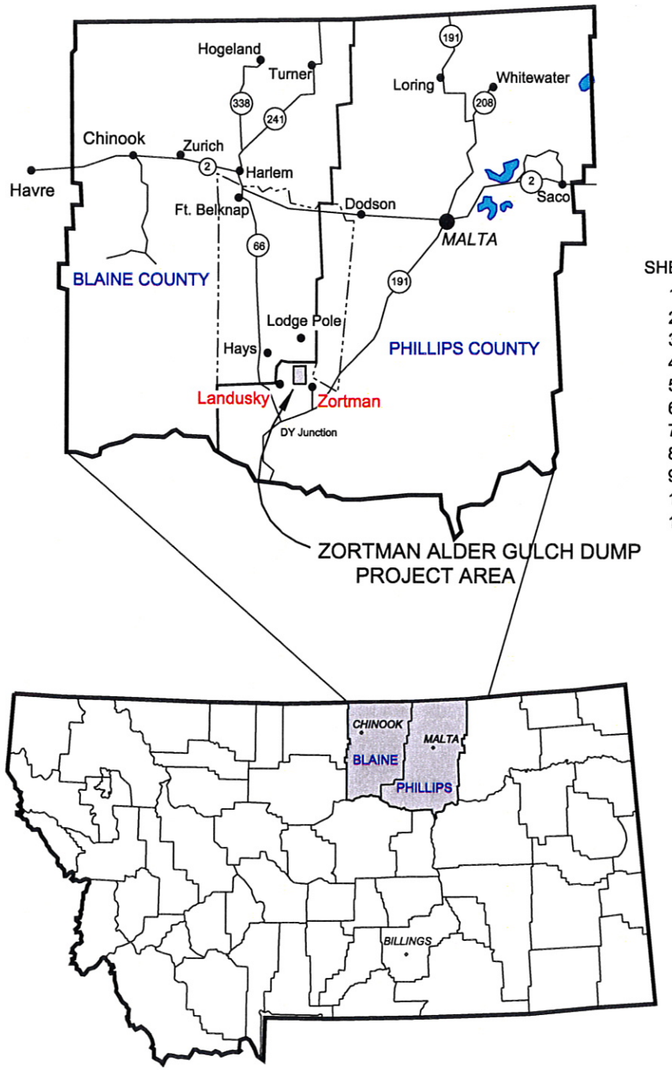
STATE OF MONTANA

Department of Environmental Quality, Permitting and Compliance Division

ZORTMAN ALDER GULCH DUMP PROJECT

DEQ CONTRACT NO. 507023

Phillips County, Montana



STATE OF MONTANA

MAP SHEET INDEX

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3	COVER SOIL STRIPPING AND STOCKPILE AREAS
4	GRADING PLAN CROSS SECTION LOCATIONS
5	GRADING PLAN CROSS SECTIONS
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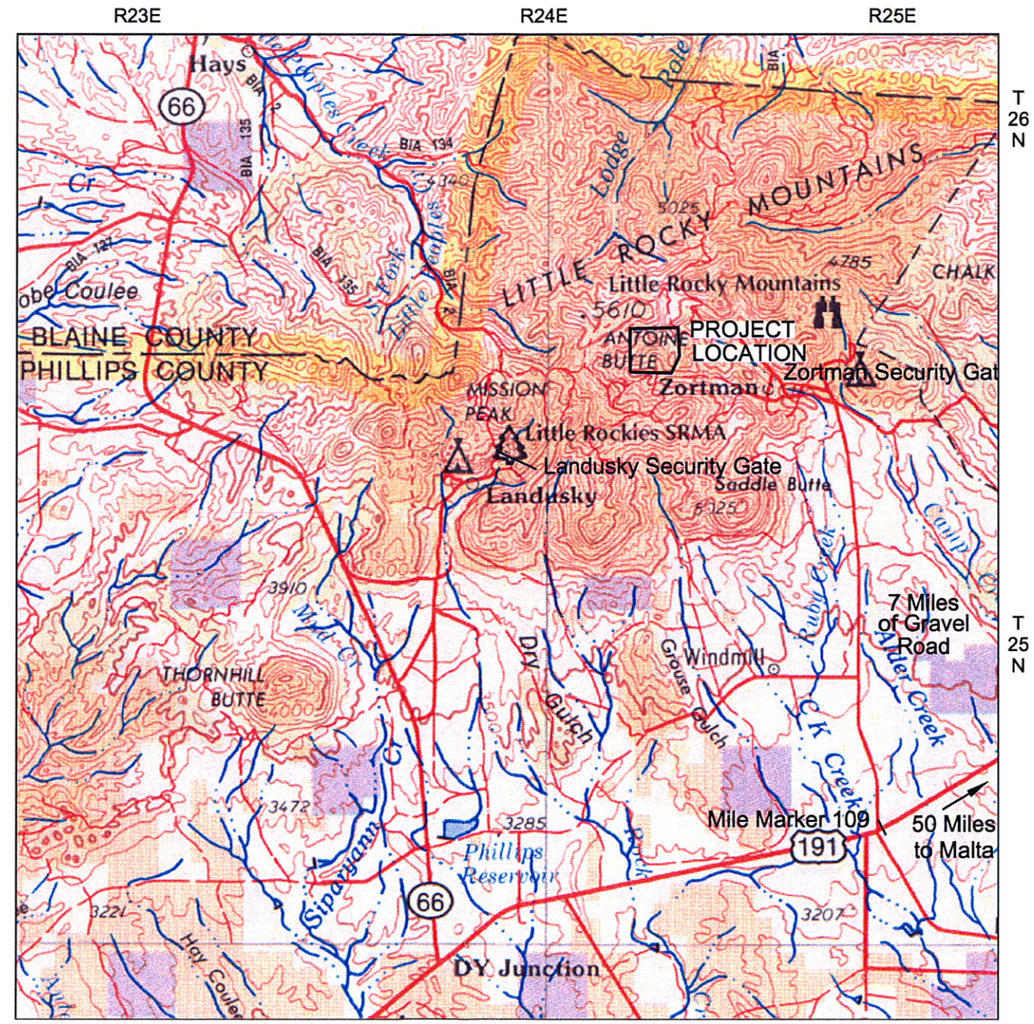
10	GEOSYNTHETIC CLAY LINER INSTALLATION PLAN
11	COVER SOIL REPLACEMENT PLAN



ZORTMAN ALDER GULCH DUMP PROJECT AREA

CONSTRUCTION LIMITS

ACCESS ROUTES, WORK AREAS, AND CONSTRUCTION LIMITS WILL BE FIELD STAKED BY THE ENGINEER. VEHICLE TRAVEL WILL BE LIMITED TO ROUTES FLAGGED AT POSTED SPEED LIMITS.

ENGINEER'S CERTIFICATE

I HEREBY CERTIFY THAT THE WORK SHOWN ON THESE PLAN SHEETS WERE PREPARED UNDER MY SUPERVISION. I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MONTANA.

William C. Maehl

William C. Maehl
Montana PE No. 5274PE

REVISIONS		
NO.	DESCRIPTION	DATE

SPECTRUM ENGINEERING
1413 4th Ave. North
Billings, MT 59101
Phone: (406) 259-2412

February 2007

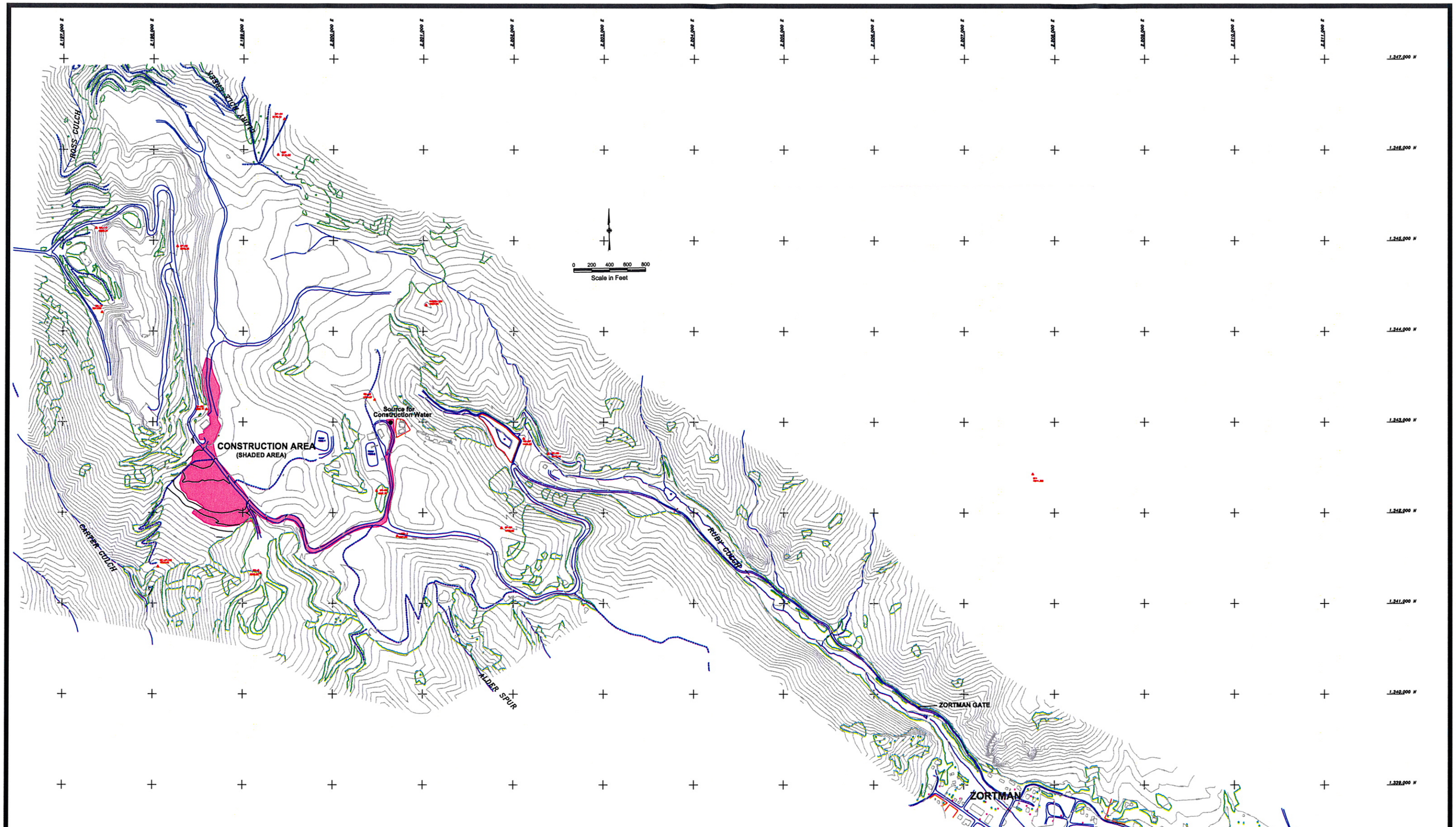
STATE OF MONTANA
Department of Environmental Quality
PERMITTING AND COMPLIANCE DIVISION
1520 East Sixth Avenue
Helena, MT 59620

