEWAY

DITCH

12" PVC SD

SWALE

CURB CUT SWALE SD

4464

4462

4463

4465

4466

4467

4468

4469

4470

2610.55

180°40'58"

24.012'

A15 A14 A27 A13 A12 A11 A10 A9 A26 A8 A7 A6 A5 A4 A3

B1 B5 B4 B10

BLOCK 3

BLOCK 4

BLOCK 5

Detention Pond #A2
3250 SQFT AT MID DEPTH X 3.0 FEET DEEP
CONSTRUCT AS SHOWN
3:1 SIDE SLOPE
BOTTOM ELEVATION:
4459.0 ft

STORM DRAIN INLET, SEE 8/C15

6' VALLEY GUTTER

Detention Pond #A1
2,325 SQFT AT MID DEPTH X 3.0 FEET DEEP
CONSTRUCT AS SHOWN
3:1 SIDE SLOPE
BOTTOM ELEVATION:
4462.0 ft

IRRIGATION LINE

LEGEND

- RETENTION OR DETENTION POND
- DRAINAGE LINE
- STORMWATER CATCH BASIN
- PROPOSED WELL
- EXISTING WELL
- 18" OR 24" CULVERT

Scale In Feet 0 20 40

APPROVED
Montana Department of
Environmental Quality
Permitting and Compliance Division
DE 3/6/07
Reviewer Date

STATE OF MONTANA
MARK A. CHANDLER
No. 9076ES
REGISTERED
PROFESSIONAL ENGINEER AND LAND SURVEYOR
3/02/2007

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MAR 05 2007
MT DEQ
PUBLIC WATER & SANITATION BUREAU

SW3

COUNTRYSIDE ESTATES
DRAINAGE PLAN
GALLATIN COUNTY, MONTANA

Drawing Date: 1/11/06

STORMWATER COLLECTION

REVISION:

ENGINEER: PMR
DRAWN: CMS

C&H Engineering and Surveying Inc.
1091 Stoneridge Drive • Bozeman, MT 59718
Phone (406) 587-1115 • Fax (406) 587-9758
www.chengineers.com • info@chengineers.com

Sheet 8 of 6

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Page: 38 of 115
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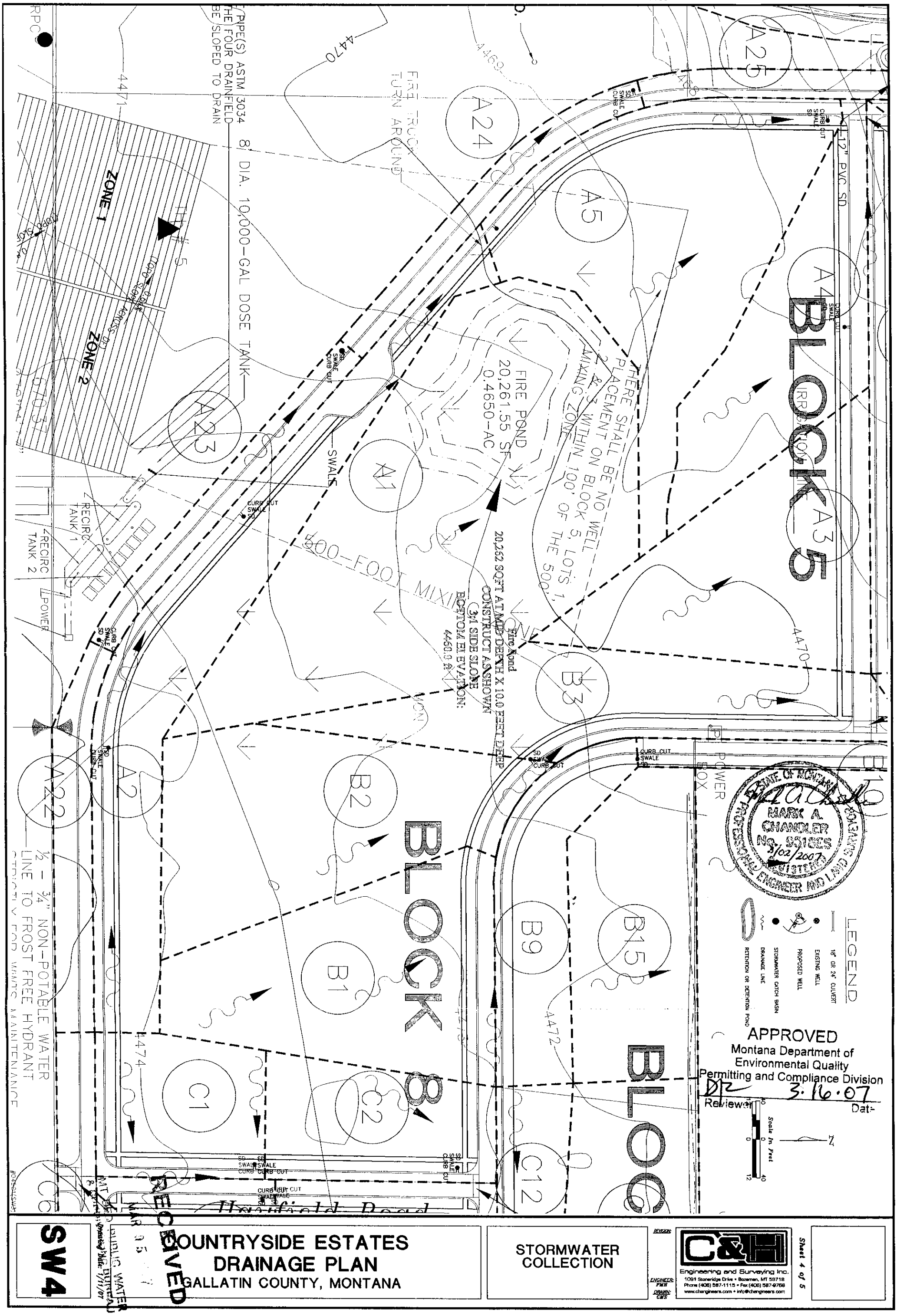
Charlotte Mills-Gallatin Co MTMISC 805.00



MARK A. CHANDLER
NO. 9516ES
3/02/2007
REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR
STATE OF MONTANA

SW4

COUNTRYSIDE ESTATES
DRAINAGE PLAN
GALLATIN COUNTY, MONTANA

STORMWATER COLLECTION

REVISION:

ENGINEER: PMH
DRAWN: CMS

C&H
Engineering and Surveying Inc.
1091 Stoneridge Drive • Bozeman, MT 59718
Phone (406) 587-1115 • Fax (406) 587-9768
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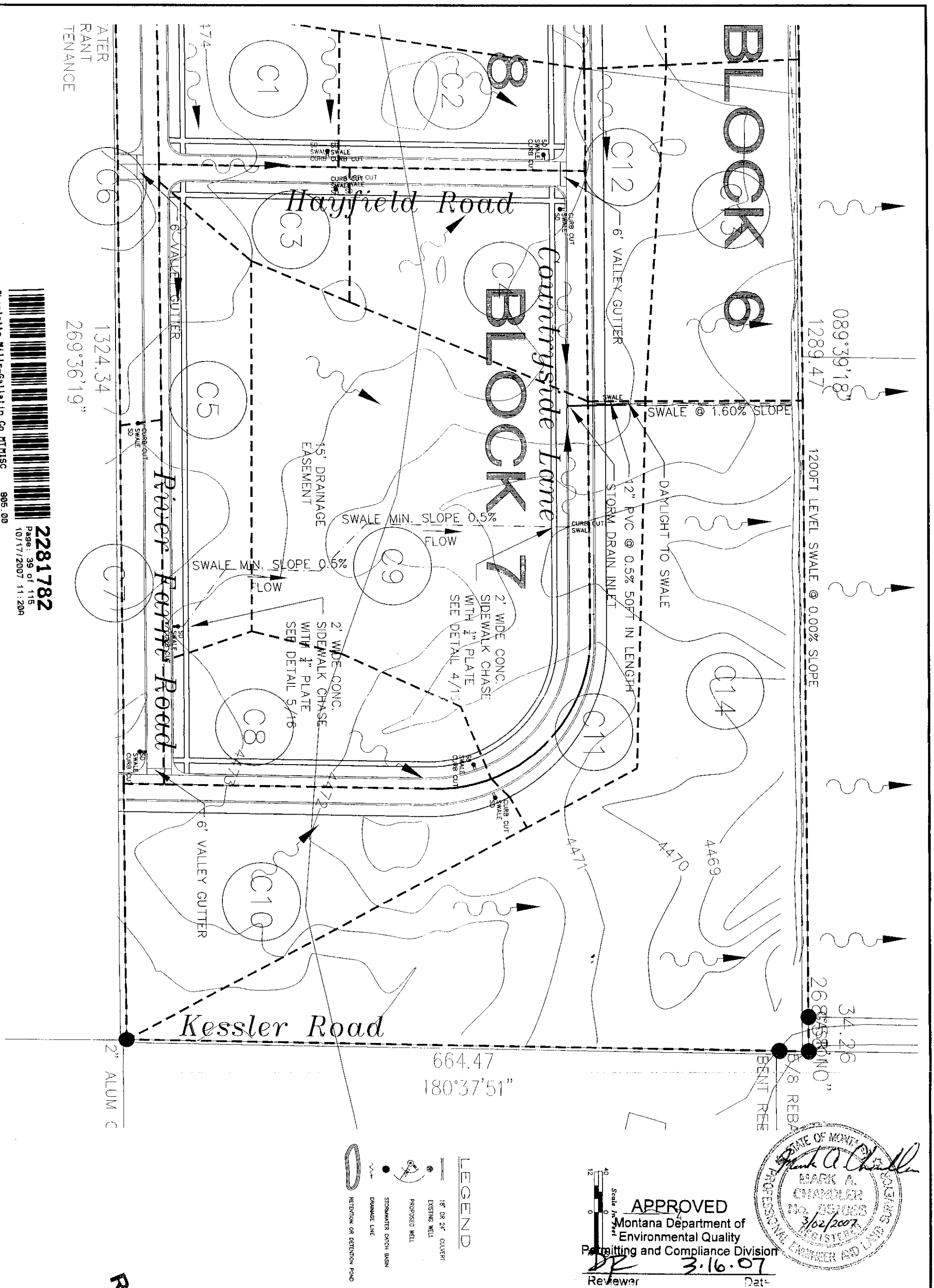

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DEQ
PERMITTING & COMPLIANCE
SWS

COUNTRYSIDE ESTATES
DRAINAGE PLAN
GALLATIN COUNTY, MONTANA

STORMWATER COLLECTION

REVISION:

ENGINEER: PMH
DRAWN: CMS

C&H
Engineering and Surveying Inc.
1091 Stoneridge Drive • Bozeman, MT 59718
Phone (406) 587-1115 • Fax (406) 587-9768
www.chengineers.com • info@chengineers.com

Sheet 5 of 5

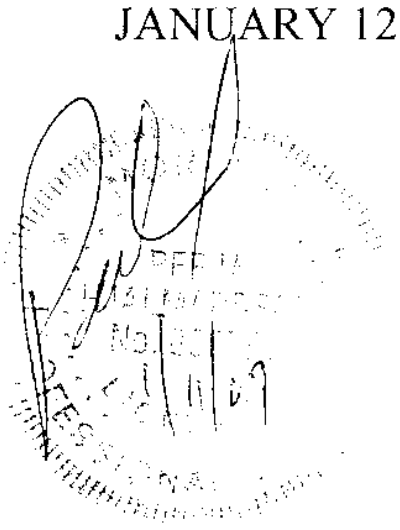
CONSTRUCTION SPECIFICATIONS
PUBLIC WASTEWATER TREATMENT SYSTEM
COUNTRYSIDE ESTATES SUBDIVISION
GALLATIN COUNTY, MT

OWNER:
David Graham, Graham Development, LLC
257 Eze Street
Belgrade, MT 59714
(406) 580-8312

Prepared By:
C&H Engineering and Surveying, Inc.
1091 Stoneridge Drive, Bozeman, MT 59718
Phone: (406) 587-1115

Project #: 04901

JANUARY 12, 2007



CONSTRUCTION SPECIFICATIONS

This project will be constructed in accordance with *Montana Public Works Standard Specifications*, Fifth Edition, March 2003 and *Montana Department of Environmental Quality - DEQ Circular- 2 Design Standards for Wastewater Facilities*, dated 9/10/1999.

The following Sections of Construction Specifications and Standard Drawings listed are according to said *Montana Public Works Standard Specifications* and *Montana Department of Environmental Quality - DEQ Circular- 2 Design Standards for Wastewater Facilities*, dated 9/10/1999, are made a part of the Construction Specifications and Bid Form by reference only (see below). All or part of the corresponding MPWSS section may apply. Site specific specifications are also enclosed in these specifications with copies attached. A full set of Construction Specifications is on file for inspection at the office of the Engineer, C&H Engineering and Surveying, Inc. 1091 Stoneridge Drive, Bozeman, MT 59718 (406) 587-1115.

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MPWSS SECTION 01500 Construction and Temporary Facilities
MPWSS SECTION 01570 Construction Traffic Control
MPWSS SECTION 01700 Contract Closeout

DIVISION 2 - SITE WORK

MPWSS SECTION 02100 - Site Preparation
MPWSS SECTION 02200 - Earthwork
MPWSS SECTION 02221 - Trench excavation and backfill for pipelines & appurtenant structures

MPWSS SECTIONS 02700 - SEWERAGE AND DRAINAGE
MPWSS SECTION 02730 - Sanitary Sewer Collection System

SITE SPECIFIC SPECIFICATIONS

SECTION 02630 - Drainfield Specifications
SECTION 02650 - Septic Tank Specifications
SECTION 11750 - Sanitary Sewer Lift Station

DIVISION 3 - CONCRETE

MPWSS SECTIONS 03310 - Structural Concrete
SECTION 3400 - Precast Concrete Structures

APPENDIX A

LIST OF STANDARD DRAWINGS

MPW	02213-1	Manhole Adjustment
MPW	02221-1	Typical Utility Trench Detail
MPW	02221-2	Pipe Bedding Alternative
MPW	02720-3	Sanitary Sewer and Storm Drain Manhole
MPW	02720-5	48" Standard Manhole Showing Two Types of Cone Sections
MPW	02720-6	Precast Manhole Bases
MPW	02720-7	Typical Manhole Channel Details
MPW	02720-8	Standard Cast iron Cover
MPW	02720-9	Standard 24" Cast Iron Ring Manhole Frame
MPW	02730-1	Nomograph for Air Testing Gravity Sewer Mains
MPW	02730-2	Sanitary Sewer Service Line
MPW	02730-3	Deep Sanitary Sewer Service Line

SECTION 2630
Drainfield Specifications.

1.01. General
Work under this section shall include furnishing all labor, materials, tools, and equipment necessary for the installation and pressure testing of the two (2)-inch diameter, Schedule 40, PVC drainfield lateral piping and the 6-inch Sch 40 piping that connects the drainfield laterals with the suction pump station, as shown on the plans and specified herein.

1.02. Materials
The sewer service lateral shall be PVC Type 1, Schedule 40. Fittings shall be PVC Type 1, Schedule 40 solvent weld fittings and comply with ASTM D1785 or D2241 construction standards. All laterals shall be 172-feet long consisting of forty three (43) INFILTRATOR Quick4™ Standard Chambers per lateral.

1.03. Installation

A. When crossing water lines, the sewer service lateral shall be at a minimum of eighteen (18)-inches below the water line. When installed parallel to waterlines, sewer lines shall maintain a ten (10)-feet of horizontal separation between the water and sewer pipe.

B. PREPARATION & EXCAVATION:

1. Stake out the location of all trenches and lines. Set the elevations of the tank, pipe, and trench bottom.

2. Install sedimentation and erosion control measures. Temporary drainage swales/berms may be installed to protect the site during rainfall events.

3. Excavate and level 3-foot wide trenches with proper center-to-center separation. Verify that the trenches are level or have the prescribed slope.

4. Rake the bottom and sides if smearing has occurred while excavating. Remove any large stones and other debris. Do not use the bucket teeth to rake the trench bottom.

Note: Raking to eliminate smearing is not necessary in sandy soils. In fine textured soils (silts and clays), avoid walking in the trench to prevent compaction and loss of soil structure.

5. Verify that each trench is level using a level, transit, or laser. The trench bottom shall be smooth and uniform.

C. Trench depths shall provide a minimum cover over the pipe as shown on Detail 5 of **Drawing SS5**. A maximum of twenty-four (24)-inches of cover is required for installing the INFILTRATOR Quick4™ Standard Chambers.

D. Placement shall provide a firm, smooth and uniform bottom for pipe support. The pipe shall be laid level in the trench. Slope shall be verified with a level. Material excavated from the pipe trench that is unsuitable for backfill shall be removed and disposed of by the Installer, and suitable material imported.

E. Installing the INFILTRATOR Quick4™ Standard Chambers (**See Drawing SS5**).

1. Check the header pipe to be sure it is level.

2. Set the invert height at 8-inches as specified in the design from the bottom of the inlet.

3. Place the inlet end of the first chamber over the back edge of the end cap.

4. Lift and place the end of the next chamber onto the previous chamber by holding it at a 45-degree angle. Line up the chamber end between the connector hook and locking pin at the top of the first chamber. Lower it to the ground to connect the chambers.

Note: When the chamber end is placed between the connector hook and locking pin at a 45-degree angle, the pin will be visible from the back side of the chamber.

Note: The connector hook serves as a guide to ensure proper connection and does not add structural integrity to the chamber joint. Broken hooks will not affect the structure or void the warranty

5. Swivel the chamber on the pin to achieve the proper direction for the trench layout.

Note: The Quick4 Standard Chamber allows 10-degrees of swivel in either direction at each joint.

6. Continue connecting the chambers until the trench is completed.

Note: As chambers are installed, verify they are level.

7. The last chamber in the trench requires an end cap. Lift the end cap at a 45-degree angle and insert the connector hook through the opening on the top of the end cap. Applying firm pressure, lower the end cap to the ground to snap it into place. Do not remove the tear-out seal.

8. To ensure structural stability, fill the sidewall area by pulling soil from the sides of the trench with a shovel. Start at the joints where the chambers connect. Continue backfilling the entire sidewall area, making sure the fill covers the louvers.

9. Pack down the fill by walking along the edges of the trench and chambers. This is an important step in assuring structural support.

Note: In wet or clay soils, do not walk in the sidewalls.

10. Proceed to the next trench and begin with Step **1.03.E.1.**

F. A layer of synthetic fabric or layers of untreated building paper shall separate the INFILTRATOR Quick4™ Standard Chamber trench from the native backfill soil.

G. When in the trench, pipe ends shall be effectively plugged and kept free from debris at all times. Pipe ends shall be open only when installation is actively undertaken.

1.04 Laterals

A. All lateral ends must be capped. Preparing the End Cap.

1.With a screwdriver or utility knife start the tear-out seal at the appropriate diameter for the inlet pipe. The seal allows for a tight fit for a 4-inch SCH40 pipe.

2. Pull the tab on the tear-out seal to create an opening on the end cap.

3. Snap off the molded splash plate located on the bottom front of the end cap.

4. Install splash plate into the appropriate slots below the inlet to prevent trench bottom erosion.

5. Insert the inlet pipe into the end cap at the beginning of the trench. Extend the pipe into the end cap roughly 4 inches. (Screws optional.)

B. All lateral ends shall have a steel rod placed in the ground to locate all PVC Lateral End Risers. **See Detail 7 Sheet SS5.**

C. All lateral 3-foot wide trenches must be placed at a minimum of seven (7) feet on-center.

D. All laterals shall have 5/32-inch holes drilled along the top of each 172-foot long lateral **with every fourth hole** drilled downward. Begin the first hole at 2-feet in from the manifold.

1.05 Covering the System

Before backfilling, the system must be inspected by the project engineer, a certified Gallatin County Installer, and/or the Gallatin City-County Health Department. Create an as-built drawing at this time for future records that must be turned into the Gallatin City-County Health Department within 30-days of installation.

A. Backfill the trench by pushing fill material over the chambers with a backhoe. Keep a minimum of 12 inches of compacted cover over the chambers before driving over the system.

B. It is best to mound several inches of soil over the finish grade to allow for settling. This also ensures that runoff water is diverted away from the system.

C. After the system is covered, the site should be seeded or sodded to prevent erosion.

Note: It is important to leave marking stakes along the boundary of the system. This will notify contractors of the site location so they will not cross it with equipment or vehicles.

1.06 Pressure Testing

PVC sewer service lateral shall be tested with water for leakage in the presence of the project engineer, certified Gallatin County Installer, and/or the Gallatin City-County Health Department. Test pressure shall be sixty (60) PSIG, or one and a half times (1½) the working pressure of the line, whichever is greater. Test duration shall be one hour. Any pressure loss over the one (1) hour period is unacceptable.

SECTION 2650
Septic Tank Specifications

1.01 General
This section describes the primary septic tank and the pumping septic tank as required for all residential services. All septic tanks shall be manufactured and furnished with two (2)-access openings, eighteen (18)-inches in diameter and of the configuration shown on the **Drawing SS-9**. Tanks shall have a twenty-four (24)-inch diameter formed in the top of the tank at the access opening for installation of twenty-four (24) inch diameter riser. Tanks shall be installed in strict accordance with the manufacturer's recommended installation instructions. Modification of completed tanks shall not be permitted unless approved by the Engineer, Gallatin City-County Health Department, and/or the Montana Department of Environmental Quality. Fiberglass or plastic septic tanks shall NOT be allowed on the Commercial Properties.

1.02

A. 1500–gallon Septic–Dose Tank for Commercial Lots

1. Primary septic tank shall be 1000-gallons and the attached/enclosed dose tank equal to 500-gallons. (i.e. a two (2)-compartment style tank)
2. The tank shall be pre-cast concrete, and shall have the floor and walls of the tank monolithically poured.
3. The tank shall be sealed with a heavy cement-based waterproof coating, (i.e. Thoroseal or approved equal), on both the inside and outside surfaces of the tank.
4. The inlet to the septic tank from the building sewer line shall penetrate eighteen (18) inches into the liquid from the inlet flow line.
5. See **Drawing SS-9**.

B. 7,000-gallon Septic–Dose Tank for the Multi-family Lot

1. Tank Dimensions (Refer to Xerxes literature.)
   a. Tank shall have nominal capacity of 7000 gallons.
   b. Tank shall have nominal outside diameter of 8-feet
2. Tank shall be manufactured with 100% resin and glass-fiber reinforcement. No sand fillers.
3. Resin used in tank and accessories shall be premium isophthalic polyester.
4. Tank manufacturer shall be in the business of manufacturing tanks with materials conforming to the requirements of ANSI/AWWA D120-02 Thermosetting Fiberglass-Reinforced Plastic Tanks.

1.03 Special Provisions
Flow rates account for variations in septic tank sizes for the Countryside Estates Wastewater Collection System.

Residential Lots:
The Countryside Estates Sanitary Sewer Collection system allows a residential property owner to install a 1500-gallon septic tank in lieu of the 1500-gallon septic-dose tank system described above (Section 1.02.A.).

Commercial Lots:
Must install the tank described in Section 1.02.A. of this specification.

Multi-family Lot:
Must install a 7,000-gallon described in Section 1.02.B of this specification

1.04 Outlet Risers
Two outlet risers shall be provided for each tank. Risers shall be at least twelve inches (12") high, shall have a minimum nominal diameter of twenty-four (24) inches. Outlet risers shall be provided for the following locations.

A. Traffic Rated Areas

1. Outlet risers shall be pre-cast concrete as manufactured by Anderson Pre-Cast or approved equal.
2. Risers shall be installed on the septic tank with a watertight seal.
3. A 6" x 6" non-shrink concrete ring shall be poured around the joint between the outlet riser and the septic tank, for stabilization of the riser.

B. Non-Traffic Areas

Outlet risers shall be pre-cast concrete as manufactured by Anderson Pre-Cast or approved equal, and shall be factory equipped with the following:

1. Neoprene Grommets: Two grommets, one for the spice box and one for the pump discharge, installed as shown on the drawing.
2. Adhesive: Two-part epoxy, one pint per riser, for bonding riser to tank. Bond and seal shall be watertight.

1.05. Lids
One frame and lid shall be furnished with each riser. Traffic rated lids shall be 24" cast iron frame and cover with gas tight gasket. Any non-traffic lid shall be Orenco System Model FL-24g fiberglass with green aggregate finishes, and provided neoprene gasket, stainless steel bolts and wrench or approved equal. The riser and lid combination shall be able to support a 2,500 lb wheel load.

1.06. Excavation and Installation

A. Excavation

1. Be sure of outside dimensions of tank

   a. Must have a minimum of twelve (12)-inches of clear space all the way around tank.

   b. Take into account the base material and inlet elevation for the hole depth

      i. The incoming line must have a minimum of one-quarter (¼)-inch per foot slope from facility to tank.

      ii. Allow a minimum of 4-6 inches bedding material in bottom of hole; allow for over excavation if there are unstable soils.

iii. Must know the distance from outside bottom of tank to the invert of the inlet.

2. Place excavated material in an area that will not be in the way of the delivery truck. Most tank delivery vehicles require being within about six (6) feet of the hole.

B. Check area leading into the excavation site before delivery

1. Check for low hanging wires.

2. Check for trees, buildings, etc., that may be in the way of the boom.

3. Look for mud, soft spots, steep grades, or tight corners.

C. Setting the tank in the hole

1. Take safety measures.

   a. Do not stand in hole while tank is being placed.

   b. Watch for water coming into the hole and walls sliding off in the hole.

   c. Stay away from edge of hole and watch the equipment operator.

2. Ensure the tank is level.

3. Check for proper alignment between inlet pipe and tank inlet.

D. Backfill instructions for 7,000 gallon 2-piece

1. Tank shall be installed according to the Xerxes Installation Manual and Operating Guidelines in effect at time of installation. The contractor shall be knowledgeable in proper installation procedures by the tank manufacturer, the supplied specifications, and/or the project engineer.

2. Set bottom half in prepared hole and make sure it is level

3. Place seal around the bottom part of the tank and set top half onto bottom half ensuring the inlet is in the correct position.

4. Backfill should be of proper size and gradation.

   a. No stones over 6" in diameter.

   b. Thick sand or pea gravel should be used as backfill to provide uniform support for the tank walls.

   d. Make sure the backfill contains sufficient moisture for proper compaction

1.07 Septic Tank Hydrostatic Testing

A. Concrete SEPTIC-DOSE TANK: The concrete septic tanks shall be tested with water for leakage. All tests shall be performed in the presence of a certified Gallatin City-County Installer or Site Inspector.

1. Plug all inlets and outlets.
2. Fill tank with water to full height, including a two -inch (2") depth in the lid.
3. Allow water to stand for twenty-four (24) hours.
4. Any loss of water, or leakage in a twenty-four (24) hour period constitutes failure.
5. Repair and retest all tanks that do not pass hydrostatic test.

B. For the 7,000-gallon Fiberglass Tank: The Multi-Family Lot 7,000 gallon septic tank shall be tested according to the Xerxes Installation Manual and Operating Guidelines in effect at time of installation. Where:
   1. The inlets, outlets, and access ports shall be sealed and secured.
   2. The tank shall be charged with 5 psig.
   3. Allow tank pressure to stabilize.
   4. Disconnect the air supply.
   5. If there is any noticeable pressure drop in 1-hour, the tank must be repaired.
   6. Repeat the test after repair.
   7. Release air carefully through an appropriate valve mechanism.

