

# Data Transmittal Report

CLEAR CREEK CONSULTANTS



**To:** Upper Clear Creek Watershed Association (UCCWA)

**CC:**

**From:** Mike Crouse

**Date:** 13-July-2020

**Re:** Stream Gaging Report Water Year 2019 – Clear Creek at Kermitts (Station CC-40)

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Clear Creek Consultants (CCC) has been retained by UCCWA to operate and maintain the stream flow gaging station on Clear Creek above Johnson Gulch near Kermitts (Station CC-40). The UCCWA and others utilize streamflow data from this gage to assess water quality conditions in Clear Creek. From October 1994 to October 2005, the gage was operated by the U.S. Geological Survey and records were published in annual reports. CCC has operated the CC-40 gage and published the flow data annually since 2006. This report presents data collected at the gage from October 2018 to October 2019.

## Data Collection and Evaluation

A continuous recording Campbell Scientific data logger was used to measure a submersible pressure transducer to develop the water stage height record for CC-40. The 15-minute average stream stage height was recorded during ice-free periods extending from approximately March to November. The transducer was calibrated using an electronic tape gage referenced to the base of the gage enclosure box. An outside staff gage mounted in the stream is also utilized as a stream stage height reference.

Continuous recording water quality probes were also operated at the CC-40 gage. A combination conductivity/temperature probe recorded in-stream temperature and conductivity (dissolved solids) conditions related to salt loading in Clear Creek (see attached specific conductance data plot). An in-stream turbidity probe was used to monitor stream turbidity conditions related to suspended sediment loading (see attached turbidity data plot). These water quality parameters are recorded by the data logger as 15-minute average and daily maximum values. A tipping bucket rainfall intensity gauge was also operated at the CC-40 gage (see attached precipitation data plot).

Operation of the CC-40 streamgage requires the development and maintenance of a discharge rating to define the relationship between stream stage height and discharge (flow). Data collection methods and procedures used at the CC-40 streamgage follow standard USGS guidelines and protocols (USGS, 1982 – Measurement and Computation of Streamflow, Volumes 1 and 2).

Direct measurements of stream flow using a current meter are required each year to document this relationship at various seasonal flow rates. Three to six direct current meter discharge measurements are taken each season to maintain the discharge rating. Measurement results are available upon request. The discharge rating is evaluated annually to assess the accuracy of the rating in comparison to the direct measurements. The measurements are plotted on log-normal distribution using a computer program for comparison to the existing rating. If necessary, either shift adjustments are applied to the data before calculating discharge, or the rating is revised to maintain accuracy.

Three separate rating curves were developed and utilized for the CC-40 gage representing low flow (20-70 cfs), medium flow (70-300 cfs), and high flow (300-2,000 cfs). The streamflow rating table for CC-40 is attached.

The stage height record was compiled for review, plotted, and any necessary corrections were made based on field calibration measurements. The final stage height record was then imported into an Access database program for the computation of discharge and archiving.

The discharge rating equations were applied to the corrected stage height data for the computation of discharge. A stream flow computation program was used within the Access database framework to compute the 15-minute discharge. Statistical output summaries from the database program include mean daily flow; mean hourly flow; and maximum and minimum instantaneous flow by month.

## Results

The gage was audited approximately monthly during ice-free periods to check calibration against the gage reference points and make any necessary adjustments to maintain accuracy. Routine maintenance of the gage included removal of silt accumulated in the stilling well and instrument maintenance.

Stream flow results during the operation season are available in real-time on Clear Creek Consultants web site for rafters and other water users to obtain current stream flow conditions at [clearcr.com/flow-pages.html](http://clearcr.com/flow-pages.html).

The CC-40 mean daily discharge results for this reporting period are presented in the attached table, along with the flow hydrograph. The gage is not operated over the winter months (November-March) because the gage rating is not accurate during heavy ice-cover conditions which occur each year at CC-40. Significant channel ice accumulation renders the flow rating useless during the winter. When possible, wintertime flows are estimated based on Clear Creek flows at the Golden USGS gage (CC-60) adjusted using the average flow ratio for the winter low-flow period.

Minimum Clear Creek flows occur in winter, with maximum flows typically in June. Minimum flows range from 30 to 40 cfs at CC-40. Mean daily flows were below average in April and May 2019 and above average in June and July. Peak snowmelt flow in 2019 was later (2-July) than normal and was higher than years 2018 and 2017.