ZORTMAN ALDER GULCH DUMP PROJECT
SECTIONS 7 AND 18
T25N, R25E of Phillips County, Montana

GENERAL LOCATION MAP

FILE NAME: 1-TitleZ6.dwg

SHEET NO. 1 OF 11



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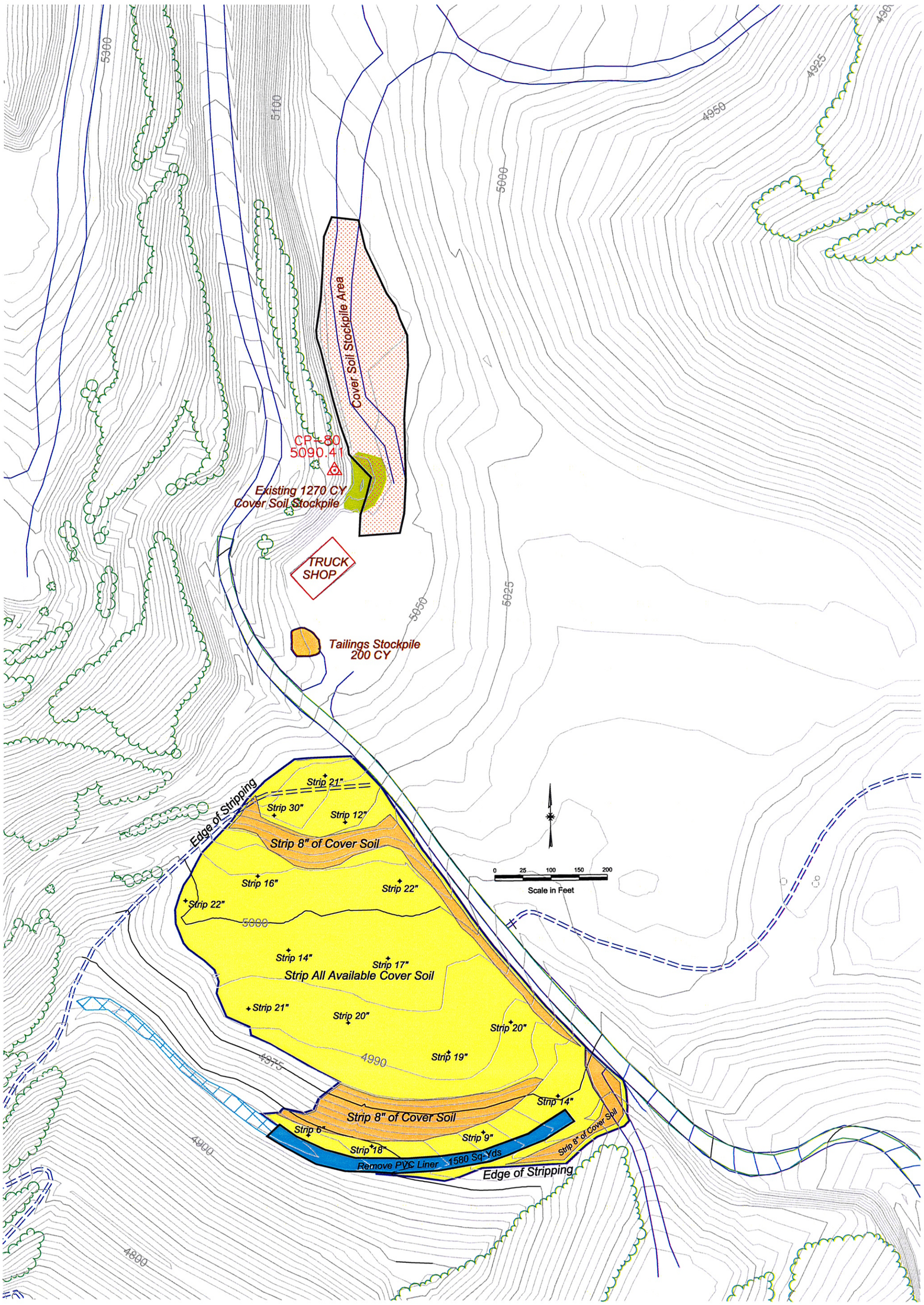
1520 East Sixth Avenue
Helena, MT 59620

ZORTMAN ALDER GULCH DUMP PROJECT
SECTIONS 7 AND 18
T25N, R25E of Phillips County, Montana

SITE ACCESS ROADS AND CONSTRUCTION AREA

FILE NAME: 2-Area_FeaturesZ-6.dwg

SHEET NO. 2 OF 11



Cover Soil Salvage Quantity = 15,400 BCY (Est.)
Cover Soil In Existing Stockpile = 1,270 BCY (Est.)
Tailings In Stockpile = 200 CY

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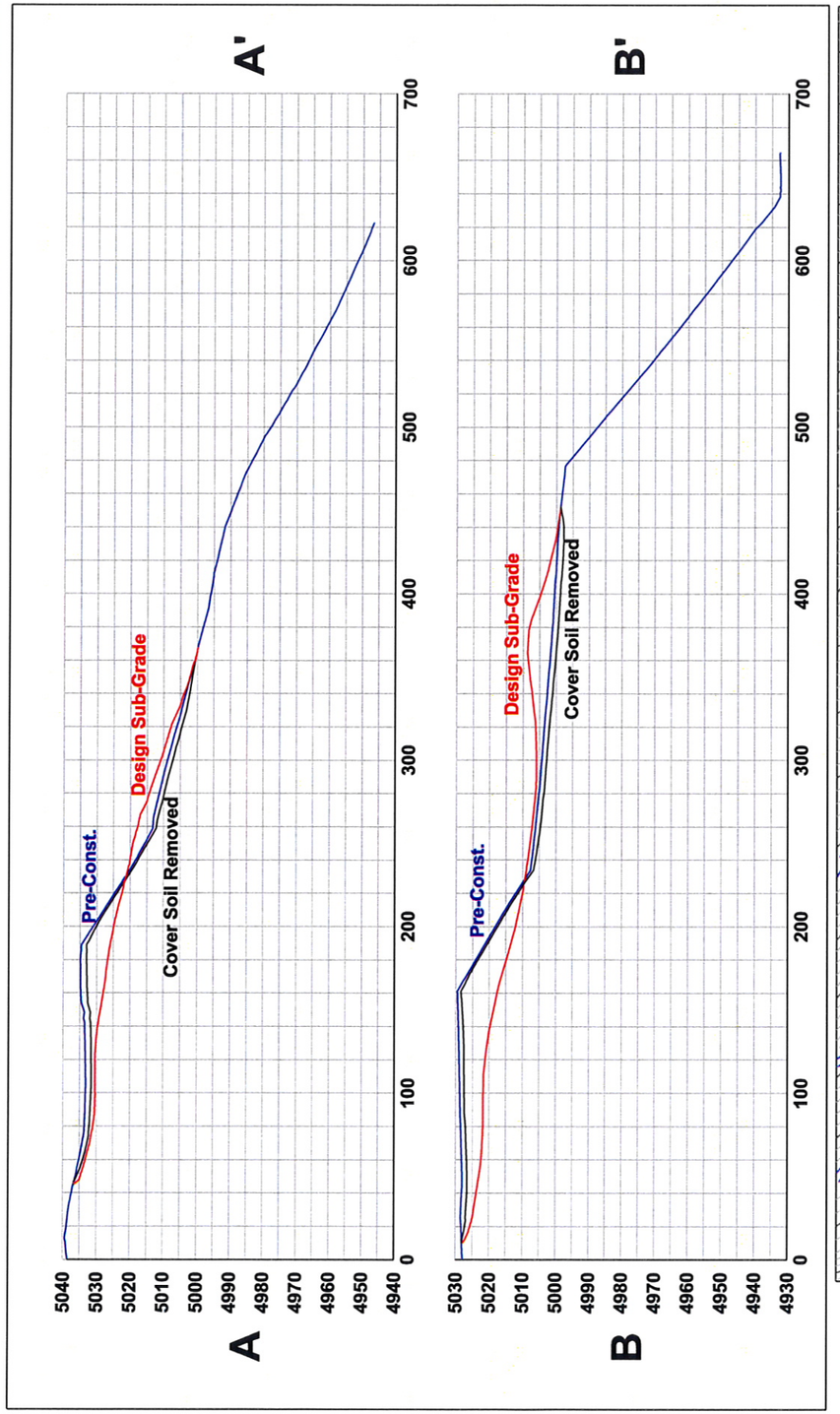
Helena, MT 59620

ZORTMAN ALDER GULCH DUMP PROJECT
SECTIONS 7 AND 18
T25N, R25E of Phillips County, Montana

