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Sandia National Laboratories

Operated for the United States Department of Energy
by National Technology and Engineering Solutions
of Sandia, LLC.

Albuquerque, New Mexico 87185-0101
Livermore, California 94551-0969

date: February 26, 2019

to: Records Center

from: Todd R. Zeitler

A handwritten signature in black ink, appearing to read "T. Zeitler".

subject: Calculation of Shaft and Experimental Area Dimensions for Use in the CRA-2019 PA

Introduction

In the wake of the 2014 radiological release event at the WIPP site, a modified ventilation system is planned that will provide sufficient airflow necessary for the resumption of increased-rate disposal operations in the future. The primary components of the modified ventilation system are an additional exhaust shaft in the north end of the repository and associated drifts to connect the additional shaft to the experimental area of the repository north of the planned northernmost panel closure areas.

There are four shafts currently located in the repository north end, namely a salt handling shaft, an exhaust shaft, a waste shaft, and an air intake shaft. In WIPP PA, these shafts have been combined into a single shaft representation that captures the combined impacts of all of them (SNL 1992). The additional, planned exhaust shaft will be combined with the four existing shafts in the CRA-2019 PA.

Additionally, mined volume in the repository north end will be modified in the repository representation to include the additional drifts created to access the new shaft by increasing the modeled volume of the experimental area. A similar approach was employed for the SHFT14 analysis that accompanied a PCN submitted to the EPA in 2017 (Camphouse 2014), with the difference that the drift volume was added to the operations area. That analysis showed minimum impact to the long-term repository performance from representing the additional shaft and drifts. The location and dimensions of the shaft and drifts assumed for the SHFT14 analysis were based on a preliminary design, while the location and dimensions assumed for the CRA-2019 PA are based on a more recent design and are described below. The purpose of this

WIPP: 4.0.1: PA: DA-L: 508737

memo is to document the derivation of updated grid cell dimensions for the shaft and experimental area representations in the BRAGFLO Salado grid.¹

Shaft Representation

For the CRA-2014 PA, the four shafts currently in the repository north end were modeled as a single shaft (Figure 1). This modeling treatment was set forth in an early WIPP PA calculation (SNL (1992)) and will continue to be used for the CRA-2019 PA by lumping all five shafts (the four existing shafts plus the proposed additional exhaust shaft) into a single shaft model.² SNL (1992) referenced a combined shaft cross-sectional area of 94.9 m² and used a square representation of the shaft base (i.e., a square column 9.74 m on a side), although it was noted that the shape was “not likely to be important.” SNL (1992) showed that fluid flows up the shaft are approximately proportional to the shaft cross section, such that modeling each shaft individually is approximately equivalent to modeling a lumped representation of all shafts. Additionally, SNL (1992) showed that shaft flows in general did not substantially impact repository performance and that observation has been confirmed for recent calculations as well (Camphouse 2013, Kim 2013, Camphouse 2014).

Because the true distance of the new shaft from the waste areas is greater than the distance between the waste areas and the multi-shaft representation, incorporation of the new shaft in the multi-shaft representation will provide a more conservative impact on releases (i.e., the relatively high permeability new shaft will be represented in the model at a much closer distance to the waste than reality, so flows up the shaft in the model will be greater than expected). Additionally, the current multi-shaft representation incorporates material properties (including properties of the surrounding disturbed rock zone (DRZ)) into the single shaft representation—at this time, no fundamental differences in the properties of the shaft is expected, so no reexamination of shaft or shaft seal properties is currently planned.

The BRAGFLO code is the WIPP PA code used to model brine and gas flow in and around the repository. In calculations performed for the Compliance Certification Application (CCA), a 10.00 m × 9.50 m representation of the shaft base was used (i.e., a 95 m² cross-sectional area with a non-square basis) in BRAGFLO calculations. The base area of the shaft representation in the BRAGFLO grid for subsequent compliance calculations, including the CRA-2014 PA, was also 10.00 m × 9.50 m (Column 43 in Figure 1).

To calculate the grid cell dimensions of the combined shaft representation for the CRA-2019 PA, the volumes of all five shafts will be combined and a cross-sectional area calculated based on a common shaft length as previously used in WIPP PA. From the cross-sectional area, the *x*- and

¹ A second BRAGFLO grid, one used for direct brine calculations, is not impacted by the changes in this memo.

² In the TBM analysis (Stein 2002), the removal of the shafts from the BRAGFLO grid was proposed and tested due to the relatively low impact on releases. However, all certification compliance calculations have included a shaft representation (Appendix MASS-2014; DOE 2014).

z-dimensions of the shaft base will be derived assuming a proportional increase of the CRA-2014 PA dimensions due to the new shaft. Camphouse (2014) employed a slightly different method to deriving shaft dimensions for the SHFT14 analysis, but differences in dimensions are minimally different between the two methods.

The new exhaust shaft has a diameter that varies between 28 and 30 ft across three separate sections of the shaft according to the design drawing and accompanying description (Appendix A) for a total excavated volume of 38,239 m³ (Table 1). The volume of the four-shaft representation used in the CRA-2014 PA is calculated based on the shaft base of 95 m² and length of 658.56 m (Table 2) for a volume of 62,563 m³.³ The volume of the five-shaft representation is thus 100,802 m³ and cross-sectional area is 153.06 m² (Table 3).

With the assumption that the increase in the *x* and *z* dimensions to attain the combined base area of all five shafts is proportional to current dimensions (i.e., the aspect ratio is maintained), the cross-sectional area can be represented by the equation $(10.0 * D)(9.5 * D) = 153.06$. The result is a value of 1.26933 for *D*. Thus, the shaft representation is modified to have *x*- and *z*- dimensions of 12.6933 m and 12.0586 m, respectively, for the CRA-2019 PA (Table 3). An updated BRAGFLO Salado grid that highlights the updated shaft and experimental area (discussed below) dimensions is found in Figure 2.

³ The length of the shaft from the repository floor to the surface is used to update the cross-sectional area of the shaft base. Note that because of the nature of the BRAGFLO grid, updating the dimensions of the column containing the shaft representation also updates the dimensions of the areas represented at lower elevations (i.e., Marker Bed 139, Salado, Castile, and Castile Brine Reservoir).