Data graphs for specific conductance, temperature, and turbidity at CC-40 for this reporting period are also attached. Daily precipitation data for the seasonal monitoring periods are also tabulated.

**CLEAR CREEK ABOVE JOHNSON GULCH NEAR KERMITTS  
WY 2019**

Provisional Data - Subject to Revision

LOCATION -- 0.5 mi upstream Johnson Gulch      LATITUDE 39 44'47"    LONGITUDE 105 26'08"  
GAGE DRAINAGE AREA -- 267 sq-mi      GAGE ELEVATION -- 7210 ft-msl  
PERIOD OF RECORD -- October 1994 to Current Year

**DISCHARGE IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 2018 TO OCTOBER 2019**

**MEAN DAILY VALUES**

DAY	2018 OCT	2018 NOV	2018 DEC	2019 JAN	2019 FEB	2019 MAR	2019 APR	2019 MAY	2019 JUN	2019 JUL	2019 AUG	2019 SEP	2019 OCT
1	48.3	45.4	31 e	29 e	34 e	28 e	34.9	86.7	173	1051	334	115	74.2
2	49.3	42 e	16 e	27 e	32 e	26 e	35.0	78.8	226	1066	317	111	75.2
3	52.6	46 e	22 e	31 e	33 e	22 e	35.8	75.9	289	1006	309	111	70.1
4	50.8	47 e	17 e	35 e	33 e	18 e	35.2	75.7	314	956	317	114	74.7
5	49.0	46 e	13 e	38 e	31 e	26 e	36.3	76.4	382	905	323	105	75.1
6	48.4	42 e	30 e	39 e	29 e	33 e	37.7	81.3	471	871	307	110	69.2
7	50.2	37 e	30 e	37 e	22 e	36 e	39.0	90.1	591	832	284	130	70.3
8	51.3	33 e	33 e	35 e	22 e	35 e	42.4	96.5	693	788	293	106	73.2
9	50.9	27 e	36 e	34 e	28 e	32 e	47.6	93.6	744	750	298	110	67.0
10	48.3	35 e	34 e	35 e	35 e	29 e	54.4	87.9	693	713	265	102	61.6
11	49.2	42 e	34 e	35 e	32 e	28 e	48.9	85.8	682	692	299	100	60.3
12	51.5	35 e	38 e	35 e	31 e	29 e	47.0	84.4	698	696	290	98.2	65.8
13	50.9	27 e	36 e	32 e	33 e	39 e	44.7	89.2	764	671	250	95.0	58.7
14	53.6	39 e	32 e	26 e	36 e	32 e	43.2	104	857	655	226	95.6	58.4
15	47.2	43 e	37 e	31 e	33 e	29 e	43.6	135	864	669	233	92.7	57.0
16	47.3	42 e	38 e	39 e	29 e	30 e	46.8	171	858	682	187	90.0	55.1
17	49.9	41 e	35 e	36 e	20 e	30 e	48.6	195	871	635	179	88.4	54.2
18	49.6	33 e	38 e	35 e	27 e	32 e	51.0	171	875	615	169	84.6	59.6
19	50.2	37 e	36 e	32 e	26 e	33 e	51.9	156	896	577	164	86.1	57.5
20	48.9	38 e	33 e	32 e	24 e	31 e	58.0	158	906	573	167	86.7	59.6
21	49.9	37 e	33 e	32 e	28 e	31 e	62.5	153	933	571	174	83.1	48.7
22	49.8	39 e	36 e	31 e	32 e	32 e	63.7	140	937	535	178	81.2	54.7
23	53.0	39 e	28 e	26 e	34 e	33 e	65.1	140	821	492	175	78.8	60.1
24	52.1	37 e	30 e	28 e	31 e	33 e	71.7	132	724	464	165	79.2	60.4
25	52.0	30 e	34 e	30 e	31 e	33 e	74.9	134	681	440	144	80.9	57.6
26	49.5	22 e	31 e	31 e	31 e	33.7	87.0	144	671	416	135	82.4	63.6
27	51.0	43 e	32 e	34 e	30 e	35.5	104	156	710	396	126	80.6	58.7
28	47.9	44 e	25 e	33 e	29 e	38.6	105	155	797	381	124	91.1	47.9
29	48.1	38 e	20 e	27 e		41.1	102	147	903	357	122	84.0	56.3
30	54.3	35 e	28 e	28 e		38.0	94.4	142	989	344	122	76.2	44.9
31	49.5		29 e	33 e		34.9		147		329	118		65.3
<b>TOTAL</b>	1554	1145 e	947 e	1004 e	837 e	980 e	1713	3779	21010	20126	6792	2848	1915
<b>MEAN</b>	50.1	38 e	31 e	32 e	30 e	32 e	57.1	122	700	649	219	94.9	61.8
<b>MAX</b>	54.3	47 e	38 e	39 e	36 e	41 e	105	195	989	1066	334	130	75.2
<b>MIN</b>	47.2	22 e	13 e	26 e	20 e	18 e	34.9	75.7	173	329	118	76.2	44.9
<b>AC-FT</b>	3,083	2,271 e	1,878 e	1,991 e	1,661 e	1,943 e	3,397	7,496	41,673	39,921	13,472	5,650	3,798

