Los Alamos
NATIONAL LABORATORY

WQCC 24-65(R):
Petition to Amend 20.6.4.126 NMAC and 20.6.4.141 NMAC to Establish a Segment-Specific Temperature Criterion for a Portion of the Upper Sandia Canyon Assessment Unit

Direct Testimony of Matthew V. Segura on behalf of Petitioners (Triad National Security, LLC, and the U.S. Department of Energy, NNSA, Los Alamos Field Office)

May 13, 2025

LA-UR-25-24097

NNSA National Nuclear Security Administration
Managed by Triad National Security, LLC, for the U.S. Department of Energy's NNSA.

Testimony Overview

- Matthew Segura Qualifications
- UAA Implementation of Work Plan
- Water Temperature Analysis
  - Thermograph Data Collection
  - Air-Water Temperature Models
  - Streamflow Data
- Additional Factors Affecting Aquatic Life
  - Habitat and Species Analysis
  - Dissolved Oxygen and pH
- Recommended Regulatory Amendment

Matthew Segura Qualifications

Education

- B.S. Biology, University of New Mexico
- Dual Masters in Water Resources and Community and Regional Planning, University of New Mexico

Professional Experience

- 8+ years of hydrology experience with a focus on surface water quality and watershed management
- Support LANL's surface water quality standards program
- Manage hydrologic datasets and field data collection

Role in Developing Final UAA

- Technical lead and coauthor
- Coauthor of response to comments (Exhibits H and J)
- Co-lead public meetings and stakeholder engagements

Sandia Use Attainability Analysis: Implementation of Final Work Plan

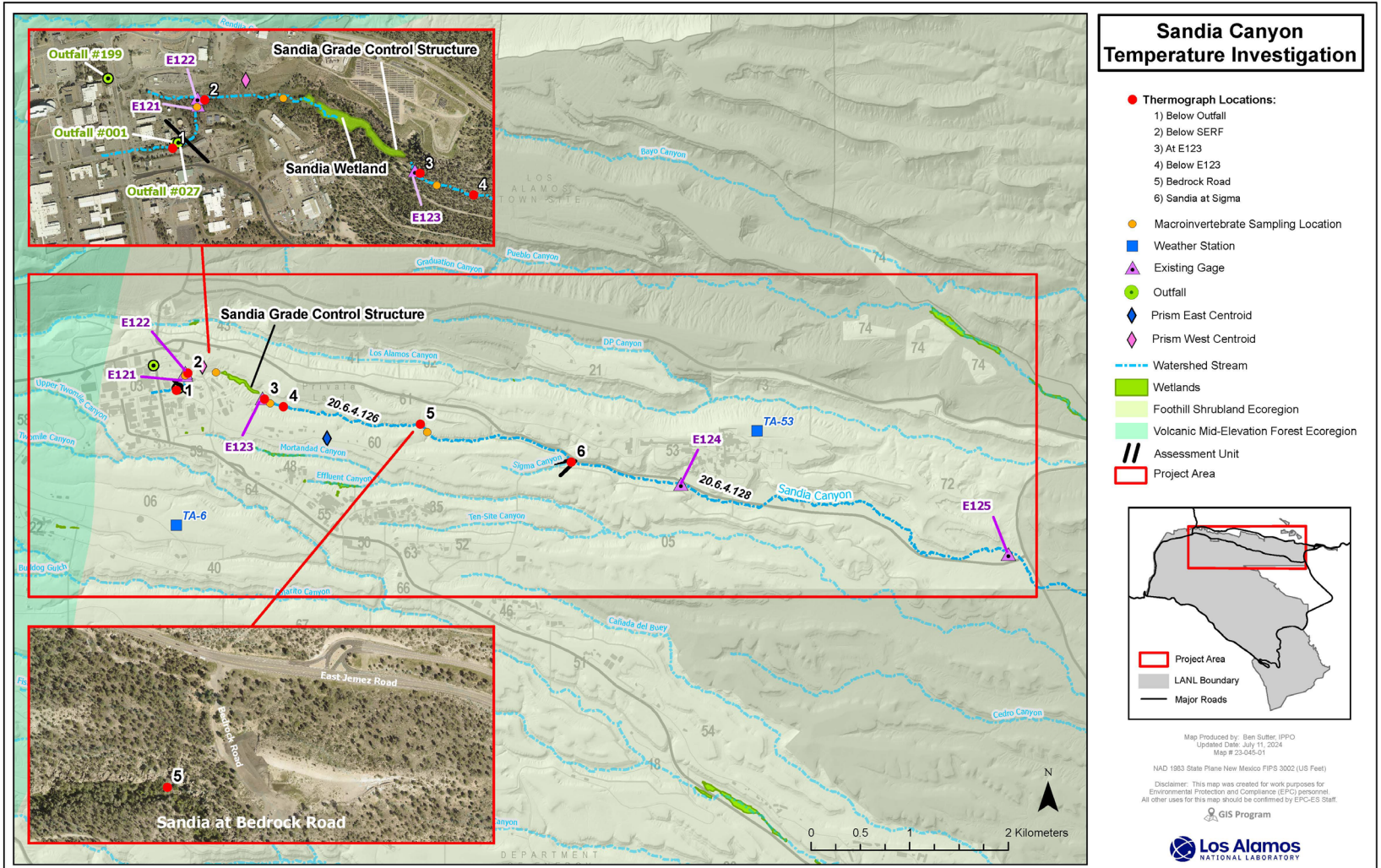
Work Plan Objectives for the UAA:	UAA Execution
• Determine if **natural thermal conditions are preventing attainment of coldwater ALU** • Analyze water quality data and models • Evaluate flow via gaging stations • Perform aquatic life surveys and document endangered species or critical habitat • Compare influences of Outfall 001 water temperature and air temperatures in AU • Provide public notice, stakeholder outreach and engagement efforts	• Study found that **air temperature is a major factor in preventing coldwater ALU attainment** • Thermograph data analysis: coldwater criteria consistently exceeded • Modeling showed air temperature is dominant factor in stream temperature regulation • DO & pH were within compliance; not limiting factors • Biological data: No coldwater-sensitive taxa observed • Outfall 001 has a limited influence on downstream waters with limited flows beyond LANL boundary • NMED, stakeholders, Tribes, and the public were informed at major milestones

