



**VALLEY LEACH FACILITY 2  
PHASE 3 STAGE A.2  
RECORD OF CONSTRUCTION REPORT**

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## TABLE OF CONTENTS

1. INTRODUCTION.....	1
1.1. Project Description .....	2
1.2. Parties Involved .....	2
1.3. Design Drawings and Technical Specifications.....	3
1.4. Use of this Report .....	3
2. SCHIST ISLAND PHASE 1 PIT OWNER PLACED FILL.....	3
2.1. Structural Fill/High Compaction Backfill .....	4
3. VLF2 PHASE 3 CONSTRUCTION ACTIVITIES.....	4
3.1. Clearing and Grubbing .....	5
3.2. Underground Workings Remediation .....	5
3.2.1. Confirmatory Drilling.....	5
3.2.2. Blasting.....	6
3.2.3. Remediation of Laterals .....	6
3.3. Site Grading .....	6
3.4. Subgrade Preparation.....	6
3.5. Leak Detection Trench.....	7
Detail A .....	7
3.6. Soil Liner Fill.....	7
3.7. 80-mil Geomembrane.....	8
3.8. Drain Cover Fill .....	8
3.9. 80-mil Anchor Trench .....	9
4. QUALITY ASSURANCE/QUALITY CONTROL .....	9
4.1. Testing Standards .....	10
4.1.1. Earthworks Testing Standards.....	10
4.1.2. Geomembrane Testing Standards.....	10
4.1.3. Geotextile Testing Standards .....	11
4.2. Earthworks Construction Quality Assurance.....	11
4.2.1. Structural Fill .....	11
4.2.2. Leak Detection Fill .....	11
4.2.3. Soil Liner Fill .....	12
4.2.4. Drain Cover Fill .....	12
4.3. Geosynthetics Quality Control Submittals .....	12
4.3.1. Geomembrane Installation Personnel Resumes.....	12
4.3.2. Geomembrane Roll QC Certificates.....	13
4.3.3. Geomembrane Resin QC Certificates .....	13
4.3.4. Geomembrane Welding Rod QC Certificates .....	13
4.3.5. Geotextile QC Certificates .....	13
4.4. Geomembrane Construction Quality Assurance.....	14
4.4.1. Geomembrane Third Party Conformance Testing .....	14
4.4.2. Geomembrane Panel Deployment.....	14
4.4.3. Geomembrane Fusion Seaming .....	15



4.4.4.	Geomembrane Extrusion Seaming .....	15
4.4.5.	Geomembrane Destructive Testing.....	16
4.4.6.	Geomembrane Pressure Testing .....	16
4.4.7.	Geomembrane Defects and Repairs.....	16
4.4.8.	Geomembrane Acceptance .....	17
5.	PROJECT DEVIATIONS .....	17
6.	ENGINEER'S OPINION.....	18



## ISSUED FOR CONSTRUCTION DRAWINGS<sup>1</sup>

- A000 COVER SHEET
- A010 GENERAL ARRANGEMENT
- A040 PHASE 3 PAD GRADING PLAN
- A060 PHASE 3 GEOMEMBRANE LIMITS
- A080 HIGH VOLUME SOLUTION COLLECTION PIPING LAYOUT
- A100 STAGE A GRADING PLAN
- A105 STAGE A PSSA, BENCH AND LVSC PIPING LAYOUT
- A106 STAGE A PSSA AND BENCH ALIGNMENT TABLES AND SETTING OUT DATA
- A108 STAGE A LOW COMPACTION ZONE
- A110 STAGE A ISOPACH
- A120 STAGE A PIPING PLAN
- A140 STAGE A LEAK DETECTION LAYOUTS
- A141 STAGE A LEAK DETECTION PROFILES
- A150 STAGE A HAUL ROAD PLAN AND PROFILE
- A170 STAGE A PERIMETER ACCESS ROAD PLAN AND PROFILE (1 OF 3)
- A171 STAGE A PERIMETER ACCESS ROAD PLAN AND PROFILE (2 OF 3)
- A172 STAGE A PERIMETER ACCESS ROAD PLAN AND PROFILE (3 OF 3)
- A180 STAGE A ALIGNMENT TABLES
- A420 LEAK DETECTION DETAILS (SHEET 1 OF 2)
- A421 LEAK DETECTION DETAILS (SHEET 2 OF 2)
- A430 VALLEY LEACH FACILITY SECTIONS AND DETAILS (SHEET 1 OF 3)
- A431 VALLEY LEACH FACILITY SECTIONS AND DETAILS (SHEET 2 OF 3)
- A432 VALLEY LEACH FACILITY SECTIONS AND DETAILS (SHEET 3 OF 3)
- A440 PSSA SECTIONS AND DETAILS
- A450 PSSA RISER SECTIONS AND DETAILS (SHEET 1 OF 5)
- A451 PSSA RISER SECTIONS AND DETAILS (SHEET 2 OF 5)
- A452 PSSA RISER SECTIONS AND DETAILS (SHEET 3 OF 5)
- A453 PSSA RISER SECTIONS AND DETAILS (SHEET 4 OF 5)
- A454 PSSA RISER SECTIONS AND DETAILS (SHEET 5 OF 5)



- A460 LOW VOLUME SOLUTION COLLECTION SYSTEM DETAILS
- A461 HIGH VOLUME SOLUTION COLLECTION SYSTEM DETAILS
- A470 UNDERGROUND WORKINGS REMEDIATION PLAN TYPICAL DETAILS

<sup>1</sup>Only drawings relevant to VLF2 Phase 3 Stage A construction



## RECORD OF CONSTRUCTION DRAWINGS

- 1 SOIL LINER FILL (SLF) AS-BUILT EXHIBIT
- 2 SOIL LINER FILL (SLF) AS-BUILT EXHIBIT
- 3 LEAK DETECTION TRENCH 1 AS-BUILT EXHIBIT
- 4 LEAK DETECTION TRENCH 2 AS-BUILT EXHIBIT
- 5 80-MIL GEOEMBRANE PANEL LAYOUT AS-BUILT (SHEET 1 OF 2)
- 6 80-MIL GEOEMBRANE PANEL LAYOUT AS-BUILT (SHEET 2 OF 2)
- 7 HIGH VOLUME PIPING AS-BUILT EXHIBIT
- 8 HIGH VOLUME PIPING AS-BUILT EXHIBIT
- 9 DRAIN COVER FILL AS-BUILT EXHIBIT (SHEET 1 OF 2)
- 10 DRAIN COVER FILL AS-BUILT EXHIBIT (SHEET 2 OF 2)
- 11 DRAIN COVER FILL ISOPACH (SHEET 1 OF 2)
- 12 DRAIN COVER FILL ISOPACH (SHEET 2 OF 2)



