**Responsiveness Summary to Public Comments**
**for**
**The Issuance of an Underground Injection Control (UIC) Permit**
**for**
**Sandstone Development LLC**

On July 29, 2021, the U.S. Environmental Protection Agency (EPA) Region 3 issued a public notice requesting comment and the opportunity for a public hearing for the proposed issuance of an Underground Injection Control (UIC) permit, PASR420BMCK, to Sandstone Development LLC. EPA did not receive a request to hold a public hearing.

The responsiveness summary which follows provides answers to 18 written comments that were raised and sent to the attention of EPA Region III. EPA wishes to thank the commenters for their informative and thoughtful comments.

1. COMMENT: *The permit should not be granted. Sandstone Development LLC submitted a US EPA permit on 3/15/2021 to convert a conventional well to a Class II-R (enhanced recovery) Underground Injection Control (UIC) well. Federal UIC Class II statutory mandates fail to address the hazards associated with the oil and gas industry operation while also lacking oversight with self-reporting. There is no measurable assurance water resources are protected.*

RESPONSE: The EPA Region III UIC program has utilized the construction and testing standards discussed below for injection wells in Pennsylvania since it started implementing the UIC program in June 1984. EPA continues to find that these requirements effectively protect Underground Sources of Drinking Water (USDWs) from the subsurface injection of Class II fluids.

A provision of the UIC regulations, 40 C.F.R. § 147.1955(b)(1), requires an injection well's surface casing to be placed at least 50 feet below what is determined to be the lowermost USDW. The surface casing must also be cemented to the surface. The surface casing is an impermeable steel casing that encapsulates the long string casing and injection tubing and prevents fluids from entering or leaving the borehole. The top of the lowermost USDW, where the proposed injection well will be located, is found at a depth of approximately 360 feet below ground surface. The well is constructed with 502 feet of surface casing that is cemented back to the surface, as required by Paragraph III.A.2.c of the final Permit.

Pennsylvania well requirements, 25 Pa. Code § 78.83, similarly incorporate protective casing and cementing procedure requirements, including a requirement that the operator "drill to approximately 50 feet below the deepest fresh groundwater". 25 Pa. Code § 78.83(c). The depth of the surface casing in the proposed injection well will exceed both the federal and state requirements.



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In addition, the final Permit requires long string casing to be set above the shallowest injection zone, approximately 1,860 feet below ground surface and cemented back to the ground surface. Injection tubing and packer (a device lowered into the well to produce a fluid-tight seal) is then set inside the long string casing and injection occurs through the tubing and packer. The surface casing, the long string casing, and tubing and packer provide three layers of protection for the USDWs. Sandstone Development will also have to meet any additional well construction conditions required by the PADEP.

The casing in the proposed well is designed to withstand both significant internal and external pressure. Prior to operation, EPA requires that the proposed well be tested for mechanical integrity. Cementing records and logs are required to show that the well has adequate cement to prevent fluid migration out of the injection zone and an internal pressure test is required to ensure that the casing, tubing, and packer will not leak during the well's operation. The internal pressure test requires the annulus of the well (the space between the long-string casing and the tubing and packer) to be pressure tested to ten percent above the permitted maximum allowable injection pressure (1,235 psi) and held for at least 30 minutes, with no more than a five percent loss in pressure allowed. The well will shut down if a seismic event that affects its mechanical integrity were to occur, because the well will be designed to automatically cease operation if there is a mechanical integrity failure. The applicant submitted, and EPA verified, geological information indicating the absence of faults in the injection and confining zones in the vicinity of the proposed injection wells that would allow for the migration of fluid out of the injection zone.