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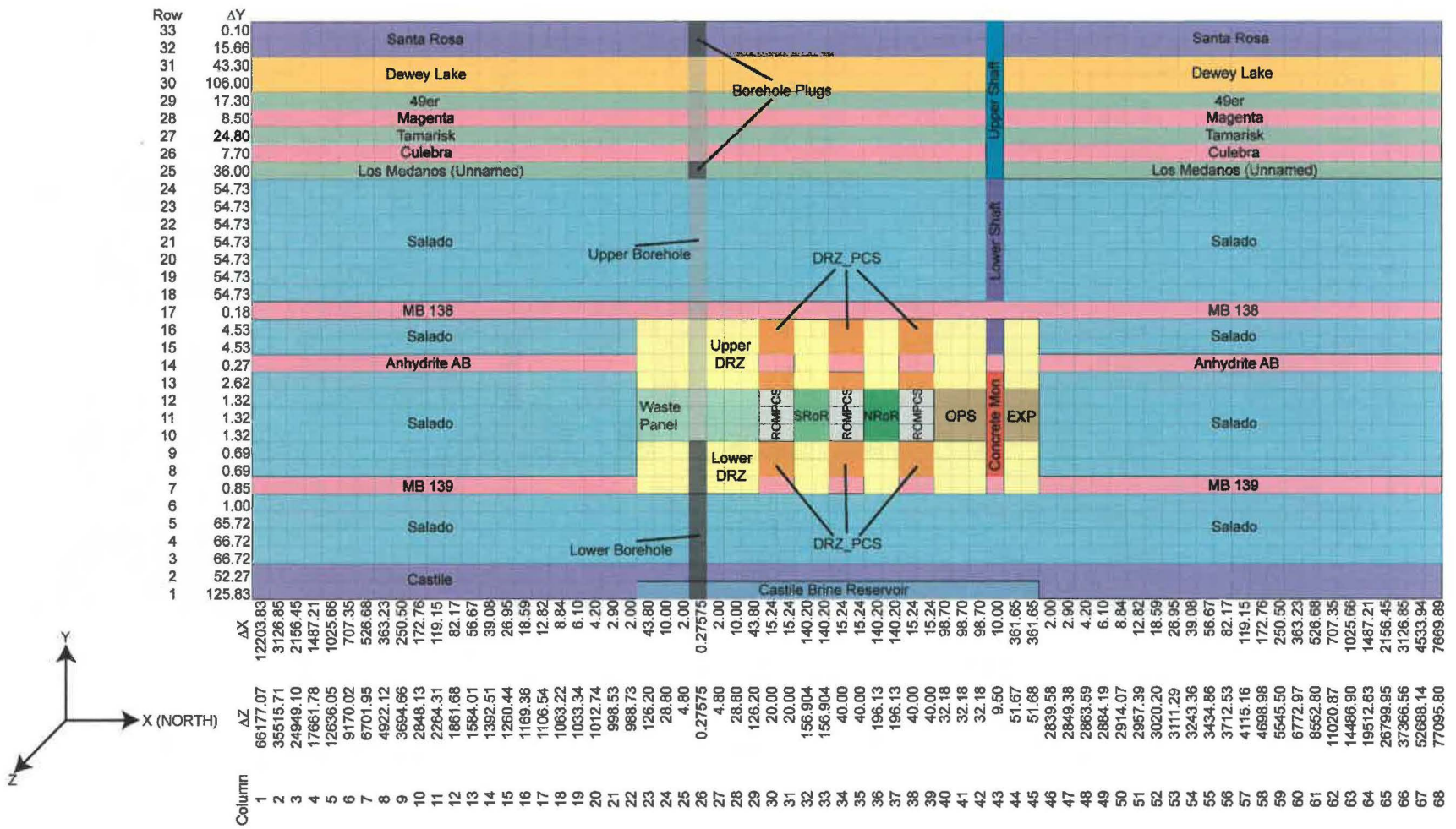


Figure 1. Computational Grid Used in BRAGFLO for the CRA-2014 PA (Camphouse 2013)