Water Temperature Analysis

- Thermograph Data Collection
- AWTC and PRISM
- MWAT
- Streamflow Data

NM Criteria for Aquatic Life Use

Designated ALU	DO (mg/L)	6T3 (°C)	TMax (°C)	pH
Coldwater	6.0	20	24	6.6–8.8
Marginal Coldwater	6.0	25	29	6.6–9.0
20.6.4.141 Coolwater	5.0	25	29	6.6–9.0
Coolwater	5.0	NA	29	6.6–9.0
Warmwater	5.0	NA	32.2	6.6–9.0



Sandia Canyon Temperature Investigation

- **Thermograph Locations:**
  1) Below Outfall
  2) Below SERF
  3) At E123
  4) Below E123
  5) Bedrock Road
  6) Sandia at Sigma
- Macroinvertebrate Sampling Location
- Weather Station
- Existing Gage
- Outfall
- Prism East Centroid
- Prism West Centroid
- Watershed Stream
- Wetlands
- Foothill Shrubland Ecoregion
- Volcanic Mid-Elevation Forest Ecoregion
- Assessment Unit
- Project Area

Map Produced by: Ben Sutter, IPPO
Updated Date: July 11, 2024
Map # 23-045-01

NAD 1983 State Plane New Mexico FIPS 3002 (US Feet)

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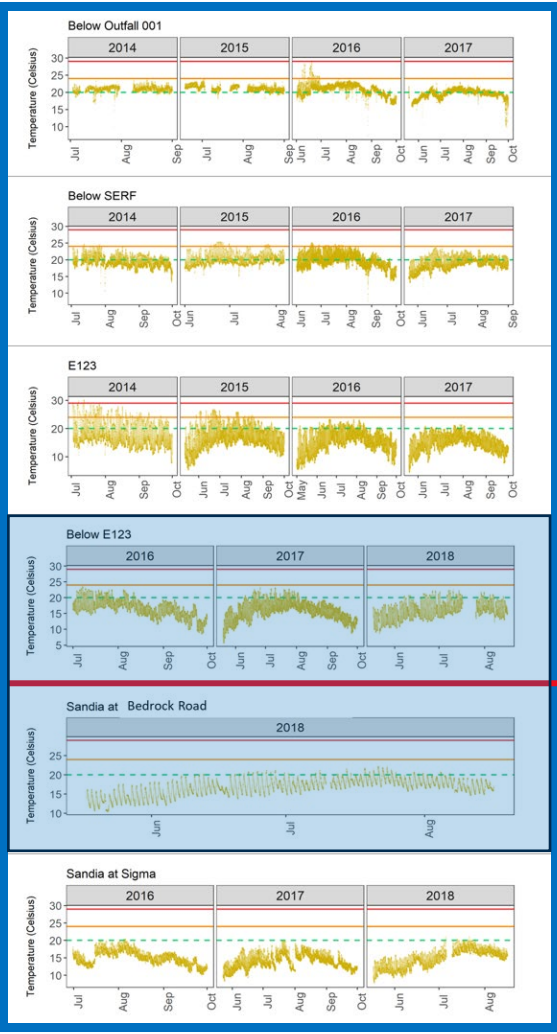
Water Temperature Variation within the Assessment Unit

Upstream

Downstream

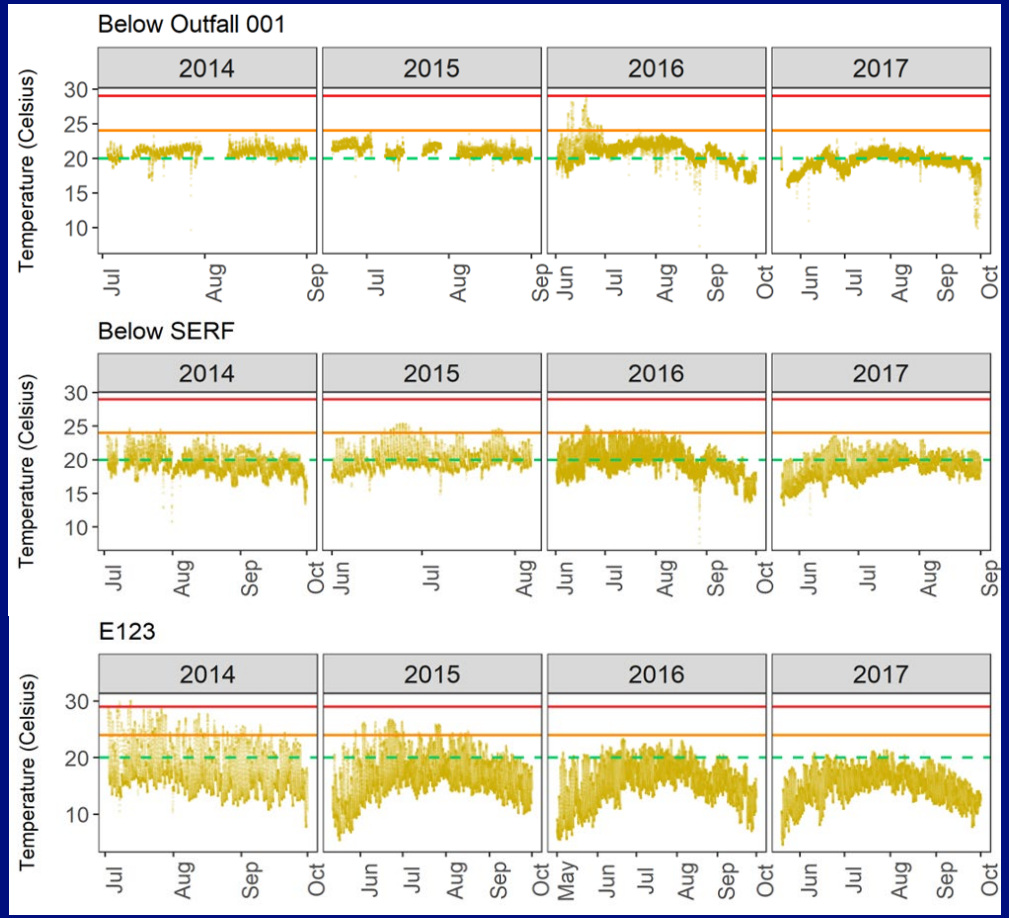


- Does **not** meet Coldwater criteria

- Meets Coldwater criteria

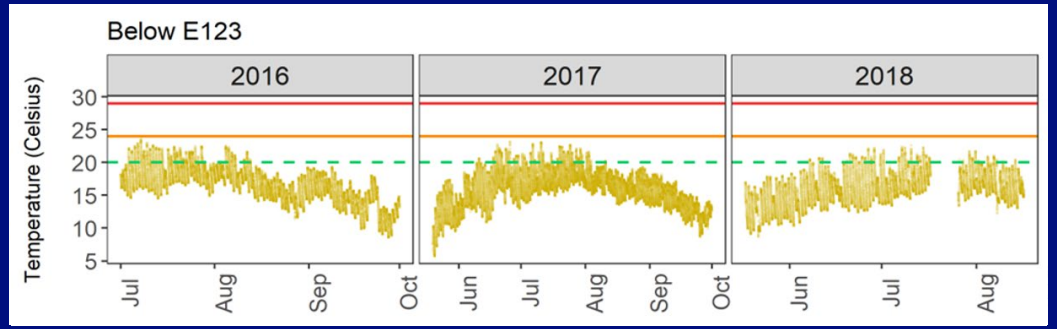
Thermograph Data Showing Exceedance of Coldwater Criteria Upstream

