

Approximate Original Contour

OSM's Evaluation of Ohio's Program Regarding AOC

Pittsburgh Field Division, Columbus Office

November 2010

FINAL REPORT

Executive Summary

This review found that permits issued by the Ohio Division of Mineral Resources Management (DMRM) address AOC based on its interpretation of current Federal and State program requirements. DMRM has no written guidelines that specify a minimum number of cross-sections or slope measurements that must be provided in permit applications. Advances in technology for evaluating pre- and post-mining contours would improve the permitting process. DMRM's processes would be improved through written guidelines that specify better pre-and post-mining land form measurements, modeling or analyses of pre-mining features, identification of the expected quantity of spoil swell and how that excess material will be distributed within the permit area to meet AOC requirements, and demonstration of the reestablishment of the pre-mining land form after mining.

Likewise, we found DMRM's process for evaluating compliance with AOC requirements during the reclamation process could also be improved. Although DMRM has many years of experience in evaluating reclaimed areas, it does not have written procedures or guidelines for evaluating AOC.

This review found that, although there are differences between pre- and post-mining topography due to changes in elevation in some areas of the mine sites, the reclaimed areas were within traditionally accepted tolerances inherent in the current State and Federal definitions of approximate original contour. Due to spoil swell, such elevation changes cannot be avoided without placing the material in fills outside the mine-out area. Even with these changes, the original drainage patterns are restored and slopes are within the tolerances specified by Ohio's Program. The land form created from placement of the volume of material resulting from spoil swell is typically considered less environmentally harmful than placing the volume of excess spoil in fills located outside the area disturbed by coal removal. This traditional approach also results in less disturbed area, achieves stability, and minimizes impacts to streams caused by direct spoil placement below the mined-out area. It achieves the "fill minimization" objectives that are being attempted in the steeper terrain and mountaintop mining operations in other states.

DMRM has maintained the same interpretation of its AOC requirements for several decades. OSM has identified few issues regarding AOC through normal oversight inspection activity. Current measurement technologies, which provide accurate comparison of pre- and post-mining land surface configuration (land form), identified areas within the permit boundaries where reclaimed land did not closely resemble pre-mining elevations in some localities of some sites. These data are cause for a reconsideration of traditional pre- and post-mining permit review processes in the evaluation of AOC. OSM will work with DMRM regarding any program changes deemed necessary regarding specific methods or procedures for evaluating pre-and post-mining land form to ensure compliance with Federal AOC requirements.

Introduction:

The Office of Surface Mining Reclamation and Enforcement (OSM) directed its field offices to conduct a national oversight review of the states' interpretation and implementation of their program provisions regarding approximate original contour (AOC). This national review focused on three aspects of the Ohio Program regarding AOC.

1. AOC interpretation and permitting documentation
2. Processes for on-the-ground AOC verification
3. Field verification that backfilling and grading are following the approved plan

Ohio's definition of "approximate original contour" is nearly the same as the Federal definition in SMCRA Section 701(2). Ohio Revised Code 1513.01(A) defines the term as follows:

"Approximate original contour" means that surface configuration achieved by backfilling and grading of a mined area so that the reclaimed area, including any terracing or access roads, closely resembles the general surface configuration of the land prior to mining and blends into and complements the drainage pattern of the surrounding terrain, with all highwalls and spoil piles eliminated; water impoundments may be permitted where the chief of the division of mineral resources management determines that they are in compliance with division (A)(8) of section 1513.16 of the Revised Code.

Ohio's backfilling and grading requirements are stated in Ohio Administrative Code (OAC) 1501:13-9-14. The provisions most pertinent to AOC are in bold and underlined.

- (A) In order to achieve the approximate original contour, the operator shall, as provided by this rule, transport, backfill, compact where advisable to ensure stability or to prevent leaching of toxic materials, and grade all spoil material to eliminate all highwalls, spoil piles, and depressions. Where highwalls are reduced by blasting, all of the provisions of this rule will apply. Small depressions may be left if compatible with the future land use and comply with the requirements of this rule. Cut and fill terraces may be used only in those situations expressly identified in this rule. **The postmining graded slopes must approximate the premining natural slopes in the area in accordance with paragraphs (B) and (C)(1) of this rule,** except as provided under paragraph (L) of this rule.
- (B) Slope measurements.
- (1) To determine the natural slopes of the area before mining, representative slopes must be accurately measured and recorded.**
- (a) Each slope measurement shall be taken along the prevailing slope extending one hundred linear feet above and below or beyond the coal outcrop or the area to be disturbed, or, where this is impractical, at locations specified by the chief.
- (b) Where the area has been previously mined, the measurements shall be representative of the premining configuration of the land.
- (c) Slope measurements shall take into account natural variations in slope so as to provide accurate representation of the range of natural slopes and shall reflect geomorphic differences of the area to be disturbed.
- (2) After the disturbed area has been graded, the final graded slopes shall be measured, comparing the premining slope measurements as shown on the application map.**
- (3) Slope measurements shall be subject to a five-degree tolerance unless otherwise specified by the chief, provided that this tolerance does not conflict with the approved postmining land use.**
- (C) Final graded slopes.
- (1) The final graded slopes shall not exceed either the approximate premining slopes as determined according to paragraph (B) of this rule** and approved by the chief or any lesser slope specified by the chief based on consideration of soil, climate, or other characteristics of the surrounding area. Proof of a minimum long-term static safety factor of 1.3 for the final slopes may

be required by the chief. Final graded slopes shall not exceed the angle of repose or such lesser slope as is necessary to achieve this minimum long-term static safety factor and to prevent slides. Postmining final graded slopes need not be uniform.

DMRM's interpretation and implementation of the requirement to return mined land to AOC is primarily based on slope measurements with a plus or minus five degree tolerance as specified by its rules.¹ The Ohio program does not require any other land form measurements, modeling or analyses of pre-mining features or demonstration of the reestablishment of the pre-mining land form after mining. The Ohio program has two provisions for granting variances to the AOC requirements: OAC 1501:13-4-12(E & K) for steep slope mining and 1501: 13-9-14(L)(1, 2, and 3) for re-mining.

Methodology:

OSM reviewed Ohio's law and regulations regarding AOC. OSM provided a questionnaire to permitting and field managers with DMRM regarding how it implements the AOC provisions of the program. OSM selected a sample of five sites where backfilling and grading were completed on all or a significant portion of the disturbed area (large, medium, and small surface mines, including area and contour mining methods). The sample sites did not include sites that had extensive unreclaimed highwalls resulting from previous mining that were re-mined.

