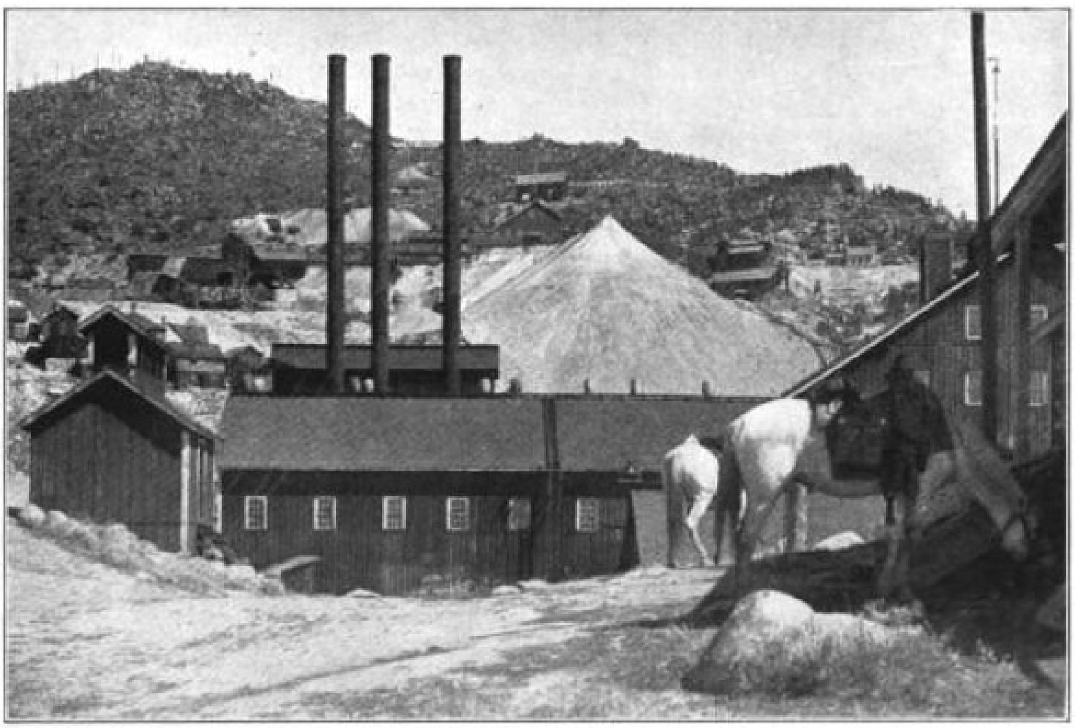
Final –
Addendum to Flint Creek Planning Area Sediment and Metals TMDLs and Framework Water Quality Improvement Plan



B. GRANITE-BIMETALLIC MINE, SHOWING WEATHERING OF GRANITE.

May 2015

Steve Bullock, Governor
Tom Livers, Director DEQ

Document Number C02-TMDL-01a-aF

(The cover image is Plate VII B from: Geology and Ore Deposits of the Philipsburg Quadrangle Montana, United States Geologic Survey Professional Paper 78, by W.H. Emmons and F.C. Calkins. 1913.)

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ACRONYM LIST

Acronym	**Definition**
AML	Abandoned Mine Lands
ARCO	Atlantic Richfield Company
ARM	Administrative Rules of Montana
BLM	Bureau of Land Management (Federal)
BMP	Best Management Practices
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWA	Clean Water Act
DEQ	Department of Environmental Quality (Montana)
DNRC	Department of Natural Resources & Conservation (Montana)
EPA	Environmental Protection Agency (U.S.)
FWP	Fish, Wildlife & Parks (Montana)
GIS	Geographic Information System
LA	Load Allocation
MCA	Montana Code Annotated
MOS	Margin of Safety
MPDES	Montana Pollutant Discharge Elimination System
NHD	National Hydrography Dataset
NPL	National Priorities List
NRDP	Natural Resource Damage Program (Montana Dept. of Justice)
OSM	Office of Surface Mining Reclamation and Enforcement
PMA	Philipsburg Mining Area
RIT/RDG	Resource Indemnity Trust/Reclamation and Development Grants Program
SMCRA	Surface Mining Control & Reclamation Act
TMDL	Total Maximum Daily Load
TPA	TMDL Planning Area
UCFRB	Upper Clark Fork River Basin
USFS	United States Forest Service
USGS	United States Geological Survey
WLA	Wasteload Allocation
WRP	Watershed Restoration Plan

DOCUMENT SUMMARY

This document presents a Total Maximum Daily Load (TMDL) for one stream in the Flint Creek TMDL planning area: Douglas Creek (**Figure 1-1**). There are two streams named Douglas Creek in the Flint Creek TMDL planning area; this report focusses on the one south of Phillipsburg (assessment unit ID: MT76E003_100). This document is presented as an addendum to the 2012 TMDL document *Flint Creek Planning Area Sediment and Metals TMDLs and Framework Water Quality Improvement Plan* (Montana Department of Environmental Quality, 2012a). The parent document will hereto forward be referenced as "DEQ, 2012a". This addendum contains one TMDL addressing a metals impairment that was not addressed in the parent document (Montana Department of Environmental Quality, 2012a). The antimony impairment was not identified until January 2014, although the water quality data on which the impairment determination is based were collected in support of the parent document (Montana Department of Environmental Quality, 2012a).

The Montana Department of Environmental Quality (DEQ) develops TMDLs and submits them to the U.S. Environmental Protection Agency (EPA) for approval. The Montana Water Quality Act requires DEQ to develop TMDLs for streams and lakes that do not meet, or are not expected to meet, Montana water quality standards. A TMDL is the maximum amount of a pollutant a waterbody can receive and still meet water quality standards. TMDLs provide an approach to improve water quality so that streams and lakes can support and maintain their state-designated beneficial uses.

The Flint Creek TMDL planning area (TPA) encompasses an area of approximately 500 square miles in western Montana, and lies almost entirely in Granite County with a small portion in Deer Lodge County. The Flint Creek watershed originates in the Flint Creek Mountains to the east, the Pintler Mountains to the south, and the Sapphire and John Long Mountains to the west. Flint Creek drains from Georgetown Lake and bisects two large agricultural valleys, the Philipsburg Valley and the Drummond Valley, which are separated by a narrow bedrock canyon. Flow in Flint Creek is seasonally augmented from a trans-basin diversion in the East Fork of Rock Creek. Approximately 2,200 residents reside within the Flint Creek TPA. Philipsburg (pop. 911) and Drummond (pop. 315) are the largest towns. Other population centers include Hall and Maxville. Land ownership in the Flint Creek TPA is primarily private and U.S. Forest Service (Beaverhead-Deer Lodge National Forest), with a small amount of land managed by Bureau of Land Management (BLM) or the State of Montana. Private lands are located predominantly in the lower areas where wide, low-gradient valleys are conducive to agriculture and development.

The Douglas Creek watershed extends over approximately 6.4 square miles southeast of Phillipsburg. The watershed is steep and forested, although small timber cuts are evident on aerial photographs. The watershed is drained by Douglas Creek and its tributary, Frost Creek. Elevations range from 8,041 feet above sea level on the top of Granite Mountain to approximately 5,120 feet at the mouth of Douglas Creek. There are limited tracts of federal land, both United States Forest Service (USFS) and Bureau of Land Management (BLM). The majority of the Douglas Creek watershed (84%) is privately owned, due to extensive historic mining activity. While there are many historic mines in the watershed, the Granite-Bimetallic is the largest and most historically significant (Montana Department of Environmental Quality, 2009).

The scope of this addendum is limited to the antimony impairment identified for Douglas Creek. The waterbody, impairment cause, and impaired use are summarized below in **Table DS-1**.

Table DS-1. Completed Metals TMDL Contained in this Document

Waterbody and Location Description	TMDL Prepared	TMDL Pollutant Category	Impaired Use
Douglas Creek, from headwaters to where stream ends, T7N R14W S25	Antimony	Metals	Drinking Water

The assessment unit for Douglas Creek was based upon the National Hydrography Dataset (NHD), which depicts Douglas Creek expiring in the alluvial fan south of Philipsburg. However, Douglas Creek flows to Flint Creek, via natural channel and ditch diversions. As of this writing, DEQ is pursuing corrections to both the NHD and DEQ's assessment unit description. Douglas Creek is shown flowing to Flint Creek in all figures in this document. The flowline is based upon recent aerial photographs.

Antimony TMDL

One antimony TMDL is provided for Douglas Creek. The parent document (Montana Department of Environmental Quality,2012a) contains arsenic, cadmium, copper, iron, lead, mercury, and zinc TMDLs for Douglas Creek, but at the time those TMDLs were prepared, the antimony impairment had not been identified. Data collected in 2007, 2008, 2009, and 2011 verified the antimony impairment for Douglas Creek and this impairment was added to the 303(d) list in 2014.

This document establishes an antimony water quality target of 5.6 µg/L, based on the human health standard. The antimony TMDL for any given streamflow may be calculated as:

$$\text{TMDL in pounds/day} = (\text{flow in cubic feet/second}) * 5.6\ \mu g/L * 0.0054$$

This document quantifies metals loads from natural background (geologic) sources and abandoned mining sources. The antimony TMDL for Douglas Creek therefore includes the following terms:

$$TMDL_{Douglas} = WLA_{ABDM} + LA_{natural}$$

TMDLs are based on the most stringent water quality target and the streamflow. The TMDL applies to any point along the waterbody and therefore protects uses along the entire stream. Necessary reductions in antimony loads range from 20% to 0%. Reductions are not required under low flow conditions, as no antimony standard exceedances were identified during low flows. Reductions will mostly depend upon abandoned mine cleanup activities. State and federal programs, as well as potential funding resources to address metals sources are summarized in **Section 9.0** of the parent document.

Water Quality Improvement Measures

Implementation of most water quality improvement measures described in this plan will depend on state or federal agency abandoned mine cleanup actions.

A flexible approach to most TMDL implementation activities may be necessary as more knowledge is gained through implementation and future monitoring. The plan includes a monitoring strategy designed to track progress in meeting TMDL objectives and goals and to help refine the plan during its implementation.

1.0 Project Overview

This document is an addendum to the 2012 TMDL document *Flint Creek Planning Area Sediment and Metals TMDLs and Framework Water Quality Improvement Plan* (Montana Department of Environmental Quality, 2012a). This addendum includes an analysis of water quality data and establishes a TMDL for antimony in Douglas Creek. The location of Douglas Creek relative to the Flint Creek TMDL Planning area is shown in **Figure 1-1**.