2. COMMENT: *Cumulative impacts of oil and gas related activities in the Upper Allegheny basin have an effect on the Allegheny River and Seneca Nation territory, yet the capacity of the Upper Allegheny watershed to handle existing and proposed oil and gas development has never been assessed.*

RESPONSE: The capacity of the Upper Allegheny watershed to handle existing and proposed oil and gas development is regulated at the state and local level. The UIC regulations were designed to protect USDWs and the UIC Program only provides EPA with the authority to regulate subsurface injection activities within the oil and gas sector. The final Permit adheres to the UIC Regulations, found in 40 C.F.R. Parts 144-147, which address subsurface injection activities and provide a regulatory scheme which ensure the occurrence of thorough and proper siting, casing, monitoring, and confinement activities that are protective of USDWs. The Bradford Third sandstone reservoir has been studied by the Permittee and has been extensively utilized for enhanced recovery in northwestern Pennsylvania. According to the article entitled "[ HYPERLINK "https://archives.datapages.com/data/phi/v14_2013/harper.htm" ]" by John A. Harper of the Pennsylvania Geological Survey (retired), "The primary reservoir, the Bradford Third sand, was the most intensively studied oil reservoir in the world during the early and mid-20th century." The above comment refers to effects on surface water in the Upper Allegheny basin, which is not within EPA's UIC permitting and decision-making authority. However, EPA notes that the final Permit's conditions, which ensure the proper siting, construction, operation, monitoring, and closure of the Moody Lot 5 #17 well in order to prevent fluid movement to

USDW, will also protect surface water bodies. State, county, and/or local jurisdictions may further study and regulate any additional, or cumulative impacts that oil and gas related activities may have in the upper Allegheny River watershed. Additionally, injection will take place approximately 1,500 feet below the lowermost USDW, so no impacts are anticipated on the USDW.

3. COMMENT: *The permit does not address or even mention long-term cumulative impacts. This is of particular concern since the EPA has already permitted 39 Class II ICU wells in the Allegheny River Basin, more than in any other basin in the state, plus there are many unconventional wells and numbers are increasing (the last nine drilling permits granted by PA were in Elk County).*

RESPONSE: The UIC regulations were designed to protect USDWs. The UIC Program only provides EPA with the authority to regulate subsurface injection activities within the oil and gas sector. The final Permit adheres to the UIC Regulations, found in 40 C.F.R. Parts 144-147, which address subsurface injection activities, and which provide a regulatory scheme that ensures the thorough and proper siting, casing, monitoring, and confinement activities that are protective of USDWs. The Bradford Third Sandstone formation has shown the capacity to accept produced fluids from the Permittee's oil and gas operations. The response to Comment 2 above is also responsive to this comment. These impacts are not a consideration for the EPA's UIC Permitting Program.

4. COMMENT: *UIC well construction in PA is precedent setting. From a 1/14/21 Pittsburgh Post-Gazette article: "There are approximately 180,000 Class II wells in the U.S., 20%, or 36,000 used for disposal of oil and gas drilling and fracking wastewater. The EPA estimates that more than 2 billion gallons of those fluids are injected into such wells in the U.S. each day, mostly in Texas, California, Oklahoma, and Kansas." The article also mentioned that there were only 13 injection wells in PA, 8 of which are operating. However, there are 42 permitted UIC Class 2R wells listed on the EPA's web site. Of these, 39 are located in the Allegheny River Basin, 2 in the Susquehanna River Basin but still very close to the headwaters of the Allegheny River, one in a tributary of the Ohio River. Some may be inactive, but the fact that they are almost all located in the Allegheny watershed is a concern since groundwater plays a big part in the high quality of the Allegheny River.*

RESPONSE: As a result of the preventative construction measures and operational requirements detailed in the response to Comment 1 above, EPA does not anticipate any impact on groundwater within the Allegheny watershed or surface waters of the Allegheny River.

