EPA Response to Comments on the

Class III In-Situ Production of Copper Permit No. R9UIC-AZ3-FY19-1

Florence Copper Project (FCP)

This Response to Comments includes a description of the changes in the Permit from the Draft Permit, a summary of the significant public comments, and EPA's response to the comments.

Description of Draft Permit Changes

Pursuant to Title 40 Code of Federal Regulations (40 C.F.R.) § 124.17(a)(1), a summary of the changes EPA made to the Permit from the Draft Permit and the reasons for these changes are provided below in items 1-5.

1. EPA changed Florence Copper, Inc. to Florence Copper LLC ("Florence Copper") at three locations in the Permit on the cover page, page 7, and page 8 to reflect the name change made by the Permittee.

2. EPA added language to Part II.I. of the Permit to specify that Florence Copper will use a resting zone, which is one or more rows of resting wells, and/or injection of fresh water, between rinsing areas and active copper recovery areas as shown in Figure A-20, Attachment A of the Permit, to ensure that both processes continue without mutual interference. The Draft Permit included Figure A-20 which illustrates the resting zone separating the active leaching zone from the rinsing zone, but the resting zone was not referenced in the Draft Permit text. EPA added explicit language to ensure that the requirement illustrated in the Figure is clear.

   The changes to Part II.I.1. of the Draft Permit are shown in bold below:

   Part II.I. of the Draft Permit, 3rd paragraph is modified as follows:

   > During the life of the Project, there will be periods of time when rinsing is ongoing in areas that are proximal to active copper recovery operations. In these instances, the Permittee will continue to maintain hydraulic control at the perimeter of the active ISCR wellfield, including both the areas undergoing active copper recovery and rinsing. **The Permittee will have resting zones between rinsing areas and active copper recovery areas to ensure rinsing progress is not impacted by ongoing ISCR operations. This resting zone includes the use of one or more rows of resting wells, and/or injection of fresh water, as necessary, between the active copper recovery areas and the rinsing area to provide physical and hydraulic separation between these two processes. The resting wells will be those that are near the end of the active leaching cycle, that are periodically pumped to recover solution, and that are being prepared for inclusion in the next rinsing group.**
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   > The aggregate recovery rate will be higher than the aggregate injection rate to ensure that more fluid is withdrawn than is injected, and to maintain the necessary inward hydraulic gradient during ISCR operations and formation rinsing. The typical hydraulic control during rinsing with active leaching going on **and a resting zone between the two processes** is shown on Figure A-20, Attachment A of this Permit. Successful hydraulic control is indicated by the criteria established in Section II.E of this Permit.

3. EPA added in Section II.H.2.a.v and II.H.2.b.v that EPA may require a schedule for implementing any required actions after review of the report documenting the AL or AQL exceedance at Section II.H. This change was made in response to a public comment to clarify that EPA would require a schedule to ensure the timely implementation of any actions that EPA determines are necessary to address an AL or AQL exceedance.

4. For clarity, EPA made a non-substantive modification to Section II.I.3. EPA changed the citation in Section II.I.3. from 40 C.F.R. § 142 to 40 C.F.R. § 141 to be consistent with the remainder of the Permit which refers to maximum contaminant levels (MCLs) under 40 C.F.R. § 141. EPA also reworded the sentence to refer to an exceedance of the MCL instead of a violation of the MCL.

5. EPA corrected a typo in Part II.A.2.a. of the Permit. The reference to Sections B through D was changed to Sections C through E to specify the correct sections for which Florence Copper is required to submit plans and specifications for approval.

Summary of Significant Public Comments and EPA Response to Comments

Pursuant to 40 C.F.R. § 124.17(a)(2), below in items 1-33, EPA briefly describes and responds to all significant comments raised during the public comment period and during the public hearing held on September 15, 2022. For clarity, EPA consolidates and organizes the comments and responses below based upon topical headings.

Water Quality Impacts

1. **Comment:** Commenters alleged past or potential changes to water quality associated with the Florence Copper project. One commenter expressed concern that sulfate and total dissolved solids in excess of drinking water standards will migrate off of Florence Copper's property and contaminate drinking water. Another commenter asserts that the hardness of their water has increased since the mine began operating. A commenter submitted a 2017 technical memorandum on the Gunnison Copper Project as an illustration of potential water quality problems at mining operations.

   EPA Response: EPA acknowledges commenters' concerns that sulfate and high-TDS fluids will migrate off of Florence Copper's property.

   EPA takes comments and concerns of the nearby community members seriously, and the Agency has thoroughly considered the ways in which fluids can escape from the wellfield into an underground source of drinking water (USDW) and concluded that the conditions in the Underground Injection Control (UIC) Permit will protect USDWs in compliance with the UIC regulations. The Permit conditions are protective of all USDWs, as defined in 40 C.F.R. § 144.3, including the un-exempted portion of the Lower Basin Fill Unit (LBFU) and the Upper Basin Fill Unit (UBFU).

   Injected fluids will be contained within the Bedrock Oxide zone (the "Oxide zone") of the in-situ copper recovery (ISCR) wellfield area, located approximately 450 feet to 1,400 feet below ground surface at the FCP site. This will be accomplished by maintaining an inward gradient by extracting at least 6% more fluid than is injected, monitoring daily to confirm the inward gradient is toward the wellfield, monitoring electrical conductivity (EC) in observation wells surrounding the active ISCR wells, and monitoring at early warning Annular Conductivity Devices (ACDs) or other monitoring wells above the Oxide zone to ensure that ISCR fluids are contained within the injection and recovery zone.

   Based on information available about the Oxide zone, the results of modeling, extensive daily monitoring throughout the wellfield, and the ability to adjust wellfield operations as needed, EPA determined that ISCR fluids should not migrate outside of the Oxide zone during copper recovery

operations.

Monitoring wells will be strategically located within the area of review (AOR) of the Florence Copper Project (FCP), which coincides with the 1997 Aquifer Exemption ("Aquifer Exemption") boundary, for early detection of contaminants above action levels and to ensure that, as a result of ISCR operations, contaminants with maximum contaminant levels (MCLs) that might remain in the FCP area after restoration do not migrate beyond the monitoring well locations to a USDW. The point of compliance (POC) and the supplemental monitoring wells outside the ISCR area are a secondary line of defense in the highly unlikely event that a contaminant was to escape detection above an action level at the ACDs, observation, or other monitoring wells near the mining and rinsing operations in the wellfield. The risk of any potential migration of a contaminant beyond the wellfield would be further reduced by the natural attenuation of that contaminant as it moves into a higher pH environment downgradient of the wellfield.

In the unlikely event that an undetected excursion of ISCR fluids migrated laterally beyond the observation wells, ACDs or other monitoring wells would detect the excursion, and Florence Copper would be required to address the excursion by cessation or reduction of injection rates, perform any necessary repairs of the well, and/or continued or increased pumping at the recovery wells.

Regarding concerns about sulfate levels raised by a commenter, restoration operations, required at Part II.I.1. of the Permit, are designed to effectively remove sulfate and other constituents to levels that prevent an impact to USDWs in a way that could adversely affect the health of persons. Restoring groundwater to meet MCLs or pre-operational concentrations if the pre-operational concentrations exceed the MCLs would result in a reduction in the concentration of all groundwater constituents in the Permit, including sulfate and total dissolved solids, not just constituents with MCLs. In addition, the Permit's operating conditions and extensive monitoring requirements are designed to protect USDWs and ensure that contaminants without primary MCLs do not impact USDWs in a way that could adversely affect the health of persons, as required at Part II.I.1.b. of the Permit. This requirement will ensure that contaminant levels are reduced to acceptable levels before closure of the FCP. For instance, while rinsing to meet restoration goals for the wellfield during the pilot project known as the Production Test Facility (PTF), Florence Copper was able to adjust rinsing operations to continue to reduce sulfate levels throughout the wellfield.

In the Permit for the commercial project, in the event that an exceedance is detected at the POC or supplemental monitoring wells surrounding the ISCR area during operations, rinsing, or the post-closure period, Florence Copper is required to address the exceedance by performing any actions determined necessary by EPA to ensure protection of the downgradient USDWs. After closure of all ISCR operations, hydraulic control would be discontinued and groundwater monitoring of water quality would continue through the five-year post closure monitoring period. In accordance with Permit conditions, the post-closure monitoring may be extended beyond five years if EPA deems it necessary to ensure adequate protection of USDWs.

In the UIC application, Exhibit B-5, Florence Copper conducted groundwater flow model simulations to evaluate the impacted area during the post-closure period of 30 years after formation rinsing is completed and hydraulic control pumping has ceased. The greatest areal extent of sulfate migration as a result of operation of the FCP has a sulfate concentration of 2 mg/L above background conditions. The simulated maximum distance of down-gradient migration of sulfate is approximately 2,000 feet beyond the ISCR area in the lower portion of the LBFU. Thus, the model does not indicate that a plume of sulfate in excess of drinking water standards will migrate off of Florence Copper's property and contaminate drinking water. USDWs will be adequately protected by ensuring that water quality standards are maintained at the monitoring wells surrounding and above the ore body, as described above.

Regarding assertions that an individual's residential water hardness has increased since the mine began operating, EPA notes that monitoring at the PTF detected no water quality changes or evidence of fluid movement that would impact hardness or affect drinking water supplies, including municipal supplies or drinking water wells, in the area.

Lastly, comments or concerns about water quality impacts associated with the Gunnison Copper Project or other copper mining operations are beyond the scope of the Florence Copper Permit. The Permit conditions are designed to ensure, through monitoring and operational controls, that the injected fluids remain within the designated injection and recovery zone.

2. **Comment:** Commenters requested that the Permit identify specific actions that must be taken in the event of water quality changes beyond the alert limits or water quality exceedances, including publishing the results, engaging the public, and ceasing injection or repairing affected wells or facilities for exceedances that continue longer than six (6) months.

   EPA Response: The Permit requires Florence Copper to maintain hydraulic control such that no water quality changes due to injected fluids occur outside the injection and recovery zone to ensure protection of USDWs. Hydraulic control will be monitored every 24 hours by comparing total flows into and out of the ISCR wellfield, and by monitoring water levels in the recovery/observation/point of compliance (POC) well triplets. The Permit requires corrective actions to be initiated within 24 hours of any loss of hydraulic control (see Permit Part II.H.1.). Corrective actions and contingency requirements must be implemented to resolve any migration of injection fluids to prevent an impact to a USDW.