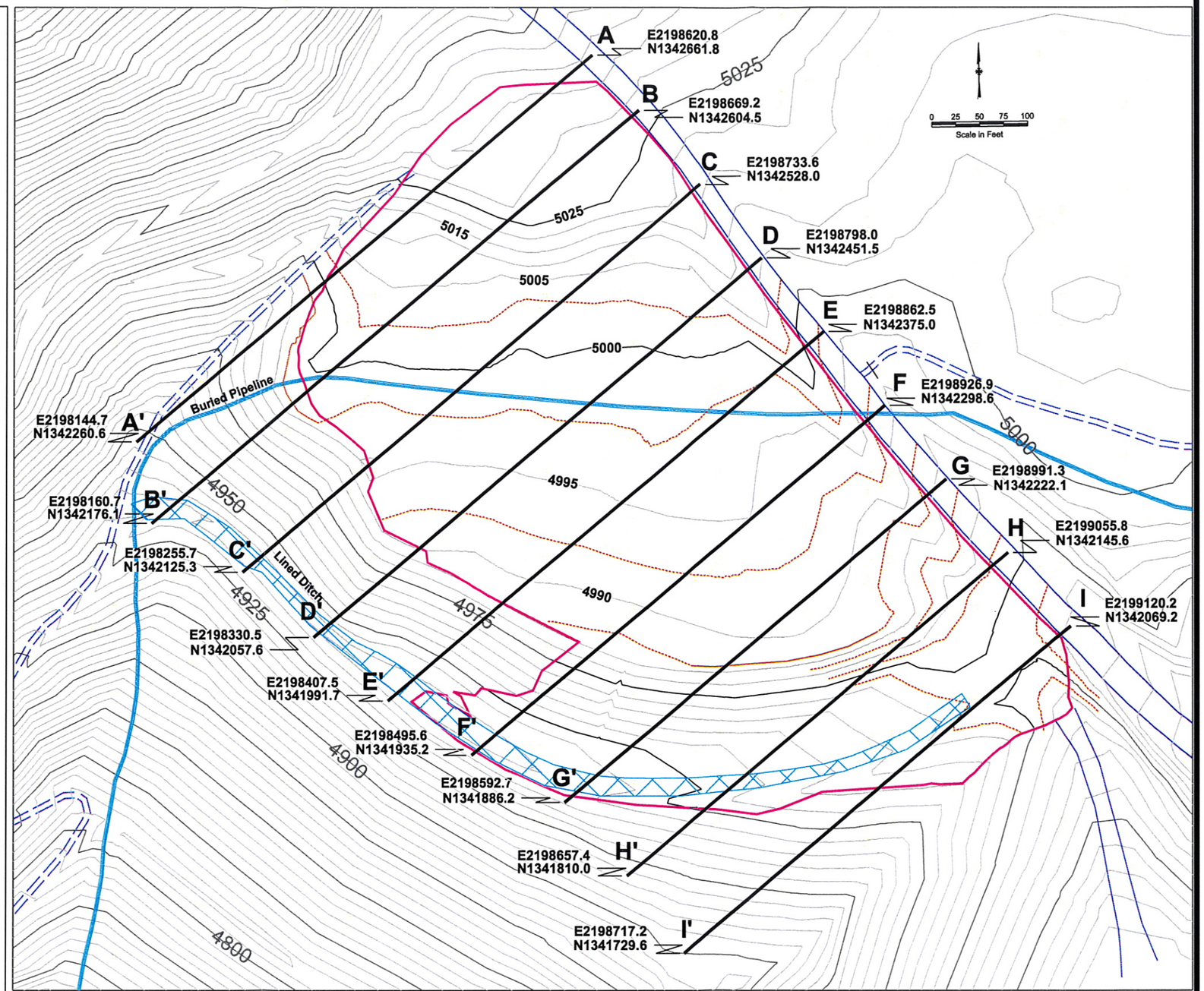
COVER SOIL STRIPPING AND STOCKPILE AREAS

FILE NAME: Z6-topsoil-stripping_plan.dwg

SHEET NO. 3 OF 11



Cross Sections A-A' And B-B'



Cross Section Locations Shown Over Pre-Construction Contours

Pre-Construction Contours Are Shown With A Regular 5 Foot Contour Interval With Supplemental Dashed 2.5 Foot Contours.

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Department of Environmental Quality

PERMITTING AND COMPLIANCE DIVISION

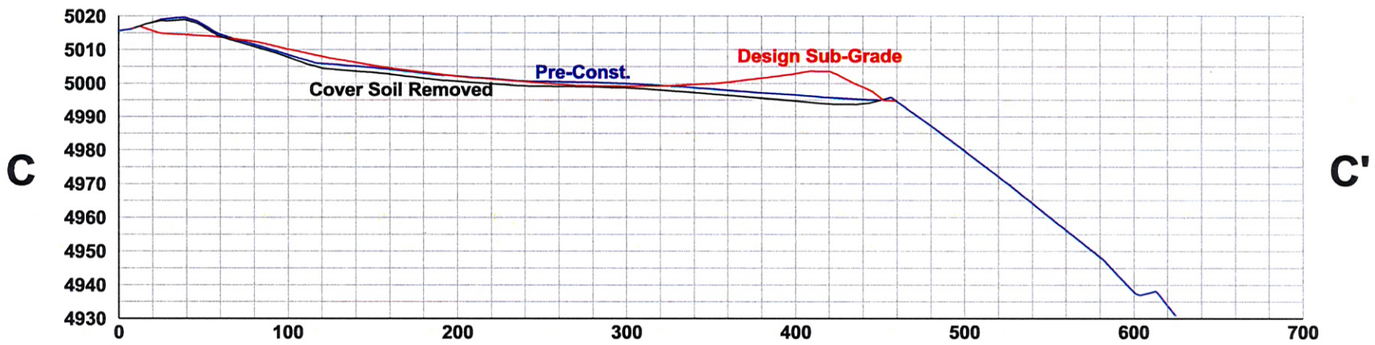
1520 East Sixth Avenue
Helena, MT 59620

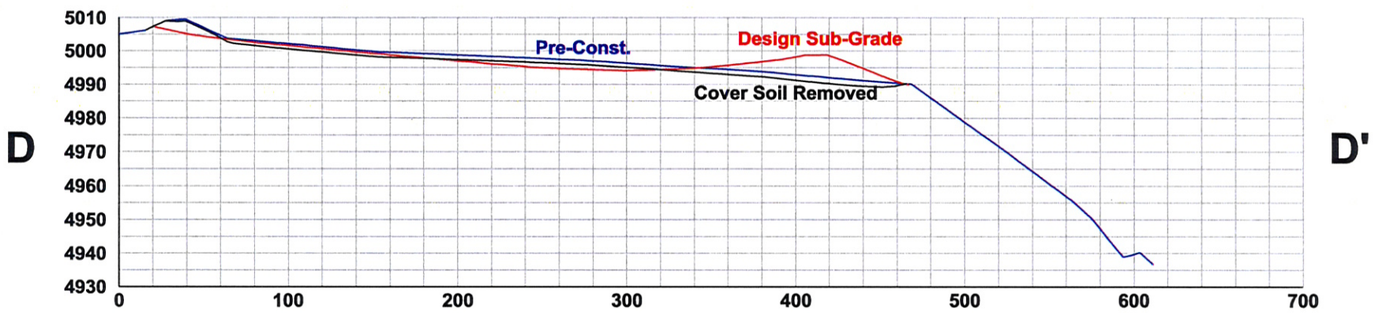
ZORTMAN ALDER GULCH DUMP PROJECT
SECTIONS 7 AND 18
T25N, R25E of Phillips County, Montana