5. COMMENT: *The proposed UIC well could affect the headwaters of 2 unnamed headwater tributaries of the East Branch of Tunungwant Creek and waterways*

*downstream (Kendall Creek, Minard Run, Tunungwant Creek, and the Allegheny River). Failures and even normal operations could increase the risk of toxic chemical and radioactive contamination of surface and groundwater. While groundwater contamination is the primary concern, there are also related risks to surface water (explosions, spills related to transport and storage, etc.). Even one spill or failure could have severe consequences. There is no way to clean up contaminated groundwater other than natural attenuation and attenuation of radioisotope contamination would take more than 1000 years.*

RESPONSE: EPA understands the commenter's concerns regarding potential spills at the well surface. However, EPA, through its UIC Program, only has jurisdiction for the permitting of subsurface injection activities. Surface spill prevention cannot be addressed through the UIC permitting process. Surface disturbances, fluid containment and spills which could occur on the injection well site are all regulated by PADEP, which is the State agency responsible for all surface construction and spill prevention at the proposed well site. In addition, Title 25, Chapter 78, of the Pennsylvania Code requires well operators to report any surface spills or releases of brine to PADEP. There may also be local or county ordinances or regulations that address surface spill prevention. When making the decision on whether to issue a UIC Permit, EPA's focus rests solely in determining whether the proposed injection operation will safely protect USDWs from the subsurface emplacement of fluids.

EPA does not anticipate any effects on headwaters of the two listed tributaries nor waterways downstream. The injection of fluids for the purpose of enhanced recovery of oil is limited by the final Permit to the Bradford Third sandstone formation in the subsurface interval between approximately 1,863 feet to 1,963 feet below ground surface. Directly above the Bradford Third formation is 25 feet of unnamed shale that will act as a confining unit for the injection zone. Additionally, between the lowermost USDW (located at 360 feet below ground surface) and the injection zone are multiple layers of shale ranging from 20 feet to 755 feet in thickness which will also act as confining units for the injection zone. Based on this, it is EPA's determination that no effects on surface waterways are expected.

6. COMMENT: *Bromide increases toxicity that is detrimental to aquatic life, particularly mussels. The Allegheny River is home to three federally listed endangered mussels. Seneca Nation waterways are home to the Clubshell, Riffleshell and Rayed Bean mussels. Therefor as part of this permit, it is necessary to include Bromide in monitoring.*

RESPONSE: EPA is legally required to comply with Section 7 of the Endangered Species Act (ESA), 16 U.S.C. § 1536, for listed endangered or threatened species, proposed endangered species, or critical habitats. On May 26, 2021, EPA Region III conducted a search approximately 1 $mi^2$ around the proposed injection well using the U.S. Fish & Wildlife's (US FWS) website, [ HYPERLINK "http://ecos.fws.gov/ipac/" ], to identify any endangered or threatened species. The official species list provided by US FWS identified one threatened species, the Northern Long-eared bat (*Myotis septentrionalis*) but made no mention of any

federally listed endangered mussels. There are no critical habitats found within the project area. The EPA made a determination that the proposed injection project will have no effect on the threatened species because injection will take place from approximately 1,863 to 1,963 feet underground. The proposed injection well is currently an active production well. Sandstone will be converting the active well into an injection well so there will be no new drilling at the site.

In addition, during the public notification period, EPA directly sent the U.S. FWS Pennsylvania Ecological Services Field Office a copy of the final Permit, Statement of Basis, and EPA memo to file explaining EPA's determination that the proposed project would have no effect on threatened species proximate to the proposed injection well. The U.S. FWS Pennsylvania Ecological Services Field Office has submitted no responsive comments to EPA regarding this proposed project.

7. COMMENT*: Injection pressure increases seismicity. The permit application includes a general PADCNR report on seismicity but no site-specific discussion. Injection well pressure caused earthquakes into Youngstown, OH, even though, similar to Potter County; the level of earthquake hazard is low there.*

RESPONSE: The SDWA regulations for Class II injection wells do not require consideration of the seismicity of the region, unlike the SDWA regulations for Class I injection wells for the injection of hazardous wastes. See regulations for Class I hazardous injection wells at 40 C.F.R. §§ 146.62(b)(1) and 146.68(f). Nonetheless, because of public concerns about injection-induced seismicity, EPA evaluated factors relevant to seismic activity as discussed below and addressed more fully in [ HYPERLINK "https://yosemite.epa.gov/oa/eab_web_docket.nsf/Attachments%20By%20ParentFilingId/0EA8C0D9BA82F48B85257CD9006624C2/$FILE/Tab%20I%20seismicity%20framework9-26-13.pdf" ]. The final Permit provides that the Permittee shall only inject produced fluids through the Injection Well and into a formation which is overlain by a confining zone free of known open faults or fractures within the Area of Review, as required pursuant to 40 C.F.R. § 146.22.