SECTION 03400
PRECAST CONCRETE STRUCTURES

PART 1 - GENERAL

1.1 DESCRIPTION

Furnish, install, and test all precast concrete structures.

1.2 SUBMITTALS

1.2.1 The Contractor shall submit the following for review in accordance with SECTION 01300, SHOP DRAWINGS AND MANUFACTURERS RECOMMENDATIONS.

A. Shop drawings for all precast concrete items showing all dimensions and locations of all appurtenances as shown on the plans.

B. A list of the design criteria used by the manufacturer for all manufactured, precast concrete items.

C. Information on lifting and erection procedures.

PART 2 - PRODUCTS

2.1 CONCRETE

2.1.1 Concrete materials including portland cement, aggregates, water, and admixtures shall conform to MPWSS SECTION 03310, STRUCTURAL CONCRETE.

2.1.2 Precast concrete shall have a minimum compressive strength at 28 days of 4000 psi with 5% (±1%) air entrainment unless otherwise specified.

2.1.3 Cement used in the concrete shall meet requirements of ASTM C 150, Type V or Type II with a maximum tricalcium aluminate content of five (5) percent.

2.2 PRECAST CONCRETE JOINT SEALANT

2.2.1 Sealant for joints between precast sections shall be flexible butyl resin sealant conforming to Federal Specification SS-S-210A and AASHTO M-198-B.

2.3 COMPRESSION-TYPE FLEXIBLE CONNECTOR

2.3.1 Flexible, watertight connections shall be equivalent to "Z-LOK" as manufactured by A-LOK Products, Inc., consisting of a rubber boot with stainless steel takup clamp providing 25 degrees omnidirectional deflection.

2.4 REINFORCING STEEL

2.4.1 Reinforcing steel used for precast concrete construction shall conform to MPWSS SECTION 03210, REINFORCING STEEL.

PART 3 - EXECUTION

3.1 FABRICATION AND CASTING

3.1.1 All precast concrete shall be fabricated and cast to the shapes, dimensions, and lengths shown on the plans. Precast concrete shall be straight, true, and free from dimensional distortions. All intergral appurtenances, openings, etc., shall be accurately located as shown on the plans. Form materials shall be steel and the systems free from leakage during the casting operation.

3.1.2 Curing of precast concrete shall be in accordance with MPWSS SECTION 3310, STRUCTURAL CONCRETE.

3.1.3 The manufacturer shall provide lifting inserts.

3.2 HANDLING, TRANSPORTING, AND STORING

3.2.1 Precast concrete structures shall not be transported away from the casting yard until the concrete has reached 75% of the minimum required 28 day compressive strength and a period of at least 5 days has elapsed since casting, unless otherwise permitted by the Engineer.

3.2.2 During handling, transporting, and storing, precast concrete structures shall be lifted and supported only at the lifting and supporting points as indicated on the shop drawings.

3.2.3 All precast concrete structures shall be stored in a manner to prevent torsion, objectionable bending, and contact with the ground.

3.2.4 Precast concrete structures shall not be used as storage areas for other materials or equipment.

3.2.5 Precast structures damaged while being handled or tranported will be rejected and shall be replaced or repaired in a manner approved by the Engineer.

3.3 INSTALLATION

3.3.1 Installation shall be carried out by the manufacturer or under his supervision using labor, equipment, tools, and materials required for proper execution of the work.

3.3.2 Contractors shall prepare all bearing surfaces to a true and level line prior to erection. Structure bedding shall meet the manufacturer's requirements. All supports of the precast structures shall be accurately located and of required size and bearing materials. Tanks shall be installed level.

3.3.3 Sealant between precast concrete sections shall be applied to both inside and outside walls of the structures.

3.3.4 In no case shall concentrated construction loads be placed on the precast members. In no case shall loads be placed on the precast members prior to backfilling (if required).

3.3.5 No Contractor, Subcontractor or any of his employees shall arbitrarily cut, drill, punch, or otherwise tamper with the precast concrete structures.

3.4 TESTING

3.4.1 Precast concrete structures shall be tested for water tightness, after installation, by filling tank with water to the maximum water level. Contractor shall be responsible for providing water sufficient to test tanks. A water level drop of more than 1" in 24 hours shall be sufficient to reject structure. The Contractor shall provide written

statement of water levels before and after testing and the duration of the test. The Engineer shall be notified of water tightness test 36 hours prior to commencement of the test.

3.4.2 If a structure fails the water tightness test, repairs must be made according to the manufacturer's recommendations and meet the approval of the Engineer. If repairs do not meet the Engineers approval, the structure shall be replace by the Contractor.

SECTION 11750
LIFT STATION

PART 1: GENERAL

1.01 WORK INCLUDED

Work under this section includes, but is not limited to furnishing and installing a duplex pump station as indicated on the project drawings, herein specified, as necessary for proper and complete performance.

1.02 RELATED WORK

A. Section 01300 – Shop Drawings and Submittals

B. Section 02221 – Trenching, Backfilling and Compacting

1.03 REFERENCES

Publications listed below form part of this specification to extent referenced in the text by basic designation only. Consult latest edition of publication unless otherwise noted:

A. American National Std. Institute (ANSI) / American Water Works Assoc. (AWWA)

1.	ANSI B16.1	Cast iron pipe flanges and flanged fittings.
2.	ANSI/AWWA C115/A21.15	Cast/ductile iron pipe with threaded fittings.
3.	ANSI 253.1	Safety Color Code for Marking Physical Hazards.
4.	ANSI B40.1	Gages, Pressure, and Vacuum.
5.	AWWA C508	Single Swing Check Valves

B. American Society for Testing and Materials (ASTM)

1.	ASTM A48	Gray Iron Castings.
2.	ASTM A126	Valves, Flanges, and Pipe Fittings.
3.	ASTM A307	Carbon Steel Bolts and Studs.
4.	ASTM A36	Structural Steel.

C. Institute of Electrical and Electronics Engineers (IEEE)

1.	IEEE Std 100	Standard Dictionary of Electrical Terms.
2.	IEEE Std 112	Test Procedure for Polyphase Induction Motors.
3.	IEEE Std 242	Protection of Industrial and Control Power Systems.

D. National Electrical Code (NEC) / National Electrical Manufacturers Assoc. (NEMA)

1.	NEC	National Electrical Code.
2.	NEMA Std MG1	Motors and Generators

E. Miscellaneous References

1.	Ten-State Standards	Recommended Standards for Wastewater Facilities.
2.	Hydraulic Institute	Std for Centrifugal, Rotary and Reciprocating Pumps.
3.	ISO 9001	International Organization for Standardization.

1.04 SYSTEM DESCRIPTION:

A. The contractor shall furnish and install one factory built automatically controlled below ground submersible pump and valve package capable of handling raw unscreened sewage or similar liquids.

B. The pumps and mechanical slide rail accessories shall be installed in the wet well as shown on the project plans. Check valves and isolation valves and associated piping shall be installed in the valve vault.

C. Factory built pump station design, including materials of construction, pump features, valves and piping, and motor controls shall be in accordance with requirements listed under PART 2 – PRODUCTS of this section.

1.05 SUBMITTALS:

A. Product Data

1. Prior to fabrication, pump station manufacturer shall submit 6 copies of submittal data for review and approval.

2. Submittal shall include shop drawings, electrical ladder logic drawings, and support data as follows: Catalog cuts sheets reflecting characteristics for major items of equipment, materials of construction, major dimensions, motor data, pump characteristic curves showing the design duty point capacity (GPM), head (FT), and hydraulic brake horsepower (BHP). Electrical components used in the motor branch and liquid level control shall be fully described.

3. Shop drawings shall provide layout of mechanical equipment and anchor bolt locations for slide rail components. Pipe penetrations and station access clearances shall be dimensioned relative to the station centerline. The electrical ladder logic drawings shall illustrate motor branch and liquid level control circuits to extent

B. Operation & Maintenance Manuals

1. Installation shall be in accordance with written instructions provided by the pump station manufacturer. Comprehensive instructions supplied at time of shipment shall enable personnel to properly operate and maintain all equipment supplied. Content and instructions shall assume operating personnel are familiar with pumps, motors, piping and valves, but lack experience on exact equipment supplied.

2. Documentation shall be specific to the pump station supplied and collated in functional sections. Each section shall combine to form a complete system manual covering all aspects of equipment supplied by the station manufacturer. Those supplying the equipment, even if mounted or included in overall station design, shall provide support data for any equipment supplied by others. Instructions shall include the following as a minimum:

a. Functional description of each major component, complete with operating instructions.

b. Instructions for operating pumps and pump controls in all modes of operation.

c. Calibration and adjustment of equipment for initial start-up, replacement of level control components, or as required for routine maintenance.

d. Support data for commercially available components not produced by the station manufacturer, but supplied in accordance with the specifications, shall be supported by literature from the prime manufacturer and incorporated as appendices.

e. Electrical schematic diagram of the pump station circuits shall be in accordance with NFPA70. Schematics shall illustrate, to the extent of authorized repair, pump motor branch, control and alarm system circuits including interconnections. Wire numbers and legend symbols shall be shown. Schematic diagrams for individual components, not normally repairable by the station operator, need not be included. Details for such parts shall not be substituted for an overall system schematic. Partial schematics, block diagrams, and simplified schematics shall not be provided in lieu of an overall system diagram.

f. Mechanical layout drawing of the pump station and components, prepared in accordance with good commercial practice, shall provide installation dimensions and location of all pumps, valves and piping.

3. Operation and maintenance instructions which rely on vendor cut-sheets and literature which include general configurations, or require operating personnel to selectively read portions of the manual shall not be acceptable. Operation and maintenance instructions must be specific to equipment supplied in accordance with these specifications.

4. Submit a minimum of four copies, one of which will be returned to the contractor.

1.06 OUALITY ASSURANCE

A. The manufacturer of the pump station shall have a quality management system in place and shall be ISO 9001 certified.

B. The manufacturer's technical representative shall inspect the completed installation, correct or supervise the correction of any defect or malfunction, and instruct operating personnel in the proper operation and maintenance of the equipment as described in Part 3 of this section.

1.07 MANUFACTURER'SWARRANTY

A. The pump station manufacturer shall warrant all equipment to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below.

1. The pumping units installed in this station shall be warranted for a period of five (5) years or 10,000 hours of operation from the time of shipment from the factory. The warranty shall cover failures due to defects in material and workmanship, not normal wear and tear. The pump station manufacturer shall pay a percentage of the list price for

replacement parts in labor as follows provided the pump with cable attached is returned pre-paid in accordance with the instructions:

Pump Warranty Obligation

Months after Startup	0-18	19-38	40-60
Hours of Operation	0-2,999	3,000-6,499	6,500-10,000
Manufacturer's Share of the Costs	100%	50%	25%

2. All remaining equipment apparatus and parts furnished shall be warranted for a period of five (5) years, excepting those items that are normally consumed in service such as light bulbs, oil, grease, packing, gaskets, o-rings, etc. The pump station manufacturer shall be solely responsible for the warranty of the station and all components.

B. Components failing to perform as specified by the engineer, or as represented by the manufacturer, or as proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer without cost of parts or labor to the owner.

C. It is not intended that the station manufacturer assume liability for consequential damages or contingent liabilities arising from failure of any vendor supplied product or part which fails to properly operate, however caused. Consequential damages resulting from defects in design. or delays in delivery are also beyond the manuf8cturer's scope of liability.

D. The warranty shall become effective upon the acceptance by the Engineer and begin on the date of substantial completion.

E. In order to unify responsibility for proper operation of the complete pumping station, it is the intent of these Specifications that all system components be furnished by a single supplier (unitary source). The pumping station must be of standard catalog design, totally warranted by the manufacturer. Under no circumstances will a system consisting of parts compiled and assembled by a manufacturer's representative or distributor be accepted.

PART 2: PRODUCTS

2.01 MANUFACTURER

A. The pump station system integrator shall have a quality management system in place and shall be ISO 9001 certified.

B. The specifications and project drawings depict equipment and materials manufactured by the ITT Flygt Corporation which are deemed most suitable for the service anticipated.

C. The pumps, controls, level indicating equipment, slide rail assembly, pump connecting assemblies and hoists shall be provided by a single supplier as a packaged system.

2.02 MANHOLES

A. Wet Well/ Valve Vault

1. Concrete shall be Type I-II SR, 5000 psi, with 5% air entrainment.

2. All sections are to be built to ASTM C-478 and shall be provided with recessed lifting points.

3. Base slab reinforcement shall be #6 rebar spaced 12" on center, each way.

4. Inside diameter is six feet (72 inches).

5. Walls are seven inches thick.

6. The lift station wet well base is 10" thick.

7. The wet well base slopes 1:1 on all sides and shall have a 4' x 4' flat hopper.

8. All connections between manhole walls and base and between wall sections, adjusting rings, and frame using "Ram-Nek", manufactured by K.T. Snyder Company, or approved equal, making the manhole watertight.

9. Pipe penetrations into manhole shall be molded from EPDM, cast into the manhole wall, and provide a flexible, watertight connection. Connections shall be Z-Loks as manufactured by A-Lok Products, Inc., or approved equal.

2.03 - 3" SUBMERSIBLE SEWAGE PUMPS

A. GENERAL

1. Contractor shall furnish all labor, materials, equipment and incidentals required to provide non-clog explosion proof submersible centrifugal sewage pumps for NEC class I, division 1, group C, D hazardous locations.

2. (OPTIONAL) Pump shall be equipped with stainless steel nameplate, stating the unit is accepted for use in NEC class I, division I, group C, D hazardous locations with third party, Factory Mutual, approval.

B. OPERATING CONDITIONS

1. Each pump shall be rated 5 H.P., 460 volts, 3 phase, 60 hertz, 3250 R.P.M. The unit shall produce 93.8. GPM at 51 feet TDH, with a minimum pump efficiency of 38 % and maximum input KW of KW. The pump shall be capable of handling a 2" spherical solid. The pump shall be non-overloading throughout the entire range of operation without employing service factor. The pump shall reserve a minimum service factor of 1.20. The performance curve submitted for approval shall state in addition to head and capacity performance, the pump efficiency, solid handling capacity and reflect motor service factor.

C. CONSTRUCTION

1. Each pump shall be of the sealed submersible type, model S3HVX as manufactured by Hydromatic Pump. The pump volute, motor and seal housing shall be high quality gray cast iron, ASTMA-48, class 30. The pump shall be fitted with a 3" standard ASA 125 lb. flange, faced and drilled. All external mating parts shall be machined and Buna N Rubber O-ring sealed on a beveled edge. All mating surfaces shall be flame proof joints

with special labyrinth joint to prevent a flame or spark to travel to the media being pumped. Gaskets shall not be acceptable. All fasteners exposed to the pumped liquids shall be 300 series stainless steel.

D. ELECTRICAL POWER CORD

1. Electrical power cord shall be STW-A, water resistant 600V, 60 degrees C., UL and CSA approved and applied dependent on amp draw for size.

2. The pump shall be triple protected with a compression fitting and two epoxy potted areas at the power cord entry to the pump. A separation between the junction box area of the pump and the motor by a stator lead sealing gland or terminal board shall not be acceptable.

3. The power cable entry into the cord cap assembly shall first be made with a compression fitting. Each individual lead shall be stripped down to bare wire at staggered intervals, and each strand shall be individually separated. This area of the cord cap shall then be fitted with an epoxy compound which will prevent water contamination to gain entry even in the event of wicking or capillary attraction.

4. The power cord leads shall then be connected to the motor leads with extra heavy connectors having brass inserts with a screwed wire to wire connection, rather than a terminal board that allows for possible leaks.

5. The connection box wiring shall be separated from the motor housing by stripping each lead down to bare wire, at staggered intervals, and separating each strand. This area shall be filled with an epoxy compound potting. Fiberglass terminal boards which are subject to heat fatigue and cracking, and which may lead to possible leaks shall not be acceptable.

6. The cord cap assembly where bolted to the connection box assembly and the connection box assembly where bolted to the motor housing shall be sealed with a Buna N Rubber O-ring on a beveled edge to assure proper sealing.

E. MOTOR

1. The stator, rotor and bearings shall be mounted in a sealed submersible type housing. The stator windings shall have Class F insulation, and a dielectric oil filled motor, NEMA B design. Further protection shall be provided by on winding thermal sensors. Because air-filled motors do not dissipate heat as efficiently as oil-filled motors, air-filled designs shall not be acceptable.

2. The pump and motor shall be specifically designed so that they may be operated partially or completely submerged in the liquid being pumped. The pump shall not require cooling water jackets. Dependence upon, or use of water jackets for supplemental cooling shall not be acceptable.

3. Stators shall be securely held in place with a removable end ring and threaded fasteners so they may be easily removed in the field without the use of heat or a press. Stators held by a heat shrink fit shall not be acceptable. Stators must be capable of being repaired or rewound by local motor service station. Units which require service only by the factory

shall not be acceptable. No special tools shall be required for pump and motor disassembly.

4. Pump shall be equipped with heat sensors. The heat sensor shall be a low resistance, bi-metal disc that is temperature sensitive. It shall be mounted directly on the stator windings and sized to open at 120 degrees C. and automatically reset at 30-35 degrees C. differential. The sensors shall be connected in series with motor starter coil so that the starter shall be equipped with 3 leg overload heaters so all normal overloads are protected by the starter.

F. BEARINGS AND SHAFT

1. An upper radial bearing and a lower thrust bearing shall be required. These shall be heavy-duty single row ball bearings which are permanently lubricated by the dielectric oil which fills the motor housing. Double row, sealed grease packed bearings shall not be acceptable. Bearings which require lubrication according to a prescribed schedule shall not be acceptable. The upper radial bearing shall have a minimum B-10 life at the specified condition of _____hours and the lower thrust bearing shall have a minimum B-10 life at the specified condition of _____hours. Bearing shall be locally available.

2. The shaft shall be machined from a solid 416 stainless steel forging and be a design which is of large diameter with minimum overhang to reduce shaft deflection and prolong life.

G. SEALS

1. The pump shall have two mechanical seals, mounted in tandem, with oil chamber between the seals. John Crane type 21, BFIC1, seals shall be used with the rotating seal faces being carbon and the stationary seal faces to be ceramic. The lower seal shall be replaced without disassembly of the seal chamber and without the use of special tools. Pump-out vanes shall be present on the backside of the impeller to keep contaminates out of the seal area. Units which require the use of tungsten-carbide seals or foreign manufactured seals shall not be acceptable. Seal shall be locally available.

2. The pump shall be equipped with a seal leak detection probe and warning system. This shall be designed to alert maintenance personnel of lower seal failure without having to take the unit out of service for inspection or requiring access for checking seal chamber oil level and consistency.

3. There shall be 2 electric probes or seal failure sensors installed in the seal chamber between the two tandem mechanical seals, to provide extra security. The sensors shall be electrically isolated to eliminate a possibility of a spark. If the lower seal fails, contaminants which enter the seal chamber shall be detected by the sensor and send a signal to the specified warning device.

4. Units equipped with opposed mechanical seals shall not be acceptable.

H. IMPELLER

1. Impeller shall be of the multi-vane, recessed non-clogging design and have pump-out vanes on the backside of the impeller to prevent grit and other materials from collecting in the seal area. Single vane design impellers which cannot be easily trimmed and which

do not maintain balance with wear causing shaft deflections and reduce seal and bearing life are not acceptable. Impeller shall not require coating. Because most impeller coatings do not remain beyond the very early life of the impeller, efficiency and other performance data submitted shall be based on performance with an uncoated impeller. Attempts to improve efficiency by coating impeller shall not be acceptable.

2. Impellers shall be dynamically balanced. the tolerance values shall be listed below according to the International Standard Organization grade 6.3 for rotors in rigid frames. C. A 400 series stainless steel washer and impeller bolt shall be used to fasten the impeller to the shaft. Straight end shafts for attachment of the impeller shall not be acceptable.

RPM	TOLERANCE
3500	.01 in. – oz./lb. of impeller weight
1750	.02 in. – oz./lb. of impeller weight
1150	.026 in. – oz./lb. of impeller weight
870	.03 in. – oz./lb. of impeller weight

I. CASING

1. The casing shall be of the recessed impeller, end suction volute type having sufficient strength and thickness to withstand all stress and strain from service at full operating pressure and load. The casing shall be of the centerline discharge type equipped with an automatic pipe coupling arrangement for ease of installation and piping alignment. The design shall be such that the pumps will be automatically connected to the discharge piping when lowered into position with the guide rails. The casing shall be accurately machined and bored for register fits with the suction and casing covers.

J. SERVICEABILITY

1. The complete rotating assembly shall be capable of being removed from the volute without disturbing the suction piping, discharge piping, and volute. The motor housing, seal housing with seal plate and impeller still attached to the shaft shall be capable of being lifted out of the volute case from the top as one assembly.

K. SUPPORT

1. Though the pump may not require feet to support the unit while installed, the pump volute must have feet support the unit when removed for service. Units which do not have feet upon which the unit can be supported when removed for service shall not be acceptable.

L. TESTING

1. Commercial testing shall be required and include the following:

   a. The pump shall be visually inspected to confirm that it is built in accordance with the specification as to the HP, voltage, phase and hertz.
   b. The motor seal and housing chambers shall be meggered for infinity to test for content or insulation defects.
   c. Pump shall be allowed to run dry to check for proper rotation.
   d. Discharge piping shall be attached, the pump submerged in water and amp readings shall be taken in each leg to check for an imbalanced stator winding. If

there is a significant difference in readings, the stator windings shall be checked with a bridge to determine if an unbalance exists. If so, the stator shall be replaced.

e. The pump shall be removed from the water, meggered again, dried and the motor housing filled with dielectric oil.

2. (OPTIONAL) In addition to the above commercial testing, a special megger test shall be performed and include the following:

a. The pump shall be submerged in water and allowed to run at maximum load for 30 minutes.

b. A written report on the above shall be prepared by the test engineer, certified and submitted to the engineer.

3. (OPTIONAL) A hydrostatic test shall also be performed on the pump. The hydrostatic test shall require that the volute and impeller be removed and a fixture installed to hold the spring and lower mechanical seal in place. A double plate, gasket and through-bolt shall be installed on the pump. A Discharge mating flange, gasket and pressure fitting shall be installed. The inlet port, volute and discharge nozzle shall then be pressurized with water to 150% of the maximum pump shut off pressure. This hydrostatic pressure shall be maintained for at least 5 minutes and the housing checked for leaks and/or loss of pressure.

4. (OPTIONAL) A non-witnesses Hydraulic Institute performance test shall be performed. This shall include the following.

a. The pump shall be tested at the design point as well as at least 4 other points to develop a curve. Data shall be collected to plot the head-capacity curve as well as KW input and amperage curve.

b. In making this test, no minus tolerance or margin shall be allowed with respect to capacity, total head or efficiency at the specified design conditioner. Pump shall be held within a tolerance of 10% of the rated capacity or at rated capacity with 5% of rated head. The pump shall be tested at shut-off, but not be plotted, and only used as a reference point when plotting the performance curve.

c. Complete records shall be kept of all information relevant to the test, as well as the manufacturer's serial number, type and size of pump, as well as any impeller modifications made to meet the design conditions.

d. A written test report shall be prepared, signed and dated by the test engineer incorporating 3 curves (head-capacity, KW input, and amperage) along with the pump serial number, test number, date speed, volts, phase, impeller diameter, and certification number. This report shall then be submitted to the engineer.

M. WARRANTY

1. The pump unit or any part thereof shall be warranted against defects in material or workmanship within one year from date of installation or 18 months from date of manufacture, whichever comes first, and shall be replaced at no charge with a new or manufactured part, EO.B. factory or authorized warranty service station. The warranty shall not assume responsibility for removal, reinstallation or freight, nor shall it assume

responsibility of incidental damages resulting from the failure of the pump to perform. The warranty shall not apply to damage resulting from accident, alteration, design,

2.04 AUTOMATIC DISCHARGE CONNECTION

A. Each pump shall be furnished with a submersible discharge connection system to permit removal and installation of the pump without the necessity of an operator entering the wet well. The design must insure an automatic and firm connection of the pump to the discharge piping when lowered into place.

B. A gray iron or fabricated steel base plate with integral guide rail pilots shall be provided along with all hardware and anchor bolts required for permanent installation to the wet well floor. The base plate shall be designed with an integral 90° elbow, or adapt to a commercially available elbow for connection to the vertical discharge piping utilizing standard ANSI 125 lbs. flanges. The base plate shall be coated with an epoxy coating for corrosion resistance. The manufacturer shall provide all necessary drawings to insure proper installation and alignment of base plate within the sump.

C. Each pump shall be provided with a replaceable ductile iron slide rail guide shoe attached to pump discharge flange. A replaceable neoprene seal shall be provided as an integral part of the guide shoe to form a seal with the base plate connection and eliminate the possibility of leakage and erosive wear during operation. The seal shall contact mating faces in a static position and shall have adequate flexibility to flex under pumping pressure to increase seal efficiency. Metal-to-metal contact at the discharge connection shall not be acceptable.

D. Upper guide rail pilots, and a lifting cable shall be furnished for each pump. Bottom pilots shall be an integral part of the base plate for ease of installation and proper alignment.

E. The guide shoe shall direct the pump down two vertical guide rails and onto the discharge connection in a simple lineal movement. The buildup of sludge and grease on guide rails shall not present problems during the lifting operation. The guide shoe shall be designed with integral hooks at the top to transmit full weight of the pump to the base, plate flange. No portion of the pump shall be supported directly on the bottom of the wet well, guide rails, or lifting cable.

F. The Contractor shall provide two lengths of 1-1/2".schedule 40 stainless steel guide rail pipe for each pump.

G. Lifting cable shall consist of a stainless steel braided wire cable attached to the pump lifting bail. A crimped ball end shall be provided at the upper end of this cable for attaching to the wet well access frame.

H. All bolts, machine screws, nuts, washers, and lock washers for complete assembly of access cover, guide rails, and discharge elbow shall be stainless steel.

I. Access Frame and Door

1. A separate access frame assembly shall be supplied with separate hinged door for removal of each pump. Access frame assembly and door shall be aluminum with 300 series stainless steel hinges and hardware. The door shall be aluminum tread plate to provide a skid-proof surface. Frame opening dimensions shall be *25 ¾"* x 35 *3/8"* with a separate access frame and door required for each pump. Load rating for the door and frame assembly shall be 150 psf and 300 psf in light traffic areas. Frame shall support float mounting bracket. The non-corrosive FRP I-beam shall attach to the access frame assembly with 300 series stainless steel fasteners. A recessed, stainless steel handle shall be provided with each door. A safety latch to hold door in open position shall also be provided.

2.05 PUMP HOIST

A. Portable Hoist
The pump station shall be provided with a portable hoist with winch assembly. Hoist shall be designed to lift pumps weighing up to 650 pounds. Portable hoist shall not weigh more than 75 pounds. Hoist socket shall be permanei1tly installed on station slab.

B. Hoist Socket
The pump station shall be provided with a hoist socket permanently installed on station slab for use with portable hoist.

