Red Dog Mine
Closure and Reclamation Plan

Supporting Document B
Plans of Operations

Red Dog Mine
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SD B1: Red Dog Mine Development Plan (TCAK, 2004)

Red Dog Mine Development Plan

SECTION 1: EXECUTIVE SUMMARY

1.1 Summary

The Red Dog mine is located 150 km north of the community of Kotzebue, Alaska. Cominco America Incorporated (now Teck Cominco American Incorporated) ("TCAI") developed the mine between 1987 and 1989 under a 1982 agreement with the NANA Regional Corporation, Inc. ("NANA"). NANA was awarded surface and subsurface rights by Congress with the passage of the Alaska Native Claims Settlement Act of December 18th, 1971. The Red Dog main ore deposit grades 21% Zn and 6% Pb. Relatively modest average mill throughput of 9,000 tonnes per day yields over 1.0 million tonnes of zinc concentrate and 0.2 million tonnes of lead concentrate annually.

This report presents the results of a revised mine plan to optimize the net present value of the current Red Dog open pit reserves. The plan objectives were to:

- Optimize the ore release characteristics with the development of pit shells rather than bench by bench mining to ultimate pit limits.
- Maximize the early release of higher grade ore to enhance project economics without jeopardizing long-term ore reserves.
- Phased waste stripping to delay peak stripping requirements until shorter waste hauls are available in the mined out Main Pit.
- Maximize submerged storage of acid generating waste in mined out Main Pit.
- Identify permitting, exploration drilling, metallurgical testing, and infrastructure capital requirements.

Implementation of the revised mine plan requires the approval of NANA and TCAI, which is expected to be received by the end of 2004.

1.2 Geology

Red Dog production from 1989 through to 2003 was derived entirely from the Main deposit, which is transected by Red Dog Creek. To the end of 2003, 32,060,000 tonnes of main pit ore has been milled yielding 9,510,400 tonnes of zinc concentrate grading 55.6% zinc and 1,600,600 tonnes of lead concentrate grading 56.0% lead. Subsequent to the development of the Main Pit reserve, two additional open pit reserves were discovered adjacent to the Main Pit. The Aqqaluk deposit is immediately to the northeast of the Main Pit on the north side of Red Dog Creek. The Qanaiyaq deposit is located south of the Main deposit. Paalaaq and Anarraaq are potential underground resource areas located north of the Main deposit.

Red Dog deposits are of a sedimentary exhalite and replacement origin. Rifting during the early Mississippian time period developed a restricted sub-basin and block faulting associated with this event provided pathways for fluid flow to the sea floor. Syngenetic barite rock and subordinate amounts of low grade sulfide rock and silica rock were deposited as sediments. The barite rock formed a cap, which restricted and localised fluid flow allowing for replacement by silica and sulfides. Upward migration of the vein system, through the exhalite, further upgraded the deposit which, was subsequently tectonically faulted into several discreet deposits.

1.3 Reserves and Resources

Reserve and resource estimates associated with the revised mine plan, which require the approval of NANA and TCAI, are as follows:

Deposit	Category	Ore (tonnes)	Zn (%)	Pb (%)	Ag (g/t)	Waste (tonnes)
Main	Proven Reserve	26,400,000	20.5	5.7	105	28,800,000
Aqqaluk	Probable Reserve	52,400,000	16.7	4.3	79	
Aqqaluk	Indicated Resource	3,200,000	11.3	4.0	85	
Aqqaluk	Total	55,600,000	16.4	4.3	79	93,000,000
Qanaiyaq	Indicated Resource	4,800,000	23.4	6.3	128	12,900,000
Paalaaq	Inferred Resource	13,000,000	15.0	4.1	90	u/g
Anarraaq	Inferred Resource	17,200,000	15.8	4.8	71	u/g

1.4 Mine Plan

The reserve model for the Main deposit was revised to include an updated metallurgical algorithm that provides for varying recoveries as a function of reserve model assays. Revised ultimate pit designs were developed utilizing a Lerch-Grossman/time value of money pit optimization routine. These ultimate pits were then subdivided into pit shells by ranking the pits generated by the optimization routine by net present value. The ranked pits were then amalgamated into logical push-backs based on mining constraints such as minimum mine equipment working widths and access ramps.

The various pit shells were then scheduled to produce an operating mine plan that honours development criteria and operating constraints. Operating constraints included grinding/floatation capacities and estimated permitting time frames as listed in the following table:

Constraint	Description	Units	Quantity
Mill Throughput	annual grinding capacity	Mt	3.3
	annual zinc floatation capacity	Mt con	1.04
	annual lead floatation capacity	Mt con	0.25
Aqqaluk	permitting time frame	years	4.5
Qanaiyaq	permitting time frame	years	2.0

Main, Aqqaluk, and Qanaiyaq pits were mined in the sequence listed. This sequence allowed for the sub-aqueous deposition of acid generating waste from Aqqaluk into the mined out Main Pit as well as relatively short hauls for Aqqaluk waste. Actual and planned production rates are summarized in the following table.

Year	Material Mined (000's t)			Milled	Zinc Grade
	Ore	Waste	Total	(000's t)	(%)
1998a	2,454	1,241	3,695	2,497	21.4
1999a	3,208	2,013	5,220	2,978	21.3
2000a	3,280	3,311	6,591	3,045	21.0
2001a	3,345	3,950	7,294	3,211	19.8
2002a	3,298	3,959	7,257	3,166	21.1
2003a	3,416	3,035	6,451	3,154	21.7
2004p	3,133	4,018	7,151	3,175	21.5
2005p	3,312	3,067	6,379	3,312	20.7
2006p	3,306	3,195	6,501	3,306	20.5
2007p	3,334	2,966	6,300	3,334	20.2
2008:17p	33,078	64,352	97,432	33,078	19.6
2018:31p	40,673	57,055	97,728	40,673	15.9
Totals p	86,836	134,653	221,491	86,878	18.0

Note: a – actual production, p – planned production.

1.5 Operating Costs

Operating costs were developed from a combination of fixed and variable cost standards for all aspects of mine operations and applied to future production plans to forecast total mine site operating costs. Historical consumption, productivity, and cost information was modified for expected changes which was then used as a basis for forecasting.

Mine operating costs are determined from historical mobile equipment hourly costs and then applied against required operating hours determined from the mine plan and forecast equipment productivities. Mine blasting costs were estimated based on planned explosives consumption rates for ore and waste (powder factors) which were then applied against planned annual production. Fixed manpower requirements for mine support and the heavy equipment shop were forecast.

Mill supply costs were determined from consumption standards established for consumables such as mill reagents, grinding media, and power which were then applied against planned annual production. Fixed manpower requirements for mill operations and support were forecast, as well as mill maintenance manpower and supplies.

Administration costs were based on manpower forecasts for accounting/MIS, human resources, materials management, and environment along with estimates for major expense types such as insurance, payments in lieu of property taxes, and consultants.

1.6 Capital Costs

Capital cost estimates were developed for four primary areas – infrastructure, mobile equipment, exploration, and permitting as well as miscellaneous expenditures required to maintain production. Historical costs in combination with the mine plan time line were used as a basis for forecasting capital expenditures.

Infrastructure requirements were limited to maintaining the existing production capacity with no planned expansions. The primary infrastructure requirements are the relocation of Red Dog Creek, which currently bisects the main pit, raising the tailings dam as required by the production schedule and the installation of larger motors on two of the SAG mills to maintain mill throughput

Mobile equipment replacement schedule is established by replacing major equipment when cumulative operating hours attained reach a set limit. Operating hours required were determined from the mine plan.

Exploration expenditures to complete infill drilling for short-term mine planning requirements were determined by the planned development sequence. Additional metallurgical testing is planned for new deposits to refine short-term planning criteria.

The main pit is fully permitted, however, future pit areas will require environmental impact assessments and baseline studies prior to development. Timing of expenditures was determined by the planned development sequence.

1.7 Economic Analysis

An economic analysis was completed to ensure the optimization of the net present value of Red Dog open pit operations under a revised open pit development plan. The three pit areas included in the plan were Main, Aqqaluk, and Qanaiyaq, which are all in close proximity to the existing infrastructure.