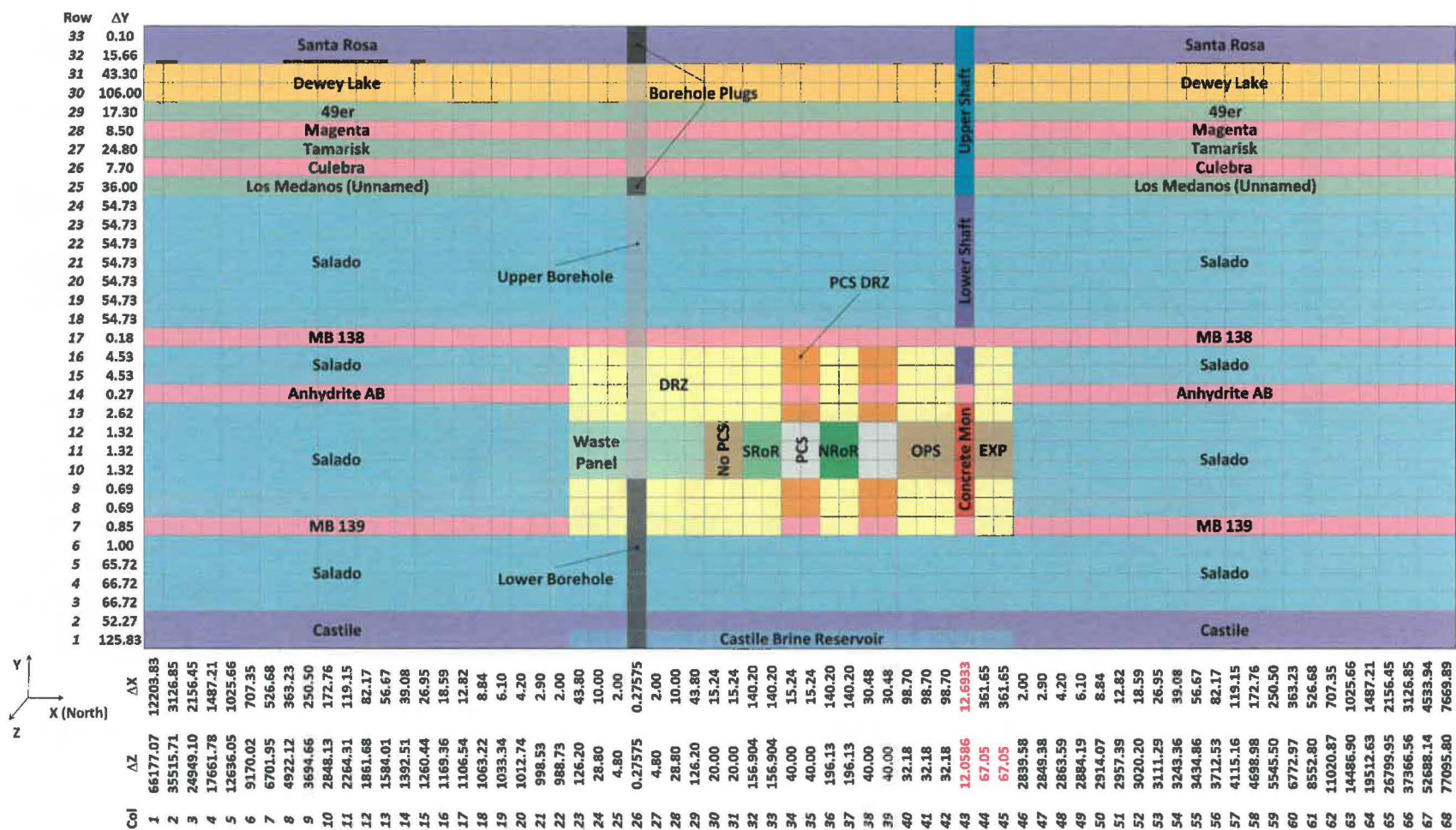


Figure 2. Updated Computational Grid for Use in BRAGFLO that Incorporates the Changes in this Memo

Table 1: New Exhaust Shaft Dimensions from Klein (2019) (Appendix A)

Section	Elevation (ft.)		Length (ft.)	Diameter (ft.)	Area (ft. ²)	Volume (ft. ³)	Volume (m ³)
	Begin	End					
1	3401.5	2981.5	420	28	615.75	258616	7323
2	2981.5	2521.5	460	30	706.86	325155	9207
3	2521.5	1276.5	1245	28	615.75	766611	21708
Total	-	-	2125	-	-	1350382	38239

Table 2: BRAGFLO Grid Cell Y-Dimensions from Surface to Repository Horizon (CRA-2014 and CRA-2019) (Camphouse 2013)

Row ⁴	Y-Dimension (m)
33	0.1
32	15.66
31	43.3
30	106
29	17.3
28	8.5
27	24.8
26	7.7
25	36
24	54.73
23	54.73
22	54.73
21	54.73
20	54.73
19	54.73
18	54.73
17	0.18
16	4.53
15	4.53
14	0.27
13	2.62
12	1.32
11	1.32
10	1.32
Sum	658.56

⁴ Note that only rows 10 (the repository floor) through 33 (the surface layer) of the BRAGFLO grid are relevant to calculating shaft length.

Table 3: BRAGFLO Grid Cell X- and Z-Dimensions for Shaft Representation (CRA-2014 and CRA-2019)

Analysis	X-Dimension (m)	Z-Dimension (m)	Area (m ²)	Length (m)	Volume (m ³)
CRA-2014	10	9.5	95	658.56	62563
CRA-2019	12.6933	12.0586	153.06	658.56	100802

Experimental Area Representation

The design of the new shaft and drifts shows that new drifts will intersect the current repository design at S-250 and S-550 (Appendix B), just north of the northernmost set of planned panel closure areas (Appendix C). The BRAGFLO model combines the northernmost two sets of planned panel closures into a single representation (northernmost ROMPCS in Figure 1), but models the drifts between them as the operations area (OPS in Figure 1). The area north of the northernmost set of panel closures is made up of the shaft and experimental area representations. Since the new drifts are planned to be located north of the northernmost panel closure design, the new drifts should be included as part of the experimental area. The SHFT14 analysis, based on a preliminary shaft/drift design, considered the drifts to be included in the operations area (Camphouse 2014).

The drifts associated with the proposed exhaust shaft have a volume of 1,555,343 ft³, which equals 44,042 m³ (Appendix B). This volume is added to the CRA-2014 PA representation of the experimental area (EXP in Columns 44-45 in Figure 1) in the BRAGFLO numerical grid to calculate the volume of the experimental area for the CRA-2019 PA. The CRA-2014 experimental area representation consists of six cells and has a volume of (361.65 m)*(3.96 m)*(51.67 m) + (361.65 m)*(3.96 m)*(51.68 m) = 148,011 m³, so the total volume of the expanded experimental area is 192,053 m³.(Table 4).

To incorporate the additional volume into the computational grid, additional cells must be added and/or the volume of current cells must be changed. To reduce impacts to input files and workflow, it was decided to change the volume of current cells. Due to the nature of the 2-dimensional, flared grid representation of the repository and surrounding area, a change to the grid cell heights for cells associated with the experimental area would impact the height of all cells in the same horizon, including cells associated with the waste areas. Since the new drifts do not alter the height of the repository, changes to the y-dimension were not considered. Additionally, changes to the x-dimension (north to south dimension) would alter the travel distance from the waste areas to the Land Withdrawal Boundary, an important distance with respect to determining compliance.

As a result of the above considerations, the increased volume is incorporated by increasing cell dimensions in the z-direction only for the two grid columns representing the experimental area.⁵ With D denoting the experimental area width in the z-direction, we have $(361.65) \cdot (3.96) \cdot (2 \cdot D) = 192,053$, which yields $D = 67.05$. Therefore, each of the two columns of grid cells representing the experimental area will have a dimension of 67.05 m in the z-direction for the CRA-2019 PA (Table 4). An updated BRAGFLO Salado grid that highlights the updated shaft and experimental area dimensions is found in Figure 2.

