NIBLACK
WASTEWATER TREATMENT AND DISPOSAL APPLICATION

2012 Post-Construction Update

Submitted to
Alaska Department of Environmental Conservation Division of Water (Wastewater Discharge Program) and Alaska Department of Natural Resources (Large Mine Permitting Team)

Prepared for

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ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
ADNR	Alaska Department of Natural Resources
APDES	Alaska Pollutant Discharge Elimination System
BMP	best management practice
CBG	CBR Gold Corporation
CBR	Committee Bay Resources Ltd.
gpm	gallons per minute
gph	gallons per hour
HDPE	high-density polyethylene
LAD	land application/dispersion
NAG	non-acid-generating
NMC	Niblack Mining Corporation
NPLLC	Niblack Project LLC
NRCS	Natural Resources Conservation Service
PAG	potentially acid-generating
QAPP	quality assurance project plan
SOP	standard operating procedure
SWPPP	Storm Water Pollution Prevention Plan
TR-55	Technical Release 55

1 INTRODUCTION

1.1 BACKGROUND

The Niblack Exploration Project is a copper-gold-zinc-silver prospect located off Moira Sound on southeastern Prince of Wales Island, approximately 30 miles southwest of the town of Ketchikan, Alaska (Figure 1-1). The project is limited to development within Patented Claim holdings, with the exception of the tideland lease area managed by the Alaska Department of Natural Resources (ADNR). Niblack Project LLC (NPLLC) is the owner and sole operator of the exploration property. Site activities operate under the Alaska Department of Environmental Conservation (ADEC) Waste Management Permit 2006-DB0037.

This wastewater treatment and disposal application has been prepared in support of the Niblack Industrial Waste Monofill Solid Waste Permit Application (NPLLC 2012a). This document serves as an update to the Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a) and incorporated into Permit 2006-DB0037. Updates to the 2007 wastewater application provided herein include presentation of site facilities and waste rock volumes produced during underground construction completed to date.

The principal purpose of this wastewater treatment and disposal application is to describe the wastewater management and treatment procedures in place at the site based on the facility and drift construction, activities, and operations conducted to date. Additional expansion of the underground drift is not anticipated at this time; however, this document also presents the original design plans, which would be followed if additional drift excavation is conducted in the future.

The Niblack area has been explored for minerals since the initial copper discovery at Niblack Anchorage in 1899. A detailed history of site ownership and exploration activities, including tons of ore produced and dates of operation, is presented in the Niblack Underground Exploration Plan of Operations 2012 Post-Construction Update (Integral 2012b). The property was first developed in 1902-3 by the Wakefield Mineral Lands Company and in 1904 was leased by the Niblack Copper Company. Available records show that the mine shipped ore from 1905 through 1908, producing just over 30,000 tons. More recently, Cominco American (1974-1976), Anaconda (1977), Noranda (1982), and Lac (1984–1993) performed exploration at the site. Abacus Minerals Corporation became involved in 1995, and Niblack Mining Corporation most recently in 2005. Niblack Mining Corporation was acquired as the principal asset of Abacus Alaska Inc. by Committee Bay Resources Ltd. on October 1, 2008, which subsequently underwent a corporate name change to CBR Gold Corporation. NPLLC acquired 100 percent ownership interest in the Niblack Exploration Project in early 2012. Table 1-1 summarizes drilling activities from 1975 to 2011.

The property is composed of 17 patented claims, 298 staked federal lode claims, and 7 Alaska State tideland claims (Figure 1-2). The claims are within Township 78 South, Range 88 East, Copper River Meridian, Sections 27, 28, 29, 32, 33, 34 and 35; and Township 79 South, Range 88 East, Copper River Meridian, Sections 1, 2, 3 and 4, Ketchikan Recording District, Alaska. Site facilities are shown on Figure 1-3 (site overview) and Figure 1-4 (site detail). Figure 1-5 outlines the exploration drift construction.

1.2 PURPOSE OF APPLICATION

With this application, NPLLC is applying for a Wastewater Treatment and Disposal authorization from ADEC under a Waste Management Permit for the site. The application is for a wastewater system designed to treat potential leachate from a temporary potentially acid-generating (PAG) waste rock storage site as well as underground water intercepted by the exploration access drift. The wastewater system is designed to handle a 24-hour, 25-year storm event and to discharge water from a water settling/treatment ponds through a land application/dispersion (LAD) system, from which water is polished via infiltration through site soils and natural attenuation.

The wastewater treatment facility and LAD area are located entirely on Patented Claims. There is no discharge to waters of the United States. The purpose of the permit application is:

1. To provide for treatment of construction and dewatering wastewater associated with the exploration drift to provide drill access to mineralized zones of interest.
2. To provide for treatment of runoff and leachate from the PAG temporary storage facility.
3. To protect local surface water and groundwater resources.

This application is consistent with the Storm Water Pollution Prevention Plan (SWPPP; RTR 2006), which was submitted previously under separate cover (October 24, 2006). The SWPPP is included as an appendix to the Revised Niblack Underground Exploration Plan of Operations (NMC 2007b).

1.3 SEPARATE PERMIT FOR INDUSTRIAL SOLID WASTE MANAGEMENT

This Wastewater Treatment and Disposal Application is submitted in conjunction with a separate Industrial Solid Waste Monofill Permit application to renew Permit 2006-DB0037. The Industrial Solid Waste application addresses the above-ground waste rock storage at the project site. Waste rock stored onsite includes PAG material placed on a lined temporary storage platform, a small lined and covered pile of mineralized material stockpiled for future test work, and non-acid-generating (NAG) material. A portion of the NAG material has been sorted and stored in a small fines stockpile that is used for road maintenance. The remainder of the material was used in construction of site facilities.Upon cessation of the project activities, the PAG and mineralized ore material will be placed underground for permanent storage in the exploration drift. Additional information on waste rock production, segregation, and storage is presented in the Niblack Industrial Solid Waste Monofill Permit application to renew Permit 2006-DB0037 (NPLLC 2012a) and is summarized in Section 3 of this application.

1.4 WATER TREATMENT AND BMP APPROACH

A permit is required from ADEC under 18 AAC 72.500 and 18 AAC 72.600 for the discharge of non-domestic wastewater to land or waters of the state, including groundwater. Because the proposed discharge from the water treatment facility is not to wetlands or other waters of the U.S., an Alaska Pollutant Discharge Elimination System (APDES) permit is not required under 33 U.S.C. § 1342 Section 402 of the Clean Water Act.

NPLLC uses a combination of water treatment processes and best management practices (BMPs) to meet State of Alaska water quality criteria. NPLLC does not intend to discharge construction dewatering fluids to areas adjacent to contaminated sites or drinking water wells, or to waters of the U.S. No domestic wells are located within 500 feet of the LAD site.

2 SITE OVERVIEW

2.1 GENERAL PHYSICAL AND HYDROLOGICAL SETTING

2.1.1 Local Climate

Climatic conditions are typical of southeast Alaska with warm summers and relatively wet, cool winters. Temperatures are moderate and rainfall is high. Typical temperatures for the region average 45.6°F and range from 28°F to 65°F (Table 2-1). Figure 2-1 presents the long-term average regional temperatures and precipitation. Figure 2-2 shows temperature and precipitation measured at the Niblack site from 2008 to 2011. Total precipitation averages 138 in. annually, and is generally greatest from September through February (Integral 2012d). Because of the mild temperatures, most precipitation falls as rain, with less than 40 in. of annual snowfall on average. Air temperature and precipitation measured at the Niblack project site and at Ketchikan Airport are presented in the annual reports (e.g., Integral 2012d). Snow cover can be heavy at higher elevations. The area encompassed by the claims is covered by temperate rainforest at lower elevations, giving way to sparse sub-alpine vegetation at the highest elevations.

2.1.2 Topography

The terrain is mountainous and rugged, with steep to moderate slopes. Elevations range from sea level to peaks of 2,600 ft and greater. The underground exploration drift is constructed at the 380-ft level within Lookout Mountain, which has an elevation of 2,300 ft. The slopes are covered with temperate rain forest and gives way to sparse vegetation only at the highest elevations, generally 1,800 ft and above. In the lower elevations of the Project area much of the land surface is occupied by wetlands that are classified as saturated needleleaf forest wetlands and saturated needleleaf forest/broadleaf scrub-shrub mix wetlands. Wetlands and surface hydrology features are shown on Figure 1-3.

2.1.3 Seismicity

The USGS seismic hazard map shows relatively low seismic risk for the Niblack project area (USGS 2012; http://earthquake.usgs.gov/earthquakes/states/alaska/hazards.php). A geotechnical analysis of the areas used as the temporary PAG and NAG waste rock disposal areas was presented in Appendix A of the original Niblack Solid Waste Landfill Application under the Waste Management Permit (NMC 2007a). The geotechnical evaluation/seismic study showed that the waste rock storage facilities are stable.

The following summary of seismicity was included in the Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a).

> The seismotectonic setting of southeastern Alaska is influenced directly by the interaction between the Pacific and North American plates. Stresses in the crust derived from movement of the plates are accommodated by a series of faults and fault systems. Several major active faults in southern Alaska have generated large crustal earthquakes within the last century. The most likely sources for an earthquake significant to the project site are the Fairweather-Queen Charlotte fault and the Chatham Strait Fault. These faults are both located approximately 90 miles west of the project site. There are no active faults in the project area. The Fairweather-Queen Charlotte fault system is capable of generating large earthquakes of approximately magnitude 8.0-8.3. There is potential for earthquakes of up to approximately magnitude 7.0 occurring along the Chatham Strait Fault. These fault systems present the greatest earthquake hazard to southeast Alaska. A map of active earthquakes in Alaska is available at http://www.aeic.alaska.edu/html_docs/pdf_files/earthquakes_in_Alaska.pg.pdf - Earthquakes in Alaska: Haeussler, P.J and Plafker, 2004, US Geological Survey publication.

2.2 WATER RESOURCES

The project is located along the bottom and lower slopes of a small, steep-sided watershed that drains directly into Niblack Anchorage. Four perennial streams referred to as Waterfall Creek, Camp Creek, Unnamed Creek 1, and Unnamed Creek 2 flow through the project area, as shown on Figure 2-3. Many small intermittent drainages, swales, and rivulets flow through the area and eventually feed into these streams, or directly into Niblack Anchorage.

Groundwater in the project area is present in two domains: 1) low residence time near surface colluvial groundwater at 10–30 ft. and 2) deeper, longer residence time groundwater at approximately 30 ft. Data from road cuts, groundwater wells, existing exploration drill holes, and soil borings from wetland delineation work appear to indicate or suggest channelized or conduit-like, highly variable flow in colluvial groundwater, which is directly related to precipitation (RTR 2007a).

A wetlands delineation survey was conducted in March 2006. Of the 83 acres surveyed, approximately 7.4 acres were classified as wetlands. These areas are shown in Figure 2-3. The survey also found that both hydric and non-hydric soil conditions exist in the area. Non-hydric soils had a shallow to moderately deep (3–7 in.) organic horizon overlying mineral soils. Specific characteristics of the site soils and wetland vegetation are presented in the Preliminary Jurisdictional Wetlands Delineation (HDR 2006).

As stated in the Niblack Waste Management Permit (2006-DB0037), Section 1.13, ADEC has determined that natural water quality in surface water and groundwater at the Niblack site exceeds water quality standards for parameters including pH, aluminum, cadmium, copper, lead, nickel, silver, and zinc. For this reason, site-specific natural condition-based water quality criteria have been established for the Niblack Project for surface water and shallow wetland groundwater. Specific procedures for establishing site-specific water quality parameters are specified in the quality assurance project plan (QAPP; Integral 2007) and are based on ADEC's Guidance for the Implementation of Natural-Condition Based Water Quality (ADEC 2006).

Water quality monitoring is summarized in Section 4 of this application. Detailed information on monitoring locations, procedures, analytical methods, and quality control is presented in the Niblack Water Quality Monitoring Plan 2012 Post-Construction Update (Integral 2012c) and QAPP (Integral 2007). Surface water and groundwater quality monitoring locations are shown on Figure 2-3. Currently active monitoring stations are shown in blue. Stations shown in green and orange were sampled to observe baseline and reference conditions and are no longer monitored on a regular basis. Generally, the points for evaluating compliance with site-specific natural condition criteria are downstream surface water sites and downgradient wetland groundwater sites.

2.2.1 Surface Hydrology

Stream stage data for the Niblack Project are recorded via a pressure transducer and an automatic datalogger hydrology station that was established in August 2006 in Camp Creek, just upstream from station WQ6. Automated stage data are available for a 2-year period from August 2006 through August 2008 and for a 7-month period from June through December 2011. Manual stream velocity measurements and associated discharge estimates were collected from August 2007 through May 2008. Due to various uncertainties with the pressure transducer data, a reliable stage – discharge rating curve could not be developed. As a result, a continuous record of flow in Camp Creek is not available at this time. Discharge estimates, based on the 14 manual measurements (multiple measurements collected at the same time were averaged) indicate that Camp Creek flows ranged from 0.5 to 48.6 cubic feet per second when the measurements were made (Table 2-2).

For comparison, average, maximum, and minimum flows for nearby streams are presented in Table 2-3. Although flow conditions vary from watershed to watershed, flows from nearby streams give some indication of regional hydrology over a long period of record.

3 SUMMARY OF FACILITIES AND ACTIVITIES

This section summarizes construction activities conducted since the Niblack Exploration Project was initiated on September 21, 2007. The current phase of underground construction and excavation commenced on September 21, 2007 and was completed on July 12, 2008. Placement of NAG material at construction sites was completed shortly thereafter, as was the loading of the temporary PAG waste rock storage facility, which was completed in spring 2008. Construction of the sediment ponds, and piping from the adit portal to the ponds, was complete prior to commencement of excavation activity in 2007. Land application of effluent water from the settling ponds began in October 2007.

No additional expansion of the underground workings, or associated production of waste rock, is anticipated at this time. However, if future expansion does occur, the site design plans presented in the Niblack Solid Waste Landfill Application under the Waste Management Permit (NMC 2007a) and the Underground Exploration Plan of Operations (NMC 2007b) will be followed.

3.1 SURFACE FEATURES

The total surface area cleared or disturbed at the project site is 13.5 acres. This total includes access roads and an existing land camp site constructed prior to 2007, which are not covered under the Niblack Underground Exploration Program permits. Photographs of site facilities are presented in the Niblack Project Underground Exploration Plan of Operations 2012 Post-Construction Update (Integral 2012b).

Surface features are shown on the site-wide as-built maps (Figures 1-3 and 1-4) and include the following:

- Access road
- Ditches, culverts, and settling basins/sediment traps for stormwater management
- Construction of laydown areas for equipment/supply storage, including a fuel storage facility, magazine sites (currently decommissioned), portal area, shop area (old camp)
- Settling ponds and LAD water discharge system
- Barge landing and dock facilities
- Surface drilling landing
- Temporary PAG waste rock storage facility
- Temporary mineralized ore stockpile

- NAG waste disposal area
- Topsoil and growth media stockpiles.

3.1.1 Waste Rock Excavation and Storage

The total underground development consists of 2,772 linear ft on the main access drift, 372 ft of short cross-cuts and utility bays, and 144 ft for two sumps, one near the portal and the other near the end of the drift (Figure 2-7). The total volume excavated during the access drift construction period was approximately 66,150 tons (39,300 yd^3).

The Niblack exploration drift totals 3,288 linear ft (main drift plus cross-cuts and sumps) and was constructed with a total of 286 blast rounds. Of this total, 43 rounds constituting 495 linear ft of drifting (approximately 9,960 tons or 5,920 yd^3) were determined to consist of PAG materials, the majority of which (26 rounds for 299 linear ft) consisted of sulfide mineralization within the Lookout Rhyolite, and related footwall alteration, at the end of the drift. The first four rounds excavated from the Lookout Rhyolite (48 linear ft of the drift representing approximately 965 tons or 574 yd^3 of material) consisted of well-mineralized rock and was set aside for future test work. This material is stored in the covered and lined temporary mineralized ore stockpile (Figure 3-1). The remainder of the PAG material (approximately 8,995 tons or 5,346 yd^3 of material) was placed on the temporary PAG storage site. NAG waste rock, dominated by mafic volcanic rocks and mafic dykes, totaled 2,793 linear ft of the total excavation and represented some 56,200 tons, or 33,400 yd^3 of material. All NAG waste rock has been used in construction activities, including the laydown areas expansion, the NAG site access roads and berms, the base for the temporary PAG storage facility, and road maintenance. Material from the lower NAG haul road (placed in 2008) has been, and will continue to be, sorted through a 6-in. grizzly to create small fines stockpile (Figure 2-2) that is used for road maintenance on an as-needed basis.

Table 3-1 summarizes the waste rock volumes produced during construction of the initial 3,288 ft of adit excavation. Table 3-2 presents the estimate of the total amount of PAG material anticipated if the underground workings were developed to the full design extent of 6,000 ft. Table 3-3 presents the same information for NAG material. The estimates in Tables 3-2 and 3-3 are reproduced from Table 1 of the Niblack Project Operational Characterization Plan (Knight Piésold 2007a).

The temporary PAG waste rock storage site (Figure 3-3) was constructed on a foundation of crushed rock overlain by a 6-in. layer of compacted sand, and lined with 80-mil high-density polyethylene (HDPE) (geo-membrane) between two layers of geotextile fabric. The liner system was overlain by another 6-in. layer of compacted sand as a service layer. Waste rock storage size designs, assumptions, and operating considerations are described in the Geotechnical Summary of Niblack Project Waste Rock Dumps (NMC 2007a, Appendix A). The PAG temporary storage facility is built on a cut platform and the full base liner is sloped to collect and convey all PAG runoff and leachate to the PAG collection pond, as shown on Figure 3-1. Figure 3-2 details the engineered liner construction at the PAG site; Detail B of this figure shows how runoff captured on the PAG liner flows to the PAG pond. The QA/QC Plan for PAG Temporary Storage Facility Liner Installation was submitted as Appendix C to the 2007 permit application (NMC 2007a). Quality assurance tests were conducted during the liner installation, generally following the installation QA/QC plan outlined in NMC (2007a, Appendix C).

The PAG pile is uncovered to allow for larger-scale kinetic testing to monitor waste rock weathering. A waiver of the intermediate cover requirement (18 AAC 60.243) under the Niblack Waste Management Permit (2006-DB0037) was granted by ADEC on January 26, 2009 (Buteyn 2009, pers. comm.). Beginning in the third quarter of 2008, the leachate and runoff water captured in the PAG pond was monitored on a weekly basis for field parameters including pH and sulfate and on a monthly basis for analytical chemistry analyses including total and dissolved metals. NPLLC has requested approval to begin a quarterly monitoring schedule for PAG pond chemistry parameters beginning in the second quarter of 2012. Field parameter monitoring will continue on a weekly schedule and will serve as an early indicator for any potential changes in PAG pond water quality. If a significant reduction in pH, or increase in sulfate or other field parameters, is observed, the chemistry monitoring frequency may be increased as determined by NPLLC and ADEC and ADNR.

During drift construction, 574 yd^3 of well-mineralized PAG material was stockpiled for future geochemical test work and processing (Figure 1-3). This material is stored in a temporary, lined and covered stockpile adjacent to the PAG temporary storage facility. The pile is covered with 80-mil HDPE geomembrane so as to prevent any introduction of surface water onto the pile. The mineralized ore stockpile was not included in the original Underground Exploration Plan of Operations (NMC 2007b) or the Reclamation and Closure Plan for the Niblack Underground Exploration Project (RTR 2007b). If the mineralized ore stockpile is not removed from the site for processing, it will be hauled back underground with the PAG materials and the stockpile site will be reclaimed.

All of the NAG material removed during underground excavation was utilized in the construction of site roads and facilities. A portion of this material, originally placed on the lower NAG haul road, has been sorted and stored in a small fines stockpile (Figure 1-3) that is used for road maintenance. If additional underground development occurs, NAG waste will be utilized onsite and/or placed in the NAG disposal area, following the design plans presented in the Niblack Solid Waste Landfill Application under the Waste Management Permit (NMC 2007a) and the Underground Exploration Plan of Operations (NMC 2007b).

3.1.2 Waste Rock Characterization

A geochemical characterization program was conducted during drift excavation in order to determine the potential for the rock comprising each blast round to be PAG or metals leaching.

PAG and NAG materials were segregated as described in the Niblack Project Operational Characterization Plan (Knight Piésold 2007a) and 2008 agreement with ADNR (McGroarty 2008, pers. comm.). The following criteria were followed for separating PAG and NAG materials:

- PAG rock: total sulfur equal to or greater than 0.4 percent[1], ratio of acid neutralizing potential to acid generating potential (ANP:AGP) equal to or less than 3, and/or visible zinc or copper sulfide minerals present in the waste rock

- NAG rock: total sulfur less than 0.4 percent, ANP:AGP greater than 3.

Segregation of PAG versus NAG waste rock was determined by onsite analysis of samples of blast-hole drill cuttings collected from each round of development rock for total sulfur and pH following oxidation with hydrogen peroxide. Additional waste rock characterization conducted during drift construction included acid/base accounting and total metals analysis.

Analytical results are included within a master acid base accounting geochemical database which has not changed following completion of the current phase of excavation in 2008. The database is included in the appendices of the 2007, 2008, and 2009 Niblack Annual Reports (Integral 2008, 2009, 2010). Based on the quality assurance and quality control verification analyses conducted as part of the geochemical characterization program, the material in the PAG pile averages approximately 1 percent total sulfur, predominately as sulfide-sulfur.

Ongoing monitoring of waste rock weathering is conducted with three field barrel kinetic tests located immediately east of the PAG waste rock pile. The barrels are loaded with different sources of PAG rock. Additionally, per agreement with ADEC (Buteyn 2009, pers. comm.), the PAG temporary storage pile is uncovered in order to allow for large, field-scale monitoring and evaluation of the weathering behavior of the PAG material. The leachate and runoff water captured in the PAG pond is monitored on a weekly basis for field parameters including pH, sulfate, conductivity, dissolved oxygen, and total dissolved solids. Additional chemistry parameters, including conventional parameters, major cations and anions, and metals, were collected on a monthly basis from August 2008 to May 2012. Monthly PAG monitoring reports were submitted to ADEC during this time period. NPLLC has requested approval to begin a quarterly monitoring and reporting schedule for PAG pond chemistry parameters beginning in the second quarter of 2012. Field parameter monitoring will continue on a weekly schedule and will serve as an early indicator for any potential changes in PAG pond water quality. If a significant reduction in pH, or increase in sulfate or other field parameters, is observed, the chemistry monitoring frequency may be increased as determined by NPLLC and ADEC/ADNR.

