

**APPENDIX J
SETTLEMENT MONITORING PLAN**

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1.0 INTRODUCTION

This appendix outlines the settlement monitoring plan for the Primary and Secondary Impoundments at the Cotter Corporation Canon City milling facility. This appendix is an update of the plan included in the 2005 Decommissioning and Reclamation Plan (MFG, 2005). Monitoring of tailings impoundment surface settlement will be conducted after placement of the interim cover to measure rates and locations of settlement prior to final cover construction. After construction of the final cover system, settlement monitoring will be conducted as part of post-reclamation performance monitoring.

2.0 PLAN OBJECTIVES

There are two objectives for settlement monitoring associated with the tailings impoundments: (1) assurance that the materials in the tailings impoundments have stabilized prior to construction of the final cover system, and (2) verification that (after final cover system construction) the final cover surface is not experiencing significant settlement. These objectives are assessed by measurement of the elevations of monitoring points at selected locations on the impoundment surfaces.

At other uranium tailings impoundments, the key issue is consolidation and settlement of tailings that have been discharged in the impoundment as a slurry, resulting in saturated materials of relatively low density. These tailings will consolidate and settle from the loading of materials placed above them and as the degree of saturation in the tailings decreases. The Nuclear Regulatory Commission staff policy requires that the subgrade surface achieve 90 percent of anticipated consolidation prior to placement of the final cover system, in order to minimize differential settlement of the cover system. Contaminated soils and mill debris in the tailings impoundment are not as significant a concern for settlement, as long as these materials are placed in lifts and void spaces are minimized to achieve densities similar to long-term values.

For the Secondary Impoundment, minimal settlement is anticipated upon reclamation. This is because the Old Ponds materials were excavated and placed in lifts, with water subsequently added to the surface for evaporation and air quality control. Minor settlement is anticipated due to random fill and interim cover placement (to meet desired reclamation slopes and elevations, and provide a protective layer for dust control of the tailings) and final cover system construction. Four settlement monuments were placed on the Secondary Impoundment in August 2009 at the locations shown on Figure J.1. The locations were selected in the area of deepest tailings. Cotter regraded the tailings surface and completed construction of a 2-ft thick interim soil cover over the tailings of the Secondary Impoundment in 2010. Settlement monitoring results for the four settlement monuments is presented in Figure J.2. The results show minor settlement through interim cover placement, ranging from 2 to 4 inches since August 2009.

For the Primary Impoundment, the areas of anticipated settlement upon reclamation are where there are significant thicknesses of slurried tailings. These areas are primarily in the lower portions of the impoundment (shown in Figure J.1). Consolidation of these areas will be enhanced by tailings dewatering (described in Appendix I of the 2011 Tailings Reclamation Plan). Minor settlement is anticipated in the remaining areas due to random fill placement (to meet desired reclamation slopes and elevations, and provide a protective layer for dust control of the tailings) and final cover system construction.