2.06 PUMP CONTROL PANEL

A. Manufacturers and UL Certification

1. UL Certification: After fabrication, the completed Control Panel assembly shall be certified by and provided with a UL label indicating approval based on UL 508 requirements for industrial control panels. Control panels with intrinsic barriers shall be provided with a UL label that indicates approval based on UL 698A requirements.

2. Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to the following:

a. Pump Control Equipment:
   1. Hydromatic Inc.
   2. Products of other manufacturers assembled to provide all specified functions. including reliability equal to that of the manufacturer listed in (a) above.

B. General Control Requirements

1. General:

   a. A control panel shall be supplied containing all the electrical and mechanical equipment necessary to provide for the operation of two [2] 10 horsepower submersible pumps as depicted on the drawings at 460 VAC, three phase power. The panel shall operate from a multiple sensor probe unit with controller and shall provide for redundant operation in the case of a failure in the system. Loss of power or protective features shall be the only cause for shut down.

   b. Supply voltage shall be 460 V, 3 Phase - 4 Wire.

c. The control function provides for the lead pump under normal conditions. If the incoming flow exceeds the pumping capacity of the lead pump, additional pumps will automatically start and pump the station to the "off' elevation as shown on the plans. In the event the flow exceeds the capacity of the pumps, a high level audible alarm and light will be exited to indicate alarm conditions. A reset function shall lock out the audible alarm; however the alarm light shall release only with the correction of the high level condition.

d. In the even of a loss of power, phase reversal of the incoming power lines, loss of phase or phase imbalances the pumps shall shut down to provide protection from single phasing. The phase monitor shall reset automatically upon removal of the stated conditions. The phase monitor shall provide protection for power variations of + or – 10%

e. Provide receptacle for a portable generator in the event of extended power outage.

2. Mechanical:

a. The control enclosure shall be a NEMA 4 manufactured from 14gauge, minimum steel. The door shall be gasketed with a rubber composition material around the perimeter and shall be installed with a retainer to assure a positive weatherproof seal. The door shall open a minimum of 180 degrees. A padlock hasp shall be provided. All seams shall be welded and ground smooth. The control enclosure shall be as manufactured by Hoffinan. Dimensions of the enclosure shall not exceed 36" W x 48" H x 12" D.

b. A polished inner aluminum dead front door shall be mounted on a continuous aluminum aircraft type hinge and shall contain cutouts for the protrusion of the control breakers and provide protection of personnel from internal live voltages. All control switches; pilot indicator lights, elapsed time meters, ground fault duplex receptacle and other operational devices shall be mounted on the external surface of the dead front. The dead front door shall open a minimum of 150 degrees to allow for access to the equipment for maintenance. A 3/4" break shall be formed around the perimeter of the dead front to provide rigidity.

c. The back plate shall be manufactured from 12 gauge sheet steel and be finished with a primer coat and two [2] coats of baked-on white enamel. All hardware shall be mounted using machine thread stainless steel screws. Sheet metal screws shall not be acceptable. All installed devices will be permanently identified with engraved tags. Use of DYMO or similar type tapes is not acceptable.

3. Power Distribution:

a. The control panel shall be completely factory wired, including all internal components. All wiring and work shall be in accordance with the NEC, and the applicable standards.

b. Terminal block: The main terminal block must be sized to handle the control panel load. As a minimum, the main terminal block and connections shall be

rated 100 amps, to accept a 100-amp feeder protected at 100 amps. There needs to be multiple lugs for distributing the power to the other loads.

c. The panel power distribution shall include all necessary components and be wired with stranded copper conductors rated at 90 degrees "c". Conductor terminations shall be as recommended by the device manufacturer.

d. The control system shall contain a main circuit breaker [MCB]. The MCB shall be a 100 amp, 3 pole, 25 kAIC main disconnect for the panel. The MCB shall disconnect all power to the panel, including control power. Provide external operator handle on the control panel door.

e. The control system shall contain motor breakers for each motor [MB], control circuit breaker [CCB], and duplex receptacle breaker [DRB] and any other devices as shown on the drawings. A padlocking operating mechanism shall be installed on each motor circuit breaker. Operator handles for the mechanisms shall be located on the door.

f. All circuit breakers shall be heavy duty, molded case, and thermal magnetic or motor circuit protector, similar and equal to Square "D "type" FAL. Each breaker shall be sized to adequately meet the operating conditions of the load and have a minimum interrupting capacity of 25,000 amps at 480 VAC.

g. Breakers shall be indicating type, providing "on-off-tripped" positions of the handle. They shall be quick make-quick break on manual and automatic operation and have inverse time characteristics. Breakers shall be designed so that nipping of one pole automatically trips all poles.

h. Wiring shall be type MTW or THWN. All conductors shall be copper. Minimum size for power conductors shall be #12 AWG. Minimum size for control conductors shall be #14 AWG. Wires connected to components mounted on the enclosure door shall be bundled and made flexible at the hinged side of the enclosure.

1. All control wiring shall be numbered and identified on each end. Ground wires Shall be colored green. Neutral wires shall be white.

j. Provide a motor starter for each Pump motor. Motor starters shall be open NEMA rated equal to model 8536 as manufactured by Square D. The overload shall be melting alloy sized for the full load amp draw of the motors. Provide OL reset pushbutton, mounted though the control panel door. The coils shall be replaceable from the front of the starter without removal from the enclosure.

4. Surge protection:

a. A transient voltage surge suppressor shall be provided. The device shall be a solid-state device with a response time of less than 5 nano-seconds with a withstanding surge capacity of 60,000 amperes. Units shall be instant recovery, long life and shall have no hold over currents.

5. Elapsed Tune Meter (ETM)

a. Provide 6 digit ETM for each pump, indicating the total run time of each pump in

hours and tenths of hours.

6. Control System:

a. A control system utilizing a probe level sensor unit shall be provided to supply input for activation of tbe pumps. The probe unit shall be a single probe with 10 sensors to suit the level differentials of the wet well depth and control required for pumping the system down. The probe output shall be provided to a solid state programmable controller unit.

b. The controller shall be an advanced pump control device providing control of two[2] pumps and four [4] alarm levels. The liquid level, system status and motor faults shall be monitored from the front panel of the controller. Sequencing and alternation shall be provided by the controller.

c. The sensors shall be high-grade SS alloy. Tbe probes shall be supplied with a PVC cable, length as required. Also provide cleaning bracket for probes.

d. A 2 sensor multi-trode backup probe system shall be installed to turn on the pumps in the event of a control module failure. The probe system shall operate from a 24 VAC source. This two-sensor unit shall be a hi-lo (two separate single probes), with a single output cable. Provide MTR relay and other associated devices as required for the backup control. This backup control system and backup probe shall be totally separate from the primary controller and probe, allowing operation of the pumps if the primary controller or primary probe fails.

e. Provide multi-trode probes as specified and as required by the application. Confirm exact elevations, sensor increments, sensor lengths, etc with Engineer prior to bidding. See drawings for more detail.

f. Intrinsic barriers. Provide intrinsically safe barrier for each multi-trode level transmitter (MTISB). An intrinsic ally safe barrier is to be provided for each level transmitter, for a Class 1, Division 1location. The lift station is a Class 1,Division 1 location, and the level transmitters must be approved for use in the Class 1, Division 1 location.

7. Alarm System:

a. An alarm system shall be incorporated to indicate any alarm condition. The alarm light and alarm horn shall activate and remain active until the alarm conditions cease to exist. The alarm horn may be silenced with the alarm light remaining active. Provide 120VAC alarm light with vapor-tight red globe, guard, conduit box, and mounting base.

b. Provide four (4) alarm output relays with individual dry contact relay outputs, for each of the following: Pump 1 Fail, Pump 2 Fail, HLA, LLA The relay output contacts shall be wired as inputs to the alarm dialer, to individually annunciate each of the alarm conditions.

8. Alarm Auto-Dialer

a. Provide dialer for reporting alarm conditions.

b. Provide 4 extra contact channels (8 total).
c. Capable of dialing up to 8 phone numbers, each up to 16 digits in length.
d. User programmable speech, from a standard 230 word vocabulary.
e. Acknowledgement. Acknowledgement by pressing telephone key, or by returning call
f. Synthesized voice. Highly intelligible solid state voice synthesizer.
g. Input monitoring. Unit shall continuously monitor the presence of AC power and the status of eight contact closure inputs. AC power loss, or closure of any of the alarm input contacts, shall cause the unit to go into alarm,.
h. Remote programming capability-from any touch tone phone.
i. Non-volatile program Memory retention. User entered programming shall be kept intact even when power is removed for 10 years.
j. LED indications. Provide front panel LED indications for each of the following: Normal Operation, Program Mode, Phone Call in Progress, Unacknowledged Alarm, Acknowledged Alarm, AC Power Present, AC Power Failure, Low or Discharging or Recharging Battery.
k. Surge protection. Surge protection is to be provided on all inputs, including power, phone, and signal lines.
l. Remote inquiry. Inquiry phone call can be made directly to the unit from any telephone. Complete status report shall be available of all variables being monitored, including power status. User may also hear all user entered programming and diagnostic counts remotely.
m. Battery backup. Provide a minimum of six hours of battery backup operation.
n. Power. Power supply shall be 120VAC, 15 watts.
o. Phone line. Standard rotary-pulse or touch tone dial up phone line. Direct leased line not required. RJ-II connection.
p. Alarm channels. The specific alarm channels are to be as follows: Pump 1 Fail, Pump 2 fail, High Level Alarm, Low Level Alarm, ATS in Emergency Position, Spare. Connect all of these alarm contacts as required for dial out.

9. Phase Monitor:

a. A phase monitor shall be supplied to measure the conditions of the incoming power. In the event of a loss of any phase, phase reversal or low voltage condition, the control circuit shall drop out the motor starters to provide protection the pumps. A time delay shall be provided to minimize nuisance trips. The motors shall automatically restart when power conditions return to normal.

10. Pump Protection Modules:

a. A plug in solid state protective relay (mini-cas) shall be provided to measure the thermal and moisture conditions of each pump. The mini-cas relay shall be able to differentiate between the thermal and moisture conditions in each pump. Thermal alarms and moisture alarms shall be individually alarmed for each pump. The pump shall be shut down in the event of an alarm condition and requires reset prior to restarting the pump. The alarm system shall be activated upon a failure mode being detected.

11. Panel Heater

a. Provide panel heater to minimize the effects of humidity and condensation. Include thermostat for control.

12. Duplex Receptacle

a. Provide 120VAC, 20A, GFI duplex receptacle mounted on the door panel of the enclosure. Protect with 15A circuit breaker.

13. Automatic cleaning with APF-Cleaner:

a. APF-Cleaner is an electronic pump sump cleaning device that helps to prevent the accumulation of dirt in the sump. The function is to supplement the primary level control system in either a single or a dual pump station.

b. The device is designed to run the pumps to obtain the lowest possible water level in the sump, at which air is drawn into the impeller and the pump starts to "snore". The point is not to let the pump snore -on the contrary snoring is minimized but prior to snoring the pump is able to pump away the grease and dirt on the water surface. Entraining air at low operating depths and a high level of turbulence at the end of the pumping are other desirable effects. The turbulence stirs up some of the dirt and grease on the sump floor, which are pumped away.

The removal of both floating and settled solids during pumping reduces routine Maintenance and sump cleaning such as sparging and desludging. Another effect is a significant improvement of reliability.

b. At regular pumping cycles, the pumps are started and stopped by the primary level control system. But, on a pre-set number of cycles each 24 hours, the APF-Cleaner overrides the primary controller to perform a "cleaning" cycle.

c. Cleaning frequency: The number of cleaning cycles per 24 hours can be selected on the front of the APF-Cleaner to 0, 1,3, 5, 10, 15,25 or 40 times.

d. Stop function: When the water in the sump has dropped to such a level that the pump begins to draw air, the motor current will drop. The APF-Cleaner detects this and stops the pump.

C. Specific Control Requirements

1. **Description:** Microprocessor based, solid-state, intelligent pump controller with built-in pump control logic and liquid level device input capability. The integrated controller shall be capable of advanced fault detection and alarm output notification. MT2PC controller.

2. **Communications Compatibility:** The microprocessor based control unit shall contain a built-in RS232 communications port to allow communication with a laptop computer directly or with a remote reporting system using a dial-up modem(over standard telephone lines).

3. **Programming Capability:**

a. A user-friendly interface shall be available via the front key pad to access and display all programming functions without the need for an external programming device.

b. In addition to built-in programming functions, the control unit shall be programmable and or upgradeable with a laptop computer via an available RS232 communications port.

c. The RS232 communications port shall also be capable of receiving connection of a dial-up modem for remote changing of control settings and display of pump information on a remote computer using control and monitoring software.

4. **Indication Characteristics:** An LED based front panel/keypad shall be capable of displaying the following information:

a. Pump status for each pump including:
   1. Pump running.
   2. Pump is in the HAND position.
   3. Pump is in the OFF position.
   4. Pump is in the AUTOMATIC position.
   5. Pump is available to run.
   6. Pump fault (Auto Reset)
   7. Pump lockout (Manual Reset).
   8. Motor overtemp (thermal) fault.
   9. Motor seal failure fault.

b. Two (2) liquid level alarm indicators.
c. Pump alternation active indicator.
d. Alternation sequence indicator.
e. Programming switch condition indicator.
f. Miscellaneous programming indicators.
g. Current liquid level.

5. **Level Sensing Capability:** The control unit shall be capable of accepting a level input signal from the following sources:

a. Multi-stage conductive sensor (multi-sensored probe) device compatible with the pump control equipment.

b. Analog input signal from a 4-20 ma level sensing device (pressure transducer, etc.) When an analog 4-2Omasignalis used for primary level measurement, the control unit shall have the ability to toggle between input sources (Le. Switch to a multisensored probe) in the event that the primary analog input fails. This toggle function shall be automatic.

6. **Pump Alternation Capability:** The control unit shall have the ability to automatically alternate pump outputs or select a fixed lead-lag pattern according to user requirements. The unit shall be field programmable to allocate pumps into separate groups and thereby select alternation patterns between groups of pumps. The unit shall be capable of setting any group of pumps to alternate automatically or operate in a fixed lead arrangement. The control unit shall also be capable of alternating some or all of the pumps.

7. **Time Delay Functions:** The control unit shall provide the following time delay functions for pump activation and deactivation:

a. **Pump Start and Stop:** The control unit shall provide programmable activation and deactivation delays that are selectable from the front keypad. These delay settings shall be able to be used for pump starting and stopping in a user selected arrangement.

b. **Interpump Delays:** A programmable interpump delay shall be provided for non-coincidental starting or stopping of pumps which will allow for a smooth transition of pump activation and deactivation without harmful cycling.

c. **Maximum Pomp Off Time:** The control unit shall be capable of automatically activating a pump if a programmable maximum pump off time is reached. This function shall allow a pump to be exercised for maintenance or other reasons. If a pump is activated using maximum off time, the pump shall run only if there is sufficient liquid level to allow for pump activation. When the liquid level reaches the off point, the pump shall be deactivated.

d. **Maximum Pump On Time:** The control unit shall be capable of turning a pump off when it is running and thereby force the running cycle to sequence between other pumps if desired. This function shall induce cycling where there has not been sufficient level change to cycle multiple pumps properly.

e. **Staging. Provide a time delay function between the starting of the two pumps. The time delay shall not allow the two pumps to start at the same time. The start of the second pomp shall be delayed 10-15 seconds after the start of the first pump. This time delay function shall operate in all conditions, even high-level alarm conditions after an extended power outage. The purpose of the time delay is to prevent overloading the emergency generator, by staggering the starts of the two pumps. This time delay function is critical. Provide the time delay on the start of the second pump in all conditions, in both the primary and backup control modes.**

8. **Fault Monitoring:** The control unit display panel shall have features which clearly identify faults and clearly indicate the status of conditions, such as lockouts, level alarms, etc. The control unit shall provide the following user configurable fault monitoring capability:

   a. **Critical Faults:** A fault condition that locks out a pump and prevents the pump from operating until the fault is cleared and the fault is manually reset on the control unit keypad.

   b. **Non-Critical Faults:** A fault condition that will temporarily disable a pump until the fault condition is cleared.

   c. **Pump Seal Failure Detection**: Adjustable pump seal detection shall be provided to indicate a pump inner seal failure and disable a pump when a seal fault is present. The seal fault function shall be user selectable to assign a seal leakage condition to a display only fault, critical (lockout) fault or non-critical (auto reset) fault.

   d. **Motor Overtemp Fault:** Adjustable pump thermal detection shall be provided to indicate a motor over temperature (thermal) condition and disable a pump when the thermal condition is present. The motor overtemp function shall be user selectable to assign a motor overtemp (thermal) condition to a display only fault, critical (lockout) fault or non-critical (auto reset) fault.

9. **Programming Features:** The control unit shall have the following additional features and functions:

a. **Pump Start/Stop Setpoints**: The pump activation and deactivation points for each pump shall be user selectable from the front keypad of the control unit.
b. **Pump Alternation:** All lead select and pump alternation settings shall be programmable from the front keypad of the control unit.
c. **Fail Safe Hand Override:** If a pump is set to the HAND mode on the control unit, the unit shall activate the designated pump and allow the pump to run only until the off setpoint of the pump is reached. This function prevents a pump from running if there is no liquid level present in the tank or sump.
d. **Lead Pump Lockout:** The pump control unit shall be capable of recording the amount of lag pump starts and stops while the lead pump continues to run. If the programmed number of lag starts is exceeded while the lead pump is running, the control unit shall be able to lockout the lead pump for occurrences of impeller wear or pump blockage.
e. **Minimum Starts Per Hour:** The pump control unit shall be capable of programming the number of pump starts per hour on any pump.
f. **Minimum Pumps Running**: The pump control unit shall be capable of programming the maximum number of pumps to run simultaneously.
g. **Mounting and Wiring:** The control unit shall have the ability to be DIN rail mounted or panel mounted. The front keypad display of the control unit shall be capable of being remotely mounted or attached directly to the control housing. For ease of removal, wiring terminations at the control unit shall be made with plug-in terminal connectors.

10. **Backup Controls.**

a. Provide MTR relay for backup control scheme
b. Provide MTR relay, 2 sensor multi-trode probe, and all other components as required for a complete redundant backup control scheme for the Lift Station
c. Upon reaching High-High level, start both of pumps. Provide 10 second time delay on the start of the second pump, to prevent starting both pumps at the same time on the generator.
d. Upon reaching Low-Low level stop both pumps
e. Repeat cycle.

D. Installation

1. Install equipment according to manufacturers written instructions.

2. Mount control equipment according to manufacturer's instructions and Division 16 Section "Basic Electrical Materials and Methods."

PART 3 - EXECUTION

3.01 EXAMINATION

A. Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Station manufacturer shall provide written instruction for proper handling. Immediately after off-loading, contractor shall inspect complete pump station and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with

shipper prior to accepting delivery. Validate all station serial numbers and parts lists with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

3.02 INSTALLATION

A. Install, level, align, and lubricate pump station as indicated on project drawings. Installation must be in accordance with written instructions supplied by the manufacturer at the time of delivery.

B. Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to station control panel.

C. Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

3.03 FIELD QUALITY CONTROL

A. Operational Test

1. Prior to acceptance by owner, an operational test of all pumps, and control systems shall be conducted to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable; it is safe and in optimum working condition; and conforms to the specified operating characteristics.

2. After construction debris and foreign material has been removed from the wet well, contractor shall supply clear water volume adequate to operate station through several pumping cycles. Observe and record operation of pumps, suction and discharge gage readings, ampere draw, pump controls, and liquid level controls. Check calibration of all instrumentation equipment, test manual control devices, and automatic control systems. Be alert to any undue noise, vibration or other operational problems.

B. Manufacturers Start-up Services

1. Coordinate station start-up with manufacturer's technical representative. The representative or factory service technician will inspect the completed installation. Calibrate and adjust instrumentation, correct or supervise correction of defects or malfunctions, and instruct operating personnel in proper operation and maintenance procedures.

3.04 CLEANING

A. Prior to acceptance, inspect interior and exterior of pump station for dirt, splashed material or damaged paint. Clean or repair accordingly. Remove from the job site all tools, surplus materials, scrap and debris.

3.05 PROTECTION

A. The pump station should be placed into service immediately. If operation is delayed, station is to be stored and maintained per manufacturer's written instructions.

END OF SECTION 11750

SECTION 13705
PROCESS INSTRUMENTATION AND CONTROLS

PART 1: GENERAL

1.1 DESCRIPTION OF WORK

A. This contractor shall furnish, install, test, start-up, adjust, and document the complete Process Instrumentation and Control (I&C) System.

B. The section shall include but not be limited to:

1. Submersible Level Transmitter

2. Control Panel

C. The system shall include primary elements for process variable measurements, analog display and control elements, and discrete display and control elements.

1.2 QUALITY ASSURANCE

A. All materials and equipment shall be new and of best quality, of the type best suited for the purpose intended, and be made by nationally recognized and substantially established manufacturers. Related items of equipment shall be the end products of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts, and manufacturer's service.

B. Where such listing is provided, all electrical materials used in this work shall be listed by the Underwriters Laboratories, Inc. (UL), or another Nationally Recognized Testing Laboratory (NRTL), and shall bear their label.

C. Where .the notation of "ISA" is indicated, the equipment or notation shall conform to standards of the Instrumentation Systems and Automation Society.

D. The supplier shall provide full-time manufacturing, engineering, service; and support personnel necessary to provide and support the complete system.

E. All hardware, software, programming, and other material provided in this section shall be warranted by this Division 13 contractor for a period of 1 year from the date of substantial completion. Warranty shall include, but not be limited to, replacement of Contractor supplied hardware that fails, plus correction of programming errors that may be discovered during operation.

1.3 SHOP DRAWINGS

A. Shop drawings shall include catalog cuts for the following:

1. Submersible Level Transmitter

2. Control Panel

B. Shop drawing submittals shall include the following:

1. Interconnecting wiring diagrams.

2. Loop diagrams.

3. Power requirements.

1.5 MANUFACTURER'S REPRESENTATIVE

A. The process control and instrumentation manufacturer shall furnish the service of a qualified representative to supervise the installation, start-up and field-testing of the instrumentation and controls. The manufacturers experience shall include a minimum of ten installations where equipment of similar size and design has been in operation successfully in a similar process for a minimum of five years.

B. The manufacture of the process control and instrumentation equipment shall be Industrial Automation Consulting or a pre-approved equal.

Industrial Automation Consulting
118 Main
Three Forks, MT *59752*
(406) 285-4627

PART 2: PRODUCTS

2.1 LEVEL CONTROLS

A. Level controls shall consist of two redundant submersible level transmitters connected, to the control panel that provide two stages of lead-lag pumping in a First-On-First-Off (FOFO) alternating sequence.

B. Provide and install submersible level transmitters consisting of level elements, transmitters, and interconnecting cables of 50 feet in total length, for continuous measurement of well level.

C. Transmitter housing shall be of 316SS waterproof construction with operating range of -20 to 60 deg C, unless otherwise noted.

D. Each transmitter shall be furnished with a ½" conduit fitting, vent filter, cable hanger, and digital panel meter for locally displaying the measured level.

E. Transmitter shall provide a two-wire 4-20mA DC output signal in linear proportion to the level being sensed.

F. Level system shall have an overall accuracy of +/-0.25% of full scale and shall operate on 9-30 VDC loop power.

G. The level transmitters shall be Pressure Systems Series 750, or approved equal.

H. Float switch shall be Warrick MGRE Float switch.

2.2 CONTROL PANEL

A. Contractor shall furnish all labor, materials, equipment and incidentals required to provide a Multitrode MT2PC Control Panel or approved equal.

2.3. PUMP CONTROLS

A. Contractor shall furnish all labor, materials, equipment and incidentals required to provide process instrumentation and controls as described in section 13705.

B. Pump Controls:

1. The pumps shall be connected to the control circuit time delay to prevent simultaneous motor starts.

2. The pumps shall be connected to the pump control panel to terminate pump operation due to high motor winding temperature or moisture in the motor housing and shall utilize the contacts in the pump motor. If either event should occur, the motor starter will drop out, and a mechanical indicator, visible on the door, shall indicate the pump motor has been shutdown. The pump motor shall automatically reset when the condition has been corrected. However, the mechanical indicator shall require manual reset. Dry contacts, wired to terminal blocks, shall be furnished for each pump for thermal/moisture shutdown.

3. The control circuit shall be protected by a normal duty thermal- magnetic air circuit breaker which shall be connected in such a manner as to allow control power to be disconnected from all control circuits.

4. The pumps shall be connected to the Pump mode selector switches to permit manual start and manual stop for each pump individually, and to select automatic operation of each pump under control of the liquid level control system. Manual operation shall override the liquid level control system.

5. The pumps shall be connected to a Pump alternator relay contacts to operate after pump shutdown. The relay contacts are rated for 10 amperes minimum at 120 volts non- inductive.

6. The pumps shall be connected to the control panel that is equipped with an oil-tight pilot light for each pump motor. The light is wired in parallel with the related pump motor starter to indicate that the motor is on or should be running.

7. The pump motors shall be connected to a six digit elapsed time indicators (non-reset type) to indicate the total running time of each pump in "hours" and "tenth of hours".

8. Pumps shall be connected to the switch that permits the station operator to select automatic alternation of the pumps, to select pump number one to be the lead

pump for each pumping cycle or to select pump number two to be the lead pump for each pumping cycle.

PART 3: EXECUTION

3.1 INSTALLATION

A. This contractor shall be ultimately responsible and shall provide for the supply, installation, certification, adjustment, and startup of a complete, coordinated system, which shall reliably perform the specified functions.

B. This Division 13 Contractor may either include installation of the I&C System within the scope of his own work, or provide for the installation by an experienced I&C System installer as a sub-contractor.

C. Upon completion of work, remove materials, scraps, and debris from premises and from interior and exterior of all devices and equipment. Touchup scratches, scrapes, or chips in interior and exterior surface finish with material matching original color and finish.

D. Control and signal wiring in control panels shall be restrained by plastic ties or ducts. Hinge wiring shall be secured at each end to that any bending or twisting will be around the longitudinal axis of the wire, and the bend area shall be protected with a sleeve.

E. Provide abrasion protection for any wire bundles, which pass through holes or across edges of sheet metal.

F. This contractor shall make all final power and signal connections, both pneumatic and electric, to all elements provided under this section. For all elements provided and/or interfaced to under this section, this contractor shall verify the correctness of connections and adjustment, and shall so certify by written notice to the Engineer. Wiring shall not be spliced or tapped except at device or terminal blocks. No more than two wires may be terminated in a single crimp lug, and no more than two lugs may be installed on a single screw terminal.

G. This contractor shall obtain from other contractors all required information regarding primary elements, valves, valve actuators, and other control equipment or devices that are required to be interfaced with, but that are not provided under, this section.

H. This contractor shall coordinate his work with other project contractors to ensure that:

1. All components provided under this section are properly installed.

2. The proper type, size, and number of control wires and conduits are provided and installed.

3. The proper type, size, and number of pneumatic tubes and conduits are provided and installed.

4. Proper electric power circuits are provided to supply all components and systems.

I. All conduits are provided and installed under Division 16 .ELECTRICAL. With the exception of certain specified special control cables, all wiring and cables are provided and installed under Division 16. Specific special control cables shall be provided and installed by this Division 13 Contractor. All control and signal wiring external to the control panels shall conform to the requirements of Division 16.