## LIST OF TABLES

- Table 1 Summary of Earthworks Material Specifications
- Table 2 Earthworks Testing Summary and Frequency
- Table 3 Summary of Weather Data
- Table 4 CQA Earthworks Testing Summary – Structural Fill (HCBF)
- Table 5 CQA Earthworks Testing Summary – Structural Fill
- Table 6 CQA Earthworks Testing Summary – Select Structural Fill
- Table 7 CQA Earthworks Testing Summary – Soil Liner Fill
- Table 8 CQA Earthworks Testing Summary – Low Volume Solution Collection Fill
- Table 9 CQA Earthworks Testing Summary – Drain Cover Fill (Crushed Ore)
- Table 10 CQA Earthworks Testing Summary – Leak Detection Fill
- Table 11 Nuclear Gauge Moisture-Density Testing Summary – Soil Liner Fill
- Table 12 Soil Liner Fill Depth Verification Summary

## LIST OF FIGURES

- Figure 1 Site Location
- Figure 2 Certification and Geomembrane Installation Limits
- Figure 3 Destructive Sample Test Codes for Dual Hot Wedge Fusion Welds
- Figure 4 Destructive Sample Test Codes for Extrusion Welds with Leister Heat Seams
- Figure 5 Leak Detection Trench 1 Plan View and Profile
- Figure 6 Leak Detection Trench 2 Plan View and Profile



## LIST OF APPENDICES

- Appendix A Staff Schedule for CQA Monitor Personnel
- Appendix B Surveyor's Professional License
- Appendix C Technical Specifications
- Appendix D Soil Liner Fill Acceptance Forms
- Appendix E Weekly Reports
- Appendix F Photographic Documentation
  - Appendix F.1 Photograph Log
  - Appendix F.2 Construction Photographs
- Appendix G Laboratory Test Results
  - Appendix G.1 Structural Fill (HCBF) Laboratory Test Results
  - Appendix G.2 Structural Fill Laboratory Test Results
  - Appendix G.3 Select Structural Fill Laboratory Test Results
  - Appendix G.4 Leak Detection Fill Laboratory Test Results
  - Appendix G.5 Soil Liner Fill Laboratory Test Results
  - Appendix G.6 Drain Cover Fill Laboratory Test Results
- Appendix H Geosynthetics Quality Control Documents and Inventory
  - Appendix H.1 Resumes of Installation Personnel
  - Appendix H.2 80-mil LLDPE Geomembrane Inventory Control
  - Appendix H.3 80-mil LLDPE Geomembrane Roll QC Certificates
  - Appendix H.4 80-mil LLDPE Geomembrane Resin QC Certificates
  - Appendix H.5 40-mil HDPE Geomembrane Inventory Control
  - Appendix H.6 40-mil HDPE Geomembrane Roll QC Certificates
  - Appendix H.7 40-mil HDPE Geomembrane Resin QC Certificates
  - Appendix H.8 Welding Rod Quality Control Certificates
  - Appendix H.9 Geotextile Roll Quality Control Certificates
- Appendix I 80-mil Geomembrane Installation Summaries
  - Appendix I.1 80-mil Geomembrane Deployment Summary
  - Appendix I.2 80-mil Geomembrane Trial Seam Summaries
    - Appendix I.2.1 80-mil Geomembrane Fusion Trial Seam Summary



- Appendix I.2.2 80-mil Geomembrane Extrusion Trial Seam Summary
- Appendix I.2.3 100-mil Geomembrane Extrusion Trial Seam
- Appendix I.3 80-mil Geomembrane Fusion Welding Summary
- Appendix I.4 80-mil Geomembrane Extrusion Welding Summary
- Appendix I.5 80-mil Geomembrane Destructive Testing Summaries
  - Appendix I.5.1 80-mil Geomembrane Fusion Destructive Testing Summary
  - Appendix I.5.2 80-mil Geomembrane Extrusion Destructive Testing Summary
- Appendix I.6 80-mil Geomembrane Pressure Testing Summary
- Appendix I.7 80-mil Geomembrane Defect/Repair Summary
- Appendix I.8 80-mil Geomembrane Acceptance Forms
- Appendix J Third Party 80-mil LLDPE Geomembrane Conformance Testing Results
- Appendix K Third Party 40-mil HDPE Geomembrane Conformance Testing Results
- Appendix L Tensiometer Certifications
- Appendix M Underground Working Observations



## 1. INTRODUCTION

NewFields Companies, LLC (NewFields) was commissioned by the Cripple Creek & Victor Gold Mining Company (CC&V), which is owned and managed by Newmont Corporation, to provide Construction Quality Assurance and Quality Control (QA/QC) for the construction of the Valley Leach Facility 2 (VLF2) Phase 3 project, formerly referred to as the Squaw Gulch VLF. The project is located in Teller County, Colorado, just east of the city of Cripple Creek. VLF2 is included in the Cresson Project, which is a gold mining and ore processing facility comprised of surface mines, crushers, lined VLFs, gold recovery plants, and associated infrastructure. The Cresson project was designed and constructed to meet or exceed the requirements established by C.R.S. §34-32-101 et seq. and regulations promulgated there under by the Mined Land Reclamation Board (MLRB). The work associated with the Cresson Project is being performed under specific criteria established in Amendment No. 10 of Permit Number M-1980-244, as approved by the MLRB.