- Coolwater TMax: 29°C (84.2°F)
- Coldwater TMax: 24°C (75.2°F)
- Coldwater 6T3: 20°C (68°F)

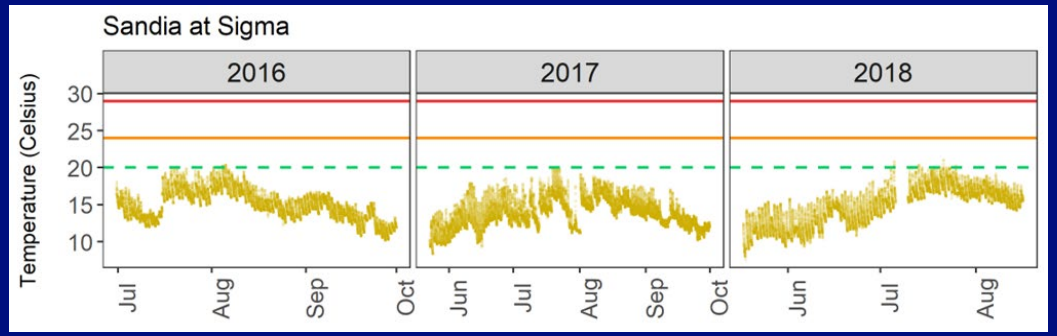


Thermograph Data (continued)

Below E123: meets **Coolwater** TMax



Sigma: meets **Coldwater** TMax and 6T3



- Coolwater TMax: 29°C (84.2°F)
- Coldwater TMax: 24°C (75.2°F)
- Coldwater 6T3: 20°C (68°F)

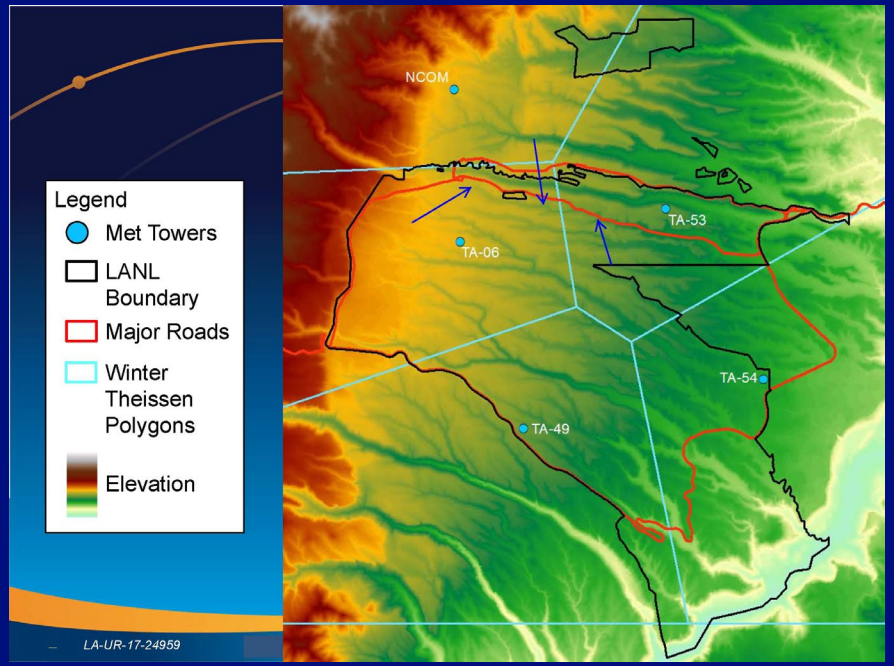
Thermograph Data: Attainment Summary

Thermograph	Year	TMax (°C)	6T3 (°C)	Designated Use Attained
Sandia Canyon below Outfall 001	2014	23.9	21.6	Coolwater
	2015	23.9	22.4	Coolwater
	2016	29.1	23.4	Warmwater
	2017	22.9	21	Coolwater
Sandia Canyon below SERF	2014	24.7	21.5	Coolwater
	2015	25.4	22.5	Coolwater
	2016	25.2	22.8	Coolwater
	2017	23.6	21	Coolwater
Sandia Canyon at E123	2014	30.1	23.6	Warmwater
	2015	26.8	22.7	Coolwater
	2016	23.3	20.1	Coolwater
	2017	21.4	19.1	Coldwater
Sandia Canyon below E123	2016	23.5	20.7	Coolwater
	2017	23.2	19.7	Coldwater
	2018	22.6	18.9	Coldwater
Sandia Canyon at Bedrock Road	2018	22.1	20.1	Coolwater
Sandia Canyon at Sigma Canyon	2016	20.4	18.4	Coldwater
	2017	20	17.6	Coldwater
	2018	21	18.7	Coldwater

	Meets warmwater based on TMax
	Meets coolwater based on TMax (and marginal coldwater based on TMAX and 6T3)
	Meets coldwater based on TMax and 6T3

Air Water Temperature Correlation (AWTC)

- NMED model (2011) was used to evaluate attainable use for Upper Sandia Canyon.
- Datasets:
  - PRISM- mean air temperature (2 polygons)
  - LANL MET station average air temp (TA-06,TA-53)
  - 5 yrs of thermograph data (2014 - 2018)
- Modeling results show Coldwater ALU is **unattainable**.



