San Antonio Water System

March 29 , 2024

Christina Williams
U.S. Fish and Wildlife Service
Austin Ecological Services Field Office
1505 Ferguson Lane
Austin, TX 78754

Via e-mail to:
christina_williams@fws.gov

Re: Clarification Requests (January 31, 2024) related to
FWS–R2–ES–2023–0069
Endangered and Threatened Wildlife and Plants; Endangered Species Status for Toothless Blindcat and Widemouth Blindcat (collectively, "Blindcats"), 88 Fed. Reg. 57,046 (August 22, 2023)

Ms. Williams:

We appreciate the opportunity to continue our dialogue with the U.S. Fish and Wildlife Service ("USFWS") regarding the above referenced proposal (the "Proposal") to list the Blindcats as endangered. On January 31, 2024, we received Clarification Requests from USFWS and have worked with our internal staff and Edwards Aquifer Authority (the "EAA") to compile information and data responsive to your requests as attached, and as made available ("Response").

As stated within the attached Response, there are some data and specifications that we believe to be related to SAWS' critical infrastructure that we are unable to provide in this format. That specific information doesn't appear to be necessary to sufficiently respond to your requests. Additionally, any infrastructure coordinates provided in the information are consistent with those publicly available and those published by TWDB. However, if you would like to discuss these data or specifications, we can do so in a follow-up face-to-face staff meeting.

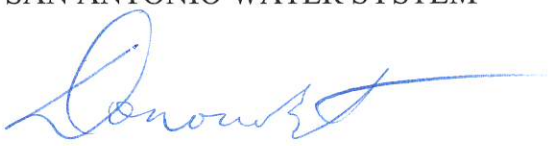
We remain committed to continuing our long-standing, open, and collaborative relationship with USFWS and other stakeholders in seeking to resolve issues the proposed listing of Blindcats would likely cause to the water supply of the San Antonio metropolitan area, which is the 7th largest city in the United States. These issues include potentially severe impacts to: the provision of water to SAWS customers, requiring an entire revamping of several areas of SAWS service area costing billions of dollars; the reliability of necessary water supply to major electrical plants that provide electricity to SAWS customers, downtown hotels, businesses, major tourist attractions in the area, hospitals and schools; and, the Edwards Aquifer Habitat Conservation Plan ("EAHCP"), which covers 11 aquifer species and provides collateral conservation benefits to many others. We again reiterate with the attached additional information that the conclusions reached by USFWS in its proposed listing are ill-advised and not supported by science or the reality of the

specific dynamics of the Edwards Aquifer, nor that of the well operations of the San Antonio Water System.

Should you have any questions about the information included in this document, please contact me by email at donovan.burton@saws.org or by phone (210) 233-3632.

Sincerely,

SAN ANTONIO WATER SYSTEM



Donovan Burton
Senior Vice President
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cc: Karen Myers, *via email: karen_myers@fws.gov*
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EDWARDS AQUIFER
AUTHORITY

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Endangered and Threatened Wildlife and Plants; Endangered Species Status for Toothless Blindcat and Widemouth Blindcat (collectively, "Blindcats"), 88 Fed. Reg. 57,046 (August 22, 2023)

Ms. Williams:

The Edwards Aquifer Authority ("EAA") received the above-referenced Clarification Requests from USFWS directed to us and the San Antonio Water System ("SAWS"). The EAA appreciates the opportunity to continue our cooperative dialogue regarding the issue. In furtherance of that end, EAA staff have worked with SAWS internal staff to compile information and data responsive to your requests.

Specifically, in lieu of creating separate documents, EAA staff provided well information and aquifer data to SAWS for use in the clarifying response. I hope the information regarding the well construction, operation, and closures are helpful in your deliberations. Please do not hesitate to reach out with additional questions or requests for information as may be needed.

Sincerely,

Roland Ruiz
General Manager

I. San Antonio Water System (SAWS): II. About SAWS A. How do SAWS wells work?

Service Clarification Request: For Artesia Pump Station Well (State Well Number 6837508), installation and modification history from well establishment to present (e.g., history of artesian versus pumped flow, any changes in pump depth), geology intersected by well, and related engineering specifications. In addition, we ask for similar information for other wells that have produced blindcats in the past. We also request information on whether wells with records of either species, noted as active in the species status assessment, remain active today.