Table 4: BRAGFLO Grid Dimensions for Experimental Area (CRA-2014 and CRA-2019)

Analysis	One-Cell Dimension			Full Dimension			Volume (m ³)
	X-Dim (m)	Y-Dim (m)	Z-Dim (m)	X-Dim (m)	Y-Dim (m)	Z-Dim (m)	
CRA-2014	361.65	1.32	51.68 ^a	723.3	3.96	51.68 ^a	148011
CRA-2019	361.65	1.32	67.05	723.3	3.96	67.05	192053

^a – Three EXP cells in the CRA-2014 PA had a z-dimension of 51.68 m and three had z-dimension of 51.67 m.

Summary

BRAGFLO Salado grid cell dimensions associated with the shaft and experimental area representations have been updated for use in the CRA-2019 PA to accommodate the planned additional exhaust shaft and associated drifts. The new x- and z-dimensions for the grid column that contains the shaft representation (Column 43 in the CRA-2014 PA grid) are 12.6933 m and 12.0586 m, respectively. The new z-dimension for the two grid columns associated with the experimental area (Columns 44-45 in the CRA-2014 PA grid) is 67.05 m.

References

Camphouse, R. 2013. Analysis Package for Salado Flow Modeling Done in the 2014 Compliance Recertification Application Performance Assessment (CRA-2014 PA). Sandia National Laboratories, Carlsbad, NM: ERMS 559980.

Camphouse, R. 2014. Impact Assessment of an Additional WIPP Shaft Sandia National Laboratories, Carlsbad, NM: ERMS 562973.

⁵ The excavated volume of the experimental area is used to update the z-dimension of the six cells associated with the EXP area in the BRAGFLO grid. Note that because of the nature of the BRAGFLO grid, updating the dimensions of the columns containing the experimental area representation also updates the dimensions of the areas represented at higher (i.e., DRZ, Marker Bed 138, Salado, Los Medanos (Unnamed), Culebra, Tamarisk, Magenta, 49er, Dewey Lake, and Santa Rosa) and lower elevations (i.e., Salado, Castile, and Castile Brine Reservoir). An additional impact to the model is that the cross-sectional area of the experimental (perpendicular to north-south flow) is increased, which will have some impact on flow, although the impact is expected to be relatively minor given the minor role played by the experimental area in terms of releases in previous PA calculations.

Franco, J.R. 2015. Response to Environmental Protection Agency Letters Dated December 17, 2014 and February 27, 2015 Regarding the 2014 Compliance Recertification Application. Letter from DOE/CBFO to the EPA. ERMS 564433.

Kim, S. 2013. Analysis Package for Salado Transport Calculations: CRA-2014 Performance Assessment. Sandia National Laboratories, Carlsbad, NM. ERMS 560174.

Sandia National Laboratories (SNL). 1992. Preliminary Performance Assessment for the Waste Isolation Pilot Plant, December 1992. Vol. 5. SAND92-0700/5. Albuquerque, NM: Sandia National Laboratories.

Stein, J.S. 2002. Memorandum to M.K. Knowles (Subject: Methodology behind the TBM BRAGFLO Grid), 13 May 2002. Carlsbad, NM: Sandia National Laboratories. ERMS 522373.

U.S. Department of Energy (DOE). 2014. Title 40 CFR Part 191 Compliance Recertification Application for the Waste Isolation Pilot Plant. DOE/WIPP. Carlsbad, NM: U.S. Department of Energy, Carlsbad Field Office.

Appendix A

This Appendix consists of an email and attachment sent from Tom Klein to Todd Zeitler on 1/29/2019. The email details dimensions for a planned new exhaust shaft. Note that although the email says that the section of the shaft from 880' to 2275' will be excavated at a minimum of 28' diameter, this section includes 150' of shaft below the repository horizon that is not relevant to the shaft representation in PA—thus, that section is assumed to be of length 2275' - 880' - 150' = 1245' for the purposes of this memo (Table 1).

From: [Klein, Thomas - RES](#)
To: [Zeitler, Todd](#)
Cc: [Kouba, Steve - WRES](#); [Madl, Larry - WRES](#)
Subject: [EXTERNAL] FW: US
Date: Tuesday, January 29, 2019 12:18:47 PM
Attachments: [101547-21-SH01-G200.pdf](#)

Todd,

Attached is the current PE-stamped Utility Shaft design as of September 2017. Below is a short description of that design. Let me know if you have any questions.

Tom

From: Farnsworth, Jill - WRES <Jill.Farnsworth@wipp.ws>
Sent: Tuesday, January 29, 2019 10:57 AM
To: Klein, Thomas - RES <Thomas.Klein@wipp.ws>
Subject: RE: US

Tom,

I have attached a final PE-stamped design drawing of the shaft. This should be able to answer all questions related to the shaft diameter. It is to be excavated at a minimum of 28' diameter for the first (upper) 420 feet of the shaft, changing to a minimum excavation of 30' diameter from 420' to the bottom of the shaft key at 880'. The remainder of the shaft (880' – 2275') will be excavated at a minimum 28' diameter.

