

Phone: (605) 787-5777 Email: office@bhwud.com

September 22, 2022

Ms. Judy Lopez Director, Environmental Management 2261 Hughes Ave, Suite 155 JBSA Lackland Air Force Base, TX 78236-9853

Dear Ms. Lopez:

This letter is in response to your August 10, 2022 correspondence to Mr. William Larson, Chair, Water Management Board, South Dakota Department of Agriculture and Natural Resources. This letter is intended to correct inaccuracies contained within that letter and to help the Department of Air Force understand the reason Black Hawk Water User District ("BHWUD" or "the District") is opposing the application of the South Dakota Ellsworth Development Authority (SDEDA) for a permit to appropriate water from the South Dakota Water Management Board.

Your August 10, 2022 correspondence states that the Air Force did not contact BHWUD "because the system is located over 10 miles from the impacted areas and is not a government entity." The current location of the Air Force's proposed well site is 2 miles west of one of the District's reservoir sites and is less than one mile from BHWUD's "Anderson" well (identified as 00040677 on Exhibit A). See Exhibit A. Additionally, the proposed well site is within the District's future use permit area which has previously been granted by the Water Management Board. See Exhibit B. The proposed SDEDA well seeks to obtain water from the Madison Aquifer, the source of water for BHWUD's Anderson well and its future use permit. Also, the proposed site is within the area of future expansion identified by the District five years ago. See Exhibit C (BHWUD's expansion map dated November 2017). BHWUD has prepared a petition to expand its geographic scope to include the area in which the proposed well site is located. This process has been in works for some time, as is evidenced by BHWUD's future use permit and expansion map which illustrates additional well sites and reservoir locations within the area and to the east of the area of the proposed SDEDA well site. SDEDA's proposed well site is over ten miles from the impacted areas, literally in the District's front yard. The distance between the impacted areas and BHWUD cannot reasonably be used as an excuse for failing to include the District in discussions regarding providing water to the impacted homes.

Your August 10, 2022 correspondence also claims that the BHWUD is not a government entity. This is simply not true. As can be seen by the attached Board of Water and Natural Resources State of South Dakota Certificate of Approval Petition for Organization of the Black Hawk Water User District (Exhibit D), BHWUD has been approved as "a body public and corporate under the provisions of this chapter and shall be a public corporation of the State of South Dakota." SDCL § 49A-9-16. The statute creating SDEDA likewise indicates that SDEDA is "a body corporate and politic." SDCL § 1-165-1. As a water user district authorized by the State of South Dakota, BHWUD has the express authority to enter into contracts with "any state, county, municipality, district, governmental, or public corporation or association, or with any person, firm, or corporation, public or private, with the government of the United States [.]" SDCL § 46A-9-43. Notably, BHWUD has the express authority pursuant to SDCL § 46A-9-41 to "own, construct, reconstruct, improve, purchase, condemn, lease, receive by gift, or otherwise acquire, hold, extend, manage, use, or operate any 'works', as defined in this chapter [.]" The definition of "works" provided in SDCL § 46A-9 includes all means of "conserving, controlling, and distributing water." This express statutory authority for BHWUD, a governmental entity, to operate a water distribution system stands in stark contrast to the clear lack of such authority provided to SDEDA. See SDCL § 1-16J-7.

Pursuant to the provisions of SDCL ch. 46A-9, the directors of BHWUD must live in the District and be elected by the individuals being served water by the District. See, SDCL § 46A-9-4, 26. By contrast, the directors of SDEDA are appointed by the Governor, none of whom appear to reside in an area to be served by the proposed project. BHWUD has provided correspondence to the South Dakota Department of Agriculture and Natural Resources, expressing its concerns with this project, including BHWUD's concerns over local control and transparency. As those concerns may also be relevant to the Air Force, that correspondence is attached as Exhibit E.

Section 101 of the Environmental Services Agreement for Design of a Community Drinking Water System to Reduce Exposure to PFOS and PFOA between the Air Force Civil Engineer Center and the South Dakota Ellsworth Development Authority ("ESA") (attached hereto as Exhibit F) states: "The purpose of this ESA is to obtain the services of SDEDA in accordance with Section 2701(d) of DERP (Title 10, United States Code, Section 2701(d)) to assist the Air Force in carrying out its responsibilities under CERCLA and DERP by designing a water system that will provide alternative drinking water to private individuals and control human exposure to PFOS and PFOA above the EPA lifetime health advisories." Section 2701(d) of DERP provides: "Subject to paragraph (3), the Secretary may enter into agreements on a reimbursable or other basis with any other Federal agency, any State or local government agency, any Indian tribe, owner, or organization to assist the Secretary in carrying out any of the Secretary's responsibilities under this section. Services which may be obtained under this subsection include the identification, investigation, and cleanup of any off-site contamination resulting from the release of a hazardous substance or waste at a facility under the Secretary's jurisdiction," The inclusion of the reference to this section in the ESA, as well as to your recitation of contacts with other local government agencies in your August 10 correspondence, makes clear that 10 USC § 270I(d) is the authority for the proposition that the Air Force must work with government agencies to assist in carrying out the remediation responsibilities undertaken by the Air Force regarding the PFOS/PFOA issue at Ellsworth. This also appears to be the authority for recent comments by a SDEDA representative that the reason SDEDA is not working with an established water provider is because: "The Air Force has specific guidelines[.]" Deb Holland, Black Hills Pioneer, August 31, 2022, attached hereto as Exhibit G. But as pointed out above, BHWUD is a government agency. Section 2701(d) provides explicit authority for the Air Force to obtain services from the District to assist in the required remedial efforts, it most certainly does not prohibit the Air Force from working with the District. Had the Air Force discussed this issue with BHWUD prior to selecting a remedial alternative that encroaches into BHWUD's service area, this could have been made clear. However, rather than contacting BHWUD and attempting to work with an existing drinking water service provider, the Air Force instead chose to ignore the existence of BHWUD altogether.

As your correspondence indicates, an Engineering Evaluation and Cost Analysis (EE/CA) was published on June 12, 2020 regarding perfluorooctane sulfonate and perfluorooctanoic acid (PFOS and PFOA) in residential wells near Ellsworth Air Force Base, South Dakota. This EE/CA is attached as Exhibit H. Page 3-1 of this EE/CA references the "mandated public comment" applicable to the document. In your August 10 correspondence to Mr. Larson, you criticize BHWUD for not contacting the Air Force about the EE/CA or the water system project during the public comment period. A review of the geographic scope of the EE/CA as compared to BHWUD's service area and future expansion area make clear the reason BHWUD did not provide any comment regarding this project.

Each of the proposed removal action alternatives identified in the 2020 EE/CA involves operations east of Elk Vale Road. The District's current areas of operation are located approximately 10 miles to the west of any of the proposed alternative remedies. BHWUD's planned expansion comes no further east than Haines Ave. Haines Avenue is approximately 3 ½ miles west of Elk Vale Road. There was quite simply nothing in the EE/CA to suggest that any of the proposed alternatives would have an impact on BHWUD's current or future service area. BHWUD did contact its engineering firm, AE2S, regarding the project. AE2S confirmed that the proposed alternatives were well outside BHWUD's current and future service area. There was simply no need for BHWUD to provide comment on alternatives that did not come close to its service areas. BHWUD had no notice that any proposed alternative would encroach into its service area and impact its plan for expansion.

A supplemental EE/CA was published on June 7, 2021. See attached as Exhibit 1. While the supplemental EE/CA added an impact area to the east of Ellsworth Air Force Base, nothing in the supplemental EE/CA suggests that any of the alternatives being considered would impact the area west of Elk Vale Road. Again, there was no reason for BHWUD to provide public comment on a project that would not impact its service area.

Given the final response plan selected, and the location of the well and the water main line, legitimate questions exist as to the adequacy of the public comment period and notice of such public comment period provided by the Air Force as it relates to this project. The well location for the proposed Air Force well is less than 1 mile from BHWUD's Anderson well. BHWUD holds future use Water Permit No. 1995-1. This future use permit reserves 1300-acre feet of water annually from the Madison Aquifer for future development in Sections 26, 27, 31, 32, 33, 34, and 35 in T 3N, R7E, and all of Sections 2, 3, 4, 5, 6, 9, 10, 11 in T 2N-R7E. See Exhibit J. The Air Force's proposed pipeline route literally dissects this future use permit area. See Exhibit K. Nothing in any of the published EE/CA's suggest that any proposed alternative would involve

construction or development west of Elk Vale Road. BHWUD was simply not provided notice that this project would exist in their front yard.

SDEDA is requesting to appropriate 1200 gpm and transport that water through BHWUD's permitted future use area. Nothing in either of the EE/CA's suggest that the volume of water required to provide water to the impacted homes would approach this amount. The requested amount far exceeds the volume necessary to provide water to the impacted homes. SDEDA requests to appropriate 1200 gpm, or 1,728,000 gallons per day to provide water to fewer than 150 homes. See, Application for Water Right Permit, Exhibit L. This equates to approximately 11,520 gallons per residence per day. By contrast, BHWUD serves more than 3,750 customers an average of 490,000 gallons per day or approximately 130 gallons per household per day. See, Exhibit M. Clearly, SDEDA intends to do more with this volume of water than provide water to the impacted homes. And as the water main transporting this volume of water runs through the middle of BHWUD's proposed expanded service area, BHWUD is very concerned that SDEDA will look to provide water in this area, after BHWUD has spent time and money planning to expand into this area. As with the location, BHWUD was provided no notice that the volume of water associated with this project would approach the amount being requested.

The August 10, 2022 correspondence also mentions communications the Department of the Air Force had with the City of Rapid City and Rapid Valley Sanitary District. The undersigned has had conversations with both the public works director for Rapid City and the Manager of Rapid Valley Sanitary District (RVSD). Your correspondence states that the City of Rapid City "chose not to participate." It is our understanding that Rapid City has a water main approximately 1½ miles from the impacted homes. Rapid City has indicated their position has changed and they are willing to discuss assisting the Air Force in its efforts to provide water to the impacted homes. Such arrangement would require construction of 1½ miles of water main, rather than construction of 14 miles of water main and a new well.

Additionally, following conversations with the Manager of Rapid Valley Sanitary District, the assertion that Rapid Valley Sanitary District "required the Base's water rights" in return for providing the water is not correct. It is our understanding that Rapid Valley Sanitary District did not request ownership, but rather that it be assigned, the amount of water rights associated with the quantity of water to be provided to the impacted residences. Rapid Valley Sanitary District could then provide the requested water without a net reduction in the water rights available for RVSD. The requested assignment is a tiny fraction of the Base's water rights. Rapid Valley Sanitary District has a reservoir located approximately 3 miles south of EAFB and 1½ miles from the impacted homes. Utilizing Rapid Valley Sanitary District to provide water to the impacted homes was not properly considered.

BHWUD has been, and remains, ready and able to work with SDEDA, the Air Force and SD DANR to provide water to the impacted homes. BHWUD has the experience, capacity and planning to responsibly develop into southern Meade County east of I-90. Even though BHWUD has been told by SDEDA that the Air Force will not discuss this issue with them, BHWUD would very much appreciate an opportunity to discuss this project with the Air Force and be considered as a part of the solution for the PFOS/PFOA issue.

Sincerely:		
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BLACK HAWK WATER USER DISTRICT

Ken LeBon,

Manager

Brian Peterson

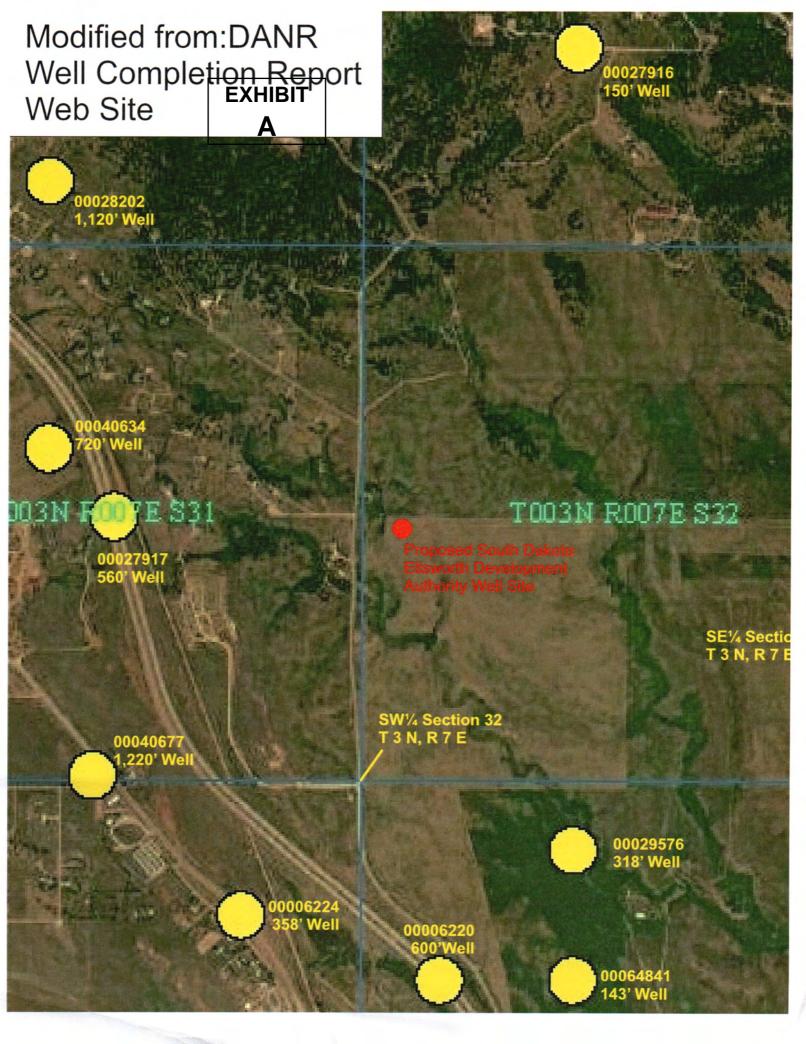
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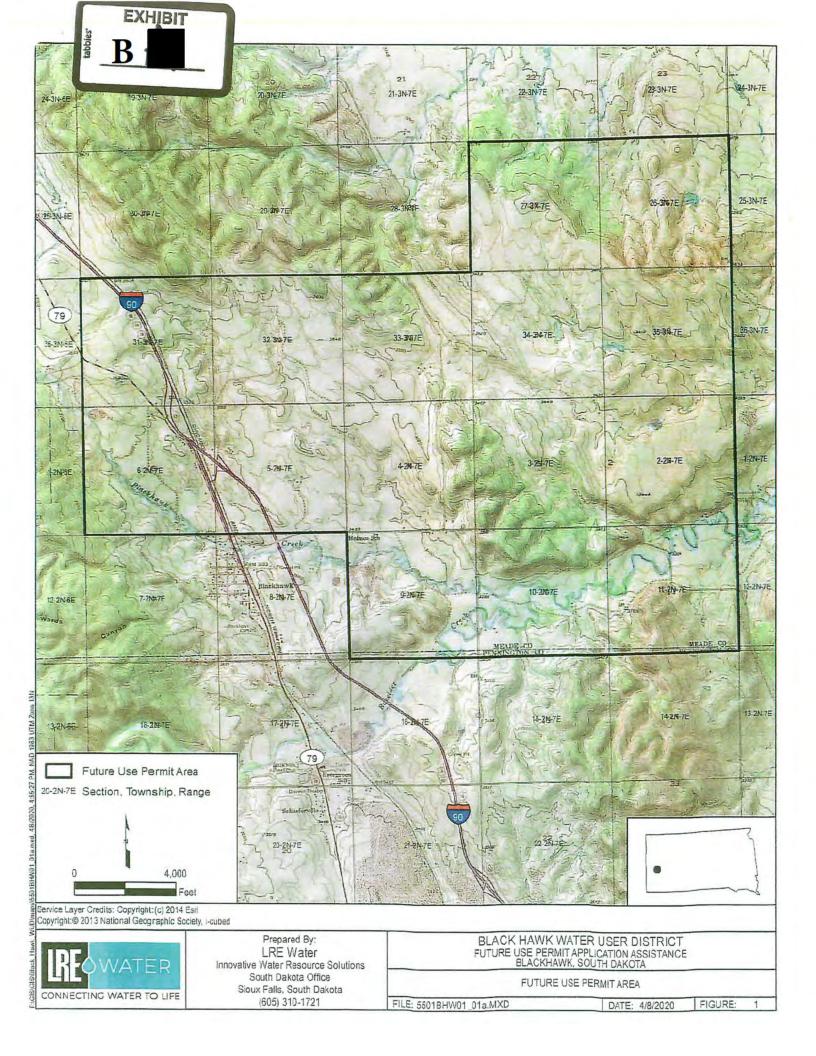
Enclosures

cc w/ encs: South Dakota Water Management Board, c/o Ron Duvall (via email)

Ann Bailey, Assistant Attorney General, South Dakota Water Rights (via email)

Greg Erlandson (via email)





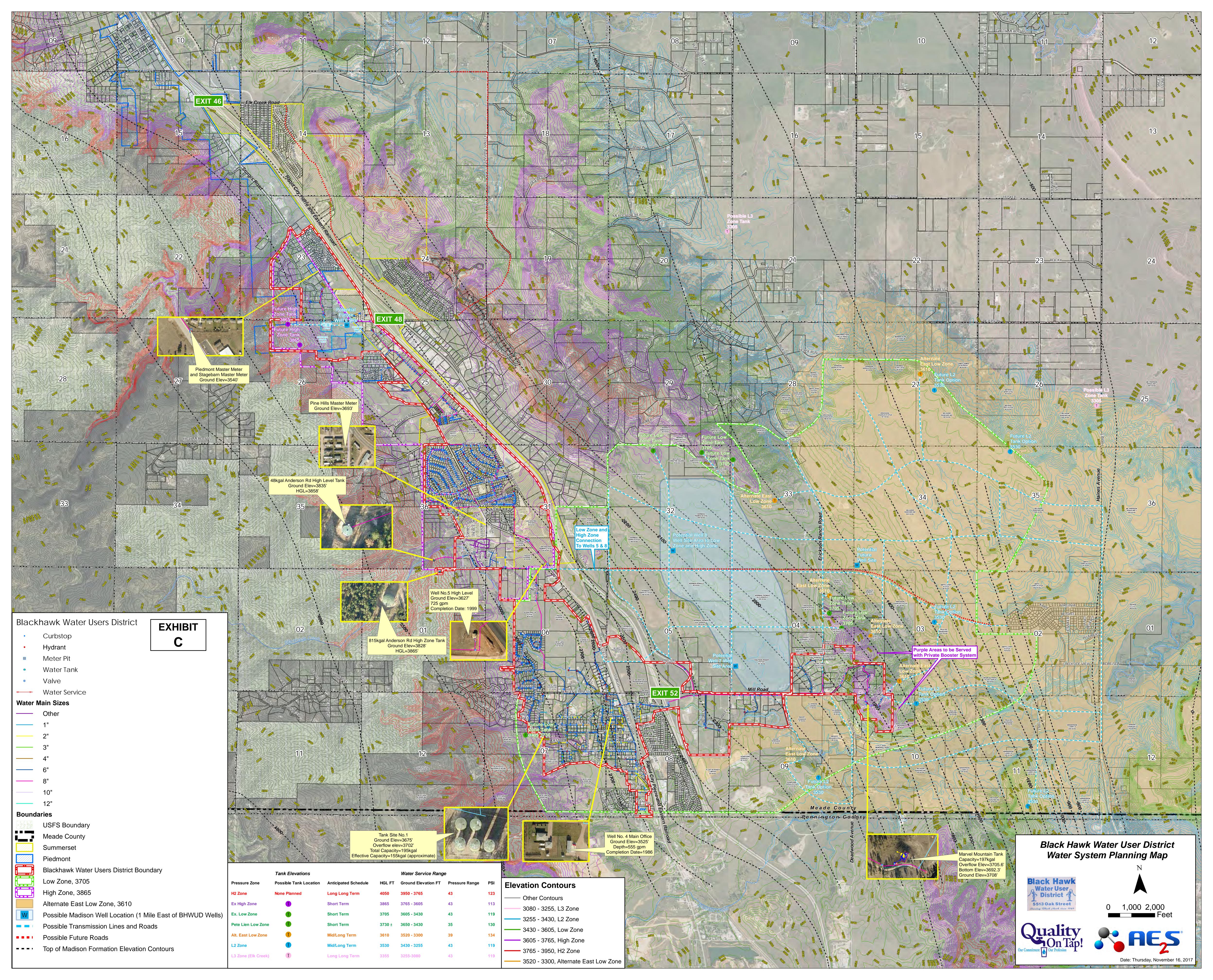


EXHIBIT D

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BOARD OF WATER AND NATURAL RESOURCES STATE OF SOUTH DAKOTA

CERTIFICATE OF APPROVAL PETITION FOR ORGANIZATION OF THE BLACK HAWK WATER USER DISTRICT

By virtue of the authority vested in the Board of Water and Natural Resources by the Laws of the State of South Dakota and more particularly by § 46A-9-16, SDCL 1967, as amended, it is hereby declared that the petitioners have complied with the Laws of the State of South Dakota and that the petition, a true copy of which is attached hereto marked Exhibit A, and made a part hereof, is approved by order of the Board of Water and Natural Resources.

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PETITION TO THE BOARD OF WATER AND NATURAL RESOURCES FOR ORGANIZATION OF BLACK HAWK WATER USER DISTRICT

Your Petitioners, pursuant to SDCL 46A-9-4, petition the South Dakota Department of Water and Natural Resources to create a water user district under the provisions of SDCL 46A-9, subject to the approval by the South Dakota Department of Water and Natural Resources. Said Petitioners petition as follows:

- 1. The name of the proposed District shall be Black Hawk Water User District.
- 2. The object and purpose of the District will be to acquire all of the assets and liabilities of Black Hawk Water Company, Inc., an existing profit South Dakota Corporation, that owns and operates a water distribution system in Black Hawk. South Dakota, serving the real property described below, including wells, reservoir tanks and distribution system. Your Petitioners dasire to provide for and maintain a dependable, high quality water service to the real property comprising this District.
- 3. The following real property will constitute the land to be contained within the proposed District. There are no incorporated cities or towns within the District. Black Hawk, South Dakota, is not an incorporated city or town. Said real property that would constitute the property served by the District and the boundaries of the District is described as follows:

LEGAL DESCRIPTION IS AS SHOWN ON ATTACHED EXHIBIT A

- 4. The location of the principal place of business of the proposed District shall be at the present offices of Black Hawk Water Company, Inc., in Black Hawk, South Dakota, having its mailing address as P. O. Box 476, Black Hawk, SD 57718-0476.
- 5. The proposed Black Hawk Water User District shall not have the power to levy taxes or assessments.
- 6. There shall be seven members of the proposed District. The Directors shall be elected at large.
- 7. The following constitute the names and addresses of the members of the initial Board of Directors, who shall serve until their successors are elected and qualified, as provided by South Dakota Statute. All persons named below are owners of land within the proposed District. Said initial Board of Directors and their addresses are as follows:

эман	ADDRESS	GROUP NO.
Brian Peterson	7512 Redridge Drive Black Hawk, SD 57718	:
Rob Schaeffer	P. O. Box 152 Black Hawk, SD 57718	1
Kurt Triscori	6316 Sunset Drive Black Hawk, SD 57718	2
Ed Striebel	7005 Timberline Road Black Hawk, SD 57718	2
Dennis Petersen	7100 Wedgewood Drive Black Hawk, SD 57718	3
John Chisen	5700 Pine Street Black Hawk, SD 57718	3
Tom Mitchell	5605 W. Elm Street P. O. Box 28 Black Hawk, SD 57718	3

Pursuant to SDCL 46A-9-8, the above Directors shall be divided into three, as nearly equal groups as possible, and shall be designated as Group 1, Group 2 and Group 3, respectively. The members of Group 1 shall hold office until their successors, elected at the first regular Water User District election thereafter, shall have qualified; the members of Group 2 shall hold office until their successors, elected at the second regular Water User District election thereafter, shall have qualified; and the members of Group 3 shall hold office until their successors, elected at the third regular Water User District election thereafter, shall have qualified. Thereafter, all

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(SEAL)

NOTARY PUBLIC Commission Exp.: april 5 1979

- All of Blocks 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14 and 15,
 Town of Black Hawk, Meade County, South Dakots.
- 2. Lot 1 and Lot 2 of Sanders Subdivision, Formerly Lots 1 through 5, Less Lot H-1 thereof, and Lots 6 through 17 of Block 7, Lots 1 through 12 of Block 8, the vacated alley in Block 7, and vacated Short Street between Blocks 7 and 8, all located in the WkNWk of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Town of Black Hawk, Meade County, South Dakota, a shown by the Plat recorded in Plat Book 17 on Page 9.
- 3. All of Blocks 1, 2, 3 and 4 of the West Addition to the Town of Black Hawk, Mesde County, South Dakota.
- 4. All of Blocks 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 of Borden Subdivision, Located in Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota.
- 5. Tract Lewis of Borden Subdivision, Located in the S\SE\ and in the NW\SE\ of Section 6, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 17 on Page 175.
- 6. Tracts A, B, C, D, E, F, G, S and T of Borden Subdivision, All in Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota.
- 7. Lots A and B of Lot 1; Lots C, D, E, F, G and H of Lot 3; Lots 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 of Lot 3; Lots 1, I and K of Lot 3 and of Lot B of Lot 5; Lots J and L of Lot B of Lot 5; All of Sutton Addition, located in the NEWNW& of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota.
- 8. Lots 1, 2 and 3 of the North Addition to the Town of Black Hawk, Meade County, South Dakota.
- 9. Lots 1, 2, 3 revised, 4, 5, 6 and 7 of Tract B, and Lots 1, 2, 3, 4, 5, 6 and 7 of Tract C, all located in the NEWNEW of Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota.
- 10. All of Blocks 18, 19, 20, 21, 21A and 22 of the NW\sw\ of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota.
- 11. All of Blocks 1, 2, 3, 4, 5 and 6, and Utility Lot, Timberline Subdivision, located in Section 6, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota.
- 12. Lote 8, 9, 20, 21, 22, 23, 24, 25, 26, 27, 28, 37, 38, 39, 40, 41, 42, K, 43A, 43R and 45R of Tract I, Eastlawn Subdivision, all located in the SWk of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota.
- 13. Lot 3R of Engle Subdivision, Formerly Lot 3, located in the SW4 of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 11 on Page 103.
- 14. Lot C in the SE\sW\ of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota as shown by the Plat recorded in Plat Book 3 on Page 203.
- 15. Lots 1, 2, 3, 4R, 5R, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 17 in Block 16 of the NWkSWk of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota.

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- 16. Lots 1, 2, 3, 4, SA, SB, 6 and 7 of Block A of Block 17, Located in the NW4SW4 of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota.
- 17. Lote 1R, 2R, 4, 5, 6 and 7 of Block B of Block 17, Located in the NW\sW\straction B, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota.
- 18. Tract X of the NW\sW\s of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Towns of Black Hawk, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 7 on Page 44.
- 19. Lot D of Ackland Subdivision, located in the SE4SW4 of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakola, as shown by the Plat recorded in Plat Book 9 on Page 51.
- 20. Lot F and Lot G of the SE\SW\ of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 3 on Page 210.
- 21. Lot 2 of Lot J of Ackland Subdivision, located in the SE\SW\u00e4 Of Section B, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, as shown by the Plat recorded in Plat Book 14 on Page 96.
- 22. Lot 9 of the NW\u00e4NW\u00e4 of Section \u00e4, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 2 on Page 16.
- 23. Tract B Revised, Less the Black Hawk Time Capsula Lot, Located in the NWkNWk of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 16, on Page 9.
- 24. Lot 11 Revised of the Bruce Subdivision, Located in Lot 11 of the NWkNWk of Section 8 and also located, by the previously Deeded Metes and Bounds Description, in the NEWNEW of Section 7, Township 2 North, Range 7 Fast of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 13 on Page 3.
- 25. Lot 12 in the NW4 of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 6 on Page 115.
- 26. Black Hawk Time Capsule Lot, formerly a portion of Tract B revised of the NW\(\frac{1}{2}\)N\(\frac{1}{2}\) Of Section 8, all located in the NW\(\frac{1}{2}\)N\(\frac{1}{2}\) Of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 16, on Page 9.
- 27. Lot 1 of Norman Estates Subdivision, located in the NYSEY of Section 5. Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 16 on Page 19.
- 28. Lots 1 and 2 of Schaeffer Subdivision, formerly a portion of Tract A, all located in the NEWSEW of Section 7, Township 2
 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 16 on Page 10.
- 29. Lots A and B of B.H.F.O. Subdivision, formerly Tract 1 of B.H.F.D. Subdivision, located in the SWASEA of Section 6, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 17 on Page 123.

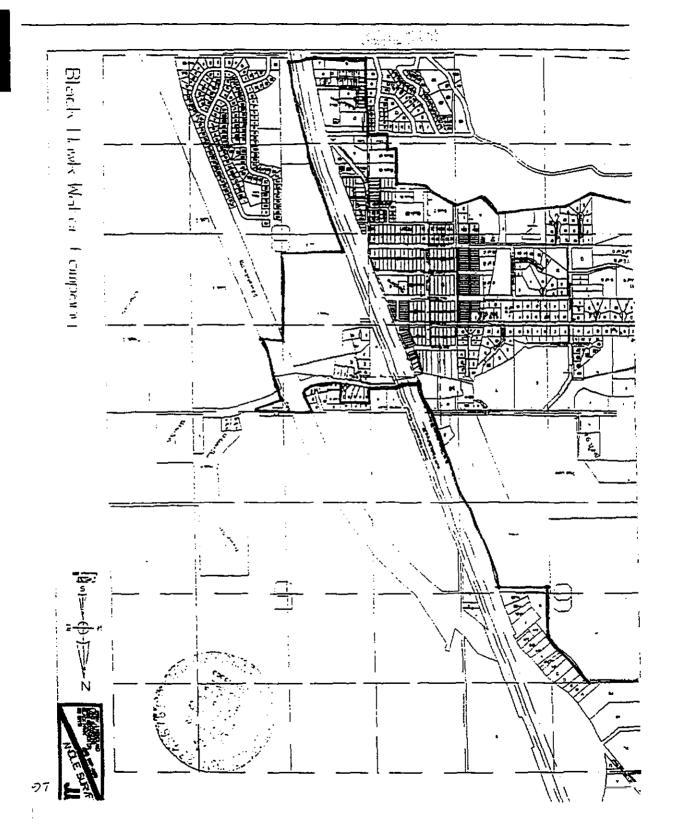
- 30. Lots 1, 2 and 3 in Block 2 of Meade-Penn Subdivision, formerly Lot E and the Balance of Lot 1 of Lot J of Ackland Subdivision, all located in the SE\s\warpink of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 17 on Page 236.
- 31. Tract 1 of Niehoff Subdivision, formerly Lot A of the NE\SE\ and 30 Road Easement and an unplatted portion of the NE\SE\, located in the NE\SE\ of Section 9, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, 88 shown by the Plat recorded in Plat Book 18 on Page 27.
- 32. Lot M (Richardson Plat), Less Lot M-1, located in the NE% of Section 6, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 4 on Page 284;
- Lot N Revised (Richardson Plat), Formerly Lot N, Located in the E% of Section 6, Township 2 North, Range 8 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 18 on Page 32.
- 33. Lot O (Richardson Plat) in the NE% of Section 6. Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 4 on Page 291.
- 34. Reservoir Lot in Lot 5 of Tract F of Borden Subdivision, Located in the SW4NE4 of Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 10 on Page 25.
- 35. Lot A in the Swiswi of Section 5, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 4 on Page 402.
- 37. Lot 1 of Lot 4 in the SW\sE\ of Section 5, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 5 on Page 241.
- 38. A Parcel of Land 100 Feet Square located in the NW\sW\ of Section 6, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown in the instrument recorded in Book 398 on Pages 579/580.
- 39. The remainder of Tract A in Government Lot 7, Located in Section 6, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 8 on Page 29 and in Plat Book 8 on Page 71.
- 40. Lot A in the SEASEA of Section 6, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 4 on Page 402.
- 41. Lots 1, 2, 3, 4 and 5 of the IMV Subdivision, formerly Lot 1 of the SENNER, Lot 2 of Tract D of Lot 6 of Borden Subdivision, Lot A-1 of the SENNER (less the South 10'), Part of Lot 2-A and Lot 2-B of the SENNER, and Lots 19 through 24 of Block 1 of the West Addition to the Town of Black Hawk, all located in the SENNER of Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 18 on Page 143.

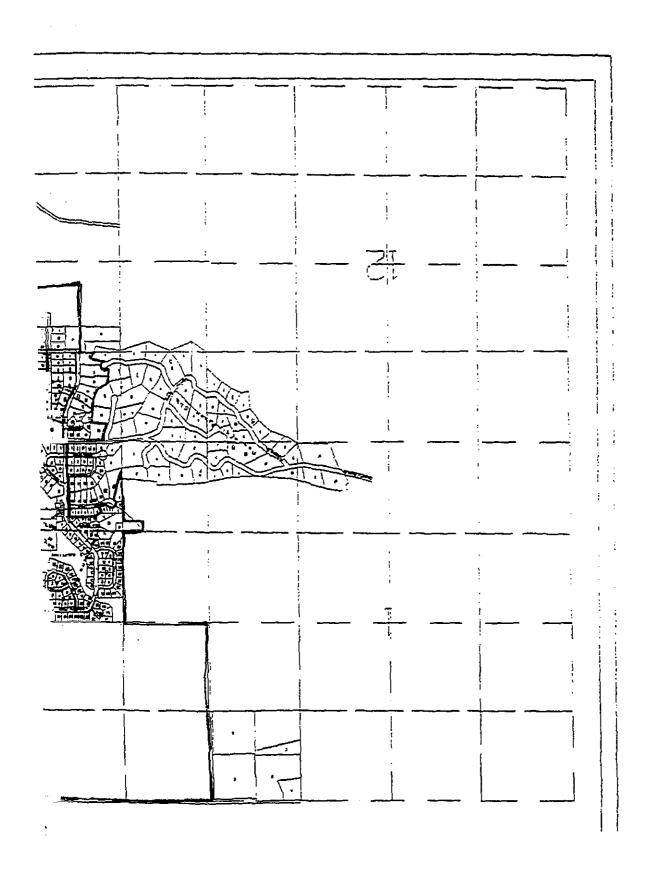


- 42. Lots 7, 8 and 9, located in the NEWNEW of Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 3 on Page 149.
- 43. Lot 10A, formerly a portion of Lot 10, located in the NEWNEW of Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 8 on Page 45.
- 44. Lot 10B revised of the Bruce Subdivision, Located in Lot 10B and a portion of Lot 11 in the NEWNEW of Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 13 on Page 3.
- 45. Lot 1 of Lot B and Lot 2 of Lot B of the SENNER of Section 7, formerly Lot B of the SENNER of Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, all located in Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 18 on Page 16.
- 46. The remainder of Lot A-2, Lot 2-B less the west 73.3', the South 10' of Lot A-1, and the South 10' of the East 26.16' of Lot 2-A, allocated in the SENNER of Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 9 on Page 11.
- 47. Lot 1 revised, Lot 2 revised and Lot 3 revised of Lot C (of Lot 5), all located in Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 9 on Page 12.
- 48. The South 934 Feet of the SENNW of Section 7, and the unplatted portion of Government Lot 2 of Section 7, all located in Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakcta.
- 49. The NEWSWA; That portion of Government Lot 4 located in Meade County; The NASEA, less Blocks 1 and 2 as shown by the Plat recorded in Plat Book 5 on Page 14, and less Tract A of the NEWSEA as shown by the Plat recorded in Plat Book 7 on Page 18, and less that part of Lot 6 as shown on the Plat recorded in Plat Book 2 on Pages 12/13; and the SEWSEA, less Tract No. 1 as shown by the Plat recorded in Plat Book 7 on Page 74; all located in Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, Reade County, South Dakota.
- 50. Government Lot 3 in Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota.
- 51. The SE\\$SW\and SW\and SW\and Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota.
- 52. Blocks 1 and 2 in the NE\SE\ of Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in plat Book 5 on Page 14.
- 53. Tract A, less Lot 1 and Lot 2 of Schaeffer Subdivision, located in the NEWSEW of Section 7, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota.
- 54. Tract 1 of Lot 1 in the NW\ of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 7 on Page 77.
- 55. Lot 3, less Lot H-1, in the NWkNEk of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 2 on Page 16.

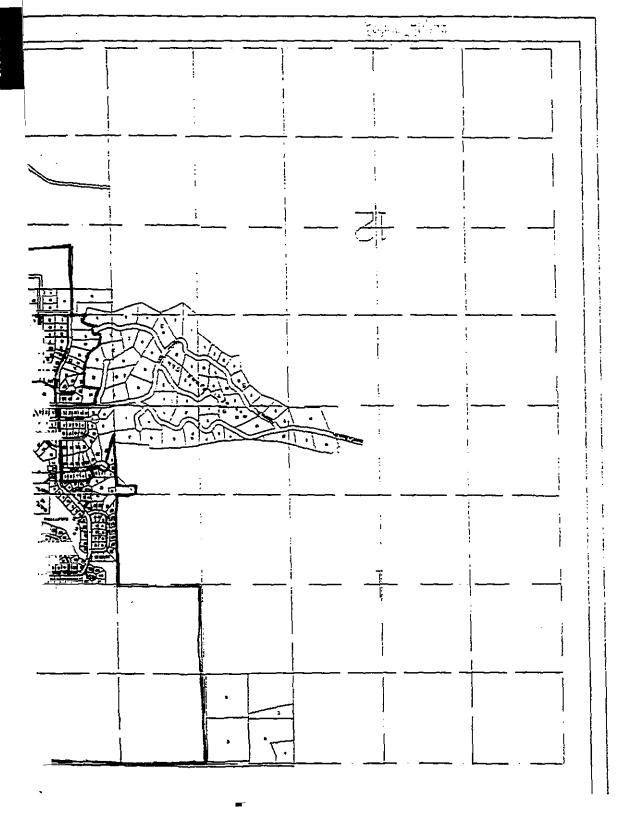
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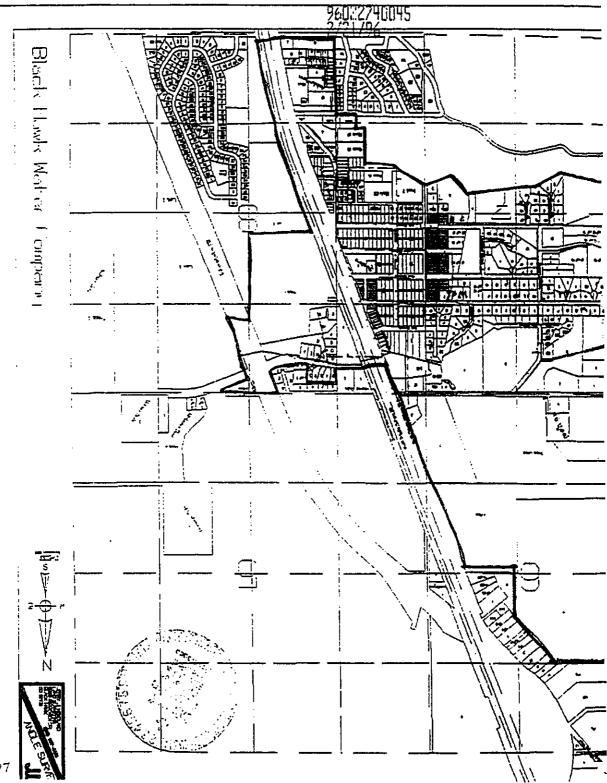
- 56. Lot AR of Stensaas Addition, formerly Lot A and a portion of Tract 1 of Lot 1 of Stensaas Addition, located in the NW% of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 13 on Page 87.
- 57. Lot A of Lot 3, Lot A of Lot 5, and Lot 4, all located in the NEWNWk of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 5 on Page 49.
- 58. Lots 5 and 7 in the NW\nW\u00e4 of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota.
- 59. Lot B of Lot 1 of the NWk of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 7 on Page 77.
- 60. Lot 2 in the ENNW of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 14 on Page 30.
- 61. Tract Lewis of Borden Subdivision, less Lots 1 and 2 of Tract Lewis of Borden Subdivision, located in the SWKSEk of Section 6, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 17 on Page 249.
- 62. Lot A of Lot 1 of Lot J of Ackland Subdivision, located in the SE\s\\ of Section 8, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 14 on Page 96.
- 63. Tract 2 of Richardson Subdivision and dedicated right of way, located in the SENSWN and the SWNSEN of Section 31, Township 3 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota, as shown by the Plat recorded in Plat Book 17 on Page 237.





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2/21/96	

File Number: WD000043

Receipt No: ._____

WATER USER DISTRICT

For

BLACK HAWK WATER USER DISTRICT

File at the request of:

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES LAURIE GATES
523 EAST CAPITOL
PIERRE SD 57501

STATE OF SOUTH DAKOTA

OFFICE OF THE SECRETARY OF STATE

\$8.