   In response to an Alert Level (AL) or Aquifer Quality Level (AQL) exceedance at a POC or monitoring well, the contingency plan provisions of the Permit require actions to evaluate the cause and mitigate the effects, if any, of the discharge responsible for the exceedance. ALs are established concentration levels defined at Part II.F.2.c. of the Permit for water quality parameters which trigger contingency requirements. AQLs are established concentration levels defined at Part II.F.2.d. of the Permit for water quality parameters with an MCL which trigger contingency requirements and below which meets restoration requirements in the wellfield. Part II.H.2. of the Permit identifies the specific actions Florence Copper must take in the event of a water quality exceedance. The required steps include collecting a verification sample within five (5) days and notifying EPA of the results. If the results confirm an exceedance, Florence Copper must submit a written report to EPA within ten (10) days and provide an evaluation of the cause, impacts, or mitigation of the discharge responsible for the exceedance or demonstrate that the exceedance resulted from an error in sampling, analysis, or statistical evaluation.

   Any confirmed exceedance resulting from an excursion (i.e., loss of hydraulic control) requires remedial operations to reverse the excursion and any other actions that EPA determines are necessary to address the exceedance. Thus, if an exceedance did occur, EPA can require additional monitoring and/or remedial actions beyond those specified in the Permit to ensure AL or AQL exceedances are mitigated (see Permit Part II.H.2.) to prevent migration to a USDW. EPA added to the Permit's Contingency requirements at Parts II.H.2.a.v. and II.H.2.b.v. that a schedule may be required to implement any actions to address AL or AQL exceedances. This addition to the Permit language will ensure that any AL or AQL exceedance will have a timely resolution to prevent migration to a USDW.

   At the completion of copper recovery for each resource block, Florence Copper will maintain hydraulic control during rinsing to restore the aquifer to MCLs defined in 40 C.F.R. § 141 or the pre-operational background concentrations, whichever is greater. If Florence Copper does not meet closure requirements for any resource block undergoing rinsing or post-rinse monitoring and EPA determines that this could potentially impact a USDW or may otherwise adversely affect the health of persons, then

EPA can require Florence Copper to cease injection of mining solutions until Florence Copper demonstrates that it can meet these closure requirements.

The Permit monitoring requirements are adequate to contain contaminants within the boundary of the AOR and the exempted aquifer in the post-restoration period. EPA can also require longer-term stability monitoring (i.e., to verify that contaminant concentrations are not increasing) if monitoring in the post-closure period indicates incomplete restoration or a rebound occurs (i.e., increase in concentrations from restored levels) and an exceedance in contaminant concentrations is detected. If that occurs, remedial actions can be required and post-closure monitoring can be extended beyond five (5) years, pursuant to Part II.I.2.b. of the Permit.

If any injection or monitoring well is damaged, e.g., as detected via Mechanical Integrity Tests (MITs) or the Permittee becomes aware of a loss of Mechanical Integrity (MI) during operations, the Permittee must (per Part II.E.3.c. of the permit) notify EPA. Depending on the circumstances, EPA may require the Permittee to cease injection, repair the well, or take other steps necessary to ensure that USDWs are not endangered prior to resuming injection operations.

EPA understands commenters' interest in ensuring that information about the Florence Copper project is available to the public. The Permit, at Part II.G.7. requires Florence Copper to create a website and post on the website copies of all quarterly reports and the Groundwater Flow Model Reports. The quarterly reports posted on the website must include a discussion of any exceedances and any mitigation actions taken during the reporting period. This information will be available to the public through a link on the EPA Region 9 UIC website.

3. **Comment:** Commenters expressed concern about allowing depleted resource blocks to be flushed and recovered while injection continues in other blocks. They assert that the potential connectivity between the blocks could allow contaminated water from other resource blocks to infiltrate a recovered block with little opportunity for mitigation.

   EPA Response: For an individual or group of resource block(s), post-closure restoration and monitoring provisions of the Permit are designed to ensure that groundwater quality in each block is restored to concentrations that are less than or equal to primary MCLs, or pre-operational background concentrations. Part II., Section I. of the Permit requires Florence Copper to commence aquifer restoration and closure activities within sixty (60) days after completing copper recovery operations for each resource block in the injection and recovery zone. Per the restoration requirements of the Permit, the groundwater quality shall be restored to concentrations which are less than or equal to primary MCLs, or pre-operational background concentrations if the pre-operational background concentrations exceed MCLs. The Permit requires Florence Copper to ensure that constituents without primary MCLs will not impact surrounding USDWs in a way that could adversely affect the health of persons. The Permit also requires Florence Copper to maintain hydraulic control of the ISCR wellfield fluids during rinsing operations, which can include injection/recovery or only recovery operations.

   According to the UIC application, Florence Copper supplemental information dated December 17, 2020, and Part II.I. of the Permit, Florence Copper will have resting zones between rinsing areas and active copper recovery areas to ensure that both processes continue without mutual interference. This resting zone includes one or more rows of resting wells, and/or injection of fresh water between the active copper recovery areas and the rinsing area, which provides physical and hydraulic separation between these two processes. All the wells actively undergoing copper recovery, rinsing, and resting will be located within the hydraulic control perimeter. Figure A-20 in Part II.I. of the Permit shows the hydraulic control configuration during typical rinsing and leaching ongoing with resting/freshwater injection wells

between the two areas. EPA added a narrative description of the leaching and rinsing management requirements in the Permit to clarify Figure A-20 of the Permit.

During closure operations, the Permit requires rinsing with fresh/treated water or sodium carbonate or other non-hazardous neutralizing agents until primary MCLs or pre-operational background concentrations, whichever is higher, are met. After closure of a resource block or group of resource blocks, post rinse monitoring conditions of the Permit will require one well in each resource block be retained for verification monitoring, which can be used for additional rinsing and recovery operations, if needed. In addition, the Permit requires evaluation of restoration of each resource block after one year of post-rinse monitoring to ensure adequate restoration.

Pursuant to Part II.I.3. of the Permit, if Florence Copper is not meeting closure criteria requirements for any resource block undergoing rinsing or post-rinse monitoring and EPA determines that this failure may impact a USDW and may cause an exceedance of a primary MCL under 40 C.F.R. § 141 or may otherwise adversely affect the health of persons, then EPA may require Florence Copper to cease injection of mining solutions until Florence Copper demonstrates that it is meeting the closure criteria.

After the end of the five (5)-year verification monitoring period, the Permit requires that the verification well for each resource block be retained for the life of the mine to assist with closure monitoring and post rinse contingency actions. POC and other monitoring wells will also be subject to a monitoring schedule and contingency actions will be required if an exceedance was to occur. According to the Permit, the post rinse contingency actions may be any actions that EPA determines are necessary to address an exceedance. At the conclusion of ISCR operations, the post-closure monitoring in the Permit may be extended beyond five (5) years if EPA deems it necessary to ensure adequate protection of USDWs.

Monitoring

4. **Comment:** Commenters requested that the Permit's monitoring parameters include more radioactive elements, referencing the prevalence of uranium and other radioactive materials associated with Arizona copper deposits. They also requested that baseline water quality data be collected for every known constituent of concern for at least a year.

   EPA Response: The Permit requires Florence Copper to sample for uranium and a suite of radioactive parameters. These water quality parameters (identified in Table 2 of the Permit) include: Gross Alpha, Adjusted Alpha, Gross Beta, Radium 226 and Radium 228, Radon, Uranium isotopes, and Uranium (Total). Florence Copper must sample and analyze for each of these parameters from each POC and monitoring well at least annually (Part II.F.2.b.). This suite of parameters was identified based on extensive field and laboratory results, historical data, and modeling of the site-specific hydrogeology to predict the constituents in the formation fluids, the injected fluids, and process byproducts as required by Class III requirements (40 C.F.R. Part 146, Subpart D) and described in Florence Copper's Permit application.

   The Permit requires Florence Copper to determine background concentrations of each of the above-named radioactive parameters before injection begins to establish aquifer restoration standards and water quality standards at the POC and other monitoring wells. Part II.F.3. requires that Florence Copper collect baseline water quality samples for all parameters such that acceptable statistical methods can be applied to assign ALs and AQLs at all POC and other monitoring wells. EPA has determined that statistical analyses described in Exhibit D-7 in Appendix J of the Permit are acceptable. The statistical analysis methods recommend a minimum of 8 to 10 independent background sampling events to allow application of the statistical methods. EPA will review and

approve the baseline data, action levels, and Florence Copper's statistical approach prior to providing approval to commence injection activities.

5. **Comment:** Commenters requested that additional monitoring wells be placed where contaminants would be most likely to migrate, with a higher density of monitoring and observation wells based on the results of modeling. They assert that wells should have packers to isolate high permeability zones in which most transport occurs.

   EPA Response: EPA agrees with the commenter that monitoring wells should be located where modeling and other information indicate that contaminants would be most likely to migrate.

   The mining area, a 212-acre ISCR area, has been divided into approximately forty-eight (48) resource blocks for planning the development of the active wellfield. Each well installed in the ISCR area will be constructed using a standard design because each well may serve multiple purposes during the life of the facility. ISCR wells may be used as injection, recovery, observation, or perimeter hydraulic control wells. The injection and recovery wells will be arranged in a five-spot pattern that effectively surrounds each injection well with four recovery wells in the ISCR area. Groups of ISCR wells within a resource block will be developed and activated incrementally. Surrounding the active injection and recovery wells will be a ring of perimeter wells and an outer ring of observation wells. The required observation well locations are based on the results of groundwater flow modeling presented in the Permit application for the FCP and on the results of modeling that EPA required Florence Copper to perform to predict potential flow paths. The placement of observation wells is designed to detect lateral fluid migration (excursions) between recovery wells, an area where excursions would be more likely to occur as supported by the modeling.

   The ISCR wellfield area will be surrounded by six (6) USDW monitoring wells and eight (8) fault monitoring wells in addition to 27 POC wells and two (2) future monitoring well clusters located within the AOR that circumscribes the ISCR wellfield area. In addition, two (2) Annular Conductivity Device (ACD) demonstration monitoring wells will be installed above the orebody in the first resource block and will be sited based on the location of known faults and/or areas of known higher fracture intensity. There are a greater number of POC and other monitoring wells down gradient of the ISCR wellfield, which is appropriate both for monitoring groundwater quality and for confirming hydraulic control. The natural groundwater flow direction is toward the northwest, which results in natural inward groundwater flow on the southeastern side of the ISCR wellfield.

   The monitoring scheme surrounding the 212-acre ISCR area is sufficient to monitor hydraulic control in the downgradient direction of natural groundwater flow. The planned observation wells surrounding the active wellfield are sufficient and their locations are appropriate for ensuring hydraulic control at the FCP to prevent migration of ISCR fluids. The purpose of monitoring EC data at the observation wells is to ensure that hydraulic control is maintained and to detect any escape of ISCR fluids between adjacent recovery wells before ISCR fluids migrate beyond the observation wells.

   Regarding comments requesting that wells be constructed with packers to isolate high permeability zones, identifying higher permeability zones has not been possible because the Oxide zone is extensively fractured throughout the rock as evident from extensive historical testing and geological data of the Oxide zone (see Attachment D in the permit application, Section D.3.4.2.1, page D-10).

