

DATE October 2, 2009**PROJECT No.** 07-1413-0077/7400

Doc. No. 123

TO Mr. Jonathan Clegg
Western Copper Corporation**CC** John Hull, Fiona Esford**FROM** Javier Ubilla**EMAIL** jubilla@golder.com**EROSION AND SEDIMENT CONTROL MEASURES, SEPTEMBER 2009, CARMACKS COPPER PROJECT,
YUKON TERRITORY**

1.0 INTRODUCTION

This technical memorandum summarizes the work completed between September 9 and 10, 2009, at the Carmacks Copper Project site. The effort consisted of an inspection and maintenance of the work completed during September 23 to 27, 2008 (Golder, 2008).

The objective of the 2008 and 2009 work is to implement a short term strategy for erosion and sediment control, designed to minimize the potential for sediment release from the Project site to Williams Creek during the spring and summer season.

Personnel and equipment available on site included Al Serafinchon (Kluane Drilling), operator of an excavator Caterpillar 225, and Javier Ubilla (Golder Associates), field supervisor.

2.0 INSPECTION AND MAINTENANCE OF 2008 WORK

After the initial inspection of the site it was noted that the work completed during September, 2008, consisting on the construction of berms, sediment basins, as well as road re-contouring and the installation of sand bags and silt fences (Golder, 2008), was able to minimize the erosion and sediment movement in the Heap Leach area.

The performance of the measures implemented during 2008 was considered satisfactory and therefore the 2009 work mainly consisted in the maintenance of the existing elements for sediment and erosion control. However, new observations led to the implementation of additional features as described in Section 3.

Table 1 presents a summary of the results of the inspection and a brief description of the work completed. Figure 1 presents the location of each one of the sites inspected.



Table 1: Inspection and Work Completed.

Site	Inspection	Work Completed
Road 1a	Sediment basin full of sediments.	Sediment basin re-excavated.
Road 1b	Sand bags damaged in culvert area.	20 new sand bags installed to replace damaged existing sandbags.
Site 2a	Silt fence damaged.	Silt fence repaired.
Site 2b	Sediment basin full of sediments.	Sediment basin re-excavated. Upstream area seeded for erosion protection (Table 3). Spillway built with clean sand and gravel and new sandbags installed at the crest of the spillway.
Site 2c	Silt fence damaged.	New silt fence installed upstream of old silt fence providing better coverage.
Road 3a	Road drainage directed to vegetated area.	No work required.
Road 3b	Road drainage directed to vegetated area.	No work required.
Road 3c	Road drainage directed to vegetated area.	No work required.
Road 4a	Flow directed to vegetated area.	Small sediment basin excavated before entering to vegetated area.
Road 4b	Sediment basin full of sediments.	Sediment basin re-excavated.
Road 4c	Road drainage directed to vegetated area.	No work required.
Road 4d	Sediment basin full of sediments. Overflow to sediment basin 2b.	Sediment basin re-excavated to restore storage capacity.
Road 5a	Berm across road.	No work required.
Road 5b	Road drainage directed to vegetated area.	No work required.
Road 5c	Sediment basin with remaining capacity.	No work required.
Road 5d	Sediment basin full of sediments. Overflow to vegetated area.	No work required.
Road 5e	Sediment basin full of sediments. Overflow to vegetated area.	No work required.
Road 5f	Road drainage directed to vegetated area.	No work required.
Road 5g	Berm directing sediments to vegetated area.	Sediment basin excavated upstream of the berm to provide storage capacity. When full over flow will be toward vegetated area.
Road 6a	Road drainage directed to vegetated area.	No work required.
Road 6b	Road drainage directed to vegetated area.	No work required.
Road 6c	Berm, reducing speed of water flow.	No work required.
Road 6d	Berm directing sediments to vegetated area.	No work required.
Road 6e	Road drainage directed to vegetated area.	No work required.
Road 7a	Road drainage directed to vegetated area.	No work required.
Road 7b	Road drainage directed to vegetated area.	No work required.
Site 8 Williams Creek North	Silt fences installed to protect watercourse severely damaged.	New silt fences installed on either side of the road.