Two OSM employees field-verified post-mining topography on three of the five sites selected. Field verification was done by using handheld Garmin Vista GPS units with altimeter capabilities to compare post-mining contours to pre-mining topography on areas that have been reclaimed to final grade. If included in the permit application, the field verification traverses followed approved cross-sections. One of the sites did not contain any cross-sections and one contained only one cross-section. For these two sites, additional traverses were chosen to collect data on the reclaimed slopes. The field data was post-processed using several technical software programs. Then it was plotted against the pre-mining contours to determine changes. These cross-sections and plan views of the sites are included in Appendix C.

Sufficient slope measurements were taken to make a reasonable comparison of pre-and post-mining slopes that are representative of those areas. Pre-mining and post-mining configuration were also assessed by comparing pre- and post-mining drainage patterns. Reviewers took photos that are representative of the overall contour and of any areas of significant difference from the contour proposed in the permit application.

The review guidelines established for the national oversight review provided 18 questions that the review was designed to answer. Each question is answered in the next section of this report.

¹ Note that OAC 1501:13-9-14(C) states: (1) The final graded slopes shall not exceed either the approximate premining slopes as determined according to paragraph (B) of this rule and approved by the chief or any lesser slope specified by the chief based on consideration of soil, climate, or other characteristics of the surrounding area. This has been interpreted that post-mining slopes may be less than pre-mining slopes but cannot exceed pre-mining slopes beyond the +/- five degree tolerance.

Responses to Questions and Discussion:

1. Is there an agreement between the regulatory authority and OSM as to the interpretation of AOC as envisioned by Directive REG-8, Appendix 1?

Other than the program provisions described above that were approved by OSM, there is no written agreement between OSM and DMRM as to the interpretation of AOC.

2. Are there any outstanding program amendments or 30 CFR 732 letters related to AOC or post-mining land uses associated with AOC waivers?

No

3. Has OSM or the State received any citizen complaints related to AOC in the past three years and what was the ultimate outcome of the complaint(s)?

No

4. Does the State have a process for applying its interpretation of AOC to evaluation of backfilling and grading plans, and is the process documented and reproducible from site to site?

DMRM provided this response:

“Backfilling and grading plans are evaluated using the AOC rules. Pre-mining slopes are shown on the application map and verified in the field. Mining plans are evaluated for overburden removal, handling and replacement procedures. Remining areas are evaluated for final proposed grades with an emphasis on reclamation slopes being less than 20 degrees. A slope stability analysis is required for all steep slope mining areas. Reclamation cross sections are required for all remining areas.”

DMRM requires each permit application to include pre-mining slope measurements on the application map and/or enough cross-sections to reflect the overall pre-mining contour. Cross-sections show the pre-mining and proposed post-mining configuration. In many cases, both slope measurements and cross-sections are included. Since one of the primary factors in Ohio’s AOC rule is slopes, DMRM uses slope measurement as the primary basis for its evaluation of plans for the restoration of AOC. The process is not documented in writing, although DMRM has used this process for many years.

5. Does the State’s interpretation of AOC appear to meet the State program definition of AOC?

DMRM provided the following statement:

“Ohio interprets AOC for contour mining as re-grading the slopes during backfilling and grading to plus or minus five degrees of the original topography and blend into the undisturbed areas. Slopes should not be greater than 20 degrees unless steep slope

mining is approved in the permit. For area mining, AOC is achieved by re-grading the area to plus or minus five degrees and generally conforming to the original topography. It is understood that the exact location of ridges and streams may move slightly as mining and reclamation progress but surface elevations and streams should resemble the original topography of the area.”

Based not only on the field verification used in this study, but also on hundreds of oversight inspections, OSM has identified no significant problems with DMRM’s interpretation of AOC meeting the program definition.

6. Do the permit documents reflect the State interpretation of AOC?

Yes. Based on OSM’s review of the permits selected for this project, all five permits clearly state that AOC will be achieved or that the post-mining contour will resemble that depicted in the cross-sections for areas affected by previous mining. In addition, OSM’s routine oversight inspections, including oversight complete and, especially, bond release inspections, consider the permit language and program requirements when evaluating AOC.

7. Are there sufficient cross-sections or contour maps in the permit to properly evaluate AOC?

DMRM provide the following statement:

“Pre and post-mining cross sections are required for all re-mining applications. The number required is based on the configuration of the mining area to get a representative analysis of the proposed reclamation plan. Not all applications require cross-sections but all applications require slope measurements.”

OSM’s review of permits affirmed this statement. Four of the five permits reviewed included one to four cross-sections each. All five included multiple slope measurements.

Even in cases where more cross-sections would be helpful, technology now exists that enables pre- and post-mining cross-sections to be generated as mining and reclamation progresses, should the need arise. For this review, OSM generated pre- and post-mining cross-sections for the one permit that did not include cross-sections.

8. If an AOC variance has been granted, are the reasons documented and in accordance with regulatory requirements for that State and OSM’s June 22, 2000, Post-Mining Land Use Policy?

There are no mountain-top removal operations in Ohio. On occasion, there are mining operations conducted on steep-slopes. DMRM reported that no variances to AOC have been granted for steep-slope mining operations. To accommodate re-mining situations, DMRM does allow variance from AOC to eliminate unreclaimed highwalls, pits, and spoil piles that will be reclaimed during the current mining process as provided by the variance requirements of OAC 1501:13-9-14(L). For all re-mining situations, applicants must provide pre-mining and proposed post-mining cross-sections.

9. Do you believe the State's process for evaluating permits is adequate to ensure that backfilled and graded areas will achieve AOC?

Based on this review and prior oversight of the Ohio Program, we have not identified significant issues with DMRM's process for evaluating the AOC provisions of permit applications. However, while slope requirements are in place and serve as a guide to achieving AOC, the requirement to closely resemble the general surface configuration prior to mining is left largely to the subjective determination of the permit reviewers and inspectors. Requiring operators to provide more advanced land form measurements, modeling or analyses of pre-mining features, and more clearly delineating what is required to be reestablished after mining could result in better documentation of pre- and post-mining land form.

10. Does the State have methods to check the operator's compliance with his backfilling and grading plan?

DMRM provided the following response:

“Inspectors monitor the plans and take measurements during the mining and reclamation process. Each active mine is inspected at least monthly.”

OSM has observed no DMRM written guidelines for the number of slope measurements, other observations, documentation and validation that an inspector must provide to support their overall evaluation of AOC. Some DMRM inspectors document slope measurements in inspection reports, but this is inconsistent.