   However, EPA has considered geologic and hydrologic features to locate monitoring for early detection of migration out of the wellfield or into the basin fill units above the orebody. The Permit requires early warning ACDs installed on 10% of injection wells to monitor above the Oxide zone at strategic locations for early detection of upward migration of ISCR fluid. In consideration of the greatest fracture intensity near the faults, additional monitoring wells are to be placed in the fault zones in the natural

downgradient direction. Monitoring wells are also to be placed along the top of the Oxide zone surrounding the ISCR area where hydraulic conductivity is greatest and the wells are more likely to detect early upward migration. Monitoring locations are adequately placed in priority areas to ensure early detection of ISCR contaminants and verify a loss of hydraulic control so that control may be regained to address any migration (i.e., triggering contingency requirements).

6. **Comment:** Commenters requested more frequent monitoring. One commenter recommended that sampling occur monthly in year 1 of commercial production, bi-monthly in year 2, quarterly in year 3, etc., and biannually in year 5. Other comments requested monthly sampling for all radioactive compounds for water quality parameters with Level 1 alert levels and quarterly sampling for Level 2 parameters.

   EPA Response: EPA determined, based on the results of modeling, site characterization information, and ISCR operations for the wellfield, that the sampling frequency at the monitoring and POC wells surrounding the ISCR area is sufficient, since any residual contaminants from the FCP wellfield would not migrate to the monitoring wells during operations or the restoration period while maintaining hydraulic control. USDWs are adequately protected because the AOR boundary, which coincides with the 1997 Aquifer Exemption boundary, is hundreds of feet beyond the monitoring well ring and any exceedance would require remedial operations to reverse the excursion and resolve the exceedance. In addition, more frequent monitoring and other actions can be required by EPA if AL or AQL exceedances were to occur (see Permit Part II.H.2.). EPA added a clarification in the Permit that Florence Copper may be required to address an AL or AQL exceedance in accordance with an approved schedule.

   Moreover, the Permit requires daily monitoring of hydraulic control and corrective actions within 24 hours for a loss of hydraulic control. In addition, observation wells are the first ring of monitoring surrounding the active ISCR wells and require daily monitoring of specific conductance that would most likely have the earliest detection of outward migration of mining fluids during copper recovery operations or rinsing, if an excursion was to occur, and require contingency actions to correct a loss of hydraulic control to pull the fluids back into the wellfield.

   The Permit requires monitoring the surrounding ISCR area and includes sampling from each POC and monitoring well on a quarterly basis for Level l analytes and annually for Level 2 parameters, including radionuclides. See also EPA's response to comments #4 and #5 above which provide further discussion of the adequacy of monitoring to protect USDWs.

7. **Comment:** Commenters offered recommendations for setting alert levels in the Permit. They recommended that the alert level for arsenic be less than 0.01 mg/l, and the sulfate criterion be not much higher than the observed background concentrations without specifying a value. They also requested that Level 1 and Level 2 alert levels be specified in the Permit and subject to public comment.

   EPA Response: Alert levels (ALs) for the UIC Permit are required to be established based on site-specific baseline conditions, using on-site monitoring data. As such, ALs for new wells cannot be determined until the monitoring wells have been constructed and baseline data is collected. For existing point of compliance (POC) wells which have previously established ALs, EPA may require revisions in accordance with the Permit based on EPA review and baseline groundwater quality monitoring data.

   Part II.F.2.c. of the Permit requires Florence Copper to establish ALs for Level 1 and Level 2 analytes, which includes sulfate and arsenic. Appendix J of the Permit states that ALs must be established and calculated following acceptable statistical guidance as approved by EPA. Florence Copper must submit proposed ALs, along with supporting ambient groundwater data, laboratory analytical reports, field

notes, and QA/QC procedures used in collection and analyses of the samples to EPA for review and approval. EPA will review the information prior to approving new ALs.

Aquifer Quality Limits (AQLs) are set based on the EPA-approved ALs. In accordance with Part II.F.2.d. of the Permit, if an AL is less than the MCL, then the AQL is set equal to the MCL and if an AL is greater than the MCL, then the AQL shall be set equal to the AL.

EPA does not agree with commenter's recommendation that the AL for arsenic should be set at a level below 0.01 mg/l (the federal MCL). ALs are intended to reflect the baseline conditions at the site, such that an exceedance of the AL represents potential migration of contaminants due to the mining operation and triggers contingency actions. Where the baseline conditions exceed the MCL for a constituent, the AL calculated using a statistical analysis based upon site-specific baseline monitoring data will exceed the MCL. Statistical analysis takes into consideration normal variability in the background groundwater quality data.

EPA also does not agree with the commenters request that the ALs be subject to public comment. Part II.F.3. of the Permit requires that each AL must be calculated and established following acceptable statistical methods from ADEQ's methodology and EPA approved guidance. Further, as noted above, each AL will be reviewed and approved by EPA to ensure the AL is properly established in accordance with the required calculation methodology. As this approach for setting the ALs was subject to public comment, EPA does not agree that additional public comment on specific ALs is warranted. Information the Permittee submits in association with determining the ALs will be available to the public, and the ALs and AQLs will be posted on the public website referred to at Part II.G.7. of the Permit.

8. **Comment:** Commenters requested that electrical conductivity (EC) sensors be required on every well. They also requested more profiling and testing of wells, including integrity testing and geophysical logging.

   EPA Response: Part II.C.7.c. of the Permit requires Florence Copper to install EC sensors at the injection zone on each of the observation wells that surround the wellfield, and Part II.C.7.d. of the Permit requires ACDs to be installed at the vertical limits of the Aquifer Exemption and above the LBFU/Oxide interface. The purpose of monitoring conductivity at the observation wells and ACDs for each resource block is to ensure hydraulic control is maintained and to detect early escape of ISCR fluids outside the mining zone before they could migrate beyond the Aquifer Exemption boundary. The EC monitoring serves the purpose cited at 40 C.F.R. § 146.32(e) for detecting any potential excursions during ISCR and rinsing operations by monitoring of water levels and EC readings on a daily basis.

   In addition, the Permit requires ACDs in 10 % of injection wells in each resource block to be placed not higher than 20 feet above the Oxide zone and LBFU interface to serve as early warning of upward ISCR fluid movement in the wellbore annulus or into the overlying basin fill units. Installation of the ACDs at mapped faults are a priority to provide early warning of potential vertical migration of injected fluid along those faults. A confirmed statistically significant increase in conductivity values above baseline conductivity and noise levels according to procedures subject to approval by EPA will trigger contingency actions to address the exceedance.

   ACD monitoring installed adjacent to the well bore also serves to demonstrate mechanical integrity under 40 C.F.R. § 146.8(a)(2). As described in response to comment #5 above, the Permit requires Florence Copper to install two ACDs on all injection, recovery, perimeter, and observation wells adjacent to the well bore at locations below and above the vertical limits of the Aquifer Exemption. ACDs are proposed to detect fluid movement through any micro-annulus that might form between the well casing and the cement seal. They are also in contact with the formation, as described above, to detect migration of injected solution through the formation, outside of the cement seal, should any occur. In

response to a confirmed above-background signal from ACDs, Permit conditions require contingency actions, which may include temperature survey, standard annular pressure test and additional geophysical logging to evaluate and resolve the exceedance.

Over the first six months of injection, the Permittee is required to perform a demonstration of the ACD response to upward movement of ISCR fluids in the injection and recovery zone. The demonstration includes monthly data collection and analyses that will be conducted once injection begins and throughout the period of the demonstration. An inconclusive demonstration of ACD response to upward movement of ISCR fluids will require implementation of additional analysis and contingency monitoring wells in the overlying UBFU and LBFU in accordance with Part II.F.1. of the Permit. If the demonstration is unsuccessful, the Permit requires an additional 49 contingency monitoring wells to be completed above the orebody in the overlying basin fill units throughout the ISCR wellfield area to replace ACD monitoring.

EPA agrees that integrity testing and geophysical logging of wells is important. Moreover, Part II.E.3. of the Permit requires Florence Copper to demonstrate that all Project wells have and maintain mechanical integrity before injection and periodically during operations to ensure protection of USDWs consistent with 40 C.F.R. §146.8. Tests and evaluations to demonstrate mechanical integrity may include standard annular pressure tests, continuous pressure monitoring in injection wells, temperature surveys, ACD monitoring program (described above), and cement evaluation analysis. Geophysical logs and other tests conducted during drilling and construction must include open-hole logs (including caliper, gamma-ray, temperature, directional surveys, neutron-density logs, and electrical logs), cased-hole logs, and injection formation tests. The Permit also notes that EPA may require Florence Copper to conduct additional geophysical surveys, if needed.

9. **Comment:** Additional monitoring requested by commenters included: monitoring in existing wells on private property in a 5-mile radius for those who request it and sampling of the pregnant leach solution (PLS), the water treatment plant effluent, and various surface ponds at the facility for radioactive chemicals.

   EPA Response: EPA disagrees that sampling at private wells is needed because, based on site-specific information and groundwater modeling, contaminates will not impact the area outside the Area of Review and the Aquifer Exemption Boundary. See the response to comment #1 above regarding water quality impacts and monitoring.

   EPA clarifies that sampling the pregnant leach solution (if it is not re-injected) during operations and sampling at surface facilities is beyond the scope of the UIC Permit. Chemistry predictions using measured values from the field (e.g., groundwater), laboratory results, historical data, and geochemical modeling for PLS as well as other process solutions is included in Attachment D, Exhibit D-3 of the Permit application and incorporated in Appendix E of the Permit. EPA considered these predictions for injected fluids, impacted formation fluids, and PLS in developing the groundwater quality monitoring program to include formation-related radioactive chemicals and other water quality parameters.

10. **Comment:** Commenters requested that post-closure audits require physical monitoring in addition to modeling.

    EPA Response: Florence Copper's Permit requires monitoring for a minimum of five (5) years post-closure. Per Part II.F.4. of the Permit, Florence Copper must monitor Level 1 parameters at least quarterly for the first two (2) years after closure and then at least once every twelve (12) months and monitor Level 2 parameters at least annually during the Final Post-Closure Period. Post rinse and closure monitoring in the Permit includes retaining one ISCR well per resource block for use as rinse verification

monitoring and monitoring at one month, six months and one-year increments after rinsing has ceased. In the event of an exceedance of the indicator sulfate concentration of 750 mg/l or an AQL, the rinse verification wells may also be used as recovery wells for additional rinsing and/or pumping if monitoring indicates additional rinsing and/or pumping is necessary to meet restoration requirements.

EPA determined that the UIC Permit monitoring requirements are sufficient to confirm containment of contaminants within the boundary of the AOR and the exempted aquifer in the post-restoration period. EPA can also require longer-term stability monitoring if monitoring in the post-closure period indicates incomplete restoration or a rebound occurs (i.e., increase in concentrations from restored levels) or an exceedance in contaminant concentration is detected in the POC or other monitoring wells. If that were to occur, remedial actions may be required and post-closure monitoring can be extended beyond five (5) years.

