VALLEY LEACH FACILITY 2
PHASE 3 STAGE A.1
RECORD OF CONSTRUCTION REPORT

Prepared for:
Cripple Creek & Victor Gold Mining Company
P.O. Box 191
Victor, CO 80860

Prepared by:
NewFields Mining Design & Technical Services
9400 Station Street, Suite 300
Lone Tree, Colorado 80124

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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.1. The following ROC reports should be referenced for Phase 3 Stage A.1 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

The attached Figures 1 and 2 present the general site location, the VLF2 Phases, and the Phase 3 Stage A.1 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 and the PSSA were brought up to grade by backfilling portions of Schist Island Pit with compacted Overburden and Structural Fill. The remainder of the lined pad area grading was reshaping the flat area between VLF2 Phase 2 and VLF2 Phase 2 to drain towards either the Phase 2 or Phase 3 PSSA.

Construction within VLF2 Phase 3 Stage A.1 was completed on December 12, 2022. 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.1 project was completed by several parties. Responsible parties involved in the project are listed below:

- Project management was provided by CC&V. Messrs. Evan Fonger, Jeff Gaul, Daniel Egley, and Robert Pacheco represented CC&V as the Construction Manager and Construction Superintendents, respectively.
- JHL Constructors (JHL) was contracted by CC&V as the general contractor responsible for all construction activities for the Stage A project.
- Kelley Trucking, Inc (KTI) was subcontracted by JHL to perform all major earthworks activities.
- JHL and Kimley-Horn performed all survey. Kimley-Horn was subcontracted by JHL to compile all survey and finalize as-built drawings.
- Tetra Tech, was subcontracted by JHL to perform the Stage A geomembrane installation.
- NewFields provided field engineering and construction QA/QC testing and inspection for the Stage A project. A Staff Schedule of NewFields personnel is presented in Appendix A.
- 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. Construction Quality Assurance (CQA) / Construction Quality Control (CQC)

CC&V contracted NewFields to perform all CQA and CQC activities for the VLF2 Phase 3 Stage A.1 project. All CQA records of testing are presented in the Tables and Appendices attached to this report.

1.4. Design Drawings and Technical Specifications

VLF2 Phase 3 Stage A.1 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.1 drawings was performed by JHL and Kimley-Horn. Copies of the Surveyor's Professional Licenses are 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 4 of this report.

1.5. Use of this Report

This report has been prepared exclusively for Cripple Creek & Victor Gold Mining Company. No third party, other than the design team (NewFields), 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. 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
- Yanmar SV100 Mini Excavator
- CAT 311F Excavator
- CAT 336F Excavator
- CAT 349E Excavator
- CAT 345B Excavator
- CAT 740 Haul Truck
- CAT D6T LGP Dozer
- CAT D6K Dozer
- 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

2.1. Clearing and Grubbing

The footprint of VLF2 Phase 3 Stage A.1 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.

2.2. Underground Workings Remediation

Historic underground workings within the VLF2 Phase 3 Stage A.1 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.1 limits during construction were given a unique identification number and are summarized in the table presented in Appendix P. 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 P contains a layout of all underground workings that were remediated within the Phase 3 Stage A.1 limits.

2.2.1. Confirmatory Drilling

Confirmatory drilling was performed at all workings that were known or encountered during Phase 3 Stage A.1 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 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.

2.2.2. 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.

2.2.3. 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.1 limits are presented in Appendix P.

2.3. Site Grading

Approximately 21,522 cy of Structural Fill (SF) material was used to grade the site within the limits of VLF2 Phase 3 Stage A.1 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 project Technical Specifications.

2.4. 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 applicable developed method specifications as described in Section 2.3. The CQA Monitor inspected and approved the finished subgrade surface prior to SLF placement.

2.5. Leak Detection Trench

Approximately 628 linear feet of leak detection trench was constructed within VLF2 Phase 3 Stage A.1 limits in accordance with the project Technical Specifications. The VLF2 Phase 3 Stage A.1 Leak Detection Trench 1 is presented in the Leak Detection Trench As-built record of construction drawing number 3.