DMRM's process could be improved. DMRM has many years of experience in evaluating reclaimed areas, however, it does not have written procedures or guidelines on assessing AOC. Other than inspectors taking slope measurements on occasion when slopes may appear steeper than required, the evaluation is primarily an ocular view of the site by experienced inspectors. With the advent of efficient and accurate planning and measuring devices and techniques, both the State and OSM need to move from less effective traditional practices and utilize the technology currently available.

11. Is the State routinely using these methods or verifying operator-supplied information at some point prior to Phase I bond release?

DMRM responded as follows:

“Measurements are taken and ARPs for variances to the reclamation plan and permanent structures are evaluated prior to Phase I bond releases.”

Again, OSM has observed no DMRM written guidelines describing the number of slope measurements, other observations, or documentation that an inspector must provide to support their overall evaluation of AOC. Some DMRM inspectors use DMRM inspection reports to document slope measurements, but this is not consistent.

12. If grading problems are identified, does the State require additional grading or permit revision?

DMRM provided this response:

“Additional grading and/or permit revision may be required prior to Phase I releases if grading problems are identified.”

OSM oversight inspections, including general oversight complete inspections and, especially, inspections specifically designed to evaluate a percentage of each phase of DMRM’s bond releases, have rarely identified issues regarding AOC. OSM has occasionally identified concerns with a few permanent last-cut impoundments that may not meet permanent impoundment criteria and may ultimately have to be removed, resulting in substantial re-grading of the area. This could affect the contour of the area and should be addressed prior to Phase I bond release. We have talked with DMRM about this concern. Based on OSM’s identification of this issue, DMRM committed to and has drafted guidelines regarding future permanent impoundments that will help address this matter. OSM has provided comments on a draft version of these guidelines and revisions are undergoing DMRM’s internal review.

13. Has OSM done any spot checking of sites to verify compliance with the approved permit regarding backfilling and grading?

Yes. OSM oversight inspections routinely evaluate compliance with AOC requirements on oversight complete inspections, particularly during evaluation of a sample of sites where the state has approved Phase 1 bond release. OSM oversight has rarely identified issues regarding AOC.

14. Based on the entirety of this process, is there a need for further checking of on-the-ground conditions?

There is no need for additional studies beyond normal oversight inspection reviews; depending on the outcome of discussions with DMRM regarding the changes recommended.

15. OSM will collect data using GPS, field surveys, or other appropriate methods on areas of the selected permits where backfilling and grading are complete. Based on the field data collected, was the site reclaimed to AOC in conformity with the approved mining and reclamation plan?

Yes. However, as discussed in response to the next question, there are some differences in elevation between the pre- and post-mining topography on the sites we evaluated. Our field surveys were based on comparison of pre- and post-mining cross-sections, combined with observations of the overall contour, slopes, and drainage patterns. We made this determination based on actual slope measurements on the ground, visual observations of how the overall contour blended into surrounding terrain, and a visual evaluation comparing the physical location of drainage patterns that existed prior to mining to where they existed after mining. The comparison of cross-sections is limited in scope to the particular lines represented by each section in the overall contour of the sites. Elevations could change significantly on either side of

the cross-section locations. Therefore, these other observations were critical to our assessment of the overall land form and compliance with AOC requirements of Ohio's program.

16. If there are differences between the approved AOC configuration for the site and the actual land form following backfilling and grading, are these differences significant; i.e., within tolerances specified by the program?

Based on cross-sections, this review found there are differences between pre- and post-mining topography regarding changes in elevation in some areas of the mine sites. These elevation changes are a result of spoil swell, a natural result of the earthmoving process. For example, due to spoil swell, there were some areas that ranged from ten to 120 feet higher than pre-mining elevations. Ohio's permits generally do not specifically address or discuss spoil swell or provide an estimated amount of swell or how it will be placed. However, it is considered in the permit review by default. By not including excess spoil fills, the swell is included in the spoil that must be graded to "closely resemble the general surface configuration of the land prior to mining." These "filled" areas were primarily located in areas that were undulations in the natural topography, swales or small ravines that likely included ephemeral drainages prior to mining. Some reclaimed areas were also higher or lower in elevation than slopes that existed prior to mining. After mining, the drainage patterns are restored, but the topography is usually less severe than prior to mining. In other words, reclaimed slopes are more uniform with far fewer undulations and deep ravines. However, the final land form of the three sites evaluated clearly meets the AOC definition below:

The land form "... closely resembles the general surface configuration of the land prior to mining and blends into and complements the drainage pattern of the surrounding terrain, with all highwalls and spoil piles eliminated..."

These filled areas are not considered excess spoil fills, because they are above the mined-out coal elevation and within the mined-out area. This approach minimizes the need for excess spoil fills below the mined-out areas.

Despite the unexpected extent of elevation changes in localized areas within some permits, we found that the actual land form for the entire permit did not dramatically change; and the contours blended well into the surrounding terrain and drainage patterns. Slopes were within the tolerances specified by Ohio's program as it has been interpreted in the past. These changes from the pre-mining elevation/contour were within the accepted tolerances inherent in the definition of approximate original contour.

17. Do differences, if any, between land forms following backfilling and grading and the approved AOC configuration observed on the sampled sites indicate a systematic problem in the State's methods for checking operator compliance with the approved backfilling and grading plan?

It is fully expected that with the amount of spoil generated and the area involved, deviations in elevation will occur. However, differences such as the 120-foot elevation difference exhibited at one of the cross-sections on one permit we reviewed do raise questions concerning DMRM's

permitting and verification processes regarding AOC. This situation is an example of a potential programmatic issue that results from insufficient planning and lack of specificity in the permit. Requiring mine operators to provide more detailed land form measurements, modeling or analysis of pre-mining features, and more clearly delineating the final land form that is required to be reestablished would result in the post-mining contour more closely resembling the pre-mining contour. DMRM should improve its methods of evaluating spoil swell and placement in the permitting process and better document its evaluation of compliance with AOC requirements.

18. Based on the review, does the OSM office find that the State's implementation of its approved program is achieving AOC?

Yes, based on current and past interpretations of the definition of AOC.

Conclusions and Recommendations

1. This review found that DMRM's permits address AOC, but could be improved. There are no written guidelines that specify a minimum number of cross-sections or slope measurements that must be provided in permit applications. Advances in technology for evaluating pre- and post-mining contours would improve the permitting process.

Likewise, we found DMRM's process for evaluating compliance with AOC requirements during the reclamation process could also be improved. Although DMRM has many years of experience in evaluating reclaimed areas, it does not have written procedures or guidelines for evaluating AOC.