This monitoring is in addition to the Post-Closure Audits required in Part II.J. of the Permit. Florence Copper must conduct an annual groundwater flow model evaluation and update using testing and operating data for model calibration. During the third (3rd), fifth (5th), seventh (7th), tenth (10th), fifteenth (15th), twentieth (20th) and twenty-fifth (25th) year after commencement of ISCR operations, Florence Copper will conduct a post-closure audit of the computer modeling to update the predicted fate and transport of pollutants produced by ISCR operations. Florence Copper will submit reports to EPA describing the annual model update and the post-closure audits, as well as any changes in the conceptual model, any model redesign, and any changes in predicted post-closure conditions.

11. **Comment:** The Tohono O'odham Nation commented on the Draft Permit and provided information regarding another proposed copper mining project known as the Ivanhoe Electric Mining Santa Cruz Project and noted that the Santa Cruz Project and the Florence Copper Project are being proposed in close proximity to each other. The Tohono O'odham Nation requested that EPA extend the comment period at least until the end of the year so that the impacts of the two large copper mines in close proximity to each other can be evaluated. The Tohono O'odham Nation also noted that it opposes the Florence Copper Project because of potential damage to the water table from acid injection.

    EPA Response: EPA disagrees that the impacts from another proposed copper mine, the Ivanhoe Electric Santa Cruz Project, which is approximately 25 miles away should be evaluated for this permitting action. The Ivanhoe Electric Project is beyond the scope of this Permit. Pursuant to the UIC regulations, EPA evaluated the impacted area of the Florence Copper Project as determined pursuant to the Area of Review (AOR) regulations at 40 C.F.R. §146.6. The AOR, also known as a zone of endangering influence, is the area surrounding injection wells in which the pressures in the injection zone may cause migration of the injection or formation fluids out of the injection zone and into a USDW, as described in 40 C.F.R. § 146.6(a)(1)(ii). The size of the AOR is based on the distance of the expected pressure influence resulting from the permitted injection activity. In the Permit process, EPA determined the AOR, based on information in the UIC application, to be the ISCR area (or mine zone boundary) and a circumscribed width of 500 feet beyond the ISCR area. The proposed Santa Cruz Project, which is located at a distance of approximately 25 miles, is far away from the AOR of the FCP. Therefore, EPA determined that extending the comment period to consider potential impacts between the two mining projects was not warranted.

    With respect to Tohono O'odham Nation's opposition to the Permit because of the potential impacts to groundwater, EPA determined in its *Cumulative Effects Analysis (40 C.F.R. § 144.33(c)(3)), for the Florence Copper Project Draft Underground Injection Control Area Permit Number R9UIC-AZ3-FY19-1,* ("Florence Copper Cumulative Effects Analysis") that the protective requirements in the Permit will prevent impacts to groundwater quality in the surrounding USDWs. Specifically, the Permit has

numerous provisions to prevent impacts to surrounding USDWs, such as maintaining hydraulic control with an inward gradient during the life of the project by extracting more fluid than is injected, monitoring to ensure there is no migration above protective levels outside the mining area, and performing contingency actions to correct any loss of hydraulic control if an exceedance is detected at a monitoring well.

In addition, while there may be short-term degradation of groundwater quality in the Oxide zone within the ISCR wellfield area due to ISCR operations, the Oxide zone is an exempt aquifer and, therefore, not a USDW. Nonetheless, the Permit requires Florence Copper to conduct aquifer rinsing within each mining block of the Oxide zone once extraction activities are completed in the block. This aquifer rinsing is required to continue until the aquifer quality is restored to safe drinking water levels (i.e., MCLs) or to background levels if pre-mining background levels exceed MCLs. The required aquifer rinsing not only mitigates the short-term degradation of the Oxide zone, but also ensures that USDWs surrounding the mining area are protected.

The final Permit is consistent with the UIC regulations and protective of USDWs. More information regarding EPA's Cumulative Effects Analysis is contained in Response to Comment #27 below.

Groundwater Flow and Excursions

12. **Comment:** Commenters expressed concern that Florence Copper's injection operations could cause groundwater to move laterally into the LBFU on the west side of the orebody if the recovery system does not operate as planned.

    EPA Response: The Permit requires Florence Copper to maintain a 106% extraction to injection volume ratio and monitor extraction and injection rates to maintain an inward hydraulic gradient to prevent fluid migration outside of the wellfield. This excess extraction rate is expected to be sufficient to overcome the low velocity of the groundwater flow to the northwest and prevent the escape of ISCR fluids between extraction wells.

    EPA determined that continuous operational monitoring and daily management of injection and extraction rates will be sufficient to maintain hydraulic control and to restore it, even if there is a temporary loss of hydraulic control. In addition to the wellfield monitoring, the POC and supplemental monitoring wells placed within the AOR perimeter and ACDs (or contingency monitoring wells) above the exempted zone in the LBFU and UBFU will ensure that any excursions are detected and reversed before escaping the AOR or moving into a nonexempt zone above the exclusion zone.

    The proposed wellfield layout and well configuration will be used to establish horizontal flow of injected solution between injection wells and recovery wells, as demonstrated by the hydraulic control test conducted by BHP Copper in 1997-98 and the operational experience from the PTF. In addition, any lateral excursions migrating away from the active wellfield will likely be detected by daily monitoring of the surrounding observation wells adjacent to the perimeter and ISCR wells and corrected by adjustments of pumping and injection rates to control and maintain horizontal flow inward to the wellfield in accordance with the Permit conditions.

    See also the EPA response to comment #5 for the detailed description of the wellfield layout and extensive monitoring.

13. **Comment:** Commenters inquired about the impact of a hydrologic sink created by extracting at 106% of the injection rate, specifically about the long-term water quality and quantity effects on surrounding aquifers when pumping operations cease and groundwater flows back into the hydraulic sink.

EPA Response: The purpose of maintaining the hydraulic gradient is to prevent migration outside of the wellfield. This is accomplished by maintaining a 106% extraction to injection volume ratio and monitoring and management of extraction and injection rates, which will cause fluids to move inwards and ensure that no fluids associated with the injection operation will migrate away from the wellfield.

Monitoring and management of extraction and injection rates are the means for maintaining the inward flow gradient and ensuring that hydraulic control is restored in the event that EC readings at the observation wells exceed action levels. In addition, the Permit includes a provision that the 106% extraction to injection volume ratio is subject to adjustment based on inward flow gradient and EC data. For example, if necessary, Florence Copper could adjust operations by shifting rinsing and pumping operations to address exceedances in specific areas of the field to maintain inward flow.

See the response to comment #1 and #2 above for the effects on the quality of downgradient USDWs during and after operations cease.

14. **Comment:** Commenters requested that Florence Copper provide a map or other illustration of how the inward gradient will be calculated, and that compliance with the inward gradient requirement not give credit to the drawdown inside the casing of a pumping well.

    EPA Response: Part II.G.2.a. of the Permit requires Florence Copper to provide a map showing groundwater elevation contours based on the quarterly monitoring data. Part II.G.2.c. of the Permit requires a table of the daily average head comparisons for each well pair and well triplet used to monitor hydraulic gradient and a graphical representation that a continuous inward hydraulic gradient is maintained. This map, table, and graphical representation will be used to demonstrate the existence of an inward gradient.

Concerns about ISL Technology

15. **Comment:** Commenters assert that in situ leaching (ISL), also known as in situ recovery (ISR), for copper production is an untested technology that can contaminate groundwater. Some commenters reference the Gunnison Project, asserting that project does not operate properly, citing carbon dioxide generation due to chemical reaction between calcite and injected sulfuric acid. They attached financial information about Excelsior mining corporation and a web posting of assay results at the facility to support the assertions.

    EPA Response: EPA disagrees that ISL technology is unproven. For example, EPA Region 9 issued a Class III ISR Permit, and copper ISR technology was tested successfully, at the BHP Pilot Test site in 1997 and 1998, at the same site as the Florence Copper Project. More recently at this site, EPA Region 9 issued a Class III ISR Permit for the Florence Copper Production Test Facility (PTF) in 2017. Florence Copper has been successfully implementing ISL technology in accordance with the PTF permit and is now undertaking an aquifer rinsing demonstration. Florence Copper's commercial-scale Permit requires submittal of the PTF rinsing demonstration report before Florence Copper may be authorized to inject in the first ISCR resource block.

    EPA notes that references to other projects such as the Gunnison Project, including the operator's finances and the site-specific activities and processes at that site are outside the scope of this UIC permitting action.

16. **Comment:** Commenters assert that every ISL operation has caused groundwater degradation, asserting that some studies have suggested that groundwater quality continues to decline even after post-mining groundwater rinsing. Commenters attached a 2009 U.S. Geological Survey presentation about a study of in situ recovery (ISR) mines in Texas, which concluded that, "to date, no remediation of an ISR operation

in the United States has successfully returned the aquifer to baseline conditions." The commenters also reference NRDC's 2015 comments on proposed Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings, in which they express concerns about the feasibility of restoring groundwater to meet primary or secondary limits and uncertainty over the protectiveness of alternative concentration limits.

EPA Response: The commenter refers to a USGS study that documented challenges restoring groundwater results at ISR uranium mines. The restoration results at ISR copper operations at the Florence Copper site are not directly comparable to results at uranium ISR mines due to numerous factors, including differences in geological settings, geochemical reactions, and mobilizing solutions applied to recover copper versus uranium.

The commenter's reference to the January 26, 2015 EPA proposed rule for Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings in support of their post-closure comments is not relevant to this Permit, as the proposed rule applies to commercial uranium mines, not to ISR copper mining. In addition, ISR uranium mining is conducted in sedimentary rocks (sandstone primarily) while ISR copper mining at the Florence Copper site is in highly fractured igneous rock. ISR uranium mining typically applies an oxidation reaction to mobilize uranium oxide using sodium bicarbonate as an oxidizing agent, while the Florence Copper project will inject dilute sulfuric acid to dissolve and mobilize copper in the pregnant leach solution. Therefore, restoration of ISR copper operations at the Florence Copper site are not directly comparable to results at uranium ISR mines.

The aquifer restoration of the BHP pilot project described above was completed successfully in 2004. The required rinsing demonstration report for the existing PTF will have to be submitted and approved before authorization to inject is provided under this Permit. Part II.I.3. of the Permit requires that Florence Copper evaluate the success of restoration of each resource block after one year of post-rinse monitoring and submit a restoration report that documents the impacts and long-term stability of meeting the closure criteria requirements. Further, if Florence Copper does not meet the restoration requirements and EPA determines that Florence Copper may cause an exceedance of a primary MCL under 40 C.F.R. Part 141 or may otherwise adversely affect the health of persons, then EPA may require Florence Copper to cease injection of mining solutions until Florence Copper demonstrates that it is meeting the closure criteria requirements.