The mine plan optimization is based on discounted net cash flow methodology, with an adjustment for working capital value at mid-year due to the atypical shipping season. The after-tax net cash flows are estimated for the mine life of the known reserves. The principal features of the economic analysis are:

- Mine plan revised to incorporate a phased development sequence to optimize ore grade and throughput to maximize net present value.
- Operating and sustaining capital costs developed by Red Dog operations based on historical results adjusted for expected changes.
- Contractual distribution costs utilized for concentrate haul to the port, AIDEA port rates, and concentrate lightering to ocean freighters. Ocean freight and off-

site storage fee component of distribution costs based on operation's five year plan.

- Contractual NANA royalty payments.
- Contractual smelting fees extended for known trends.
- Long-term forecast metal prices.

SECTION 2: GEOLOGY

2.1 Summary

Red Dog production from 1989 through to 2003 was derived almost entirely from the Main deposit, which is transected by Red Dog Creek. A small portion of Aqqaluk was mined in 2003 in order to make room for the Red Dog Creek diversion. To the end of 2003, 32,063,000 tonnes of ore has been milled yielding 9,510,100 tonnes of zinc concentrate grading 55.6% Zn and 1,591,000 tonnes of lead concentrate grading 56.0% Pb. Subsequent to the development of the Main Pit reserve, two additional open pit reserves were discovered adjacent to the Main Pit. The Aqqaluk deposit is immediately to the northeast of the Main Pit on the north side of Red Dog Creek. The Qanaiyaq deposit is located south of the Main deposit. Paalaaq, to the north of Aqqaluk, and Anarraaq, seven miles northwest of the Main Pit, are underground resource areas. The Red Dog district is illustrated in Figure 1.

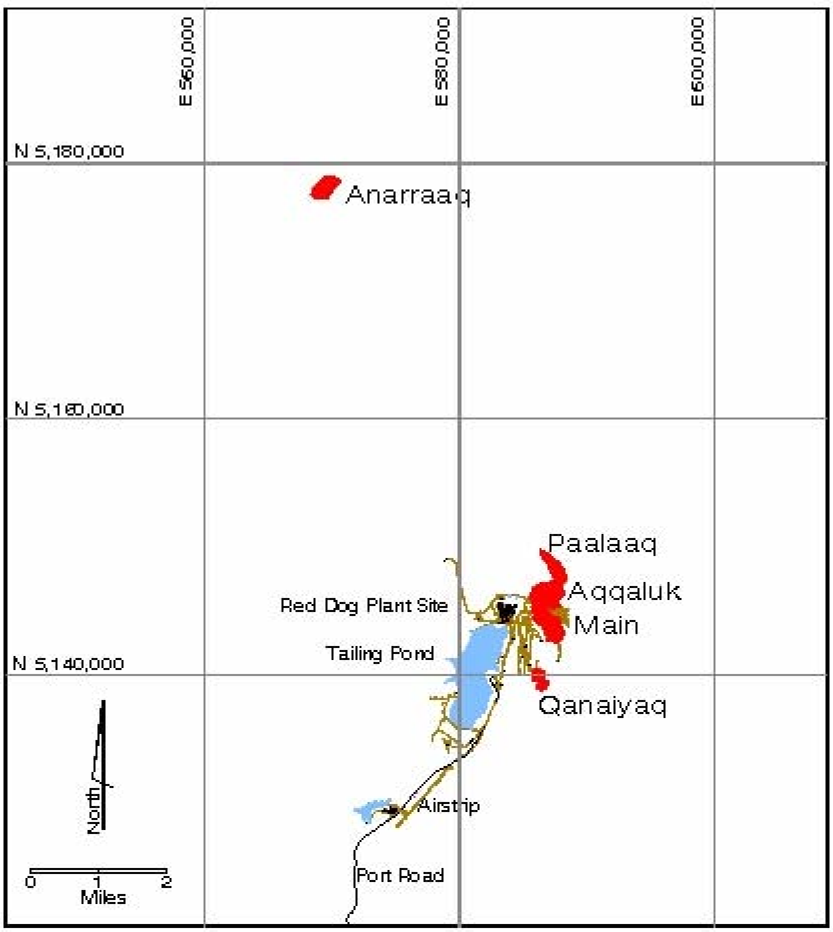

Figure 1 – Red Dog District Deposits

Red Dog deposits are of a sedimentary exhalite and replacement origin. Rifting during the early Mississippian time period developed a restricted sub-basin and block faulting associated with this event provided pathways for fluid flow to the sea floor. Syngenetic barite rock and subordinate amounts of low grade sulphide rock and silica rock were deposited as sediments. The barite rock formed a cap, which restricted and localised fluid flow allowing for replacement by silica and sulphides. Upward migration of the vein system, through the exhalite, further upgraded the deposit which was subsequently tectonically faulted into several discreet deposits. The reserve and resource estimates are as follows:

Deposit	**Category**	**Ore (tonnes)**	**Zn (%)**	**Pb (%)**	**Ag (g/t)**	**Waste (tonnes)**
Main	Proven Reserve	26,400,000	20.5	5.7	105	28,800,000
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2.2 Regional Geology

Red Dog is a Mississippian to Permian (300 my), black shale hosted, zinc-lead-silver deposit located in the DeLong Mountains, western Brooks Range, Alaska. The Brooks Range is comprised of eight stacked thrust plates that represent portions of a basin thrust northward by a Jurassic to Cretaceous aged (~85 my) compressional event. The Brooks Range allochthon, the second lowest thrust plate, is comprised of Devonian to Cretaceous clastic sediments, and contains the Red Dog deposits and all other similar regional occurrences.

All the rocks associated with the mineralising event are considered to be part of the exhalite rock package. This package is comprised of three components, silica, barite and sulphides that form three exhalite rock types; silica rock, barite rock and sulphide rock. These rocks are gradational; all can contain ore. At Red Dog, the exhalite rocks are facies of the Ikalukrok Member. Silicification was a dominant component of the mineralizing event and the host shale has been silicified and locally resembles a chert.

The major sulphides in decreasing order of abundance are sphalerite, pyrite, marcasite and galena. Most of the deposit's silver occurs within the crystal structure of the galena. The dominant ore mineral, sphalerite, is very fine grained to amorphous and is commonly intergrown with silica. Ore textures are massive, fragmental, chaotic or veined and rarely show classic sulphide sedimentary layering. The upper portion of the orebody has been physically and chemically weathered. Oxidation has altered the sulphides to sulphates.

The zinc and iron sulphates are very soluble and are readily depleted from the weathered cap, while the lead sulphate is residual and is, therefore, enriched.

Sulphide veins are common. They transect the silicified host shale at the base and periphery of the deposits and also occur in the exhalite package. Bitumen blebs occur locally in the exhalite package, are quite mature (ranging from pyrobitumen to semianthracite) and are believed to represent remobilized organic carbon from the carbonaceous host.

A genetic model has been developed for Red Dog that combines a sedimentary exhalite (sedex) and replacement origin. Rifting during the early Mississippian time period developed a restricted sub-basin and block faulting associated with this event provided pathways for fluid flow to the sea floor. Syngenetic barite rock and subordinate amounts of low grade sulphide rock and silica rock were deposited as sediments. The barite rock formed a cap, which restricted and localised fluid flow. Replacement by silica and sulphides continued under this cap. Upward migration of the vein system, through the exhalite, further upgraded the deposit. Thrusting, related to a Cretaceous aged compressional event, fragmented and structurally repeated the ore body.

2.3 Deposit Geology

Four deposits occur around the original Red Dog discovery area: the Main deposit (the area of current mining activity), the Aqqaluk deposit (a northern extension of the Main deposit), the Qanaiyaq deposit (a southern extension of the Main deposit), and the Paalaaq deposit (a deeper zone north of Aqqaluk). All four deposits are believed to be parts of one continuous ancestral deposit, which was structurally dismembered and repeated by a series of low angle Cretaceous-aged thrust faults.

In the Main, Aqqaluk and Paalaaq areas, the ancestral deposit has been structurally repeated and now occurs in four plates; upper, median, lower and sub-lower. The upper plate, restricted to the south end of the Main deposit, is not ore bearing. The median plate starts at the south end of the Main deposit and laps over the lower plate before being truncated by erosion as it rises in the north in the Aqqaluk deposit. The majority of the ore in the Main deposit is in the median plate. Portions of the northern end of the Main deposit occur in the lower plate, but this plate is best developed north of Red Dog Creek and contains the majority of the Aqqaluk reserves and resources.