Although the current Federal and Ohio programs do not specify procedures or methods for evaluating pre- and post-mining land form, OSM recommends that DMRM develop written guidelines explaining the minimum requirements for cross-sections and slope measurements and/or providing other technological methods for evaluating AOC in permit applications. Such methods should provide a detailed description of the expected quantity of spoil swell and how that excess material will be distributed within the permit area to meet AOC requirements. These guidelines would provide a better level of consistency to the permit application review process.

OSM also recommends that DMRM provide written guidelines for inspectors for evaluating compliance with AOC during mining and reclamation. Written guidelines specifying a minimum number of slope measurements, comparisons of pre- and post-mining cross-sections, evaluation of how the reclaimed area blends into surrounding terrain and drainage patterns, and specific documentation requirements would improve and better support decisions on compliance with AOC requirements. Such guidelines would be especially helpful as DMRM's inspection force is experiencing a large turnover. As demonstrated through this review, technological advances provide new ways to compare pre- and post-mining contours that would also improve evaluation techniques.

OSM will work with DMRM regarding any program changes deemed necessary regarding specific methods or procedures for evaluating pre-and post mining land form, based on current technologies, to identify compliance with State and Federal AOC requirements.

2. This review found that, although there are differences between pre- and post-mining topography due to changes in elevation in some areas of the mine sites, the reclaimed areas were within the accepted tolerances inherent in the current State and Federal definitions of approximate original contour. Due to spoil swell, such elevation changes cannot be avoided without placing the material in fills outside the mined-out area. Even with these changes, the original drainage patterns are restored and slopes are within the tolerances specified by Ohio's Program. The land form created from placement of the volume of material resulting from spoil swell is typically less environmentally harmful than placing the volume of excess spoil in fills located outside the area disturbed by coal removal. This approach also results in less disturbed area, achieves stability, and minimizes impacts to streams caused by direct spoil placement below the mined-out area. It achieves the "fill minimization" objectives that are being attempted in the steeper terrain and mountaintop mining operations in other states.

To determine if these identified differences in elevation are consistent with expected land surface configurations inherent in AOC requirements, OSM will work with DMRM and provide direction and clarity in defining AOC land form expectations and support in making any necessary program changes.

It is also recommended that OSM provide better direction in the utilization of current measurement and modeling techniques in defining AOC land form expectations at the time of permit review and post-mining AOC evaluations.

Appendices

Appendix A - Five Sites Selected for Review

**Appendix B – DMRM’s Responses to Interview Questions for DMRM Managers
Regarding AOC**

Appendix C – Site-Specific Data from OSM’s Field Verification of Permit D-2228

Appendix D – Site-Specific Data from OSM’s Field Verification of Permit D-2114

Appendix E - Site-Specific Data from OSM’s Field Verification of Permit D-2162

Appendix F – Ohio DMRM Comments on Draft Report

Appendix A
Five Sites Selected for Review

Permit	Approximate Acres	Mine Type	# of Cross-Sections in Permit	Slope Measurements	AOC Variance ²	OSM Field Verification	Summary of Field Verification Findings
D-2202	88	Area	3	Yes	No	No	NA
D-2228	73	Contour	3	Yes	No	Yes	The reclaimed site closely matches the cross-sections for the proposed final contour. There are some minor changes in elevation. The reclaimed site blends well with the surrounding contour and drainage patterns. Slopes are within allowable tolerances.
D-2114	910	Area	0	Yes	No	Yes	The reclaimed site resembles the pre-mining topography. Elevations in some areas are substantially higher than pre-mining. However, the reclaimed site blends well with the surrounding contour and drainage patterns. Slopes are within allowable tolerances considering Ohio's rule at 1501:13-9-14 (C)(1) that states: "The final graded slopes shall not exceed either the approximate pre-mining slopes as determined according to paragraph (B)..." DMRM's interpretation of this provision is that slopes less steep than pre-mining slopes are generally allowable.
D-2162	239	Contour	2	Yes	No	Yes	The reclaimed site closely matches the cross-sections for the proposed final contour. There are some minor changes in elevation. The reclaimed site blends well with the surrounding contour and drainage patterns. Slopes are within allowable tolerances.
D-2281	258	Contour	4	Yes	No	No	NA

² No official variance to AOC other than information in the permit regarding areas previously mined and un-reclaimed. The restored contour in the previously mined areas will be returned to the configuration identified on the cross-sections.

Appendix B

DMRM's Responses to Interview Questions for DMRM Managers Regarding AOC

How does DMRM interpret its definition of AOC? Are there any written policies or procedures that further interpret the definition or provide guidance to staff on evaluating AOC?

Ohio interprets AOC for contour mining as re-grading the slopes during backfilling and grading to plus or minus 5 degrees of the original topography and blend into the undisturbed areas. Slopes should not be greater than 20 degrees unless steep slope mining is approved in the permit. For Area mining, AOC is achieved by re-grading the area to plus or minus 5 degrees and generally conforming to the original topography. It is understood that the exact location of ridges and streams may move slightly as mining and reclamation progress but surface elevations and streams should resemble the original topography of the area. Inspectors are trained on evaluating AOC for compliance.

What is Ohio's process for applying its interpretation of AOC to evaluation of backfilling and grading plans, and is the process documented and reproducible from site to site?

Backfilling and grading plans are evaluated using the AOC rules. Pre-mining slopes are shown on the application map and verified in the field. Mining plans are evaluated for overburden removal, handling and replacement procedures. Remining areas are evaluated for final proposed grades with an emphasis on reclamation slopes being less than 20 degrees. A slope stability analysis is required for all steep slope mining areas. Reclamation cross sections are required for all remining areas.

Has Ohio granted variances to AOC as provided by OAC 1501:13-4-12(E & K) and 13-9-14(L)(1, 2, and 3) for steep slope mining and for remining? If variances have been granted through the permit process, provide recent (within last three years) examples of permits with variances.

Yes, Examples are: Remining: D-2340, D-2335, D-2334, D-2329, D-2327, D-2320, and D-2315
Steep Slope: D-2325, D-2312

(Note: OSM's review of the two permits reported as having a variance from AOC for steep slope areas did include steep slope mining areas but did not grant a variance from AOC requirements.)

How does Ohio determine if permit applicants must include pre-and post-mining cross-sections and the number required? Does Ohio require that all applications include cross-sections?

Pre and post-mining cross sections are required for all re-mining applications. The number required is based on the configuration of the mining area to get a representative analysis of the

proposed reclamation plan. Not all applications require cross-sections but all applications require slope measurements.

Has the State received any citizen complaints related to AOC in the past three years and what was the ultimate outcome of the complaint(s)?

