Fort Knox Mine
Plan of Operations and Waste Management Permit Amendment Request

Barnes Creek Heap Leach Facility

March 2017

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Abbreviations

amsl	above mean sea level
BCHLF	Barnes Creek Heap Leach Facility
BCWRD	Barnes Creek Waste Rock Dump
cy	cubic yard
DEC	Alaska Department of Environmental Conservation
DNR	Alaska Department of Natural Resources
FEMA	Federal Emergency Management Agency
ft	feet
ft^2	square feet
FGMI	Fairbanks Gold Mining, Inc.
Fort Knox	Fort Knox Mine
gpm	gallons per minute
H	horizontal
hr	hour
lb/cf	pounds per cubic feet
LRCS	leachate collection and recovery system
M	million
Mt	million tons
PCMS	process component monitoring system
PFS	prefeasibility study
TSF	tailings storage facility
V	vertical
WCHLF	Walter Creek Heap Leach Facility
yr	year

1.0 INTRODUCTION

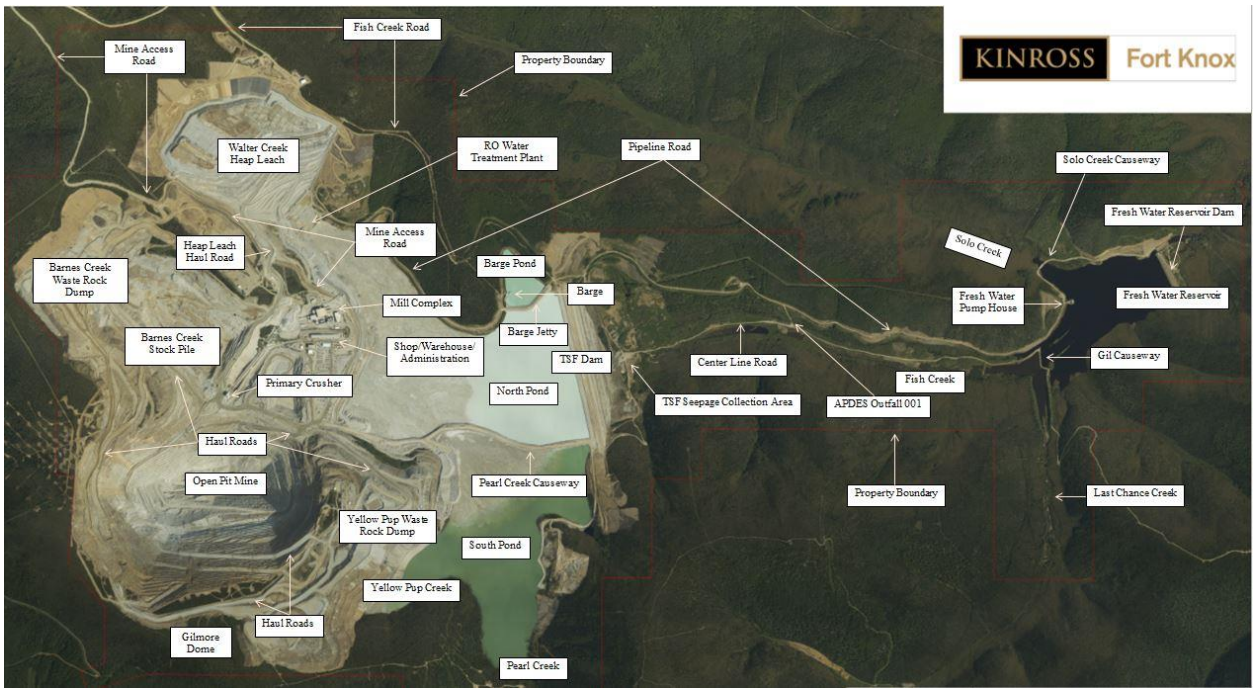
Fairbanks Gold Mining, Inc. (FGMI) is requesting a Plan of Operations amendment approval at its Fort Knox Mine (Fort Knox) for the construction and operation of the Barnes Creek Heap Leach Facility. An amendment to the Waste Management Permit Number 2014DB0002 is requested for the construction and operation of the Barnes Creek Heap Leach Facility.

1.1 Site Description

Fort Knox is owned and operated by FGMI, a wholly owned subsidiary of Kinross Gold USA, Inc. Fort Knox is located in the Fairbanks North Star Borough, approximately 26-road miles northeast of Fairbanks, Alaska (Figure 1). It is located along a belt of lode and placer deposits that comprise one of the highest gold-producing areas in Alaska. The deposit at Fort Knox is mined by conventional open-pit methods on a year-round basis, seven days per week. Fort Knox processes ore onsite at a carbon in-pulp mill with a daily capacity of up to 45,000 tons. In recent years, Fort Knox has produced approximately 350,000 to 400,000 ounces of gold annually. Major site facilities include the active open pit mine, mill, tailings storage facility (TSF), waste rock dumps, water storage reservoir, and the Walter Creek Valley Heap Leach Facility (Figure 2).

Figure 1: Site Location

Figure 2: Mine Facilities



2.0 BARNES CREEK HEAP LEACH

FGMI proposes to construct and operate the Barnes Creek Heap Leach Facility (BCHLF), which has a design capacity of 207 million tons (Mt). The BCHLF will extend up the valley from the existing Barnes Creek conveyor causeway, and will be comprised of six distinct and progressively developed stages (Stages 1 through 6). Following FGMI's planned removal of the majority of the Barnes Creek stockpile, the maximum relief across the BCHLF footprint is expected to be on the order of 720 feet (ft), from the base of the in-heap storage pond at elevation 1,450 ft above mean sea level (amsl), to the crest of the Stage 6 pad area at approximately elevation 2,340 amsl (Attachments 1 – 3).

The catchment area contributing to the BCHLF is approximately 760 acres. The BCHLF at the final Stage 6 configuration will occupy approximately 290 acres of this area. The approximate pad areas associated with the staged development of the BCHLF are presented in Table 1.

Table 1
BCHLF Staged Pad Areas (2-dimensional)

Description	Stage						Total
	1	2	3	4	5	6	
Elevation ([1])	1545	1640	1730	1820	1950	2165	
Area (M ft^2)							
Incremental	2.08	2.10	2.02	2.00	2.47	1.91	12.58
Cumulative	2.08	4.19	6.20	8.20	10.67	12.58	
Area (acres)							
Incremental	47.83	48.32	46.26	45.93	56.72	43.76	288.82
Cumulative	47.83	96.15	142.41	188.33	245.06	288.82	

Note: (1) The stage elevations represent the approximate low points at the northeastern end of each respective stage perimeter road (i.e. the road along the upper edge of each stage's perimeter).

At its final configuration, through the planned Stage 6 development, the BCHLF ore heap will reach a maximum height of approximately 800 ft from toe to crest and will achieve a storage capacity of approximately 125 M cubic yards (cy) or 210 Mt based on an average in-place ore dry density of 125 pounds per cubic-foot (lb/cf). A maximum 500-ft vertical ore thickness over the pad liner system has been adopted to remain consistent with the WCHLF. Slope stability analyses of the Stage 6 heap were conducted for both static and seismic loading conditions and provided acceptable results that confirmed the adequacy of the configuration. Settlement analyses, conducted to assess the effect of constructing the BCHLF and final heap configuration over the existing waste dumps and small portions of the Barnes Creek stockpile material that is planned to be left in place, suggest that flow reversal and localized low-points are not expected to develop along the pad liner system and that the estimated foundation settlements should not adversely affect the integrity of the proposed BCHLF liner system.

The Barnes Creek valley is predominantly disturbed and covered with waste dumps, a low-grade ore stockpile, and haul roads. Small pockets of native ground and forested areas remain on the upper northeast side-slope and in the far western reaches of the valley. Following FGMI's planned removal of the Barnes Creek stockpile material, development of the BCHLF will generally include construction procedures and components similar to those currently approved and used on the Walter Creek Heap Leach Facility (WCHLF). The construction procedures and components will generally include the following and will be built during the stages (Attachments 8 – 13) identified in the parentheses below.

1. Removing the Barnes Creek stockpile material to develop a competent foundation (Stages 1 through 6). Approximately 0 to 15 vertical ft of the stockpile material is planned to be left in place in portions of the valley bottom and will form part of the leach pad foundation surface Other portions of the leach pad basin will be over-excavated to remove low-grade ore and the resulting excavation surface will form part of the leach pad foundation surface

   The waste rock dump at the northwest end of the Barnes Creek valley will remain beneath the BCH LF and is comprised of loose-dumped mine waste rock up to approximately 250-ft thick
2. Clearing and stripping areas of native ground to a competent foundation (Stages 5 and 6)
3. Regrading the leach pad basin slopes to 2.5H:1V (horizontal:vertical) or flatter (Stages 1 through 6)
4. Installing groundwater underdrains at the interface of the pad foundation and overlying site grading fill, or on the regraded basin slopes (Stages 1 through 6)
5. Constructing an in-heap storage pond embankment fill, at the downstream toe of the facility, against the upstream face of the existing conveyor causeway to provide a kind and stable surface for the pad liner system to be installed against (Stage 1)
6. Installing a process component monitoring system (PCMS) immediately below the pad liner system (Stages 2 through 6, PCMS sumps and outlet header pipes to be constructed during Stage 1)
7. Placing a moisture conditioned and compacted low-permeability prepared soil sub-grade (prepared subbase) layer over the regraded basin slopes (Stages 1 through 6)
8. Installing an 80-mil double-side textured LLDPE geomembrane liner directly over, and in intimate contact with, the prepared subbase to form a composite liner (Stages 1 through 6). This liner is considered the secondary liner within the in-heap storage pond (Stage 1) and the primary liner above the in-heap storage pond (Stages 2 through 6)
9. Installing a leachate collection and recovery system (LCRS), comprised of drain aggregate in the valley
   bottom and a tri-planar geonet on the valley side slopes, over the composite liner within the in-heap storage pond (Stage 1)
10. Placing a non-woven geotextile layer and then a second moisture conditioned and compacted low-permeability prepared subbase layer over the LCRS drain aggregate in the bottom of the in-heap pond. If overliner drain aggregate (minus 2-inch crushed mill reject) is used within the LCRS in lieu of LCRS drain aggregate (minus 1/2-inch crushed mill reject), a layer of tri-planar geonet will also be placed to separate the overliner aggregate from the non-woven geotextile (Stage 1)
11. Installing a second 80-mil double-side textured LLDPE geomembrane liner, considered the primary liner, over the LCRS and low-permeability layer within the in-heap storage pond (Stage 1)
12. Constructing and installing the vertical and inclined solution extraction wells (Stages 1 and 2)

13. Placing a solution collection system comprised of free-draining aggregate (overliner material) with encapsulated perforated pipes over the primary liner (Stages 1 through 6)
14. Constructing an emergency spillway and outlet channel through the crest of the in-heap storage pond embankment to avoid overtopping of the embankment during the 100-yr/24-hr design storm event (Stage 1)
15. Constructing roads, diversion channels, and culvert crossings around the staged perimeters of the BCH LF (Stages 1 through 6)
16. Installing monitoring instrumentation (Stages 1 through 6)

In part, due to the Fort Knox location where cold weather conditions are experienced for significant periods of each year, and to remain consistent with the operational success of the WCHLF, the BCHLF has been designed with an in-heap pond for storage of process solution and storm water. It will be contained behind an approximate 95-ft-high in-heap pond embankment, with a crest elevation of 1545 fmsl, that will be developed on the upstream side of the existing Barnes Creek conveyor causeway.

FGMI currently plans to deliver a total solution flow of 16,000 gallons per minute (gpm) to the heap; however, to allow flexibility for future possible increases the BCHLF solution collection system has been designed to accommodate a 50-percent increase to 24,000 gpm. The maximum unit rate of solution applied to the heap will be 0.005 gpm/ft^2. The overliner solution collection system has been designed to collect and convey the process fluid from the base of the heap to the in-heap storage pond while limiting the maximum hydraulic head acting above the leach pad composite liner system to 1 ft (outside the confines of the pond).

The leach solution within the in-heap pond will be removed by a series of extraction wells located near the upstream toe of the in-heap storage pond embankment:

- Three inclined solution extraction wells will be installed on top of the overliner layer and will be extended up the northeast corner of the in-heap pond to the crest of the in-heap pond embankment. They will be used for solution collection during initial operations until the permanent vertical wells can be brought into operation (i.e. until before ore placement is completed to near the collar elevations of the vertical wells). Each of the three inclined wells has been designed to accommodate a 4,000 gpm capacity submersible pump such that a total of up to 12,000 gpm may be extracted. Because the inclined wells will be primarily used for the initial operations, and will be installed on top of the overliner layer, they will not be directly connected to the leach pad solution collection system. However, to improve hydraulic performance, the bottoms of the three wells will be interconnected with a manifold assembly and two perforated solution collectors will be extended from the manifold assembly out into the pond.
- For the long-term operation of the facility, five vertical solution extraction wells will be constructed as large diameter pumping sumps within the in-heap storage pond. Each well will include a platform base installed at the bottom of the in-heap pond, at approximate elevation 1450 fmsl, just upstream of the impounding embankment toe. The bottom of each well will be connected directly to the leach pad solution collection header pipes to promote a high level of hydraulic efficiency. The vertical wells will be extended from their bases up to elevation 1644 fmsl, which will be 4-ft above the Lift 4 bench on the front face of the heap. Each well has

been designed to accommodate a 4,000 gpm pump such that at 16,000 gpm a total of four wells will be in service, with the fifth well available for backup use.

Based on FGMI's experience with the WCHLF to date, any restriction of solution flow through the voids in the ore and into the wells is expected to be negligible, with likely only a small drawdown of the pond solution level at the wells. The direct connectivity of the vertical wells to the solution collection system, the dedicated solution collectors for the inclined wells, and the high hydraulic conductivity of the ore around the wells are expected to promote good hydraulic performance of the extraction system.

Smaller pumping wells will also be installed for the LCRS beneath the in-heap pond. The LCRS pump cans will consist of two inclined pipes running up the upstream face of the in-heap pond embankment. Two 250 gpm pumps will be operated within the LCRS pump cans, as needed, from the start of leaching operations within the in-heap pond.

To support the BCHLF final design, an updated climate study and operational period process water balance were completed. Based on seasonal ground conditions and associated infiltration, January rain-on-snow events were found to produce the largest design peak flows from surface runoff (i.e. for channel and culvert hydraulic design); however, the September rain-on-snow events were typically found to produce the largest overall volumes (i.e. the 100-yr/24-hr design storm storage component within the in-heap pond). The primary reason for the difference is that the runoff from the January event (smaller overall depth) assumes frozen ground conditions (higher runoff coefficient). These data and the staged footprint limits for the BCHLF have been used to size the in-heap pond storage components. Above the maximum normal operating levels, the following three primary components are accounted for within the in-heap pond:

- 100-year/24-hour (yr/hr) design storm event (September rain-on-snow)
  The design storm event storage components associated with Stage 1 to the Stage 6 of the BCHLF were estimated to vary between 5.2 and 31.2 M gallons, respectively.

- 24-hr emergency draindown due to loss of power or pumps
  The emergency draindown storage component was calculated to be approximately 23.0 M gallons (based on the total solution supply rate of 16,000 gpm acting over the 24-hr period).

- Freeboard allowance
  A 5-ft (vertical distance) freeboard allowance was included as a contingency against overtopping of the dam. The volume within the 5-ft freeboard allowance was calculated to be approximately 13.0 M gallons, while the freeboard volume up to the spillway invert (3 ft below the crest of the in-heap pond embankment) was calculated to be 5.1 M gallons.

To maintain sufficient capacity within the in-heap pond for the required storage components and the 5-ft freeboard allowance, the BCHLF operational period process water balance suggests that the following neutralization treatment capacities will be required by the dates indicated:

- 250-gpm capacity starting March 2020
- 2,800-gpm capacity by 2021 with a gradual increase to 3,800-gpm capacity by 2026

The maximum normal operating levels that should be honored within the BCHLF in-heap pond during operations are:

- Stage 1 — 1527.8 fmsl
- Stage 2 — 1525.3 fmsl
- Stage 3 — 1522.7 fmsl
- Stage 4 — 1520.1 fmsl
- Stage 5 — 1516.8 fmsl
- Stage 6 — 1514.0 fmsl

The total estimated capacity of the in-heap storage pond is 122.2 M gallons up to the crest of the impounding embankment. This is the storage capacity within the ore voids based on an average ore porosity of 21.8 percent, which is predicted to apply at the time of loading conditions associated with the ultimate heap arrangement at Stage 6. In comparing the maximum normal operating level for each stage of the BCHLF with the proposed pond minimum normal operating level, 1494 fmsl, a large degree of operational flexibility between the two levels will be provided.
In the very unlikely event that the heap surface becomes frozen and a major thawing and runoff event follows, it is possible that the spillway may come into service. The spillway has been designed to safely pass the flow from a completely frozen and impermeable heap surface, at the Stage 6 full build out arrangement, receiving runoff from the winter 100-yr/24-hr design storm event.

The spillway will be located on the northeast abutment of the in-heap pond embankment. Solution exiting through the spillway will be directed safely downstream to the Fish Creek storm water detention basin that has been formed between the excavated downstream slope of the over widened conveyor causeway embankment and FGMI's backfilling of the Fish Creek stockpile area. The storm water detention basin will receive any flows discharged through the BCHLF emergency spillway and from external surface runoff diverted around the facility. The design storage requirement for the basin was calculated to be approximately 4.93 Mft^3, based on the 100-yr/24-hr January rain-on-snow design storm event. While waters collected in the detention basin are expected to rapidly infiltrate beneath the Fish Creek stockpile area and be picked up by dewatering wells in the area, FGMI has indicated that the volume of water within the detention basin will be controlled via direct pumping from the basin as needed. Provisions for pumping of waters collected in the Fish Creek storm water detention basin will be included in FGMI's O&M Manual.

During the very unlikely condition that the heap surface is frozen, storm water runoff routed off the heap would be required to pass beneath the haul ramps (along the southern heap perimeter) that are planned to access the heap for loading the facility. Four in-heap culvert crossings are included in the BCHLF design and have been sized to pass the peak flow runoff associated with the 100-yr124-hr design storm event acting on the fully loaded BCHLF Stage 6 heap configuration.

During the very unlikely condition that the heap surface is frozen, storm water runoff routed off the heap would be required to pass beneath the haul ramps (along the southern heap perimeter) that are planned to access the heap for loading the facility. Four in-heap culvert crossings are included in the BCHLF design and have been sized to pass the peak flow runoff associated with the 100-yr/24-hr design storm event acting on the fully loaded BCHLF Stage 6 heap configuration.

Initial construction access and ore haulage into the bottom of the in-heap storage pond will be conducted from the upper (west) end of the valley. The Stage 1 haul road has been designed to originate from the existing crusher platform and terminate at the upper end of the Stage 1 pad area. Loading of Stages 1 and 2 are expected to originate from the crusher platform. Loading of Stage 3 and beyond will utilize access points, from the existing waste dump haul road, that will be constructed to every other lift of the ore heap.

Due to the upward-expanding nature of a valley-fill facility, the initial lifts of ore will provide smaller storage capacities than those developed in later stages. The initial heap loading will utilize a reduced rate between 70,000 and 120,000 tons per day (tpd), and is planned to begin in September and end in November of 2019. During years 2 and 3, heap loading will be conducted between July and November but at the full production loading rate of 123,000 tpd. After year 3, when additional pad area is available, loading of the ore heap is expected to occur approximately 8 months, or 244 days, out of each year (April through November) at the same loading rate of approximately 123,000 tpd, or roughly 30 M tons per annum (tpa). It is estimated that loading of the BCHLF will be completed in July 2027, approximately 8 years after thestart of loading..

2.1 Reclamation

Reclamation of the BCHLF is included as an amendment to the *Fairbanks Gold Mining, Inc., Reclamation Plan and Closure Plan, November 2013, Rev 2*. The amendment is provided as Attachment 16.

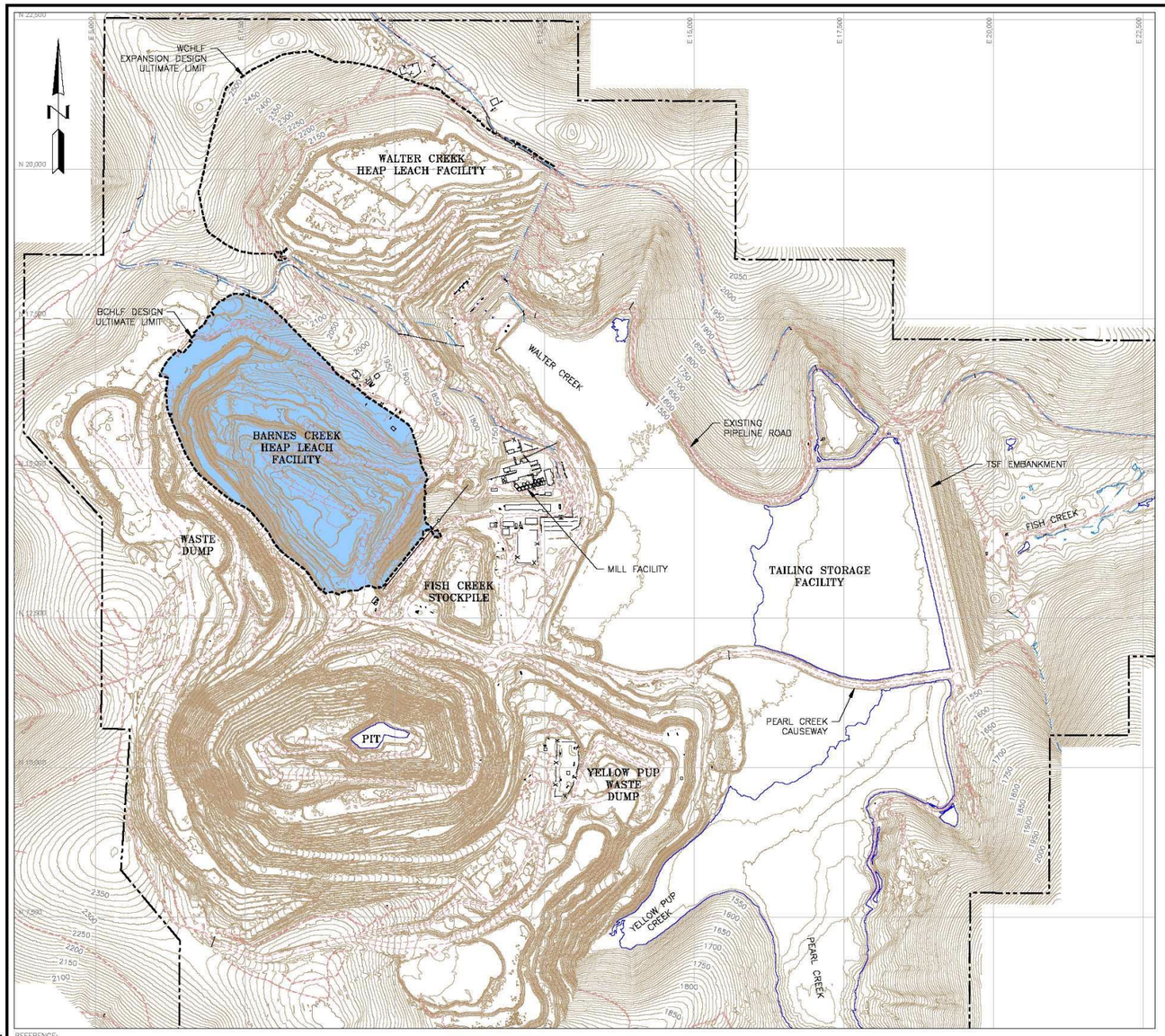
3.0 BARNES CREEK WASTE ROCK DUMP

The current Barnes Creek Waste Rock Dump (BCWRD) is authorized for an ultimate height of 2,300 amsl, and FGMI is requesting for the BCWRD ultimate height be increased 100 ft to 2,400 amsl. The figures of Attachments 2, 3, and 5 – 13 identify the increased height to 2,400 amsl. The increased height will accommodate approximately 10.2 Mt of Phase 8 pit mining waste rock.