The Paalaaq resource is contained entirely in the sub-lower plate. It is a deep-seated, mineralised assemblage that occurs to the north of and below the Aqqaluk deposit. Paalaaq mineralization dips to the north, leaving Paalaaq covered by 600 to 2,000 feet of waste. The Qanaiyaq deposit is an isolated, mineralised thrust sheet, located 2,400 feet south of the Main deposit. Figure 2 shows a generalized cross-section of the Qanaiyaq, Main, Aqqaluk and Paalaaq deposits.

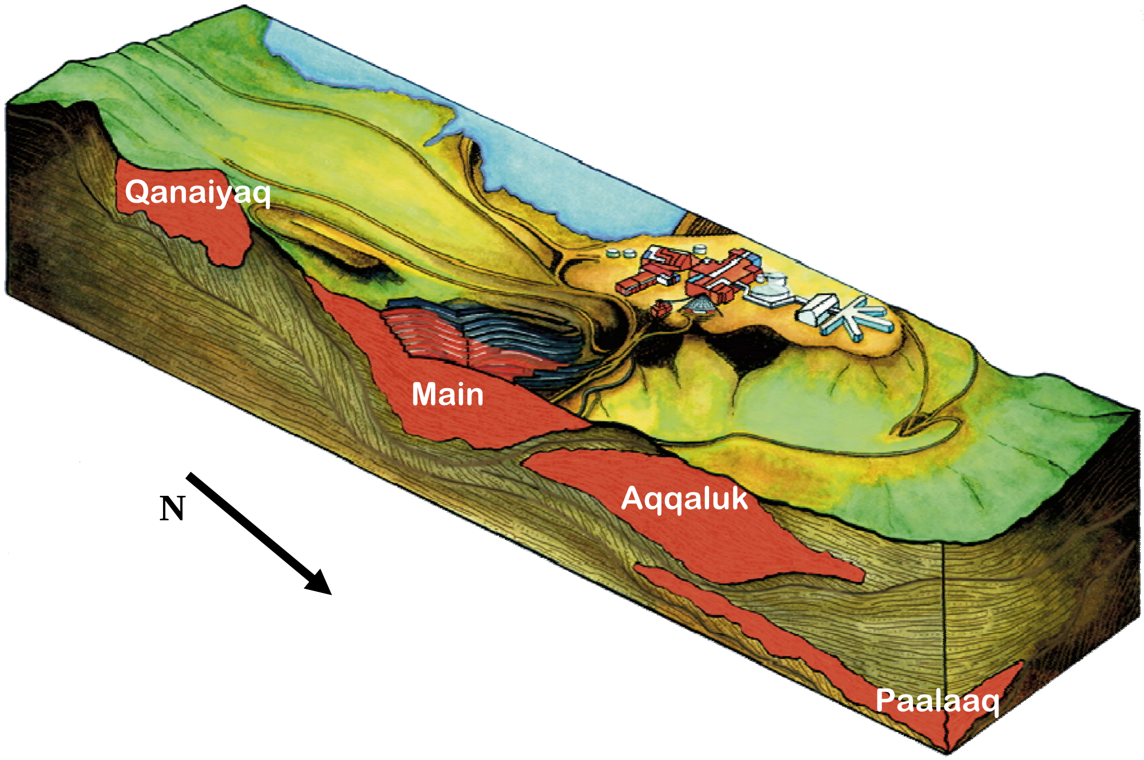


Figure 2 – Generalized cross-section of Qanaiyaq Main, Aqqaluk, and Paalaaq deposits, looking west

2.4 Main

The Main deposit reserve is defined as any ore south of the roughly east-west line made by Shelly Creek, and Red Dog Creek downstream of the Shelly Creek intersection. To date, 507 core holes totalling 204,589' (62,359m) and 160 reverse circulation holes totalling 64,416' (19,634m) have been drilled in the Main deposit, resulting in 100' x 100' drill coverage over the deposit. The deposit is closed in all directions and no additional drilling is planned.

The 26.4 Mt/20.5% Zn proven reserve for the Main deposit was calculated from a three dimensional block model. The block model was subdivided into 25' cubes, drill-hole assays were composited by geology and grade into maximum 25' intervals, and metal values were estimated from drill hole and blast-hole data using kriging. The influence of blast-hole data was restricted to 60 feet. Ore density is calculated for each block based on the Zn, Pb, Fe, and Ba values estimated for each block. Metallurgical recoveries are factored into a revenue calculation for each block. The 2004 model for the deposit contains three metallurgical ore types, each with its own zinc recovery formula based on plant performance and lab testing of the ore type. Ore reserves in the 2004 model were defined as material contained within the ultimate pit and above the revenue cut-off.

The three metallurgical ore types defined in the Main reserve are siliceous, veined and baritic. Siliceous ore is the most abundant, accounting for nearly 70% of the remaining reserve, and most variable of the three. It can contain fine to coarse grained sulphides and varying amounts of pyrite and marcasite. The metallurgical recovery for siliceous ore is variable and based on the amount of iron present. As the iron grade increases, zinc recovery decreases. Baritic ore, representing about 10% of the remaining reserve, contains greater than 7% Ba and less than 8% Fe. Sulphides tend to be very fine grained disseminations or layers in barite, although sometimes it occurs as massive sulphides in contact with massive barite. The metallurgical recovery for baritic ore is variable and based on the zinc grade. As the zinc grade increases the recovery increases. Veined ore is found in the Veined Ikalukrok unit and consists of coarse grained sulphides in a silicified black shale matrix. It represents about 20% of the remaining ore tonnage and has a fixed zinc recovery of 89%.

In 2003 a single, universal, recovery formula was developed to assign recoveries to all ore types. Figure 3 shows a typical section through the Main deposit.

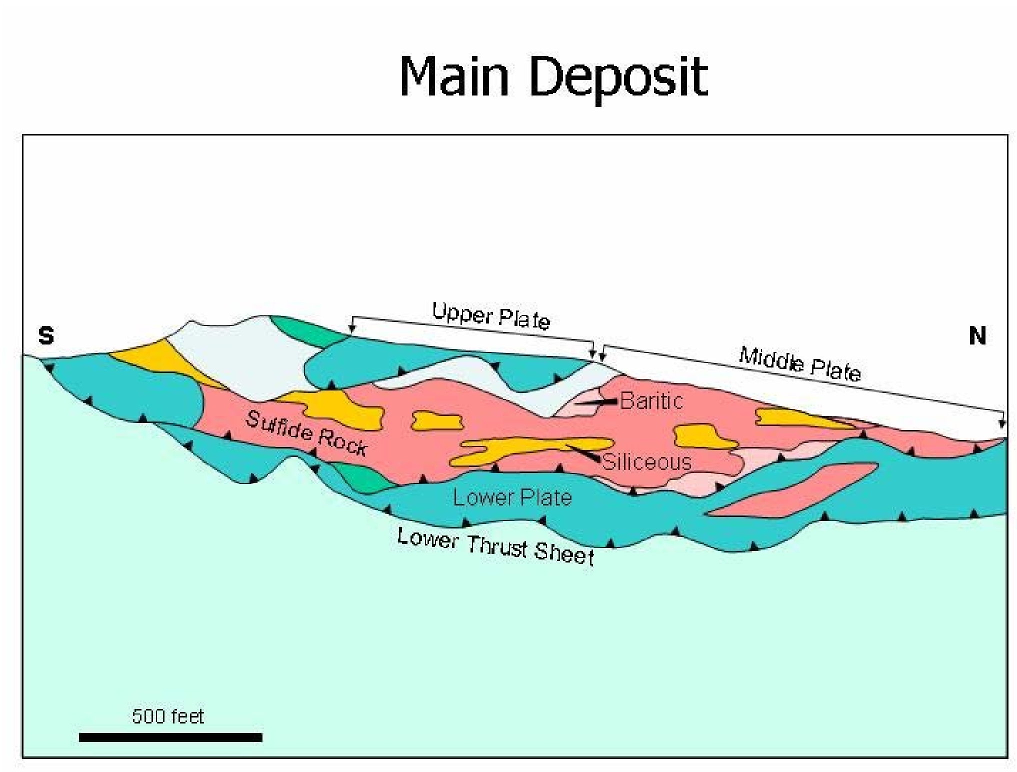


Figure 3 – Generalized cross-section of the Main deposit, looking west

2.5 Aqqaluk

The Aqqaluk deposit is defined as any open pit ore north of the roughly east-west line made by Shelly Creek, and Red Dog Creek downstream of the Shelly Creek intersection. This would mean that any Paalaaq (sub-lower plate) ore mined in an open pit would be considered Aqqaluk. To date 130 core holes totalling 82,129’ (25,033m) have been drilled in Aqqaluk, enough to define the mineralized limits of the deposit. Drill spacing is generally 100’ x 200’ in the southern end, along the common boundary with the Main deposit. Coverage decreases to 200’ x 200’ over the middle of the deposit, where the majority of reserve and resource tonnes are currently defined. Along the northern and western edges, where there is potential for a large tonnage of lower grade material, the coverage falls to 400’ x 200’.