Filed in the office of Secretary of State on Date January 30, 1996

Joyce Hazeltine Secretary of State

Fee Recieved NO CHARGE

SOS CRP 491 10/93

BOARD OF WATER AND NATURAL RESOURCES
STATE OF SOUTH DAKOTA

CERTIFICATE OF APPROVAL

RECEIVED

APR 0 3 1996
S.D. SEC. OF STATE

PETITION FOR EXTENSION OF THE

TABY OF STABLACK HAWK WATER USER DISTRICT

By virtue of the authority vested in the Board of Water and Natural Resources by the Laws of the State of South Dakota and more particularly by 46A-9-23, SDCL 1967, as amended, it is hereby declared that the petitioners have complied with the Laws of the State of South Dakota and that the petition, a true copy of which is attached hereto marked Exhibit A, and made a part hereof, is approved by order of the Board of Water and Natural Resources.

Dated this 27 day of March, 1996

Chairman, Board of Water and Natural Resources

(SEAL)

Attest:

Secretary, Board of Water and/Natural Resources

Certified by Secretary of State

Vice-Chairman, Board of Water and Natural Resources

Member, Board of Water and Natural Resources

Member, Board of Water and Natural Resources

PETITION TO THE DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES TO INCLUDE ABDITIONAL TERRITORY WITHIN THE BOUNDARIES OF BLACK HAWK WATER USER DISTRICT

Your Petitioners, landowners in the area to be included, acting pursuant to SDCL 46A-9-2D, petition to extend the boundaries of the Black Hawk water User District by including additional territory legally described as: All of Blocks B, 9, 10, 11, and 12 of Borden Subdivision, Located in Section 6, Township 2 North, Range 7 East of the Black Hills Heridian, Meade County, South Dakota.

 There are no incorporated Cities or Towns within the area proposed to be added to Slack Kawk Water User District.

This Petition was approved by a Resolution by a majority of the

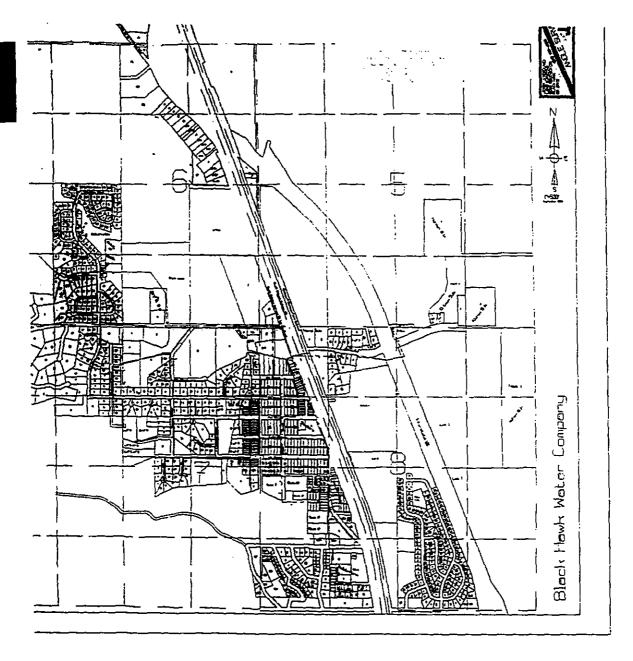
	Board of Directors of Black Hawk Water U	sear District at a meeting of the Board
	of Directors held February 10, 1996.	1 //
	An rolla U. H.	M.1. Od/2
	martella toff	Signature of Signer / /
بہار	Signature of Signer	
•	MARCE LLA KRAFT	MICHAEL J. CARIVERY
	Name of Signer (print clearly)	Name of Signer (print clearly)
	Mailing Address: 6413 Sunset Dr.	Mailling Address: 7500 Ridridge Dr.
	Black Hawk 50 57718	Black Hawk S 0 57718
	Black Hawk 50 57712 Legal Description of Property Owned:	Legal Description of Property Owned:
	SUTAN RIE	56 TAN R7E
~	Bouden Sub Lot/ 8 BIK 11	Borden Sub Lot 7 Block 8
	1 10	24
	1-411116 116M	Chase of dieta
	DIMETERIX	Signature of Signer
_ , ,	Signature of Signer	<i></i>
	Shuce Keen	Cherie L. Hilton
	Name of Signer (print clearly)	Name of Signer (print clearly)
	Mailing Address: 6404 MT. Mindow 1) w	Mailing Address: 7505 Redridge Dr.
	Rack Howk SD 57718 Legal Description of Property Owned:	Black Hawk SO \$7718 Owned:
		Tedai Esscribitou or Arobarra omuso:
_	SC T2N R7E	SGTAN BAF Bondin Sub Lot 3 BIK9
	Borden Sub Lot 7 BIK 10	1366 GIN 366 GIJ GINT
		N
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Ų"	Signature of Signer V	Signature of Signer
•		Chris Larsen
	Diana Eichinger	Name of Signer (print clearly)
	Name of Signer (print clearly) Hailing Address: 6400 mT MisdowD.	
	Black Hank 50 57712	Block House & Degrale
	Riack Hawk 50 57718 Legal Description of Property Owned:	Legal Description of Property Owned:
	SU TAN RIE	56 TAN RTF
`	Bonden Sub Lot 12 BIK 11	Bondon Sub Lot 15 BIKII
	C. Au	hi to the
	to the	(adv soluso
c ·	Signature of Signer	Signature of Signer
	Dove AS T. COIPER	Hodi Helpean
	Name of Signer (print clearly)	Name of Signer (print clearly)
	Hailing Address: 63/3 MT. Mondow Ur.	Mailing Address: 75/2 Niderday Ur.
	Black Hawk 50 57718	Black Hawk, 50 57718
	Black Hawk 50 57718 Legal Description of Property Owned:	Legal Description of Property Owned:
	56 TA U R TE	SUTBURTE
	- Bondon Sub Lot is AIK W	Bordin Sub Lot 10 AIK 8

APPIDAVIT OF CIRCULATOR

COUNTY OF MEADE)

Signatures: each person whose name appears on said faint; that (2)he believes each signature, to be included within the proposed Water User Diatrict, and residing at the address written under his/her name, and that affiant stated to every petitioner before (s)he affixed his/her signature to be included within the proposed Water User Diatrict, and residing at the address written under his/her name, and that affiant stated to every petitioner before (s)he affixed his/her signature the legal effect and nature of said Petition.

Subscribed and er in to



RESOLUTION OF BOARD OF DIRECTORS OF BLACK HAWK WATER USER DISTRICT APPROVING ADDITIONAL TERRITORY TO THE DISTRICT

WHEREAS, it would be in the best interest of Black Hawk Water User District if the real property described below were included within the boundaries of said District, now therefore,

BE IT RESOLVED that the Board of Directors of Black Hawk Water User District do hereby approve adding all of Blocks 8, 9, 10, 11 and 12 of Borden Subdivision, Located in Section 6, Township 2 North, Range 7 East of the Black Hills Meridian, Meade County, South Dakota to the boundaries of Black Hawk Water User District.

Dated this 13th day of February, 1996.

Secretary, Black Hawk Water

User District

I, the duly elected secretary of Black Hawk Water User District, do hereby certify that the within and foregoing Resolution was duly adopted by a majority of the members of the Board of Directors of Black Hawk Water User District at a Board of Directors meeting of said District held on February 13, 1996.

Dated this 13th day of February, 1996.

ecretary, Black Hawk Water

User District

maril .

BOARD OF WATER AND NATURAL RESOURCES STATE OF SOUTH DAKOTA

CERTIFICATE OF APPROVAL

PETITION FOR EXTENSION
OF THE
BLACK HAWK WATER USER DISTRICT

RECEIVED

MAR 3 1 1998

SU SEC OF STATE

WD 49

By virtue of the authority vested in the Board of Water and Natural Resources by the Laws of the State of South Dakota and more particularly by SDCL 46A-9-23, as amended, it is hereby declared that the petitioners have complied with the Laws of the State of South Dakota and that the petition, a true copy of which is attached hereto marked Exhibit A, and made a part hereof, is approved by order of the Board of Water and Natural Resources.

Dated this 25th day of March, 1998.

BY:

Chairman, Board of Water and Natural Resources

(SEAL)

Attest:

Secretary, Board of Water and Natural Resources

Certified by Secretary of State

Vice-Chairman, Board of Water and Natural Resources

Member, Board of Water and Natural Resources

Member Roard of Water and Natural Recourage

Alamba-Band of Water and Manual Danson

Member, Board of Water and Natural Resources

PETITION TO THE DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES TO INCLUDE ADDITIONAL TERRITORY WITHIN THE BOUNDARIES OF BLACK HAWK WATER USER DISTRICT

ExhibiTA

Your Petitioners, landowners in the area to be included, acting pursuant to SDCL 46A-9-29, petition to extend the brundance of the Black Hawk Water User District by including additional territory legally described as Richardson Plat. Lot K-18 of Lot K-18 of Lot K-1. Richardson Plat. Lot K-2 Rev. Lot 0 Less Right of way Richardson Plat. Tried 1 Less Track Well, Richardson Sub, Section 17 Township 2 North, Range 7 East and Red Arrow Sub Lot 2, 3, 4, 5, Section 31 Township 3 North, Range 7 East.

1. There are no incorporated Cities or Towns within the area proposed to be added to Black Hawk Water User District 2. This Petition was approved by a Resolution by a majority of the Board of Directors of Black Hawk Water User District at a meeting of the Board of Directors held 314.20 1998 ARlow A. Gohere-T. JUZIETSKI Name of Signer (Perit Clearly) Name of Signer (Pant Clearly) Mailing Address 5260 / cal-Mailing Address 8207 Acces Huy 79 Black Nawk & D 57114 Legal Description of Property Owned. Reproduce Plat Act Kills of Geral 861 1.75 Reporter Sumanure of Signer Name of Signer (Print Clearly) Mailing Address Bec 414 BL Mailing Address Legal Description of Property Owned Legal Description of Property Owned Acrew Sub Lot 5 Greitin Spiniture of Sumer Signature of Signer J. ----Name of Sugner (Front Clearly) Name of Signer (Print Clearly) Mailing Address GRC Fin lesson Making Address Legal Description of Property Owned Red Arres 5.5 Lot Y Legal Description of Property Owned 571 TIN 67E AFFIDAVIT OF CIRCULATOR STATE OF SOUTH DAKOTAL COUNTY OF MEADE being first duly swom, deposes and says, that (side is the circulator of the personally signed said Petition in the presence of this affaint, that (s)he believed each of said signers is an owner or entrymen of the land described opposite his her signature, to be reclinical within the proposed Water User District, and maxing at the address written under his/ner name, and that affiant stated to every pentioner before (s)he affixed his her agreeture the legal effect and nature of said Pennun Subscribed and sworm to before the true = 0° day of -100 1998 ISEALI NOTARY PUBLIC Compassion Exp. 4.5.00





RESOLUTION OF BOARD OF DIRECTORS OF BLACK HAWK WATER USER DISTRICT APPROVING ADDITIONAL TERRITORY TO THE DISTRICT

WHEREAS, it would be in the best interest of Black Hawk Water User District if the real property described below were included within the boundaries of said District, now therefore.

BE IT RESOLVED that the Board of Directors of Black Hawk Water User District do hereby approve adding all or Richardson Plat, Lot K-1B of Lot K-1. Richardson Plat of k-2 Rev., lot 0 Less Right of way Richardson Plat Tract 1 less Track Well, Richardson Sub, Section 6 Township 2 North, Range 7 East and Red Arrow Sub Lot 2, 3, 4, 5, Section 31 Township 3 North Range 7 East of the Black Hills Meridian, Meade County, South Dakota to the boundaries of Black Hawk Water User District.

Dated this 20th Day of February, 1998.

Brian Peterson, Secretary





DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES

JOE FOSS BUILDING 523 EAST CAPITOL PIERRE SOUTH DAKOTA 57501-3181

March 30, 1998

MEMO TO:

Secretary of State Office - Corporations

FROM:

Laurie Garesullu

Division of Financial & Technical Assistance

SUBJECT:

Black Hawk Water User District Boundary Extension

The Board of Water and Natural Resources executed the attached Certificate of Approval on March 25, 1998. The Board took action on the Black Hawk Water User District request to extend the boundaries of the water user district to include additional lands. The department verified that all requirements for extension were met under SDCL 46A-9-20 through 23.

I have enclosed three original certificates to be certified by the Secretary of State. Return two to me for filing with the Meade County Auditor and department file and the other can be retained for your files. Should you have any questions concerning this matter, please call me at 4907.

Attachment (3)



RECEIPT NO.

FILE NO. W9-000048

FEE RECEIVED: \$

CERT OF APPROVAL FOR EXTENSION

(MS)

OF

BLACK HAWK WATER USER DISTRICT

Filed at the Request of:

LAURIE GATES
DEPT ENVIRON & NATURAL RESCURCES
FOSS BLDG
PIERRE SD 57501

State of South Dakota ss Office of the Secretary of State Filed in the office of the Secretary of State on March 31, 1998.

JOYCE HAZELTINE Secretary of State

EXHIBIT E

Phone: (605) 787-5777

Email: office@bhwud.com



BLACK HAWK WATER USER DISTRICT 5513 OAK STREET P.O. Box 476 BLACK HAWK, SD 57718

Berving Black Hawk since 1949

August 9, 2022

South Dakota Ellsworth Development Authority PO Box 477 Rapid City, SD 57709

RE:

Public Hearing

Meade County Water Project

Please accept this correspondence as written comments of the Black Hawk Water User District for the South Dakota Ellsworth Development Authority ("SDEDA") Meade County Water Project (the "Project") public hearing.

Black Hawk Water User District ("BHWUD") has provided potable water services to communities and individuals in the Black Hawk, SD area since 1949. Black Hawk Water User District currently serves water to the City of Piedmont, the City of Summerset, Stagebarn, Black Hawk and the surrounding area an average of 490,000 gallons of water per day. BHWUD's Board of Directors consists of local individuals who live and work in the area, and use the water provided by BHWUD and who are elected by the users. BHWUD has serious concerns with SDEDA's Project being considered for funding by the Board of Water and Natural Resources.

The Project proposes to construct approximately 14 miles of 16" water main to provide water to private properties identified by the Air Force. The total cost of the project is nearly \$30 million, with just over \$12 million being requested from the State of South Dakota. SDEDA has informed BHWUD that a primary purpose for the Meade County Water Project is to provide potable water to approximately 50 residences at the far end of the pipeline whose potable water source has been impacted by polyfuoroaklkyl substances ("PFAS"). Obviously, a 16" water line is not necessary for 50 residences. SDEDA clearly has plans to provide potable water to others in the area, including future development.

The Project in part goes through the BHWUD's planned service area. BHWUD has invested time and resources into plans for developing its water system into the area through which the SDEDA pipeline proposes to run. BHWUD holds Future Use Water Permit No. 1995-1. This future use permit reserves 1300 acre feet of water annually from the Madison Aquifer for future development in Sections 26, 27, 31, 32, 33, 34, 35 in T3N-R7E and all of Sections 2,3,4,5,6,9,10, 11 in T2N-R7E. See Exhibit A. SDEDA's proposed pipeline route literally dissects this future use permit area. See Exhibit B, (obtained from application to Meade County for improvements in Section Line Right-of-Way).

SDEDA August 9, 2022 Page 2 of 5

BHWUD has a significant amount of existing infrastructure in the area of the proposed SDEDA project, including water distribution lines and an existing water reservoir east of I-90. Additionally, BHWUD has already expended considerable resources planning to further expand its distribution system east of I-90, in the precise area where SDEDA's proposed pipeline would be constructed. See Exhibit C, Black Hawk Water User District Water System Planning Map (dated November 16, 2017). BHWUD has been planning to expand into this area for more than five years.

It is BHWUD's understanding that other options for providing water to the PFAS-impacted homes exist. For example, BHWUD understands that the City of Rapid City has a water main approximately 1½ miles from the impacted homes and has offered to supply water to the area. And Rapid Valley Sanitary District also offered help supplying water. BHWUD has offered to provide water to the PFAS-impacted homes at no cost to the homeowner and BHWUD also has the capacity to serve water to other planned users. Representatives from SDEDA have rejected BHWUD's offer to use existing water supply capacity to serve the PFAS-impacted homes. BHWUD could provide the water required without the current need to drill a new well. BHWUD is also aware that construction of the SDEDA Project would result in the loss of a future development project in this area that BHWUD planned to serve.

Introducing a competing water utility will erode BHWUD growth, for which investments have already been made, including water distribution lines on Peaceful Pines Rd, Norman Avenue, and Erickson Ranch Rd and water storage facilities on Marvel Mountain, thereby potentially eroding the financial capacity for growth of BHWUD. When the federal government provides funding for rural water associations, language within the enabling regulations (7 U.S.C.1926 (b)) indicates that the service provided by the water utility receiving the loan "shall not be curtailed or limited by inclusion of the area served by association within the boundaries of any municipal corporation or other public body...." This language is intended to protect the utility's ability to repay the loan by not allowing a municipality or other public body to provide the same service within the utility's existing boundaries. While BHWUD does not currently have a federal loan that would provide protection under section 1926(b), the rationale for such protection applies here. BHWUD currently has multiple SRF loans totaling millions of dollars; timely repayment of these loans would be negatively impacted by a competing water distribution system operating in the area. BHWUD has invested funds on water infrastructure in this area, with the investment-backed expectation of growth in the area to be served. Introducing a competing water utility would negatively impact BHWUD's ability to continue expansion of its operations in the area where it has already invested resources. In addition to the intrusion into BHWUD's potential service area, BHWUD has other specific concerns with SDEDA's proposed water project.

SDEDA August 9, 2022 Page 3 of 5

SDEDA is a creature of statute, created by SDCL 1-16J-1, whose powers of authority are derived from SDCL 1-16J-7. Notably absent from the authorities granted SDEDA in SDCL 1-16J-7, is any reference to construction or operation of a potable water distribution system. By contrast, SDEDA's power to construct and operate a wastewater treatment facility is expressly granted by SDCL 1-16J-7(25). In other words, the Legislature has not granted SDEDA the legal authority to construct or operate a potable water distribution system.

Also, SDEDA has applied to Meade County to construct its water main in 16 miles of unopened section lines in Meade County, and design of that route is apparently 90% complete. However, during the recent Meade County Commission meeting, it was noted that 1½ miles of the section line where SDEDA seeks to construct its water main was vacated decades ago. At this point, the route chosen by SDEDA is not available.

Perhaps most fundamentally, BHWUD is concerned that an organization, with no experience in potable water distribution and with no local accountability, is forcing its way into the region. BHWUD is very concerned about transparency and accountability as SDEDA seeks to become the region's drinking water provider. The Board members of SDEDA are appointed by the Governor, and SDEDA reports to the Governor's Office of Economic Development. As is clear from SDEDA's website, the Board of Directors rarely meets. During the most recent meeting, which occurred in May, the agenda makes no mention of the Project, a project that will transform water distribution in the region and expand the scope of SDEDA's activities into entirely new territory. By contrast, BHWUD's Board of Directors are local individuals who are elected by the users.

BHWUD's concerns over transparency and accountability are heightened by the manner in which this project has been pursued. BHWUD has repeatedly stated its willingness to work with SDEDA, and the Air Force to provide water to the PFAS impacted homes. In response, SDEDA has indicated that the Department of Defense ("DOD") requires that SDEDA drill a well and own the infrastructure that will provide water to these residences. But no support for this contention has been forthcoming. BHWUD does not understand why the DOD would require an entity to own water distribution infrastructure that has no experience, or legal authority, to operate a water distribution system. Further, SDEDA's ownership of the facility will result in an administrative "bump" to the water rates charged to the end users, because SDEDA apparently plans to contract with a for-profit contractor to perform system operation and maintenance. To the fee charged by the for-profit O&M provider, SDEDA will add an administrative lift for SDEDA's efforts. This is clear from SDEDA's application for funding, referring to the manner its Waste Water Treatment Facility is operated, and the administrative bump (a percentage of the O&M costs billed to the wastewater customers) paid to SDEDA.

SDEDA August 9, 2022 Page 4 of 5

BHWUD recently applied for Drinking Water Facilities Funding for its I-90 Exit 52 Transmission Main Crossing Project. In order to apply for funding, BHWUD was required to demonstrate its technical, managerial and financial capacity. In order to do this, BHWUD completed Capacity Assessment Worksheets required by the DANR. BHWUD also submitted Financial Spreadsheets reflecting a coverage ratio of greater than 110% to demonstrate its ability to repay the requested loan. In order to have its funding application considered, BHWUD demonstrated its managerial and technical experience and expertise, as well as its ability to repay the loan – the same as every other applicant for an SRF loan has had to do. In contrast, the information provided by SDEDA in support of this application illustrates that BHWUD's concerns over transparency and accountability are well-placed.

SDEDA's application is largely blank, with occasional references to the fact that because no water system exists, large portions of the worksheets are inapplicable. The "Water Supply Assessment Certification Form" avoids the required certification that "consideration has been given to alternative publicly owned drinking water supply sources" by making a statement that the proposed future system will be "served by a publicly-owned water source or privately-owned water source for a public water system." Rather than completing the Capacity Assessment Worksheets, SDEDA states: "Checklist N/A & Not Completed." The Financial Spreadsheets accompanying this application reflect no operating income and a zero or negative coverage ratio. Furthermore, the resolution authorizing the application itself is signed by the Executive Director, an independent contractor hired by SDEDA, rather than a Board member. BHWUD has always been informed that it cannot apply for SRF funding using future expansion as the repayment mechanism; this appears to be exactly what SDEDA is doing. Consistent application of state rules to SDEDA as historically applied to other applicants would lead to rejection of this application.

BHWUD borrowed money in order to responsibly upgrade existing infrastructure to expand into the area SDEDA now seeks to serve. BHWUD was required to increase its rates to demonstrate the ability to repay these loans. Now, SDEDA seeks to expand its authority into the water utility space, eliminating BHWUD's ability to naturally and organically expand. The impact of loaning funds to SDEDA for this purpose will impact the entire Piedmont Valley. The current BHWUD users will be destined to pay these increased rates while the infrastructure will be stranded unable to be used to its full potential due to the loss of the future customer base.

BHWUD has been, and remains, ready and able to work with DANR, SDEDA, and the Air Force to provide water to PFAS contaminated homes. BHWUD has the experience, capacity and planning to responsibly develop into southern Meade County east of I-90. BHWUD strongly believes that any organization tasked with providing drinking water to the current and

SDEDA August 9, 2022 Page 5 of 5

future residents of the area must be transparent, accountable and experienced in water distribution.

Sincerely:

BLACK HAWK WATER USER DISTRICT

Ken LeBon, Manager

Brian Peterson

President

ENVIRONMENTAL SERVICES AGREEMENT

For

DESIGN OF A COMMUNITY DRINKING WATER SYSTEM TO REDUCE EXPOSURE TO PFOS AND PFOA

Between

THE AIR FORCE CIVIL ENGINEER CENTER

And

THE SOUTH DAKOTA ELLSWORTH DEVELOPMENT AUTHORITY

THIS ENVIRONMENTAL SERVICES AGREEMENT FOR DESIGN OF A COMMUNITY WATER SYSTEM TO REDUCE EXPOSURE TO PFOS AND PFOA (this "ESA") is made by and between the UNITED STATES OF AMERICA, acting by and through the AIR FORCE CIVIL ENGINEER CENTER (the "Air Force"), and the SOUTH DAKOTA ELLSWORTH DEVELOPMENT AUTHORITY, a corporate and political subdivision of the State of South Dakota ("SDEDA"), acting by and through its BOARD OF DIRECTORS. The Air Force and SDEDA sometimes are collectively referred to in this ESA as the "Parties."

RECITALS

A. In 2017, Perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) exceeding the levels recommended in the May 2016 United States Environmental Protection Agency (EPA) lifetime health advisories for human exposure to PFOS and PFOA through drinking water were detected in wells belonging to and serving private individuals whose affected real properties were located in one of four geographic areas south of Ellsworth Air Force Base, South Dakota. In 2019, PFOS and PFOA exceeding the EPA lifetime health advisories were detected in wells belonging to and serving private individuals whose affected properties were located in a fifth geographic area south of Ellsworth Air Force Base. One of

the five geographic areas outside Ellsworth Air Force Base where PFOS and PFOA concentrations in drinking water exceed EPA lifetime health advisories is located southwest of the military installation and the other four areas are located southeast of the installation. The impacted areas are identified as Areas A, B, C, D, and E on Figure 1 in the Appendix to this Agreement.

- B. Due to the health advisory exceedances, the Air Force purchased bottled water as an immediate, emergency response and later installed point-of-entry treatment systems as a short-term, interim response at most impacted properties in Areas A, B, C, and D where the residents did not already have an alternate source of drinking water that met the EPA lifetime health advisories for PFOS and PFOA. For impacted properties in Area E, the Air Force provided bottled water as an immediate, emergency and short-term, interim response.
- C. Section 104 of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), Executive Order 12580, and the Defense Environmental Restoration Program (DERP) authorize the Department of Defense, by and through the Air Force, to respond to releases of pollutants or contaminants from Federal facilities that have migrated off of those facilities.
- D. PFOS and PFOA are CERCLA pollutants or contaminants.
- E. The Air Force's authorization under CERCLA Section 104 (Title 42, United States Code, Section 9604) and the DERP (Title 10, United States Code, Sections 2701-2711) includes providing alternate water supplies and controlling exposure in drinking water to PFOS and PFOA that exceed the EPA lifetime health advisory levels.
- F. The Air Force has determined that its activities on Ellsworth Air Force Base may be,

among others, a potential source of the PFOS and PFOA contamination affecting private drinking water wells in five geographic areas (Areas A, B, C, D, and E) south of the military installation. The Air Force has also determined that it has authority under CERCLA and DERP to provide a response to the PFOS and PFOA impact that includes the provision of alternate drinking water supplies and, if needed, a treatment system to prevent exposure to PFOS and PFOA at levels above the EPA health advisories.

ARTICLE I

ESA PURPOSE AND SCOPE

SECTION 101. Purpose.

The purpose of this ESA is to obtain the services of SDEDA in accordance with Section 2701(d) of DERP (Title 10, United States Code, Section 2701(d)) to assist the Air Force in carrying out its responsibilities under CERCLA and DERP by designing a water system that will provide alternate drinking water to private individuals and control human exposure to PFOS and PFOA above the EPA lifetime health advisories.

SECTION 102 Scope.

This ESA seeks to have SDEDA complete a rural water system design to provide alternate drinking water supplies to PFOS and PFOA-impacted private properties identified by the Air Force and located in two geographic areas (Areas A and B) south of Ellsworth Air Force Base.

ARTICLE II

OBLIGATIONS OF THE PARTIES

SECTION 201. SDEDA Obligations.

SDEDA agrees to complete a design for a rural water system to provide drinking

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water to 36 private properties, which includes one mobile home park, identified by the Air Force to be impacted by PFOS and PFOA at concentrations above the EPA lifetime health advisories. The impacted properties are located in Areas A and B south of Ellsworth Air Force Base.

SDEDA agrees that the water system design will include a new, deep well into the Madison Aquifer, a pumping station, distribution pipelines and associated connectors, and storage (with the capacity limited to that required to meet domestic usage pressures during peak demand). In addition, if the deep well will draw groundwater that is impacted by PFOS or PFOA, then the design will include a treatment system to control exposure in drinking water to PFOS and PFOA that exceed the EPA lifetime advisories.

SDEDA agrees that the water system design will locate the well, associated pipelines, and equipment or materials necessary to construct the drinking water production and distribution system will be located on real property SDEDA owns, leases, or otherwise has or is taking steps to acquire enforceable rights to access and use. When developing the design SDEDA needs to take into consideration that the Air Force will not reimburse SDEDA for any costs related to the purchase, lease, or other acquisition of enforceable rights to access and use the real property needed to locate the rural water system, distribution pipeline, and associated equipment and material. Further, the Air Force will not reimburse SDEDA for any costs for permits or other authorizations SDEDA obtains from Federal, State, County, and municipal government authorities.

In no case shall SDEDA perform actions on behalf of the Air Force beyond the term of this ESA specified in Section 601 below.

SECTION 202. Air Force Obligations.

The Air Force agrees to reimburse SDEDA for costs to complete the water system design described in Section 201 above. However, the Air Force will not reimburse SDEDA for any costs associated with including in the design County or municipal fire protection capabilities (e.g., excess water storage capacity, fire hydrant system) or additional or other capabilities or features that are not required to provide impacted properties alternate water supplies that do not exceed the EPA lifetime health advisories for PFOS and PFOA.

The Air Force agrees to reimburse SDEDA for actions and activities described in Sections 201 and 202 of this ESA in accordance with Section 301 below.

ARTICLE III

FUNDING AND PAYMENT

SECTION 301. Air Force Payments.

During the ESA Term (as defined in Section 601 below), the Air Force will reimburse SDEDA for services performed under this ESA within 30 days of delivery to the Air Force by SDEDA of a) a payment request relating to completion of the water system design, and b) documentation to substantiate the work specified in the payment request.

The Air Force will reimburse SDEDA for services performed at the following rates:

- a) The Air Force will reimburse SDEDA for work associated with attaining 30 percent design approval at a rate not to exceed a total of \$300,000.00.
- b) The Air Force will reimburse SDEDA for work associated with attaining 60 percent design approval at a rate not to exceed a total of \$300,000.00.
 - c) The Air Force will reimburse SDEDA for work associated with attaining

90 percent design approval at a rate not to exceed a total of \$300,000.00.

d) The Air Force will reimburse SDEDA for work associated with attaining 100 percent design approval at a rate not to exceed a total of \$183,995.00.

The total cost reimbursed for all work associated with completion of the rural water system design shall not exceed a total of \$1,083,995.00 over the term of this Agreement.

For purposes of this Section, "design approval" means the water system design meets the applicable Federal, State, County, and municipal standards and is acceptable to the Air Force (for design documents not submitted to the State) or the State of South Dakota (for design documents submitted to the State).

SECTION 302. Anti-Deficiency Act.

The obligation of the Air Force to make reimbursements is subject to the availability of appropriated funds. Nothing in this ESA shall be interpreted to require payments by the Air Force in violation of the Anti-Deficiency Act (Title 31, United States Code, Section 1341).

SECTION 303. Relation to Prompt Payment Act.

This ESA is not a contract as defined in Office of Management and Budget Circular A-125 which implements the Prompt Payment Act of 1982 (Title 31, United States Code, Sections 1421- 3906) (the "Act"). Therefore, the Act does not apply to this ESA. However, the Air Force will use its best efforts to make payment within 30 days of submission of an invoice.

ARTICLE IV

APPLICABLE LAWS

SECTION 401. Compliance with Applicable Laws.

SDEDA shall comply, at its sole cost and expense (except for matters for which the Air Force remains obligated under applicable federal laws and, other applicable laws for which the United States has expressly waived its sovereign immunity) with all federal, state and local laws, rules, regulations and ordinances which are applicable to SDEDA. The Air Force shall comply, at its sole cost and expense, with all federal laws and other laws for which the United States has expressly waived its sovereign immunity which are applicable to matters for which the Air Force is obligated.

ARTICLE V

DISPUTE RESOLUTION

SECTION 501. Dispute Resolution.

In the event of any dispute arising out of or relating to this ESA, the Parties shall attempt, in good faith, to promptly resolve the dispute by mutual agreement using unassisted negotiation techniques (i.e., without the assistance of a neutral third party). As part of the unassisted negotiation, the Parties shall consider employing joint fact- finding, if material factual disputes are involved, and shall use other early resolution techniques appropriate to the circumstances. If the dispute cannot be resolved by mutual agreement, before or in conjunction with pursuing any remedy available to them under law or equity, the Parties, again by mutual agreement, may submit the dispute to an alternative dispute resolution procedure authorized by the Administrative Dispute Resolution Act of 1996, Pub. L. No. 104-320 (codified at Title 5, United States Code, Section 571-584). Notwithstanding the above, each Party shall have the right to take whatever action at law or in equity deemed necessary or desirable to enforce any obligation of the other Party set forth in this ESA.

ARTICLE VI

GENERAL PROVISIONS

SECTION 601. Effective Date and ESA Term.

This ESA is effective on the last day signed by one of the Parties to this Agreement. However, this ESA shall commence on September 1, 2021 and will terminate on August 31, 2022 unless renewed by mutual agreement of the Parties. Either Party may terminate this Agreement at will prior to the termination date by providing the other Party at least sixty (60) days advanced written notice.

SECTION 602. Amendment.

This ESA may be amended only by an instrument in writing, signed by the Parties.

SECTION 603. Successors and Assigns.

This ESA may not be assigned by a Party. All obligations and covenants made under this ESA shall bind and inure to the benefit of any successor to a Party, whether or not expressly assumed by such successor.

SECTION 604. Entire Agreement.

This ESA constitutes the entire agreement between the Parties regarding the provision of alternate water supplies. Any/all prior discussions and understandings, written or oral, on this matter are superseded by this ESA.

SECTION 605. Severability.

If any provision of this ESA is held invalid by a court, the remainder of the ESA shall continue in force and effect to the extent not inconsistent with such holding.

SECTION 606. Execution.

This ESA may be executed in two counterparts, each of which shall be deemed an original.

SECTION 607. Conflict of Interest.

The Parties shall ensure that their employees are prohibited from using their positions for a purpose that is or gives the appearance of being motivated by a desire for private gain for themselves or others.

SECTION 608. Officials Not to Benefit.

SDEDA acknowledges that no member or delegate to the United States Congress, or resident Commissioner, shall be permitted to share in any part of this ESA or receive any benefit that may arise therefrom.

SECTION 609. Nondiscrimination.

SDEDA covenants and agrees that no person, on the grounds of race, religion, color, national origin, sex, age or handicap, shall be denied benefits of, or otherwise be subjected to discrimination in connection with SDEDA's performance under this ESA. Accordingly, SDEDA covenants and agrees to comply with the following to the extent applicable:

- Title VI of the Civil Rights Act of 1964 (Title 42, United States Code, Sections 2000d-2000d-7), and Department of Defense regulations (Title 32, Code of Federal Regulations, Part 300) issued thereunder;
- Executive Order 11246 and Department of Labor regulations issued thereunder (Title 41, Code of Federal Regulations, Part 60);
- 3. Section 504 of the Rehabilitation Act of 1973 (Title 29, United States Code, Section 794); and,

4. The Age Discrimination Act of 1975 (Title 42, United States Code, Sections 6101-6107) and implementing regulations issued thereunder as incorporated in Title 45, Code of Federal Regulations, Part 90.

SECTION 610. Lobbying.

SDEDA covenants and agrees that it will not expend any funds appropriated by Congress to pay any person for influencing or attempting to influence an officer or employee of any agency or a Member of Congress in connection with any of the following covered federal actions: the awarding of any federal contract; the making of any federal grant; the entering into of any agreement; the making of any federal loan; and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, agreement or loan.

SDEDA also agrees to comply with restrictions on lobbying, issued by the Office of Management and Budget (OMB) and Department of Defense (Title 32, Code of Federal Regulations, Part 28) that implement the provisions of Title 31, United States Code, Section 1352.

SECTION 611. Drug-Free Work Place.

SDEDA covenants and agrees that it will comply with the provisions of the Drug- Free Work Place Act of 1988, (Title 41, United States Code, Sections 701-707) and maintain a drug-free workplace.

SECTION 612. Audits.

The Comptroller General, the Inspector General of the Department of Defense, the Defense Contract Audit Agency and/or the Air Force Audit Agency shall have direct access to sufficient records and information of SDEDA, as they determine, to ensure accountability for federal funds. Any audit shall be conducted in accordance with OMB Circular A-133 and Title 32, Code of Federal

Regulations, Section 33.26.

SECTION 613. Notices.

Any notice, transmittal, approval, or other official communication made under this ESA shall be in writing and shall be delivered by hand, facsimile transmission, or by mail to the other party at the address or facsimile transmission telephone number set forth below, or at any such other address as may be later designated from time to time by written notice using certified mail:

1. The Air Force points of contact for this ESA are:

Primary: (b) (6) , 106 Peacekeeper Drive, Building 323, Room 227, Offutt Air Force Base, NE 68113

Alternate: , 28 CES/CEI, 2125 Scott Drive, Ellsworth Air Force Base, South Dakota 57706

2. SDEDA points of contact for this ESA are:

Primary: (b) (6) , SDEDA, P.O. Box 477,
Rapid City, SD 57709.

Alternate: , SDEDA, P.O. Box 477,

Rapid City, SD 57709.

SECTION 614. No Joint Venture.

Nothing contained in this ESA shall make, nor shall be construed to make, the Parties partners or joint ventures with each other. Neither will anything in this ESA render, nor be construed to render, either of the Parties liable to any third party for the debts or obligations of the other Party.

SECTION 615. Exhibits.

Reserved

SECTION 616. Change of Circumstances.

Each Party will promptly notify the other Party of any legal impediment, change of circumstances, pending litigation, or any other event or condition that may adversely affect such Party's ability to carry out any of its obligations under this ESA

SECTION 617. Force Majeure.

The Parties shall perform the requirements of this ESA except to the extent performance is prevented or delayed by events that constitute force majeure. "Force majeure" is defined as any event arising from causes which are beyond the control of a Party and which cannot be overcome with due diligence, and include but are not limited to war, terrorism, riots, strikes and other labor issues, severe weather, legal action by private citizens or organizations that result in injunction, and acts of God, to the extent such events result in delays or cessation of the Tasks or Evaluation.

APPENDIX

Figure 1. Off-base Areas with PFOS/PFOA-Impacted Drinking Water above the EPA Lifetime Health Advisories, Ellsworth Air Force Base, South Dakota.

IN WITNESS WHEREOF, the Parties to this ESA, by their authorized representatives, hereby cause this ESA be executed as of the Effective Date.

Air Force Signature Page to **Environmental Services Agreement**

UNITED STATES AIR FORCE, acting by and through the AIR FORCE CIVIL ENGINEER CENTER

DENTINO.DAVID.H Digitally signed by DENTINO.DAVID.H.1126570488 Date: 2021.09.01 14:55:58 -05'00'

By: DAVID H. DENTINO, SES, DAF

Executive Director, AF Civil Engineer Center

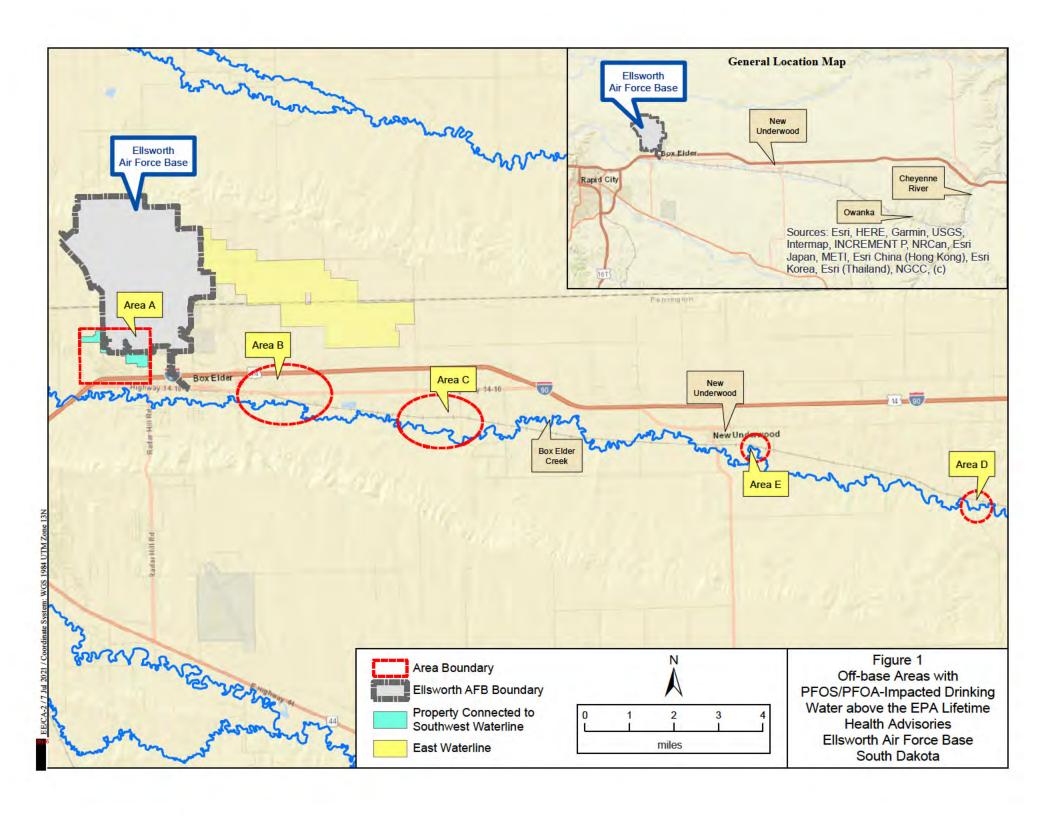
Date: 1 Sep 2021

SDEDA Signature Page to Environmental Services Agreement

SOUTH DAKOTA ELLSWORTH
DEVELOPMENT AUTHORITY, acting by
and through its BOARD OF DIRECTORS



Date: 7-30-2021



https://www.bhpioneer.com/local_news/ellsworth-development-authority-working-to-find-solutions-for-pipeline-project/article_fd5cdf78-28ae-11ed-b108-5b738e68c518.html

Ellsworth Development Authority working to find solutions for pipeline project

By Deb Holland Black Hills Pioneer Aug 31, 2022 EXHIBIT G



The proposed water pipeline project through Meade County. Courtesy photo

STURGIS – Officials with the South Dakota Ellsworth Development Authority are working hard to answer the barrage of questions surrounding a water pipeline project in Meade County they are spearheading, the group's managing director said.