4.0 REFERENCES

Knight Piésold Consulting. Fairbanks Gold Mining, Inc. Barnes Creek Heap Leach Facility Report on Prefeasibility Study Design, Issued in Final, Revision 0. September 8, 2015

Knight Piésold Consulting. Fairbanks Gold Mining, Inc. Fort Knox Project Barnes Creek Heap Leach Facility Final Design, reissued in Final Revision 1, March 27 2017.



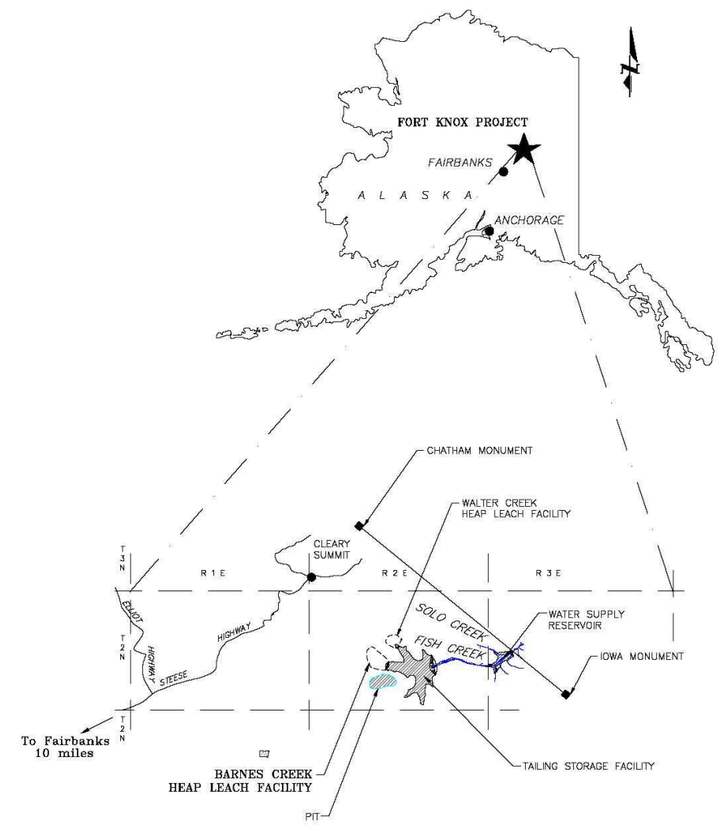
REFERENCE:
-AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 08/12/2015 (MAY 2015 AERIAL SURVEY)
-2015 AS-BUILT INFORMATION PROVIDED BY AAP AND FGMI, NOVEMBER 2015.

PLAN

1000 0 1000 2000 FEET
1" = 1000' AT FULL SIZE (ANSI D)
1" = 2000' AT HALF SIZE (ANSI B)

LEGEND:

- 2200 EXISTING GROUND SURFACE CONTOUR AND EL, FEET
- PROPERTY BOUNDARY
- EXISTING DRAINAGE/DIVERSION
- EXISTING ROAD
- FENCING
- TSF SUPERNATANT POND LIMITS
- EXISTING STRUCTURES



NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

REV	DATE	DESCRIPTION	APP'D	CADD
A	10/10/16	ISSUED FOR CLIENT REVIEW	JTR	CB
0	01/27/17	ISSUED FOR CONSTRUCTION	JTR	CB

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ACTIVITY CODE N/A | XREF N/A

CLIENT: FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

PROJECT: FORT KNOX PROJECT
BARNES CREEK HEAP LEACH FACILITY FINAL DESIGN

TITLE: PROJECT LOCATION AND OVERALL SITE PLAN

DESIGNED BY	JTR	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
DRAWN BY	CB	DV101	00089.99	100	0

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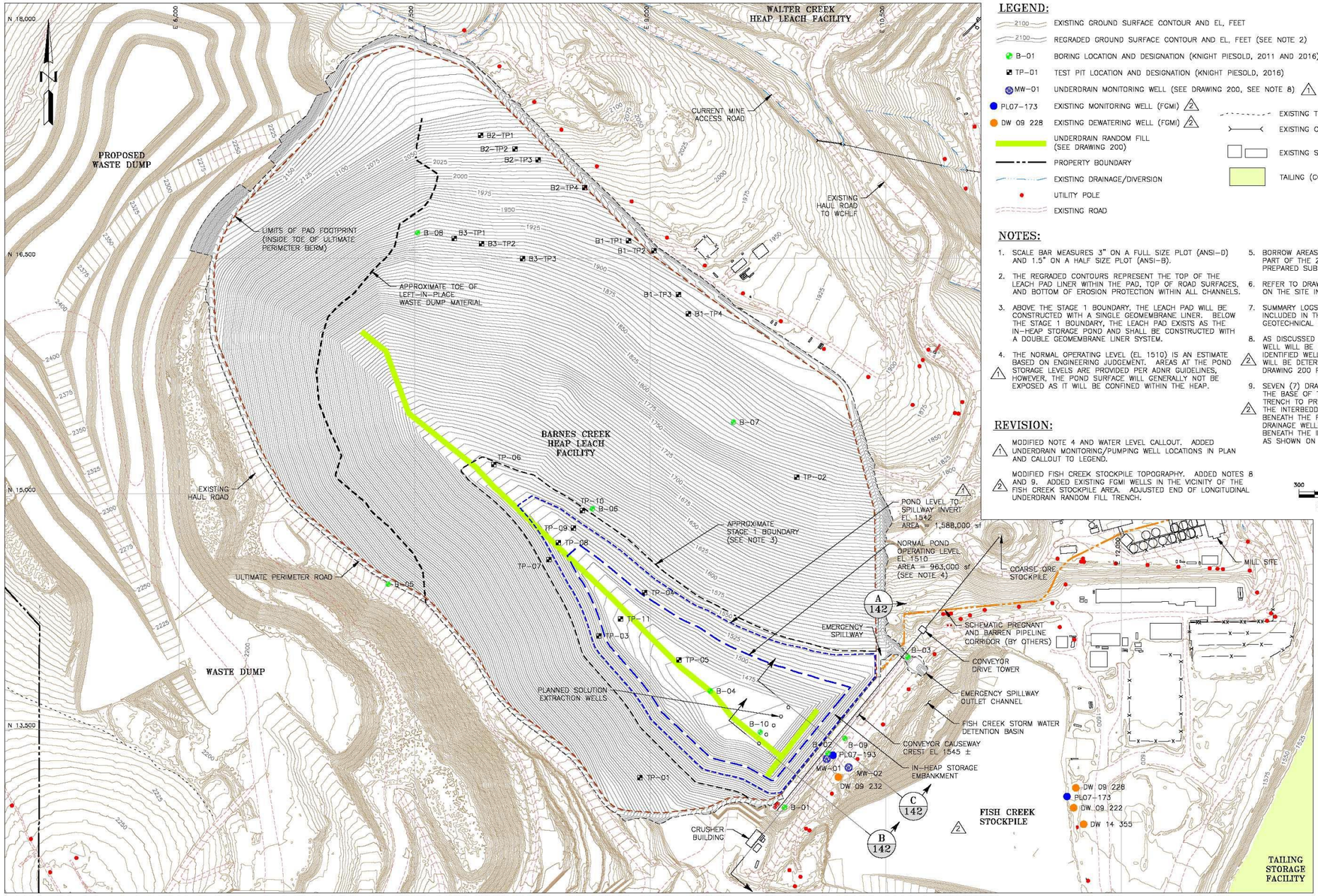

LEGEND:

- 2100 — EXISTING GROUND SURFACE CONTOUR AND EL, FEET
- 2100 — REGRADED GROUND SURFACE CONTOUR AND EL, FEET (SEE NOTE 2)
- B-01 — BORING LOCATION AND DESIGNATION (KNIGHT PIESOLD, 2011 AND 2016)
- TP-01 — TEST PIT LOCATION AND DESIGNATION (KNIGHT PIESOLD, 2016)
- MW-01 — UNDERDRAIN MONITORING WELL (SEE DRAWING 200, SEE NOTE 8) 1 2
- PL07-173 — EXISTING MONITORING WELL (FGMI) 2
- DW 09 228 — EXISTING DEWATERING WELL (FGMI) 2
- UNDERDRAIN RANDOM FILL (SEE DRAWING 200)
- PROPERTY BOUNDARY
- EXISTING DRAINAGE/DIVERSION
- UTILITY POLE
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING CULVERT
- EXISTING STRUCTURES
- TAILING (CONFIGURATION AS OF AUGUST 2014)

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).
2. THE REGRADED CONTOURS REPRESENT THE TOP OF THE LEACH PAD LINER WITHIN THE PAD, TOP OF ROAD SURFACES, AND BOTTOM OF EROSION PROTECTION WITHIN ALL CHANNELS.
3. ABOVE THE STAGE 1 BOUNDARY, THE LEACH PAD WILL BE CONSTRUCTED WITH A SINGLE GEOMEMBRANE LINER. BELOW THE STAGE 1 BOUNDARY, THE LEACH PAD EXISTS AS THE IN-HEAP STORAGE POND AND SHALL BE CONSTRUCTED WITH A DOUBLE GEOMEMBRANE LINER SYSTEM.
4. 1 THE NORMAL OPERATING LEVEL (EL 1510) IS AN ESTIMATE BASED ON ENGINEERING JUDGEMENT. AREAS AT THE POND STORAGE LEVELS ARE PROVIDED PER ADNR GUIDELINES, HOWEVER, THE POND SURFACE WILL GENERALLY NOT BE EXPOSED AS IT WILL BE CONFINED WITHIN THE HEAP.
5. BORROW AREAS B1, B2, AND B3 WERE INVESTIGATED AS PART OF THE 2016 FIELD PROGRAM FOR POTENTIAL PREPARED SUBBASE MATERIAL.
6. REFER TO DRAWINGS 110 THRU 132 FOR MORE INFORMATION ON THE SITE INVESTIGATION PROGRAM.
7. SUMMARY LOGS OF KNIGHT PIESOLD'S BOREHOLES ARE INCLUDED IN THE BARNES CREEK HEAP LEACH FACILITY GEOTECHNICAL REPORT.
8. AS DISCUSSED WITH ADEC, A THIRD UNDERDRAIN MONITORING WELL WILL BE INSTALLED IN THE VICINITY OF THE TWO IDENTIFIED WELLS. THE EXACT LOCATION OF THE THIRD WELL WILL BE DETERMINED PRIOR TO CONSTRUCTION. REFER TO DRAWING 200 FOR MORE INFORMATION.
9. 2 SEVEN (7) DRAINAGE WELLS WILL BE CONSTRUCTED WITHIN THE BASE OF THE TRANSVERSE UNDERDRAIN RANDOM FILL TRENCH TO PROMOTE DRAINAGE FROM THE TRENCH AND INTO THE INTERBEDDED HIGHER CONDUCTIVITY COLLUVIAL MATERIALS BENEATH THE PRE-CONVEYOR CAUSEWAY SURFACE. THE DRAINAGE WELLS WILL BE DRILLED-IN APPROXIMATELY 30' BENEATH THE INVERT OF UNDERDRAIN RANDOM FILL TRENCH AS SHOWN ON DRAWINGS 202 AND 206.

REVISION:

1. MODIFIED NOTE 4 AND WATER LEVEL CALLOUT. ADDED UNDERDRAIN MONITORING/PUMPING WELL LOCATIONS IN PLAN AND CALLOUT TO LEGEND.
2. MODIFIED FISH CREEK STOCKPILE TOPOGRAPHY. ADDED NOTES 8 AND 9. ADDED EXISTING FGMI WELLS IN THE VICINITY OF THE FISH CREEK STOCKPILE AREA. ADJUSTED END OF LONGITUDINAL UNDERDRAIN RANDOM FILL TRENCH.

PLAN

300 0 300 600 FEET

1" = 300' AT FULL SIZE (ANSI D)
1" = 600' AT HALF SIZE (ANSI B)

REFERENCE:
- AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 08/12/2015 (MAY 2015 AERIAL SURVEY)
- AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 09/18/2014 (AUGUST 2014 AERIAL SURVEY)
- PLANNED EXCAVATION SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED WASTE DUMP SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED FISH CREEK STOCKPILE SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 02/27/2017.

REV	DATE	DESCRIPTION	APP'D / CADD
B	10/10/16	REISSUED FOR CLIENT REVIEW	JTR / CB
0	01/27/17	ISSUED FOR CONSTRUCTION	JTR / CB
1	02/07/17	REISSUED FOR CONSTRUCTION	JTR / CB
2	03/24/17	REISSUED FOR CONSTRUCTION	JTR / CB

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ACTIVITY CODE N/A | XREF N/A

CLIENT: FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

PROJECT: FORT KNOX PROJECT
BARNES CREEK HEAP LEACH FACILITY FINAL DESIGN

TITLE: GENERAL ARRANGEMENT PLAN
(TOPOGRAPHIC MAP OF DAM SITE)

DESIGNED BY	JTR	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
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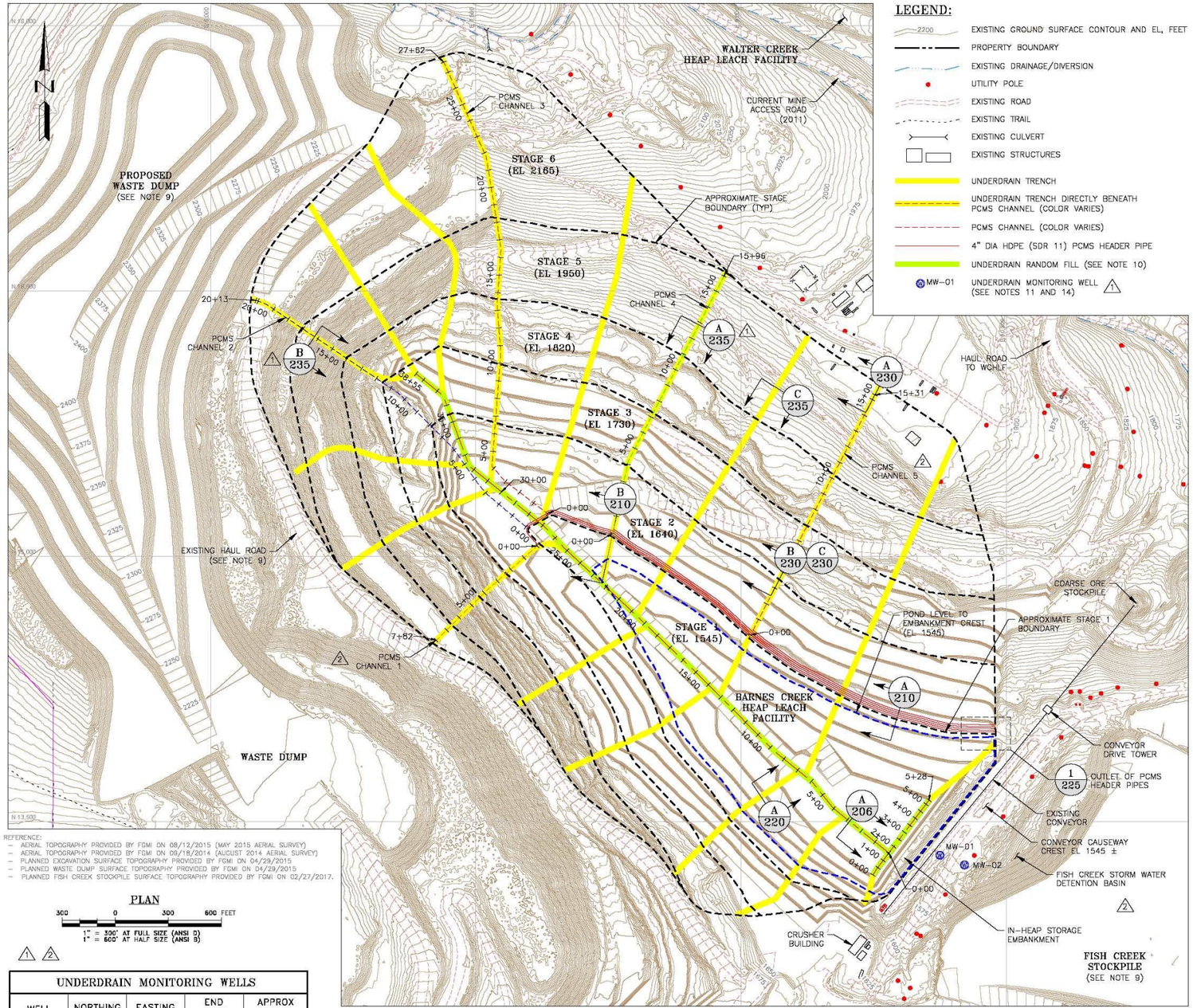

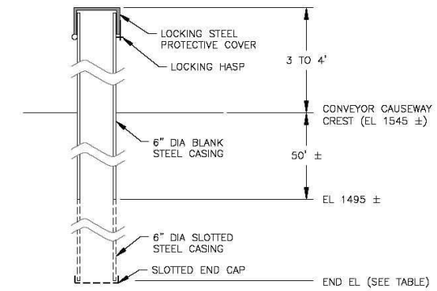

1 UNDERDRAIN MONITORING WELL
NTS
(SEE NOTE 11)

REFERENCE:
- AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 08/12/2015 (MAY 2015 AERIAL SURVEY)
- AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 09/18/2014 (AUGUST 2014 AERIAL SURVEY)
- PLANNED EXCAVATION SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED WASTE DUMP SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED FISH CREEK STOCKPILE SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 02/27/2017.

PLAN

300 0 300 600 FEET
1" = 300' AT FULL SIZE (ANSI D)
1" = 600' AT HALF SIZE (ANSI B)

NOTES: 1 2

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B SHEET).
2. PCMS – THE PROCESS COMPONENT MONITORING SYSTEM IS LOCATED BENEATH THOSE PORTIONS OF THE LINER WHICH HAVE GREATER POTENTIAL FOR LEAKAGE – MAINLY BENEATH THE MAIN SOLUTION COLLECTION HEADERS. THE PCMS CHANNELS ARE LIMITED TO THE AREA OUTSIDE THE IN-HEAP STORAGE POND.
3. ALL UNDERDRAIN TRENCHES TERMINATE AT THE EDGE OF THE UNDERDRAIN RANDOM FILL.
4. UNDERDRAIN TRENCH LOCATIONS SHALL BE ADJUSTED IN THE FIELD DURING THE LEACH PAD GRADING OPERATIONS TO INTERCEPT GROUNDWATER SEEPS AND SPRINGS. IN SOME CASES THIS MAY INVOLVE ADDITIONAL UNDERDRAINS TO REACH SEEPS AND SPRINGS IDENTIFIED DURING FUTURE STAGES OF CONSTRUCTION. ADDITIONAL UNDERDRAINS SHALL BE CONSTRUCTED AS NEEDED BASED ON SECTION D ON DRAWING 235.
5. ALL EXISTING CULVERTS WITHIN THE LEACH PAD BASIN AREA SHALL BE REMOVED PRIOR TO THE START OF LEACH PAD REGRADING.
6. EACH UNDERDRAIN MONITORING WELL WILL HAVE 2 HEAT TRACES AND RTD'S INSTALLED (DESIGN BY OTHERS). THE FIRST LOOP IS A PRIMARY LOOP AND THE SECOND LOOP A BACKUP.
7. THE INTER-STAGE BOUNDARIES ARE APPROXIMATE AND SHALL BE FINALIZED PRIOR TO CONSTRUCTION OF EACH STAGE.
8. THE STAGE ELEVATIONS IN BRACKETS REPRESENT THE APPROXIMATE LOW POINTS AT THE NORTHEASTERN END OF THE RESPECTIVE STAGE PERIMETER ROAD.
9. FGMI'S PLANNED EXCAVATION SURFACE TO REMOVE ORE FROM THE BARNES CREEK STOCKPILE, ITS PLANNED FUTURE WASTE DUMP CONFIGURATION, AND THE CURRENT BACKFILLED CONFIGURATION OF THE FISH CREEK STOCKPILE AREA HAVE BEEN INCORPORATED INTO THE BASE TOPOGRAPHY FOR THE BARNES CREEK HEAP LEACH FACILITY DEVELOPMENT. THE EXCAVATION SURFACE IS ENVISIONED TO BE ACHIEVED PRIOR TO THE START OF THE BCHLF CONSTRUCTION, WHILE THE FUTURE WASTE DUMP IS EXPECTED TO BE LOADED OVER THE LIFE OF THE BCHLF. FGMI'S EXISTING HAUL ROAD ON THE SOUTH SIDE OF THE PLANNED BCHLF, AND THE PLANNED WASTE DUMP, WILL NEED TO BE ADJUSTED TO ALLOW HAUL ACCESS AROUND THE UPPER END OF THE STAGE 6 LEACH PAD.
10. THE UNDERDRAIN RANDOM FILL IS PRIMARILY ENVISIONED AS A LARGE TRENCH DRAIN EXCAVATED DOWN THE CENTER OF THE BARNES CREEK VALLEY. THE UNDERDRAIN RANDOM FILL WILL DROP BELOW THE IN-HEAP STORAGE POND LCRS SUMP AND TERMINATE AT THE UPSTREAM TOE OF THE EXISTING CONVEYOR CAUSEWAY EMBANKMENT. A SECOND UNDERDRAIN RANDOM FILL TRENCH, 20' WIDE BY 6' DEEP, WILL BE EXCAVATED LATERALLY ACROSS THE VALLEY ALONG THE UPSTREAM TOE OF THE CONVEYOR CAUSEWAY.
11. THE UNDERDRAIN MONITORING WELLS WILL BE INSTALLED THROUGH THE APPROXIMATE LOW-POINT OF THE VALLEY THAT EXISTED PRIOR TO CONSTRUCTION OF THE CONVEYOR CAUSEWAY. THE WELLS SHALL BE DRILLED AND INSTALLED TO BETWEEN 5 AND 10' INTO THE UNDERLYING BEDROCK SURFACE, AS SHOWN ON DRAWING 142. IF THE BEDROCK SURFACE IS ENCOUNTERED PRIOR TO THE ESTIMATED DEPTHS SHOWN, THE BOREHOLES MAY BE STOPPED. WELL CASING, SLOTTING, AND PUMPS ARE BY FGMI.
12. SEE DRAWING 202 FOR THE UNDERDRAIN RANDOM FILL PROFILES AND HORIZONTAL CONTROL DATA.
13. SEE DRAWINGS 204 AND 205 FOR THE PCMS CHANNEL PROFILES AND HORIZONTAL CONTROL DATA.
14. AS DISCUSSED WITH ADEC, A THIRD UNDERDRAIN MONITORING WELL WILL BE INSTALLED IN THE VICINITY OF THE TWO IDENTIFIED WELLS. THE EXACT LOCATION OF THE THIRD WELL WILL BE DETERMINED PRIOR TO CONSTRUCTION, HOWEVER, IT IS EXPECTED IT WILL BE COMPLETED TO AN APPROXIMATE DEPTH BETWEEN 225 TO 275' BELOW GROUND SURFACE.
15. SEE DRAWINGS 140 AND 560 FOR THE LOCATIONS OF FGMI'S EXISTING MONITORING AND DEWATERING WELLS IN THE VICINITY OF THE FISH CREEK STOCKPILE AREA.
16. SEVEN (7) DRAINAGE WELLS WILL BE CONSTRUCTED WITHIN THE BASE OF THE TRANSVERSE UNDERDRAIN RANDOM FILL TRENCH TO PROMOTE DRAINAGE FROM THE TRENCH AND INTO THE INTERBEDDED HIGHER CONDUCTIVITY COLLUVIAL MATERIALS BENEATH THE PRE-CONVEYOR CAUSEWAY SURFACE. THE DRAINAGE WELLS WILL BE DRILLED-IN APPROXIMATELY 30' BENEATH THE INVERT OF UNDERDRAIN RANDOM FILL TRENCH AS SHOWN ON DRAWING 206. IF CONTACT WITH THE BEDROCK SURFACE IS ENCOUNTERED PRIOR TO COMPLETING THE 30' WELL DEPTH, THE BOREHOLE SHALL BE STOPPED. THE 30' WELL DEPTH SHOULD BE CONSIDERED AN APPROXIMATE MAXIMUM DEPTH.