Aqqaluk uses the same block model and similar interpolation approach as the Main deposit. Search distances were increased in Aqqaluk due to the wider spaced drill-hole coverage. The 55.6 Mt/16.4% Zn deposit is broken into a reserve and a resource. The probable reserve of 52.4 Mt/16.7% Zn is defined as any material within the ultimate pit and inside the zone of 200’ x 200’ spaced drill-holes and also satisfying the revenue cut-off grade. This variable cut off strategy is explained in more detail in Section 3. Aqqaluk uses the universal zinc recovery formula for the five ore types defined in the deposit, except for veined ore which uses a fixed recovery of 87%. These ore types were determined after the 1999-2000 Phase I in-fill drilling program. The indicated resource of 3.2 mt at 11.3% Zn is defined as the material outside the 200’x 200’ drill zone but inside the pit shell.

There are five metallurgical ore types defined in the Aqqaluk model: low iron siliceous, high iron siliceous, baritic, veined and median plate. The siliceous ores comprise the bulk of the Aqqaluk ore and are found in non-baritic and non-veined geologic units. The zinc to iron ratio separates the low iron (Zn/Fe >=2.1) from the high iron (Zn/Fe <2.1) siliceous ore. Zinc grades and grain sizes for siliceous ore are variable, with higher zinc grades tending to be associated with finer grained sulphides. The average grade for siliceous ore is approximately 18% Zn. Baritic ore is found in the Ikalukrok Barite unit and is generally fine grained sulphides disseminated in barite, averaging less than 11% Zn. Veined ore is found in the Veined Ikalukrok unit and tends to be coarse grained sulphides in a silicified black shale matrix. The average grade of the veined ore is about 12% Zn and it has a fixed zinc recovery of 87%. Median plate ore is found near the surface at the southern end of Aqqaluk and is actually a remnant of the Main Pit median plate, which contains the bulk of the Main Pit reserve. In Aqqaluk the median plate ore tends to be very high grade and fine grained, averaging over 20% Zn. Studies comparing Main Pit and Aqqaluk metallurgy indicate that the Main Pit universal recover equation is applicable to all ore types in Aqqaluk except the veined unit. Figure 4 shows a section through the Aqqaluk deposit.

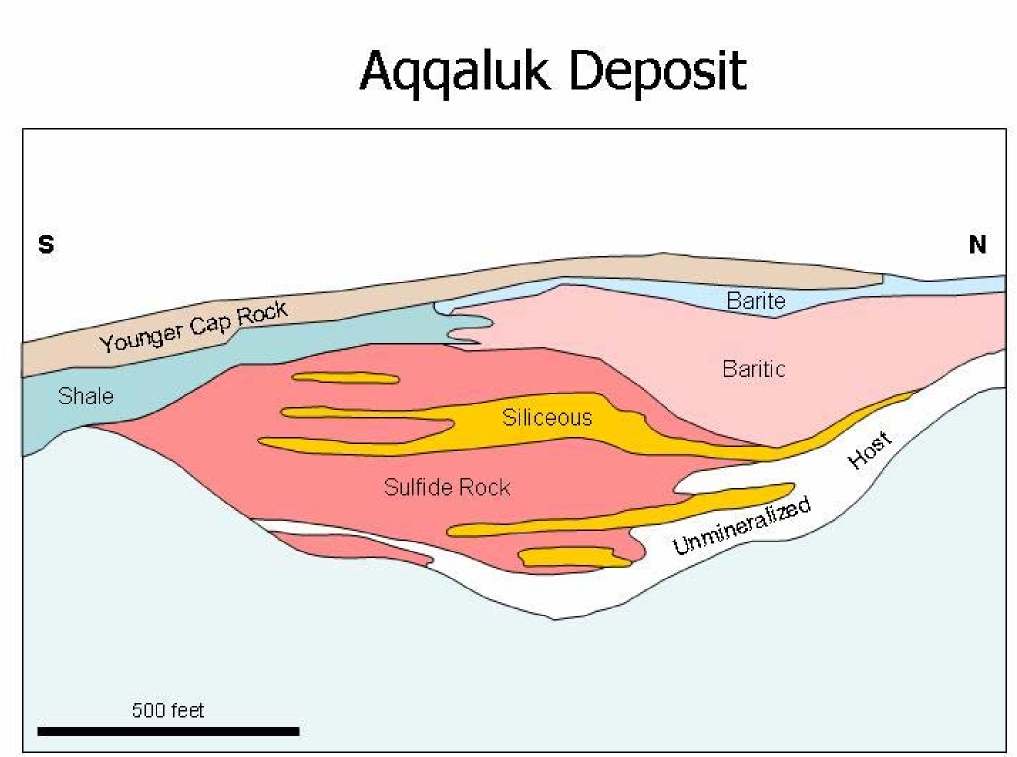


Figure 4 – Generalized cross-section of the Aqqaluk deposit, looking west

2.6 Qanaiyaq

There are 79 holes covering Qanaiyaq, 44 core totalling 27,910' (8,507m) and 35 reverse circulation totalling 31,217' (9,515m). Portions of the middle of the resource are drilled at 100' x 100' while other portions of the currently outlined >6% Zn zone are at 400' x 200'.

The 4.8 Mt/23.5% Zn, indicated resource was calculated using a three dimensional block model similar to the models used for the Main and Aqqaluk deposits. An economic pit was designed using long term projected metal prices. Metallurgical recoveries were based on Qanaiyaq specific ore tests using core from the 2001 drill program.

There are two metallurgical ore types defined in the Qanaiyaq model, regular and weathered with low copper values. Regular ore is defined as any ore with a soluble lead assay of less than 2%. Soluble lead is used as an indicator of the degree of weathering; the higher the soluble lead assay, the greater the weathering. Weathered with low copper ore is defined as ore with a soluble lead assay of greater than or equal to 2% and a copper assay of less than 0.2%. Metallurgical testing has shown that weathered ore with greater than 0.2% Cu performs poorly and is currently uneconomic. Regular ore with high copper values does not seem to perform in the same poor manner, so there is no copper criterion for regular ore. As additional drilling occurs more metallurgical testing will be required, leading to a better understanding of Qanaiyaq metallurgical ore types.

2.7 Block Modeling and Resource Estimation

The Red Dog deposits exist in two geologic block models: Main – Aqqaluk and Qanaiyaq. Project limits, model names and cell block sizes for each MineSight® model are detailed in the following table.

Deposit – Model Name	Axis	Minimum (ft)	Maximum (ft)	Block Size (ft)
Main & Aqqaluk – RED2004-A	X (east)	585,000	589,500	25
	Y (north)	141,500	148,500	25
	Z (elev.)	400	1,350	25
Qanaiyaq – QAN04	X (east)	584,500	588,000	25
	Y (north)	137,000	142,000	25
	Z (elev.)	1,000	1,600	25

Modeling philosophy is similar for both models, with geologic features being important in controlling the extent of interpolation. In the area containing these deposits, 25 units are recognized. These comprise sedimentary, exhalite and structural units that are unmineralized to strongly sulfide mineralized. Units used in grade interpolation are listed in the following table. Not all units occur in each deposit. Many units are defined by structural location and lithology (e.g., barite-rich exhalite units, shale types). A key discriminant between the strongly and weakly sulfide mineralized units is a 15% zinc grade boundary.

