



Colorado Department  
of Public Health  
and Environment



## UPPER CLEAR CREEK WATERSHED PLAN

*319-Grant Report – Phase-I Work Tasks*



*CDPHE-WQCD Purchase Order #OE FAA WQC05000024*

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*On Behalf of:*

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TDS Project Number 0405

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***Technical Memorandum***

Date: August 31, 2005 (in progress)

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Subject: Completion Report (revised draft), Upper Clear Creek Watershed Plan – Phase-I  
Tasks, UCCWA 319 Grant #OE FAA WQC05000024  
*TDS Project No. 0405-10c/12*

The subject revised draft report text and Appendix E (WORD files) are attached as my most-recent Task 12 (seventh) deliverable as a Technical Memorandum to UCCWA and the 319-Grant Management Committee. If useful, I'll request that Chris Crouse have a few hard copies to distribute at the next UCCWA regular monthly meeting (Thursday, 9/8/05); however, I will not be present to provide a status oral report at this meeting. This deliverable compiles all previous watershed-plan components (1/12/05, 1/26/05, 2/25/05, 4/8/05, 6/22/05, and 7/29/05 deliverables). In this current deliverable, however, I've considered review comments (Appendix E, Anne Beierle) and also made some minor updates to the list of acronyms and references. The intent is that this Watershed Plan remains a dynamic and evolving document, with additions and replacement versions of various sections incorporated as they are completed and/or as revised/updated.

As was the case for the previously-submitted Task-1, Tasks-3/-4, Task 5, Tasks-6/-7, Tasks-8/-9 and Task 10 deliverables, the narrative for these tasks is short and to the point, in keeping with task-level budget limitations. We're still awaiting supplemental critical source-investigations' information for Tasks 6 and 7 that was planned as an Appendix D by R.L. Jones. Any final review comments on this latest deliverable, as well as my other deliverables, for incorporation into the evolving Watershed Plan, will be appreciated.

Files: UCC319/Task12FinalReport/TechMemoTask12(rev1).doc (below). With Executive Summary added. A revised Appendix E (skeleton TMDL; separate WORD file) also is provided. *[Appendix D, R.L. Jones' previous assignment for the planned Task 7a deliverable, still is pending; Appendix E (Skeleton TMDL, partial completion) is included herein for your further consideration.]*

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Appendix D – NPS Reductions and Controls [*R.L. Notes, Task 7b, in preparation? See guidance from TDS dated 2/17/05. No information nor deliverable has been received to date.*]

Appendix E – Skeleton TMDL, Upper Clear Creek Watershed Selected 303(d)-Listed Segments

Appendix F -- Public Input to Conceptual NPS Control Plan (Task 11, non-Grant)

### Acronyms

AMLP	abandoned mine land program (USFS)
ARAR(s)	applicable or relevant and appropriate requirement(s)
ARD	acid-rock drainage
BHCCSD	Black Hawk/Central City Sanitation District
BMP(s)	best management practice(s)
CC	(mainstem stream) Clear Creek
CCWF	Clear Creek Watershed Forum
CCWF	Clear Creek Watershed Foundation
CDLG	Colorado Division of Local Government
CDM	Camp Dresser & McKee (Superfund Site investigations)
CDMG	Colorado Division of Mines and Geology
CDOT	Colorado Department of Transportation
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health & Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	Colorado School of Mines
CWA	Clean Water Act
EE/CA	engineering evaluation and cost analysis
HMWMD	Hazardous Materials & Waste Management Division (of CDPHE)
lbs/d	pound(s) per day
LRCWE	Leonard Rice Consulting Water Engineers (UCCWA library)
ug/L	micrograms per liter
mg/L	milligrams per liter
MOS	margin of safety
NFCC	North Fork Clear Creek
NPS	nonpoint source
OSCs	on-site coordinators (USFS-AMLP)
PA	preliminary assessment (USFS-AMLP)
(P)COC	(potential) contaminant of concern
PAI(s)	potentially affected interest(s)