[1] The original total sulfur cut-off value for segregation of PAG and NAG materials specified in the Niblack Operational Characterization Plan was 0.22 percent. In 2008, ADNR agreed to increase the total sulfur cut-off value to 0.4 percent for the Hanging Wall Unit and associated mafic dykes (McGroarty 2008, pers. comm.).

3.1.3 Water Management Features

Figures 1-3 and 1-4 present overview and detail views of stormwater and surface water control features, including diversion ditches at the PAG and NAG areas, the PAG runoff capture pond, the settling/treatment ponds, and sediment traps adjacent to the access road. Figure 2-3 shows streams, surface water bodies, and water quality monitoring stations. The PAG temporary storage facility was designed to route all run-on around the facility. PAG facility runoff and leachate are routed to the PAG pond, and then piped to the site settling/treatment ponds. The settling ponds also receive underground water from the exploration drift, which is piped from the adit portal. If necessary, water may be pumped from the first pond through a water-treatment chemical mixing tank, which can be used to increase pH and reduce trace element concentrations through lime addition and flocculation. The second pond allows for additional precipitation and settling of trace elements. From the settling ponds, water is routed to the LAD system, where it is discharged through a network of low-flow emitters for infiltration into site soils and final polishing.

The water management and treatment systems are shown by facility in Figure 3-3 and summarized in the general site flow chart on Figure 3-4. To date, low concentrations of trace elements in effluent water and passive treatment through settling and natural soil attenuation have controlled effluent water quality, and chemical water treatment has not been necessary. The water treatment plant was tested for effectiveness in September 2009 and is ready to begin the treatment of mine wastewater should the need arise. Regular surface water and groundwater quality monitoring is conducted, as described in the Water Quality Monitoring Plan 2012 Post-Construction Update (Integral 2012c). Water quality monitoring results are summarized in quarterly and annual reports; e.g., the Niblack Exploration Project 2011 Annual Report (Integral 2012d) submitted to ADEC on March 30, 2012.

3.2 EXPLORATION DRILLING

Overall, a total of over 300 core boreholes have been drilled on the Niblack Project area between 1975 and late 2011, for a total of over 300,000 ft. NPLLC has drilled approximately 183,727 ft in 146 holes (136 underground and 10 surface) since 2009. Table 1-1 summarizes drilling conducted at the Niblack site from 1975 to 2011.

In May and June 2011, a helicopter-supported surface drill rig was added to the Niblack exploration program to test exploration targets in the area of the historic Niblack Mine. Surface drilling and associated reclamation activities are conducted as described in the Plan of Operation for Mineral Exploration at the Niblack Project (NPLLC 2012b). Seven surface holes totaling approximately 5,000 ft were drilled. Surface disturbance in 2011 was approximately 0.1 acre, including all drill sites and helicopter landing zones. The majority of surface drilling activity in 2011 took place on patented claims; nevertheless, these sites were reclaimed according to the standards for state or federal land. One location was inside the boundaries of the Tongass National Forest; the drill pad was only partially completed and no drilling activity took place before the end of the program

3.3 RECLAMATION

Construction reclamation and interim reclamation activities have been conducted at the site in accordance with the Niblack Project Reclamation and Closure Plan (RTR 2007b). Post-closure reclamation and monitoring are discussed in detail in the Niblack Reclamation and Closure Plan 2012 Post-Construction Update (Integral 2012a).

4 WATER MANAGEMENT AND TREATMENT SYSTEMS

This section summarizes the water management and treatment systems for the Niblack Project. The overall water management and treatment concepts are unchanged from those set forth in the original Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a) and incorporated into Permit 2006-DB0037, except where otherwise noted below.

The overall water management area is defined as that area within which NPLLC would actively employ source controls like minimization, water management, and BMPs for explosives. Water dispersion, BMPs, and water treatment are used in order to limit potential surface water and groundwater quality impacts related to the underground construction activities.

4.1 WATER MANAGEMENT OVERVIEW

The approach to Niblack Exploration Project water management practices is shown with site facilities on Figure 3-3 and as a general flowchart on Figure 3-4. Post-construction handling of wastewater generally follows the plans described in the original Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a). The original facility designs are reproduced in Appendix A to this application. These designs provide useful context for the post-construction layout of site facilities. Additionally, if additional drift excavation is conducted in the future, the original design plans will be followed. Figures A-1 and A-2 present the as-built site facilities superimposed over the proposed designs. Figures A-4 through A-10 show the original facility designs, including details for the waste rock storage facilities.

The original proposed drift excavation wastewater water management program was designed to involve a three-step wastewater treatment process that included 1) minimization and pre-treatment underground, 2) settling in a frac tank and treatment in the water treatment facility (additional settling, chemical coagulation/precipitation treatment if necessary), and 3) dispersion through the LAD system and land infiltration for final polishing. PAG pile runoff and leachate water is captured in the PAG pond, then routed to the settling ponds/treatment facility and LAD system. The following changes to the original proposals have been adopted:

- Underground flocculent addition and settling in a frac tank have not been initiated
- Chemical water treatment at the settling ponds has not been initiated.

To date, low concentrations of trace elements in effluent water and passive treatment through settling and natural soil attenuation have controlled effluent water quality, and chemical water treatment has not been necessary. The water treatment plant was tested for effectiveness in September 2009 and is ready to begin the treatment of mine wastewater should the need arise.

Water management also involves water quality monitoring at downgradient surface water and groundwater compliance points. The water quality monitoring program is summarized in Section 6 below, and outlined in detail in the Niblack Water Quality Monitoring Plan 2012 Post-Construction Update (Integral 2012c). Monitoring locations are presented on Figure 2-3. Data from this monitoring program is evaluated and reported to ADEC in quarterly and annual reports. NPLLC reviews the monitoring results to evaluate the efficacy and efficiency of the water management BMPs and facilities.

4.2 WATER MINIMIZATION

Minimization of water flows into the access drift is an important component of site water management practices. Minimization includes grouting and packing and other water management controls involving polymer coating (i.e., Mineguard or Rockguard™) over rock fissures and surfaces to stabilize and/or retard groundwater inflow/infiltration into the excavation area.

Run-on storm water is diverted around both the NAG and PAG waste rock storage sites. Diversion ditches are shown in Figure 1-3. Diverted water is routed back into existing stream channels or is dispersed to the forest floor. Original plans described that runoff from the NAG storage site would be collected in sediment ponds and traps below the site. Sediment traps were constructed, as shown on Figure 1-3. Note that all of the NAG material generated during drift excavation was used in construction of roads and site facilities. The only NAG material stored at this time is the stockpiled fine material taken from the lower NAG haul road for use in road maintenance. A sediment control and drainage diversion is constructed below the fines stockpile.

Original design plans specified that the PAG waste rock pile would be covered to prevent stormwater from infiltrating the pile. A waiver of the temporary cover requirement (18 AAC 60.243) under the Permit was granted by ADEC on January 26, 2009 (Buteyn 2009, pers. comm.). In January 2009, former site owners Committee Bay Resources requested approval to leave the pile uncovered for large-scale kinetic testing (Kleespies 2009, pers. comm.). The uncovered pile provides an opportunity to evaluate the weathering behavior of the PAG rock and provides quantitative information for waste management practices for possible future site development. The leachate and runoff water captured in the PAG pond is monitored on a weekly basis for field parameters and sulfate and on a regular basis for water quality including metals. The PAG effluent is entirely captured and controlled through the liner and PAG pond system. A cover will be placed on the PAG pile if required due to a change in the chemistry of the PAG effluent or at the request of ADEC or ADNR.

4.2.1 Water Management Needs

A general approach to Niblack Exploration Project water management practices is shown as a flowchart on Figure 3-4. The left side of the chart summarizes BMPs applied to drainage from the exploration drift that were implemented during the underground construction. These BMPs focused on reduction of nitrates (from explosives) and total suspended solids. Table 4-1 lists the main practices of underground water management employed during drift excavation; Table 4-2 focuses on water management related to construction in the mineralized Lookout Unit. As discussed above, no additional drift excavation is anticipated at this time; however, the information presented in Tables 4-1 and 4-2 provide guidelines to follow if the drift is expanded in the future. Additional details regarding explosives management and contingency water were provided in the original Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a).

4.2.2 Employee Education and Training

Employee education and training is an important component to ensuring that water management procedures are followed and that BMPs are properly implemented. Staff training is conducted at the site as needed. The training program emphasizes preventative measures including the following:

- Water management
- Workplace housekeeping procedures
- Review of past incidents, causes, and resulting corrective measures
- Procedures to clean up or mitigate incidents.

Operators are specifically trained in underground and surface water management, explosives spill prevention and control, and related mitigation measures as part of Mining Safety and Health Administration training. In the event of further underground development, employees will be instructed in the proper procedures for storage and handling of explosives, drill hole charging and detonation practices, and procedures to follow in the event of a spill or incomplete detonation. The training program for underground construction would emphasize preventative measures including the following:

- Explosives handling practices
- Awareness of health risks of explosives used at the project
- Review of the water and explosives management practices

- Incident (spills and undetonated explosives) reporting procedures.

5 ESTIMATED FLOWS AND FACILITY DESIGNS

This section summarizes the peak discharge flows used to develop facility designs. The efficacy of the Niblack Exploration Project water management and treatment systems is dependent on accurate hydrologic interpretation and flow modeling. As described in Section 3, the initial phase of site construction, underground excavation and waste rock generation, was conducted from September 2007 through July 2008. Additional underground drift excavation and associated production of waste rock is not anticipated at this time. However, to allow for possible future expansion of the drift, the design discharge estimates presented in the original Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a) and incorporated into Permit 2006-DB0037 are presented here. The design estimates are unchanged from RTR (2007a).

The original wastewater discharge limit for the Niblack Exploration Project was 150 gallons per minute (gpm), as specified in Section 1.4 of Permit 2006-DB0037. During initial underground construction in 2007 and 2008, groundwater flows exceeded pre-project estimates and necessitated grouting to remain below the permitted wastewater discharge limit of 150 gpm. To reduce flows, grout was applied along almost the entire length of the exploration drift. The resulting grout curtain has been successful in eliminating significant water seepage into the drift. On August 13, 2008, approval was granted by ADEC for an increase in the permitted wastewater discharge limit to 250 gpm (George 2008, pers. comm.). An additional increase in the permitted wastewater discharge limit up to 300 gpm was approved by ADEC on December 31, 2009 (Nakanishi 2009, pers. comm.).

5.1 OBSERVED DISCHARGES

Water flow volumes and rates observed since underground exploration began in September 2007 are presented in Table 5-1. As shown on this table, LAD system flows average about 122 gpm, ranging from 8 to 224 gpm. Of the overall flow to the site settling ponds and LAD system, approximately 95 percent comes from drainage from the underground exploration drift. Approximately 3 percent is attributed to runoff and leachate captured in the PAG pond, and approximately 2 percent is from precipitation falling directly on the settling ponds.

5.2 DESIGN DISCHARGE ESTIMATES

The overall water management and treatment system is dependent on accurate hydrologic interpretation and flow modeling. In Appendix A, Figure A-5 shows the original site plan detail used in the hydrologic flow calculations. (For comparison, Figure A-2 presents the current as-built drawings superimposed over the original designs.) To determine water management volumes and ultimate water treatment needs, the hydrologic criteria were superimposed over the original site plans (Figure A-5). Based on the 24-hour/25-year storm event, peak discharge from the Niblack Lookout Unit exploratory drift was estimated at between 60 and 120 gpm, whereas peak discharge from the PAG facility was estimated at 20 gpm. Combined total peak discharge to the water treatment facility from the adit and PAG temporary storage facility was estimated at 140 gpm.

5.2.1 Stormwater Analysis Calculations

Stormwater flow calculation methods were presented in the original Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a). A summary of these methods is reproduced here; no changes to the calculations were made for this wastewater treatment and disposal application.

Surface flow diversions were designed to convey the design storm event defined in 18 AAC 60.210(b)(3)(D), which is the peak discharge from a 24-hour, 25-year storm event. The hydrologic analysis for stormwater management was presented as Appendix B to the original Niblack Solid Waste Landfill Application under the Waste Management Permit (NMC 2007a).

To calculate stormwater flows, the project area was divided into drainage basins for planning purposes (Appendix A, Figure A-6). The lower boundary of basins B and G is the upper end of the PAG temporary storage facility and NAG waste disposal areas, respectively. These two waste storage sites are the focus of the site wastewater and stormwater management efforts. Runoff from these basins is intercepted by diversion ditches upslope from the PAG and NAG areas and conveyed to adjacent drainage channels. A summary of hydrologic features is presented in Table 5-2.

Peak flows were calculated using the Technical Release 55 (TR-55) hydrology model (NRCS 1986), which uses basin area, the 24-hour rainfall for the selected return interval, the runoff curve number and the time of concentration to estimate the instantaneous peak flow and runoff hydrograph for a single drainage basin or a network of basins.

Basin areas were measured using the site map (Appendix A, Figure A-6). According to Miller (1963), the 24-hour precipitation at the site varies from 5 in. for the 2-year return period, to 6 in. for the 25-year return period. A precipitation value of 5 in. was used to calculate the peak flows for the seven offsite basins, because the originally anticipated duration of the project was less than 18 months.

A runoff curve number of 60 was used for all offsite basins. This curve number is typical for soils in heavily forested areas with a relatively high infiltration rate, and is representative of the soils at the Niblack site. The time of concentration for each basin was calculated using the methods described in the TR-55 manual. The times of concentration for these basins are relatively short due to the steep slopes of the basins.

Other sources of water flow considered in the design of water management and treatment facilities include groundwater from construction excavation dewatering of underground drifts and leachate collected from the collection system beneath the temporary PAG waste rock storage facility.

5.2.2 Design Discharge Estimate Assumptions

As described in the original Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a), the assumptions described below were made to estimate water discharge for the site.

The peak adit discharge estimates are based on the original full design length of 5,890 linear ft of tunnel, approximately 13.5 ft x 14 ft in cross section. The estimates were made using a transient numerical groundwater flow model assuming a tunneling rate of 20 ft per 24 hours, mean hydraulic conductivities for the bedrock of 2.5×10^{-6} to 6.7×10^{-6} cm/s, and a drainable porosity of 0.02. The hydraulic conductivities were first estimated by calibrating the numerical model in steady-state to groundwater elevations ranging from 50 to 1,835 ft above mean sea level measured in five exploration boreholes. Assumed recharge values for calibrating the steady-state model were either 10% or 25% of 174 in. annual total precipitation. The lower mean hydraulic conductivity estimate and lower adit discharge estimate correspond to the lower net recharge assumption. The peak discharges occur simultaneously with advancement of the adit. Longer-term adit discharges, 1 year after construction, decline to between 45 and 110 gpm. These estimates would be used conservatively for determining potential long-term water treatment needs. Stormwater modeling results and calculations are presented in Appendix 1 to the original Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a).

The flow rate for discharge from the PAG temporary storage facility is dominated by the 25-year, 24-hour design storm of 6 in. Water flow calculations assumed that approximately one-quarter of the PAG site footprint (originally estimated at 38,700 ft^2) would be active at any one time, resulting in an active area of approximately 9,700 ft^2. Based on this, and a Natural Resources Conservation Service (NRCS) runoff curve number of 90, the peak discharge from the PAG facility was estimated to be approximately 0.84 cubic feet per second and the total runoff volume for the design storm was estimated to be approximately 4,100 ft^3. Current design of the PAG site contemplates a PAG site with a footprint of only 25,000 ft^2, which will result in lower stormwater flow rates than the calculated estimate. The wastewater management system is designed based on the larger footprint and will therefore have excess capacity.

5.3 WATER MANAGEMENT DESIGN FOR ACCESS DRIFT

Since project activity began in September 2007, groundwater flows from the exploration access drift averaged 117 gpm (Table 5-1). (For comparison, flow from the portal was estimated at up to 120 gpm, based on the stormwater calculations summarized above and originally presented in the Niblack Wastewater Treatment and Disposal Application submitted in 2007 [RTR 2007a]). Groundwater is collected and treated in a series of treatment and water management systems. Settling pretreatment to reduce suspended solids from the underground construction drift water is achieved by collecting water near the portal exit in underground sumps. Should additional settling of suspended solids be needed in the future, a frac tank could be installed outside the portal entrance to receive drift water pumped from the sumps. Polymers could be added to a frac tank to facilitate flocculation and settling, as discussed below in Section 5.6.1.

From the portal, the drift wastewater is piped to the site settling ponds (Figure 1-3), where drift wastewater is mixed with discharge from the PAG facility.

5.4 WATER MANAGEMENT DESIGN FOR TEMPORARY PAG STORAGE SITE

The PAG temporary waste rock storage site is designed to an engineered capacity of 16,500 yd^3. An estimated volume of 14,300 yd^3 of PAG waste rock is anticipated if the underground drift were to be expanded to the full design length of approximately 6,000 ft (Table 3-2). Water management features at the PAG temporary storage site include 1) diversion ditches and/or dispersion terraces to intercept and re-route run-on from upgradient flows and runoff into heavily vegetated forest areas or back into existing channels; 2) an impermeable HDPE liner to isolate the PAG rock from the underlying soil and groundwater; and 3) routing PAG pile runoff and leachate to the PAG settling pond. As discussed in Section 3.1.2, per agreement with ADEC the PAG pile is uncovered to allow for large-scale kinetic testing and monitoring. Figure 1-4 presents a detailed view of the PAG facility. Figures 3-1 and 3-2 provide additional PAG facility design views. The original design drawings are presented in Appendix A.

The PAG/ML facility is designed such that direct precipitation, un-diverted upland run-on water, and leachate through the pile is collected and temporarily stored in a lined detention/sediment pond at the toe of facility. The PAG site detention/settlement pond is sized to store the 4,000 ft^3 of runoff from the design storm. The average daily discharge from the detention pond after the design storm was estimated to be 20 gpm. The pond will hold up to 50 gpm. Water collected in the detention/sediment pond is piped to the site settling ponds.

The PAG storage site is planned and designed to be temporary. At closure of the Niblack Exploration Project, the material will be moved back underground for final reclamation. No PAG material will be left above ground. This will mitigate potential surface water quality impacts. Reclamation and closure plans are presented in the Niblack Reclamation and Closure Plan 2012 Post-Construction Update (Integral 2012a).

5.5 WATER MANAGEMENT DESIGN FOR THE NAG STORAGE SITE

As described in Section 3, all NAG material produced during the initial drift construction was used in construction of site facilities, and no NAG material is currently stored in the NAG disposal area other than the stockpiled fines material. The NAG disposal area was designed to manage runoff as follows: 1) minimization by diverting upland run-on around the facility and using dispersion terraces to route the runoff into heavily vegetated forest areas or back into existing channels; 2) natural infiltration through the waste pile and the highly permeable talus substrate beneath it; 3) infiltration through the forest floor between the toe of the NAG pile and the sedimentation ponds; and 4) collection of surface runoff downgradient of the NAG site and intervening forest floor in sediment traps. Surface water run-on from areas upland of the NAG pile is diverted around the pile and discharged to the natural drainages. Precipitation, snowmelt and contact water runoff from the NAG pile are captured in downgradient sediment traps. Site layout details are shown in Figure 1-3. In Appendix A, Figure A-1 presents the as-built site facilities superimposed over the original designs.

For purposes of this design, it is assumed that the NAG site, if constructed, would have a footprint area of approximately 116,000 ft^2. For water management, stormwater runoff would control the sizing of treatment facilities for the NAG site. The design storm for storm runoff from the NAG site was based on the 25-year, 24-hour point precipitation of approximately 6.0 in. A conservative estimate of storm runoff was calculated assuming an NRCS runoff curve number of 90. Runoff from the 6.0-in. design storm for a curve number of 90 is 4.85 in. Applying this runoff to the 116,000 ft^2 of the NAG site resulted in a total potential runoff volume of approximately 47,000 ft^3 of water.

The NAG storage site is located over a talus slope northeast of the portal area (Figure 1-3 and Appendix A, Figure A-1). Pre-construction geochemical evaluations estimated that about 46,600 yd^3 of NAG waste rock material would be generated during construction (Table 3-3). Design plans specify that the pile would be built using a side hill construction approach from the bottom up at 1.5(H):1(V) to 1.3(H):1(V). The permeable foundation underneath the site would further enhance infiltration. Figures A-4 through A-10 reproduce the original facility design drawings presented in the original Niblack Solid Waste Landfill Application under the Waste Management Permit (NMC 2007a).

5.6 WATER TREATMENT FACILITY DESIGN

The water treatment facility includes paired settling ponds and a chemical mixing tank which are located north and east of the exploration drift (Figure 1-3). The settling ponds receive flows from the adit and from the PAG temporary storage area. Based on the 24-hour/25-year storm event, peak discharge from the exploration drift was estimated at a maximum of 120 gpm and peak discharge from the PAG facility was estimated at 20 gpm. Combined total peak discharge to the water treatment facility from the adit and PAG temporary storage facility was estimated at 140 gpm. Since project activity began in September 2007, groundwater flows from the exploration access drift averaged 117 gpm, runoff from the PAG facility averaged 3.3 gpm, and precipitation directly to the settling ponds averaged 2.9 gpm (Table 5-1).

Water would be pumped from the first pond through a mixing tank for treatment, if necessary, before entering the second pond for settling. If chemical treatment is needed, lime flocculent can be added to the tank to treat metals, reduce pH, and enhance settling. From the settling ponds, water is routed to the LAD system, where it is discharged through a network of low-flow emitters for infiltration into site soils and final polishing. All piping, chemical mix tanks, and facilities are designed so as to allow for routing inspections for leaks. No pond overflows are planned. However, in the event of unusual or unforeseen circumstances resulting in an accidental overflow, NPLLC would report such events to ADEC following requirements specified in the Permit.

5.6.1 Proposed Chemical Water Treatment

To date, low concentrations of trace elements in effluent water and passive treatment through settling and natural soil attenuation have controlled effluent water quality, and chemical water treatment has not been necessary. The water treatment plant was tested for effectiveness in September 2009 and is ready to begin the treatment of mine wastewater should the need arise. Water quality in the settling ponds is monitored at station EFF1, located at the outlet pipe to the LAD system (Figure 2-3). Additionally monitoring locations can be added upline of the chemical mixing tank and first settling pond as needed to guide and evaluate settling and chemical treatment operations.

Previous site owners, NMC, evaluated three wastewater treatment processes: settling only, lime polymer and chemical (flocculent) addition, and secondary filtration. The evaluation was presented in the Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a) and is summarized here.