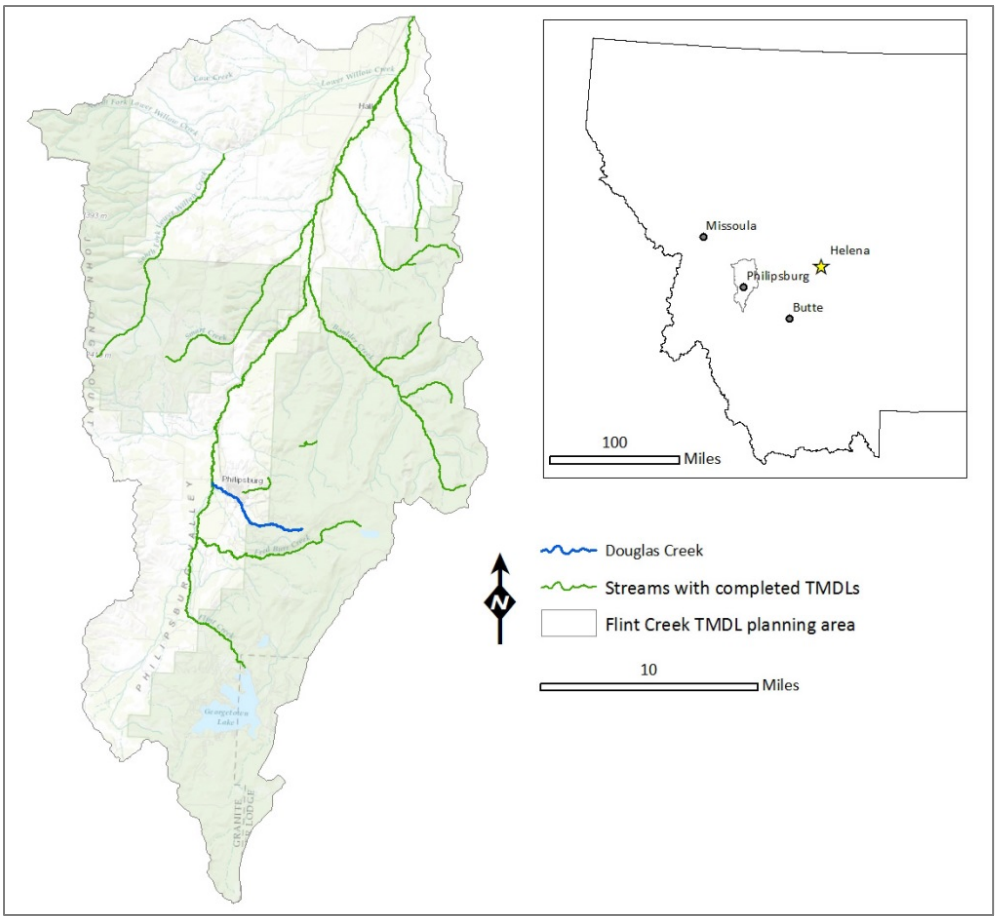

Figure 1-1. Douglas Creek and streams with approved TMDLs in the Flint Creek TPA

1.1 Water Quality Impairments and TMDLs Addressed by this Document

Table 1-1 below identifies the impairment cause from the "2014 Water Quality Integrated Report" (Montana Department of Environmental Quality, 2014) that is addressed in this document.

One antimony TMDL is provided for Douglas Creek (**Table 1-1**). The parent document (Montana Department of Environmental Quality, 2012a) contains arsenic, cadmium, copper, iron, lead, mercury, zinc, and sediment TMDLs for Douglas Creek, but at the time those TMDLs were prepared, the antimony impairment had not been identified. Data collected in 2007, 2008, 2009, and 2011 established the antimony impairment for Douglas Creek and this impairment was added to the 303(d) list in 2014.

Table 1-1. Water Quality Impairment Causes for the Flint Creek TPA Addressed within this Document

Waterbody and Location Description*	Waterbody ID	Impairment Cause	Pollutant Category	Impairment Cause Status	Included in 2014 Integrated Report
Douglas Creek, from headwaters to where stream ends, T17N R14 W S25	MT76E003_100	Antimony	Metals	Antimony TMDL completed	Yes

* All waterbody segments within Montana's Water Quality Integrated Report are indexed to the National Hydrography Dataset. The NHD description for Douglas Creek is incorrect, as it flows to Flint Creek. DEQ is in the process of updating this description.

1.2 What this Document Contains

This document addresses all of the required components of a TMDL and includes an implementation and monitoring strategy. The TMDL components are summarized within the main body of the document. Additional technical details are contained in the appendices. In addition to this introductory section, this document includes:

Section 2.0 Douglas Creek watershed description:
Describes the physical characteristics and social profile of the watershed.

Section 3.0 Montana Water Quality Standards:
Discusses the water quality standards that apply to Douglas Creek.

Section 4.0 Defining TMDLs and Their Components:
Defines the components of a TMDL and how each is developed.

Sections 5.0 Metals TMDL Components:
This section includes (a) a discussion of the affected waterbody and the pollutant's effect on designated beneficial uses, (b) the information sources and assessment methods used to evaluate stream health and pollutant source contributions, (c) water quality targets and existing water quality conditions, (d) the quantified pollutant loading from the identified sources, (e) the determined TMDL for the waterbody, (f) the allocations of the allowable pollutant load to the identified sources.

Section 6.0 Water Quality Improvement Plan:
Discusses water quality restoration objectives and a strategy to meet the TMDL.

Section 7.0 Monitoring for Effectiveness:
Describes a water quality monitoring plan for evaluating the long-term effectiveness of the TMDL and pollutant allocations presented in this document.

Section 8.0 Public Participation & Public Comments:
Describes other agencies and stakeholder groups who were involved with the development of this plan and the public participation process used to review the draft document. Addresses comments received during the public review period.

2.0 Douglas Creek Watershed Description & Source Assessment

Please refer to the watershed description in the parent document for an overview of physical, ecological, and social context of the Flint Creek TPA (Montana Department of Environmental Quality, 2012a). Selected attributes of the Douglas Creek watershed are summarized below.

2.1 Douglas Creek Watershed Description

The Douglas Creek watershed extends over approximately 6.4 square miles southwest of Phillipsburg. The watershed is steep and forested, although small timber cuts are evident on aerial photographs. The watershed is drained by Douglas Creek and its tributary, Frost Creek. Elevations range from 8,041 feet above sea level on the top of Granite Mountain to approximately 5,120 feet at the mouth of Douglas Creek (**Figure 2-1**).

Douglas Creek flows approximately 5.43 miles to Flint Creek. The creek is diverted into a wooden flume for about 0.6 miles around reclaimed Bimetallic Mill tailings (**Attachment A**).

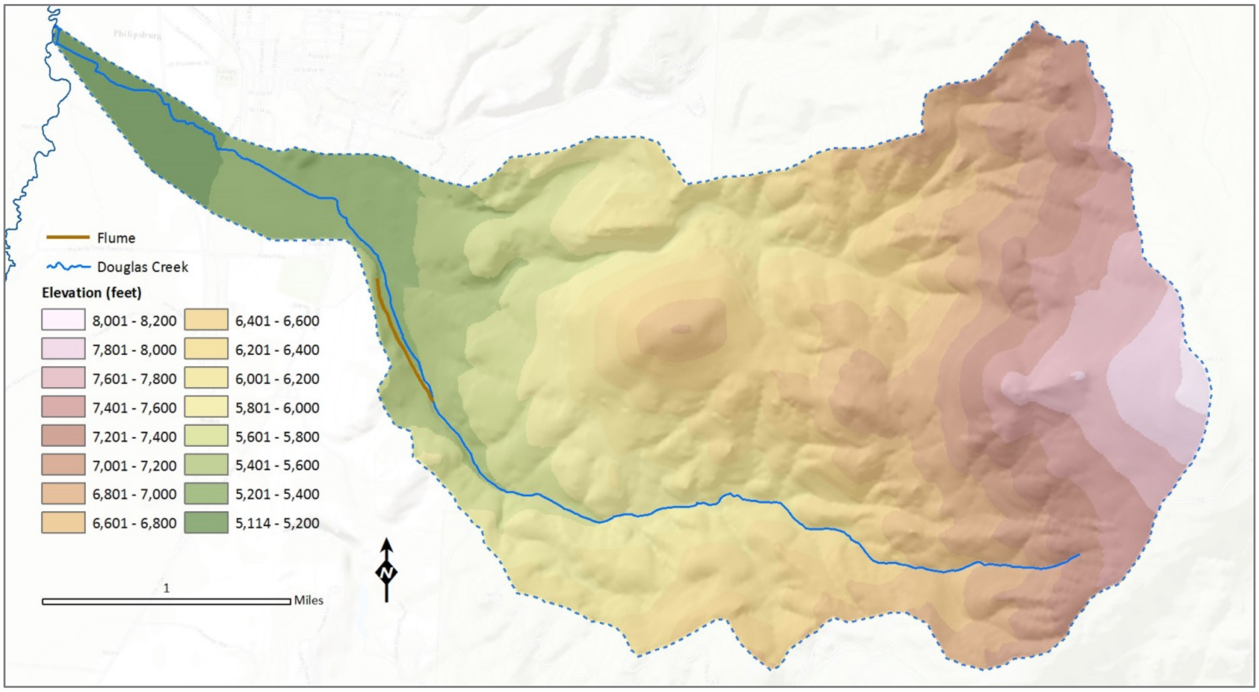

Figure 2-1. Topography of the Douglas Creek watershed

There are limited tracts of federal land, both USFS and US BLM. The majority of the Douglas Creek watershed (84%) is privately owned, due to the extensive historic mining activity (**Figure 2-2**).