This Record of Construction (ROC) report documents the QA/QC services for the VLF2 Project through Phase 3 Stage A.2. The following ROC reports should be referenced for Phase 3 Stage A.2 documentation that was completed during Phase 1, Phase 2A, and Phase 2B:

- “Squaw Gulch VLF Pregnant Solution Storage Area Project Final Report,” submitted by AMEC in November 2014
- “Squaw Gulch VLF Phase 1 (9,450’ to 9,500’ Bench) Final Report,” submitted by AMEC in October 2015
- “Squaw Gulch VLF Phase 1 (9,550-foot Elevation Bench to Completed Areas Outlined on Figure 2) Final Report,” submitted by AMEC in January 2016
- “Squaw Gulch Valley Leach Facility Phase 1 Completion Record of Construction Report,” submitted by NewFields in October 2016
- “Squaw Gulch Valley Leach Facility Phase 2A Part 1 Record of Construction Report,” submitted by NewFields in July 2019
- “Squaw Gulch Valley Leach Facility Phase 2A Part 2 Record of Construction Report,” submitted by NewFields in September 2019
- “Squaw Gulch Valley Leach Facility Phase 2A Part 3 Record of Construction Report,” submitted by NewFields in July 2020
- “Squaw Gulch Valley Leach Facility Phase 2B Part 1 Record of Construction Report,” submitted by NewFields in September 2020
- “Squaw Gulch Valley Leach Facility Phase 2B Part 2 Record of Construction Report,” submitted by NewFields in November 2020
- “Valley Leach Facility Phase 3 Stage A.1 Record of Construction Report Revision 1” submitted by NewFields in May 2023



The attached **Figures 1 and 2** present the general site location, the VLF2 Phases, and the Phase 3 Stage A.2 certification limits.

### 1.1. Project Description

VLF2 Phase 3 is the expansion of the existing VLF2. The general design of the VLF2 Phase 3 expansion comprises a lined pad and a dedicated internal Process Solution Storage Area (PSSA). Sections of lined pad area were brought up to grade by backfilling portions of Schist Island Pit Phase 1 with Overburden and compacted Structural Fill. No Overburden Fill was placed within the A.2 project limits. The remainder of the lined pad area grading included reshaping the flat area east of VLF2 Phase 2 and VLF2 Phase 3 to drain towards either the Phase 2 or Phase 3 PSSA.

Construction of the geomembrane system within VLF2 Phase 3 Stage A.2 was completed on September 5th, 2023. Construction of the High Volume Collection System piping was completed on October 6<sup>th</sup>, 2023. Construction of Drain Cover Fill was completed on October 25<sup>th</sup>, 2023. The VLF2 Phase 3 Stage A grading plan is shown on Drawing A100 of the IFC drawings.

### 1.2. Parties Involved

Work performed during the VLF2 Phase 3 Stage A.2 project was completed by several parties. Responsible parties involved in the project are listed below:

- Project management was provided by CC&V. Evan Fonger, Jeff Gaul, Daniel Egley, JR Sperry, and Robert Pacheco represented CC&V as the Construction Manager and Construction Superintendents, respectively.
- CC&V mining operations placed the Schist Island Owner Placed Structural Fill to rough sub-grade for SLF for the Stage A.2 project.
- JHL Constructors (JHL) was contracted by CC&V as the general contractor responsible for all contractor construction activities for the Stage A project. In addition, JHL performed survey and completed as-built drawings.
- Kelley Trucking, Inc (KTI) was subcontracted by JHL to perform all major earthworks activities.
- Tetra Tech was subcontracted by JHL to perform the Stage A.2 geomembrane installation.
- NewFields provided field engineering, Construction Quality Assurance (CQA), Construction Quality Control (CQC) and inspection for the Stage A project. A Staff Schedule of NewFields personnel is presented in **Appendix A**. All CQA records of testing are presented in the Tables and Appendices attached to this report.
- Agru America Inc. (Agru) manufactured and delivered geomembrane materials.
- TenCate Geosynthetics manufactured and delivered all the geotextile materials.



- Texas Research International, Inc. (TRI) was subcontracted by NewFields to perform third party conformance testing during the geosynthetics manufacturing.

### 1.3. Design Drawings and Technical Specifications

VLF2 Phase 3 Stage A.2 was constructed in general accordance with the Design Drawings and Technical Specifications from the report titled “*Cripple Creek & Victor Gold Mining Company Valley Leach Facility 2 Phase 3,*” issued by NewFields in July 2020. NewFields developed updated Issued for Construction Drawings and Technical Specifications dated August 2021. In March 2020, NewFields updated the Earthworks Technical Specifications to allow for 3-inch minus crushed ore to be used as Drain Cover Fill. The IFC Drawings and ROC Drawings are attached to this document. Survey for the VLF2 Phase Stage A.2 drawings was performed by JHL. A copy of the Surveyor’s Professional License is presented in [Appendix B](#). The Technical Specifications are presented in [Appendix C](#) and the earthwork material specifications are summarized in [Table 1](#). Any deviations from the IFC drawings or project Technical Specifications are discussed in [Section 5](#) of this report.

### 1.4. Use of this Report

This report has been prepared exclusively for Cripple Creek & Victor Gold Mining Company. No third party shall be entitled to rely on any information, conclusions, opinions, or other information contained herein without the express written consent of CC&V. Any third party that does rely on any information, conclusions, opinions, or other information contained herein without the express written consent of CC&V understands and acknowledges that NewFields is not liable for any claim arising out of such use.

## 2. SCHIST ISLAND PHASE 1 PIT OWNER PLACED FILL

CC&V performed the Structural Fill/High Compaction Backfill (HCBF) activities prior to and during the VLF2 Phase 3 A.2 project.

Equipment used to perform these activities is listed below:



- CAT 793 Loader
- CAT 794 Loader
- CAT 777 Water Truck
- CAT 6060 Shovel
- CAT 6015 Excavator
- CAT 793 Haul Truck
- CAT D10T Dozer

### 2.1. Structural Fill/High Compaction Backfill

Approximately 336,623 cubic yards of Run of Mine material was placed as SF/HCBF within the limits of VLF2 Phase 3 Stage A.2 area. The SF/HCBF was placed in maximum 5-foot-thick loose lifts and compacted using wheel rolling by loaded 793 haul trucks. The entire surface of each lift was compacted with a minimum of two passes (one pass = forward and backward) in accordance with the developed method specification.

The method specification was developed by building loose 5-foot-thick test pads on firm and unyielding surfaces in the Schist Island Phase 1 Pit. A grid was marked across the test pads and surveyed by Foresight West Surveying or CC&V survey. These same points were surveyed after each pass of a loaded 793 haul truck until the elevation change was minimal.

All subgrade preparation and SF/HCBF placement associated with site grading was monitored by the CQA Monitor to ensure that it met the project Technical Specifications.