REVISION:

1 MOVED SECTION CALLOUTS. MODIFIED NOTES 10 AND 11. ADDED UNDERDRAIN WELL LOCATIONS IN PLAN, LEGEND, DETAIL, AND SETTING OUT TABLE.

2 ADDED TWO PCMS CHANNELS AND MODIFIED FISH CREEK STOCKPILE TOPOGRAPHY. MODIFIED NOTE 11 AND SETTING OUT DATA REGARDING WELL DEPTHS. ADDED NOTES 14 THROUGH 16.

1 2

UNDERDRAIN MONITORING WELLS

WELL ID	NORTHING (ft)	EASTING (ft)	END ELEV (fmsl)	APPROX DEPTH (ft)
MW-01	13,308.5	10,122.5	1382.0	224.0
MW-02	13,254.0	10,262.3	1373.5	224.0

REV	DATE	DESCRIPTION	APP'D
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2	03/24/17	REISSUED FOR CONSTRUCTION	JTR / CB

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ACTIVITY CODE N/A | XREF N/A

CLIENT: FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

PROJECT: FORT KNOX PROJECT
BARNES CREEK HEAP LEACH FACILITY FINAL DESIGN

TITLE: UNDERDRAIN SYSTEM AND PCMS PLAN

DESIGNED BY	JTR	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
DRAWN BY	CB	DV101	00089.99	200	2

LAST SAVED BY: JREVA
DRAWING PATH: G:\101\00089.99\CAD\CAD Dept\Drawings\DV101-00089-99_200-205.dwg
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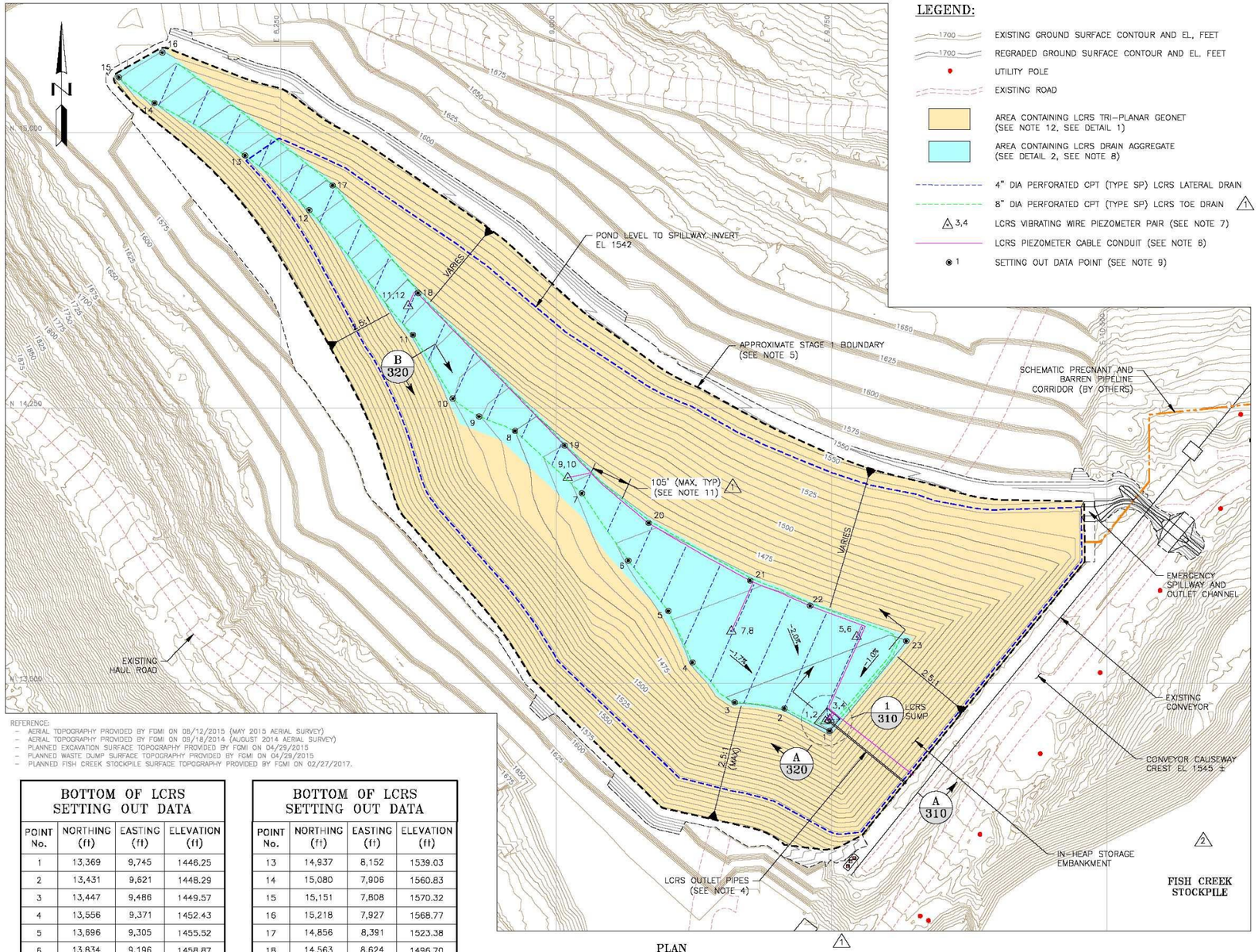

REFERENCE:
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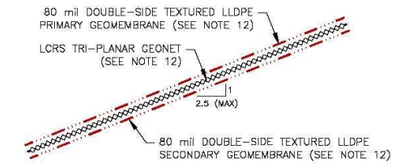
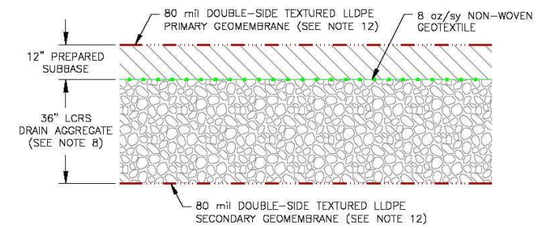
- AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 09/18/2014 (AUGUST 2014 AERIAL SURVEY)
- PLANNED EXCAVATION SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED WASTE DUMP SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED FISH CREEK STOCKPILE SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 02/27/2017.

LEGEND:

- EXISTING GROUND SURFACE CONTOUR AND EL, FEET
- REGRADED GROUND SURFACE CONTOUR AND EL, FEET
- UTILITY POLE
- EXISTING ROAD
- AREA CONTAINING LCRS TRI-PLANAR GEONET (SEE NOTE 12, SEE DETAIL 1)
- AREA CONTAINING LCRS DRAIN AGGREGATE (SEE DETAIL 2, SEE NOTE 8)
- 4" DIA PERFORATED CPT (TYPE SP) LCRS LATERAL DRAIN
- 8" DIA PERFORATED CPT (TYPE SP) LCRS TOE DRAIN △1
- △3,4 LCRS VIBRATING WIRE PIEZOMETER PAIR (SEE NOTE 7)
- LCRS PIEZOMETER CABLE CONDUIT (SEE NOTE 8)
- ◉1 SETTING OUT DATA POINT (SEE NOTE 9)



1 — TYPICAL LCRS AND ADJACENT LINER ON SLOPES 10% OR STEEPER
NTS



2 — TYPICAL LCRS AND ADJACENT LINER ON SLOPES FLATTER THAN 10%
NTS

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B SHEET).
2. LCRS – THE LEACHATE COLLECTION AND RECOVERY SYSTEM (LCRS) PROVIDES DETECTION AND RECOVERY OF POTENTIAL LEAKAGE THROUGH THE PRIMARY GEOMEMBRANE WITHIN THE IN-HEAP STORAGE POND.
3. ALL PIPE CONNECTIONS SHALL BE FORMED USING MANUFACTURER SUPPLIED TEES, WYES AND COUPLERS. ALL CPT PIPE CONNECTIONS SHALL BE SECURED TO THE PIPE USING WIRE TIES AROUND BOTH ENDS OF THE CONNECTIONS. ALL PIPEWORK CONNECTED WITH SPLIT COUPLERS SHALL HAVE THE COUPLER SEAM ROTATED TO THE SIDE OF THE PIPE.
4. TWO 18" DIA STEEL LCRS OUTLET PIPES WILL SERVE AS CONDUITS FOR SUBMERSIBLE LCRS PUMPS. THE SUBMERSIBLE PUMPS FOR THE LCRS SHALL BE EQUIPPED WITH DISCHARGE HOSES AND ELECTRICS (BY OTHERS).
5. ABOVE THE STAGE 1 BOUNDARY, THE LEACH PAD WILL BE CONSTRUCTED WITH A SINGLE GEOMEMBRANE LINER. BELOW THE STAGE 1 BOUNDARY, THE LEACH PAD EXISTS AS THE IN-HEAP STORAGE POND AND SHALL BE CONSTRUCTED WITH A DOUBLE GEOMEMBRANE LINER SYSTEM AND LCRS.
6. EACH LCRS PIEZOMETER PAIR SHALL INCLUDE SEPARATE CABLES AND ONE CABLE CONDUIT. THE PIEZOMETER CABLE CONDUITS SHALL GENERALLY RUN ALONG THE TOE OF THE NORTHEAST VALLEY SLOPE OR BETWEEN LCRS DRAINS TO AVOID INTERFERENCE TO THE EXTENT POSSIBLE. THE LCRS PIEZOMETER CONDUITS AND CABLES SHALL REPORT TO A CENTRAL READOUT BOX TO BE LOCATED ON THE IN-HEAP STORAGE EMBANKMENT CREST.
7. REFER TO DRAWING 720 FOR INSTRUMENTATION SECTIONS, DETAILS, AND SETTING OUT DATA.
8. THE 36"-THICK LAYER OF LCRS DRAIN AGGREGATE MAY BE REPLACED WITH OVERLINER MATERIAL, IF PREFERRED BY FGMI, PROVIDED THE TRI-PLANAR LCRS GEONET (IN-HEAP POND SIDE-SLOPES) IS EXTENDED BENEATH THE FLOOR OF THE IN-HEAP POND BETWEEN THE LCRS OVERLINER MATERIAL AND THE 8 oz/sy NON-WOVEN GEOTEXTILE.
9. THE SETTING OUT DATA REPRESENT THE BOTTOM OF THE IN-HEAP POND SECONDARY GEOMEMBRANE LINER (i.e. THE TOP OF THE UNDERLYING PREPARED SUBBASE) AT THE TOE OF THE SIDE-SLOPE WITHIN THE LCRS.
10. ALL SETTING OUT DATA SHALL BE APPROVED BY THE ENGINEER AND/OR FGMI IN THE FIELD PRIOR TO CONSTRUCTION. IF THE EXISTING TOPOGRAPHY DIFFERS FROM THAT SHOWN ON THE DRAWINGS, THE ENGINNER SHALL ADJUST THE DESIGN FOR UNFORESEEN CONDITIONS.
11. △1 THE LCRS LATERAL DRAIN SPACING SHOWN ASSUMES OVERLINER DRAIN AGGREGATE WILL BE USE FOR THE LCRS AGGREGATE MATERIAL ALONG THE POND FLOOR (SEE NOTE 8 AND DETAIL 2). IF LCRS DRAIN AGGREGATE IS USED, THE LCRS LATERAL DRAIN SPACING SHALL BE REDUCED TO 38' PERPENDICULAR BETWEEN THE PIPES.
12. △2 ALL 80-mil DOUBLE-SIDE TEXTURED LLDPE GEOMEMBRANE SHALL BE GSE OR SOLMAX STANDARD PRODUCT, OR ENGINEER APPROVED EQUIVALENT. ALL TRI-PLANAR LCRS GEONET SHALL BE GSE TENDRAIN 300, OR ENGINEER APPROVED EQUIVALENT.

PLAN

150 0 150 300 FEET
1"=150' AT FULL SIZE (ANSI D)
1"=300' AT HALF SIZE (ANSI B)

BOTTOM OF LCRS SETTING OUT DATA

POINT No.	NORTHING (ft)	EASTING (ft)	ELEVATION (ft)
1	13,369	9,745	1446.25
2	13,431	9,621	1448.29
3	13,447	9,486	1449.57
4	13,556	9,371	1452.43
5	13,696	9,305	1455.52
6	13,834	9,196	1458.87
7	14,017	9,070	1463.20
8	14,187	8,888	1475.07
9	14,226	8,790	1480.36
10	14,275	8,718	1485.08
11	14,449	8,610	1493.31
12	14,789	8,327	1522.20

BOTTOM OF LCRS SETTING OUT DATA

POINT No.	NORTHING (ft)	EASTING (ft)	ELEVATION (ft)
13	14,937	8,152	1539.03
14	15,080	7,906	1560.83
15	15,151	7,808	1570.32
16	15,218	7,927	1568.77
17	14,856	8,391	1523.38
18	14,563	8,624	1496.70
19	14,147	9,023	1469.92
20	13,936	9,252	1460.39
21	13,779	9,528	1455.49
22	13,711	9,691	1453.04
23	13,615	9,953	1449.37

REVISION:

△1 DISTINGUISHED BETWEEN LCRS LATERAL AND TOE DRAINS. CHANGED TOE DRAINS TO 8" DIAMETER. ADDED NOTE 11.

△2 ADDED NOTE 12 SPECIFYING GEOMEMBRANE AND GEONET. MODIFIED FISH CREEK STOCKPILE TOPOGRAPHY.

REV	DATE	DESCRIPTION	APP'D	CADD
A	10/10/16	ISSUED FOR CLIENT REVIEW	JTR	CB
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ACTIVITY CODE N/A
XREF N/A

CLIENT: FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

PROJECT: FORT KNOX PROJECT
BARNES CREEK HEAP LEACH FACILITY FINAL DESIGN

TITLE: IN-HEAP STORAGE POND LCRS PLAN

DESIGNED BY	JTR	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
DRAWN BY	CB	DV101	00089.99	300	2

LAST SAVED BY: JREMA
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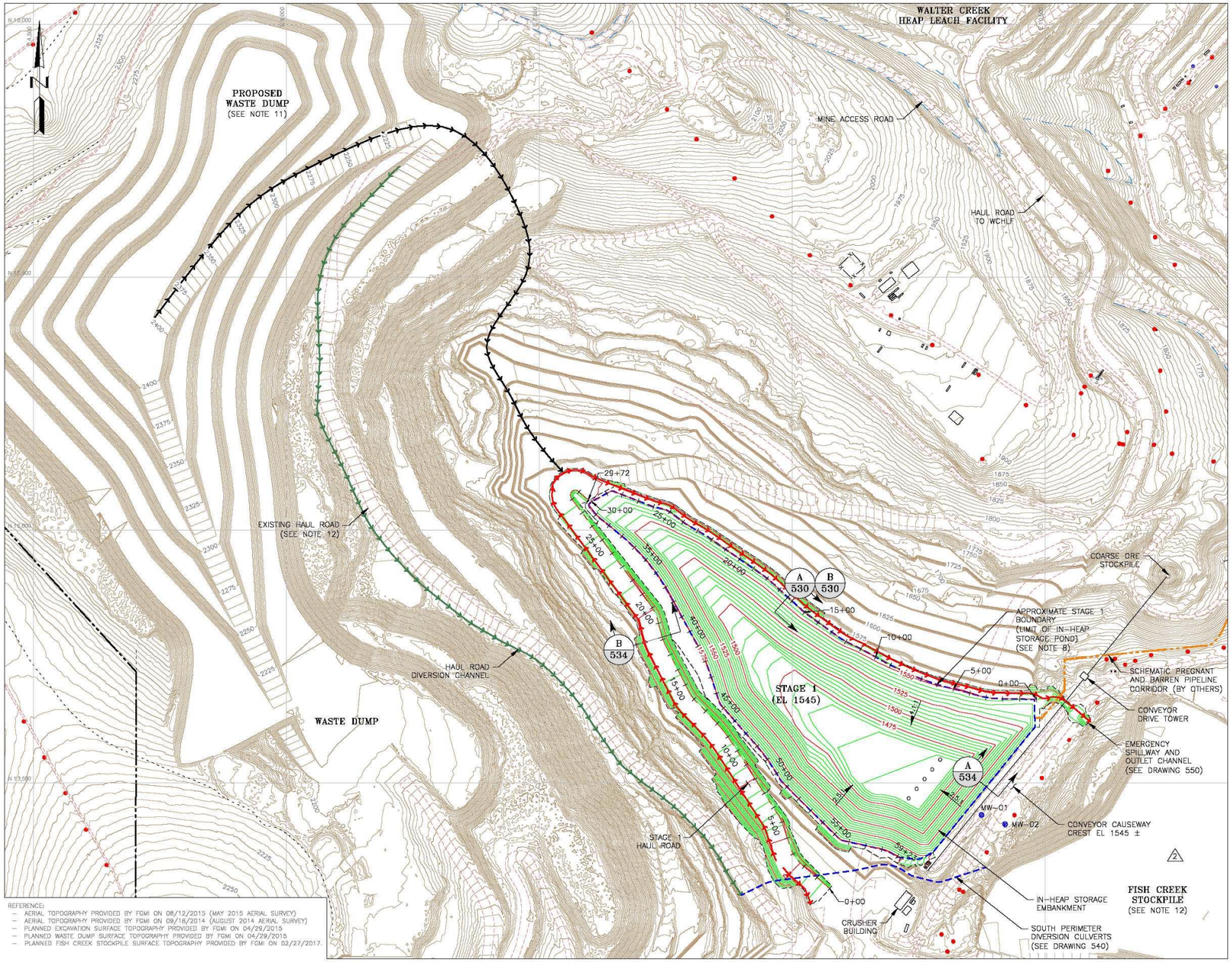

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- PLANNED WASTE DUMP SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED FISH CREEK STOCKPILE SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 02/27/2017.

LEGEND:

- EXISTING GROUND SURFACE CONTOUR AND EL, FEET
- REGRADED GROUND SURFACE CONTOUR AND EL, FEET
- PROPERTY BOUNDARY
- PROPOSED HAUL ROAD DIVERSION CHANNEL
- PROPOSED INTER-STAGE DIVERSION
- NATURAL DRAINAGE (OR DIVERSION BY OTHERS)
- EXISTING DRAINAGE/DIVERSION
- UTILITY POLE
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING STRUCTURES
- VERTICAL SOLUTION EXTRACTION WELL (SEE DRAWING 512)
- MW-01 UNDERDRAIN MONITORING WELL (SEE DRAWING 200) 1

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).
2. THE REGRADED CONTOURS REPRESENT THE TOP OF THE LEACH PAD LINER WITHIN THE PAD, TOP OF ROAD SURFACES, AND BOTTOM OF EROSION PROTECTION WITHIN ALL CHANNELS.
3. ALL UNSUITABLE MATERIALS ENCOUNTERED DURING CONSTRUCTION MUST BE REMOVED AND EITHER REPLACED WITH COMPACTED RANDOM FILL, SITE GRADING FILL, OR HAVE THE EXCAVATED SURFACE PREPARED AS THE ROUGH GRADE SURFACE.
4. SLOPES OF THE REGRADED PAD GROUND SURFACE CONTOURS SHALL NOT EXCEED 2.5H:1V.
5. ALL USABLE MATERIALS (PREPARED SUBGRADE MATERIAL, RIPRAP, ETC.) ENCOUNTERED BUT NOT USED DURING CONSTRUCTION SHALL BE REMOVED AND STOCKPILED FOR LATER USE AS REQUIRED BY FGMI.
6. THE EXISTING POWER LINE SHALL BE RELOCATED AS REQUIRED BY FGMI.
7. ALL EXISTING CULVERTS WITHIN THE LEACH PAD BASIN AREA SHALL BE REMOVED PRIOR TO THE START OF LEACH PAD REGRADING.
8. ABOVE THE STAGE 1 BOUNDARY, THE LEACH PAD WILL BE CONSTRUCTED WITH A SINGLE GEOMEMBRANE LINER. BELOW THE STAGE 1 BOUNDARY, THE LEACH PAD EXISTS AS THE IN-HEAP STORAGE POND AND SHALL BE CONSTRUCTED WITH A DOUBLE GEOMEMBRANE LINER SYSTEM WITH LCRS.
9. SEE DRAWING 430 FOR THE STAGE 1 PERIMETER ROAD PROFILE AND HORIZONTAL CONTROL DATA.
10. SEE DRAWING 435 FOR THE STAGE 1 HAUL ROAD PROFILE AND HORIZONTAL CONTROL DATA.
11. THE STAGE ELEVATIONS IN BRACKETS REPRESENT THE APPROXIMATE LOW POINTS AT THE NORTHEASTERN END OF THE RESPECTIVE INTER-STAGE PERIMETER ROADS.
12. FGMI'S PLANNED EXCAVATION SURFACE TO REMOVE ORE FROM THE BARNES CREEK STOCKPILE, ITS PLANNED FUTURE WASTE DUMP CONFIGURATION, AND THE CURRENT BACKFILLED CONFIGURATION OF THE FISH CREEK STOCKPILE AREA HAVE BEEN INCORPORATED INTO THE BASE TOPOGRAPHY FOR THE BARNES CREEK HEAP LEACH FACILITY DEVELOPMENT. THE EXCAVATION SURFACE IS ENVISIONED TO BE ACHIEVED PRIOR TO THE START OF THE BCHLF CONSTRUCTION, WHILE THE FUTURE WASTE DUMP IS EXPECTED TO BE LOADED OVER THE LIFE OF THE BCHLF. FGMI'S EXISTING HAUL ROAD ON THE SOUTH SIDE OF THE PLANNED BCHLF, AND THE PLANNED WASTE DUMP, WILL NEED TO BE ADJUSTED TO ALLOW HAUL ACCESS AROUND THE UPPER END OF THE STAGE 6 LEACH PAD.