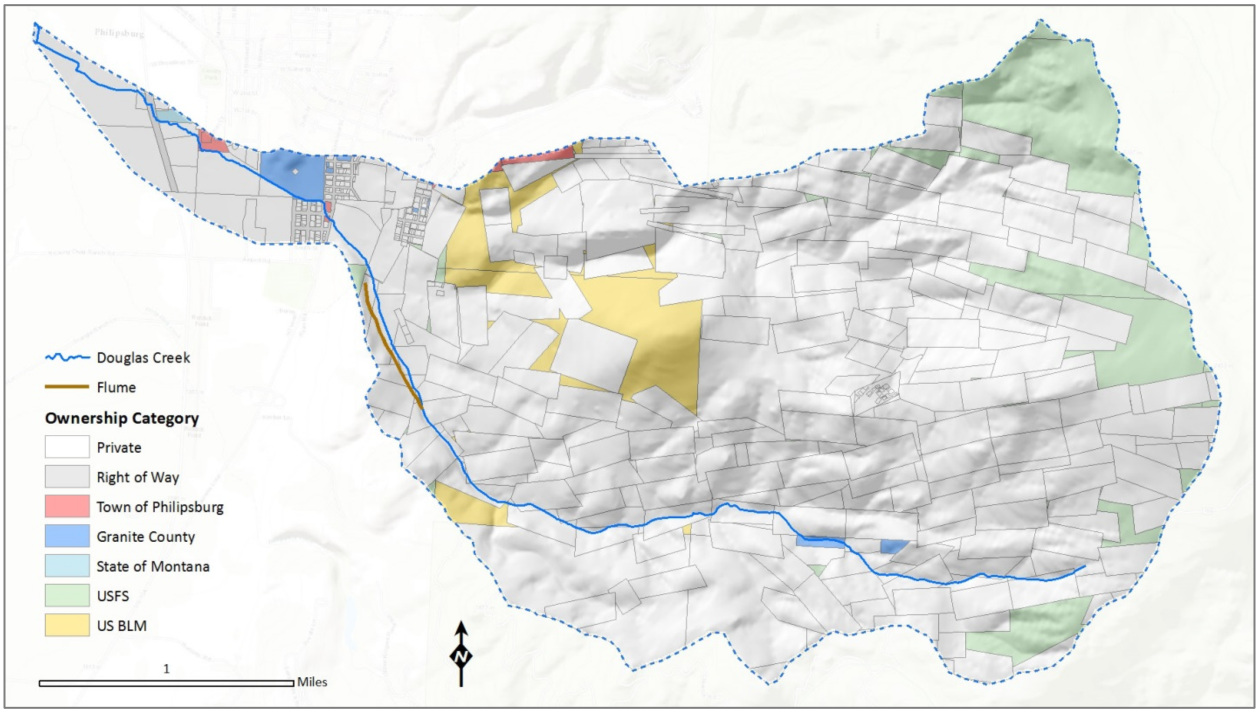

Figure 2-2. Property ownership within the Douglas Creek watershed

2.2 Douglas Creek Metals Sources

Identified metals sources in the Douglas Creek watershed include the native geology and sites related to historic mining activity that expose these rocks to accelerated weathering.

2.2.1 Geology

Antimony is a natural component of the local geology. The lode mines in the Douglas Creek watershed worked veins that were noted for antimony-bearing minerals, particularly stibnite and tetrahedrite (Emmons and Calkins, 1913; Sanford et al., 1917; Emmons, 1917; Prinz, 1967; Koschmann and Bergendahl, 1968). The antimony-bearing minerals are generally confined to veins within the granitic rocks of the Philipsburg batholith (Prinz, 1967). An example analysis of ore from the Bimetallic mine is provided below in **Figure 2-3**, taken from Emmons and Calkins (1913). The percent antimony (Sb) is reported as 0.13%.

Analysis of mill run, Bimetallic mill, Jan. 29, 1905.

[E. E. Blumenthal, analyst.]

SiO_2	75.70
Fe	4.30
S	4.40
Mn	1.71
Pb	1.20
Zn	.85
Cu	.14
MgO	.5
As	.21
Sb	.13
Na	.11
K	.06
CaO	.1
Au and Ag	.12
Silver ....ounces	36.12
Gold	$1.60

Figure 2-3. Example analysis of ore from the Bimetallic mine (Emmons and Calkins, 1913, page 204)

As antimony is naturally present in some of the mineralized zones, it is likely that low concentrations of antimony were present in Douglas Creek prior to the onset of mining. However, mining and milling ore results in exponentially-greater rates of weathering (and subsequent loading to surface water). Mine workings expose mineral-rich rock to (near) atmospheric conditions, and mine workings function as drains for groundwater in overlying rock. This increases the flow of water through veins and fractures. Water within mines washes over exposed rock much faster than native groundwater flows through undisturbed rock. Water draining from mine adits transports metals and other constituents to the surface, and sometimes to surface water. Milling ore into fine particles increases the surface area to volume ratio. Mill tailings on the surface are exposed to rain, snowmelt, and surface water, and constitute another mining-related metals source. See Stiller (2000) for an accessible but in-depth overview of environmental issues related to historic metals mining.

2.2.2 Historic Mining

The lode mines in the Douglas Creek watershed were notable producers of silver and gold. The Granite Mountain Mine was for a time the most productive silver mine in the US (Emmons and Calkins, 1913). Although precious metals production largely ceased by the middle of last century, the district was the only domestic source of natural dry cell battery grade manganese oxide. The district became an important source of manganese oxide during World War I, and production continued into the 1960s (Prinz, 1967). The history of mining in the Philipsburg area, and the Douglas Creek watershed in particular, is long and fascinating, and well-summarized in DEQ's abandoned mine historic narratives (Montana Department of Environmental Quality, 2009).

Montana's abandoned mine lands (AML) program has identified nine priority abandoned mine sites in the watershed, shown below in **Figure 2-4** (Pioneer Technical Services, Inc., 1995). Two of these are near the ghost town of Granite: Granite Mountain and Bimetallic/Old Red. Several priority abandoned mine sites related to these two mines are located on the Douglas Creek valley bottom: Douglas Creek waste areas and extensive waste from Bimetallic Mill. Still other priority sites are located in or near Frost Creek, a tributary to Douglas Creek: Algonquin, Little Gem, Trout, Wenger #2 (refer to Appendix A, Figure A-18 in the parent document). The Douglas Creek tunnel (referred to as the Granite Drain in the parent document) is a long adit that was opened in 1896 to simplify working the consolidated Granite

Mountain and Bimetallic Mines. This adit drains metals-laden water from the Granite-Bimetallic workings to Douglas Creek (Montana Department of Environmental Quality, 2012a) (**Attachment A**).

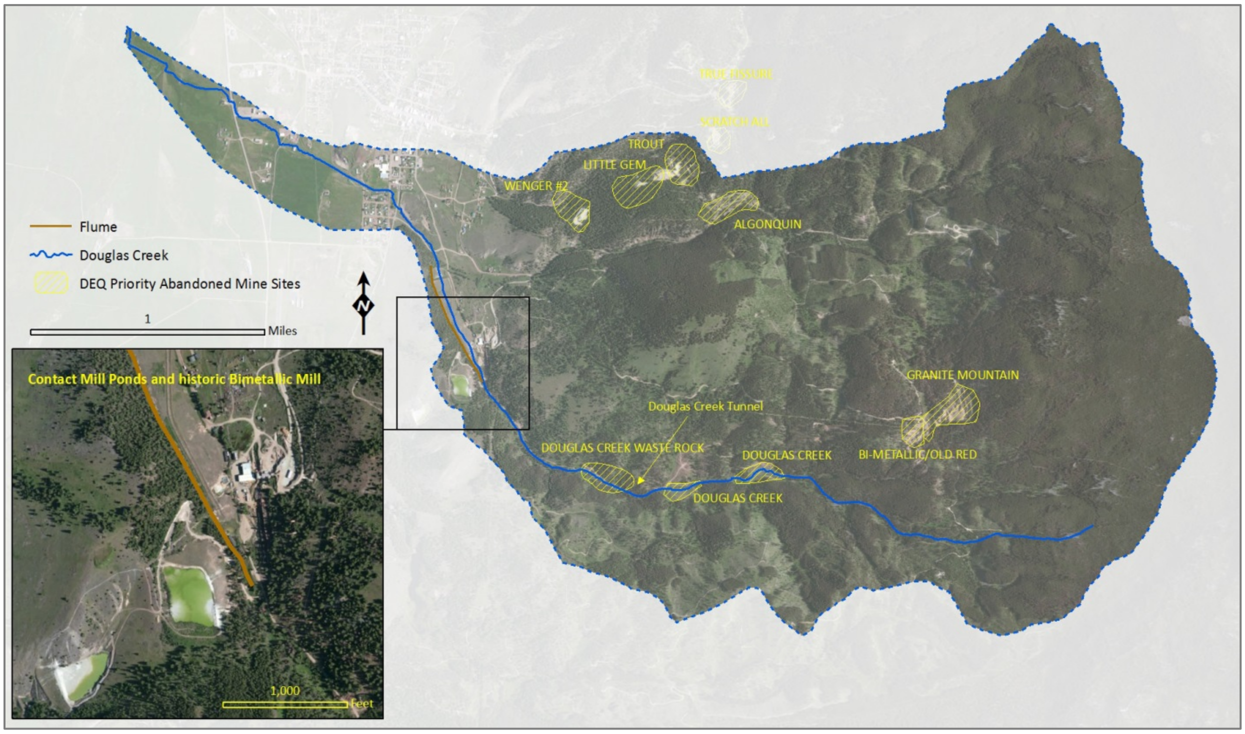

Figure 2-4. Mining-related features in the Douglas Creek watershed

In 2000, Montana DEQ reclaimed the Douglas Creek Tailings priority site by placing the tailings in lined repositories and covering them with a geomembrane. This effort also moved the stream to flow around the repositories. Historic Bimetallic Mill tailings cover an area of about 600,000 square feet near the mouth of the Douglas Creek valley and may have been partially reclaimed in the 1980s as a condition of the original Contact Mill permit (Montana Department of Environmental Quality, 2012a). Little information can be found about this reclamation effort. The stream enters a wooden flume for diversion around a portion of the Bimetallic Mill tailings.

The US EPA is investigating the Philipsburg Mining Area (PMA) for inclusion on the National Priority List (aka Superfund). Douglas Creek is one potential site under consideration for listing (CERCLIS ID MTD980666523). A preliminary assessment was completed in 2010 (URS Operating Services, Inc., 2010), and a site investigation report was completed in 2012. The site investigation report is attached to this document as **Attachment A**.

2.2.3 Current Metals Production

As of December 9, 2014, there are no active Montana Pollutant Discharge Elimination System (MPDES) permits that discharge to Douglas Creek. Two groundwater discharge permits are held by the Contact Mining Company near Douglas Creek. The facility has two tailings impoundments, one of which is located in Douglas Creek watershed. The Contact Mill is a 500-600 ton per day floatation mill that began operation in the 1970s (**Attachment A**). It operates on a contract basis, and is not associated with a specific mine. The mill does not discharge surface water to Douglas Creek or its tributaries. However, operational activities at the site have the potential to release impounded water and tailings, as was noted in the EPA's site investigation when field staff observed tailings slurry overflowing the tailings dam towards Douglas Creek (**Attachment A**). The mill pond does represent a potential groundwater to surface water pathway for metals loading. Groundwater monitoring near this operation began in 2011 to assure this potential source meets conditions in adherence to the combined wasteload allocation provided in the parent document (Section 6.5.3.4 in the parent document (Montana Department of Environmental Quality, 2012a). Montana DEQ noted that the ponds are not lined and likely discharge to groundwater, while the operators contend the ponds have self-sealed through deposition of 'slimes', the silt-sized fraction of mill tailings (Montana Department of Environmental Quality, 2012a). No antimony data are available from this operation.