3.0 MONITORING PLAN

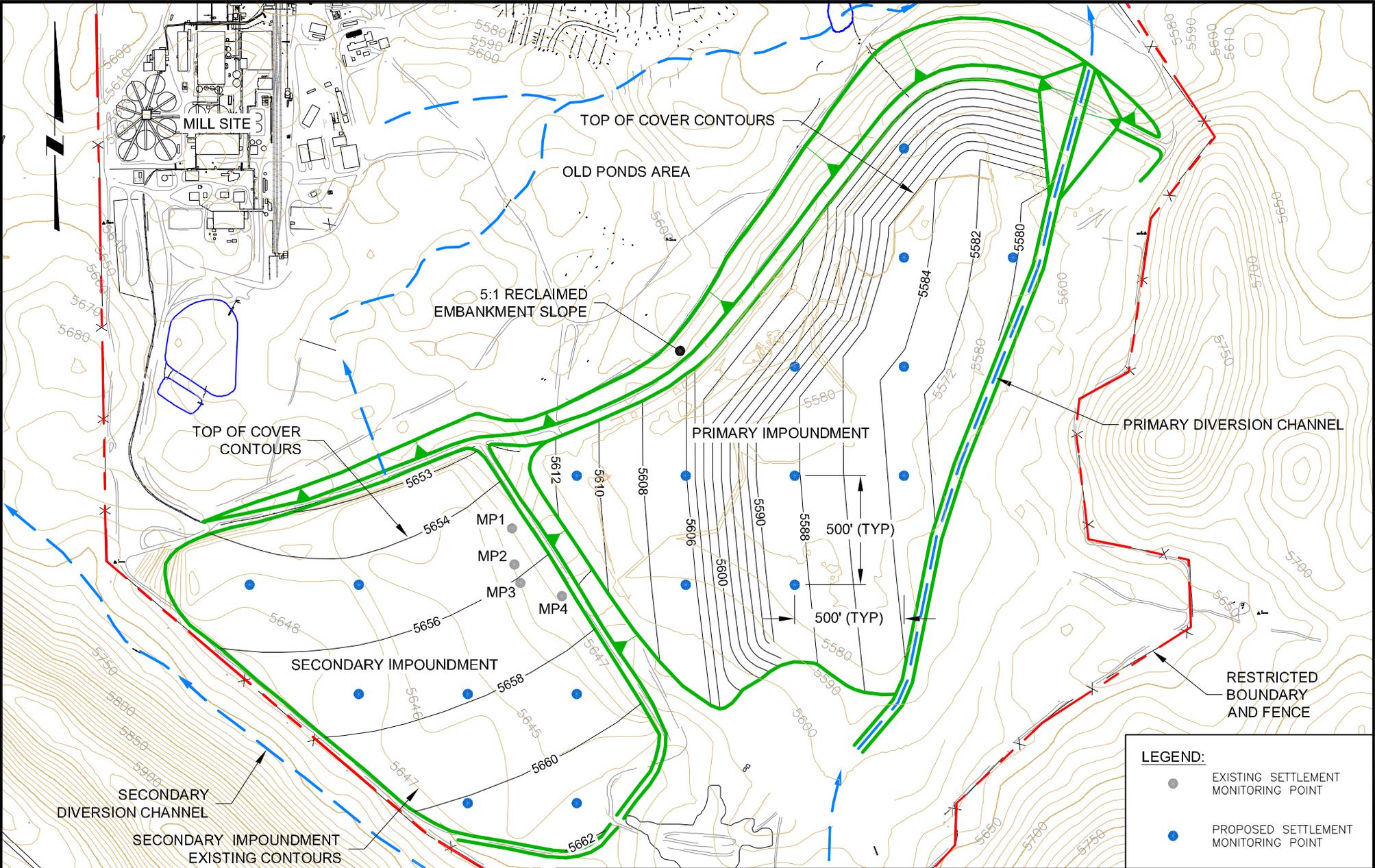
The settlement monitoring plan will consist of two phases: (1) monitoring the interim cover surface prior to final cover system construction, and (2) monitoring of the top-of-cover surface after cover system construction. Monitoring of both phases would be done at the specific points shown on Figure J.1. These points are located on a 500-foot grid system over the Primary and Secondary Impoundments, except for the Secondary Impoundment in the area of the existing settlement monuments, and were chosen to include areas representing the thickest tailings or fill materials. The monitoring points for both phases will be surveyed for elevations on a quarterly basis. Survey accuracy would typically be to the nearest 0.01 foot (3 mm).

The new settlement monitoring points used prior to final cover construction will be wooden stakes or rebar driven a minimum of 12 inches into the interim cover. These points will be adequately located and marked with flagging to facilitate location for surveying and to avoid contact with construction equipment. It is recommended the new monitoring points for the Secondary Impoundment be installed in 2011, since the interim cover has already been placed. The monitoring points for the Primary Impoundment will be installed after interim cover placement. These monitoring points may require replacement in areas of active interim fill placement and compaction. A monitoring period of one to two years prior to final cover system construction is anticipated. The objective for this phase is to demonstrate that approximately 90 percent of anticipated consolidation of the materials beneath the subgrade surface has occurred prior to final cover system construction.

The settlement monitoring points used after final cover construction would be a more permanent installation, consisting of rebar or other metal rod driven a minimum of 24 inches below the cover surface. These points would be adequately located and marked with PVC pipe or other markers, to facilitate location for surveying and to avoid contact with vegetation maintenance equipment. A monitoring period of two to five years after final cover system construction is anticipated. The objective for this phase is to verify that no significant cover surface settlement is taking place, typically less than 0.1 feet (30 mm) of cumulative settlement over a four quarter period.

4.0 REFERENCES

MFG, Inc., 2005. "2005 Update of the Mill Decommissioning and Tailings Reclamation Plan for the Cotter Corporation Canon City Milling Facility." Prepared for Cotter Corporation. August.



LEGEND:	
	EXISTING SETTLEMENT MONITORING POINT
	PROPOSED SETTLEMENT MONITORING POINT

REFERENCE:
 • EXISTING GROUND CONTOURS FROM USGS (SEAMLESS.USGS.GOV).
 • SITE TOPOGRAPHY FROM COTTER CORPORATION (2007).



