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711 North Bridge Street  
Chippewa Falls, WI 54729-1876

## MEMORANDUM

DATE: March 7, 2014  
TO: Tom Maul, EOG Resources  
FROM: Seth Ebel, Department of Land Conservation & Forest Management  
RE: Tunnel City Reclamation Plan Amendment – DS Mine

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In October of 2013 EOG Resources informed the Chippewa County Department of Land Conservation & Forest Management (LCFM) of its interest in mining and processing select layers of the Tunnel City sandstone formation at both the S&S Mine and DS Mine.

In response to that request the LCFM reviewed the applicable reclamation plans, permit conditions, and ordinance requirements.

### S&S Mine:

The reclamation plan for the S&S Mine does not distinguish between the Wonewoc and Tunnel City formations and assumes the full depth of both these sandstone formations will be mined and processed. Given this fact, no additional information is required by Chippewa County for EOG Resources to mine the Tunnel City sandstone formation.

### DS Mine:

The reclamation plan for the DS Mine describes the Tunnel City sandstone formation as overburden that will be used in mine reclamation. The LCFM made an earlier determination that an administrative amendment to the existing nonmetallic mining reclamation plan could be used to allow mining and removal of the Tunnel City sandstone formation at the DS Mine (memo dated October 29, 2013).

In conveying this determination the LCFM requested that EOG Resources provide additional engineering documentation to describe the proposed change as needed to create the plan amendment.

In response EOG Resources submitted a document titled "EOG DS Mine Amendment #1" on 12-19-2013.

The LCFM subsequently reviewed this document and requested clarification of some of the information provided (memo dated January 14, 2014).

In response EOG Resources submitted a revised document titled "EOG DS Mine Amendment #1" on 2-18-2014.

The LCFM then reviewed this document and requested minor revisions to the material volume numbers in Appendix H of the reclamation plan (email dated March 3, 2014).

EOG Resources through their engineer (Ayres Associates) responded the same day (March 3, 2014) with an updated Appendix H and supporting documentation.

The documentation provided shows that mining the Tunnel City sandstone formation will reduce the volume of material available for use in reclamation. The result of this reduction will lower the reclaimed mine surface and increase in the amount of surface water that drains off site, as compared to the previously proposed reclaimed mine surface in the approved reclamation plan dated August 22, 2011.

Based upon our analysis of the documents provided we have concluded that the proposed changes to the surface elevations and the associated changes in site drainage will have a limited impact on EOG Resources' ability to comply with the reclamation standards as established in NR 135, and the provisions of the reclamation plan and permit 2011-03 for the DS Mine.

Recognizing the scope of your proposal and the County's authority under section 30-131 of the Nonmetallic Mining Reclamation Ordinance and State Administrative Code NR 135.24, the LCFM has approved the administrative plan amendment that allows mining and removal of the Tunnel City sandstone formation.

For the purposes of this amendment, now referenced as "Amendment #2", the following documents have been incorporated into the reclamation plan for the DS Mine:

1. A memo titled "EOG DS Mine Amendment #1" received February 17, 2014 (attached).
2. A table titled "Sand Resource Quantity Estimation – Tunnel City Amendment" received March 3, 2014 (attached).
3. A map titled "Final Site Plan" received February 17, 2014 (attached).
4. A map titled "Site Cross Sections" received February 17, 2014 (attached).

Where inconsistencies exist between the original reclamation plan and previous plan amendments the most recent document supersedes any previously approved documents and the originally approved reclamation plan – "Non-Metallic Mining Reclamation Plan; DS Mine; Town of Cooks Valley, Chippewa County, Wisconsin", dated and received August 22, 2011.

Thank you for submitting your proposal and for supplying the information needed to calculate the impacts on the DS Mine reclamation plan.

If you have any questions please contact me at 715-720-3644.

SE

CC: Dan Masterpole, Chippewa County LCFM  
David Nashold, Chippewa County LCFM

**MEMORANDUM**

To: Seth Ebel, Chippewa County LCFM

From: Michael C. Stoffel, PE

Date: February 13, 2014

Project No.: 23-1382.03

Re: EOG DS Mine Amendment #1

The following is a summary of the proposed amendment to the EOG DS Mine reclamation plan dated July 6, 2011. In general, EOG proposes to include the mining of the Tunnel City group as a marketable product. The original reclamation plan identified the Tunnel City as overburden which ultimately would end up in the final reclamation. This amendment documents mining of the Tunnel City group and the revisions to the stormwater control and final reclamation contours which will occur as a result.

