

**Sample and Analysis Plan
For Moab Area Watershed Partnership Castle Valley Monitoring
Published December 11, 2022**

The Moab Area Watershed Partnership and its Watershed Coordinator have a Sampling Analysis Plan (SAP) for Castle Valley that will be used to assess water quality and evaluate project successes and ongoing improvements in the watershed. The SAP is as follows:

1. Monitoring Goals and Objectives

The goal of this SAP is to document the overall monitoring plan for Castle Valley, Utah and provide clear documentation for how the Watershed Coordinator will provide assistance monitoring.

Monitoring goals for this project are related to the UDWQ and Watershed Coordinator roles of monitoring water quality for assessment and long term data collection related to TMDLs.

Specific Objectives:

- Monitor five stations for total coliform and in E. coli streams monthly from May through October to assess whether recreation and drinking source beneficial uses are met.-Flow will also be measured when E. coli samples are collected
- Monitor two stations for total coliform and E. coli in streams monthly from May through October to assess whether recreation and drinking source beneficial uses are met at part of UDWQ’s Waterborne Pathogen Monitoring Program. Repeat sampling will be collected if necessary. Flow will not be measured at these sites.
- Monitor five stations for field parameters temperature, pH, and specific conductance to establish baseline conditions and track watershed improvement as part of the identified TMDL. Dissolved oxygen and percent saturation may also be collected.
- Monitor and service two station for continuous (every 15 minutes) temperature and pressure data. Flow will be measured at those sites as needed.
- Determine base flow annually in late November at two stations.
- Monitor six monitoring wells for E. coli in conjunction with UGS Sampling Analysis Plan.
- Monitor as requested and needed by Moab Area Watershed Partners and UDWQ.

2. Background & Project Area Description

This project takes place along Castle Creek which flows through the town of Castle Valley. Castle Creek has its headwaters in the La Sal Mountains on USFS land and flows through the rural residential community of Castle Valley before it empties directly into the Colorado River.

| Table 1: Assessment Units particulars for sites in this sampling analysis plan | | | | |
|--|-----------------|-----------------|---|--|
| Name | Assessment Unit | Beneficial Uses | 2022 Assessment | TMDL |
| Castle Creek – 1 | 14030005-009 | 1C, 2A, 3B, 4 | Impaired for 2A E. Coli and 3B: Benthic Macroinvertebrate | TMDL for TDS resulted in a site specific Standard TMDL Required, but not yet |

| | | | | |
|--------------------|--------------|---------------|-----------------------------------|--|
| | | | | created for other constituents |
| Castle Creek – 2 | 14030005-012 | 1C, 2A, 3B, 4 | Fully Supporting | None |
| Colorado River – 4 | 14030005-019 | 1C, 2A, 3B, 4 | Impaired for E. Coli and Selenium | TMDL for Selenium. TMDL required for E. coli |

Impairments to Castle Creek for TDS were initially detected in 1997 and the DWQ has developed an approved TMDL for lower Castle Creek for TDS. The TMDL resulted in a site specific TDS standard. Impairments to Castle Creek from E. coli were initially detected in 2015. The area has a Watershed Coordinator (WC) and a watershed group “[Moab Area Watershed Partnership](#)”

3. Watershed Coordinator Role

The Watershed Coordinator will help with water quality sampling. Specifically, he/she will collect will measure several field parameters using calibrated field probes (temperature, pH, etc.), and they will collect an *E. coli* sample for IDEXX testing. The Watershed Coordinator will also service the continuous monitoring (deploying, checking, and downloading the probe). The Watershed Coordinator will record and enter all data in the appropriate locations. If the volunteer needs more supplies they will either procure them from a certified source or contact the UDWQ Monitoring program in time to ensure delivery of supplies before the next scheduled sampling event. The Watershed Coordinator will also share photos, stories, and potential problems with appropriate UDWQ and other agencies staff.