Glen Kane said the Development Authority is doing its best to be transparent and helpful during the process of designing the nearly \$30 million pipeline and seeing it to completion.

"By all of us working together, we will find the best solution. We're trying to make everybody have best we can," Kane said.

Privacy - Terms

The Development Authority is seeking \$12.1 million of funding from the Board of Water and Natural Resources for the water project that will consist of the construction of a new regional water system located to the north of Rapid City, east of Black Hawk and extending east to Box Elder.

The purpose of the project is to provide an alternative water supply to properties currently having contaminate-impacted water supplies and do address regional water needs.

The process of looking for an alternative water source began at the behest of the Air Force, Kane said.

Judy Lopez, director of Environmental Management for the Air Force, explained the need for quality water in a letter dated Aug. 10 to William Larson, Chair of the Water Management Board of the South Dakota Department of Agriculture and Natural Resources.

"The purpose of this letter is to communicate U.S. Air Force support for the South Dakota Ellsworth Development Authority's March 1, 2022 application for a water rights permit to support a community water system in the vicinity of Ellsworth Air Force Base," she wrote.

She goes on to say that the Air Force has determined that releases from historic firefighting activities on Ellsworth AFB are a likely contributor to the presence of perfluorooctane sulfonate and perfluorooctanoic acid in shallow groundwater that is used as a drinking water source for residences near Ellsworth.

When the petition for utility improvements along section line right-of-ways for the pipeline came before the Meade County Commission, it was learned that the water was for 38 homes near Ellsworth.

The Air Force completed an Engineering Evaluation and Cost Analysis in 2020 to identify response alternatives, costs, and estimated times for implementation to deal with the water issues.

An action memorandum was subsequently signed in January 2021 to document the chosen alternatives and numerous meetings were held to discuss implementation options with the city of Box Elder between 2018 and 2021, Lopez said.

She said that talks fell through after the Air Force determined that its restoration work funds could not be used to pay for some of the engineering requirements, such as fire flow, that the city of Box Elder required to expand their municipal system.

Additionally, the city of Box Elder currently requires residences to be annexed into the city to receive city services and a majority of the impacted residences stated their refusal to annex, Lopez said.

The Air Force also met with the city of Rapid City, who chose not to participate. The Rapid Valley Water District, approximately five miles south of Ellsworth AFB, initiated a meeting with the Air Force to express their willingness to help; however, they required the base's water rights in return, which is not viable for national security reasons, Lopez said.

The Air Force did not contact the Black Hawk Water User District, which submitted a petition on June 6 opposing SDEDA's water permit application, because the system is located more than 10 miles from the impacted areas and is not a government entity, she said.

"After being unable to work out a support arrangement with the existing municipal systems close to Ellsworth, the Air Force obtained the services of SDEDA in 2021 to design a water system to provide alternate drinking water to private individuals and control human exposure to PFOS/PFOA above the 2016 EPA Lifetime HAs," Lopez wrote in the letter.

of 6

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She said the Development Authority collaborated with the Air Force and city of Box Elder to build the Regional Wastewater Treatment Plant, which treats wastewater from both the city of Box Elder and Ellsworth AFB.

"As an existing utility provider in the local community, SDEDA is well-suited to build and operate a community water system," she wrote.

The Air Force and SDEDA are in the process of entering into a new agreement where the Air Force will provide partial funding (about \$17.5 million) to SDEDA to build the community water system and connect PFOS/PFOA impacted residents to the system.

She said the Air Force is only providing the funding necessary to install a new well into the Madison Aquifer and provide water to PFOS/PFOA impacted residents. SDEDA is upsizing the system and is obtaining funding from other sources to supplement the funding provided by the Air Force.

"The Air Force trusts SDEDA to do what is in the best interest of both Ellsworth AFB and the surrounding community," Lopez said.

One of the questions asked of the Development Authority is why they don't just dig a well near Box Elder.

Kane said they wanted to provide the best quality of water possible, and they believe they have found that in the Madison Aquifer northeast of Black Hawk and Summerset.

Another question that arose at the Aug. 23 meeting of the Meade County Commission was the concern that a portion of the route which the pipeline would follow is along a vacated section line.

Kane said they learned about the vacated section line after visiting the Meade County Register of Deeds office.

"Hiccups happen along the way, and this was a shock to us," he said.

The information about the vacated section line was filed with the auditor not with the Register of Deeds, Kane said.

And another pressing question is why the Development Authority is not working with an established water provider such as the Black Hawk Water User District.

"The Air Force has specific guidelines. It would be much easier for us to do that, but we have to own and operate the system. It just isn't in the cards," Kane said.

Ken LeBon, Manager of the Black Hawk Water User District, addressed his concerns about the pipeline at a recent meeting hosted by Elevate Rapid City on Aug. 10.

He said the Development Authority clearly has plans to provide potable water to others in the area, including future development.

"The Project in part goes through the BHWUD's planned service area. BHWUD has invested time and resources into plans for developing its water system into the area through which the SDEDA pipeline proposes to run," he wrote in a letter to the Development Authority.

LeBon goes on to say that the Black Hawk Water User District has a significant amount of existing infrastructure in the area of the proposed Development Authority project, including water distribution lines and an existing water reservoir east of 1-90. Additionally, the district has already expended

considerable resources planning to further expand its distribution system east of 1-90, in the precise area where SDEDA's proposed pipeline would be constructed.

"BHWUD has been, and remains, ready and able to work with DANR, SDEDA, and the Air Force to provide water to PFAS contaminated homes," LeBon wrote. "BHWUD strongly believes that any organization tasked with providing drinking water to the current and future residents of the area must be transparent, accountable and experienced in water distribution."

The issue of the pipeline is slated to come before the Meade County Commission again at its Oct. 11 meeting.

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ENGINEERING EVALUATION AND COST ANALYSIS NON-TIME CRITICAL REMOVAL ACTION FOR PERFLUOROOCTANOIC ACID AND PERFLUOROOCTANE SULFONIC ACID IN RESIDENTIAL WELLS ELLSWORTH AIR FORCE BASE, SOUTH DAKOTA

Contract Number: W9128F-16-D-0044
Delivery Order: W9128F19F0178

Prepared for:



USACE Omaha District 1616 Capitol Ave Omaha, NE 68102-4901

Prepared by:



Tehama 1600 Genessee Street, Suite 754 Kansas City, MO 64102

June 12, 2020

ENGINEERING EVALUATION AND COST ANALYSIS NON-TIME CRITICAL REMOVAL ACTION FOR PERFLUOROOCTANOIC ACID AND PERFLUOROOCTANE SULFONIC ACID IN RESIDENTIAL WELLS

ELLSWORTH AIR FORCE BASE, SOUTH DAKOTA

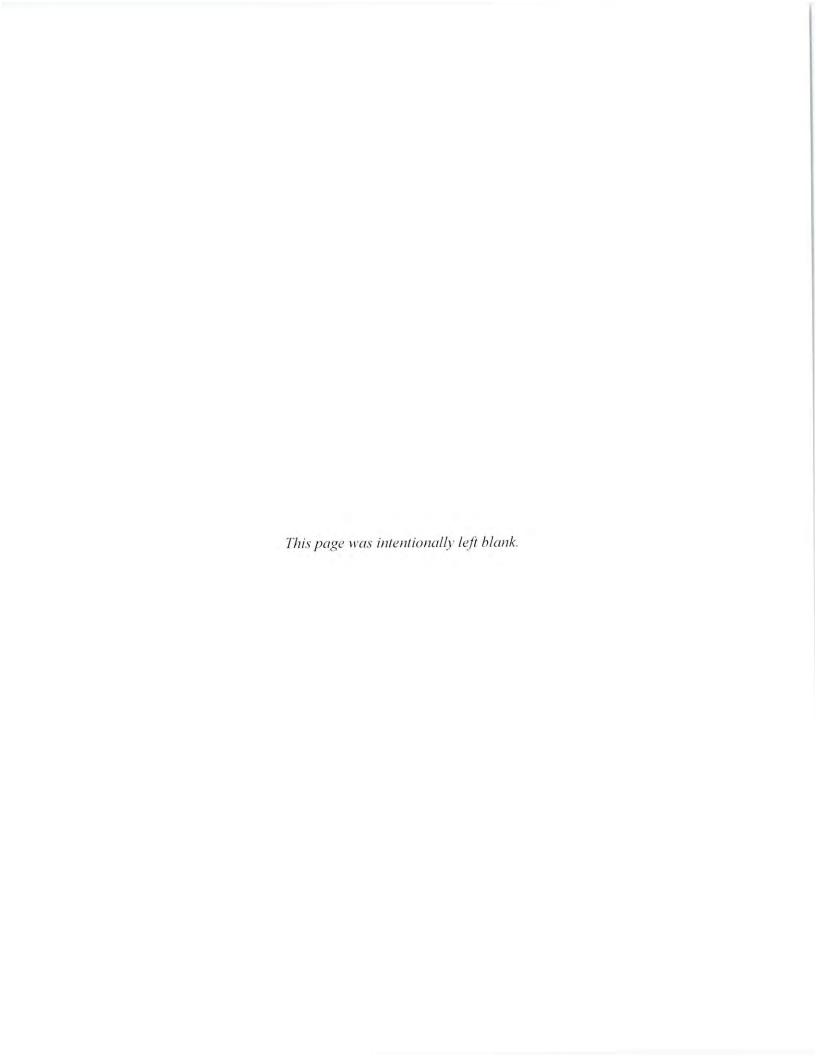


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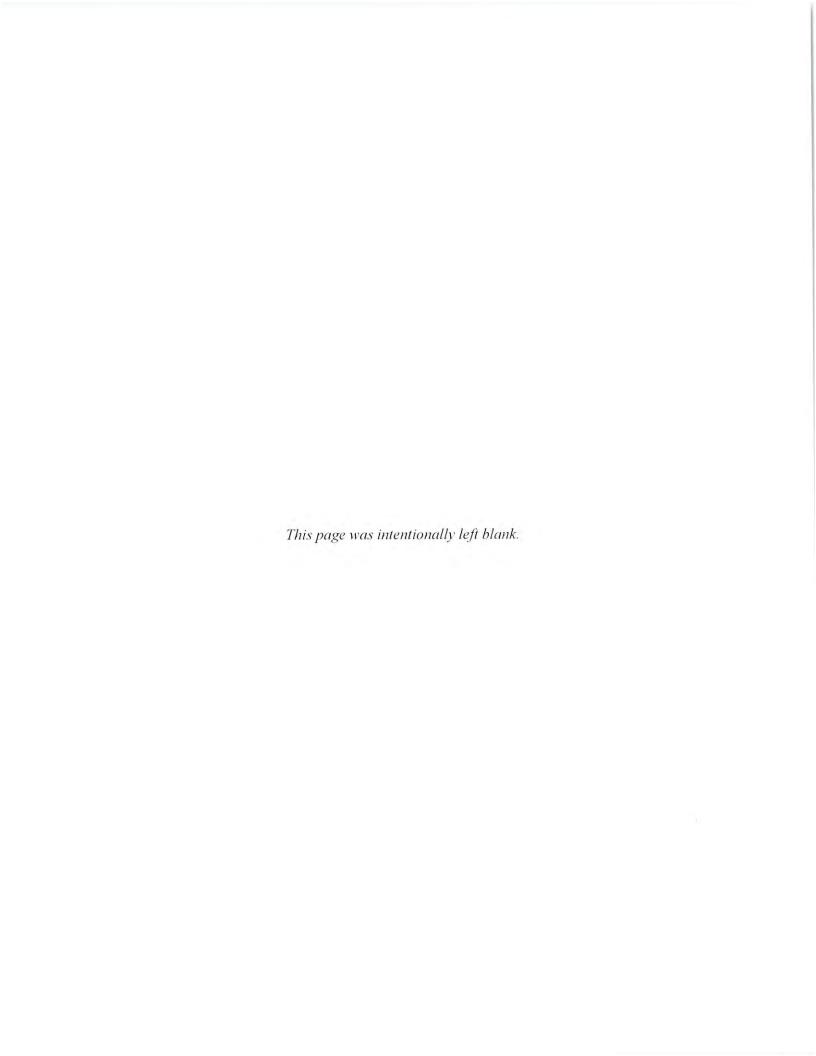
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Appendix A Cost Estimate



LIST OF ACRONYMS AND ABBREVIATIONS

AFB Air Force Base

AFFF aqueous film-forming foam

AFI Air Force instruction AOC area of concern

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act,

42 USC §§ 9601-9675

CFR Code of Federal Regulations

DERP Defense Environmental Restoration Program, 10 USC §§ 2701-2711

DoD (U.S.) Department of Defense

DoDI 4715.07 Department of Defense Instruction 4715.07, Defense Environmental

Restoration Program (DERP), May 21, 2013 (incorporating Change 2,

August 31, 2018)

DoDM 4715.20 Department of Defense Manual 4715.20, Defense Environmental

Restoration Program (DERP) Management, March 9, 2012 (incorporating

Change 1, August 31, 2018)

EE/CA engineering evaluation and cost analysis

EO 12580 Executive Order 12580, Superfund Implementation, January 23, 1987

EPA (U.S.) Environmental Protection Agency

gpm gallons per minute

LHA lifetime health advisory

μg/L microgram per liter

NCP National Oil and Hazardous Substances Pollution Contingency Plan, 40

CFR Part 300

NTCRA non-time critical removal action

OU operable unit

O&M operation and maintenance

PA preliminary assessment PFOA perfluorooctanoic acid

PFOS perfluorooctane sulfonic acid

ppt parts per trillion

RAO removal action objective

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

SARA	Superfund Amendments and Reauthorization Act, Public Law 99-499 (1986)
SDEDA	South Dakota Ellsworth Development Authority
SI	site investigation
TBC	to be considered
TCRA	time critical removal action
U.S.	United States
USAF	U.S. Air Force

U.S. Code

USC

EXECUTIVE SUMMARY

The U.S. Air Force (USAF) will conduct a non-time critical removal action (NTCRA) to address the releases from the use of aqueous film forming foam (AFFF) during USAF firefighting activities. While AFFF was used in accordance with manufacturer guidelines, it contained perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) that are a likely potential contamination source of groundwater used as a drinking water source for residences near Ellsworth Air Force Base, South Dakota. In 24 privately-owned wells, concentrations of PFOS and PFOA are greater than recently developed U.S. Environmental Protection Agency (EPA) lifetime health advisory (LHA) action levels. These exceedances of the LHA action levels prevent the residents from using their wells for potable water and triggered the need for this NTCRA.

This engineering evaluation and cost analysis (EE/CA) identifies the removal action objective (RAO), identifies and evaluates potential alternatives for completing the NTCRA, and recommends which alternative or combination of alternatives should be implemented to achieve the RAO. These alternatives are:

- Alternative 1, no further action: maintain the status quo through the USAF operating and
 maintaining point-of-entry or wellhead treatment systems installed as part of the 2017
 time critical removal action (TCRA) and alternative water supply actions in the
 Southwest Waterline area. Alternative 1 provides a baseline against which the other
 removal action alternatives can be evaluated.
- Alternative 2, Box Elder new water supply well: install new water supply well and connect affected properties to Box Elder's water distribution system.
- Alternative 3, South Dakota Ellsworth Development Authority (SDEDA), Rapid
 City source, new transmission main: connect the affected properties to a new regional
 water system that is operated by SDEDA and obtains water from Rapid City. Water would
 be conveyed through a new transmission main.
- Alternative 4, SDEDA, new supply well: similar to Alternative 3 except SDEDA would obtain water from a new supply well located in or near Box Elder.
- Alternative 5, purchase affected properties: the USAF or another entity, such as SDEDA, would purchase the properties with contaminated wells and the current occupants would relocate.
- Alternative 6, connect Area C to rural water system: connect the Area C properties to the Sunset Ranch rural water system.
- Alternative 7, drill new individual wells: install a new alluvial well to replace each contaminated well.

One or more of the above alternatives, depending on site-specific circumstances, will be used to assure attainment of the RAO. This proposed action will protect human health from exposure to PFOS and PFOA in drinking water at concentrations in excess of the EPA LHA action levels.

ENGINEERING EVALUATION AND COST ANALYSIS NON-TIME CRITICAL REMOVAL ACTION FOR PERFLUOROOCTANOIC ACID AND PERFLUOROOCTANE SULFONIC ACID IN RESIDENTIAL WELLS ELLSWORTH AIR FORCE BASE, SOUTH DAKOTA

1.0 INTRODUCTION

1.1 PURPOSE AND OBJECTIVE

The U.S. Air Force (USAF) will conduct a non-time critical removal action (NTCRA) to address historical releases by the USAF of pollutants or contaminants into the environment that are a likely potential cause of concentrations of perfluorooctanoic acid (PFOA) and/or perfluorooctane sulfonic acid (PFOS) exceeding U.S. Environmental Protection Agency (EPA) lifetime health advisory (LHA) action levels in 24 wells used to supply drinking water to private residences near Ellsworth Air Force Base (AFB), South Dakota. This engineering evaluation and cost analysis (EE/CA) identifies and evaluates proposed alternatives for completing the NTCRA to protect human health from exposure to these pollutants or contaminants in drinking water. The EE/CA identifies the removal action objective (RAO); identifies and evaluates potential alternatives for conducting the removal action; and recommends the best-suited removal action alternative. This proposed action will protect human health from exposure to PFOS and PFOA in drinking water in excess of the EPA LHA action levels.

The U.S. Department of Defense (DoD) has the authority to undertake this removal action pursuant to Sections 104 and 120 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S. Code (USC) §§ 9604, 9620; Section 2701 of the Defense Environmental Restoration Program (DERP), 10 USC § 2701; Section 300.415 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) § 300.415; Executive Order (EO) 12580, as amended; and EPA, DoD, and USAF guidance. This EE/CA was prepared for Ellsworth AFB, the Air Force Civil Engineer Center, and the U.S. Army Corps of Engineers, Omaha District, under Contract Number W9128F-16-D-0044, Delivery Order W9128F19F0178, in accordance with the *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA, 1993).

1.2 STATUTORY FRAMEWORK

CERCLA and the NCP provide authority for the lead federal agency to take action to abate, prevent, minimize, stabilize, mitigate, or eliminate the release or threat of release of a pollutant or contaminant the agency determines poses an imminent and substantial danger to public health or welfare, and the lead federal agency determines that such action is appropriate based on consideration of several factors, to include actual or potential exposure to nearby human populations, and actual or potential contamination of potential drinking water supplies. The EPA has categorized removal actions in three ways (emergency, time-critical, and non-time critical) based on the type of situation, the urgency and threat of the release or potential release, and the subsequent time frame in which the action must be initiated. CERCLA and NCP define removal

actions to include such actions as may necessarily be taken in the event of the threat of release of pollutants or contaminants into the environment; and such action as may be necessary to monitor, assess, and evaluate the release or threat of release, the disposal of removal material, or the taking of such other actions as may be necessary to prevent, minimize or mitigate damage to the public health or welfare or to the environment, which may otherwise result from a release or threat of release.

Removal actions are usually interim measures that, to the extent practicable, must contribute to the efficient performance of any anticipated, long-term remedial action. One example of a removal action listed in 40 CFR 300.415(e) is provision of an alternate water supply until a permanent remedy can be implemented. Another potential removal action is treatment of the extracted groundwater before use. This latter action is currently being implemented through point-of-use treatment at residences near Ellsworth AFB as part of the time critical removal action (TCRA) for responding to off-Base drinking water sources with PFOS and PFOA at concentrations above the EPA LHA action levels.

USAF is the lead federal agency for a removal action to address PFOS and PFOA contamination in off-Base, household drinking water supply wells that it determines is attributable, at least in part, to USAF activities and poses an imminent and substantial danger to public health or welfare (i.e., exceeds the EPA LHA action levels). As such, USAF has final approval authority, with state and EPA concurrence, over the recommended alternative and all public participation activities. This EE/CA complies with the requirements of CERCLA, DERP, the NCP, and EO No. 12580. This removal action has been determined to be appropriate because factors under 40 CFR § 300.415(b)(2)(ii) apply, namely that there is actual contamination of private wells used to supply households with drinking water.

1.3 REPORT ORGANIZATION

The remainder of this EE/CA is organized in the following sections:

- Section 2.0 provides site characterization information such as site description, site investigation, and a streamlined risk assessment.
- Section 3.0 defines RAOs for the proposed removal action.
- Section 4.0 presents the identification and analysis of removal action alternatives.
- Section 5.0 provides a comparative analysis of removal action alternatives.
- Section 6.0 identifies the recommended removal action alternative.
- Section 7.0 provides references used in preparation of this report.
- Appendix A presents the cost estimate for each alternative.

2.0 SITE CHARACTERIZATION

2.1 SITE DESCRIPTION AND BACKGROUND

Ellsworth AFB is located 6 miles northeast of Rapid City, South Dakota and adjacent to the City of Box Elder, South Dakota (Figure 2.1). The Base encompasses 4,858 acres within Meade and Pennington counties. Ellsworth AFB has been in operation since the 1940s and has been the base of operations for several types of aircraft and missile systems. Presently, the 28th Bomb Wing (B-1B bombers) is the host unit of Ellsworth AFB. The installation is composed of one major runway supported by taxiways, airfield operations, industrial areas, housing units, and recreational facilities. Ellsworth AFB is bordered to the north and west by ranch land, and to the east and south by residential and commercial areas as well as ranches. During the 1990s, the USAF installed a waterline southwest of the Base to provide drinking water to properties with residential drinking water wells that had been contaminated with volatile organic compounds from a landfill. This waterline is called the Southwest Waterline.

Environmental investigations began in 1984 and Ellsworth AFB was placed on the National Priorities List in 1990 (EPA identification: SD2571924644). The USAF, State of South Dakota, and EPA Region 8 entered into a Federal Facilities Agreement under CERCLA Section 120 (42 USC § 9620) in 1992. The 1992 Federal Facility Agreement identified 12 operable units (OUs). After two partial deletions in 2006 and 2012, OU-11 (Basewide Groundwater) is all that remains on the National Priorities List requiring further cleanup (URS, 2017). The site for this NTCRA encompasses PFOS and PFOA in off-Base groundwater used as a potable water supply by off-Base, private residences.

2.2 INVESTIGATION OF PFOS AND PFOA

Investigation of PFOS and PFOA was initiated in 2011 with soil and groundwater sampling at FT001, also known as OU-1, a former fire training area that had been previously investigated and deleted from the National Priorities List. Because PFOS and PFOA have only recently been identified as potential contaminants, samples collected at FT001 during the historical investigations had not been analyzed for these compounds. FT001 was identified as a potential area of concern (AOC) for PFOS and PFOA contamination because historical fire training activities used aqueous film-forming foam (AFFF) in accordance with manufacturer guidelines to extinguish fires. PFOS and PFOA are ingredients of AFFF. PFOS and PFOA are considered emerging contaminants and the EPA is currently working to promulgate drinking water standards.

The analytical results of the 2011 samples showed PFOS and PFOA contamination in both soil and groundwater at FT001. In 2014 – 2015, a Basewide preliminary assessment (PA) evaluated 18 sites where PFOS and PFOA could have been used and released. The PA reviewed historical records to identify fire training areas, crash sites, and other areas at the installation where AFFF could have been used, stored, handled, or released. FT001 was one of the 18 sites included in the PA. The PA recommended no further action for five sites, completion of a site investigation (SI) for 12 sites, and further investigation of FT001 (CH2M Hill, 2015). In 2014, an SI was performed to assess the presence of PFOS and PFOA at four of the sites recommended for investigation by the Basewide PA. Detections reported for groundwater samples from all four sites were greater than the screening values (SES Construction and Fuel Services LLC, 2015).

A Basewide SI was initiated in 2016. The investigation targeted the 12 sites identified by the PA and included soil, groundwater, surface water, and sediment sampling. The four sites from the 2014 SI were part of the 12 sites evaluated in the Basewide SI. Based on the analytical results, further investigation was recommended for 10 sites and no further action was recommended for two sites. In total, there are 11 sites recommended for investigation of PFOS and PFOA: 10 sites from the Basewide SI and FT001. In 2016 – 2018, additional investigation of the PFOS and PFOA contamination emanating from FT001 showed groundwater contamination migrating off-Base to the south.

The results of the above investigations prompted the initial sampling of drinking water wells for private residences. In 2016, PFOS and PFOA were identified in one off-Base, private drinking water well that supplied two residences. In 2018 – 2019, sampling of private, residential, drinking water wells near the Base identified 22 household wells with PFOS and/or PFOA concentrations greater than the LHA action levels in addition to the contaminated well identified in 2016 (APTIM Federal Services, LLC, 2019a). One of these wells supplies drinking water to the Plainsview Mobile Manor Home Park with, on average, 65 occupied residences and a maximum of 119 occupied residences. The number of occupied residences fluctuates. The other contaminated wells each supply drinking water to one or more residences. Samples with action level exceedances from the 2018-2019 well survey are listed in Table 2.1.

The groundwater data collected to date suggest that PFOS and PFOA are migrating from Ellsworth AFB to and along Box Elder Creek through the surface drainage alluvium. Most private wells in the area are approximately 20 to 50 feet deep and generally located within drainage alluvia (APTIM Federal Service, LLC, 2019b).

In 2016, the Ellsworth AFB drinking water supply was sampled for analysis of PFOS and PFOA. Neither compound was detected. In 2018, the City of Box Elder sampled their supply wells, which are 4,500 feet deep, for analysis of PFOS and PFOA. Neither compound was detected in these deep groundwater samples (USAF, 2019).

2.3 PREVIOUS AND ONGOING ACTIONS

The NTCRA being evaluated in this document is a follow-on to actions initiated in September 2018 which continue today in accordance with the TCRA Action Memorandum that was signed on June 5, 2019. All removal actions are part of the USAF's larger, long-term response action to the groundwater contamination.

In 1970, the Air Force began using AFFF, which contains PFOS and PFOA. AFFF is the most efficient extinguishing method for petroleum fires and is widely used across the firefighting industry, including at all commercial airports, to protect people and property. Once PFOS and PFOA were identified as emerging contaminants, the USAF began to investigate Ellsworth AFB for the presence of these compounds. These investigations started in 2011 and are ongoing.

In January 2017, two residential properties south of the Base with PFOS and/or PFOA concentrations exceeding the LHA action levels of 0.07 μ g/L (70 ppt) for PFOS and PFOA individually, and 0.07 μ g/L (70 ppt) for the two compounds in combination in the private drinking

water well were connected to an existing, temporary potable water supply line (Southwest Waterline).

In July 2017, a property south (downgradient) of the Base was investigated for PFOS and PFOA in surface water and groundwater. In 2018-2019, a well survey was completed and 112 drinking water wells were sampled for PFOS/PFOA. This survey identified 22 residential drinking water wells with PFOS and/or PFOA concentrations greater than the LHA action levels. These 22 contaminated wells supply water to 91 residences. The USAF purchased bottled water for the affected residences as a temporary solution. To date, three residences have been connected to the Box Elder municipal water supply, four residences are planned for connection, 19 point-of-entry treatment systems have been installed, and installation of one point-of-entry treatment system is planned.

Current PFOS and PFOA actions include the following activities:

- Continued provision of bottled drinking water to residences with PFOS and/or PFOA
 concentrations above the LHA action levels in drinking water wells until an alternate water
 source (treatment system, replacement well, or connection to a water system) is available.
- Operation and maintenance (O&M), including semiannual sampling, of the point-of-entry treatment systems that have been installed and the treatment system for the well that supplies drinking water to the Plainsview Mobile Manor Home Park.
- Quarterly resampling of residential wells with PFOS and/or PFOA previously detected at
 concentrations between 35 parts per trillion (ppt) and 70 ppt to confirm that concentrations
 in these wells do not increase to greater than the LHA action level.
- Seventeen residences that were connected in the 1990s to the Southwest Waterline as part
 of an environmental response action to volatile organic compound/trichloroethene
 contamination and two residences that were connected to this supply line in January 2017
 in response to PFOS/PFOA contamination from the installation (see above) will remain on
 the Southwest Waterline until implementation of the NTCRA that this EE/CA supports.

Reports in the administrative record documenting the investigations and actions taken to date are listed below and are available on the publicly available administrative record website available at https://ar.afcec-cloud.af.mil/search.aspx.

- Final Preliminary Assessment Report for Perfluorinated Compounds at Ellsworth Air Force Base, South Dakota (CH2M Hill, 2015) (AR #8339).
- Final Site Investigation Report for Site Investigations of Fire Fighting Foam Usage at Various Air Force Bases in the United States for Ellsworth Air Force Base, Meade and Pennington Counties, South Dakota (SES Construction and Fuel Services, LLC, 2015) (AR #8343).
- Final Technical Memorandum Residential Well Survey Perfluorinated Compound Delineation at Area of Concern Perfluorinated Compound-1, Ellsworth Air Force Base, South Dakota (Ayuda Partners Joint Venture, 2017) (AR #8492).
- Final Phase I Field Sampling Report, Perfluorinated Compound Sampling, Ellsworth Air Force Base, South Dakota – Farrar Ranch (APTIM Federal Services, LLC, 2018) (AR #8547).

- Draft Remedial Investigation Report Per- and Polyfluoroalkyl Substances Area of Concern Perfluorinated Compounds-1, Ellsworth Air Force Base, South Dakota (Ayuda Partners Joint Venture, 2018) (AR #8588).
- Final Site Inspection Report of Aqueous Film Forming Foam Areas at Ellsworth Air Force Base, Meade and Pennington Counties, South Dakota (Aerostar SES, LLC, 2019) (AR #8596).
- Final Phase II Off-Base Per- and Polyfluoroalkyl Substances in Private Wells Sampling Report, Ellsworth Air Force Base, South Dakota. (APTIM Federal Services, LLC, 2019b) (AR #8650).
- Technical Memorandum: Additional Well Sampling, Implementation of High Resolution Site Characterization and Remediation Techniques at Complex Sites at Ellsworth Air Force Base, South Dakota (OTIE, 2019) (AR #8655).
- Action Memorandum for a Time-Critical Removal Action, Treatment of PFOS- and PFOA-Contaminated Water in Residential Wells Near Ellsworth Air Force Base, South Dakota (USAF, 2019) (AR # 8603).

2.4 SOURCE, NATURE, AND EXTENT OF CONTAMINATION

The source of PFOS and PFOA contamination at Ellsworth AFB is historical use of AFFF. AFFF was developed in the 1960s to extinguish petroleum fires. The USAF started using AFFF in 1970. Because of their ability to put out fires and suppress re-ignition, AFFFs were widely used at both military and civilian airports. AFFF, which contains both PFOS and PFOA, would have been used during fire training exercises, during suppression of actual fires, and in fire suppression systems.

As described above, PFOS and PFOA investigations completed to date at Ellsworth AFB have identified 11 sites where historical activities resulted in PFOS and PFOA contamination in groundwater at concentrations exceeding the EPA LHA action levels. Data collected from residential wells indicate that this contamination has migrated in groundwater off-Base to the west, south, and east; and surface water data show that it has discharged into the surface water of Box Elder Creek. The combined PFOS and PFOA concentrations reported for the residential wells have a maximum of 17,370 ppt for a well located due south of the Base boundary. Along Box Elder Creek between New Underwood and Owanka, combined PFOS/PFOA groundwater concentrations of 280.9 ppt and 101.9 ppt were reported. The maximum combined PFOS and PFOA concentration reported for the on-Base samples is 551,000 ppt at FT001.

PFOS/PFOA contamination from releases at Ellsworth AFB is assumed to have migrated in surface water approximately 25 miles east of Ellsworth AFB to Owanka (Figure 4-1), based on the detection of PFOS and PFOA above the EPA LHA in an irrigation well. The furthest affected drinking water well is located 18 miles east of the Base (Area D as discussed further in Section 4). PFOS and PFOA were not detected in two samples collected from wells located between Owanka and the Cheyenne River. The well in Owanka marks the easternmost, or most downgradient, boundary of this NTCRA because PFOS and PFOA were not detected in drinking water wells located east of Owanka. PFOS and PFOA migrate readily with groundwater contamination because they are highly soluble and have little tendency to associate with soil particles, thus these compounds tend to form long plumes of groundwater contamination. Note: surface water will be evaluated in future investigation efforts.

2.5 ANALYTICAL DATA

As described above, several PFOS and PFOA investigations have been completed at Ellsworth AFB. The wells with PFOS and/or PFOA concentrations greater than the LHA action levels are listed in Table 2.1. The analytical results for these investigations can be found in the reports listed in Section 2.3, which are available on the Administrative Record website at https://ar.afceccloud.af.mil/search.aspx.

2.6 STREAMLINED RISK EVALUATION

In 2016, the EPA published the current LHA action levels of 0.07 μ g/L (70 ppt) for PFOS and PFOA individually, and 0.07 μ g/L (70 ppt) for the two compounds in combination (EPA, 2016a; 2016b). The State of South Dakota does not currently have a drinking water standard for PFOS or PFOA. The EPA used a two-step process, explained in the following paragraphs, to calculate the LHA action levels.

First, the EPA calculated the water concentration that a lactating woman could drink with no health effects. A lactating woman was used in this calculation because this individual represents a sensitive population (newborns can be exposed to PFOA and PFOS through breast milk) and, on a body weight basis, this individual drinks more water than other adults. For these reasons, a lactating woman is the most conservative receptor for exposure to PFOS and PFOA through drinking water. The resulting safe concentration, called the drinking water equivalent level, is 0.37 μ g/L (370 ppt). This concentration is protective of people who are exposed to PFOS and PFOA solely through drinking water.

Historically, PFOS and PFOA were used in many consumer goods, including carpets, stain-resistant upholstery, food packaging, non-stick cookware, textiles, and leather goods. Most manufacturing of PFOS in the United States was discontinued in 2002, and the phase-out of PFOA manufacturing began in 2006. The USAF has phased out the use of the former AFFF in favor of the more environmentally friendly C6 AFFF at Ellsworth AFB and nationwide. Because of the historical uses of PFOS and PFOA, these compounds are widespread throughout the environment and are found in many food products such as eggs, meat, milk, fish, and root vegetables. PFOS and PFOA have been measured in indoor dust. The primary routes by which people are exposed to PFOS and PFOA are food and indoor dust (EPA, 2016a; 2016b).

To account for the cumulative health effects of exposure to PFOS and PFOA from sources other than drinking water (e.g., food, indoor dust), the EPA multiplied the drinking water equivalent level of 0.37 μ g/L (370 ppt) by a relative source contribution factor of 20% (or 0.2). The resulting number is the LHA action level of 0.07 μ g/L (70 ppt).

As noted above, PFOS and/or PFOA concentration in 24 off-Base residential wells (the initial well identified in 2016, 22 wells identified in 2018 – 2019, and one well identified in 2020) exceed the LHA action levels. For the individuals who use these wells as a potable water supply, their exposure to PFOS and PFOA through use of the well water may pose an unacceptable health risk. As noted in Section 2.4, the extent of the PFOS/PFOA contamination beyond the boundary of Ellsworth AFB is due to the high solubility of these compounds, allowing them to migrate over

long distances in groundwater and surface water. be from non-Air Force sources.	It is also possible that some PFOS/PFOA may

3.0 REMOVAL ACTION OBJECTIVES

This section identifies the statutory framework of removal actions and determines the removal scope based on the RAO.

3.1 STATUTORY FRAMEWORK

This removal action is performed pursuant to CERCLA and the NCP under the authority delegated by the Office of the President of the United States through EO 12580 as re-delegated. This order, as implemented through Department of Defense Instruction (DoDI) 4715.07 and Department of Defense Manual (DoDM) 4715.20 as amended, provides USAF with authorization to conduct removal actions. DERP provides funding to USAF for removal actions conducted under CERCLA. This removal action is non-time critical because the planning period from the time a removal action was determined to be necessary to the time when the removal action will be initiated is greater than 6 months.

This EE/CA provides an analysis of seven removal alternatives for the site and recommends a removal action alternative. This EE/CA complies with the requirements of CERCLA, DERP, NCP, and EO 12580. This EE/CA is prepared pursuant to Section 300.415(b)(4)(i) of the NCP. The requirements for this EE/CA and its mandated public comment period provide an opportunity for public input with regard to the cleanup process.

3.2 SCOPE OF THE REMOVAL ACTION AND REMOVAL ACTION OBJECTIVE

The scope of this removal action is to supply drinking water to the residential properties that have private, household wells that cannot be used for drinking water due to the presence of PFOS and/or PFOA at concentrations greater than the LHA action levels. The residences with PFOS- and PFOA-contaminated wells that have been or will be replaced with connections to the Box Elder municipal water supply are not included in the areas and removal action alternatives because these locations will comply with the RAO through implementation of the TCRA that was initiated in 2017. All other household wells described in Table 2.1 and the residences connected to the Southwest Waterline will be addressed as part of the NTCRA. Non-household wells, such as those used for irrigation or livestock, that have PFOS/PFOA concentrations greater than the LHA action levels are not included in the scope of this NTRCA. This NTCRA encompasses only wells that supply drinking water to private, off-Base residences. It is unlikely that a future remedial action to address non-household wells will conflict with or contribute to a future remedial action for the groundwater itself.

The RAO specifies what the proposed removal action is expected to accomplish. In other words, it defines the goals for the removal action. As such, RAOs are site-specific and are influenced by the nature and extent of chemical contamination, current and potentially threatened resources, and the potential for human and environmental exposure. Based on the scope of the removal action, which is to prevent off-Base residents from being exposed to PFOS and PFOA in drinking water, the following RAO was developed:

Prevent exposure of off-Base residents to drinking water that contains PFOS and/or PFOA at concentrations that, individually or in combination, exceed the EPA LHA action levels of 0.07 μg/L (70 ppt).

3.3 REMOVAL ACTION CRITERIA

The removal action criteria are the contaminant concentrations that the removal action alternative must achieve. The current EPA LHA action level of $0.07~\mu g/L$ (70 ppt) for PFOS and PFOA concentrations individually and combined is the removal action criterion.

3.4 REMOVAL SCHEDULE

The removal schedule calls for completing the Action Memorandum and advertising a remedial response contract for the removal action in summer 2020. Proposals will be evaluated and a contract awarded before the end of September 2020. The selected firm will then plan and construct the removal action and begin operations in 2021.

3.5 PLANNED REMEDIAL ACTIVITIES

At this time, specific remedial activities for PFOS and PFOA in soil, groundwater, and surface water are not planned because investigation of the on-Base and off-Base contamination is ongoing. Until there is a more complete understanding of the nature and extent of PFOS and PFOA contamination, as well as risks to human health and the environment via other exposure routes, potential remedial activities for these contaminants cannot be identified. Regardless, because the potential removal action alternatives will not alter groundwater flow and chemical conditions, the alternatives considered for this NTCRA will not interfere with or hinder any future groundwater remedial action.

4.0 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

This section identifies remedial technologies and approaches that could achieve the RAO, develops removal action alternatives based on these technologies/approaches, and evaluates each removal action alternative in terms of effectiveness, implementability, and cost. EPA guidance on NTCRAs (EPA, 1993) lists the following considerations for effectiveness, implementability, and cost:

- Effectiveness: An alternative's effectiveness is its ability to meet the objective within the scope of the removal action. This criterion considers protection of public health, the community, workers during implementation, and the environment. The following factors are also considered:
 - Long-term effectiveness and permanence: the extent and effectiveness of controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes.
 - Reduction of toxicity, mobility, or volume through treatment.
 - Short-term effectiveness, which addresses the effects of the alternative during implementation before the RAO has been met.
- Implementability: This criterion evaluates the technical and administrative feasibility of each alternative and the availability of the services and materials needed to implement the alternative. This criterion also considers state and community acceptance. The acceptance of an alternative will be evaluated during the public comment period and preparation of the NTCRA Action Memorandum that announces which alternative the Air Force decides to implement. The final version of this EE/CA will be made available for a 30-day public comment period, and all comments received will be summarized and addressed in the responsiveness summary section of the Action Memorandum.
 - Technical feasibility: the ability of the technology to implement the remedy and the technology's reliability. Technical feasibility is evaluated from construction through operation and maintenance of the removal action. This factor also evaluates whether an alternative will contribute to the anticipated performance of any remedial activity.
 - Administrative feasibility: this factor evaluates those activities needed to coordinate
 with other offices and agencies, the need for off-site permits, adherence to applicable
 non-environmental laws, and concerns of other regulatory agencies.
 - Availability of services and materials: this factor considers whether the requisite personnel, equipment, and materials will be available during the removal action schedule; the adequacy of off-site treatment capacity if the alternative includes off-site removal and treatment of waste; and whether the technology has been sufficiently developed for full-scale application.
- Cost: The direct and indirect capital, operation, and maintenance costs are estimated for each alternative. Costs are calculated on a present worth basis for any removal action lasting longer than 12 months.

State and community acceptance will be evaluated as part of the responsiveness summary to be included in the NTCRA Action Memorandum.

4.1 POTENTIAL APPROACHES

In developing the removal alternatives, several strategies were considered: treatment of contaminated groundwater prior to use; development of an alternative drinking water supply; and buy-out of the affected properties to eliminate the need for drinking water at those locations. The options associated with each strategy are described in the subsections below. The term "affected property" refers to a residence supplied by a well with PFOS/PFOA concentrations greater than the EPA LHA action levels.