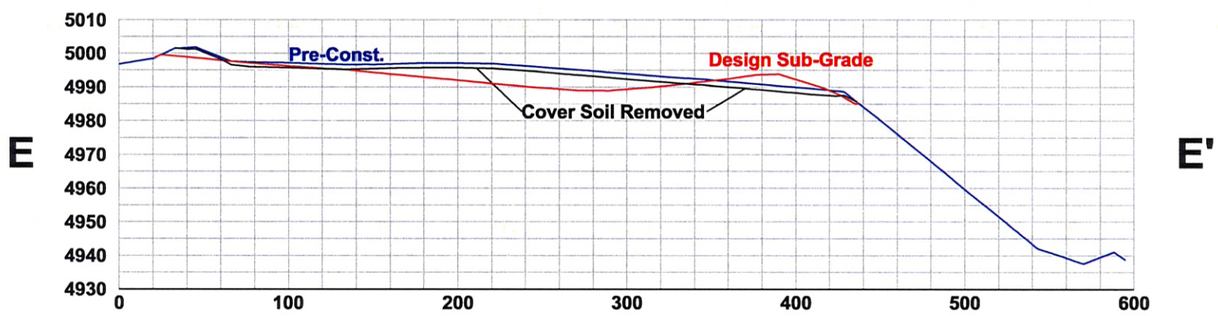
GRADING PLAN
CROSS SECTION LOCATIONS

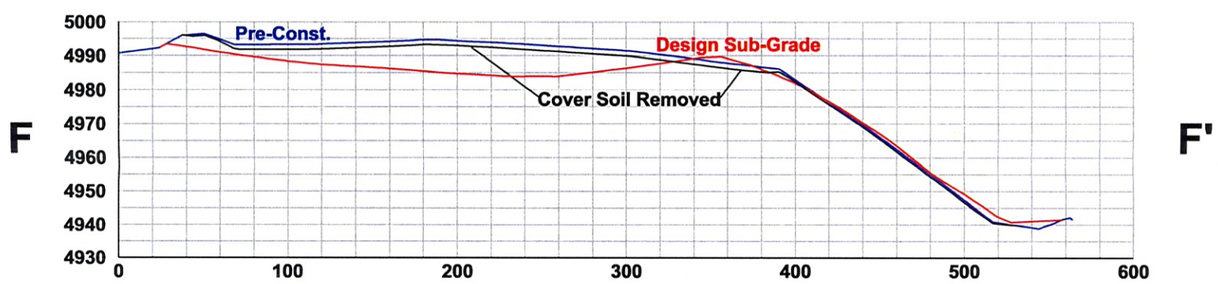
FILE NAME: 3-z6-grading_plan.dwg

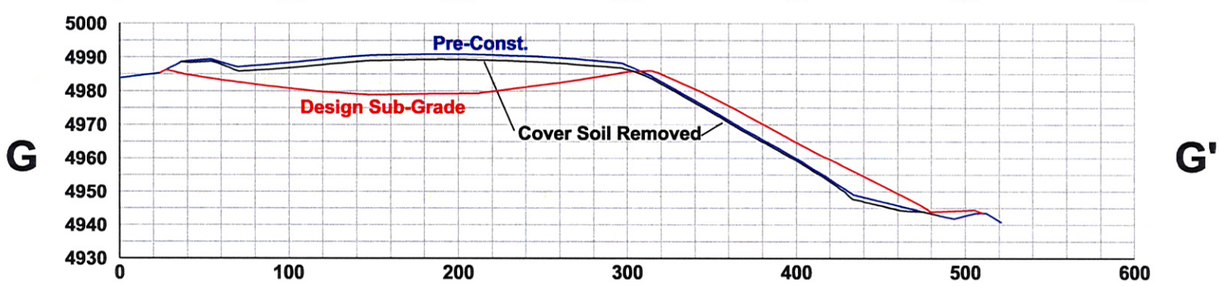
SHEET NO. 4 OF 11

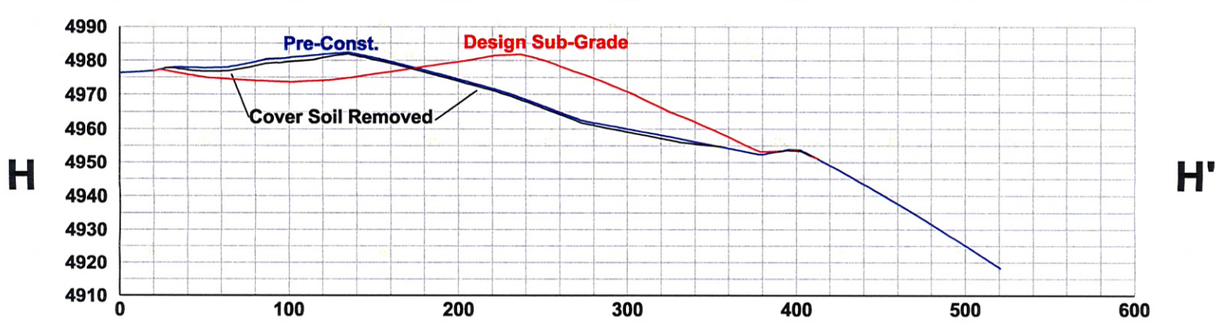


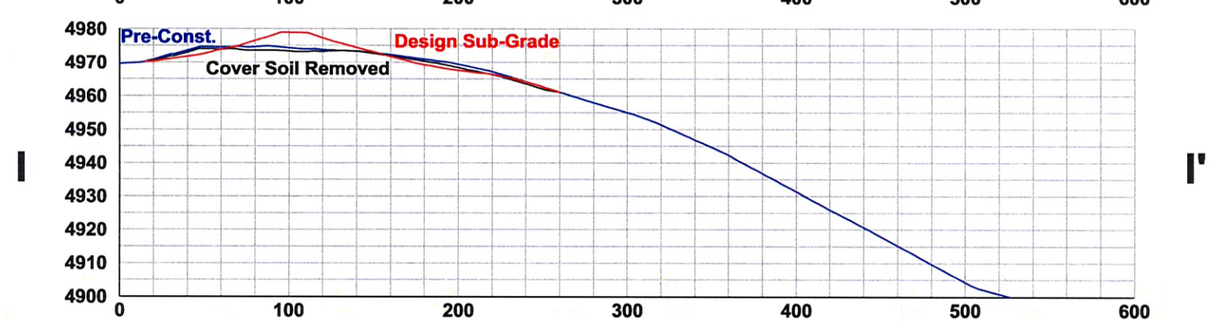












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STATE OF MONTANA
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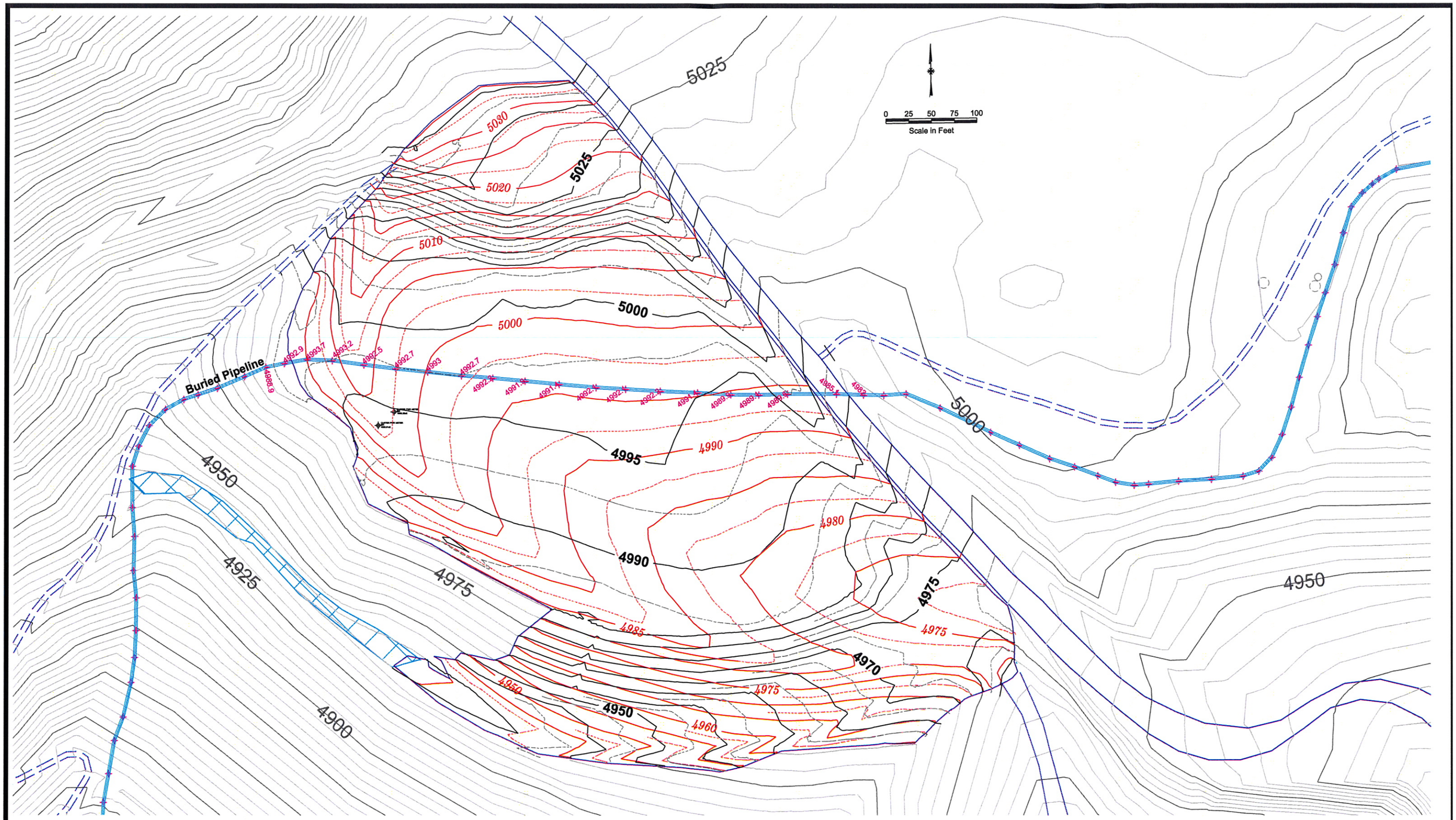
PERMITTING AND COMPLIANCE DIVISION
1520 East Sixth Avenue
Helena, MT 59620

ZORTMAN ALDER GULCH DUMP PROJECT
SECTIONS 7 AND 18
T25N, R25E of Phillips County, Montana

GRADING PLAN
CROSS SECTIONS

FILE NAME: 3-z6-grading_plan.dwg

SHEET NO. 5 OF 11



Black Elevation Contours Shown Inside The Grading Boundary Are On The Dump Surface Following Cover Soil Removal.
Black Contours Are Shown With A Regular 5 Foot Contour Interval With Supplemental Dashed 2.5 Foot Contours.
Red Elevation Contours Are The Design Contours For The Liner Sub-Grade And For The Cover Soil Replacement Sub-Grade Outside The Liner Area.
Red Contours Are Shown With A Regular 5 Foot Contour Interval With Supplemental Dashed 2.5 Foot Contours.
Magenta Elevation Annotations Along The Buried Pipeline Are At The Top Of The Pipe.