Code	Mineralized Geology Unit
1	Median plate lower-grade (<15% Zn) exhalite
2	Lower-grade (<15% Zn) weathered exhalite, any plate
6	Median plate Ikalukrok vein unit
7	Sub-lower plate (Paalaaq) barite
8	Lower plate, lower-grade (<15% Zn) exhalite
9	Upper plate, lower-grade (<15% Zn) exhalite
10	Sub-lower plate (Paalaaq) vein unit
11	Median plate higher-grade (>15% Zn) exhalite
12	Higher-grade (>15% Zn) weathered exhalite, any plate
13	Lower plate Ikalukrok vein unit
15	Median plate Ikalukrok barite
16	Lower plate Ikalukrok barite
17	Upper plate Ikalukrok barite
18	Lower plate higher-grade (>15% Zn) exhalite
21	Sub-lower plate (Paalaaq), lower-grade (<15% Zn) exhalite

Initially, the Main, Aqqaluk and Qanaiyaq deposits are interpreted on section (east-west and north-south) then balanced in plan view. The sectional geological outlines were used for tagging geology codes in the core and RC drill hole assay database. Blastholes in the Main deposit were tagged from the plan geology outlines. The plan geology outlines were used to tag the geology codes into the block models using a majority rule basis, meaning that there is only one geology code per block.

The assays for core and RC holes were composited into 25 foot fixed length composites, honoring geology units. Blastholes have only one assay per hole and are treated as composites equal to their length, typically 25 feet.

Bulk density for the Main-Aqqaluk model is calculated with the following regression equation:

$$\text{Bulk density (tons/ft}^3\text{)} = 0.99 / (12.25 - ((((12.25 - 7.81) / 67.1) * (Zn)) + (((12.25 - 4.27) / 86.6) * (Pb)) + (((12.25 - 6.54) / 46.54) * (Fe)) + (((12.25 - 7.12) / 58.86) * (Ba))))$$

The equation begins with an assumed host rock porosity (1%) and a general bulk density value for unmineralized host rock (12.25 ft^3/ton) and is modified by contributions defined by amounts of sphalerite (Zn analysis), galena (Pb analysis), pyrite/marcasite (Fe analysis) and barite (Ba analysis). The result is a tonnage factor, which is applied to all blocks containing units shown in the previous table. Blocks containing other units are given a default tonnage factor.

The bulk density for the Qanaiyaq model is calculated using the same general formula, but because of the weathered nature of the deposit the assumed host rock porosity in most exhalite units is 12%. Only in the baritic units does the porosity remain at 1%. Waste shale units are given default tonnages that reflect the weathered nature of the deposit.

2.7.1 Statistical Analysis

Core and reverse circulation values for Zn, Pb, Fe, Ba, sPb, Ag, S, and TOC (plus sZn and Cu at Qanaiyaq) were composited into maximum 25' intervals, relative to the geology units listed in Table 2.7.2. Classical statistics on composite values were completed for each grade element, on the total population, individual rock domain and by grouped domains. A similar analysis was also done for Zn, Pb, Fe, Ba and sPb, blasthole composites from the Main deposit.

Frequency distribution, histogram and probability plots were developed for all grade elements based on rock type and domain. Only Ba values required a topcut. Due to overlapping normal and lognormal distributions a 15% Ba topcut was adopted for the non-baritic exhalite domain and a 44% Ba topcut was applied to the baritic exhalite domain. Histograms, probability plots and Ba topcut analysis are available in a separate document.

2.7.2 Geostatistical Analysis

Semi-variogram analysis for Zn, Pb, Fe, Ba, Ag, sPb, S and TOC were prepared separately for each geologic rock type grouping of exhalite for the Main and Aqqaluk portions of the Main – Aqqaluk model. Since blasthole data were also available for Zn, Pb, Fe, Ba and sPb in the Main deposit they were also analyzed. In Qanaiyaq, analysis was run on sZn and Cu in addition to the elements analyzed in the Main – Aqqaluk model. Directional semi-variograms oriented at 11° to 22.5° increments were prepared to define the variability of composites relative to sample separation. Lag distance was defined at 25 ft for vertical semi-variograms and ranged between 25 and 150 feet for horizontal semi-variograms depending on data density and variogram range. In some cases a local mean squared (LMS) normalizing technique was applied to modify the Gamma (h) values. Experimental semi-variogram models were created using the nested spherical modeling approach. Summary results for each element in all deposits, including semi-variogram plots, are available in a separate document.

2.7.3 Interpolation

Independent "short-term", "long-term" and "planning" models were prepared on the Main deposit. The short-term model is restricted to active mining areas on the Main deposit and is used primarily for short range mine planning, detailed mine design and grade control. The short-term model was constructed using all available data including blast holes, diamond drill holes and RC holes. The long-term model, which covers both Main and Aqqaluk deposits, was prepared using diamond drill holes and RC holes only. Grade interpolation within the long-term model is restricted to a zone that extends 150' beyond the limit of drilling.

The planning-model at Main combines both short and long-term models on the Main deposit. Portions of the model falling within 60 feet of blast holes were defined by the short-term model (blast hole, DDH and RC data). Blocks more than 60 feet from blast holes were defined by the long-term model (DDH and RC). The combined model was used for long term planning, reserves and resources.

Since blast hole information does not exist at Aqqaluk or Qanaiyaq, long-term models were used for mine planning, as well as reserve and resource reports.

Grade interpolation adopted a multi pass kriging approach. The first pass of the short-term model uses a search ellipse of 100' x 100' x 60' with a minimum of 3 and maximum of 7 composites needed to interpolate a block. The second pass uses a smaller search ellipse, 50' x 50' x 30', and requires a minimum of 4 and maximum of 7 composites to interpolate a block. The second pass will overwrite some blocks from the first pass. Both passes are geology matching, so composite geology must match block geology in order for the composite to be used to interpolate the block. The short-term runs interpolate Zn, Pb, Fe, Ba and sPb, because only those elements are assayed in blast holes. All elements are ordinary kriged.

The first pass of the long-term run at Main uses a 300' x 300' x 150' search ellipse with a minimum of 2 and a maximum of 15 composites needed to interpolate each block. The second pass uses a 150' x 150' x 80' search ellipse with a minimum of 3 and a maximum of 12 composites to interpolate each block. As in the short-term run, both passes are geology matching. The long-term runs interpolate Zn, Pb, Fe, Ba, sPb, Ag, S and TOC.

The Aqqaluk portion of the long- term model uses a method similar to the long-term run in the Main Pit. The major difference was the use of a three pass kriging approach to ensure that all blocks in the pit receive interpolated values. The first pass uses a search ellipse of 400' x 400' x 30' with a minimum of 2 and a maximum of 15 composites needed to interpolate each block. This pass is global in that composites from any exhalite geology unit within a structural plate can be used to interpolate any exhalite block in that plate. The second pass uses a search ellipse of 400' x 400' x 200' with a minimum of 2 and a maximum of 15 composites to interpolate each block. The third pass uses a search ellipse of 300’ x 300’ x 150’ with a minimum of 3 and a maximum of 12 composites to interpolate each block. The second and third passes are geology matching, as in the Main pit interpolation runs. The Aqqaluk runs use ordinary kriging to interpolate Zn, Pb, Fe, Ba, sPb, Ag, S and TOC.

The Qanaiyaq long-term model uses composites from core and reverse-circulation holes to interpolate metal values. A three-pass method, similar to the Aqqaluk portion of the Main – Aqqaluk model is used. The first pass is a global filling of blocks, where any exhalite composite can be matched with any exhalite block. It uses a search radius of 300’ x 300’ x 80’ and requires a minimum of 2 and a maximum of 15 composites to interpolate a block. The second and third passes are geology matching. The second pass uses a search radius of 300’ x 300’ x 80’ and requires a minimum of 2 and maximum of 15 composites to interpolate a block. The third pass uses a search radius of 150’ x 150’ x 40’ and requires a minimum of 3 and maximum of 12 composites to interpolate a block. The Qanaiyaq runs use ordinary kriging to interpolate Zn, Pb, Fe, Ba, sPb, sZn, Cu, Ag, S and TOC.