NMC's water treatment process evaluation was based on treatability screening results for test work (bench-scale and pilot) performed at another mining project located in southeastern Alaska. The screening results are presented in Table 5-3. At the underground mine project used for the treatability tests, multiple polymers were evaluated for treatment efficiency (Table 5-3). Overall, both lime and ferric chloride were demonstrated to be effective settling agents at the pilot test project. The dosage was generally maintained at 0.2–0.4 lb/ton, and showed good settling effects at this relatively low dosage. The pilot studies conducted at the test project showed the most effective treatment process for mine construction-related drainage was the addition of ferric chloride, Betz 1100 polymer, and lime to optimize flocculation and treat varying water quality conditions likely to be encountered during construction of the portal and underground drift. While flows at the pilot testing program were much higher than anticipated for the Niblack Project during testing (up to 400 gpm), the treatment scheme was proven to be effective.

Chemical treatment and lime addition showed the following treatability results at the test project for key parameters:

- Cadmium – 33-50% removal
- Copper – 40-55% removal
- Nickel – 40-55% removal
- Silver – 33-50% removal
- Zinc – 70-90 % removal.

The treatment methods tested were considered appropriate for the Niblack Project based on available geochemical and acid-base accounting data for the rocks tested during drift excavation, and the time frame over which the project is expected to be operational. Analysis of waste rock geochemistry and potential for metals leaching and acid generation are presented in the Revised Niblack Project Underground Exploration Plan of Operations, (NMC 2007b) and the Operational Characterization Plan (Knight Piésold 2007a).

To assist determination of the relative projected water treatment needs for flows from the construction project, NMC evaluated representative water quality at the Niblack Project site vs. treatability results. Treatability simulations (desktop analyses) were performed based on the pilot test work discussed above, and compared against Alaska water quality criteria, as shown in Table 5-4. The table utilizes representative water quality from all the sample sites (6 stations) at Niblack monitored between October 1996 and February 2006. This analysis was designed to take into account seasonal fluctuations. Estimated treatment efficiencies used in the simulations show that water quality will be maintained at the site.

5.7 LAND APPLICATION/DISPERSION SYSTEM DESIGN

As described above in Section 5.6, the water treatment facility was originally designed to accommodate a combined peak flow from the exploration drift and PAG facility discharge of 140 gpm. Final construction layout of the LAD system involves 10 individual LAD zones spread over 2.9 acres, as shown on Figure 1-3. The size of the system as-built was designed for up to 300 gpm when fully operational. The original designs outlined in the Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a) described four application/dispersion zones, sized at about 1.5 to 2 acres each, for a total LAD system area of 6 to 8 acres. The original LAD layout is shown in Appendix A, Figures A-1 and A-5. LAD design calculations are presented in Appendix 2 to the original Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a).

As discussed in Section 5, ADEC approved an increase from the original wastewater discharge limit of 150 up to 300 gpm on December 31, 2009 (Nakanishi 2009, pers. comm.). Table 5-5 presents an estimate of the minimum LAD area needed to discharge the current maximum allowable discharge of 300 gpm. The estimated required acreage of 2.65 acres is less than the constructed size of the LAD system (2.9 acres).

The original calculations for land application were based on the following conceptual design criteria:

- Land application/dispersion rate = 6.0 in. (infiltration rate) over five acres (four 1.25-acre sites)
- Application rate using 1,400 drip emitters = 6 gallons per hour (gph)
- Application area = typically 1.25 acres depending on site geometry
- Application time = 24 hours
- Conveyance pipe = 6-in.-diameter HDPE.

Natural attenuation of metals in the site soils underlying the LAD system will not occur when the system is operated on flooded ground. The site is a wet environment with local bog-type meadows and pot-hole saturated depressions. The system must be observed to ensure that flooded conditions do not occur. If ground beneath the LAD system becomes oversaturated, the affected LAD zones must be rested to allow the discharge water to infiltrate into the site soils. Onsite percolation tests were performed at the site, as described in Appendix 2 to the Niblack Wastewater Treatment and Disposal Application (RTR 2007a). The four percolation test values ranged from 3.2 to 24 in./day. A design infiltration rate of 6 in./day was selected for design of the drip emitter systems. Review of published literature and NRCS information suggests that land application/attenuation criteria to forested areas with silty and sandy soils ranges from 2.4 to 7.2 in./day, which is within the proposed range for Niblack.

In early 2010, NPLLC staff incorporated several measures to reduce the possibility of freezing conditions or oversaturation preventing proper functioning of the LAD system. System improvements included replacing the existing LAD system emitters, which discharged at a rate of 6 gph, with higher-volume 12 gph emitters. Regular alternation of LAD zones was initiated to allow extra time for discharge water and precipitation to percolate through system soils. Additionally, a daily process of system checks has been initiated to monitor LAD system function. Upline of the LAD system, screen filters were installed to reduce clogging in the LAD emitters. Coil water heaters were also installed, for use during the winter, to prevent discharge water from freezing in the LAD lines.

5.7.1 Siting Considerations for Land Application/Attenuation Site

Topography and suitability considerations were addressed in siting land application areas for the Niblack property. Temperature and precipitation information were important site evaluation considerations. Land use in terms of proximity to water courses, wells, and other construction activities were evaluated. Other criteria for facilities siting included the following:

- Location of site with respect to point of wastewater collection and conveyance
- Compatibility with other potential uses at the site (facilities siting)
- Land ownership
- Proximity to wetlands and fish-bearing surface waters (wetlands were avoided in facilities siting and buffers were established around creeks)
- Soil and vegetation types
- Geology and potential connection with local groundwater
- Number and size of available land parcels for land application (rest/rotation).

The LAD zones include allowances for a 50-ft setback from active waterways and inclusion of compost windrows around the downside perimeters of the zones. The land application/attenuation facility was sited so as not to contribute to any nuisance conditions to adversely affect public health. Land application is conducted utilizing best practical methods, BMPs, and best available pretreatment and treatment processes.

6 WATER QUALITY MONITORING

The Niblack Water Quality Monitoring Plan 2012 Post-Construction Update (Integral 2012c) presents station coordinates, descriptions, and activity status, and purpose. This report also details sample collection methods, analytical procedures and requirements, monitoring schedules, and a visual monitoring program. Surface water, groundwater, and mine water quality monitoring locations are listed in Table 6-1 and shown on Figure 2-3. Currently active monitoring stations are shown in blue. Stations shown in green and orange were sampled to observe baseline and reference conditions and are no longer monitored on a regular basis. Generally, the points for evaluating compliance with site-specific natural condition criteria are downstream surface water sites and downgradient wetland groundwater sites.

Sampling and analysis of groundwater and surface water through Q2 2008 was performed as required by the Permit and as described in the Niblack Water Quality Baseline and Site Monitoring Plan (Knight Piésold 2007b) and QAPP (Integral 2007). In 2008, ADEC approved changes to the Permit requirements for sampling and analysis of groundwater and surface water (George 2008, pers. comm.). These changes included reduction in the location and frequency of surface water and groundwater monitoring, as well as a reduction in the analytical parameter list to include only those parameters needed to determine permit compliance and selected additional general water quality parameters needed to track trends in overall water quality. These changes were initiated beginning in Q3 2008 and are incorporated into the Niblack Water Quality Monitoring Plan (Integral 2012c).

Water quality monitoring results are reported and evaluated in reports that are submitted to ADEC on a regular schedule. A detailed review of baseline surface water and groundwater quality data collected during seven sampling events from 1996 though 2006 is presented in Niblack Water Quality Baseline and Site Monitoring Plan (Knight Piésold 2007b). Section 1.7.3 of the Niblack Permit 2006-DB0037 requires submittal of a comprehensive annual report to ADEC. The annual reports (Integral 2008, 2009, 2010, 2011a, 2012d) are comprehensive summaries of current and historical water quality. These reports include water quality monitoring results presented as time series plots, statistical analyses, screening against Alaska water quality standards, quality assurance and quality control evaluations, tabulated data, and visual monitoring logs. Quarterly reports (e.g., Integral 2011b) present water quality monitoring results for a given quarter. To date, 15 quarterly reports have been submitted to ADEC, beginning with Q3 2007. From Q3 2008 through Q2 2012, results of onsite waste rock kinetic tests and PAG pond monitoring were reported monthly (e.g., pHase 2011); NPLLC has requested permission to reduce reporting to quarterly beginning in Q2 2012.

As stated in the Niblack Waste Management Permit (2006-DB0037), Section 1.13, ADEC has determined that natural water quality in surface water and groundwater at the Niblack site exceeds water quality standards for parameters including pH, aluminum, cadmium, copper, lead, nickel, silver, and zinc. For this reason, site-specific natural condition-based water quality criteria have been established for the Niblack Project for surface water and shallow wetland groundwater. Specific procedures for establishing site-specific water quality parameters are specified in the QAPP (Integral 2007) and are based on ADEC's Guidance for the Implementation of Natural-Condition Based Water Quality (ADEC 2006).

6.1.1 Drift Monitoring

Monitoring within the underground exploration drift focuses on sources and inflows. Water should be observed frequently at various areas in the drift to evaluate flows from areas with the potential to produce elevated water quality parameters. During the period of active underground excavation (2007–2008), underground monitoring involved inspections of explosives storage areas and explosives handling equipment, as well as regular inspection of drill hole charging and blasting practices to determine the effectiveness of the explosives management procedures. Additional information on monitoring ammonia and nitrates during drift construction was provided in the Niblack Water Quality Baseline and Site Monitoring Plan (Knight Piésold 2007b).

7 REGULATORY REQUIREMENTS AND OPERATING PROCEDURES

7.1 REGULATORY REQUIREMENTS

The U.S. Environmental Protection Agency compiled the National Recommended Water Quality Criteria, which are pursuant to Section 304(a) of the Clean Water Act. The State of Alaska, ADEC, used these criteria to develop water quality standards under 18 AAC 70 and the Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances (ADEC 2008).

As stated in the Niblack Waste Management Permit (2006-DB0037), Section 1.13, ADEC has determined that natural water quality in surface water and groundwater at the Niblack site exceeds water quality for multiple parameters. For this reason, site-specific natural condition-based water quality criteria have been established for the Niblack Project for surface water and shallow wetland groundwater. Specific procedures for establishing site-specific water quality parameters are specified in the QAPP (Integral 2007) and are based on ADEC's Guidance for the Implementation of Natural-Condition Based Water Quality (ADEC 2006).

Surface water and groundwater monitoring is designed to determine compliance with site-specific water quality standards. The water quality monitoring program is summarized in Section 6 of this application and presented in detail in the Niblack Water Quality Monitoring Plan 2012 Post-Construction Update (Integral 2012c). As stated in the Permit, if site-specific water quality measures are exceeded, the cause of the exceedance will be determined. If natural occurrences cause the exceedance, as determined by ADEC, monitoring per the guidelines set forth in the monitoring plan will be implemented. If the exceedance is due to waste rock leachate, a plan for additional monitoring and remediation will be submitted to ADEC.

7.2 STANDARD OPERATING PROCEDURES

The wastewater management, treatment, and disposal system at Niblack are currently and will continue to be operated according to the following standard operating procedures (SOPs):

- **SOP #1** – Site staff will conduct visual monitoring of the entire water management area as described in the Niblack Water Quality Monitoring Plan 2012 Post-Construction Update (Integral 2012c). This consists of weekly examination of the LAD dispersal area for stress to vegetation and channelization or other signs of erosion, as well as visual monitoring of the entire facility for signs of damage or potential damage to waste piles, wastewater settlement/treatment and land application systems, roads, and stormwater management structures. A visual monitoring form/checklist is used for monthly checks, with regular reporting to ADEC as part of the annual reports. The primary objectives of the visual monitoring are to ensure all components of the wastewater management system are operating properly, to identify damage to facilities and equipment, and to identify and mitigate potential leaks.

- **SOP #2** – Monitoring of water quality will be performed as detailed in the Niblack Water Quality Monitoring Plan 2012 Post-Construction Update (Integral 2012c). This plan includes a description of compliance points for surface and groundwater monitoring that will be used to ensure the treatment system is meeting site-specific water quality standards.
- **SOP #3 –** NPLLC will conduct corrective action measures if damage to a facility is found such that environmental damage is likely to occur, or any violation of a permit condition is observed during monitoring or an inspection. Corrective action will follow measures described in the Niblack Water Quality Monitoring Plan 2012 Post-Construction Update (Integral 2012c).
- **SOP #4** – Site staff will record land application rates and report these to ADEC monthly. LAD system flow rates are also summarized in the annual reports.
- **SOP #5** – Water will not be spread or applied to land application areas when the ground is saturated. Application areas will be rotated and rested as-needed to avoid conditions of standing/pooling water. These rest periods are critical to prevent soil clogging and to maximize natural attenuation in site soils.
- **SOP #6** – Water will not be applied in quantities that will adversely affect vegetation.
- **SOP #7** – NPLLC will incorporate evaporative BMPs, snow and ice-making, and other water conservation practices into the overall water management strategy as needed and as practically feasible.
- **SOP #8** – Any potential oils and greases from machinery at the construction site will be separated and removed as pretreatment using absorbent material and/or mechanical separation.
- **SOP #9** – No water flow dispersion or diversion related to construction water management will create either a thermal barrier or flow barrier to existing anadromous fish movement, or exclusion of fish from the aquatic habitat at the site.
- **SOP #10** – Surface water run-on and run-off is to be controlled and vegetation removal at the LAD areas is to be minimized. Downgradient berms and compost rows may be used to limit run-on and run-off from the site. Typical BMPs for limiting erosion and sedimentation are shown in Revised Niblack Project Underground Exploration Plan of Operations (NMC 2007b).
- **SOP #11** – An operational and maintenance manual will be developed for the wastewater management system. The manual addresses water treatment methodology, monitoring and maintenance of the collection and piping system, monitoring and

maintenance of holding ponds and sediment ponds, zone rotation of application areas, and environmental monitoring and protocols.

- **SOP #12** – Upon completion of the exploration project, NPLLC will submit to ADEC a completion report including:
  - Total construction and adit water applied
  - Acre-inches per acre applied
  - Dewatering program water quality monitoring results, including upgradient and downgradient sites
  - Summary of potential effects of temporary land application on local land, vegetation, and water resources
  - Photo-documentation of temporary program results, efficiencies, and potential environmental issues
  - Submittal of appropriate land application and visual reporting forms.

Wastewater from the project is managed so as not to create a public health hazard or nuisance, or impact existing or future beneficial uses of groundwater and surface water. No underground sources of drinking water are located within 500 feet of the LAD site. The LAD system is bonded as part of the overall project reclamation financial assurance. Reclamation procedures and cost estimates are described in the Niblack Reclamation and Closure Plan 2012 Post-Construction Update (Integral 2012a).

8 REFERENCES

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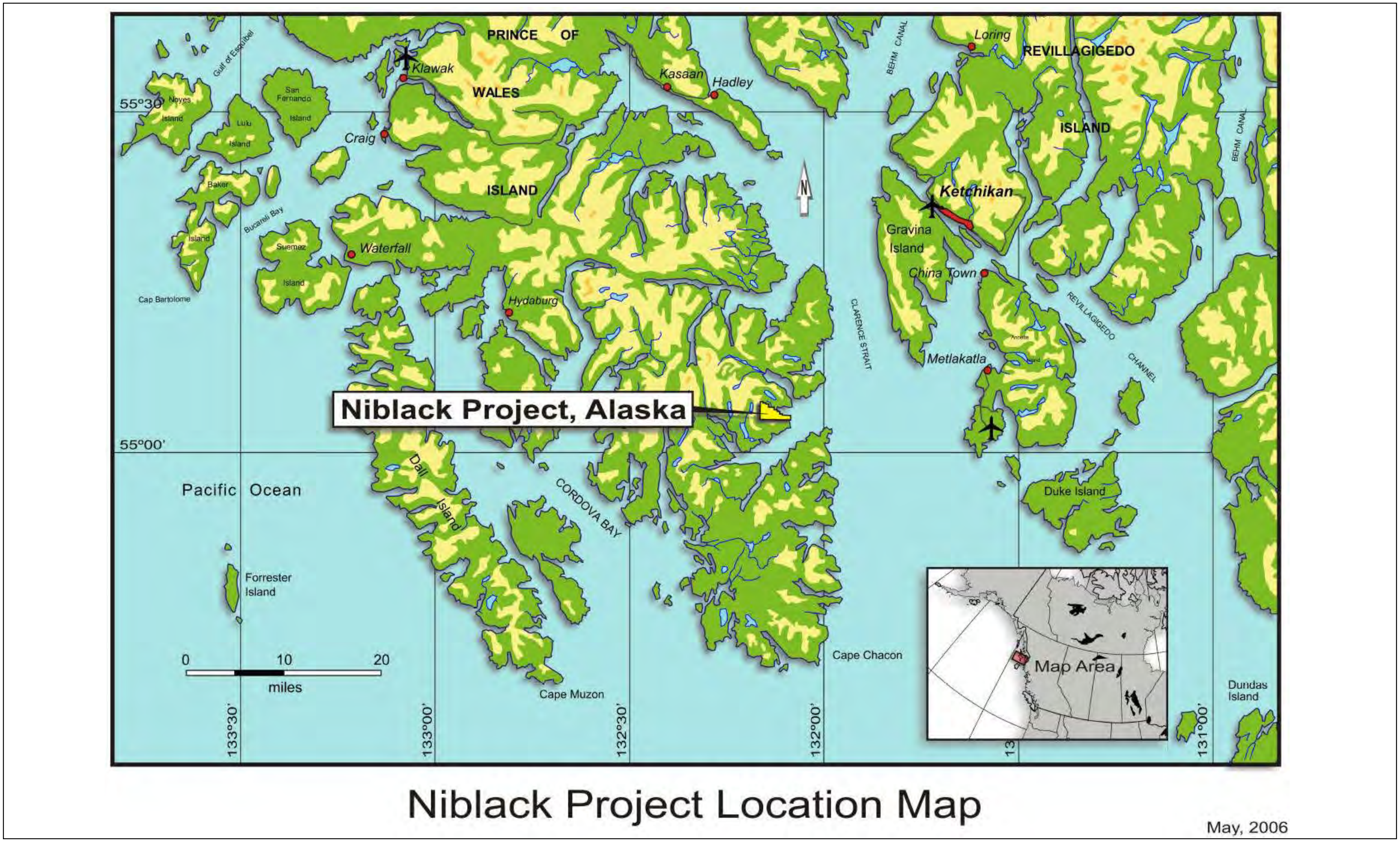
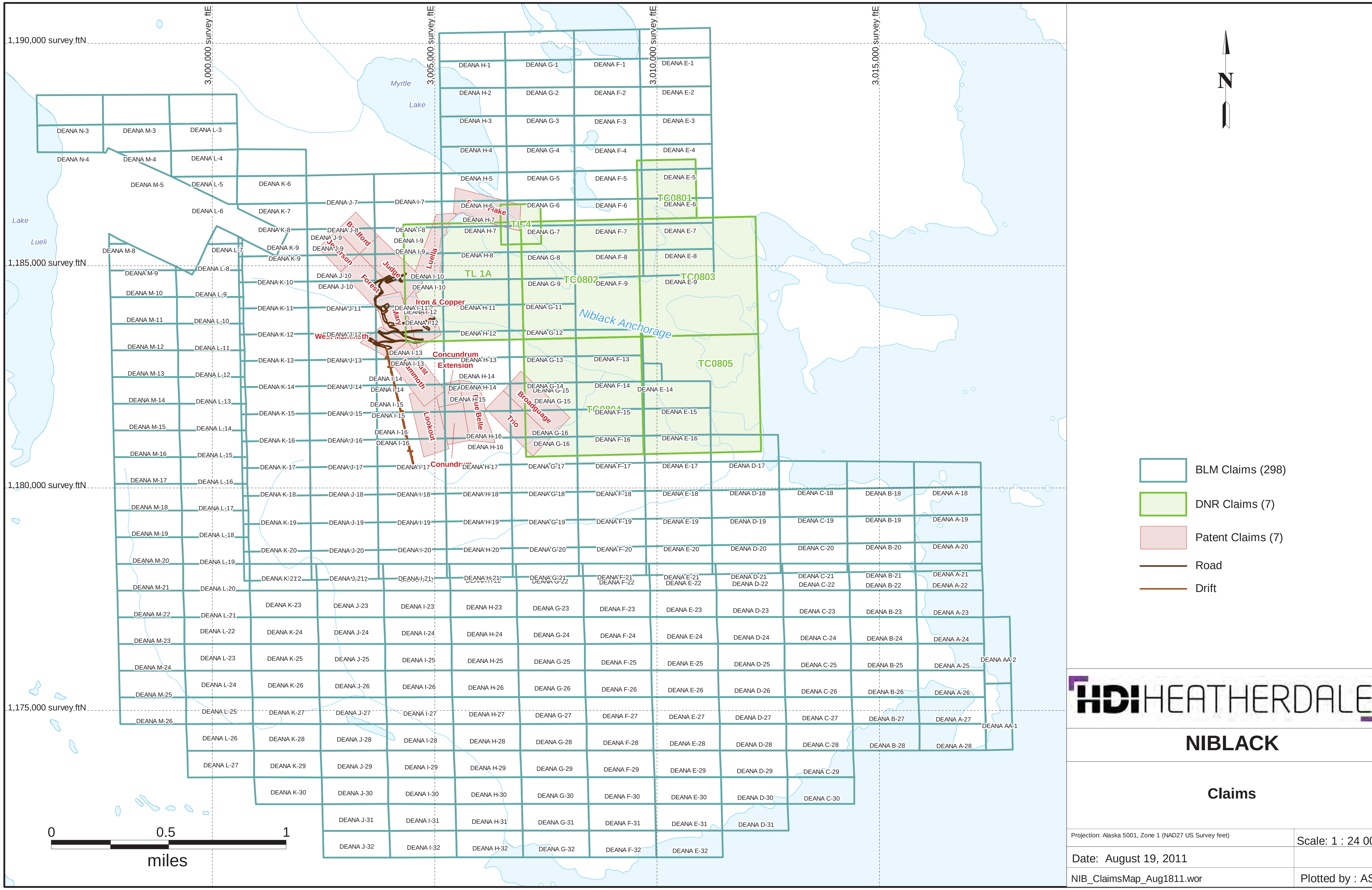
FIGURES