SAWS Response:

Of the 79 wells listed in the 2022 USFWS assessment report (assessment report) Appendix B., 24 wells are either plugged or abandoned per EAA and TWDB records. Of the 11 wells with species, as documented in Table.1 of the assessment report, 8 are confirmed plugged, 1 is considered abandoned per EAA, and 2 are operational. Available plugging reports for wells listed in Appendix B. and/or Table.1 of the assessment report are included in the assembled reference material. The reduction of active production wells (plugged wells) demonstrates a significant reduction in the overall production potential within the hypothesized Potential Area of Occurrence. In reference to the geology intersected by the wells, available geophysical logs for the wells listed in Table.1 of the assessment are included in the reference materials. Historical records reflect that the pump in State Well Number (SWN) 6837508 was raised by 40 feet (ft) in 1996 to an elevation of 640 ft relative to mean sea level (MSL). During the sampling period as described in the assessment (January through May 1978), SWN 6837508 was flowing under artesian pressure and was not subject to pumping. Subsequently, any species collected were not related to groundwater pumping. Applicable information on pumped versus artesian flow can be found for SWN 6837508 in the included reference materials.

II. SAWS: II. About SAWS A. How do SAWS wells work? 2. Is it possible for the pumps to pull up blindcats from the depths that have been presumed for their habitat?

Service Clarification Request: Specific documentation for Artesia Pump Station Well (State Well Number 6837508) (e.g., engineering specifications and other information) regarding 50 feet water draw depth. Given prolonged pumping, would groundwater be pulled from depths past 50 feet? What volume of groundwater is be pumped from a maximum depth of 50 feet? At what amount of pumping would groundwater be pulled from beyond 50 feet? If so, how frequently would that occur?

SAWS Response:

Specific documentation regarding system data “engineering specifications” for SWN 6837508 is considered information that is part of our critical infrastructure and is not available to be shared in this context. However, engineering specifications are not technically necessary to address this question. As noted, the Total Dynamic Head (TDH) of well pump number 4 at the Artesia Pump Station (SWN

6837508) is approximately 50 ft, i.e., the pump has only enough power to lift water the height of the TDH, in our case approximately 50 ft. The confined portion of the aquifer is under hydraulic pressure above the ambient atmospheric pressure. The pumps are appropriately set below the artesian pressure derived water level of the aquifer, and water enters the casing under natural (aquifer system) pressure. Flowing artesian conditions, water levels above the top of the aquifer, are common within the confined portions of the Edwards, limiting the requirement for pumping. However, when required to run, the pump lifts water the height of the TDH from inside the casing into the tank, the natural pressure within the aquifer system replaces the water removed to continue the process. Regarding volume and well yield, Maclay 1995 observes “Many of the wells in the freshwater zone of the confined aquifer can yield more than 1,000 gal/min. Yields of wells generally are limited more by the capacity of the pumps to discharge water than by the ability of the aquifer to provide water to the well." Page 41 of the assessment notes previous researchers “assumed that fish were randomly exposed to capture by sampled wells and not clumped due to rate of water flow from those wells (Longley and Karnei 1978a, p. 35; 1978b, pp. 36, 38)." If USFWS believes that it requires more technical information regarding wells it might be possible to discuss those specifications in a follow-up face-to-face staff meeting.

Service Clarification Request: Documentation requested from Item I above as well as any other information regarding the operation history of Artesia Pump Station Well (State Well Number 6837508) as it relates to history of artesian flow versus controlled pumping. Were fish produced due to/during unregulated artesian flow? How frequently did unregulated artesian flow occur at this well and when was that flow regulated by valving? Does unregulated artesian flow occur today?

SAWS Response:

Documentation is included in available reference materials. Analysis of historical aquifer conditions using J17 water elevations relative to surface elevations at SWN 6837508 indicate this well would have experienced artesian flow, i.e., non-pumping conditions, near 40-percent of the period of record (1934 to 10/1/2023). As previously mentioned, during the sampling period as described in the assessment (January through May 1978), SWN 6837508 was flowing under artesian pressure and was not subject to pumping. Flow into the tank is regulated by valving and no “unregulated artesian flow” occurs at this well or any SAWS production well.

Service Clarification Request: Documentation requested from Item I above as well as any citations/supporting materials regarding lack of capacity to draw past 50 feet depth and total dynamic head for Artesia Pump Station Well (State Well Number 6837508). If available, similar information for active and historical blindcat wells in Excel spreadsheet format. If water is drawn out of the well to a depth of 50 feet, isn’t that removed volume replaced by water under artesian pressure – forced into well pipe? If the pump operates over a long period would water be drawn from greater depths to replace withdrawn volumes? Would artesian pressure associated with this activity – water replacement - have the potential to capture fish?