### 3. VLF2 PHASE 3 CONSTRUCTION ACTIVITIES

JHL performed construction activities during the VLF2 Phase 3 project, excluding large earthworks and geomembrane installation. Major earthworks activities such as hauling and grading were performed by KTI.

Equipment used to perform these activities is listed below:

- |                               |                             |
|-------------------------------|-----------------------------|
| ➤ CAT 308E Mini Excavator     | ➤ CAT 740 Haul Truck        |
| ➤ Yanmar SV100 Mini Excavator | ➤ John Deere 460 Haul Truck |
| ➤ CAT 311F Excavator          | ➤ John Deere 950k LGP Dozer |
| ➤ CAT 336F Excavator          | ➤ CAT D6T LGP Dozer         |
| ➤ CAT 349E Excavator          | ➤ CAT D6K Dozer             |
| ➤ CAT 345B Excavator          | ➤ CAT D6XE Dozer            |



- CAT D8T Dozer
- CAT D10R Dozer
- CAT CS56 Smooth Drum Roller
- CAT 730 Water Wagon
- CAT 926M Wheel Loader
- CAT 980G Front End Loader
- CAT 299D3 Skid Steer
- CAT 289D Skid Steer

### 3.1. Clearing and Grubbing

The footprint of VLF2 Phase 3 Stage A.2 was stripped of all deleterious materials. Any soil containing vegetation was removed and placed in several site topsoil stockpiles designated by CC&V. All cleared areas were inspected by the CQA Monitor to ensure that all deleterious material was removed prior to further construction activities.

### 3.2. Underground Workings Remediation

Historic underground workings within the VLF2 Phase 3 Stage A.2 footprint were remediated in accordance with **IFC Drawing A470** and the project Technical Specifications. All underground workings that were encountered within the Phase 3 Stage A.2 limits during construction were given a unique identification number and are summarized in the table presented in **Appendix M**. The table includes the historic identification number, identification number, location (northing, easting, and surface elevation), type of working, remediation type, remediation quantities and remarks regarding the remediation. Workings were only identified if they were within 50 feet of the finished subgrade surface. Investigation and remediation were not required for any workings that exist at a depth greater than 50 feet below the finished subgrade surface. **Appendix M** contains a layout of all underground workings that were remediated within the Phase 3 Stage A.2 limits.

#### 3.2.1. Confirmatory Drilling

Confirmatory drilling was performed at all workings that were known or encountered during Phase 3 Stage A.2 construction to help define the limits of the working. The goal of the confirmatory drilling was to isolate the working so that the proper remediation could be completed.

Pneumatic hammer track drill rigs were used to drill four-inch diameter holes in designated patterns on known or encountered Underground Workings. If drilling activities indicated that 50 feet of crown pillar existed above the working, then the drill hole was marked as a “miss.” If any voids were encountered during drilling, then the drill hole was marked as a “hit,” and the void depths were recorded. LiDAR scanning equipment was lowered into the “hit” voids to determine the size and extents of the void and to map its geographical location. After the underground working was scanned, a remediation plan was developed for the working.



All drill holes were grouted with bentonite slurry or backfilled with native material prior to blasting the crown pillar and remediating the working.

### **3.2.2. Blasting**

Blasting was required when drilling indicated that voids existed within 50 feet of the finished subgrade surface. Existing and/or additional drill holes were loaded, and the working was blasted with the intent to collapse the crown pillar into the voids.

### **3.2.3. Remediation of Laterals**

All laterals were blasted prior to remediating the working. If the lateral was shallow, the blasted material was excavated, and the working was backfilled with compacted SF. If the working could not be fully removed during excavation, then a geogrid cap was placed 15 feet beyond the limits of the working. In most instances, a two-layer geogrid cap was installed in accordance with **Detail 22** on **IFC Drawing A470**; however, in some areas, a third layer of geogrid was installed based on the working size and depth, field conditions and location of the working within the pad. As-built figures for the geogrid caps installed within the VLF2 Phase 3 Stage A.2 limits are presented in **Appendix M**.

### **3.3. Site Grading**

Approximately 48,556 cy of Structural Fill (SF) material was used to grade the site within the limits of VLF2 Phase 3 Stage A.2 area. The SF was placed in maximum 2-foot-thick loose lifts, moisture conditioned as required, and compacted using a 12-ton vibratory smooth drum roller. The entire surface of each lift was compacted with a minimum of three passes (one pass = forward and backward) in accordance with the developed method specifications.

The method specifications were developed by building a 2-foot-thick test pad on a firm and unyielding surface along the west side of the PSSA. A grid was marked across the test pad and surveyed by Foresight West Surveying. These same points were surveyed after each pass of the smooth drum vibratory roller until the elevation change was minimal.

All subgrade preparation and SF placement associated with site grading was monitored by the CQA Monitor to ensure that it met the requirements of the Technical Specifications.

### **3.4. Subgrade Preparation**

The subgrade was prepared and inspected prior to SLF placement. The exposed subgrade surface was moisture conditioned and compacted using a 12-ton smooth drum vibratory roller where needed. Compaction of the subgrade was performed in accordance with the method



specifications as described in **Section 2.1**. The CQA Monitor inspected and approved the finished subgrade surface prior to SLF placement.

### **3.5. Leak Detection Trench**

Approximately 4,664 linear feet of leak detection trench was constructed within VLF2 Phase 3 Stage A.2 limits in accordance with the project Technical Specifications. The VLF2 Phase 3 Stage A.2 Leak Detection Trench 1 and Leak Detection Trench 2 is presented in the **Leak Detection Trench As-built ROC Drawings Number 3 and 4**.

**Detail A** on **IFC Drawing A420** shows the typical leak detection trench section. Per **Detail A**, a minimum one-foot by one-foot trench was excavated and lined with 40-mil smooth HDPE geomembrane. The geomembrane was installed in long strips with 5-feet overlap and was overlain by a 12 oz/yd<sup>2</sup> non-woven geotextile. A 4-inch diameter perforated corrugated polyethylene pipe (CPeP) was then placed in the trench. The trench was backfilled with Leak Detection Fill (LDF) and the geotextile was wrapped around the fill with a minimum 1-foot overlap. A flowline slope of 2 percent was maintained along the entire length of the trench. In areas where this slope could not be maintained, the slope was reduced to a minimum of 0.5 percent in localized areas only. The CQA Monitor observed the leak detection trench installation to date.