PLAN

300 0 300 600 FEET

1" = 300' AT FULL SIZE (ANSI D)
1" = 600' AT HALF SIZE (ANSI B)

REVISION:

1. ADDED UNDERDRAIN MONITORING WELL LOCATIONS IN PLAN AND CALLOUT TO LEGEND.
2. REMOVED SOUTH PERIMETER OUTLET CHANNEL. MODIFIED FISH CREEK STOCKPILE TOPOGRAPHY.

REV	DATE	DESCRIPTION	APP'D CADD	APP'D CB
A	10/10/16	ISSUED FOR CLIENT REVIEW	JTR	CB
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ACTIVITY CODE N/A | XREF N/A

CLIENT: FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

PROJECT: FORT KNOX PROJECT
BARNES CREEK HEAP LEACH FACILITY FINAL DESIGN

TITLE: STAGE 1 GRADING PLAN

DESIGNED BY	JTR	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
DRAWN BY	CB	DV101	00089.99	400	2

LAST SAVED BY: JREVA
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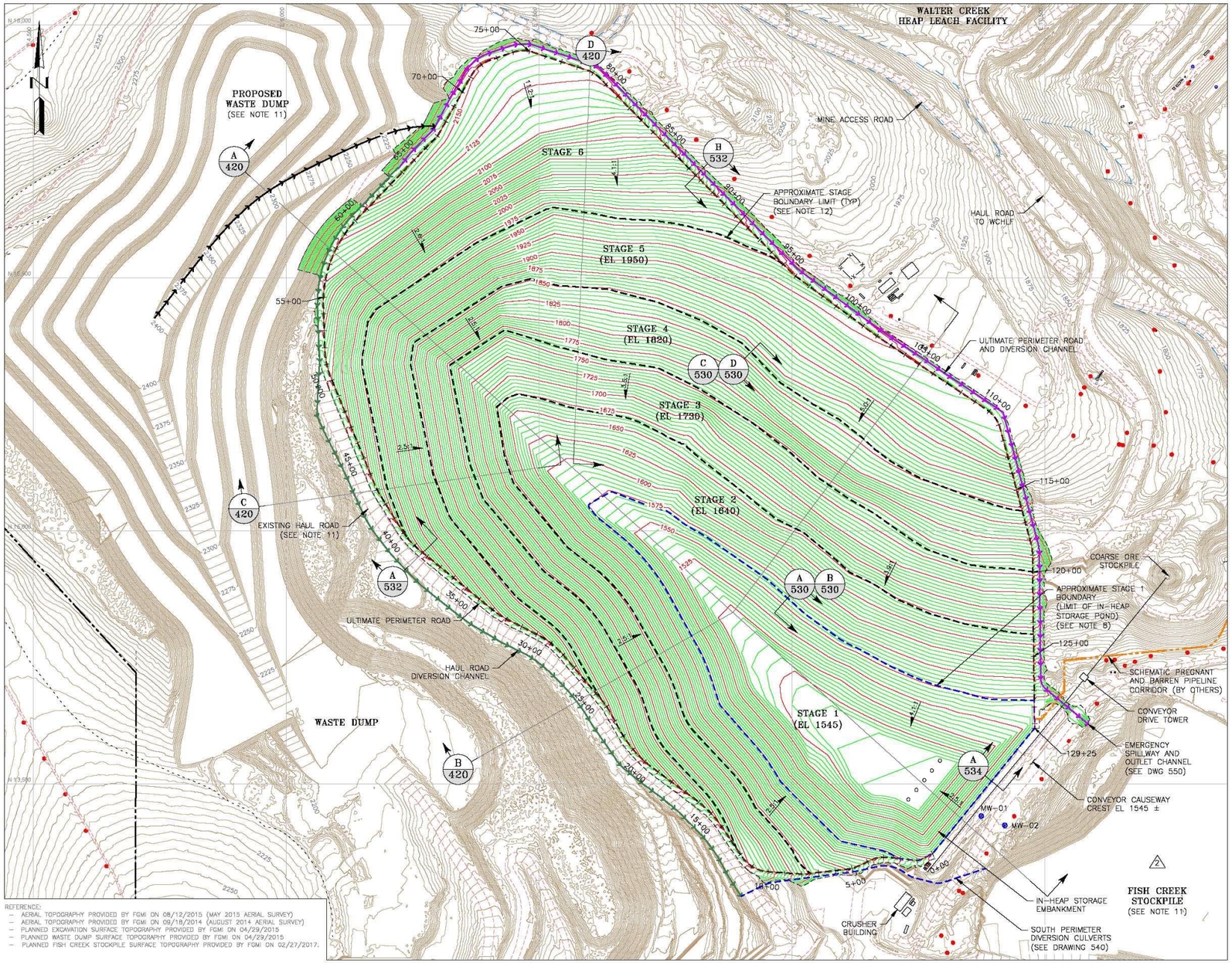

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- PLANNED WASTE DUMP SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED FISH CREEK STOCKPILE SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 02/27/2017.

LEGEND:

- EXISTING GROUND SURFACE CONTOUR AND EL, FEET
- REGRADED GROUND SURFACE CONTOUR AND EL, FEET
- PROPERTY BOUNDARY
- PROPOSED NORTH PERIMETER DIVERSION AND OUTLET CHANNEL
- PROPOSED HAUL ROAD DIVERSION CHANNEL
- NATURAL DRAINAGE (OR DIVERSION BY OTHERS)
- EXISTING DRAINAGE/DIVERSION
- UTILITY POLE
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING STRUCTURES
- VERTICAL SOLUTION EXTRACTION WELL (SEE DRAWING 512)
- MW-01 UNDERDRAIN MONITORING WELL (SEE DRAWING 200) 1

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).
2. THE REGRADED CONTOURS REPRESENT THE TOP OF THE LEACH PAD LINER WITHIN THE PAD, TOP OF ROAD SURFACES, AND BOTTOM OF EROSION PROTECTION WITHIN ALL CHANNELS.
3. ALL UNSUITABLE MATERIALS ENCOUNTERED DURING CONSTRUCTION MUST BE REMOVED AND EITHER REPLACED WITH COMPACTED RANDOM FILL, SITE GRADING FILL, OR HAVE THE EXCAVATED SURFACE PREPARED AS THE ROUGH GRADE SURFACE.
4. SLOPES OF THE REGRADED PAD GROUND SURFACE CONTOURS SHALL NOT EXCEED 2.5H:1V.
5. ALL USABLE MATERIALS (PREPARED SUBGRADE MATERIAL, RIPRAP, ETC.) ENCOUNTERED BUT NOT USED DURING CONSTRUCTION SHALL BE REMOVED AND STOCKPILED FOR LATER USE AS REQUIRED BY FGMI.
6. THE EXISTING POWER LINE SHALL BE RELOCATED AS REQUIRED BY FGMI.
7. ALL EXISTING CULVERTS WITHIN THE LEACH PAD BASIN AREA SHALL BE REMOVED PRIOR TO THE START OF LEACH PAD REGRADING.
8. ABOVE THE STAGE 1 BOUNDARY, THE LEACH PAD WILL BE CONSTRUCTED WITH A SINGLE GEOMEMBRANE LINER. BELOW THE STAGE 1 BOUNDARY, THE LEACH PAD EXISTS AS THE IN-HEAP STORAGE POND AND SHALL BE CONSTRUCTED WITH A DOUBLE GEOMEMBRANE LINER SYSTEM WITH LCRS.
9. SEE DRAWINGS 480 AND 485 FOR THE ULTIMATE PERIMETER ROAD PROFILE AND HORIZONTAL CONTROL DATA, RESPECTIVELY.
10. THE STAGE ELEVATIONS IN BRACKETS REPRESENT THE APPROXIMATE LOW POINTS AT THE NORTHEASTERN END OF THE RESPECTIVE INTER-STAGE PERIMETER ROADS.
11. FGMI'S PLANNED EXCAVATION SURFACE TO REMOVE ORE FROM THE BARNES CREEK STOCKPILE, ITS PLANNED FUTURE WASTE DUMP CONFIGURATION, AND THE CURRENT BACKFILLED CONFIGURATION OF THE FISH CREEK STOCKPILE AREA HAVE BEEN INCORPORATED INTO THE BASE TOPOGRAPHY FOR THE BARNES CREEK HEAP LEACH FACILITY DEVELOPMENT. THE EXCAVATION SURFACE IS ENVISIONED TO BE ACHIEVED PRIOR TO THE START OF THE BCHLF CONSTRUCTION, WHILE THE FUTURE WASTE DUMP IS EXPECTED TO BE LOADED OVER THE LIFE OF THE BCHLF. FGMI'S EXISTING HAUL ROAD ON THE SOUTH SIDE OF THE PLANNED BCHLF, AND THE PLANNED WASTE DUMP, WILL NEED TO BE ADJUSTED TO ALLOW HAUL ACCESS AROUND THE UPPER END OF THE STAGE 6 LEACH PAD.
12. THE INTER-STAGE BOUNDARIES ARE APPROXIMATE AND SHALL BE FINALIZED PRIOR TO CONSTRUCTION OF EACH STAGE.

PLAN

300 0 300 600 FEET

1" = 300' AT FULL SIZE (ANSI D)
1" = 600' AT HALF SIZE (ANSI B)

REVISION:

1. ADDED UNDERDRAIN MONITORING WELL LOCATIONS IN PLAN AND CALLOUT TO LEGEND.
2. REMOVED SOUTH PERIMETER OUTLET CHANNEL. MODIFIED FISH CREEK STOCKPILE TOPOGRAPHY.

REV	DATE	DESCRIPTION	APP'D	CADD
A	10/10/16	ISSUED FOR CLIENT REVIEW	JTR	CB
0	01/27/17	ISSUED FOR CONSTRUCTION	JTR	CB
1	02/07/17	REISSUED FOR CONSTRUCTION	JTR	CB
2	03/17/17	REISSUED FOR CONSTRUCTION	JTR	CB

DISCLAIMER
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ACTIVITY CODE N/A
XREF N/A

CLIENT: FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

PROJECT: FORT KNOX PROJECT
BARNES CREEK HEAP LEACH FACILITY FINAL DESIGN

TITLE: STAGE GRADING PLAN THRU STAGE 6

DESIGNED BY	JTR	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
DRAWN BY	CB	DV101	00089.99	410	2

LAST SAVED BY: JREVA
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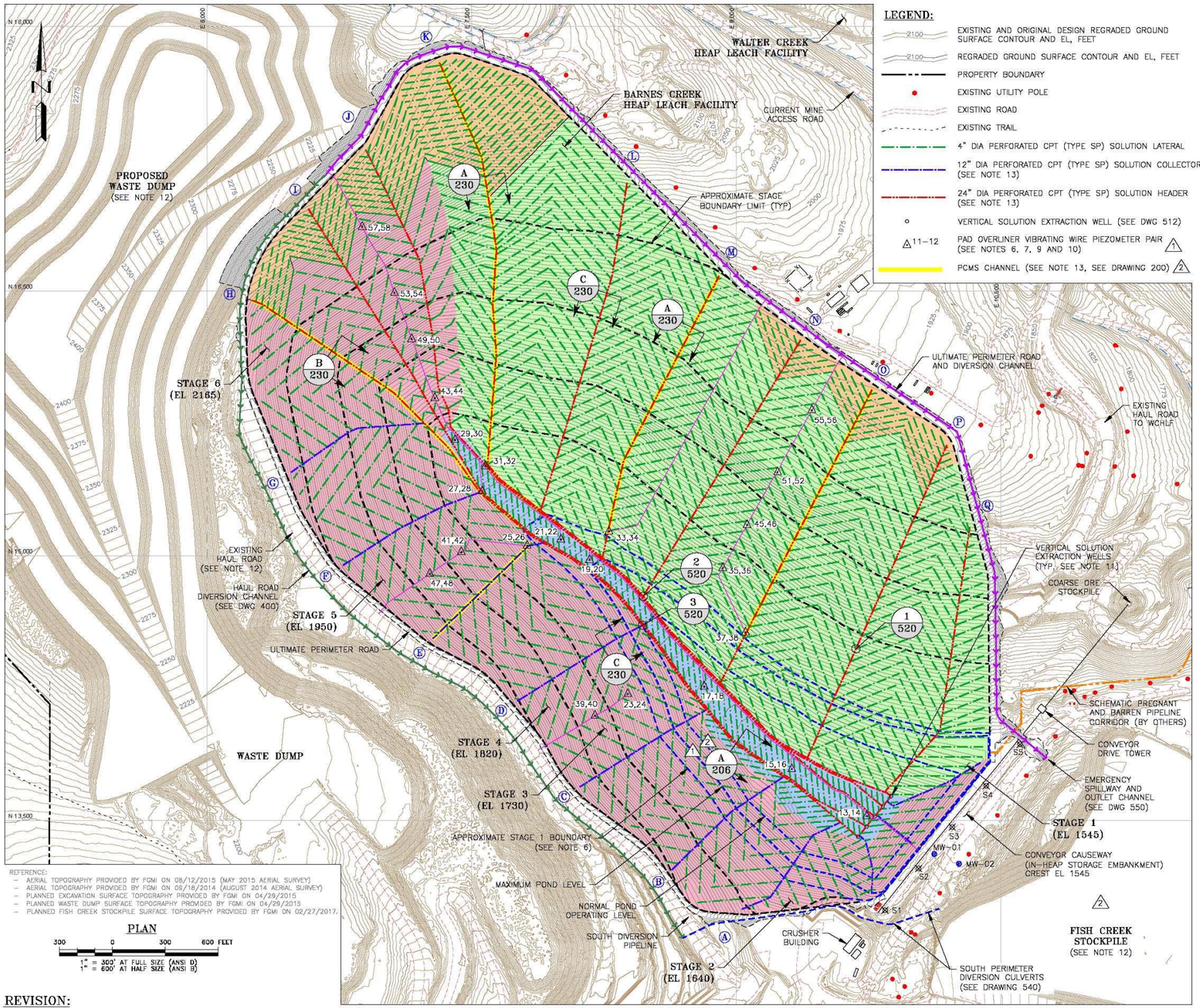

REFERENCE:
- AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 08/12/2015 (MAY 2015 AERIAL SURVEY)
- AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 08/18/2014 (AUGUST 2014 AERIAL SURVEY)
- PLANNED EXCAVATION SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED WASTE DUMP SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED FISH CREEK STOCKPILE SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 02/27/2017.

PLAN

300 0 300 600 FEET

1" = 300' AT FULL SIZE (ANSI D)
1" = 600' AT HALF SIZE (ANSI B)

LEGEND:

- EXISTING AND ORIGINAL DESIGN REGRADED GROUND SURFACE CONTOUR AND EL, FEET
- REGRADED GROUND SURFACE CONTOUR AND EL, FEET
- PROPERTY BOUNDARY
- EXISTING UTILITY POLE
- EXISTING ROAD
- EXISTING TRAIL
- 4" DIA PERFORATED CPT (TYPE SP) SOLUTION LATERAL
- 12" DIA PERFORATED CPT (TYPE SP) SOLUTION COLLECTOR (SEE NOTE 13)
- 24" DIA PERFORATED CPT (TYPE SP) SOLUTION HEADER (SEE NOTE 13)
- VERTICAL SOLUTION EXTRACTION WELL (SEE DWG 512)
- 11-12 PAD OVERLINER VIBRATING WIRE PIEZOMETER PAIR (SEE NOTES 6, 7, 9 AND 10) △1
- PCMS CHANNEL (SEE NOTE 13, SEE DRAWING 200) △2
- MW-01 UNDERDRAIN MONITORING WELL (SEE DRAWING 200) △1
- PIEZOMETER CABLE CONDUIT WITH 12" DIA PERFORATED CPT (TYPE SP) BACKUP PIPE (SEE NOTE 9)
- S1 SETTLEMENT MONUMENT
- A SOLUTION COLLECTOR/HEADER DESIGNATION
- <10% SLOPE ALONG THE VALLEY BOTTOM (A 520) (B 520)
- 5H:1V TO 10H:1V PAD SLOPES ABOVE IN-HEAP POND (C 520) (D 520)
- 4H:1V TO 4.5H:1V PAD SLOPES (C 520) (D 520)
- 2.5H:1V PAD SLOPES (C 520) (D 520)

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).
2. THE REGRADED CONTOURS REPRESENT THE TOP OF THE LEACH PAD LINER WITHIN THE PAD, TOP OF ROAD SURFACES, AND BOTTOM OF EROSION PROTECTION WITHIN ALL CHANNELS.
3. ALL PIPE CONNECTIONS SHALL BE FORMED USING MANUFACTURER SUPPLIED FABRICATED COUPLERS, TEES OR WYES. ALL CPT CONNECTIONS WHICH CHANGE DIAMETER, SLOPE OR ALIGNMENT MUST BE WIRE-TIED AROUND BOTH ENDS OF THE CONNECTIONS.
4. WHERE CPT SOLUTION PIPES TERMINATE, THEY SHALL BE FITTED WITH MANUFACTURER SUPPLIED END CAPS. ALL PIPEWORK, INCLUDING TERMINATION POINTS, SHALL BE SURVEYED FOR FUTURE IDENTIFICATION.
5. THE BARNES CREEK HEAP LEACH FACILITY CONTAINS FOUR RELATIVELY DISTINCT PAD SLOPES AS INDICATED BY THE SHADED AREAS. REFER TO TABLE 1 ON DWG 520 FOR THE SOLUTION LATERAL PIPE SPACING WITHIN EACH AREA.
6. ABOVE THE STAGE 1 BOUNDARY THE LEACH PAD CONTAINS A SINGLE GEOMEMBRANE LINER. BELOW THE STAGE 1 BOUNDARY THE LEACH PAD EXISTS AS THE IN-HEAP STORAGE POND AND IS CONSTRUCTED WITH A DOUBLE GEOMEMBRANE LINER SYSTEM WITH LCRS. REFER TO THE SECTIONS AND DETAILS FOR THE LEACH PAD LINER SYSTEMS.
7. THE STAGE ELEVATIONS IN BRACKETS REPRESENT THE APPROXIMATE LOW POINTS AT THE NORTHEASTERN END OF THE RESPECTIVE INTER-STAGE PERIMETER ROADS.
8. THE INTER-STAGE BOUNDARIES ARE APPROXIMATE AND SHALL BE FINALIZED PRIOR TO CONSTRUCTION OF EACH STAGE.
9. EACH PIEZOMETER PAIR SHALL INCLUDE SEPARATE CABLES AND ONE CABLE CONDUIT. THE PIEZOMETER CABLE CONDUITS SHALL GENERALLY RUN ALONG THE TOE OF THE NORTHEAST VALLEY SLOPE OR BETWEEN LATERAL PIPES TO AVOID INTERFERENCE WITH THE SOLUTION COLLECTION PIPES TO THE EXTENT POSSIBLE. THE PIEZOMETER CONDUITS AND CABLES SHALL REPORT TO CENTRAL READOUT BOXES TO BE LOCATED ON THE IN-HEAP STORAGE POND EMBANKMENT CREST FOR STAGE 1 PIEZOMETERS, AND AT THREE DISTINCT LOCATIONS ON THE UPSTREAM SIDE OF THE PAD FOR STAGES 2 THROUGH 6. THE STAGE 2 THROUGH 6 READOUT BOXES WILL BE RELOCATED AS THE PAD IS BUILT INCREMENTALLY UP THE VALLEY, BUT ARE NOT SHOWN FOR CLARITY. A 12" DIAMETER PERFORATED CPT PIPE SHALL BE INSTALLED ADJACENT TO EACH PIEZOMETER CABLE CONDUIT TO ALLOW MANUAL PIEZOMETER READINGS, IF NEEDED, SHOULD PROBLEMS BE EXPERIENCED WITH THE INSTALLED PIEZOMETERS.
10. REFER TO DRAWING 720 FOR INSTRUMENTATION SECTIONS AND DETAILS.
11. REFER TO DRAWINGS 510 AND 512 FOR THE VERTICAL SOLUTION COLLECTION WELLS SECTIONS AND DETAILS. REFER TO DRAWING 514 FOR THE TEMPORARY INCLINED SOLUTION EXTRACTION WELLS PLAN AND SECTIONS (NOT SHOWN FOR CLARITY).
12. FGMI'S PLANNED EXCAVATION SURFACE TO REMOVE ORE FROM THE BARNES CREEK STOCKPILE, ITS PLANNED FUTURE WASTE DUMP CONFIGURATION, AND THE CURRENT BACKFILLED CONFIGURATION OF THE FISH CREEK STOCKPILE AREA HAVE BEEN INCORPORATED INTO THE BASE TOPOGRAPHY FOR THE BARNES CREEK HEAP LEACH FACILITY DEVELOPMENT. THE EXCAVATION SURFACE IS ENVISIONED TO BE ACHIEVED PRIOR TO THE START OF THE BCHLF CONSTRUCTION, WHILE THE FUTURE WASTE DUMP IS EXPECTED TO BE LOADED OVER THE LIFE OF THE BCHLF. FGMI'S EXISTING HAUL ROAD ON THE SOUTH SIDE OF THE PLANNED BCHLF, AND THE PLANNED WASTE DUMP, WILL NEED TO BE ADJUSTED TO ALLOW HAUL ACCESS AROUND THE UPPER END OF THE STAGE 6 LEACH PAD.
13. THE SOLUTION COLLECTORS (12" DIAMETER PERFORATED CPT) AND HEADERS (24" DIAMETER PERFORATED CPT) SHALL GENERALLY BE INSTALLED WITHIN 20' OF THE LOCATIONS SHOWN IN PLAN. SOLUTION COLLECTORS AND HEADERS OVERLYING PCMS CHANNELS SHALL FOLLOW THE PCMS CHANNEL HORIZONTAL CONTROL DATA ON DRAWINGS 204 AND 205. △2

REVISION:

△1 ADDED A/220 CALLOUT. MODIFIED LEGEND DESCRIPTION. ADDED UNDERDRAIN MONITORING/PUMPING WELL LOCATIONS IN PLAN AND CALLOUT TO LEGEND.