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 a 5-foot overlap and was overlain by a 12 oz/yd^2 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% in localized areas only. The CQA Monitor observed the leak detection trench installation to date.

The Stage A.1 portion of Leak Detection Trench 1 was constructed by installing approximately 3,140 square feet of 40-mil smooth HDPE geomembrane, 3,140 square feet of 12 oz/yd^2 non-woven geotextile, 628 linear feet of 4-inch CPeP and 23 cy of LDF.

2.6. Soil Liner Fill

Approximately 33,845 cy of SLF was placed within the VLF2 Phase 3 Stage A.1 area. The as-built SLF surface is presented in Soil Liner Fill As-Built record of construction drawings.

Materials from the ECOSA 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 stockpiled 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.1 footprint. The material was spread using D6 and D8 dozers equipped with GPS, and moisture conditioned in place by tandem-axle 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 CQA Monitor 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 3.2.3. SLF acceptance forms are provided in Appendix D.

2.7. PSSA Composite Liner System

The composite liner system for the PSSA consists of a layer of secondary 100-mil LLDPE double sided textured geomembrane, a low volume solution collection system, and a primary layer of 100-mil LLDPE double sided textured geomembrane. The low volume solution collection system is described in further detail in Section 2.6.1. The as-built filling curve for the PSSA is provided in Figure 5.

Tetra Tech installed approximately 515,031 square feet of secondary 100-mil LLDPE geomembrane and 508,091 square feet of primary 100-mil LLDPE geomembrane within the PSSA. Panels were deployed from the top of the 10,000’ bench using forklifts and deployed down the length of the 2H:1V slope so that stresses on the seams between panels were minimized.

The secondary geomembrane was underlain by the 1’ thick layer of SLF that was placed across the entire lined project footprint. The SLF surface was moisture conditioned, compacted and approved by the CQA Monitor prior to secondary geomembrane deployment.

2.7.1. Low Volume Solution Collection System

The Low Volume Solution Collection System (LVSCS) consists of a three-foot-thick layer of low volume solution collection fill (LVSCF), and a network of approximately 4,162 linear feet of perforated 4-inch CPe pipes laid out in a herringbone pattern across the secondary geomembrane of the PSSA. The pipes convey solution to the sump, where three 18” dia. HDPE low volume solution collection risers run from the bottom of the sump to the 10,000’ bench of the PSSA.

2.7.2. PSSA Anchor Trench

Using a mini excavator, JHL excavated approximately 3,412 feet of anchor trench around the crest of the PSSA. The anchor trench was a minimum of 3 feet deep by 2 feet wide and was used for both secondary and primary geomembranes. The secondary and primary geomembranes in the anchor trench are separated by approximately 1 foot of SLF or approved SLF reject material, and the configuration is shown in Detail 4 of IFC drawing number A440. Once both secondary and primary geomembranes were installed in the anchor trench, JHL used a skid steer and a mini excavator with vibrating plate attachment to backfill and to compact the material in the anchor trench. In areas where the anchor trench would remain exposed until the 2023 construction season, the SLF was placed to the top of liner and sloped to direct stormwater away from the anchor trench.

2.8. 80-mil Geomembrane

Tetra Tech installed approximately 394,420 square feet of 80-mil LLDPE geomembrane within the VLF2 Phase 3 Stage A.1 area as shown on Record Drawing No. 9. 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 the SLF.

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.

2.9. 80-mil Anchor Trench

The geomembrane was anchored at the limits of the VLF2 Phase 3 Stage A.1 area in a minimum 2-foot wide and 3-foot-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.

2.10. High Volume Solution Collection System

The piping layout plan view of the High Volume Solution Collection System (HVSCS) is shown on drawing A120 of the IFC drawing set. Piping details are shown on IFC drawing A461.

All HVSCS piping was installed on approved geomembrane and held in place with sandbags during DCF placement. The sandbags were filled with approved DCF material and were split open prior to being covered with DCF. Approximately 10,417 linear feet of 4-inch diameter perforated corrugated polyethylene pipe (CPeP), 2,197 linear feet of 8-inch diameter perforated CPeP, 688 linear feet of 12-inch diameter perforated CPeP, 417 linear feet of perforated 18-inch CPeP, and 2,539 linear feet of 24-in CPeP were installed.