17. **Comment:** Commenters expressed concern about the toxic nature of the composition of the lixiviant. Commenters noted that the fact sheet should describe its expected pH (as low as 1). A commenter asserts that Florence Copper is using per- and polyfluoroalkyl substances (PFAS) in its operations and there is no information on whether the water treatment process removes PFAS before injection. The commenter also asserts that Florence Copper should describe how it will handle and dispose of PFAS-containing chemicals and treat process water for PFAS.

    EPA Response: Injection fluids will be limited to those fluids authorized in Part II.E.6. of the Permit and generated by the FCP operation. Florence Copper provided information about the forecasted composition of the injectate in their Permit application, which EPA incorporated into the Permit at Table 1 of Appendix E. The Permit notes that injection fluid may not be modified by Florence Copper unless approved by EPA. Although it is not in the Fact Sheet, the Permit provides that the ISCR process initially involves injecting lixiviant that contains approximately 99.5 percent water mixed with 0.5 percent sulfuric acid with a pH of approximately 2 and not less than, 1 as specified in Part II.E.6.d. of the Permit.

    The injected solution dissolves the copper bearing minerals, is subsequently recovered from the oxide and may be re-acidified and re-injected to increase copper concentrations to develop a copper enriched

Pregnant Leach Solution (PLS). The PLS is pumped to the Solvent Extraction and Electrowinning (SX/EW) plant to be stripped of copper and becomes "barren" raffinate solution. The raffinate solution is recirculated for injection in the wellfield. The raffinate is reacidified prior to injection by removing a small portion of raffinate and replacing with fresh sulfuric acid to maintain solution chemistry for reinjection.

Regarding the comment alleging that Florence Copper is injecting PFAS, according to records for the PTF, a PFAS with the ingredients of Fluoroalkyl Acrylate Adduct and water is used as an Acid Mist Suppressant in the SX/EW processing plant. This is a fluorochemical additive that helps suppress sulfuric acid mist for worker protection during the electrowinning stage of copper production. This chemical is not directly added to the recirculated injection fluids.

The Permit limits the injected fluids to a dilute sulfuric acid solution that includes inorganic and organic constituents as defined in the Permit. Inorganic constituents in the recirculated in-situ solutions are a product of both process chemicals as well as chemical reactions resulting from the interaction of raffinate with the host rock of the Oxide zone during ISCR wellfield operations. The PFAS chemical is not identified in the chemistry predictions of injected fluids in Table 1, Appendix E of the Permit as described in the response to comment #9. If any part of the process chemicals remains in the recirculated raffinate to the Oxide zone, including any PFAS, it would be recovered with the PLS during the copper recovery operations.

Prior to commencement of operations of the Commercial scale project, the Permit requires Florence Copper to submit a report for EPA's approval of each process chemical proposed to be used in the SX/EW process. As described in the new Permit, EPA will consider approval of these process chemicals, such as PFAS, and may require constituents of the new chemicals to be added to the groundwater monitoring and/or the injectate monitoring programs, pursuant to Part II.E.6.h. of the Permit. Groundwater impacted by copper recovery operations is subject to the hydraulic control, monitoring, and aquifer restoration requirements of the Permit as described in response to comment #1 above. Residual contaminants remaining in the formation after copper recovery operations would be reduced to acceptable levels during aquifer restoration before closure of the FCP. Disposal of process chemicals and treatment of process water, including any PFAS, is beyond the scope of this UIC Permit.

Aquifer Exemption

18. **Comment:** Some commenters objected to the 1997 Aquifer Exemption, asserting that the aquifer is needed for other uses, citing drought conditions in Arizona and groundwater supply concerns due to climate change. Commenters representing landowners near the mine claim that planned development will require significant amounts of water from groundwater that is hydraulically connected to the orebody. They attached a 2016 petition to EPA, which asserted that the Aquifer Exemption regulations are not adequate given new information related to groundwater supply, treatment technologies, and contaminant fate and transport since the rules were written.

    EPA Response: As discussed in more detail in response to comment #19 below, the 1997 Aquifer Exemption is in place, has no expiration date, and is not reviewable pursuant to the Florence Copper Permit proceeding. Similarly, the 2016 Petition regarding EPA's aquifer exemption regulations is not reviewable pursuant to this proceeding regarding the Florence Copper Permit. Since the 1997 Aquifer Exemption is in place and is not reviewable pursuant to the Florence Copper permit, EPA did not reevaluate the 1997 Aquifer Exemption based upon the drought and climate change.

19. **Comment:** A commenter asserts that the LBFU does not meet the Aquifer Exemption criterion at 40 C.F.R. 146.4(b)(1) because it does not contain minerals that are expected to be commercially producible.

EPA Response: EPA issued the 1997 Aquifer Exemption, upon which the Permit relies, on May 1, 1997. The 1997 Aquifer Exemption, which has no expiration date, was issued in conjunction with the Class III UIC Permit issued to BHP Copper in 1997. EPA did not solicit comments on the 1997 Aquifer Exemption as part of the public notice for the Permit because the 1997 Aquifer Exemption is a separate and independent agency action from the Permit that is subject to separate regulatory requirements contained in 40 C.F.R. §§ 146.4 and 144.7(b).

Precedent from EPA's Environmental Appeals Board ("EAB") is consistent with and supports EPA's position that the 1997 Aquifer Exemption is a separate and independent agency action from the Permit. Southwest Value Partners ("SWVP"), one of the commenters on the Draft Permit, previously challenged the 1997 Aquifer Exemption before the EAB as part of their petition for review of the 2017 PTF Permit. In response to SWVP's challenge, the EAB held that aquifer exemption decisions are independent agency action that are not subject to the EAB's jurisdiction for reviewing permits pursuant to 40 C.F.R. § 124.19. *See, In Re Florence Copper, Inc.,* 17 E.A.D. at 419 (EAB 2017). The EAB held the following with respect to the Aquifer Exemption challenge.

> "Aquifer exemption decisions, though made using criteria set forth in the UIC implementing regulations at 40 C.F.R. § 146.4, are not themselves UIC permitting decisions or elements thereof within the meaning of 40 C.F.R. § 124.19(a). Aquifer exemption decisions are, instead, discrete "final agency actions" that delineate the boundaries of USDWs, are subject to public notice, and must be challenged in the appropriate federal circuit court of appeals within forty-five days or later if based solely on grounds arising after that deadline. *See* SDWA § 1448(a)(2), 42 U.S.C. § 300j-7(a)(2) . . . 40 C.F.R. § 144.7(b)(2)-(3)."

EAB at 419. The EAB also found that an aquifer exemption "serves as a background legal condition that must be considered by an Agency permit writer when processing UIC permit applications and the public generally when making decisions that may affect or involve USDWs." EAB at 421.

The EAB noted that if Petitioners would like EPA to reconsider the 1997 Aquifer Exemption, then Petitioners could file a petition requesting that EPA do so. *Id.* At 422. On May 5, 2020, SWVP filed such a petition (the "Petition") asking EPA to revoke or revise the 1997 Aquifer Exemption. After careful consideration, on August 15, 2022, EPA denied the Petition (the "Petition Response") because EPA determined the exempted aquifer continues to meet the 40 C.F.R §§ 146.4(a) and 146.4(b)(1) criteria for an aquifer exemption and the exempt aquifer cannot now and will not in the future serve as a source of drinking water because it has been demonstrated by the permit applicant to contain minerals that are expected to be commercially producible pursuant to 40 C.F.R. § 146.4(b)(1). Although beyond the scope of this permit proceeding, more information regarding EPA's determination that the 1997 Aquifer Exemption continues to meet the 40 C.F.R § 146.4(b)(1) criteria for an aquifer exemption is available in EPA's Petition Response. *See,* Petition Response at 26-32.

20. **Comment:** Commenters request that EPA require Florence Copper to show how they propose to comply with Arizona law that specifies a discharge shall not cause a pollutant to be present in an aquifer which impairs reasonably foreseeable uses of water (AAC § R18-11-405(A) & (C)).

EPA Response: Compliance with state law is beyond the scope of this Permit. The UIC regulations cover the construction, operation, permitting and closure of injection wells used to place fluids underground. 40 C.F.R. Parts 144-148. The EPA directly implements the UIC regulations and issues

permits in states without an approved UIC program. 40 C.F.R. § 144.1(e). Because the State of Arizona has not received approval to implement the UIC Program, the Region is the permitting authority in Arizona. See 40 C.F.R. § 144.1(e); 40 C.F.R. §§ 147.1(a-b), 147.151 (Subpart D).

Arizona also issued an Aquifer Protection Permit pursuant to state law covering portions of the proposed commercial scale facility. As noted on Arizona's website, an Arizona Aquifer Protection Permit is required for any facility that discharges pollutants to the groundwater (Arizona's Aquifer Protection Permit (APP) Compliance Assistance | ADEQ Arizona Department of Environmental Quality (azdeq.gov)). See, Arizona's Aquifer Protection Permit No. P-101704 for the FCP in the Administrative Record.

Arizona's Aquifer Protection Permit is separate and independent from EPA's UIC Permit and is beyond the scope of this permit proceeding. Although EPA does not require compliance with Arizona law, the Permit issued by EPA protects USDWs as required by the SDWA. Parts II.B.2-3 prohibit migration into and between USDWs during the life of the Permit, and Part II.B.3. requires protection of USDWs by requiring restoration of groundwater in each resource block to MCLs or pre-operational levels if those concentrations exceed MCLs. Various other provisions of the Permit protect USDWs by requiring mechanical integrity of wells, extensive monitoring, and contingency actions if necessary.

Groundwater Modeling

21. **Comment:** A commenter asserts that the groundwater modeling for the Florence Copper project is based on incorrect assumptions that the orebody is homogeneous.

    EPA Response: The EPM model utilized to inform the Permit application is appropriate for the purpose of constructing a groundwater model of the orebody, with variations for consideration of fault zones that may provide preferential flow paths.

    EPA determined that for the purposes of the Permit application, heterogeneity has been adequately addressed. Fractures are so pervasive that the ore zone rock consists largely of rubble, as evidenced in cores. The heavily fractured nature of the Bedrock Oxide zone cannot be modeled on the basis of individual fractures or fracture zones.

    Testing performed before and during operation of the PTF facility (e.g., tracer tests and aquifer pump tests) informed an understanding of subsurface characteristics of the Bedrock Oxide zone, overlying basin fill units, and the confining Middle Fine-Grained Unit (MFGU) within the AOR. Based on this testing, EPA required Florence Copper to modify the model to account for higher hydraulic conductivity in the plane of the major fault zone that intersects the FCP orebody. These modeling modifications included the evaluation of seven possible scenarios of porosities, hydraulic conductivities, preferential flow in the plane of the Sidewinder Fault Zone, and localized absence of the MFGU confining layer, which were based on information provided in the UIC Permit application and studies or reports associated with the application. An assumed worst-case scenario with loss of hydraulic control for thirty (30) days was the basis in all scenarios except for the 48-hour basis applied in the Scenario 1 base model. The knowledge gained during the PTF informed modeling for the commercial-scale project. See EPA's responses to comment #22 for additional information on EPA's evaluation of these tests.