Because of the large area encompassed by the affected properties, the site was divided into Areas A, B, C, and D for developing strategies for the removal alternatives. These areas are shown on Figure 4.1. The sample locations included in each area are identified in Table 2.1. The three residences with PFOS- and PFOA-contaminated wells that have been or will be replaced with connections to the Box Elder municipal water supply are not included in the areas and removal action alternatives because these locations will comply with the RAO through implementation of the TCRA that was initiated in 2017. All other household wells described in Table 2.1 and the residences connected to the Southwest Waterline will be addressed as part of the NTCRA. The three residences that are considering connecting to the Box Elder municipal water supply are included in Table 2.1. Area A consists of the properties southwest of the Base and encompasses nine wells that serve 12 dwellings and one well that supplies drinking water to the mobile home park identified during the rapid response action. Additionally, the 19 residences currently served by the Southwest Waterline are in Area A. Area B and Area C encompass six wells and three wells. respectively, and are southeast of the Base, with Area C located east of Area B. Area D consists of one well east of Area C that serves two properties. This well is evaluated separately because of its distance from the Base and the other contaminated residential wells.

4.1.1 Treatment of Contaminated Groundwater

As shown on Figure 4.1, the affected residential wells extend from southwest of the Base boundary to approximately 18 miles east of the Base. Because of the large area spanned by the affected wells, the only practical approach for treatment of the contaminated groundwater is to install a unit at each affected residence to provide point-of-entry treatment or, in the case of the single well which supplies the mobile home park, a well-head treatment system. As part of the TCRA initiated in 2017, the USAF has installed or is in the process of planning/installing point-of-entry or wellhead treatment systems for 20 properties (17 wells). There are three commercially available technologies for point-of-entry treatment systems: reverse osmosis, granular activated carbon, and ion exchange. All three technologies are capable of effectively removing PFOS and PFOA to concentrations less than the LHA action levels. The TCRA Action Memorandum identified all three technologies as options for the point-of-entry treatment systems. Depending on site-specific circumstances, one or more of these technologies will be used to assure the removal action objective is met.

Continued operation of the existing and planned point-of-entry treatment systems is identified as a removal action alternative. Because this alternative maintains the status quo established by the

TCRA, this alternative is identified as the "no action" alternative. Per guidance, the no action alternative should evaluate the situation in which no action is taken at all to prevent exposure to the site contaminants. However, the Action Memorandum for the TCRA already determined that "no action" is not protective of human health and specified an action that is in the process of being implemented. Thus, to define the no action alternative for the current NTCRA as the pre-TCRA situation would be to ignore the site's current conditions. For this reason, the "no action" alternative is defined as no further action beyond that completed by implementation of the TCRA.

4.1.2 Alternative Drinking Water Supplies

This strategy consists of providing a permanent, alternative water supply to the affected properties. There are two general options available for this strategy: connection to a municipal water system and installation of a new supply well(s).

4.1.2.1 Connection to Municipal Water Supply

There are three entities that could provide drinking water to the affected properties: City of Box Elder (Box Elder); City of Rapid City (Rapid City); and South Dakota Ellsworth Development Authority (SDEDA). The latter was established in 2009 as a corporate and political organization of the State of South Dakota, a designation that allows SDEDA to act as a utility provider. In addition, there is a rural water service, Sunset Ranch, that could provide water to the properties in Area C.

Box Elder surrounds Ellsworth AFB on three sides and currently operates a drinking water supply system. Its distribution system is adjacent to several of the affected properties. In fact, three residences (2 wells) with PFOS and PFOA-contaminated drinking water wells have been connected to the Box Elder municipal water supply under the TCRA, and another four residences (one well each) are considering being connected. The city, however, does not have enough water at times to meet current demand and will not accommodate additional new customers outside of their city limits without either the property being annexed into the city or an increase in its water supply. In the recent past, Box Elder has had to obtain water from both Rapid City and Ellsworth AFB to meet peak demand.

Rapid City operates a municipal water system located southwest of Box Elder. Both Box Elder and Ellsworth AFB have connections to the Rapid City distribution system. For cost and operational reasons, however, Rapid City is not interested in expanding its distribution system that far outside of its current boundaries. The closest portion of the Rapid City distribution system is more than 2 miles from Ellsworth AFB.

Some of the affected properties east of Ellsworth AFB are near a rural development, Sunset Ranch, that is served by a privately owned and operated community water system. The Sunset Ranch water system is supplied by a deep well that obtains water from the Inyan Kara aquifer, which is a confined aquifer about 1,900 feet below the contaminated zone and unlikely to be affected by contamination from the alluvial groundwater. The water system operator was contacted, and the initial indication was that the water system would accommodate additional customers. The Sunset Ranch well has not been sampled for PFOS/PFOA; however, one well screened in the Inyan Kara aquifer was inadvertently sampled for PFOS/PFOA in 2019. The well, with a total depth of 2,700

feet, had concentrations of 0.719 ng/l PFOS and 1.79 ng/l PFOA, which are below the LHAs. The Sunset Ranch well will be sampled for PFOS/PFOA before connecting the affected properties.

4.1.2.2 <u>Installation of New Supply Well</u>

The PFOS and PFOA contamination appears to be confined to the shallow alluvial groundwater. The alluvial zone is the unconsolidated material, such as sand or silt, that lies above bedrock. Bedrock aquifers in the contaminated area include the Inyan Kara (uppermost), Minnelusa, and Madison (deepest) aquifers. Because of its water quality and quantity, the Madison aquifer is the preferred water source near Ellsworth AFB. Box Elder's supply wells that extract from the Madison aquifer produce between 275 gallons per minute (gpm) and 440 gpm (KTM Design Solutions, Inc., 2018). This aquifer, however, is 4,500 feet deep. This depth makes it expensive to construct a supply well in the Madison aquifer. The cost of installing a supply well in the Madison aquifer is estimated to be \$2,000,000.

The Madison aquifer is overlain by the Minnelusa aquifer. Box Elder installed a new supply well in 2012. This new well appears to pull water from both the Madison and Minnelusa aquifers. This well yields water that has high concentrations of radionuclides, total dissolved solids, sulfate, iron, and manganese. Although the high sulfate, total dissolved solids, iron, and manganese concentrations are attributed to water from the Minnelusa aquifer, it cannot be determined with certainty if the high radionuclide concentrations come from the Madison aquifer or Minnelusa aquifer (KTM Design Solutions, Inc., 2018).

The Inyan Kara aquifer is 2,600 feet deep, but its water often has high total dissolved solids concentration and its flow rate is typically less than 50 gpm. Because the Inyan Kara aquifer is not as deep as the Madison, it costs less to install a well in the Inyan Kara aquifer as compared to the Madison aquifer. The cost of a supply well installed in the Inyan Kara aquifer is estimated to be \$1,500,000.

4.1.3 Purchase Affected Properties

If the USAF or another entity purchases the affected properties with no intent to occupy the homes, then it will not be necessary to provide an alternative water supply or point-of-entry treatment. The contamination at any properties purchased to prevent exposure to PFOS/PFOA in drinking water will be addressed as part of the final remedy.

4.2 REMOVAL ACTION ALTERNATIVES

The removal action alternatives are listed below. It is possible for the alternatives to be applied to one or two areas instead of all three. For example, it is possible for the USAF to implement Alternative 5, purchase affected properties, in Area C while using Alternative 2 for Areas A and B. "Affected properties" refers to residences with private drinking water supply wells with PFOS/PFOA concentrations greater than the EPA LHA action levels.

 Alternative 1, no further action: maintain the status quo through the USAF operating and maintaining point-of-entry or wellhead treatment systems installed as part of the 2017 TCRA and alternative water supply actions in the Southwest Waterline area. Alternative 1 provides a baseline against which the other removal action alternatives can be evaluated.

- Alternative 2, Box Elder new water supply well: install new water supply well and connect affected properties to Box Elder's water distribution system.
- Alternative 3, SDEDA, Rapid City source, new transmission main: connect the
 affected properties to a new regional water system that is operated by SDEDA and obtains
 water from Rapid City. Water would be conveyed through a new transmission main.
- Alternative 4, SDEDA, new supply well: similar to Alternative 3 except SDEDA would obtain water from a new supply well located in or near Box Elder.
- Alternative 5, purchase affected properties: the USAF or another entity, such as SDEDA, would purchase the affected properties and the current occupants would relocate.
- Alternative 6, connect Area C to rural water system: connect the Area C properties to the Sunset Ranch rural water system.
- Alternative 7, drill new individual wells: install a new alluvial well to replace each contaminated well.

The selected removal alternative will need to be operated until replaced by or incorporated into a remedy for PFOS and PFOA contamination in the groundwater. At this time, it is not known how long it will take to fully investigate and develop a remedy for the PFOS and PFOA contamination. For the purposes of this EE/CA, it is assumed that each alternative would be operated for 30 years. Each alternative is described and evaluated below.

4.2.1 Alternative 1 - No Further Action

The no further action alternative consists of maintaining the status quo. The USAF would continue to operate the 20 PFOS/PFOA treatment systems installed or being installed as part of the TCRA initiated in 2017and retain connection of the 19 residences to the Southwest Waterline. Because this alternative relies on existing infrastructure, the alternative does not include construction.

4.2.1.1 Effectiveness

By removing PFOS and PFOA through the point-of-entry or wellhead treatment systems, Alternative 1 prevents people from being exposed to PFOS and PFOA in their drinking water, thereby achieving the RAO. This alternative is protective of human health.

Because the treatment systems are already in place or being installed, Alternative 1 poses no short-term effects on workers or the community.

The point-of-entry systems can effectively remove PFOS and PFOA to concentrations less than the LHA action levels provided that these systems are monitored and maintained. Proper monitoring and maintenance require long-term access to the affected properties.

Long-term operation of the treatment systems would decrease PFOS and PFOA mobility and volume through removing the compounds from the extracted groundwater. Given the small volume of groundwater that would be treated by these systems relative to the probable volume of contaminated groundwater, the active PFOS/PFOA treatment provided by this alternative would have negligible effect on the overall remediation of the PFOS/PFOA plume.

Additionally, the USAF may want to explore options for changing how the alternative water supply is provided to the residences connected to the Southwest Waterline once the environmental restoration action the Southwest Waterline supported has achieved its objective and cleanup work is complete...

4.2.1.2 Implementability

In the short-term, the no further action alternative is readily implementable because the treatment systems are in place or will be installed soon. In the long-term, however, it may be difficult for the USAF to retain the access needed to properly monitor and maintain the point-of-entry treatment systems, particularly if the affected properties are sold.

There are no permits required for this alternative. The material, equipment, and labor needed to implement this alternative are readily available. This alternative relies on conventional technologies.

4.2.1.3 Cost

The estimated cost for Alternative 1 is provided in Appendix A. Because the point-of-entry treatment systems have been or are being installed as part of the TCRA, Alternative 1 has no capital cost.

The 30-year cost is estimated to be \$10,643,000 and is based on the following assumptions:

- The USAF would pay the operation and maintenance (O&M) costs for each PFOS/PFOA treatment system. The USAF would hire a certified contractor to perform the O&M work or pay an upfront cost and turn the O&M and sampling over to a utility provider.
- Costs include O&M of affected properties in each area and the property east of Area C.

4.2.2 Alternative 2 – Box Elder New Water Supply Well

Alternative 2 consists of connecting all but one of the affected properties to the Box Elder water distribution system. Because of the distance between the easternmost contaminated drinking water well in Area D and Box Elder, approximately 18 miles, it would be prohibitively expensive to connect this household to the Box Elder water supply. Therefore, Alternative 2 does not address the contamination at the Area D and another alternative (i.e., providing an alternate source of water or maintaining a treatment system) is still required.

As described in Section 4.1.2.1, Box Elder does not have the capacity to meet its current peak water demand. It is estimated that Alternative 2 would increase the average demand on the Box Elder system by almost 31,000 gallons per day (21.5 gpm) and the peak demand by 88.5 gpm. To

allow the Box Elder water supply system to accommodate these additional demands, Alternative 2 includes drilling a new supply well into the Madison aquifer and constructing conveyance piping and a booster station.

It is assumed that the new supply well would be installed in or near Area A. The final well location will be determined in subsequent project investigation and design. This area has the highest number of affected properties, and Box Elder currently does not have a Madison aquifer well in this area. Water distribution mains would be built to connect the new well to the existing distribution system. The properties in Areas A and B would be connected to the existing Box Elder distribution system. A new water main would be constructed to connect Area C to the Box Elder distribution system.

Due to limited capacity, Box Elder is currently requiring annexation for connection of new properties to the Box Elder water distribution system. The new well included in this alternative will alleviate the city's current capacity constraints and may allow the city to waive its annexation requirements.

All new construction under this alternative would be limited to those distribution mains and service connections required to address the affected properties. Additional improvements desired by Box Elder, even if they were related to the new supply well or distribution needs, would have to be funded by Box Elder since they would be outside of the scope of this removal action.

4.2.2.1 Effectiveness

The provision of municipal water would achieve the RAO and be protective of human health for all but one of the affected properties. A different removal action would be required for the property that is too far from the Box Elder water system to be included in this alternative.

The new supply well and distribution system would be constructed in accordance with the South Dakota regulations.

It is not known if Box Elder would waive its current annexation requirement for properties to be connected to the municipal water distribution system; however, this alternative alleviates the primary concern expressed by Box Elder regarding the limited quantity of water available to non-residents. Some residents have expressed concern about annexation due to increased taxes and limitations on land use, such as raising livestock.

This approach would provide a long-term effective and permanent solution for all but one of the affected properties. During construction of the piping and booster station, there could be short-term effects on the local community with respect to traffic, dust generation, noise, and road closures. These impacts, however, could be readily mitigated through standard practices. Because construction would occur along existing rights-of-way, there would be little impact on the environment.

This alternative would not reduce toxicity, mobility, or volume of PFOS and PFOA contamination released by the Air Force.

4.2.2.2 Implementability

This alternative could be implemented with readily available material, services, and labor. This alternative relies on well-established, conventional technologies.

The 2012 attempt by Box Elder to install a new supply well was not successful due to the poor quality of the groundwater extracted by the new well. To limit the potential for installing a supply well in a zone of poor groundwater quality, design of the new well would consider all available information on lithology and groundwater quality from the existing well network.

The new mains would be constructed along existing rights-of-way. Landowner permission would be needed to install the piping to connect each residence to the municipal water distribution system. It may be moderately difficult to obtain landowner permission for installation of the connection piping for those landowners objecting to being annexed into Box Elder.

This alternative would require appropriating additional or reappropriating previous water rights for Box Elder and obtaining/modifying well construction, distribution system, and operating permits.

4.2.2.3 Cost

The 30-year cost is estimated to be \$8,117,000 and is based on the assumptions listed below.

- Capital costs include construction of the new supply well in the Madison aquifer, booster station, transmission mains, and connection piping.
- The existing temporary potable water supply line (Southwest Waterline) for 19 residences in Area A can be connected to the Box Elder distribution system, precluding the need to install connection piping to these 19 locations.
- Additional water storage capacity is not required by Box Elder.
- O&M costs will not be paid for by the USAF but will be paid by the landowners/customers
 through a monthly water bill with the rates set by Box Elder, Box Elder will directly bill
 the landowners/customers.

4.2.3 Alternative 3 - SDEDA, Rapid City Source, New Transmission Main

Under Alternative 3, SDEDA would create a regional water system to serve the affected properties excluding Area D. Similar to Alternative 2, because of the distance from Area D to the other affected properties, it would be prohibitively expensive to connect Area D to a new, regional water system and another alternative would be required for that well.

Water would be obtained from Rapid City through a new transmission main. The new transmission main would connect Rapid City's system to Areas A, B, and C. Distribution piping would be constructed within each area to connect the affected properties to the new transmission main. SDEDA would own and operate the entire distribution system from the Rapid City connection to the individual properties. A pressure reducing station would be required to serve properties at an elevation less than 3,200 feet above mean sea level.

Permits may be required for SDEDA to construct and operate the new distribution system.

4.2.3.1 Effectiveness

This alternative would achieve the RAO and be protective of human health for all but Area D. A different removal alternative would be required for Area D.

Alternative 3 would provide a permanent, long-term solution. Similar to Alternative 2, there could be short-term effects on the local community and workers during construction of the transmission main and connection piping. The potential effects could be managed through standard construction practices. Because construction would occur in existing rights-of-way, there would be minimal impact to the environment.

This alternative would not reduce toxicity, mobility, or volume of PFOS and PFOA contamination released by the Air Force.

4.2.3.2 Implementability

This alternative could be implemented with readily available material, services, and labor. This alternative relies on well-established, conventional technologies.

The new mains would be constructed along existing rights-of-way. Landowner permission would be needed to install the piping to connect each affected property to the SDEDA water distribution system.

This alternative requires SDEDA to negotiate with Rapid City for the purchase of water to supply the affected properties. Rapid City might not agree to supplying water to a new entity located outside of Rapid City.

This alternative may require SDEDA to obtain a distribution system permit(s) and waterline easements. The Air Force would have to enter into an agreement with SDEDA that described how SDEDA would help the Air Force implement this alternative.

4.2.3.3 Cost

The 30-year cost is estimated to be \$14,399,000 and is based on the assumptions listed below.

- Additional water storage or reservoir is not required.
- Rapid City will agree to sell water to SDEDA.
- The existing temporary potable water supply line (Southwest Waterline) for 19 residences in Area A can be connected to the SDEDA distribution system, precluding the need to install connection piping to these 19 locations.
- The property owners will pay a monthly water bill with the rates set by SDEDA. Therefore, the USAF will not pay for O&M of the water supply system.

4.2.4 Alternative 4 – SDEDA, New Supply Well

Alternative 4 consists of SDEDA creating a regional water system and constructing a new supply well for the water system. The well would preferably be located in Area A and screened in the Madison aquifer, and transmission mains would be constructed to serve Areas B and C. Distribution piping would be constructed to connect the affected properties to the new transmission mains.

Again, because of the distance from Area D to the other affected properties, it would be prohibitively expensive to connect Area D to a new, regional water system. Therefore, Alternative 4 excludes Area D.

4.2.4.1 Effectiveness

Alternative 4 would achieve the RAO and be protective of human health for all but Area D. A different removal alternative would be required for Area D.

The new supply well and distribution system would be constructed in accordance with the South Dakota regulations, and SDEDA may be required to obtain permits and licenses to construct and operate the new distribution system.

Alternative 4 would provide a permanent, long-term effective solution. There could be short-term effects on the local community and workers during construction of the distribution system. The potential effects could be managed through standard construction practices. Because construction would occur in existing rights-of-way, there would be minimal impact to the environment.

This alternative would not reduce toxicity, mobility, or volume of PFOS and PFOA contamination.

4.2.4.2 Implementability

This alternative could be implemented with readily available material, services, and labor. This alternative relies on well-established, conventional technologies.

The 2012 attempt by Box Elder to install a new supply well was not successful due to the poor quality of the groundwater extracted by the new well. To limit the potential for installing a supply well in a zone of poor groundwater quality, design of the new well would consider all available information on lithology and groundwater quality from the existing well network.

The new mains would be constructed along existing rights-of-way. Landowner permission would be needed to install the piping to connect each affected property to the SDEDA water distribution system.

This alternative would require SDEDA appropriating water rights and may require them to obtain well construction and distribution system permits.

4.2.4.3 Cost

The 30-year cost is estimated to be \$14,832,000 and is based on the assumptions listed below.

- A water reservoir is not required. Capital costs include installation of tanks at the new well
 to provide storage and maintain system pressure.
- The existing temporary potable water supply line (Southwest Waterline) for 19 residences in Area A can be connected to the SDEDA distribution system, precluding the need to install connection piping to these 19 locations.
- The affected property owners will pay a monthly water bill with the rates set by SDEDA. Therefore, the USAF will not pay for O&M of the water supply system.

4.2.5 Alternative 5 – Purchase Affected Properties

Under Alternative 5, the USAF or another entity, such as SDEDA, would purchase the affected properties and the current occupants would relocate. Similar to the other alternatives, this alternative could be combined with another alternative to achieve a more cost-effective solution. The contamination at any property purchased under this alternative would be addressed as part of the final remedy.

4.2.5.1 Effectiveness

By eliminating use of wells with PFOS/PFOA concentrations greater than the LHA action levels, this alternative would achieve the RAO.

Purchasing the affected properties would eliminate the need to use the contaminated groundwater, thereby providing a long-term effective and permanent solution for these properties.

Because this alternative would not require any construction, there would be no short-term effects on workers. People who live on the purchased properties would need to find new homes, temporarily increasing the demand for rental or sale properties until the re-location is complete.

This alternative would not reduce toxicity, mobility, or volume of PFOS and PFOA contamination released by the Air Force.

4.2.5.2 Implementability

Alternative 5 would not require any permits. Although some property owners may be willing to move, others might wish to stay in their current homes. Depending on the property owners, it might not be possible to purchase all of the affected properties. If an alternate water supply was still required for residents not willing to sell, purchasing the affected properties may be impractical. However, it may still make sense to purchase isolated, affected properties rather than making a capital expenditure and incurring annual O&M costs. Finally, because other alternatives are available, the government would likely not consider condemnation of properties with owners not willing to sell unless other overriding considerations (e.g., new missions requiring additional property or buffer areas) were to arise in the future.

Alternative 5 would not require any technical expertise, material, or equipment. The legal skills needed to complete the property transactions are readily available. The purchase of any property by the Air Force would need to be completed in accordance with DoDI 4165.71 and AFI 32-9001, which require Department of Defense approval of proposals to purchase 1,000 or more acres of land, or land with an estimated purchase price that exceeds one million dollars (\$1 million). Purchase proposals must be approved early on in the acquisition process. Depending on property cost and the number of properties purchased, the requirement for Department of Defense approval might not be triggered (for example, if this alternative is used on a limited number of properties).

4.2.5.3 Cost

The cost is estimated to be \$9,633,000 and is based on the estimated prices for the individual properties and the assumptions listed below.

- There are no O&M costs.
- Purchase prices were based on information in Zillow, an online real estate database.

As mentioned, this alternative does not need to be used for all affected properties but, instead, can be applied to individual properties that are difficult to incorporate into the other alternatives. For example, Alternative 5 could be used for Area D that is too far from the other properties to allow cost-effective connection to a regional water system.

4.2.6 Alternative 6 - Connect Area C to Rural Water System

Alternative 6 consists of connecting three affected properties in Area C to the rural water system operated by Sunset Ranch. This alternative does not address the Area D, Area A, and Area B. Alternative 6 would need to be combined with other alternatives to address all of these areas.

4.2.6.1 Effectiveness

Alternative 6 would achieve the RAO and provide a long-term effective and permanent solution for the three affected properties in Area C.

Construction of the connection piping would cause short-term impacts on the local community and workers that could be readily mitigated through standard practices. Piping would be placed in existing rights-of-way, thereby limiting potential effects on the environment.

Alternative 6 would not reduce toxicity, mobility, or volume of the PFOS and PFOA contamination released by the Air Force.

4.2.6.2 Implementability

Alternative 6 can be implemented with readily available material, equipment, and labor. The USAF would need to obtain permission from Sunset Ranch, but initial information indicates that Sunset Ranch would agree to adding the three affected properties to its water system.

4.2.6.3 Cost

The cost is estimated to be \$960,000 and is based on the assumptions listed below.

- The distribution system between Sunset Ranch and the three affected properties does not require a water storage structure.
- The residents of the three affected properties would pay a monthly water bill with rates set by Sunset Ranch. The USAF would incur no O&M costs.

4.2.7 Alternative 7 – Drill New Individual Wells

Alternative 7 consists of replacing the well on each affected property with a new well drilled into the shallow alluvial groundwater. Deeper wells for individual residents are cost prohibitive, and a common deep well is already evaluated as a component of municipal water supply alternatives. Although the extent of the PFOS and PFOA contamination in groundwater is not completely defined, the well survey data suggest that it would be difficult to find a location on each affected property in Areas A and B where groundwater concentrations are less than the LHA action levels. Even if an uncontaminated area could be found in Areas A and B, it is not known if future plume migration or well pumping would cause the PFOS and PFOA concentration in the new wells to increase to unacceptable levels with time. Therefore, Alternative 7 was not considered for properties in Areas A and B.

The well survey data suggest that the groundwater plume narrows as it migrates east of the Base (APTIM Federal Services, LLC, 2019b). In Area C, while it may be possible to find an area where the shallow groundwater is unaffected, it is still unlikely and multiple wells may have to be drilled. In Area D, it is more likely that an uncontaminated area can be found for a replacement well. Therefore, Alternative 7 was only retained for the affected property in Area D. Fate and transport modeling could be used to support placement of a future well to limit the potential for PFOS/PFOA contamination in groundwater to migrate towards the replacement well.

4.2.7.1 Effectiveness

If Area D encompasses alluvial groundwater characterized by PFOS/PFOA concentrations less than the LHA action levels, then Alternative 7 could achieve the RAO and provide a long-term effective and permanent solution for this affected property. Because of the potential for the groundwater contamination to continue to migrate, routine sampling of replacement well(s) would be required to confirm that the PFOS/PFOA concentration does not exceed the LHA action levels in the future.

Potential short-term effects associated with installation of an alluvial well in Area D would be minimal. Risks to workers could be mitigated through standard practices. There would be no effect on the local community.

Alternative 7 would not reduce the toxicity, mobility, or volume of PFOS and PFOA contamination released by the Air Force.

4.2.7.2 Implementability

The materials, equipment, and labor needed to implement Alternative 7 are readily available. It may be difficult to obtain landowner permission to obtain access for routine monitoring of the replacement well to confirm that it does not become contaminated with PFOS/PFOA.

4.2.7.3 Cost

The cost is estimated to be \$65,000 and is based on the assumptions listed below.

- The cost of installing an alluvial well ranges from \$5,000 to \$20,000.
- This cost does not include the connection piping.
- It might be necessary to install more than one well to find shallow groundwater with PFOS/PFOA concentrations less than the LHA action levels and costs could increase accordingly. Similarly, it might be necessary to install more than one well to meet the water demand of both homes.

5.0 COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

This section provides a comparative analysis of the removal action alternatives described and evaluated in Section 4. This analysis is summarized in Table 5.1.

5.1 EFFECTIVENESS

Alternatives 1 through 5 would achieve the RAO and be protective of human health for all or most of the affected properties. Alternative 6 would need to be combined with other alternatives to address the affected properties in Areas A, B and D. Alternatives 2, 3, 4, and 6 would need to be combined with Alternatives 1, 5, or 7 to address Area D.

Alternative 7 would need to be combined with another alternative for the affected properties in Areas A, B, and C, and might not meet the RAO for Area D depending on the extent of groundwater contamination. Even if a clean replacement well can be installed in Area D, pumping of the new well could affect groundwater flow and cause migration of PFOS and PFOA contamination to the well. For these reasons, Alternative 7 has the lowest effectiveness.

Because Alternative 1 requires long-term monitoring and maintenance of the point-of-entry treatment systems, this alternative provides a relatively low degree of long-term effectiveness and permanence.

Alternative 1 has the lowest potential for short-term impacts. Alternatives 2, 3, 4, 6, and 7 involve construction that could affect workers and the local community. The greatest effects would be associated with Alternative 3, which would install the most piping of the alternatives. Short-term effects posed by installation of piping, wells, and other infrastructure could be mitigated with standard practices. Alternative 5 could temporarily affect the local housing market as occupants of the purchased properties find new homes.

Only Alternative 1 includes treatment that would decrease contaminant toxicity, mobility or volume. The potential treatment provided by continued operation of the point-of-entry systems, however, would have negligible effect on the long-term groundwater remediation.

5.2 IMPLEMENTABILITY

All alternatives rely on conventional technologies or strategies (property purchase) that can be implemented with readily available materials, equipment, and labor.

Alternative 1 would not require any permits but would need long-term access to the point-of-entry treatment systems for monitoring and maintenance. It may be difficult for the USAF to ensure continued access in the long-term, particularly if the property is sold. Additionally, USAF would have to continue providing water for the Southwest Waterline or implement a different way to provide an alternative water supply to the 19 residences.

Alternative 5 also would not require permits, but the USAF would need to obtain landowner concurrence to purchase the affected properties at a fair market price. Some landowners might not

wish to move. In addition, purchase of these properties may require prior approval from the Office of the Secretary of Defense pursuant to AFI 32-9001.

Alternative 7 would require long-term access to confirm that PFOS/PFOA contamination has not migrated to the replacement well. It may be difficult to retain long-term access to the property, particularly if the property is sold.

Alternative 3 may be difficult to implement because Rapid City might not agree to supplying a new entity outside of the city limits. In addition, use of SDEDA to build and operate a utility would require implementation of a binding agreement between SDEDA and the USAF to specify how SDEDA will conduct these activities.

Alternative 6 could be readily implemented if Sunset Ranch is willing to add customers to their system, but Alternative 6 would need to be combined with other alternatives.

Alternatives 2 and 4 are the most implementable. Both alternatives would require water appropriation and permits for well construction and the distribution systems. The appropriation and permits, however, should be readily obtainable by Box Elder or SDEDA. Both alternatives also provide solutions for all but one of the affected properties.

5.3 COST

The estimated costs for Alternatives 1 through 6 range from \$960,000 for the three properties in Area C to \$14,832,000 for Alternative 4. The uncertainties described below need to be considered in evaluating the relative costs. Also, evaluation of the cost for Alternative 6 must consider that this alternative would need to be combined with one or more of the other alternatives to achieve the RAO at all affected properties.

Because of the uncertainty associated with finding uncontaminated shallow groundwater in Area D, it is difficult to estimate the cost of Alternative 7 with certainty. Although each alluvial well would cost between \$5,000 and \$20,000, it is not known how many wells would need to be installed and sampled before clean groundwater is found. The 30-year life-cycle sampling and O&M costs result in an estimated total cost of just over \$65,000 for Area D provided that the first well drilled encounters uncontaminated groundwater.

Alternatives 2 and 4 both require construction of a new well in the Madison aquifer. As demonstrated by Box Elder's recent installation of a supply well, there is no guarantee that a new well will provide water of a quality that can be used for drinking water. The cost estimates for Alternatives 2 and 4 do not account for the possibility of drilling a well that cannot be used as a supply well because of poor water quality.

For Alternative 2, Box Elder may identify additional requirements before connecting the affected properties to the city's distribution system. These requirements could add costs or deter landowners from connecting to their system.

For all alternatives that include new piping, the costs were based on installing the piping in city or county rights-of-way. Easements and permitting may require alternate routing at additional cost.

In addition, if the existing temporary potable water supply line (Southwest Waterline) for 19 residences in Area A cannot be re-used, then costs will increase to account for installation of new connections to these residences.

The cost for Alternative 5 is based on pricing information listed on Zillow. The landowners might request higher pricing for their properties.

The most cost-effective approach is likely a combination of different alternatives for Areas A, B, C, and D.

The cost estimates do not include USAF staff time to prepare and implement agreements with the local governments or SDEDA, to review plans or specifications, or to procure properties or services. These costs are similar across most of the alternatives and will depend on the extent contract assistance is required and how the alternative is implemented.

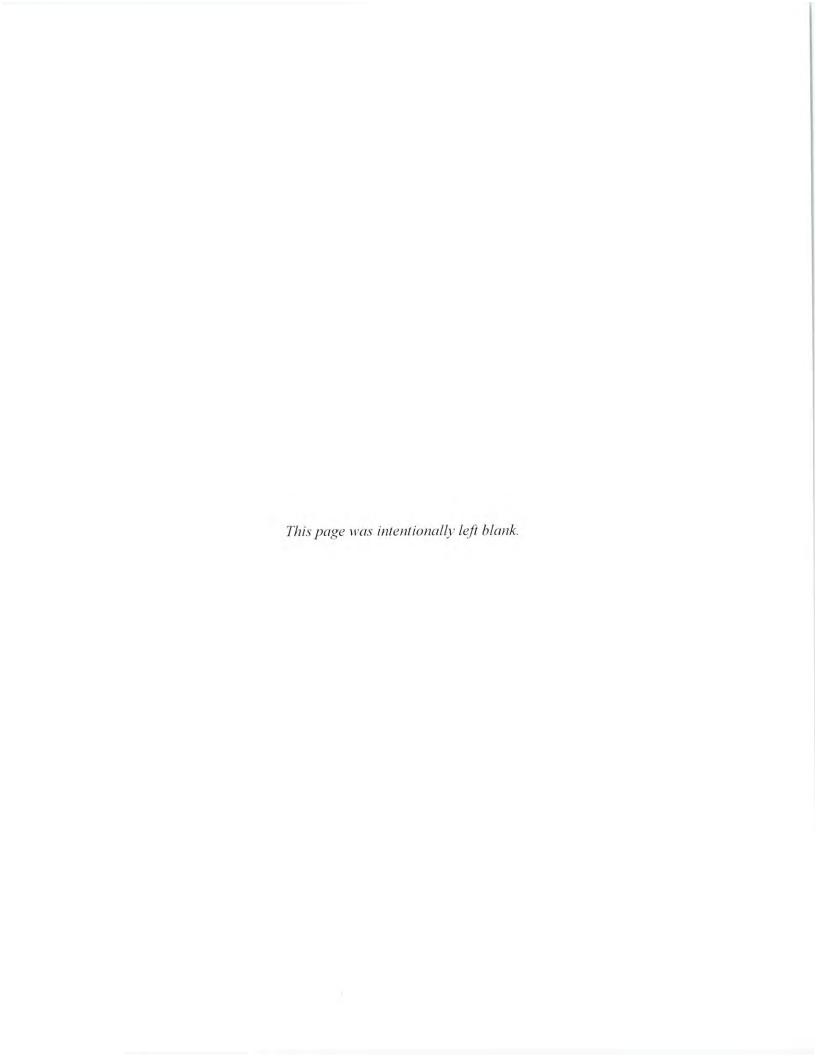
6.0 RECOMMENDED REMOVAL ACTION ALTERNATIVE

Because of the infrastructure required to connect all of the affected properties to a centralized water supply system, the most cost-effective approach is a combination of a centralized system for the properties that are close together and a decentralized approach for the properties several miles away from the Base. Therefore, the following combination of removal action alternatives is recommended:

- Area A and Area B: Alternative 2, Box Elder water supply, is recommended for the affected
 properties that are close together. This alternative achieves all RAOs for these properties.
 If an agreement with Box Elder cannot be reached, then Alternative 4, a new supply well
 and water distribution system operated by SDEDA, could be implemented with similar
 benefits and should be retained as a contingency.
- Three properties in Area C: Alternative 6, connect to the private rural water system at Sunset Ranch. If an agreement with the rural water system cannot be reached, then these properties could be connected to the new water supply operated by Box Elder (Alternative 2) or the USAF could continue to maintain the existing point-of-entry treatment systems (Alternative 1) at these locations as an interim measure until other alternatives are evaluated in the feasibility study.
- Area D: Alternative 7, drill a replacement well in an uncontaminated portion of the shallow aquifer. If uncontaminated, shallow groundwater is not available on this property, then the USAF could continue to maintain the existing point-of-entry treatment systems (Alternative 1) as an interim measure until other alternatives are evaluated in the feasibility study.

The estimated cost for the above combination of alternatives is \$6,980,000. The cost estimate for the recommended approach is presented in Appendix A.

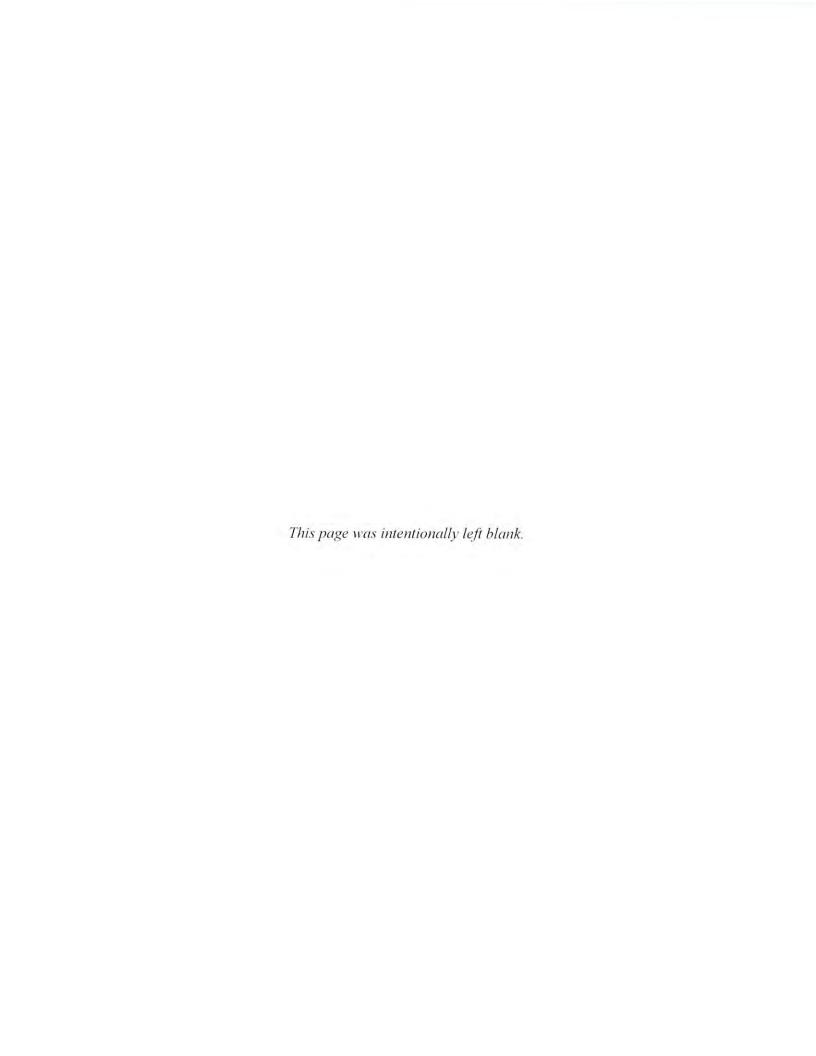
In summary, it is recommended that the removal action alternative consist of a combination of Alternatives 2, 6, and 7, with Alternative 4 as a contingency. Alternative 1 is also a contingency for Areas C and D. As plans and the alternatives are developed, other combinations of alternatives may become more favorable.