△2 REMOVED SOUTH PERIMETER OUTLET CHANNEL. MODIFIED FISH CREEK STOCKPILE TOPOGRAPHY. ADDED PCMS CHANNEL LOCATIONS. MODIFIED NOTE 13 AND PIEZOMETERS. MODIFIED SOLUTION COLLECTION PIPEWORK AROUND PCMS CHANNEL 4. MOVED PREVIOUS SECTION A/220 TO DRAWING 206.

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ACTIVITY CODE N/A | XREF N/A

CLIENT: FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

PROJECT: FORT KNOX PROJECT
BARNES CREEK HEAP LEACH FACILITY FINAL DESIGN

TITLE: SOLUTION COLLECTION PIPEWORK AND INSTRUMENTATION PLAN

DESIGNED BY	JTR	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
DRAWN BY	CB	DV101	00089.99	500	2

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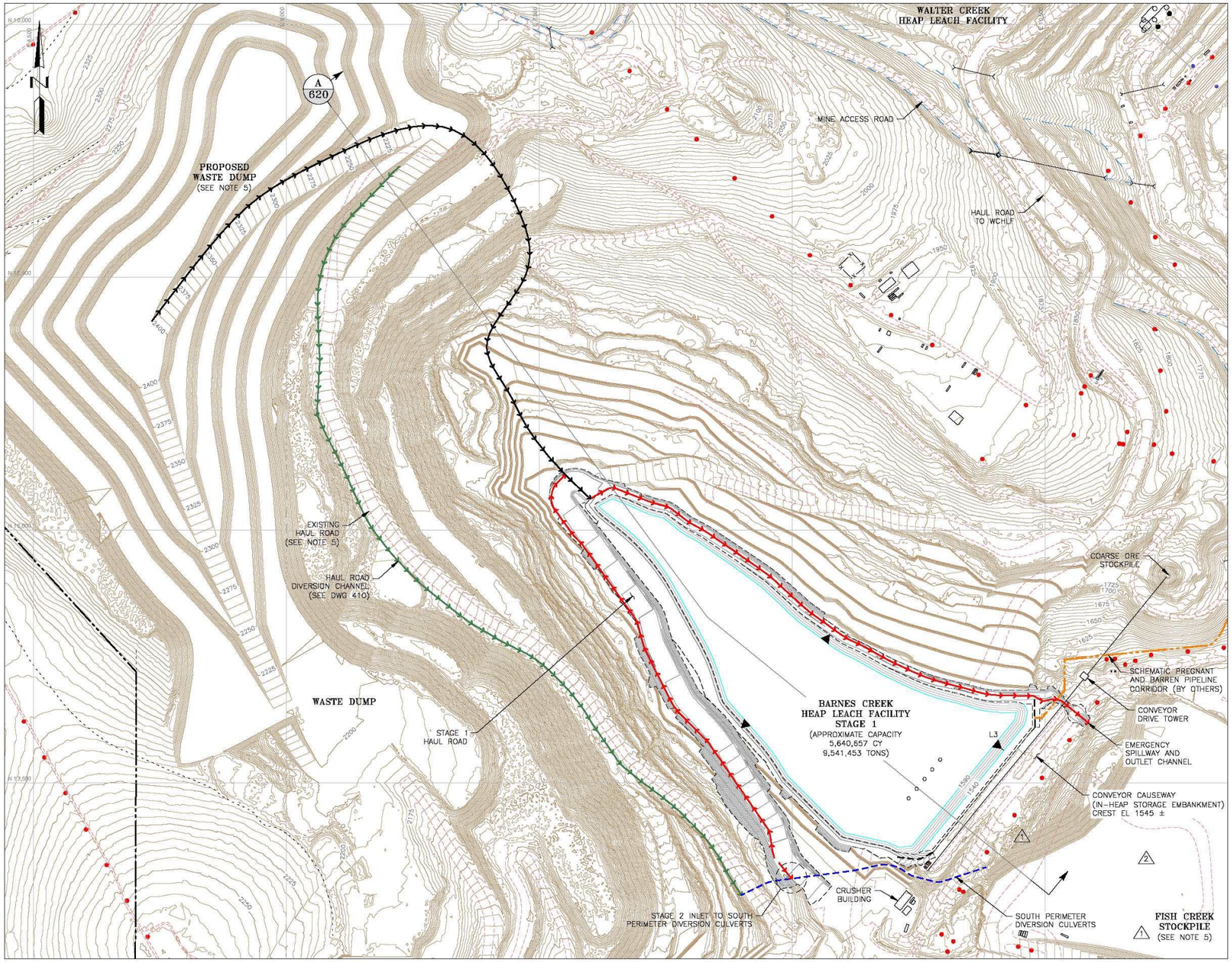

LEGEND:

- EXISTING GROUND SURFACE CONTOUR AND EL, FEET
- HEAP SURFACE CONTOUR AND EL, FEET
- REGRADED GROUND SURFACE CONTOUR AND EL, FEET
- PROPERTY BOUNDARY
- PROPOSED HAUL ROAD DIVERSION CHANNEL
- PROPOSED INTER-STAGE DIVERSION
- NATURAL DRAINAGE (OR DIVERSION BY OTHERS)
- EXISTING DRAINAGE/DIVERSION
- UTILITY POLE
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING CULVERT
- SOLUTION EXTRACTION WELL
- L3 HEAP LIFT DESIGNATION (SEE NOTE 6) △1
- EXISTING STRUCTURES

NOTES:

1. SCALE BAR MEASURES 3" WHEN PLOTTED AT FULL SIZE (ANSI-D) AND 1.5" WHEN PLOTTED AT HALF SIZE (ANSI-B).
2. THE APPROXIMATE HEAP CAPACITY IS BASED ON AN ORE DENSITY OF 125.3 lb/ft^3.
3. REFER TO SECTION A ON DRAWING 620 FOR THE RELATIONSHIPS OF HEAP ELEVATION, HEAP LIFT, AND STAGE BOUNDARY.
4. THE APPROXIMATE HEAP CAPACITY CONSIDERS LOADING ROUGHLY UP TO ONE LIFT HIGHER THAN THE HIGH-POINT ELEVATION OF EACH RESPECTIVE INTER-STAGE PERIMETER ROAD NEAR THE UPPER END OF THE VALLEY.
5. FGMI'S PLANNED EXCAVATION SURFACE TO REMOVE ORE FROM THE BARNES CREEK STOCKPILE, ITS PLANNED FUTURE WASTE DUMP CONFIGURATION, AND THE CURRENT BACKFILLED CONFIGURATION OF THE FISH CREEK STOCKPILE AREA HAVE BEEN INCORPORATED INTO THE BASE TOPOGRAPHY FOR THE BARNES CREEK HEAP LEACH FACILITY DEVELOPMENT. THE EXCAVATION SURFACE IS ENVISIONED TO BE ACHIEVED PRIOR TO THE START OF THE BCHLF CONSTRUCTION, WHILE THE FUTURE WASTE DUMP IS EXPECTED TO BE LOADED OVER THE LIFE OF THE BCHLF. FGMI'S EXISTING HAUL ROAD ON THE SOUTH SIDE OF THE PLANNED BCHLF, AND THE PLANNED WASTE DUMP, WILL NEED TO BE ADJUSTED TO ALLOW HAUL ACCESS AROUND THE UPPER END OF THE STAGE 6 LEACH PAD.
6. LIFTS 1 AND 2 ARE LOCATED WITHIN THE IN-HEAP STORAGE POND.

REVISION:

△1 CORRECTED NOTE CALLOUTS. REMOVED UNDERDRAIN MONITORING WELL AND CALLOUT.

△2 REMOVED SOUTH PERIMETER OUTLET CHANNEL. MODIFIED FISH CREEK STOCKPILE TOPOGRAPHY.

PLAN

300 0 300 600 FEET

1" = 300' AT FULL SIZE (ANSI D)
1" = 600' AT HALF SIZE (ANSI B)

REFERENCE:
- AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 08/12/2015 (MAY 2015 AERIAL SURVEY)
- AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 09/18/2014 (AUGUST 2014 AERIAL SURVEY)
- PLANNED EXCAVATION SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED WASTE DUMP SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED FISH CREEK STOCKPILE SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 02/27/2017.

REV	DATE	DESCRIPTION	APP'D / CADD
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2	03/17/17	REISSUED FOR CONSTRUCTION	JTR / CB

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ACTIVITY CODE N/A XREF N/A

CLIENT: FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

PROJECT: FORT KNOX PROJECT
BARNES CREEK HEAP LEACH FACILITY FINAL DESIGN

TITLE: STAGE 1
SCHEMATIC HEAP CONFIGURATION

DESIGNED BY	JTR	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
DRAWN BY	CB	DV101	00089.99	600	2

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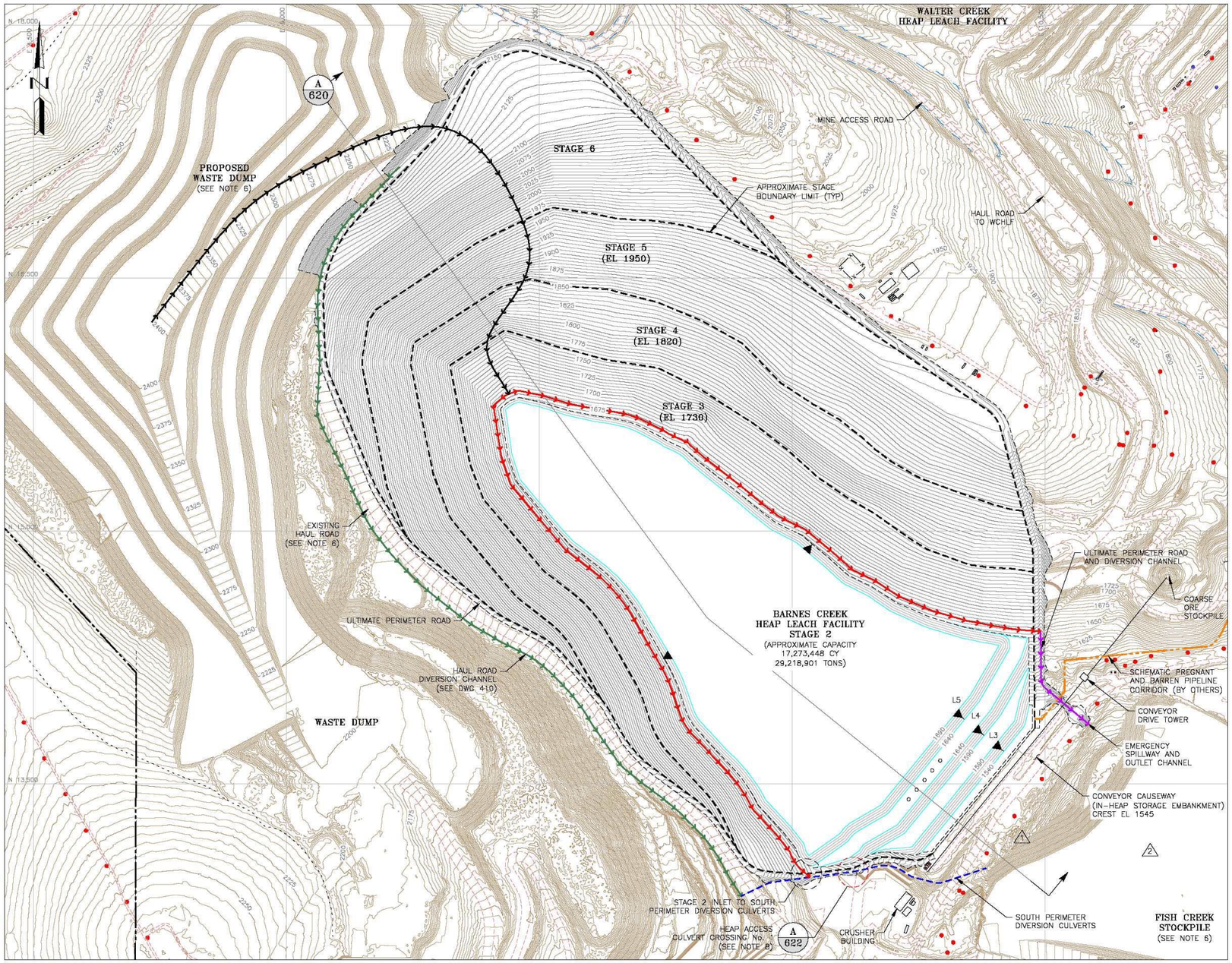

LEGEND:

- EXISTING GROUND SURFACE CONTOUR AND EL, FEET
- HEAP SURFACE CONTOUR AND EL, FEET
- REGRADED GROUND SURFACE CONTOUR AND EL, FEET
- PROPERTY BOUNDARY
- PROPOSED NORTH PERIMETER DIVERSION AND OUTLET CHANNEL
- PROPOSED HAUL ROAD DIVERSION CHANNEL
- PROPOSED INTER-STAGE DIVERSION
- NATURAL DRAINAGE (OR DIVERSION BY OTHERS)
- EXISTING DRAINAGE/DIVERSION
- UTILITY POLE
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING CULVERT
- SOLUTION EXTRACTION WELL
- L3 HEAP LIFT DESIGNATION (SEE NOTE 7)
- EXISTING STRUCTURES

NOTES:

1. SCALE BAR MEASURES 3" WHEN PLOTTED AT FULL SIZE (ANSI-D) AND 1.5" WHEN PLOTTED AT HALF SIZE (ANSI-B).
2. THE APPROXIMATE HEAP CAPACITY IS BASED ON AN ORE DENSITY OF 125.3 lb/ft^3.
3. REFER TO SECTION A ON DRAWING 620 FOR THE RELATIONSHIPS OF HEAP ELEVATION, HEAP LIFT, AND STAGE BOUNDARY.
4. THE STAGE ELEVATIONS IN BRACKETS REPRESENT THE APPROXIMATE LOW POINTS AT THE NORTHEASTERN END OF THE RESPECTIVE INTER-STAGE PERIMETER ROADS.
5. THE APPROXIMATE HEAP CAPACITY CONSIDERS LOADING ROUGHLY UP TO ONE LIFT HIGHER THAN THE HIGH-POINT ELEVATION OF EACH RESPECTIVE INTER-STAGE PERIMETER ROAD NEAR THE UPPER END OF THE VALLEY.
6. FGMI'S PLANNED EXCAVATION SURFACE TO REMOVE ORE FROM THE BARNES CREEK STOCKPILE, ITS PLANNED FUTURE WASTE DUMP CONFIGURATION, AND THE CURRENT BACKFILLED CONFIGURATION OF THE FISH CREEK STOCKPILE AREA HAVE BEEN INCORPORATED INTO THE BASE TOPOGRAPHY FOR THE BARNES CREEK HEAP LEACH FACILITY DEVELOPMENT. THE EXCAVATION SURFACE IS ENVISIONED TO BE ACHIEVED PRIOR TO THE START OF THE BCHLF CONSTRUCTION, WHILE THE FUTURE WASTE DUMP IS EXPECTED TO BE LOADED OVER THE LIFE OF THE BCHLF. FGMI'S EXISTING HAUL ROAD ON THE SOUTH SIDE OF THE PLANNED BCHLF, AND THE PLANNED WASTE DUMP, WILL NEED TO BE ADJUSTED TO ALLOW HAUL ACCESS AROUND THE UPPER END OF THE STAGE 6 LEACH PAD.
7. LIFTS 1 AND 2 ARE LOCATED WITHIN THE IN-HEAP STORAGE POND.
8. HEAP ACCESS CULVERT CROSSINGS NOS. 1 THRU 4 WILL BE REQUIRED NEAR THE SOUTHWEST CORNERS OF THE STAGES 2, 3, 4, AND 5 LEACH PADS, RESPECTIVELY, TO ALLOW HAUL ACCESS FOR LOADING THE ORE HEAP. THESE CULVERT CROSSINGS WILL BE REQUIRED WITH EACH RESPECTIVE AREA OF PAD DEVELOPMENT, BUT MAY BE REMOVED ONCE THE SUBSEQUENT OR FINAL HEAP ACCESS POINT IS DEVELOPED FOR LOADING.

REVISION:

1. REMOVED UNDERDRAIN MONITORING WELL AND CALLOUT.
2. REMOVED SOUTH PERIMETER OUTLET CHANNEL. MODIFIED FISH CREEK STOCKPILE TOPOGRAPHY.

PLAN

300 0 300 600 FEET

1" = 300' AT FULL SIZE (ANSI D)
1" = 600' AT HALF SIZE (ANSI B)

REFERENCE:
- AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 08/12/2015 (MAY 2015 AERIAL SURVEY)
- AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 09/18/2014 (AUGUST 2014 AERIAL SURVEY)
- PLANNED EXCAVATION SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED WASTE DUMP SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED FISH CREEK STOCKPILE SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 02/27/2017.

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ACTIVITY CODE N/A | XREF N/A

CLIENT: FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

PROJECT: FORT KNOX PROJECT
BARNES CREEK HEAP LEACH FACILITY FINAL DESIGN

TITLE: STAGE 2 (EL 1640)
SCHEMATIC HEAP CONFIGURATION

DESIGNED BY	JTR	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
DRAWN BY	CB	DV101	00089.99	602	2

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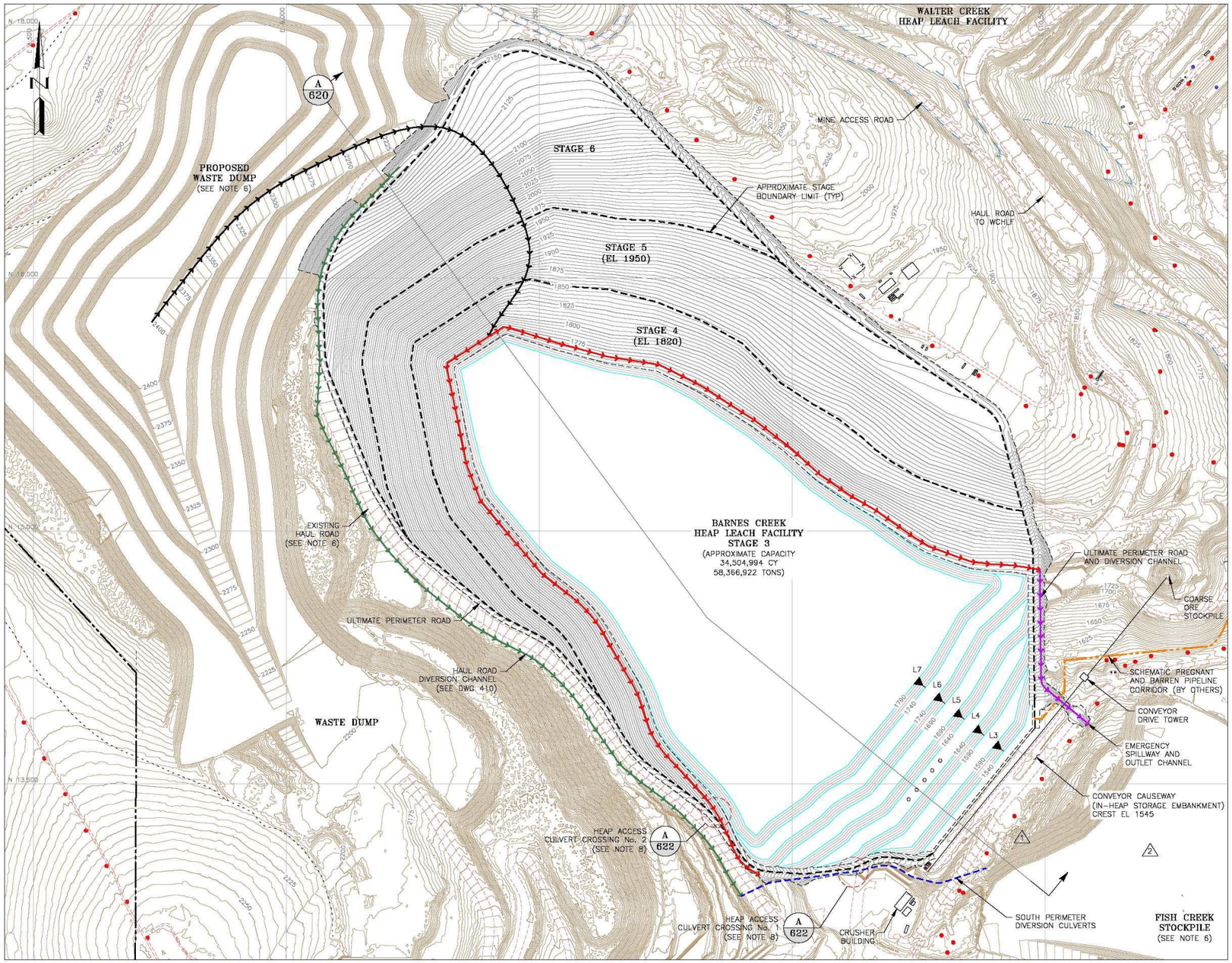

LEGEND:

- EXISTING GROUND SURFACE CONTOUR AND EL, FEET
- HEAP SURFACE CONTOUR AND EL, FEET
- REGRADED GROUND SURFACE CONTOUR AND EL, FEET
- PROPERTY BOUNDARY
- PROPOSED NORTH PERIMETER DIVERSION AND OUTLET CHANNEL
- PROPOSED HAUL ROAD DIVERSION CHANNEL
- PROPOSED INTER-STAGE DIVERSION
- NATURAL DRAINAGE (OR DIVERSION BY OTHERS)
- EXISTING DRAINAGE/DIVERSION
- UTILITY POLE
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING CULVERT
- SOLUTION EXTRACTION WELL
- L3 HEAP LIFT DESIGNATION (SEE NOTE 7)
- EXISTING STRUCTURES

NOTES:

1. SCALE BAR MEASURES 3" WHEN PLOTTED AT FULL SIZE (ANSI-D) AND 1.5" WHEN PLOTTED AT HALF SIZE (ANSI-B).
2. THE APPROXIMATE HEAP CAPACITY IS BASED ON AN ORE DENSITY OF 125.3 lb/ft^3.
3. REFER TO SECTION A ON DRAWING 620 FOR THE RELATIONSHIPS OF HEAP ELEVATION, HEAP LIFT, AND STAGE BOUNDARY.
4. THE STAGE ELEVATIONS IN BRACKETS REPRESENT THE APPROXIMATE LOW POINTS AT THE NORTHEASTERN END OF THE RESPECTIVE INTER-STAGE PERIMETER ROADS.
5. THE APPROXIMATE HEAP CAPACITY CONSIDERS LOADING ROUGHLY UP TO ONE LIFT HIGHER THAN THE HIGH-POINT ELEVATION OF EACH RESPECTIVE INTER-STAGE PERIMETER ROAD NEAR THE UPPER END OF THE VALLEY.
6. FGMI'S PLANNED EXCAVATION SURFACE TO REMOVE ORE FROM THE BARNES CREEK STOCKPILE, ITS PLANNED FUTURE WASTE DUMP CONFIGURATION, AND THE CURRENT BACKFILLED CONFIGURATION OF THE FISH CREEK STOCKPILE AREA HAVE BEEN INCORPORATED INTO THE BASE TOPOGRAPHY FOR THE BARNES CREEK HEAP LEACH FACILITY DEVELOPMENT. THE EXCAVATION SURFACE IS ENVISIONED TO BE ACHIEVED PRIOR TO THE START OF THE BCHLF CONSTRUCTION, WHILE THE FUTURE WASTE DUMP IS EXPECTED TO BE LOADED OVER THE LIFE OF THE BCHLF. FGMI'S EXISTING HAUL ROAD ON THE SOUTH SIDE OF THE PLANNED BCHLF, AND THE PLANNED WASTE DUMP, WILL NEED TO BE ADJUSTED TO ALLOW HAUL ACCESS AROUND THE UPPER END OF THE STAGE 6 LEACH PAD.
7. LIFTS 1 AND 2 ARE LOCATED WITHIN THE IN-HEAP STORAGE POND.
8. HEAP ACCESS CULVERT CROSSINGS NOS. 1 THRU 4 WILL BE REQUIRED NEAR THE SOUTHWEST CORNERS OF THE STAGES 2, 3, 4, AND 5 LEACH PADS, RESPECTIVELY, TO ALLOW HAUL ACCESS FOR LOADING THE ORE HEAP. THESE CULVERT CROSSINGS WILL BE REQUIRED WITH EACH RESPECTIVE AREA OF PAD DEVELOPMENT, BUT MAY BE REMOVED ONCE THE SUBSEQUENT OR FINAL HEAP ACCESS POINT IS DEVELOPED FOR LOADING.