**INSTANTANEOUS MEASUREMENTS**

<b>MAX FLOW</b>	58.8					121	205	1080	1146	354	319	110
<b>DATE</b>	27-Oct					28-Apr	17-May	30-Jun	2-Jul	1-Aug	6-Sep	31-Oct
<b>MIN FLOW</b>	42.8					32.3	72.8	160	318	113	72.4	39.6
<b>DATE</b>	15-Oct					1-Apr	4-May	1-Jun	31-Jul	31-Aug	30-Sep	31-Oct

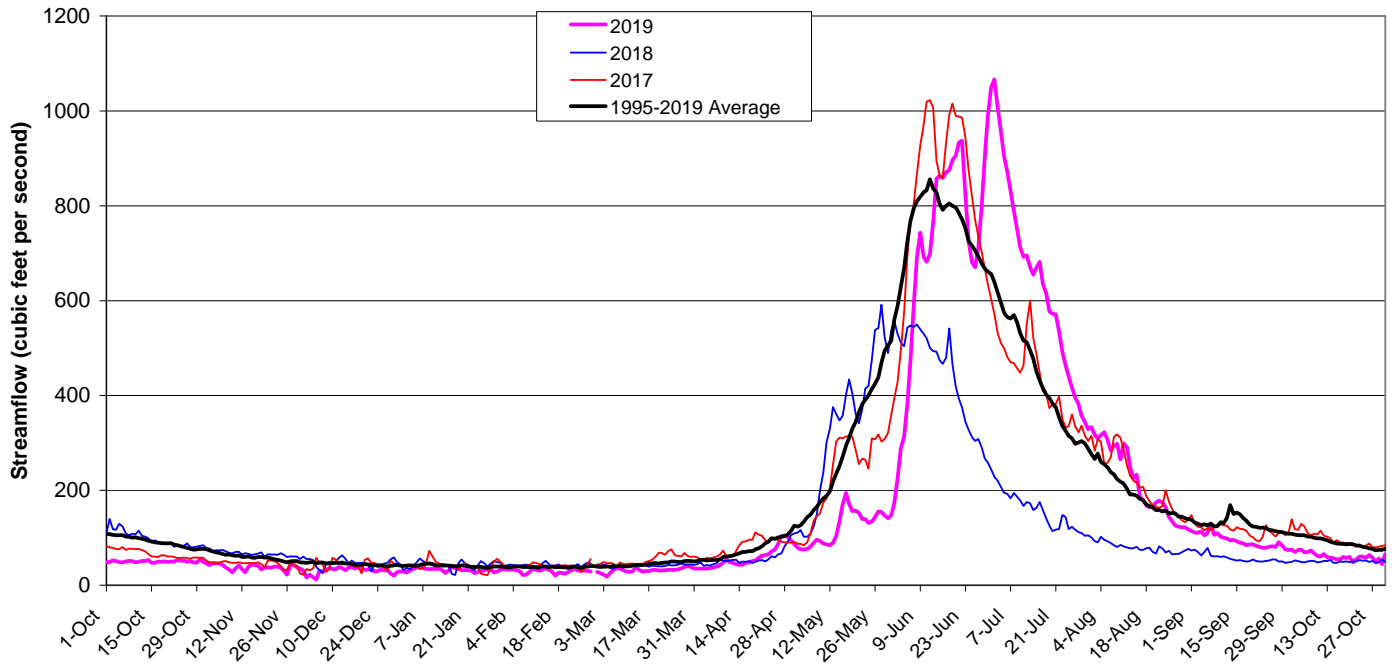
e = estimated during ice affected period using average ratio of CC-60 flow