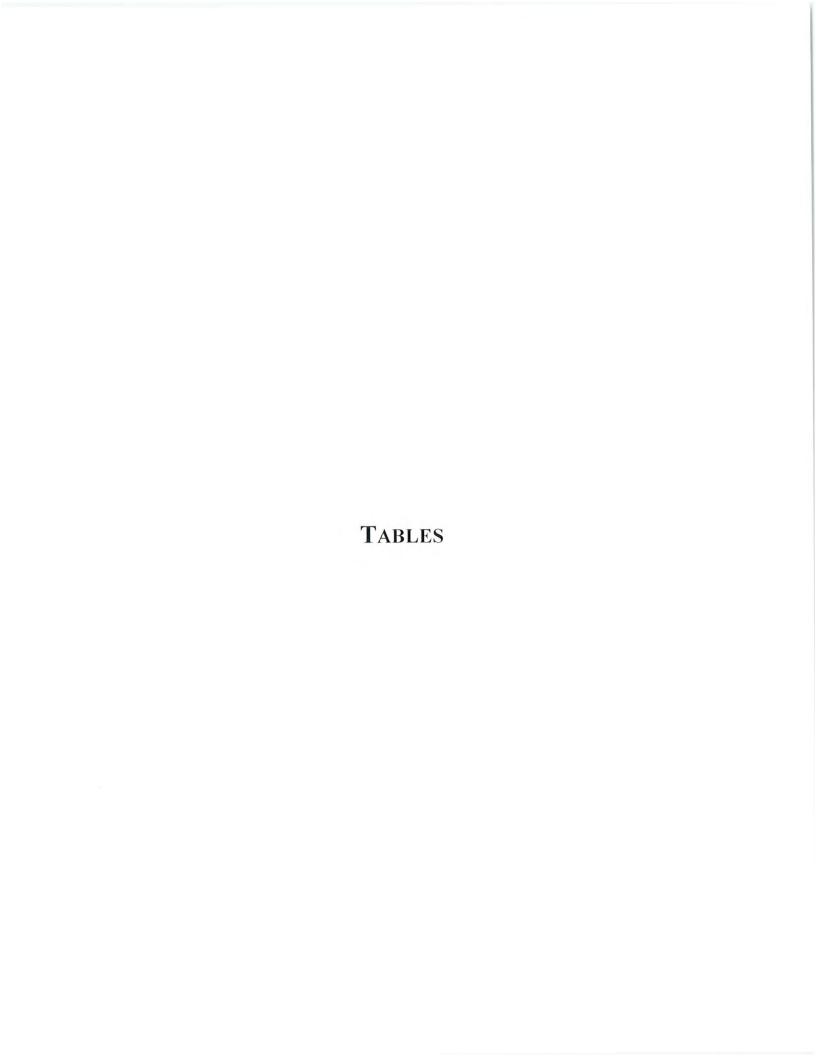


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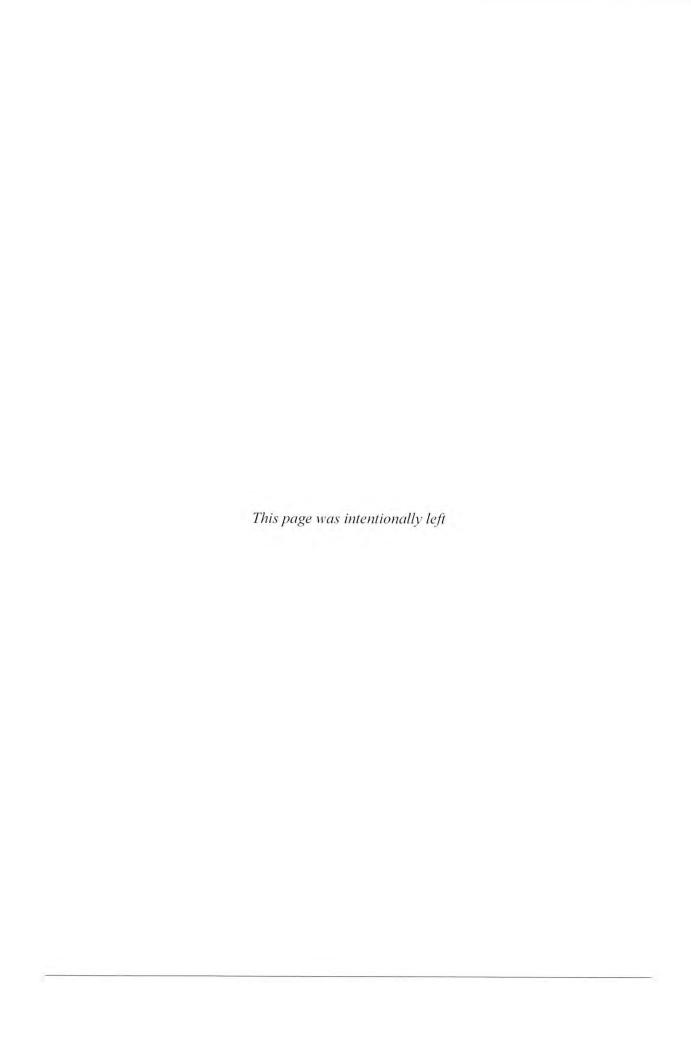


Table 2.1
Private Wells With PFOS/PFOA Concentrations Greater than LHA Action Levels
Ellsworth Air Force Base, South Dakota

Type of Well Number of Wells		Location	
Household	1	South of Base (connected to Southwest Waterline)	
Household	9	Southwest of Base (Area A)	
Not household	1	Southwest of Base	
Not household	8	South of Base	
Household	1	West of Base (Area A)	
Household	3	East of Base (connected to or planned for connection to municipal water supply; not part of NTCRA)	
Not household	2	South-southeast of Base	
Not household	5	Southeast of Base	
Household	6	Southeast of Base (Area B)	
Household	3	Southeast of Base (Area C)	
Household	1	Southeast of Base (Area D)	

Note: household refers to a well that supplies drinking water; not household refers to a well that supplies water for non-drinking uses

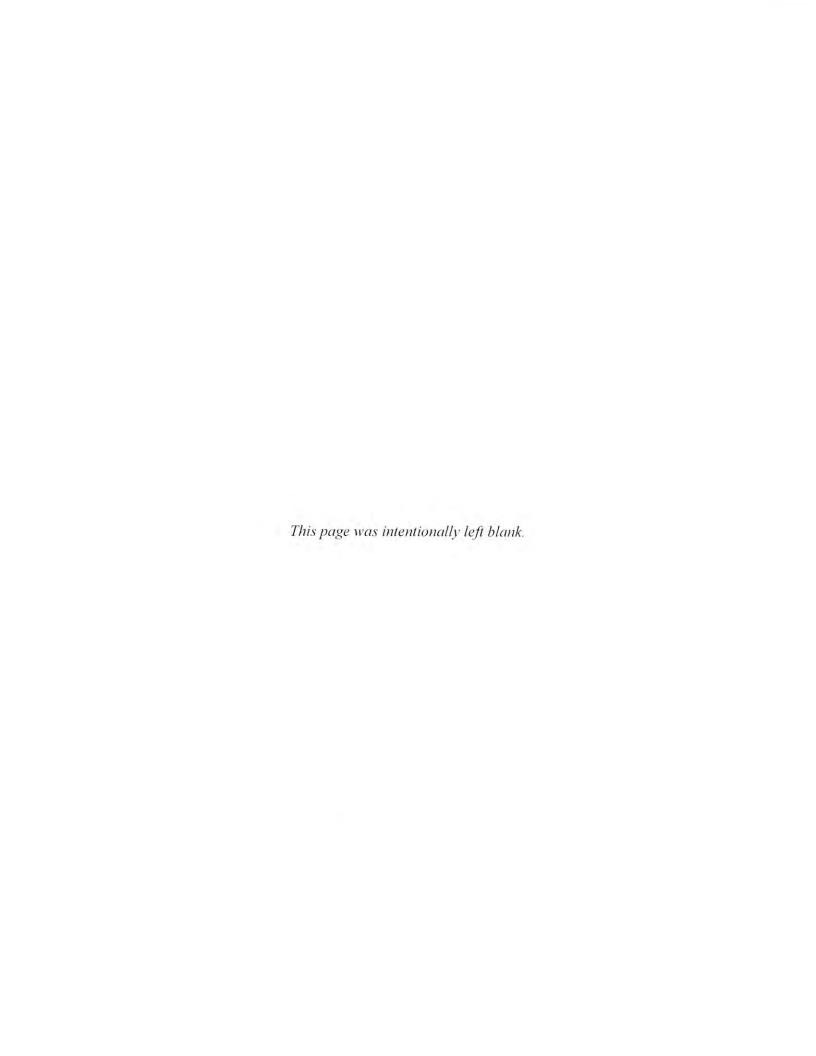
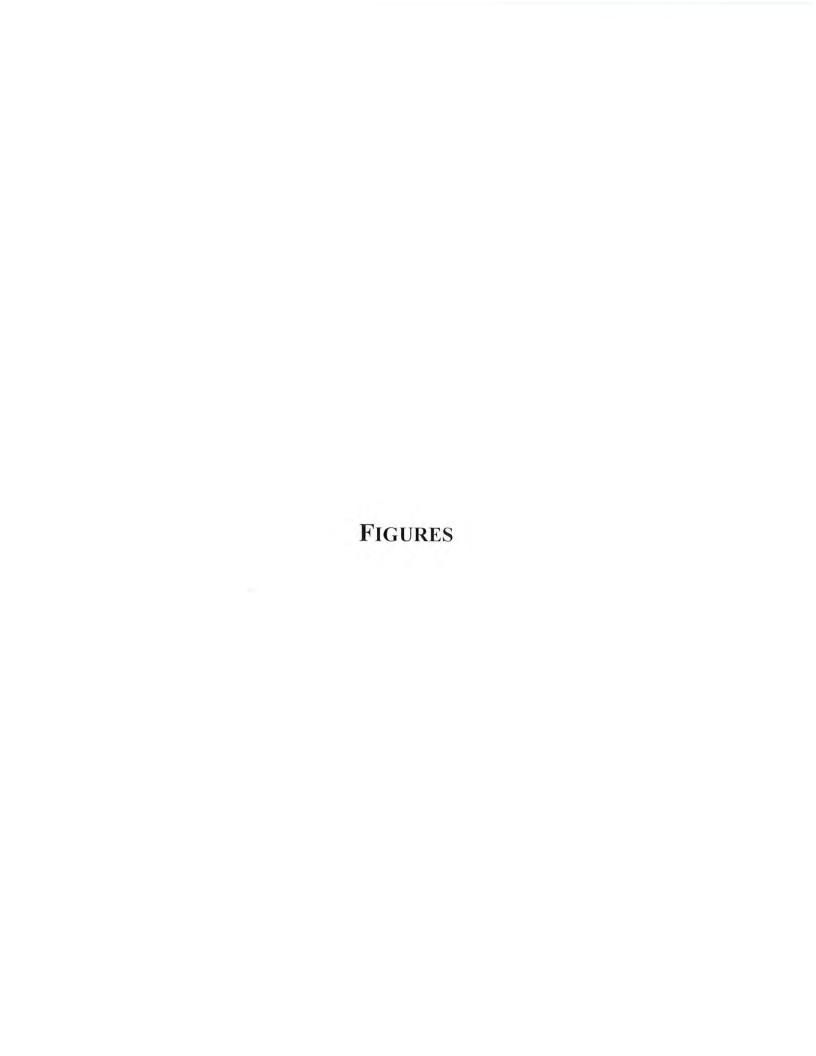
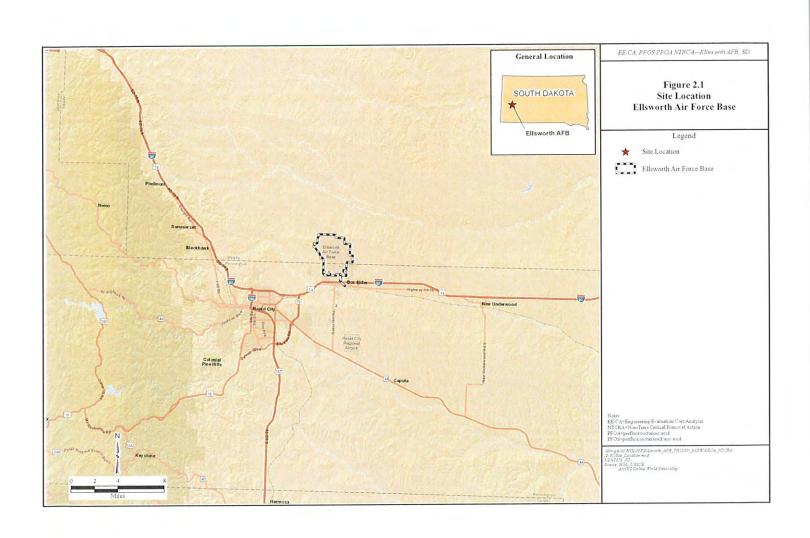
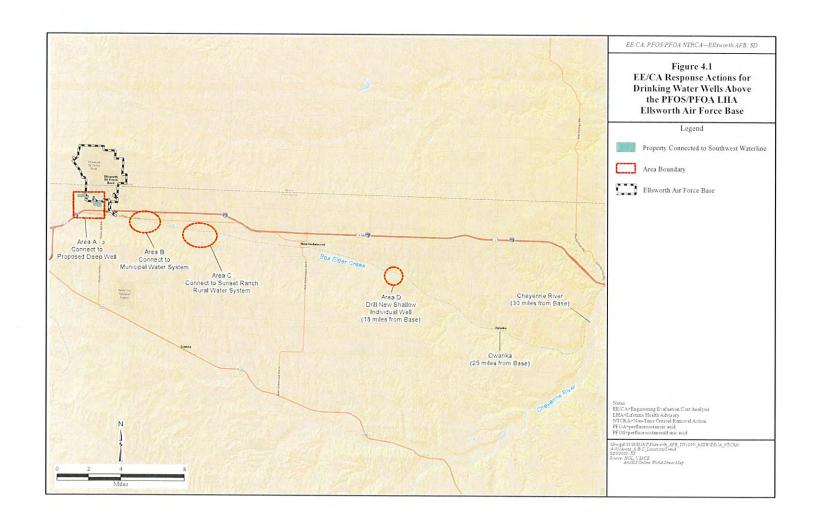


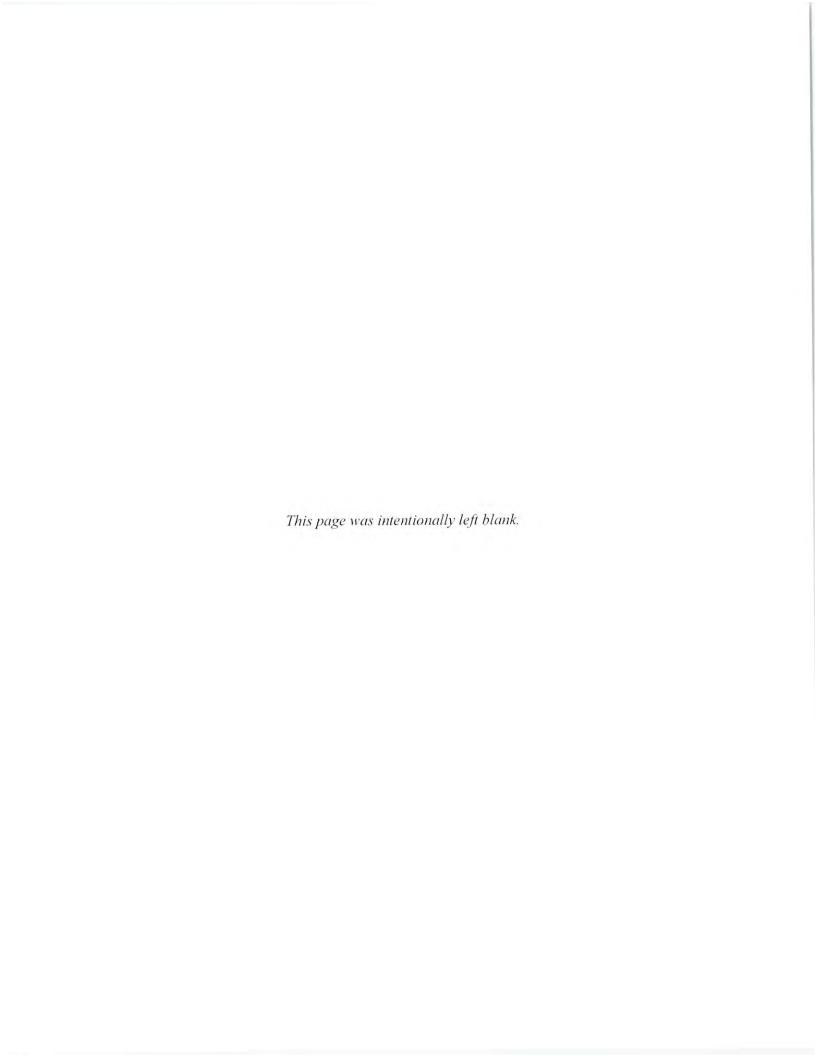
Table 5.1 Summary of Comparative Analysis of Removal Action Alternatives Ellsworth Air Force Base, South Dakota

Alternative	Effectiveness	Implementability	Cost
1. No further action (maintain status quo)	Requires long-term O&M of treatment systems.	Readily implemented but access for treatment system monitoring and maintenance may be difficult to retain for 30 years.	\$10,643,000
2. Connect to Box Elder water supply	Would achieve objectives for all but Area D. High effectiveness.	Readily implemented; requires water appropriation permit.	\$8,117,000
3. SDEDA, Rapid City source, new transmission main	Effective but would incur the most short-term impacts during piping installation. Rapid City might not be willing to provide water to new users outside of the city limits.		\$14,399,000
4. SDEDA, new well	Would achieve objectives for all but Area D. High effectiveness. Readily implemented; requires water appropriation permit.		\$14,832,000
5. Purchase affected properties	High degree of effectiveness through permanently eliminating water use at affected properties.	Homeowners might not wish to sell their residences. Requires approval from the Office of the Secretary of Defense if purchase price is greater than \$1,000,000.	\$9,633,000
6. Connect Area C to rural water system	Effective for Area C but would need to be combined with other alternatives for Areas A, B, and D.	Requires concurrence from Sunset Ranch rural water system.	\$960,000 (addresses only Area C)
7. Drill new wells	Least effective due to potential inability to find uncontaminated groundwater and potential future migration of contamination to replacement well.	May require multiple wells. Access to monitor water quality may be difficult to retain for 30 years.	\$65,225 (per well)
Recommended alternative: Alternative 2 for Areas A and B; Alternative 6 for Area C; and Alternative 7 for Area D	ternative: Alternative all properties. High degree of effectiveness. and Alternative 7		\$6,980,000









APPENDIX A COST ANALYSIS

ITEM NO.	DESCRIPTION OF ITEM	UNIT	QTY UN	IT COST	TOTAL COST
A-1	Area A (Excluding Plainsview Mobile Manor)				
1	Individual Ion Exchange/GAC Annual O&M (from APTIM report)	EA	12	2,096	25,152
2	Total Individual Ion Exchange/GAC 30 Year O&M	YR	30	25,152	754,560
A-2	Area A (Plainsview Mobile Manor only)				
3	Mobil Home Ion Exchange/GAC Annual O&M (from APTIM report)	YR	30	215,750	
4	Mobil Home Ion Exchange Media Change (Annual)	YR	30	95,000	
	30 Year O&M Total				9,322,500
В	Area B (Central)			E aves	
1	Individual Ion Exchange/GAC Annual O&M (from APTIM report)	EA	5	2,096	
2	Total Individual Ion Exchange/GAC 30 Year O&M	YR	30	10,480	314,400
С	Areas C and D				
1	Individual Ion Exchange/GAC Annual O&M (from APTIM report)	EA	4	2,096	8,384
2	Total Individual Ion Exchange/GAC 30 Year O&M	YR	30	8,384	251,520
		Subtotal Excludi	ng Plainsview Mobil	e Manor (PMM)) 1,320,480
			Total in	cluding PMM	10,643,000

ITEM NO.	DESCRIPTION OF ITEM	UNIT	QTY		UNIT COST		TOTAL COS
Source	Water Source			1			
1	Madison Aquifer Well	LS	1	\$	1,350,000	\$	1,350,000
2	Well House - Pump, Aeration, Chemical Feed	LS	1	\$	650,000	\$	650,000
Α	Area A				Subtotal	\$	2,000,000
1	Water Distribution Mains, 8" PVC	LF	4,800	\$	CF	č	212.000
2	Service Lines, 1"	LF	1,400		65	\$	312,000
3	8" Gate Valves	EA	5	\$	40 2,500	\$	56,000
4	Fire Hydrants	EA	5	\$			12,500
5	8" Pipe Fittings	EA			5,000	\$	25,00
5	Connect to Service Line	EA	19 12	\$	1,000	\$	19,20
7	Erosion & Sediment Control	LF		\$	2,500	\$	30,00
8	Surface Restoration	LF	4,800	\$	2.00	\$	9,60
			4,800	\$	10.00	\$	48,00
9	Booster Station	LS	1	\$	200,000 Subtotal	\$	200,00 712,30
В	Area B				Subtotal	Y	712,30
1	Water Distribution Mains, 8" PVC	LF	2,500	\$	65	\$	162,50
2	Service Lines, 1"	LF	2,500	\$	40	\$	100,00
3	8" Gate Valves	EA	3	\$	2,500	\$	7,50
1	Fire Hydrants	EA	3	\$	5,000	\$	15,00
5	8" Pipe Fittings	EA	10	\$	1,000	\$	10,00
ĵ.	Connect to Service Line	EA	3	\$	2,500	\$	7,50
7	Erosion & Sediment Control	LF	2,500	\$	2.00	\$	5,00
3	Surface Restoration	ĹF	2,500	\$	10.00	\$	25,00
2	Area C				Subtotal	\$	332,50
1	Water Transmission Main, 6" PVC	LF	17,500	ė	45.00	d	707 50
2	Service Lines, 1"	LF	1,700	\$	40.00	\$	787,50
3	8" Gate Valves	EA	4	\$	2,500.00		68,00
1	Fire Hydrants	EA	4	\$	5,000.00	\$	10,00
5	Pipe Fittings	EA	18	\$	1,000.00	\$	20,00
5	Connect to Service Line	EA	3	\$	2,500.00	\$	17,50
7	Erosion & Sediment Control	ĹF	17,500	\$	2,300.00	\$	7,50
3	Surface Restoration	LF	17,500	\$	10.00	\$	35,00
		L	17,500	Ą	Subtotal	-	175,00 1,120,50
					Summary	4	Cos
					Water Source		2,000,00
					Area A		712,30
					Area B	\$	332,50
					Area C	_	1,120,50
					Subtotal		4,165,30
					oilization (8%)	\$	333,00
			General	Kequi	irements (8%)	\$	333,00
			64.7		Subtotal		4,831,30
		15			ingency (25%)		1,207,82
		(onstruction	Conti	ingency (15%)	\$	724,69
		E. C.	50m - 12 - 1		Subtotal		6,763,82
		Engineering and Cor	istruction A	aminis	stration (20%)	Ş	1,353,00

ITEM NO.	DESCRIPTION OF ITEM	UNIT	QTY	UNIT	COST		TOTAL COST
Source	Water Source						
	Transmission Main From Rapid City, 8" PVC	LF	13,400	\$	75.00		1,005,000
					Subtotal	\$	1,005,000
1	Area A			3.			
1	Water Distribution Mains, 8" PVC	LF	5,600	\$	65.00	\$	364,000
2	Service Lines, 1"	LF	2,500	\$	40.00	\$	100,000
3	8" Gate Valves	EA	6	\$		\$	15,000
4	Fire Hydrants	EA	6	\$	5,000.00	\$	30,000
5	Connect to Service Line	EA	12	\$	2,500.00	\$	30,000
5	Erosion & Sediment Control	LF	5,600	\$	2.00	\$	11,200
7	Surface Restoration	LF	5,600	\$	10.00	\$	56,000
3	PRV/Booster Station	LS	1	\$	150,000.00	\$	150,000
					Subtotal	\$	778,600
В	Area B				21.24	-	2/12/2017
1	Water Transmission Main, 8" PVC	LF	37,800	\$	65.00	\$	2,457,000
2	Water Distribution Mains, 8" PVC	LF	3,100	\$		\$	201,500
3	Service Lines, 1"	LF	1,400	\$	40.00	\$	56,000
4	8" Gate Valves	EA	41	\$	2,500.00	\$	102,500
5	Fire Hydrants	EA	17	\$	5,000.00	\$	85,000
6	Pipe Fittings	EA	82	\$		\$	81,800
7	Connect to Service Line	EA	3	\$	2,500.00	\$	7,500
8	Erosion & Sediment Control	LF	40,900	\$	2.00	\$	81,800
9	Surface Restoration	LF	40,900	\$	10.00	\$	409,000
					Subtotal	\$	3,482,100
C	Area C						- 5 E C 3 E 2 E
1	Water Transmission Main, 6" PVC	LF	34,400	\$	45.00	\$	1,548,000
2	Service Lines, 1"	LF	1,700	\$	40.00	\$	68,000
3	8" Gate Valves	EA	7	\$	2,500.00	\$	17,500
4	Fire Hydrants	EA	7	\$	5,000.00	\$	35,000
5	Pipe Fittings	EA	34	\$	1,000.00	\$	34,400
6	Connect to Service Line	EA	3	\$	2,500.00	\$	7,500
7	Erosion & Sediment Control	LF	34,400	\$	2.00	\$	68,800
8	Surface Restoration	LF	34,400	\$	10.00	\$	344,000
					Subtotal	\$	2,123,200
					Summary		Cost
						\$	1,005,000
					Area A		778,600
							3,482,100
							2,123,200
							7,388,900
				MAG	bilization (8%)		591,000
			Concen		irements (8%)		591,000
			Genera	nequ	Subtotal	_	8,570,900
			Com	o Con	tingency (25%)		2,142,725
					tingency (25%) tingency (15%)		
			Constructio	Con	Committee of the committee of the committee of		11,999,260
		- Contraction	od Canabarratian A	dorin			
		Engineering ar	nd Construction A		d Project Cost		2,400,000

TEM NO.	DESCRIPTION OF ITEM	UNIT	QTY	UNI	T COST		TOTAL COS
ource	Water Source		13(1)	10.41		_	TOTAL COS
	Madison Aquifer Well	LS	1	\$	1,350,000	\$	1,350,000
	Well House - Pump, Aeration, Chemical Feed, & Pressure Tanks	LS	1	\$	850,000	\$	850,000
		0.0	2.	*	Subtotal	\$	2,200,000
A	Area A				20210131		-,,
	Water Distribution Mains, 8" PVC	LF	6,000	\$	65	\$	390,000
	Service Lines, 1"	LF	2,500	\$	40	\$	100,000
	8" Gate Valves	EA	6	\$	2,500	\$	15,000
	Fire Hydrants	EA	6	\$	5,000	\$	30,000
	8" Pipe Fittings	EA	24	\$	1,000	\$	24,000
	Connect to Service Line	EA	12	\$	2,500	\$	30,000
	Erosion & Sediment Control	LF	6,000	\$	2.00	\$	12,000
	Surface Restoration	LF	6,000	\$	10.00	\$	60,000
	Booster Station	LS	1	\$	200,000	\$	200,000
	Control of the contro	23		. 7		\$	887,400
	Area B				Subtotal	7	007,400
	Water Transmission Main, 8" PVC	LF	22,000	\$	65.00	\$	1,430,000
	Water Distribution Mains, 8" PVC	LF	5,930	\$	65.00	\$	385,450
	Service Lines, 1"	LF	1,400	\$	40.00	\$	56,000
	8" Gate Valves	EA	28	\$	2,500.00	\$	70,000
	Fire Hydrants	EA	12	\$	5,000.00	\$	60,000
	Pipe Fittings	EA	56	\$	1,000.00	\$	55,860
	Connect to Service Line	EA	3	\$	2,500.00	\$	7,500
	Erosion & Sediment Control	LF	27,930	\$	2.00	\$	55,860
	Surface Restoration	LF	27,930	\$	10.00	Ś	279,300
				Τ.	Subtotal	\$	2,399,970
	Area C						
	Water Transmission Main, 6" PVC	LF	34,400	\$	45.00	\$	1,548,000
	Service Lines, 1"	LF	1,700	\$	40.00	\$	68,000
	8" Gate Valves	EA	7	\$	2,500.00	\$	17,500
	Fire Hydrants	EA	7	\$	5,000.00	\$	35,000
	Pipe Fittings	EA	34	\$	1,000.00	\$	34,400
	Connect to Service Line	EA	3	\$	2,500.00	\$	7,500
	Erosion & Sediment Control	LF	34,400	\$	2.00	\$	68,800
	Surface Restoration	LF	34,400	\$	10.00	\$	344,000
					Subtotal	\$	2,123,200
					Summary		Cost
					Water Source	\$	2,200,000
					Area A	\$	887,400
					Area B	\$	2,399,970
					Area C		2,123,200
					Subtotal	\$	7,610,570
					bilization (8%)	\$	609,000
			Genera	Requ	irements (8%)	\$	609,000
					Subtotal	\$	8,828,570
					ingency (25%)	\$	2,207,143
		C	onstruction	Cont	ingency (15%)	\$	1,324,286
					Subtotal		12,359,998
	Engineerin	g and Con	struction A	dmini	stration (20%)	\$	2,472,000

Alternative 5: Pur	chase Affected Properties		
Location	Estimated Property value	Assumed Taxes and Fees (13%)	Total
Area A	\$5,884,306	\$764,960	\$6,649,266
Area B	\$602,684	\$78,349	\$681,033
Areas C and D	\$2,037,646	\$264,894	\$2,302,540
Total		7,7,7,7,7	\$9,632,839

ITEM NO.	DESCRIPTION OF ITEM	UNIT	QTY	UNIT COST		T	OTAL COS
С	Area C			1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2			
1	Water Main, 4" PVC	LF	11,300	\$ 2	5.00	\$	282,500
2	Service Lines, 1"	LF	1,700	\$ 4	0.00	\$	68,000
3	Connect to Service Line	EA	3	\$ 2,50	0.00	\$	7,500
4	Erosion & Sediment Control	LF	11,300	\$	2.00	\$	22,600
5	Surface Restoration	LF	11,300	\$ 1	0.00	\$	113,000
				Sul	ototal	\$	493,600
				Sum	mary		Cost
				A	rea C	\$	493,600
				Sub	total	\$	493,600
				Mobilization	(8%)	\$	39,000
			General	Requirements	(8%)	\$	39,000
				Sub	total	\$	571,600
				Contingency (\$	142,900
			Construction	Contingency (15%)	\$	85,740
				Sub	total	\$	800,240
		Engineering and	Construction A	dministration (20%)	\$	160,000
			Total Esti	mated Project	Cost	\$	960,000

ITEM NO.	DESCRIPTION OF ITEM	UNIT	QTY	UNIT COST		7	OTAL COST
1	Alluvial Well	EA	1	\$	20,000	\$	20,000
					Capital Cost	\$	20,000
	Annual O&M (costs taken from APTIM report)						
1	PFOS/PFOA Sampling, analytical + field labor, travel	EA	2	\$	434	\$	868
2	PFOS/PFOA Reporting, data validation & reporting labor hours	Hr	2	\$	160	\$	320
3	Admin, planning, coordination	Hr	2	\$	160	\$	320
			To	otal Anni	ual O&M Cost	\$	1,508
	30 Year Life-Cycle Cost						
1	Capital Cost	EA	1	\$	20,000	\$	20,000
2	O&M Cost	Yrs	30	\$	1,508	\$	45,225
			Total 3	30 Year L	ife-Cycle Cost		65,225

ITEM							
NO.	DESCRIPTION OF ITEM	UNIT	QTY	UI	NIT COST	TOTAL COST	
Capita							
Area A	Water Distribution - Alternative 2 (install new v	well, con	nect to mur	nicipa	al water sup	ply)	
1	Water Distribution Mains, 8" PVC	LF	4,800	\$	65	\$	312,000
2	Service Lines, 1"	LF	1,400	\$	40	\$	56,000
3	8" Gate Valves	EA	5	\$	2,500	\$	12,500
4	Fire Hydrants	EA	5	\$	5,000	\$	25,000
5	8" Pipe Fittings	EA	19	\$	1,000	\$	19,200
6	Connect to Service Line	EA	12	\$	2,500	\$	30,000
7	Erosion & Sediment Control	LF	4,800	\$	2.00	\$	9,600
8	Surface Restoration	LF	4,800	\$	10.00	\$	48,000
9	Booster Station	LS	1	\$	200,000	\$	200,000
					Subtotal	\$	712,300
Area B	Water Distribution - Alternative 2 (install new v	vell, conr	nect to mur	nicipa	l water sup	ply)	
1	Water Distribution Mains, 8" PVC	LF	2,500	\$	65	\$	162,500
2	Service Lines, 1"	LF	2,500	\$	40	\$	100,000
3	8" Gate Valves	EA	3	\$	2,500	\$	7,500
4	Fire Hydrants	EA	3	\$	5,000	\$	15,000
5	8" Pipe Fittings	EA	10	\$	1,000	\$	10,000
6	Connect to Service Line	EA	3	\$	2,500	\$	7,500
7	Erosion & Sediment Control	LF	2,500	\$	2.00	\$	5,000
8	Surface Restoration	LF	2,500	\$	10.00	\$	25,000
					Subtotal	\$	332,500
Area A	& B Water Source - Alternative 2						200
1	Madison Aquifer Well	LS	1	\$	1,350,000	\$ 1	1,350,000
2	Well House - Pump, Aeration, Chemical Feed	LS	1	\$		\$	650,000
					Subtotal	_	2,000,000
Area C	- Alternative 6 (connect to rural water system)						
1	Water Main, 4" PVC	LF	11,300	\$	25.00	\$	282,500
2	Service Lines, 1"	LF	1,700	\$	40.00	\$	68,000
3	Connect to Service Line	EA	3	\$	2,500.00	\$	7,500
4	Erosion & Sediment Control	LF	11,300	\$	2.00	\$	22,600
5	Surface Restoration	LF	11,300	\$	10.00	\$	113,000
			- 3.0		Subtotal	\$	493,600
Area D	- Alternative 7 (install individual well)				20077001		135/14
	경기, 그렇게 되었다면 하다는 집 하는 이렇게 다 하는 아이를 하는 것이 없다.	EA	1	\$	20,000.00	\$	20,000
				7	Subtotal	\$	20,000

			S	ummary		Cost		
			Wate	er Source	\$ 2	2,000,000		
				Area A	\$	712,300		
				Area B	\$	332,500		
				Area C	\$	493,600		
				Area D	\$	20,000		
	Subtotal							
	Mobilization (8%)							
General Requirements (8%)								
Subtotal								
Scope Contingency (25%)								
Construction Contingency (15%)						619,260		
				Subtotal	\$!	5,779,760		
Engineering	and Construc	tion Ad	ministrati	on (20%)	\$:	1,156,000		
	Total Estin				\$ (5,936,000		
Operation and Maintenance Costs								
Area D - Alternative 7 O&M Cost								
1 PFOS/PFOA sampling and reporting	Annual	30	\$	1,508	\$	45,225		
Total Estimated Capital	and O&M Cos	ts, 30 Ye	ear Prese	nt Worth	\$	6,980,000		



ENGINEERING EVALUATION AND COST ANALYSIS

NON-TIME CRITICAL REMOVAL ACTION FOR PERFLUOROOCTANOIC ACID AND PERFLUOROOCTANE SULFONIC ACID IN RESIDENTIAL WELLS

ELLSWORTH AIR FORCE BASE, SOUTH DAKOTA

Prepared by:

Air Force Civil Engineer Center Offutt Installation Support Section

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Acronyms and Abbreviations

AFB Air Force Base

AFFF aqueous film-forming foam

AFI Air Force Instruction

ARAR applicable or relevant and appropriate requirement

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act, 42

USC §§ 9601-9675

CFR Code of Federal Regulations

DERA Defense Environmental Restoration Account

DERP Defense Environmental Restoration Program, 10 USC §§ 2701-2711

DoD (U.S.) Department of Defense

DoDI 4715.07 Department of Defense Instruction 4715.07, Defense Environmental

Restoration Program (DERP), May 21, 2013 (incorporating Change 2, August

31, 2018)

DoDM 4715.20 Department of Defense Manual 4715.20, Defense Environmental Restoration

Program (DERP) Management, March 9, 2012 (incorporating Change 1,

August 31, 2018)

EE/CA engineering evaluation and cost analysis

EO 12580 Executive Order 12580, Superfund Implementation, January 23, 1987

FFA Federal Facilities Agreement

FY fiscal year

gpm gallons per minute HA health advisory

μg/L microgram per liter

NCP National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR

Part 300

NDAA National Defense Authorization Act

NTCRA non-time critical removal action

OU operable unit

O&M operation and maintenance

PA preliminary assessment

PFOA perfluorooctanoic acid

PFOS perfluorooctane sulfonic acid

POETS point-of-entry treatment system

ppt parts per trillion

RAO removal action objective

SDEDA South Dakota Ellsworth Development Authority

SI site inspection

TCRA time critical removal action
TMV toxicity, mobility, or volume

U.S. United States

USAF U.S. Air Force

USEPA U.S. Environmental Protection Agency

USC U.S. Code

VOC volatile organic compound

EXECUTIVE SUMMARY

The U.S. Air Force (USAF) will complete a non-time critical removal action (NTCRA) to address the releases from use of aqueous film forming foam (AFFF) during USAF firefighting activities. While AFFF was used in accordance with manufacturer guidelines, it contained perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) that are a likely potential contamination source of groundwater used as a drinking water source for residences near Ellsworth Air Force Base, South Dakota. In 24 privately-owned wells, concentrations of PFOS and PFOA are greater than U.S. Environmental Protection Agency (USEPA) lifetime health advisory (HA) action levels, which is the benchmark the Department of Defense (DoD) and the Department of the Air Force (DAF) are using for exercising their response authorities under federal environmental restoration statutes.

An engineering evaluation and cost analysis (EE/CA) completed in 2020 (Tehama, 2020) identified removal action objectives (RAOs), identified and evaluated potential alternatives for completing the NTCRA, and recommended the combination of Alternatives 2, 6, and 7. The reason for recommending a combination of alternatives is because no single alternative was available and economically practical for all affected residences. As a result, the selected alternative for residents in one geographic area (e.g., Area A) was not the selected remedy for impacted properties in a different geographic area (e.g., Area C). These alternatives are:

- Alternative 2, Box Elder new water supply well: install new water supply well and connect affected properties in geographic Areas A and B to Box Elder's water distribution system.
- Alternative 6, Connect residences to rural water system: connect the affected properties in Area C to the Sunset Ranch rural water system.
- Alternative 7, Drill new individual wells: install a new alluvial well to replace each contaminated well for the impacted properties in Area D.

The USAF accepted the recommendations made in the EE/CA and documented that decision in an Action Memorandum (USAF, 2020). That Action Memorandum specified that if the selected action for a given geographic area cannot be successfully implemented, the USAF would take one or more of the following contingency actions to achieve the NTCRA RAOs:

- Areas A and B: If an agreement between the USAF and Box Elder cannot be reached, then a new supply well and associated distribution system for affected properties could be installed and operated by South Dakota Ellsworth Development Authority (Alternative 4 in the 2020 EE/CA).
- Area C: If an agreement between the USAF and the rural water system cannot be reached, then affected properties could be connected to a new water supply operated by Box Elder (Alternative 2) or the USAF could continue to maintain the existing point-of-entry treatment systems (POETSs) as an interim measure until other measures are implemented as part of the remedial action (Alternative 1).

 Area D: If shallow groundwater that meets the Lifetime HAs for PFOS/PFOA is not available, then the USAF could continue to maintain the existing POETSs as an interim measure until other measures are implemented as part of the remedial action (Alternative 1).

However, after difficulties reaching agreement between the USAF and the City of Box Elder on implementing the selected alternative for Areas A and B, this new EE/CA is being completed to flesh out the cost of installing wells into deeper aquifers, which was briefly considered when scoping the 2020 EE/CA and discarded due to assumed cost inefficiency and to include Alternative analysis for Area E, which was not designated at the time of the previous EE/CA. The Action Memorandum that will document the USAF's decision in response to this new, 2021 EE/CA will focus on implementing the selected EE/CA alternative for Area A, Area B, Area E, and impacted areas near Ellsworth AFB that are in Area A, Area B, or Area E but have not been identified yet. An "impacted area" is a residence where the drinking water source contains PFOS and/or PFOA at concentrations above the USEPA Lifetime HA action levels. This proposed action will protect human health by preventing exposure to PFOS and PFOA in drinking water at concentrations in excess of the USEPA Lifetime HA action levels.

1.0 INTRODUCTION

1.1 PURPOSE AND OBJECTIVE

The U.S. Air Force (USAF) will conduct a non-time critical removal action (NTCRA) to address historic releases by the USAF of pollutants or contaminants into the environment that are a likely potential cause of concentrations of perfluorooctanoic acid (PFOA) and/or perfluorooctane sulfonic acid (PFOS) exceeding the U.S. Environmental Protection Agency (USEPA) lifetime health advisory (HA) action levels in 24 wells used to supply drinking water to private residences near Ellsworth Air Force Base (AFB), South Dakota. This engineering evaluation and cost analysis (EE/CA) identifies and evaluates proposed alternatives for completing the NTCRA to protect human health from exposure to these pollutants or contaminants in drinking water. The EE/CA identifies the removal action objectives (RAOs); identifies and evaluates potential alternatives for conducting the removal action(s); and recommends the best-suited removal action alternative. This proposed action will protect human health from exposure to PFOS and PFOA in drinking water in excess of the USEPA Lifetime HA action levels.

The U.S. Department of Defense (DoD) has the authority to undertake this removal action pursuant to Sections 104 and 120 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S. Code (USC) §§9604, 9620; Section 2701 of the Defense Environmental Restoration Program (DERP), 10 USC §2701; Section 300.415 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) §300.415; Executive Order (EO) 12580, as amended; and USEPA, DoD, and USAF guidance. This EE/CA was prepared for Ellsworth AFB by the Air Force Civil Engineer Center in accordance with the *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (USEPA, 1993).

1.2 STATUTORY FRAMEWORK

CERCLA and the NCP provide authority for the lead federal agency to take action to abate, prevent, minimize, stabilize, mitigate, or eliminate its release or threat of release of a pollutant or contaminant the agency determines poses an imminent and substantial danger to public health or welfare, and the lead federal agency determines that such action is appropriate based on consideration of several factors, to include actual or potential exposure to nearby human populations, and actual or potential contamination of potential drinking water supplies. The USEPA has categorized removal actions in three ways (emergency, time-critical, and non-time critical) based on the type of situation, the urgency and threat of the release or potential release, and the subsequent time frame in which the action must be initiated. CERCLA and NCP define removal actions to include such actions as may necessarily be taken in the event of the threat of release of pollutants or contaminants into the environment; and such action as may be necessary to monitor, assess, and evaluate the release or threat of release, the disposal of removal material, or the taking of such other actions as may be necessary to prevent, minimize or mitigate damage to the public health or welfare or to the environment, which may otherwise result from a release or threat of release.

Removal actions are usually interim measures that, to the extent practicable, must contribute to the efficient performance of any anticipated, long-term remedial action. One example of a removal action listed in 40 CFR 300.415(e) is provision of an alternate water supply until a permanent remedy can be implemented. Another potential removal action is treatment of the extracted groundwater before use.

USAF is the lead federal agency for a removal action to address PFOS and PFOA contamination in off-base, household drinking water supply wells that it determines is attributable, at least in part, to USAF activities and poses an imminent and substantial danger to public health or welfare (i.e., exceeds the USEPA Lifetime HA action levels). As such, USAF has final approval authority, with state and USEPA concurrence, over the recommended alternative and all public participation activities. This EE/CA complies with the requirements of CERCLA, DERP, the NCP, and EO No. 12580. This removal action has been determined to be appropriate because factors under 40 CFR §300.415(b)(2)(ii) apply, namely that there is actual contamination of private wells used to supply households with drinking water.

1.3 REPORT ORGANIZATION

The remainder of this EE/CA is organized in the following sections:

- Section 2.0 provides site characterization information such as site description, site investigation, and a streamlined risk assessment.
- Section 3.0 defines RAOs for the proposed removal action.
- Section 4.0 presents the identification and analysis of removal action alternatives.
- Section 5.0 provides a comparative analysis of removal action alternatives.
- Section 6.0 identifies the recommended removal action alternative.
- Section 7.0 provides references used in preparation of this report.
- Appendix A presents the cost estimate for each alternative.