A report conducted by the *Commonwealth of Pennsylvania Department of Conservation and Natural Resources Bureau of Topographic and Geologic Survey*, [ HYPERLINK "http://elibrary.dcnr.pa.gov/GetDocument?docId=1752494&DocName=ES10_EQHazard_Pa.pdf" ] documents known epicenters found in Pennsylvania. Per the report, there are no documented cases in which the epicenter of an earthquake was traced back to McKean County, Pennsylvania, which is the location of the well. On page 7 of the report, the author states, "The great majority of earthquakes occur along boundaries between tectonic plates. The reason for this is not completely clear, but it appears that stress levels are higher along plate boundaries, and that strain energy builds up more rapidly in those areas. Eastern North America, including Pennsylvania, today is far from the nearest plate boundary – the mid-Atlantic Ridge, some 2,000 miles to the East."

The United States Geological Survey as well as the Pennsylvania Bureau of Topographic and Geologic Survey have not recorded and EPA has not been notified of any seismic activity that originated in McKean County, Pennsylvania. Sandstone's injection activity is for the purpose of enhanced recovery which has a low potential to induce seismicity due to a change in minimal formation pressure as the injection fluid replaces the volume of oil and gas extracted. The final Permit includes an injection pressure limit, the surface Maximum Allowable Injection Pressure ("MAIP"), to prevent the initiation or propagation of fractures that could create conduits for the injected fluid to flow to any existing faults. The MAIP is set at a level less than both the Instantaneous Shut-In Pressure and the fracture pressure in order to prevent the initiation of new, or the propagation of existing fractures as a result of injection activities. The Instantaneous Shut-In Pressure is the wellhead pressure immediately after pumps are shut down following a fracture treatment or test. The formula used to calculate the surface MAIP can be found in Paragraph III.B.4. of the final Permit.

8. COMMENT: *Information included in the permit application is very limited. The maps show more than 100 conventional wells in Sandstone's Moody but there is no discussion regarding numbers in the Andrus McDowell field or well types (conventional or unconventional). A short contingency plan was provided but seems insufficient given the amount of wastewater that will be injected (Avg 40 barrels /day, Max 100 barrels / day) and also stored on site (500 barrels or 12,500 gallons of wastewater plus biocides and other injection additives).*

RESPONSE: 40 C.F.R. § 146.24(2) requires "A map showing the injection well or project area for which a Permit is sought and the applicable area of review. Within the area of review, the map must show the number or name and location of all existing producing wells, injection wells, abandoned wells, dry holes, and water wells. The map may also show surface bodies of waters, mines (surface and subsurface), quarries and other pertinent surface features including residences and roads, and faults if known or suspended. Only information of public record and pertinent information known to the applicant is required to be included on this map. This requirement does not apply to existing Class II wells." 40 C.F.R. § 146.24(3) requires "A tabulation of data reasonably available from public records or otherwise known to the applicant on all wells within the area of review included on the map required under paragraph (a)(2) of this section which penetrate the proposed injection zone or, in the case of Class II wells operating over the fracture pressure of the injection formation, all known wells within the area of review which penetrate formations affected by the increase in pressure. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of plugging and complete, and any additional information the Director may require. In cases where the information would be repetitive and the wells are of similar age, type, and construction, the Director may elect to only require data on a representative number of wells. This requirement does not apply to existing Class II wells." All the information required by the regulations has been supplied. The UIC Program assesses that information to make sure the wells do not provide a conduit for fluid migration.