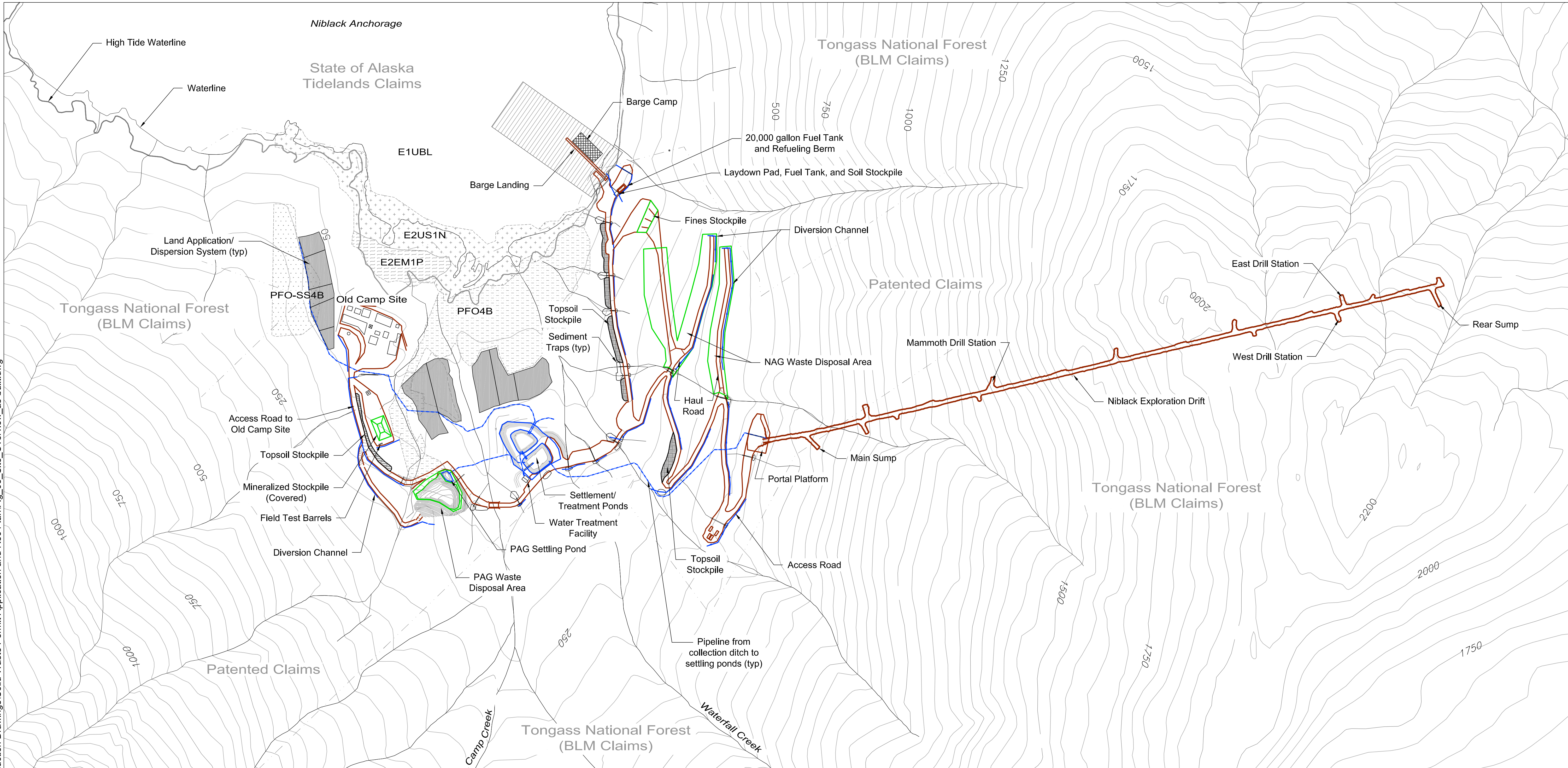
NIBLACK PROJECT LLC integral consulting inc.

Figure 1-1
Niblack Project Location Map
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update



NIBLACK PROJECT LLC integral consulting inc.

Figure 1-2
Claims Map
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update



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LEGEND

- E1UBL Estuarine - Subtidal
- E2US1N Estuarine - Unvegetated Intertidal
- E2EM1P Estuarine - Emergent Intertidal
- PFO-SS4B - Needleleaf Forest/Scrub - Shrub Wetland
- PFO4B - Needleleaf Forest Wetland
- Land Application Areas
- Tideland Lease Area
- Property/Patented Claim Boundary
- Waste Rock Storage Facilities
- Water Management Features
- Roads and Exploration Access Drift

NOTE

1. All dimensions and elevations are in feet unless otherwise noted

SOURCES

1. As-built drawings provided by Niblack Project LLC (2011)
2. Land application area boundaries from Turner (2009, personal communication)

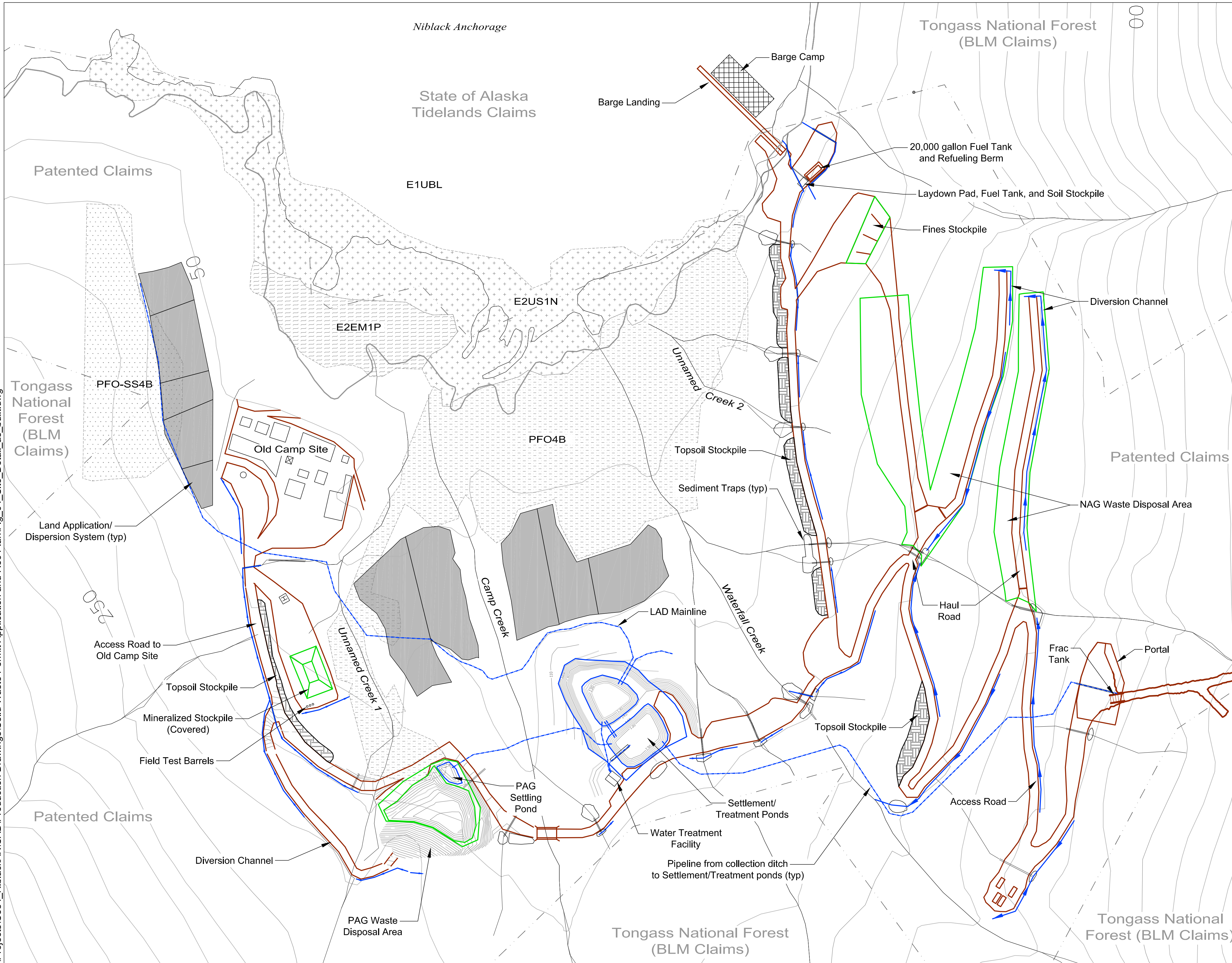
NIBLACK PROJECT LLC

integral consulting inc.

0 200 400 Feet

N

Figure 1-3
General Site Plan
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update



LEGEND

- E1UBL Estuarine - Subtidal
- E2US1N Estuarine - Unvegetated Intertidal
- E2EM1P Estuarine - Emergent Intertidal
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- PFO4B - Needleleaf Forest Wetland
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- Property/Patented Claim Boundary
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- Water Management Features
- Roads and Exploration Access Drift

NOTE

1. All dimensions and elevations are in feet unless otherwise noted

SOURCES

1. As-built drawings provided by Niblack Project LLC (2011)
2. Land application area boundaries from Turner (2009, personal communication)

P:\Projects\C384_NiblackAK\CAD\Production Drawings\Solid Waste Permit Application and Rec Plan\Fig_04_Site_Detail_as_built.dwg

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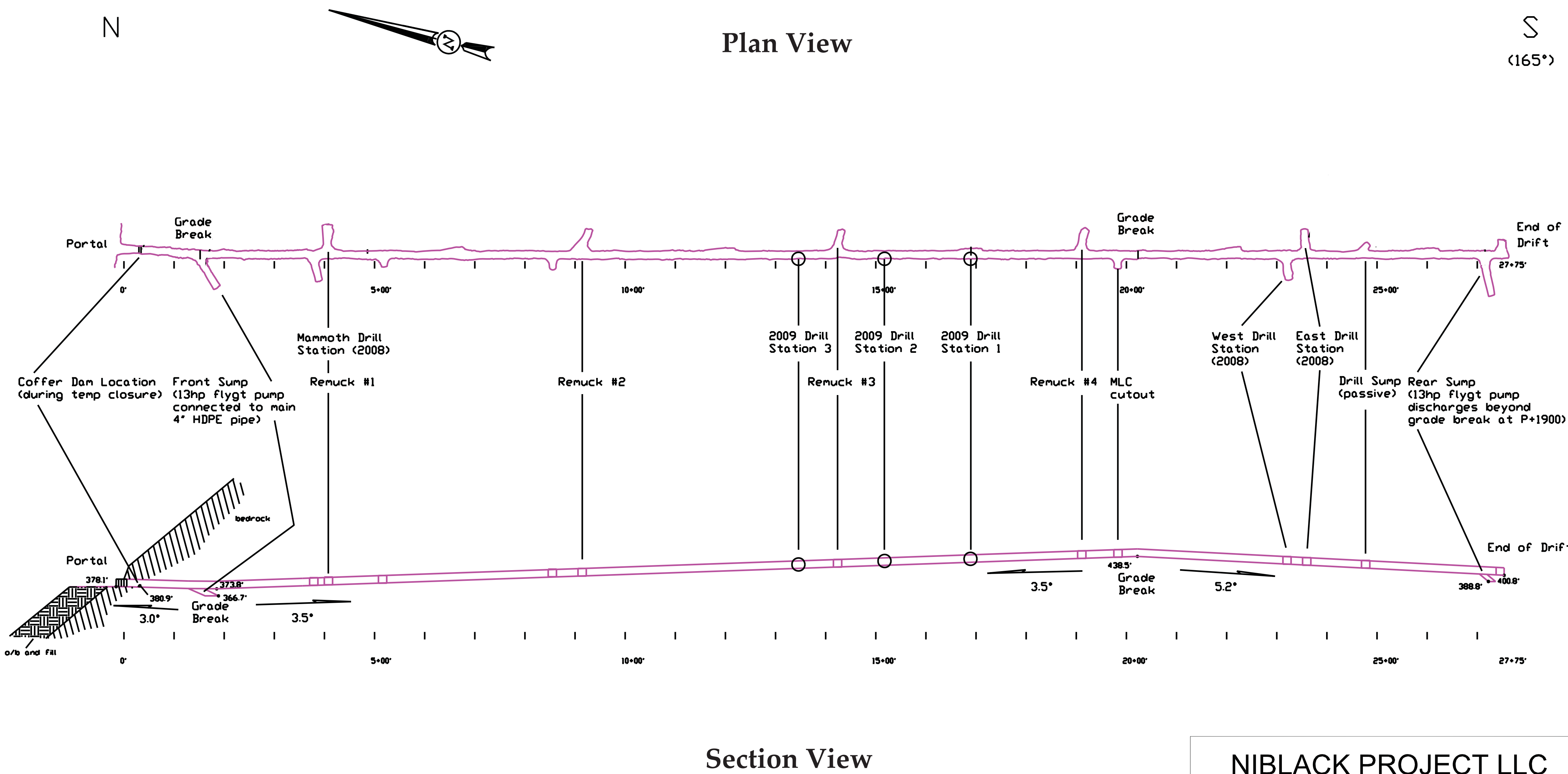
Figure 1-4
Site Plan Detail
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update



NIBLACK PROJECT LLC

Figure 1-5
Niblack Project Exploration Drift
Plan and Section Views

Scale in Feet: 0 50 100 150 200 400
Scale in metres: 0 125

DATE:	23 November 2009	MODIFIED BY:	A. Turner
DWG:	Portal_091123.dwg	SCALE:	1" : 300'

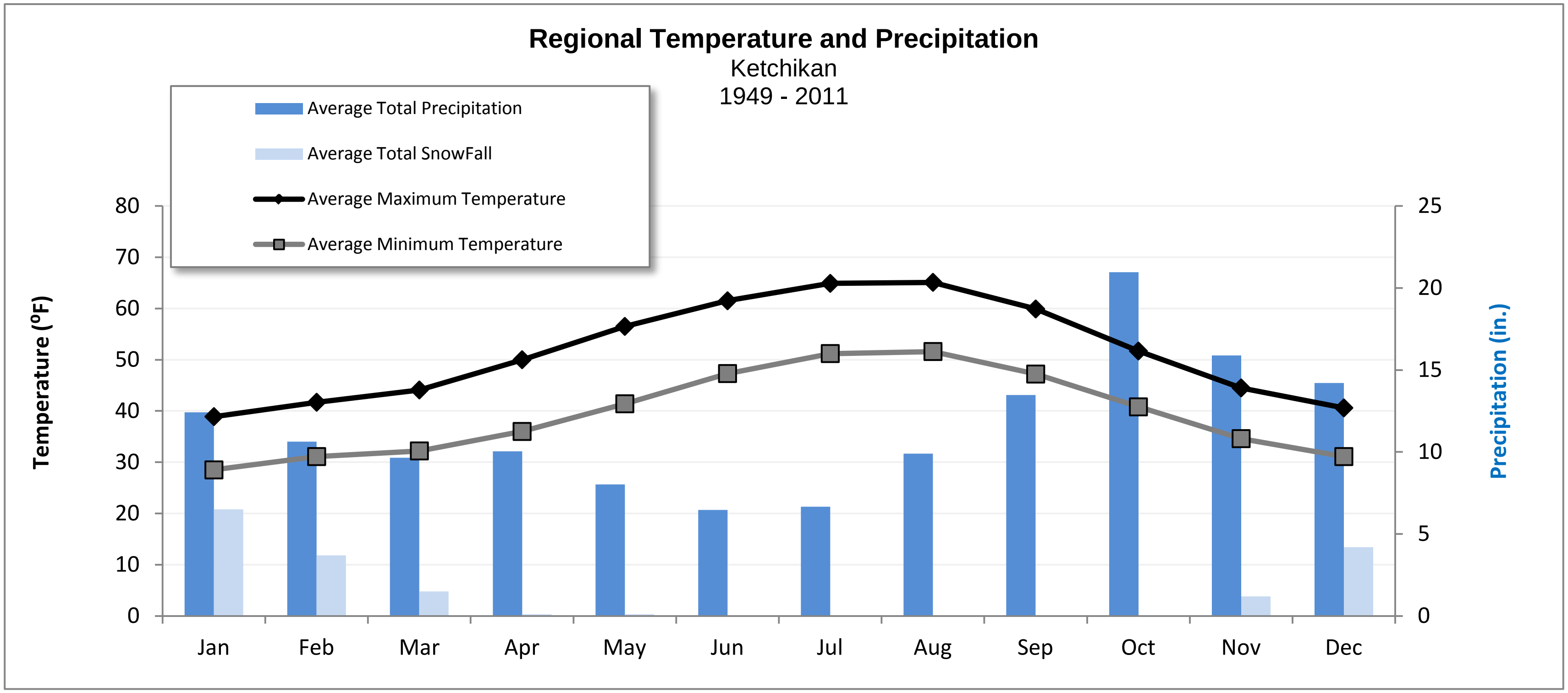


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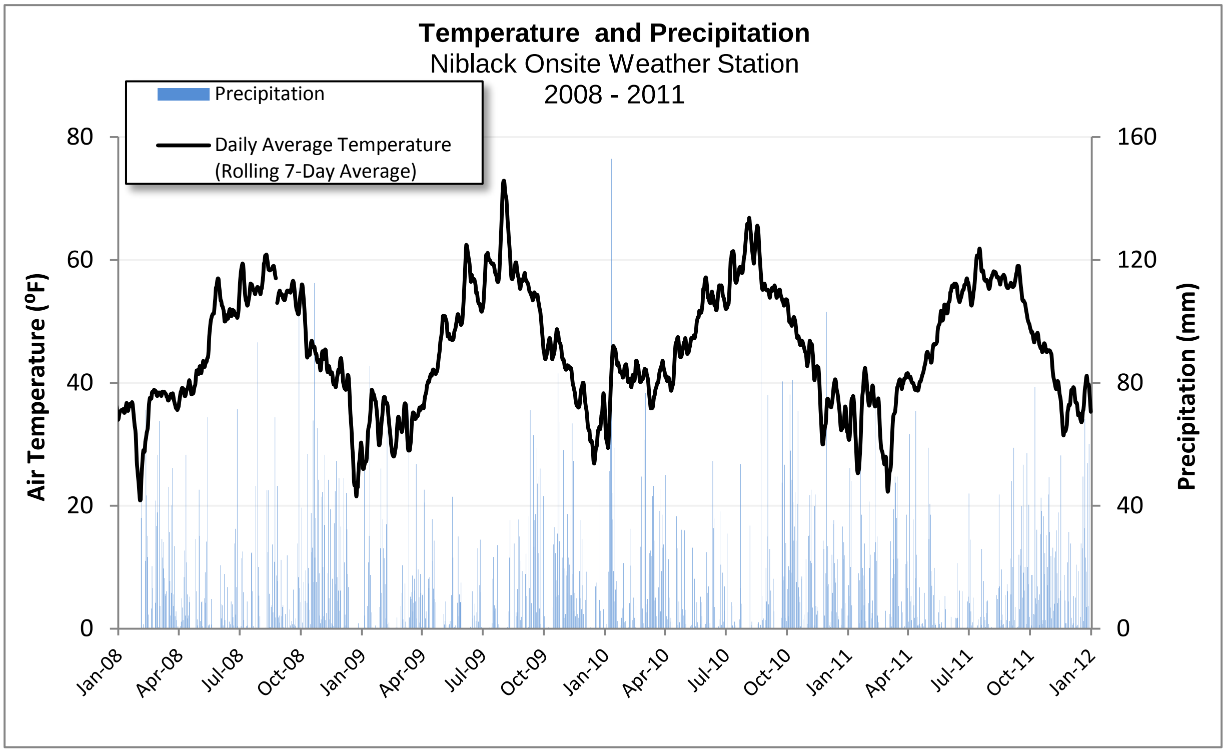
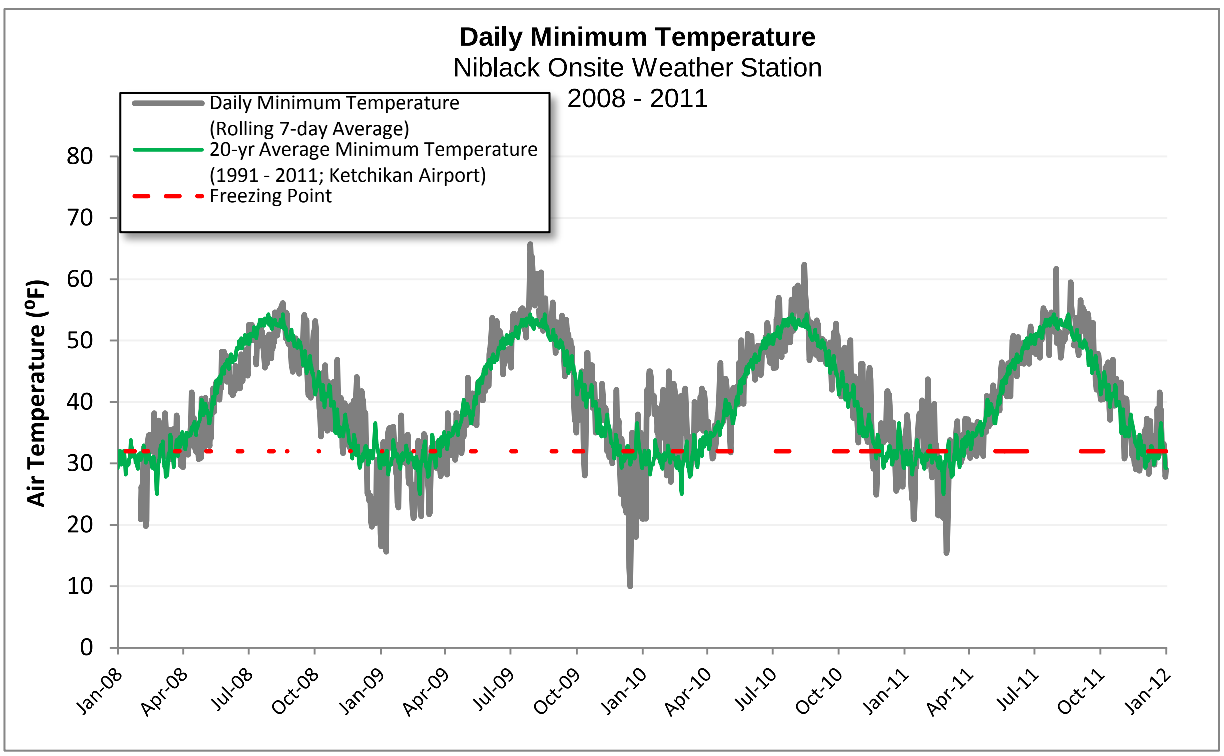
Figure 2-1
Regional Temperature and Precipitation
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update