p = partial data      NA = not available

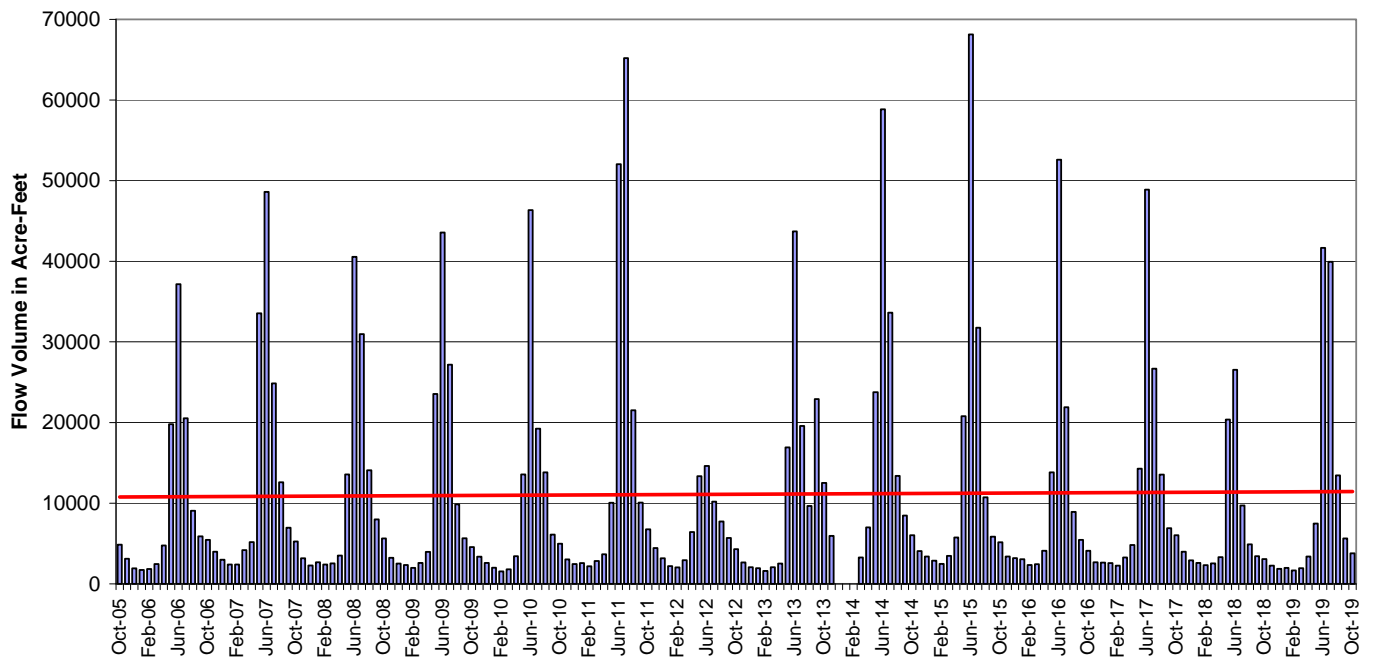


Clear Creek Consultants

**Clear Creek Mean Daily Streamflow by Water Year  
above Johnson Gulch near Kermitts (CC-40)  
Drainage Area = 267 square miles**