3.0 MONTANA WATER QUALITY STANDARDS

The federal Clean Water Act (CWA) provides for the restoration and maintenance of the chemical, physical, and biological integrity of the nation's surface waters so that they support all designated uses. Water quality standards are used to determine impairment, establish water quality targets, and to formulate the TMDLs and allocations.

Montana's water quality standards and water quality standards in general include three main parts:
1. Stream classifications and designated uses
2. Numeric and narrative water quality criteria designed to protect designated uses
3. Nondegradation provisions for existing high-quality waters

Montana's water quality standards also incorporate prohibitions against water quality degradation as well as point source permitting and other water quality protection requirements.

Nondegradation provisions are not applicable to the TMDL developed within this document because of the impaired nature of Douglas Creek. The water quality standard that applies to this document is reviewed briefly below. More detailed descriptions of Montana's water quality standards may be found in the Montana Water Quality Act (75-5-301,302 Montana Code Annotated), and Montana's Surface Water Quality Standards and Procedures (Administrative Rules of Montana (ARM) 17.30.601-670).

3.1 STREAM CLASSIFICATIONS AND DESIGNATED BENEFICIAL USES

Waterbodies are classified based on their designated uses. All Montana waters are classified for multiple uses. Douglas Creek is classified as a B-1 stream. For a B-1 classification, the 'B' denotes the specific level of protection applied to uses and the '1' denotes the suitability for growth and propagation of salmonid fishes and associated aquatic life. Waters classified as B-1 are to be maintained suitable for:

- Drinking culinary, and food processing purposes, after conventional treatment
- Bathing, swimming and recreation
- Growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers
- Agriculture and industrial water supply

While some waterbodies might not actually be used for a designated use (e.g., drinking water supply), the state still requires that the quality of these waterbodies be maintained suitable for that designated use. Douglas Creek is not currently used as a drinking water source. However, Douglas Creek is not capable of supporting that use due to the antimony impairment.

DEQ's water quality assessment methods are designed to evaluate the most sensitive uses for each pollutant, thus ensuring protection of all designated uses. For streams in western Montana, the most sensitive use is commonly aquatic life. This is the case for other identified impairments to Douglas Creek, for which there are approved TMDLs (Montana Department of Environmental Quality, 2012a). However, there are no aquatic life standards for antimony, and therefore the human health standard is the most sensitive use considered in this document (**Table 3-1**).

Table 3-1. Impaired Waterbodies and Their Impaired Designated Uses in the Flint Creek TPA

Waterbody and Location Description	Waterbody ID	Impairment Cause	Impaired Use
Douglas Creek, headwaters to where stream ends, T7N R14W S25	MT76E003_100	Antimony	Drinking water

3.2 Numeric and Narrative Water Quality Standards

Section 3.2 of the parent document (Montana Department of Environmental Quality, 2012a) provides a summary of Montana's numeric and narrative water quality standards and the differences between them. A numeric standard based on the human health criterion of 5.6 µg/L is applied to the antimony TMDL covered by this document.

4.0 Defining TMDLs and Their Components

A Total Maximum Daily Load (TMDL) is a tool for meeting water quality standards and is based on the relationship between pollutant sources and water quality conditions. More specifically, a TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive from all sources and still meet water quality standards.

Pollutant sources fall into one of two categories: point sources or nonpoint sources. Point sources are discernible, confined and discrete conveyances, such as pipes, ditches, wells, or containers, from which pollutants are being, or may be, discharged. All other pollutant loading sources are considered nonpoint sources. Nonpoint sources are diffuse and are typically associated with runoff, streambank erosion, most agricultural activities, atmospheric deposition, and groundwater seepage. Naturally occurring background loading is a type of nonpoint source.

4.1 General Description of TMDLs and Their Components

Section 4.0 in the parent document (Montana Department of Environmental Quality, 2012a) provides an introductory description of the TMDL components with more detailed description of the TMDL process and components in **Sections 4.1** through **4.4**. The reader should refer to those sections for more detail. **Figure 4-1** below provides a graphical summary of the TMDL process and components. **Figure 4-1** shows multiple point and nonpoint source allocations; however, composite allocations may be used in some cases where data is limited. Composite wasteload or load allocations provide stakeholders with flexibility in addressing sources, allowing them to choose where to focus remediation or restoration efforts.

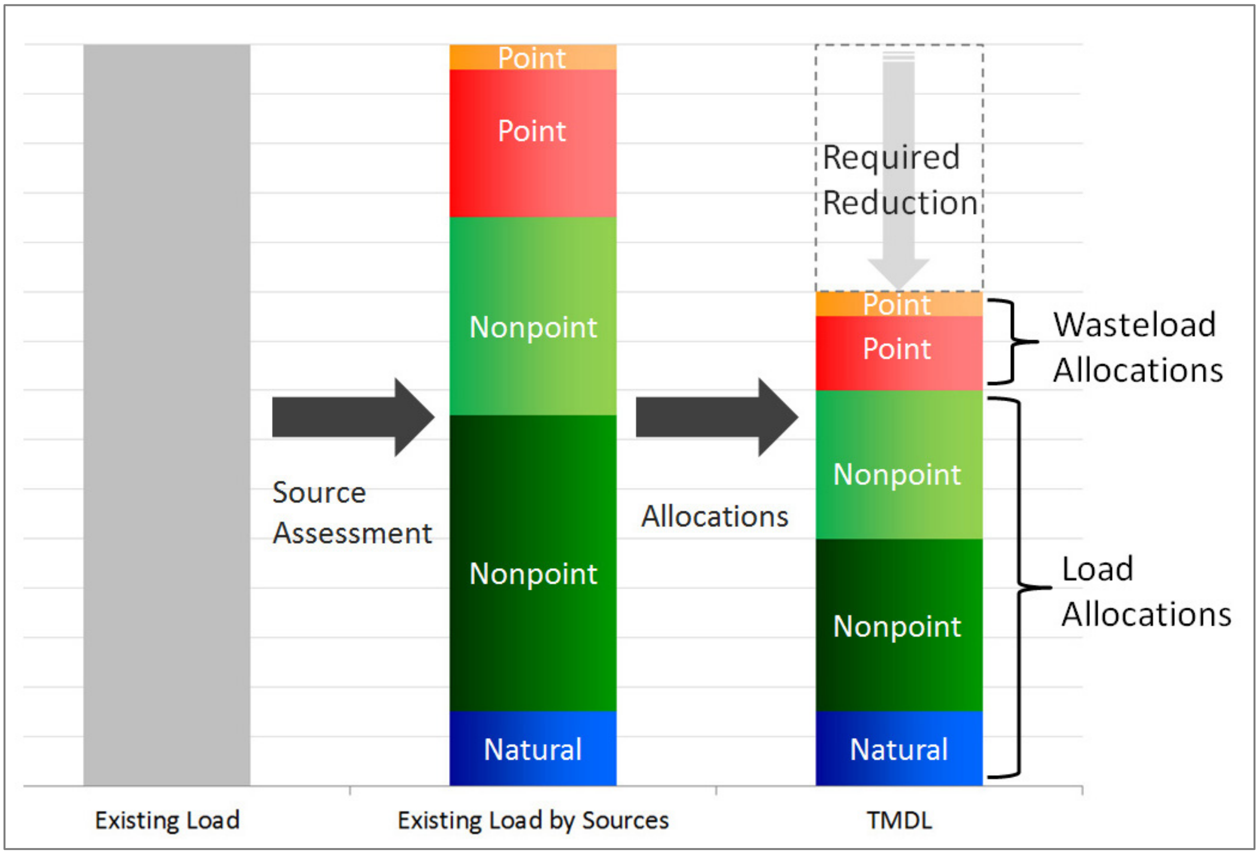

Figure 4-1. Illustration of TMDL components and the TMDL development process.

4.2 Implementing TMDL Allocations

The CWA and Montana state law (Section 75-5-703 of the Montana Water Quality Act) require wasteload allocations (WLAs) to be incorporated into appropriate discharge permits, thereby providing a regulatory mechanism to achieve load reductions from point sources. There are currently no permitted point source surface water discharges in the Douglas Creek watershed. Point sources related to Superfund sites and operated under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) are not subject to permit requirements under the CWA. However, the performance goals of CERCLA operations are adopted from the same water quality standards provided under the CWA. Although this scenario does not currently apply, it is possible that future Superfund operations may result in point source discharges managed under CERCLA (e.g. the Douglas Creek tunnel). Nonpoint source reductions linked to load allocations (LAs) are not required by the CWA or Montana statute, and are primarily implemented through voluntary measures.

DEQ uses an adaptive management approach to implement TMDLs to ensure that water quality standards are met over time (outlined in **Section 9.0** of the parent document (Montana Department of Environmental Quality, 2012a). This includes a monitoring strategy and an implementation review that is required by Montana statute (see **Section 9.2** of the parent document (Montana Department of Environmental Quality, 2012a). TMDLs may be refined as new data become available, land uses change, remediation goals are met, or new sources are identified.

5.0 Metals TMDL Components

This addendum to the Flint Creek TMDL document (Montana Department of Environmental Quality, 2012a) document focuses on antimony as a cause of water quality impairment in Douglas Creek. As antimony is a metal, this section describes: (1) the mechanisms by which metals impair beneficial uses, (2) the specific stream segment of concern, (3) the presently available data pertaining to antimony impairment in the watershed, (4) the various contributing sources of antimony based on recent data and studies, and (5) the antimony TMDL and allocations.

5.1 Effects of Excess Metals on Beneficial Uses

Waterbodies with elevated metals concentrations can impair support of numerous beneficial uses including aquatic life, coldwater fisheries, drinking water, and agriculture. Within aquatic ecosystems, elevated concentrations of heavy metals can have a toxic, carcinogenic, or bio-concentrating effect on biota. Likewise, humans and wildlife can suffer acute and chronic effects from consuming water or fish with elevated metals concentrations. Because elevated metals concentrations can be toxic to plants and animals, high metals concentrations in irrigation or stock water may affect agricultural uses. Antimony is classified as a human health toxin in Montana's Numeric Water Quality Standards (Montana Department of Environmental Quality, 2012).

5.2 Stream Segments of Concern

This document addresses one waterbody segment and metal-related impairment cause identified on the 2014 Montana 303(d) List: antimony in Douglas Creek (**Figure 1-1**). The assessment unit for Douglas Creek was based upon the National Hydrography Dataset (NHD), which depicts Douglas Creek expiring in the alluvial fan south of Philipsburg. However, Douglas Creek flows all the way to Flint Creek, via natural channel and ditch diversions. As of this writing, DEQ is pursuing corrections to both the NHD and DEQ's assessment unit description. In this document, Douglas Creek is shown flowing to Flint Creek in all figures. The flowline is based upon recent aerial photographs.