2.7.4 Reserve and Resource Classification

The Main deposit within its ultimate pit outline is classified as a proven mineral reserve. This level of reserve category is supported by good mill blast hole model reconciliation and a dense core and RC drill pattern of 100 x 100 feet. Economic parameters are also well established and supported by current production.

The Aqqaluk deposit contains a probable reserve as well as an indicated resource. Both are contained within the same ultimate pit and are differentiated based on drilling density. The Aqqaluk probable reserve is defined as any ore within the ultimate pit that is also inside a zone of at least 200’ x 200’ drilling. The Aqqaluk indicated resource is contained within the Aqqaluk ultimate pit, but outside the area of 200’ spaced drilling. The drill spacing over the indicated resource is roughly 400’ x 200’, making its extent less certain and justifying its classification as an indicated resource.

Qanaiyaq is classified as an indicated resource within its ultimate pit outline. Since the deposit is a kleppe its extent is known, and with drill coverage ranging from 100’ x 100’ to 400’ x 400’, zones of potentially economic mineralization have been outlined, and in some areas are well defined. Metallurgical testing performed in 2001 indicates that portions of the deposit can be processed in the Red Dog mill. Overall, confidence exists to support the indicated resource classification.

2.8 ARD Block Modeling and Classification

The Aqqaluk and Qanaiyaq deposits were modeled to provide information on the potential for acid generation in waste rock. The units of concern included all the shale units as well as the lower grade exhalite units, and are listed in the following table:

Code	ARD Geology Unit
2	Lower-grade (<15% Zn) weathered exhalite, any plate
3	Siksikpuk and Otuk Barite
4	Siksikpuk and Otuk Shale
6	Median plate Ikalukrok vein unit
8	Lower plate, lower-grade (<15% Zn) exhalite
12	Higher-grade (>15% Zn) weathered exhalite, any plate
13	Lower plate Ikalukrok vein unit
15	Median plate Ikalukrok barite
16	Lower plate Ikalukrok barite
18	Lower plate higher-grade (>15% Zn) exhalite (Qanaiyaq only)
25	Okpikruak Shale
26	Ikalukrok Shale
27	Kivalina Shale
29	Basal Mélange

Additional data were required for the ARD models. Waste shale units needed zinc, lead, barium, total inorganic carbon (TIC) and total sulfur (STOT) assays, while the exhalite units needed only TIC and STOT. Where core had been previously sampled the original assay pulps were composited into 25'intervals and assayed, while in waste zones that had not been previously sampled the existing core was split and assayed.

2.8.1 Statistical Analysis

The combined ARD database for Aqqaluk and Qanaiyaq consists of 1,363 total inorganic carbon (TIC) and total sulfur composites collected in the ARD sampling program, were merged with 1,630 additional composites of waste units (rock types 3, 4, 5, 25, 26, 27, 29) assembled from existing assays. Assays were composited into 25 ft intervals. Composites less than 12.5 ft were combined with the previous interval of the same geologic rock type up to maximum intervals of 37.5 ft. Composites of rock types with intervals shorter 12.5 ft were not included. Samples further than 200 ft. outside the earlier ultimate pits designed for Aqqaluk and Qanaiyaq have been excluded. Classical statistics on composite values were done for each grade element.

Frequency distribution histograms and probability plots were created for TIC, total sulfur, zinc, lead and barite for exhalite and waste geologic rock types. Rock types with similar distributions were grouped together for further analysis. Topcuts were selected to remove the influence of high grade erratic values. The coefficient of variation was recalculated where topcuts were applied. Histograms and probability plots from the statistical analysis are available in a separate document.

2.8.2 Geostatistical Analysis

Semi-variogram analysis for TIC, total sulfur, zinc, lead and barite were prepared separately for each geologic rock type group of exhalite and waste units for Aqqaluk and Qanaiyaq. Directional semi-variograms oriented at 22.5° increments with additional semi-variograms at 15°, 30°, 112.5° and 120° prepared to determine the variability of the samples relative to sample separation. Lag distances ranged between 200 and 250 feet for horizontal semi-variograms and between 24 to 55 feet for vertical semi-variograms. In some cases local mean squared (LMS) normalizing was applied to modify the Gamma (h) values. Experimental semi-variogram models were created using nested spherical modeling. Summary results for each element in Aqqaluk and Qanaiyaq, including semi-variogram plots, are available in a separate document.

2.8.3 ARD Interpolation

The geology interpretations in the existing Main – Aqqaluk and Qanaiyaq models were used to control interpolation of the new data. Modeling technique was similar to what was used to interpolate ore grades. In Aqqaluk there were two passes for each item to be interpolated. The first was a global pass, matching any exhalite composite to any exhalite block, with a search radius of 600' x 600' x 200' requiring a minimum of 1 and a maximum of 15 composites to interpolate a block. The second pass was geology matching and used a search radius of 400' x 400' x 200' and minimum of 2 and a maximum of 15 composites to interpolate a block.

The Qanaiyaq first pass was global, allowing any composite to be used with any block, with a search radius of 600' x 600' x 250' and a minimum of 1 and a maximum of 15 composites to interpolate a block. The second pass was geology matching using a search radius of 300' x 375' x 250' and a minimum of 1 and a maximum of 15 composites to interpolate a block.

Search distances increased and composite minimums decreased in ARD modeling due to the relative lack of data available compared to the ore reserve models. Both Aqqaluk and Qanaiyaq runs used ordinary kriging to interpolate Zn, Pb, Ba, TIC and STOT in units required for modeling.

2.8.4 ARD Characterization and Classification

The model items listed in the following table were calculated and used to determine the ARD potential of each block in the Aqqaluk and Qanaiyaq pits.

AP – Acidification Potential	31.25 * SinPy
NP – Neutralization Potential	TIC * (1001/12)
NNP – Net Neutralization Potential	NP – AP
NPR – Neutralization Potential Ratio	NP / AP
SinPy – Sulfur in Pyrite (<8% Fe)	STOT – (32.1*((%Zn/65.4)+(%Pb/207) + (%Ba/237)))
SinPy – Sulfur in Pyrite (>=8% Fe)	(2 * (32.1/55.8)) * %Fe

Blocks were then categorized based on geology unit and NPR, and the amount of waste in each category was determined. Waste in categories 1 and 2 tends to generate acid rapidly, while waste in categories 3 and 4 likely generates acid slower, or possibly not at all. ARD categories and relative percents of waste in each category for Aqqaluk and Qanaiyaq are listed in the following tables.

Aqqaluk – ARD Categories and Percent of Waste by Category

ARD Category	Description	% of Aqqaluk Waste
1	Exhalite Waste regardless of NPR	48%
2	NPR < 0.49	15%
3	0.50 < NPR < 2.00	20%
4	NPR > 2.00	17%

Qanaiyaq - ARD Categories and Percent of Waste by Category

ARD Category	Description	% of Qanaiyaq Waste
1	Exhalite Waste with NPR < 0.49	90%
2	0.50 < NPR < 2.00	3%
3	NPR > 2.00	5%
4	Okpikruak Shale	2%

SECTION 3: MINE PLAN

3.1 Summary

The reserve models for the Main, Aqqaluk and Qanaiyaq deposits were revised to include an updated metallurgical algorithm that provides for varying recoveries as a function of reserve model assays. Revised ultimate pit designs for the three deposits were developed utilizing a Lerch-Grossman/time value of money pit optimization routine. These ultimate pits were then subdivided into pit shells by ranking the pits generated by the optimization routine by net present value (NPV). The ranked pits were tested to see which combination of logical pushbacks and ultimate pit yielded the highest net present value. These push-backs were selected on the basis of mining constraints such as minimum mine equipment working widths and access ramps. The logical pushback phases were further tested in the smoothing process by developing preliminary mine plans to ensure that ore flow and mine capacity constraints were met.