SAWS Response:

As noted above specific documentation regarding system data "engineering specifications" for SWN 6837508 is considered information that is part of our critical infrastructure but is however, not technically necessary to address this question. As described, when pumping is required, water is lifted from inside the casing into the tank, the natural pressure within the aquifer system then replaces the removed water within the casing. Determinations of flow contribution from "greater depths" to replace withdrawn volumes is a function of natural aquifer system dynamics. However, for a live catfish to be moved upward in a well, it would have to first be entrained in the casing. The occurrence of the species in artesian wells is not related to nor caused by the power, capacity, or mechanics of the pumps. The "replacement water" as described in the clarification request above, is likely coming from elevations that are hundreds of feet above the presumed blindcat habitat, as dictated by the species physiology, that is described in the assessment.

III SAWS: III. Environmental Context & Analysis: Technical Comments on the Proposal
C. Compounded assumptions and bias.

Service Clarification Request: Is there potential for genetic analyses of museum specimen tissues and additionally acquired tissue samples to assess blindcat current/historical effective population size and structure as well as potential for past genetic bottlenecks?

SAWS Response:

No genetic research has been done by EAA or SAWS, and no comment can be made regarding the potential for genetic analysis of museum specimen tissue that is not under the control of either entity.

IV. SAWS: G. Blindcat capture as a function of up-hole velocities in wells.

Service Clarification Request: What is the relationship between mapped aquifer hydraulic (see Lindgren et al. 2004, p. 26 as example), zones of greater or lesser conduit presence, and well water velocity? Are there site-specific details regarding these factors that can be provided for active/historical blindcat well sites?

SAWS Response:

Direct analysis of the relationships between mapped aquifer hydraulics, i.e. zones of great or lesser conduit presence and well velocities is outside of SAWS purview to address. Any site-specific details regarding these factors would be associated with well construction and borehole data SAWS and EAA have provided in the included reference materials. Several subject matter publications discussing aquifer hydraulics and/or conduit presence are available for review in the following examples. The inclusion of these examples is for the convenience of USFWS and is not intended to indicate a review or endorsement of these materials by SAWS or the accuracy of these materials.

- Hovorka, S.D., Phu, T., Nicot, J.P., and Lindley, A., 2004,

Refining the conceptual model for flow in the Edwards aquifer—Characterizing the role of fractures and conduits in the Balcones fault zone segment: Contract report to Edwards Aquifer Authority

- Hovorka, S.D., Mace, R.E., and Collins, E.W., 1998, Permeability structure of the Edwards aquifer, south Texas—Implications for aquifer management: Austin, University of Texas, Bureau of Economic Geology Report of Investigations 250

- Lindgren, R.J., Dutton, A.R., Hovorka, S.D., Worthington, S.R.H., and Painter, Scott, 2004, Conceptualization and simulation of the Edwards aquifer, San Antonio region, Texas: U.S. Geological Survey Scientific Investigations Report 2004–5277.

- Maclay, R. W., 1995, Geology and hydrology of the Edwards Aquifer in the San Antonio area, Texas: U. S. Geological Survey Water-Resources Investigation report 95-4186.

- Worthington, S.R.H., 2003, Conduits and turbulent flow in the Edwards aquifer: Worthington Groundwater, contract report to Edwards Aquifer Authority, San Antonio, Texas.

Service Clarification Request: Compiled borehole diameters, yields, water velocities, and state well numbers for individual wells referenced above for Immediate Area Analysis Units and Potential Area of Occurrence in Excel spreadsheet format. Also, request TWDB plugging report for 80 wells referenced above.

SAWS Response:

Requested documentation, for wells listed in Appendix B. and Table.1 of the assessment have been compiled in spreadsheet format and are included in the assembled reference materials. Available plugging reports were matched based on best available data per well. Comment regarding water velocities is below.

Service Clarification Request: Yield, casing diameter data, water velocities, and state well numbers requested for 21 wells referenced above in Excel spreadsheet format. Is the 5fps velocity a reasonable potential threshold above and below which blindcats are less or more likely to be expelled by wells? What are uses of wells with up-hole velocities greater than 5 fps?