5.3 Water Quality Data and Information Sources

Information sources for evaluating the location and magnitude of antimony sources in Douglas Creek are largely the same as those used for metals in the parent document (Montana Department of Environmental Quality, 2012a) with the addition of the EPA's Superfund site investigation (**Attachment A**). The water quality data used are from DEQ's previous TMDL investigation and from EPA's site investigation. The primary information sources used are academic and professional papers, published Geographic Information System (GIS) data, available water quality data, and aerial photos. The water quality data are summarized below in **Section 5.4.3** (**Table 5-1**). GIS data included the DEQ High Priority Abandoned Hardrock Mine sites, the DEQ Abandoned Hardrock Mines database, the DEQ Active Hardrock Mine sites, and permitted point sources (i.e., Montana Pollutant Discharge Elimination System permits). As stated in **Section 2.0**, there are no permitted point sources of surface water discharge in the Douglas Creek watershed. Water quality sample sites are shown below in **Figure 5-1**. A larger version of this figure is provided as **Appendix A.**

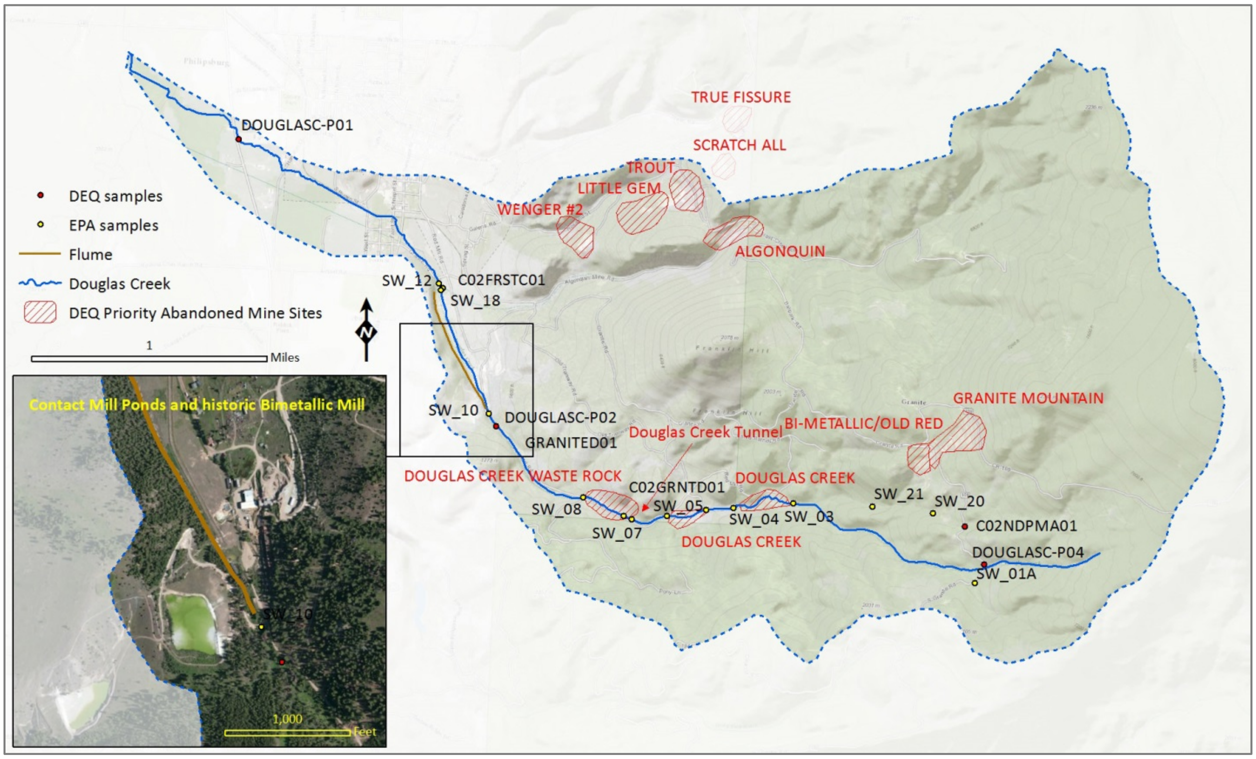

Figure 5-1. Location of mining-related features and water quality sites

5.4 Water Quality Targets

DEQ adopts the most stringent applicable water quality standard as the water quality target for TMDL development. The water quality data described in **Section 5.3** were compiled and compared to the target value described below.

5.4.1 Target

By protecting the most sensitive use, DEQ ensures that all uses are protected. There are no aquatic life standards for antimony. Therefore, the numeric human health standard is adopted as the water quality target for antimony in Douglas Creek. The human health standard is 5.6 µg/L, total recoverable (Montana Department of Environmental Quality, 2012). The antimony standard does not vary according to water hardness unlike some metals. From this point forward in this addendum, the term “target” is used interchangeably with the numeric human health standard of 5.6 µg/L.

5.4.2 Metals Evaluation Framework

A TMDL is developed for antimony if the data support an impairment determination. This metals impairment determination depends on target compliance, the presence of human sources, and dataset size as follows.

- If the waterbody is considered not impaired, a TMDL will not be developed if the water quality target is not exceeded and the sample size is at least eight.
- If the waterbody is considered impaired, a TMDL will be developed if data are not in compliance with the aquatic life target, and human sources are identified. This scenario does not apply in this document, as there are no aquatic life standards for antimony.

- If a waterbody is considered impaired, a TMDL will be developed if there is a single exceedance of the human health standard.

5.4.3 Data Compilation and Comparison to Targets

DEQ collected antimony data from seven sites in 2007, 2008, and 2009 to support TMDL development. EPA collected water chemistry data from 14 sites during high flow conditions in 2011. Results are shown in **Table 5-1**. DEQ data are total recoverable metals; EPA data are total metals. The two fractions are sufficiently similar for the EPA data to be used for source assessment. Six of the 17 samples from Douglas Creek exceed the target concentration of 5.6 µg/L. Antimony is confirmed as a cause of impairment to Douglas Creek, and an antimony TMDL is developed.

Table 5-1. DEQ and EPA Antimony Data (Values in Bold Exceed the Target)

Sample Site	Location	Sample Date	Flow (cfs)	Antimony (µg/L)
Data from DEQ TMDL investigation (2007-2009). Concentrations are of total recoverable metals.				
DOUGLASC-P01	Douglas Creek	7/8/2008	3.31	<5.0
DOUGLASC-P01	Douglas Creek	6/2/2009	5.1	**7.0**
DOUGLASC-P01	Douglas Creek	8/18/2009	2.28	3.0
DOUGLASC-P02	Douglas Creek	8/23/2007	0.73	5.0
DOUGLASC-P04	Douglas Creek	8/29/2007	0.50	<1.0
C02FRSTC01	Frost Creek upstream of Douglas Creek	6/9/2009	7.7	1.0
C02GRNTD01	Granite Drain at discharge point	6/9/2009	6.7	4.0
GRANITED01	Granite Drain	8/18/2009	6.57	5.0
C02NDPMA01	New Departure mine adit downstream of road	6/9/2009	7.6	<1.0
Data from EPA site investigation (2011). Concentrations are of total metals.				
SW_01A	South Branch Douglas Creek background	June 2011	-	2.0
SW_03	Douglas Creek immediately downstream of the Granite Mountain/Bi-Metallic/Old Red tailings and waste rock	June 2011	-	4.4
SW_04	Douglas Creek immediately downstream of the Douglas Creek east tailings	June 2011	-	4.7
SW_05	Douglas Creek immediately upstream of the Douglas Creek west tailings	June 2011	-	4.7
SW_06	Douglas Creek immediately downstream of the Douglas Creek west tailings	June 2011	-	4.9
SW_07	Douglas Creek immediately upstream of the discharge from the Granite Mountain/Bi-Metallic/Old Red adit	June 2011	-	**7.2**
SW_08	Douglas Creek immediately downstream of the discharge from the Granite Mountain/Bi-Metallic/Old Red adit, and upstream of the Douglas Creek waste rock pile	June 2011	-	**6.7**
SW_09	Douglas Creek immediately downstream of the Douglas Creek waste rock	June 2011	-	**6.7**
SW_10	Douglas Creek immediately upstream of the Contact Mill east tailings impoundment	June 2011	-	**7.3**
SW_12	Douglas Creek downstream of the historical Bi-Metallic Mill tailings	June 2011	-	**6.9**
SW_19	Douglas Creek below confluence with Frost Creek	June 2011	-	4.3

Table 5-1. DEQ and EPA Antimony Data (Values in Bold Exceed the Target)

Sample Site	Location	Sample Date	Flow (cfs)	Antimony (µg/L)
SW_20	Douglas Creek above Granite Mountain and Bi-Metallic/Old Red	June 2011	-	4.3
SW_21	Douglas Creek below Granite Mountain and Bi-Metallic/Old Red PPE	June 2011	-	5.1
SW_18	Frost Creek above confluence with Douglas creek	June 2011	-	4.2

A flow meter was not available during EPA's June 2011 investigation. Flow in Douglas Creek was high, estimated at ~30 cfs (**Attachment A**).

Antimony data concentrations detected in surface water samples are shown below in **Figure 5-2**. This figure includes data from both DEQ and EPA investigations. Concentrations exceeding the target are plotted in purple; concentrations below the target are plotted in green. Non-detect results are plotted in grey.

