

MASS BALANCE

CEC stopped accepting fly and bottom ash for disposal following 2016 and no ash was disposed of in 2021. Reclamation work has been completed. All overburden material from the Long-Term Spoil Area was previously used as fill for the remaining portion of the B-Pit, and as the 6-foot final cover over the top layer of ash in the filled area of the B Pit. No additional overburden was placed after 2021. The 2019 to 2020 topo shows that there is no remaining topsand to be removed and placed for reclamation. No mine waste rock was delivered to the Keenesburg site for disposal during the year. In 2020, the reclamation activities included the final placement of topsand material, seeding approximately 55.55 acres (Areas 43, 38, 35, and 36), and continuing to maintain the quality of the revegetation. No on-site work was completed in 2021.

Remaining B-Pit Airspace Volume 0 BCY (final reclamation contours achieved)

Remaining A-Pit Airspace Volume 0 BCY (final reclamation contours achieved)

[A-PIT AND B-PIT ARE CLOSED]

Long-Term Spoil Remaining on Site 0 BCY

Topsand Stockpiled on Site 0 BCY

Review of 2003 versus 2008 Topographic Surfaces

Since reliability of the topographic map work is essential to most activities relative to reclamation, it is important to build reliability into this database. In 2003 through 2005, CEC had the site flown and contoured at 2-foot intervals in the disturbed “active reclamation” areas, as opposed to the 5-foot interval used prior to 2003. For 2006 and after, the entire site has been flown and contoured at the 2-foot interval. This more detailed topographic mapping has resulted in consecutive years of more accurate elevation mapping and better estimates of the volumes of materials used and their placement. CEC has concluded that the expanded 2-foot contour interval mapping for the entire site is a long-term benefit worth the additional investment.

Review of 2011, 2012, and 2013 Topographic Surfaces

In 2012, CEC had the site resurveyed and new control points added for future mapping and volume calculations. The new survey also moved the coordinate system to State Plane coordinates from the previously used local coordinates, however the volumes for 2012 were still calculated based on the local grid system. In 2013, and in subsequent mapping events, the state plane coordinate system alone was used to prepare the surfaces and calculate volumes to ensure mapping activities into the future more accurately estimate the volumes of materials used and their placement and more

accurate comparisons for future activities. This change from local to state plane coordinate system resulted in a change in elevation across the site which also results in a recalculated volume of materials. The following note has been added to each drawing to explain the change:

The October 2012 Aerial survey of Keenesburg Mine was compiled and triangulated on Colorado State Plane North (surface) and reprojected to Local Mine datum using follow report:

Horizontal Reprojection to Local Mine Datum:

Translation north: -1282156.5640 ft

Translation east: -3240307.3930 ft

Rotation: 0°01'39.45"

Origin north: 1318616.5640 ft

Origin east: 3280875.3930 ft

Scale factor: 1.00148829949

Vertical Reprojection to Local Mine Datum:

Note: there is a vertical plane between the New Vertical Datum and Local Mine Datum.

The following points were best fit to match Local Mine Datum.

X 36620.749 Y 28971.406 -3.834 ft at power pole

X 36498.977 Y 36412.435 -0.25 ft at control point 1101

X 40568.000 Y 36460.000 1.273 ft at control point 1103

X 41733.435 Y 28217.937 -1.834 ft at power pole

In 2013, and in subsequent mapping events, the flyover was mapped in state plane coordinates to match the 2012 change. Additionally, the volume calculations were conducted using Carlson software, arguably more accurate software than the previously used AutoCAD Land Development software (see note below). The two changes together result in a more accurate assessment of the remaining airspace for filling and soils available for use as cover during reclamation.

Computer-Aided Drafting System Software Explanation

As noted above, the volumes for the 2020 AHR Report were computed using the Triangulation by Two Surface Volumes method provided in the Carlson Software programs rather than the previously used AutoCAD Land Development Desktop software. Carlson software, arguably, results in more accurate volume calculations. These methods calculate faster in most cases than other methods and are the most accurate because it uses true TIN to TIN prismatic volumes. The Triangulation method re-triangulates a new surface based on the points from both surfaces (TIN). It uses the points from both surfaces (TIN), as well as any location where the triangle edges between the two surfaces cross. The Triangulation method then calculates the new surface elevations based on the difference between the elevations of the two surfaces.

PERMIT ACTIVITY SUMMARY FOR 2021

<u>Minor Revisions</u>	<u>Approved</u>	<u>Description of Revision</u>
NA		

<u>Technical Revisions</u>	<u>Approved</u>	<u>Description</u>
NA		

<u>"Other"</u>	<u>Approved</u>	<u>Description</u>
SL-10	Ongoing	Phase Change
RN-8	Ongoing	Permit Renewal