### Acronyms (*concluded*)

PRG(s)	preliminary remediation goal(s)
PRP	potentially responsible party
PS(s)	point source(s)
RAO	remedial action objective
ROD	Record of Decision
SFCC	South Fork Clear Creek
SLCs	Standley Lake Cities
SOW	scope of work
SS(s)	stream segment(s)
START	Superfund Technical Assistance Response Team (USEPA)
SDWA	Safe Drinking Water Act
TDS	TDS Consulting Inc.
TM(s)	trace metal(s)
Temp Mod(s)	temporary modifications (standards)
Tt-RMC	Tetra Tech – Rocky Mountain Consultants
TVS(s)	table value standard(s)
UCC	upper Clear Creek (stream)
UCCWA	Upper Clear Creek Watershed Association
US	underlying (equation-based) standard; ultimate target(s), site-specific
USACOE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
WFCC	West Fork Clear Creek
WQCD	Water Quality Control Division (of CDPHE)
WQS(s)	water-quality standard(s)
WTP(s)	water-treatment plant(s)
WWTP(s)	wastewater treatment plant(s)
WY	water year (beginning on October 1 and ending on September 30)

## *Executive Summary*

Several stream segments from the Clear Creek watershed are on the proposed 2004 303(d) list of impaired waters; most of these segments have been listed since 1998. Five of these segments are the subject of the Section-319 grant request for the upper Clear Creek watershed considered in this study report: §2 (Mainstem of Clear Creek from Silver Plume to the Argo Tunnel), §5 (West Fork of Clear Creek), §9a (Fall River), §11 (Mainstem from the Argo Tunnel to Farmers Highline Canal), and §13(b) (Lower portion of the North Fork). All of these segments are listed for violations of the zinc standard; segments 2, 5, and 9a are in nonattainment of the copper standard, and segments 11 and 13(b) exceed the cadmium standard. The water-quality standards for these stream segments currently consist of various table value standards, site-specific standards, and/or temporary modifications, depending on the segment. Adopted beneficial uses for these segments include aquatic life cold water class 1, recreation class 1a, water supply, and agricultural uses. Ambient levels of key trace metals adversely impact aquatic life in several of the watershed's streams, as well as drinking-water supplies downstream. Clear Creek supplies water to over 300,000 residents in the metropolitan Denver area. The metals in streamflow originate primarily from nonpoint sources, including numerous abandoned or inactive mines, mine/mill tailings, and waste-rock piles located throughout the watershed. Several, but not all, of these sources have been remediated or are scheduled to undergo remediation through Superfund (CERCLA) or other funding sources.

The overall goal of this Upper Clear Creek Watershed Plan is to provide a basic framework for the development of nonpoint-source controls such that currently applicable or ultimate (underlying) stream standards for key trace metals of concern can be met. This initial (Phase-I) Plan addresses five of the nine USEPA-recommended elements (called herein watershed-plan components); a subsequent study-phase is proposed to complete the Watershed Plan for remaining elements and for other water-quality variables of concern.

An extensive compilation and assessment of streamflow trace-metals data from several sources were completed in order to quantify the non-attainment of various current stream standards as well as to develop and compare conditions with seasonal (high-flow/low-flow) stream standards for the several stream segments of concern (Table 1-1). The delineation of non-attainment of the proposed seasonal standards is given in Table 1-3 and accompanying Figure 1-2.

Highlights of this Phase-I project effort for this Upper Clear Creek Watershed Plan are summarized by watershed-plan component as follows:

*Identification of trace-metals sources and causes that potentially need to be controlled.*—Fortunately, a number of technical field investigations and studies have been completed in this watershed. Through resultant data and information, the numerous sources and causes of elevated key trace-metals concentrations have been inventoried and summarized for this Plan (see Section 2 and associated tables). As a critical part of this inventory and summary, prioritization and ranking of more critical sources have been included, for consideration in subsequent watershed-plan components' analyses.