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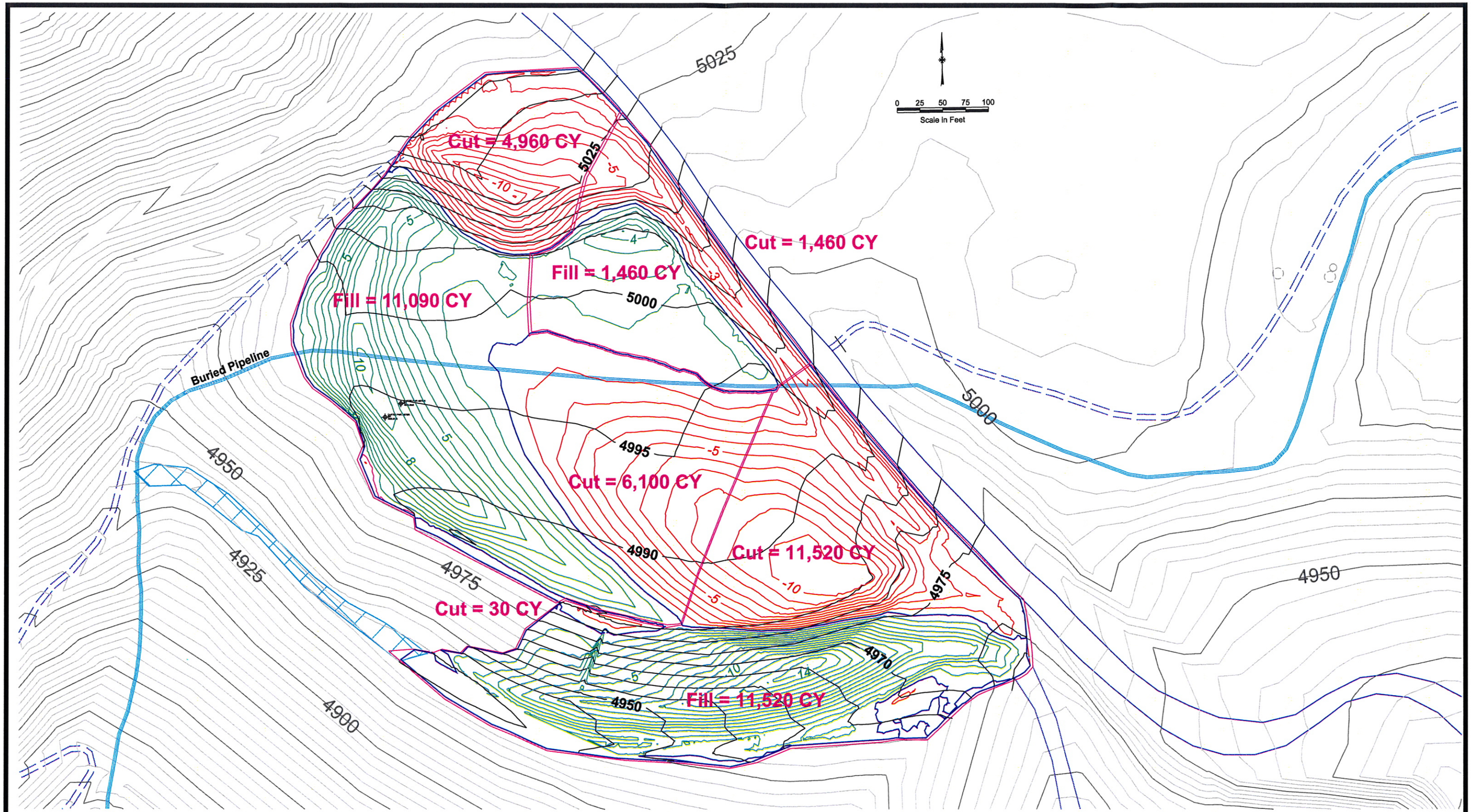
1520 East Sixth Avenue
Helena, MT 59620

ZORTMAN ALDER GULCH DUMP PROJECT
SECTIONS 7 AND 18
T25N, R25E of Phillips County, Montana

GRADNG PLAN
SUB-GRADE CONTOURS

FILE NAME: 3-z6-grading_plan.dwg
SHEET NO. 6 OF 11



Black Elevation Contours Shown Inside The Grading Boundary Are On the Dump Surface Following Cover Soil Removal.
Black Contours Are Shown With A 5 Foot Contour Interval And Assume Cover Soil Removed To Planned Depths.
Red Isopleths Are Cut Depths To The Liner Or Cover Soil Replacement Sub-Grade.
Green Isopleths Are Fill Depths To The Liner Or Cover Soil Replacement Sub-Grade.
Red And Green Cut/Fill Isopleths Are Shown At A 1 Foot Interval.
Dark Blue Isopleth Between The Red And Green Isopleths Represents The At Grade Line Or Zero Cut -Zero Fill.
Balanced Cut/Fill Areas Are Shown Outlined In Magenta With Quantity Annotations.
Total Cut Quantity Is Estimated At 24,070 BCY. The Fill Balance Assumes No Shrinkage or Swell.

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ZORTMAN ALDER GULCH DUMP PROJECT
SECTIONS 7 AND 18
T25N, R25E of Phillips County, Montana

GRADING PLAN
CUT/FILL ISOPLETHS
AND QUANTITIES

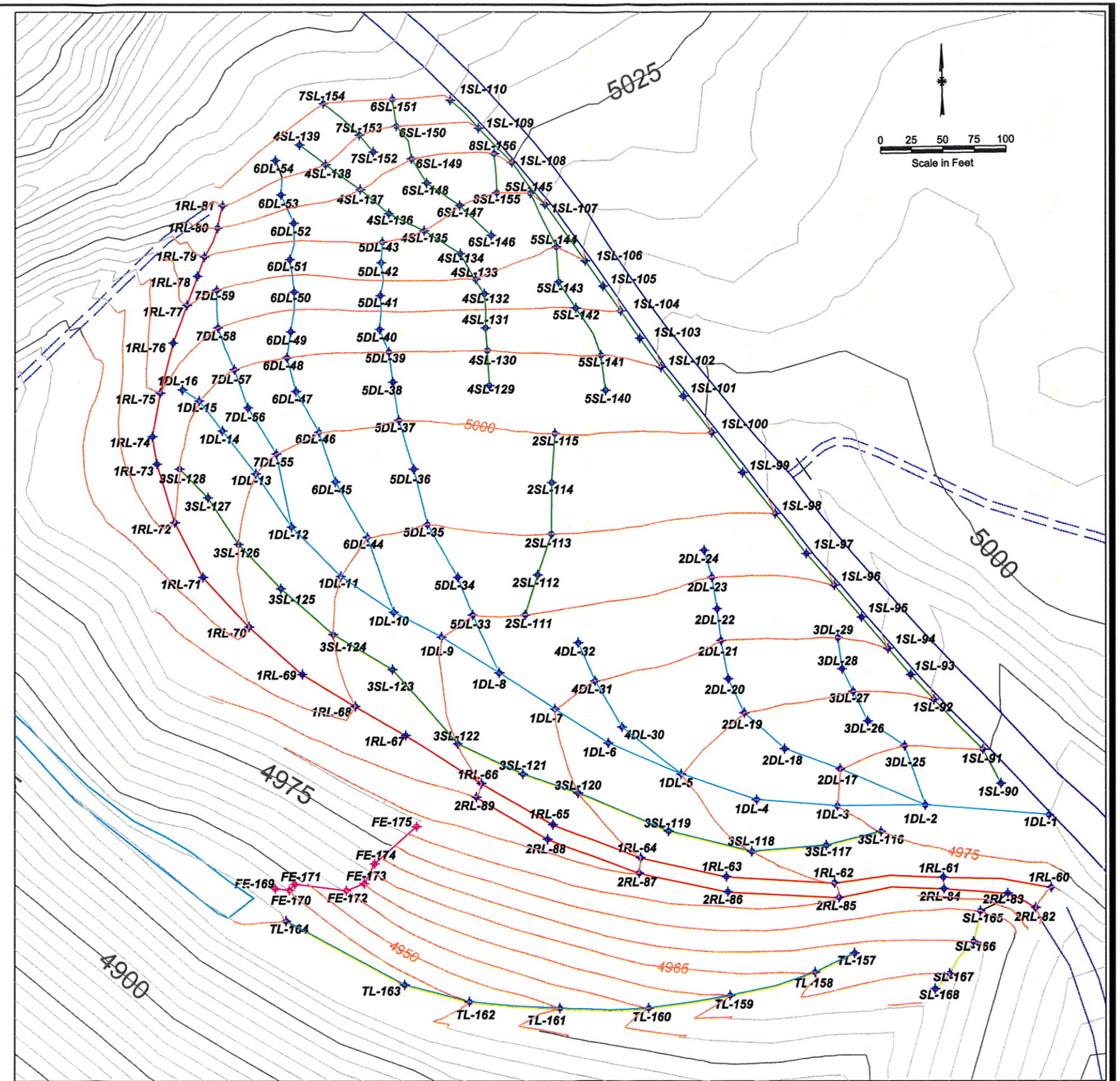
FILE NAME: 3-z6-grading_plan.dwg
SHEET NO. 7 OF 11