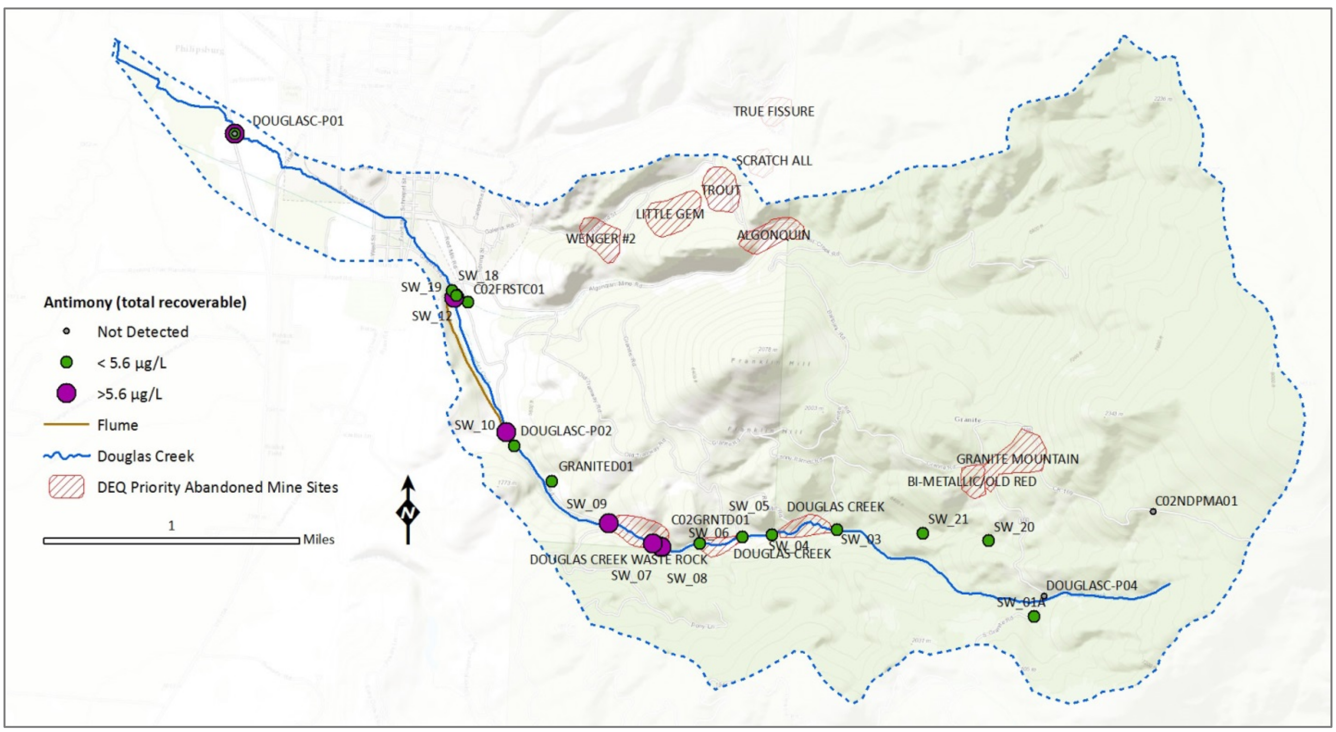

Figure 5-2. Antimony water quality data

5.5 Loading Evaluation and Source Assessment

DEQ data did not include any exceedances of the antimony target above site DOUGLASC-P01, located at the Highway 1 crossing. However, the EPA site investigation reported multiple exceedances of the antimony target as far upstream as the Douglas Creek tunnel (located between sites SW-07 and SW_08). DEQ's samples were collected under both high and low flow regimes. The single exceedance identified by DEQ was collected under high flow conditions. All of EPA's site investigation samples were collected during higher-than-average high flows in June 2011. The high flows were attributed to higher-than-average snowfall the preceding winter (**Attachment A**) and the surface runoff and stream scouring associated with this spring snowmelt probably explain the higher antimony concentrations reported by EPA. No target exceedances were identified under low-flow conditions.

Water quality exceedances are clustered lower in the watershed, despite potential sources of metals higher in the Douglas Creek drainage, such as waste rock from the Granite and Bimetallic mines located upslope of the stream. In particular, they occur in the vicinity of the Douglas Creek tunnel and downstream. However, sample SW_07 was collected just upstream of the Douglas Creek tunnel and had an antimony concentration of 7.2 µg/L. This suggests that diffuse sources of antimony (upslope waste rock, smaller waste rock piles, or even reclaimed tailings) may all contribute minor antimony loads that cumulatively cause exceedance of the target by this point in the stream. These sources are consistent with loading pathways that cause target exceedances only during runoff conditions. Therefore, although numerous potential antimony sources are identified, the data do not currently provide enough resolution to identify specific contributions from individual sources.

The EPA's site investigation identified a background concentration of antimony in Douglas Creek of 2.0 µg/L (total metals fraction). This sample was collected from the south branch of Douglas Creek (SW_01A), where there are no identified mining influences upstream. The site investigation report reports an antimony background concentration of 2.0 µg/L (Tables 8 and 9; Figure 4; **Attachment A**). Given that it appears that problems occur during high flow, a background concentration of 2.0 µg/L is appropriate for this TMDL. Note that the background concentration of 0.54 µg/L reported in **Attachment A**, Table 1 is an erroneous value that was discarded due to quality control issues (Robert Parker, personal e-mail with Eric Sivers, 2015).

5.6 TMDL and Allocations

5.6.1 Antimony TMDL for Douglas Creek (MT76E00_100)

Based on the antimony water quality target of 5.6 µg/L, the TMDL for any given streamflow may be calculated as:

TMDL in pounds/day = (flow in cubic feet/second) * 5.6 µg/L * 0.0054

The TMDL has a linear relationship to streamflow, and this can be expressed graphically as shown below in **Figure 5-3.**

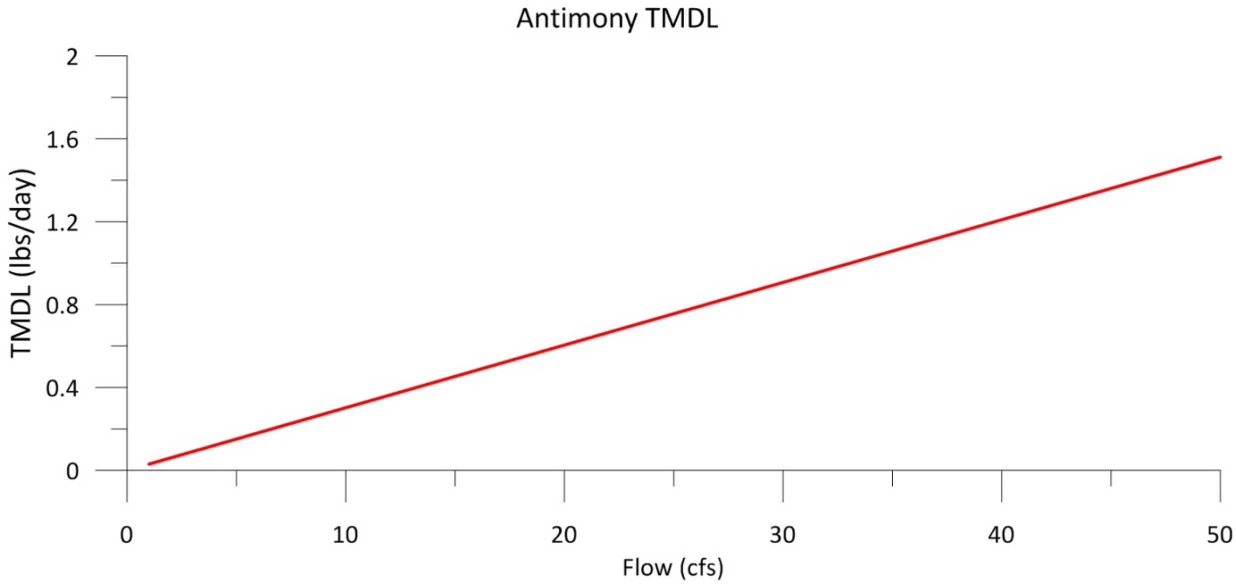

Figure 5-3. Plot of antimony TMDL versus streamflow

5.6.2 Antimony Allocations for Douglas Creek (MT76E00_100)

As discussed in **Section 4.0**, the total allowable load must be allocated to all contributing sources. The allocation components of a TMDL include: a wasteload allocation (WLA), a load allocation (LA), and a margin of safety (MOS). WLAs are allowable pollutant loads that are assigned to permitted and non-permitted point sources. LAs are allowable pollutant loads assigned to nonpoint sources and may include the pollutant load from naturally occurring sources, as well as human-caused nonpoint loading. TMDLs must also take into account uncertainties in the relationship between loads and the receiving water quality by incorporating a MOS. These elements are combined in the following equation:

TMDL = ∑WLA + ∑LA + MOS
WLA = Wasteload allocation = allocation for point sources
LA = Load allocation = allocation for nonpoint sources and naturally occurring background
MOS = Margin of safety or an accounting of uncertainty about the relationship between metals loads and receiving water quality

The MOS can be implicit, explicit, or a combination of both to account for the uncertainties within TMDL development. For this addendum, DEQ is applying an implicit MOS based on conservative TMDL development assumptions discussed further in **Section 5.7**. Where an implicit MOS is applied, the MOS in the above TMDL equation is equal to zero.

Natural background concentrations of antimony are not believed to contribute significantly to water quality impairment. Naturally occurring sources are provided a load allocation (**$LA_{natural}$**) in pounds/day based on the estimated naturally occurring metals concentration of 2.0 µg/L and streamflow. This load allocation is calculated according to the following formula:

$LA_{natural}$ = 2.0 µg/L x flow in cubic feet per second x 0.0054

The major antimony sources in the Douglas Creek watershed are related to abandoned and inactive mining sites. Although prominent abandoned/inactive mines have been investigated (**Sections 2.2** and

5.5), data are insufficient to provide allocations for each individual abandoned mine feature. Furthermore, the nature of Montana's abandoned mining legacy is such that many small non-permitted point sources (adits, seeps, tailings piles, etc.) may be scattered throughout a watershed. Finally, the Philipsburg Mining Area is being considered for inclusion on the National Priority List (aka Superfund) and individual WLAs assigned to specific sources may unnecessarily complicate future CERCLA activities. Therefore a composite wasteload allocation (**WLA_{ABDM}**) for abandoned mining sources is provided in pounds/day to any and all metals sources related to abandoned or inactive mines. This composite wasteload allocation approach recognizes that abandoned mine remediation is best pursued in an adaptive manner that balances remediation costs with achievable load reductions within each watershed. Conceptually, this composite WLA is defined as the allowable load remaining after the natural background load ($LA_{natural}$) is accounted for. The WLA_{ABMD} is calculated as the difference between the TMDL and the load allocation to naturally-occurring sources:

$WLA_{ABDM} = TMDL_{Douglas} - LA_{natural}$

Therefore, the antimony TMDL equation for Douglas Creek (MT76E003_100) is as follows:
$TMDL_{Douglas} = WLA_{ABDM} + LA_{natural}$.

An example TMDL using DEQ data from June 27, 2009 at DOUGLASC-P01 is provided below:

$TMDL_{Douglas}$ = 5.6 µg/L x 5.1 cfs x 0.0054 = 0.154 lbs/day

0.154 lbs/day = [0.099 lbs/day (WLA_{ABDM}) + 0.055 lbs/day ($LA_{natural}$)]

Example high and low flow TMDLs are presented below in **Table 5-2**. Both examples are based on DEQ sampling data from 2009. The examples are based on measured concentrations of 7 µg/L (high flow) and 3 µg/L (low flow) total recoverable antimony. In this example, a 20% reduction in antimony loading is necessary in order to meet the TMDL under high flow conditions. No reduction is required under low flow conditions. Percent reduction is calculated by dividing the difference between the existing load and the TMDL by the existing load. It is equivalent to the same percent reduction that would be required to meet the target concentration. Based on the results presented within **Table 5-1**, the 20% reduction represents a typical required reduction under conditions where the target (and thus the TMDL) is exceeded.