9. COMMENT: *Require an assessment of well integrity on the surrounding wells; well #17 was only well that had injectivity test conducted. Structural deficiencies in any nearby well will increase risks. Regulations address UIC construction, operation, monitoring & testing, reporting and closure requirements. However, no discussion regarding Sandstone's compliance record is available.*

RESPONSE: As noted in the response to Comment 16, below, EPA determined that a fixed radius Area of Review of one-quarter mile was appropriate for this well. In this instance as is the case for other UIC wells, EPA did an assessment of the Area of Review. Part of this assessment was a review of the status of all wells within the Area of Review. There are no plugged wells, and no known unplugged / abandoned wells, within the Area of Review. The Permittee indicated that it has 20 active production wells within the Area of Review, including the proposed injection well, Moody Lot 5 #17. The Permittee's submission showed that the 20 production wells were properly constructed and operated to comply with PADEP regulations. See also the response to Comment 16.

10. COMMENT: *Site geology discussion is missing from the permit application; only item provided is the 2009 driller's logs for the wells located in ¼-mile radius of well #17. An assessment of the geology is vital to prevent contamination of drinking water sources.*

RESPONSE: Geological and geophysical information is found within Attachment B of the Permit application. As stated in the attachment, "Geological and geophysical information was obtained from each of the well drillers log, as well as cross reference by the well logs provided by PENNGOLD. Fresh water was encountered approximately 100-300ft from surface while drilling on air as noted in the drillers log." The information the applicant provided in the Permit application is sufficient in EPA's understanding of where freshwater is located within the ¼-mile Area of Review.

11. COMMENT: *Very limited information was included in the permit application regarding the quality of the wastewater that will be accepted other than a lab report for one sample of unknown origin which may or may not be representative of wastewater that will be accepted, and only a few wastewater related parameters were analyzed.*

RESPONSE: The UIC Final Permit Number PAS2R420BMCK states that the Permit authorizes Sandstone Development LLC to "construct and operate a Class II-R enhanced recovery injection well… for the purpose of injecting fluids produced solely in association with oil and gas production from Sandstone Development LLC". The final Permit is not a commercial Permit; therefore, the only fluids that Sandstone Development will be allowed to inject into the proposed Moody Lot 5 #17 injection well are fluids produced as a byproduct of Sandstone Development's own oil and gas production activities. In addition, the final Permit requires that the injection fluids must be classified as Class II fluids, which are primarily brines (salt water)

that are brought to the surface while producing oil and gas. Wastewater from hydraulic fracturing activities, including the brines that are separated from hydrocarbons at the surface, can be injected into Class II wells. The fluids injected into the proposed Moody Lot 5 #17 injection well are limited by the final Permit to Class II fluids produced by Sandstone Development. Part II.C.1 of the final Permit continues, "Samples and measurements taken from the Injection Well for the purpose of monitoring shall be representative of the monitored activity. The Permittee shall obtain representative sample(s) of the fluid to be analyzed and conduct analysis(es) of the sample(s) in accordance with the approved methods and test procedures provided in 40 C.F.R. § 136.3 and EPA's SW-846 Compendium, or other methods and test procedures otherwise approved by the Director. The Permittee shall identify in its monitoring records the types of tests and methods used to generate the monitoring data." The parameters chosen for sampling reflect not only some of the typical constituents found in the injection fluid, but also in shallow ground water. Should a ground water contamination event occur during the operation of the injection well, EPA would be able to compare samples collected from ground water with the injection fluid analysis to help determine whether operation of the injection well may be the cause of the contamination. EPA believes that these Permit conditions are sufficient to adequately characterize and monitor the wastewater for injection purposes. The purpose of this monitoring is to verify that the fluids injected in the well are the type of fluids authorized in the Permit.