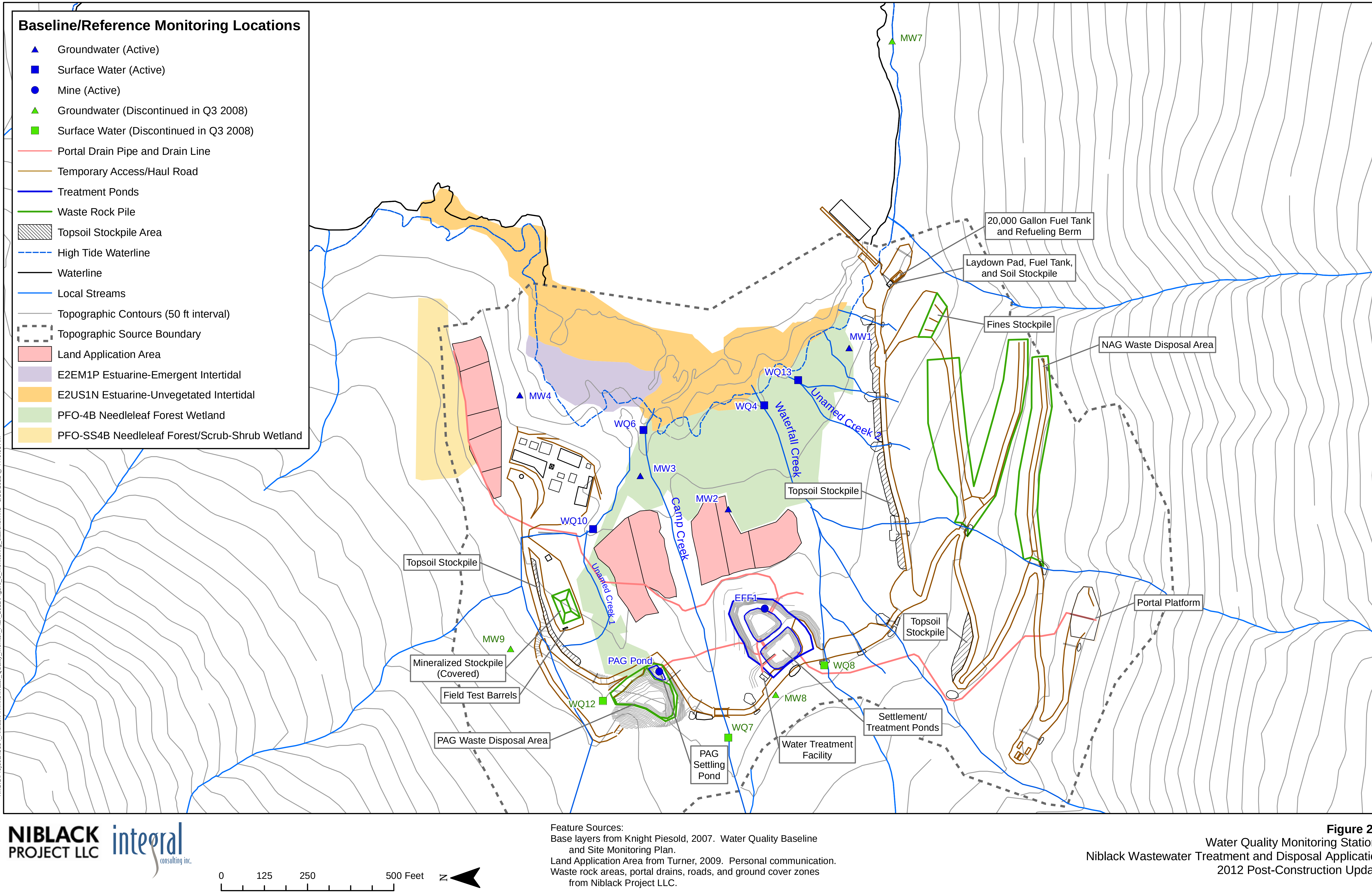




Note: Onsite weather station was not available from 9/18/2009 - 2/27/2009 due to instrument malfunction. Daily temperature and precipitation data for the Ketchikan Airport NOAA weather station are shown for this time period.

NIBLACK PROJECT LLC integral consulting inc.

Figure 2-2
Niblack Project Site Temperature and Precipitation
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update

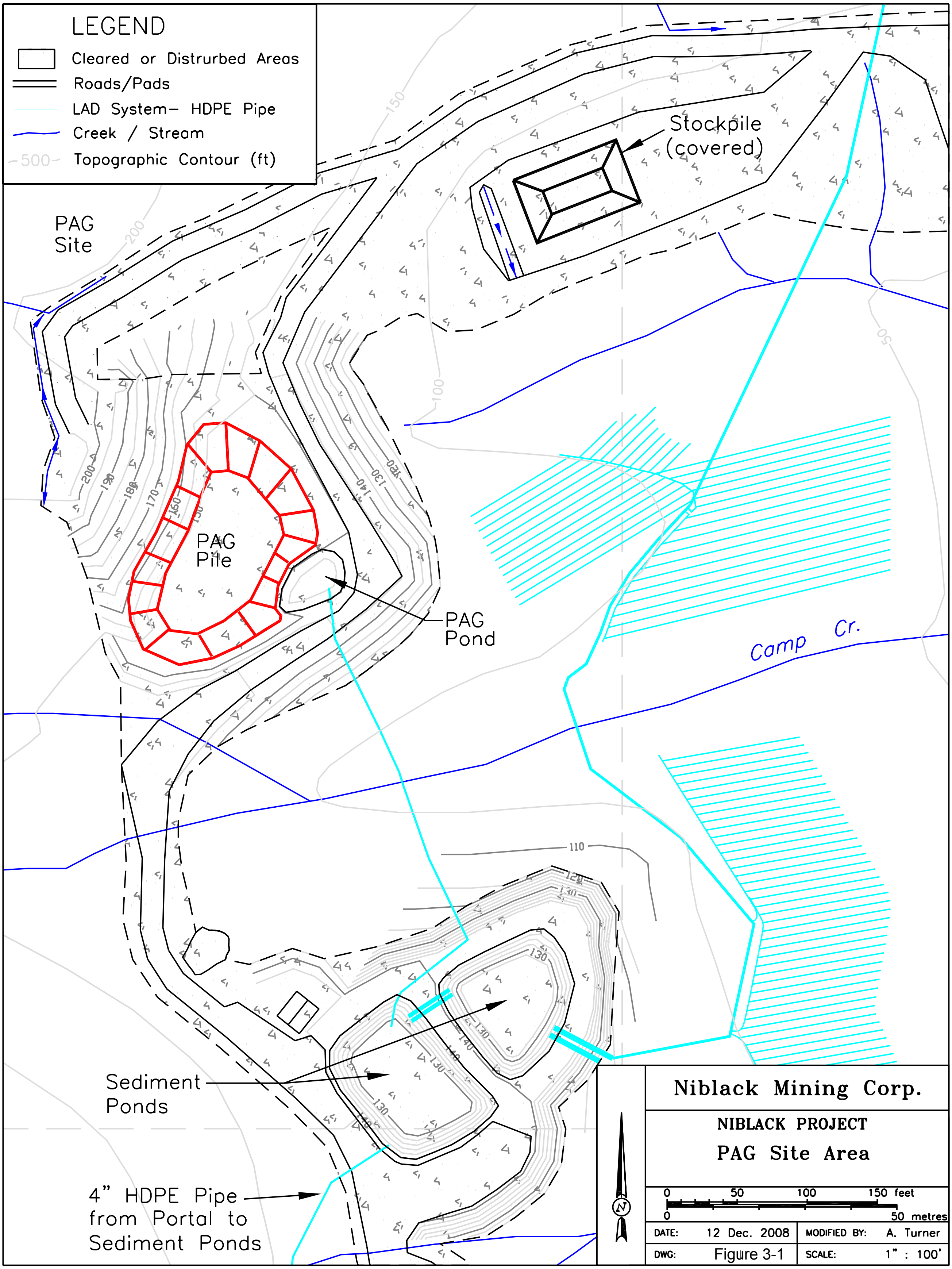


NIBLACK PROJECT LLC

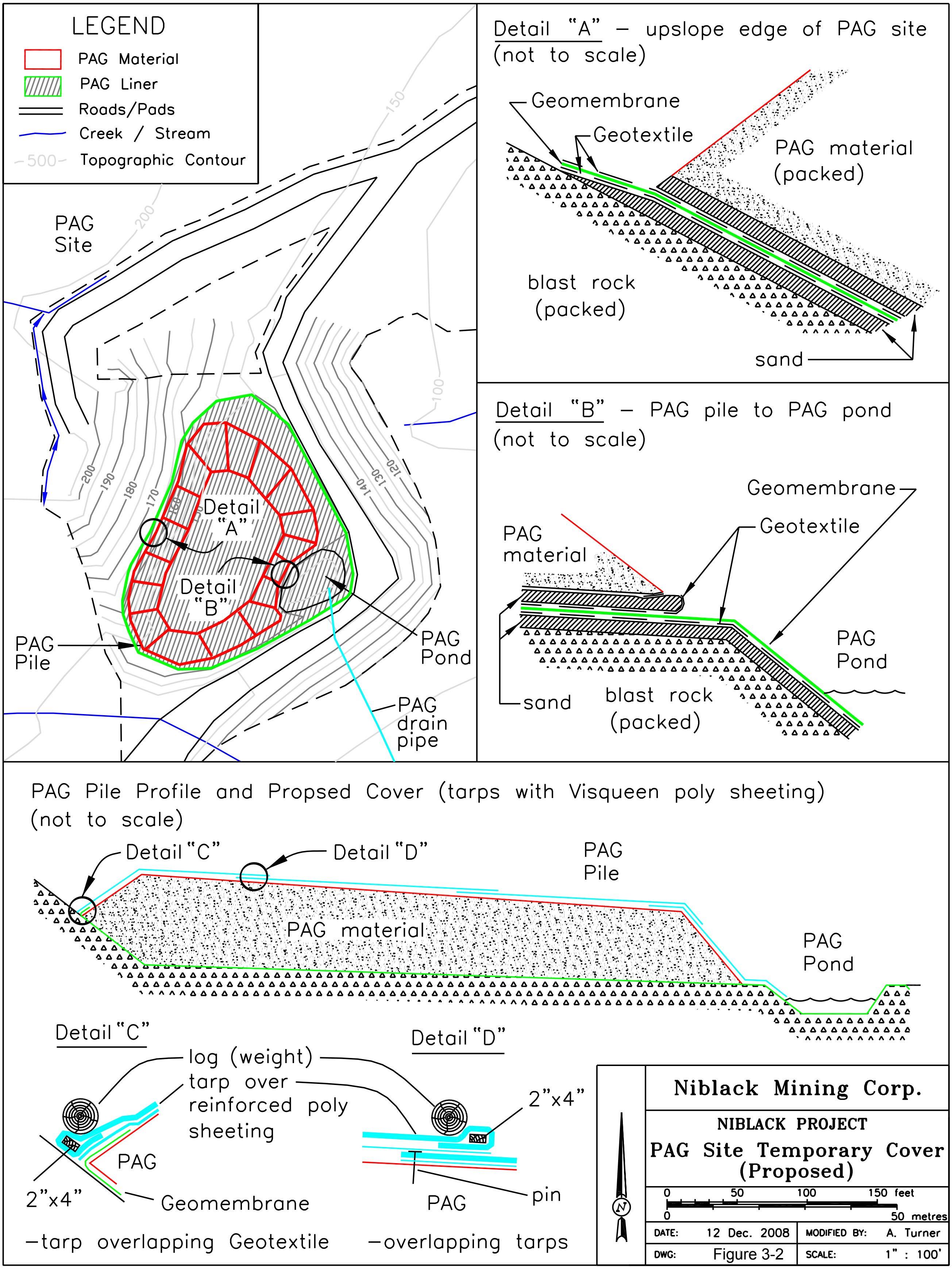
integral consulting inc.

Feature Sources:
Base layers from Knight Piesold, 2007. Water Quality Baseline and Site Monitoring Plan.
Land Application Area from Turner, 2009. Personal communication.
Waste rock areas, portal drains, roads, and ground cover zones from Niblack Project LLC.

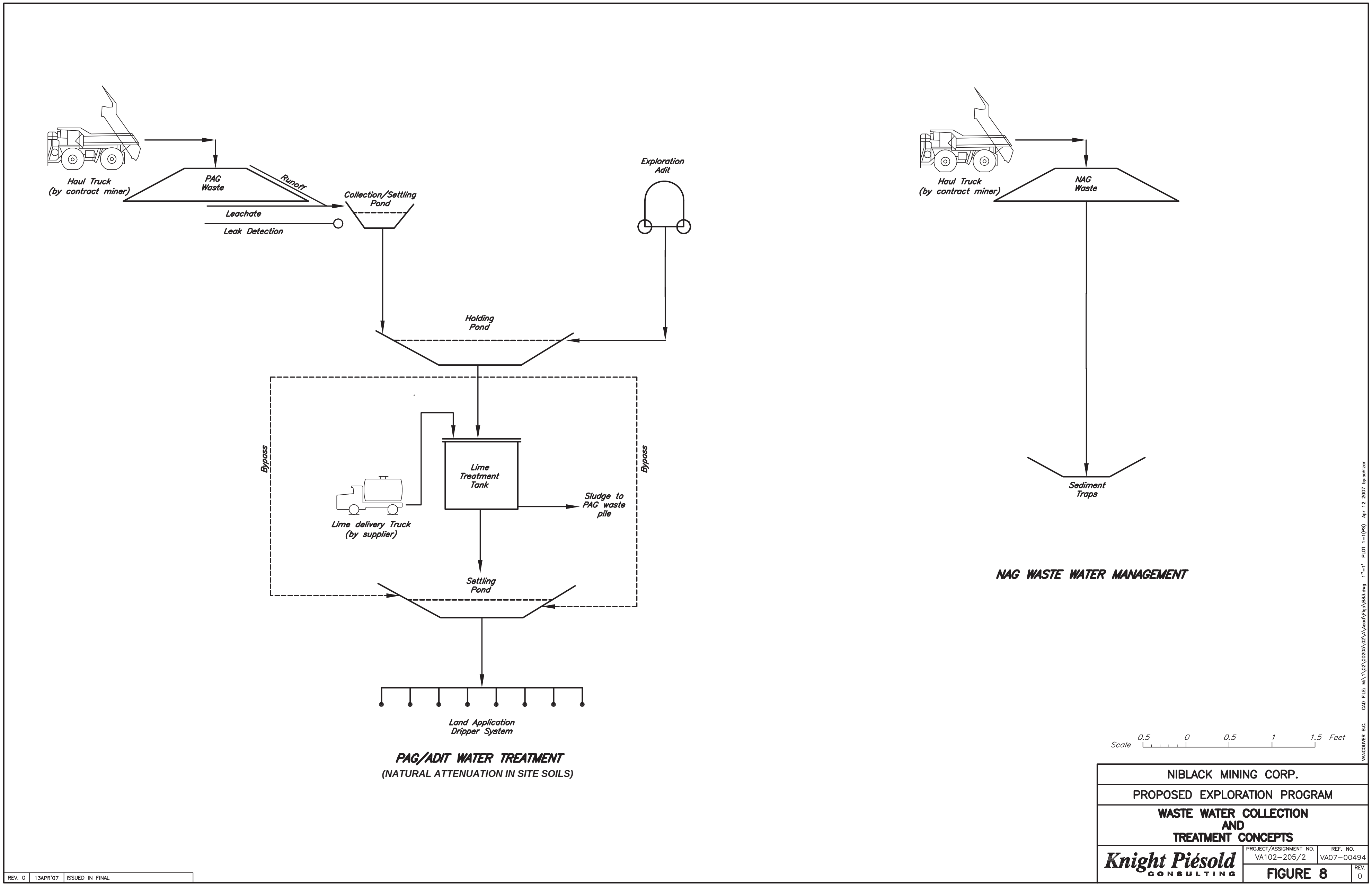
Figure 2-3
Water Quality Monitoring Stations
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update



LEGEND
Cleared or Distrurbed Areas
Roads/Pads
LAD System- HDPE Pipe
Creek / Stream
500
Topographic Contour (ft)
PAG Site
Stockpile (covered)
PAG Pile
PAG Pond
Camp Cr.
Sediment Ponds
4" HDPE Pipe from Portal to Sediment Ponds
Niblack Mining Corp.
NIBLACK PROJECT
PAG Site Area
0 50 100 150 feet
0 50 metres
DATE: 12 Dec. 2008
MODIFIED BY: A. Turner
DWG: Figure 3-1
SCALE: 1" : 100'



LEGEND
PAG Material
PAG Liner
Roads/Pads
Creek / Stream
500 Topographic Contour
PAG Site
150
200
100
200
190
180
170
160
150
140
130
120
Detail "A"
Detail "B"
PAG Pile
PAG Pond
PAG drain pipe
Detail "A" – upslope edge of PAG site
(not to scale)
Geomembrane
Geotextile
PAG material (packed)
blast rock (packed)
sand
Detail "B" – PAG pile to PAG pond
(not to scale)
Geomembrane
Geotextile
PAG material
PAG Pond
sand
blast rock (packed)
PAG Pile Profile and Propsed Cover (tarps with Visqueen poly sheeting)
(not to scale)
Detail "C"
Detail "D"
PAG Pile
PAG material
PAG Pond
Detail "C"
log (weight)
tarp over reinforced poly sheeting
PAG
2"x4"
Geomembrane
–tarp overlapping Geotextile
Detail "D"
2"x4"
PAG
pin
–overlapping tarps
N
Niblack Mining Corp.
NIBLACK PROJECT
PAG Site Temporary Cover (Proposed)
0 50 100 150 feet
0 50 metres
DATE: 12 Dec. 2008
MODIFIED BY: A. Turner
DWG: Figure 3-2
SCALE: 1" : 100'



NIBLACK PROJECT LLC

integral consulting inc.

Figure 3-3
Wastewater Collection and Treatment Concepts
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update

Niblack Construction Wastewater Treatment Conceptual Flow Chart

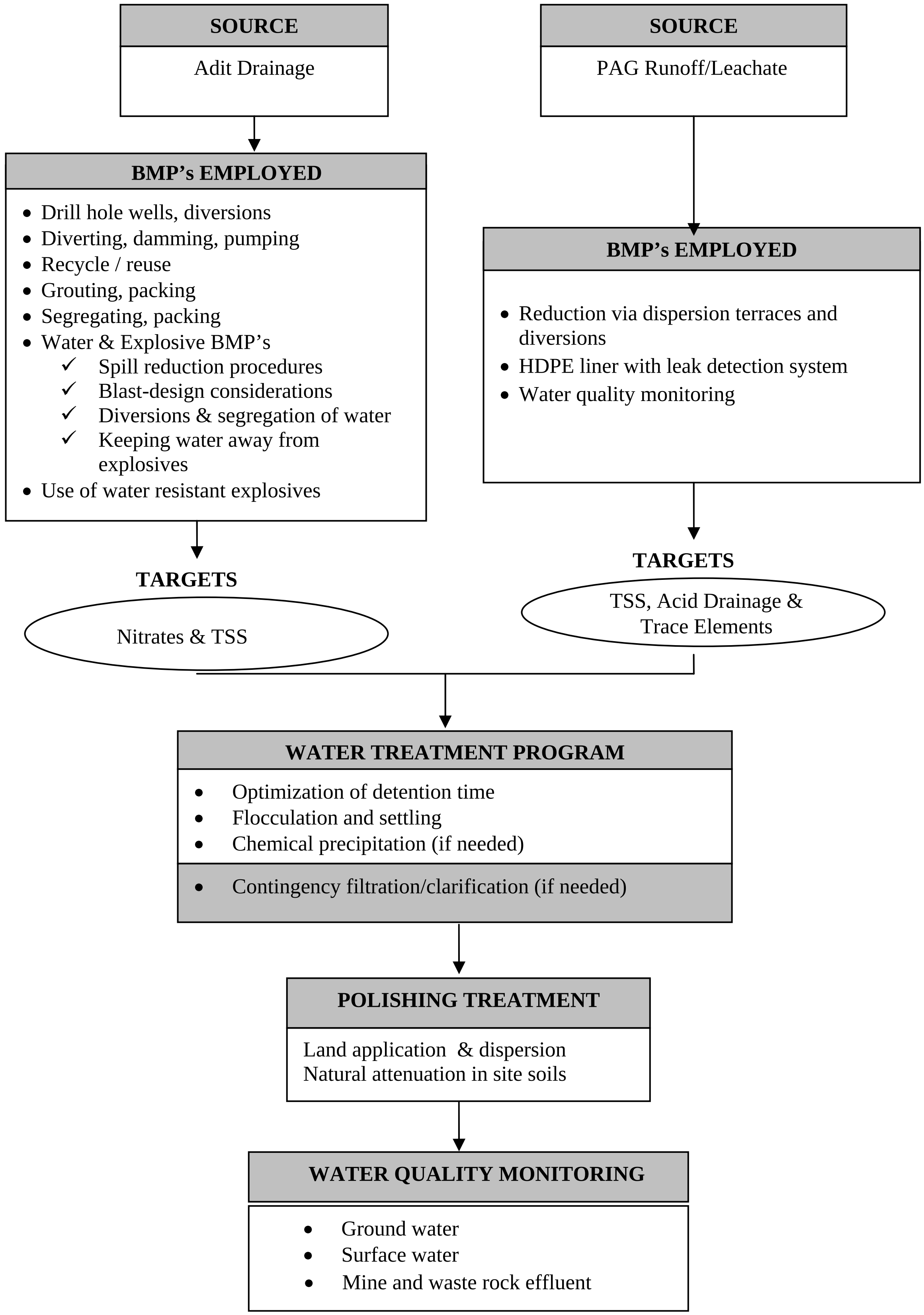


Figure 3-4
Niblack Construction Wastewater Treatment Conceptual Flow Chart
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update

TABLES

Table 1-1. Summary of Drilling at the Niblack Site, 1975 to 2011

Year	Company	# of Holes	Drilling Length (feet)
1975	Cominco	6	2,893
1978	Anaconda	1	1,132
1982-83	Noranda	18	8,536
1984-89	Lac	20	10,912
1992-93	Lac	14	15,712
1995	Abacus	19	12,755
1996	Abacus	45	34,612
1997	Abacus	37	36,373
2005	NMC	7	6,215
2006	NMC	32	27,369
2007	NMC	3	1,617
2008	CBG	25	19,765
2009	CBG	8	8,610
2009 - 2011	NPLLC	136	183,727

Source:

Drilling information from 1975 - 2006 reproduced from Table 2.2, Underground Exploration Plan of Operations (NMC 2007b)

Drilling information for 2007 from Niblack Underground Exploration Project Annual Report (Integral 2008)

Drilling information for 2008 - 2011 from Niblack Underground Exploration Project 2011 Annual Report (Integral 2012d)

Table 2-1. Monthly Climate Summary for Ketchikan, Alaska

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Maximum Temperature (°F)	38.9	41.7	44.1	50	56.5	61.5	64.9	65.1	59.9	51.7	44.5	40.6	51.7
Average Minimum Temperature (°F)	28.5	31.1	32.2	36	41.4	47.3	51.2	51.6	47.2	40.8	34.6	31.1	39.5
Average Total Precipitation (in.)	12.42	10.63	9.65	10.04	8.02	6.46	6.67	9.9	13.47	20.97	15.89	14.2	138.32
Average Total SnowFall (in.)	6.5	3.7	1.5	0.1	0.1	0	0	0	0	0	1.2	4.2	17.3

Data Source:
Western Regional Climate Center
Station 504590, Ketchikan, Alaska
Period of Record : 9/ 1/1949 to 12/31/2011
http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ak4590

Table 2-2. Summary of Camp Creek Streamflow

Date	2007	2008
	Manual Measurements Discharge (CFS)	
March 7	--	33.4
March 9	--	29.8
April 11	--	38.3
May 24	--	48.6
August 10	1.86[a]	--
August 11	0.5[a]	--
August 12	0.38[a]	--
August 17	1.79[a]	--
August 22	--	27.9
October 4	--	2.12
October 11	3.4[a]	--
November 3	3.55	--
November 10	32.9	--
November 11	4.07	--

Notes:
cfs = cubic feet per second
[a]Value represents average of multiple discharge estimates from same day measurements.