Regards,

Jill Farnsworth

Senior Technical Advisor

AECOM Management Services – Regulatory Environmental Services

A Nuclear Waste Partnership LLC Affiliate Company

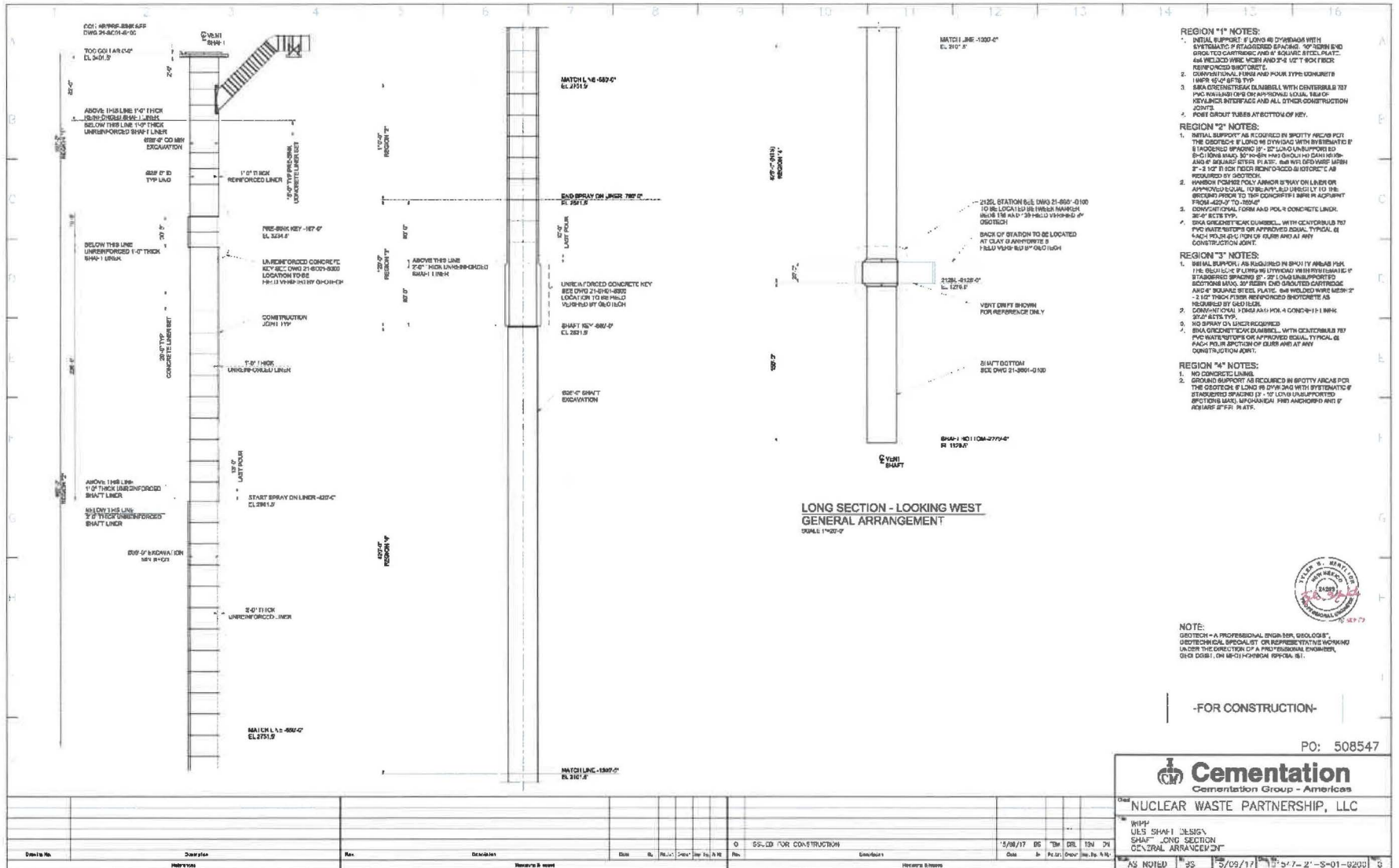
Contractor to the U.S. Department of Energy

400-2 Cascades Ave. Suite 203

Carlsbad, New Mexico 88220

Office: (575) 234-3252

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Appendix B

This Appendix consists of an email and attachments sent from Steve Kouba to Todd Zeitler on 2/21/2017. The email details dimensions for a planned new exhaust shaft and associated drifts. Only the dimensions of the drifts are used in this memo, as the shaft dimensions have been superseded by those provided in Appendix A. Attachment "Excavation Analysis.xlsx" provides a total volume (shaft + drifts) of 2,866,940 ft³ and a shaft volume of 1,311,597 ft³, thus the volume associated with the drifts is 1,555,343 ft³ or 44,042 m³. Note that there is a discrepancy in the shaft volume compared to that provided in Appendix A due to an updated shaft design.

From: [Kouba, Steve - WRES](#)
To: [Zeitler, Todd](#); [Camphouse, Russell Chris](#)
Cc: [Klein, Thomas - RES](#); [Watson, Rob - RES](#); [Davis, Amanda - WRES](#); [Pearson, Marcus - RES](#); [Madl, Larry - WRES](#); [Patterson, Russ - FedNet](#)
Subject: [EXTERNAL] FW: New Shaft Project Excavation Volumes
Date: Tuesday, February 21, 2017 12:30:00 PM
Attachments: [Excavation Analysis.xlsx](#)
[Figure 1 and Figure 2 only - New Shaft and Drift Dimensions.docx](#)

Todd and Chris

I received this new information from the NWP PM.

Is this sufficient for a new PA analysis in support of a PCN to EPA?

Steve Kouba, PMP
Nuclear Waste Partnership LLC
Regulatory Environmental Services
Contractor to the Department of Energy
4021 National Parks Hwy - MS GSA-109
Carlsbad, NM 88220
steve.kouba@wipp.ws
575 234-7443
575 302-3242 (Cell)

From: Whisenhunt, Rodney - NWP
Sent: Tuesday, February 21, 2017 11:41 AM
To: Kouba, Steve - WRES
Subject: New Shaft Project Excavation Volumes

Steve,
The amount excavated for the Shaft will be 48,578 Cubic Yards. The amount excavated for the drifts will be 57,605 Cubic Yards. The letter sent in August 2014 by Hank Carey preceded the Critical decision Process required by DOE Order 413.3B so any information conveyed there is null and void concerning Shaft and Drift Designs since we have received Critical Decision 1 approval on the project.
Let me know if you need any other information.

Rodney L. Whisenhunt, P.E.
Senior Project Manager
(575) 234-8203
WIPP Waste Isolation Pilot Plant
33 Miles Southeast of Carlsbad
Carlsbad, NM 88220

Rodney

I have not yet received a response.

I have a meeting with SNL in the morning.

Steve Kouba
Manager, EPA Compliance Programs

Professional Solutions LLC – Regulatory Environmental Services
A Nuclear Waste Partnership LLC Affiliate Company
Contractor to the U.S. Department of Energy
400-2 Cascades Avenue, Suite 203
Carlsbad, New Mexico 88220
steve.kouba@wipp.ws<<mailto:steve.kouba@wipp.ws>>
Office: (575) 234-3217 Cell: (575) 302-3242

From: Kouba, Steve - WRES
Sent: Wednesday, February 15, 2017 11:49 AM
To: Whisenhunt, Rodney - NWP <Rodney.Whisenhunt@wipp.ws<<mailto:Rodney.Whisenhunt@wipp.ws>>>
Cc: Klein, Thomas - RES <Thomas.Klein@wipp.ws<<mailto:Thomas.Klein@wipp.ws>>>; Madl, Larry - WRES
<Larry.Madl@wipp.ws<<mailto:Larry.Madl@wipp.ws>>>
Subject: FW: [EXTERNAL] RE: January 2017 Monthly Report meeting -Follow up

Rodney

Based on our conversation of earlier this week, the information that SNL has received from NWP on the new shaft is not consistent. Specifics follow.