The Stage A.2 portion of Leak Detection Trench 1 and the entire Stage A Leak Detection Trench 2 was constructed by installing approximately 23,320 square feet of 40-mil smooth HDPE geomembrane, 23,320 square feet of 12 oz/yd<sup>2</sup> non-woven geotextile, 4,664 linear feet of 4-inch CPeP and 173 cy of LDF.

### **3.6. Soil Liner Fill**

Approximately 89,450 cy of SLF was placed within the VLF2 Phase 3 Stage A.2 area. The as-built SLF surface is presented in the **Record of Construction Drawings 1 and 2**.

Materials from the ECOSA and WHEX borrow were processed through a custom-designed screen in order to remove oversized rock and uniformly condition the material. A mobile incline screening plant with a double deck was also used to screen the material. After processing, the SLF was placed in designated stockpiles around the site.

The contractor used 40-ton articulated haul trucks to haul SLF from the local stockpiles to the VLF2 Phase 3 Stage A.2 footprint. The material was spread using D6 and D8 dozers equipped with GPS, and moisture conditioned in place by 740 water trucks and laborers. A 12-ton smooth drum vibratory roller, track-mounted skid steer with roller attachment, and mini excavator with vibrating plate attachment were utilized to compact the SLF to a minimum thickness of 12 inches.



The specified minimum density was 95 percent of the maximum dry density with a moisture content within minus 2 percent to plus 3 percent of optimum as determined by American Society for Testing and Materials (ASTM) D698.

Laboratory testing, moisture content verification, nuclear density testing, depth verification, and visual inspection of the SLF were performed by the NewFields CQA prior to approval for geomembrane deployment. If deficient areas of the SLF were encountered, the area was reworked and retested until the area was compliant with the project Technical Specifications. All SLF was inspected and approved by the CQA Monitor, CC&V, KTI, and Tetra Tech prior to geomembrane deployment. SLF laboratory testing is discussed in [Section 4.2.3](#). SLF acceptance forms are provided in [Appendix D](#).

### **3.7. 80-mil Geomembrane**

Tetra Tech installed approximately 2,415,000 square feet of 80-mil LLDPE geomembrane within the VLF2 Phase 3 Stage A.2 area as shown on [Record of Construction Drawing Numbers 5 and 6](#). The edge of geomembrane along the eastern and northern sides of the project limits, which will tie in with future construction phases, was protected by burying it within a permanent anchor trench.

Forklifts were used to transport and deploy the geomembrane panels parallel to the slopes to minimize stress on seams. Double-wedge fusion welding was the primary method of geomembrane seaming. Extrusion welding methods were used to perform tie-in seaming, defect repairs, and detail activities. Continuity conformance of fusion welded seams was performed using pressure testing methods, while extrusion welded seams and repairs were non-destructively tested using vacuum testing methods. Destructive testing was performed for both seaming types. The CQA Monitor observed and documented all geomembrane installation and repair activities, as provided in [Appendix I](#).

### **3.8. Drain Cover Fill**

Approximately 178,900 cy of crushed ore Drain Cover Fill (DCFO) was placed in accordance with the project Technical Specifications. To produce DCFO, Durable ore was sent to the crusher which processed the ore to the 3 inch-minus Technical Specification. After processing, the DCFO was stockpiled east of VLF2 in an area designated by CC&V. KTI used 40-ton articulated trucks to haul DCFO from the stockpile to the VLF2 Phase 3 Stage A.2 project area. The DCFO was placed in a minimum 2-foot-thick layer over approved 80-mil and 100-mil geomembrane using D6 dozers. The DCFO as-built exhibit is shown on [Record of Construction Drawings Number 9 and 10](#)



Haul routes consisted of 4-foot-lifts that were spread into 2-foot-lifts upon finish grading the area. All DCFO was placed in an uphill direction on slopes steeper than 4H:1V, and grade was checked using dozers with GPS capability.

A CQA Monitor was present during all DCFO placement activities to verify that the DCFO was placed in accordance with the project Technical Specifications and that no damage to the geomembrane occurred. If any damage to the geomembrane was noted, work activities were paused, and the damage was repaired prior to resuming DCFO placement. The DCFO as-built isopach is shown on **Record of Construction Drawing Number 11 and 12**. It is important to note that the DCFO isopach was developed by generating a volume surface between two surfaces, the top of the SLF and the top of the DCFO. The SLF and DCFO surfaces were created from survey points. All survey points were not taken in the same location for each surface. The depths showing less than 2 feet have some level of error associated with them due to the surface triangulation between points. Any identified low spot was hand measured and verified in the field by NewFields to ensure a minimum depth of 2 feet. If a low spot was found in the field, the contractor was notified and additional material was added to achieve a the 2-foot minimum.

### **3.9. 80-mil Anchor Trench**

The geomembrane was anchored at the limits of the VLF2 Phase 3 Stage A.2 area in a minimum 2-feet-wide and 3-feet-deep anchor trench. The anchor trench was backfilled by JHL using a mini excavator and skid steer. The backfill material, which was composed of SLF and rejected material from the SLF screening plant, was placed in 8 to 12-inch loose lifts and compacted with a mini excavator with vibrating plate attachment. In areas where future geomembrane installation would cover the anchor trench, SLF was used to backfill the top 12 inches of the anchor trench.

## **4. CONSTRUCTION QUALITY ASSURANCE/CONSTRUCTION QUALITY CONTROL**

CQA and CQC activities were performed by NewFields CQA for all shifts during the VLF2 Phase 3 Stage A.2 project. An office and field laboratory were used to organize data and perform necessary laboratory testing onsite. CQA and CQC activities performed included: monitoring all aspects of construction, inspection and approval of all project components, laboratory testing of soils and geomembrane, field testing of soils and geomembrane, documentation of construction, and CQA and CQC activities.

Daily and weekly construction progress reports were generated and submitted to CC&V and the Engineer of Record (EOR). The weekly construction progress reports are presented in **Appendix E**. The timeline of activities covered in the reports is listed below:

- Week ending April 21, 2023 to August 11, 2023 – Structural Fill placement



- Week ending May 19, 2023 to September 1, 2023 – SLF placement
- Week ending June 16, 2023 to September 8, 2023 – Geomembrane deployment
- Week ending July 21, 2023 to October 25, 2023 – DCF placement

Photographs of key construction elements taken by the CQA monitor throughout the project are presented in **Appendix F**. All testing and inspections were performed in accordance with the Technical Specifications presented in **Appendix C**.