Figure 2 shows photographs of the sediment basins at Sites 2b and 4d. The basins were re-excavated to restore the initial storage capacity. These two sites together with Site 5g (sediment basin and berm, Figure 3) are considered the final features in the sediment plan program to retain sediments from being transported from the heap area towards Williams Creek (Figure 1). Sediment basins 2b, 4d and 5g were re-excavated to restore the storage capacity they had after the 2008 work. Sediment control elements in roads 4, 5, 6 and 7 also help to reduce the amount of sediments being mobilized.

Figure 4 shows the silt fences that were replaced or repaired, particularly in Sites 2a, 2c and Site 8.

Figure 5 presents the upstream and downstream ends of the culvert area in Road 1. Due to the limited supply of sand bags, the sand bags were installed only to replace the most damaged sand bags. It was also observed that sand bags are not performing effectively in the long term. Due to environmental exposure most of the sand bags were ripped and, in general, the sand bags were not providing the desired level of protection of the soils at the culvert. It is recommended that if the development of the operation is delayed, a more effective longer term solution, for example the installation of light rip-rap, should be considered to replace the sand bags and minimize the sediment load entering Williams Creek in this area.

It was also noted that along the east or upslope side of Road 4, a natural ditch was created by the water flowing downstream. This ditch is more prominent on the north side of Road 4 and eventually could affect the access to the north area of the site through Road 4. No work was required or completed in this area as it is not required at this time. However, it is recommended that the implementation of engineered measures to stabilize this natural ditch be considered next year if the erosion continues.

3.0 ADDITIONAL WORK FOR EROSION AND SEDIMENT CONTROL

During the 2009 fieldwork a few new elements were included to the system for erosion and sediment control implemented during the 2008 fieldwork, as described in Table 2.

Table 2: New Elements for Erosion and Sediment Control

Site	Work Completed
Site 2c	Sediments deposit area (see Figure 1) between silt fence and road (next to Site 2f) seeds were sowed (Table 3).
Site 2d	Road regraded and berm breached to direct water and sediments toward vegetated area.
Site 2e	Road regraded and berm breached to direct water and sediments toward vegetated area.
Site 2f	Berm to stop high velocity water before crossing road.

As mentioned in Tables 1 and 2 some areas where seeded with a Custom Reclamation Mix provided by Alexco Resource Group (Whitehorse Office). Three 25 Kg bags of seeds were provided and about 1.8 bags were used on site, the rest were left in the site office to be used early in the 2010 spring season, if needed. Table 3 presents a detailed content of the seeds.

Table 3: Seed Mixture

Seed Type	Percentage
Violet Wheatgrass	36%
Fringed Bromegrass	15%
Sheeps Fescue	14%
Rocky Mountain Fescue	14%
Tundra Bluegrass	11%
Able Alfalfa	10%

Figure 6 presents photographs of the seeding activities, including ripping the surface in Site 2c before sowing the seeds. Seeds were spread from about 3 m behind the silt fence shown in the photographs all the way to the road next to site 2f (Figure 1). It is anticipated that the vegetation will help to stabilize the sediments in this area. The same type of seed mixture was spread on Site 2b on the sediments excavated from the sediment basin and upstream the sediment basin (See Figure 2).

Sites 2d and 2e are also new features developed this year to minimize ongoing erosion. At the time of site visit the Road 2 was in good condition however, according to Al Serafinchon, (a personal communication), this road had significant erosion which he repaired during June, 2009. The source of this erosion was water over flowing from sediment basin 2b and reaching Road 2, then moving eastward and eventually reaching the Site 2c (Figure 1). Based on this information, Road 2 was regraded at two points as shown in Figure 7. This provides an exit point and diverts the water and sediments running through Road 2 to vegetated areas before reaching Site 2c.