**Clear Creek above Johnson Gulch near Kermitts (Station CC-40)  
Monthly Flow Volume: 2006-2019**

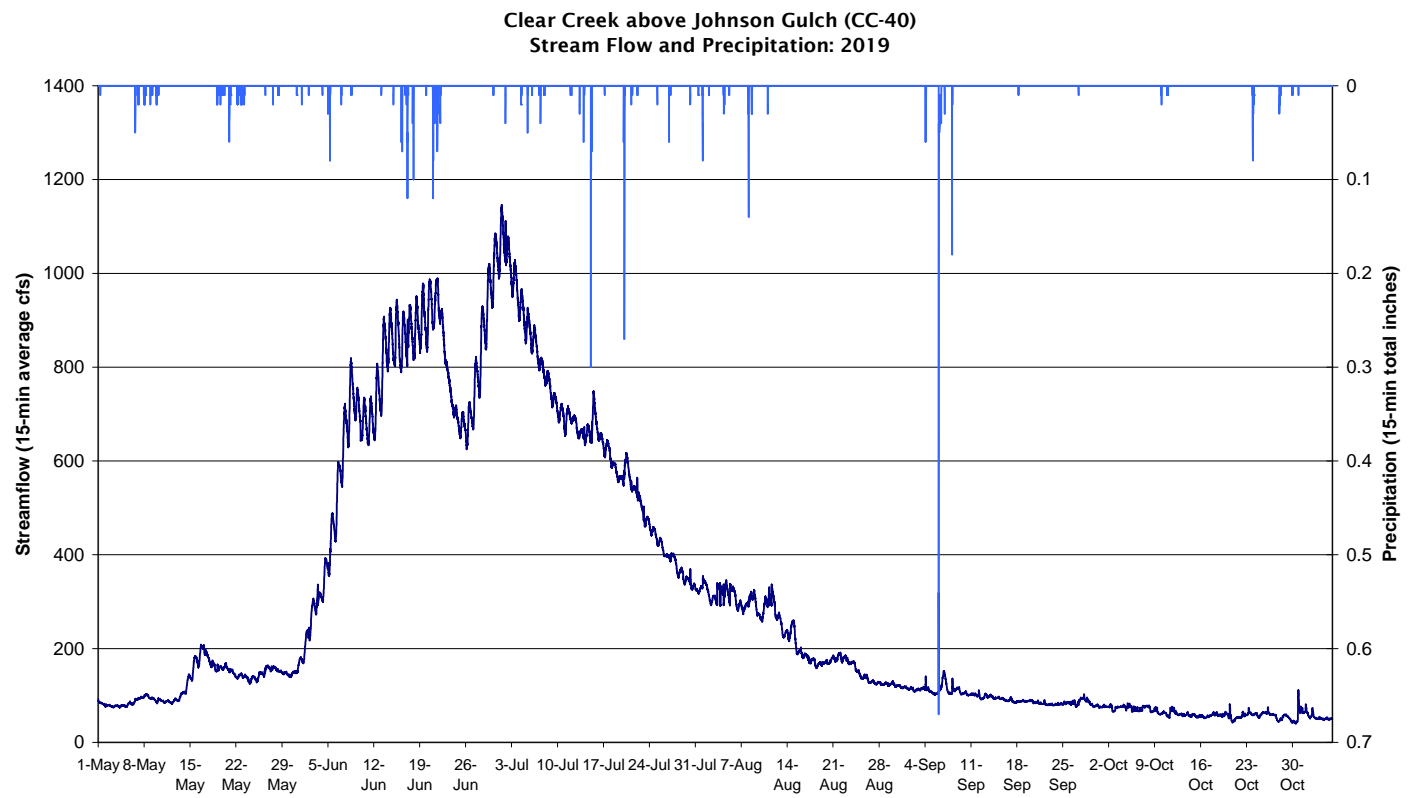
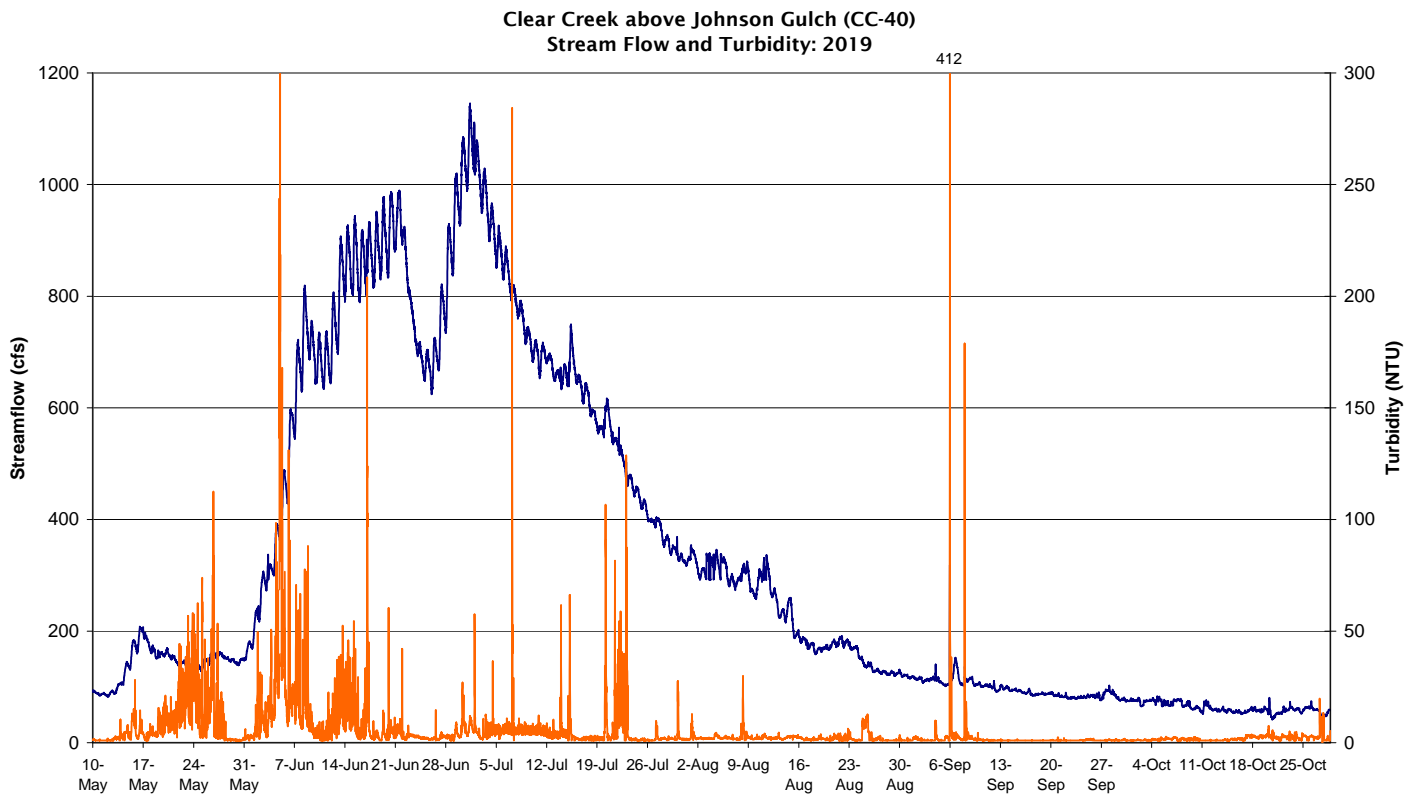