PRISM Projected Attainable Use

Year	Average July Air Temperature (ATEMP) (°C)		6T3 (°C)		TMAX (°C)		Projected Attainable Use by Year by Metric	
	Upper Sandia AU-West	Upper Sandia AU-East	Upper Sandia AU-West	Upper Sandia AU-East	Upper Sandia AU-West	Upper Sandia AU-East	Upper Sandia AU-West	Upper Sandia AU-East
1991–2020 Normals	19.7	20.9	21.7	22.9	26.0	27.2	MCW or Coolwater	MCW or Coolwater
1981–2010 Normals	19.0	20.2	21.0	22.2	25.2	26.5	MCW or Coolwater	MCW or Coolwater
1991–2020 Normals: 800m Headwater Grid	20.4	NA	22.4	NA	26.7	NA	MCW or Coolwater	NA

AWTC:

$$6T3 = 1.0346 \times ATEMP + 1.3029$$

$$TMAX = 1.0661 \times ATEMP + 4.9547$$

AWTC Projected Attainable Use based on LANL MET Stations

Year	ATEMP		6T3 (°C)		TMAX (°C)		Projected Attainable Use by Year by Station	
	LANL MET		LANL MET		LANL MET		LANL MET	
	TA-6	TA-53	TA-6	TA-53	TA-6	TA-53	TA-6	TA-53
2014	20	21.5	22.0	23.5	26.3	27.9	Coolwater	Coolwater
2015	19.4	19.6	21.4	21.6	25.6	25.9	Coolwater	Coolwater
2016	22.9	24.6	25.0	26.8	29.4	31.2	Warmwater	Warmwater
2017	21.4	23	23.4	25.1	27.8	29.5	Coolwater	Warmwater
2018	21.6	23.3	23.7	25.4	28.0	29.8	Coolwater	Warmwater

AWTC:

$$6T3 = 1.0346 \times ATEMP + 1.3029$$

$$TMAX = 1.0661 \times ATEMP + 4.9547$$

Maximum Weekly Average Water Temperature (MWAT) Analysis

- Equations from NMED (2011) used to predict 6T3 and TMAX from MWAT:

  6T3 = 1.0346 x MWAT + 1.3029

  TMAX = 1.0661 x MWAT + 4.9547

- For upper Sandia Canyon AU, MWAT was calculated from 15-minute thermograph measurements at each location.
- Analysis of MWAT data suggests **Coolwater ALU** is typically attainable for Upper Sandia Canyon.

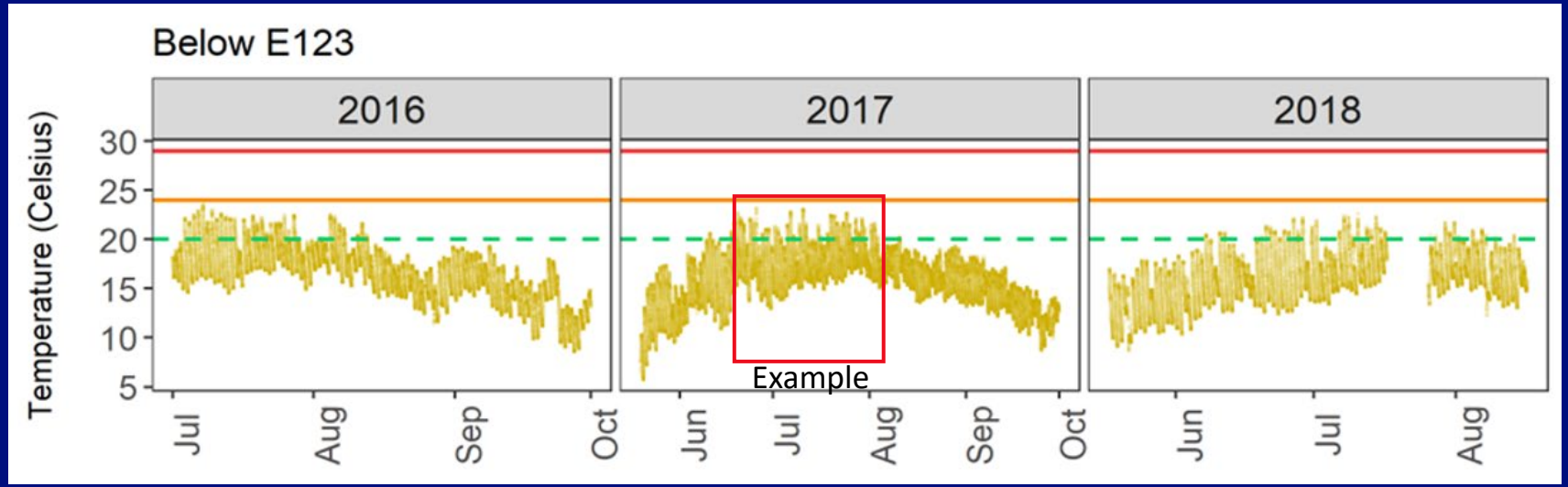
Predicted Attainable Use: MWAT (Max Weekly Average Water Temp, July)

Sandia Canyon Location	Year	Measured MWAT (°C)	Predicted 6T3 (°C)	Predicted TMax (°C)	Predicted Attainable Use
Below Outfall 001	2014	21.44	23.48	27.81	Coolwater
	2015	ND	ND	ND	ND
	2016	22.31	24.2	28.55	Coolwater
	2017	20.96	22.99	27.3	Coolwater
Below SERF	2014	20.67	22.69	26.99	Coolwater
	2015	21.2	23.24	27.56	Coolwater
	2016	21.18	23.22	27.53	Coolwater
	2017	20.18	22.18	26.47	Coolwater
At E123	2014	20.36	22.37	26.66	Coolwater
	2015	19.35	21.32	25.58	Coolwater
	2016	18.61	20.56	24.79	Coolwater
	2017	17.87	19.79	24.01	Coolwater
Below E123	2016	19.29	21.26	25.52	Coolwater
	2017	18.88	20.84	25.08	Coolwater
	2018	17.62	19.53	23.74	Coldwater
At Bedrock Road	2018	19.19	21.16	25.41	Coolwater
At Sigma Canyon	2016	17.89	19.81	24.03	Coolwater
	2017	16.63	18.51	22.68	Coldwater
	2018	18.05	19.98	24.2	Coolwater