I am not aware of any (Heavilin), nor am I (Clark).

What procedure does Ohio follow to evaluate compliance with backfilling and grading plans?

Inspectors monitor the plans and take measurements during the mining and reclamation process. Each active mine is inspected at least monthly.

Does Ohio routinely use these methods or verify operator-supplied information at some point prior to Phase I bond release?

Yes, measurements are taken and ARPs for variances to the reclamation plan and permanent structures are evaluated prior to Phase I releases.

If grading problems are identified, does the State require additional grading or permit revision prior to granting a Phase 1 release?

Yes, additional grading and/or ARPs may be required prior to Phase I releases if grading problems are identified.

Are there sufficient cross-sections or contour maps in the permit application for inspector's to properly evaluate AOC?

Yes

Comments:

Stream reconstruction is not subject to the plus or minus 5-degree tolerance rule that applies to rough backfilling and grading. Stream profiles are to be constructed as specified in the approved stream reconstruction plan(s).

Appendix C

Site-Specific Data from OSM's Field Verification

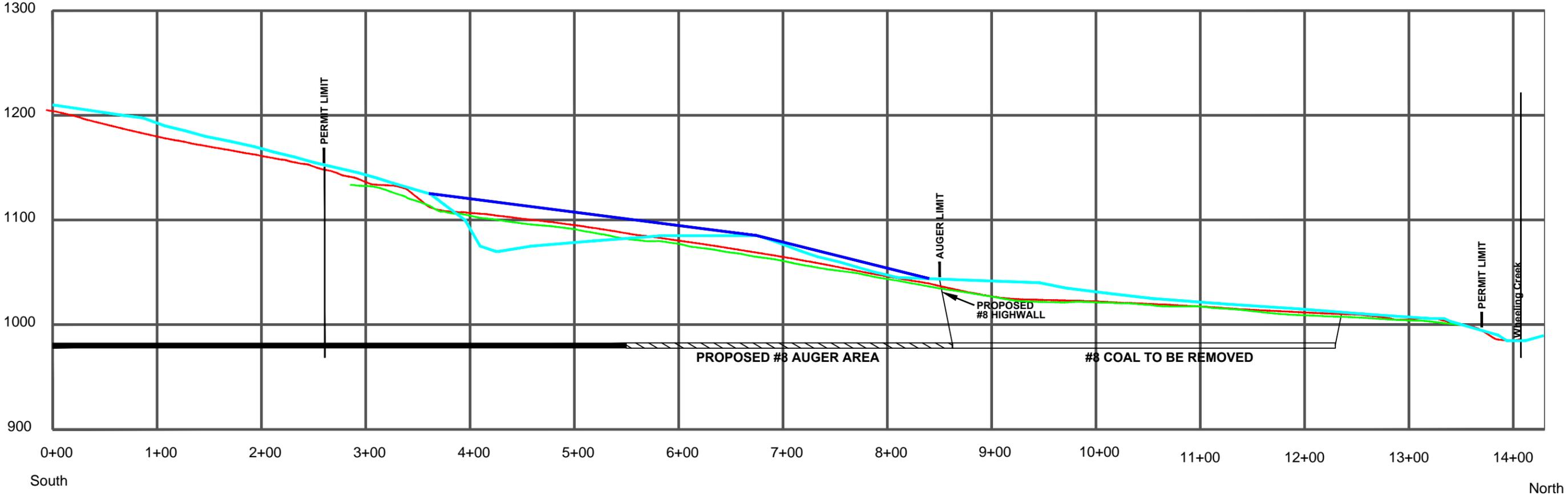
Permit D-2228

This mine site is located in Belmont County, Ohio. It is a small contour operation that mined the #8 and a small amount of the #9 coal. Both seams were previously mined with highwalls remaining on the site. Permit included three pre-mine cross sections (A-A', B-B', C-C'). The three cross-sections were digitized and geo-referenced for use in the field data collection portion of the review. Field review was conducted by OSM personnel using Garmin HcX GPS units with altimeters. The cross-section location information was downloaded to the GPS units. A base elevation point was established to use as a control point for post-processing the rover unit's data.

The mine has been reclaimed with all affected portions of the remaining highwalls eliminated – several portions of the #9 highwall that were not affected by the operator remain. All spoil was kept within the mine area; no excess spoil fills were created. The three cross-sections were located on the permit and were traversed using two separate GPS units. Track logs from each unit were downloaded and compared to the sections included in the approved permit. As shown on the attached graphs, although the post-mine slopes do vary slightly from the pre-mine configuration, the final slopes are within tolerances of Ohio rules and regulations of AOC. Since no spoil disposal occurred outside the mined-out area, with the exception of placement in the abandoned #9 pit, the most obvious reason for the increase in surface elevation is the swell factor of the mine spoil (which, depending on material, can range from 30-50 percent).

The final graded areas blend with the surrounding topography, the drainage courses have been re-established, and the ground is stable. (See photos)

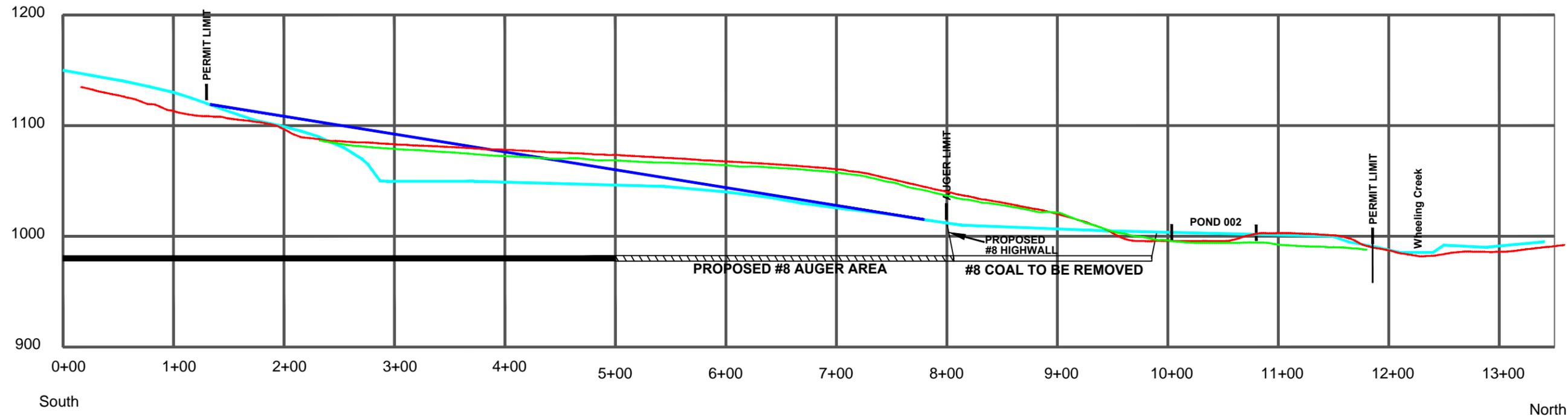
Cross Section A-A'