Section 3.0 is hereby replaced in its entirety with the following:

### **3.0 Geologic Composition and Depth of Mineral Deposit**

The geology of the proposed project location consists of Cambrian-age sedimentary rocks that overlie Paleoproterozoic volcanic and intrusive rocks. The geology encountered in soil borings advanced throughout the project site includes the Tunnel City Group, the Wonewoc Formation, and the Eau Claire Formation.

The mineral deposits of interest at the proposed DS Mine site are the sandstone grains in the Tunnel City Group and the Wonewoc Formation. Tunnel City Group overlays the Wonewoc Formation and is mainly comprised of the Lone Rock Formation, a very fine to medium-grained, non-glaucinitic to slightly glauconitic and dolomitic sandstone (Mossler 2008). The Lone Rock Formation thickness averages 20 feet across the site. The top of the Lone Rock is not known at this site because it is directly beneath the unconsolidated soil. The approximate bottom of the Lone Rock is at elevation 1240. Below the Lone Rock is a very fine grained sandstone member and a glauconitic member of the Tunnel City that are both overburden. They extend from the Wonewoc up to approximately elevation 1240 and sit directly on top the Wonewoc. The Wonewoc consists of fine to coarse-grained, moderately to well sorted, quartzose sandstone (Mossler 2008). Boring information shows little or no soil between the B-Horizon and the Tunnel City, the approximate elevation of the bottom of the Tunnel City Group/the top of the Wonewoc is 1185 feet MSL and approximate elevation of the bottom of the Wonewoc is 1105 feet MSL. The Wonewoc Formation is underlain by the Eau Claire Formation, a fine-grained, thin-bedded siliciclastic unit, composed mainly of very fine to fine-grained sandstone, siltstone, and shale. An illustrative cross section of the proposed DS Mine site geology is shown in Appendix E-2, "Geologic Site Cross Section".

### Section 6.3 Storm Water Management and Erosion Control

The inclusion of the mining of the Tunnel City Group through this amendment will not have an impact on storm water management. Interim and final drainage patterns and protections will remain the same. The only change will be that the final reclamation surface will be at a lower elevation due to the removal of more product.

## Appendix H Sand Resource Quantity Estimation

The table in Appendix H is hereby replaced with the attached table. This attached table has been updated to include the additional tons of Tunnel City Group material in Areas 4 through 8. The Tunnel City Group material from areas 1 through 3 has been disturbed to date and is no longer in situ, therefore is not included. The net increase of product is estimated to be approximately 5,000,000 tons of material (~2,500,000 CY). This will be the approximate net reduction of material available for final reclamation. The net product quantities of the Tunnel City are reflective of approximately 40% reject material which will be returned to site to be used in the reclamation. It is estimated that a net of 500,000 tons of Tunnel City will be produced in 2014.