    Additionally, prior to injection, Part II.C.9. of the Permit requires Florence Copper to perform aquifer pump tests in the resource blocks in order to evaluate subsurface characteristics of the Bedrock Oxide zone, overlying basin fill units, and the confining MFGU within the FCP AOR. Testing will be conducted to confirm hydraulic data and to further characterize formation hydraulic variability across the site, including faulted areas. The results of the aquifer tests will be compared to parameters used in the groundwater flow model, and the model parameters will be revised accordingly if the resulting test

parameters are significantly different from those used in the original model. The geophysical logs and aquifer pump testing required before ISCR operations begin in each block will provide additional data specific to the FCP that can be used to modify key model parameters and improve the accuracy of the model predictions.

Even considering the heterogeneity of the Oxide zone, ISCR fluids will not migrate beyond the lateral extent of the wellfield as long as hydraulic control is maintained. The UIC Permit requirements for maintaining an inward head gradient by means of extracting at least 6% more fluid than is injected, and monitoring electrical conductivity in observation wells, will ensure that ISCR fluids are contained within the wellfield. In addition, the required monitoring above the Oxide zone will confirm that ISCR fluids are contained within the Oxide zone during operations.

22. **Comment:** A commenter asserts that data collected before and during operations at the PTF show evidence of aquifer heterogeneity, and cited the following:

    - Pre-operational spinner flow meter surveys and neutron porosity logging results with several long intervals with little or no inflow, and several shorter intervals where almost all the inflow occurs.
    - The results of an August 2018 tracer test that shows inconsistency as to which ports received detectable dyes.
    - Differences between information on monthly water table maps and Florence Copper predictions. The commenter asserts that the smooth contours outside the mined area are not based on actual data or reflect actual conditions.
    - Changes in water well elevations over short periods of time in the absence of significant operational changes.

    EPA Response: As part of its oversight responsibilities for the PTF, EPA reviewed the testing data to which the commenter refers.

    EPA reviewed the spinner flow profiling results for four wells and concluded that the results did indicate vertical differences in horizontal hydraulic conductivity, with greatest flow in the upper screened interval. However, the results were consistent with the lithologic description of the upper part of the oxide bedrock consisting of weathered bedrock fragments, which is expected to have higher hydraulic conductivity than the lower parts. EPA did identify discrepancies between the spinner flow profiling and the groundwater flow modeling, where the lower layers of the model domain are hydrologically controlled by the Sidewinder fault zone and associated high secondary permeability.

    The model simulations reflect a worst-case scenario wherein the Sidewinder fault acts as a preferential flow pathway and represents a conservative assessment of the distance that fluid may flow if such a pathway existed. These model simulations were completed prior to drilling, construction, and testing of the PTF wells and consequently, spinner flow meter data were not available to validate assumptions regarding hydraulic properties of the Sidewinder fault. The spinner flow meter data in the lower portions of the wells reflects relatively lower flow indicating that the Sidewinder fault is not a preferential flow pathway, and that the model therefore conservatively overestimates the effect of a potential fluid excursion at depth.

    EPA also reviewed the neutron density logs run in well R-01 and four injection wells in the PTF wellfield. EPA found that the calculated porosity values from the logs for the Bedrock Oxide unit are close to those applied in the groundwater flow model. The porosity values calculated for the alluvial

units were somewhat lower but are within the range of values determined by previous site-wide testing, considering the limitations of the logging tool in the oversized borehole in the alluvial sections of the wells.

EPA acknowledges that tracer test results did show both horizontal and vertical heterogeneity. The wells monitored for the tracer test showed fluorescein breakthrough within about three (3) to seven (7) days, which was well within the fourteen (14) days anticipated in the formation testing plan. EPA recommended that Florence Copper continue to evaluate and adjust operational conditions during operations and evaluate additional information on heterogeneity within the formation. For example, during rinsing operations for the PTF, Florence Copper was able to adjust operations to address higher sulfate levels in specific areas of the wellfield (e.g., by shifting rinsing and pumping operations in those specific areas).

The differences between information on monthly water table maps and Florence Copper predictions that the commenter describes do not necessarily indicate a loss of hydraulic control. As noted above, the water level data and other information generated during operations allow the Permittee to adjust facility operations to ensure that fluids do not migrate from the wellfield. A lack of contours outside of the mining area likely reflects a lack of activity, consistent with the limited scope of the PTF. Finally, changes in water well elevations over short periods of time do not necessarily reflect a loss of hydraulic control.

As noted in the previous response, the heterogeneity of the orebody was adequately addressed in the model and Florence Copper has implemented, and the Permit requires Florence Copper to continue to implement, appropriate adjustments to operations and monitoring to address any unanticipated results.

23. **Comment:** A commenter cited data from the Broken Hill Properties (BHP) project in the mid-1990s, including hydro-physical logging data, a tracer test, and cross sections of the orebody as evidence of heterogeneity of the orebody.

    EPA Response: EPA reviewed information about the BHP project as part of its decision-making process for the PTF. See the Response to Comments for the PTF, #4, #11, and #58 (December 20, 2016). Based on our review of all BHP Pilot Test information and data provided by Florence Copper, EPA found no basis to deny the UIC Permit for the PTF or the commercial-scale project. None of the data or reports showed evidence that hydraulic control was lost without regaining control during the short 105-day duration of hydraulic control demonstration, or during the rinsing and monitoring operations that followed until 2004 when aquifer restoration was achieved, and EPA approval was given to cease the rinsing operations. While EPA acknowledges that BHP Pilot Test data indicated that hydraulic control was temporarily lost in two brief occurrences during the hydraulic control test, it was detected and regained within 24 hours in both occurrences through operational modifications, as required by the BHP Permit. The prompt and successful restoration of hydraulic control in those instances demonstrates the ability to restore hydraulic control during operations with similar but more stringent monitoring requirements for the Florence Copper project.

    In addition, the UIC Permit for the commercial-scale Florence Copper facility is significantly different from the BHP Permit in that it requires outer observation and inner perimeter wells to be placed along the outer edge of the active wellfield. Observation wells will be used to detect potential lateral excursions of ISCR fluids between recovery wells. Perimeter wells will be used for additional pumping to maintain hydraulic control and to monitor water levels for ensuring maintenance of the required inward gradient. The Permit also requires ACDs on all injection, recovery, perimeter, and observation wells at the limits of the Aquifer Exemption and on 10% of wells at the LBFU/Oxide zone interface as an early warning of any upward ISCR fluid movement. Contingency monitoring wells will be used above the

orebody in each resource block if ACD testing is inconclusive. In contrast, no perimeter wells and fewer observation wells were installed near the BHP wellfield for the earlier BHP Pilot Test.

The tracer tests at the BHP project referenced by the commenter are not necessarily representative of flow at the Florence Copper project. Furthermore, the same POC monitoring wells used for the BHP Pilot Test will be used with additional monitoring wells placed in the USDW of the basin fill units above the exempt aquifer situated along the western boundary of the ISCR area and placed at the major faults between the ISCR area and the Aquifer Exemption boundary. See the response to comment #5 above for details on the adequacy of monitoring.

EPA expects that with additional safeguards built into the modeling, testing procedures, and monitoring under Florence Copper's Permit (relative to the Permit requirements for the BHP Pilot Test), hydraulic control of the FCP will exceed that experienced during the successfully completed BHP Pilot Test. Testing and performance of the PTF facility has furthered EPA's confidence in issuing the Permit for the commercial-scale FCP.

24. **Comment:** A commenter cites a 2014 legal challenge to ADEQ's proposed Aquifer Protection Permit (APP) for the PTF project and claims that EPA ignored the presiding state of Arizona Administrative Law Judge's finding that "ADEQ unreasonably and improperly accepted the Permittee's assumption that the aquifers impacted by mining will act as a homogenous geologic unit (equivalent porous media)..."

    EPA Response: ADEQ's Aquifer Protection Permit is beyond the scope of EPA's UIC Permit pursuant to the SDWA. ADEQ's Aquifer Protection Program is independent from the federal UIC program. Although EPA evaluated a number of technical issues that Florence Copper included in their UIC Permit application that were also part of ADEQ's APP evaluation, EPA did so independently pursuant to SDWA and the UIC regulations. See EPA's response to comments #21-22 above for a discussion of how EPA evaluated aquifer heterogeneity.

25. **Comment:** A commenter requested that Florence Copper update the model using operational data and demonstrate that injection will not impact the LBFU, that the recalibrated flow model be used in updating Florence Copper's transport model, and that the geochemical model be reviewed for consistency with all other information.

    EPA Response: The modeling that supported the permitting decision for the commercial-scale project is based on site-specific information, including operational information and data gathered during PTF testing and operations, as well as planned operational parameters as defined in the Permit limits for the commercial-scale project.

    EPA considers ground water modeling to be an acceptable simulation and prediction of aquifer flow conditions, and appropriate for the geologic conditions observed and hydraulic properties measured at the FCP property.

    Modifications to Florence Copper's modeling for the PTF informed the characterization and modeling of the commercial-scale project. The model was updated in 2019 to incorporate pumping and water level data from 2010 through 2017, and to incorporate hydraulic parameters for the Bedrock Oxide Unit developed from pump tests and geophysical logging conducted at the PTF wellfield. The calibrated extended model was used to perform predictive transport evaluation. The model simulations described in the commercial-scale application show that the extent of vertical migration of fluid into and through the LBFU is closely related to the balance of injection and recovery rates. Where the recovery rate is greater than the injection rate as required in the Permit, injected solution does not migrate into the LBFU or to the LBFU/MFGU contact.

EPA agrees that the geochemical model should incorporate and be consistent with other information about the site. One of the objectives of the PTF was to develop a geochemical model for possible future ISCR operations at the site and provide a reliable basis for predicting the geochemical performance of any future ISCR operations at the site. The predictions of geochemical performance were updated for planning and design of the commercial-scale site using measured field data, laboratory results, historical data, and geochemical modeling results generated from prior site owners and the PTF operations. In the application for the commercial-scale project, the geochemical model results refined forecasts of process solution composition and compared favorably to geochemical data generated from the PTF operations. Part II.I.3. of the Permit requires further geochemical modeling for the commercial scale project to consider the long-term conditions of restoration.

Additionally, as described in response to comment #21 above, prior to injection for the commercial scale project, Part II.C.9. of the Permit requires Florence Copper to perform aquifer pump tests in the resource blocks to evaluate subsurface characteristics of the Bedrock Oxide zone, overlying basin fill units, and the confining MFGU within the FCP Area Of Review. The results of the aquifer tests or log porosities will be compared to parameters used in the groundwater flow model, and the model parameters will be revised accordingly if the resulting parameters are significantly different from those used in the original model for the affected ISCR wellfield area.