#### **4.1. Testing Standards**

The CQA Monitor completed the earthwork laboratory testing in an on-site soils laboratory to verify that all earthwork construction materials met the project Technical Specifications. Geomembrane and geotextile samples were sent to a third-party laboratory to verify that the material properties met the project Technical Specifications. Testing was performed in accordance with these American Society for Testing and Materials (ASTM) standards.

##### **4.1.1. Earthworks Testing Standards**

- Particle size analysis (ASTM C117, C136, D1140, D6913)
- Atterberg limits (ASTM D4318)
- Laboratory moisture/density relationship (ASTM D698)
- Moisture Content (ASTM D2216)
- Flexible Wall Permeability (ASTM D5084, Method D)
- Density of soil in place by nuclear method (ASTM D6938)
- Soil Classification (ASTM D2488)

##### **4.1.2. Geomembrane Testing Standards**

- Thickness (ASTM D5199/D5994)
- Density (ASTM D1505/D792, Method B)
- Carbon Black Content (ASTM D4218)
- Carbon Black Dispersion (ASTM D5596)
- Tensile Properties (ASTM D6693)
- Ultimate Elongation (ASTM D6693)
- Puncture Strength (ASTM D4833)
- Peel and Shear Strength (ASTM D6392)



#### 4.1.3. Geotextile Testing Standards

- Mass per Unit Area (ASTM D5261)
- Puncture Resistance (ASTM D4833)
- CBR Puncture (ASTM D6241)
- Apparent Opening Size (ASTM D4751)

#### 4.2. Earthworks Construction Quality Assurance

All earthwork activities for the VLF2 Phase 3 Stage A.2 project were performed in accordance with the design drawings and project specifications as discussed in [Section 1.3](#). The CQA Monitor observed, documented, and performed testing during material placement. This included: ensuring the proper materials were placed, fills were free of deleterious materials, lift placement was performed uniformly and on a firm and unyielding underlying layer, haulage traffic was spread across fill surfaces when practical, moisture conditioning was performed uniformly with acceptable moisture content, the proper method specification was used when applicable, and specified densities were achieved during field testing. Earthworks laboratory and field testing and frequencies are summarized in [Tables 5-10](#).

The CQA Monitor checked ambient temperatures and logged the daily high and low temperatures, maximum wind speeds and amount of precipitation in [Table 3](#). If earthwork activities were performed while the ambient temperature was below 32°F, fill temperatures were monitored by the CQA Monitor to ensure no frozen material was placed in accordance with the applicable project specifications. Ambient temperatures are presented in [Table 3](#).

##### 4.2.1. Structural Fill

VLF2 Phase 3 Stage A.2 was constructed by placing 48,556 cy of SF. The particle size distribution and Atterberg limits testing frequencies were one sample for every 50,000 cy. One SF sample was tested for particle size and Atterberg limits based on the quantity of material placed and passing results were achieved. SF laboratory testing is summarized in [Table 4](#) and individual test results are presented in [Appendix G.1](#).

No laboratory compaction testing was performed on the SF placed within the VLF2 Phase 3 Stage A.2 area, as all SF material contained more than 30 percent retained on the 3/4-inch sieve. Density was achieved by placing the material in accordance with the method compaction specifications presented in [Section 3.3](#).

##### 4.2.2. Leak Detection Fill

The VLF2 Phase 3 Stage A.1 portion of the leak detection trench was constructed by placing 173 cy of LDF. The particle size distribution and Atterberg limits testing



frequencies were one sample for every 10,000 cy. Two LDF samples were required to be tested for particle size and Atterberg limits. Two LDF samples were tested with passing results. LDF laboratory testing is summarized in [Table 9](#) and individual test results are presented in [Appendix G.4](#).

#### **4.2.3. Soil Liner Fill**

The VLF2 Phase 3 Stage A.2 area was constructed by placing 89,450 cy of SLF. The particle size distribution, Atterberg limits, laboratory compaction, and permeability testing frequencies were one sample for every 4,000 cy. A minimum of 23 SLF samples were required and 31 SLF samples were tested and found to be within specifications. SLF laboratory testing is summarized in [Table 7](#), and individual test results are presented in [Appendix G.5](#).

The nuclear density/moisture testing frequency for SLF is one test for every 500 cy. A minimum of 179 SLF nuclear density/moisture tests were required, and a total of 195 SLF nuclear density/moisture tests were performed with passing results. The depth check frequency is two checks per acre of finished SLF. A minimum of 98 SLF depth checks were required. A total of 195 SLF depth checks were performed with passing results. SLF nuclear density/moisture testing and SLF depth checks are presented in [Tables 11 and 12](#), respectively.

#### **4.2.4. Drain Cover Fill**

VLF2 Phase 3 Stage A.2 was constructed by placing 178,900 cy of crushed ore drain cover fill (DCFO). No non-ore DCF was used for this construction. The particle size distribution and Atterberg limits testing frequencies were one sample for every 20,000 cy. A minimum of 9 DCFO samples were required to be tested for particle size and Atterberg limits. A total of 14 DCFO samples were tested with passing results. DCFO laboratory testing is summarized in [Table 8](#), and individual test results are presented in [Appendix G.6](#)

### **4.3. Geosynthetics Quality Control Submittals**

The NewFields CQA reviewed and approved all geosynthetic QC submittals, including geomembrane installation personnel resumes, geomembrane roll QC certificates, geomembrane resin QC certificates, welding rod QC certificates, and geotextile QC certificates. The NewFields CQA tracked all geomembrane delivered to site. The site inventories for all 80-mil, and 40-mil geomembrane are presented in [Appendices H.2 and H.5](#), respectively.

#### **4.3.1. Geomembrane Installation Personnel Resumes**

Tetra Tech submitted the resumes of all installation personnel prior to construction or repair activities within the VLF2 Phase 3 Stage A.2 area. The CQA Monitor verified that



the Installation Superintendent, Master Seamer and QC Inspector possessed the installation experience required by the project Technical Specifications. Geomembrane installation personnel resumes for all crews that performed work on the VLF2 Phase 3 Stage A.1 area are presented in [Appendix H.1](#).