- PERMIT ORIGINAL GRADE
- PERMIT POST-MINING GRADE
- GPS VERIFIED POST-MINING GRADE
- REMOTE SENSING VERIFIED POST-MINING GRADE

APPROXIMATE ORIGINAL CONTOUR OH CRAVAT COAL COMPANY PERMIT D-2228
CROSS SECTION A-A'
A-A' CROSS SECTION FROM PERMIT WITH PRE AND POST MINING DATA

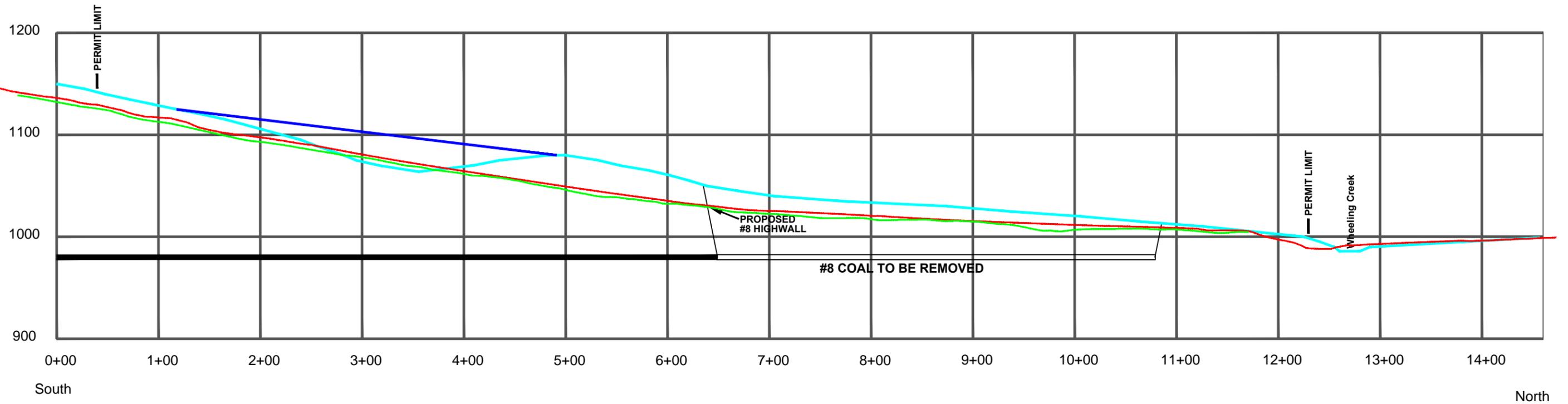
Cross Section B-B'



- PERMIT ORIGINAL GRADE
- PERMIT POST-MINING GRADE
- GPS VERIFIED POST-MINING GRADE
- REMOTE SENSING VERIFIED POST-MINING GRADE

APPROXIMATE ORIGINAL CONTOUR OH CRAVAT COAL COMPANY PERMIT D-2228
CROSS SECTION B-B'
B-B' CROSS SECTION FROM PERMIT WITH PRE AND POST MINING DATA

Cross Section C-C'



- PERMIT ORIGINAL GRADE
- PERMIT POST-MINING GRADE
- GPS VERIFIED POST-MINING GRADE
- REMOTE SENSING VERIFIED POST-MINING GRADE

APPROXIMATE ORIGINAL CONTOUR OH CRAVAT COAL COMPANY PERMIT D-2228
CROSS SECTION C-C'
C-C' CROSS SECTION FROM PERMIT WITH PRE AND POST MINING DATA



View looking west towards highwall



View looking south showing reclamation



View looking north showing final graded slope

Appendix D

Site-Specific Data from OSM's Field Verification Permit D-2114

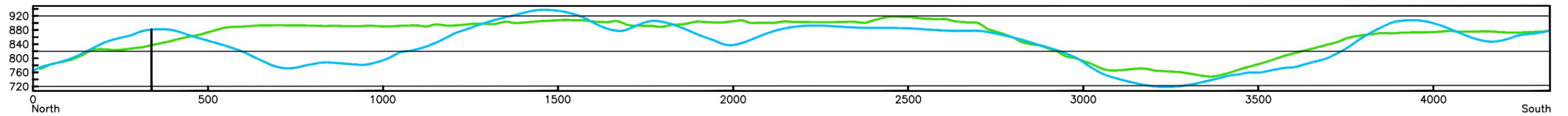
This mine site is a large area-type surface mine located in Vinton County, Ohio. Approximately 626 acres have been mined thus far (three coal seams), and 331 acres have been reclaimed. All spoil was returned to the mined-out area. There are no excess spoil fills outside of the mined-out area. Although the approved permit maps included the required slope measurements, there were no pre- or post-mine cross-sections. This site was not previously mined.

The field review was conducted in a similar manner to the Cravat mine site review. However, since there were no established cross-sections to compare pre-mining topography, the original topography was determined from USGS quadrangle contours (USGS hypsography data). To collect field data, the reviewers established their own cross-sections by traversing several reclaimed portions of the mine site. Four cross-sections were developed and compared to the original topography.

As shown on the attached cross-sections, the post-mining slopes generally approximate the pre-mining slope configurations. The reclaimed configuration blends into the surrounding topography, and the drainage patterns have been returned to the approximate original locations. There are several areas, most notably on section A-A', where the final elevation is considerably higher than pre-mine elevations. As stated, this is a large area-type mine that has moved a considerable amount of spoil and coal. It is fully expected, with the amount of spoil generated and the area involved, that there will be deviations in elevation. In addition, with the spoil volumes created by the operation, the percent of swell of the material (30-50 percent) certainly account for these deviations.

As stated (and shown in the attached photos), the reclamation blends in well with the area, and the pre-mine drainage patterns have been reestablished.