12. COMMENT: *The permit only requires that wastewater be samples initially then once every 2 years for a few pertinent parameters but not all major wastewater contaminants of concern. Monitoring should be required monthly for the first year of operation.*

RESPONSE: 40 C.F.R. § 146.23(b)(1) requires "monitoring of the nature of injected fluids at time intervals sufficiently frequent to yield data representative of their characteristics". The Permit states in Paragraph II.C.3 that "The Permittee shall monitor the nature and composition of the injection fluid injected into the Injection Well by sampling, analyzing, and recording the injection fluid for the parameters listed below at the initiation of the injection operation and every two (2) years thereafter, or whenever the operator observes or anticipates a change in the injection fluid." EPA regions have discretion to require monitoring for the injection fluid constituents that they deem critical to protect USDWs in their respective states or regions. Because of the nature of enhanced recovery wells and historical practices to characterize a Class II fluid within EPA Region 3's UIC Program, the Permit requirements are consistent with federal regulations and sufficient to properly characterize and to adequately monitor these fluids for injection purposes for this type of well.

13. COMMENT: *The permit does not require analyses for many contaminants of concern: radionuclides, heavy metals (Al, As, Be, Cd, Co, Cu, Pb, Li, Mo, Zn, Strontium, thallium, selenium, etc.), diesel fuel and other petroleum hydrocarbons, nutrients (TP, NH3, NO3/NO2), or VOC's (BTEX) and other organic compounds. Therefore, even if Sandstone complies with the permit, it is impossible to characterize wastewater.*



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RESPONSE: EPA regions have discretion to require monitoring for the injection fluid constituents that they deem critical to protect underground sources of drinking water in their respective states or regions. Throughout the history of the Program, Region 3's UIC Program has found that the analytical parameters listed in Paragraph II.C.3. of the final Permit are appropriate to characterize a Class II fluid and that the conditions found in Part II, Paragraphs C.2. and C.3. of the final Permit, are sufficient to adequately monitor these fluids for injection purposes. The response to Comment 12 cites the UIC regulations and Permit language that addresses injected fluid analysis.

14. COMMENT: *Additional pollutants of concern are Calcium, Phosphates, Nitrates, Potassium, Sulfates, Bromide and Strontium. Minimally, more analytes should be added to the monitoring requirements (i.e. 2,4,6-Trichlorophenol, 2-Butanone, acetone, acetophenone, benzene, ethyl benzene, glycol, methyl alcohol, o-Cresol, p-Cresol, phenolics, pyridine, surfactants, pH, turbidity, and conductivity) with increased frequency of testing for contaminants of concern (i.e. Cadmium, Chromium, Copper, and Radium).*

RESPONSE: 40 C.F.R. § 146.23(b)(1) requires "monitoring of the nature of injected fluids at time intervals sufficiently frequent to yield data representative of their characteristics". EPA believes that the analytical parameters listed in Paragraph II.C.3. of the final Permit are appropriate to characterize a Class II fluid and that the conditions found in Part II, Paragraphs C.2. and C.3. of the final Permit, are sufficient to properly characterize and to adequately monitor these fluids for injection purposes. The responses to Comments 12 and 13 above are also responsive to this comment.

15. COMMENT: *Failures and even normal operations increase the risk of toxic chemical and radioactive contamination of surface and groundwater. While groundwater contamination is the primary concern, there are also related risks to surface water (explosions, spills related to transport and storage, etc.).*

RESPONSE: Naturally occuring radioactive material or "NORM" are radioactive compounds that exist naturally at low levels in soils and rocks. Some oil and gas production fluids may contain these radioactive byproducts (i.e., Ra-226 and Ra-228) depending upon the geologic formation from where the fluid has been produced. For example, fluids produced from shale tend to contain greater concentrations of natural radioactivity because of the clay content in the shale. However, the management and disposal of NORM wastes associated with the production of oil and gas are not federally regulated and EPA considers the injection of Class II fluids deep underground to pose minimal environmental risk and to be a safer alternative than other available methods of disposal, such as allowing them to be discharged into a stream, disposed of in a landfill or treated and stored in containment pits or storage tanks. EPA also characterizes the reuse or recycling of produced fluid as a sound environmental management practice. Public and privately owned wastewater treatment facilities are unable to adequately