J. This Contractor shall observe and advise on the installation performed by other Divisions to the extent required to certify in writing that the equipment will perform as required.

3.2 TESTING

A. All elements of the I&C System shall be tested prior to actual operation to demonstrate that the total system satisfies all requirements of this specification.

B. All special testing materials and equipment shall be provided by the contractor. Where it is not practical to test with real process variables, this contractor shall provide a suitable means of simulation. These simulation techniques shall be subject to the approval of the Engineer.

C. This contractor shall coordinate testing with all other associated project contractors.

D. Prior to onsite testing, the I&C contractor shall provide 8 hours of onsite training for designated Owner's personnel in the operation and maintenance of the system.

E. The testing requirements of Section *16045* of these specifications shall apply in addition to testing described herein.

F. Factory Tests:

1. All panels and assemblies shall be tested for proper operation prior to shipment from the manufacturer.

2. Results of the factory tests shall be recorded and submitted to the Engineer for approval before shipment of any panel or assembly to the project site.

G. Operational Acceptance Tests are to demonstrate that the P&I System is ready for final operation:

1. Check P&I System for proper installation, adjustment, and calibration on a loop-by-loop basis.

2. Check all system elements for proper installation and proper wiring terminations.

3. Adjust set points on all discrete elements and check for proper operation; interlocks, contact closure, etc.

4. Set preliminary controller tuning constants.

5. Correct any errors before proceeding with Functional Acceptance Tests.

H Functional Acceptance Tests are to demonstrate that the I&C System operates in compliance with the specified performance requirements:

1. All functional acceptance tests shall be performed in the presence of the Owner's representative(s), and each shall perform to satisfactory completion before acceptance by them.

2. Each function shall be demonstrated on a paragraph-by-paragraph and loop-by-loop basis.

3. Performance of each loop shall be documented showing loop number, loop description, test procedure description, component numbers, component manufacturer, and test results.

4. Components requiring calibration shall further include documentation of the manufacturer model number, serial number, calibration range, calibration data for at least 3 points (10%, 50% and 90% of span), switch settings, contact action, dead band, etc.

5. This contractor shall notify the Engineer at least 2 weeks prior to the date of the Functional Acceptance Test.

I. System acceptance shall be that time when the following requirements have been fulfilled:

1. All submittals and documentation have been submitted, reviewed, and approved.

2. The complete system of instrumentation and controls has successfully completed all testing requirements cited herein.

3. Owner's staff personnel training has been completed.

3.3 DOCUMENTATION

A. Provide O&M manuals for the P&I System as described in Section 16045 of these specifications.

B. In addition to the material described in Section 16045, include the following information in the O&M manuals:

1. Manufacturer's installation, operating, and maintenance instructions.

2. Internal wiring diagrams, showing terminal block number designations and wire numbers. Diagrams, device designations, and symbols shall be in accordance with NEMAJICS Standard 1-101.

C. Provide one set of record drawings showing as-built changes to the P&I diagrams. Record drawings shall specifically show changes to the following:

1. Panel diagrams.

2. Interconnecting wiring diagrams.

3. Loop diagrams.

3.4 FUNCTIONAL DESCRIPTION

A. Submersible level transmitters shall monitor wet well level and transmit it to the PLC. If either transmitter is detected as having failed, PLC shall operate from other unit.

B. Pump On/Pump Off points shall be programmed into PLC logic as directed by Owner. At defined level for stage one pumping, the lead pump shall be turned on. If level continues to rise to the stage two level, the lag pump shall be turned on.

C. If level reaches the high alarm point, a high level alarm shall be transmitted to the HMI computer system.

D. As well level drops, the lead pump and lag pump shall both be turned off at the Stage I OFF point.

E. At a low well level, a low level alarm shall be transmitted to the HMI computer.

F. If either pump starter fails to operate when called for, a pump failure alarm shall be transmitted to the HMI computer.

3.5 ALARMS

A. The following alarms shall be transmitted by telephone line to the HMI computer described elsewhere in this section:

1. High well level.

2. Low well level.

3. Level transducer failure.

4. Pump failure.

5. Pump seal failure.

6. Power failure.

7. Building intrusion.

8. Low building temperature.

PART 4: SPECIAL PROVISIONS

4.1 MEASUREMENT AND PAYMENT

A. When not listed in the proposal, all "PROCESS INSTRUMENTATION AND CONTROLS" costs will be considered incidental work for which no separate payment will be made.

B. Payment for all work required to install and furnish the complete process instrumentation and controls specified under this section and as shown on the drawings to be made at the lump sum price named in the proposal for "Process Instrumentation and Controls," complete and acceptable to the Engineer. All other work required under this section will be considered incidental work for which no separate payment will be made.

C. Payment indicated to include complete compensation for all labor, equipment, materials and incidentals involved in work specified under this section. No additional compensation to be allowed.

END OF SECTION 13705

SECTION 16110
RACE WAYS AND FITTINGS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Rigid metal conduit and fittings.

B. Intermediate metal conduit and fittings.

C. Electrical metallic tubing and fittings.

D. Flexible metal conduit and fittings.

E. Liquid-tight flexible conduit and fittings.

F. Nonmetallic conduit and fittings.

1.2 RELATED WORK

Outlet Boxes Section 16130

Supporting Devices Section 16190

Secondary Grounding Section 16450

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. National Electrical Code (NEC). Raceways shall be approved for the intended application, and shall meet the requirements of the NEC.

1.4 REFERENCES

A. ANSI C80.1 Rigid Steel Conduit. Zinc coated.

B. ANSI C80.3 Electrical Metallic Tubing. Zinc coated.

C. ANSI/INEMA FB 1 - Fittings and supports for Conduit and Cable Assemblies.

PART 2 PRODUCTS

2.1 RIGID METAL CONDUIT AND FITTINGS

A. Rigid Steel Conduit: ANSI C80.1.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1: Threaded type, material to match conduit. Per NEC Article 346.

2.2 INTERMEDIATE METAL CONDUIT (IMC) AND FITTINGS

A. Conduit: Galvanized steel.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1: use fittings and conduit bodies specified above for rigid steel conduit. Per NEC Article *345.*

2.3 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. EMT: ANSI C80.3 galvanized tubing.

B. For embedded in concrete and in wet or damp areas:

Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel compression. Rain tight and concrete tight. Per NEC Article 348.

C. For exposed use, dry areas:

Steel connectors with set screws (not die-cast).

2.4 FLEXIBLE METAL CONDUIT AND FITTINGS

A. Conduit: steel

B. Fittings and Conduit Bodies: ANSJJNEMA FB 1. Per NEC Article *350.*

C. Internal ground conductor required in all flexible conduit.

2.5 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

A. Conduit: Flexible metal conduit with PVC jacket.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1. Per NEC Article 351.

C. Internal ground conductor required in all flexible conduit.

2.6 PLASTIC (PVC) CONDUIT AND FITTINGS

A. Conduit: NEMA TC 2; Schedule 40 and 80 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3. Per NEC Article 347.

C. Internal ground conductor required in PVC conduit.

2.7 CONDUIT SUPPORTS

A. Conduit clamps, straps and supports: Steel or malleable iron.

2.8 ACCEPTABLE MANUFACTURERS

A. 1 Jones and Laughlin

A.2 National

A.3 Republic Steel

A.4 Youngstown

A.5 Carlon

A.6 Barrett

PART 3 EXECUTION

3.1 CONDUIT SIZING, ARRANGEMENT AND SUPPORT

A. Arrange conduit to maintain head room and present a neat appearance.

B. Route exposed conduit parallel and perpendicular to walls and adjacent piping.

C. Maintain minimum 6 inch clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, steam pipes and heating appliances.

D. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay in adjustable hangers, clevis hangers or bolted split stamped galvanized hangers.

E. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.

F. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction before conductors are pulled.

G. Support conduit and wireways in accordance with NEC.

3.2 CONDUIT AND WIREWAYS INSTALLATION

A. Cut conduit square using a saw or pipe cutter; de-burr cut ends.

B. Bring conduit to the shoulder of fittings and couplings and fasten securely.

C. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes and for fastening conduit to sheet metal boxes in damp or wet locations.

D. Install no more than the equivalent of three 90-degree bends between boxes.

E. Use conduit bodies to make sharp changes in direction, as around beams.

F. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 1-¼ inches in size. Heating of conduit to facilitate bending is prohibited.

G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

H. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.

I. Provide suitable pull string in all empty conduit except sleeves and nipples.

J. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.

K. No conduit, including rigid, may be run under floor slabs resting directly on soil. All conduit in slabs shall be encased with 2 inches minimum thickness of concrete.

L. Number of conductors per conduit or wireway shall conform to the latest National Electrical Code (NEC) requirements.

M. All metal conduit installed underground shall be covered as indicated but in no case less than 18 inches minimum below grade, except under vehicular traffic, which shall be minimum 24 inches below grade. PVC conduit shall be minimum 24 inches below grade.

N. Sleeves for conduits passing through walls or floors shall be of such size and in such a location so as not to impair the strength of the construction. Sleeves shall be of a maximum diameter of 4 inches, minimum spacing of three diameters or unless approved in writing by the Architect/Engineer. No reinforcing bars shall be displaced or cut.

0. Install flexible and liquid-tight flexible conduit for motors, transformers and mechanical equipment where subject to movement and vibration. Curve to a minimum 90 degrees to minimize sound transmission.

END OF SECTION 16110

SECTION 16190
SUPPORTING DEVICES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Conduit and equipment supports.

B. Fastening hardware.

1.2 RELATED WORK

Raceways and Fittings Section 16110
Outlet Boxes Section 16130

1.3 COORDINATION

A. Coordinate all supports with associated trades as to location, weights, etc.

1.4 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 PRODUCTS

2.1 MATERIAL

A. Support channel: painted steel.

B. Hardware: corrosion resistant.

PART 3 EXECUTION

3.1 INSTALLATION

A. Fasten hanger rods, conduit clamps, outlet and junction boxes to building structure using beam clamps.

B. Do not fasten supports to piping, ductwork, mechanical equipment or conduit.

C. Do not use powder-actuated anchors.

D. Do not drill structural steel members.

E. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

F. Install raceway supports within 12 inches of junction boxes and conduit couplings.

G. Electrical equipment shall be fastened in place with bolts and/or screws. Welding in place will not be allowed.

END OF SECTION 16190

AdvanTex® - AX100 System
Heated Air
9-POD System

DESIGN FLOW BASIS:

62 4-BEDROOM HOMES @ 350 GPD
9 3-BEDROOM HOMES @ 300 GPD
(FUTURE) 20 4-BEDROOM HOMES @ 300 GPD
4 COMMERCIAL FACILITIES @ 0.975 LBS BOD/DAY

DESIGN NOTES:

(BASED ON RESIDENTIAL STRENGTH EFFLUENT)
EXPECTED FLOWS
$Q_{ave.} \leq$ 19,390 GPD
$Q_{design} \leq$ 38,700 GPD

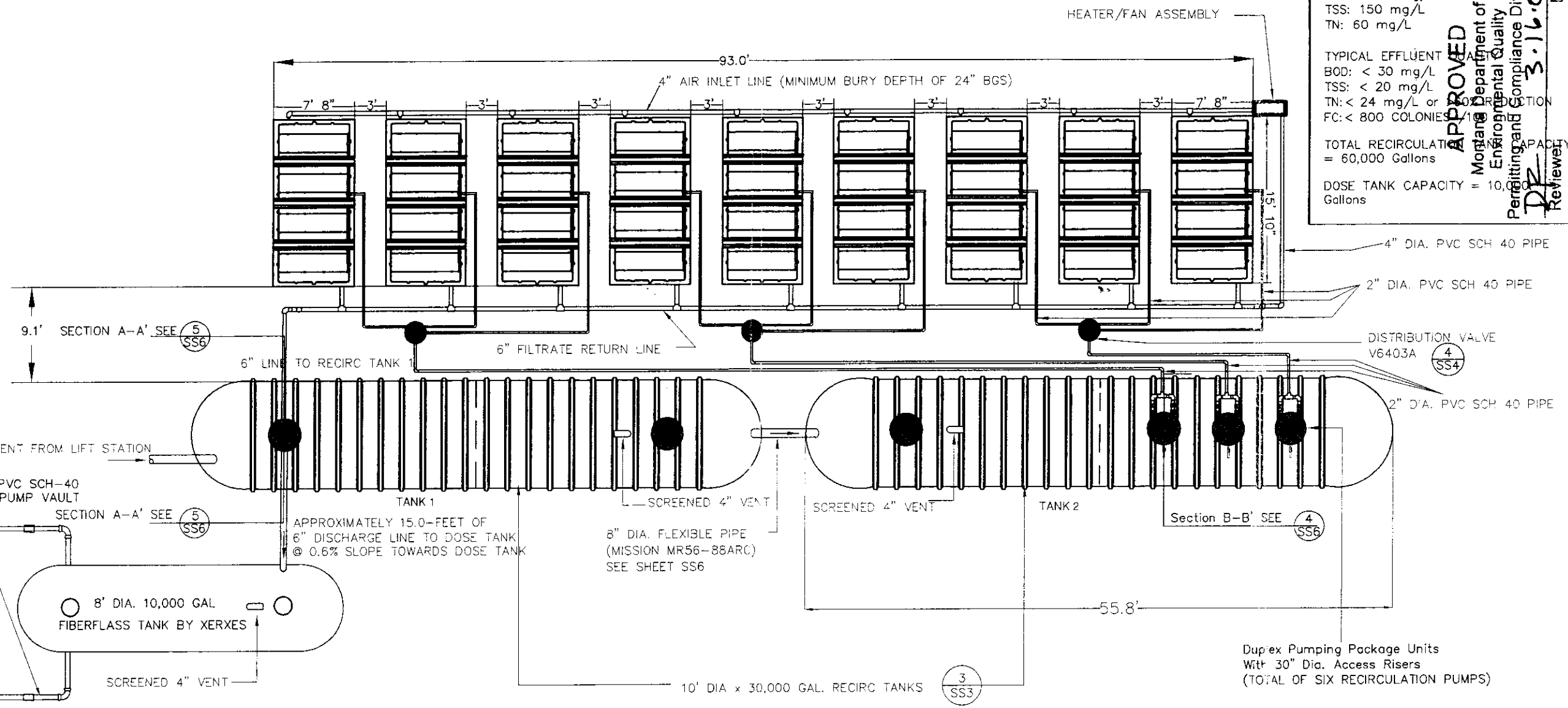
EXPECTED INFLUENT QUALITY
GREASE & OIL: 20 mg/L
BOD: <210 mg/L
TSS: 150 mg/L
TN: 60 mg/L

TYPICAL EFFLUENT QUALITY
BOD: < 30 mg/L
TSS: < 20 mg/L
TN: < 24 mg/L or 50% REDUCTION
FC: < 800 COLONIES/100 ML

TOTAL RECIRCULATION TANK CAPACITY = 60,000 Gallons

DOSE TANK CAPACITY = 10,000 Gallons

APPROVED
Montana Department of Environmental Quality
Permitting and Compliance Division
Date: 3.16.07
Reviewer



1 SS1 **ADVANTEX WASTEWATER TREATMENT SYSTEM PLAN VIEW**
SCALE: NTS

CONSTRUCTION NOTES:

1. ADVANTEX WASTEWATER TREATMENT SYSTEM: CONSISTING OF 10,000 GALLON DOSE TANK, 2-30,000 GALLON RECIRCULATION TANKS, NINE (9) AX-100 COMMERCIAL PODS, AND A SUCTION PUMP VAULT
2. ALL WORK SHALL BE IN ACCORDANCE WITH GALLATIN CITY COUNTY HEALTH DEPARTMENT AND MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY REGULATIONS FOR WASTEWATER TREATMENT SYSTEMS.
3. ALL SYSTEM COMPONENTS WILL BE BURIED, COVERED AND INSULATED TO PREVENT MALFUNCTION. USE INSULATED PVC RISERS AND 2" RIGID INSULATION WHERE REQUIRED.
4. ALL SYSTEM COMPONENTS (PUMPS AND CONTROLS) MUST BE EQUIPPED WITH AN AUDIBLE AND/OR VISUAL ALARM(S), TO INDICATE FAILURE OF THE SYSTEM.
5. EFFLUENT SAMPLES CAN BE OBTAINED AT THE 10,000-GALLON DOSE TANK.
6. INSTALLER RESPONSIBLE FOR CONFIRMING SITE CONDITIONS, SEWER STUB LOCATIONS PRIOR TO CONSTRUCTION.
7. FINAL GRADE AROUND THE WWTS MUST DIVERT ANY SPRING AND/OR STORMWATER RUNOFF FROM ALL SEWER SYSTEM COMPONENTS TO PREVENT SYSTEM MALFUNCTION
8. ALL SYSTEM COMPONENTS MUST BE INSTALLED AND BEDDED AS PER MANUFACTURERS RECOMMENDATIONS.
9. THIS PLAN IS BASED UPON THE EXPECTED FLOWS AND WASTEWATER STRENGTHS PROVIDED IN THE DESIGN BASIS, FOR THE PURPOSE OF SERVING COUNTRYSIDE ESTATES, ANY CHANGE(S) IN USAGE THAT MAY AFFECT FLOWS OR WASTEWATER QUALITY STRENGTH(S) SHALL REQUIRE A REVIEW BY THE DESIGN ENGINEER AND/OR MANUFACTURER.
10. DO NOT DISPOSE OF OF TOXICS OR CHEMICALS INTO THE WASTEWATER TREATMENT SYSTEM SUCH AS: RESTAURANT DEGREASERS AND CLEANERS, WAX STRIPPERS FOR LINOLEUM, CARPET SHAMPOO WASTE PRODUCTS, OR OTHER TOXICS.
11. THIS ADVANTEX WASTEWATER TREATMENT SYSTEM REQUIRES AN APPROVED ADVANTEX O & M MANUAL FOR PROPER OPERATION AND MAINTENANCE OF THIS SYSTEM FOR THE LIFE OF THE SYSTEM.
12. OWNER MUST PROVIDE A TELEPHONE LINE TO THE CONTROL PANEL FOR THE LIFE OF THE SYSTEM. FOR REMOTE MONITORING BY THE ORENCO CORPORATION. ELEC DISCONNECT, ELEC SERVICE, AND PHONE LINE WILL BE SUPPLIED AND CONNECTED TO TEH ADVANTEX CONTROL PANEL BY THE GENERAL CONTRACTOR.
13. A WATER SUPPLY LINE AND FROST FREE HYDRANT, SOLELY FOR MAINTENANCE PURPOSES, MUST BE AVAILABLE WITHIN 50-FEET OF THE WWTS, WHICH SHALL BE INSTALLED NEAR OR IN THE MAINTENANCE BUILDING.

#04901(S)

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STATE OF MONTANA
CHRISTOPHER K. TJALMARSSON
No. 8887PE
PROFESSIONAL ENGINEER
Sheet 1 of 9
C&H Engineering and Surveying Inc.
1091 Stoneridge Drive • Bozeman, MT 59718
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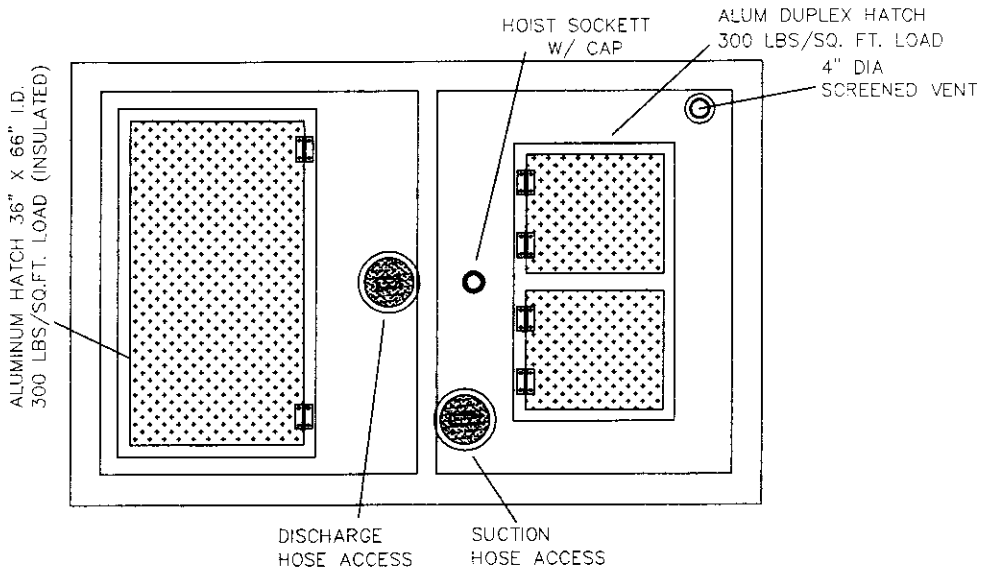
www.cshengineers.com • info@cshengineers.com

SANITARY SEWER COLLECTION SYSTEM DETAILS

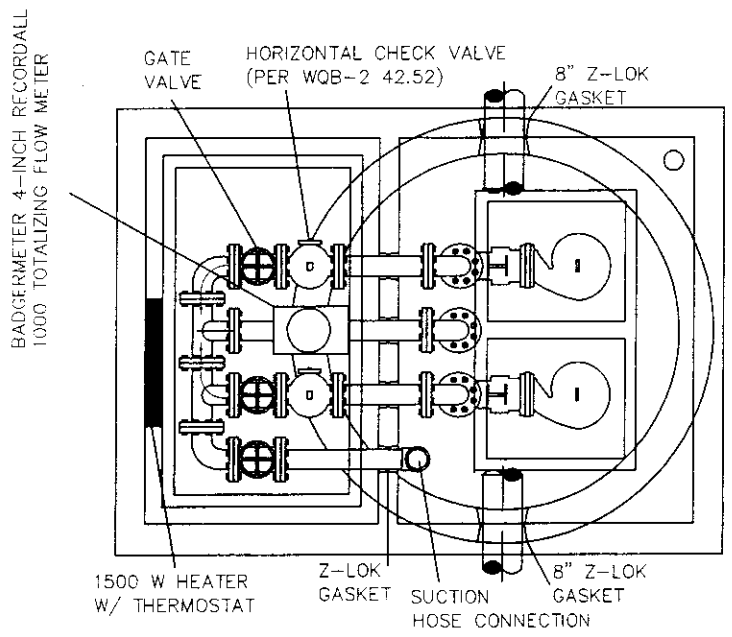
COUNTRYSIDE ESTATES
SANITARY SEWER COLLECTION
GALLATIN COUNTY, MONTANA

Drawing Date: 01/11/07

SS1



1 SS2 **72-INCH DIAMETER WET WELL PLAN VIEW**
SCALE: NTS



2 SS2 **72-INCH INSIDE DIAMETER WET WELL INTERIOR PLAN VIEW**
SCALE: NTS

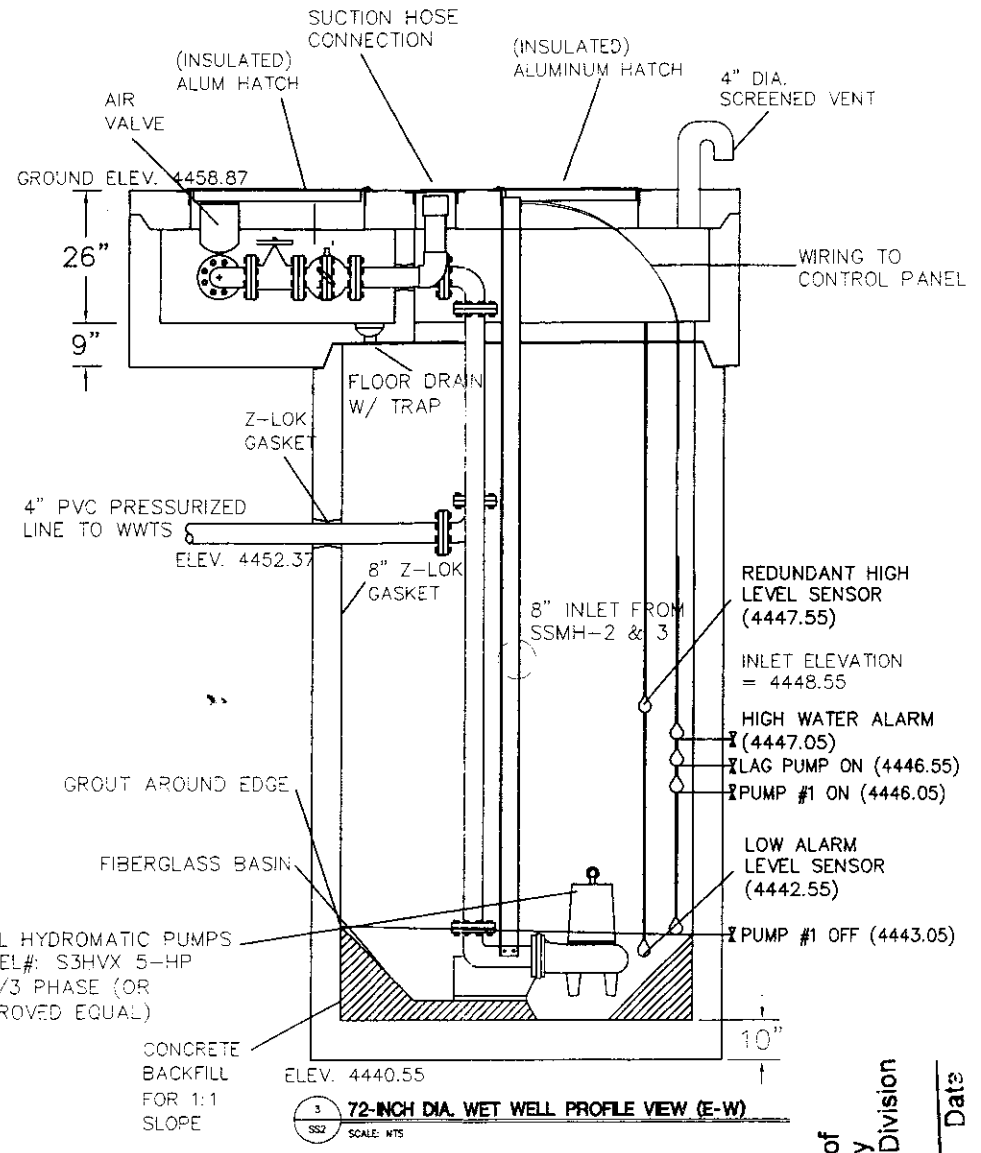
NEMA 4 CORROSION-RESISTANT
PAINTED STEEL ENCLOSURE

CONTROL PANEL

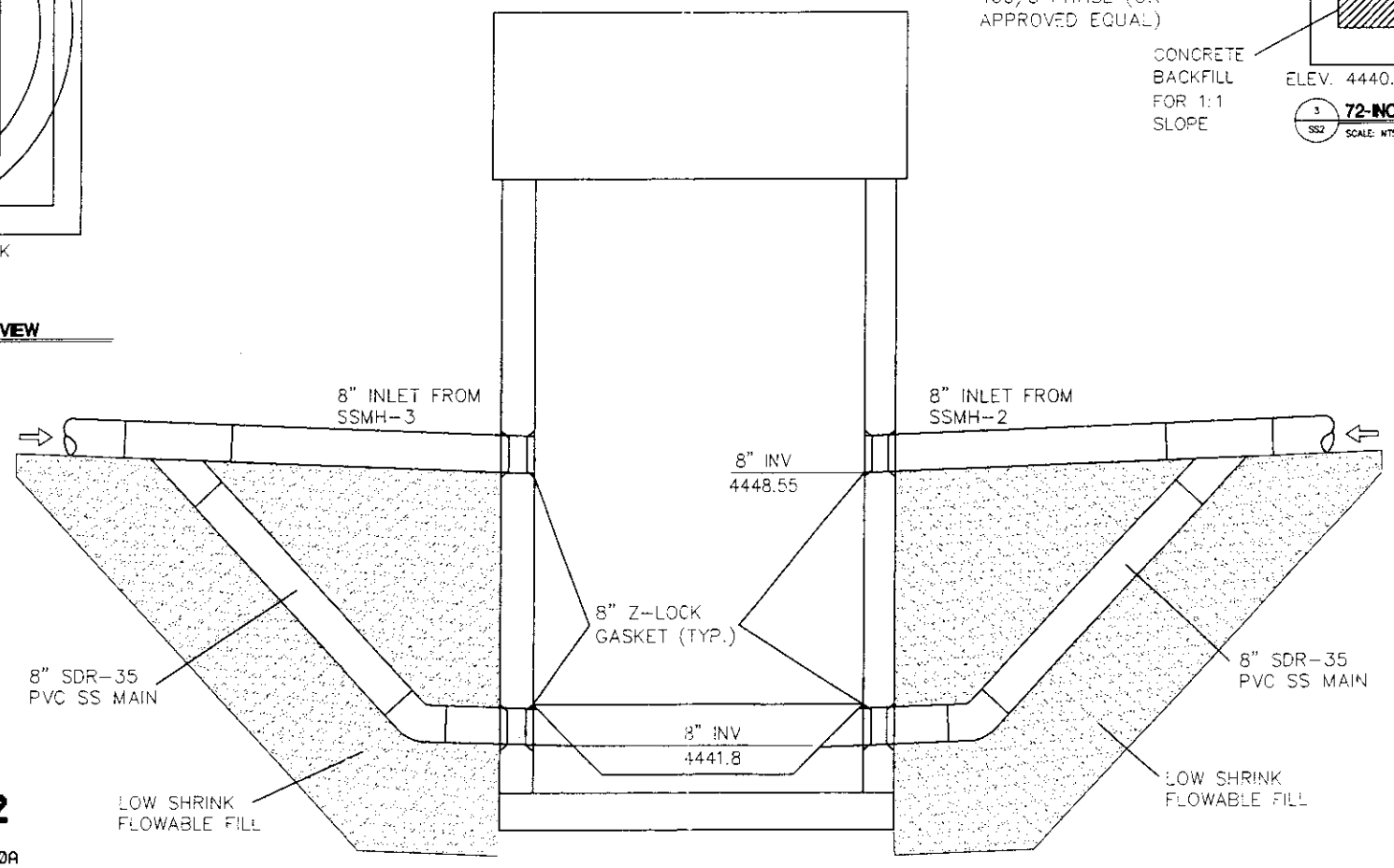
HYDROMATIC CONTROL PANEL
NOVUS 3000 WITH BATTERY BACKUP
AUDIO VISUAL ALARM

LIFT STATION NOTES:

1. FOR TANK DEPTH TO 18-FEET, 1 INTERMEDIATE GUIDERAIL MUST BE INSTALLED. SUCH THAT THE PUMPS MAY BE REMOVED
2. ALL WORK SHALL BE DONE IN ACCORDANCE W/ MONTANA PUBLIC WORKS STANDARDS, DEQ CIRCULARS, AND GALLATIN COUNTY.
3. FLOATS SHALL BE SET A DEPTHS THAT SHALL NOT SURPASS A PUMPING TIME OF 15-MINUTES.
4. DUAL HYDROMATIC S4HVX
10 HP 230/3 PHASE PUMPS



3 SS2 **72-INCH DIA. WET WELL PROFILE VIEW (E-W)**
SCALE: NTS



4 SS2 **72-INCH DIA. WET WELL PROFILE VIEW (N-S)**
SCALE: NTS

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PER M. HJALMARSSON No. 8867LS Registered PROFESSIONAL ENGINEER STATE OF MONTANA

Sheet 2 of 9

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Bozeman, Montana 59718
Phone (406) 587-1115 • Fax (406) 587-9758
www.cherpeters.com • info@cherpeters.com

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1 08/08/06		
2 11/16/06		
3 1/16/07		

SANITARY SEWER COLLECTION SYSTEM DETAILS

COUNTRYSIDE ESTATES
SANITARY SEWER COLLECTION
GALLATIN COUNTY, MONTANA

Drawing Date: 10/01/06

SS2

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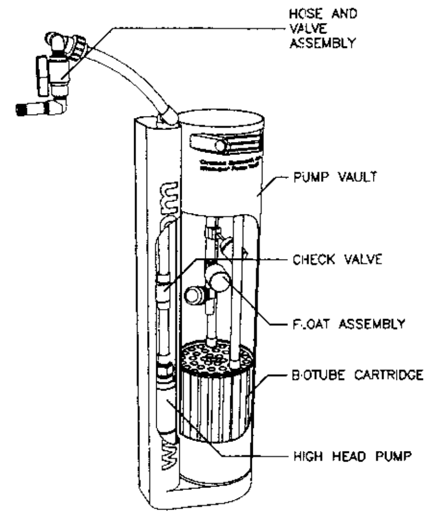
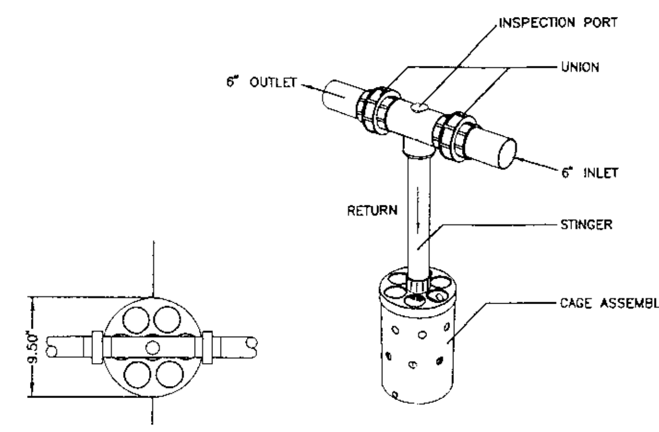
CONSTRUCTION NOTES:

1. ALL WORK SHALL BE IN ACCORDANCE WITH GALLATIN CITY COUNTY HEALTH DEPARTMENT REGULATIONS FOR WASTEWATER TREATMENT SYSTEMS.
2. USE ADVANTEX SYSTEM WITH 10,000 GALLON DOSE TANK, 2-30,000 GALLON RECIRCULATION TANKS, AND NINE (9) AX-100 COMMERCIAL PODS
3. ALL SYSTEM COMPONENTS WILL BE BURIED, COVERED AND INSULATED TO PREVENT MALFUNCTION. USE INSULATED PVC RISERS AND 2" RIGID INSULATION WHERE REQUIRED.
4. ALL SYSTEM COMPONENTS (PUMPS AND CONTROLS) WILL BE CORROSION RESISTANT. AN AUDIBLE OR VISUAL ALARM SHALL BE PROVIDED TO INDICATE FAILURE OF THE SYSTEM.
5. EFFLUENT SAMPLES CAN BE OBTAINED AT 10,000 GALLON DOSE TANK, 30,000-GALLON RECIRC TANK 1, AND THE LIFT STATION.
6. INSTALLER RESPONSIBLE FOR CONFIRMING SITE CONDITIONS, SEWER STUB LOCATIONS PRIOR TO CONSTRUCTION.
7. OPERATOR/INSTALLER MUST DIVERT ANY SPRING AND/OR STORM RUNOFF AWAY FROM ALL SEWER SYSTEM COMPONENTS TO PREVENT SYSTEM MALFUNCTION
8. ALL SYSTEM COMPONENTS MUST BE APPROVED BY THE ENGINEER AND/OR MANUFACTURER.
9. ALL INSTALLED SEPTIC TANK-SERVICE CONNECTION(S) MUST BE EQUIPPED WITH EFFLUENT FILTER(S).
10. SEWER LINES MUST PROVIDE 10-FEET (MIN) HORIZONTAL AND 18-INCHES (MIN) VERTICAL SEPERATION FROM ALL WATER LINES
11. SUFFICIENT AREA MUST BE PROVIDED TO SERVICE AND MAINTAIN ALL SYSTEM COMPONENTS
12. ALL SYSTEM COMPONENTS MUST BE PROTECTED FROM DAMAGE, VANDALISM, ETC.
13. ALL SYSTEM COMPONENTS WILL MEET OR EXCEED ALL DESIGN CRITERIA AS OUTLINED IN MDEQ-CIRCULAR DEQ-4 "DESIGN STANDARDS FOR WASTEWATER FACILITIES."
14. SEWER SYSTEM CONTRACTOR MUST BE LICENSED AND QUALIFIED TO INSTALL SEPTIC SYSTEMS IN GALLATIN COUNTY.
15. THE DESIGN IS BASED UPON THE EXPECTED FLOWS AND WASTE STRENGTHS PROVIDED IN THE 'DESIGN BASIS' FOR THE PURPOSE OF SERVING THE COUNTRYSIDE ESTATES SUBDIVISION, ANY CHANGE IN USAGE THAT WOULD AFFECT FLOWS OR WASTE STRENGTHS REQUIRES A REVIEW BY THE DESIGN ENGINEER AND/OR MANUFACTURER.



1 / SS3 **BIOTUBE EFFLUENT PUMP PACKAGE DETAIL**
SCALE: NTS



2 / SS3 **MM6U RECIRCULATING SPLITTER VALVE**
CAP MUST BE
SCALE: NTS
NOTE: THE ~~EMERGENCY OVERFLOW VALVE HAS BEEN~~ REMOVED FROM THE INSPECTION PORT AND MUST REMAIN REMOVED AT ALL TIMES FOR FLOW BACK FROM THE DOSE TANK TO RECIRC TANK 1 TO OCCUR UPON SUCTION PUMP FAILURE.

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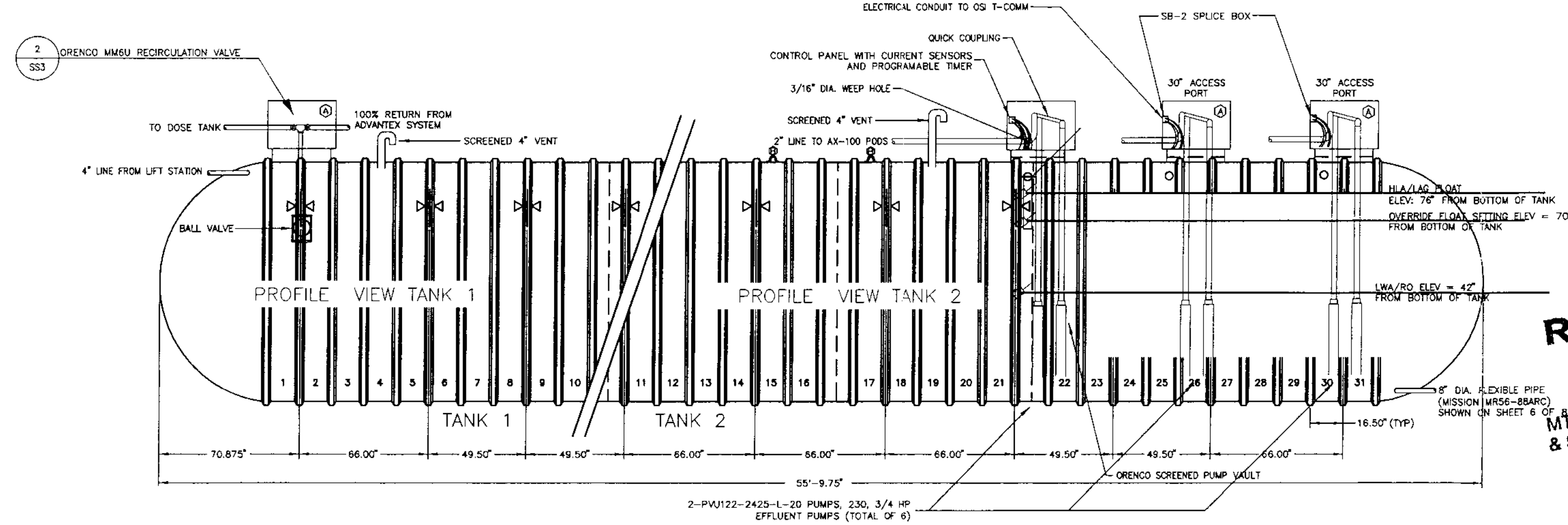

2 SS3 ORENCO MM6U RECIRCULATION VALVE
TO DOSE TANK
4" LINE FROM LIFT STATION
BALL VALVE
100% RETURN FROM ADVANTEX SYSTEM
SCREENED 4" VENT
PROFILE VIEW TANK 1
PROFILE VIEW TANK 2
TANK 1
TANK 2
ELECTRICAL CONDUIT TO OSI T-COMM
QUICK COUPLING
CONTROL PANEL WITH CURRENT SENSORS AND PROGRAMABLE TIMER
3/16" DIA. WEEP HOLE
SCREENED 4" VENT
2" LINE TO AX-100 PODS
SB-2 SPLICE BOX
30" ACCESS PORT
30" ACCESS PORT
HLA/LAG FLOAT ELEV: 76" FROM BOTTOM OF TANK
OVERRIDE FLOAT SETTING ELEV = 70" FROM BOTTOM OF TANK
LWA/RO ELEV = 42" FROM BOTTOM OF TANK
8" DIA. FLEXIBLE PIPE (MISSION MR56-8BARC) SHOWN ON SHEET 6 OF 8
16.50" (TYP)
70.875"
66.00"
49.50"
49.50"
66.00"
66.00"
66.00"
49.50"
49.50"
66.00"
55'-9.75"
ORENCO SCREENED PUMP VAULT
2-PVU122-2425-L-20 PUMPS, 230, 3/4 HP EFFLUENT PUMPS (TOTAL OF 6)

(A)	RISER PIPE, FOR 30" ACCESS OPENING
(B)	LIFTING LUG

3 / SS3 **10' DIA. 30,000 GALLON FIBERGLASS RECIRCULATION TANK DETAIL**
SCALE: NTS XERXES CORP. S10-892 OR EQUAL
PROFILE VIEWS OF THE 30,000-GALLON RECIRC TANKS 1 & 2. SHOWING PROFILE VIEW OF OPERATIONAL APPURTENANCES IN EACH 30,000 GALLON RECIRC TANK .

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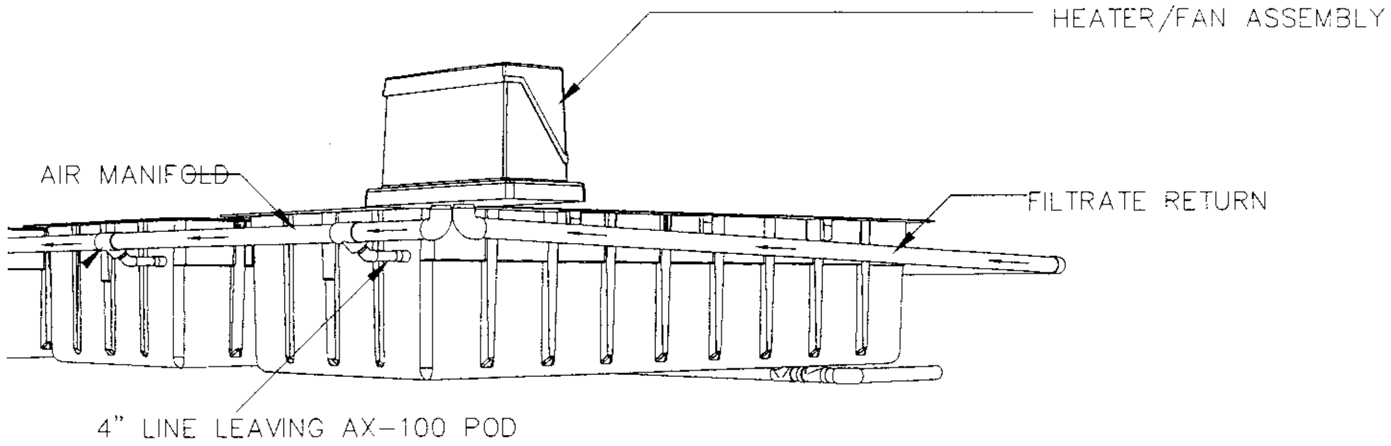
SANITARY SEWER COLLECTION SYSTEM DETAILS

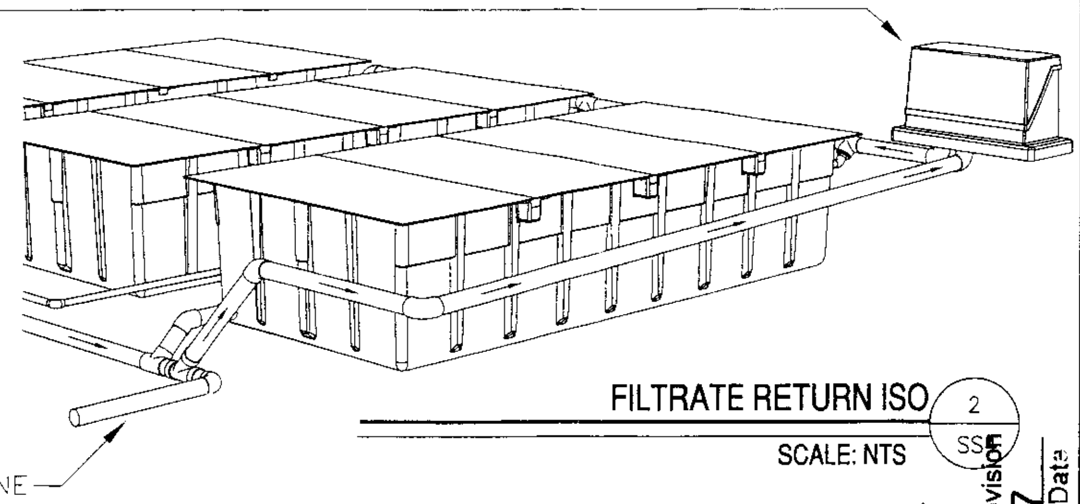
COUNTRYSIDE ESTATES
SANITARY SEWER COLLECTION
GALLATIN COUNTY, MONTANA

Drawing Date: 10/01/06

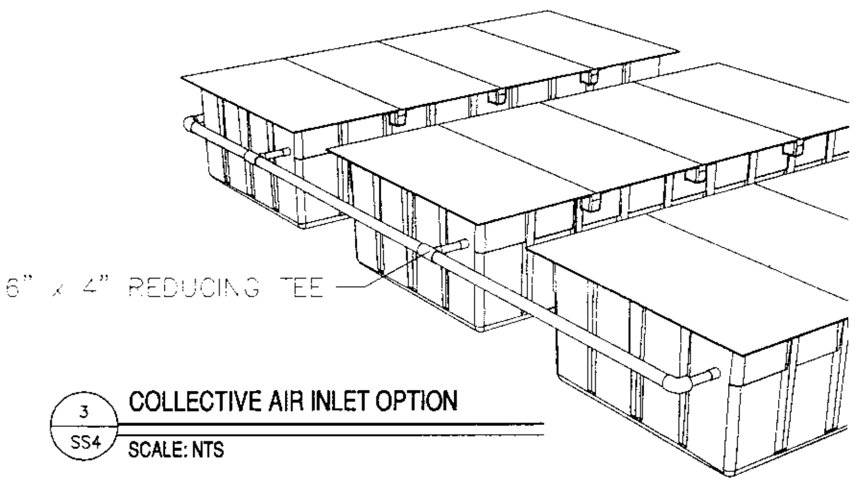
SS3



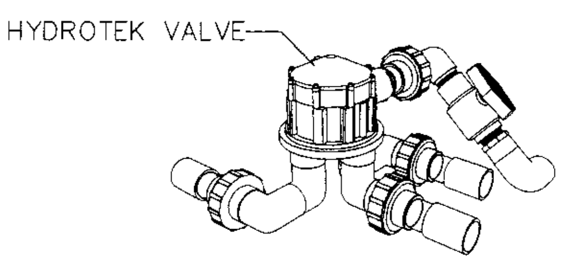
1 SS4 **AIR MANIFOLD ISO**
SCALE: NTS



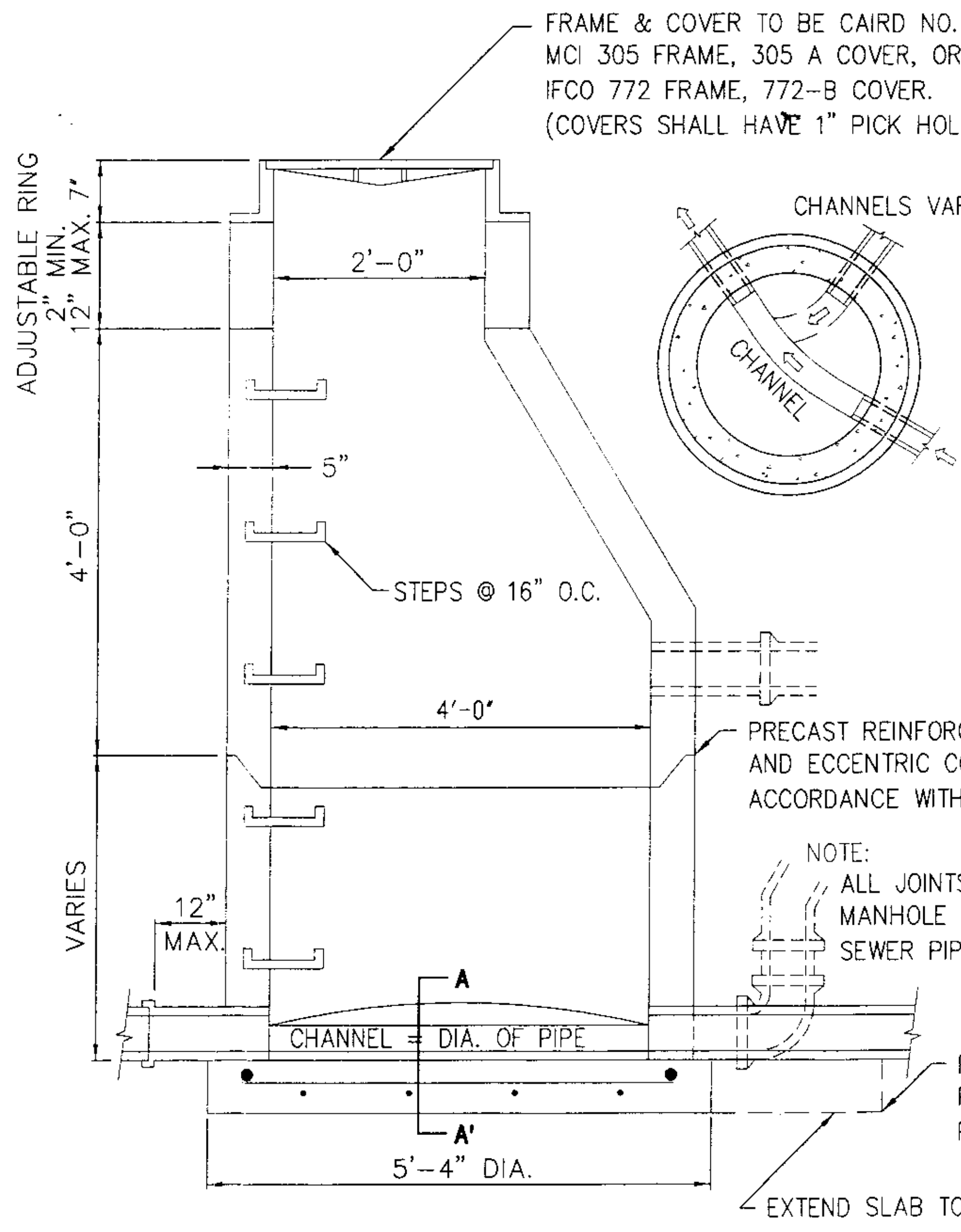
2 SS4 **FILTRATE RETURN ISO**
SCALE: NTS



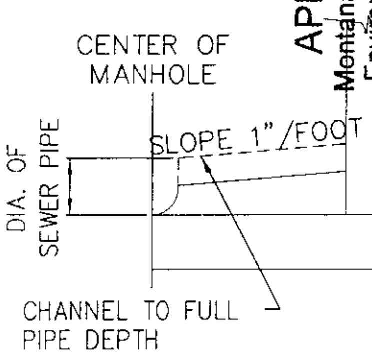
3 SS4 **COLLECTIVE AIR INLET OPTION**
SCALE: NTS



4 SS4 **AUTOMATIC DISTRIBUTING VALVE DETAIL**
SCALE: NTS


FRAME & COVER TO BE CAIRD NO. 52441,
MCI 305 FRAME, 305 A COVER, OR
IFCO 772 FRAME, 772-B COVER.
(COVERS SHALL HAVE 1" PICK HOLES)
ADJUSTABLE RING
2" MIN.
12" MAX. 7"
2'-0"
5"
4'-0"
STEPS @ 16" O.C.
4'-0'
PRECAST REINFORCED CONCRETE MANHOLE RISER
AND ECCENTRIC CONE TOP MANUFACTURED IN
ACCORDANCE WITH ASTM DESIGNATION C-478
NOTE:
ALL JOINTS BETWEEN MANHOLE SECTIONS,
MANHOLE RING AND TOP SECTION, AND AROUND
SEWER PIPE INTO MANHOLE SHALL BE WATERTIGHT
VARIES
12"
MAX.
A
CHANNEL = DIA. OF PIPE
A'
5'-4" DIA.
PRECAST OR POURED-IN-PLACE BASE.
POURED, MIN. 8" THICK BELOW PIPE
PRECAST, MIN. 6" THICK BELOW PIPE
EXTEND SLAB TO SUPPORT ELBOW OF DROP INLET
CHANNELS VARY
CHANNEL