COTTER CORPORATION (N.S.L.)

PROJECT
CANON CITY MILLING FACILITY

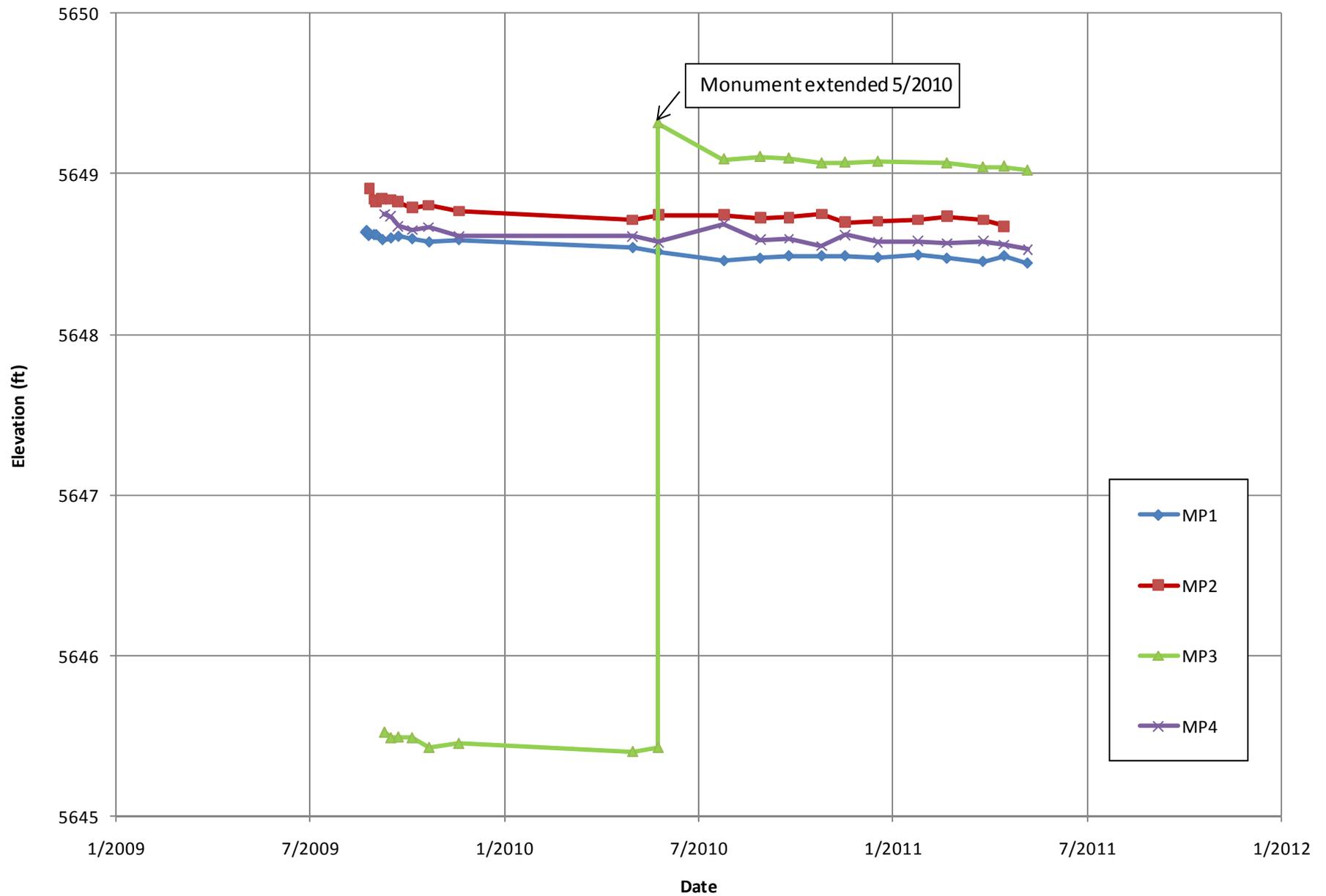
TITLE
PROPOSED SETTLEMENT MONITORING POINT LAYOUT



DATE
JUNE 2011

FILE NAME
1007533D007

FIGURE J.1



PROJECT
CANON CITY MILLING FACILITY

TITLE
SECONDARY IMPOUNDMENT
SETTLEMENT MONITORING RESULTS



DATE
JUN 2011

FIGURE J.2

FILENAME
Figure J.2.pptx