SAWS Response:

Requested documentation has been compiled in spreadsheet format and is included in the assembled reference materials. Available well use and casing information for wells listed in Appendix B. and

Table.1 of the assessment have been provided in the assembled material. The up-hole casing velocity of 5 feet per second (fps) is a hypothetical not definitive threshold considered by SAWS contractors at which species may be expelled. Any definitive determinations of flow requirements for the species cannot be addressed by SAWS or the EAA. In general, borehole velocities decrease downhole and up-hole velocities in wells vary based on construction/completion and flow contributions from stratigraphic zones. Respectively, up-hole velocities in wells having varied casing sizes and/or open hole diameters should be considered in any calculations. In general, flow velocities in a well decrease vertically downward and decline exponentially once in the aquifer system (open hole and beyond). The location of such intersection is hundreds of feet above the presumed blindcat habitat. The nature of geologic material strongly influences the velocity of groundwater flow and must be taken into consideration. Karst aquifers are considered triple permeability/porosity aquifers. Meaning, groundwater flow in karst has several contributing factors including diffuse or matrix flow (baseflow), flow through fractures, and quickflow or flow through large conduits (Hovorka et al., 2004, Kuniansky et al., 2001). In addition, the effective aquifer thickness, porosity, and permeability vary significantly in the Edwards, both spatially and temporally, and hydraulic conductivity and transmissivity are documented to be multimodal and vary up to eight orders of magnitude with significant heterogeneity among closely spaced wells (Lindren et al., 2004, Hovorka et al., 1998, Maclay, 1995).

V. SAWS: III. Environmental Context & Analysis: Technical Comments on the Proposal H. Influences of well pumping on Blindcat habitat.

Service Clarification Request: If 50 feet is not necessarily applicable, can some estimation be provided for wells that have produced blindcats in the past?

SAWS Response:

To clarify, the Edwards aquifer, as described in Worthington 2003, is more like an ideal karst aquifer than an ideal porous medium aquifer. The drawdown characteristics in the confined portion of the Edwards exhibit classical behavior for a confined karst aquifer with increased hydraulic conductivities and high transmissivity. Maclay 1995, observes “the large transmissivity of the Edwards is indicated by hundreds of highly productive wells and many of the wells in the confined Edwards aquifer yield more than 1,000 gal/min with drawdowns of only a few feet.” It should be noted that pressure transients are effectively transmitted in confined aquifers and drawdown is reflected accurately as pressure, i.e., relative drawdown is a pressure gradient and limited head change is common (Maclay, 1995, Lindgren et al., 2004, Bertetti and Adkins, 2020, Adkins et al., 2023).

Modeling in karst aquifers dominated by complex non-symmetric conduit networks, as in the Edwards, can require compound analysis with multi-well pump tests, analytical solutions with anisotropic capability, or fully three-dimensional model fitting able to incorporate non-darcian laminar and turbulent flow (Hovorka et al., 2004, Halfortd and Yobbi, 2006). Accordingly, there are many methods and analyses that can be applied to evaluate assumed influences of well pumping on the hypothesized Blindcat habitat. However, the simplest transient solution for flow to a well is generally the Theis (1935) solution. Which describes the head decline with time at any radial distance from a pumping a well. This test applies several assumptions including a single homogeneous, isotropic, infinitely large, horizontal, and confined aquifer of uniform thickness, which the karstic Edwards Aquifer is not (Hovorka et a., 2004, Lindgren et al., 2004, Worthington, 2003, Maclay, 1995). A radial distance of 50ft was applied by SAWS contractors as an estimated condition to exemplify methods of calculation and represent reasonable aquifer parameters, that may be applied to evaluate pumping influences of wells within the hypothetical

habitat. As observed, the occurrence of the species in artesian wells is not related to the power, capacity, or mechanics of the pumps but rather the overall flow dynamics of the aquifer system.

VI. SAWS: III. Environmental Context & Analysis: Technical Comments on the Proposal I. Well construction as it relates to Blindcat impacts.

Service Clarification Request: Request pump impeller depth data for wells in Immediate Area Analysis Units and Potential Area of Occurrence referenced above in Excel spreadsheet format as well as total well depths.

SAWS Response:

All pumps have a single intake point, impellers are internal to the pump set within the casing. SAWS pumps are generally set at approximately 550ft MSL. Driller reports, included in the reference material, may contain documentation for pump settings at the time of install. However, initial pump setting depths do not account for any subsequent changes owing to pump replacement or well modification.

Service Clarification Request: If available, extent of aquifer drilled depth (i.e., degree of aquifer penetration) for wells within Immediate Area Analysis Units and Potential Area of Occurrence in Excel spreadsheet format.

SAWS Response:

Available well completion depths for the wells listed in Appendix B. and Table.1 of the assessment are compiled in spreadsheet form and included in the reference material.

Included Attachments:

- Spreadsheet containing available TWDB and/or EAA well data for wells listed in Appendix B. and Table.1 of the assessment.
- Aquifer conditions spreadsheet
- Available plugging reports for wells listed in Appendix B. and Table.1 of the assessment.
- TWDB drillers reports.
- Available, geophysical logs for wells listed in Table.1 of the assessment.