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remove many constituents found in brine, for example, chlorides and bromides. When these constituents are discharged to streams or rivers, they can pose serious risk to fish and other aquatic organisms living in the stream as well as contribute to serious health effects for people who obtain their drinking water from these streams and rivers. The UIC Permitting program is designed to provide an alternative through which injection activities may occur in a regulated and environmentally protective manner which ensures that best management practices are identified and employed. As further detailed in the response to Comment 2, potential surface impacts are not a consideration for the EPA's UIC Permitting Program.

16. COMMENT: *Enhanced oil recovery wells extract additional oil and natural gas resources that primary recovery was unable to produce. This is needless. Additionally, injection of fluids or gases into the reservoir moves or "pushes" the oil or natural gas to surrounding producing wells, making the resource available for production so it is necessary to determine the possible influence of the surrounding wells on the proposed injection well (pressures, failures, and groundwater contamination, etc.).*

RESPONSE: The determination of possible influence of the surrounding wells on the proposed injection well is carried out during the assessment of the Area of Review. Pursuant to the applicable regulations, 40 C.F.R. §§ 144.3 and 146.6(b), the "Area of Review" is an area surrounding the Injection Well for which the applicant must first research, and then develop, a program for corrective action to address any wells that penetrate the injection zone and which may provide conduits for fluid migration during the injection operation at the Facility. Sandstone proposed a fixed radius Area of Review of one-quarter mile, which EPA has determined to be acceptable. In determining the fixed radius, EPA has considered the following information provided by the Permittee: chemistry of injected and formation fluids; hydrogeology, population and groundwater use and dependence; and historical practices in the area. Sandstone has provided documentation identifying and describing the fluid to be injected, the groundwater uses in the area, and on the well population within the one-quarter mile Area of Review. The injection formations are oil and gas bearing zones and therefore compatible with the injectate given that the fluids to be injected are byproducts of oil and gas production. There are no drinking water wells within a half mile radius of the Injection Well. The Permittee has reported the presence of six natural springs within the mile and one quarter radius but confirms that none of those springs are used as a drinking water source within the Area of Review. There are no plugged wells, and no known unplugged / abandoned wells, within the Area of Review. If any unplugged / abandoned wells that penetrate the injection zone are later found within the Area of Review, the final Permit requires the Permittee to perform corrective action. The Permittee also indicated that there are 20 active production wells within the Area of Review, including the proposed injection well Moody Lot 5 #17. With the lowermost USDW for the proposed injection well Moody Lot 5 #17 determined to be located 360 feet below ground surface, each of the 20 active production wells within the Area of Review has a surface casing set no higher than 500 feet below ground surface and no lower than 517 feet below ground surface to protect freshwater aquifers. The surface casing is designed to isolate freshwater zones from the well in order to prevent

contamination. Each production well within the Area of Review has a surface casing that is set no less than 140 feet below the lowermost USDW.

17. COMMENT: *The US EPA should require identification of all affected special status species due to habitat loss and fragmentation caused by disruption from noise and traffic at the proposed injection well site. Likewise, the US EPA should require Sandstone to comply with the US EPA and USFWS guidelines for mitigating or reducing impacts on special status species. All plans should seek to reduce the risk of habitat loss and species. Special buffers or protections necessary for historic or cultural resources should be determined based on individual site conditions. The current application lacks sufficient information to make these determinations with respect to special status species.*