5 SS4 **SANITARY SEWER MANHOLE**
SCALE: NTS



SECTION A-A'
NTS

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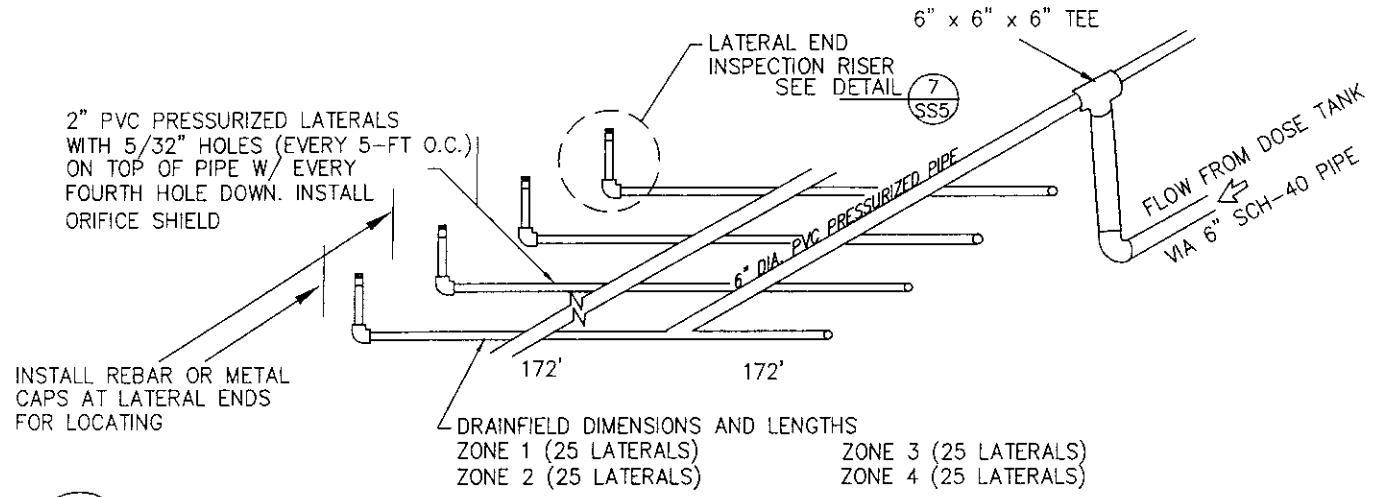
ENGINEER: PMH
DRAWN: RRU

SANITARY SEWER COLLECTION SYSTEM DETAILS

COUNTRYSIDE ESTATES
SANITARY SEWER COLLECTION
GALLATIN COUNTY, MONTANA

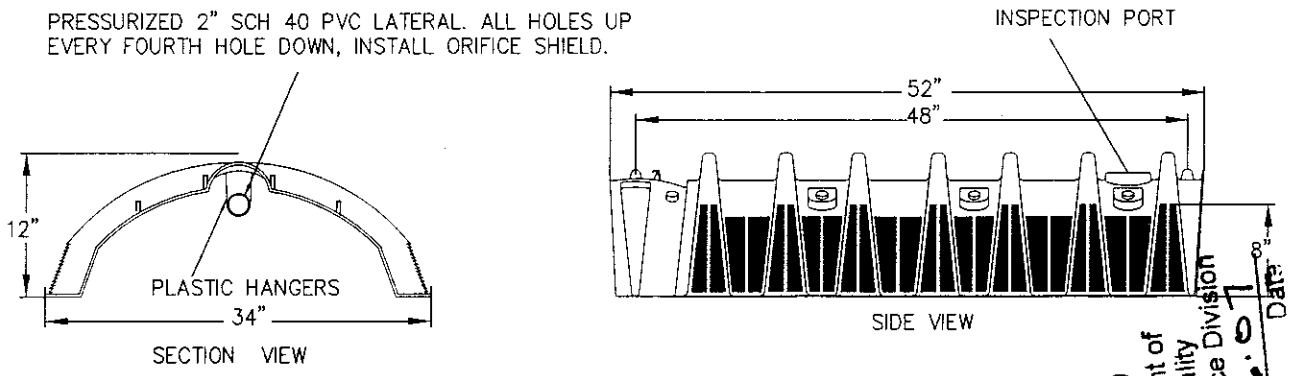
Drawing Date: 10/01/06

SS4



1 SS5 TYPICAL PRESSURIZED MANIFOLD DETAIL

SCALE: NTS INSTALL CLEANOUTS AT THE END OF EVERY OTHER LATERALS
THERE SHALL NOT BE GREATER THAN A 1.5-FT DROP ACROSS ANY LATERAL
THE INSTALLED DISTRIBUTION PIPING MUST BE TO ASTM 1785 OR ASTM 2241 CONSTRUCTION STANDARDS



2 SS5 GRAVELLESS TRENCH DETAIL (PRESSURE)

SCALE: NTS INFILTRATOR SYSTEMS, INC. QUICK 4 STANDARD INFILTRATOR CHAMBER

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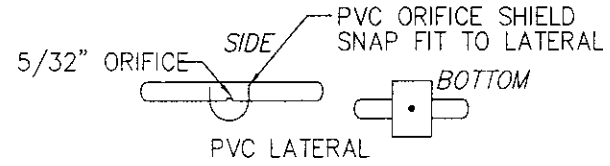
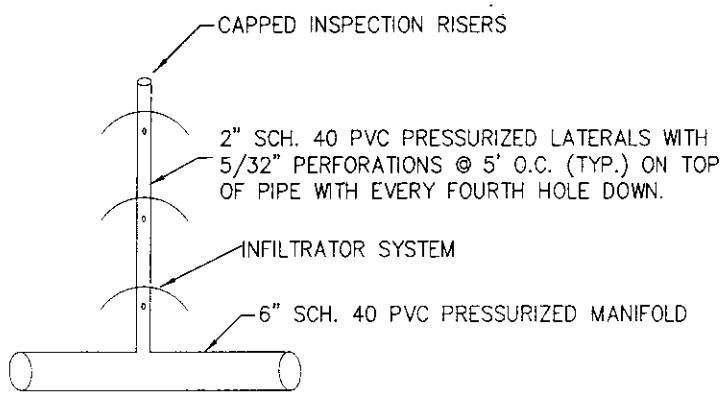


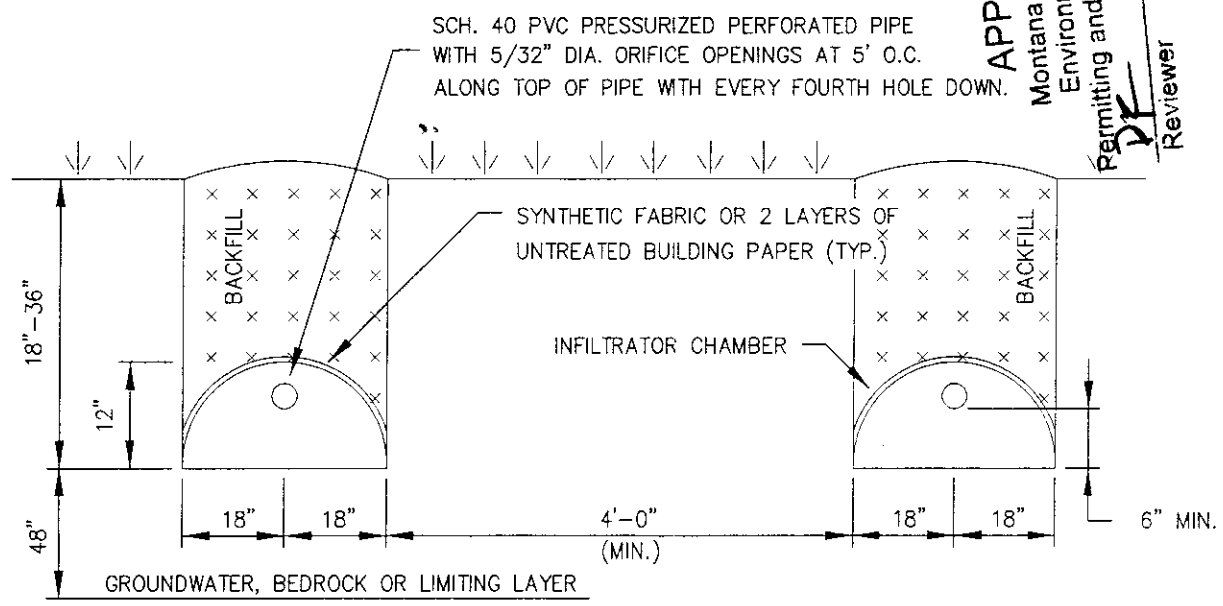
3 SS5 ORIFICE SHIELD

SCALE: NTS



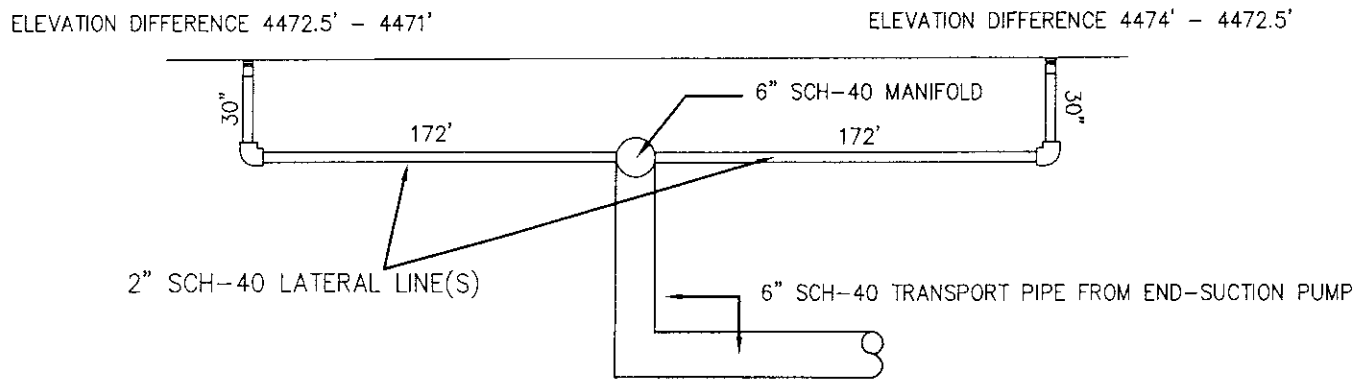
4 SS5 TYPICAL MANIFOLD TEE DETAIL

SCALE: NTS



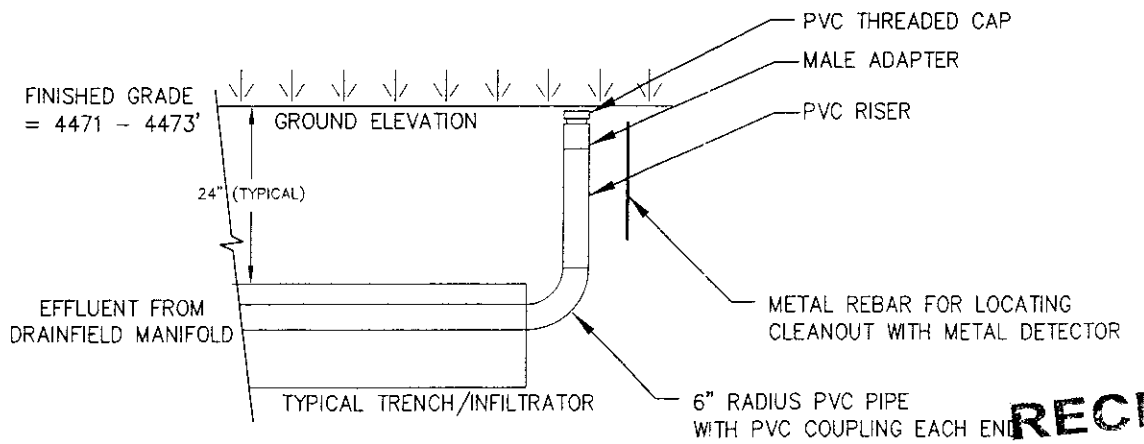
5 SS5 TYPICAL GRAVELLESS TRENCH DETAIL

SCALE: NTS



6 SS5 DRAINFIELD LATERAL DETAIL

SCALE: NTS 2" SCH 40 PVC PRESSURIZED LATERALS WITH 5/32" HOLES ON TOP OF PIPE EVERY FOURTH HOLE ON BOTTOM @ 5 FEET O.C. BEGIN FIRST HOLE 2 FEET IN FROM MANIFOLD



7 SS5 TYPICAL DRAINFIELD LATERAL END INSPECTION RISER

SCALE: NTS INSTALL CLEANOUTS AT THE END OF EVERY LATERAL

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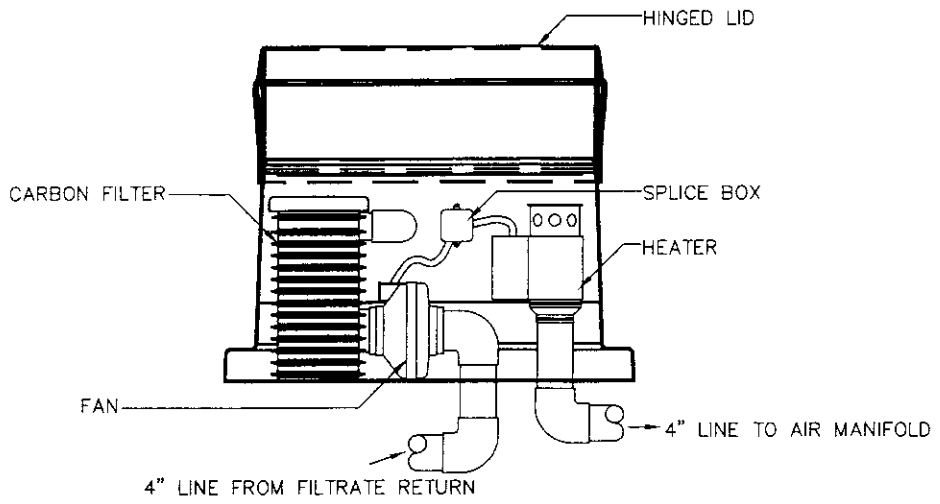
ENGINEER'S SEAL AND SIGNATURE

SANITARY SEWER COLLECTION SYSTEM DETAILS

COUNTRYSIDE ESTATES SANITARY SEWER COLLECTION SYSTEM GALLATIN COUNTY, MONTANA

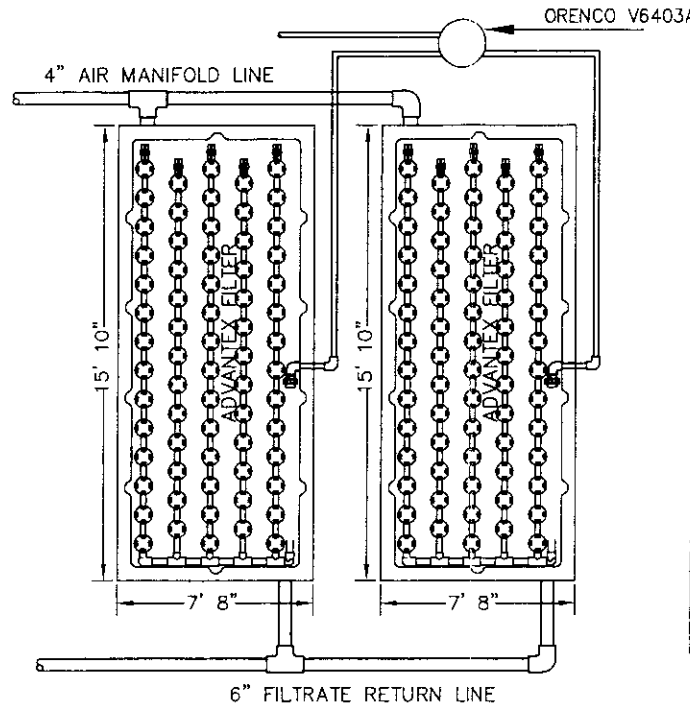
Drawing Date: 10/01/06

SS5



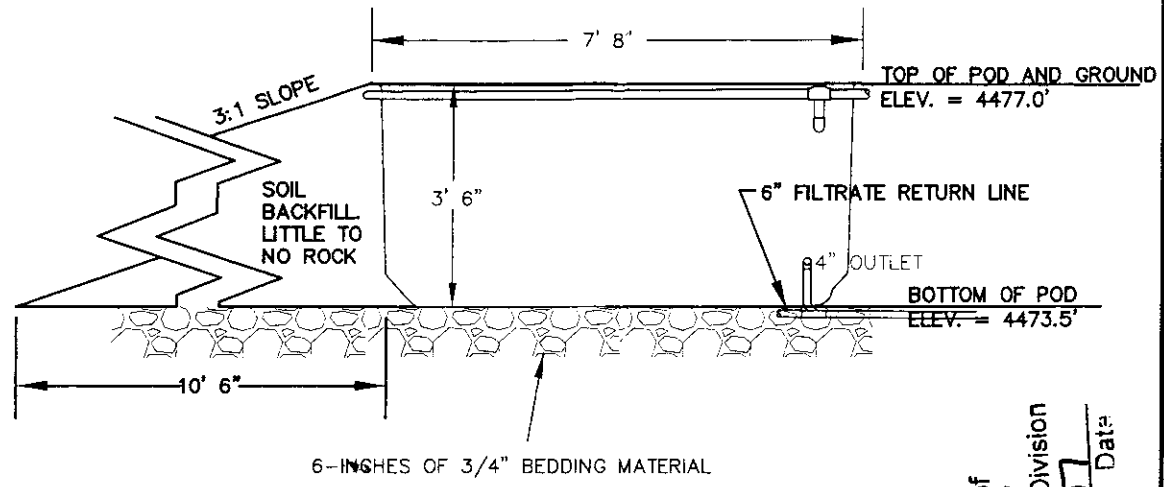
1 SS6 **HEATER FAN ASSEMBLY**

SCALE: NTS



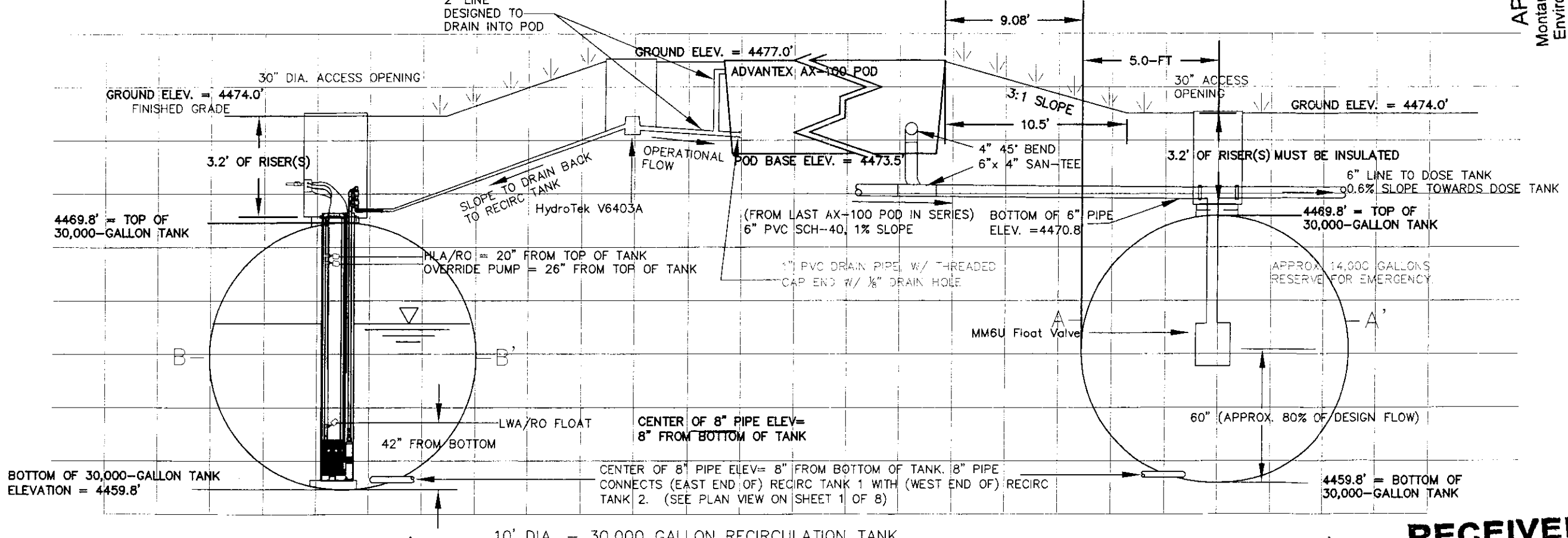
2 SS6 **ADVANTEX AX-100 POD PLAN VIEW**

SCALE: NTS



3 SS6 **ADVANTEX AX-100 POD PROFILE VIEW**

SCALE: NTS



4 SS6 Section B-B'

SCALE: NTS

10' DIA. - 30,000 GALLON RECIRCULATION TANK

5 SS6 Section A-A'

SCALE: NTS

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SANITARY SEWER COLLECTION SYSTEM DETAILS

COUNTRYSIDE ESTATES
SANITARY SEWER COLLECTION
GALLATIN COUNTY, MONTANA

Drawing Date: 01/11/07

SS6

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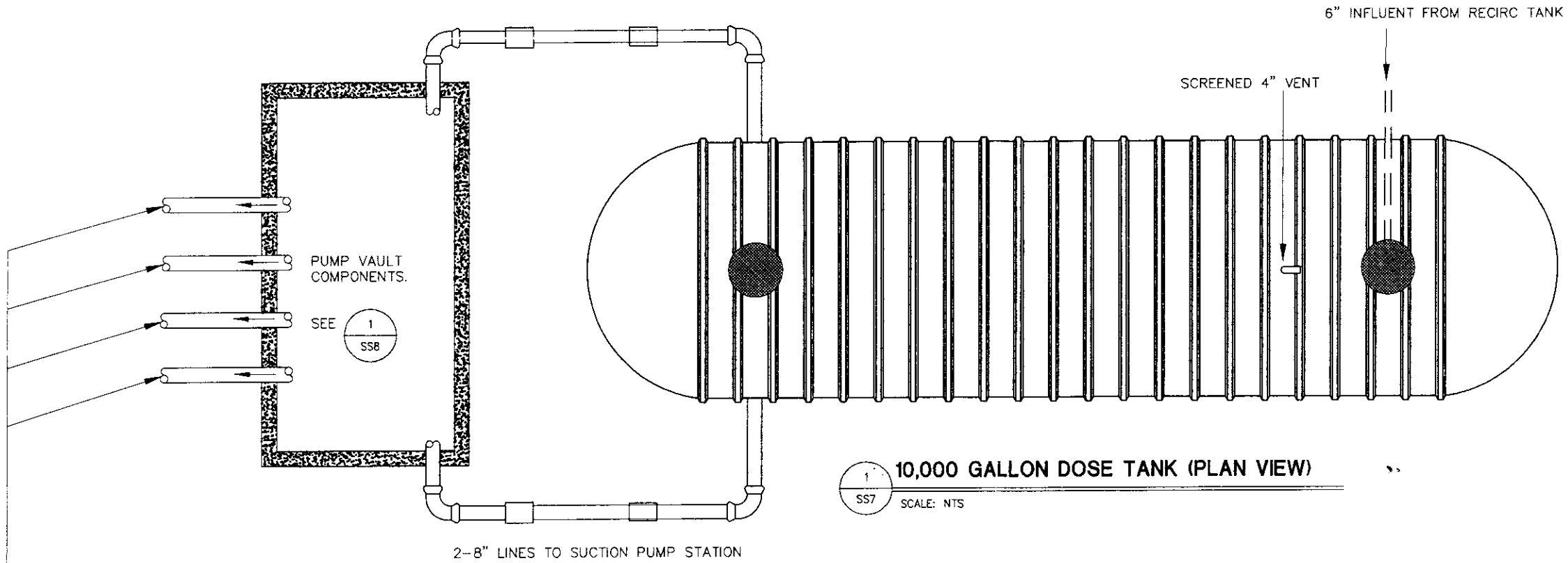
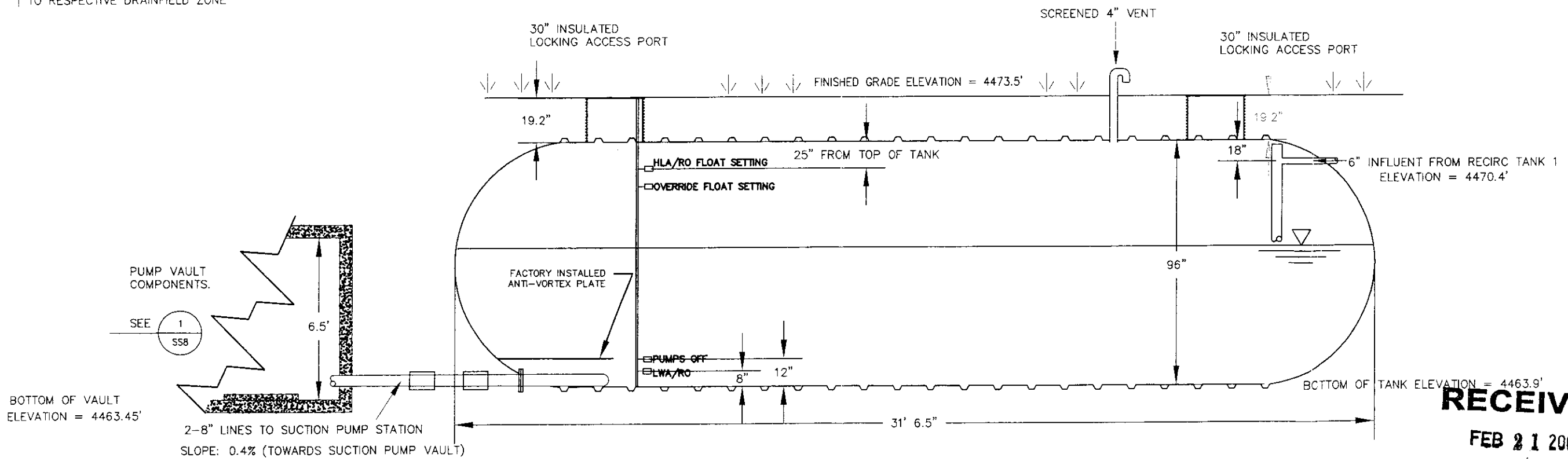