The various pit shells were then scheduled to produce an operating mine plan that honours development criteria and operating constraints. The annual zinc and lead flotation capacity was constrained at 1.04 and 0.25 Mt of concentrate for all three deposits. The grinding capacities varied since harder ores are expected as the zinc grade drops in Aqqaluk. The grinding capacities assumed for pit optimization are as listed in the following table:

Pit	Units	Quantity
Main	Mt/year	3.1
1st six years Aqqaluk	Mt/year	3.1
Remaining years Aqqaluk	Mt/year	3.0
Qanaiyaq	Mt/year	3.1

Note that due to the increase in estimated ore hardness in Aqqaluk after eleven years mining, the grinding throughput rate was forecast at 2.75 Mt/year. The mine plan study assumes that when this occurs, two larger SAG mill motors will be installed resulting in capacities of about 3.0 Mt/year. The modification will be required in 2021. Documentation of the mill throughput increase study and corresponding cost estimate are available in separate reports.

The mine plan sequence schedules the Main, Aqqaluk, and Qanaiyaq deposits in a series of pushback phases. This phasing allowed for an even distribution of mine production and resulted in higher grade ore in early production years. There are two phases in the Main Pit, four phases in Aqqaluk Pit, and one phase in Qanaiyaq Pit. The mine plan assumes that the Main Pit will be mined first, which allows for the sub-aqueous deposition of acid generating waste from Aqqaluk Pit into the mined out Main Pit as well as relatively short waste hauls for Aqqaluk pre-stripping.

Actual and planned production rates are summarized in the following table:

Year	Material Mined (000's t)			Milled	Zinc Grade
	Ore	Waste	Total	(000's t)	(%)
1998a	2,454	1,241	3,695	2,497	21.4
1999a	3,208	2,013	5,220	2,978	21.3
2000a	3,280	3,311	6,591	3,045	21.0
2001a	3,345	3,950	7,294	3,211	19.8
2002a	3,298	3,959	7,257	3,166	21.1
2003a	3,416	3,035	6,451	3,154	21.7
2004p	3,133	4,018	7,151	3,175	21.5
2005p	3,312	3,067	6,379	3,312	20.7
2006p	3,306	3,195	6,501	3,306	20.5
2007p	3,334	2,966	6,300	3,334	20.2
2008p	3,319	3,003	6,322	3,319	20.5
2009p	3,293	4,195	7,489	3,293	20.7
2010p	3,305	5,578	8,884	3,305	20.3
2011p	3,304	6,688	9,991	3,304	19.7
2012p	3,301	6,706	10,007	3,301	19.6
2013p	3,309	6,719	10,029	3,309	19.4
2014p	3,321	6,767	10,088	3,321	19.6
2015p	3,318	8,314	11,632	3,318	19.5
2016p	3,304	8,191	11,495	3,304	18.1
2017p	3,304	8,191	11,495	3,304	18.1
2018p	3,304	8,191	11,495	3,304	18.1
2019p	3,304	8,191	11,495	3,304	18.1
2020p	3,304	8,191	11,495	3,304	18.1
2021p	3,025	5,199	8,224	3,025	16.0
2022p	3,025	5,199	8,224	3,025	16.0
2023p	3,025	5,199	8,224	3,025	16.0
2024p	3,025	5,199	8,224	3,025	16.0
2025p	3,025	5,199	8,224	3,025	16.0
2026p	3,025	1,254	4,279	3,025	14.4
2027p	3,025	1,254	4,279	3,025	14.4
2028p	3,025	1,254	4,279	3,025	14.4
2029p	3,025	1,254	4,279	3,025	14.4
2030p	3,025	1,254	4,279	3,025	14.4
2031p	511	217	728	511	14.4
Totals p	86,836	134,653	221,491	86,878	18.0

Note: a – actual production, p – planned production

3.2 Pit Optimization

This pit optimization study incorporated updated block models, current and projected operating cost data, as well as updated smelter and shipping terms. The three block models selected for optimization were: Main-2004, Aqqaluk-2004 and Qanaiyaq-2004. The deposits were modeled using Whittle 4-X Analyser optimization software. The software utilizes the Lerch-Grossman algorithm and evaluates pits by net present value. The software is not based on a static economic model (fixed cut-off grade, cost or metal price), but rather on the geologic model, recovered metal, processing costs, recovery factors, densities and concentrate grades assigned to each block within the model. The Whittle program generates a series of mathematically optimal pit shells organized in order of decreasing value. Each shell maximizes the discounted cash flow through the entire mining cycle resulting in the most economic material being mined first. An ultimate pit was selected and tested by using a series of logical starter pits.

The combination of starter pits and ultimate pit which yielded the highest net present value was used as the basis for detailed pit design. The selected Whittle shells were then evaluated using Qpit software to smooth, phase and locate the placement of appropriate ramps. After the smoothed phases were completed, preliminary mine plans were developed to ensure access, ore flow and mine capacity constraints were met. If necessary, appropriate adjustments were made to the phase shape and then the new set of phases were confirmed again with a mine plan.

3.2.1 Open Pit Optimization Parameters

The pit optimization assumptions were developed through test work, consultant reviews, and general operating experience over the previous 14 years of operation. Aqqaluk costs were segmented to reflect different operating assumptions. For the first six years of Aqqaluk mining, the mill throughput rate is expected to be the same as the Main Pit (3.1 Mt/yr), and throughput will be limited by the capacity of the flotation/dewatering circuits. The zinc grade declines to approximately 17% in the following years and ore hardness is expected to increase resulting mill throughput liminted by grinding circuit capacity. The declining mill throughput will increase the marginal cut-off, due to high fixed operating costs, used in the pit optimization program resulting in a reduction of ore reserves. The mill throughput estimate for lower grade ore (less than 17% zinc) was 2.75 Mt/yr. An throughput study concluded that a 10% increase to 3.025 Mt/yr was achievable by increasing the power to two of the SAG mills. The resulting increase in NPV was significant. Based on these results, Aqqaluk economic estimates assumed a 10% throughput increase to 3.0 Mt/yr.

The optimization parameters assumed for this mine plan are discussed in the following sections.

3.2.1.1 Metal Price and Discount rate

Estimated long term average metal prices for zinc, lead and silver were used in the pit optimization study. The discount rates assumed were appropriate for long term economic and risk considerations.

3.2.1.2 Metal Recoveries

The following table details the metal recoveries used in the optimization for the three deposits itemized by metallurgical ore type:

Deposit	**Ore Type**	**Zinc**		**Lead**		**Ag Recovery**	
		Rec (%)	**Grade (%)**	**Rec (%)**	**Grade (%)**	**To Zn (%)**	**To Pb (%)**
Main	All	URF	55.0	71.8	52.5	44.5	AgR
Aqqaluk	Low iron	URF	55.0	71.8	58.0	44.5	AgR
	High iron	URF	55.0	59.0	58.0	44.5	AgR
	Vein	87.0	56.0	73.2	65.0	44.5	AgR
	Baritic	URF	55.0	63.1	62.0	44.5	AgR
	Median plate	URF	55.0	78.4	55.0	44.5	AgR
Qanaiyaq	Regular	83.0	55.0	75.7	58.0	47.5	23.5
	Weathered	82.0	53.0	53.6	61.0	53.5	16.0

URF is the Universal Recovery Formula and is calculated using the estimated ore assays.

Silver recovery to lead concentrate (AgR) is variable and is calculated using the estimated silver head grades.

3.2.1.3 Operating Costs

Operating cost estimates are based on historical mine operating experience, projected annual ore tonnes and grade, waste tonnes and contractual obligations.

3.2.1.4 Distribution Costs

Site distribution costs vary with concentrate production. Long term contracts for site trucking (NANA/Lynden), barge lightering (FOSS) and the port (Alaska Industrial Development Export Authority – AIDEA) are the basis for the forecasts.

Of-site shipping cost estimates are based on projected distribution of concentrate to markets in Europe, the Far East and to Trail.

3.2.1.5 Smelter Terms

Smelter terms used for pit optimization were based on long term average forecast developed by Teck Cominco marketing, incorporating average projected costs to Trail, Far-East and Europe. In addition to the charges and penalties, deductions were also applied for oxidation during shippin and marketing.