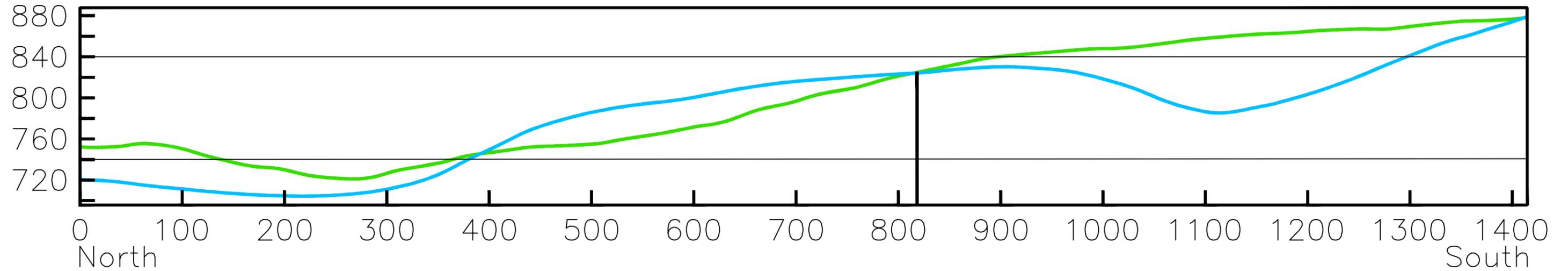
Sands Hill OSM Section A-A'



- PERMIT ORIGINAL GRADE
- GPS VERIFIED POST-MINING GRADE

APPROXIMATE ORIGINAL CONTOUR
OH SANDS HILL D-2114
CROSS SECTION A-A'
CROSS SECTION FROM OSM SITE VISIT
WITH PRE AND POST MINING DATA

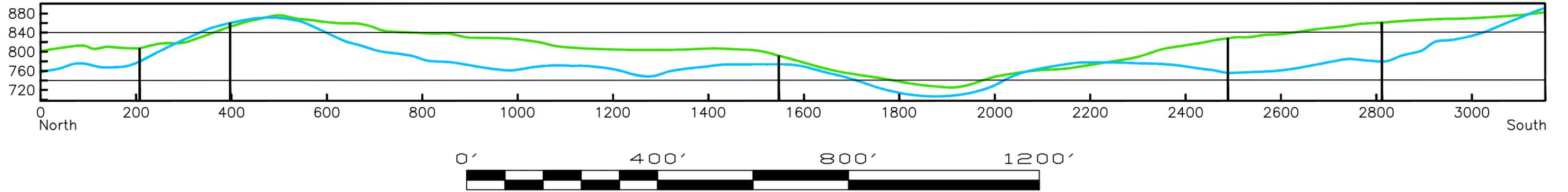
Sands Hill OSM Section B-B'



- PERMIT ORIGINAL GRADE
- GPS VERIFIED POST-MINING GRADE

APPROXIMATE ORIGINAL CONTOUR
OH SANDS HILL D-2114
CROSS SECTION B-B'
CROSS SECTION FROM OSM SITE VISIT
WITH PRE AND POST MINING DATA

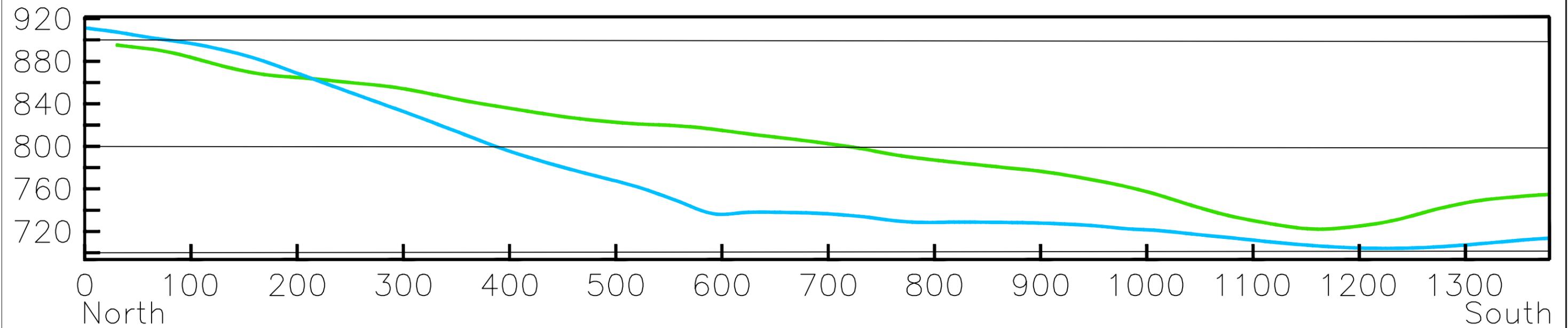
Sands Hill OSM Section C-C'



- PERMIT ORIGINAL GRADE
- GPS VERIFIED POST-MINING GRADE

APPROXIMATE ORIGINAL CONTOUR
OH SANDS HILL D-2114
CROSS SECTION C-C'
CROSS SECTION FROM OSM SITE VISIT
WITH PRE AND POST MINING DATA

Sands Hill OSM Section D-D'



- PERMIT ORIGINAL GRADE
- GPS VERIFIED POST-MINING GRADE

APPROXIMATE ORIGINAL CONTOUR
OH SANDS HILL D-2114
CROSS SECTION D-D'
CROSS SECTION FROM OSM SITE VISIT
WITH PRE AND POST MINING DATA



Slope at SE end of A-A'



View looking NE from approx location of A'



View looking east - B-B' runs from right to left

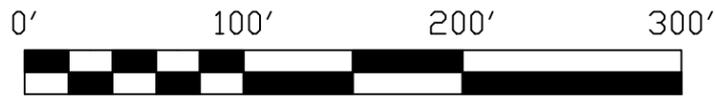
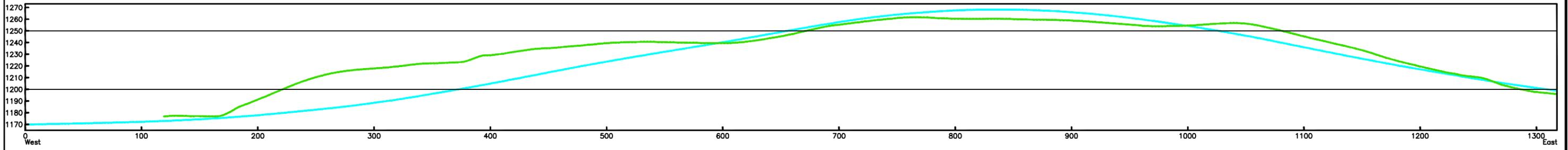
Appendix E
Site-Specific Data from OSM's Field Verification
Permit D-2162

This permit is a medium-sized operation that mined the #7 coal. The permit included one pre-mine cross-section (A-A'). This cross-section was digitized and geo-referenced for use in the field data collection portion of the review. Field review was conducted by OSM personnel using Garmin HcX GPS units with altimeters. The cross-section location information was downloaded to the GPS units. A base elevation point was established to use as a control point for post-processing the rover unit's data.