2.10.1. HVSCS Riser Foundation

The LVSCF underneath the HVSCS risers was compacted to within 95% of the MDD using a skid steer with roller attachment. The in-place moisture and density was tested using a nuclear densometer.

2.10.2. HVSCS Risers

The steel base plates for the HVSCS risers were installed on a layer of padding over the primary geomembrane in the sump of the PSSA. The padding was designed to protect the geomembrane and consisted of a layer of GCL, a layer of 3-inch-thick closed cell foam, and a layer of conveyor belting. Extra conveyor belting was used as needed to level the steel plates.

2.11. Select Drain Cover Fill

Approximately 300 cubic yards of Select Drain Cover Fill (SDCF) was placed around the circumference of the HVSCS risers in the sump of the PSSA, up to the elevation of the 6-inch perforated CPe collector pipes. The SCDF was placed using a 336 excavator on a 4-foot-thick layer of DCF. A layer of DCF was placed around the SDCF to buttress the material in place.

2.12. Drain Cover Fill

Approximately 67,685 cy of crushed ore DCF was placed within the VLF2 Phase 3 Stage A.1 area in accordance with the project Technical Specifications. Durable ore was sent to the crusher which processed the ore to the 3 inch-minus technical specification. After processing, the DCF was stockpiled east of VLF2 in an area designated by CC&V.

KTI used 40-ton articulated trucks to haul DCF from the stockpile to the VLF2 Phase 3 Stage A.1 project area. The DCF was placed in a minimum 2-foot-thick layer over approved 80-mil and 100-mil geomembrane using D6 dozers. The DCF as-built exhibit is shown on Record Drawing No. 13.

Haul routes consisted of 4-foot-lifts that were spread into 2-foot-lifts upon finish grading the area. All DCF 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 DCF placement activities to verify that the DCF 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 DCF placement. The DCF as-built isopach is shown on Record Drawing No. 14. It is important to note that the DCF isopach was developed by generating a volume surface between two surfaces, the top of the SLF and the top of the DCF. The SLF and DCF 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 remediated it to 2 feet thick minimum.

3. QUALITY ASSURANCE/QUALITY CONTROL

QA/QC activities were performed by the CQA Monitor for all shifts during the VLF2 Phase 3 Stage A.1 project. An office and field laboratory was used to organize data and perform necessary laboratory testing onsite. QA/QC 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 QA/QC 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 June 17, 2022 to October 21, 2022 – SLF placement
- Week ending July 29, 2022 to August 26, 2022 – Secondary geomembrane deployment
- Week ending September 2, 2022 to September 30, 2022 – LVSCF placement
- Week ending September 23, 2022 to October 21, 2022 – Primary geomembrane deployment
- Week ending October 7, 2022 to October 28, 2022 – 80-mil geomembrane placement
- Week ending October 21, 2022 to December 9, 2022 – 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.

3.1. 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. All testing was performed in accordance with these American Society of Testing and Materials (ASTM) standards.

3.1.1. 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)

3.1.2. 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)

3.1.3. Geotextile Testing Standards

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

3.2. Earthworks Construction Quality Assurance

All earthwork activities for the VLF2 Phase 3 Stage A.1 project were performed in accordance with the design drawings and project specifications as discussed in Section 1.4. 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 Table 2.

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 compacted. Ambient temperatures are presented in Table 3.

3.2.1. Structural Fill

VLF2 Phase 3 Stage A.1 was constructed by placing 21,522 cy of SF. The particle size distribution and Atterberg limits testing frequencies were one sample for every 50,000 cy. A minimum of one SF sample was required to be tested for particle size and Atterberg limits based on the quantity of material placed. A total of two SF samples were tested with passing results. 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.1 area, as all SF material contained more than 30 percent retained on the ¾-inch sieve. Density was achieved by placing the material in accordance with the method compaction specifications presented in Section 2.3.