REVISION:

1. REMOVED UNDERDRAIN MONITORING WELL AND CALLOUT.
2. REMOVED SOUTH PERIMETER OUTLET CHANNEL. MODIFIED FISH CREEK STOCKPILE TOPOGRAPHY.

PLAN

300 0 300 600 FEET

1" = 300' AT FULL SIZE (ANSI D)
1" = 600' AT HALF SIZE (ANSI B)

REFERENCE:
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- PLANNED WASTE DUMP SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED FISH CREEK STOCKPILE SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 02/27/2017.

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1	02/07/17	REISSUED FOR CONSTRUCTION	JTR / CB
2	03/17/17	REISSUED FOR CONSTRUCTION	JTR / CB

DISCLAIMER
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ACTIVITY CODE N/A | XREF N/A

CLIENT: FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

PROJECT: FORT KNOX PROJECT
BARNES CREEK HEAP LEACH FACILITY FINAL DESIGN

TITLE: STAGE 3 (EL 1730)
SCHEMATIC HEAP CONFIGURATION

DESIGNED BY	DRAWN BY	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
JTR	CB	DV101	00089.99	604	2

LAST SAVED BY: CBEARLAND
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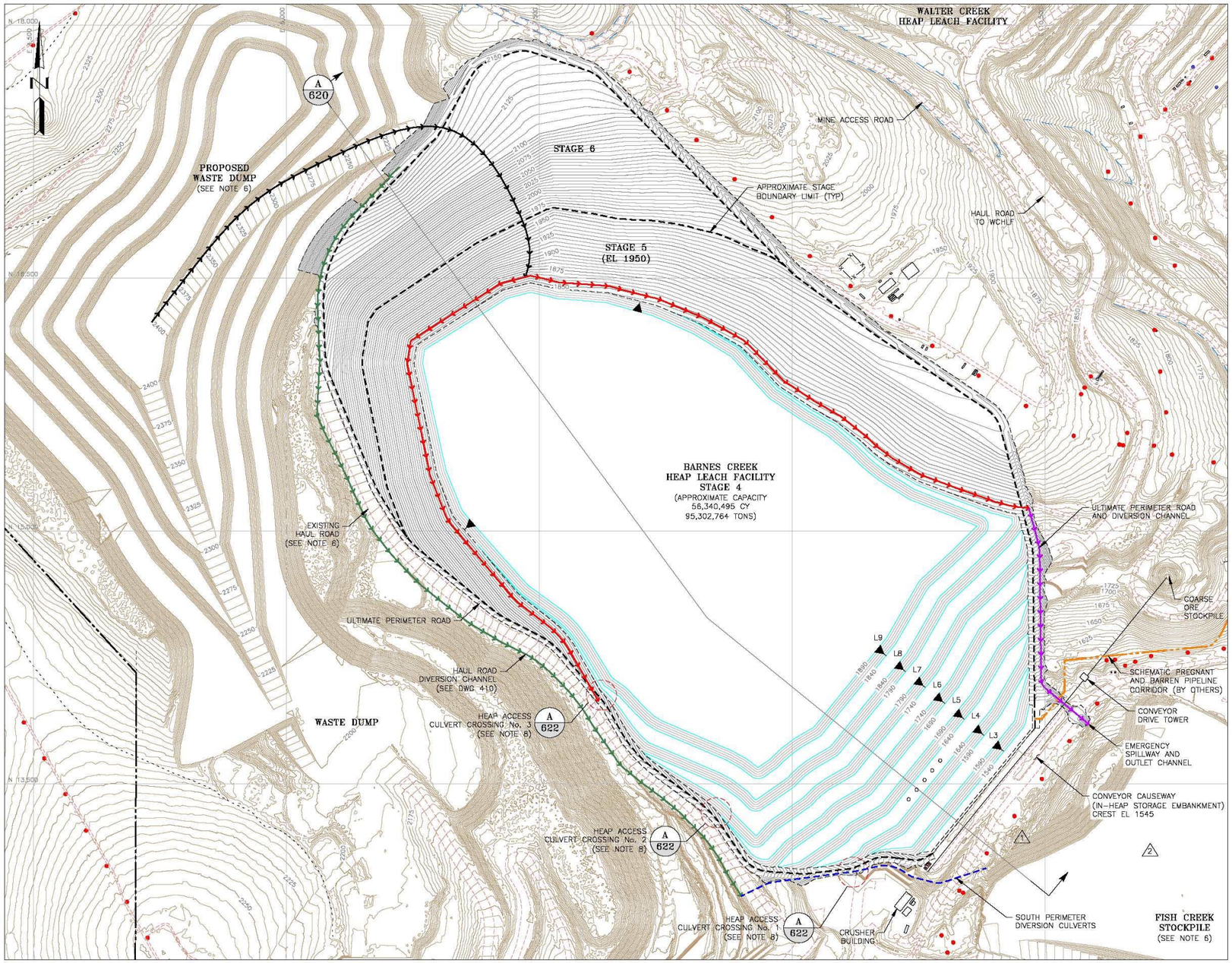

LEGEND:

- EXISTING GROUND SURFACE CONTOUR AND EL, FEET
- HEAP SURFACE CONTOUR AND EL, FEET
- REGRADED GROUND SURFACE CONTOUR AND EL, FEET
- PROPERTY BOUNDARY
- PROPOSED NORTH PERIMETER DIVERSION AND OUTLET CHANNEL
- PROPOSED HAUL ROAD DIVERSION CHANNEL
- PROPOSED INTER-STAGE DIVERSION
- NATURAL DRAINAGE (OR DIVERSION BY OTHERS)
- EXISTING DRAINAGE/DIVERSION
- UTILITY POLE
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING CULVERT
- SOLUTION EXTRACTION WELL
- L3 HEAP LIFT DESIGNATION (SEE NOTE 7)
- EXISTING STRUCTURES

NOTES:

1. SCALE BAR MEASURES 3" WHEN PLOTTED AT FULL SIZE (ANSI-D) AND 1.5" WHEN PLOTTED AT HALF SIZE (ANSI-B).
2. THE APPROXIMATE HEAP CAPACITY IS BASED ON AN ORE DENSITY OF 125.3 lb/ft^3.
3. REFER TO SECTION A ON DRAWING 620 FOR THE RELATIONSHIPS OF HEAP ELEVATION, HEAP LIFT, AND STAGE BOUNDARY.
4. THE STAGE ELEVATIONS IN BRACKETS REPRESENT THE APPROXIMATE LOW POINTS AT THE NORTHEASTERN END OF THE RESPECTIVE INTER-STAGE PERIMETER ROADS.
5. THE APPROXIMATE HEAP CAPACITY CONSIDERS LOADING ROUGHLY UP TO ONE LIFT HIGHER THAN THE HIGH-POINT ELEVATION OF EACH RESPECTIVE INTER-STAGE PERIMETER ROAD NEAR THE UPPER END OF THE VALLEY.
6. FGMI'S PLANNED EXCAVATION SURFACE TO REMOVE ORE FROM THE BARNES CREEK STOCKPILE, ITS PLANNED FUTURE WASTE DUMP CONFIGURATION, AND THE CURRENT BACKFILLED CONFIGURATION OF THE FISH CREEK STOCKPILE AREA HAVE BEEN INCORPORATED INTO THE BASE TOPOGRAPHY FOR THE BARNES CREEK HEAP LEACH FACILITY DEVELOPMENT. THE EXCAVATION SURFACE IS ENVISIONED TO BE ACHIEVED PRIOR TO THE START OF THE BCHLF CONSTRUCTION, WHILE THE FUTURE WASTE DUMP IS EXPECTED TO BE LOADED OVER THE LIFE OF THE BCHLF. FGMI'S EXISTING HAUL ROAD ON THE SOUTH SIDE OF THE PLANNED BCHLF, AND THE PLANNED WASTE DUMP, WILL NEED TO BE ADJUSTED TO ALLOW HAUL ACCESS AROUND THE UPPER END OF THE STAGE 6 LEACH PAD.
7. LIFTS 1 AND 2 ARE LOCATED WITHIN THE IN-HEAP STORAGE POND.
8. HEAP ACCESS CULVERT CROSSINGS NOS. 1 THRU 4 WILL BE REQUIRED NEAR THE SOUTHWEST CORNERS OF THE STAGES 2, 3, 4, AND 5 LEACH PADS, RESPECTIVELY, TO ALLOW HAUL ACCESS FOR LOADING THE ORE HEAP. THESE CULVERT CROSSINGS WILL BE REQUIRED WITH EACH RESPECTIVE AREA OF PAD DEVELOPMENT, BUT MAY BE REMOVED ONCE THE SUBSEQUENT OR FINAL HEAP ACCESS POINT IS DEVELOPED FOR LOADING.

REVISION:

1. REMOVED UNDERDRAIN MONITORING WELL AND CALLOUT.
2. REMOVED SOUTH PERIMETER OUTLET CHANNEL. MODIFIED FISH CREEK STOCKPILE TOPOGRAPHY.

PLAN

300 0 300 600 FEET

1" = 300' AT FULL SIZE (ANSI D)
1" = 600' AT HALF SIZE (ANSI B)

REFERENCE:
- AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 08/12/2015 (MAY 2015 AERIAL SURVEY)
- AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 09/18/2014 (AUGUST 2014 AERIAL SURVEY)
- PLANNED EXCAVATION SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED WASTE DUMP SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED FISH CREEK STOCKPILE SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 02/27/2017.

REV	DATE	DESCRIPTION	APP'D
A	10/10/16	ISSUED FOR CLIENT REVIEW	CADD / JTR / CB
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ACTIVITY CODE N/A XREF N/A

CLIENT: FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

PROJECT: FORT KNOX PROJECT
BARNES CREEK HEAP LEACH FACILITY FINAL DESIGN

TITLE: STAGE 4 (EL 1820)
SCHEMATIC HEAP CONFIGURATION

DESIGNED BY	JTR	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
DRAWN BY	CB	DV101	00089.99	606	2

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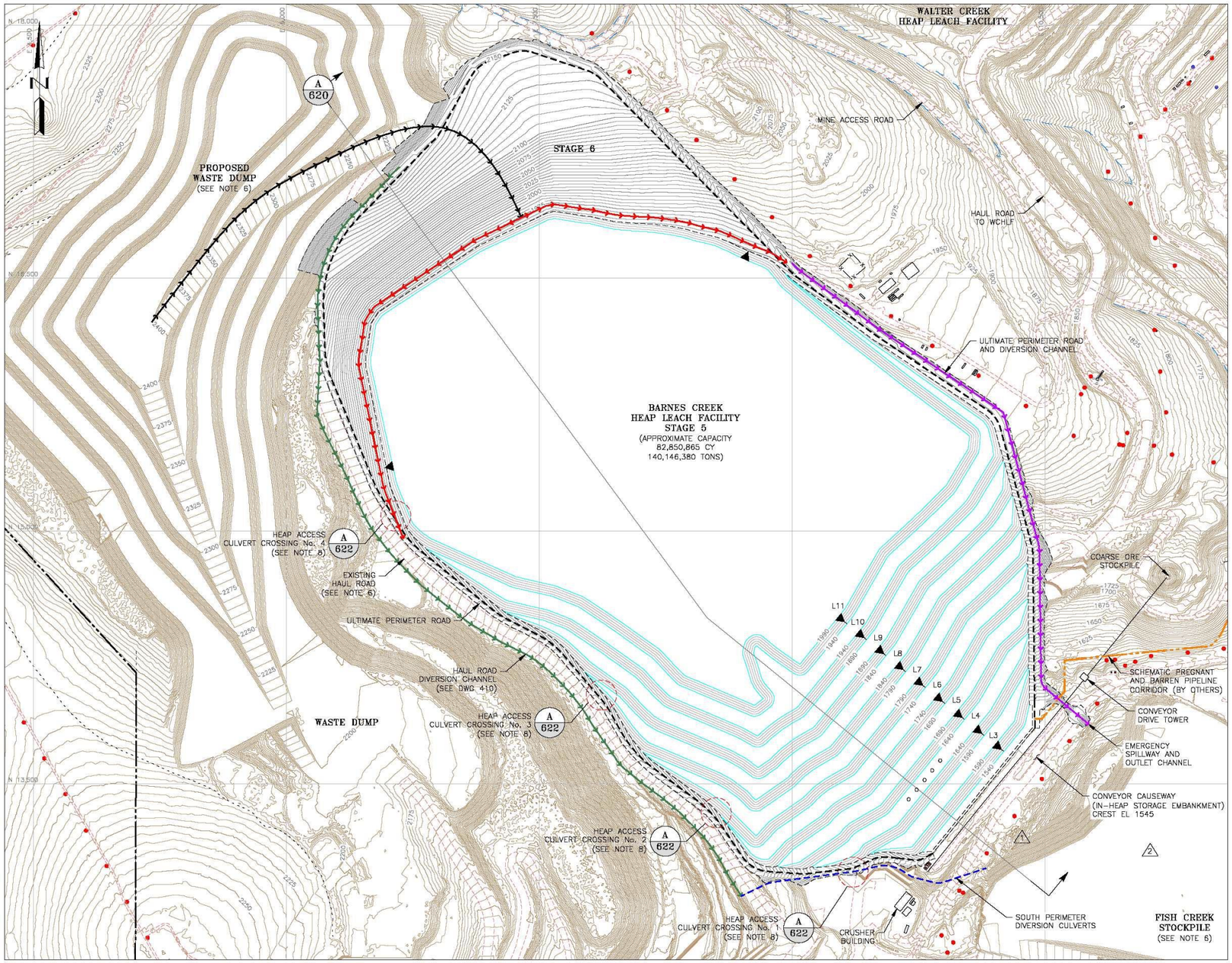

LEGEND:

- EXISTING GROUND SURFACE CONTOUR AND EL, FEET
- HEAP SURFACE CONTOUR AND EL, FEET
- REGRADED GROUND SURFACE CONTOUR AND EL, FEET
- PROPERTY BOUNDARY
- PROPOSED NORTH PERIMETER DIVERSION AND OUTLET CHANNEL
- PROPOSED HAUL ROAD DIVERSION CHANNEL
- PROPOSED INTER-STAGE DIVERSION
- NATURAL DRAINAGE (OR DIVERSION BY OTHERS)
- EXISTING DRAINAGE/DIVERSION
- UTILITY POLE
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING CULVERT
- SOLUTION EXTRACTION WELL
- L3 HEAP LIFT DESIGNATION (SEE NOTE 7)
- EXISTING STRUCTURES

NOTES:

1. SCALE BAR MEASURES 3" WHEN PLOTTED AT FULL SIZE (ANSI-D) AND 1.5" WHEN PLOTTED AT HALF SIZE (ANSI-B).
2. THE APPROXIMATE HEAP CAPACITY IS BASED ON AN ORE DENSITY OF 125.3 lb/ft^3.
3. REFER TO SECTION A ON DRAWING 620 FOR THE RELATIONSHIPS OF HEAP ELEVATION, HEAP LIFT, AND STAGE BOUNDARY.
4. THE STAGE ELEVATIONS IN BRACKETS REPRESENT THE APPROXIMATE LOW POINTS AT THE NORTHEASTERN END OF THE RESPECTIVE INTER-STAGE PERIMETER ROADS.
5. THE APPROXIMATE HEAP CAPACITY CONSIDERS LOADING ROUGHLY UP TO ONE LIFT HIGHER THAN THE HIGH-POINT ELEVATION OF EACH RESPECTIVE INTER-STAGE PERIMETER ROAD NEAR THE UPPER END OF THE VALLEY.
6. FGMI'S PLANNED EXCAVATION SURFACE TO REMOVE ORE FROM THE BARNES CREEK STOCKPILE, ITS PLANNED FUTURE WASTE DUMP CONFIGURATION, AND THE CURRENT BACKFILLED CONFIGURATION OF THE FISH CREEK STOCKPILE AREA HAVE BEEN INCORPORATED INTO THE BASE TOPOGRAPHY FOR THE BARNES CREEK HEAP LEACH FACILITY DEVELOPMENT. THE EXCAVATION SURFACE IS ENVISIONED TO BE ACHIEVED PRIOR TO THE START OF THE BCHLF CONSTRUCTION, WHILE THE FUTURE WASTE DUMP IS EXPECTED TO BE LOADED OVER THE LIFE OF THE BCHLF. FGMI'S EXISTING HAUL ROAD ON THE SOUTH SIDE OF THE PLANNED BCHLF, AND THE PLANNED WASTE DUMP, WILL NEED TO BE ADJUSTED TO ALLOW HAUL ACCESS AROUND THE UPPER END OF THE STAGE 6 LEACH PAD.
7. LIFTS 1 AND 2 ARE LOCATED WITHIN THE IN-HEAP STORAGE POND.
8. HEAP ACCESS CULVERT CROSSINGS NOS. 1 THRU 4 WILL BE REQUIRED NEAR THE SOUTHWEST CORNERS OF THE STAGES 2, 3, 4, AND 5 LEACH PADS, RESPECTIVELY, TO ALLOW HAUL ACCESS FOR LOADING THE ORE HEAP. THESE CULVERT CROSSINGS WILL BE REQUIRED WITH EACH RESPECTIVE AREA OF PAD DEVELOPMENT, BUT MAY BE REMOVED ONCE THE SUBSEQUENT OR FINAL HEAP ACCESS POINT IS DEVELOPED FOR LOADING.

REVISION:

1. REMOVED UNDERDRAIN MONITORING WELL AND CALLOUT.
2. REMOVED SOUTH PERIMETER OUTLET CHANNEL. MODIFIED FISH CREEK STOCKPILE TOPOGRAPHY.

PLAN

300 0 300 600 FEET

1" = 300' AT FULL SIZE (ANSI D)
1" = 600' AT HALF SIZE (ANSI B)

REFERENCE:
- AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 08/12/2015 (MAY 2015 AERIAL SURVEY)
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- PLANNED EXCAVATION SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED WASTE DUMP SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED FISH CREEK STOCKPILE SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 02/27/2017.