The mine has been reclaimed with all highwalls eliminated. All spoil was kept within the mine area – no excess spoil fills were created. Cross-section A-A' was located on the permit and was traversed using three separate GPS units. An additional cross-section (B-B') was created by the field personnel who traversed the site from the NE to the SW portion of the permit. Track logs from each unit were downloaded and compared to the sections included in the approved permit. As shown on the attached graphs, although the post-mine slopes do vary slightly from the pre-mine configuration, the final slopes are within tolerances of Ohio rules and regulations of AOC. Since no off-site spoil disposal occurred, the most obvious reason for the increase in surface elevation is the swell factor of the mine spoil (which, depending on material, can range from 30-50 percent).

The final graded areas blend with the surrounding topography, the drainage courses have been re-established, and the ground is stable. (See attached photos)

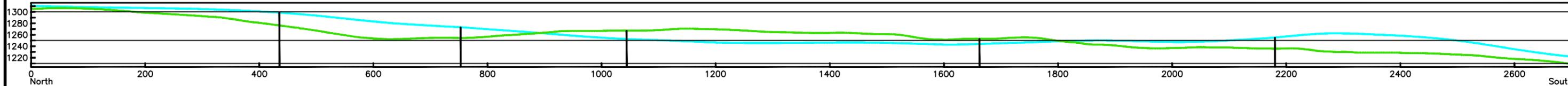
BIMCO 2162 Applicant's Section AA'



- PERMIT ORIGINAL GRADE
- GPS VERIFIED POST-MINING GRADE

APPROXIMATE ORIGINAL CONTOUR
OH BIMCO D-2162
APPLICANT'S CROSS SECTION A-A'
CROSS SECTION FROM DSM SITE VISIT
WITH PRE AND POST MINING DATA

BIMCO 2162 OSM Section BB'



- PERMIT ORIGINAL GRADE
- GPS VERIFIED POST-MINING GRADE

APPROXIMATE ORIGINAL CONTOUR
OH BIMCO D-2162
OSM CROSS SECTION B-B'
CROSS SECTION FROM OSM SITE VISIT
WITH PRE AND POST MINING DATA



View looking west towards origin of A-A'



View looking north towards origin of B-B'



View looking SW along B-B'

Appendix F

Ohio DMRM Comments on Draft Report

CS 6*



Ohio Department of Natural Resources

TED STRICKLAND, GOVERNOR

SEAN D. LOGAN, DIRECTOR

Division of Mineral Resources Management

John F. Husted, Chief

2045 Morse Road, H2

Columbus, Ohio 43229-6693

Phone: (614) 265-6633

May 21, 2010

Mr. Dan Schrum
Office of Surface Mining
4605 Morse Road, Room 102
Columbus, Ohio 43230

RE: Ohio's Comments Regarding OSM's National AOC Review

Dear Dan:

The Division has reviewed the draft report entitled Approximate Original Contour -- OSM Evaluation of Ohio's Program Regarding AOC.

DMRM was pleased to see the report highlight the positive aspects of Ohio's program, and to see confirmation that Ohio's program meets the requirements for AOC. We will certainly review and consider OSM's recommendations regarding possible areas of improvement within our permitting and inspection processes.

We have no specific comments regarding the content and results of this study, but we should add our "thanks" for the effort that OSM put forth to conduct this study, and for the proactive communication that took place during the development and data collection phases of the study.

Sincerely,

A handwritten signature in black ink, appearing to read "John F. Husted".

John F. Husted
Chief

c: Lanny Erdos, Deputy Chief - DMRM
Dave Clark, Coal Statewide Manager - DMRM
Wayne Schalk, Coal Assistant Manager - DMRM
Brent Heavilin, Natural Resource Administrator - DMRM
Sue Grant, Permitting Assistant Manager - DMRM
Greg Mills, Coal Assistant Manager - DMRM
Mike Kosek, Cambridge District Manager - DMRM
File



Ohio Department of Natural Resources

TED STRICKLAND, GOVERNOR

SEAN D. LOGAN, DIRECTOR

*John F. Husted, Chief
Division of Mineral Resources Management
2045 Morse Road, Building H-2
Columbus, OH 43229-6693*

November 23, 2010

Mr. George Rieger
United States Department of the Interior
Office of Surface Mining Reclamation & Enforcement
Oversight and Inspection Office
4605 Morse Road, Room 102
Columbus, Ohio 43230

Re: Ohio's Comments, OSM's National Oversight Topic, AOC

Dear Mr. Rieger:

The Division has reviewed the final report entitled Approximate Original Contour – OSM Evaluation of Ohio's Program Regarding AOC.

DMRM appreciated the recognition provided by OSM that the reclaimed areas studied in Ohio were within the accepted tolerances as prescribed by our approved program, and that Ohio's effort to keep mine spoil within the mined-out area results in less disturbed area and less stream impact than would be the case if fills were placed beyond the mined-out area. As Chief, I am always pleased to see reports that highlight the positive aspects of Ohio's program, and in this case to see confirmation that Ohio's program meets the requirements for AOC.

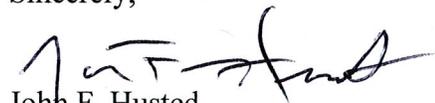
DMRM will take under advisement your recommendations regarding the development of written procedures for evaluating the pre- and post-mining landforms both at the time of permitting and during the inspection process. We are aware of some of the advances in technology that would allow us to be more accurate and efficient with our evaluations. To that end, we do appreciate OSM's recommendation that it (OSM) provide better direction in the utilization of current measurement and modeling techniques, and we will welcome your input. Ohio might also suggest that the Appalachian States come together under the ARTT umbrella and conduct a symposium to more fully explore these improved technologies, and the applications that will help us improve our programs.



Mr. George Rieger
November 23, 2010
Page 2

We have no specific comments regarding the content of this final report, but we will simply add our “thanks” for the opportunity to remain involved in the process.

Sincerely,



John F. Husted
Chief

JFH:cs

c: Lanny Erdos, MRM
Dave Clark, MRM
Brent Heavilin, MRM
Sue Grant, MRM
Wayne Schalk, MRM
Greg Mills, MRM
Mike Kosek, MRM
Dan Schrum, OSM
File

OSM made no changes to the draft report in response to DMRM's positive comments. We did add an executive summary in the final report. OSM did make some substantial changes in response to internal comments on the draft report.