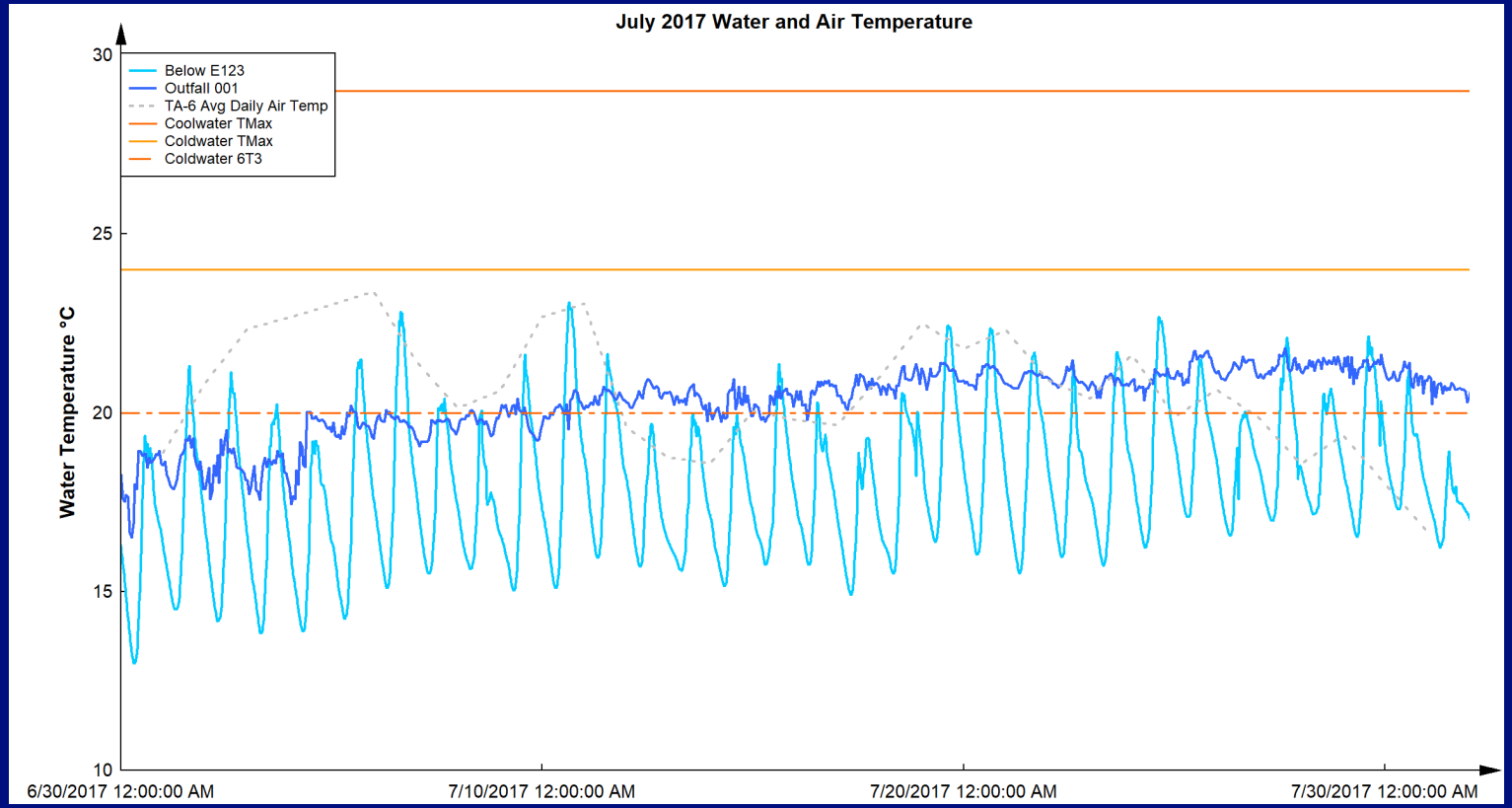
$$6T3 = 1.0346 \times MWAT + 1.3029$$

$$TMax = 1.0661 \times MWAT + 4.9547$$

How Does Air Temperature Affect Water Temperature?



Comparison of Water Temperature (Below E123 and Outfall 001) with TA-06 Air Temperature