26. **Comment:** A commenter requests that Florence Copper be required to perform a post-closure audit of the PTF to validate the model using compliance monitoring data on recovered volume to injected volume, inward hydraulic gradient, maximum injection pressure, and water quality data. The commenter asserts that Florence Copper's finding that the pilot project produced no "new hydrologic, lithologic, or geophysical data" that require a modelling update is inaccurate and violates the audit requirement of the PTF Permit.

    EPA Response: The purpose of the post-closure audit of the PTF was to determine if the parameters in the model matched operational data. EPA determined that the model was validated, and therefore there was no need to revise any parameters. To clarify, Florence Copper did collect operating and monitoring data, including new hydrologic, lithologic, and geophysical data, as required by the PTF Permit. However, the new data collected were found to be consistent with the model parameters used, and therefore validated the modeling approach.

    For the Commercial scale project, the original model for the PTF was updated to include regional pumping well data and water level data extended from 2010 through 2018 and calibrated to match observed water level data at the site as documented in a technical memorandum dated June 12, 2019, in Exhibit A-2 and B-5 of the UIC Permit application. No change in the hydraulic properties of the model were needed to achieve adequate calibration. Part II.J. of the Permit requires groundwater modeling updates to be conducted annually. The modeling updates will incorporate new hydraulic information acquired from the Project's aquifer tests and geophysical logging and subsequent model re-calibration to re-evaluate the groundwater flow model's accuracy. The Permit also requires verification that the pollutant fate and transport are behaving as predicted on a specified schedule or as directed by EPA as mining, rinsing, and closure operations progress over the life of the mine.

Cumulative Effects and the National Environmental Policy Act ("NEPA")

27. **Comment:** Commenters assert that EPA did not adequately analyze the cumulative effects of granting the Permit. Commenters assert that the "cumulative impacts" analysis must review the "cumulative impacts" to resources such as air, water, wildlife, cultural resources, and neighboring properties as well as the "cumulative impacts" of other projects (including the Resolution Copper Project) citing the

Dewey-Burdock Uranium In-Situ Recovery Project Permit in Custer and Fall River Counties, South Dakota ("Dewey-Burdock Permit").

Response: EPA's Cumulative Effects Analysis for the Florence Copper Permit is consistent with the requirements of 40 C.F.R. § 144.33. The UIC regulations require EPA to consider the cumulative effects from the drilling and operation of multiple wells for area permits issued pursuant to 40 C.F.R. § 144.33. For area permits, 40 C.F.R. § 144.33(c)(3) requires EPA to consider "the cumulative effects of drilling and operation of additional injection wells" and determine that any cumulative effects are acceptable. Accordingly, EPA considered the potential cumulative effects of construction and operation of additional injection/recovery wells to impact USDWs at or near the project site and determined that the potential cumulative effects of the Permit are acceptable pursuant to 40 C.F.R. § 144.33(c)(3).

As noted in Response to Comment #28 below, EPA is not required to conduct environmental review under NEPA for UIC permits. Commenters incorrectly conflate the "cumulative effects analysis" requirements for UIC area permits pursuant to 40 C.F.R. § 144.33(c)(3) with the "cumulative impacts" requirements under NEPA. The Dewey-Burdock Permit is for a uranium mine in South Dakota for which the Nuclear Regulatory Commission performed a NEPA analysis pursuant to its licensing requirements for uranium mines. In addition, the Dewey-Burdock Permit is beyond the scope of this permit proceeding.

To meet the requirements of 40 C.F.R. § 144.33(c)(3) for a proposed area permit, EPA evaluates cumulative effects on a project-by-project basis. EPA is not required to consider the "cumulative impacts" to resources such as air, water, wildlife, cultural resources, or other projects, such as Resolution Copper project, which is approximately 25 miles beyond the Area of Review for the Florence Copper Permit, as part of its cumulative effects analysis pursuant to 40 C.F.R. § 144.33(c)(3). EPA summarized the protective provisions that are contained in the Permit and found the following in its Cumulative Effects Analysis:

> The Draft Permit sets construction and operating requirements to protect underground sources of drinking water (USDWs) from contamination from the proposed injection activity. EPA has concluded that the requirements in the Draft Permit are protective to prevent impacts to groundwater quality in the surrounding USDWs. The protective drilling and construction requirements in the Draft Permit are designed to prevent vertical and lateral migration of in-situ copper recovery (ISCR) injection fluids, process by-products, or formation fluids out of the approved injection zone and must be met before EPA will authorize operation of the injection/recovery wells. Construction, operational, restoration and closure requirements work together to prevent ISCR solution migration out of the injection interval and into USDWs, and the extensive monitoring program in the Draft Permit is designed to detect any potential threat to USDWs in a timely manner enabling the Permittee to implement mitigation measures before USDWs are impacted. Based on the proposed requirements and direct knowledge obtained by previous regulation of injection activities within the permit area, EPA has determined that the potential cumulative effects of this permit action are acceptable because migration of mining fluids will be prevented from causing groundwater impacts to USDWs that may exceed maximum contaminant levels (MCLs) under 40 C.F.R. Part 141.

In addition, EPA's Cumulative Effects Analysis evaluated the potential for Spills and Leaks at the surface, including an evaluation of the requirements of the Arizona Department of Environmental Quality's (ADEQ's) Aquifer Protection Permit No. P-101704 requirements to protect groundwater from surface releases. More specifically, EPA's Cumulative Effects Analysis acknowledged that the state's Aquifer Protection Permit contains protections to protect groundwater from surface releases and Part II.E.1. of

the Permit incorporates by reference the Operations Plan into the Permit in Appendix E. The Operations Plan requires monitoring of the ISCR process that includes monitoring and prevention of spills and leaks of process solutions to protect the shallow groundwater and the response required to contain and correct a problem from process solutions, water, and runoff-surface impoundments. The Cumulative Effects Analysis also noted ADEQ's Aquifer Protection Permit requires surface impoundments must be double-lined with leak collection and removal systems and runoff ponds have to be single lined.

EPA's Cumulative Effects Analysis for the Florence Copper Project thoroughly evaluated the potential for multiple injection wells to impact groundwater and USDWs that may be impacted by the Florence Copper project pursuant to 40 C.F.R. § 144.33(c)(3) and determined that the impacts were acceptable.

28. **Comment:** Commenters acknowledge that EPA's UIC regulations at 40 C.F.R. § 129.9(b)(6) provide that UIC permits are not subject to the environmental impact statement (EIS) provisions of the NEPA, but they assert that this regulation is premised upon EPA providing the functional equivalent to a NEPA EIS. Commenters assert that NEPA is not satisfied because the Florence Copper cumulative effects analysis is not functionally equivalent to what would be evaluated under NEPA.

EPA Response: Forty C.F.R. § 124.9(b)(6) expressly exempts UIC permits from NEPA. As noted above, Commenters incorrectly conflate the cumulative effects analysis requirements for UIC area permits pursuant to 40 C.F.R. § 144.33(c)(3) with the cumulative impacts requirements under NEPA and assert that EPA must review the cumulative impacts to resources such as air, water, wildlife, cultural resources, and neighboring properties to be functionally equivalent to NEPA citing functional equivalence cases under NEPA.

The functional equivalence cases cited by commenters under NEPA do not reference 40 C.F.R. § 124.9(b)(6). EPA's Environmental Appeals Board ("Board") directly addressed 40 C.F.R. § 124.9(b)(6) and the applicability of NEPA for UIC permits in *American Soda LLP. See, UIC Appeal Nos. 00-1 & 00-2, Order Denying Review*, June 30, 2000, at 289-292. In *American Soda LLP,* the Board found "40 C.F.R. § 124.9(b)(6) dispositive on the question of the UIC permit program's functional equivalence to NEPA" and held that NEPA is not required for UIC permits. In addition, the Board in *American* Soda declined to allow Petitioners to challenge the codification of 40 C.F.R. § 124.9(b)(6) in the permit proceeding citing *In re Woodkiln, Inc.*, 7 E.A.D. 254, 269 (EAB 1997) and *In re Suckla Farms, Inc.*, 4 E.A.D. 686, 698 (EAB 1993). Therefore, consistent with 40 C.F.R. § 124.9(b)(6), NEPA does not apply to the Florence Copper Permit. Thus, EPA is not required to review the cumulative impacts to resources such as air, water, wildlife, cultural resources, and neighboring properties pursuant to NEPA as asserted by commenters.

Commenters also cite the Board's decision in *In re: Phelps Dodge Corporation, Verde Valley Ranch Development*, 10 E.A.D. 460, (May 21, 2002) ("*Phelps Dodge"*). However, *Phelps Dodge* does not support commenters functional equivalence argument. *See, Phelps Dodge* at 484, finding that the Board "need not decide whether the NPDES permitting analysis engaged in by Region IX in this instance was functionally equivalent to NEPA, for the entire concept of functional equivalence is misplaced here" because NPDES permits, except for new sources, are exempt from NEPA by the Clean Water Act. For UIC permits, the exemption is regulatory pursuant to 40 C.F.R. § 124.9(b)(6), but as noted above the Board reached the same conclusion in *American Soda*.

Although EPA is not required to consider effects to cultural resources and wildlife as part of its cumulative affects analysis for area permits pursuant to 40 C.F.R. § 144.33(c)(3) or NEPA, EPA did consider and address cultural resources pursuant to the National Historic Preservation Act (NHPA) and potential impacts to endangered and threatened species pursuant to the Endangered Species Act (ESA) consistent with 40 C.F.R. § 144.4.

EPA conducted an extensive NHPA process for the Florence Copper Permit and engaged in government-to-government consultation with interested Tribes regarding potential impacts to cultural properties. The Florence Copper Property contains known archaeological sites and cultural resources that are eligible for inclusion in the National Register of Historic Places (NRHP). In compliance with Section 106 of NHPA and its implementing regulations, EPA identified the Area of Potential Effect as the entire Florence Copper property. Pursuant to 36 C.F.R. § 800.5(a), EPA found that the proposed project may have adverse effects on historic properties within the Area of Potential Effect because the project may directly or indirectly alter the characteristics of some of the historic properties. EPA notified the Advisory Council on Historic Preservation (ACHP) of the finding of adverse effects and ACHP elected to participate in the Section 106 Consultation process. In addition, EPA identified, in coordination with the Arizona State Historic Preservation Office (SHPO), consulting parties in accordance with 36 C.F.R. § 800.2. The consulting parties include four federally-recognized tribes, Gila River Indian Community, the Hopi Tribe, Tohono O'odham Nation, and Yavapai-Prescott Indian Tribe, in addition to the Arizona State Historic Preservation Office, the Arizona State Land Department (ASLD), the National Park Service, the Arizona State Museum, Archaeology Southwest, the Town of Florence, and the Bureau of Indian Affairs (BIA) – San Carlos Irrigation Project.