*Estimation of trace-metals loads reductions from planned CERCLA work and additional NPS measures.*—High-priority areas identified in the watershed for consideration of remediation for achieving WQ stream-standard targets consist of the North Fork Clear Creek subwatershed and

Virginia Canyon (see Section 3). Moderate-priority area consist of the Georgetown-to-Idaho Springs area and the Silver Plume area, both along the mainstem Clear Creek (including key tributaries). Overall, in the mainstem Clear Creek in downstream stream-segment (SS) 11, estimate effective TMs loads' removal is estimated to be more than 80 percent for Cu and in the range of 30-50 percent for Zn. Estimated removal rates for Cd are suspect, due to small source-generated loads and inability to depict relative mobility of this TM relative to Cu and Zn, that are more affected by stream-channel sediments.

Needed NPS management measures needed to implement the trace-metals loads reductions.— Further evaluation was made of NPS-management measures, with the goal of meeting existing or ultimate stream standards (Section 4). This evaluation was conducted on the basis of individual stream segments and the previously identified seasonal water-quality standards' exceedances. Given the anticipated TMs loads reductions, ambient low-flow stream standards would be attained for SS 2 (Cu; upper Clear Creek), SS 13b (Cd, Cu, and Zn; North Fork Clear Creek), and SS 11 (Zn; lower Clear Creek). Stream standards would not be achieved for SS 2 (Zn, low-flow season), SS 9a (Cu, Fall River, high-flow season), and SS 9b (Cd, Cu, and Zn, Trail Creek, high-flow season). For the more-stringent ultimate (underlying) stream standards, only the Cu target for SS 2 (upper Clear Creek) would be attained, and all other standards would not be fulfilled assuming the currently planned remedial actions for reducing TMs loads (Section 4).

Preliminary estimates of technical and financial (costs) assistance needed to implement this Plan.— For the Superfund's OU4 preferred remediation alternative (4B, involving predominately the North Fork Clear Creek subwatershed), capital costs of \$11.8 million and O&M costs of nearly \$11.5 million (annualized, \$926,000) were estimated. Preliminary engineering-design work for high-priority components is currently proposed. For the Virginia Canyon area, remediation work is underway during the 2005 summer season. For completed remediation projects and several proposed future efforts, estimated costs were included in UCC-WAG (2001, Table B-1). Various sources of technical support and financial assistance have been inventoried (Section 10).

Enhancement of public understanding of this conceptual Plan through public meeting(s) and continued participation in selection/design of NPS implementation measures.-- A presentation overview of this Plan's findings and recommendations is planned as part of the *Clear Creek Watershed Forum 2005 – Creating a Sustainable Future*, scheduled for September 27, 2005. A wide audience is being sought for participating in this Forum. During work-group sessions at this Forum, the general public and various stakeholders will have the opportunity to express opinions on materials presented as well as to help to prioritize various watershed concerns. Appendix F of this Plan will provide details of the results of this scheduled Forum, and it will be summarized in Section 5.

Recommended TMs-related actions, based upon results documented to date in this Plan, include the following:

- Further WQ characterization of Trail Creek is warranted (Sections 1 and 3). The existing data are limited and it appears that this tributary is a significant TMs contributor to the mainstem Clear Creek (SS 2 and downstream).

- Further characterization of TMs loads contributed from a set of waste-rock piles representing a range of mineralogy, areal location, age, and other conditions. This would improve or provide a technically-sound basis for estimating TMs load reductions. Priority should be given to high-ranked areas of Virginia Canyon and the North Fork Clear Creek (Section 3).
- Re-evaluation of assumed TMs-loads reductions for PSs (treatment facilities) and waste-rock piles (see previous item), as well as other critical NPS areas.
- Additional monitoring-related work, including source-area site characterizations, might be considered (Section 4).
- Further evaluation of review/assessment work and TMs-reduction comparisons reported in this Plan should be made with relevant profiles developed by various Medine modeling studies (Section 4).

As was mentioned previously, this Plan currently includes only the Phase-I work tasks identified in the 319-grant award under a proposal submitted by the Upper Clear Creek Watershed Association (UCCWA) and approved under this contract by the CDPHE-WQCD. The remaining USEPA watershed-plan elements not yet addressed by this Plan should be completed; UCCWA plans to take action on including these aspects in the Plan during 2006. In addition, because this Plan focuses on stream standards and associated impaired segments involving only trace-metals concentrations, the Plan should be enhanced to address other water-resources and water-quality issues facing UCCWA and the watershed's stakeholders.