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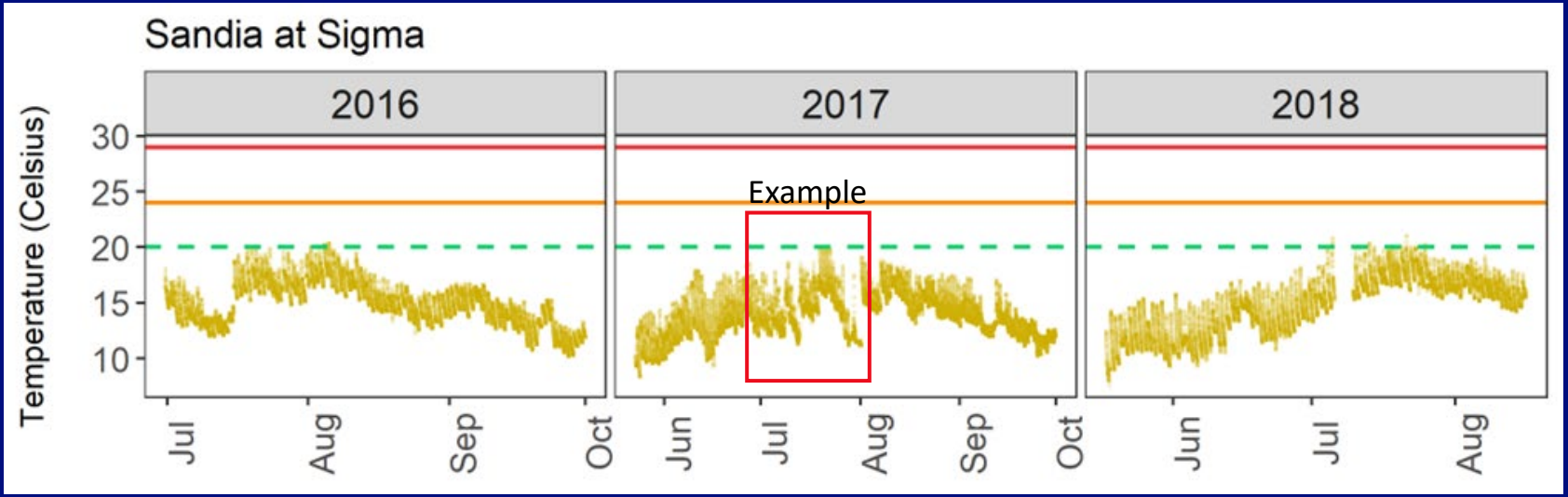
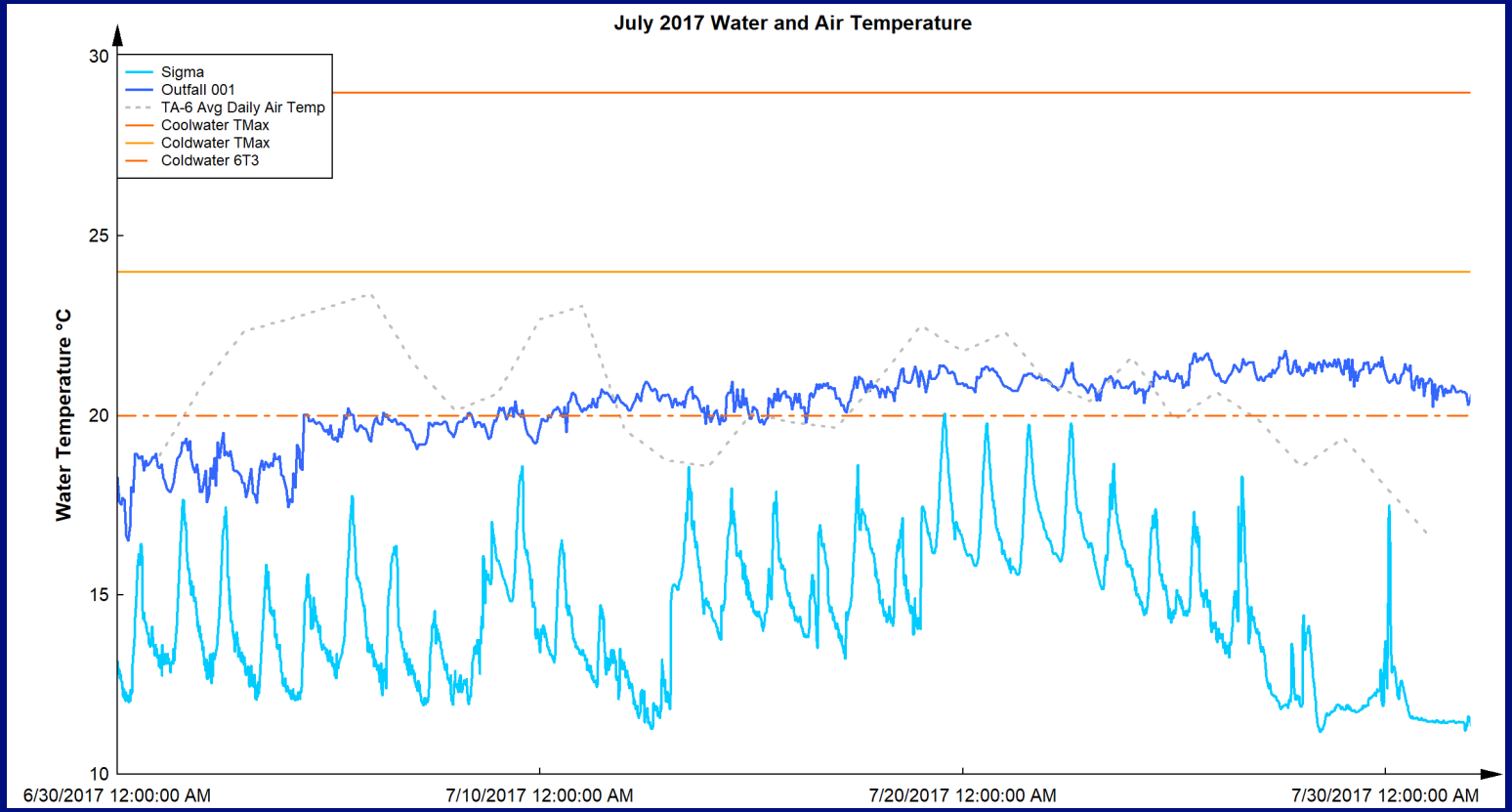
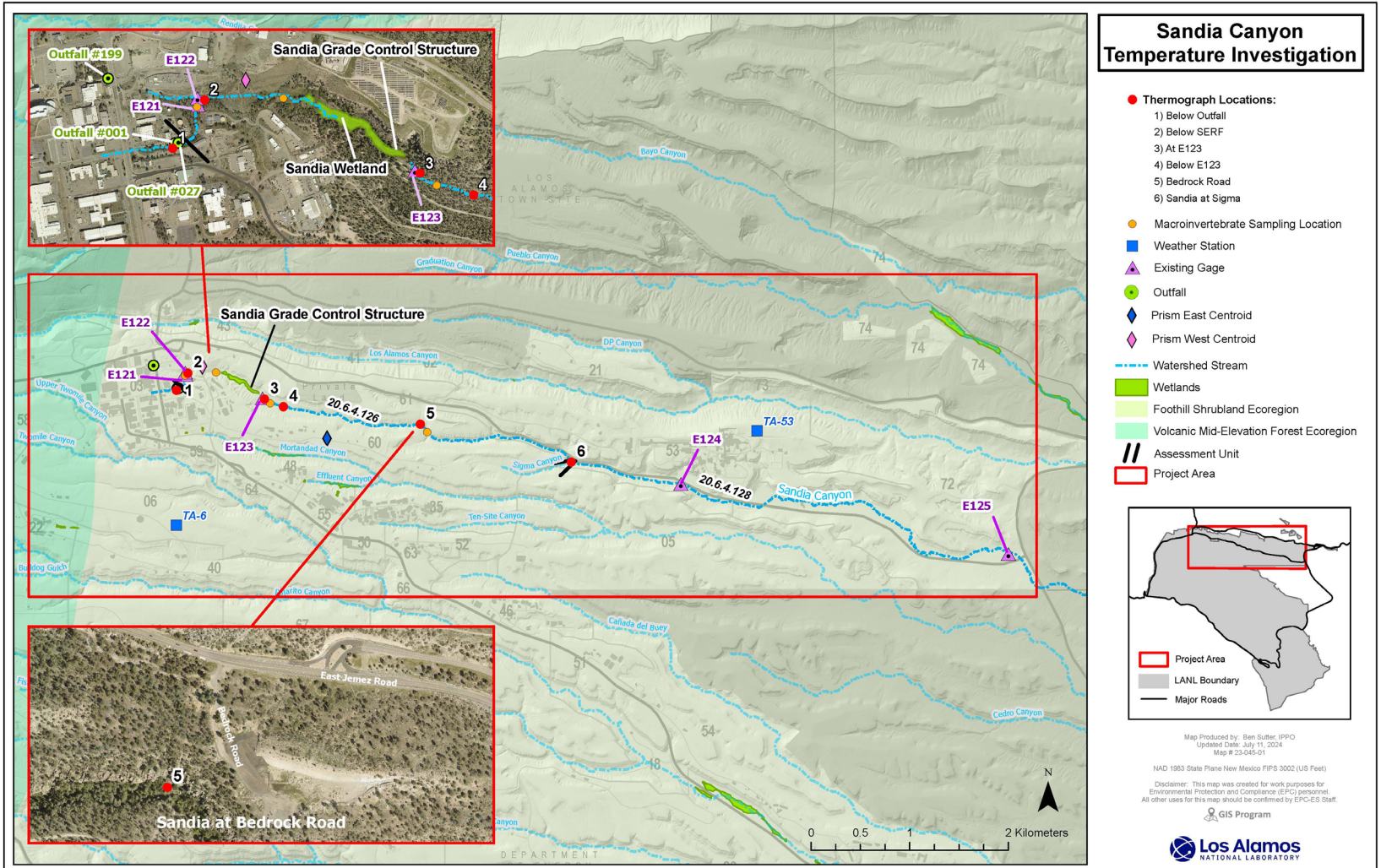