The area of Site 2f is shown in Figure 8. It is a zone located just upstream of Site 2c with significant gradient and shows evidence of erosion. Even though the material on the slope appeared stable and no further sediment movement was expected, it could be a source of water reaching Site 2c that may cause erosion. For this reason a berm was built with the intention of reducing the energy of water crossing Road 2 and reaching Site 2c.

Additional work also includes the excavation of a ditch along the east side of Road 1 to the south of Williams Creek, with the objective of directing water to vegetated areas away from the road. This work was being completed at the time of Golder representative arrived to site.

4.0 COMMENTS AND RECOMMENDATIONS

The interim erosion and sediment control measures described above are not intended to prevent erosion from occurring on site. Instead, they are prescribed and implemented to assist in both reducing the rates of erosion and localizing the extents of erosion and sediment deposition. They were implemented with available equipment and resourced prior to onset of winter conditions. These temporary measures are intended to be enhanced or repaired with more robust measures and management practices in early 2010 (after freshet).

We recommend that immediately after the snowmelt and spring runoff in 2010, the temporary measures should be inspected to assess current conditions and to determine how the features functioned in the freshet period. Several of these interim structures are designed to promote sediment deposition and storage, and consequently they may require periodic maintenance. In the event of delays in the start of large-scale construction at the site, and in the implementation of the construction-phase storm water management plan (Golder, 2007), a review of site conditions in June 2010 will identify what, if any, additional interim measures may be warranted in 2010 for erosion and sediment control at the site.

GOLDER ASSOCIATES LTD.

ORIGINAL SIGNED

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Geological Engineer

ORIGINAL SIGNED AND SEALED

John Hull, P.Eng. (BC, NWT, NU, YK)
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Attachments: Figures 1 to 8

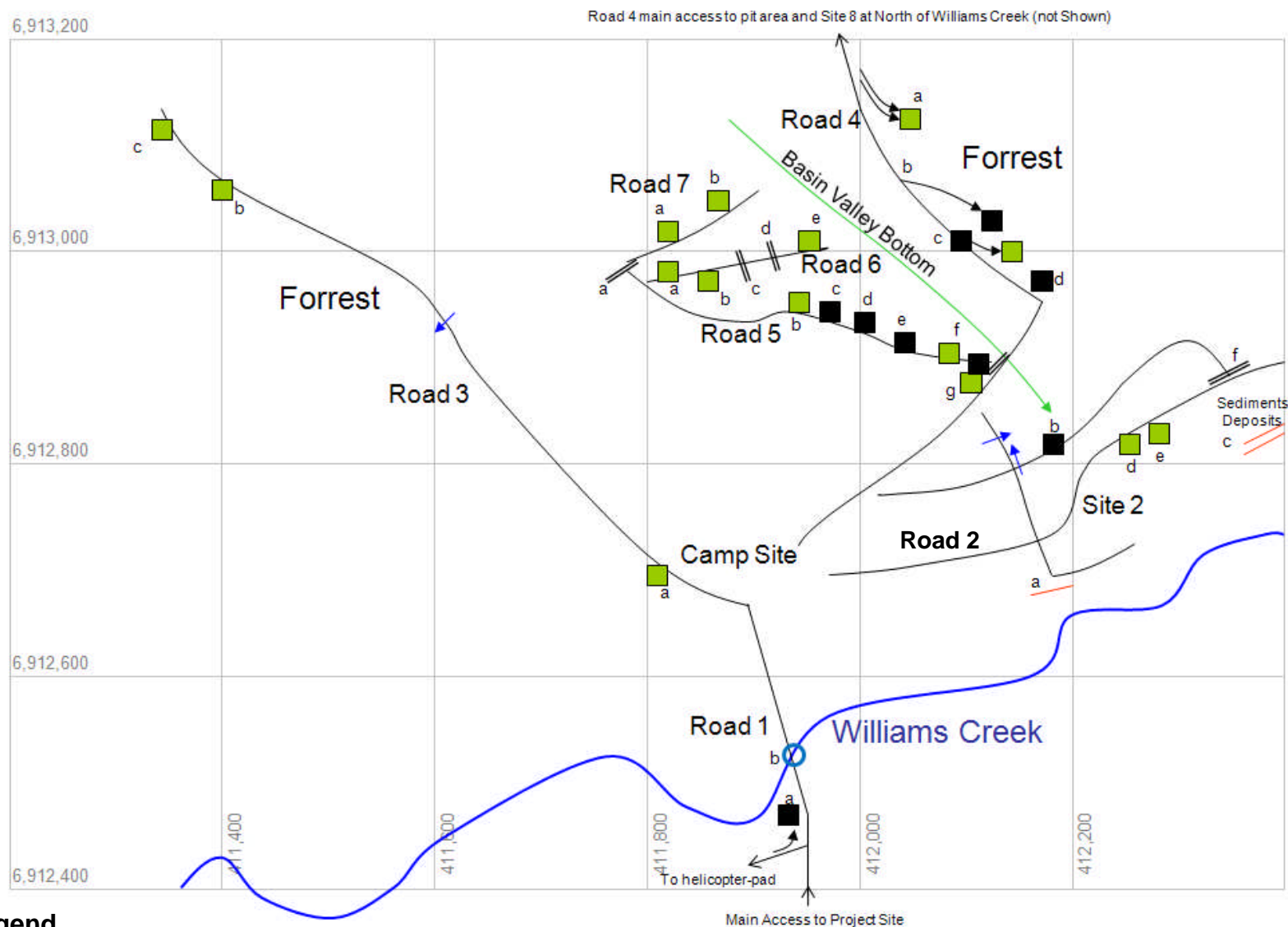
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REFERENCES

