

**Sample and Analysis Plan
For Castle Valley Moab Area Watershed Partnership Monitoring
Published January 1, 2018**

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 and provide clear documentation for how the Watershed Coordinator will provide assistance monitoring.

Monitoring objectives 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 as part of the UDWQ’s Waterborne Pathogen Monitoring Program. Repeat sampling will be collected if necessary. Flow will also be measured when E. coli samples are collected
- Monitor five stations for field parameters temperature, pH, dissolved oxygen, percent saturation and specific conductance to establish baseline conditions and track watershed improvement as part of the identified TMDL
- Monitor and service one station for continuous (every 15 minutes) temperature and pressure data. Flow will be measured at those sites as needed.

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	2016 Assessment	TMDL
Castle Creek – 1	14030005-009	1C, 2A, 3B, 4	Impaired for 3B: Benthic Macroinvertebrate	Required, but not yet created
Castle Creek – 2	14030005-012	1C, 2A, 3B, 4	Not impaired; not all assessed	None

The area has a watershed coordinator and is part of the watershed group “[Moab Area Watershed Partnership](#)”

3. Watershed Coordinator Role

The Watershed Coordinator will help with water quality sampling. Specifically, they 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. 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	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

5. Sample Parameters

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

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
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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 Valley Creek @ Castleton	4958070	Field Parameters Biological Parameters
Castle Creek -2 / Castle Ck ab USFS Rd Xing to CO	4958075	Field Parameters Biological Parameters

6. Sampling Frequency

Parameters	Responsible Party	Frequency	Timeline
Field Parameters	Watershed Coordinator (WC)	Once a month	December 2013 – Present
Biological Parameters	WC	monthly May – October	December 2013 – Present
Continuous monitoring	WC	Collecting data every 15 min.	December 2013 – 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 $\mu\text{S}/\text{cm}$)

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	Each sampling trip	NA	Audit and train

	at 10 % of sites or 1 per trip if less than 10 sites. 1 Field Blank per trip			
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 on the datasheet. The Watershed Coordinator will submit the electronic data to UDWQ as requested by UDWQ. The original field datasheets 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 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 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

Table 6: Participants in this Sampling Analysis Plan			
Name	Role	Email	Phone
Arne Hultquist	Watershed Coordinator	arnehultquist@gmail.com	435-259-7558
Lucy Parham	DWQ Scientist	lparham@utah.gov	801-536-4331
Ann Marie Aubry	BLM Hydrologist	aubry@blm.gov	435-259-2173

APPENDIX



UWW Tier II Stream Data Sheet

UtahStateUniversity
WATER QUALITY EXTENSION

Certified Monitor Name(s) _____ UWW ID # _____

Site Name _____ UWW Site # _____

Sample Date _____ Sample Time _____:_____ (HH:MM 24 Hour)

Field Observations:

_____ **Flow** 1 – No flow 2 – Low 3 – Normal / Baseflow 4 – High / Runoff 5 – Flood

_____ **Water Surface** 1 – Clear 2 – Scummy 3 – Foamy 4 – Natural debris 5 – Trash 6 – Sheen/Oily

_____ **Water Clarity** 1 – Clear 2 – Cloudy/Milky 3 – Turbid

_____ **Water Color** ___ Normal ___ Abnormal 1 – Clear 2 – Brownish 3 – Greenish 4 – Reddish 5 – Blue 6 – Orange

_____ **Water Odor** 1 – None 2 – Oil 3 – Sewage 4 – Rotten Egg 5 – Fishy 6 – Musky 7 – Chlorine

_____ **Algae Cover** 1- Rare 2- Moderate substrate layer 3- Thick substrate layer 4- Little filamentous 5- Abundant filamentous

_____ **Dead Fish** 1 – None 2 – 1 to 3 3 – 4 to 10 4 - >10

_____ **Present Weather** 1 – Clear 2 – Cloudy 3 – Overcast 4 – Light Rain 5 – Heavy Rain 6 – Snow

_____ **Past 24Hr Weather** 1 – Clear 2 – Cloudy 3 – Overcast 4 – Light Rain 5 – Heavy Rain 6 – Snow

_____ **Inches of rainfall** accumulation in past 72 Hrs

Comments: _____

IDEXX *E.coli* Sample Collected: YES NO

Sampling Location ___ Side ___ Center **Habitat** ___ Riffle ___ Run ___ Pool

Meter Calibration Log: Store and calibrate standard at room temperature.					
Calibrated within 24 hours of sampling?		Yes	No	Date	Time
Parameter	Type	Standard Value	Initial Meter Reading	Post Calibration Reading	
Conductivity		1413			
pH		4.01			
pH		7.00			
pH		10.01			

_____ **Air Temperature** (°C) _____ **Water Temperature** (°C) _____ **pH**

_____ **Conductivity** (µS/cm) _____ **TDS** (ppm) _____ **Salinity** (ppm)

Turbidity > / = (circle one) _____ **Turbidity Tube** (cm) **Total Depth** _____ (cm)

_____ **Hours sampling and traveling** _____ **Miles traveled (roundtrip)** _____ **# of participants** _____ **Decontamination**