Table 5-2. Douglas Creek Example Antimony TMDL, Allocations, and Required Reduction

Site	Flow (cfs)	$TMDL_{Douglas}$ (lbs/day)	WLA_{ABDM} (lbs/day)	$LA_{natural}$ (lbs/day)	Existing Load (lbs/day)	Required Reduction
DOUGLASC-P01	5.1	0.154	0.099	0.055	0.193	20%
DOUGLASC-P01	2.28	0.069	0.044	0.025	0.037	0%

5.7 Seasonality and Margin of Safety

All TMDL documents must consider the seasonal variability (seasonality) on water quality impairment conditions, TMDLs and allocations. TMDL development must also incorporate a margin of safety to account for uncertainties in pollutant sources and other watershed conditions, and ensure (to the degree practicable) that the TMDL components and requirements are sufficiently protective of water quality and beneficial uses. This section describes the considerations of seasonality and an MOS in the Douglas Creek antimony TMDL development process.

5.7.1 Seasonality

Seasonality addresses the need to ensure year round beneficial-use support. Seasonality is addressed in this document as follows:

- Metals concentrations and loading conditions are evaluated for varying flow conditions that occur during the different seasons of the year.
- Metals TMDLs incorporate streamflow as part of the TMDL equation.
- The antimony target applies year round.
- Example targets, TMDLs, and load reduction needs are developed for high and low flow conditions. The TMDL equation incorporates all potential flow conditions that may occur during any season

5.7.2 Margin of Safety

The MOS is to ensure that TMDLs and allocations are sufficient to sustain conditions that will support beneficial uses. The antimony TMDL incorporates an implicit MOS. The implicit MOS is applied by using multiple conservative assumptions throughout the TMDL development process and is addressed by the following:

- DEQ's assessment process includes a mix of high and low flow sampling since variable metals sources and pathways can lead to elevated metals loading during high and/or low flow stream conditions.
- The lowest or most stringent numeric water quality standard is used for TMDL target and impairment determination. This ensures protection of all designated beneficial uses.
- Target attainment, refinement of allocations, and TMDL-development decisions are all based on an adaptive management approach that relies on future monitoring and assessment for updating planning and implementation efforts.
- The composite allocation approach ensures that the TMDL accounts for all metals sources, even any as-yet unidentified sources.

5.8 Uncertainty and Adaptive Management

Uncertainties in the accuracy of field data, applicable target value, source assessment, loading calculations, and other considerations are inherent when assessing and evaluating environmental variables for TMDL development. While uncertainties are an undeniable fact of TMDL development, mitigation and reduction of uncertainties through adaptive management approaches is a key component of ongoing TMDL implementation and evaluation. Uncertainties, assumptions, and considerations are addressed throughout this document and point to the need to refine analysis, conduct further monitoring, and address unknowns in order to develop a better understanding of impairment conditions and the processes that affect impairment. For instance, additional water quality sampling under high flow conditions may help refine the source assessment.

Adaptive management is predicated on the premise that targets, TMDLs, allocations, and the analyses supporting them are not static, but are processes subject to modification and adjustment as new information and relationships are understood. The adaptive management process allows for continual feedback on the progress of restoration activities and status of beneficial uses. It provides the flexibility to refine targets or allocations as necessary to ensure protection of the resource or to adapt to new information concerning target or allocation achievability.

In order to achieve the antimony TMDL and water quality target of 5.6 µg/L, significant sources of antimony loading must be addressed via abandoned mine remediation efforts, in addition to all reasonable land, soil, and water conservation practices. DEQ recognizes that in spite of all reasonable efforts, attainment of the antimony water quality target may not be possible due to the potential presence of unalterable human-caused sources. For this reason, an adaptive management approach will be used to evaluate target attainment. Under this adaptive management approach, antimony in Douglas Creek will ultimately fall into one of the three categories identified below:

- Implementation of remediation activities resulting in full target attainment;
- Implementation of remediation activities fails to result in target attainment due to underperformance or ineffectiveness of restoration actions. Under this scenario the waterbody remains impaired and will require further remediation efforts. The target may or may not be modified based on additional information, but conditions still exist that require additional load reductions to support beneficial uses and meet applicable water quality standards. This scenario would require some form of additional, refocused remediation work.
- Implementation of remediation activities fails to result in target attainment, but target attainment is deemed unachievable even though all applicable remediation activities have been completed. Under this scenario, site-specific water quality standards, reclassification of the waterbody, and/or a modification of DEQ's metals assessment methodology may be necessary. This would then lead to a new target (and TMDL) for antimony, and the new target could either reflect the existing conditions at the time or the anticipated future conditions associated with the restoration work that has been performed.

The Philipsburg Mining Area site (CERCLIS ID MTD980666523) is a candidate for listing on the National Priorities List (NPL). To date, federal investigations have included a preliminary assessment (URS Operating Services, Inc., 2010) and a site investigation (**Attachment A**). The EPA may continue to do additional characterization and remediation work in the watershed, in cooperation and consultation with the local watershed group (Granite Headwaters) and DEQ (Robert Parker, personal e-mail with Eric Sivers, 2015). The Abandoned Mines Section of DEQ's Remediation Division leads abandoned mine restoration projects funded by provisions of the Surface Mine Reclamation and Control Act of 1977. DEQ's Federal Superfund Bureau (also in the Remediation Division) provides technical and management assistance to EPA for remedial investigations and cleanup actions at NPL mine sites in federal-lead status.

DEQ acknowledges that construction or maintenance activities related to reclamation and remediation may result in short term increases in surface water metals concentrations. For any activities that occur within the stream or floodplain, all appropriate permits should be obtained before commencement of the activity. Federal and State permits necessary to conduct work within a stream or stream corridor are intended to protect the resource and reduce, if not completely eliminate, pollutant loading or degradation from the permitted activity. The permit requirements typically have mechanisms that allow for some short term impacts to the resource, as long as all appropriate measures are taken to reduce impacts to the least amount possible.

Stream restoration design should incorporate local geomorphology and hydrology to identify a channel form and design that is appropriate for the setting and rapidly achieves equilibrium.

6.0 Water Quality Improvement Plan

Resource development (historical mining) is the primary source of metals impairment to Douglas Creek. This section describes an overall strategy for attaining antimony water quality standards in this stream. The strategy includes general measures for reducing loading from significant metals pollutant sources and would apply adaptive management (**Section 5.8**) for adjusting restoration plans in response to monitoring results and advances in reclamation technology. Refer to Section 8 in the parent document (Montana Department of Environmental Quality, 2012a) for improvement plan details related to other pollutants.

6.1 Water Quality Restoration Objectives

The general water quality goal of this TMDL document is to provide technical guidance for recovery of drinking water use support to Douglas Creek. The components of this guidance are:

- Specified water quality targets for antimony,
- An assessment of major metal pollutant sources, and
- A general restoration strategy for metal-impaired waters.

The parent document (Montana Department of Environmental Quality, 2012a) provided guidance for recovery of aquatic life beneficial-use support. However, as discussed in **Section 3.1**, there are no aquatic life standards for antimony, and the human health standard is the appropriate water quality target.

6.2 Montana DEQ and Other Agency Roles

Successful restoration requires collaboration among private landowners, government land managing agencies, and other interested stakeholders. Stakeholders in the Flint Creek TPA include:

- Region 8 EPA
- DEQ Federal Superfund Bureau
- DEQ Abandoned Mine Lands Section
- Douglas Creek area landowners
- Beaverhead-Deerlodge National Forest
- Bureau of Land Management
- Granite Headwaters
- Granite County Conservation District
- Granite County
- Town of Philipsburg

In addition to DEQ mine remediation programs, DEQ provides technical and financial assistance for stakeholders interested in improving water quality. DEQ also administers programs that fund water quality improvement and pollution prevention projects. The DEQ collaborates with interested participants to develop locally-driven watershed restoration plans (WRPs) that are guided by established TMDLs. Although the DEQ often does not conduct pollutant reduction projects directly, DEQ is a valuable contact for locating potential funding sources for nonpoint source pollution control.

Other organizations and non-profits that may provide technical assistance, funding, and outreach services include Montana Water Center, University of Montana Watershed Health Clinic, Montana State University Extension Water Quality Program, and Montana Trout Unlimited. Specific agency and stakeholder roles relevant to restoration strategy components in Douglas Creek are described in the following sections.

6.3 Metals Restoration Strategy for Mining Sources

Metal mining is the principal human-caused source of excess metals loading in Douglas Creek. Federal and state government agencies have funded most of the investigation and reclamation associated with past mining completed to date. Statutory mechanisms and corresponding government agency programs will continue to have the leading role for future restoration. Restoration of metals sources is typically conducted under state and federal cleanup programs. Rather than a detailed discussion of specific Best Management Practices (BMPs), this section describes general restoration programs and funding sources applicable to mining sources of metals loading. Past efforts have produced abandoned mine site inventories with enough descriptive detail to prioritize the properties contributing the largest metals loads. Additional monitoring needed to further describe impairment conditions and loading sources is addressed in the **Section 7.0** framework monitoring plan.

A number of state and federal regulatory programs continue to address water quality problems from past metal mining, milling, and refining impacts. The statutes that have authorized and funded water quality restoration projects and investigations targeting mining sources in the Douglas Creek watershed include:

- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA),
- The Surface Mining Control and Reclamation Act of 1977 (SMCRA)

6.3.1 Superfund Authority in the Douglas Creek watershed

Congress passed the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in 1980. CERCLA established that parties responsible for releasing hazardous substances could be held liable for subsequent remediation. CERCLA created a tax on the petroleum and chemical industries. Funds generated by the tax went into a trust fund known as the “Superfund”, which became the commonly used name for the CERCLA program. The purpose of the fund was to pay for government cleanup when no responsible party could be identified and compelled to perform or pay for remediation. The trust fund expired at the end of 1995 and CERCLA activities without a potentially responsible party are now paid for with general appropriated funds. Information about the CERCLA program is available from a database known as CERCLIS (the Comprehensive Environmental Response, Compensation, and Liability Information System).

CERCLA addresses cleanup on sites, such as historic mining areas, where there has been a release, or threat of a release of hazardous substances. Sites are prioritized on the National Priority List (NPL) using a hazard ranking system focused on human health effects. CERCLA authorizes two kinds of response actions:

1. Short-term removals that require a prompt response, and
2. Long-term remediation actions that reduce environmental and health threats from hazardous substance releases.

Short-term (i.e. time critical) removals are warranted where the contamination is judged to pose an immediate threat to human health or the environment. Long-term remediation actions apply to serious, but not immediately life threatening releases at NPL sites. Under CERCLA, those responsible for the release must pay for remediation. Where property owners or others responsible for releases cannot be identified, funding and responsibility for cleanup is delegated by EPA. Remediation funding is only available with EPA authorization. Cleanup actions under CERCLA must be based on professionally developed project plans. CERCLA authority is most commonly delegated to government agencies with project planning capacity.