Table 2-3. Hydrology for Streams Near the Niblack Exploration Project

	Discharge (ft^3/s)			Discharge (m^3/s)			Unit Area Discharge ($L/s/km^2$)		
	Monthly Average	Monthly Maximum	Monthly Minimum	Monthly Average	Monthly Maximum	Monthly Minimum	Monthly Average	Monthly Maximum	Monthly Minimum
Stanley Creek, Craig, Alaska [a]									
January	380	896	24	10.8	25.4	0.7	80.6	189.9	5.1
February	348	636	16	9.9	18	0.4	73.8	134.8	3.4
March	263	436	102	7.5	12.4	2.9	55.8	92.5	21.7
April	384	1151	146	10.9	32.6	4.1	81.5	244	31
May	348	659	116	9.9	18.7	3.3	73.7	139.6	24.6
June	187	304	60	5.3	8.6	1.7	39.5	64.3	12.8
July	124	288	38	3.5	8.2	1.1	26.2	61	8
August	163	359	24	4.6	10.2	0.7	34.5	76.2	5
September	416	917	24	11.8	26	0.7	88.1	194.3	5
October	774	1546	276	21.9	43.8	7.8	164	327.6	58.6
November	552	1374	147	15.6	38.9	4.2	117	291.2	31.1
December	472	1133	113	13.4	32.1	3.2	100.1	240.2	23.9
Indian Creek, Hollis, Alaska [b]									
January	81	235	4	2.3	6.7	0.1	100	291.4	4.9
February	75	151	5	2.1	4.3	0.1	93	186.7	6.5
March	62	110	14	1.8	3.1	0.4	77	135.8	17
April	99	160	34	2.8	4.5	0.9	122.9	198.7	41.5
May	112	204	32	3.2	5.8	0.9	139	253.5	40
June	63	159	3	1.8	4.5	0.1	78	196.7	4.2
July	28	68	9	0.8	1.9	0.3	34.9	84.9	11.4
August	40	77	4	1.1	2.2	0.1	50.1	95.1	4.5
September	75	112	28	2.1	3.2	0.8	92.7	138.3	34.2
October	159	286	59	4.5	8.1	1.7	196.6	354.4	73.3
November	117	198	50	3.3	5.6	1.4	144.6	246	61.6
December	119	192	27	3.4	5.4	0.8	148.1	238.6	33.3
Cabin Creek, Kasaan, Alaska [c]									
January	88	100	77	2.5	2.8	2.2	109.4	123.4	95.5
February	108	112	104	3.1	3.2	2.9	133.4	138.4	128.4
March	33	35	31	0.9	1	0.9	40.5	42.9	38.1
April	62	63	61	1.7	1.8	1.7	76.2	77.4	75.1
May	63	86	40	1.8	2.4	1.1	78.3	106.7	49.8
June	70	105	39	2	3	1.1	86.6	129.5	47.7
July	31	47	15	0.9	1.3	0.4	38.7	57.6	18.1

Table 2-3. Hydrology for Streams Near the Niblack Exploration Project

	Discharge (ft^3/s)			Discharge (m^3/s)			Unit Area Discharge ($L/s/km^2$)		
	Monthly Average	Monthly Maximum	Monthly Minimum	Monthly Average	Monthly Maximum	Monthly Minimum	Monthly Average	Monthly Maximum	Monthly Minimum
August	25	39	9	0.7	1.1	0.2	30.5	48.2	10.8
September	64	82	48	1.8	2.3	1.3	78.8	101	58.9
October	156	208	104	4.4	5.9	3	193.4	257.6	129.3
November	121	149	92	3.4	4.2	2.6	149.6	185.1	114.2
December	149	166	132	4.2	4.7	3.7	184.7	205.4	164
Myrtle Creek, Prince of Wales Island, Alaska [d]									
January	--	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--
May	--	--	--	1.9	2	1.8	145.1	152.8	137.5
June	--	--	--	2.2	4.2	1.9	168.1	320.9	145.1
July	--	--	--	1.8	2.3	1.6	137.5	175.7	122.2
August	--	--	--	1.8	2.8	1.3	137.5	213.9	99.3
September	--	--	--	1.7	1.7	1.7	129.9	129.9	129.9
October	--	--	--	--	--	--	--	--	--
November	--	--	--	--	--	--	--	--	--
December	--	--	--	--	--	--	--	--	--

Notes:

[a] Station No. 15081500, Elevation 2.0, 55deg48minutes, 133degress07minutes, Drainage area 51.60 miles
Period of record: October 1964 - September 1981

[b] (Station No. 1324141, Elevation 52', 55026', 132041', Drainage Area 8.82 $miles^2$) 22.84 km^2
Period of record: July 1949 - September 1964

[c] (Station No. 15085300, Elevation 5', 55025', 132028', Drainage Area 8.83 $miles^2$) 22.87 km^2
Period of record: June 1962 - September 1964

[d] (Elevation 5', 55deg4', 132deg07', Drainage Area 5.1 $miles^2$) 22.87 km^2
Period of record: May 1997 - September 1997

-- = Data not available.

Source:
Data reproduced from Tables 3.1, 3.2, 3.3, and 3.4, Underground Exploration Plan of Operations (NMC 2007b).

Table 3-1. Volumes of Potentially Acid-Generating and Non-Acid-Generating Waste Rock Produced during Excavation of the Niblack Exploration Drift

Description	Volume Generated (cubic yards)	Volume Generated (tons)	Drift Length (linear feet)	Number of Blast Rounds	Primary Composition	Notes
PAG Waste Rock	5,346	8,995	447	39	Sulfide mineralization within the Lookout Rhyolite and related footwall alteration	Stored in temporary PAG facility
Mineralized Ore Stockpile	574	965	48	4	Lookout Rhyolite	Well-mineralized PAG material stockpiled for potential future testing; stored adjacent to temporary PAG facility
NAG Waste Rock	33,400	56,200	2,793	243	Mafic volcanic rocks and mafic dykes	All NAG materials were used in site construction
Totals	**39,320**	**66,160**	**3,288**	**286**		

Source: Monthly Report. December 2011. Uncovered (PAG) Waste Rock Storage Facility, Monitoring Program.
Niblack Project, Alaska. Report prepared for Niblack Project LLC. pHase Geochemistry, Vancouver, BC. February 29, 2012.

Notes:
NAG = non-acid-generating
PAG = potentially acid generating

Table 3-2. Estimated Volumes of Potentially Acid-Generating Waste Rock Produced by the Niblack Exploration Drift

	2007 Volume Estimates from Design Plans								
			Chemical Analyses				PAG Rock[a]		
Unit	Tunnel Length (ft)	PAG[a] NP/MPA <3 (number samples)	NAG[b] NP/MPA >3 (number samples)	PAG[a] (%)		Tunnel Length (ft)	Volume in-situ[c] (ft^3)	Volume in-situ[d] (yd^3)	Volume as waste[e] (yd^3)
Hanging Wall	4,440	6	52	10%		459	86,810	3,247	4,383
Lookout	275	11	15	42%		116	21,989	822	1,110
Foot Wall	1,225	14	7	67%		817	154,350	5,773	7,793
Totals:	5,940	31	74	- -		1,392	263,149	9,842	14,300[f]

Source:
The waste rock estimates presented here are reproduced from Table 1 of the Niblack Project Operational Characterization Plan (Knight Piésold 2007a).

Notes:

[a] PAG = Potentially acid-generating/potentially metals-leaching rock, defined as: (neutralizing potential) / (maximum potential acidity) <= 3.

[b] NAG = Non-acid-generating rock, defined as: (neutralizing potential) / (maximum potential acidity) >3

[c] Nominal 13.5 X 14 ft tunnel dimension - multiply linear footage totals by 189 to get cubic footage (unbroken).

[d] Volume in cubic yards = cubic ft * 0.0374.

[e] Waste volume assumes 45% expansion of waste relative to in-situ volume.

[f] Adjusted for additional expansion factor.

Table 3-3. Estimated Volumes of Non-Acid-Generating Waste Rock Produced by the Niblack Exploration Drift

	2007 Volume Estimates from Design Plans								
		Chemical Analyses					**NAG Rock[b]**		
Unit	**Length Tunnel (ft)**	**PAG[a] NP/MPA <3 (number samples)**	**NAG[b] NP/MPA >3 (number samples)**	**NAG[b] (%)**		**Tunnel Length (ft)**	**Volume in-situ[c] (ft^3)**	**Volume in-situ[d] (yd^3)**	**Volume as waste[e] (yd^3)**
Hanging Wall	4,440	6	52	90%		3,981	752,350	28,138	37,986
Lookout	275	11	15	58%		159	29,986	1,121	1,514
Foot Wall	1,225	14	7	33%		408	77,175	2,886	3,897
Totals:	5,940	31	74	- -		4,548	859,511	32,146	**46,600[f]**

Source:
The waste rock estimates presented here are reproduced from Table 1 of the Niblack Project Operational Characterization Plan (Knight Piésold 2007a).

Notes:
[a] PAG = Potentially acid-generating/potentially metals-leaching rock, defined as: (neutralizing potential) / (maximum potential acidity) <= 3.
[b] NAG = Non-acid-generating rock, defined as: (neutralizing potential) / (maximum potential acidity) >3
[c] Nominal 13.5 X 14 ft tunnel dimension - multiply linear footage totals by 189 to get cubic footage (unbroken).
[d] Volume in cubic yards = cubic ft * 0.0374.
[e] Waste volume assumes 45% expansion of waste relative to in-situ volume.
[f] Adjusted for additional expansion factor.

Table 4-1. Key Components of Underground Water Management

Water Management Approach	Planned BMPs
Sample water from active work areas	Keep high nitrogen waters separate. Treat separately or pipe for reuse. Mix with low nitrogen waters. Monitor water quality as listed in the Niblack Water Quality Monitoring Plan 2012 Post-Construction Update (Integral 2012c).
Overall source control	Determine mixed water quality. Evaluate options for treatment, dilution, or nitrogen elimination.
Water and construction management	Separate and divert water for reuse or other options (drilling, road watering, other). Coordinate water and explosives management; water and explosives management options may not be easily separated.

Source:
This table is a slightly modified version of Table 3 of the Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a).

Notes:
BMP = best management practice

Table 4-2. Explosives and Water Management BMPs for Underground Lookout Unit Construction

Potential Storage, Transfer, and Loading Losses	**Planned BMPs to Mitigate Impacts**
1. General spillage of explosives during storage and loading. Ammonium nitrate mixed w/fuel oil makes ANFO. ANFO can be loaded in large diameter holes, pneumatic deliver, and sealed bag form.	Train employees in explosives handling. Provide properly maintained storage and loading equipment, and ensure employees are trained. Encourage good-housekeeping and providing cleanup equipment and supplies to remove and dispose of spilled explosives.
2. Bulk explosives may spill out of poorly designed or damaged bins and transfer augers. Spills from bulk emulsion type explosives (if used) can occur at storage tank outlets and at pump-transfer areas.	Locate bulk-explosive bins or storage tanks in dry areas allowing easy cleanup and no dissolution. Storage areas and loading equipment will be inspected and maintained regularly to prevent explosive spills and to facilitate clean-up.
3. Improper handling and loading practices can cause a significant amount of explosive spillage.	Provide training to upgrade loading procedures and associated spillage of explosives during transfer and loading into blastholes.
4. If an entire bag of explosives is not used at the end of a loading procedure, spillage can occur.	Ensure that the bags are properly sealed and returned to storage to reduce spillage of any remaining explosives.
5. During loading, explosives are sometimes ejected from the hole as blowback. Blasting shock and pressure can blow away the collar of adjacent firing holes. Explosives within these collar regions are cut off and end up undetonated in the shot rock.	Prevent overloading of drill holes by establishing minimum open collar lengths.
6. Loading explosives into wet or damp holes can dissolve and desensitize explosives and cause partial or total failure to detonate.	See water management BMPs later in this discussion. Prior to explosives loading, blowing out water in drill holes with compressed air. Use water resistant explosives.

Source:

Table reproduced from Table 4 of the Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a).

Notes:

BMP = best management practice

Table 5-1. Niblack Exploration Project Water Flow Volumes, 2007 – 2011

Year	Month	Adit Flow (gal)	PAG Runoff (gal)	Direct Precipitation (gal)	Flow to LAD System (gal)	Portal Flow (gpm)	PAG Runoff (gpm)	Direct Precipitation (gpm)	Flow to LAD System (gpm)
2007	September	-	-	-	-	-	-	-	-
	October	89,280	-	-	342,080	2	-	-	8
	November	331,200	-	142,352	473,552	8	-	3	11
	December	267,840	-	156,704	-	6	-	4	-
2008	January	923,138	5,423	4,426	-	21	0	0	-
	February	918,720	140,486	121,550	423,834	23	3	3	11
	March	982,080	208,243	180,813	1,371,136	22	5	4	31
	April	1,562,400	96,699	85,415	1,746,514	36	2	2	40
	May	2,115,072	104,122	90,406	2,309,600	47	2	2	52
	June	3,033,893	107,375	93,231	3,234,500	70	2	2	75
	July	4,315,694	133,080	115,551	4,564,325	97	3	3	102
	August	4,609,457	153,146	132,973	4,895,575	103	3	3	110
	September	4,273,104	115,185	100,012	4,488,300	99	3	2	104
	October	3,416,630	299,458	260,012	3,976,100	77	7	6	89
	November	1,932,900	271,492	234,044	1,932,900	45	6	5	45
	December	514,500	79,381	68,432	514,500	12	2	2	12
2009	January	909,673	139,375	120,151	1,169,200	20	3	3	26
	February	1,900,759	92,661	79,880	2,073,300	47	2	2	51
	March	2,374,606	149,239	128,655	2,652,500	53	3	3	59
	April	2,186,859	120,587	103,954	2,411,400	51	3	2	56
	May	1,923,299	76,904	66,297	2,066,500	43	2	1	46
	June	2,328,634	51,967	44,799	2,425,400	54	1	1	56
	July	2,512,114	43,170	37,216	2,592,500	56	1	1	58
	August	2,692,699	99,675	85,927	2,878,300	60	2	2	64
	September	4,493,402	271,042	233,657	4,998,100	104	6	5	116
	October	6,793,690	194,252	167,459	7,155,400	152	4	4	160
	November	8,558,062	223,428	192,610	8,974,100	198	5	4	208
	December	7,149,228	142,300	122,672	7,414,200	160	3	3	166
2010	January	7,327,766	239,805	206,729	7,774,300	164	5	5	174
	February	8,605,501	82,972	71,528	8,760,000	213	2	2	217
	March	9,202,702	282,104	243,194	9,728,000	206	6	5	218
	April	9,125,046	124,729	107,525	9,357,300	211	3	2	217
	May	9,279,383	39,696	34,221	9,353,300	208	1	1	210
	June	8,088,966	123,644	106,590	8,319,200	187	3	2	193
	July	6,860,095	55,640	47,966	6,963,700	154	1	1	156
	August	8,268,126	87,093	75,081	8,430,300	185	2	2	189
	September	7,994,709	182,104	156,987	8,333,800	185	4	4	193
	October	9,228,185	316,269	272,646	9,817,100	207	7	6	220
	November	8,689,276	217,137	187,187	9,093,600	201	5	4	211
	December	6,318,029	158,894	136,978	6,613,900	142	4	3	148

Table 5-1. Niblack Exploration Project Water Flow Volumes, 2007 – 2011

Year	Month	Adit Flow (gal)	PAG Runoff (gal)	Direct Precipitation (gal)	Flow to LAD System (gal)	Portal Flow (gpm)	PAG Runoff (gpm)	Direct Precipitation (gpm)	Flow to LAD System (gpm)
2011	January	6,842,917	165,076	142,307	7,150,300	153	4	3	160
	February	8,103,109	126,790	109,302	8,339,200	201	3	3	207
	March	8,405,986	194,469	167,646	8,768,100	188	4	4	196
	April	8,435,083	122,668	105,749	8,663,500	195	3	2	201
	May	8,493,017	115,293	99,391	8,707,700	190	3	2	195
	June	9,626,275	34,599	29,827	9,690,700	223	1	1	224
	July	9,032,587	78,200	67,414	9,178,200	202	2	2	206
	August	8,282,926	70,499	60,775	8,414,200	186	2	1	188
	September	8,339,317	231,454	199,529	8,770,300	193	5	5	203
	October	5,039,835	258,135	222,530	5,520,500	113	6	5	124
	November	4,291,840	163,775	141,185	4,596,800	99	4	3	106
	December	3,850,972	195,228	168,300	4,214,500	86	4	4	94

Notes:
LAD system flows measured at an automatic flow meter at the outlet from the settling ponds to the LAD system.
PAG pile runoff and leachate calculated based on the monthly rainfall measured at the site multiplied by the PAG pile surface area (17,400 ft^2).
Direct precipitation to the site settling ponds calculated based on the monthly rainfall measured at the site multiplied by the settling pond surface area (15,000 ft^2).
Discharge from the underground exploration drift adit calculated as the total LAD system flow minus the sum of the PAG and direct precipitation flows.

- = no data available
gpm = gallons per minute
LAD = land application/dispersion system
PAG = potentially acid generating

Table 5-2. Offsite Drainage Basin Characteristics

Basin	Description	Basin Area (acres)	Peak Runoff from 5-in Precipitation Event (cfs)	Preliminary Estimate for Culvert or Diversion Ditch
A	Unnamed drainage north of PAG temporary storage area	21.13	12.1	24-inch diameter culvert
B	PAG temporary storage area	1.18	0.9	Trapezoidal channel, 2-ft bottom width, 2:1 side slopes, 0.5 ft deep
C	Camp Creek	359	206.2	2 x 48-inch diameter culverts
D	North Waterfall Creek	65.13	37.4	36-inch culvert
E	South Waterfall Creek	43.59	25.03	36-inch culvert
F	Unnamed drainage east of portal area	45.91	26.37	36-inch culvert
G	NAG Disposal Area	24.58	18.48	Trapezoidal channel, 3-ft bottom width, 2:1 side slopes, 1 ft deep

Source:
Table reproduced from Table 5 of the Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a).

Notes:
cfs = cubic feet per second

Table 5-3. Representative Water Treatment Screening Matrix

Process	Effectiveness	Pre-treatment Required	Relative Cost	Advantages	Disadvantages
Chemical Precipitation - Clarification					
Lime	Good	No	Medium	Ease of operation, cost, stable sludge	Various optimum pH for metals
Caustic	Good	No	Medium	Same + liquid	Hazardous, diff sludge
Ferric chloride	Excellent	No	Medium/ High	Tested	High maintenance, selective
$Mg(OH)_2$	Varies	No	Medium	Less hazardous liquid	Only low pH, expensive
Conventional Filter	Solids removal only	Yes	Low	Low Tech	Coarse filter
GAC	Medium	Yes	Very High	Low tech	Limited effectiveness, regeneration
RO	Medium	Yes	Very High	Low tech	Brine disposal, membrane life

Source:
Table reproduced from Table 6 of the Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a).

Table 5-4. Treatability Simulations for NMC Water Management Program

Key WQ Parameter	WQ Criteria (µg/L)[a]	Existing WQ @ Niblack (µg/L)	Treatment Efficiency	WQ (µg/L) Results[b]
Cadmium (Cd)	0.52	0.048	33%	0.024
Copper (Cu)	3.8	1.6	40%	0.08
Nickel (Ni)	145	1	40%	≅0.5
Silver (Ag)	0.37	<0.02	33%	≅0.02
Zinc (Zn)	37	<5.0	70%	≅2.5
pH		5.2	NA	NA

Source:

Table reproduced from Table 7 of the Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a).

Notes:

[a] Hardness dependent – Cd, Cu, Ni, Aquatic Life Chronic Criteria
[b] All parameters meet state water quality standards

NMC = Niblack Mining Corporation
WQ = water quality

Table 5-5. Land Application/Dispersion System Size Calculations

Parameter	Parameter Description	Current Discharge Limit		Original Design Flow	
LAD Flow	Constant value	300	gpm	140	gpm
Minutes per Day	Constant value	1440	min/day	1440	min/day
Acre-Foot/Gallon Conversion	Constant value	3.069E-06	acre ft/gal	3.069E-06	acre ft/gal
Infiltration Rate	Measured	0.5	ft/day	0.5	ft/day
Application Rate	Calculated : Design Flow x Minutes per Day x Conversion	1.33	acre ft/day	0.62	acre ft/day
LAD Acreage Needed	Calculated : Application Rate / Infiltration Rate	2.65	acres	1.24	acres

Notes:

ADEC approved an increase from the original wastewater discharge limit of 150 up to 300 gpm on December 31, 2009 (Nakanishi 2009, pers. comm.).

Calculations based on initial design flows of 140 gpm initially presented in Appendix 2 to in the Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a).