#### **4.3.2. Geomembrane Roll QC Certificates**

The VLF2 Phase 3 Stage A.2 geomembrane was manufactured by AGRU America. Manufacturing Roll QC certificates were submitted for every roll of geomembrane (approximately one every 9,000 square feet), exceeding the required minimum frequency of one per 50,000 square feet of geomembrane. The roll QC certificates were reviewed by the CQA Monitor, ensuring all geomembrane materials met or exceeded the Technical Specifications requirements. It should be noted that a separate Asperity test measuring the height of the microspikes on the liner was also recorded in the QC certificates. The Asperity height is separate from the thickness of the liner. All QC certificates for 80-mil, and 40-mil geomembrane for VLF2 Phase 3 Stage A.2 are provided in [Appendices H.3 and H.6](#), respectively.

#### **4.3.3. Geomembrane Resin QC Certificates**

AGRU America manufactured the geomembrane for the VLF2 Phase 3 Stage A.2 by using LLDPE polymer raw material (resin). Chevron Phillips Chemical Company provided resin QC certificates at a rate of one per rail car shipment. The resin QC certificates were reviewed by the CQA Monitor, ensuring all materials met or exceeded the Technical Specification requirements. The resin QC certificates for all 80-mil and 40-mil geomembrane used within the Phase 3 Stage A.2 area are presented in [Appendices H.4 and H.7](#), respectively.

#### **4.3.4. Geomembrane Welding Rod QC Certificates**

AGRU America manufactured the extrusion welding rod for VLF2 Phase 3 Stage A.2 from various resin lots. The CQA Monitor reviewed and verified that all welding rod QC certificates that were provided by Chevron Phillips Chemical Company met the requirements defined in Technical Specifications and was manufactured using the same type of resin. The welding rod QC certificates are presented in [Appendix H.8](#).

#### **4.3.5. Geotextile QC Certificates**

Tencate Geosynthetics manufactured the 12 oz/yd<sup>2</sup> non-woven geotextile that was used to construct the leak detection trench. The CQA Monitor verified that the geotextile QC certificates, presented in [Appendix H.9](#), met the project Technical Specifications.



#### **4.4. Geomembrane Construction Quality Assurance**

CQA performed on installed LLDPE geomembrane consisted of visual observations of panel deployment, double-wedge fusion seaming, extrusion seaming, extrusion welded repairs, non-destructive testing, and destructive testing. Fusion welded seams were non-destructively tested for continuity using pressure testing methods. Extrusion welds were non-destructively tested using vacuum testing methods. Fusion and extrusion welding methods were also tested destructively. All field sampling and testing was performed by Tetra Tech and observed by the CQA Monitor. Visual observations of field seams and panels were routinely made to inspect the seam for squeeze-out, melt, over-grind, and overlap. Defects and/or failed seams were marked and repaired in accordance with the specified repair procedures.

Welding machines were continually inspected for proper operation, settings and condition by performing trial welds prior to actual geomembrane installation. Logs of the trial welds, panels, seams, continuity testing, repairs, and destructive testing were maintained by both the contractor and the CQA Monitor on a daily basis. The CQA Monitor's geomembrane installation logs are presented in [Appendix I](#).

Geomembrane installation for the VLF2 Phase 3 project was performed in accordance with design drawings and project specifications. [Record of Construction Drawings Numbers 5 and 6](#) show panel locations, seams, and destructive test locations.

##### **4.4.1. Geomembrane Third Party Conformance Testing**

The third-party conformance test samples for the 40-mil and 80-mil geomembrane were obtained at a rate of one test for every 150,000 square feet, and at least one test for each resin lot, resulting in a total of 23 tests for 80-mil LLDPE, and 2 tests for 40-mil HDPE. Samples were tested by TRI in Anaheim, CA. All conformance test results were reviewed by a NewFields representative and met the Technical Specification requirements. Third-party conformance test results for 80-mil LLDPE and 40-mil HDPE are presented in [Appendices J and K](#), respectively.

##### **4.4.2. Geomembrane Panel Deployment**

The SLF surface was inspected by the CQA monitor prior to geomembrane deployment, ensuring the surface was free of any protruding rocks greater than 0.75-inches, desiccation cracks greater than 0.25-inches in width or depth, or irregularities (rutting, ridges, indentations, etc.) greater than 0.5-inches. The SLF surface was approved by Tetra Tech, JHL, CC&V, and the CQA Monitor prior to and during deployment each day. SLF acceptance forms are presented in [Appendix D](#). During geomembrane panel deployment, the CQA Monitor logged the dimensions of each panel, the roll number used for each panel, and measured the thickness of the panel edges. Roll numbers were checked against



the site inventory to ensure only approved geomembrane was deployed. Deployment summaries for 80-mil geomembrane are presented in [Appendix I.1](#).

#### **4.4.3. Geomembrane Fusion Seaming**

Double-wedge fusion welding was the primary method of geomembrane seaming for the VLF2 Phase 3 Stage A.2 project. Prior to fusion welding activities, trial-welds were performed by each welding machine and corresponding welding technician combination for each type of geomembrane. The fusion welding trial seam logs for 80-mil geomembrane are presented in [Appendix I.2.1](#). The weld was inspected constantly for insufficient overlap, burnouts, or any other damage caused during the welding process. The CQA Monitor logged the welding machine and welding technician combination, the length of the seam, the direction the seam was welded, time of seaming, the welding machine temperature, and the welding machine speed. Destructive test samples were marked during fusion seaming and are discussed further in [Section 4.4.5](#). Continuity conformance of the seam was also performed using pressure testing methods and is discussed further in [Section 4.4.6](#). The geomembrane fusion welding summaries for 80-mil LLDPE geomembrane are presented in [Appendix I.3](#).

#### **4.4.4. Geomembrane Extrusion Seaming**

Extrusion seaming was primarily used to tie in the 80-mil LLDPE to the 100-mil LLDPE at the 10,000-foot elevation bench of the PSSA, and to tie in the Phase 3 80-mil geomembrane to the Phase 2 geomembrane on the southern boundary of the 2022 certification limits. Some extrusion seaming was also used within the A.2 limits as a secondary method to double-wedge fusion welding.