EPA consulted with all parties to identify historic properties, assess effects, and resolve potential adverse effects to historic properties from this undertaking through the Programmatic Agreement. The Programmatic Agreement was effective upon signature by the ACHP. The Programmatic Agreement requires the following: 1) Florence Copper shall, if possible, avoid adverse effects to historic properties; 2) where avoidance is not possible, Florence Copper shall minimize or mitigate adverse effects to historic properties through implementation of the Historic Properties Treatment Plan; and 3) Florence Copper has agreed to additional mitigation pursuant to the Escalante Ruin and Poston Butte Ball Court Protection Plan. Additional information with respect to EPA's NHPA actions and Tribal consultation is contained in EPA's Fact Sheet for the Draft Permit and the separate Response to Comments on the NHPA, which EPA issued on June 12, 2023.

With respect to the Endangered Species Act (ESA), EPA is required to ensure that any action authorized by the Agency does not jeopardize the continued existence of any endangered or threatened species or destroy or adversely modify critical habitat. As part of its review of the Draft Permit, EPA requested technical assistance from the United States Fish and Wildlife Service (USFWS) Arizona Ecological Services Field Office to determine whether federally listed or threatened species that may occur in the project area would be affected by the proposed project. Based on informal consultation with the USFWS regarding the ESA screening analysis for the Draft Permit, EPA confirmed that there were no areas within the proposed project boundaries that are designated or proposed for designation as critical habitat for federally listed or threatened species. For the endangered or threatened species identified as potentially present in the ESA screening analysis, EPA requested technical assistance from USFWS, and made a no effect determination in its 2022 Biological Evaluation because none of the identified endangered or threatened species are present in the action area.

Also, with technical assistance from USFWS, EPA determined that the Sonoran desert tortoise, which was a candidate species for listing, may occur in the action area for the project, but, if present, will likely only occur transiently. As a candidate for listing, the Sonoran desert tortoise did not have protections under the ESA. However, Florence Copper agreed to implement a Wildlife Monitoring Plan (Appendix H of the Permit), which includes measures for protection of the Sonoran desert tortoise.

In July of 2023, EPA updated the ESA screening analysis for Florence Copper prior to making its final permit decision. The updated screening analysis identified two additional endangered species for

consideration in the action area. The new species are the ocelot (*Leopardus pardalis*) and the Gila chub (*Gila intermedia*). After technical discussions with the USFWS, EPA made a no effects determination for both species in its updated Biological Evaluation. For the Gila chub, EPA determined the action area does not contain suitable habitat. For the ocelot, EPA determined that the ocelot is unlikely to be present in the action area given the vegetation type and surrounding land uses and that the action area does not contain suitable habitat for the ocelot or provide a wildlife corridor.

Other Comments

29. **Comment:** Commenters asked EPA to reissue the draft Permit and initiate at least a 90-day public comment period because commenters assert that the draft Permit is incomplete.

    EPA Response: EPA disagrees that the Draft Permit needs to be reissued. The Draft Permit reflects EPA's three-year review of the extensive information that Florence Copper provided in its UIC Permit application and in response to EPA requests to clarify, modify, and supplement the application. EPA's independent review of the information submitted did not reveal any deficiencies in the application or significant issues in the Draft Permit. Based on EPA's review of all relevant information, EPA found no basis to deny the UIC Permit.

30. **Comment:** Comments about the financial assurance conditions questioned the adequacy of the surety bond to ensure that taxpayers do not have to pay for an expensive cleanup. They requested that the Permit include information on how the bond amount was calculated.

    EPA Response: To protect USDWs, Part II.L. of the Permit requires Florence Copper to "post an approved financial instrument such as a surety bond or other financial assurance in the amount of $31,357,250 to guarantee aquifer restoration, ground water monitoring, and plugging and abandonment activities for closure and post-closure" and provides the level of financial assurance shall be reviewed and updated as requested by EPA. Florence Copper must maintain this financial responsibility for the duration of UIC permit-authorized well operations, closure and post-closure.

    EPA evaluated the financial assurance estimates in Attachment F, including Exhibit F-4 of the Permit application, and determined that $31,357,250 is sufficient to cover the costs of the required aquifer restoration, ground water monitoring, and plugging and abandonment activities. The amount of the required financial assurance from the total closure and post-closure cost estimate tables, Attachment F of the application, are included in the Permit, Appendix C, Tables F-1 and F-2.

31. **Comment:** Commenters asked EPA to inventory all instances in which, they allege, EPA "waived enforcement" of the PTF Permit. The commenter references alleged mechanical integrity test failures, waivers of annual pressure tests, annulus cementing failures, and requirement that EC sensors be installed on all Westbay wells. They also asked EPA to clarify its policies and intended practices with respect to enforcement of the commercial Permit.

    EPA Response: EPA's oversight of the PTF is out of scope for the public notice of the commercial-scale UIC permit. However, EPA can clarify that all the wells in the wellfield at the PTF demonstrated external mechanical integrity by temperature logging, and Florence Copper performed the required monitoring using conductivity sensors on the observation wells through the LBFU/Oxide interface and ACDs on the Westbay wells in compliance with the Permit.

    In addition, the PTF is a pilot project and, while not every aspect of the project proceeded as planned, all issues were addressed as they arose to ensure that USDWs were protected. The purpose of the pilot was to gather information to develop and refine a model and gather data to support a potential

commercial-scale project. EPA is closely monitoring Florence Copper's implementation of the PTF Permit and ensuring Florence Copper's compliance with the Permit's terms and conditions to protect USDWs and plans to continue to do so throughout operation of the commercial-scale Permit.

The existing PTF ISCR wells, currently operating under UIC Permit R9UIC-AZ3-FY11-1, will be incorporated into the commercial-scale ISCR wellfield configuration. After Financial Responsibility requirements in Part II.L. of the Permit are met, EPA will revoke UIC Permit R9UIC-AZ3-FY11-1. Under the commercial scale Permit, the Westbay wells and monitoring wells within 500 feet of the PTF will be plugged and abandoned, in accordance with the Permit.

32. **Comment:** Commenters requested that the Permit include contingencies for a loss of hydraulic control in the event of loss of power to the facility.

    EPA Response: As described above, the Permit requires that Florence Copper maintain an injection-production ratio that will ensure that an inward hydraulic gradient is maintained and prevent the migration of fluids outside of the Oxide zone. This is accomplished by maintaining a 106% extraction to injection volume ratio and at least one (1) foot in head differential in any triplet of observation, recovery/perimeter, and POC wells used to monitor hydraulic gradient and monitoring and managing extraction and injection rates.

    Should a loss of hydraulic control occur, regardless of the cause, contingencies in Part II.H.1.b. of the Permit require Florence Copper to, within 24 hours: cease injection as necessary to restore hydraulic control; operate recovery wells until the amount recovered equals an amount sufficient to restore the ratio of fluid recovered to injected during the prior 72-hour period to a minimum of 106 percent; restore all recovery/observation/POC well triplet head differentials to at least 1 foot to verify an inward flow gradient; verify proper operation of all facilities within the ISCR wellfield; and perform any necessary repairs.

    In the unlikely event of a loss of power, it is unlikely that fluids would migrate away from the orebody. As described in the Permit application, if power is lost to the recovery wells, power would also be lost to the injection pumps and injection will cease. In such an event, the solution remaining in the subsurface would migrate at the same rate as ambient groundwater flow. Injection would not recommence until hydraulic control would be reestablished in accordance with the Permit conditions.

    In addition, injection without hydraulic control for extended periods is not realistic because all ISCR solutions are continuously recycled. Consequently, a loss of all recovery well pumping capacity will quickly result in the cessation of injection due to the lack of solution. Contingency plans described above and detailed in the Permit identify actions to be taken in the event of the loss of hydraulic control.

    Furthermore, in the Permit application, Florence Copper estimated the maximum horizontal distance of fluid migration for a worst-case condition of a loss of hydraulic control for 30 days using the FCP groundwater flow model. This worst-case condition had the worst-case variations in hydraulic parameters and 30 days of injection without recovery well pumping, which as noted, is not likely to occur for a loss of power at the facility. The maximum horizontal distance of fluid migration for this worst-case condition was approximately 250 feet. When considering loss of hydraulic control for 48 hours, the maximum estimated horizontal migration distance of lixiviant was only approximately 138 feet.

    Under this worst-case condition of a loss of hydraulic control for 30 days, the injected solution would migrate vertically further into the LBFU and migrate to the LBFU/MFGU contact where the LBFU is thinnest (80 feet) because of the upward hydraulic gradient generated by imbalanced injection. Under

normal operating conditions, where the recovery rate is greater than the injection rate, injected solution does not migrate into the LBFU as demonstrated by modeling and operation of the PTF.

The AOR is equivalent to the area of the ISCR well field and a circumscribing width of 500 feet. Therefore, under this worst-case condition with a 30-day loss of hydraulic control and continued injection, injected fluids would still remain within the AOR with a factor of safety of between 2 and 4 times the actual distance injected fluids would migrate under a 30-day loss of hydraulic control.

33. **Comment:** A commenter expressed concern that mining could release trapped radon gas.

EPA Response: If the commenter is concerned that radon gas could contaminate ground water, Part II.F.2.b. of the Permit requires Florence Copper to sample annually for a suite of radioactive parameters, which include radon. Should any exceedance occur at a POC or monitoring well, Part II.H.2. of the Permit identifies the specific actions Florence Copper must take, including collecting a verification sample within five (5) days and notifying EPA of the results. If the results indicate an exceedance, Florence Copper must submit a written report to EPA within ten (10) days providing an evaluation of the cause, impacts, or mitigation of the discharge responsible for the AL exceedance or demonstrating that the AL exceedance resulted from an error in sampling, analysis, or statistical evaluation. EPA may require additional monitoring and/or any actions that EPA determines are necessary to address an exceedance in accordance with the conditions at Parts II.H.2.a.v., II.H.2.b.v. and II.I.3.

The Permit also requires Florence Copper to rinse the aquifer once injection operations cease so that water quality is returned to MCLs or pre-operational background levels if greater than MCLs, thereby further ensuring that any constituents in the groundwater would not migrate beyond the wellfield.

If the commenter is concerned about leakage of radon gas to the air, that is outside the scope of the UIC Permit. However, given the depth of the orebody and the presence of the MFGU that acts as a confining layer, escape of trapped radon to the surface due to the mining operations is highly unlikely. Moreover, the monitoring and mitigation actions described above would be expected to detect and address increased radon concentrations above the AL at monitoring wells. If radon gas was brought to the surface during recovery operations, it would not pose a significant health risk to the public because the radon disperses rapidly into the atmosphere.