Infiltration rates determined through on-site percolation tests as described in Appendix 2 to in the Niblack Wastewater Treatment and Disposal Application submitted in 2007 (RTR 2007a).

gpm = gallons per minute
LAD = land application/dispersion system

Table 6-1. Water Quality Monitoring Stations

Monitoring Point	Location	Coordinates (NAD27, UTM Zone 8N) Easting	Northing	Status	Purpose: Pre-project Reference Conditions	Compliance Location	Information Only	Post-closure Monitoring
Effluent								
EFF1	Settling ponds at point of discharge to LAD	682103.6	6105572.1	Active			X	
PAG	PAG leak detection system	--	--	Active (no water) [c]			X [c]	
PAG Pond	PAG leachate/runoff capture pond	682046.3	6105664.3	Active			X	
Surface Waters								
WQ1	Off-site at Deer Pasture Creek – downstream	684358.0	6104664.0	Inactive			X	
WQ2	Off-site at Lookout Creek – downstream	683575.0	6105162.0	Inactive			X	
WQ3	Off-site at Myrtle Creek – downstream	683179.0	6105980.0	Inactive			X	
WQ4	Waterfall Creek – downstream	682283.3	6105575.9	Active	X	X		X
WQ8	Waterfall Creek – upstream	682054.7	6105518.6	Active	X			
WQ5	Camp Creek – middle reach of creek	682054.7	6105518.6	Inactive	X			
WQ6	Camp Creek – downstream	682259.5	6105682.2	Active	X	X		
WQ7	Camp Creek – upstream	681989.1	6105602.1	Discontinued [a]	X			
WQ10	Unnamed Creek 1 – downstream	682171.0	6105725.0	Discontinued [a]	X	X		
WQ12	Unnamed Creek 1 – upstream	682019.5	6105713.6	Discontinued [a]	X			
Seep	Unnamed Creek 1 – upstream groundwater seep	682306.0	6105546.4	Inactive	X			
WQ13	Unnamed Creek 2 – downstream	682306.0	6105546.4	Active	X			X
WQ14	Unnamed Creek on South side of Lookout Mountain	682955.0	6101933.0	Discontinued [b]			X	X
Groundwater Wells								
MW1	Wetlands below NAG site	682335.3	6105502.0	Active	X	X [d]		X
MW2	Wetlands below settling ponds and LAD area	682191.0	6105606.0	Active	X	X [d]		X

Table 6-1. Water Quality Monitoring Stations

Monitoring Point	Location	Coordinates (NAD27, UTM Zone 8N)		Status	Purpose			
		Easting	Northing		Pre-project Reference Conditions	Compliance Location	Information Only	Post-closure Monitoring
MW3	Wetlands below PAG site and LAD area	682219.1	6105684.2	Active	X	X [d]		X
MW4	Wetlands below and LAD area	682288.0	6105792.0	Active	X	X [d]		X
MW7	Wetlands – offsite and to the east of the project	682607.0	6105469.0	Discontinued [a]	X			
MW8	Upgradient of LAD area and MW3	682028.0	6105561.0	Discontinued [a]			X [e]	
MW9	Upgradient of and LAD area and MW4	682064.0	6105796.0	Discontinued [a]			X [e]	
GW1	Pre-existing drill hole	682134.0	6105711.0	Inactive	X			
GW2	Upgradient of and LAD area and MW6	682178.0	6105640.0	Inactive	X			

Notes:

ADEC = Alaska Department of Environmental Conservation

LAD = land application/dispersion

NAG = non-acid generating

PAG = potentially acid-generating

[a] Removed from the water quality monitoring network subsequent to Q3 2008, as per agreement with ADEC.

[b] Monitoring at station WQ14 was discontinued following collection of 20 baseline samples in the second quarter of 2012.

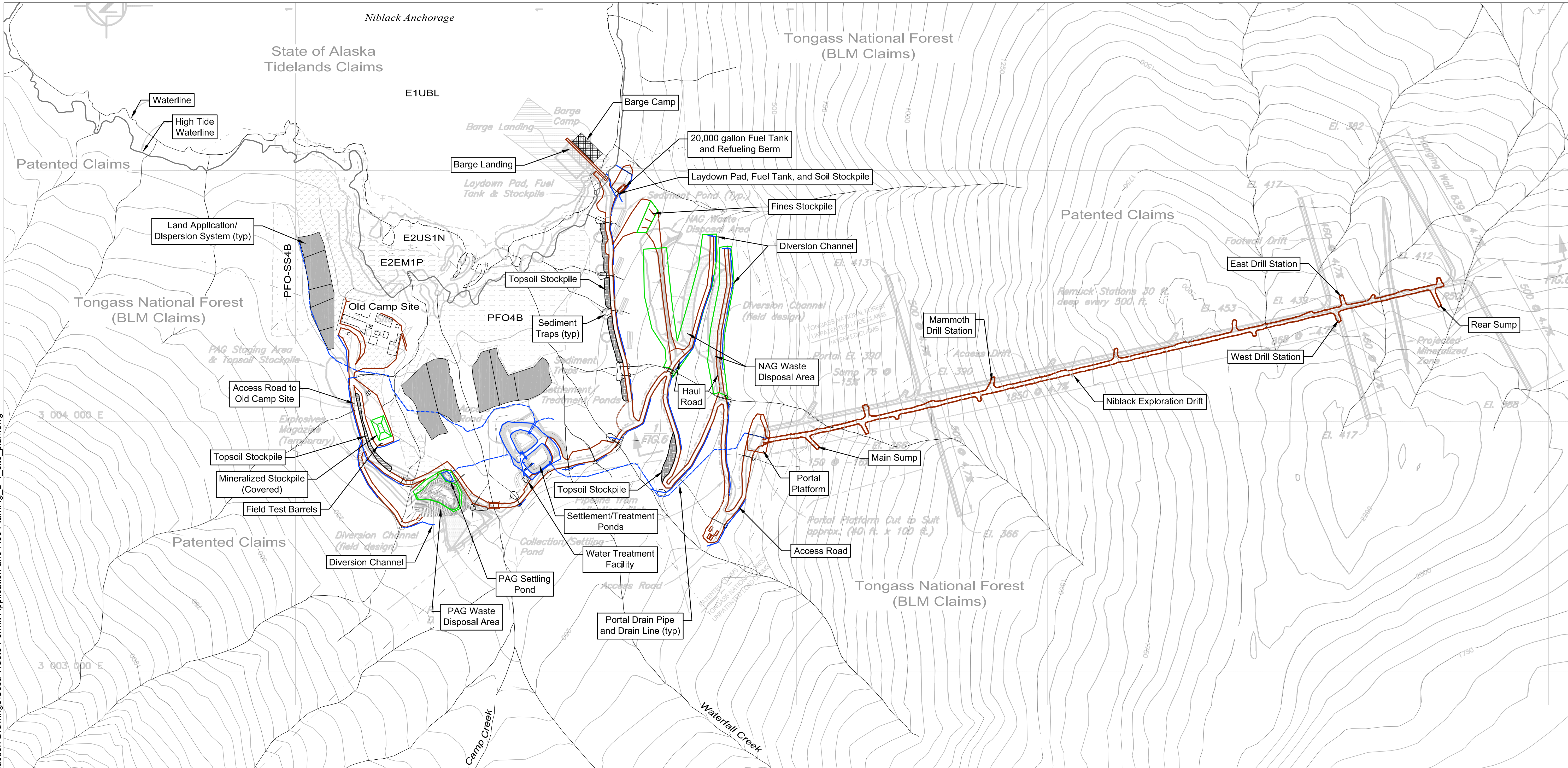
[c] A visual monitoring station was established below the PAG waste disposal area as part of a leak detection system. No water is anticipated to collect at this point unless there is a breach in the liner

[d] MW1, MW2, MW3, and MW4 will be used to monitor changes to natural water quality in wetlands water when compared to historical values and remote wetland wells.

[e] MW8 and MW9 will be used to determine background groundwater quality for information purposes only.

APPENDIX A

NIBLACK EXPLORATION PROJECT
DESIGN DRAWINGS



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LEGEND

- E1UBL Estuarine - Subtidal
- E2US1N Estuarine - Unvegetated Intertidal
- E2EM1P Estuarine - Emergent Intertidal
- PFO-SS4B - Needleleaf Forest/Scrub - Shrub Wetland
- PFO4B - Needleleaf Forest Wetland
- Land Application Areas
- Land Application Areas (2007)
- Tideland Lease Area
- Property/Patented Claim Boundary
- 2007 Design Plan (RTR 2007)
- Waste Rock Storage Facilities
- Water Management Features
- Roads and Exploration Access Drift

NOTE

1. All dimensions and elevations are in feet unless otherwise noted

SOURCES

1. Original design drawings reproduced from Figure 2 of the Reclamation and Closure Plan for the Niblack Underground Exploration Project (RTR 2007)
2. As-built drawings provided by Niblack Project LLC (2011)
3. Land application area boundaries from Turner (2009, personal communication)

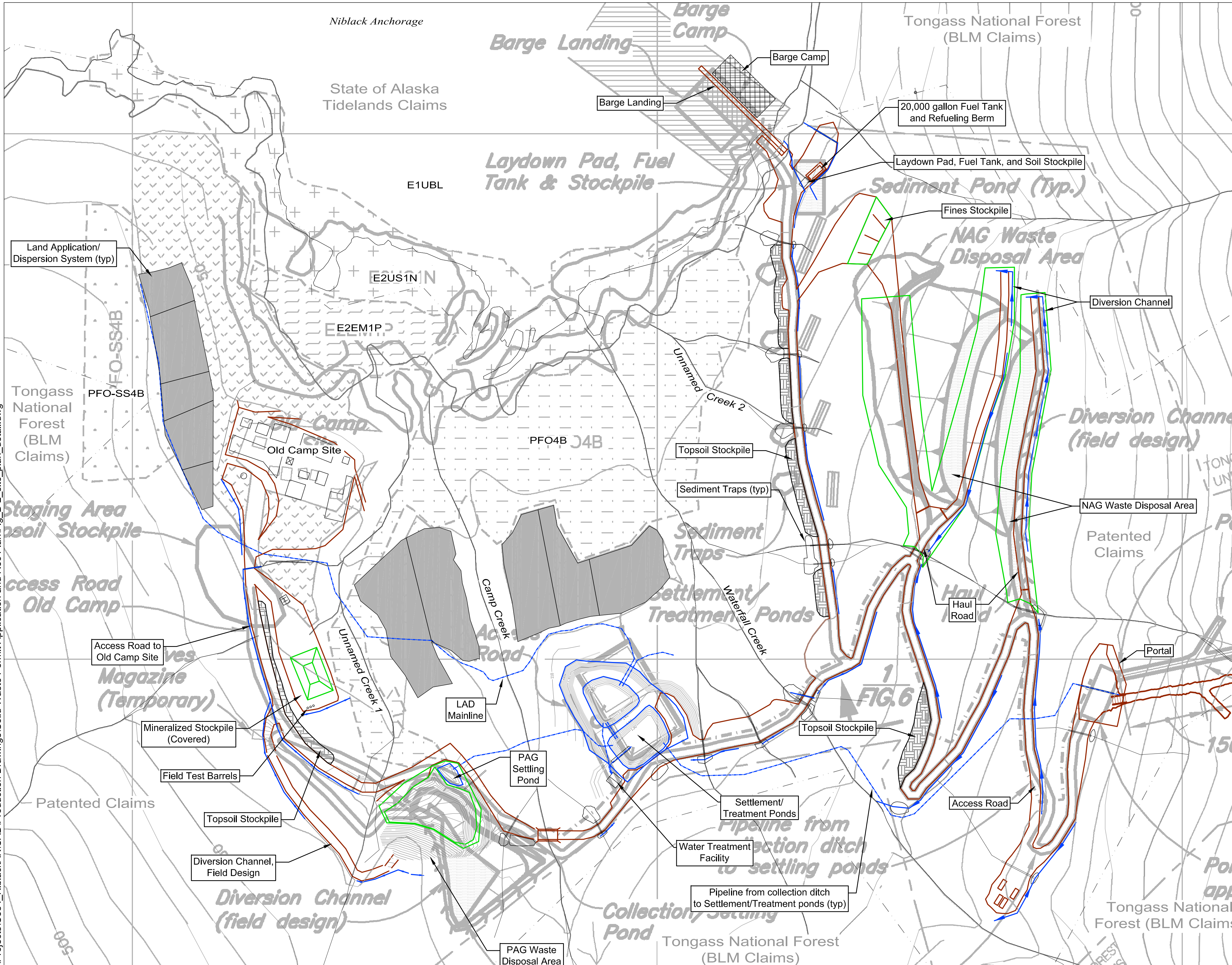
NIBLACK PROJECT LLC

integral consulting inc.

0 200 400 Feet

N

Figure A-1
General Site Plan - As-built Drawings and Design Plans
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update



LEGEND

- E1UBL Estuarine - Subtidal
- E2US1N Estuarine - Unvegetated Intertidal
- E2EM1P Estuarine - Emergent Intertidal
- PFO-SS4B - Needleleaf Forest/Scrub - Shrub Wetland
- PFO4B - Needleleaf Forest Wetland
- Land Application Areas (2007)
- Land Application Areas
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- 2007 Design Plan (RTR 2007)
- Waste Rock Storage Facilities
- Water Management Features
- Roads and Exploration Access Drift

NOTE

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NIBLACK PROJECT LLC

integral consulting inc.

0 100 200 Feet

N

Figure A-2
Site Plan Detail - As-built Drawings and Design Plan
Niblack Wastewater Treatment and Disposal Application
Solid Waste Permit Application

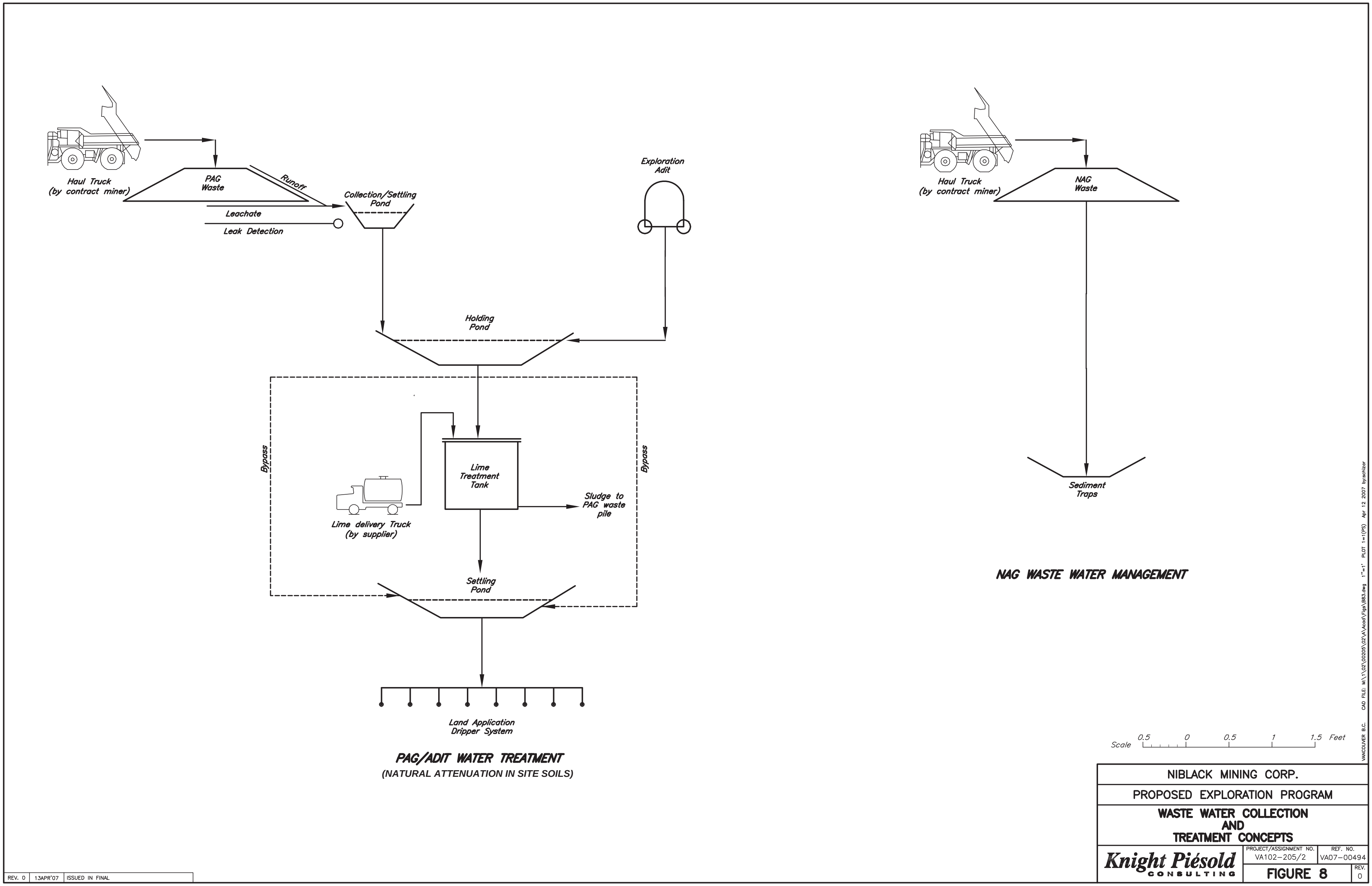

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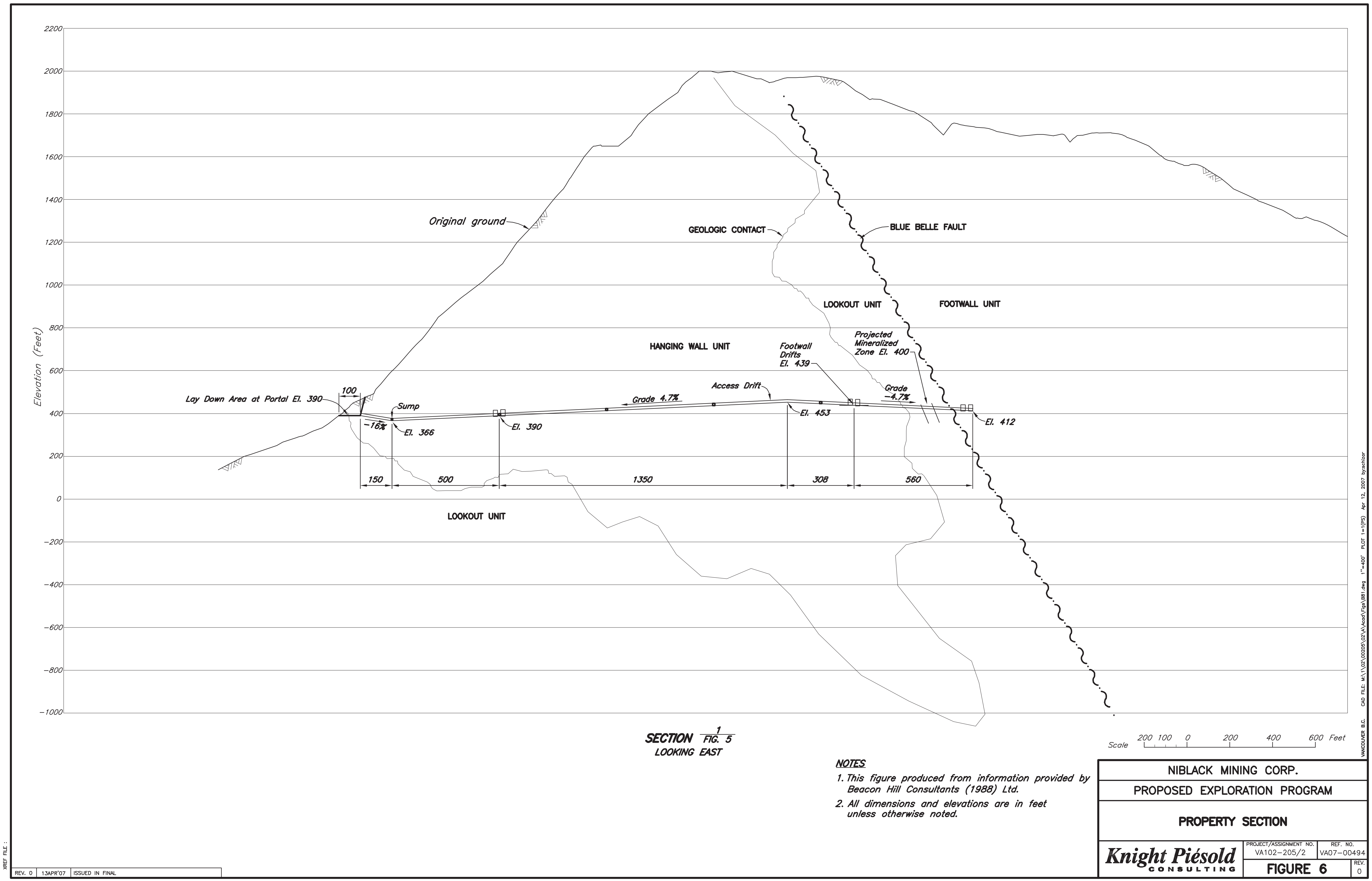
Figure A-3

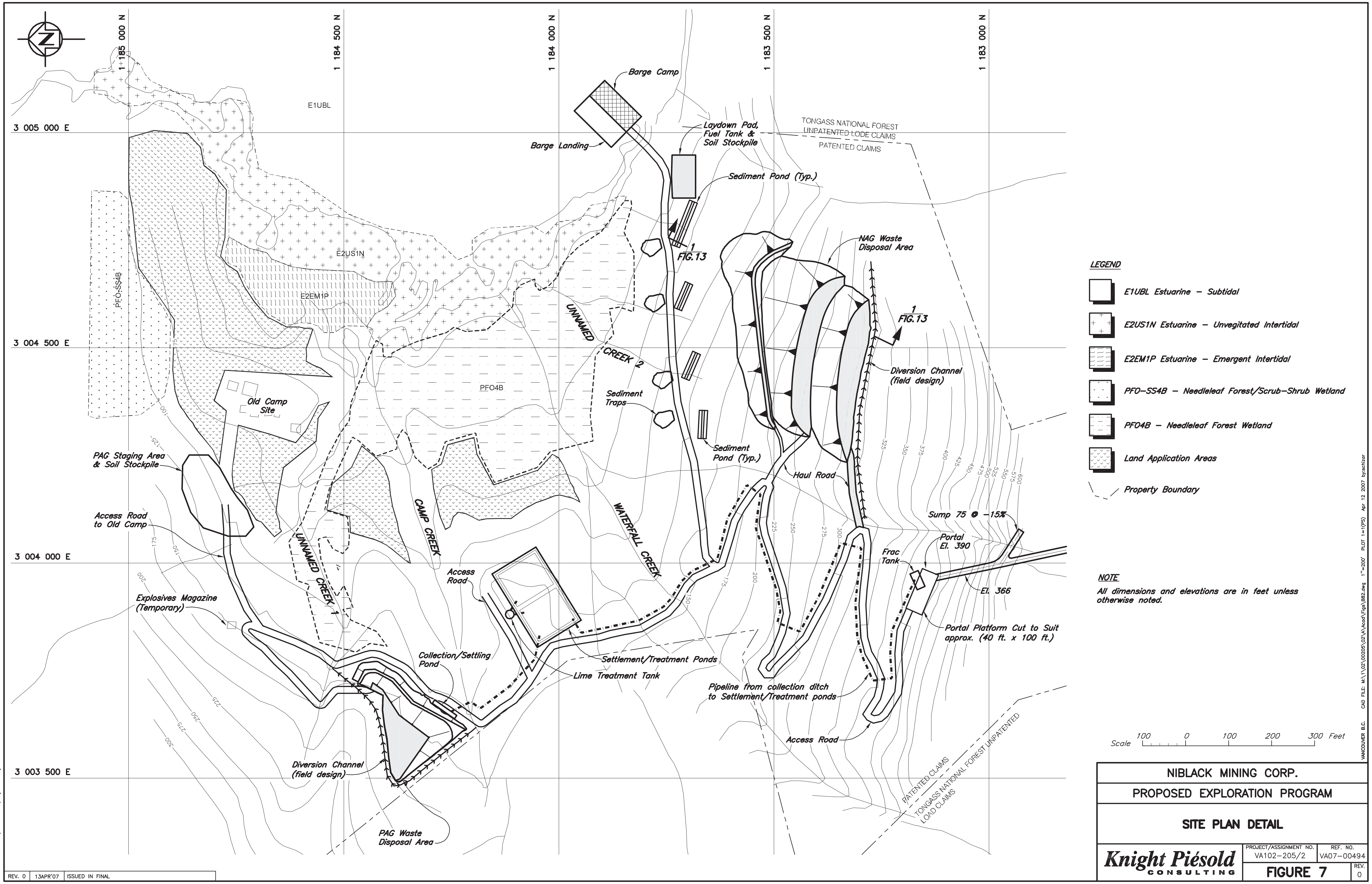
Wastewater Collection and Treatment Concepts
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update



NIBLACK PROJECT LLC integral consulting inc.