Any damage caused to the existing geomembrane at the tie-in to the 100-mil LLDPE at the 10,000 -foot elevation bench of the PSSA as it was exposed was repaired with 100-mil LLDPE by completely covering the damaged area with an extrusion welded patch. Any damage caused to the existing geomembrane at the Phase 2 tie-in as it was exposed was repaired by extending the overlap of new liner or by completely covering the damaged area with a patch. Prior to extrusion seaming activities, trial welds were performed for each welding machine and welding technician combination for each type of geomembrane. The trial seam logs for the 80-mil and 100-mil LLDPE are presented in [Appendices I.2.2 and I.2.3](#), respectively. As extrusion seaming was performed, proper techniques were verified including welding angle, grinding, and weld/welding rod cleanliness. The CQA Monitor logged the welding machine and welding technician combination, the length of the seam, the direction the seam was welded, time of seaming, the pre-heat temperature, and the welding temperature. Destructive test samples were marked during extrusion seaming and testing is discussed further in [Section 4.4.5](#). All



extrusion welded seams were vacuum tested, which is discussed further in [Section 4.4.7](#). Extrusion welding summaries for 80-mil geomembrane are presented in [Appendix I.4](#).

#### **4.4.5. Geomembrane Destructive Testing**

During welding activities destructive test samples were marked at a minimum every 500 linear feet of seam for each welding type and each welding machine/welding technician combination. A 36-inch long by 12-inch-wide sample was cut from the seam centered on the seam lengthwise. The sample was then cut into three 12-inch-long sections. Two 12-inch-long sections were archived by the CQA Monitor to be tested later, if necessary. Ten 1-inch coupons were then cut from the remaining 12-inch section. Five coupons were tested for shear strength and five coupons were tested for peel strength using a tensiometer. The different failure types and test codes for fusion and extrusion destructive testing are presented on [Figures 3 and 4](#), respectively. All destructive testing was performed by Tetra Tech in the presence of the CQA Monitor. Within the A.2 limits 292 fusion ([Appendix I.5.1](#)) and 32 extrusion ([Appendix I.5.2](#)) destructive samples were tested and passed. Tensiometer certifications can be found in [Appendix L](#).

#### **4.4.6. Geomembrane Pressure Testing**

Pressure testing was performed to ensure all fusion welded seams had continuity throughout their entire length. The ends of the seam were sealed and the air channel in the seam was pressurized using a small air compressor to a minimum of 30 pounds per square inch (psi), for a minimum of five minutes. A pressure gauge and needle were used to monitor the air pressure in the seam. If the pressure dropped less than 3 psi, the opposite end of the seam from the pressure gauge was cut. If the needle dropped, continuity was confirmed throughout entire seam length and the test was considered “passing.” If a pressure drops of more than 3 psi occurred or the continuity was not proven, smaller sections of the seam were tested to delineate the failing section of the seam. All failing seams or portions of seams were repaired, and vacuum tested. Air pressure testing summaries for secondary, primary, and 80-mil geomembrane are presented in [Appendix I.6](#).

#### **4.4.7. Geomembrane Defects and Repairs**

The CQA Monitor constantly inspected the geomembrane for defects from the time it was deployed until it was covered with DCF. A defect is defined as any item in which a repair is necessary to create a continuously sealed geomembrane layer. All defects were marked with a defect number by the CQA Monitor. Repairs were performed using the extrusion welding method and patches extended at least 6 inches beyond the defect in all directions.



All repairs and extrusion welded seams were non-destructively tested using a vacuum box. The area being tested was covered in soapy water and the vacuum box was sealed to the geomembrane. A vacuum was pulled over the area for at least 10 seconds and if no bubbles were present, the test passed. If bubbles were present, the section of weld failed and was marked as a defect. The repair process would then be repeated for the failing vacuum test. Vacuum tests overlapped each other by a minimum of 3 inches. The 80-mil defect/repair summary is presented in [Appendix I.7](#).

#### **4.4.8. Geomembrane Acceptance**

Prior to DCFO placement, the geomembrane was accepted by Tetra Tech, JHL, CC&V, and the CQA Monitor. All CQA logs and survey data were thoroughly reviewed ensuring that all aspects of the geomembrane installation were performed in accordance with project Technical Specifications. The 80-mil geomembrane acceptance forms are presented in [Appendix I.8](#).

## **5. PROJECT DEVIATIONS**

Throughout construction, the following deviations from the Design and IFC Drawings were approved by the Engineer of Record:

- 40-mil HDPE smooth geomembrane was substituted for 40-mil LLDPE smooth geomembrane in the leak detection trench.
- The grading of the Stage A.2 was modified to better match the as-built Schist Island pit conditions and to maintain the width of the Schist Island haul road. The as-built conditions are reflected in the Record of Construction Drawings and meet the intent of the original design.
- The excavation of the Leak Detection Trench traversed across areas that were previously mined to grade through an existing pit highwall or haul roads. The leak detection trench alignment also traversed over fills constructed out of High Compaction Backfill or historically placed Run of Mine fills that are not anticipated to have settlement. The difficulty in cleanly excavating into bedrock and Run of Mine fills led to the pathway being flatter than 2 percent in certain areas. Further explanation can be found in [Figures 5 and 6](#).
- No geomembrane destructive testing sample was taken on 6/16/23 for machine #42. This machine was used on 8 welds that day, for a total of 318 ft of welding and had not been used on the project prior. However, two passing trial seams for that welder were tested that day. Over the duration of the project, machine #42 was used for a total of 27,778 ft of welding with 62 destructive testing samples being taken on those welds, resulting in an average sample frequency of 1 per 448 ft.



## 6. ENGINEER'S OPINION

Based on the construction activities observed, testing performed, and inspections completed, NewFields certifies that the project was constructed in general accordance with the approved IFC Drawings and Technical Specifications.



**FINAL CERTIFICATION**

**VALLEY LEACH FACILITY 2**  
**QUALITY ASSURANCE**  
**PHASE 3 STAGE A.2 COMPLETION AREA**  
**TELLER COUNTY, COLORADO**

I, Jay N. Janney-Moore, a registered professional engineer in the State of Colorado, hereby certify that the construction of the VLF2 Phase 3 Stage A.2 Completion Area, as outlined in **Figures 1 and 2**, was completed in compliance with the drawings and project Technical Specifications approved as part of Permit Number M-1980-244, Amendment No. 10 as well as subsequent changes approved by the Office of Mined Land Reclamation.

**NewFields Mining Design & Technical Services,**



Jay N. Janney-Moore, PE

CO PE No. 37571