LINER AND COVER SOIL SUB-GRADE POINTS

POINT	EASTING	NORTHING	SUB-GRADE ELEVATION
1DL-1	2,199,109.89	1,342,057.70	4,970.23
1DL-2	2,199,011.69	1,342,065.64	4,972.50
1DL-3	2,198,940.77	1,342,064.85	4,975.00
1DL-4	2,198,875.67	1,342,069.91	4,977.50
1DL-5	2,198,814.76	1,342,090.66	4,980.00
1DL-6	2,198,755.60	1,342,115.42	4,982.50
1DL-7	2,198,712.67	1,342,142.79	4,985.00
1DL-8	2,198,668.59	1,342,171.73	4,987.50
1DL-9	2,198,621.97	1,342,200.44	4,990.00
1DL-10	2,198,583.74	1,342,220.37	4,992.50
1DL-11	2,198,541.26	1,342,249.02	4,995.00
1DL-12	2,198,501.89	1,342,288.60	4,997.50
1DL-13	2,198,472.88	1,342,331.30	5,000.00
1DL-14	2,198,445.79	1,342,365.60	5,002.50
1DL-15	2,198,427.05	1,342,389.51	5,005.00
1DL-16	2,198,413.40	1,342,398.30	5,007.50
2DL-17	2,198,942.86	1,342,094.67	4,975.00
2DL-18	2,198,898.01	1,342,110.71	4,977.50
2DL-19	2,198,865.89	1,342,139.51	4,980.00
2DL-20	2,198,853.01	1,342,166.94	4,982.50
2DL-21	2,198,847.04	1,342,197.61	4,985.00
2DL-22	2,198,843.94	1,342,223.00	4,987.50
2DL-23	2,198,839.77	1,342,248.17	4,990.00
2DL-24	2,198,833.43	1,342,269.84	4,992.50
3DL-25	2,198,995.27	1,342,113.13	4,975.00
3DL-26	2,198,965.43	1,342,132.94	4,977.50
3DL-27	2,198,953.55	1,342,156.60	4,980.00
3DL-28	2,198,944.58	1,342,174.80	4,982.50
3DL-29	2,198,941.20	1,342,199.70	4,985.00
4DL-30	2,198,766.78	1,342,128.31	4,982.50
4DL-31	2,198,745.00	1,342,165.19	4,985.00
4DL-32	2,198,731.68	1,342,195.83	4,987.50
5DL-33	2,198,647.26	1,342,218.08	4,990.00
5DL-34	2,198,635.27	1,342,248.30	4,992.50
5DL-35	2,198,610.63	1,342,290.51	4,995.00
5DL-36	2,198,599.82	1,342,334.95	4,997.50
5DL-37	2,198,587.99	1,342,374.05	5,000.00
5DL-38	2,198,583.16	1,342,404.56	5,002.50
5DL-39	2,198,579.95	1,342,428.61	5,005.00
5DL-40	2,198,572.54	1,342,446.64	5,007.50
5DL-41	2,198,573.09	1,342,473.76	5,012.50
5DL-42	2,198,573.75	1,342,500.09	5,017.50
5DL-43	2,198,574.77	1,342,516.47	5,020.00
6DL-44	2,198,562.64	1,342,280.40	4,995.00
6DL-45	2,198,537.10	1,342,324.78	4,997.50
6DL-46	2,198,523.64	1,342,364.54	5,000.00
6DL-47	2,198,505.37	1,342,397.13	5,002.50
6DL-48	2,198,498.02	1,342,424.02	5,005.00
6DL-49	2,198,501.06	1,342,444.75	5,007.50
6DL-50	2,198,503.89	1,342,476.58	5,012.50
6DL-51	2,198,500.28	1,342,502.47	5,017.50
6DL-52	2,198,503.42	1,342,531.54	5,022.50
6DL-53	2,198,493.07	1,342,554.18	5,027.50
6DL-54	2,198,488.52	1,342,581.64	5,032.50
7DL-55	2,198,489.45	1,342,347.07	5,000.00
7DL-56	2,198,466.53	1,342,383.98	5,002.50
7DL-57	2,198,455.57	1,342,414.52	5,005.00
7DL-58	2,198,442.19	1,342,448.04	5,010.00
7DL-59	2,198,441.22	1,342,478.03	5,015.00

POINT	EASTING	NORTHING	SUB-GRADE ELEVATION
1RL-60	2,199,111.55	1,341,999.58	4,980.00
1RL-61	2,199,025.93	1,342,007.85	4,978.75
1RL-62	2,198,938.24	1,342,003.22	4,980.00
1RL-63	2,198,851.20	1,342,008.44	4,982.50
1RL-64	2,198,781.96	1,342,023.52	4,985.00
1RL-65	2,198,711.03	1,342,050.15	4,987.50
1RL-66	2,198,654.26	1,342,083.10	4,990.00
1RL-67	2,198,593.43	1,342,121.54	4,992.50
1RL-68	2,198,552.95	1,342,144.93	4,995.00
1RL-69	2,198,510.29	1,342,170.51	4,997.50
1RL-70	2,198,467.56	1,342,208.55	5,000.00
1RL-71	2,198,430.03	1,342,248.42	5,002.50
1RL-72	2,198,407.22	1,342,292.25	5,005.00
1RL-73	2,198,392.90	1,342,339.06	5,007.50
1RL-74	2,198,389.23	1,342,361.02	5,008.33
1RL-75	2,198,395.43	1,342,395.84	5,010.00
1RL-76	2,198,405.82	1,342,435.85	5,012.50
1RL-77	2,198,416.97	1,342,466.05	5,015.00
1RL-78	2,198,425.44	1,342,489.22	5,017.50
1RL-79	2,198,431.17	1,342,504.71	5,020.00
1RL-80	2,198,441.80	1,342,527.68	5,025.00
1RL-81	2,198,445.98	1,342,545.47	5,030.00
2RL-82	2,199,099.19	1,341,983.40	4,980.00
2RL-83	2,199,077.01	1,341,994.94	4,979.37
2RL-84	2,199,026.43	1,341,998.58	4,978.75
2RL-85	2,198,941.93	1,341,991.60	4,980.00
2RL-86	2,198,852.42	1,341,996.20	4,982.50
2RL-87	2,198,780.73	1,342,011.28	4,985.00
2RL-88	2,198,706.63	1,342,038.44	4,987.50
2RL-89	2,198,650.23	1,342,072.11	4,990.00
1SL-90	2,199,071.67	1,342,082.85	4,972.50
1SL-91	2,199,057.36	1,342,110.20	4,975.00
1SL-92	2,199,018.69	1,342,150.09	4,980.00
1SL-93	2,199,000.23	1,342,170.11	4,982.50
1SL-94	2,198,981.99	1,342,191.05	4,985.00
1SL-95	2,198,960.36	1,342,216.23	4,987.50
1SL-96	2,198,938.38	1,342,241.77	4,990.00
1SL-97	2,198,915.82	1,342,267.14	4,992.50
1SL-98	2,198,890.77	1,342,299.18	4,995.00
1SL-99	2,198,864.76	1,342,331.99	4,997.50
1SL-100	2,198,839.84	1,342,364.09	5,000.00
1SL-101	2,198,816.89	1,342,393.22	5,002.50
1SL-102	2,198,799.11	1,342,416.39	5,005.00
1SL-103	2,198,781.68	1,342,439.47	5,007.50
1SL-104	2,198,765.90	1,342,461.41	5,010.00
1SL-105	2,198,751.55	1,342,481.39	5,012.50
1SL-106	2,198,737.21	1,342,501.71	5,015.00
1SL-107	2,198,704.87	1,342,546.49	5,020.00
1SL-108	2,198,678.58	1,342,580.21	5,025.00
1SL-109	2,198,652.18	1,342,607.57	5,030.00
1SL-110	2,198,629.29	1,342,629.80	5,035.00
2SL-111	2,198,688.99	1,342,218.32	4,990.00
2SL-112	2,198,698.91	1,342,250.22	4,992.50
2SL-113	2,198,709.90	1,342,283.00	4,995.00
2SL-114	2,198,710.14	1,342,324.18	4,997.50
2SL-115	2,198,712.74	1,342,363.49	5,000.00

POINT	EASTING	NORTHING	SUB-GRADE ELEVATION
3SL-116	2,198,975.92	1,342,044.49	4,975.00
3SL-117	2,198,931.67	1,342,033.35	4,977.50
3SL-118	2,198,871.81	1,342,028.55	4,980.00
3SL-119	2,198,804.84	1,342,044.87	4,982.50
3SL-120	2,198,731.48	1,342,075.38	4,985.00
3SL-121	2,198,687.02	1,342,090.60	4,987.50
3SL-122	2,198,635.07	1,342,114.91	4,990.00
3SL-123	2,198,582.75	1,342,174.36	4,992.50
3SL-124	2,198,535.14	1,342,202.49	4,995.00
3SL-125	2,198,493.18	1,342,239.27	4,997.50
3SL-126	2,198,458.91	1,342,274.67	5,000.00
3SL-127	2,198,433.95	1,342,312.12	5,002.50
3SL-128	2,198,410.99	1,342,335.05	5,005.00
4SL-129	2,198,660.78	1,342,401.78	5,002.50
4SL-130	2,198,659.18	1,342,429.80	5,005.00
4SL-131	2,198,657.74	1,342,447.93	5,007.50
4SL-132	2,198,656.88	1,342,475.13	5,012.50
4SL-133	2,198,649.74	1,342,486.83	5,015.00
4SL-134	2,198,637.39	1,342,507.15	5,017.50
4SL-135	2,198,608.00	1,342,525.50	5,020.00
4SL-136	2,198,580.03	1,342,539.21	5,022.50
4SL-137	2,198,556.93	1,342,558.52	5,025.00
4SL-138	2,198,529.21	1,342,578.34	5,030.00
4SL-139	2,198,507.93	1,342,594.18	5,032.50
5SL-140	2,198,753.70	1,342,398.09	5,002.50
5SL-141	2,198,750.03	1,342,426.09	5,005.00
5SL-142	2,198,729.73	1,342,463.80	5,010.00
5SL-143	2,198,716.02	1,342,484.67	5,012.50
5SL-144	2,198,714.11	1,342,512.65	5,015.00
5SL-145	2,198,693.27	1,342,555.47	5,020.00
6SL-146	2,198,662.36	1,342,521.83	5,017.50
6SL-147	2,198,637.02	1,342,545.68	5,020.00
6SL-148	2,198,609.99	1,342,563.72	5,022.50
6SL-149	2,198,598.20	1,342,582.96	5,025.00
6SL-150	2,198,585.97	1,342,609.18	5,030.00
6SL-151	2,198,582.71	1,342,630.63	5,035.00
7SL-152	2,198,567.39	1,342,588.57	5,027.50
7SL-153	2,198,556.18	1,342,602.06	5,030.00
7SL-154	2,198,527.14	1,342,627.20	5,035.00
8SL-155	2,198,666.78	1,342,555.93	5,020.00
8SL-156	2,198,664.68	1,342,587.22	5,025.00
TL-157	2,198,954.50	1,341,947.04	4,967.50
TL-158	2,198,922.41	1,341,931.72	4,965.00
TL-159	2,198,854.20	1,341,913.27	4,960.00
TL-160	2,198,788.52	1,341,903.11	4,955.00
TL-161	2,198,716.66	1,341,903.19	4,950.00
TL-162	2,198,644.55	1,341,908.21	4,945.00
TL-163	2,198,592.45	1,341,921.85	4,942.50
TL-164	2,198,497.22	1,341,972.93	4,940.00
SL-165	2,199,055.28	1,341,980.76	4,975.00
SL-166	2,199,049.99	1,341,956.13	4,970.00
SL-167	2,199,030.95	1,341,930.63	4,965.00
SL-168	2,199,019.49	1,341,918.37	4,962.50
FE-169	2,198,488.44	1,341,999.12	4,942.50
FE-170	2,198,500.01	1,341,997.97	4,945.00
FE-171	2,198,504.28	1,342,002.75	4,947.50
FE-172	2,198,545.62	1,341,997.66	4,955.00
FE-173	2,198,559.91	1,342,003.29	4,960.00
FE-174	2,198,568.27	1,342,019.17	4,967.50
FE-175	2,198,601.76	1,342,048.83	4,982.50