Source: NMC 2007a

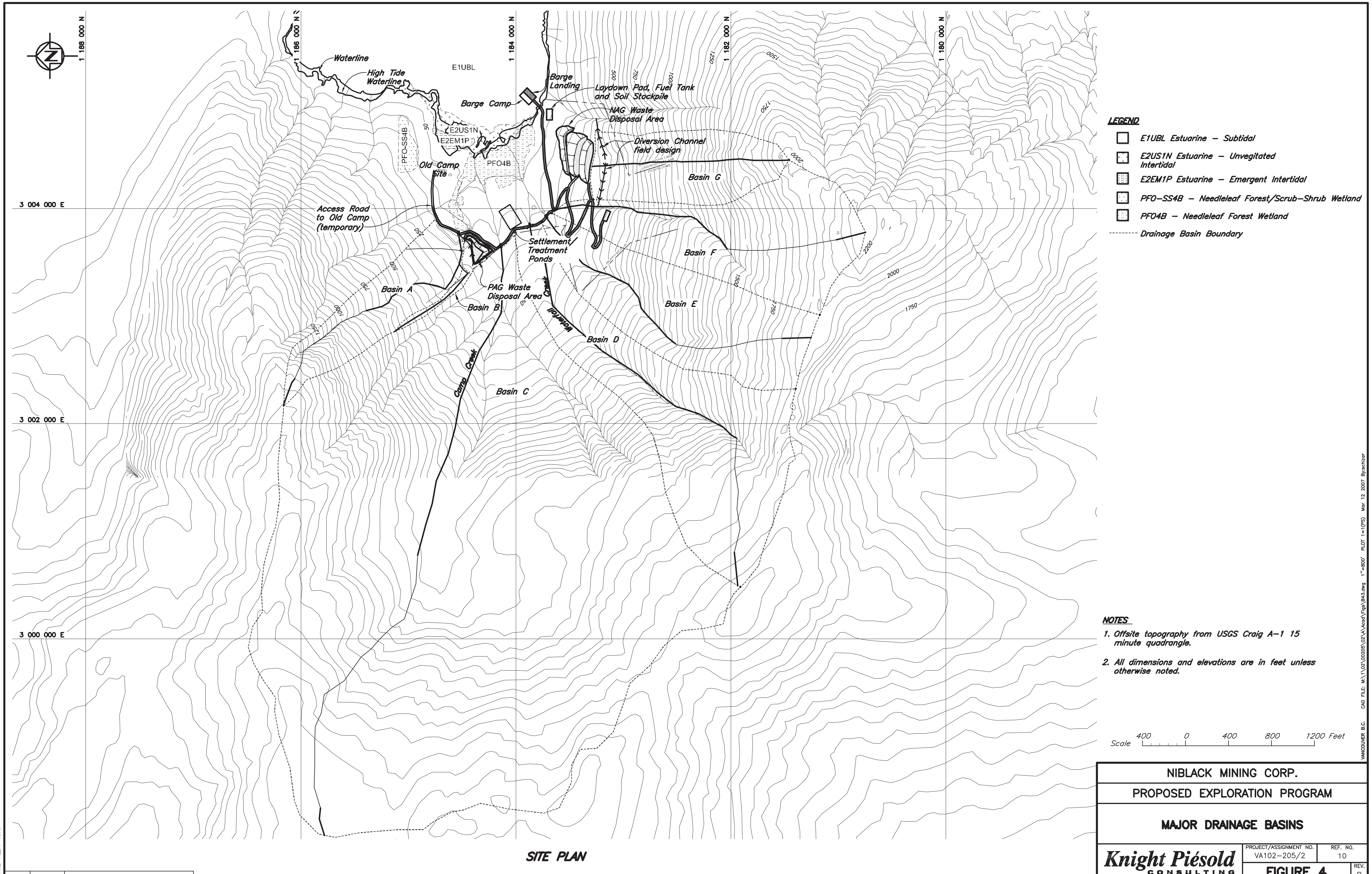
Figure A-4
Property Section
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update



NIBLACK PROJECT LLC integral consulting inc.

Source: NMC 2007a

Figure A-5
Site Plan Detail
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update



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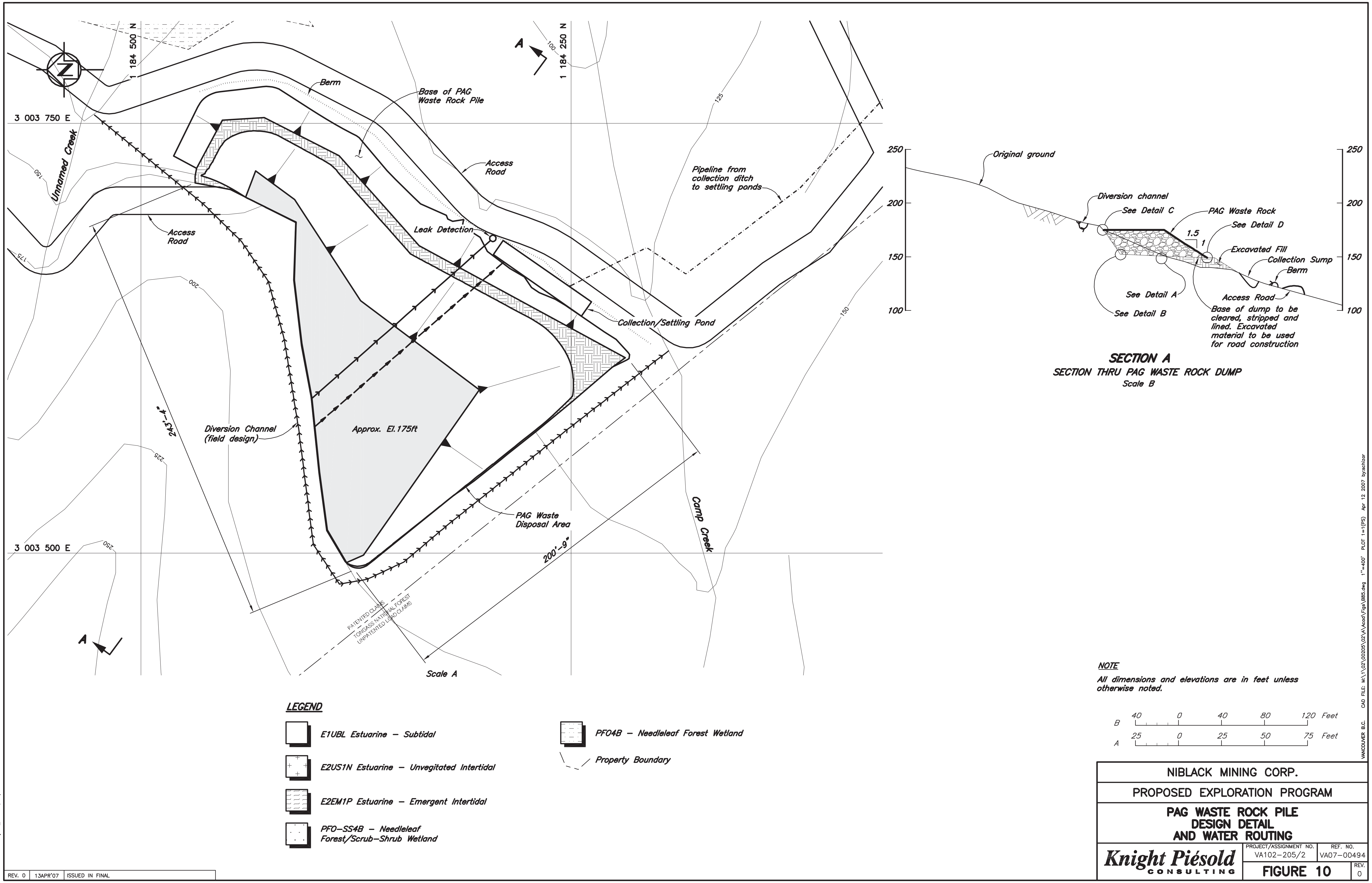
Source: NMC 2007a

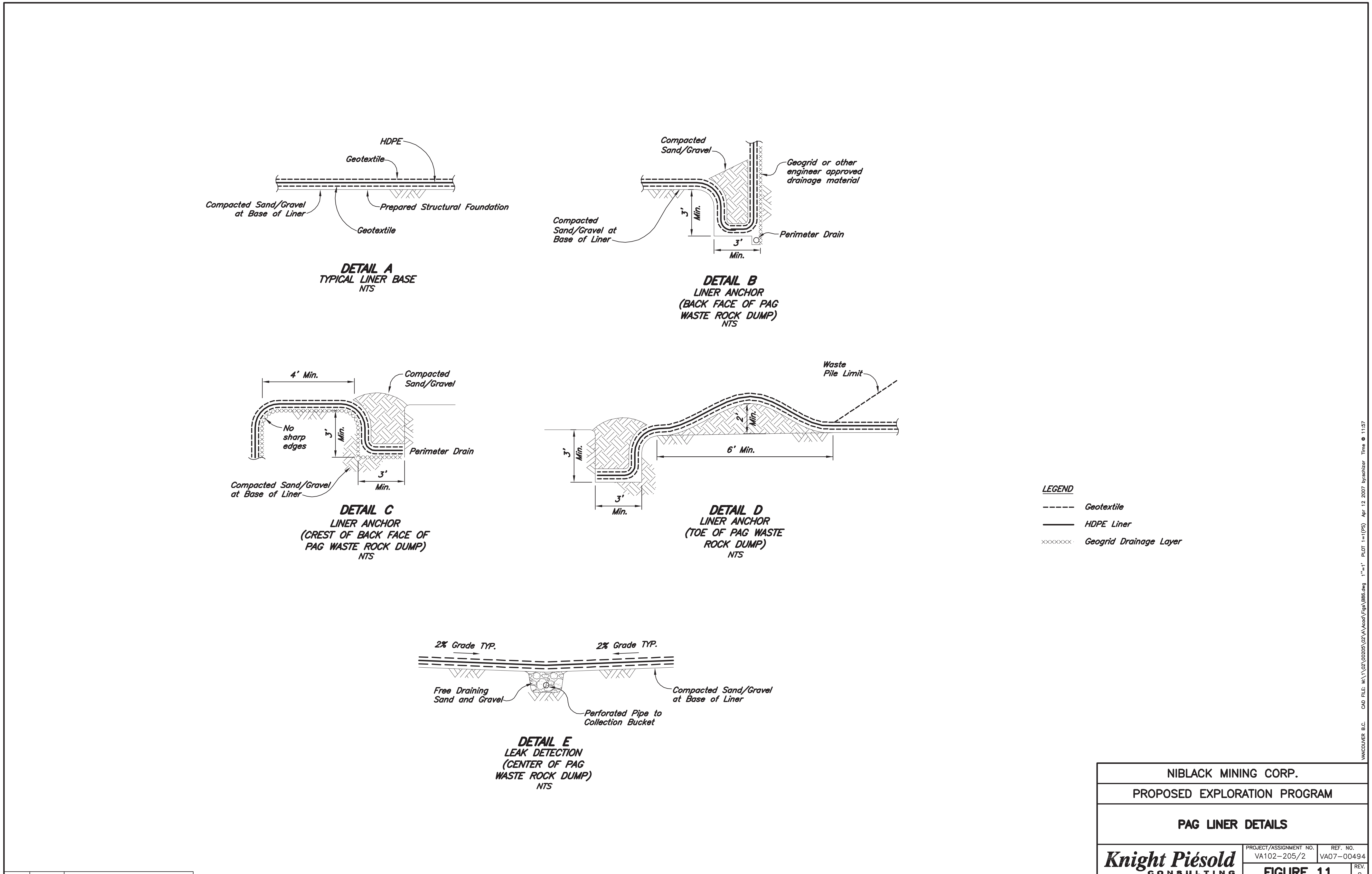
Figure A-6
Major Drainage Basins
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update



NIBLACK PROJECT LLC

Source: NMC 2007a

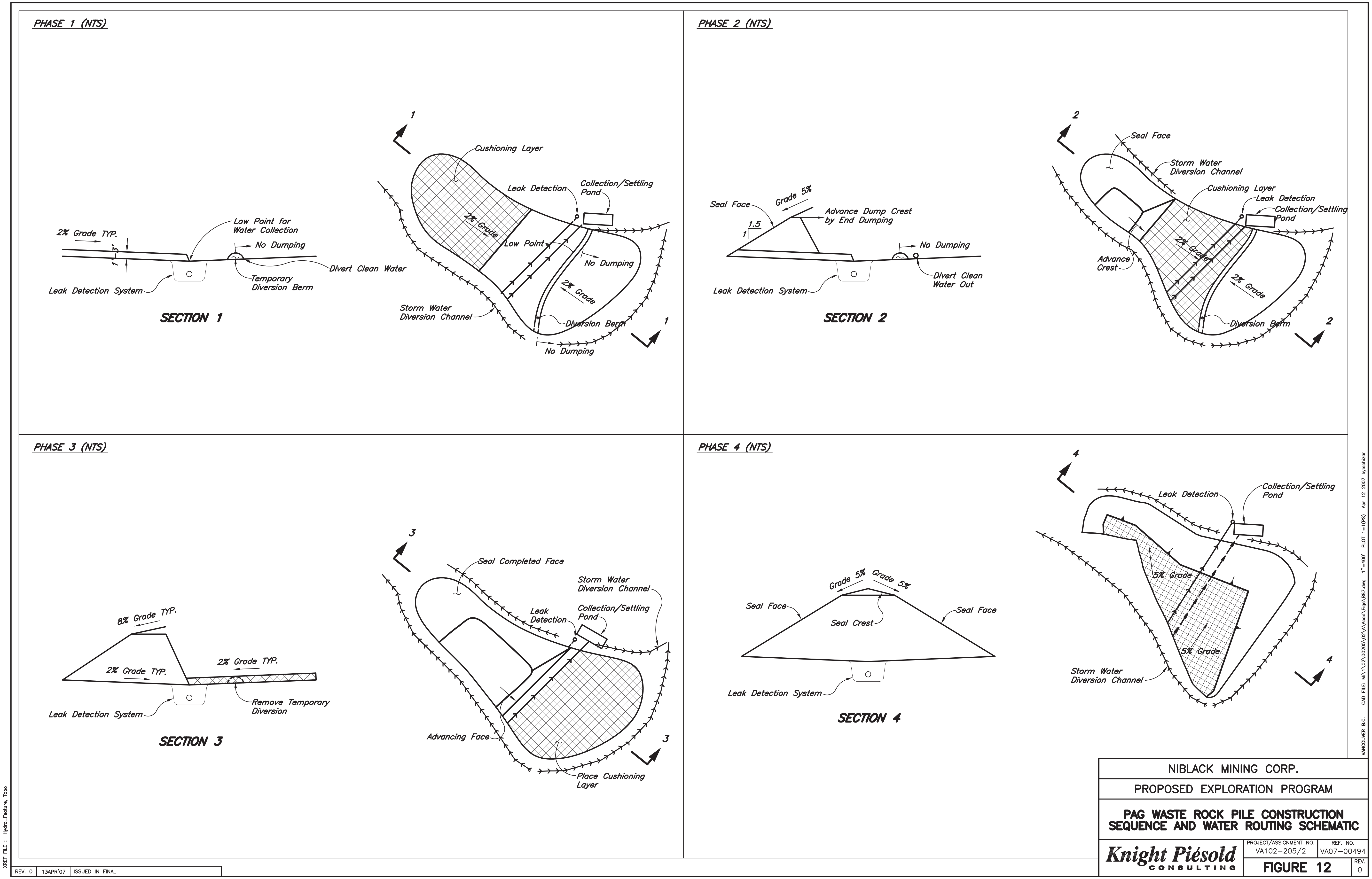
Figure A-7
PAG Waste Rock Design Detail and Water Routing
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update



NIBLACK PROJECT LLC integral consulting inc.

Source: NMC 2007a

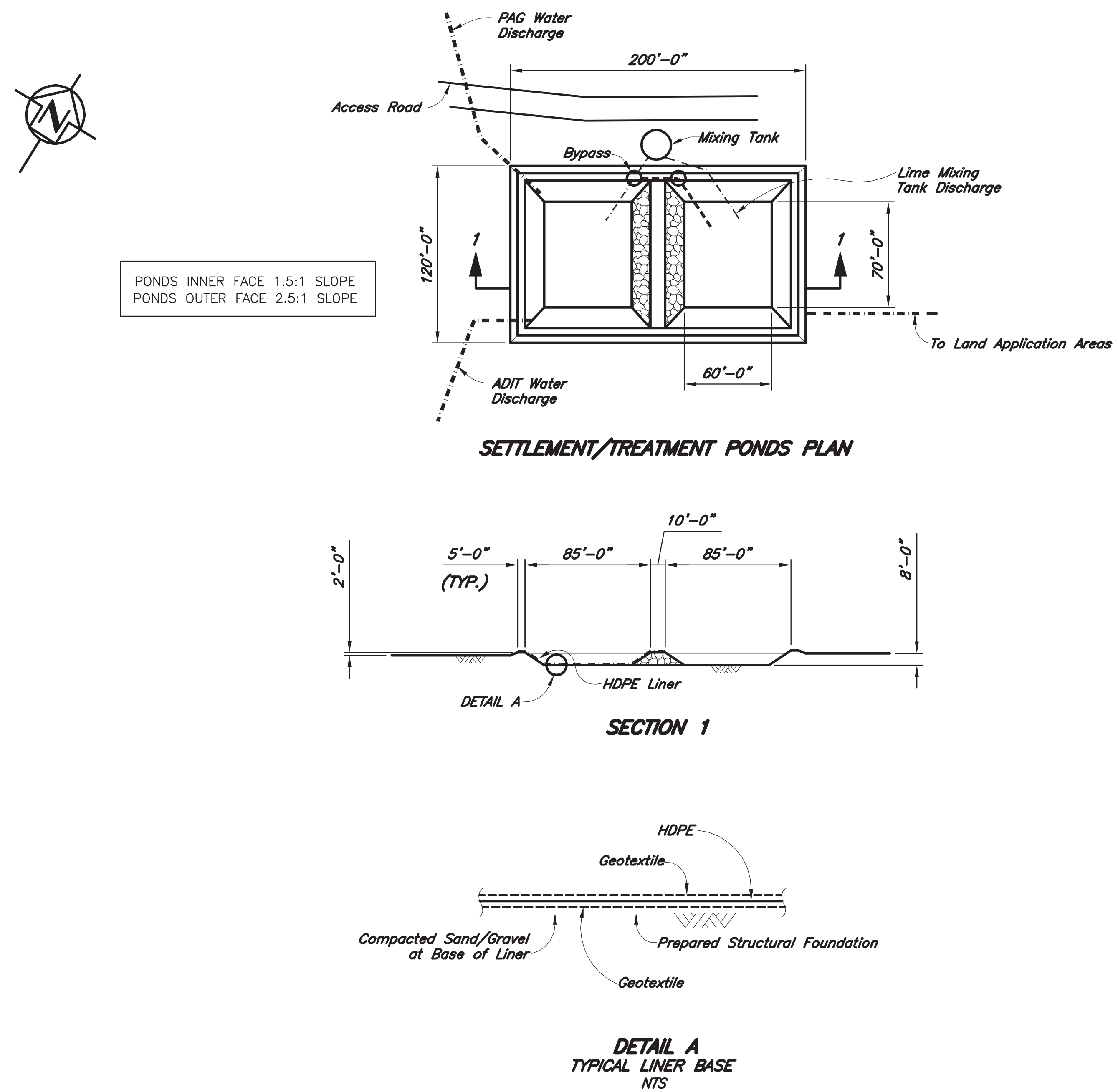
Figure A-8
PAG Liner Details
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update



NIBLACK PROJECT LLC integral consulting inc.

Source: NMC 2007a

Figure A-9
PAG Waste Rock Pile Construction Sequence and Water Routing Schematic
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update



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NIBLACK MINING CORP.

PROPOSED EXPLORATION PROGRAM

SETTLEMENT/TREATMENT POND SECTION

Knight Piésold CONSULTING

PROJECT/ASSIGNMENT NO.	REF. NO.
VA102-205/2	VA07-00494
FIGURE 13	REV. 0

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REV. 0	13APR'07	ISSUED IN FINAL

NIBLACK PROJECT LLC integral consulting inc.

Source: NMC 2007a

Figure A-10
Settlement/Treatment Pond Section
Niblack Wastewater Treatment and Disposal Application
2012 Post-Construction Update