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ACTIVITY CODE N/A | XREF N/A

CLIENT: FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

PROJECT: FORT KNOX PROJECT
BARNES CREEK HEAP LEACH FACILITY FINAL DESIGN

TITLE: STAGE 5 (EL 1950)
SCHEMATIC HEAP CONFIGURATION

DESIGNED BY	DRAWN BY	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
JTR	CB	DV101	00089.99	608	2

LAST SAVED BY: CBEARLAND
DRAWING PATH: G:\101\00089.99\CAD\CAD Dept\Drawings\DV101-00089-99_608.dwg
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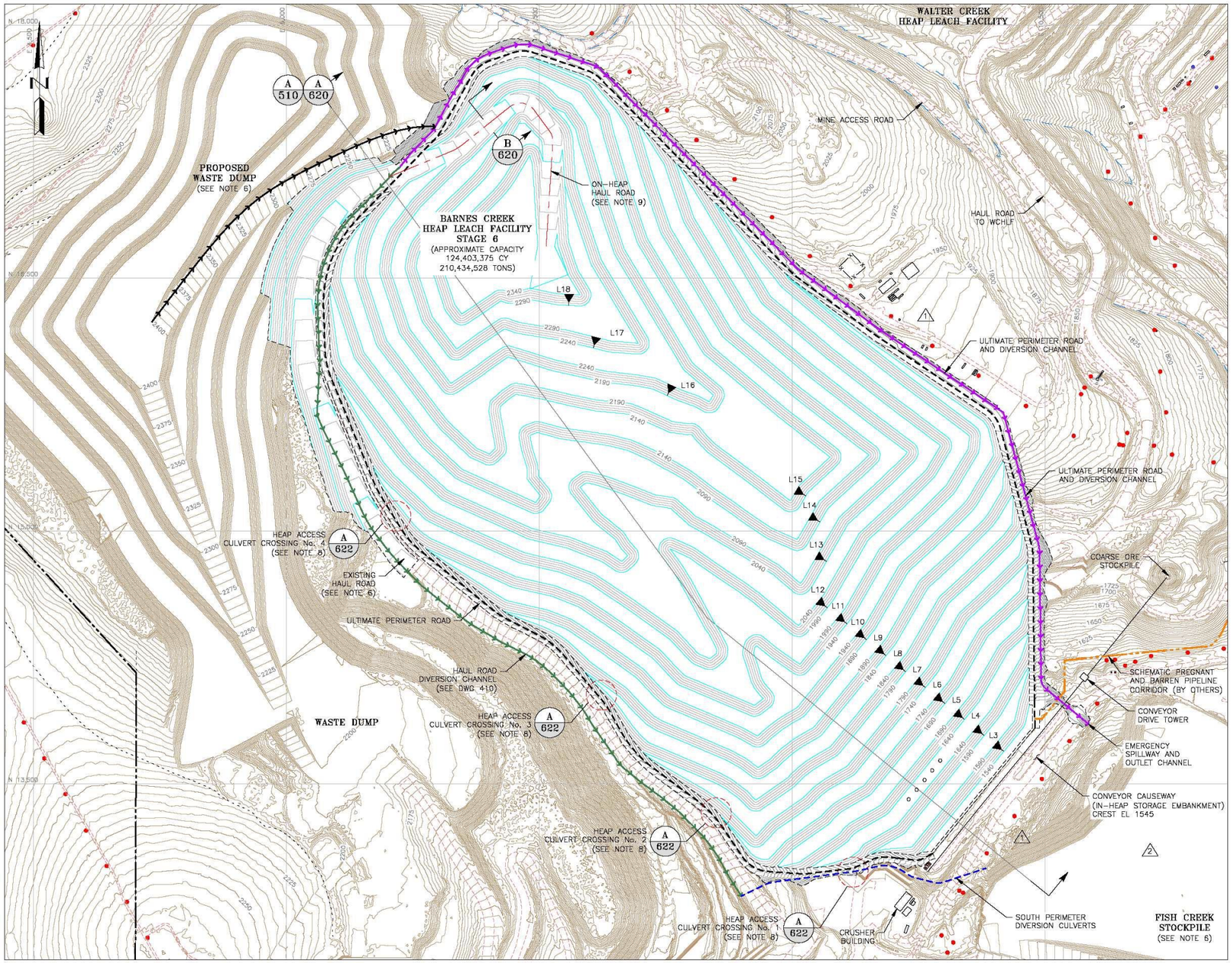

LEGEND:

- EXISTING GROUND SURFACE CONTOUR AND EL, FEET
- HEAP SURFACE CONTOUR AND EL, FEET
- REGRADED GROUND SURFACE CONTOUR AND EL, FEET
- PROPERTY BOUNDARY
- PROPOSED NORTH PERIMETER DIVERSION AND OUTLET CHANNEL
- PROPOSED HAUL ROAD DIVERSION CHANNEL
- PROPOSED INTER-STAGE DIVERSION
- NATURAL DRAINAGE (OR DIVERSION BY OTHERS)
- EXISTING DRAINAGE/DIVERSION
- UTILITY POLE
- EXISTING ROAD
- EXISTING TRAIL
- EXISTING CULVERT
- SOLUTION EXTRACTION WELL
- L3 HEAP LIFT DESIGNATION (SEE NOTE 7)
- EXISTING STRUCTURES

NOTES:

1. SCALE BAR MEASURES 3" WHEN PLOTTED AT FULL SIZE (ANSI-D) AND 1.5" WHEN PLOTTED AT HALF SIZE (ANSI-B).
2. THE APPROXIMATE HEAP CAPACITY IS BASED ON AN ORE DENSITY OF 125.3 lb/ft^3.
3. REFER TO SECTION A ON DRAWING 620 FOR THE RELATIONSHIPS OF HEAP ELEVATION, HEAP LIFT, AND STAGE BOUNDARY.
4. THE STAGE ELEVATIONS IN BRACKETS REPRESENT THE APPROXIMATE LOW POINTS AT THE NORTHEASTERN END OF THE RESPECTIVE INTER-STAGE PERIMETER ROADS.
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7. LIFTS 1 AND 2 ARE LOCATED WITHIN THE IN-HEAP STORAGE POND.
8. HEAP ACCESS CULVERT CROSSINGS NOS. 1 THRU 4 WILL BE REQUIRED NEAR THE SOUTHWEST CORNERS OF THE STAGES 2, 3, 4, AND 5 LEACH PADS, RESPECTIVELY, TO ALLOW HAUL ACCESS FOR LOADING THE ORE HEAP. THESE CULVERT CROSSINGS WILL BE REQUIRED WITH EACH RESPECTIVE AREA OF PAD DEVELOPMENT, BUT MAY BE REMOVED ONCE THE SUBSEQUENT OR FINAL HEAP ACCESS POINT IS DEVELOPED FOR LOADING.
9. THE ON-HEAP HAUL ROAD HAS BEEN CONFIGURED WITH A 10-PERCENT CONSTANT GRADE.

REVISION:

1. REMOVED UNDERDRAIN MONITORING WELL AND CALLOUT.
2. REMOVED SOUTH PERIMETER OUTLET CHANNEL. MODIFIED FISH CREEK STOCKPILE TOPOGRAPHY.

PLAN

300 0 300 600 FEET

1" = 300' AT FULL SIZE (ANSI D)
1" = 600' AT HALF SIZE (ANSI B)

REFERENCE:
- AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 08/12/2015 (MAY 2015 AERIAL SURVEY)
- AERIAL TOPOGRAPHY PROVIDED BY FGMI ON 09/18/2014 (AUGUST 2014 AERIAL SURVEY)
- PLANNED EXCAVATION SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED WASTE DUMP SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 04/29/2015
- PLANNED FISH CREEK STOCKPILE SURFACE TOPOGRAPHY PROVIDED BY FGMI ON 02/27/2017.

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ACTIVITY CODE N/A | XREF N/A

CLIENT: FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

PROJECT: FORT KNOX PROJECT
BARNES CREEK HEAP LEACH FACILITY FINAL DESIGN

TITLE: STAGE 6 (FINAL)
SCHEMATIC HEAP CONFIGURATION

DESIGNED BY	DRAWN BY	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
JTR	CB	DV101	00089.99	610	2

LAST SAVED BY: CBEARLAND
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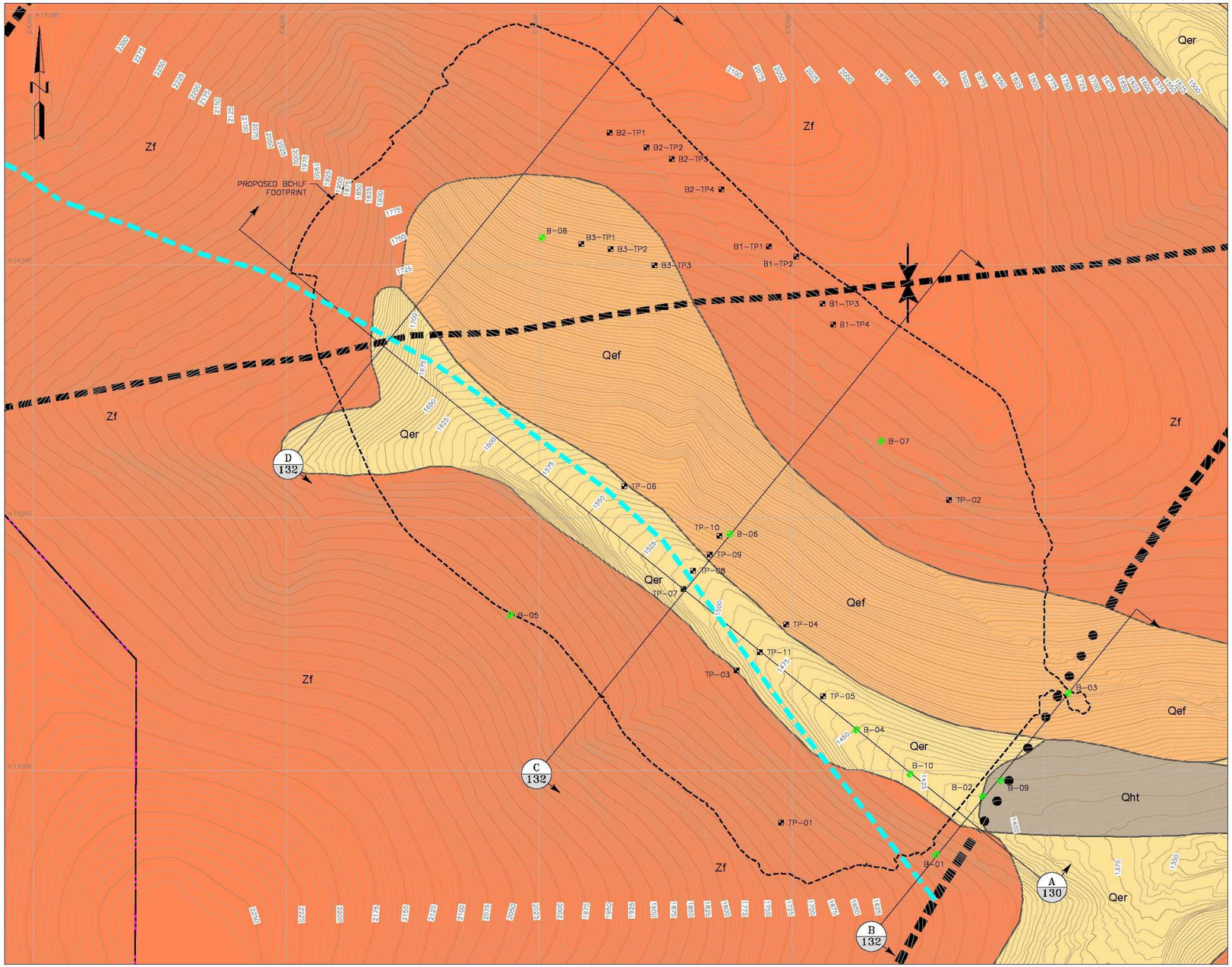

LEGEND:

- 2100 — 1994 ORIGINAL GROUND SURFACE CONTOUR AND EL, FEET
- PROPERTY BOUNDARY
- B-01 — BORING LOCATION AND DESIGNATION (KNIGHT PIESOLD, 2011 AND 2016)
- TP-01 — TEST PIT LOCATION AND DESIGNATION (KNIGHT PIESOLD, 2016)
- CONTACT (APPROXIMATELY LOCATED)
- HIGH ANGLE FAULT (DASHED WHERE INFERRED, DOTTED WHERE CONCEALED)
- SYNCLINE (SHOWING TRACE OF AXIAL PLANE AND DIRECTION OF PLUNGE, DASHED WHERE INFERRED OR CONCEALED, DOTTED WHERE QUESTIONABLE)
- INFERRED FAULT (2011 LOCAL MAPPING)

Qht — REWORKED CREEK GRAVEL TAILINGS. PLACER-MINE DREDGE TAILINGS. TAN TO BROWN COLOR GRAVEL WITH COBBLES.

Qef — FAIRBANKS LOESS. MASSIVE, HOMOGENEOUS, UNCONSOLIDATED EOLIAN SILT. MAY INCLUDE RETRANSPORTED DEPOSIT ON SLOPES. WELL SORTED CONTAINING LESS THAN 10 PERCENT CLAY. LOCALLY CEMENTED BY IRON OXIDE AND LOCALLY CALCAREOUS.

Qer — RETRANSPORTED SILT. MASSIVE, HOMOGENEOUS, UNCONSOLIDATED EOLIAN SILT RETRANSPORTED FROM HILLS TO LOWER SLOPES AND VALLEY BOTTOMS. MAY CONTAIN ORGANIC MATERIAL AND OVERLIE TERTIARY GRAVEL IN VALLEY BOTTOMS.

Zf — QUARTZ MUSCOVITE SCHIST, QUARTZITE, AND CHLORITE QUARTZOSE SCHIST. LIGHT TO MEDIUM GRAY, FINE GRAINED, QUARTZITE, QUARTZ MUSCOVITE SCHIST, AND GARNET BIOTITE QUARTZ MUSCOVITE SCHIST. MODERATELY RESISTANT DUE TO ITS RELATIVELY HIGH QUARTZ CONTENT.

PLAN

300 0 300 600 FEET

1" = 300' AT FULL SIZE (ANSI D)
1" = 600' AT HALF SIZE (ANSI B)

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).
2. SUMMARY LOGS OF KNIGHT PIESOLD'S BOREHOLES ARE INCLUDED IN THE BARNES CREEK HEAP LEACH FACILITY GEOTECHNICAL REPORT.
3. BORROW AREAS B1, B2, AND B3 WERE INVESTIGATED AS PART OF THE 2016 FIELD PROGRAM FOR POTENTIAL PREPARED SUBBASE MATERIAL.

REFERENCE:
-1994 TOPOGRAPHY PROVIDED BY FGMI
-GEOLOGIC MAPPING SITE WIDE PROVIDED BY ALASKA DIVISION OF GEOLOGICAL AND GEOPHYSICAL SURVEYS
(1998 PRELIMINARY GEOLOGIC MAP OF THE FAIRBANKS MINING DISTRICT, ALASKA)
DATA FILE NAMED: TREND USGS GEOLOGY.PDF
SEE G:\01\00089.19\CAD\DESIGN\BASE FILES\MAPS

REV	DATE	DESCRIPTION	APP'D
			CADD
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0	01/27/17	ISSUED FOR CONSTRUCTION	JTR / CB

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ACTIVITY CODE N/A | XREF N/A

CLIENT: FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

PROJECT: FORT KNOX PROJECT
BARNES CREEK HEAP LEACH FACILITY FINAL DESIGN

TITLE: GEOLOGIC MAP WITH PRE-DISTURBANCE TOPOGRAPHY

DESIGNED BY	JTR	LOCATION	PROJECT NUMBER	DRAWING NUMBER	REVISION
DRAWN BY	CB	DV101	00089.99	120	0

LAST SAVED BY: DMEETINGS
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PRINTED BY: JASON REIMA, PRINT TIME: 3/29/2017 11:55 AM

BCHLF In-Heap Pond Storage Component Summary

Stage	1		2		3		4		5		6	
2-Dimensional Pad Area ([1])	2.08 M ft^2		4.19 M ft^2		6.20 M ft^2		8.20 M ft^2		10.67 NA ft^2		12.58 M ft^2	
Component	**Elev elms!)**	**Volume (M gal)**	**Elev (fmsl)**	**Volume (M gal)**	**Elev (fmsl)**	**Volume (M gal)**	**Elev (fmsl)**	**Volume (M gal)**	**Elev (fmsl)**	**Volume (M gal)**	**Elev (fmsl)**	**Volume (M gal)**
Maximum Normal Operating Level ([2].[3])	1527.8	81.0	1525.3	75.8	1522.7	70.8	1520.1	65.8	1516.8	59.7	1514.0	54.9
100-yr124-hr Storm Event ([3])	1530.2	1527.8 to1525.3 5.2	to 1530.2	10.4	1522.7 to 1530.2	15.4	1520.1 to 1530.2	20.4	1516.8 to 1530.2	26.5	1514.0 to 1530.2	31.2
24-hr Emergency Draindown ([4])	1530.2 to 1540.0	23.0	1530.2 to 1540.0	23.0	1530.2 to 1540.0	23.0	1530.2 to 1540.0	23.0	1530.2 to 1540.0	23.0	1530.2 to 1540.0	23.0
Freeboard Allowance (to spillway invert)	1542.0	1540.0 to1540.0 5.1	to 1542.0	5.1	1540.0 to 1542.0	5.1	1540.0 to 1542.0	5.1	1540.0 to 1542.0	5.1	1540.0 to 1542.0	5.1
Freeboard Allowance (above spillway invert)	1542.0 to 1545.0	7.9	1542.0 to 1545.0		1542.07.9 t		1542.07.9 t		1542.07.9 t		1542.07.9 t	7.9
Total		122.22		122.22		122.22		122.22		122.22		122.22

Notes: 1. The pad areas shown represent the cumulative 2-dimensional areas through each stage of the proposed BCHLF pad development, including FGMI's envisioned ultimate potential arrangement which includes expansion up to the valley ridgeline to the northwest and northeast of the currently defined Stage 6 footprint.

2. The Maximum Normal Operating Level represents the maximum elevation the pond should be operated at any stage of the BCHLF development to maintain the necessary capacity above it for the 100-yr/24-hr Storm Event and 24-hour Emergency Draindown components, in addition to maintaining 5 ft of freeboard below the crest of the in-heap pond embankment. The storage volumes presented for the Maximum Normal Operating Level are the total volumes from the bottom of the in-heap storage pond (elevation 1450 fmsl) to the elevations shown.
3. While the pond components associated with the Emergency Draindown and Freeboard allowance are assumed to remain constant throughout the life of the facility, the storage components associated with the Maximum Normal Operating Level and the 100-yr/24-hr Storm Event are inversely related to each other. As the pad area grows with each stage of development, the 100-yr/24-hr Storm Event component increases and reduces the Maximum Normal Operating Pond Level. It is expected that with on-going operational experience, FGMI will be able to readily adapt to this reducing level.
4. The 24-hr Emergency Draindown component provides storage fora condition where the power supply is interrupted or if pumps are temporarily rendered inoperable; both of which would result in reduced pumping capacity from the in-heap pond and its subsequent filling. Unlike the WCHLF, and as requested by FGMI and the ADNR, no recirculation of solution has been considered for the BCHLF emergency draindown condition. The BCH LF emergency draindown component is instead based on a drainage rate equal to the full solution supply rate of 16,000 gpm for entire 24-hr period.

Fort Knox Mine

Reclamation and Closure Plan Amendment

March 2017

FORT KNOX MINE

RECLAMATION AND CLOSURE PLAN AMENDMENT

Prepared By:

Fairbanks Gold Mining, Inc.
(a subsidiary of Kinross Gold Corporation)
PO Box 73726
Fairbanks, Alaska 99707-3726

March 2017

FORT KNOX MINE

RECLAMATION AND CLOSURE PLAN

Submitted to:

Alaska Department of Natural Resources
Division of Mining, Land and Water
3700 Airport Way
Fairbanks, Alaska 99709

Alaska Department of Environmental Conservation
Division of Air and Water Quality
610 University Avenue
Fairbanks, Alaska 99709-3643

and

Department of the Army
USACE Alaska District Regulatory Division
Fairbanks Field Office
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LIST OF ABBREVIATIONS

ACOE	Army Corp of Engineers
ADNR	Alaska Department of Natural Resources
ac-ft	acre-feet
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Division of Fish and Game
ADNR	Alaska Department of Natural Resources
AMSL	above mean sea level
ARD	acid rock drainage
BMP	Best Management Practice
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CIC	Carbon-In-Columns
COO	Chief Operating Officer
cm/sec	centimeters per second
FA	Financial Assurance
FGMI	Fairbanks Gold Mining, Inc.
FWR	Fresh Water Reservoir
GVEA	Golden Valley Electric Association
HDPE	high density polyethylene
HDR	HDR Alaska
INCO	Company name-patented cyanide destruction process
KGC	Kinross Gold Corporation
LCRS	Leachate Collection and Recovery System
LLDPE	Linear Low Density Polyethylene
MHTLO	Mental Health Trust Land Office
mg/L	milligrams per liter
MSHA	Mining Safety & Health Administration
MWS	Maximum Water Surface
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NWS	Normal Water Surface
PCMS	Process Component Monitoring System
PJD	Preliminary Jurisdictions Determination
PMC	Plant Materials Center, ADNR
PMP	Probable Maximum Precipitation
ppm	parts per million
PSS	palustrine scrub-shrub
QA/QC	Quality Assurance/Quality Control
RVP	Regional Vice President
SRCE	Standardized Reclamation and Closure Estimator
SWS	Schlumberger Water Services
TDS	total dissolved solids
TSF	Tailings Storage Facility
USACE	United States Army Corps of Engineers
WAD CN	weak acid dissociable cyanide
WEWG	Wetlands Evaluation Working Group
WSR	Water Supply Reservoir

1 INTRODUCTION

1.1 Purpose

Fairbanks Gold Mining Inc. (FGMI), a wholly owned subsidiary of Kinross Gold Corporation (KGC), has prepared this amendment to Reclamation and Closure Plan Rev 2 dated November 2013. This amendment will be incorporated into the next revision due by March 27, 2019. This plan is submitted to:

- Alaska Department of Natural Resources, Division of Mining (ADNR) in accordance with AS 27.19.010 et. seq. and 11 AAC 97.100 et. seq.
- Alaska Department of Environmental Conservation (ADEC), Division of Air and Water Quality, as required by Waste Management Permit 2014DB0002
- U.S. Army Corps of Engineers (ACOE) as required by the Clean Water Act Section 404 Permit No. N-920574, Fish Creek 23

Due to the constantly changing regulatory framework and the introduction of new reclamation methods, the reclamation plan may be amended as deemed necessary (11AAC 97.330 Amendment of Reclamation Plan).