### Figure 3 Final Site Plan

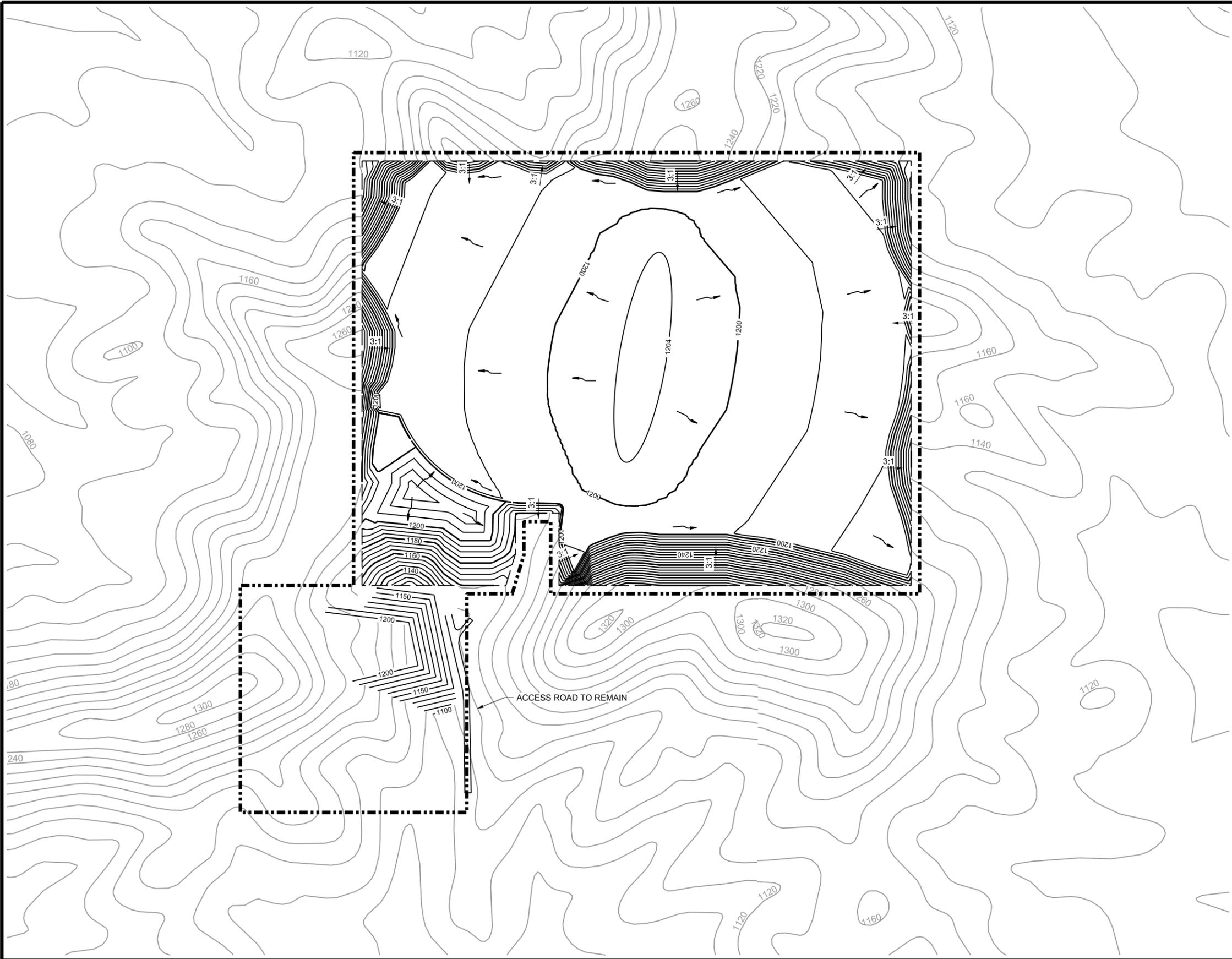
The attached updated Figure 3 shows the approximate final reclamation contours reflective of the net removal of the approximately 5,000,000 tons of the Tunnel City Group material. This resulted in the lowering of the final reclamation surface of approximately 5-10 feet. Also the drainage flow arrows were corrected to properly show that the final reclamation surface will have a positive drainage in order to achieve successful reclamation for the uses identified in Section 8.4 of the existing plan.

### Figure 4 Site Cross Sections

The attached updated Figure 4 shows the change in the approximate final reclamation surface as well as the identification of the Tunnel City Group as part of the sand resource. The Tunnel City extends from the bottom of the B-Horizon down to the top of the Wonewoc. The approximate break between the Tunnel City and Wonewoc is also identified.

**Sand Resource Quantity Estimation  
Tunnel City Amendment**

<b>Area</b>	<b>Sand Depository Quantity (Tons)</b>	<b>Area (Acres)</b>	<b>Topsoil (C.Y.) (Avg 7" Thickness)</b>	<b>B-Horizon Subsoil (C.Y.) (Avg 19" Thickness)</b>	<b>Overburden (C.Y.) (Bottom B-Horiz to Top of Sand)</b>	<b>Reject Fines (Tons) (Avg 28% of Deposit)</b>
A-1	898,000	14.4	13,600	36,800	99,000	251,000
A-2	849,000	10.2	9,600	26,100	431,000	238,000
A-3	1,499,000	23.9	22,500	61,100	1,340,000	420,000
A-4	2,834,000	17.0	16,000	43,400	1,482,000	794,000
A-5	6,144,000	34.1	32,100	87,100	5,491,000	1,720,000
A-6	3,582,000	26.7	25,100	68,200	1,739,000	1,003,000
A-7	3,939,000	30.2	28,400	77,100	3,112,000	1,103,000
A-8	2,889,000	27.3	25,700	69,700	2,307,000	809,000
<b>Total</b>	<b>22,634,000</b>	<b>184</b>	<b>173,000</b>	<b>469,500</b>	<b>16,001,000</b>	<b>6,338,000</b>
<b>Net Increase/(Decrease)</b>	<b>5,000,000</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>(2,500,000)</b>	<b>1,400,000</b>