4. Stream and Well Sampling Locations are shown below in Table 2

| DWQ Assessment Unit Name / Stream Name | AWMQS Monitoring ID | Description | Latitude Longitude |
|--|---------------------|---|-----------------------------------|
| Castle Creek -1 / Castle Creek | 4958030 | Castle Creek at U128 Xing | 38°40'38.936"N 109°26'57.423"W |
| Castle Creek -1 / Castle Creek | 4958085 | Castle Creek at Castle Valley Bridge | 38°39'26.780"N 109°25'25.695"W |
| Castle Creek -1 / Castle Creek | 4958088 | Castle Creek ab Diversion in town | 38°39'3.19"N 109°24'57.67"W |
| Castle Creek -1 / Castle Creek | 4958067 | Castle Creek along Castleton Rd 0.55m BL Castleton Cemetery turnoff | 38°36'43.31"N 109°19'50.77"W |
| Castle Creek -1 / Castle Creek | 4958070 | Castle Valley Creek @ Castleton | 38°36'23.946"N 109°19'23.417"W |
| Castle Creek -2 / Castle Creek | 4958075 | Castle Ck ab USFS Rd Xing to CO | 38°35'25.950"N 109°15'36.415"W |
| Colorado River – 4 /Colorado River | 4957000 | Colorado River at US191 Xing and Moab Bridge | 38°39'16.25"N 109°34'24.88" |
| Colorado River – 4 /Colorado River | 4957997 | Colorado River at Take Out Beach | 38°39'41.50"N 109°30'02.00" |

| | | | |
|--|-------------------|---|------------------------------|
| Castle Valley -1 & 2 / Castle Creek | Not Applicable | Six monitoring wells in the UGS Sampling Analysis Plan | See UGS SAP for locations |
|--|-------------------|---|------------------------------|

5. Sample Parameters

Field Parameters: Temperature, pH, Conductivity, and Salinity. Dissolved Oxygen, and Percent Saturation may also be collected. Flows are measured when E. coli is collected.

Base flow is determined in late November.

Biological Parameters: Total Coliforms and E. coli

Continuous monitoring: Pressure Transducers (Pressure Transducers also measure temperature concurrently). Flows are determined as needed to develop flow curve.

| DWQ Assessment Unit Name / Site Name | AWMQS Monitoring ID | Monitoring |
|---|---------------------|--|
| Castle Creek -1 / Castle Creek at U128 Xing | 4958030 | Field Parameters Biological Parameters Continuous Monitoring |
| Castle Creek -1 / Castle Creek at Castle Valley Bridge | 4958085 | Field Parameters Biological Parameters |
| Castle Creek -1 / Castle Creek ab Diversion in town | 4958088 | Field Parameters Biological Parameters |
| Castle Creek -1 / Castle Creek along Castleton Rd 0.55m BL Castleton Cemetery turnoff | 4958067 | Flow Continuous Monitoring |
| Castle Creek -1 / Castle Valley Creek @ Castleton | 4958070 | Field Parameters Biological Parameters |
| Castle Creek -2 / Castle Ck ab USFS Rd Xing to CO | 4958075 | Field Parameters Biological Parameters |
| Colorado River – 4 / Colorado River at US191 Xing and Moab Bridge | 4957000 | Field Parameters Biological Parameters |
| Colorado River – 4 / Colorado River at Take Out Beach | 4957997 | Field Parameters Biological Parameters |
| Castle Creek -1&2 / Six Castle Valley Monitoring Wells | N/A | Biological Parameters |

6. Sampling Frequency

| Parameters | Responsible Party | Frequency | Timeline |
|------------------------------|----------------------------|-----------------------|-------------------------|
| Field Parameters | Watershed Coordinator (WC) | Once a month | December 2013 – Present |
| Stream Biological Parameters | WC | monthly May – October | December 2013 – Present |

| | | | |
|----------------------------|-----------|---|-------------------------|
| Well Biological Parameters | WC & USGS | Twice per year, Once in Spring and Fall | December 2022 - Present |
| Continuous monitoring | WC | Collecting data every 15 min. | December 2013 – Present |
| Base Flow | WC | Once in late November | November 2020 – Present |

7. Methodologies

The Watershed Coordinator has and will attend a training where he/she are instructed on proper techniques for sampling. Please refer to the UDWQ SOPs if additional review is needed.

The UDWQ SOPs are managed by UDWQ staff. For latest versions visit [their website or contact their staff](#). The WC will be provided with a hard copy of the current SOPs at the time of this document's creation.