LINER AND COVER SOIL SUB-GRADE POINT LOCATIONS SHOWN ON PLANNED SUB-GRADE CONTOURS (5 Foot Contour Interval)

REVISIONS		
NO.	DESCRIPTION	DATE

SPECTRUM ENGINEERING
1413 4th Ave. North
Billings, MT 59101
Phone: (406) 259-2412

February 2007

STATE OF MONTANA
Department of Environmental Quality

PERMITTING AND COMPLIANCE DIVISION

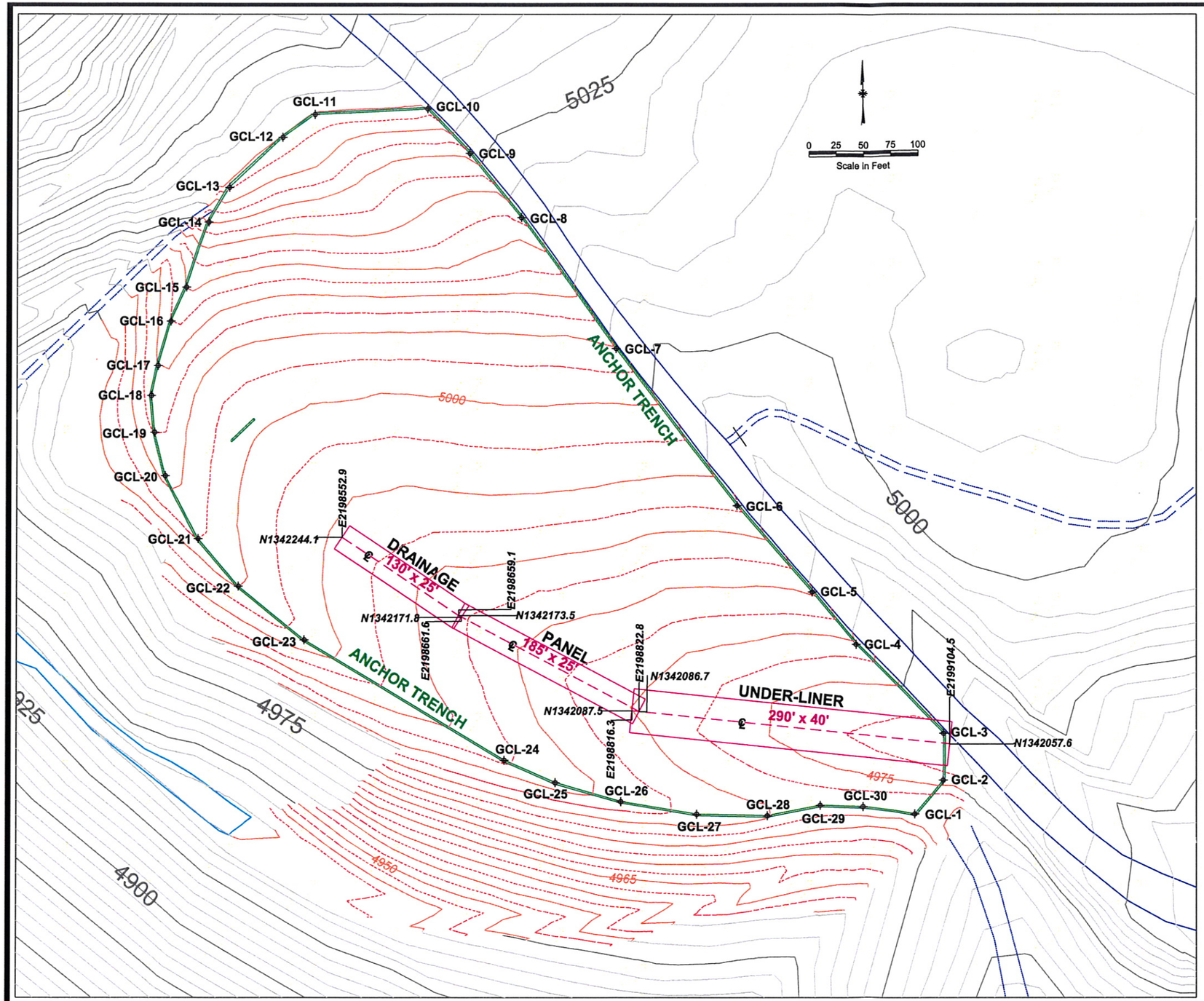
1520 East Sixth Avenue
Helena, MT 59620

ZORTMAN ALDER GULCH DUMP PROJECT
SECTIONS 7 AND 18
T25N, R25E of Phillips County, Montana

SUB-GRADE DESIGN POINTS

FILE NAME: z6-Sub-grade-work.dwg

SHEET NO. 8 OF 11



ANCHOR TRENCH POINTS
Along Inside Edge

POINT	EASTING	NORTHING
GCL-1	2,199,073.50	1,341,994.53
GCL-2	2,199,098.95	1,342,024.96
GCL-3	2,199,099.19	1,342,067.32
GCL-4	2,199,019.93	1,342,147.49
GCL-5	2,198,979.53	1,342,194.82
GCL-6	2,198,911.36	1,342,272.83
GCL-7	2,198,801.52	1,342,414.47
GCL-8	2,198,715.77	1,342,532.41
GCL-9	2,198,668.88	1,342,590.19
GCL-10	2,198,630.17	1,342,630.39
GCL-11	2,198,527.55	1,342,625.22
GCL-12	2,198,498.62	1,342,604.58
GCL-13	2,198,450.21	1,342,559.48
GCL-14	2,198,431.40	1,342,528.25
GCL-15	2,198,411.17	1,342,469.57
GCL-16	2,198,397.08	1,342,438.91
GCL-17	2,198,385.34	1,342,398.95
GCL-18	2,198,379.35	1,342,372.00
GCL-19	2,198,382.35	1,342,338.84
GCL-20	2,198,392.10	1,342,299.63
GCL-21	2,198,422.22	1,342,242.86
GCL-22	2,198,458.96	1,342,200.03
GCL-23	2,198,518.60	1,342,151.56
GCL-24	2,198,700.73	1,342,042.91
GCL-25	2,198,746.72	1,342,022.62
GCL-26	2,198,806.14	1,342,005.57
GCL-27	2,198,875.22	1,341,994.22
GCL-28	2,198,939.07	1,341,992.85
GCL-29	2,198,986.93	1,342,002.25
GCL-30	2,199,026.24	1,342,000.88

GCL ANCHOR TRENCH AND UNDER-LINER LOCATIONS SHOWN ON
PLANNED SUB-GRADE CONTOURS (2.5 Foot Contour Interval)

REVISIONS		
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SPECTRUM ENGINEERING
1413 4th Ave. North
Billings, MT 59101
Phone: (406) 259-2412
February 2007

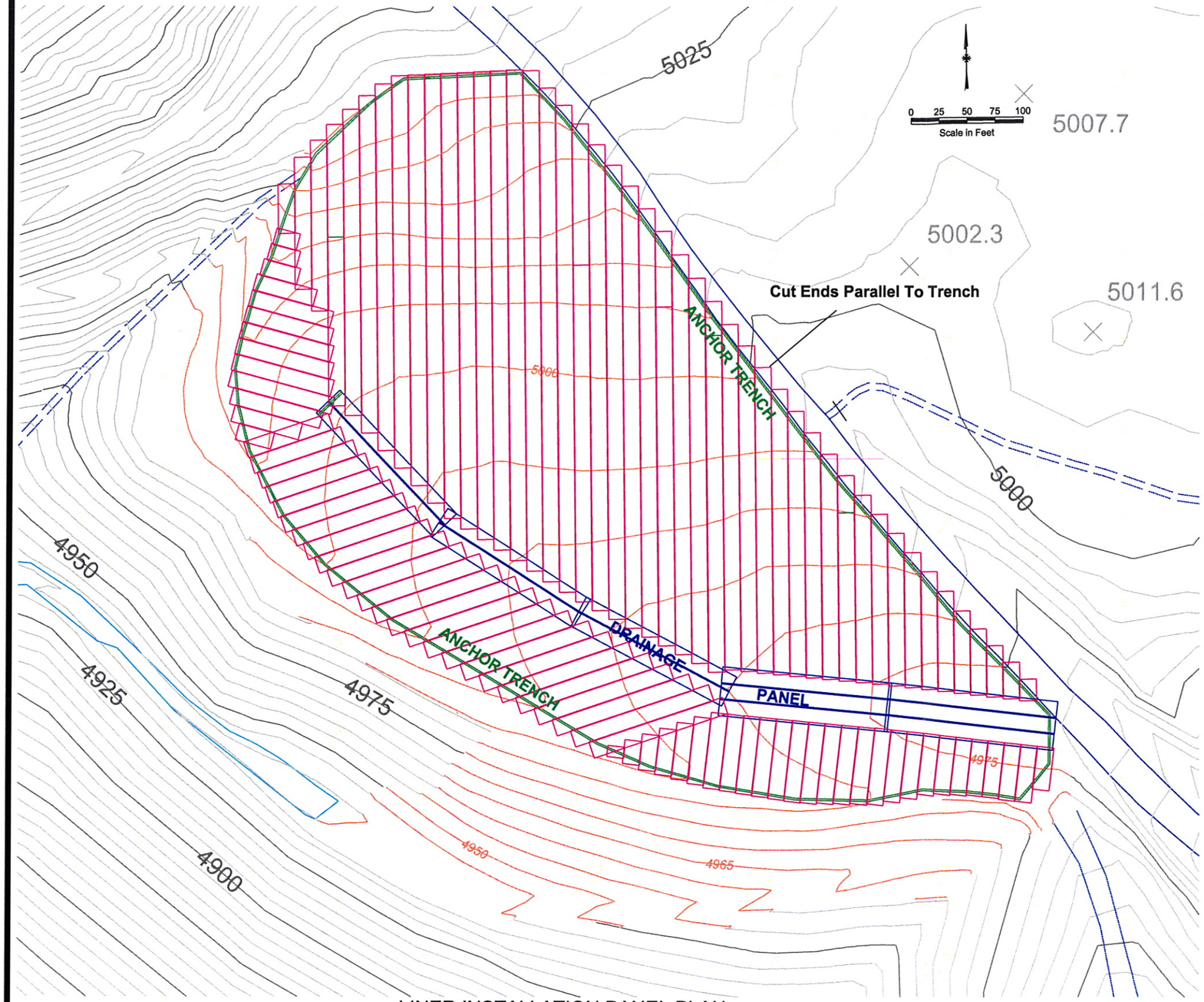
STATE OF MONTANA
Department of Environmental Quality
PERMITTING AND COMPLIANCE DIVISION
1520 East Sixth Avenue
Helena, MT 59620