Comparison of Water Temperatures (Sigma and Outfall 001) with Air Temperatures





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NAD 1983 State Plane New Mexico FIPS 3002 (US Feet)

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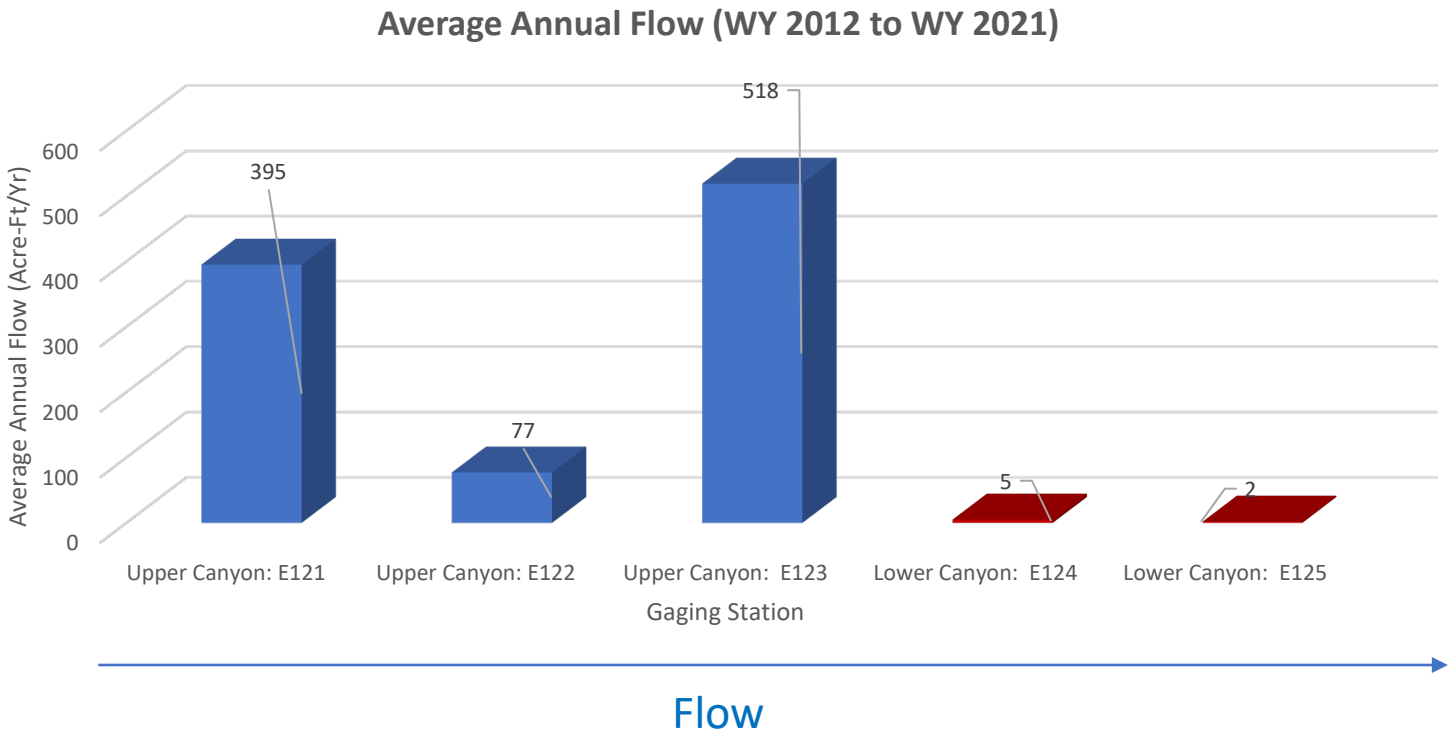
Limited Effects of Flow to Downstream Waters



Other Factors Affecting Aquatic Life

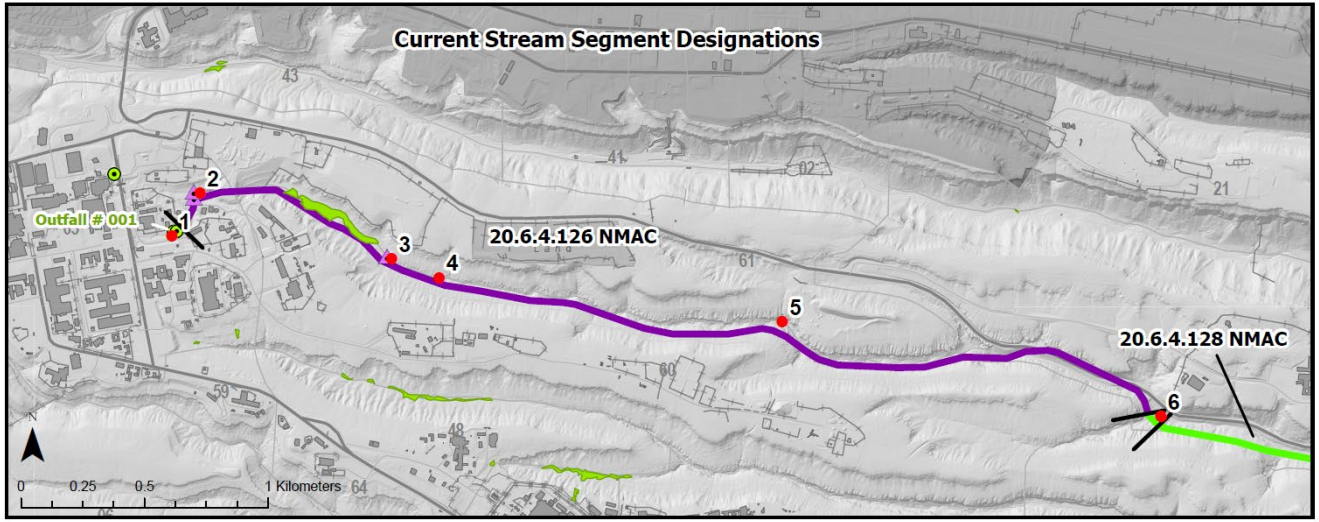
Dissolved Oxygen (DO): Ranged from 6.26 to 11.23 mg/L, within regulatory limits. DO is not a limiting factor for the attainment of coldwater ALU in Upper Sandia Canyon.