2.0 SITE CHARACTERIZATION

2.1 SITE DESCRIPTION AND BACKGROUND

Ellsworth AFB is 6 miles northeast of Rapid City, South Dakota and adjacent to the City of Box Elder, South Dakota (**Figure 1**). The Base encompasses 4,858 acres within Meade and Pennington counties. Ellsworth AFB has been in operation since the 1940s and has been the base of operations for several types of aircraft and missile systems. Presently, the 28th Bomb Wing (B-1B bombers) is the host unit of Ellsworth AFB. The installation is composed of one major runway supported by taxiways, airfield operations, industrial areas, housing units, and recreational facilities. Ellsworth AFB is bordered to the north and west by ranch land, and to the east and south by residential and commercial areas as well as ranches.

Environmental investigations began in 1984 and Ellsworth AFB was placed on the National Priorities List in 1990 (USEPA identification: SD2571924644). The USAF, State of South Dakota, and USEPA Region 8 entered into a Federal Facilities Agreement (FFA) under CERCLA Section 120 (42 USC § 9620) in 1992. The 1992 FFA identified 12 operable units (OUs). During the 1990s, the USAF installed two waterlines to provide drinking water to properties with residential drinking water wells that had been contaminated with volatile organic compounds (VOCs). The Southwest Waterline services 17 residences and the East Waterline services over 100 residences. In 2006, the City of Box Elder assumed operation of the East Waterline; however, the USAF has continued to provide the alternate water at no cost for 57 residences. After two partial deletions in 2006 and 2012, OU-11 (Basewide Groundwater), is all that remains on the National Priorities List requiring further cleanup (URS, 2017). The site for this NTCRA encompasses PFOS and PFOA contamination in off-base groundwater used as a potable water supply by off-base, private residences.

2.2 GEOLOGIC AND HYDROLOGIC SETTING OF THE BLACK HILLS AREAS

The hydrologic setting of the Black Hills area in **Figure 2**. The major aquifers in the Black Hills area are the Inyan Kara, Minnekahta, Minnelusa, Madison, and Deadwood aquifers. Numerous wells are completed in alluvial deposits in the Black Hills area, but these aquifers are considered minor because they are not regionally extensive.

Within the Mesozoic rock interval, the Inyan Kara Group contains an aquifer that is used extensively. As much as 4,000 feet of Cretaceous shales act as the upper confining layer to the Inyan Kara aquifer. Artesian (confined) conditions generally exist within the aquifers where an upper confining layer is present. Under artesian conditions, water in a well will rise above the top of the aquifer in which it is completed

Within the Paleozoic rock interval, aquifers in the Minnekahta Limestone, Minnelusa Formation, Madison Limestone, and Deadwood Formation are used extensively. These aquifers are collectively confined by the underlying Precambrian rocks and the overlying Spearfish Formation. Individually, these aquifers are separated by minor confining layers or by relatively impermeable

layers within the individual units. In general, groundwater flow in these aquifers is radially outward from the central core of the Black Hills. Although the lateral component of flow predominates, extremely variable leakage (vertical component of flow) can occur between these aquifers.

The Minnekahta aquifer, which overlies the Opeche Shale, typically is very permeable, but well yields are limited by the aquifer thickness. The overlying Spearfish Formation acts as a confining unit to the aquifer.

The Minnelusa aquifer occurs within layers of sandstone, dolomite, and anhydrite in the lower portion of the Minnelusa Formation and sandstone and anhydrite in the upper portion. The Minnelusa aquifer has primary porosity in the sandstone units and secondary porosity from collapse breccia associated with solution of interbedded evaporites and fracturing. The Minnelusa aquifer is confined by the overlying Opeche Shale and by low-permeability layers within the Minnelusa Formation.

The Madison aquifer generally occurs within the karstic upper part of the Madison Limestone. Numerous fractures and solution openings in the Madison Limestone provide extensive secondary porosity in the Madison aquifer. The Madison aquifer generally is confined by low permeability layers in the overlying Minnelusa Formation.

The Deadwood Formation contains the Deadwood aquifer, which overlies the Precambrian rocks. In general, the Deadwood aquifer serves as a source of water mainly for domestic and municipal users near its outcrop area. There may be some hydraulic connection between the Deadwood and the underlying weathered Precambrian rocks, but regionally the Precambrian rocks act as a lower confining unit to the Deadwood aquifer.

Because the bedrock formations dip away from the core of the Black Hills, the depth to these formations increases with increasing distance from the outcrop. Therefore, well depth can be used as an indication of distance from the outcrop for four of the aquifers (Inyan Kara, Minnelusa, Madison, and Deadwood aquifers). Well depth is easily quantifiable (as compared to distance from the outcrop) and is available for almost every well sampled. The well depths for samples collected from these aquifers vary from less than 50 feet to greater than 1,500 feet. For the Minnekahta, Precambrian, and all minor aquifers considered, wells generally are located either on or very near the outcrop and, therefore, well depth is relatively constant; water-quality variations with well depth for these aquifers were not determined.

2.2.1 Water Hardness

In scientific terms, water hardness is generally the amount of dissolved calcium and magnesium in water. But in layman's terms, you may notice water hardness when your hands still feel slimy after washing with soap and water, or when your drinking glasses at home become less than crystal clear. Hard water is not a health risk, but a nuisance because of mineral buildup on fixtures and poor soap and/or detergent performance (Water Research Center).

Regulations

There is no EPA Primary or Secondary standard for water hardness. Water hardness is classified by the U.S. Department of Interior and the Water Quality Association as presented in **Table 2.1**:

Table 2.1 Water Hardness Classification

Classification	mg/L or ppm	grains/gal	
Soft	0 - 17.1	0 – 1	
Slightly Hard	17.1 – 60	1 - 3.5	
Moderately Hard	60 – 120	3.5 - 7.0	
Hard	120 – 180	7.0 - 10.5	
Very Hard	108+	10.5+	

General Statement on Hardness in the Black Hills

Groundwater within the Black Hills and surrounding area is generally hard to very hard. The Inyan Kara and Madison aquifers have hard to very hard water. However, the shallow unconfined aquifer has very hard water (USGS, 2001).

2.2.2 Radionuclides

Radionuclides generally enter drinking water through the erosion or chemical weathering of naturally occurring mineral deposits, although human activity (such as mining, industrial activities, or military activities that use or produce man-made radioactive materials) can also contribute to their presence in water. The ions in the Uranium-238 and Thorium-232 decay series (**Figure 3**) are the most common radionuclides found in groundwater. Other naturally occurring radionuclides tend to be environmentally immobile or have short half-lives, meaning they are far less likely to be found in significant amounts in groundwater.

Regulation

On December 7, 2000, EPA published the Radionuclides Final Rule. The new rule revised the radionuclides regulation, which had been in effect since 1977. The revisions set new monitoring requirements for community water systems (CWS). A CWS is a public water system, which serves at least 15 service connections, used by year-round residents or regularly serves at least 25 year-round residents. This ensured customers receive water meeting maximum contaminant levels (MCL) for radionuclides in drinking water. When asked why the Radionuclide Rule only applies to CWSs the EPA stated "EPA applied the cost/benefit analysis and the modeling indicated that the impact would not be great enough to warrant a regulation" (USEPAa). South Dakota regulations are in line with the Federal regulations (SD ANR).

The radionuclides regulated for community water systems are:

- Beta/photon emitters (4 millirem/year dose equivalent)
 - o Strontium-90 (bone marrow) = 8 pCi/L
 - o Tritium (total body) = 20,000 pCi/L

- Gross alpha particle (including radium-226 but excluding radon and uranium) (15 pCi/L)
 - o Radium
 - o Thorium
- Combined radium-226/228 (5 pCi/L)
- Uranium (30 ug/L)

There is currently no standard set for the amount of radon permitted in public drinking water supplies. The federal Safe Drinking Water Act provided for an extensive study by the National Academy of Science to determine a radon standard in the drinking water. Federal regulations for radon have not yet been adopted.

Inhaled radon is known to cause lung cancer and EPA recommends mitigation when the radon concentration in indoor air is above 4 picocurries per liter. There is no maximum contaminant level for radon in water. Ingested radon is believed to cause cancer, but the risk is very small (National Research Council, 1999). Small amounts of radon in water can escape into the air wherever the water is used, like during showering or washing dishes (National Research Council, 1999).

General Statements on Radionuclides in the Inyan Kara and Madison Aquifers:

General information about radionuclide concentrations in the Black Hills area Alluvial, Inyan Kara, and Madison aquifers is provided in **Table 2.2** (USGS, 2001). In general, gross alphaparticle activity, gross beta activity, and radium-226, are higher in the Inyan Kara aquifer than in the Madison (USGS, 1991). A principal deterrent to the use of water from the Inyan Kara aquifer is locally excessive radionuclide concentrations (USGS, 1986). Radionuclide concentrations in the Madison aquifer generally are acceptable (USGS, 1991). In some areas, water from the Inyan Kara and Madison aquifers to be used for public water systems may require treatment or dilution (USGS, 1986).

Table 2.2 General Information about Radionuclide Concentrations in the Black Hills Area

				Alluvial Aquifer		Inyan Kara Aquifer		Madison Aquifer	
Cor	stituent	Unit	MCL	Median	Median	Median	Range	Median	Range
nitters	Alpha radioactivity as Thorium-230	pCi/L		7	1	-	-	4.6	1.1 to 16
Alpha Emitters	Gross alpha as Uranium-natural	pCi/L	15		T +	25	5.6 to 150	7.6	2.2 to 14
Alr	Thorium	ug/L		5.0	ND to 29	6.3	ND to 36	7.4	ND to 22
Emitters	Gross beta as Cesium-137	pCi/L			3.8	14	4.3 to 43	5.3	2.5 to 19
Beta/Photon Em	Gross beta as Strontium/ Yttrium-90	pCi/L	15		3.0	13	3.9 to 39	4.0	2.0 to 13
Beta/P	Tritium	pCi/L	20,000	357	-	ND	ND	29	ND to 105

			Alluvial Aquifer		Inyan Kara Aquifer		Madison Aquifer	
Constituent	Unit	MCL	Median	Median	Median	Range	Median	Range
Radium-226	pCi/L	5	0.2	0.1 to 0.3	4.1	0.2 to 43	1.2	ND to 3.0
Radium-228	pCi/L			ND to 4.0	ND	ND	1	ND
Radon-222	pCi/L	N/A	280	ND to 1,300			186	ND to 300
Uranium	pCi/L	30	10	ND to 62	7.7	0.1 to 109	3.8	0.1 to 39

Reference: USGS, 2001

ND - not detected

NS - Not sampled

pCi/L - picoCuries per liter

ug/L - micrograms per liter

2.3 INVESTIGATION OF PFOS AND PFOA

Investigation of PFOS and PFOA was initiated in 2011 with soil and groundwater sampling at FT001, also known as OU-1, a former fire training area that had been previously investigated and deleted from the National Priorities List. Because PFOS and PFOA have only recently been identified as potential contaminants, samples collected at FT001 during the historical investigations had not been analyzed for these compounds. FT001 was identified as a potential area of concern for PFOS and PFOA contamination because historical fire training activities used aqueous film-forming foam (AFFF) in accordance with manufacturer guidelines to extinguish fires. PFOS and PFOA are ingredients of AFFF. PFOS and PFOA are considered emerging contaminants and the USEPA is currently working to promulgate drinking water standards.

The analytical results of the 2011 samples showed PFOS and PFOA contamination in both soil and groundwater at FT001. In 2014-2015, a Basewide preliminary assessment (PA) evaluated 18 sites where PFOS and PFOA could have been used and released. The PA reviewed historical records to identify fire training areas, crash sites, and other areas at the installation where AFFF could have been used, stored, handled, or released. FT001 was one of the 18 sites included in the PA. The PA recommended no further action for five sites, completion of a site inspection (SI) for 12 sites, and further investigation of FT001 (CH2M Hill, 2015). In 2014, a limited SI was performed to assess the presence of PFOS and PFOA at four of the sites recommended for investigation by the Basewide PA. Detections reported for groundwater samples from all four sites were greater than the screening values (SES Construction and Fuel Services LLC, 2015).

A Basewide SI was initiated in 2016 (Aerostar SES, LLC, 2019). The investigation targeted the 12 sites identified by the PA and included soil, groundwater, surface water, and sediment sampling. The four sites from the 2014 limited SI were part of the 12 sites evaluated in the Basewide SI. Based on the analytical results, further investigation was recommended for 10 sites and no further action was recommended for two sites. In total, there are 11 sites recommended for investigation of the PFOS and PFOA: 10 sites from the Basewide SI and FT001. In 2016-2018, additional investigation of the PFOS and PFOA contamination emanating from FT001 showed groundwater contamination migrating off-base to the south.

The results of the above investigation prompted the initial sampling of drinking water wells for private residences. In 2016, PFOS and PFOA were identified in one off-Base, private drinking water well that supplied two properties. In 2018-2019, sampling of private, residential, drinking water wells near the Base identified 20 household wells with PFOS and/or PFOA concentrations greater than the Lifetime HA action levels in addition to the contaminated well identified in 2016 (APTIM Federal Services, LLC, 2019). One of these wells supplies drinking water to a mobile home park with, on average, 65 occupied residences and a maximum of 102 occupied residences. The number of occupied residences fluctuates. The other contaminated wells each supply drinking water to one or more residences. The 2018-2019 sampling efforts also identified 7 wells with concentrations that warranted further monitoring and were placed in the quarterly monitoring program. Since implementing the quarterly monitoring program, concentrations increased to greater than the Lifetime HA action levels in 3 wells (TCRA implemented), are increasing in 1 well (continued quarterly monitoring), are stable to decreasing in 1 well (reduced frequency to annual monitoring), and quarterly monitoring has been discontinued 2 wells.

In 2016 and 2021, the Ellsworth AFB drinking water supply was sampled for analysis of PFOS and PFOA. Neither compound was detected during either event. In 2018, the City of Box Elder sampled their supply wells, which are 4,500 feet deep and in the Madison Aquifer, for analysis of PFOS and PFOA. Neither compound was detected in these deep groundwater samples (USAF, 2019).

In 2020, the USAF completed sampling at 30 monitoring wells in the east off-base plume area to check progress on meeting the RAOs for VOCs as described in the Basewide Groundwater Record of Decision and subsequent Record of Decision Amendment. Additionally, since the memoranda of agreement will be terminated once the VOCs have been remediated, PFOS/PFOA analyses were completed because the area had not been sampled due to the memoranda of agreement restricting groundwater usage as drinking water due to the VOC contamination. The PFOS/PFOA concentrations exceeded the Lifetime HA action levels in 24 of 30 monitoring wells sampled. Since these are monitoring wells, no action was necessary. However, since the VOC remedial action objectives have been met and the existing memoranda of agreement will be terminated, there will no longer be land use controls restricting groundwater use for drinking water in this area and some property owners may want to reinstate use of a groundwater well for domestic purposes.

The groundwater data collected to date suggest that PFOS and PFOA are migrating from Ellsworth AFB to and along Box Elder Creek through the surface drainage alluvium. Most private wells in the area are approximately 20 to 50 feet deep and generally located within drainage alluvia (APTIM Federal Service, LLC, 2019).

2.4 PREVIOUS AND ONGOING ACTIONS

The NTCRA being evaluated in this document is a follow-on to actions initiated in September 2018 which continue today in accordance with the TCRA Memorandum signed June 5, 2019 (USAF, 2019) and the 2020 NTCRA Memorandum signed January 8, 2021 (USAF, 2020). NTCRAs as defined in the 2020 NTCRA Memorandum are being implemented for Area C (in part) and Area D. However, if the current NTCRAs cannot be completed due to the inability to

come to agreement with the Sunset Ranch Community Water System (Area C) or to find a non-impacted shallow water source (Area D) the actions described in this NTCRA could be applied. All removal actions are part of the USAF's larger, long-term response action to the groundwater contamination.

In 1970, the USAF began using AFFF, which contains PFOS and PFOA. AFFF is the most efficient extinguishing method for petroleum fires and is widely used across the firefighting industry, including at all commercial airports, to protect people and property. Once PFOS and PFOA were identified as emerging contaminants, the USAF began to investigate Ellsworth AFB for the presence of these compounds. These investigations started in 2011 and are ongoing.

In January 2017, 2 properties (served by 1 well) south of the Base with PFOS and/or PFOA concentrations exceeding the Lifetime HA action levels of 0.07 micrograms per liter (µg/L) (70 parts per trillion [ppt]) for PFOS and PFOA individually, and 0.07 µg/L (70 ppt) for the two compounds in combination in the private drinking water well were connected to an existing potable water supply line (Southwest Waterline). In July 2017, a property south (down-gradient) of the base was investigated for PFOS and PFOA in surface water and groundwater. In 2018-2019, a well survey was completed and 112 drinking water wells were sampled for PFOS/PFOA. This survey identified 19 private drinking water wells (serving 23 residences) and 1 community water supply (serving 102 residences) impacted by PFOS and/or PFOA concentrations greater than the Lifetime HA action levels. The 2018-2019 sampling efforts also identified 7 wells had PFOS/PFOA concentrations that warranted further monitoring and were placed in the quarterly monitoring program. Since implementing the quarterly monitoring program, PFOS/PFOA concentrations increased to greater than the Lifetime HA in 3 wells (TCRA implemented), are increasing in 1 well (continued quarterly monitoring), are stable to decreasing in 1 well (reduced frequency to annual monitoring), and quarterly monitoring has been discontinued at 2 wells. The actions taken to date and recommended removal actions are summarized in Table 2.3.

Table 2.3 Summary of Actions Taken to Date and Recommended Removal Actions

Location	Type of Well	Shared Well (Y/N)	Emergency Action	TCRA Proposed	TCRA Implemented	FY20 NTCRA Alternative	FY21 NTCRA Alternative
Area A							
SWW1	Individual	N	N/A	N/A	N/A	2/3/4	2
SWW2	Individual	N	N/A	N/A	N/A	2/3/4	2
SWW3	Individual	N	N/A	N/A	N/A	2/3/4	2
SWW4	Individual	N	N/A	N/A	N/A	2/3/4	2
SWW5	Individual	N	N/A	N/A	N/A	2/3/4	2
SWW6	Individual	N	N/A	N/A	N/A	2/3/4	2
SWW7	Individual	N	N/A	N/A	N/A	2/3/4	2
SWW8	Individual	N	N/A	N/A	N/A	2/3/4	2
SWW9	Individual	N	N/A	N/A	N/A	2/3/4	2
SWW10	Individual	N	N/A	N/A	N/A	2/3/4	2
SWW11	Individual	N	N/A	N/A	N/A	2/3/4	2
SWW12	Individual	N	N/A	N/A	N/A	2/3/4	2

Location	Type of Well	Shared Well (Y/N)	Emergency Action	TCRA Proposed	TCRA Implemented	FY20 NTCRA Alternative	FY21 NTCRA Alternative
SWW13	Individual	N	N/A	N/A	N/A	2/3/4	2
SWW14	Individual	N	N/A	N/A	N/A	2/3/4	2
SWW15	Individual	N	N/A	N/A	N/A	2/3/4	2
SWW16	Individual	N	N/A	N/A	N/A	2/3/4	2
SWW17	Individual	Y1	N/A	Connect to SWW	Connect to SWW	2/3/4	2
SWW18	Individual	Y1	N/A	Connect to SWW	Connect to SWW	2/3/4	2
486	Individual	N	Bottle Water	POETS	POETS	2/3/4	2
495	Individual	N	Bottle Water	POETS	POETS	2/3/4	2
1604	Individual	Y2	Bottle Water	POETS	POETS	2/3/4	2
1519	Individual	Y2	Bottle Water	POETS	POETS	2/3/4	2
1603	Individual	Y2	Bottle Water	POETS	POETS	2/3/4	2
446	Individual	N	Bottle Water	POETS	POETS	2/3/4	2
459	Individual	N	Bottle Water	POETS	POETS	2/3/4	2
438	Individual	N	Bottle Water	POETS	POETS	2/3/4	2
1299	Individual	N	Bottle Water	POETS	POETS	2/3/4	2
457	Individual	N	Bottle Water	POETS	POETS	2/3/4	2
447	Individual	N	N/A	Qtrly Sampling	Qtrly Sampling	TBD	TBD
453	Individual	Y3	Bottle Water	POETS	POETS	2/3/4	2
439	Individual	Y3	Bottle Water	POETS	POETS	2/3/4	2
467	Community	N	Bottle Water	POETS	POETS	2/3/4	2
Area B - No	orth						
1593	Individual	N	Bottle Water	Connect to BE	Connect to BE	N/A	N/A
1596	Individual	Y5	Bottle Water	Connect to BE	Connect to BE	N/A	N/A
1597	Individual	Y5	Bottle Water	Connect to BE	Connect to BE	N/A	N/A
1570	Individual	N	Bottle Water	Connect to BE	Connect to BE	N/A	N/A
1316	Individual	N	N/A	Qtrly Sampling	Qtrly Sampling	TBD	TBD

Location	Type of Well	Shared Well (Y/N)	Emergency Action	TCRA Proposed	TCRA Implemented	FY20 NTCRA Alternative	FY21 NTCRA Alternative
Area B - So	uth						
1028	Individual	N	Bottle Water	Connect to BE	None to date	N/A	2
1548	Individual	N	Bottle Water	POETS	POETS	2/3/4	2
1060	Individual	N	Bottle Water	POETS	POETS	2/3/4	2
1566	Individual	N	Bottle Water	POETS	POETS	2/3/4	2
1564	Individual	N	Bottle Water	Connect to BE	None to date	N/A	2
1565	Individual	N	Bottle Water	Connect to BE	None to date	N/A	2
Area C						-	
1686	Individual	N	Bottle Water	POETS	POETS	6	N/A
1585	Individual	N	Bottle Water	POETS	POETS	6	N/A
1580	Individual	N	Bottle Water	POETS	POETS	6	N/A
Area D							
1645	Individual	N	Bottle Water	POETS (3)	POETS (3)	7	N/A
Area E							
1641	Individual	N	Bottle Water	Connect to NU	None to date	N/A	4

Acronyms:

BE = City of Box Elder

NU = City of New Underwood TBD = to TBD = To be determined

EE/CA = engineering evaluation/cost

POETS = Point of Entry Treatment

TCRA = time critical removal action

analysis

System

NTCRA = non-time critical removal

action

N/A = not applicableSWW = SWW = Southwest Waterline

These 24 impacted drinking water wells serve 29 properties which include 132 residences. The USAF purchased bottled water for the affected residences as an emergency response action while planning a time critical removal action (TCRA) for responding to off-Base drinking water sources with PFOS and PFOA concentrations above the USEPA Lifetime HA action levels. Table 2.4 includes the TCRAs that have taken place to date:

Table 2.4 TCRAs Taken to Date

Number of Residences	Number of Properties	Number of Wells	TCRA Implemented (number connections/systems)
2	2	1	Connection to Ellsworth AFB Southwest Waterline (2)
4	4	3	Connection to Box Elder Municipal System (4)
20	18	15	POETS (20)
102	1	1	Well Head Treatment System (1)
3	3	3	None – no signed ROE to connect to a City of Box Elder municipal system due to annexation issues
1	1	1	None – no signed ROE to connect to a City of New Underwood municipal system

The TCRA Action Memorandum memorialized the approval and decision by the USAF to conduct a TCRA in response to the presence of PFOS and PFOA above relevant EPA lifetime HA levels in at least 22 residential drinking water wells near Ellsworth AFB in Meade and Pennington Counties, South Dakota (USAF, 2019). The TCRA Response Action Completion Report (APTIM, Federal Service, LLC, 2019b) documents the response actions taken during implementation of the TCRA.

An EE/CA completed in 2020 (Tehama, 2020) identified RAOs, identified and evaluated potential alternatives for completing the NTCRA, and recommended the combination of Alternatives 2, 6, and 7. These alternatives are:

- Alternative 2, Box Elder new water supply well: install new water supply well and connect affected properties to Box Elder's water distribution system.
- Alternative 6, Connect Area C to rural water system: connect the Area C properties to the Sunset Ranch rural water system.
- Alternative 7, Drill new individual wells: install a new alluvial well to replace each contaminated well.

Additionally, the 2020 Action Memorandum (USAF, 2020) gave provisions if any of the above actions for a given area cannot be successfully implemented, the USAF would take one or more of the following contingency actions to achieve the NTCRA RAOs:

- Areas A and B: If an agreement with Box Elder cannot be reached, then the new supply well and associated distribution system for Areas A and B could be operated by South Dakota Ellsworth Development Authority (Alternative 4 in the 2020 EE/CA).
- Area C: If an agreement with the rural water system cannot be reached, then these
 properties could be connected to the new water supply operated by Box Elder (Alternative
 2) or the USAF could continue to maintain the existing point-of-entry treatment systems
 (POETSs) as an interim measure until other measures are implemented as part of the
 remedial action (Alternative 1).
- Area D: If shallow groundwater that meets the Lifetime HAs for PFOS/PFOA is not available, then the USAF could continue to maintain the existing POETSs as an interim measure until other measures are implemented as part of the remedial action (Alternative 1).

However, after difficulties reaching agreement between the USAF and the City of Box Elder on implementing the selected alternative for Areas A and B and a new area becoming impacted (Area E), this new EE/CA is being completed to flesh out the cost of installing individual wells into a deeper aquifers, which was initially discarded due to assumed cost inefficiency and to include Alternatives analysis for Area E, which was not designated at the time the previous EE/CA. The Action Memorandum that will document the USAF's decision in response to this new, 2021 EE/CA will focus on implementing the selected EE/CA alternative for Area A, Area B, Area E, and impacted areas near Ellsworth AFB that are in Area A, Area B, or Area E but have not been identified yet. An "impacted area" is a residence where the drinking water source contains PFOS and/or PFOA at concentrations above the USEPA Lifetime HA action levels.

Current PFOS and PFOA related actions include the following activities:

- Continued provision of bottled drinking water to residences with PFOS and/or PFOA
 concentrations above the Lifetime HA action levels in drinking water wells until an
 alternate water source (treatment system, replacement well, or connection to a water
 system) is available.
- Operation and maintenance (O&M), including semi-annual sampling, of the point-of-entry treatment systems that have been installed.
- O&M of the well head treatment system for the well that supplies drinking water to the Plainsview Mobile Manor.
- Quarterly resampling of residential wells with PFOS and/or PFOA previously detected at concentrations between 35 ppt and 70 ppt to confirm that concentrations in these wells do not increase to greater than the Lifetime HA action level.
- Seventeen residences that were connected in the 1990s to the Southwest Waterline as part
 of an environmental response action to VOC/trichloroethene contamination and two

- properties that were connected to this supply line in January 2017 in response to PFOS/PFOA contamination from the installation (see above) will remain on the Southwest Waterline until implementation of the NTCRA that this EE/CA supports.
- NTCRA implementation of the Alternatives selected for Area C and Area D in the FY20 EE/CA and Action Memo.

Additionally, investigations into the nature and extent of the PFOS/PFOA contamination and the surface water/groundwater interaction along Box Elder Creek are on-going. These investigations will further define the impacted areas.

Reports in the administrative record documenting the investigations and actions taken to date are listed below and are available on the publicly available administrative record website available at https://ar.afcec-cloud.af.mil/search.aspx.

- Final Preliminary Assessment Report for Perfluorinated Compounds at Ellsworth Air Force Base, South Dakota (CH2M Hill, 2015; AR #8339).
- Final Site Investigation Report for Site Investigations of Fire Fighting Foam Usage at Various Air Force Bases in the United States for Ellsworth Air Force Base, Meade and Pennington Counties, South Dakota (SES Construction and Fuel Services, LLC, 2015; AR #8343).
- Final Technical Memorandum Residential Well Survey Perfluorinated Compound Delineation at Area of Concern Perfluorinated Compound-1, Ellsworth Air Force Base, South Dakota (Ayuda Partners Joint Venture, 2017; AR #8492).
- Final Phase I Field Sampling Report, Perfluorinated Compound Sampling, Ellsworth Air Force Base, South Dakota – Farrar Ranch (APTIM Federal Services, LLC, 2018; AR #8547).
- Draft Remedial Investigation Report Per- and Polyfluoroalkyl Substances Area of Concern Perfluorinated Compounds-1, Ellsworth Air Force Base, South Dakota (Ayuda Partners Joint Venture, 2018; AR #8588).
- Final Site Inspection Report of Aqueous Film Forming Foam Areas at Ellsworth Air Force Base, Meade and Pennington Counties, South Dakota (Aerostar SES, LLC, 2019; AR #8596).
- Final Phase II Off-Base Per- and Polyfluoroalkyl Substances in Private Wells Sampling Report, Ellsworth Air Force Base, South Dakota. (APTIM Federal Services, LLC, 2019; AR #8650).
- Technical Memorandum: Additional Well Sampling, Implementation of High Resolution Site Characterization and Remediation Techniques at Complex Sites at Ellsworth Air Force Base, South Dakota (OTIE, 2019; AR #8655).
- Action Memorandum for a Time-Critical Removal Action, Treatment of PFOS- and PFOA-Contaminated Water in Residential Wells Near Ellsworth Air Force Base, South Dakota (USAF, 2019; AR #8603).
- EE/CA, NTCRA for PFOA and PFOS in Residential Wells (Tehama, 2020; AR #8662).
- Action Memorandum for a NTCRA for PFOA and PFOS in Residential Wells (USAF, 2020; AR #8692).

2.5 SOURCE, NATURE, AND EXTENT OF CONTAMINATION

The source of PFOS and PFOA contamination at Ellsworth AFB is historical use of AFFF. AFFF was developed in the 1960s to extinguish petroleum fires. The USAF started using AFFF in 1970. Because of their ability to put out fires and suppress re-ignition, AFFFs were widely used at both military and civilian airports. AFFF, which contains both PFOS and PFOA, would have been used during fire training exercises, during suppression of actual fires, and in fire suppression systems.

As described above, PFOS and PFOA investigations completed to date at Ellsworth AFB have identified 11 sites where historical activities resulted in PFOS and PFOA contamination of the groundwater at concentrations exceeding the USEPA Lifetime HA action levels. The maximum combined PFOS and PFOA concentration reported for the on-base samples is 551,000 ppt at the former fire training area. Data collected from residential wells indicate that this contamination has migrated in groundwater off-base to the west, south, and east; and surface water data show that it has discharged into the surface water of Box Elder Creek. The combined PFOS and PFOA concentrations reported for the residential wells have a maximum of 17,370 ppt for a well located due south of the base boundary. Along Box Elder Creek between New Underwood and Owanka, combined PFOS/PFOA groundwater concentrations of 280.9 ppt and 101.9 ppt were reported (APTIM Federal Services, LLC, 2019).

PFOS/PFOA contamination from releases at Ellsworth AFB is assumed to have migrated in surface water approximately 25 miles east of Ellsworth AFB to Owanka (**Figure 1**), based on the detection of PFOS and PFOA above the USEPA Lifetime HA in an irrigation well. The furthest affected drinking water well is located 18 miles east of the Base (Area D as discussed further in **Section 4**). PFOS and PFOA were not detected in two samples collected from wells located between Owanka and the Cheyenne River. The well in Owanka marks the easternmost, or most down-gradient, boundary of this NTCRA because PFOS and PFOA were not detected in drinking water wells located east of Owanka. PFOS and PFOA migrate readily with groundwater contamination because they are highly soluble and have little tendency to associate with soil particles, thus these compounds tend to form long plumes of groundwater contamination. Note: surface water will be evaluated in future investigation efforts.

2.6 ANALYTICAL DATA

As described above, several PFOS and PFOA investigations have been completed at Ellsworth AFB. The locations with PFOS and/or PFOA concentrations greater than the Lifetime HA action levels are listed in **Table 2.1**. The analytical results for these investigations can be found in the reports listed in **Section 2.3**, which are available on the Administrative Record (AR) website at https://ar.afcec-cloud.af.mil/search.aspx. Once on the AR, from the "Installation List" on the left, scroll down and select Ellsworth AFB, SD. Enter a document name in the "Subject or Title" box or enter the AR# in the "AR#" box. When the documents appear at the bottom, click on the magnifying glass to open.

2.7 STREAMLINED RISK EVALUATION

In 2016, the USEPA published the current Lifetime HA action levels of 0.07 $\mu g/L$ (70 ppt) for PFOS and PFOA individually, and 0.07 $\mu g/L$ (70 ppt) for the two compounds in combination (USEPA, 2016a; 2016b). The State of South Dakota does not currently have a drinking water standard for PFOS or PFOA. The USEPA used a two-step process, explained in the following paragraphs, to calculate the Lifetime HA action levels.

First, the USEPA calculated the water concentration that a lactating woman could drink with no health effects. A lactating woman was used in this calculation because this individual represents a sensitive population (newborns can be exposed to PFOA and PFOS through breast milk) and, on a body weight basis, this individual drinks more water than other adults. For these reasons, a lactating woman is the most conservative receptor for exposure to PFOS and PFOA through drinking water. The resulting safe concentration, called the drinking water equivalent level, is $0.37~\mu g/L$ (370 ppt). This concentration is protective of people who are exposed to PFOS and PFOA solely through drinking water.

Historically, PFOS and PFOA were used in many consumer goods, including carpets, stain-resistant upholstery, food packaging, non-stick cookware, textiles, and leather goods. Most manufacturing of PFOS in the United States was discontinued in 2002, and the phase-out of PFOA manufacturing began in 2006. The USAF has phased out the use of the former AFFF in favor of the more environmentally friendly C6 AFFF at Ellsworth AFB and nationwide. Because of the historical uses of PFOS and PFOA, these compounds are widespread throughout the environment and are found in many food products such as eggs, meat, milk, fish, and root vegetables. PFOS and PFOA have been measured in indoor dust. The primary routes by which people are exposed to PFOS and PFOA are food and indoor dust (USEPA, 2016a; 2016b).

To account for the cumulative health effects of exposure to PFOS and PFOA from sources other than drinking water (e.g., food, indoor dust), the USEPA multiplied the drinking water equivalent level of 0.37 μ g/L (370 ppt) by a relative source contribution factor of 20% (or 0.2). The resulting number is the Lifetime HA action level of 0.07 μ g/L (70 ppt).

As noted above, PFOS and/or PFOA concentration in 24 off-base residential wells (the initial well identified in 2016 and 21 wells identified in 2018-2019, and two wells identified in 2020) exceed the Lifetime HA action levels. For the individuals who use these wells as a potable water supply, their exposure to PFOS and PFOA through use of the well water may pose an unacceptable health risk. As noted in **Section 2.4**, the extent of the PFOS/PFOA contamination beyond the boundary of Ellsworth AFB is due to the high solubility of these compounds, allowing them to migrate over long distances in groundwater and surface water. It is also possible that some PFOS/PFOA may be from non-USAF sources.

3.0 REMOVAL ACTION OBJECTIVES

This section identifies the statutory framework of removal actions and determines the removal scope based on the RAO.

3.1 STATUTORY FRAMEWORK

This removal action is performed pursuant to CERCLA and the NCP under the authority delegated by the Office of the President of the United States through EO 12580 as re-delegated. This order, as implemented through Department of Defense Instruction (DoDI) 4715.07 and Department of Defense Manual (DoDM) 4715.20 as amended, provides USAF with authorization to conduct removal actions. DERP provides funding to USAF for removal actions conducted under CERCLA. This removal action is non-time critical because the planning period from the time a removal action was determined to be necessary to the time when the removal action will be initiated is greater than 6 months.

This EE/CA provides an analysis of nine removal alternatives for Areas A, B, E, and similarly impacted areas near Ellsworth AFB, and recommends a removal action alternative. This EE/CA complies with the requirements of CERCLA, DERP, NCP, and EO 12580. This EE/CA is prepared pursuant to Section 300.415(b)(4)(i) of the NCP. The requirements for this EE/CA and its mandated public comment period provide an opportunity for public input with regard to the cleanup process.

3.2 SCOPE OF THE REMOVAL ACTION AND REMOVAL ACTION OBJECTIVE

The scope of this removal action is to supply alternate source of drinking water to the residential properties that have private, household wells that cannot be used for drinking water due to the presences of PFOS and/or PFOA at concentrations greater than the Lifetime HA action levels. The residences with PFOS- and PFOA-contaminated wells that have been replaced with connections to the Box Elder municipal water supply are not included in the areas and removal action alternatives because these locations comply with the RAO through implementation of the TCRA that was initiated in 2017. Additionally, residences where the 2020 NTCRA selected alternatives are being implemented are not included in the alternatives analysis since those locations will comply with the RAO once implementation is complete. All locations listed in **Table 2.1** and others similarly impacted by PFOS/PFOA near Ellsworth AFB may be addressed as part of the NTCRA. Non-household wells, such as those used for irrigation or livestock, that have PFOS/PFOA concentrations greater than the Lifetime HA action levels are not included in the scope of this NTRCA. This NTCRA encompasses only wells that supply drinking water to private, off-Base residences. It is unlikely that a future remedial action to address non-household wells will conflict or contribute to a future remedial action for the groundwater itself.

The RAO specifies what the proposed removal action is expected to accomplish. In other words, it defines the goals for the removal action. As such, RAOs are site-specific and are influenced by the nature and extent of chemical contamination, current and potentially threatened resources, and the potential for human and environmental exposure. Based on the scope of the removal action,

which is to prevent off-Base residents from being exposed to PFOS and PFOA in drinking water, the following RAO was developed:

• Prevent exposure of off-Base residents to drinking water that contains PFOS and/or PFOA at concentrations that, individually or in combination, exceed the USEPA Lifetime HA action levels of 0.07 μg/L (70 ppt).

3.3 REMOVAL ACTION CRITERIA

The removal action criteria are the contaminant concentrations that the removal action alternative must achieve. The current USEPA Lifetime HA action level of 0.07 μ g/L (70 ppt) for PFOS and PFOA concentrations individually and combined is the removal action criterion.

3.4 REMOVAL SCHEDULE

The removal schedule calls for completing the Action Memorandum and advertising a remedial response contract for the removal action in Summer 2021. Proposals will be evaluated and a contract awarded before the end of September 2021. The selected firm will then plan and construct the removal action and begin operations in 2022.

3.5 PLANNED REMEDIAL ACTIVITIES

At this time, specific remedial activities for PFOS and PFOA in soil, groundwater, and surface water are not planned because investigation of the on-Base and off-Base contamination is on-going. Until there is a more complete understanding of the nature and extent of PFOS and PFOA contamination, as well as risks to human health and the environment via other exposure routes, potential remedial activities for these contaminants cannot be identified. Regardless, because the potential removal action alternatives will not alter groundwater flow and chemical conditions, the alternatives considered for this NTCRA will not interfere with or hinder any future groundwater remedial action.

4.0 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

This section identifies remedial technologies and approaches that could achieve the RAO, develops removal action alternatives based on these technologies/approaches, and evaluates each removal action alternative in terms of effectiveness, implementability, and cost. USEPA guidance on NTCRAs (USEPA, 1993) lists the following considerations for effectiveness, implementability, and cost:

- Effectiveness: An alternative's effectiveness is its ability to meet the objective within the scope of the removal action. This criterion considers protection of public health, the community, workers during implementation, and the environment. The following factors are also considered:
 - Short-term effectiveness, which addresses the effects of the alternative during implementation before the RAO has been met.
 - Long-term effectiveness and permanence: the extent and effectiveness of controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes.
 - o Reduction of toxicity, mobility, or volume (TMV) through treatment.
- Implementability: This criterion evaluates the technical and administrative feasibility of each alternative and the availability of the services and materials needed to implement the alternative. This criterion also considers state and community acceptance. The acceptance of an alternative will be evaluated during the public comment period and preparation of the NTCRA Action Memorandum that announces which alternative the Air Force decides to implement. The final version of this EE/CA will be made available for a 30-day public comment period, and all comments received will be summarized and addressed in the responsiveness summary section of the Action Memorandum.
 - <u>Technical feasibility</u>: the ability of the technology to implement the remedy and the technology's reliability. Technical feasibility is evaluated from construction through operation and maintenance of the removal action. This factor also evaluates whether an alternative will contribute to the anticipated performance of any remedial activity.
 - <u>Administrative feasibility</u>: this factor evaluates those activities needed to coordinate with other offices and agencies, the need for permits, adherence to applicable non-environmental laws, and concerns of other regulatory agencies.
 - Availability of services and materials: this factor considers whether the requisite
 personnel, equipment, and materials will be available during the removal action
 schedule; the adequacy of off-site treatment capacity if the alternative includes off-

site removal and treatment of waste; and whether the technology has been sufficiently developed for full-scale application.

• Cost: The direct and indirect capital, operation, and maintenance costs are estimated for each alternative. Costs are calculated on a present worth basis for any removal action lasting longer than 12 months.

State and community acceptance will be evaluated as part of the responsiveness summary to be included in the NTCRA Action Memorandum.

Section 121(d) of the CERCLA (42 U.S.C. §9621(d)) requires that on-site remedial actions attain or waive federal environmental applicable or relevant and appropriate requirements (ARARs), or more stringent state environmental ARARs, upon completion of the remedial action. 40 C.F.R. § 300.415(j) specifies that certain types of removal actions must, to the extent practicable considering the exigencies of the situation, attain ARARs. The removal action contemplated by the USAF is not one of the types addressed in 40 C.F.R. by § 300.415(j) (i.e., removal action funded by the Superfund or an abatement action taken under 42 U.S.C. § 9606). Regardless, ARARs are not relevant to this NTCRA because the Air Force is not taking action to remove, treat, or otherwise address the source of the PFOS and PFOA concentrations in drinking water above the EPA Lifetime HAs. Instead, the Air Force is preventing human exposure to drinking water that contains PFOS and PFOA at concentrations above the Lifetime HAs. ARARs will be considered in the Feasibility Study during the analysis of remedial action alternatives.