UDWQ *E.coli* field sampling and processing SOPs

UDWQ Pressure Transducer SOP

UDWQ's Field Parameter sampling SOP

8. Field Equipment

Field Parameters:

UWW Datasheet (Appendix)

Notebook

Pencil

[Oakton PCS 35 Testr](#)

[In-Situ SmarTroll](#)

Calibration Solutions for pH (4, 7, & 10) and conductivity (1413 $\mu\text{s}/\text{cm}$)

Standard Reference Solutions for pH (9) and conductivity (500 $\mu\text{s}/\text{cm}$)

Marsh Mcbirney Flow Meter

Biological Parameters:

UDWQ *E.coli* Datasheet

Sterile *E.coli* sample bottles

Marker

Cooler with wet ice

Thermometer

Continuous Monitoring:

[Rugged TROLL 100 Pressure Transducer](#)

Supplies to install and secure probes in the stream

UDWQ Continuous Monitoring Data Sheet

9. Health & Safety

Safety is a primary concern at all times and in all sampling situations for field personal. All UWW volunteers are trained to minimize risk and sample in a safe manner. In any marginal or questionable situation, monitoring personnel (samplers) are required to assume worst case conditions and use safety

precautions and equipment appropriate to that situation. Samplers who encounter conditions which in their best professional judgment may exceed the protection of their safety equipment (PFD, waders, boat, etc.) or may in any way represent a potential hazard to human health (high water levels, ice, etc.) and safety should immediately leave the area and sample at another safer time.

There should be a minimum of two sampling personnel present in the field. Samplers will wash hands and arms thoroughly with bacterial soap after sampling, before eating and drinking and at the end of the sampling run.

Before heading out to sample, samplers will inform a family member or friend when they are leaving for the field and their estimated time of return. Samplers are strongly encouraged to carry a cell phone. In case of emergency call 911.

General safety steps should be followed when on site. Wearing proper equipment (proper shoes or waders, PFD, etc.) and bringing a first aid kit is essential. Identify potential hazards (steep cliffs, barbed wire, broken glass, etc.) both on land and in the water. Follow the general standard that water flows above 1 cfs or that are deeper than knee depth can be hazardous.

10. QAQC

All monitors have attended a training where they were instructed on proper techniques for sampling. Please refer to the UTDWQ SOPs if additional review is needed.

| Parameter | QC Check | Frequency | Acceptable Range | Correction Actions |
|----------------|--|-----------------------------------|-------------------------|---|
| <i>E. coli</i> | 8 hour holding time; Replicates at 10 % of sites or 1 per trip if less than 10 sites. 1 Field Blank per trip | Each sampling trip | NA | Audit and train |
| pH | Standard Reference Material | Within 24 hours prior to sampling | ± 10% | Repeat field check; if not correct return meter to manufacturer for repair |
| Temperature | Annual calibration against NIST thermometer | Annually | On the calibration mark | Repeat measurement with different thermometer; if not correct return meter to manufacturer for repair |
| Conductivity | Standard Reference Material | Within 24 hours prior to sampling | ± 10% of standard | Repeat field check; if not correct return meter to manufacturer for repair |

Data entry QAQC – Watershed Coordinator will double check data when they enter data on-line or submit to UDWQ. The database also has internal quality control for extreme values and data entry limitations. All data submitted to UDWQ is examined by UDWQ staff with a QAQC checker to examine high values and data entry errors.

11. Data Documentation and Storage

Field Parameters: The Watershed Coordinator volunteer will record all field data in a notebook. The Watershed Coordinator will submit the electronic data to UDWQ as requested by UDWQ. The original field notebook will be stored with the local watershed coordinator who can provide copies to UDWQ if needed. The WC will be provided with a filing system to store all QA/QC data sheets, SOPs, and SAPs in a clearly identifiable location. Coliform data will be sent electronically by the WC to UDWQ for entry into the AQWMS data base. The WC will also maintain hard copies of QA/QC and bench sheets for three years after analysis.

Continuous temperature probe and pressure transducer data will be maintained by the WC.

12. Decontamination

All monitors are educated about the importance of proper decontamination to prevent the spread of aquatic invasive species. This is especially important for volunteers who travel to different watersheds or lakes.

The WC follows the Utah Division of Wildlife Resources recommended strategy of cleaning, draining, and drying all equipment. For further instructions visit the State of Utah’s [decontamination webpage](#).

13. Participants

| Name | Role | Email | Phone |
|---|---------------------------------------|--|--------------|
| Arne Hultquist | Watershed Coordinator | arnehultquist@gmail.com | 435-259-7558 |
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| John Groo and Town of Castle Valley Water Board | Water Board for Town of Castle Valley | johng@castlevalleyutah.com | |
| Janae Wallace | Utah Geological Survey Scientist | Janaewallace@utah.gov | 801-537-3387 |