RESPONSE: As noted in the response to Comment 6, EPA is legally required to comply with Section 7 of the Endangered Species Act (ESA), 16 U.S.C. § 1536, for listed endangered or threatened species, proposed endangered species, or critical habitats. On May 26, 2021, EPA Region III conducted a search 1.08 $mi^2$ around the proposed injection well using the U.S. Fish & Wildlife's (US FWS) website, [ HYPERLINK "http://ecos.fws.gov/ipac/" ], to identify any endangered or threatened species. The US FWS list of threatened and endangered species that may occur in the proposed project location or may be affected by the proposed project identified one threatened species, the Northern Long-eared bat (*Myotis septentrionalis*). There are no critical habitats found within the project area. Because the proposed injection project will have no effect on the threatened species based on the fact that injection will take place from approximately 1,863 to 1,963 feet underground, the only way for injection fluid to impact species at the surface would be through a surface spill. The PADEP has jurisdiction over spill prevention associated with tanks, surface containment, etc. at the injection well. The UIC program does not have the authority to require Sandstone Development to mitigate or reduce impacts on special species status due to habitat loss and fragmentation at the ground surface.

The UIC program regulates those activities taking place in the subsurface to protect USDWs. However, nothing in the Permit shall be construed to preclude the institution of any legal action or relieve the Permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state or local law or regulation. The response to Comment 6 is also responsive to this comment.

18. COMMENT: *Increased inspection frequency minimizes impact due to well integrity failures. Operators are required to do so-called "mechanical integrity" tests at regular intervals, at least once every five years for Class II wells. This interval is too long. Although, repair of most well failures occurs within six months of discovery, as US EPA data shows, with as much as five years passing between integrity tests, irreversible contamination may happen. Of 6,466 well drilled in Pennsylvania, USA between 2008 to 2013 3.4% had well integrity and barrier issues with 0.24% causing leak to surface (Vidic et al., 2013).*

RESPONSE: In keeping with federal UIC regulatory requirements, all injection wells must have and demonstrate mechanical integrity prior to being placed into operation. The mechanical integrity test involves increasing the pressure in the casing, tubing, and annulus (the space between the injection tubing and long string casing) to a pressure above the maximum allowable surface injection pressure authorized by the Permit. The pressure must be maintained over a period of 30 minutes to evaluate the mechanical integrity of the long string casing, tubing, and packer and to determine whether there are any leaks. Federal regulations found at 40 C.F.R. § 146.13(b)(3), and the final Permit itself, require mechanical integrity testing to be performed at least once every five years during the life of the well. In addition, mechanical integrity testing is required after the well has undergone any repairs, modifications, or rework. EPA will also receive and thoroughly review Sandstone Development's Well Completion Report for this proposed Injection Well, which will include a review of all well construction information, an evaluation of the well logging, casing, and cementing, and the results of all required mechanical integrity testing. EPA will thoroughly review the cement bond logs to further evaluate whether the well has been properly cemented, in accordance with 40 C.F.R §147.1955(b)(5) requirements, to prevent injected fluid from flowing through the wellbore outside the casing. Even after a successful mechanical integrity test is conducted, the Permit requires continuous monitoring of the injection well during its operation to verify its continuing mechanical integrity. As detailed in Part II.D.3 of the final Permit, "The Permittee shall report to the Director any Permit noncompliance which may endanger, or which has endangered, human health or the environment. The Permittee shall provide such report orally to the EPA Region 3 UIC Hotline at 215-814-2816 within twenty-four (24) hours from the time the Permittee becomes aware, or otherwise has reason to know, of such noncompliance."

In order to protect the USDW, as noted in the response to Comment 1 and in the responses to other comments, the final Permit requires the permittee to meet the construction standards for the UIC well, which includes carrying out a mechanical integrity test, as well as the operational requirements as noted in several responses. Further, as noted in the response to Comment 7, once injection of the fluid commences, the permit imposes an injection pressure limit, the MAIP, to prevent the propagation of fractures in the injection zone. Also, the same response points out that because the injection fluid replaces the extracted volume of oil and gas, there is minimal change in formation pressure. Finally, the response to Comments 11 and 16 also points out that, the fluids to be injected are byproducts of oil and gas production, so the well will be injecting the fluids into injection formations that are oil and gas bearing zones and therefore compatible with the injectate.