4.1 POTENTIAL APPROACHES

In developing the removal alternatives, several strategies were considered: treatment of contaminated groundwater prior to use; development of an alternative drinking water supply; and buy-out of the affected properties to eliminate the need for drinking water at those locations. The options associated with each strategy are described in the subsections below. The term "impacted property" refers to a residence that 1) is supplied by a well with PFOS/PFOA concentration greater than the USEPA Lifetime HA action levels, and 2) where the past release of AFFF containing PFOS and PFOA at Ellsworth AFB is probably a source, in whole or in part, of the Lifetime HA action level exceedances.

Because of the large area encompassed by the affected properties, the site was divided into Areas A, B, and E for developing strategies for the removal alternatives. Please note that the selected alternatives from the 2020 NTCRA are currently being implemented in Areas C and D. These areas are shown on **Figure 1** and briefly described below. The locations included in each area are identified in **Table 2.1**.

Area A consists of the properties southwest of the Base and encompasses 9 wells that serve 12
residences and one well that supplies drinking water to the mobile home park identified during
the rapid response action. Additionally, the 19 properties currently served by the Southwest
Waterline are in Area A.

- Area B consists of the properties east of the Base and encompasses five wells serving five residences.
- Area C consists of properties further east of the Base but west of the City of New Underwood and encompasses three wells serving three residences.
- Area D consists of properties east of the City of New Underwood and encompasses one well
 that serves three residences.
- Area E consists of properties surrounding the City of New Underwood.

4.1.1 Treatment of Contaminated Groundwater

As shown on **Figure 1**, the impacted residential wells extend from southwest of the Base boundary to approximately 18 miles east of the Base. Because of the large area spanned by the impacted wells, the only practical approach for treatment of the contaminated groundwater is to install a point-of-entry treatment system (POETS) at each impacted residence or, in the case of the single well which supplies the mobile home park, a well-head treatment system. As part of the TCRA initiated in 2017, the USAF has installed or is in the process of planning/installing point-of-entry or wellhead treatment systems for 21 properties (19 wells). There are three commercially available technologies for point-of-entry treatment systems: reverse osmosis, granular activated carbon, and ion exchange. All three technologies are capable of effectively removing PFOS and PFOA to concentrations less than the Lifetime HA action levels. The TCRA Action Memorandum identified all three technologies as options for the POETS. Systems implemented to date include a combination of granular activated carbon and ion exchange. Depending on site-specific circumstances, one or more of these technologies will be used to assure the removal action objective is met.

Continued operation of the existing and planned POETS is identified as a removal action alternative. Because this alternative maintains the status quo established by the TCRA, this alternative is identified as the "no action" alternative. Per guidance, the no action alternative should evaluate the situation in which no action is taken at all to prevent exposure to the site contaminants. However, the Action Memorandum for the TCRA already determined that "no action" is not protective of human health and specified an action that is in the process of being implemented. Thus, to define the no action alternative for the current NTCRA as the pre-TCRA situation would be to ignore the site's current conditions. For this reason, the "no action" alternative is defined as no further action beyond that completed by implementation of the TCRA.

4.1.2 Alternative Drinking Water Supplies

This strategy consists of providing a permanent, alternative water supply to the affected properties. There are two general options available for this strategy: connection to a municipal water system and installation of a new supply well(s).

4.1.2.1 Connection to Municipal Water Supply

There are three entities that could provide drinking water to the impacted properties: City of Box Elder (Box Elder), City of Rapid City (Rapid City), and South Dakota Ellsworth Development

Authority (SDEDA). In addition, there is a community water system, Sunset Ranch, that could provide water to the properties in Area C and Area E could be served by the City of New Underwood.

Box Elder surrounds Ellsworth AFB on three sides and currently operates a drinking water supply system. Its distribution system is adjacent to several of the affected properties. In fact, four residences (3 wells) with PFOS and PFOA-impacted drinking water wells have been connected to the Box Elder municipal water supply under the TCRA, and another three residences (one well each) are considering being connected to a municipal source. Properties not within the City limits have historically been able to connect to the Box Elder municipal system, and pay a higher water rate than properties within the City limits. The city, however, does not have enough water at times to meet current demand and will not accommodate additional new customers outside of their city limits without either the property being annexed into the city or an increase in its water supply. In the recent past, Box Elder has had to obtain water from both Rapid City and Ellsworth AFB to meet peak demand. USAF has had several discussions with Box Elder since publication of the previous EE/CA (Tehama, 2020) and Action Memorandum (USAF, 2020) regarding expanding their water system to serve the impacted properties in Areas A and B. Box Elder provided the engineering requirements (i.e., fire flow) that would be necessary to expand the water system in order to connect impacted residences. The USAF determined that Defense Environmental Restoration Account (DERA) funds cannot be used to fund some of the engineering requirements (i.e., fire flow); therefore, Box Elder is no longer interested in participating in a removal action effort.

Rapid City operates a municipal water system southwest of Box Elder. Both Box Elder and Ellsworth AFB have connections to the Rapid City distribution system. For cost and operational reasons, however, Rapid City is not interested in expanding its distribution system that far outside of its current boundaries. The closest portion of the Rapid City distribution system is more than 2 miles from Ellsworth AFB.

SDEDA was established in 2009 as a corporate and political organization of the State of South Dakota, a designation that allows SDEDA to act as a utility provider. There have been many discussions with SDEDA since publication of the previous EE/CA (Tehama, 2020) regarding setting up a rural water system to serve the impacted properties in Area A. Since the proposed rural water system would be within the 3 mile jurisdictional boundary of Box Elder the Box Elder engineering requirements are required. DERA funds cannot be used to fund some of the engineering requirements (i.e., fire flow). However, SDEDA is looking into additional funding sources and may not be able to meet the execution deadline.

Area E is in proximity to the City of New Underwood; which operates a municipal water system. Properties not within the City limits are able to connect to the municipal system and pay a higher water rate.

4.1.2.2 <u>Installation of New Municipal Supply Well</u>

The PFOS and PFOA contamination appears to be confined to the shallow alluvial groundwater. The alluvial zone is the unconsolidated material, such as sand or silt, that lies above bedrock. Bedrock aquifers in the contaminated area include the Inyan Kara (uppermost), Minnelusa, and Madison (deepest) aquifers. Because of its water quality and quantity, the Madison aquifer is the preferred water source near Ellsworth AFB. Box Elder's supply wells that extract from the Madison aquifer produce between 275 gallons per minute (gpm) and 440 gpm (KTM Design Solutions, Inc., 2018). This aquifer, however, is 4,500 feet deep. This depth makes it expensive to construct a supply well in the Madison aquifer. The cost of installing a municipal supply well in the Madison aquifer is estimated to be \$2,000,000.

The Madison aquifer is overlain by the Minnelusa aquifer. Box Elder installed a new supply well in 2012. This new well appears to pull water from both the Madison and Minnelusa aquifers. This well yields water that has high concentrations of radionuclides, total dissolved solids, sulfate, iron, and manganese. Although the high sulfate, total dissolved solids, iron, and manganese concentrations are attributed to water from the Minnelusa aquifer, it cannot be determined with certainty if the high radionuclide concentrations come from the Madison aquifer or Minnelusa aquifer (KTM Design Solutions, Inc., 2018).

The Inyan Kara aquifer ranges from 2000 to 3000 feet deep, with depth increasing eastward from the Black Hills, but its water often has high total dissolved solids concentration and its flow rate is typically less than 50 gpm. Because the Inyan Kara aquifer is not as deep as the Madison, it costs less to install a well in the Inyan Kara aquifer as compared to the Madison aquifer. The cost of a municipal supply well installed in the Inyan Kara aquifer is estimated to be \$1,500,000.

4.1.2.3 Installation of New Individual Wells

Installation of new individual wells is similar to installation of a new municipal well. The major differences is that the size of the well (i.e., well diameter) needed to produce water for individual (or several) residences is smaller than a municipal well. Individual wells are being considered for installation into the Inyan Kara and the Minnelusa or Madison aquifer. A new alluvial well was considered at properties that were large enough to find an area in the alluvial aquifer not impacted by PFOS/PFOA; therefore, this is not applicable to Areas A, B, or E. Smaller properties will be considered for an Inyan Kara well. If water quantity or quality issues are encountered in the Inyan Kara aquifer a well in the Minnelusa or Madison aquifer may be considered on a case-by-case basis. Proper drilling procedures (i.e., double casing) must be implemented when drilling through the Pierre Shale to reach the deeper aquifers in order to not create preferential pathways for PFOS/PFOA to migrate downward.

4.1.3 Purchase Affected Properties

If the USAF or another entity purchases the affected properties with no intent to occupy the homes or use the impacted groundwater for drinking water, then it will not be necessary to provide an alternative water supply or point-of-entry treatment.

4.2 REMOVAL ACTION ALTERNATIVES

The removal action alternatives for this NTCRA are listed below and may not correspond to a similar alternative from the 2020 NTCA. The alternatives can be applied to individual or multiple areas. "Impacted properties" refers to residences with private drinking water supply wells with PFOS/PFOA concentrations greater than the USEPA Lifetime HA action levels as a result, at least in part, of past firefighting operations at Ellsworth AFB.

- Alternative 1, no further action: maintain the status quo through the USAF providing bottled water as part of the 2018 Rapid Response Emergency Action, operating and maintaining point-of-entry or wellhead treatment systems installed as part of the 2017 TCRA, and alternative water supply actions in the Southwest Waterline area. Alternative 1 provides a baseline against which the other removal action alternatives can be evaluated.
- Alternative 2, community water system, new supply well: connect the affected properties to a new community water system that is owned/operated by SDEDA and obtains water from a new supply well. Water would be conveyed through a new transmission mains.
- Alternative 3, purchase affected properties: the USAF or another entity, such as SDEDA, would purchase the affected properties and the current occupants would relocate.
- Alternative 4, drill new individual Inyan Kara wells: install a new Inyan Kara well to replace each impacted well.
- Alternative 5, drill new individual Minnelusa/Madison wells: install a new Minnelusa/Madison well to replace each impacted well
- Alternative 6, connect to New Underwood municipal system: connect the Area E property to the New Underwood municipal water system.

The selected removal alternative will need to be operated until replaced by or incorporated into a remedy for PFOS and PFOA contamination in the groundwater. At this time, it is not known how long it will take to fully investigate and develop a remedy for the PFOS and PFOA contamination. For the purposes of this EE/CA, it is assumed that each alternative would be operated for 30 years. Each alternative is described and evaluated below.

4.2.1 Alternative 1 – No Further Action

The no further action alternative consists of maintaining the status quo. The USAF would continue to provide bottled water to 4 residences, operate 16 PFOS/PFOA treatment systems installed in Areas A and B as part of the TCRA initiated in 2017, and retain connection of the 19 residences to the Ellsworth AFB Southwest Waterline. Because this alternative relies on existing agreements and infrastructure, the alternative does not include construction.

4.2.1.1 Effectiveness

By providing bottled water or treated water, remaining a purveyor of water through the Ellsworth AFB Southwest Waterline, and removing PFOS and PFOA through the POETS or wellhead treatment systems, Alternative 1 prevents people from being exposed to PFOS and PFOA in their drinking water, thereby achieving the RAO. This alternative is protective of human health.

<u>Short-Term Effectiveness:</u> Because all actions are already in place, Alternative 1 poses no short-term effects on workers or the community.

<u>Long-Term Effectiveness:</u> The treatment systems can effectively remove PFOS and PFOA to concentrations less than the Lifetime HA action levels provided that these systems are monitored and maintained. Proper monitoring and maintenance require long-term access to the impacted properties. Additionally, the treatment systems create a contaminated waste stream that must be dealt with for the lifetime of the system.

Additionally, the USAF may want to explore options for changing how the alternative water supply is provided to the residences connected to the Southwest Waterline since the environmental restoration action the Southwest Waterline supported has achieved its objective and cleanup work is complete.

Reduction of TMV: Long-term operation of the treatment systems would decrease PFOS and PFOA mobility and volume through removing the compounds from the extracted groundwater. Given the small volume of groundwater that would be treated by these systems relative to the probable volume of contaminated groundwater, the active PFOS/PFOA treatment provided by this alternative would have negligible effect on the overall remediation of the PFOS/PFOA plume.

4.2.1.2 Implementability

In the short-term, the no further action alternative is readily implementable because bottled water is provided by a commercial vendor, the Ellsworth AFB Southwest Waterline infrastructure is already in place, and the treatment systems are in place. In the long-term, however, it may be difficult for the USAF to retain the access needed to properly monitor and maintain the point-of-entry treatment systems, particularly if the affected properties are sold.

There are no permits required for this alternative. The material, equipment, and labor needed to implement this alternative are readily available. This alternative relies on conventional technologies.

4.2.1.3 Cost

The estimated cost for Alternative 1 is provided in Appendix A. Because the point-of-entry treatment systems have been or are being installed as part of the TCRA, Alternative 1 has no capital cost.

The 30-year cost is estimated to be \$10,707,540.00 and is based on the following assumptions:

- The USAF would pay for bottled water service through a commercial vendor.
- The USAF would continue O&M of the Southwest Waterline.
- The USAF would pay the O&M costs for each PFOS/PFOA treatment system (20 POETSs and 1 wellhead system). The USAF would hire a certified contractor to complete the O&M work or pay an upfront cost.

4.2.2 Alternative 2 – Community Water System Owned and Operated by SDEDA with a New Supply Well

Under Alternative 2, SDEDA would create and maintain a community water system after constructing a new supply well for the water system to serve the impacted properties in Areas A and B. The well would preferably be located near Area A and screened in the Madison aquifer. Transmission mains would be constructed to serve Areas B. Distribution piping would be constructed to connect the affected residences to the new transmission mains. Because of the distance from Area E to the other impacted properties, it would be prohibitively expensive to connect Area E to a new, community water system and another alternative would be required for that well.

Permits may be required for SDEDA to construct and operate the new rural water system. All new construction under this alternative would be limited to a supply well and those distribution mains and service connections required to address the impacted properties. Additional improvements desired by SDEDA, even if they were related to the distribution needs, would have to be funded by SDEDA since they would be outside of the scope of this removal action. Additionally, all engineering requirements may not be eligible for expenditure of DERA funds; therefore, SDEDA would also have to fund any non-DERA eligible requirements to have a jurisdictionally compliant water system.

4.2.2.1 Effectiveness

Alternative 2 would achieve the RAO and be protective of human health for all but two impacted properties. A different removal alternative would be required Areas D and E properties since they are too far from the other impacted properties to be included in this alternative.

<u>Short-Term Effectiveness:</u> There could be short-term effects on the local community and workers during construction of the distribution system. The potential effects could be managed through standard construction practices. Because construction would occur in existing rights-of-way, there would be minimal impact to the environment.

<u>Long-Term Effectiveness:</u> Alternative 2 would provide a permanent, long-term effective solution.

<u>Reduction of TMV:</u> This alternative would not reduce TMV of PFOS and PFOA contamination released by the Air Force.

4.2.2.2 Implementability

<u>Technical</u>: This alternative could be implemented with readily available material, services, and labor. This alternative relies on well-established, conventional technologies. The 2012 attempt by Box Elder to install a new supply well was not successful due to the poor quality of the groundwater extracted by the new well. To limit the potential for installing a supply well in a zone of poor groundwater quality, design of the new well would consider all available information on lithology and groundwater quality from the existing well network.

<u>Administrative</u>: The new mains may be constructed along existing rights-of-way or SDEDA may need to obtain easements. Landowner permission would be needed to install the piping to connect each affected property to the SDEDA water distribution system.

SDEDA will require the new supply well and distribution system to be constructed in accordance with local, state, and federal requirements in order to assume operation and maintenance. Since SDEDA would need to fund some requirements the implementation timeline may be effected.

This alternative would require SDEDA to obtain a water rights permit. SDEDA may be required to obtain permits and licenses to construct and operate the new distribution system. The USAF may have to enter into an agreement with SDEDA that describes how the USAF and SDEDA will work together to implement this alternative.

4.2.2.3 Cost

The 30-year cost is estimated to be \$12,007,317.09 and is based on the assumptions listed below.

- A water rights permit can be obtained. SDEDA will have to obtain the permit and would not be reimbursed by DERA funds for doing so.
- Capital costs include construction of a water tank/tower, transmission mains, and connection piping.
- A water reservoir is required to meet fire flow requirements. Capital costs include installation of tanks at the new well to provide storage and maintain system pressure. This requirement is not DERA-eligible, so SDEDA would have to fund.
- The existing temporary potable water supply line (Southwest Waterline) for 19 residences in Area A can be connected to the SDEDA distribution system, precluding the need to install connection piping to these 19 locations.
- O&M costs will not be paid for by the USAF but will be paid by the landowners/customers through a monthly water bill with the rates set by SDEDA. SDEDA will directly bill the landowners/customers at some point after the system is constructed and operating.

4.2.3 Alternative 3 – Purchase Impacted Properties

Under Alternative 3, the USAF or another entity, such as SDEDA, would purchase the impacted properties and the current occupants would relocate. The purchase of properties by an entity other than the USAF is not discussed further since it would not be a USAF action. Similar to the other alternatives, this alternative could be combined with another alternative to achieve a more cost-effective solution. The contamination at any property purchased under this alternative would be addressed as part of the final remedy.

4.2.3.1 Effectiveness

By eliminating use of the PFOS/PFOA impacted drinking water wells, this alternative would achieve the RAO.

<u>Short-Term Effectiveness:</u> Because this alternative would not require any construction, there would be no short-term effects on workers. People who live on the purchased properties would need to find new homes, temporarily increasing the demand for rental or sale properties until the re-location is complete.

<u>Long-Term Effectiveness:</u> Purchasing the affected properties would eliminate the need to use the impacted groundwater, thereby providing a long-term effective and permanent solution for these properties.

<u>Reduction of TMV:</u> This alternative would not reduce TMV of PFOS and PFOA contamination released by the USAF.

4.2.3.2 Implementability

<u>Technical</u>: Alternative 3 would not require any technical expertise, material, or equipment. The legal skills needed to complete the property transactions are readily available.

Administrative: Alternative 3 would not require any permits. Although some property owners may be willing to move, others might wish to stay in their current homes. Depending on the property owners, it might not be possible to purchase all of the affected properties. If an alternate water supply was still required for residents not willing to sell, purchasing the affected homes may be impractical. Finally, because other alternatives are available, the government would likely not consider condemnation of properties with owners not willing to sell unless other overriding considerations (e.g., new missions requiring additional property or buffer areas) were to arise in the future.

The purchase of any property by the USAF would need to be completed in accordance with DoDI 4165.71, Air Force Instruction (AFI) 32-9001, and DoD Memorandum "Guidance for Acquiring Property Pursuant to Section 344 of the National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2020". DoDI 4165.71 and AFI 32-9001 require Department of Defense approval of proposals to acquire 1,000 or more acres of land, or land with an estimated purchase price that

exceeds one million dollars (\$1 million). Purchase proposals must be approved early on in the acquisition process. Depending on property cost and the number of properties purchased, the requirement for DoD approval might not be triggered (for example, if this alternative is used on a limited number of properties). However, the FY20 NDAA Section 344 states that a real property acquisition due to PFOS/PFOA impacts must satisfy all of the five following requirements must be within half-mile down-gradient of the outer perimeter of the Air Force Base, must show signs of contamination from PFOA and PFOS, the contamination must be due to activities of the base, the acquisition must extend the contiguous geographic footprint of the base, and must increase the force protection standoff near critical infrastructure and runways. Due to these five requirements for expenditure of USAF funds, this Alternative is only valid for Area A. Lastly, the funding sources would not be DERA, it would have to be an unobligated funds sources to be determined at the time of requesting acquisition approval.

4.2.3.3 Cost

The cost is estimated to be \$8,419,044.61 and is based on the estimated prices for the individual properties and the assumptions listed below.

- There are no O&M costs.
- Purchase prices were based on information in Zillow, an online real estate database.
- If an estimated value was not provided on Zillow, then the average percent difference between the provided Zillow estimated property values and the assessed property values for the area was used to estimate a property value.

As mentioned, this alternative does not need to be used for all affected properties but, instead, can be applied to individual properties.

Section 344 of the NDAA for FY2020 authorizes the USAF to purchase land in the vicinity of an Air Force base if the land shows signs of PFOS/PFOA impact due to activities on the base. However, this authorization only applies if acquiring impacted land would extend the contiguous geographic footprint of the base and would increase the force protection standoff near critical infrastructure and runways. The Assistant Secretary of Defense for Sustainment issued Section 344 implementation guidance on August 4, 2020. That guidance said "in the vicinity" means the impacted property is within a half-mile gradient of the outer perimeter of the base, "shows signs of impact" means unacceptable risk to human health or the environment based on site-specific exposure, and "activities on base" means on-base activities are the sole source of impact. The implementation guidance also said an acquisition under Section 344 must promote land use to meet the mission of DoD and the Air Force. Finally, the guidance requires the USAF to seek Department of Defense approval before making an acquisition under Section 344 authority. For all practical purposes acquisition under Section 344 of the FY20 NDAA is not a viable option for affected properties in Area B and Area D, and would difficult to utilize for affected properties in Area A.

4.2.4 Alternative 4 - Drill New Individual Inyan Kara Wells

Alternative 4 consists of replacing the existing shallow alluvial well on each impacted property with a new well drilled into the Inyan Kara aquifer. Previously, this alternative was thought to be cost prohibitive; however, recent market research has proven otherwise.

4.2.4.1 Effectiveness

Alternative 4 could achieve the RAO and provide a long-term effective and permanent solution for the impacted properties. PFOS/PFOA sampling will be completed during the start-up/shakedown process of a newly installed well.

<u>Short-Term Effectiveness:</u> Potential short-term effects associated with installation of an Inyan Kara well would be moderate due to the type of drilling equipment necessary. Risks to workers could be mitigated through standard practices. There would be no effect on the local community.

<u>Long-Term Effectiveness:</u> Alternative 4 would achieve the RAO and provide a long-term effective and permanent solution for the impacted properties.

Reduction of TMV: Alternative 4 would not reduce the TMV of the PFOS and PFOA contamination released by the Air Force.

4.2.4.2 Implementability

Technical: Alternative 4 can be implemented with readily available material, equipment, and labor.

Administrative: Landowner permission would be needed to install the new Inyan Kara well and piping. At least one property, but possibly several, will need to obtain a State issued water rights permit. Federal SDWA drinking water standards only apply to public water systems (not individual private wells) and South Dakota regulations are in line with the Federal regulations. Installation of individual wells would protect against health effects from PFOS/PFOA and comply with federal and state regulations; however, if the property owner desires additional drinking water treatment it would be at their own cost.

4.2.4.3 Cost

The cost is estimated to be \$13,282,114.80 and is based on the assumptions listed below.

- The cost of installing an Inyan Kara well ranges from \$40 to \$50 per foot.
- The per well cost (without project management related tasks) is estimated at \$295,756.
- The total cost includes the connection piping, waste disposal, removal of the previously install POETSs, abandonment of the existing alluvial well, and project management related tasks.

4.2.5 Alternative 5 – Drill New Individual Minnelusa/Madison Wells

Alternative 5 consists of replacing the existing shallow alluvial well on each impacted property with a new well drilled into the Minnelusa/Madision aquifer. Previously, this alternative was thought to be cost prohibitive; however, recent market research has proven otherwise.

4.2.5.1 Effectiveness

Alternative 5 could achieve the RAO and provide a long-term effective and permanent solution for the impacted properties. PFOS/PFOA sampling will be completed during the start-up/shakedown process of a newly installed well.

<u>Short-Term Effectiveness:</u> Potential short-term effects associated with installation of a Minnelusa/Madision well would be moderate due to the type of drilling equipment necessary. Risks to workers could be mitigated through standard practices. There would be no effect on the local community.

<u>Long-Term Effectiveness</u>: Alternative 5 would achieve the RAO and provide a long-term effective and permanent solution for the impacted properties.

<u>Reduction of TMV:</u> Alternative 5 would not reduce the TMV of the PFOS and PFOA contamination released by the Air Force.

4.2.5.2 Implementability

<u>Technical</u>: Alternative 5 can be implemented with readily available material, equipment, and labor.

Administrative: Landowner permission would be needed to install the new Minnelusa/Madision well and piping. At least one property, but possibly several, will need to obtain a State issued water rights permit. Federal SDWA drinking water standards only apply to public water systems (not individual private wells) and South Dakota regulations are in line with the Federal regulations. Installation of individual wells would protect against health effects from PFOS/PFOA and comply with federal and state regulations; however, if the property owner desires additional drinking water treatment it would be at their own cost.

4.2.5.3 Cost

The cost is estimated to be \$20,594,597.00 and is based on the assumptions listed below.

- The cost of installing a Minnelusa/Madision well ranges from \$100 to \$120 per foot.
- The per well cost (without project management related tasks) is estimated at \$553,220.
- The total cost includes the connection piping, waste disposal, removal of the previously install POETSs, abandonment of the existing alluvial well, and project management related tasks.

4.2.6 Alternative 6 - New Underwood Water System

Alternative 6 consists of connecting impacted property in Area E to the municipal water system owned and operated by City of New Underwood. This alternative does not address Areas A and B. Alternative 6 would need to be combined with other alternatives to address all of these areas.

4.2.6.1 Effectiveness

Alternative 6 would achieve the RAO and be protective of human health only for the impacted property in Area E. A different removal alternative would be required Areas A and B properties since they are too far from the City of New Underwood to be included in this alternative.

<u>Short-Term Effectiveness:</u> Construction of the connection piping would cause short-term impacts on the local community and workers that could be readily mitigated through standard practices. An easement would need to be obtained by the City of New Underwood, thereby creating a minor potential effects on the environment.

<u>Long-Term Effectiveness</u>: Alternative 6 would achieve the RAO and provide a long-term effective and permanent solution for the three impacted properties in Area E.

<u>Reduction of TMV:</u> Alternative 6 would not reduce TMV of the PFOS and PFOA contamination released by the USAF.

4.2.6.2 Implementability

<u>Technical:</u> Alternative 6 can be implemented with readily available material, equipment, and labor. This alternative relies on well-established, conventional technologies.

<u>Administrative</u>: The City of New Underwood would need to obtain a new easement for the transmission line. Landowner permission would be needed to install the piping to connect each residence to the community water system.

4.2.6.3 Cost

The cost is estimated to be \$484,365.58 and is based on the assumptions listed below.

- The distribution system between the City of New Underwood and the affected property does not require a water storage structure.
- The residents of the affected property would pay a monthly water bill with rates set by City of New Underwood. The USAF would incur no O&M costs.
- O&M costs will not be paid for by the USAF but will be paid by the landowners/customers through a monthly water bill with the rates set by the City of New Underwood. The City of New Underwood will directly bill the landowners/customers.

5.0 COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

This section provides a comparative analysis of the removal action alternatives described and evaluated in Section 4 and summarized in Table 5.1.

Table 5.1 Summary of Comparative Analysis of Removal Action Alternatives

Alternative	Effectiveness	e Analysis of Removal Action Alter Implementability	Cost	
No further action (maintain status quo)	No further action Requires long-term O&M Readily implemented but access for aintain status of treatment systems and treatment system monitoring and			
2. Community water system owned & operated by SDEDA with a new supply well	Would achieve objectives Areas A and B but not Area E. High effectiveness.	reas A and B but not cannot be used for all requirements (i.e., certain engineering requirements, requires		
3. Purchase affected properties	Tromes mets might not wish to ben then		\$8,419,044.61	
4. Drill New Individual Inyan Kara Wells	Would achieve objectives for all Areas. High effectiveness.	Readily implemented. Landowner permission would be needed.	\$13,282,114.80	
5. Drill New Individual Minnelusa/Madision Wells	Would achieve objectives for all Areas. High effectiveness.	Readily implemented. Landowner permission would be needed.	\$20,594,597.00	
6. New Underwood Water System	Effective for Area E but would need to be combined with other alternatives for Areas A and B. The City of New Underwood would need to obtain a new easement for the transmission line. Landowner permission would be needed to install the piping to connect to the municipal water system.		\$484,365.58	
Recommended Alternative: • Alternative 2 for Areas A and B • Alternative 4 for Area E	for all properties. High degree of effectiveness. Alt. 2 - However, DERA funds cannot be used for all requirements (i.e., certain engineering requirement, a State issued water rights permit, required easements).		\$12,760,237.89	

5.1 EFFECTIVENESS

A matrix showing which Alternative are effective for each area is presented in **Table 5.2**. Alternatives 1, 3, and 4 would achieve the RAO and be protective of human health for all of the impacted properties. Alternatives 2 would need to be combined with other alternatives to address all impacted properties.

Table 5.2 Alternative Effectiveness for Each Area

Alternative	Area A	Area B	Area E	
1. No Further Action (maintain status quo)	X	X	X	
Community Water System Owned and Operated by SDEDA with a New Supply Well	X	X		
3. Purchase Impacted Properties	X			
4. Drill New Individual Inyan Kara Wells	X	X	X	
5. Drill New Individual Minnelusa or Madison Wells	X	X	X	
6. New Underwood Water System			X	

Short-Term Effectiveness: Alternative 1 has the lowest potential for short-term impacts. Alternatives 3, 4, and 5 involve construction that could affect workers and the local community. The greatest effects would be associated with Alternative 4 due to the time required to complete a Minelusa/Madison well. Alternative 2 could temporarily affect the local housing market as occupants of the purchased properties find new homes.

<u>Long-Term Effectiveness:</u> Alternative 1 requires long-term provision of bottled water and monitoring/maintenance of the POETSs and the Well Head treatment system; therefore, this alternative provides a relatively low degree of long-term effectiveness and permanence.

<u>Reduction of TMV</u>: Only Alternative 1 includes treatment that would decrease contaminant TMV. The potential treatment provided by continued operation of the treatment systems, however, would have negligible effect on the long-term groundwater remediation.

5.2 IMPLEMENTABILITY

<u>Technical</u>: All alternatives rely on conventional technologies or strategies (property purchase) that can be implemented with readily available materials, equipment, and labor.

<u>Administrative</u>: Alternative 1 would not require any permits but would need long-term access to the treatment systems for monitoring and maintenance. It may be difficult for the USAF to ensure continued access in the long-term, particularly if the property is sold. Additionally, USAF would have to continue providing water for the Southwest Waterline or implement a different way to provide an alternative water supply to the 19 properties.

Alternatives 2 is implementable but would require easements, a State issued water rights permit, and permits for the construction and operation of the well and distribution systems. Use of SDEDA

to build and operate a utility would require implementation of a binding agreement between SDEDA and the USAF to specify how SDEDA will conduct these activities. The appropriation and permits should be readily obtainable by SDEDA. Additionally, all engineering requirements may not be eligible for expenditure of DERA funds; therefore, SDEDA would have to fund any non-DERA eligible requirements to have a jurisdictionally compliant water system. Landowner permission would be needed to install and connect the piping.

Alternative 3 also would not require permits, but the USAF would need to obtain landowner concurrence to purchase the affected properties at a fair market price. Some landowners might not wish to move. In addition, purchase of these properties may require prior approval from the Office of the Secretary of Defense pursuant to AFI 32-9001.

Alternative 4 would require landowner permission to install the new Inyan Kara well and piping and a State issued water rights permit for at least one property.

Alternative 5 would require landowner permission to install the new Minnelusa or Madision well and piping and a State issued water rights permit for at least one property.

Alternative 6 would require the City of New Underwood to acquired easements for the transmission piping and landowner permission would be needed to install and connect piping.

5.3 COST

The estimated costs for Alternatives 1 through 6 range from \$484,365.58 for the single property in Area E to \$20,594,597.00 for Alternative 5. The uncertainties described below need to be considered in evaluating the relative costs. Also, evaluation of the cost for Alternatives 2 and 5 must consider that these alternatives would need to be combined with one or more of the other alternatives to achieve the RAO at all affected properties.

For all alternatives that include new piping, the costs were based on installing the piping in city or county rights-of-way. Easements and permitting may require alternate routing at additional cost.

The cost for Alternative 3 is based on pricing information listed on Zillow obtained in April 2021. The landowners might request higher pricing for their properties.

Alternatives 2, 4, and 5 both require construction of new wells in deeper aquifers. As noted in the **Section 2** and demonstrated by Box Elder's recent installation of a supply well, there is no guarantee that a new well will provide water of a quality that can be used for drinking water. The cost estimates for Alternatives 2, 4, and 5 do not account for the possibility of drilling a well that cannot be used as a supply well because of poor water quality.

The cost estimates do not include USAF staff time to prepare and implement agreements with the local governments or SDEDA, to review plans or specifications, or to procure properties or services. These costs are similar across most of the alternatives and will depend on the extent contract assistance is required and how the alternative is implemented.

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6.0 RECOMMENDED REMOVAL ACTION ALTERNATIVE

Alternative 2 – Community Water System Owned and Operated by SDEDA with a New Supply Well is recommended for Areas A and B. This alternative achieves all RAOs for these properties.

Alternative 3 – Drill New Individual Inyan Kara Wells is recommended for Areas A, B, and E and other similarly impacted properties near Ellsworth AFB. This alternative achieves all RAOs for these properties.

The estimated cost for the above combination of alternatives is \$12,760,237.89. The cost estimate for the recommended approach is presented in **Appendix A**.

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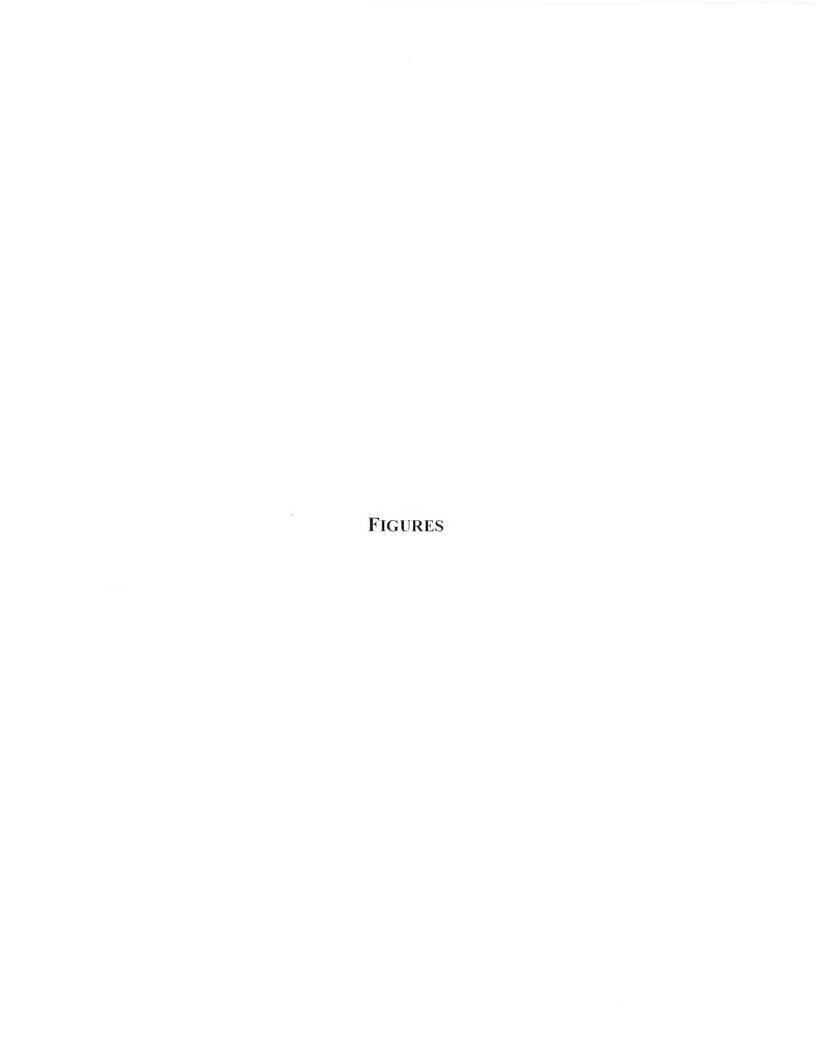
7.0 REFERENCES

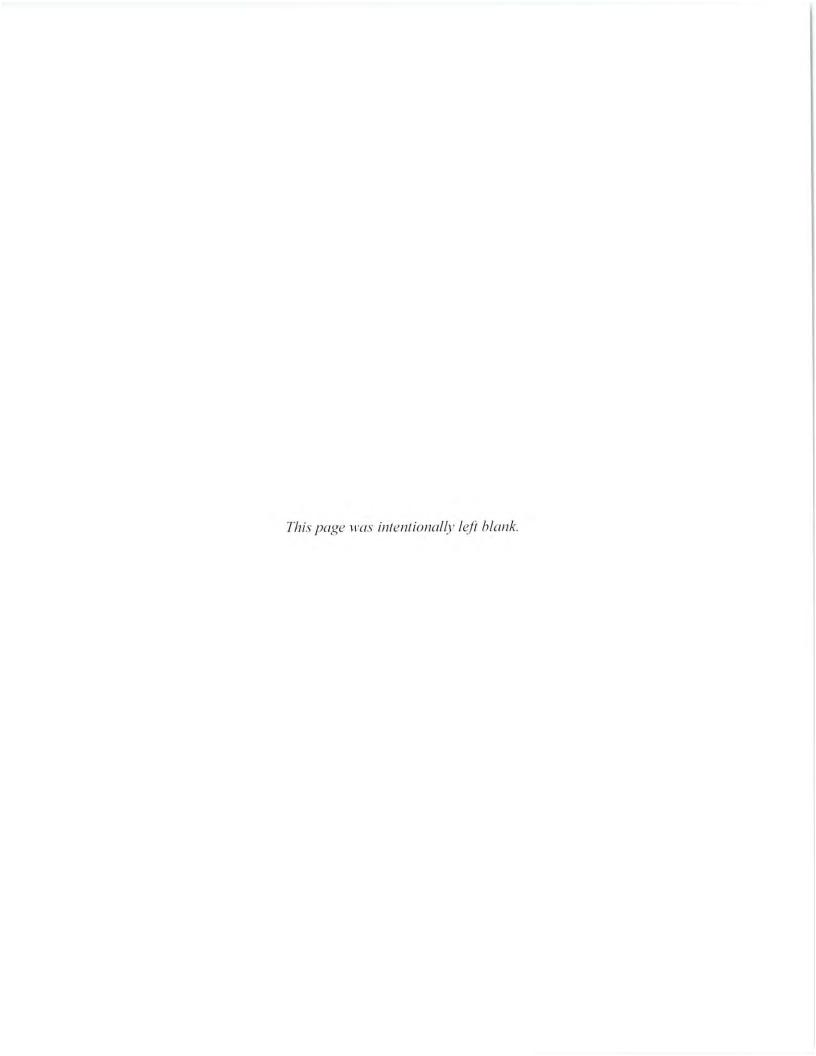
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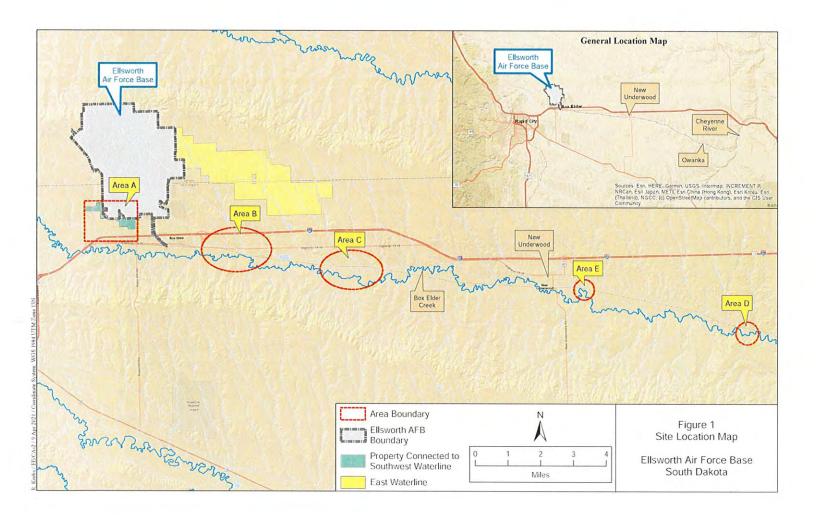
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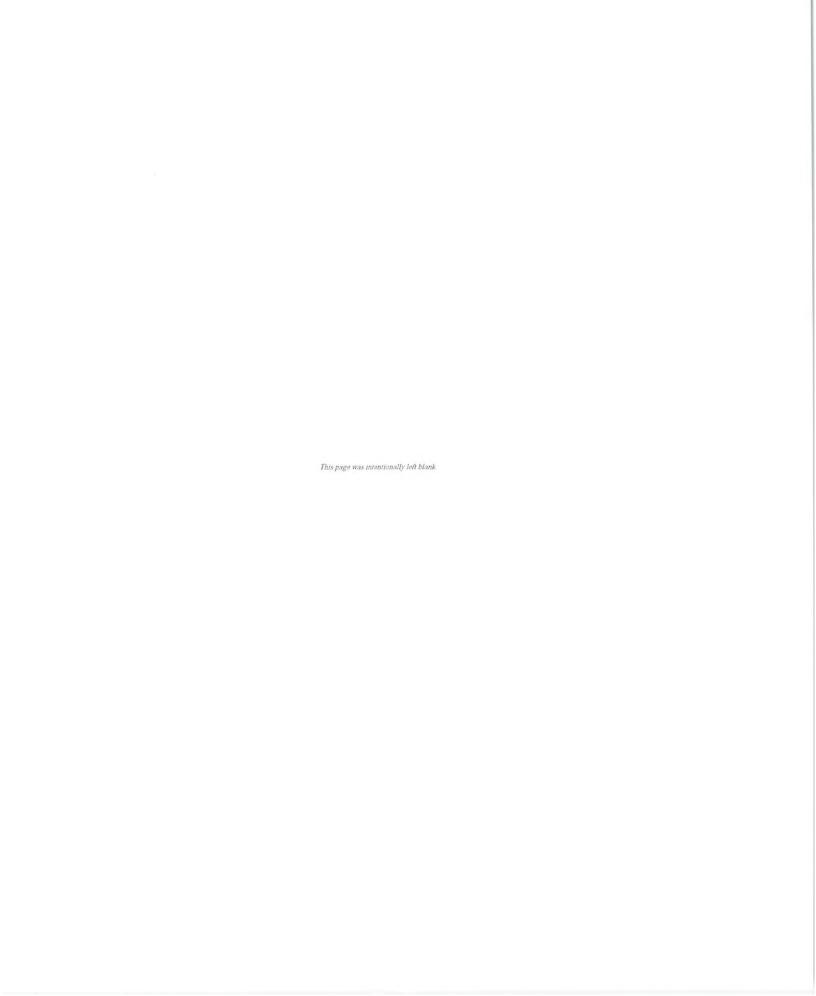
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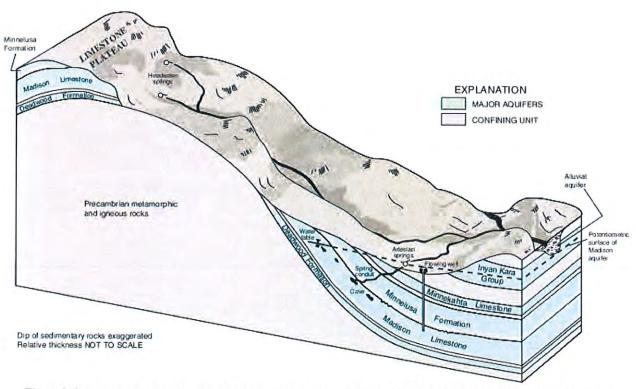


Figure 2. Schematic showing simplified hydrogeologic setting of the Black Hills area (Source: USGS, 2001; Figure 5).