1/SS7 **10,000 GALLON DOSE TANK (PLAN VIEW)**

SCALE: NTS

(4) 6" DISCHARGE LINES

TO RESPECTIVE DRAINFIELD ZONE



1/SS7 **10,000 GALLON DOSE TANK (PROFILE VIEW)**

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SANITARY SEWER COLLECTION SYSTEM DETAILS

COUNTRYSIDE ESTATES
SANITARY SEWER COLLECTION
GALLATIN COUNTY, MONTANA

Drawing Date: 01/11/07

SS7

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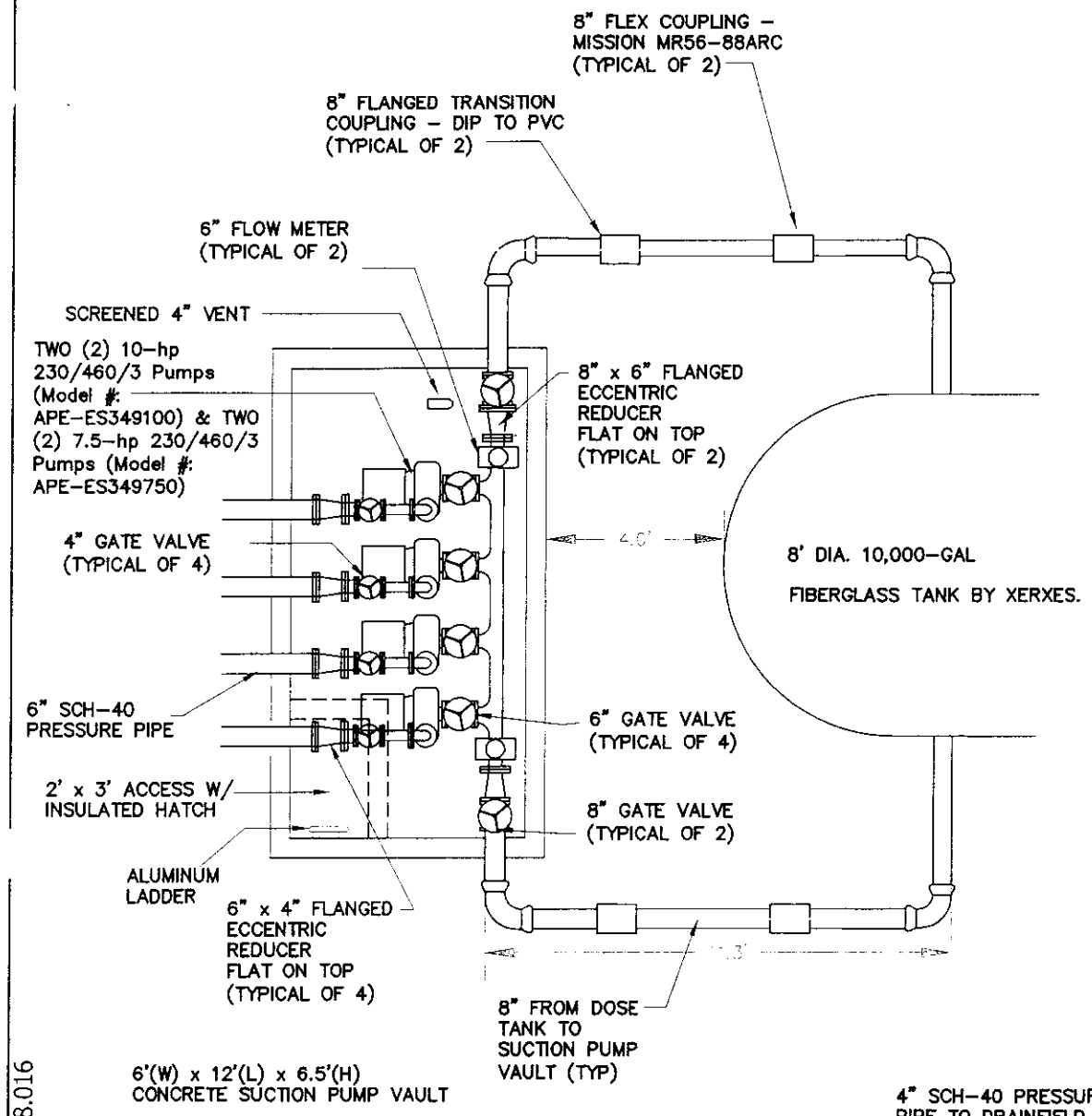

1 SS8 **SUCTION PUMP VAULT (PLAN VIEW)**

SCALE: NTS

NOTES:

1. Vaults, pumps, interior piping and tanks by Advanced Pump & equipment. Provide shop drawings to verify equipment meets the following specifications.
2. Vault ID = 6' x 12' x 6.5'H, Non-Traffic Rated
3. Vault Access ID = 2' x 3' w/ Ladder and Insulated 2' x 3' Hatch
4. The 7.5-hp pumps to deliver 420gpm @ 47.44' TDH
4. The 10-hp pumps to deliver 420gpm @ 62.66' TDH

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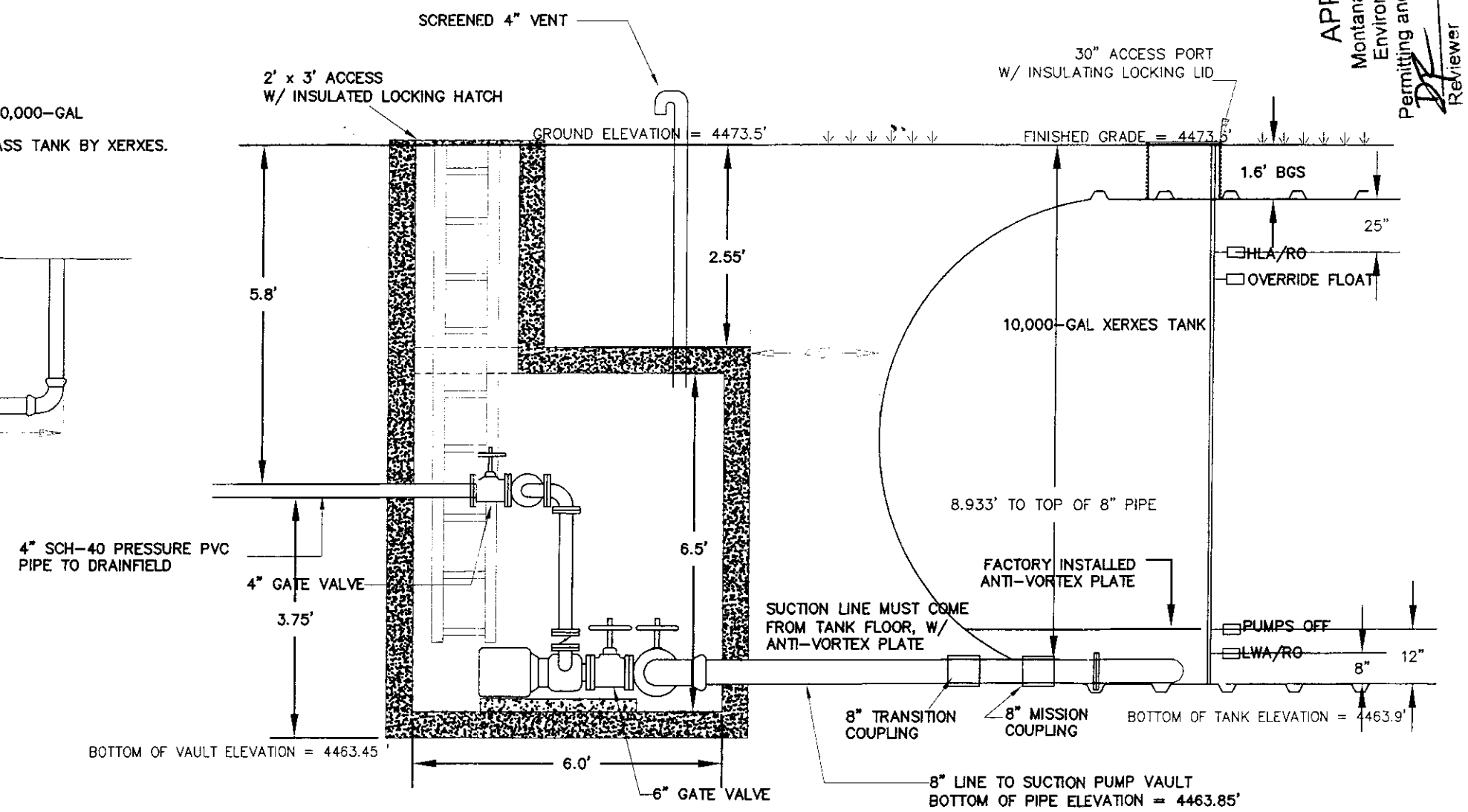
Permitting and Compliance Division
3.16.07 Date
Reviewer



2 SS8 **SUCTION PUMP VAULT (PROFILE VIEW)**

SCALE: NTS

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SANITARY SEWER COLLECTION SYSTEM DETAILS

COUNTRYSIDE ESTATES
SANITARY SEWER COLLECTION
GALLATIN COUNTY, MONTANA

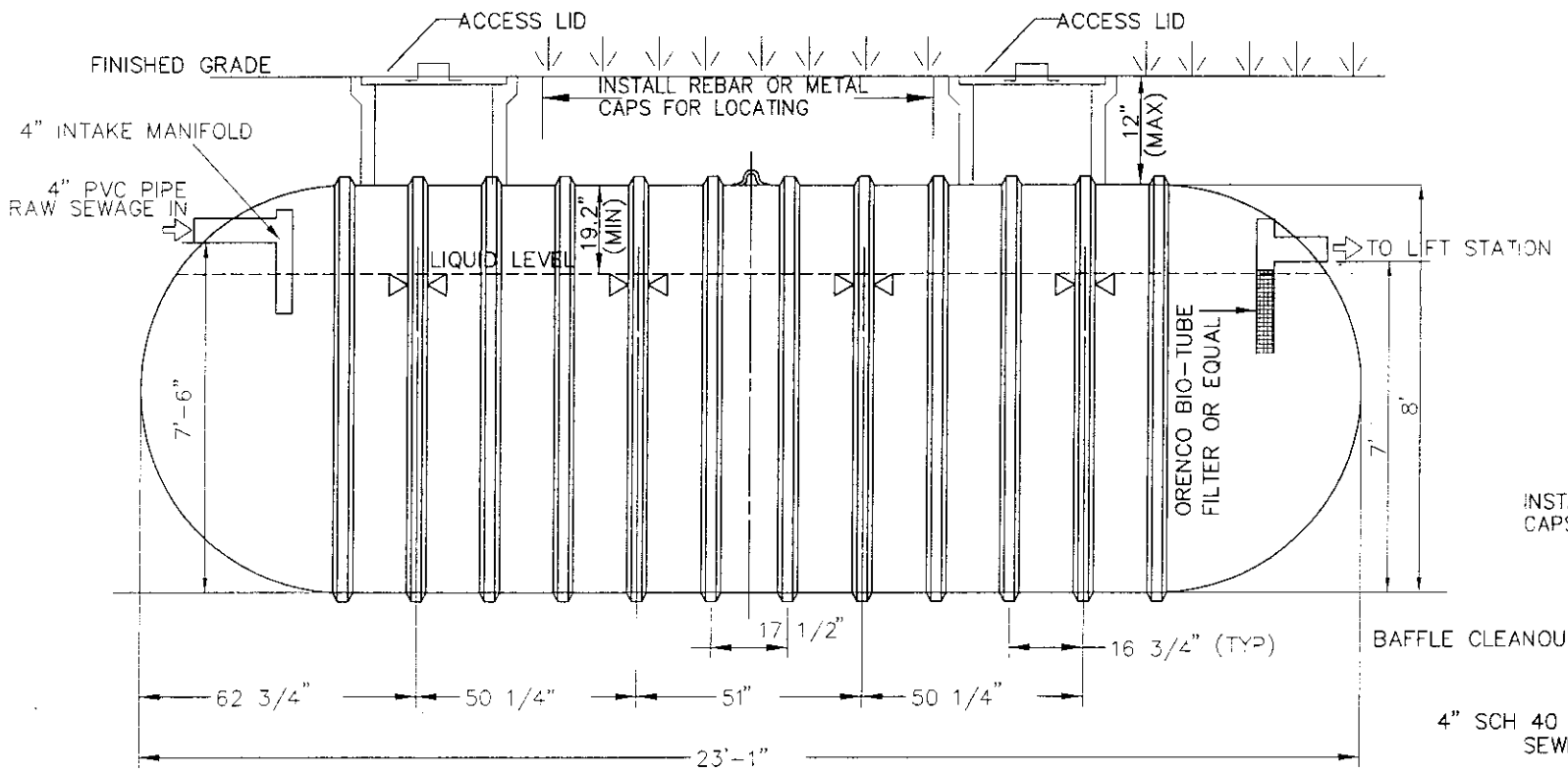
Drawing Date: 01/11/07

SS8

#04901(S)

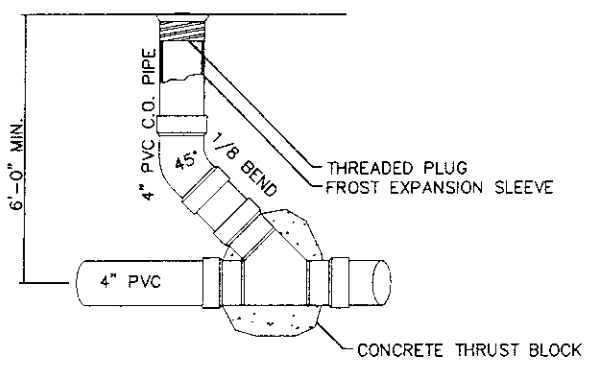
CONSTRUCTION NOTES:

1. ALL WORK SHALL BE IN ACCORDANCE WITH GALLATIN CITY-COUNTY HEALTH DEPT. REGULATIONS CH. 3 AND DEQ CIRCULAR-4 CH. 7.
2. USE 1,000 GALLON (MIN) SEPTIC/500-GAL DOSE TANK W/ EFFLUENT FILTER(S) FOR EACH COMMERCIAL LOT. ALL COMMERCIAL LOTS SHALL HAVE A CONTROL PANEL WITH AN ELAPSED TIME METER, TO MONITOR FLOWS.
3. USE 7,000 GALLON SEPTIC TANK W/ EFFLUENT FILTER FOR MULTI-FAMILY LOT.
4. ALL SYSTEM COMPONENTS WILL BE BURIED, COVERED AND INSULATED TO PREVENT MALFUNCTION. USE INSULATED PVC RISERS AND/OR 2" RIGID INSULATION WHERE REQUIRED.
5. ALL SYSTEM COMPONENTS SHALL COMPLY WITH DEQ CIRCULAR-4 SECTION 6.6.3. ALL PUMPS AND CONTROLS WILL BE CORROSION RESISTANT. AN AUDIBLE OR VISUAL ALARM SHALL BE PROVIDED TO INDICATE FAILURE OF THE SYSTEM.
6. INSTALLER RESPONSIBLE FOR CONFIRMING SITE CONDITIONS, SEWER STUB LOCATIONS PRIOR TO CONSTRUCTION.
7. OWNER MUST DIVERT ANY SPRING AND/OR STORM RUNOFF FROM HOMESITE AWAY FROM ALL SEWER SYSTEM COMPONENTS TO PRVENT SYSTEM MALFUNCTION
8. ALL SYSTEM COMPONENTS (OR EQUALS) TO BE APPROVED BY THE ENGINEER.
9. SEPTIC TANK(S) MUST BE REINFORCED CONCRETE AND EQUIPPED WITH EFFLUENT FILTER.
10. INSTALLER MUST BE LICENSED AND QUALIFIED TO INSTALL COMPLEX WASTEWATER TREATMENT SYSTEMS IN GALLATIN COUNTY, MONTANA.



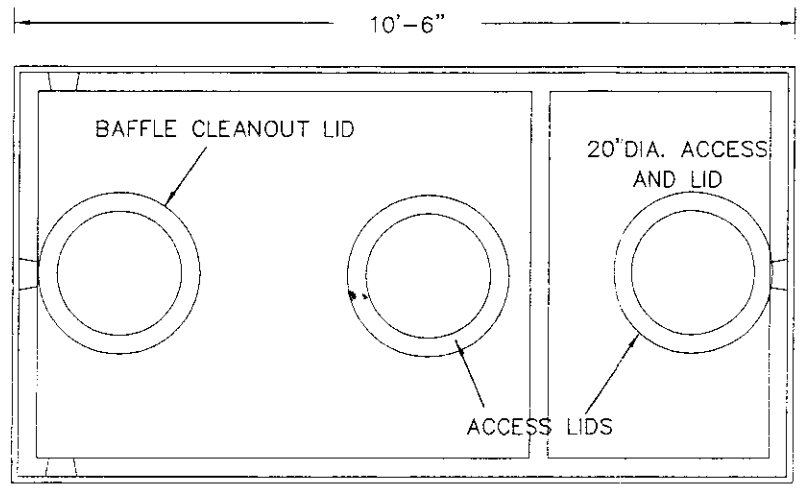
1 / SS9 **SEPTIC TANK DETAIL (7,000 GALLON)**

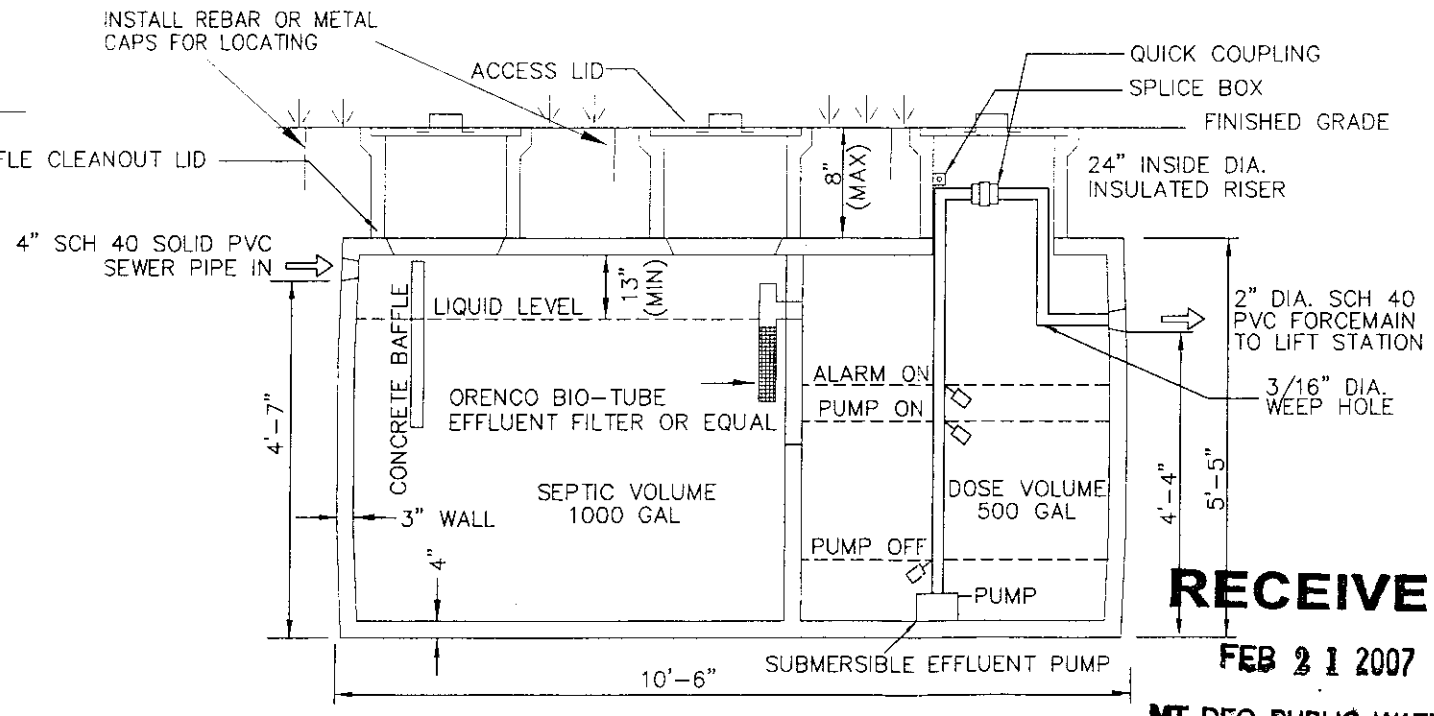
SCALE: NTS XERXES TANK FOR MULTI-FAMILY LOT



2 / SS9 **SANITARY SEWER CLEANOUT**

SCALE: NTS





3 / SS9 **1,000 GAL SEPTIC TANK/ 500 GAL DOSE CHAMBER DETAIL**

SCALE: NTS NON TRAFFIC RATED FOR EACH COMMERCIAL LOT

NOTES:

DOSE CHAMBER SHALL BE EQUIPPED WITH AUDIO AND/OR VISUAL ALARM CONTROL PANEL TO BE ORENCO SIMPLEX "S1" OR EQUIVALENT TO BE APPROVED BY ENGINEER.

ACCESS TO DOSE CHAMBER SHALL NOT BE LOCATED MORE THAN 8 INCHES BELOW THE FINISHED GRADE OF THE GROUND SURFACE

PUMP SHALL BE EXPLOSION PROOF OR REMAIN SUBMERSED AT ALL TIMES.

APPROVED
Montana Department of Environmental Quality
Permitting and Compliance Division
Date: 3.16.07
Reviewer

RECEIVED
FEB 21 2007
MT DEQ PUBLIC WATER & SUBDIVISIONS BUREAU

JEFF M. HULMARSON No. 9867PE Polson PROFESSIONAL ENGINEER
STATE OF MONTANA
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Sheet 9 of 9

SANITARY SEWER COLLECTION SYSTEM DETAILS

COUNTRYSIDE ESTATES
SANITARY SEWER COLLECTION
GALLATIN COUNTY, MONTANA

Drawing Date: 10/01/06

SS9

#04901(S2)

CONSTRUCTION SPECIFICATIONS
MULTI-USER WATER SUPPLY SYSTEM
COUNTRYSIDE ESTATES SUBDIVISION
GALLATIN COUNTY, MT

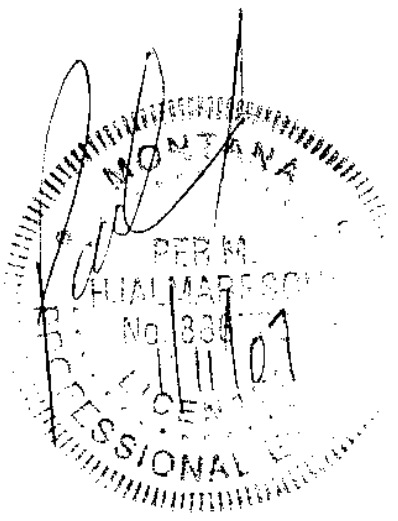
OWNER:
David Graham, Graham Development, LLC
257 Eze Street
Belgrade, MT 59714
(406) 580-8312

Prepared By:
C&H Engineering and Surveying, Inc.
1091 Stoneridge Drive, Bozeman, MT 59718
Phone: (406) 587-1115

Project #: 04901

JANUARY 12, 2007

APPROVED
Montana Department of
Environmental Quality
Permitting and Compliance Division
DF 3.16.07
Reviewer Date



CONSTRUCTION SPECIFICATIONS

This project will be constructed in accordance with *Montana Public Works Standard Specifications*, Fifth Edition, March 2003 and *Montana Department of Environmental Quality - DEQ Circular- 3 Montana Standards for Small Water Systems*, 2006 Edition.

The following Sections of Construction Specifications and Standard Drawings listed are according to said Montana Public Works Standard Specifications and Board of Water Well Contractors Montana Codes Annotated Administrative Rules of Montana, (ARM 36.21), are made a part of the Construction Specifications and Bid Form by reference only (see below). All or part of the corresponding MPWSS section may apply. Site specific specifications are also enclosed in Sections 02800 on well construction and water quality. A full set of Construction Specifications is on file for inspection at the office of the Engineer, C&H Engineering and Surveying, Inc. 1091 Stoneridge Drive, Bozeman, MT 59718 (406) 587-1115.

BIDDING REQUIREMENTS, CONTRACT FORMS AND CONDITIONS OF THE CONTRACT

MPWSS SECTION 00100	Invitation to Bid
MPWSS SECTION 00200	Instructions to Bidders
MPWSS SECTION 00300	Bid Form
MPWSS SECTION 00500	Agreement Form
MPWSS SECTION 00700	General Conditions for Public Works Projects EJCDC 00700(Reference only -not included)
MPWSS SECTION 00810	Supplementary Conditions to the General Conditions

MISCELLANEOUS FORMS(for guidance only)

FORM C-430	Bid Bond
FORM C-510	Notice of Award
FORM C-550	Notice to Proceed
FORM C-610	Performance Bond
FORM C-615	Payment Bond
FORM C-620	Contractor's Application for Payment
FORM C-940	Work Change Directive
FORM C-941	Change Order
FORM C-942	Field Order

DIVISION 1 - GENERAL REQUIREMENTS

MPWSS SECTION 01010	Summary of Work
MPWSS SECTION 01041	Project Coordination
MPWSS SECTION 01050	Field Engineering

MPWSS SECTION 01090	References
MPWSS SECTION 01300	Submittals
MPWSS SECTION 01400	Contractor Quality Control and Owner Quality Assurance
MPWSS SECTION 01500	Construction and Temporary Facilities
MPWSS SECTION 01570	Construction Traffic Control
MPWSS SECTION 01700	Contract Closeout
ARM 36.21	Board of Water Well Contractors

DIVISION 2 - SITE WORK

MPWSS SECTIONS 02200 - EARTHWORK

MPWSS SECTION 02221	Trench excavation and backfill for pipelines & appurtenant structures

MPWSS SECTIONS 02600 - WATER DISTRIBUTION

MPWSS SECTION 02660	Water distribution systems

DIVISION 3 - SITE SPECIFIC SPECIFICATIONS

SECTIONS 02800 - WELL CONSTRUCTION/WATER QUALITY SPECIFICATIONS
SECTION 02801 - WATER QUALITY AND QUANTITY
SECTION 02802 - WELL CONSTRUCTION AND TESTING
SECTION 02803 - WATER DISTRIBUTION SYSTEM
SECTION 02804 - FINISHED WATER STORAGE

APPENDIX A

LIST OF STANDARD DRAWINGS

MPW	02213-2	Water Valve Adjustment
MPW	02221-1	Typical Utility Trench Detail
MPW	02221-2	Pipe Bedding Alternative
MPW	02660-2	Water and Sewer Main Separation
MPW	02660-3	Thrust Blocking for Water Main Valves
MPW	02660-6	Water Service Line

SECTION 02800 - WELL CONSTRUCTION/WATER QUALITY SPECIFICATIONS

SECTION 02801 - WATER QUALITY AND QUANTITY

A. Ground Water

A ground water source includes all water from dug, drilled, bored or driven wells, and infiltration lines. Prior to construction of a well intended to serve a public water supply, the proposed location and the plans and specifications must be approved by MDEQ in accordance with the requirements of this section. In order to assess the available water quality and quantity, MDEQ may require construction and testing of the well in accordance with the approved plans and specifications and at the approved location prior to approval of other system components. All wells must be constructed by a licensed water well contractor in accordance with Title 37, Chapter 43, MCA, and Title 36, Chapter 21, ARM, current edition, (Water Well Contractor rules) with the following additional requirements. A copy of the above referenced codes and rules can be provided by C & H Engineering and Surveying Inc. 1091 Stonegate Drive, Bozeman, MT 59718 (406) 587-1115. These technical specifications are in accordance with DEQ Circular 1, Chapters 4 & 5. Prior to construction, the Contractor shall supply the Engineer with shop drawings for the sources of material proposed to be used on the project, and also supply acknowledgment from a qualified testing laboratory attesting to the compliance of the materials with the drawings and specifications.

B. Quantity

1. **Domestic:** The new water source shall yield a total developed capacity equal to or greater than 25.0-gallons per minute (gpm). See water use calculations in the design report.

2. **Fire Flow:** Fire suppression will not be provided by this proposed well.

C. Ground Water Quality

1. **Water Testing Specifications:** Upon completion of well construction, following development and disinfection, water samples shall be collected and examined for microbiological, physical and chemical quality and shall conform with DEQ Circular 3, chp 3.2. At this time, the testing requirements for a Multi-user water supply well will require the following test type and frequency:
   1. Nitrate + Nitrite (annual)
   2. Specific Conductance "conductivity" (annual)
   3. Total Coliform (monthly)

D. **Microbiological Quality**

1. Disinfection of every new, modified or reconditioned ground water source must be provided in accordance with ARM 36.21.662(1) prior to and after placement of permanent pumping equipment.
2. More than 72 hours after disinfection, two or more water samples must be submitted to a laboratory certified by the Department of Public Health and Human Services for microbiological analysis with satisfactory results reported to MDEQ prior to placing the well into service.
3. If the DEQ determines from the required application materials that the source may be groundwater under the direct influence of surface water in accordance with Circular PWS-5, then further assessment or treatment may be required.