Currently, there are no Superfund sites in the Douglas Creek watershed. The Philipsburg Mining Area site (CERCLIS ID MTD980666523) is a candidate for listing on the NPL. To date, federal investigations have included a preliminary assessment (URS Operating Services, Inc., 2010) and a site investigation (**Attachment A**). The EPA may continue to do additional characterization and remediation work in the watershed, in cooperation and consultation with the local watershed group (Granite Headwaters) and DEQ (Robert Parker, personal e-mail with Eric Sivers, 2015).

6.3.2 The Surface Mining Control and Reclamation Act (SMCRA)

DEQ's Abandoned Mine Lands program (AML) is responsible for reclamation of abandoned mines in Montana. The AML reclamation program is funded through the Surface Mining Control and Reclamation Act of 1977 (SMCRA). SMCRA funding is collected as a per ton fee on coal production that is then distributed to states by the federal Office of Surface Mining Reclamation and Enforcement (OSM). Funding eligibility is based on land ownership and date of mining disturbance. Eligible abandoned coal mine sites have a priority for reclamation construction funding over eligible non-coal sites. Areas within federal Superfund sites or areas where there is a reclamation obligation under state or federal law are not eligible for expenditures from the abandoned mine reclamation program. **Table 6-1** lists the priority abandoned mines in the Douglas Creek watershed. These are a subset of the priority abandoned mines found within the Flint Creek TPA, summarized in Section 8.5.6 of the parent document (Montana Department of Environmental Quality, 2012a).

Table 6-1. Priority Abandoned Mine sites in the Douglas Creek watershed

Site Name	Receiving Stream	Disturbed Area (acres)	Ranking Score
Algonquin	Frost Creek	13.5	16.12
Bimetallic/Old Red	Douglas Creek	16.6	52.2
Douglas Creek Tailings*	Douglas Creek	12.9	347.98
Douglas Creek Tailings*	Douglas Creek	8.2	347.98
Douglas Creek Waste Rock	Douglas Creek	6.8	14.1
Granite Mountain	Douglas Creek	5.3	38.66
Little Gem	Frost Creek	11.9	5.15
Trout	Frost Creek	19.3	57.6
Wenger #2	Frost Creek	13.1	76.35

*Remediation action completed.

6.3.3. Other Historical Mine Remediation Programs

The State of Montana was awarded monies for the Upper Clark Fork River Basin Grant Program via a series of settlements against the Atlantic Richfield Company (ARCO) signed between 1999 and 2008. These settlements were a result the extensive mining-related damages to natural resources within the Upper Clark Fork watershed. The Natural Resource Damage Program (NRDP), which is part of the

Montana Department of Justice, filed the lawsuit and administers a grant process as a way to disperse the settlement funds. Government agencies and private entities/individuals are eligible for the grant funding, and Upper Clark Fork River Basin (UCFRB) is a unique opportunity for remediation in the Flint Creek TPA. Funding must be applied within the Upper Clark Fork watershed, and the Flint Creek watershed is included within its boundaries.

Several types of projects are eligible for funding but those most applicable to TMDL implementation are restoration projects and monitoring and research projects. UCFRB is an annual program and has a slightly different application process for grants under $25,000 than for those over $25,000. **Appendix B** provides a summary of additional mining remediation programs and approaches that may be applied within the Douglas Creek watershed. The extent that these programs may be necessary will depend in part on the decision whether or not to add the Philipsburg Mining Area to the NPL.

6.4 Restoration Approaches by Source Category

Refer to Section 8.5 of the parent document (Montana Department of Environmental Quality, 2012a) for an explanation of restoration approaches by source category, including metals.

6.5 Potential Funding Sources

Funding of water quality restoration or improvement project is essential for completing restoration activities and evaluating the resulting load reductions. Several government agencies fund watershed or water quality improvement projects. Below is a brief summary of potential funding sources for such projects. Other funding opportunities exist for addressing nonpoint source pollution. Additional information regarding funding opportunities from state agencies is contained in Montana's Nonpoint Source Management Plan (Montana Department of Environmental Quality, 2012b) and information regarding additional funding opportunities can be found at http://www.epa.gov/nps/funding.html.

6.5.1 Section 319 Nonpoint Source Grant Program

Section 319 grant funds are typically used to help identify, prioritize, and implement water quality protection projects with focus on TMDL development and implementation of nonpoint source projects. Individual contracts under the yearly grant typically range from $20,000 to $150,000, with a 25% or more match requirement. 319 projects typically need to be administered through a non-profit or local government such as a conservation district, a watershed planning group, or a county.

6.5.2 Future Fisheries Improvement Program

The Future Fisheries grant program is administered by Fish, Wildlife and Parks (FWP) and offers funding for on-the-ground projects that focus on habitat restoration to benefit wild and native fish. Anyone ranging from a landowner or community-based group to a state or local agency is eligible to apply. Applications are reviewed annually in December and June. Projects that may be applicable to the Douglas Creek watershed include restoring streambanks, improving fish passage, and restoring/protecting spawning habitats.

6.5.3 Watershed Planning and Assistance Grants

The Department of Natural Resources & Conservation (DNRC) administers Watershed Planning and Assistance Grants to watershed groups that are sponsored by a Conservation District. Funding is capped at $10,000 per project and the application cycle is quarterly. The grant focuses on locally developed watershed planning activities; eligible activities include developing a watershed plan, group coordination costs, data collection, and educational activities.

6.5.4 Resource Indemnity Trust/Reclamation and Development Grants Program

The Resource Indemnity Trust/Reclamation and Development Grants Program (RIT/RDG) is a biennial program administered by DNRC that can provide up to $300,000 to address environmental issues. This money can be applied to low-priority sites included on the AML priority list for which cleanup under AML is uncertain. RIT/RDG funds can also be used for conducting site assessment and characterization activities such as identifying specific sources of water quality impairment. RIT/RDG projects typically need to be administered through a non-profit or local government such as a conservation district, watershed planning group, or county government office.

6.5.5 Other Funding Sources

Numerous other funding opportunities exist for addressing nonpoint source pollution. Additional information regarding funding opportunities from state agencies is contained in Montana's Nonpoint Source Management Plan (Montana Department of Environmental Quality, 2012) and information regarding additional funding opportunities can be found at http://www.epa.gov/nps/funding.html.

7.0 Monitoring for Effectiveness

Future monitoring of Douglas Creek will include efforts from EPA, DEQ and Granite Headwaters. Refer to the parent document (Montana Department of Environmental Quality, 2012a) for an explanation of monitoring for effectiveness in the Flint Creek TPA.

Antimony issues in Douglas Creek appear to be linked to remaining mine waste in the lower canyon, and occur primarily during high flow. Suggestions for further antimony sampling include the Douglas Creek tunnel, further bracketing of the identified Douglas Creek waste rock deposits, Contact Mill slurry, and groundwater between the Contact Mill and Douglas Creek. DEQ recommends that any future samples collected in the Douglas Creek watershed by EPA or other parties be analyzed for total recoverable metals to aid comparison to Montana's water quality standards.

8.0 Stakeholder and Public Participation

Stakeholder and public involvement is a component of total maximum daily load (TMDL) planning supported by EPA's guidelines and required by Montana state law (Montana Code Annotated (MCA) 75-5-703, 75-5-704) which directs DEQ to consult with watershed advisory groups and local conservation districts during the TMDL development process. Technical advisors, stakeholders and interested parties, state and federal agencies, interest groups, and the public were solicited to participate in differing capacities throughout the TMDL development process in the Flint Creek TPA. Stakeholder and public involvement efforts for this addendum follow the general steps outlined in Section 10 of the parent document (Montana Department of Environmental Quality, 2012a) and include many of the same participants.

8.1 Participants and Roles

Throughout completion of the parent document, DEQ worked with stakeholders to keep them apprised of project status and solicited input from a TMDL technical advisory group. A description of the participants and their roles is provided in Section 10 of the parent document (Montana Department of Environmenal Quality, 2012a). That advisory group also played a similar role with the current addendum document. Agencies and groups that participated in the development of this document are summarized below.

8.1.1 Montana Department of Environmental Quality

Montana state law (MCA 75-5-703) directs DEQ to develop all necessary TMDLs. DEQ has provided resources toward completion of these TMDLs in terms of staff, funding, internal planning, data collection, technical assessments, document development, and stakeholder communication and coordination. DEQ has worked with other state and federal agencies to gather data and conduct technical assessments. DEQ has also partnered with watershed organizations to collect data and coordinate local outreach activities for this project.

8.1.2 U.S. Environmental Protection Agency

EPA is the federal agency responsible for administering and coordinating requirements of the CWA. Section 303(d) of the CWA directs states to develop TMDLs (see **Section 1.1**), and EPA has developed guidance and programs to assist states in that regard. EPA has provided funding and technical assistance to Montana's overall TMDL program and is responsible for final TMDL approval. Project management was primarily provided by the EPA Regional Office in Helena, Montana.

The Douglas Creek Site (Philipsburg Mining Area) is being considered for addition to the National Priority List (aka Superfund).EPA Superfund Technical Assessment and Response Team 3 completed a preliminary assessment and a site investigation of the site, and the resulting reports were of great value to DEQ's source assessment efforts.

8.1.3 TMDL Advisory Group

The TMDL advisory group members and participation was summarized in Section 10 of the parent document (Montana Department of Environmental Quality, 2012a). For this addendum, DEQ provided an electronic draft of the document to members of the parent document TMDL advisory group for a three-week review period. DEQ corresponded with members of the TMDL advisory group via e-mail and telephone.

8.1.4 Area Landowners

Since much of the Douglas Creek watershed is in private ownership, local landowner cooperation in the TMDL process was critical. Their contribution included access for stream sampling and field assessments. The DEQ sincerely thanks the planning area landowners for their logistical support and informative participation in impromptu water resource and land management discussions with DEQ's and EPA's field staff and consultants.

8.2 Response to Public Comments

Upon completion of the draft TMDL document, and prior to submittal to EPA, DEQ issues a press release and enters into a public comment period. During this timeframe, the draft TMDL document is made available for general public comment, and DEQ addresses and responds to all formal public comments.

The public review period began on February 26, 2015, and ended on April 1, 2015. DEQ made the draft document available to the public, and solicited public input and comments. These outreach efforts were conducted via emails to watershed advisory group members and other interested parties, posts on the DEQ website, and announcements in the following newspapers: the Philipsburg Mail, the Montana Standard (Butte), the Anaconda Leader, and the Missoulian.

No comments were received during the public comment period.

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