3.2.2. Leak Detection Fill

The VLF2 Phase 3 Stage A.1 portion of the leak detection trench was constructed by placing 23 cy of LDF. The particle size distribution and Atterberg limits testing frequencies were one sample for every 10,000 cy. One LDF sample was required to be tested for particle size and Atterberg limits. One LDF sample was tested with passing results. LDF laboratory testing is summarized in Table 9 and individual test results are presented in Appendix G.3.

3.2.3. Soil Liner Fill

The VLF2 Phase 3 Stage A.1 area was constructed by placing 33,845 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 nine SLF samples were required to be tested for the above parameters. Seventeen SLF samples were tested and found to be within specifications. SLF laboratory testing is summarized in Table 6, and individual test results are presented in Appendix G.4.

The nuclear density/moisture testing frequency for SLF is one test for every 500 cy. A minimum of sixty eight SLF nuclear density/moisture tests were required, and a total of eighty-seven SLF nuclear density/moisture tests were performed with passing results. The depth check frequency for SLF is two checks for every acre. A minimum of twenty SLF depth checks were required. A total of eighty-seven SLF depth checks were performed with passing results. SLF nuclear density/moisture testing and SLF depth checks are presented in Tables 10 and 11, respectively.

3.2.4. Low Volume Solution Collection Fill

Approximately 59,831 cubic yards of LVSCF were placed in the PSSA over approved secondary geomembrane. The minimum testing frequency for particle size distribution and Atterberg limits is one sample per 10,000 cy. A minimum of 6 LVSCF samples were required at this frequency, and 9 were tested and found to be within specifications. LVSCF laboratory testing is summarized in Table 7.

3.2.5. Drain Cover Fill

VLF2 Phase 3 Stage A.1 was constructed by placing 67,685 cy of crushed ore drain cover fill (DCFO). No non-ore DCF was used for the construction of VLF2 Phase 3 Stage A.1. The particle size distribution and Atterberg limits testing frequencies were one sample for every 20,000 cy. A minimum of four DCFO samples were required to be tested for particle size and Atterberg limits. A total of ten 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.

3.3. Geosynthetics Quality Control Submittals

The CQA Monitor 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 CQA Monitor tracked all geomembrane delivered to site in the site inventory. The site inventories for all 100-mil, 80-mil, and 40-mil geomembrane are presented in Appendices H.2, H.5, and H.8, respectively.

3.3.1. 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.1 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.

3.3.2. Geomembrane Roll QC Certificates

The VLF2 Phase 3 Stage A.1 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 project Technical Specifications. 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 100-mil, 80-mil, and 40-mil geomembrane for VLF2 Phase 3 Stage A.1 are provided in Appendices H.3, H.6, and H.9, respectively.

3.3.3. Geomembrane Resin QC Certificates

AGRU America manufactured the geomembrane for the VLF2 Phase 3 Stage A.1 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 project Technical Specifications. The most recent resin QC certificates for all 100-mil, 80-mil, and 40-mil geomembrane used within the Phase 3 Stage A.1 area are presented in Appendices H.4, H.7, and H.10, respectively.

3.3.4. Geomembrane Welding Rod QC Certificates

AGRU America manufactured the extrusion welding rod for VLF2 Phase 3 Stage A.1 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 project Technical Specifications and was manufactured using the same type of resin. The welding rod QC certificates are presented in Appendix H.11.

3.3.5. Geotextile QC Certificates

Tencate Geosynthetics manufactured the 12 oz/yd^2 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.12, met the project Technical Specifications.

3.4. 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 Appendices I, J and K.

All geomembrane installation for the VLF2 Phase 3 project was performed in accordance with design drawings and project specifications. Record Drawing numbers 4, 8 and 9 show panel locations, seams, and destructive test locations.

3.4.1. Geomembrane Third Party Conformance Testing

The third party conformance test samples for the 40-mil, 80-mil and 100-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 10 tests for 100-mil LLDPE, 23 tests for 80-mil LLDPE, and 1 test 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 Specifications. Third party conformance test results for 100-mil LLDPE, 80-mil LLDPE, and 40-mil HDPE are presented in Appendices L, M and N, respectively.