E. **Physical and chemical quality**

1. Every new, modified or reconditioned ground water source must be examined for applicable physical, and chemical characteristics by tests of representative samples in laboratories certified by the Department of Public Health and Human Services, with the results reported to MDEQ.
2. Testing must include nitrate/nitrite and total dissolved solids or conductivity as a minimum for individual systems and transient non-community, public water systems. Additional testing may be required for other parameters where MDEQ has information suggesting they may be present in harmful quantities or where additional regulatory requirements apply.
3. Testing must include the constituents of **ARM 17.38.216** for non-transient, non-community public water systems.
4. The above testing may be waived where information submitted confirms water quality will be acceptable.
5. Samples must be collected at the conclusion of the test pumping procedure prior to disinfection and examined as soon as practical. MDEQ may require sample results to be submitted to the Department for review and approval to demonstrate conformance with Title 17, Chapter 38, Sub-chapter 2, ARM, prior to use of a new source or construction of a new system.

SECTION 02802 - WELL CONSTRUCTION AND TESTING

A. **Well Location**

1. Contractor must:
   a. Provide protection of the well head from possible damage or vandalism.
   b. Maintain 100' horizontal distance to existing or proposed drainfield(s).
   c. Maintain 50' horizontal distance to existing or proposed septic tank(s) and sewers.
   d. Maintain 100' horizontal distance from existing or potential sources of contamination.

B. Testing and Records

1. Yield and drawdown tests must
   a. be performed on every production well after construction or subsequent treatment and prior to placement of the permanent pump,
   b. have the test methods clearly indicated in specifications,
   c. provide data of the following at one-hour intervals or less as may be required by MDEQ:
      1. Pumping rate,
      2. pumping water levels,
      3. static water level,
      4. water recovery rate and levels, and
      5. time of starting and ending each test cycle,
   d. Provide for continuous constant rate pumping at 1.5 times the design pump capacity for at least 24 hours. Data collection must begin at time zero. The test may be terminated if stabilized drawdown occurs for at least six hours during the test. If the design pumping rate is 35 gpm or greater, the minimum stabilized drawdown period must be at least eight hours. When sufficient historical information is available, a step drawdown test, may be approved by MDEQ. The maximum test pumping rate may be reduced to the capacity of the design pump for both the step drawdown test and constant rate test for wells sized to provide peak instantaneous demand.
2. Results must be reported to MDEQ.
3. Geological data must be determined in accordance with **ARM 36.21.667.** A copy of the well log must be submitted to MDEQ.

C. General well construction

1. Minimum protected depths.

a. Wells must have unperforated casing to a minimum depth of 25 feet or continuous disinfection must be provided.

b. Full time disinfection is required where the water source is an aquifer with a water table that is within 25 feet of ground surface. A deviation of this standard may be granted by MDEQ in accordance with the procedures of Section 1.4.

2. Permanent steel casing pipe must

a. be in accordance with **ARM 36.21.640**,

b. be equipped with a drive shoe when driven, and

c. have joints in accordance with **ARM 36.21.642.**

3. Nonferrous casing materials: Plastic well casing must be in accordance with **ARM 36.21.645** and **ARM 36.21.646.**

4. Packers: Packers must be of material that will not impart taste, odor, toxic substance or bacterial contamination to the well water. Lead packers must not be used.

5. Grouting requirements

a. All permanent well casing must be sealed in accordance with **ARM 36.21.654** through **ARM 36.21.660.**

b. The casing must be provided with centralizers in accordance with **ARM 36.21.649.**

6. Upper terminal well construction.

a. Permanent casing for all ground water sources must be in accordance with **ARM 36.21.647**.

b. Where a well house is constructed, the floor surface must be at least six (6) inches above the final ground elevation.

c. Sites subject to flooding must be provided with an earth mound surrounding the casing and terminating at an elevation at least two feet above the 100-year flood level or highest known flood elevation

d. The top of the well casing at sites subject to flooding must terminate at least three feet above the 100-year flood level or highest known flood elevation.

e. Protection from physical damage and tampering must be provided.

7. Development

Every well must be developed in accordance with **ARM 36.21.653.**

8.Capping requirements

Temporary capping requirements must be in accordance with **ARM 36.21.661.**

9. Well abandonment

All wells that have no further use must be abandoned in accordance with **ARM 36.21.670** through **ARM 36.21.678.**

10. Special conditions

The following special aquifer types and construction methods must be reviewed by MDEQ on a case-by-case basis to assure proper design and protection of public health:

a. sand or gravel wells,
b. gravel pack wells,
c. radial wells,
d. infiltration lines,
e. dug wells,
f. limestone or sandstone wells and
g. flowing wells.

D. Well Pumps:

1. Where a submersible pump is used:
   a. The top of the casing shall be effectively sealed against the entry of water under all conditions of vibration or movement of conductors or cables.
   b. Each pump shall have a positive-acting check valve on the discharge side between the pump and the shut-off valve.
   c. shall have a standard pressure gauge on its discharge line
   d. shall have a means for measuring the discharge
   e. Contractor will provide a minimum of 3/4-hp, 25 gpm submersible pump in the Well (or equivalent) to be approved by the Engineer. Recommended pumps include Grundfos, Aermotor, Meyers, etc.

E. Casing Vent:

1. Provisions must be made for venting the well casing to atmosphere. Venting must be provided by factory manufactured vented well cap or fabricated vent assembly. All vents must be screened with corrosion resistant material to prevent entry of insects and oriented to prevent entry of rainwater.

2. Fabricated vents must terminate in a downturned position, at or above the top of the casing or pitless unit in a minimum 1-½ inch diameter opening covered with a 24-mesh screen. The pipe connecting the casing to the vent must be of adequate size to provide rapid venting of the casing. Fabricated vent assemblies must be of such design and strength as to be vandal resistant.

F. Water level measurement

1. Provisions (i.e. probe access tube or air line) should be made for periodic measurement of water levels in the completed well.

2. Where pneumatic water level measuring equipment is used it must be made using corrosion resistant materials attached firmly to the drop pipe or pump column and in such a manner as to prevent entry of foreign materials.

G. Well Screen

1.Provide a stainless steel well screen in accordance with **ARM 36.21.652.**

SECTION 02803 - WATER DISTRIBUTION SYSTEM

A. Distribution Systems

All materials including pipes, fittings, valves and fire hydrants must conform to the latest standards issued by the AWWA and ANSI/NSF where such standards exist and be acceptable to MDEQ. In the absence of such standards, materials meeting applicable product standards and acceptable to MDEQ may be selected.

1. Water Main Design

a. Pressure

All water mains, including those not designed to provide fire protection, must be sized after a hydraulic analysis based on flow demands and pressure requirements. The system must be designed to maintain a minimum normal working pressure of 35 psi. Maximum normal working pressure should be approximately 60 to 80 psi. Minimum pressure under all conditions of flow (e.g. fire flows) must be 20 psi. Minimum required pressures must be based on those occurring at ground level at the highest building sites or fire hydrant served by the proposed water mains excluding service line head losses.

b. Diameter: The main feeding the (9) unit condominium facility, must be a 2 inch diameter HDPE pipe sized to handle design flows.

c. Hydrants: Water mains not designed to carry fire flows shall not have standard size fire hydrants connected to them.

d. Dead Ends: Dead ends shall be minimized by looping of all mains whenever practical.

e. Valves: Sufficient valves shall be provided on the water mains so that inconvenience and sanitary hazards will be minimized during repairs.

2. Installation of Mains

a. Standards: Specifications shall incorporate the provisions of the AWWA standards, Montana Public Works Standard Specifications (MPW) and manufacturer's recommended installation procedures.

b. Cover: All water main trenches shall be excavated, bedded. The pipe will then be placed, covered with bedding materials then backfilled as per MPW standards and be covered with a minimum 6 feet of sufficient earth or other insulation to prevent possible damage or freezing. Where the main is to run under roadways, parking lots or structural load bearing areas, Type I backfill will be used. Backfill will be placed in 8 to 12 inch lifts and compacted to 95 % maximum density at optimum moisture content as per ASTM D 698. Type II backfill can be used in all other areas not discussed above.

3. Pressure and Leakage Testing

a. Leakage: The installed pipe shall be pressure tested and leakage

tested in accordance with MPW Standard Specifications, Section 02660.

b. Disinfection: All new, cleaned or repaired water mains shall be disinfected, flushed, and bacteriologically tested in accordance with AWWA Standard C651.

All new construction, and any pipe or equipment that has been opened for repairs, if it is to come into contact with the portable water, must disinfected before being placed into service. Water mains taken out of service for inspection, repair, or other activities that might lead to contamination of water shall be disinfected before they are returned to service. Disinfection starts with good construction and repair practices. Pipe should be inspected while being installed to be sure no trash, such as rags, bird nests, rodents, soil or weeds are present. Sanitary conditions should be maintained at all times. Open ends of pipe should be closed off at the end of each day. At the finish of construction or repair work, the section of pipe should be thoroughly flushed and then chlorinated according to AWWA Standard C651-05 - Disinfecting Water Mains and AWWA Standard C654-03 - Disinfection of Wells.

4. Separation of Water Mains and Sewers
   a. Parallel Installation: Water mains must be laid at least 10 feet horizontally from any existing or proposed sewer. The distance must be measured edge to edge.
   b. Crossings: Water mains crossing sewers shall be laid to provide a minimum distance of 18 inches between the outside of the water main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer. At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.
5. Cross Connections and Interconnections
   a. Cross connections: There shall be no connection between the distribution system and any pipes, pumps, hydrants or tanks whereby unsafe water or other contaminating materials may be discharged or drawn into the system.
6. Water Services and Plumbing
   a. Plumbing: Water services and plumbing shall conform to the Uniform Plumbing Code as amended by **ARM 8.70.302**.
   b. Booster Pumps: Individual home booster pumps shall not be considered or required for any individual service from the water supply mains unless specifically approved by the MDEQ.

SECTION 02804 - FINISHED WATER STORAGE

A. Finished Water Storage

The materials and designs used for finished water storage structures must provide stability and durability as well as protect the quality of the stored water. Steel, concrete, fiberglass-reinforced plastic, and flexible membrane water storage facilities must follow current AWWA Standards. Other materials of construction are acceptable when properly designed to meet the requirements of Chapter 7 of Department Circular DEQ-1, "Standards for Water Works". Porous material, including wood and concrete block, are not suitable for potable water contact applications.

B. Pressure Tanks

Hydropneumatic (pressure) tanks, when provided as the only storage facility, are acceptable only in very small water systems. Pressure tanks must meet applicable ASME code requirements. Pressure tanks for which the ASME code does not apply (i.e., those with nominal water containing capacity of 120 gallons or less) must meet ASME code requirements or must satisfactorily pass a hydrostatic test of 1.5 times the maximum allowable working pressure of the tank. The maximum allowable working pressure must be marked on each tank.

1. Location: The tank shall be located above normal ground surface and be completely housed.

2. System Design and Sizing:

A. The capacity of the wells and pumps in a hydropneumatic system shall be equal to the peak instantaneous demand. See Pressure Tank Sizing Calculations in the design report. The active storage volume of the hydropneumatic tanks shall be sufficient to limit pump cycling to manufacturer's and industry recommendation. Maximum cycling frequency shall be determined to be 3.0 minutes. Reduction of required tank volume for systems with alternating pump controls will not be allowed.

B. If applicable, the sizing of the hydropneumatic storage tanks must consider the need for chlorine contact time, as applicable, independent of the requirements in 7.2.2.a above. Tanks with a common inlet and outlet will not be given any credit for chlorine contact time.

3. Piping: Each tank in a multiple tank system shall have bypass piping or valves to permit operation of the system while the tank is being repaired or painted.

A. Appurtenances:

1. Each tank shall have a means of draining, automatic or

manual air blow-off, and a means for adding air.
2. Control equipment consisting of a pressure gage, pressure relieving device, and pressure operated start-stop controls for the pumps shall be provided for the hydropneumatic tank system. A shut-off valve shall not be installed between the pump and the pressure operated start-stop controls.
3. The pressure relieving device shall prevent the pressure from rising more than 10 percent above the maximum allowable working pressure. The discharge capacity of the pressure relieving device shall be adequately sized. Pressure gages shall have a range of no less than 1.2 times the pressure at which the pressure relieving device is set to function.

CHLORINE DISINFECTING PROCEDURES
CALCULATING QUANTITIES OF CHLORINE FOR DISINFECTING WATER MAINS

The need for and design of treatment processes and devices will depend on evaluation of the nature and quality of the water to be treated and the desired quality of the finished water. MDEQ shall use the Department Circular DEQ-1, "Standards for Water Works," as a guide for the review and approval of treatment processes and equipment. In accordance with ARM 17.38.101, treatment processes and equipment are required to be designed by a registered professional engineer.

The amount or weight of chlorine required to disinfect a particular segment of water line is directly related to the volume of water contained in that particular segment of water main.

A Volume of Water in Pipe

Volume of Water (Gallons) = Area of pipe (Ft^2) x Length (ft) x 7.48
= 7C R2 L X 7.48

Where:	π	= 3.1416
	R	= Inside Radius of Pipe in Feet
	L	= Length of Pipe to be Disinfected, in Feet
	7.48	= Gallons per Cubic Foot

B. Formula to Determine Lbs. Of Chlorine Required

Lbs. Of Chlorine = ppm x MG x 8.34

where:	Lbs. of Chlorine	= 100% Effective Chlorine
	ppm	= Chlorine Dosage in Parts per Million
	MG	= Million Gallons of Water
	8.34	=8.34 Lbs. of Water per Gallon

C. Sample Calculations

Example: 200 Lineal feet of 1.5" water main to be disinfected at a chlorine concentration of 25 ppm.

Volume of Water		= πR^2 L x 7.48
	R	= .75" = .75/12 Ft = 0.0625 Ft
	L	= 200 Ft
Volume of Water		= 3.1416 x (.0625)^2 x 200 x 7.48
		= 18.3587 Gallons
		= 0.00001836 MG

Lbs - of Chlorine = ppm, x MG x 8.34

ppm = 25

Lbs. Of Cholrine = 25 x 0.00001836 x 8.34

= .003828 Lbs= 1.736 grams. Of 100% Effective Chlorine

D. Using Chlorine Compounds or Solutions Less Than 100% Effective Chlorine

Most dry chlorine compounds or chlorine solutions on the market do not contain 100% effective chlorine. Normally the containers of the compound or solution will state the amount of effective chlorine as a percentage.

Example: Determine how much Chlorox (Sodium Hypochlorite) solution is required to provide .003828 lbs. of 100% effective chlorine - Chlorox container is labeled at 5.25% effective chlorine.

Effective Chlorine Per Gallon Chlorox = .0525 x 8.34 Lbs./Gal = 0.44 Lbs.

Gallons of Chlrox Required = $\frac{.003828}{0.44}$ =0.0087 Gallons= 2.23 tablespoons

E. Chlorine Dosage Table

Table 1 following presents the chlorine required to produce a 25 ppm concentration in 100 feet of pipe. Also shown are the gallons required for a solution containing 1 percent effective chlorine

TABLE 1
Chlorine Required to Produce 25mg/L
Concentration in 100 ft. of Pipe - by Diameter

Pipe Diameter Inches	100% Effective Chlorine Lbs.	1 Percent Chlorine Solutions Gallons
4	0.013	0.16
6	0.030	0.36
8	0.085	1.02
10	0.120	1.02
12	0.22	1.44
16	0.27	2.60
18	0.34	3.30
20	0.49	4.07
24	.076	5.87
30	1.10	9.17
36	1.96	13.19
48		23.50

F. Dosage Table for Hypochlorite Tablets

The number of 5-g tablets required for each pipe section to provide a chlorine dosage of 25 mg/L is equal to 0.0012 x d x L., where d is the inside pipe diameter in inches and L is the length of the pipe section in feet. Table 2 shows the number of tablets required for commonly used sizes of pipe.

TABLE 2
Number of a5-g Hypochlorite Tablets
Required for Dose of 25 mg/L

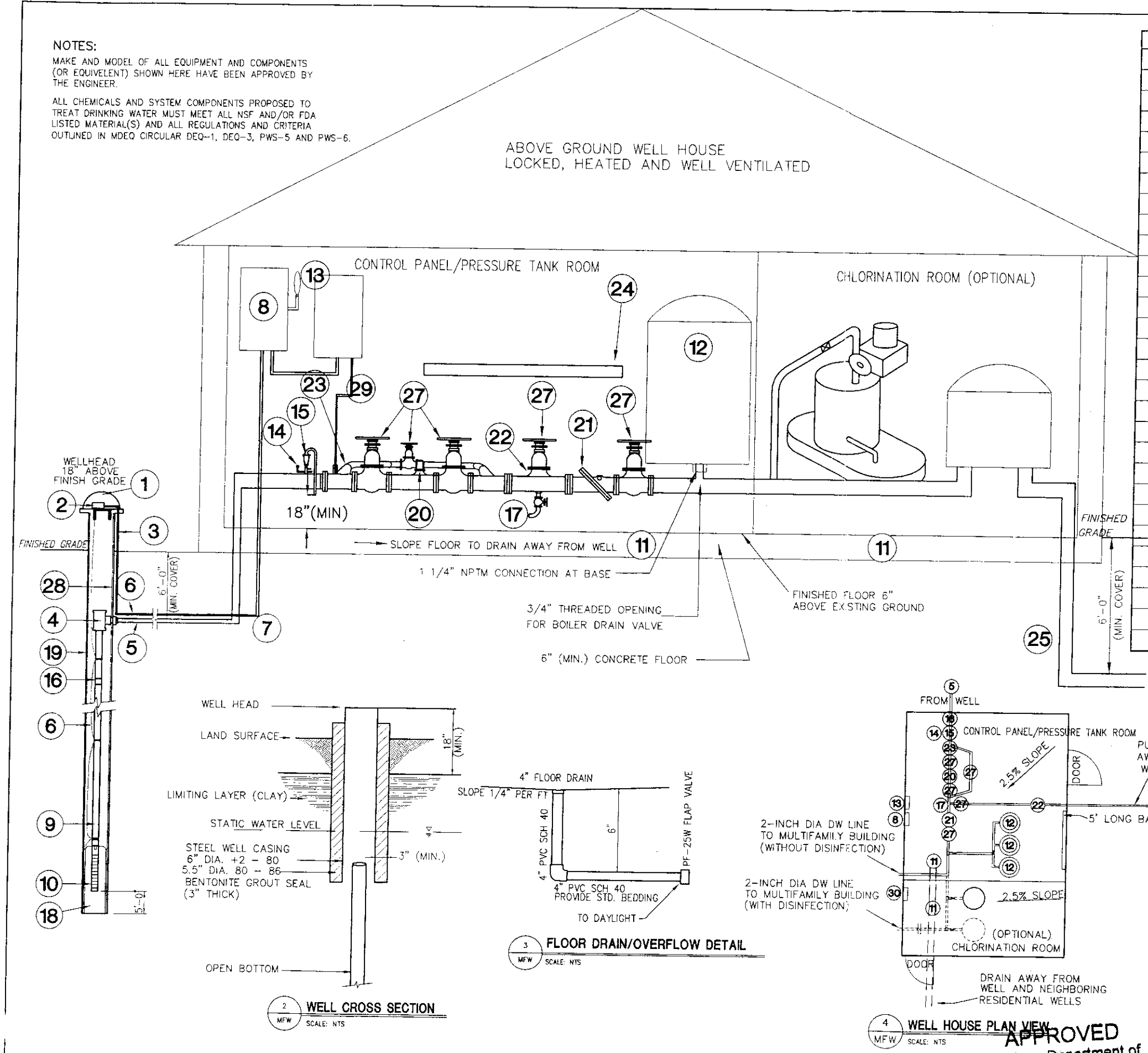
Pipe Diameter	Length of Pipe Section, ft.				
	13 or Less	18	20	30	40
4	1	1	1	1	1
6	1	1	1	2	2
8	1	2	2	3	4
10	2	3	3	4	5
12	3	4	4	6	7
16	4	6	7	10	13
18	5	7	8	12	16
20	7	9	10	15	20
24	9	13	14	21	28

[a]Based on 3.25 g available chlorine per tablet. Any portion of tablet rounded to next higher number.

NOTES:

MAKE AND MODEL OF ALL EQUIPMENT AND COMPONENTS (OR EQUIVELENT) SHOWN HERE HAVE BEEN APPROVED BY THE ENGINEER.

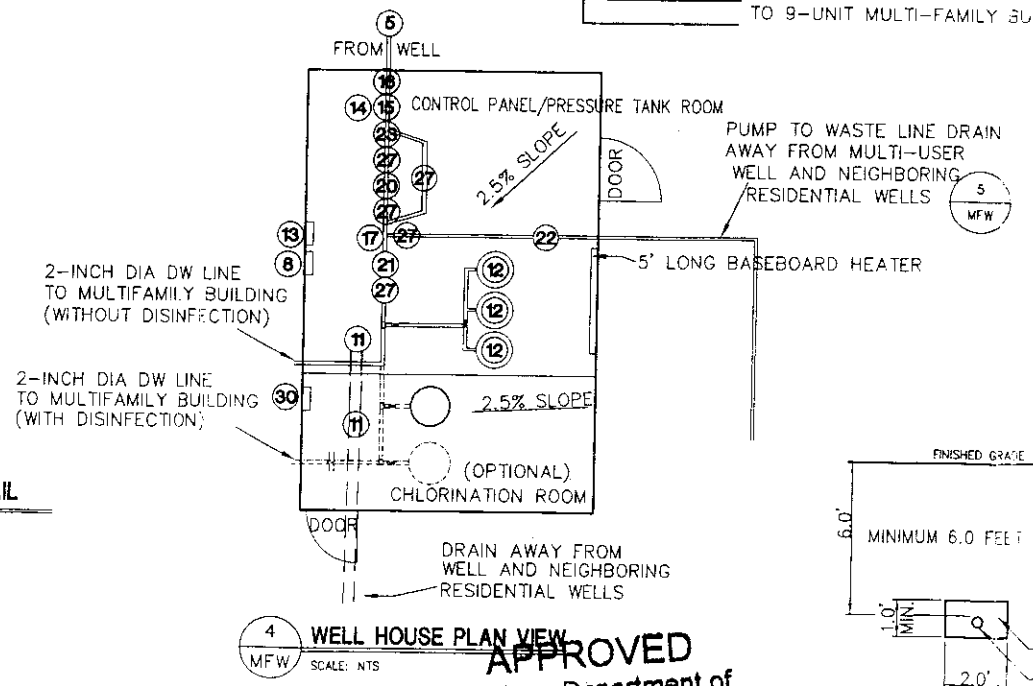
ALL CHEMICALS AND SYSTEM COMPONENTS PROPOSED TO TREAT DRINKING WATER MUST MEET ALL NSF AND/OR FDA LISTED MATERIAL(S) AND ALL REGULATIONS AND CRITERIA OUTLINED IN MDEQ CIRCULAR DEQ-1, DEQ-3, PWS-5 AND PWS-6.



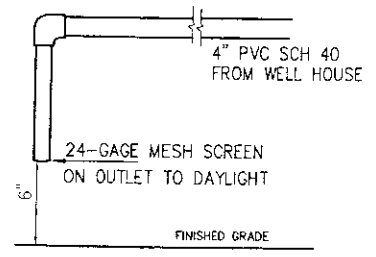
NO.	DETAIL
1	VENTED/SCREENED/VANDAL PROOF WELL CAP WITH SANITARY WELL SEAL
2	CONDUIT CONNECTOR
3	1" PVC ELECTRICAL CONDUIT TO CONTROL PANEL
4	4" PITLESS ADAPTER (CAMPBELL S20)
5	APPROX. 20 LF OF 4" DIA. D.I. SERVICE LINE TO MECHANICAL ROOM (BURIAL DEPTH APPROX. 6 FEET BELOW GRADE)
6	SUBMERSIBLE CABLE AND U/G WIRING
7	U/G ELEC FROM METER BOX 12 GAUGE COPPER
8	MAIN ELEC CONTROL PANEL
9	4" DIA. SCH 80 PVC DROP PIPE WITH LIGHTNING ARRESTOR
10	4" AERMOTOR 230 VOLT (MIN) 3/4 HP, 2 WIRE, S25 SUBMERSIBLE PUMP
11	4" FLOOR DRAIN
12	WELLRITE WR260-03 85 GALLON TANKS SET TO 40-60 PS (MINIMUM OF THREE)
13	DISCONNECT SWITCH
14	PRESSURE GAUGE RANGE 1 - 100 PSI
15	AIR RELIEF VALVE
16	LINE PRESSURE CHECK VALVE (CLA-VALVE) INSTALLED IN WELL (55 PSI)
17	SMOOTH NOSED SAMPLING TAP
18	DRIVE SHOE
19	8" DIA. STEEL WELL CASING
20	WATER METER (DIGITAL FLOW SENSOR AND FLOW COMPUTER SIAMETRICS FT420)
21	CHECK VALVE
22	4-INCH PUMP TO WASTE LINE
23	METER BY-PASS
24	5' LONG BASE BOARD HEATER
25	MAIN SERVICE LINE OUT
26	SCHAEFER VENTILATION SHUTTER FAN (2" DIA. ASTM D-2922 D.I.)
27	GATE VALVE
28	1" MEASURING CONDUIT
29	PUMP PRESSURE SWITCH

2 MFW WELL CROSS SECTION
SCALE: NTS

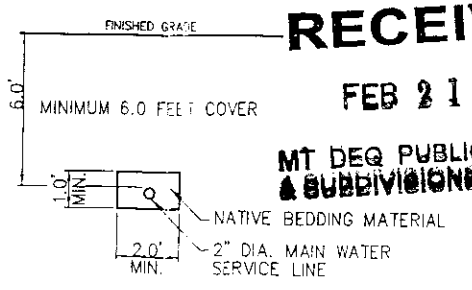
3 MFW FLOOR DRAIN/OVERFLOW DETAIL
SCALE: NTS



4 MFW WELL HOUSE PLAN VIEW
SCALE: NTS



5 MFW PUMP TO WASTE DETAIL
SCALE: NTS



6 MFW TYPICAL WATER MAIN TRENCH DETAIL
SCALE: NTS

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APPROVED
Montana Department of Environmental Quality
Permitting and Compliance Division
DE 3-16-07
Reviewer Date

2281782
Page: 115 of 115
10/17/2007 11:20A
Charlotte Mills-Gallatin Co MT MISC 805.00

PER M. KJALMARSSON No. 8867PE REGISTERED PROFESSIONAL ENGINEER STATE OF MONTANA

Sheet 1 of 1

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ENGINEER: PMM
DRAWN BY: MAS

WATER AND WELL DETAILS

COUNTRYSIDE ESTATES
MULTI-USER PUBLIC WATER SYSTEM
GALLATIN COUNTY, MONTANA

Drawing Date: 11/17/06

MFW

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