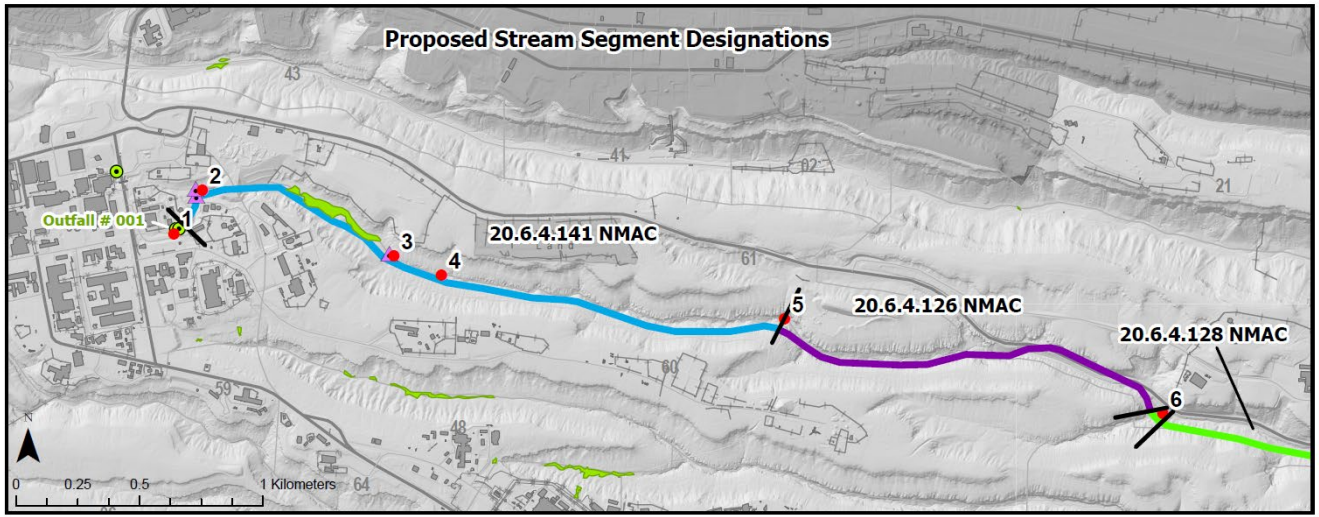
pH: Remained within the acceptable range of 6.6 to 8.8 throughout the study period, indicating no pH-related impairment.

Threatened & Endangered Species: No federally or state-listed aquatic species were found in the upper Sandia Canyon AU during biological surveys.

Critical Habitat: The proposed reclassification will not affect habitat or endangered species.

Sandia Canyon Temperature Investigation





Thermograph Locations:

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3) At E123
4) Below E123
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6) Sandia at Sigma

- Existing Gage
- Outfall
- 20.6.4.141 NMAC
- 20.6.4.126 NMAC
- 20.6.4.128 NMAC
- Wetlands
- Assessment Unit
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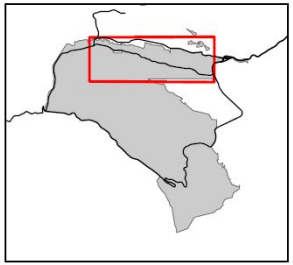

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Map # 23-045-02

NAD 1983 State Plane New Mexico FIPS 3002 (US Feet)

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Proposed Amendment to Aquatic Life Use (ALU)

Petitioners recommend amending NM water quality standards to:

- **Split the Upper Sandia Canyon assessment unit**, to establish **a new coolwater ALU segment** from Bedrock Road to Outfall 001 (with a TMax of 29 °C and a 6T3 of 25 °C) (see proposed amendment to 20.6.4.141 NMAC)

- **Retain the coldwater ALU in the segment from Sigma Canyon to Bedrock Road** (retaining the current coldwater criteria as set out in 20.6.4.900 NMAC) (see proposed amendment to 20.6.4.126 NMAC)

Proposed Amendment to NM WQS

20.6.4.141 RIO GRANDE BASIN: Sandia canyon from Sandia canyon at Bedrock Road upstream to LANL NPDES outfall 001.

A. Designated uses: coolwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following additional segment-specific criterion applies: a 6T3 temperature of 25 °C (77 °F).

20.6.4.126 RIO GRANDE BASIN: Perennial waters within lands managed by the U.S. department of energy (DOE) within Los Alamos National Laboratory (LANL), including but not limited to: Cañon de Valle from LANL stream gage E256 upstream to Burning Ground spring, Sandia canyon ~~[from Sigma canyon upstream to LANL NPDES outfall 001]~~ at Sigma canyon upstream to Sandia canyon at Bedrock Road, Pajarito canyon from 0.5 miles below Arroyo de La Delfe upstream to Homestead spring, Arroyo de la Delfe from Pajarito canyon to Kieling spring, Starmers gulch and Starmers spring and Water canyon from Area-A canyon upstream to State Route 501.

A. Designated uses: coldwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

Final UAA: Summary

Results	• Coldwater is **NOT** supported through entire reach due to natural conditions. Measured data show exceedances of coldwater 6T3 and or TMAX at most thermograph locations except Sigma. Modeled data support cool or warm water.
Recommendations	• Petitioners recommend splitting the reach: the upper segment as coolwater with a 6T3 criterion of 25°C and the lower segment as coldwater.
Environmental Considerations	• Air temperature predominantly drives stream temperatures • Outfall cooling may not reduce downstream temperatures and requires significant energy inputs.
Highest Attainable Use	• Proposed amendment protects aquatic life and maintains the Coldwater designation in the lower segment.

[extra slides]

NM Criteria for Aquatic Life Use

Designated ALU	DO (mg/L)	4T3 (°C)	6T3 (°C)	TMAX (°C)	pH
High-Quality Coldwater	6.0	20	NA	23	6.6–8.8
Coldwater	6.0	NA	20	24	6.6–8.8
Marginal Coldwater	6.0	NA	25	29	6.6–9.0
Coolwater	5.0	NA	NA	29	6.6–9.0
Warmwater	5	NA	NA	32.2	6.6–9.0
Marginal Warmwater	5	NA	NA	32.2	6.6–9.0
Limited Aquatic Life	NA	NA	NA	NA	NA