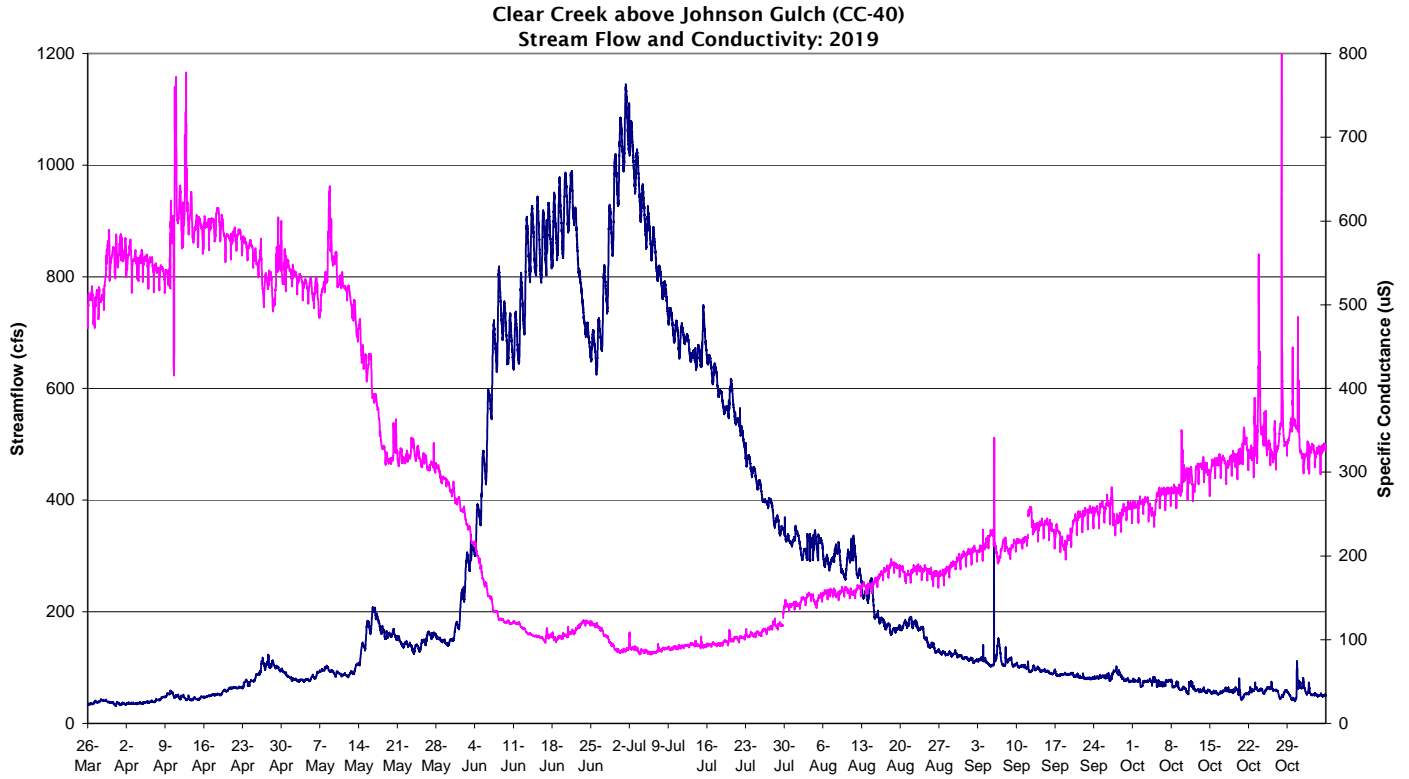
<b>CLEAR CREEK NEAR KERMITTS (Station CC-40)</b>	
<b>PROVISIONAL STREAMFLOW RATING TABLE</b>	
<b>GAGE HEIGHT</b>	<b>STREAMFLOW</b>
<b>(feet)</b>	<b>(cubic feet per second)</b>
3.3	31
3.4	38
3.5	46
3.6	57
3.7	73
3.8	86
3.9	102
4.0	120
4.1	141
4.2	165
4.3	191
4.4	222
4.5	256
4.6	295
4.7	294
4.8	318
4.9	342
5.0	368
5.1	395
5.2	424
5.3	454
5.4	485
5.5	518
5.6	553
5.7	589
5.8	627
5.9	667
6.0	709
6.1	752
6.2	797
6.3	844
6.4	894
6.5	945
6.6	998
6.7	1053
6.8	1111
6.9	1171
7.0	1233
7.1	1297
7.2	1364
7.3	1433
7.4	1505
7.5	1579