- LEGEND**
- DIRECTION OF FLOW
  - 3:1 SLOPE
  - EXISTING CONTOURS
  - PROPOSED FINAL CONTOURS
  - MINE OPERATIONS BOUNDARY

- EROSION CONTROL NOTES:**
- 1 UTILIZE LONG TERM TEMPORARY SEDIMENT BASINS, DIVERSIONS, ETC. TO THE FULLEST EXTENT POSSIBLE THROUGH RECLAMATION.
  - 2 PHASE INSTALLATION OF TOPSOIL, SEED, MULCH AND EROSION CONTROL MATS AS SLOPES ARE BUILT UP TO FOLLOW EROSION CONTROL PLAN.
  - 3 LONGER RECLAMATION SLOPES MAY INCLUDE BENCHING AT VARYING INTERVALS AS FIELD CONDITIONS WARRANT.



Ayres\_assoc.plt  
 ES: State: ct.tbl  
 12/19/2013  
 V:\ES\Eng\Reclamation\DS Mine Amended Rec Plan\DS Mine Amended Rec Plan\DS Mine Amended Rec Plan\_03\_final.dgn

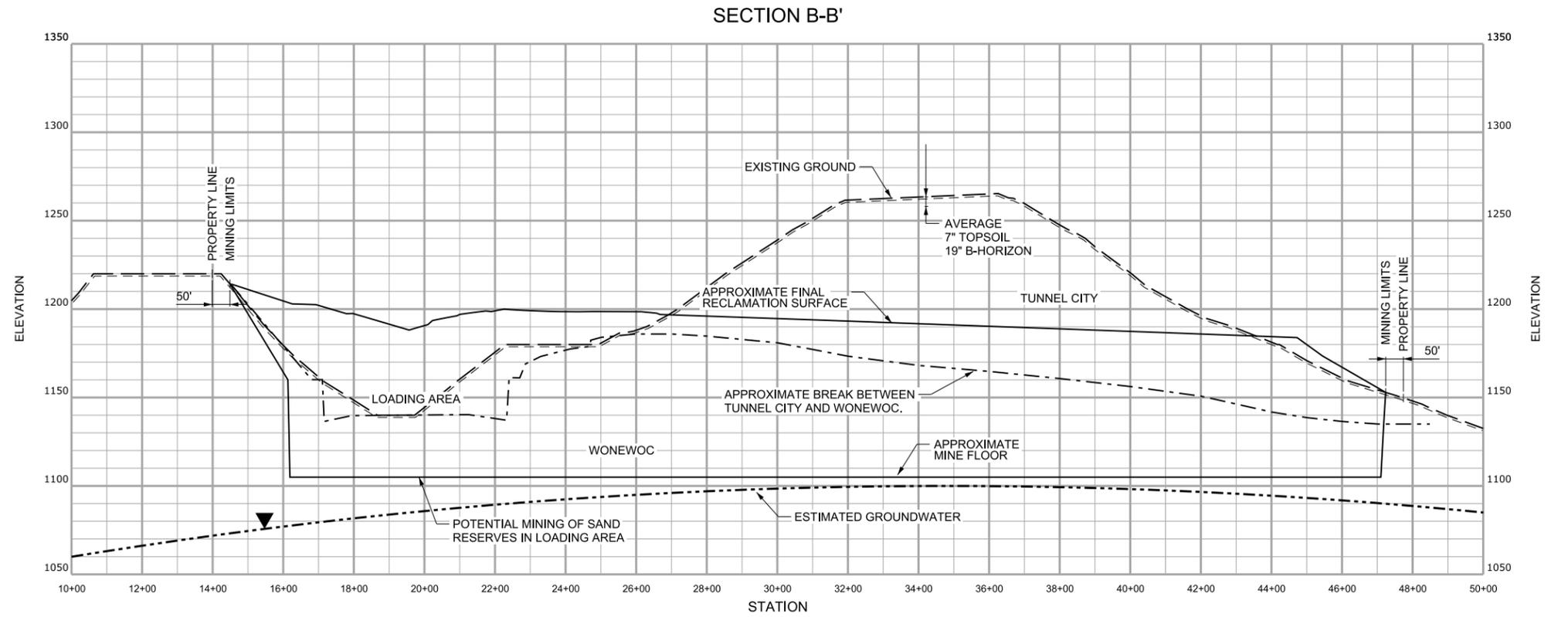
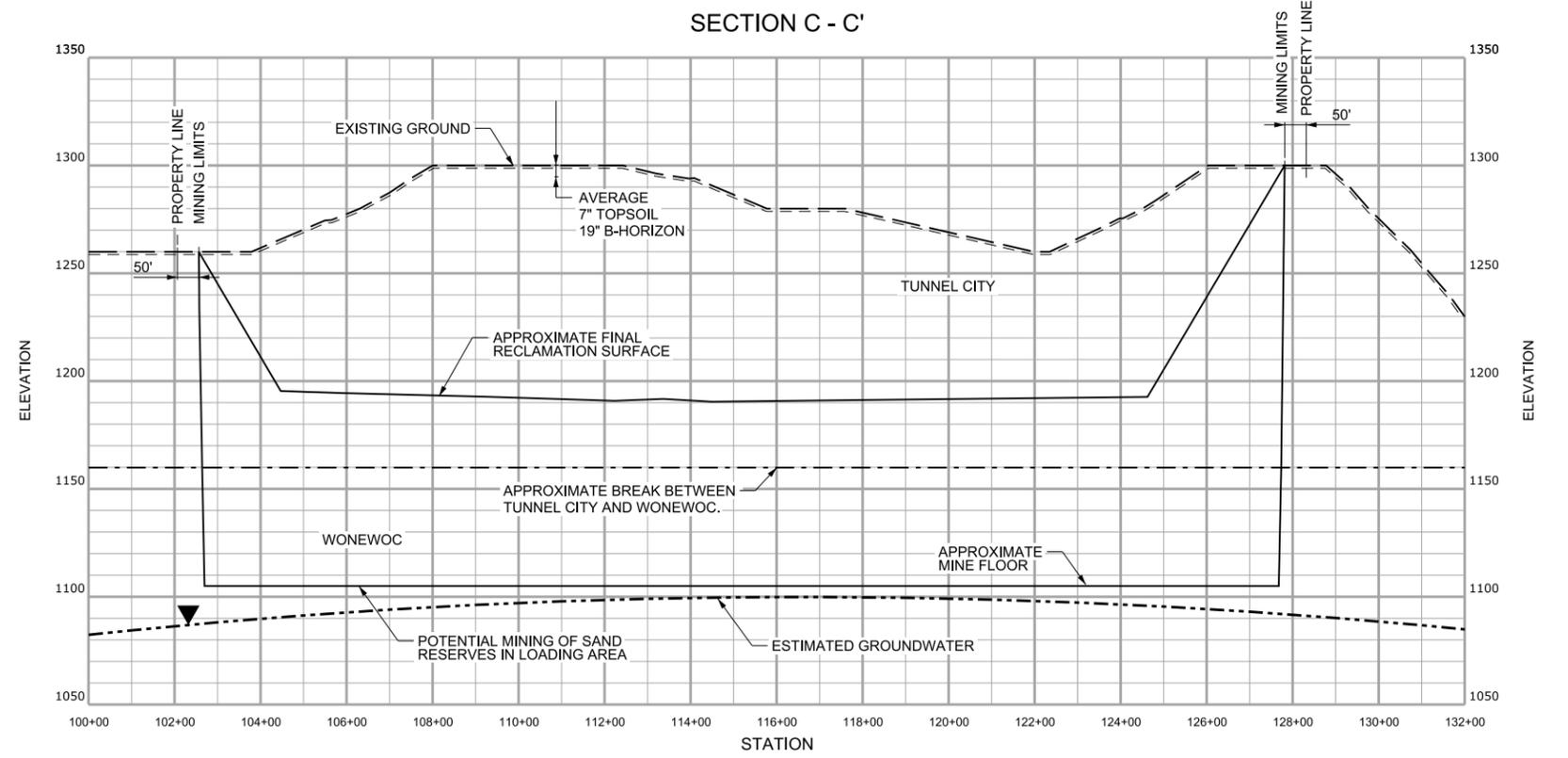
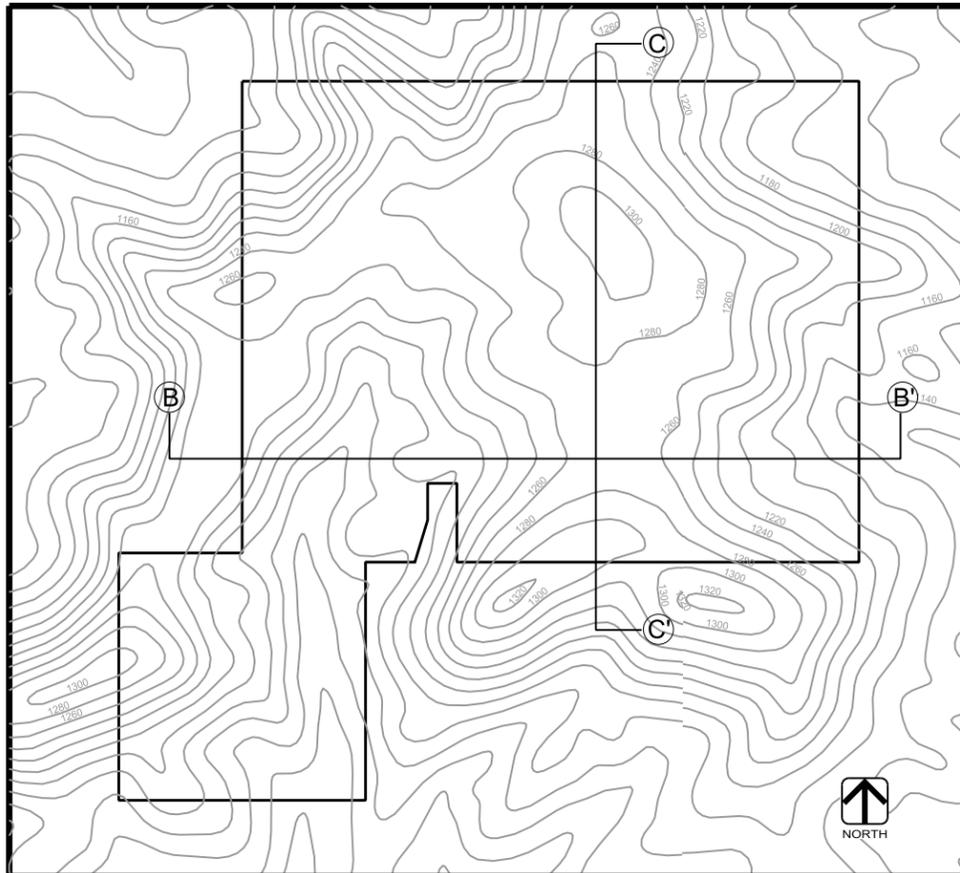
DES BY	BDL	BOOK NO							
DR BY	CRB	JOB NO	23-1382.03 RECAM						
CHK BY	MCS	DATE	DEC 2013	NO	DATE	REVISION	NO	DATE	REVISION

**DS MINE RECLAMATION PLAN AMENDMENT #1**  
**EOG RESOURCES, INC.**  
**TOWN OF COOKS VALLEY, CHIPPEWA COUNTY, WISCONSIN**



FINAL SITE PLAN

DRAWING NO  
**3**  
SHEET NO



OPERATIONAL SLOPES AND BENCHING DETERMINED BY FIELD CONDITIONS AND MSHA STANDARDS

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 ES: State.ctb  
 12/17/2013  
 J:\ENGINEERING Resources\DS Mine Ammended Rec Plan\DGN\23138203\_RecAm\_04\_xs.dgn

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DR BY	CRB	JOB NO	23-1382.03 RECAM
CHK BY	MCS	DATE	DEC 2013
		NO	DATE
		REVISION	
		NO	DATE
		REVISION	

**DS MINE RECLAMATION PLAN AMENDMENT #1**  
**EOG RESOURCES, INC.**  
 TOWN OF COOKS VALLEY, CHIPPEWA COUNTY, WISCONSIN



SITE CROSS SECTIONS

DRAWING NO  
**4**  
SHEET NO