1.2 Applicant Information

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Fairbanks Gold Mining, Inc. is a wholly owned subsidiary of Kinross Gold Corporation

Alaska Registered Agent

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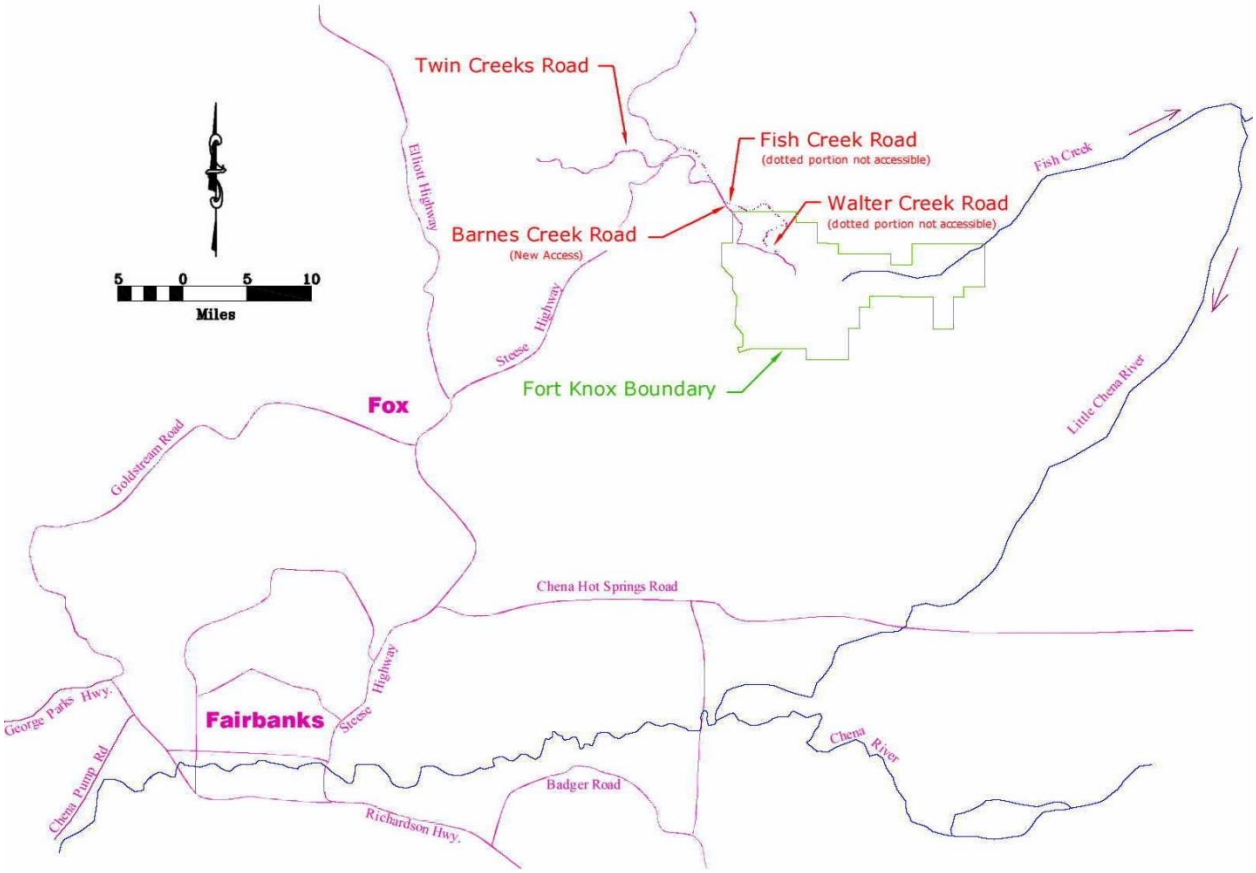
1.3 Location and Land Status

The project site is located approximately 15 air miles northeast of Fairbanks, Alaska in the Fish Creek drainage, as shown on Figure 1.1. More specifically, the project area is located in portions of Sections 4-5, 8-12, 13-17, 20-23, and 26-27, T2N, R2E, Fairbanks Meridian; and Sections 7-8 and 17-19, T2N, R3E, Fairbanks Meridian.

Figure 1.1 Fort Knox Location



2 PROJECT DESCRIPTION

FGMI operates the Fort Knox Mine located northeast of Fairbanks, Alaska. The mine site is located in the upper headwaters of Fish Creek Valley, approximately four miles southeast of Cleary Summit. The project site is accessible by the Twin Creeks road. The Fort Knox Mine operations include an open-pit mine, a heap leach facility and related milling facilities to recover gold.

2.1 Barnes Creek Heap Leach Facility

The Barnes Creek Heap Leach Facility is located in the upper end of the Barnes Creek drainage upstream from the tailings impoundment. The heap leach pad will be constructed within the footprint of the former Barnes Creek low grade stockpile. Excluding the haul road and access roads, the heap leach facility will potentially cover 290 acres and will have a capacity of approximately 125 million cubic yards or 207 million tons. The heap leach design is segmented into six sections. The final section configuration will reach elevation 2340 amsl equating to a height of 810 feet from toe to crest. The design criteria of a maximum 500 foot vertical ore thickness will be maintained over the pad liner system.

In-heap storage of process solution and storm water is accomplished by an embankment at the downstream toe of the heap. The mechanical quality of the rock used for construction of the in-heap storage embankment is similar to the mechanical quality of the rock that has been used to construct the downstream random fill for the tailings and Walter Creek heap leach dam. The liner system for the valley fill consists of 12 inches of engineered sub-base with a permeability of 10^{-5} centimeters per second (cm/sec) over the entire basin. The composite liner system beneath the in-heap storage Pond is double-lined with an 80 mil, double-sided, LLDPE geomembrane liner, then a leachate recovery system, then the primary LLDPE liner. Beyond the limits of the in-heap storage reservoir, there will be a single 80 mil LLDPE liner overlaying the sub-base. The portion of the BCHLF outside the in-heap storage pond will be constructed with a PCMS immediately beneath the pad composite liner system. Overlaying the LLDPE liner, is 36 inches of cover material consisting of crushed rock and placed with a network of drainpipe to maintain low head pressures on the liner and promote a rapid flow of solution to the in-heap storage reservoir. LLDPE geomembrane was selected for use because it is more flexible and compliant than high-density polyethylene (HDPE), giving it a slightly higher interface shear strength with the prepared subbase to improve overall heap stability. LLDPE geomembrane also provides the necessary chemical, ultraviolet (UV) light, and puncture resistances required for the facility.

A Leachate Collection and Recovery System (LCRS), constructed in conjunction with the double liner in the area of the in-heap storage reservoir, provides leak detection. A Process Component Monitoring System (PCMS), constructed under the main header lines to contain collected leakage from the pad liner system. The channels will be backfilled with an approximate 12-ft top-width and 2-ft depth cross-section of PCMS drain aggregate for conveyance of flows.

Barren solution will be applied on the heap leach using drip emitters. BCHLF solution collection headers have been designed to accommodate a solution flowrate of up to 24,000 gpm, with a unit area application rate of 0.005 gpm/ft^2. The solution will flow through the run-of-mine ore. Pregnant solution will flow to the in-heap storage reservoir. The pregnant solution that collects in the in-heap storage reservoir is pumped to the two Carbon-In-Columns (CIC) plants using pumps located in the in-heap storage reservoir. Barren solution and pregnant solution will be pumped in separate pipes between the heap leach pad and CIC 1 and CIC 2 plants through a lined corridor. Loaded carbon is processed in the Fort Knox mill facilities.

3 RECLAMATION PRACTICES

FGMI's long-term goals for reclamation performed during and after mining and milling operations are to contour, stabilize, and revegetated disturbed areas in order to return the land to a safe, stable and productive condition. FGMI is contouring and stabilizing disturbed areas to create ground conditions that promote vegetation development and provide conditions for colonization by native species. Native grass species available commercially are used for rapid soil stabilization.

The objectives of the reclamation and closure plan are:

1. Stabilization and protection of soil materials from wind and water erosion.
2. Stabilization of steep slopes through contouring to provide rounded land forms with erosion control.
3. Establishment of long-term, self-sustaining vegetation communities conducive to natural invasion and succession.

FGMI will continue working with ADNR, Division of Agriculture Plant Materials Center, and Alaska Department of Fish and Game to achieve the successful implementation and subsequent evaluation of both concurrent and long-term reclamation activities. FGMI considers reclamation to be a progressive process that includes the design, construction, operation, and closure of the mining operation. Reclamation will or has occurred in the following phases, with some overlap:

1. Reclamation completed during and directly after process component construction (includes interim reclamation to stabilize and maintain viability of topsoil stockpiles).
2. Reclamation concurrent with mining.
3. Final reclamation will commence upon cessation of mining, milling and heap leach operations. Final reclamation will include removal of process components, contouring, and placement of growth media unless otherwise approved by ADNR, and revegetation.

3.1 Schedule of Reclamation Activities

3.1.1 *Reclamation Schedule*

Under the current plan, milling is projected to cease in 2019 and mining will cease in 2024. The heap leach operation will continue to have ore loaded through 2024. Cyanide solution will continue for two years after the final ore is loaded on the pad. An additional two years of leaching without applying cyanide is projected to follow the cyanide leaching phase. Following economic leaching, four years of rinsing is expected before the solution will meet water quality standards for the TSF. Once rinsing is complete and DEC approves, the heap leach liner will be punctured to prevent future ponding within the pad. Three months of draindown are expected, during this time the facility will be regraded and growth media placed. Closure of the heap leach pad is projected to be completed in 2029.

3.2 General Reclamation Procedures

The primary components of reclamation for the Fort Knox Reclamation Plan include earthwork, growth media placement, seedbed preparation, fertilizing, seeding, and monitoring. FGMI will manage these components keeping in mind that the ultimate goal is to achieve a stable, revegetated post-mining land surface that will promote natural invasion by native plants. FGMI will continue to work in coordination with ADF&G, Division of Habitat to develop and enhance the fish and wildlife potential throughout the project area.

3.2.1 *Earthwork*

Waste rock dumps and the heap leach facility will require major grading, contouring, and revegetation. Other disturbed areas will be revegetated; some may require regrading. Generally, slopes will be graded to 2.5H:1V or shallower. For the purposes of Financial Assurance (FA) calculations use a slope of 3H:1V.

Earthwork will utilize heavy equipment typical to the industry. It is anticipated that the equipment list will include (or equivalents thereof): D10N Cat., D9N Cat., D8L Cat., rubber-tired scraper, water truck, and motor graders. Other equipment such as (but not limited to) front-end loaders, track and tire mounted backhoes, and haul trucks may be substituted for or included with this general equipment list. Equipment needs and use must and will remain dynamic, as specific conditions require during implementation of the plan.

3.2.2 *Control of Sedimentation*

Implementation of Best Management Practices (BMPs) to control erosion during active mining will be designed to minimize re-disturbance during reclamation. The BMPs will be consistent with those measures and practices identified in Alaska Department of Transportation and Public Facilities, *Alaska Storm Water Guide*, December 2011.

Temporary control devices will be removed when the site-specific potential for erosion has been minimized through earthwork or revegetation.

3.2.3 *Growth Media*

Growth media is defined herein as all native soil (in-place) material with the physical and chemical properties capable of germinating and sustaining vegetation growth with or without amendments. At the Fort Knox site, the term "growth media" is interchangeable with the terms "topsoil" and "overburden". Overburden material, suitable for use as growth media, is the unconsolidated

material that lies between the topsoil horizon (where present) and bedrock and exhibits no chemical characteristics that will inhibit vegetation development.

Growth media (topsoil and overburden) will be stockpiled at Fort Knox in anticipation of future reclamation needs. Growth media application depth will be at a depth that will achieve successful vegetation establishment. Growth media will be hauled and placed by dump truck and spread by a dozer. Highly compacted areas such as equipment lots and roads will be ripped in a linear fashion prior to growth media placement if it is required. A final survey to determine the amount of growth media available will be done after construction activities are completed. A portion of the growth media stockpiled and borrow sources have been utilized due to its suitability for use as engineered seal and filter material for the tailings dam and engineered sub-base for the heap leach.

3.2.4 *Seedbed Preparation*

Mine and mine related disturbances can result in compacted surfaces unsuitable for revegetation. Thus, preparation of a seedbed suitable for plant germination and growth can be a critical task in any successful land reclamation project.

At Fort Knox, the general method of seedbed preparation will be ripping or scarifying on the contour 12 to 18 inches deep using a D8N or D10 CAT (or equivalent) equipped with a 2 or 3-shank ripper. The FA accounts for the use of a D10 CAT.

Ripping will occur along contours of sloped areas to promote erosion control in addition to creating a suitable seedbed. The specific site will be prepared for seeding by ripping on the contour to roughen the surface. A broken, roughened surface will serve to trap moisture, reduce wind shear, minimize surface erosion by increasing infiltration, and create micro-habitats conducive to seed germination and development.

3.2.5 *Fertilizer and Fertilization*

Prepared seedbeds will be fertilized prior to, after, or during the seeding operation. Specific fertilization requirements will depend on the quality of growth media used. Growth media will be tested for standard soil agricultural constituents including nitrogen, phosphorus and potassium. Based on available field-testing and soil test results at Fort Knox, the general recommended rate of fertilizer application will range from 100 to 300 pounds per acre of 20N-20P-10K for a spring seeding or 10N-20P-10K for a fall seeding. The FA accounts for 300 pounds per acre and the spring fertilizer ratio. Final fertilizer and application rates for the tailings will consider information acquired from current reclamation and soil tests.

3.2.6 *Seed and Seeding*

The grass seed mix presently used at Fort Knox is listed in Table 3.2. The primary purpose of this seed mix is to achieve quick vegetative cover that will help minimize soil erosion. Forb species that may be considered in the future for revegetation include: Silverberry, Lupin, Oxytropis, Wild Sweet Pea, Sweetbroom, Burnet, Siberian Aster, Goldenrod, Alpine Milk Vetch, Wild Sage, Dragonshead Mint and Wild Rhubarb. However, these varieties are not currently available commercially, and a commercial source must be located if they are to be incorporated in the seeding mix. The seed mix may change over time in response to such factors as internal and external research results, changes in technology, changes in land management philosophy, and commercial availability. Native species will be the preferred mix. However, other species may be used in some years due to availability or if deemed to better meet the post-mining land use criteria and approved by ADNR.

Table 3-1 Seed Mix

Seed Type	Mix %
Arctared Fescue	50%
Gruening Alpine Bluegrass	20%
Tundra Glaucous Bluegrass	20%
Nortran Tufted Hairgrass	10%

Seeding will be accomplished using broadcast methods that may include but not be limited to hand broadcasting, dozer or off-road vehicle mounted broadcasting and aerial broadcast application. The application rate for broadcast seeding using the presently proposed grass seed mix will be 9 pounds of pure live seed per acre. The rate has been reduced based on successful results of revegetation efforts at True North and discussions with Plant Materials Center. The need for mulch application will be evaluated if seed germination becomes a limiting factor in the reestablishment of vegetation.

3.2.7 *Revegetation Timing*

Seeding will be conducted as soon as possible following seedbed preparation. Ground conditions suitable for large scale earthwork occur primarily during the spring and summer months. Research and experience with concurrent reclamation will be used to evaluate the potential of dormant seeding. Generally, seeding is implemented after spring break up until mid-July. Such seeding allows the seed to take advantage of the summer moisture period. However, actual experience has shown that all seedbed preparation on large-scale mine reclamation projects cannot and does not occur at one point in time. Thus, while every effort will be made to conduct the majority of seeding after spring breakup and before mid-July, seeding actually may occur during spring, summer or fall.

FGMI currently uses a native grass seed mix ratio, seed application rate and fertilizer rate recommended by the Plant Materials Center with approval from ADNR. The grass mix was developed during the construction of the wetlands below the tailings impoundment and is still being used for concurrent reclamation projects. Planting of dormant willow cuttings and encouraging the natural invasion of adjacent native species are methods used in the past to promote species diversity. However, an increase in plant species diversity was recommended to improve the wildlife habitat surrounding the developed wetlands in the environmental audit of 2003 (Golder, 2004). Opportunities to increase species diversity in all areas of the mine site will continue to be pursued.

4 BARNES CREEK CLOSURE

4.1 Barnes Creek Heap Leach Closure

The proposed method of closure for the Fort Knox heap leach is based on site-specific conditions, facility design, currently available test work, and the technical analyses completed as part of closure planning. Key aspects of the site and operation that are considered for closure include the following:

1. The climate at the site is characterized by moderate precipitation, moderate evaporation, and cold temperatures. As a result, the long-term drainage from the heap leach after closure is predicted to be minimal.
2. Laboratory test work shows that cyanide concentrations will decrease rapidly through recirculation with freshwater if reagents are not added to maintain process-level concentrations.
3. The tailings impoundment is located directly down gradient from the heap leach and will be used as an integral part of the long-term solution management scheme.
4. To facilitate closure management, solution from the heap leach will be combined with pit lake water leaching has ended.
5. The facility will be regraded to an overall 3:1 slope and covered with growth media. The regrade design will include erosion control measures as necessary to avoid loss of growth media.
6. The underdrain water quality will be monitored by monitoring wells. The monitoring wells will be installed upstream of the pit dewatering wells through the crest of the existing conveyor causeway and into its foundation just below the interface with the original Barnes Creek ground surface. Heap Leach Closure Procedures and Schedule

4.2 Closure Sequence

1. Residual leaching until uneconomic.
2. Solution recirculation/rinsing to remove cyanide and achieve water quality standards for the TSF.
3. Pump draindown from rinsing to the pit.
4. Once standards are achieved, puncture the liner of in-heap storage pond and allow water to flow to the tailings impoundment.
5. Removal of structures associated with pumping operations.
6. Regrade the pad, place growth media, and scarify and seed.
7. Project specific stipulations from Reclamation and Closure Plan Approval No. F20149852RCP

4.2.1 *Residual Leaching*

Following completion of mining in the pit and final placement of ore on the pad, it is anticipated that there will be 2 years of leaching with cyanide or until it is no longer economically feasible. Gold recovery is projected to continue for approximately 2 years after the last application of cyanide. The criteria for advancing to the rinsing phase will be based on the economics of gold recovery. Heap leach facilities often continue to economically recover gold for a number of years after the addition of cyanide is discontinued. During this period, barren solution will be recirculated to the heap while processing continues to recover gold held in solution inventory. The exact duration of residual leaching will be dependent on continuing gold recovery.

4.2.2 *Solution Recirculation and Rinsing*

Since there is anticipated to be an extended period of residual leaching without the addition of cyanide, rinsing will likely be of short duration. The rinsing rate will be between 16,000 and 24,000 gpm. The actual duration of this step will be controlled by the time required for the water quality to achieve levels suitable for discharge. Rinsing of the heap leach will entail applying water pumped from the pit to the heap leach via the mill then pumping the rinse water collected in the in-heap storage pond to the pit via the mill. This phase of rinsing is projected to have duration of four years.

4.2.3 *Release of Draindown to the Tailings Impoundment*

After Water Quality Standards for the TSF have been met and following approval by ADEC, preparation for releasing the heap leach water to the tailings impoundment will begin. The pit to the heap leach pumping circuit will be will be terminated, however the heap leach to the pit pumping circuit will continue until he in-heap storage pond is pumped down to a level that is operationally practical. The water remaining in the in-heap storage impoundment will be released by penetrating the primary and secondary liners of the LCRS and the prepared sub-base utilizing a drilling rig. A minimum of three holes will be drilled to allow the water to drain by gravity through the ground water underdrain system that interfaces with the tailings impoundment.

4.2.4 *Release of Minor Long-term Seepage*

Long-term seepage from the heap leach will flow by gravity to the tailings impoundment and be managed according to the closure plan for that facility. Discharge from the heap leach pad will mix with the water of the tailings impoundment.

4.2.5 *Regrading and Cover*

Following completion of rinsing, the heap will be regraded to an overall 3H:1V Approximately twelve inches of growth media will be placed over the regraded area. The growth media will be sourced from stockpiles created during facility construction. The growth media will be scarified and seeded subsequent to placement. An erosion control method is to scarify and seed the growth media, which slows down water migration and allows the water to permeate the ground aiding the success of revegetation.

4.2.6 *Project Specific Stipulations*

The following stipulation applies to the Walter Creek Heap Leach came from the Approved Reclamation and Closure Plan Approval and is expected to apply to the Barnes Creek Heap Leach. Prior to initiation of the reclamation of the heap leach FGMI shall submit to ADNR final facility closure pans and schedule, for review and approval. The final facility closure plans shall include consideration of water quality monitoring (including drain-down quality), required or geochemical characterization, and the results of any environmental audits. If seepage or run-off

from the heap leach facility exceeds water quality standards, ADNR may require the reclamation of the heap leach to minimize infiltration and or impacts from run-off and may require the cover to, growth medium replacement, seed/fertilizer application and also surface diversion ditches

5 MONITORING

The Fort Knox Mine Monitoring Plan (FGMI Inc., 2012) gives a detailed description of the monitoring requirements for the site, including the TSF, heap leach, pit lake, stream corridor/wetlands and the water supply reservoir. The monitoring plan includes:

1. Water quality sampling procedures and analytical profiles and sampling schedules.
2. Characterization of acid rock drainage and processed tailings.
3. Monitoring of inert solid waste landfills.
4. Potable water monitoring requirements.
5. Wildlife mortality reporting procedures.
6. Documentation, record keeping and reporting requirements.
7. Quality assurance/quality control manual.

The closure monitoring plan will include water quality sampling, water level measurements, and observations of the success of revegetation. The frequency of sampling events will be adjusted as appropriate between the reclamation and closure, and post-closure phases based on observed improvements in water quality.

5.1 Inspection of Surface Stabilization

Visual observation of revegetation success will be performed on an annual basis during the pre-stabilization phase. Inspection for erosion and formation of gullies will be completed quarterly.

5.2 Heap Leach Water Quality

The Fort Knox Monitoring Plan, (FGMI, Inc. 2012) outlines the operational monitoring and response plan in detail for the Walter Creek Heap Leach and will be adopted for the Barnes Creek Heap Leach. The principal components of the operational monitoring plan include the LCRS, PCMS, underdrain system, pregnant solution composition and pond levels.

The operational monitoring of solution chemistry and levels will continue while recirculation/rinsing of the heap leach is in progress. During the recirculation/rinsing period samples will be collected on a quarterly basis to assess the composition and the rate at which the solution chemistry is improving. Recirculation/rinsing will continue until water quality is suitable for discharge to the tailings impoundment see Table 5.1

Once solution composition is suitable for discharge to the tailings impoundment, monitoring of the heap leach LCRS and PCMS and the underdrain system will no longer be required. The underdrain system will be sampled on a semi-annual basis for the Profile II list of analytes (Table 5.2). The underdrain system will be sampled via monitoring These monitoring wells will be used to monitor the waters in the underdrain during the active life of the heap leach pad ending the quarter after water quality standards have been met.

Table 5-1 Summary of Heap Leach closure monitoring requirements

Identification	Parameter	Frequency
LCRS	WAD CN/pH	Quarterly (during rinsing)
PCMS	WAD CN/pH	Quarterly (during rinsing)
Groundwater Underdrain (via monitoring wells)	Profile II WAD CN/pH	Quarterly (during rinsing))
Residual Solution (via Storage Pond recovery wells	Profile II WAD CN/pH	Quarterly (during rinsing)
Closure Drainage	Profile II	Quarterly (during rinsing)
Preg Solution	WAD CN/pH	Quarterly (during rinsing)
In-Heap Storage Pond	Elevation	Continuous (automatic)

Table 5-2 Analytical profile II–groundwater inorganic parameters

General Chemistry and Major Ions		Trace Metal Chemistry
Lab pH	Alkalinity (as CaCO3)	Antimony*
Lab Conductivity	Bicarbonate	Arsenic*
Temperature (field)	Chloride	Barium*
Turbidity	Fluoride	Bismuth*
Total Suspended Solids	Nitrogen, Ammonia	Cadmium*
Total Dissolved Solids	Nitrate as Nitrogen	Chromium*
Total Hardness	Nitrite as Nitrogen	Copper*
	Total Phosphorus	Iron*
	Sulfate	Lead*
Total cyanide	Sulfide	Manganese*
WAD Cyanide	Calcium*	Mercury*
	Magnesium*	Nickel*
	Potassium*	Selenium*
	Sodium*	Silver*
	Silicon*	Zinc*

* Dissolved