Streamgauge sponsored by the Upper Clear Creek Watershed Association

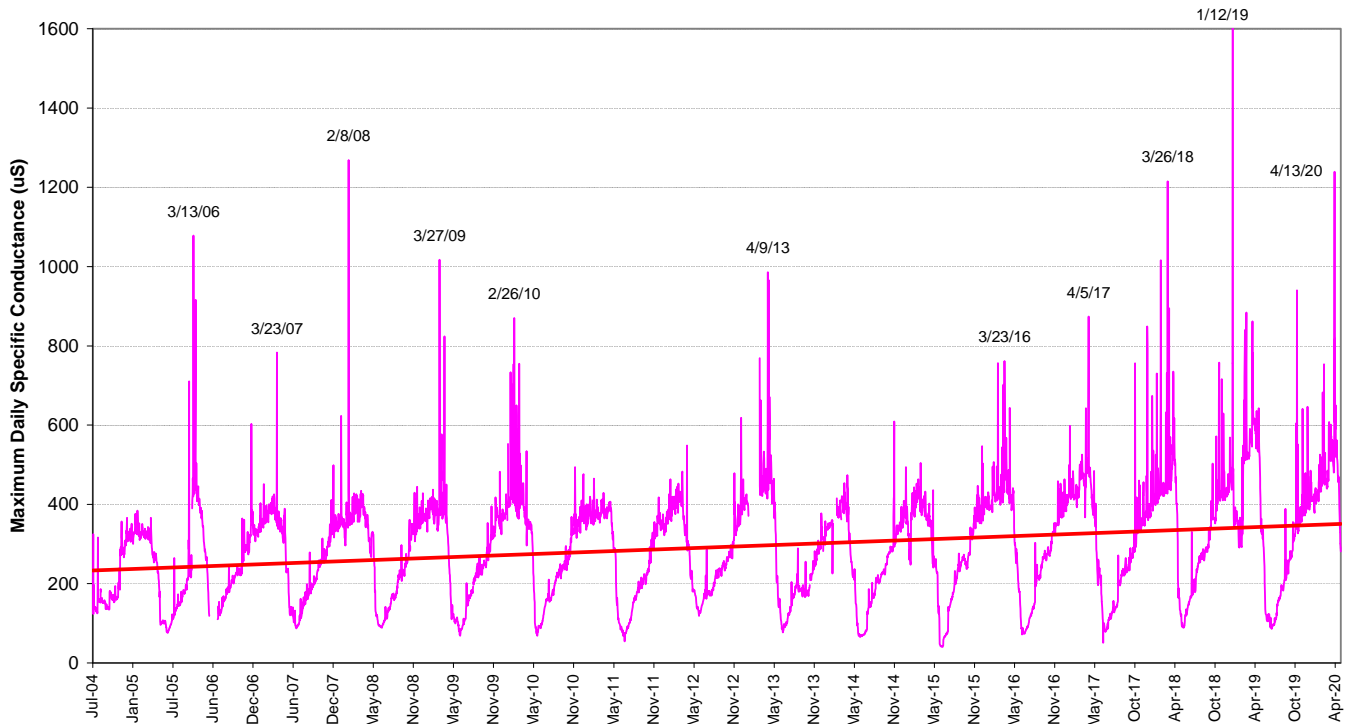
Operated by:  *Clear Creek Consultants*

Based on Rating No. 11





### Clear Creek above Johnson Gulch (CC-4) Specific Conductance Trend July 2004 to May 2020



**DAILY RAINFALL RECORDS (inches)**  
**CLEAR CREEK STATION CC-40 (above Johnson Gulch)**  
 Lat 39 44' 46.27" N Long 105 26' 9.19" W Elev. 7220 ft-MSL  
 YEARS: 2019, 2020, 2021

DATE	2019						2020						2021					
	MAY	JUN	JUL	AUG	SEP	OCT	MAY	JUN	JUL	AUG	SEP	OCT	MAY	JUN	JUL	AUG	SEP	OCT
1	0.01	0.02	0	0.17	0	0												
2	0	0.01	0.11	0.01	0	0												
3	0	0	0	0	0	0												
4	0	0.01	0.05	0.15	0.08	0												
5	0	0.31	0.09	0.01	0	0												
6	0	0	0.01	0	2.59	0												
7	0.2	0.03	0.07	0	0.04	0												
8	0.22	0	0.03	0.26	0.34	0												
9	0.16	0.02	0	0.09	0	0												
10	0.18	0	0	0	0	0.04												
11	0	0	0	0.09	0	0.09												
12	0	0	0.02	0	0.11	0												
13	0	0.01	0.05	0	0	0												
14	0	0	0.08	0	0	0												
15	0	0.03	0	0	0	0												
16	0	0.19	0	0	0	0												
17	0	0.34	0.01	0	0	0												
18	0	0.19	0	0	0.01	0												
19	0.12	0	0	0	0	0												
20	0.19	0.01	0.54	0	0	0												
21	0.52	0.5	0.04	0	0	0												
22	0.17	0.37	0.02	0	0	0												
23	0.4	0	0	0	0	0												
24	0	0	0	0	0	0.58												
25	0	0	0.02	0	0	0												
26	0.01	0	0	0	0	0												
27	0	0	0.09	0	0.01	0												
28	0.06	0	0	0	0	0.22												
29	0.02	0	0	0	0	0												
30	0	0.02	0.08	0	0	0.03												
31	0.02	0.02	0.02	0	0.01	0.01												
<b>TOTAL</b>	<b>2.28</b>	<b>2.06</b>	<b>1.33</b>	<b>0.78</b>	<b>3.18</b>	<b>0.97</b>	<i>NA</i>	<i>NA</i>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
<b>RainDays</b>	14	15	17	7	7	6			0	0	0	0	0	0	0	0	0	0
<b>MAX</b>	0.52	0.50	0.54	0.26	2.59	0.58	<i>NA</i>	<i>NA</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>X-2D</b>	0.71	0.87	0.58	0.35	2.63	0.58	<i>NA</i>	<i>NA</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>X-3D</b>	1.09	0.88	0.60	0.35	2.97	0.58	<i>NA</i>	<i>NA</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>DryDays</b>	17	15	14	24	23	25			0	0	0	0	0	0	0	0	0	0
<b>NA</b>	No data collected at raingauge / Not available																	
*	Rain gauge not present P partial data																	