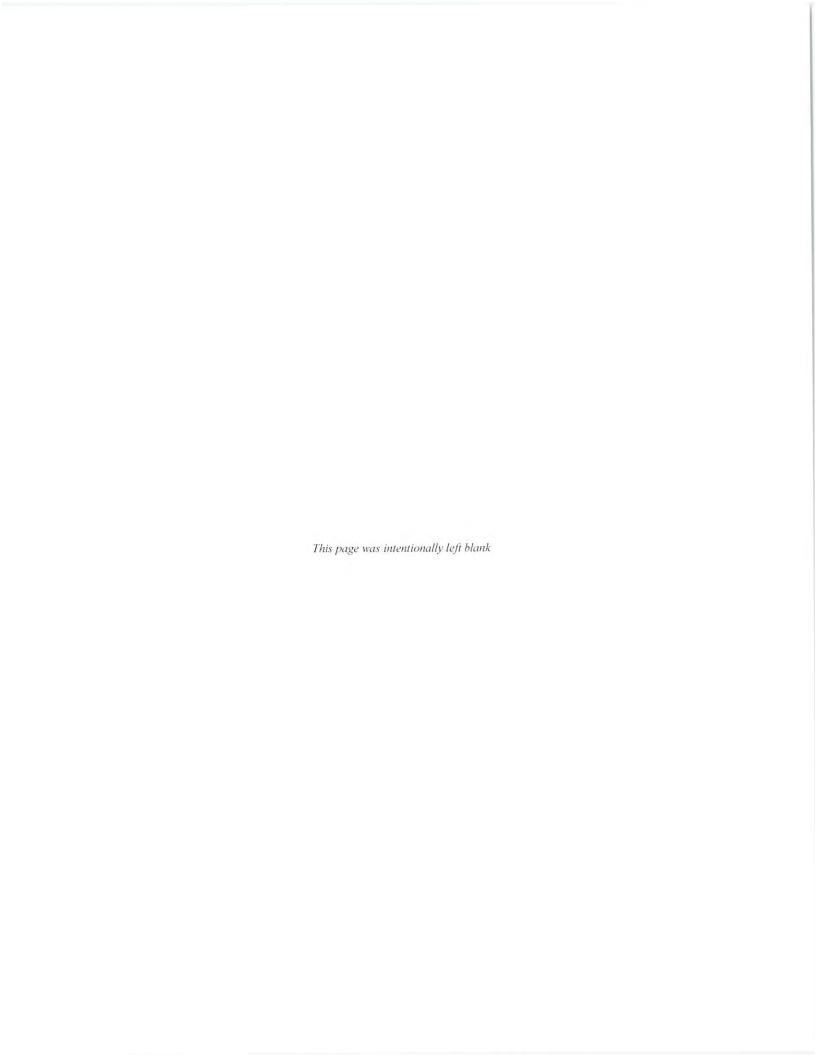
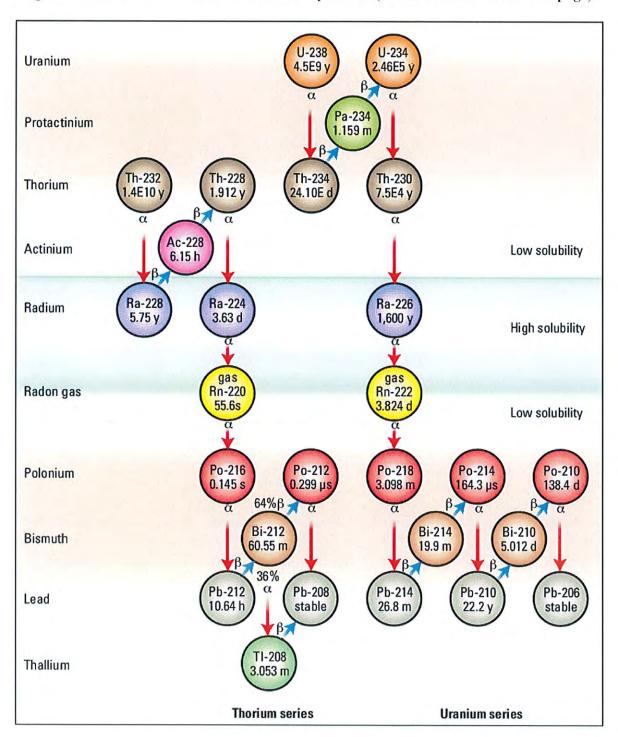
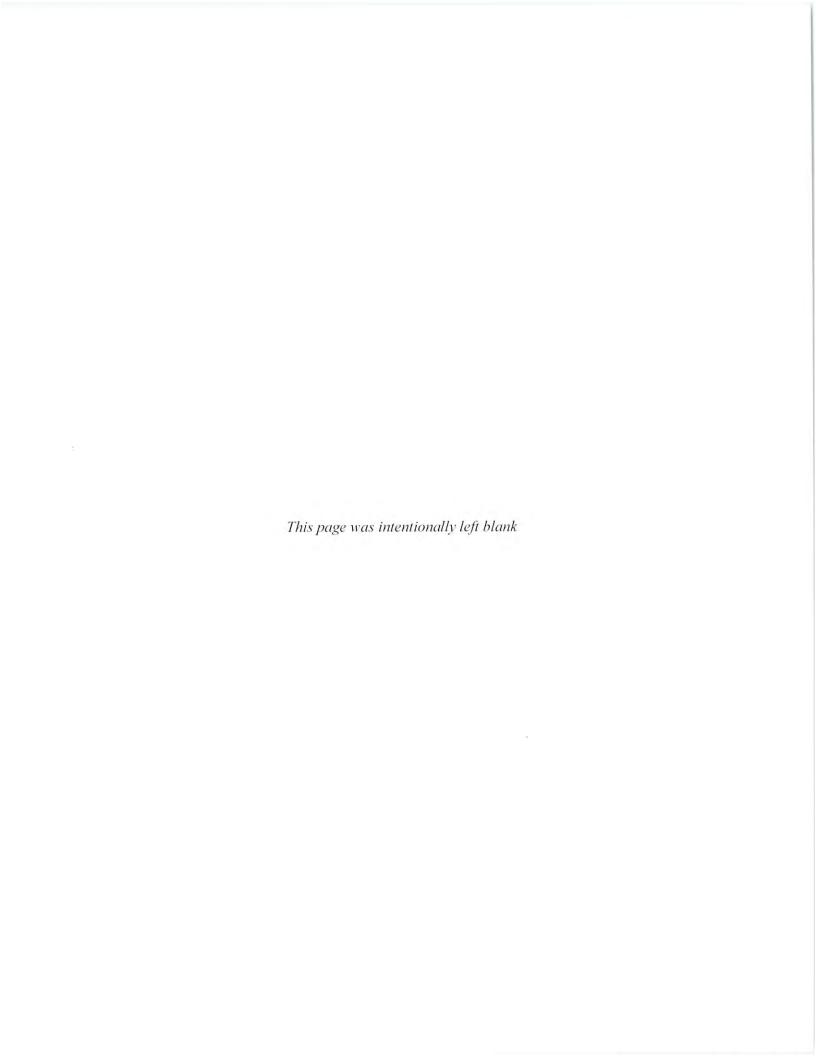
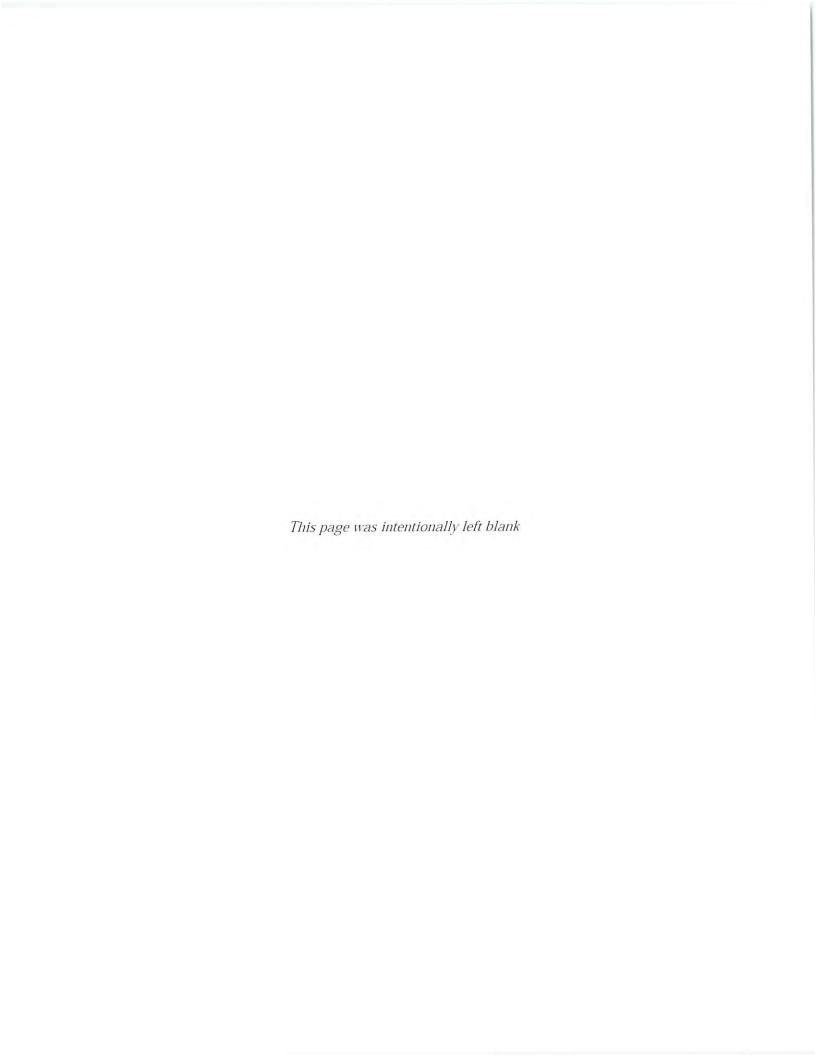


Figure 3. Natural thorium and uranium decay chains (Source: ResearchGate webpage).





APPENDIX A COST ANALYSIS



Alternative 1 No Further Action (maintain status quo)

ITEM	DESCRIPTION OF ITEM	UNIT	QTY	UNIT COST	1	TOTAL COST
Area A	Y.					
1	Individual POETS (Annual O&M)	EA	12	\$ 2,096.00	\$	25,152.00
2	PMM Treatment System (Annual O&M)	YR	1	\$ 215,750.00	\$	215,750.00
3	PMM IX/GAC Media Change (Annual)	YR	1	\$ 95,000.00	\$	95,000.00
4	Southwest Waterline Water Cost (annual)	YR	1	\$ 3,000.00	S	3,000.00
5	Southwest Waterline O&M (annual)	YR	1	\$ 7.200.00	S	7,200.00
Area B	3					
1	Individual POETS (Annual O&M)	EA	2	\$ 2,096.00	\$	4,192.00
2	Bottled Water (Annual)	EA	3	\$ 1,656.00	\$	4,968.00
Area E						
2	Bottled Water (Annual)	EA	1	\$ 1,656.00	\$	1,656.00
				Annual Total	\$	356,918.00
				30 Year Total	\$	10,707,540.00

Notes:

O&M costs from APTIM report

Bottle Water cost from Mitigation 1 contractor (\$54/mo cooler rental & \$84/mo bottled water).

Acronyms & Abbreviations:

GAC = granular activated carbon

IX = ion exchange

O&M = operation and maintenance

PMM = Plainsview Mobile Manor

POETS = point-of-entry treatment system

QTY = quantity

 ${\bf Alternative~2} \\ {\bf Rural~Water~System~Owned~and~Operated~by~SDEDA~with~a~New~Supply~Well}$

	DESCRIPTION OF ITEM	UNIT	QTY		UNIT COST	1	OTAL COST
Gener	ral				Anti-rate for the		
l	Mobilization	EA	1	\$	75,000.00	\$	75,000.00
2	Traffic Control	EA	1	\$	25,000.00	\$	25,000.00
3	Erosion Control	EA	1	\$	75,000.00	\$	75,000.0
1	Material Testing	EA	1	\$	45,000.00	\$	45,000.0
5	Unclassified Excavation	CY	50,000	\$	1.35	\$	67,500.0
6	Unclassified Embankment	CY	50,000	\$	1.65	\$	82,500.0
7	Topsoil, stockpile and replace	CY	60,000	\$	3.50	\$	210,000.0
8	Seed, fertilize, and mulch	AC	50	\$	1,200.00	\$	60,000.0
9	Miscellenous Removals	EA	1	\$	60,000.00	\$	60,000.0
10	Incidental	EA	1	\$	50,000.00	\$	50,000.0
					Subtotal	\$	750,000.0
Wate	r Source						w karadadahan
1	Madison Aquifer Well	EA	1	\$	1,100,000.00	\$	1,100,000.0
2	Controls	EA	1	\$	180,000.00	\$	180,000.0
3	Control Valve Stations	EA	4	\$	110,000.00	\$	440,000.0
4	Adjust Power and Communications	EA	1	\$	20,000.00	\$	20,000.0
5	Water Reservoir (40,000 gal)	EA	1	\$	100,000.00	\$	100,000.0
6	All weather surfacing	LS	1	\$	250,000.00	\$	250,000.0
7	Fencing	LF	50,000	\$	3.75	S	187,500.0
8	Water Transmission Mains, 12" PVC	LF	68,052	\$	65.00	\$	4,423,380.0
9	12" Miscellaneous Appurtences	EA	340	\$	1,600.00	\$	544,416.0
10	12" Gate Valves	EA	76	\$	5,800.00	\$	438,557.3
11	Flushing Valves	EA	76	\$	4,900.00	\$	370,505.3
12	Cathodic Protection	EA	1	\$	125,000.00	\$	125,000.0
					Subtotal	\$	8,179,358.6
Area							
1	Water Distribution Mains, 8" PVC	LF	4,984	\$	44.00	\$	219,296.0
2	8" Miscellaneous Appurtences	EA	25	\$	1,000.00	\$	24,920.0
3	8" Gate Valves	EA	6	\$	4,500.00	\$	24,920.0
4	Flushing Valves	EA	6	\$	4,900.00	\$	27,135.1
5	Service Lines, 1"	LF	2,439	\$	40.00	\$	97,560.0
6	Connect to Service Line	EA	13	\$	7,000.00	\$	91,000.0
7	Remove Exiting POETS	EA	12	\$	900.00	\$	10,800.0
8	Connect to Existing	EA	3	\$	20,000.00	\$	60,000.0
Area	D.				Subtotal	\$	555,631.1
Area l	Water Transmission Main, 8" PVC	LF	2,425	\$	44.00	\$	106,700.0
2	8" Miscellaneous Appurtences	EA	12	\$	1,000.00	\$	12,125.0
3	8" Gate Valves	EA	3	\$	4,500.00	\$	12,125.0
4	Flushing Valves	EA	3	\$	4,900.00	\$	13,202.7
5	Service Lines, 1"	LF	2,114	\$	40.00	\$	84,560.0
6	Connect to Service Line	EA	6	\$	7,000.00	\$	42,000.0
7		EA	1	\$	75,000.00	\$	75,000.0
	Rail Road Crossing	EA	1	\$	90,000.00	\$	90,000.0
8 9	Box Elder Creek Crossing Remove Exiting POETS	EA	3	\$	900.00	\$	2,700.0
J	Kemove Exiting (OE13	LA	J	Φ	Subtotal	\$	438,412.7
					Subtotal	Φ	430,412.7

$\label{eq:Alternative 2} Alternative \ 2$ Rural Water System Owned and Operated by SDEDA with a New Supply Well

ITEM DESCRIPTION OF ITEM	UNIT	QTY	UNIT COST	7	TOTAL COST
			Summary		Cost
			General	\$	750,000.00
			Water Source	\$	8,179,358.67
			Area A	\$	555,631.11
			Area B	\$	438,412.78
			Subtotal	\$	9,923,402.56
			Contingency (10%)	\$	992,340.26
			Subtotal	\$	10,915,742.81
	Engineering and Cons	truction A	Administration (10%)	\$	1,091,574.28
			Total	\$	12,007,317.09

Notes:

Cost based on proposal submitted by 26 March 2021. Pipe Fitting 1 every 200' Gate valve one per 900', at a tee, and near control stations Flushing valve one per 900'

Alternative 3 Purchase Impacted Properties

Location ID	Assessed Value		ssessed Value Estimated Property Value			imed Taxes and Fees (13%)		Total
Area A					_			
SWW1	\$	196,700.00	\$	207,554.00	\$	26,982.02	\$	234,536.02
SWW2	\$	319,100.00	\$	337,556.00	\$	43,882.28	\$	381,438.28
SWW3	\$	247,300.00	\$	256,450.00	\$	33,338.50	\$	289,788.50
SWW4	\$	143,000.00	\$	211,207.00	\$	27,456.91	\$	238,663.91
SWW5	\$	289,500.00	\$	353,190.00	\$	45,914.70	\$	399,104.70
SWW6	\$	212,000,00	\$	225,636.00	\$	29,332.68	\$	254,968.68
SWW7	\$	20,600.00	\$	218,400.00	\$	28,392.00	\$	246,792.00
SWW8	\$	239,000.00	\$	218,626.00	\$	28,421.38	\$	247,047.38
SWW9	\$	127,900.00	\$	181,740.00	\$	23,626.20	\$	205,366.20
SWW10	\$	51,800.00	\$	170,186.00	\$	22,124.18	\$	192,310.18
SWW11	\$	324,800.00	\$	365,779.00	\$	47,551.27	\$	413,330.27
SWW12	\$	126,700.00	\$	181,932.00	\$	23,651.16	\$	205,583.16
SWW13	\$	154,500.00	\$	185,350.00	\$	24,095.50	\$	209,445.50
SWW14	\$	250,900.00	\$	239,748.00	\$	31,167.24	\$	270,915.24
SWW15	\$	126,200.00	\$	175,141.00	\$	22,768.33	\$	197,909.33
SWW16	\$	92,400.00	\$	188,220.00	\$	24,468.60	\$	212,688.60
SWW17	\$	126,100.00	\$	153,842.00	\$	19,999.46	\$	173,841.46
SWW18	\$	112,918.00	\$	137,759.96	\$	17,908.79	\$	155,668.75
486	\$	265,900.00	\$	291,155.00	\$	37,850.15	\$	329,005.15
495	\$	192,000.00	\$	230,894.00	\$	30,016.22	\$	260,910.22
1604	\$	55,800.00	\$	85,932.00	\$	11,171.16	\$	97,103.16
1519	\$	90,000.00	\$	185,039.00	\$	24,055.07	\$	209,094.07
1603	\$	12,100.00	\$	346,100.00	\$	44,993.00	\$	391,093.00
446	\$	40,200.00	\$	193,217.00	\$	25,118.21	\$	218.335.21
459	\$	86,300.00	\$	132,902.00	\$	17,277.26	S	150,179.26
438	\$	38,600.00	\$	187,745.00	\$	24,406.85	\$	212,151.85
1299	\$	15,200.00	\$	23,408.00	\$	3,043.04	\$	26,451.04
457	\$	81,100.00	\$	124,894.00	\$	16,236.22	\$	141,130.22
453	\$	112,400.00	\$	179,836.00	\$	23,378.68	\$	203,214.68
439	\$	27,600.00	\$	86,285.00	\$	11,217.05	\$	97,502.05
467	\$	857,900.00	\$	1,321,166.00	\$	171,751.58	\$	1,492,917.58
467	\$	34,800.00	\$	53,592.00	\$	6,966.96	\$	60,558.96
						Total	\$	8,419,044.61

Notes:

^{*}Average differences between estimated and assessed values by area:

SWW	22%
A	54%

^{*}Assessed values obtained from the County.

^{*}Estimated property values obtained from Zillow.com in April 2021.

^{*}If estimated value was not provided on Zillow.com, then the average percent difference between the provided Zillow estimated property values and assessed property values for the area was used to estimate the property value.

Alternative 4 Drill New Individual Inyan Kara Wells

ITEM	DESCRIPTION OF ITEM	UNIT	QTY		UNIT COST	TOTAL COST
Inyan	Kara Well					
1	Drill well, install pump, connect to residence	EA	37	\$	214,478.00	\$ 7,935,686.00
2	Abandon Existing shallow water well	EA	17	\$	7,198.00	\$ 122,366.00
3	Site Restoration	EA	37	\$	64,808.00	\$ 2,397,896.00
4	Drilling waste disposal	EA	37	\$	6,565.00	\$ 242,905.00
5	Remove residential treatment system	EA	14	\$	2,707.00	\$ 37,898.00
					Subtotal	\$ 10,736,751.00
Docum	nentation					
1	Project Management	EA	1	\$	53,344.00	\$ 53,344.00
2	Work Plans	EA	1	\$	70,941,00	\$ 70,941.00
3	Meetings	EA	1	\$	85,956.00	\$ 85,956.00
4	Reporting	EA	1	\$	121,437.00	\$ 121,437.00
					Subtotal	\$ 331,678.00
					Summary	Cost
					Field Work	\$ 10,736,751.00
					Documentation	\$ 331,678.00
					Subtotal	\$ 11,068,429.00
				C	ontingency (10%)	\$ 2,213,685.80
					Total	\$ 13,282,114.80

Alternative 5
Drill New Individual Minnelusa/Madison Wells

ITEM	DESCRIPTION OF ITEM	UNIT	QTY	UNIT COST	TOTAL COST
Madis	on Well				
1	Drill well, install pump, connect to residence	EA	37	\$ 501,069.00	\$ 18,539,553.00
2	Abandon Existing shallow water well	EA	17	\$ 7,198.00	\$ 122,366.00
3	Site Restoration	EA	37	\$ 34,136.00	\$ 1,263,032.00
4	Drilling waste disposal	EA	37	\$ 8.110.00	\$ 300,070.00
5	Remove residential treatment system	EA	14	\$ 2,707.00	\$ 37,898.00
				Subtotal	\$ 20,262,919.00
Docum	nentation				
1	Project Management	EA	1	\$ 53,344,00	\$ 53,344.00
2	Work Plans	EA	1	\$ 70,941.00	\$ 70,941.00
3	Meetings	EA	1	\$ 85,956.00	\$ 85,956.00
4	Reporting	EA	1	\$ 121,437.00	\$ 121,437.00
				Subtotal	\$ 331,678.00
				Total	\$ 20,594,597.00

Alternative 6 New Underwood Water System

FTEN	M DESCRIPTION OF ITEM	UNIT	UNIT QTY UNIT COST		T	OTAL COST	
Area	E						
1	Water Distribution Mains, 8"	PVC LF	3,680	\$	44.00	\$	161,920.00
2	8" Miscellaneous Appurtences	EA	18	S	1,000.00	\$	18,400.00
3	8" Gate Valves	EA	4	S	4,500.00	\$	18,400.00
4	Flushing Valves	EA	4	\$	4,900.00	\$	20,035.56
5	Service Lines, 1"	LF	241	\$	40.00	\$	9,640.00
6	Connect to Service Line	EA	1	\$	1,750.00	\$	1,750.00
7	Erosion & Sediment Control	LF	3,680	\$	2.00	\$	7,360.00
8	Surface Restoration	LF	3,680	\$	3.00	\$	11,040.00
9	Rail Road Crossing	EA	1	\$	75,000.00	\$	75,000.00
10	Box Elder Creek Crossing	EA	1	\$	90,000.00	\$	90,000.00
					Subtotal	\$	248,545.50
					Summary		Cost
					Area E	\$	248,545.50
				N	Mobilization (8%)	\$	19,883.64
			Genera	al R	equirements (8%)	\$	19,883.64
					Subtotal	\$	288,312.84
			Scop	e C	ontingency (25%)	\$	72,078.21
		Con			ontingency (15%)	\$	43,246.93
					Subtotal	\$	403,637.98
		Engineering and Const	ruction	Adı		\$	80,727.60
					Including PMM	_	484,365.58

Notes:

Cost based on proposal submitted by 26 March 2021 for Areas A & B.

Pipe Fitting 1 every 200'

Gate valve one per 900', at a tee, and near control stations

Flushing valve one per 900'

Preferred Alternative

ITEN	1 DESCRIPTION OF ITEM	UNIT	QTY		UNIT COST	7	TOTAL COST
Alter	native 4 - Areas A and B						
	General	EA	1	\$	750,000.00	\$	750,000.00
	Water Source	EA	1	\$	8,179,358.67	\$	8,179,358.67
	Area A	EA	1	\$	555,631.11	\$	555,631.11
	Area B	EA	1	\$	438,412.78	\$	438,412.78
					Subtotal	\$	9,923,402.56
				Co	ntingency (10%)	\$	992,340.26
					Subtotal	\$	10,915,742.81
	Engineering and	d Constr	uction.	Admi	nistration (10%)	\$	1,091,574.28
					Alt. 4 - Subtotal	\$	12,007,317.09
Alter	rnative 8 - Area E and other similarily impact	ed area	s near	Ellsw	orth AFB		
	n Kara Well						
1	Drill well, install pump, connect to residence	EA	1	\$	214,478.00	\$	214,478.00
2	Abandon Existing shallow water well	EA	1	\$	7,198.00	\$	7,198.00
3	Site Restoration	EA	1	\$	64,808.00	\$	64,808.00
1	Drilling waste disposal	EA	1	\$	6,565.00	\$	6,565.00
5	Remove residential treatment system	EA	1	\$	2,707.00	\$	2,707.00
					Subtotal	\$	295,756.00
Docu	mentation						
l	Project Management	EA	1	\$	53,344.00	\$	53,344.00
2	Work Plans	EA	1	\$	70,941.00	\$	70,941.00
3	Meetings	EA	1	\$	85,956.00	\$	85,956.00
1	Reporting	EA	1	\$	121,437.00	\$	121,437.00
					Subtotal	\$	331,678.00
					Summary		Cost
					Field Work	\$	295,756.00
					Documentation	\$	331,678.00
					Subtotal	\$	627,434.00
				Co	ntingency (10%)	\$	125,486.80
					Alt 8 - Subtotal	\$	752,920.8
					Total	\$	12,760,237.89

EXHIBIT I

FUTURE USE WATER PERMIT NO. 1995-1

Name of Applicant: Black Hawk Water Oser Distric	<u>ct</u>	
Address: PO Box 476, Black Hawk SD 57718	Phone: <u>605 391-5750</u>	
Amount of Water Claimed: 1,300 AF Total	Acres: NA	
Source of Water Supply: Madison Aquifer		
Water to be used for: <u>rural water system</u> Co	ounty: Meade	
Type of Waste Disposal System:		
Location: north west of Black Hawk		
1140.4.7	pplication/License Fee: \$\frac{165.00}{200}	
Remarks: <u>Future Use Reservation</u>	-4	
Future Use area: Sec 26, 27, 31, 32, 33, 34, 35 in		
T3N-R7E Sec 2, 3, 4, 5, 6, 9, 10, 11 in T2N-R7E		
Land to be Irrigated: AN		
Depth of Well:		
Well Driller:		
Remarks:		
Type of Map: topo		
Prepared by:		
Reviewed and the Number Assigned on: 4-16-20	By: Karen Schlaak	
Notice of Hearing - date to intervene:		

SOUTH DAKOTA FUTURE USE PERMIT NO. 1995-1

Date of first receipt of application April 15, 2020.

The Chief Engineer, on behalf of the Water Management Board, issues Future Use Permit No. 1995-1 to Black Hawk Water User District, PO Box 476, Black Hawk SD 57718 subject to the following limitations, conditions and qualifications:

- 1. Future Use Permit No. 1995-1 reserves 1,300 acre-feet of water annually from the Madison Aquifer. The area to be reserved for future use includes all Sections 26, 27, 31, 32, 33, 34, 35; in T3N-R7E and all of Sections 2, 3, 4, 5, 6, 9, 10, 11; all in T2N-R7E. This permit does not authorize construction of works or application of water to beneficial use.
- 2. The water appropriated shall be used for the purpose of <u>providing future supplies for the district serving users in Meade County</u> and may not exceed the amount of water needed for beneficial use.
- 3. The water is to be used during the following described annual period: January 1 December 31.
- 4. The date of approval of Permit No. 1995-1 is July 13, 2020.
- 5. The date from which applicant may claim right is April 15, 2020.
- 6. Water rights obtained in compliance with the laws of the State of South Dakota may not be unlawfully impaired by this appropriation.

QUALIFICATIONS

- 1. Future Use Permit No. 1995-1 reserves 1,300 acre feet of water annually from the Madison aquifer.
- 2. That Future Use Permit No. 1995-1 is approved with the stipulation that this Permit is subject to review by the Water Management Board as to accomplishment in developing reserved water upon expiration of seven (7) years. This Permit shall be subject to cancellation if the Water Management Board determines during the review that the holder cannot demonstrate a reasonable need for the Permit.
- At such time as definite plans are made to construct works and put the water reserved by this permit to beneficial use, specific application for all or any part of the reserved water must be submitted prior to construction of facilities pursuant to SDCL 46-5-38.1.

WATER MANAGEMENT BOARD

Eric Gronlund, Chief Engineer

Water Rights Program

Department of Environment and Natural Resources

JUL 2 7 2020

date



UTILITY IMPROVEMENTS IN SECTION LINE RIGHT-OF-WAY

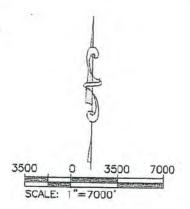
located in:

Sections 32-36, T3N, R7E;

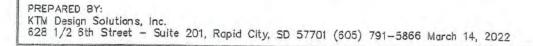
Sections 31-33, T3N, R8E; Sections 1-5, T2N, R7E; &

Sections 4-6, T2N, R8E, BHM

Meade County, South Dakota



31	Norman Avenue	33	34	35	36	31	32	33	35-
8	5	Township 4	3 North 2 North 3	2	1	6	-		
						8 East	2 S	4	3



	EVUIDIT
FORM 2: Application for uses other than irrigation	L
(type or print) Mail to: (office use only)	DATI
No. 2016-1 Hydrologic Unit 1012011 MAR 0 1 2022	AIL
DENR - Water Rights 523 E Capitol Ave Basin WATER RIGHTS WATER RIGHTS Chr. C.	IR 1 2022
Pierre, SD 57501-3182 Newspaper La Chi Tradesported 1 217 2111 (111)	79383
ph. (605) 773-3352 Rec't#_	
Rupid City Journal 394-8462	
Application For Permit To Appropriate Water Within The State Of South	n Dakota
Check use(s) of water:	
	utional
	hermal
Type of Application: New Vested Right (Use predates Mar 2, 1955) Future Use R	eservation
(check one) Place to Beneficial Use Water Reserved by Future Use Permit No.	
Amendment/Correction to Permit No.	
Description of amendment/correction: (i.e. change diversion point(s), add diversion point(s), change use, etc.)	
Name to Appear on Water Permit South Dakota Ellsworth Development Authority	
Mailing Address P.O. Box 477 Rapid City SD	57709
(Address) (City) (State) Phone (605) 719-3844 Mobile Email	(Zip Code)
2 47	Now w
2. Amount of water claimed Flow rate and volume are both required. (*Cubic Feet per Second) (**Gallons per Minute) **AF or (**Acre Feet - storage capacity of dam/of	Gallons dugout or annual use)
Source of water supply Well, Madison Aquifer	
	Manda
(example - 3 wells in SW1/4 NE1/4 section 12-T104N-R53W)	
If not a public water supply (e.g. municipal), will water be used outside of the area described above?	es No
If "Yes," where will water be used? (example - NW1/4 section 12-T104N-R53W)	
5. County or counties where water will be used Meade and Pennington	
6. Annual period during which water is to be used 12 months	
 Give a description of the project. When available include any preliminary engineering report or other re information that will help explain the project. (Attach sheet if more space is needed) 	ports or
Water supply source for the Meade County Water Line project to convey water from proposed Madison Aquifer Well to Ellsworth AFB	the
I, John Wetstein Project Engineer/Geologist, the applicant, ce	ertify under

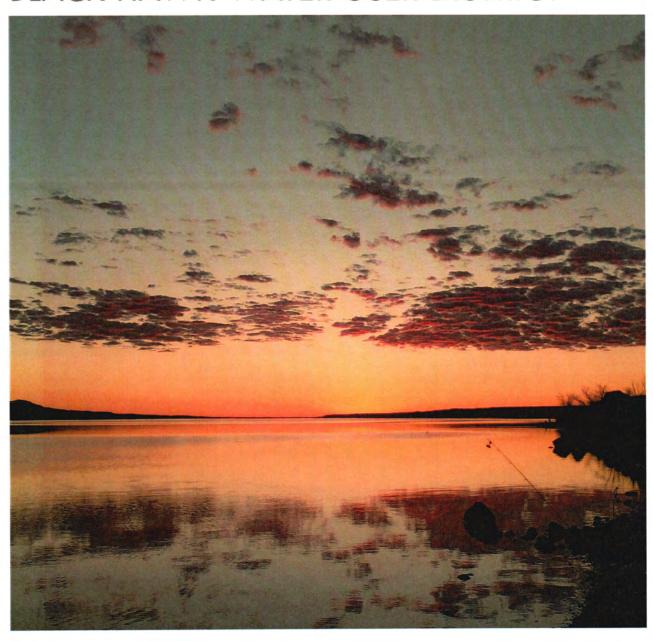
penalty of perjury that I have read this application, examined the attached map, and that the matters stated are true. I further certify, if acting on behalf of an entity or individual other than myself, that I am authorized to submit this application.

Supplemental Information

(type or print)

1. Well Information (check one or both as applicable)	☑Drilling new well(s) ☐Using existing well(s)
a) If new wells, how many Have test holes b	peen drilled Yes No Drilled by
b) If existing wells, how many Provide copy	y of log(s), if available. Drilled by
For either Existing or Proposed Wells:	
c) Well Depth (required) 1.500' Depth to Top	of Water Bearing Material 1,100' Depth to Water from Surface 20
	s property _1.320' Property owned by others _1.970'
	1,070
2. Wastewater Disposal System Information	
a) Type of System (i.e. septic tank, drain field)	
b) System Capacity (gallons)	Year Constructed
c) Connected to the City of	Sanitary System
3. Dugout Information	
a) Surface Dimensions	Depth
b) Depth to water (ground surface to water level)	
bepar to water (ground surface to water to very	
4. Water Storage Dams	
	or more storage dams, please furnish the information requested below to be shown on the map submitted with the application.
	nent agency was involved in the design of this dam, please give their
 a) If a private engineering firm or government name and address: 	
	b) Freeboard
	c) Crest Width
	Crest Length
	d) Height
	e) Primary Outlet Capacity
c	If pipe, diameter f) Secondary Spillway Capacity
▼ Water Surface b	Spillway Width
▼ Water Surface	g) X & Y Slope (e.g. 3 to 1 is a typical slope)
/ y y \	d Upstream
x x	Downstream
/	h) Surface Area of Impoundment
e	i) Storage Acre Feet
	j) Drainage Area Above Dam Acres

BLACK HAWK WATER USER DISTRICT



2021

Drinking Water Report

Contact us by calling (605)787-5777 or write us at PO Box 476 Black Hawk SD 57718-0476

Black Hawk Water User District

DRINKING WATER REPORT

WATER QUALITY

Last year, the Black Hawk Water User District monitored your drinking water for possible contaminants. This report is a snapshot of the quality of the water that we provided last year. Included are details about where your water comes from, what it contains, and how it compares to Environmental Protection Agency (EPA) and state standards. We are committed to providing you with information because informed customers are our best allies.

Water Source

We serve more than 3,750 customers an average of 490,000 gallons of water per day. Our water is groundwater that we produce from local wells. The state has performed an assessment of our source water and they have determined that the relative susceptibility rating for the Black Hawk Water User District public water supply system is medium.

For more information about your water and information on opportunities to participate in public meetings, call (605)787-5777 and ask for Ken LeBon.

Additional Information

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from
 urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production,
 mining, or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, and septic systems.
- Radioactive contaminants, which can be naturally-occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water which must provide the same protection for public health.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline (800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants can be obtained by calling the Environment Protection Agency's Safe Drinking Water Hotline (800-426-4791).

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The Black Hawk Water User District public water supply system is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

Detected Contaminants

The attached table lists all the drinking water contaminants that we detected during the 2021 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1 – December 31, 2021 The state requires us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

2021 Table of Detected Regulated Contaminants For Black Hawk Water User District (EPA ID 0043)

Terms and abbreviations used in this table:

- * Maximum Contaminant Level Goal(MCLG): the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
- * Maximum Contaminant Level(MCL): the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
- * Action Level(AL): the concentration of a contaminant which, when exceeded, triggers treatment or other requirements which a water system must follow. For Lead and Copper, 90% of the samples must be below the AL.
- * Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water. For turbidity, 95% of samples must be less than 0.3 NTU
- * Running Annual Average(RAA): Compliance is calculated using the running annual average of samples from designated monitoring locations.

Chills:								
*MFL: million fibers per liter	iter			*pCi/l: picocu	*pCi/l: picocuries per liter(a measure of radioactivity)	measure of ra		*ppt: parts per trillion, or nanograms per liter
*mrem/year: millirems per year(a measure of radiation absorbed by the body)	r year(a measure of ra	diation absorbed by th	(kpoq a	*ppm: parts p	*ppm: parts per million, or milligrams per liter(mg/l)	nilligrams per		'ppq: parts per quadrillion, or picograms per liter
*NTU: Nephelometric Turbidity Units	bidity Units			*ppb: parts pe	*ppb: parts per billion, or micrograms per liter(ug/l)	icrograms per		*pspm: positive samples per month
Substance	90% Level	Test Sites > Action Level	Date Tested	Highest Level Allowed (AL)	Ideal	Units	Major So	Major Source of Contaminant
Copper	0.2	0	08/27/20	AL=1.3	0	mdd	Corrosion of household plumbing sy wood preservatives.	Corrosion of household plumbing systems; erosion of natural deposits; leaching fron wood preservatives.
Lead	2	0	09/17/20	AL=15	0	qdd	Corrosion of household plumbing systems; erosion of natural deposits.	stems; erosion of natural deposits.

		deposits.		ge from	-	nual
Major Source of Contaminant	Erosion of natural deposits.	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits.	Erosion of natural deposits.	Erosion of natural deposits; water additive which promotes strong teeth; discharge from fertilizer and aluminum factories.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits.	By-product of drinking water chlorination. Results are reported as a running annual average of test results.
Units	pCi/l	udd	pCi/I	uıdd	mdd	qdd
Ideal Goal (MCLG)	0	2	0	4	10	0
Highest Level Allowed (MCL)	15	2	5	4	10	08
Date Tested	02/26/20	02/26/20	02/26/20	01/11/21	11/23/21	09/14/21
Range	ND - 4	0.203 - 0.335	ND - 2	0.22 - 1.12		
Highest Level Detected	4	0.335	2	1.12	0.262	3.83
Substance	Alpha emitters	Barium	Combined Radium	Fluoride	Nitrate (as Nitrogen)	Total trihalomethanes (RAA)

Please direct questions regarding this information to Mr Ken LeBon with the Black Hawk Water User District public water system at (605)787-5777.