3.4.2. Geomembrane Panel Deployment

The SLF surface was inspected by the CQA monitor prior to geomembrane deployment, ensuring the surface was free of any protruding rock greater that 0.75-inches, desiccation crackers 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. Geomembrane panel deployment summaries for secondary and primary 100-mil geomembrane in the PSSA are presented in Appendices I.1 and J.1, respectively. Deployment summaries for 80-mil geomembrane are presented in Appendix K.1

3.4.3. Geomembrane Fusion Seaming

Double-wedge fusion welding was the primary method of geomembrane seaming for the VLF2 Phase 3 Stage A.1 project. Prior to fusion welding activities, trial welds were performed for each welding machine and welding technician combination for each type of geomembrane. The fusion welding trial seam logs for 100-mil secondary, 100-mil primary, and 80-mil geomembrane are presented in Appendices I.2.1, J.2.1 and K.2.1, respectively. 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 3.4.5. Continuity conformance of the seam was also performed using pressure testing methods and is discussed further in Section 3.4.6. The geomembrane fusion welding summaries for secondary 100-mil, primary 100-mil, and 80-mil LLDPE geomembrane are presented in Appendices I.3, J.3, and K.3, respectively.

3.4.4. 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 PSSA as a secondary method to double-wedge fusion welding.

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 are presented in Appendix I.2.2, J.2.2 and K.2.2. 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 3.4.5. All extrusion welded seams were vacuum tested, which is discussed further in Section 3.4.7. Extrusion welding summaries for secondary, primary, and 80-mil geomembrane are presented in Appendices I.4, J.4, and K.4, respectively.

3.4.5. 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 PSSA, 69 fusion (Appendix I.5.1) and 6 extrusion (Appendix I.5.2) destructive samples were tested on secondary geomembrane and passed. On primary geomembrane, 67 fusion (Appendix J.5.1) and 10 extrusion (Appendix J.5.2) destructive samples were tested and passed. On 80-mil geomembrane, 49 fusion (Appendix K.5.1) and 19 extrusion (Appendix K.5.2) destructive samples were tested and passed. Tensiometer certifications can be found in Appendix O.

3.4.6. 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 drop 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 Appendices I.6, J.6 and K.6, respectively.

3.4.7. 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 area 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 secondary and primary geomembrane defect/repair summaries, including vacuum testing logs, are presented in Appendices I.7 and J.7, respectively. The 80-mil defect/repair summary is presented in Appendix K.7.

3.4.8. Geomembrane Acceptance

Prior to LVSCF and DCF 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. PSSA Geomembrane Acceptance Forms are presented in Appendices I.8 and J.8. The 80-mil geomembrane acceptance form is presented in Appendix K.8.

4. 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.
- A 30-inch diameter DR17 perforated HDPE pipe was substituted for the 28-inch diameter DR11 perforated HDPE pipe on the High Volume Solution Collection Header, as shown on Detail 5 on IFC drawing A450.
- A 36-inch diameter DR17 HDPE pipe was substituted for the 36-inch DR21 HDPE pipe on the High Volume Solution Collection Header, as shown on Detail 5 on IFC drawing A450.

- The elevation of the Stage A Perimeter Road was raised by 6 feet to accommodate the as-built surface of the Yas Marina geogrid. The alignment was adjusted outward to accommodate the west edge of the PSSA.
- Three four-inch perforated CPeP were added to the spillway between Phase 2 and Phase 3.
- The grading of the Stage A.1 was modified to better match the as-built Schist Island pit conditions. The as-built is reflected in the record of construction drawings and meets the intent of the original design.
- The bottom elevation of the PSSA was lowered by 3 feet, from 9933 feet to 9930 feet as measured to the secondary layer of geomembrane in the sump.
- The 10,000’ bench of the PSSA was widened from 15 feet to 24 feet for better constructability.
- Several localized HVSCS alignment changes were made throughout construction to better accommodate the actual site conditions. The alignment changes were minor and as such are not highlighted in the Record of Construction Drawings.

5. 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.1 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.1 Completion Area, as outlined in Figure 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