In the attached email chain, SNL (Shoemaker) is asking CBFO (Agege) for, "Exact data needed on the location and dimensions of the new shaft to support PA analyses." Comparing the information in the attached 12/08/16 PVS SOW drawings and Dennis Huddleston's email below with information NWP provided SNL in August 2014 (attached), the shaft and drift dimensions are not the same.

As noted in Todd Zeitler's email below, "(SNL) would need a more precise number for the volume to be excavated for the drifts."

SNL needs firm, consistent and referenceable data to use in PA calculations submitted to the EPA. Thank you for your help in clarifying this.

Steve Kouba
Manager, EPA Compliance Programs

Professional Solutions LLC – Regulatory Environmental Services
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Carlsbad, New Mexico 88220
steve.kouba@wipp.ws<<mailto:steve.kouba@wipp.ws>>
Office: (575) 234-3217 Cell: (575) 302-3242

From: Zeitler, Todd [<mailto:tzeitl@sandia.gov>]
Sent: Wednesday, February 15, 2017 9:33 AM
To: Kouba, Steve - WRES <Steve.Kouba@wipp.ws<<mailto:Steve.Kouba@wipp.ws>>>
Cc: Shoemaker, Paul - SNL <peshoem@sandia.gov<<mailto:peshoem@sandia.gov>>>; Camphouse, Chris - SNL
<rccamph@sandia.gov<<mailto:rccamph@sandia.gov>>>
Subject: FW: [EXTERNAL] RE: January 2017 Monthly Report meeting -Follow up

Steve,

As a follow-up to the discussion in today's meeting, I'm forwarding the email that we recently received regarding the shaft and drift dimensions. Attached are drawings that show the proposed drifts out to the proposed shaft. The shaft diameter and drift dimensions are very different from those in the August 2014 letter we discussed this morning. I've done a rough calculation of the volume that would need to be excavated based on the dimensions in the drawings, but if we were to do a PA sometime in the future that included the new shaft, we would need a more precise number for the volume to be excavated for the drifts.

Todd

From: Huddleston, Dennis [<mailto:Dennis.Huddleston@wipp.ws>]
Sent: Monday, February 13, 2017 8:52 AM
To: Agege, Victor - DOE <victor.agege@cbfo.doe.gov>; Shoemaker, Paul E <peshoem@sandia.gov><<mailto:peshoem@sandia.gov>>>
Cc: Rhoades, James - FedNet <james.rhoades@cbfo.doe.gov><<mailto:james.rhoades@cbfo.doe.gov>>>; Ronald Gill <Ronald.Gill@cbfo.doe.gov><<mailto:Ronald.Gill@cbfo.doe.gov>>>; Gadbury, Donald (Casey) - FedNet <casey.gadbury@cbfo.doe.gov><<mailto:casey.gadbury@cbfo.doe.gov>>>
Subject: [EXTERNAL] RE: January 2017 Monthly Report meeting -Follow up

If it is not apparent on here, the shaft diameter is 30 foot.

Dennis

From: Victor Agege [<mailto:Victor.Agege@cbfo.doe.gov>]
Sent: Monday, February 13, 2017 8:47 AM
To: Shoemaker, Paul - SNL
Cc: Huddleston, Dennis; Rhoades, James - FedNet; Ronald Gill; Gadbury, Donald (Casey) - FedNet
Subject: January 2017 Monthly Report meeting -Follow up

Hi

Following up with you to confirm we have resolved the integration issues from the January 2017 Monthly report Meeting. I am referring to the following:

- Exact data needed on the location and dimensions of the new shaft to support PA analyses
- Plans need to be formulated honoring DOE equities in the development of CRA-2019 and what to submit to EPA with respect to the withdrawal from the south end of the mine and panel closures (or lack thereof) for panels 3, 4, 5, and 6
- Overall, integrated regulatory strategy needed for the near-term future of WIPP (5 to 10 years)

Thanks

Victor Agege

Risk Management and Planning Specialist

Carlsbad Field Office

U. S. Dept. of Energy

Email – victor.agege@cbfo.doe.gov<<mailto:victor.agege@cbfo.doe.gov>>

Work (575)234-7493

Cell : 575-706-0120

APPROX. 186,183 CUBIC YARDS OF MATERIAL TO EXCAVATE, INCLUDING SHAFT AND ALL GREEN ZONES ON FIGURE 5.

Shaft accounts for almost half of the total, with the shaft removing 1.3 million cubic feet, and the drifts accounting

for the remainder of 1.5 million cubic feet.

Let me know if you want this fine-tuned, and I can talk with Daniel or who-ever created Figures 1 and 2, and get the actual dimensions to verify the assumed values.

Thanks -

Clark Fuhlage, PE

Project Engineer - New Underground Ventilation System
Waste Isolation Pilot Plant
Carlsbad, NM

Office – 575-234-3144
Mobile – 573-999-7311

From: Whisenhunt, Rodney - NWP
Sent: Wednesday, February 15, 2017 2:35 PM
To: Fuhlage, Clark - Value Added Solutions <Clark.Fuhlage@wipp.ws<<mailto:Clark.Fuhlage@wipp.ws>>>
Subject: [EXTERNAL] RE: January 2017 Monthly Report meeting -Follow up