Golder Associates (Golder), 2007. Report on Preliminary Surface Water Management Plan, Carmacks Copper Project, Carmacks, Yukon. Doc. No. 046 dated November 29, 2007.

Golder Associates (Golder), 2008. Erosion and Sediment Control Measures, Fall 2008, Carmacks Copper Project, Yukon Territory. Doc. No. 088 dated October 21, 2008.



Legend

- Road / Trail
- Silt fence
- == Berm
- Sand bags culvert area
- Road drainage directed to vegetated area
- Road drainage directed to sediment basin
- Road re-sloping for drainage



**CARMACKS COPPER
PROJECT**

Site Sketch

Drawn: JU

App'd:

Date: September 25, 2009

Figure:

1

Project No.: 000-0000

Revision No.:



Site 2b – Main sediment basin re-excavated



Site 4d – Caterpillar 225 working



Site 2b – New sand bags spillway area



Site 4d – Pond re-excavated



**CARMACKS COPPER
PROJECT**

Sediment Basin Excavation

Drawn: JU

App'd:

Date: September 25, 2009

Figure: **2**

Project No.: 000-0000

Revision No.:



**CARMACKS COPPER
PROJECT**

**Site 5g - Berm and Sediment
Basin**

Drawn: JU

App'd:

Date: September 25, 2009

Figure: **3**

Project No.: 000-0000

Revision No.:



Site 8 – New silt fence



Site 2c – New silt fence



Site 8 – New silt fence



Site 2a – Silt fence repaired



**CARMACKS COPPER
PROJECT**

Silt Fence Installation

Drawn: JU

App'd:


Date: September 25, 2009

Revision: **4**


Project No.: 000-0000

Revision No.:



		CARMACKS COPPER PROJECT	
		Sand Bags Culvert Area	
Drawn: JU	App'd:	Date: September 25, 2009	Figure: 5
Project No.: 000-0000		Revision No.:	




		CARMACKS COPPER PROJECT Seeding	
Drawn: JU	App'd:	Date: September 25, 2009	Figure: 6



Site 2d – Road 2 regraded and side berm breached



Site 2e – Road 2 regraded and side berm breached

		CARMACKS COPPER PROJECT	
		Site 2 – Road Regraded	
Drawn: JU	App'd:	Date: September 25, 2009	Figure: 7



**CARMACKS COPPER
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Site 2f – New Berm

Drawn: JU

App'd:

Date: September 25, 2009

Figure:

8

Project No.: 000-0000

Revision No.: