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date: January 17th, 2022

to: WIPP Records Center

from: James Bethune and Sarah Brunell (Org. 08881) *Signature on File*

subject: Determination of Culebra Release Point Number and Location in a Repository with New Panels

Summary

This memo documents the method for determining the locations for Culebra release points in a WIPP repository with replacement and additional panels. The addition of waste storage area to the West of the existing repository necessitates reconsideration of the number and location of potential release points for radionuclides entering the Culebra. It has been determined that there will be four Culebra release points (CRP). CRP Group 1 includes Panels 1 – 10 and is located at the original (CCA through CRA-2019) release point location. The location of the release points for CRP 2 through 4 corresponds to the centroid of the smallest area encompassing the panel members of each group: CRP Group 2 includes Panels 11, 12, and 13; CRP Group 3 includes Panels 14 and 19; and CRP Group 4 includes Panels 15, 16, 17, and 18.

Determination of Panel Group Members

Kushnereit et al. (2020) calculated the particle tracks of non-reactive tracers released into points distributed across the western repository region using the mining-modified flow field realizations from CRA-2019. That work was used to group the new panels with similar particle transport behavior. Table 1 shows the median time to the LWB from a point released near the center of the panel cell. The column "Point ID" refers to the ID number given to individual particles in Kushnereit et al. (2020). Although the median travel times for particles released from the center of Panel 18 are longer than for the rest of Culebra Release Group 4, a large portion of Panel 18 intersects the mining affected area (Figure 1). Since travel times for particles released within the mining affected area are expected to be much shorter than those released from non-affected areas, Panel 18 has been included in Culebra Release Group 4.

WIPP:4.4.1.4.1:PA:QA-L:576342

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Table 1. Median Time (*yr*) to LWB, Full Mining

Panel Number	Point ID	Replicate 1	Replicate 2	Replicate 3
11	52	72,070	81,881	74,045
12	51	98,073	108,414	105,242
13	50	123,938	115,982	131,477
14	49	167,995	163,713	181,936
15	48	65,889	76,268	76,291
16	47	11,931	12,336	7,121
17	4	8,802	12,610	7,996
18	5	130,267	105,106	137,217
19	6	137,648	131,152	138,364
Green:	Culebra Release Point 2			
Red:	Culebra Release Point 3			
Orange:	Culebra Release Point 4			

Discharge to the Culebra from the shaft and from boreholes in Panels 1 through 10 will continue to be modeled with a release point near the centroid of the existing repository. These panels comprise Culebra release point group 1 (CRP 1).

Panel Group 2 (CRP 2) is composed of Panels 11, 12, and 13, which are characterized by particle tracks with predominately southward flow and shorter travel distances and times to the land withdrawal boundary relative to Group 3.

Panel Group 3 (CRP 3) is composed of Panels 14 and 19, which are characterized by having particle tracks that predominately flow to the south and east, but with longer travel distances and times to the land withdrawal boundary relative to Group 2.

Panel Group 4 (CRP 4) is composed of Panels 15, 16, 17, and 18, which are characterized by having a relatively high percentage of particle tracks that exit the western land withdrawal boundary in the full-mining scenario. Waste panels in Group 4 are all at least partially inside the full-mining region.

Culebra Release Point Centroid Calculations

The centroid location for each CRP was determined by calculating the centroid of the smallest area that encompasses the entirety of the panels comprising each CRP. Panel locations come from Google Earth files provided by NWP (see Appendix A and the file archive at /data/cvs/CVSLIB/WIPP_EXTERNAL/ap193).

First, the file Repository_LM_190930.kmz was loaded into Google Earth Pro to determine the latitude and longitude (WGS84) for the corners of each of the 19 panels. The latitude and longitude coordinates were then loaded into an online geographic unit converter (West Virginia Department of Environmental Protection, 2021) to obtain UTM (NAD27 Zone 13N) coordinates in meters.

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The UTM (x) and UTM (y) coordinates of the centroid were then calculated by:

$$UTM_{x,centroid} = \frac{SE_x + SW_x}{2}$$

$$UTM_{y,centroid} = \frac{NW_y + SW_y}{2}$$

Where:

SW: The Southwest corner of the panel group (UTM, m)
SE: The Southeast corner of the panel group (UTM, m)
NW: The Northwest corner of the panel group (UTM, m)

After the centroid locations were known in UTM coordinates, the new SECOTP2D grid coordinates were calculated relative to the CCA SECOTP2D grid location. SECOTP2D defines its cell indices with the origin in the southwest corner and the positive x-direction to the east and the positive y-direction to the north. Since one grid cell in SECOTP2D represents 50 meters:

$$i_{centroid} = i_{CCA} + \left(\frac{UTM_{x,centroid} - UTM_{x,CCA}}{50}\right)$$

$$j_{centroid} = j_{CCA} + \left(\frac{UTM_{y,centroid} - UTM_{y,CCA}}{50}\right)$$

The spreadsheet detailing the latitude, longitude, UTM coordinates, and centroid calculations is archived at /data/cvs/CVSLIB/WIPP_EXTERNAL/ap193. The final centroid locations are shown in Figure 1.

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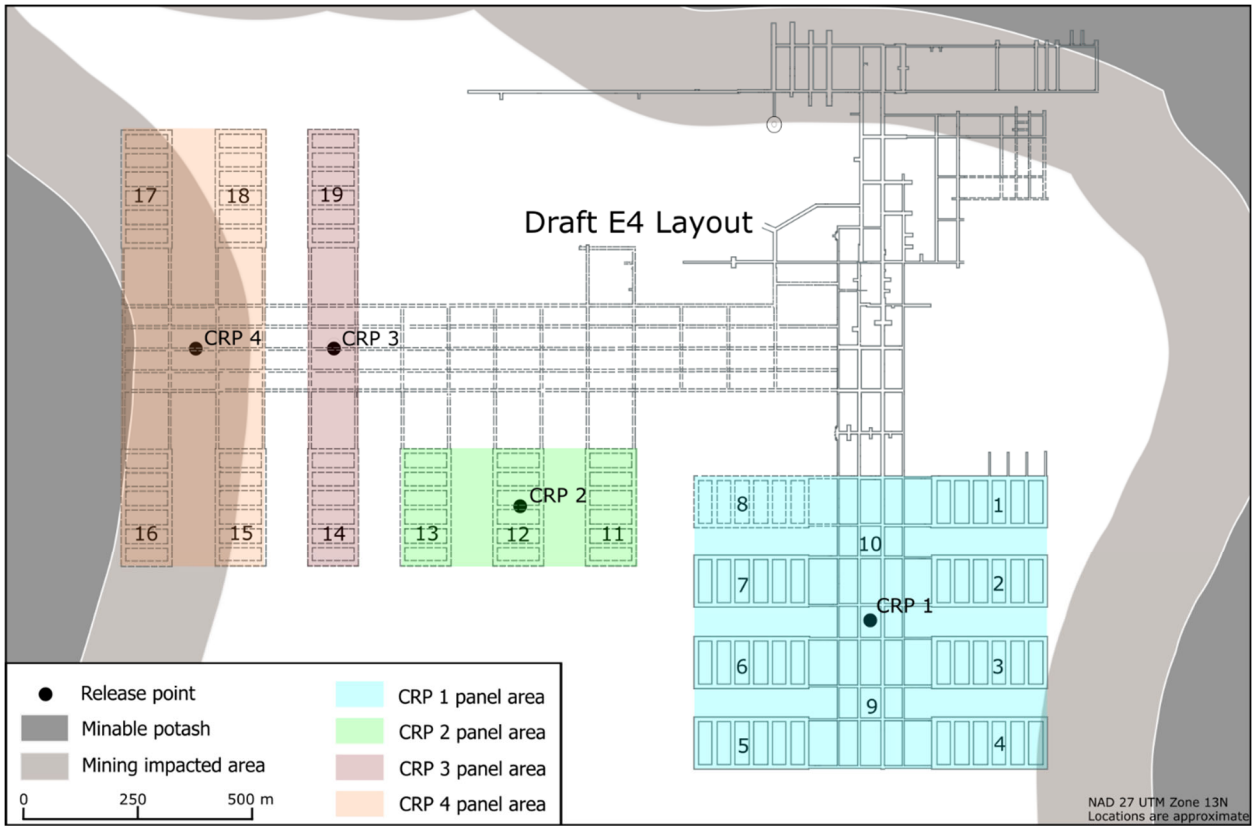


Figure 1. Culebra Release Point Locations

References

Kushnereit, R., A. Wahi, and T. Yan. 2020. Culebra Release Point Reassessment Analysis Report. ERMS 574216. Carlsbad, NM: Sandia National Laboratories.

West Virginia Department of Environmental Protection. 2021. "Coordinate Conversion & Identification." Department of Environmental Protection GIS Server. Technical Applications and GIS Unit. Accessed December 2021. https://tagis.dep.wv.gov/convert/.

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Appendix A: Excerpt From Email From Ty Zimmerly to Ross Kirkes

From: Zimmerly, Ben (Ty) - NWP <BenTy.Zimmerly@wipp.ws>
Sent: Thursday, April 16, 2020 12:50 PM
To: Kirkes, G Ross <grkirke@sandia.gov>
Cc: Beeman, Bob - NWP <Bob.Beeman@wipp.ws>; Ganaway, David - RES <david.ganaway@wipp.ws>
Subject: FW: [EXTERNAL] FW: Quick question

Ross,

I don't believe that we have any official drawings like the ones you are showing. But David Ganaway with RES did create the attached kmz files that ties the repository to latitude and longitude. I have also attached an image file that shows the LWA sections and the repository including the west mains and panels.

You may need google earth pro to open the kzm files.

David can better answer any question related to Google Earth Pro.

Is this kind of the information you are looking for?

Ty

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From: Kirkes, G Ross <grkirke@sandia.gov>
Sent: Thursday, April 16, 2020 8:06 AM
To: Zimmerly, Ben (Ty) - NWP <BenTy.Zimmerly@wipp.ws>
Subject: [EXTERNAL] FW: [EXTERNAL] FW: Quick question

WARNING - EXTERNAL EMAIL
****
This message does not originate from a known WIPP email system.
Use caution if this message contains attachments, links or requests
for information.
****

Ty:

Please see the email chain below. We are needing a .gis file or something similar of the E4 additional panels design that we can integrate into the PA grid development. Does something like that exist in your world?

Thanks,

G. Ross Kirkes
Piru Associates, Inc.

WIPP FEPs and Regulatory Analyses
Carlsbad Programs Group
Sandia National Laboratories
575 302-6921

From: Wagner, Steve <swagner@sandia.gov>
Sent: Wednesday, April 15, 2020 4:31 PM
To: Kirkes, G Ross <grkirke@sandia.gov>
Cc: King, Seth <sking@sandia.gov>
Subject: FW: [EXTERNAL] FW: Quick question

Ross,
Do you have an idea who might?
Steve

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From: King, Seth <sking@sandia.gov>
Sent: Wednesday, April 15, 2020 6:24 AM
To: Wagner, Steve <swagner@sandia.gov>
Subject: FW: [EXTERNAL] FW: Quick question

Hi Steve,

James is asking if we have a gis shape file for the additional panels layout. I have only seen the draft E4 design as a PDF. The layout Intra was given is not what we have been looking at in the E4 design. Any idea on who we could ask for a gis shape file?

Thanks,
Seth

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