From: Kouba, Steve - WRES
Sent: Wednesday, February 15, 2017 11:49 AM
To: Whisenhunt, Rodney - NWP <Rodney.Whisenhunt@wipp.ws<<mailto:Rodney.Whisenhunt@wipp.ws>>>
Cc: Klein, Thomas - RES <Thomas.Klein@wipp.ws<<mailto:Thomas.Klein@wipp.ws>>>; Madl, Larry - WRES <Larry.Madl@wipp.ws<<mailto:Larry.Madl@wipp.ws>>>
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Cc: Rhoades, James - FedNet <james.rhoades@cbfo.doe.gov<<mailto:james.rhoades@cbfo.doe.gov>>>; Ronald Gill <Ronald.Gill@cbfo.doe.gov<<mailto:Ronald.Gill@cbfo.doe.gov>>>; Gadbury, Donald (Casey) - FedNet <casey.gadbury@cbfo.doe.gov<<mailto:casey.gadbury@cbfo.doe.gov>>>
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Sent: Monday, February 13, 2017 8:47 AM
To: Shoemaker, Paul - SNL
Cc: Huddleston, Dennis; Rhoades, James - FedNet; Ronald Gill; Gadbury, Donald (Casey) - FedNet
Subject: January 2017 Monthly Report meeting -Follow up

Hi

Following up with you to confirm we have resolved the integration issues from the January 2017 Monthly report Meeting. I am referring to the following:

- Exact data needed on the location and dimensions of the new shaft to support PA analyses
- Plans need to be formulated honoring DOE equities in the development of CRA-2019 and what to submit to EPA with respect to the withdrawal from the south end of the mine and panel closures (or lack thereof) for panels 3, 4, 5, and 6
- Overall, integrated regulatory strategy needed for the near-term future of WIPP (5 to 10 years)

Thanks

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Attachment: Excavation Analysis.xlsx

This document provides a preliminary estimate for the amount of material to be removed from the underground for the following excavations:

- 1) New Shaft
- 2) New Drifts around the New Shaft, as shown by the green zones on Attachment 1.

Assumptions:

- 1) Rounding of entrances between drifts and panels is not included.
- 2) Dimensions used are assumed to be as-built.
- 3) Volumes are as-removed volumes, and don't account for any volumetric changes due to excavation/removal activities.

Area Description	Length (Feet)	Height (Feet)	Width (Feet)	Volume (Cubic Feet)	Cumulative Excavated Volume (Cubic Feet)	Diameter (Feet)	
Shaft		2130		1,311,597	1,311,597		
1 - Zone between Shaft and western drift		20	20	8,000	1,319,597		Depth adjusted upward by 20' to account for rectangular excavation at horizon depth, calculated in Zone 1D below.
1A - Enlarged Zone West of Shaft	99.5	20	25	49,750	1,369,347		
1B - Enlarged Zone East of Shaft	40	20	30	24,000	1,393,347		Assumed length of 40'
1C - Enlarged Zone North of Shaft	40	20	30	24,000	1,417,347		Assumed length of 40'
1D - Shaft Zone	30	20	30	18,000	1,435,347		
1E - Enlarged Zone South of Shaft	50	20	30	30,000	1,465,347		Assumed length of 50'
2 - Drift South of Enlarged Zone - 2nd Drift, Remaining Length	477	14	25	166,950	1,632,297		
3 - Drift at western edge	592	14	20	165,760	1,798,057		Assumed 40' north of Shaft drift CL.
4 - Drift to no-where - at 120' south of Shaft CL.	100	14	20	28,000	1,826,057		Assumed length of 100'
5 - Cross drift between west drift and 2nd drift	122	14	16	27,328	1,853,385		
6 - Main Southern Drift - E-W (S-550)	1786.9	14	16	400,266	2,253,651		
7 - Main E-W drift, northern side (S-400)	1177.5	14	16	263,760	2,517,411		
8 - 3 N-S Cross Drifts between main E-W Drifts	402	14	16	90,048	2,607,459		
9 - N-S Drift to connect with W-620 Drift.	436	14	16	97,664	2,705,123		Assumes 14x16 drift
10 - N-S Connecting Drift (W-470)	286	14	16	64,064	2,769,187		Assumes 14x16 drift
11 - Connection between W-620 and W-170	436.4	14	16	97,754	2,866,940		Assumes 14x16 drift

Volume in Cubic Yards = 106,183

Attachment: Figure 1 and Figure 2 only – New Shaft and Drift Dimensions.docx

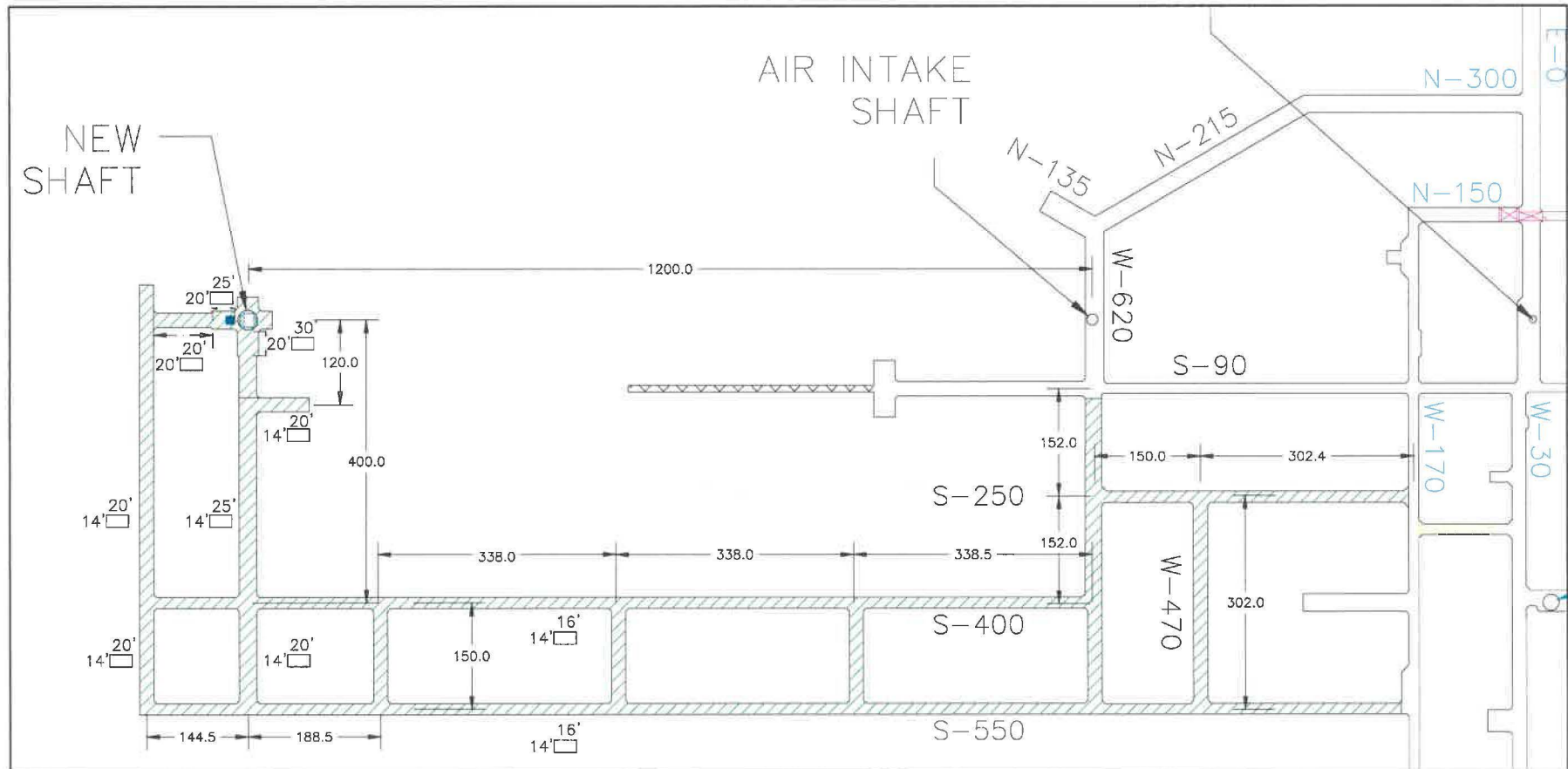


Figure 3 New Shaft Location and New Drift Layout

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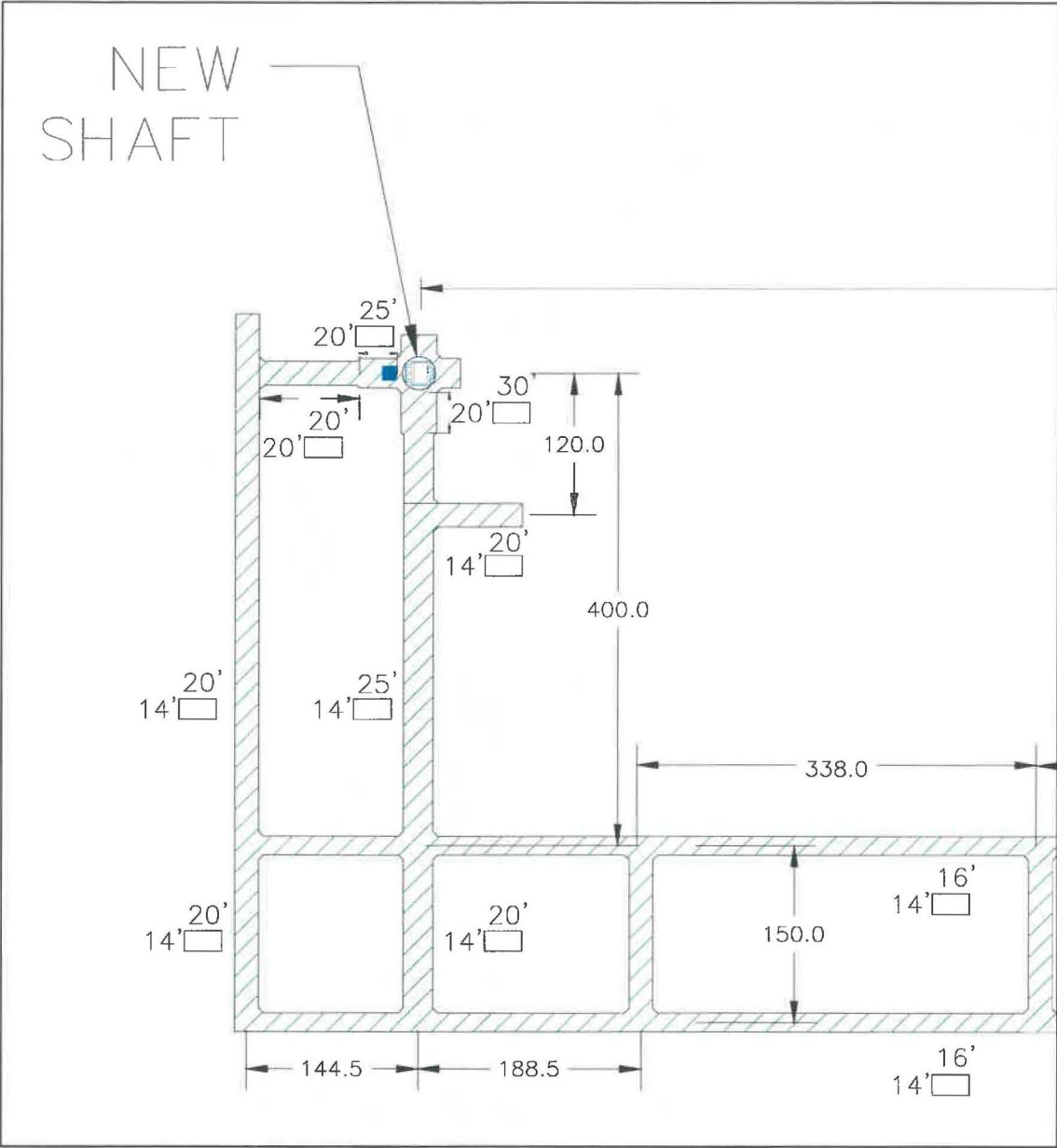


Figure 4 New Shaft Layout

Appendix C

This Appendix consists of a copy of Figure 1 from Franco (2015). Franco (2015) indicates that the “northernmost panel closures would be located in north-south access drifts W-170, W-30, E-140 and E-300 just north of S-700 and just south of the waste and exhaust shafts.” The new shaft/drift design shows drifts at S-250 and S-500 (Appendix B), north of the northernmost panel closures.