ZORTMAN ALDER GULCH DUMP PROJECT
SECTIONS 7 AND 18
T25N, R25E of Phillips County, Montana

ANCHOR TRENCH AND UNDER-LINER LOCATIONS

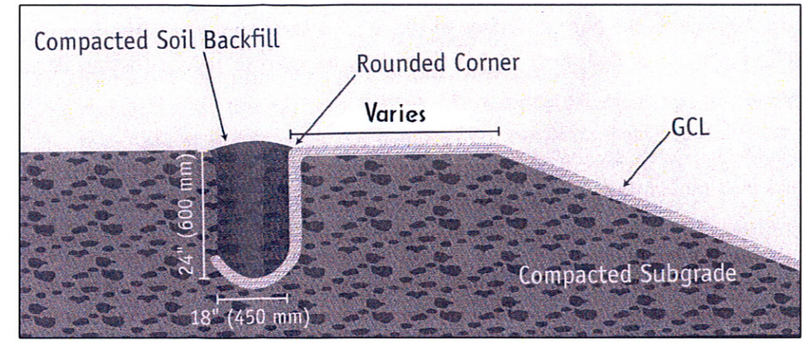
FILE NAME: anchor-trench_n_under_liner.dwg

SHEET NO. 9 OF 11

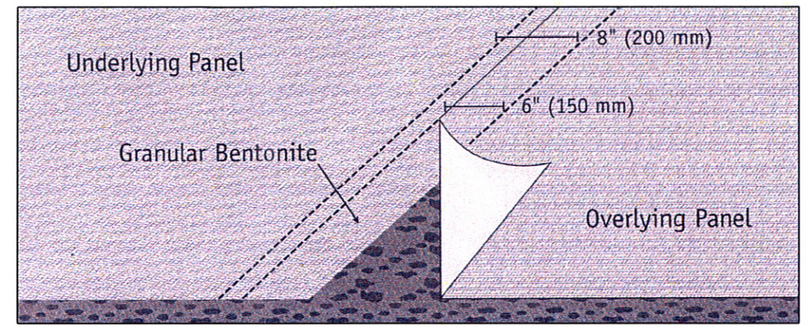


LINER INSTALLATION PANEL PLAN

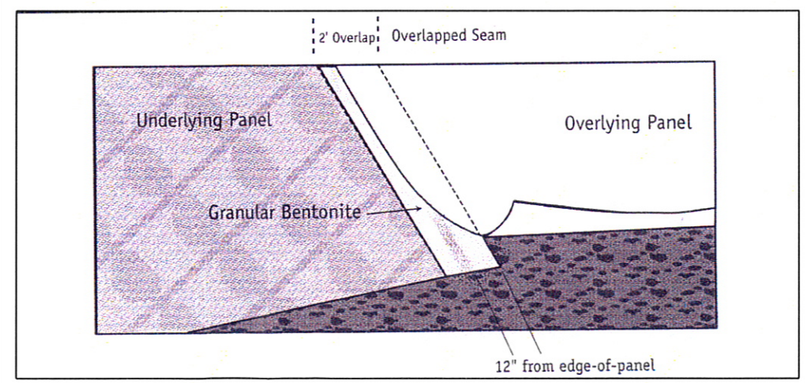
Orange Elevation Contours Indicate the Sub-Grade And Are Shown With A 5 Foot Contour Interval.



ANCHOR TRENCH (TYPICAL)



LONGITUDINAL SEAMS (Except Where Otherwise Specified)



END-OF-PANEL OVERLAPPED SEAM

INSTALLATION DETAILS

Install 130 Rolls of Geosynthetic Clay Liner Over Prepared Sub-Grade In Accordance With Tech. Specification SubSection 500.

SPECIAL INSTRUCTIONS

(1) The Drainage Panel shall be constructed with a 1 foot wide longitudinal seam.
(2) Overlaps on Drainage Panel sections shall be at least 2 feet wide.
(3) Side Panel overlaps on the Drainage Panel shall be a minimum of 1 foot wide in any area along the overlap.
(4) Any Side Panel overlap that extends more than 2 feet over the Drainage Panel shall be trimmed parallel with the edge of the Drainage Panel. The trimmed edge shall provide a 2 foot wide overlap.

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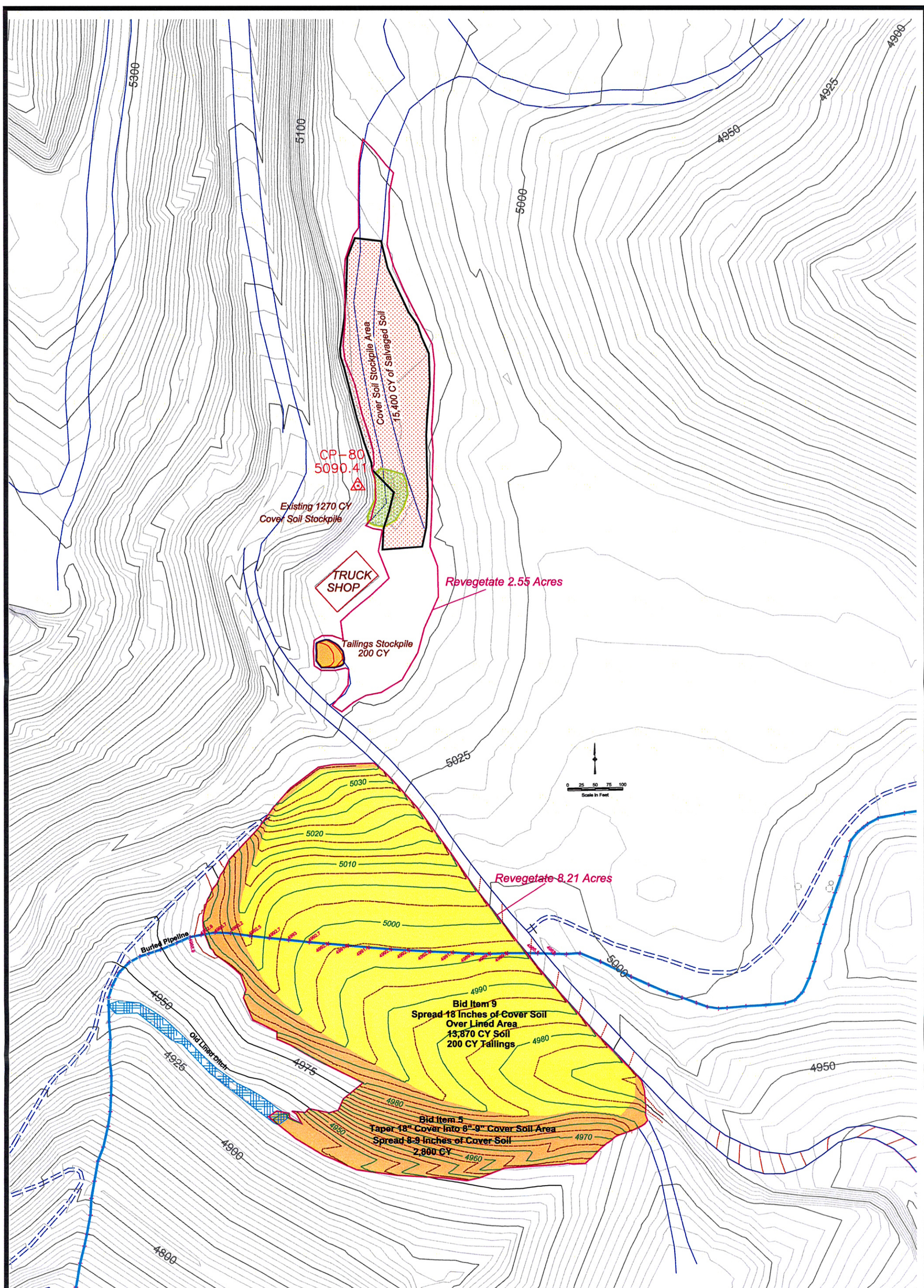
Helena, MT 59620

ZORTMAN ALDER GULCH DUMP PROJECT
SECTIONS 7 AND 18
T25N, R25E of Phillips County, Montana

GEOSYNTHETIC CLAY LINER INSTALLATION PLAN

FILE NAME: z6-Sub-grade_work.dwg

SHEET NO. 10 OF 11



Final Contours at 2.5 C.I. Shown on Alder Dump

REVISIONS		
NO.	DESCRIPTION	DATE

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Billings, MT 59101
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February 2007

STATE OF MONTANA
Department of Environmental Quality

PERMITTING AND COMPLIANCE DIVISION

1520 East Sixth Avenue
Helena, MT 59620

ZORTMAN ALDER GULCH DUMP PROJECT
SECTIONS 7 AND 18
T25N, R25E of Phillips County, Montana

COVER SOIL
REPLACEMENT PLAN

FILE NAME: 6-replace-soil.dwg

SHEET NO. 11 OF 11