3.2.1.6 Pit Slopes

In 2003, Golder Associates were retained to update the pit slope criteria used in the Main, Aqqaluk and Qanaiyaq Pits. Golder recommended that the geotechnical domains should be based on rock units. For Main and Aqqaluk Pits, a three dimensional model was developed based on the following inter-ramp slopes and rock units:

Exhalite/barite units	47^{0} inter-ramp slopes
Siksikpuk units	45^{0} inter-ramp slopes
Mélange/black shale units	41^{0} inter-ramp slopes

This three dimensional model was used in the Whittle runs to ensure that the optimized shells would honor the appropriate inter-ramp slopes. A conservative inter-ramp slope of 37^{0} was applied to Qanaiyaq Pit due to very poor quality rock. Bench face angles, berm widths and other detailed pit design criteria can be found in Section 3.3.

3.3 Mine Design Criteria

Red Dog mine design assumptions have been developed through test work, consultant reviews, and general operating experience over the previous 14 years of operation.

3.3.1 Haul Roads

Haul roads are designed to a running surface width of 70 feet and including necessary berms (12 feet) and ditches (6 feet) resulting in a total width of 88 feet for two-lane traffic. Temporary ramps of less than two benches in height may be designed for single lane traffic with a total width of 58 feet. Maximum grades were limited to 10%.

3.3.2 Bench Heights

Bench heights are limited to 25 feet to meet the digging envelope of the Caterpillar model 992G loader.

3.3.3 Pit Design

In addition to the inter-ramp slope constraints mentioned in Section 3.3.1.6, bench face angles and berm widths were recommended for the rock units by Golder Associates. The following table summarizes the detailed pit design parameters:

Rock Unit	**Inter-Ramp (degrees)**	**Bench Face (degrees)**	**Berm Width (feet)**
Exhalite/Barite	47	70.0	14.2
Siksikpuk	45	66.6	14.2
Mélange/Shale	41	60.0	14.2
Qanaiyaq	37	52.8	14.2

Minimum mining width was set at 100 feet.

3.3.4 Blending Criteria

The following blending criteria were utlized to honour grinding/flotation capacities and optimize plant recovery. However, there were periods in the mine plan where it was impossible to achieve all of the blending constraints.

Parameter	**Constraint**
Zinc/Iron ratio	> = 2.50
Zinc/Total Lead ratio	> = 3.65
Total Organic Carbon	< = 0.65%
Baritic Ore	< = 10%
Weathered Ore	< = 5%

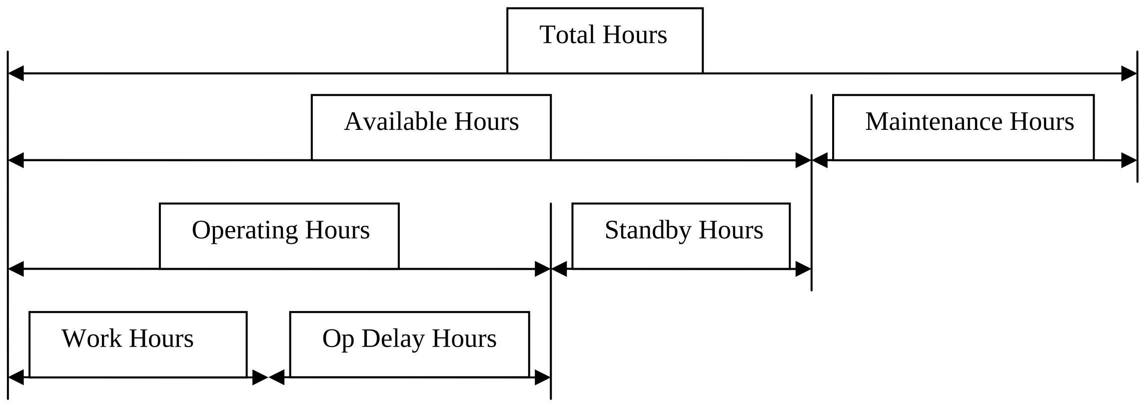
3.3.5 Equipment Assumptions

The major equipment assumed for this plan was:

- Caterpillar 777D haul trucks
- Caterpillar 992G loaders
- Ingersoll Rand DM-L drills

The equipment hour definition was used to determine annual equipment operating time.

This definition is illustrated in the following schematic:



The following table lists the availabilities assumed for each piece of equipment. The use of availability will vary as mine capacity demands increase:

Availability	777D Haul Truck	992G Loader	DM-L Drill
Physical Availability	75 %	70 %	80 %
Use of Availability	65 %	65 %	50 %

Based on the equipment hour definition, availabilities and estimates of operating delays, the following table summarizes the equipment hour summary by year:

Annual Hours	777D Haul Truck	992G Loader	DM-L Drill
Total	8,760	8,760	8,760
Maintenance	2,190	2,628	1,752
Available	6,570	6,132	7,008
Standby	2,300	2,146	3,504
Operating	4,271	3,986	3,504
Working	3,648	3,405	2,993
Operating delays	623	581	511

Truck productivities were based on the following cycle time assumptions:

- Spot at loader - 1 minute
- Dump - 1 minute
- Load - 2 minutes
- Queue - 0.75 minutes
- Rolling resistance - 3%
- Operator efficiency - 85%
- 10% downhill loaded - 16.1 km/hr (10 mph)
- All other segments - truck speeds to a maximum of 40 km/hr (25 mph)
- Wet payload - 87.1 tonnes/load
- Dry payload - 83.6 tonnes/load

Haul truck hours were determined by calculating the cycle times from haulage profiles. The haulage profiles were based on pit bench centroids with haul route and dumping point established for each material type. A Caterpillar® simulation program called Fleet Production and Cost (FPC) was used to calculate cycle times. Inputs to the program included the cycle time assumptions and haulage profiles for each haul. Cycle times were converted to working hours and then truck productivity.

Loader and drill productivities, based on historic data are summarized in the table below:

	Productivity (tonnes/operating hour)	
Equipment	Ore	Waste
992G Loader	1,100	950
DM-L Drill	1,375	1,456

The estimated equipment operating hours can be found in the production summary detail in Section 3.4.5.

3.3.6 Material Properties

Material properties used in the design of waste dumps and tailings disposal are as follows:

Material Property	**Description**	**Units**	**Quantity**
Swell	loose volume/in-place volume	none	1.3
Angle of Repose	free place material	degrees	36.5
Waste bulk density	Insitu weight per volume	t/ft^3	0.0825
Ore bulk density	Insitu weight per volume	t/ft^3	varies
Tailings Density	specific gravity	none	2.87
Tailings Solids	weight percent solids	%	76.0
Tailings Solids	volume percent solids	%	52.5
Construction Waste	sulphides less than	%	3.5

3.4 Pit Design and Production Schedule

The Whittle optimizer generated a series of shells organized in order of decreasing value for each pit. Based on schedule criteria such as throughput, mining rate and concentrate production limits, scheduled cases of starter shells and ultimate shells were evaluated to determine which combinations resulted in the highest NPV. The starter shells were based on mining width and ore presentation. Two shells were selected for the Main Pit and three shells were selected for Aqqaluk Pit as templates to design the logical push-backs. One pit was selected for Qanaiyaq Pit due to minimum mining width constraints. These shells were then transferred into Qpit mine design software along with the grade model information for detailed pit design and ramp placement. After each phase and ultimate pit were completed, preliminary mine plans were developed bench by bench to test the correct size and shape of the smoothed phases. The pit phases were altered to achieve ore blending criteria. In the Aqqaluk Pit, an additional phase was added to smooth mine production, resulting in a total of four phases. The additional Aqqaluk phase extended the period of higher grade Aqqaluk ore and therefore, higher grinding rates/lower cutoff costs were sustained through to 2020. Whittle pit runs were based on the assumption that the lower throughput would occur in 2017.

The three pits will be mined in seven phases over the remaining 27-year mine life. Zinc concentrate production was limited to 1.04 million tonnes per year. Reserves/resource estimates, compiled by pit, are as follows:

Deposit	Pit	Ore (kt)	Zn (%)	Pb (%)	Ag (g/t)	Waste (kt)
Main	M-1	12,102	22.7	7.4	136	11,265
	M-2	11,153	17.8	3.7	74	13,488
	2004 budget	3,132	21.5	5.9	97	4,018
	Total	26,387	20.5	5.7	105	28,772
Aqqaluk	A-1	6,584	22.3	5.2	83	6,580
	A-2	11,069	19.8	4.6	78	13,519
	A-3	10,114	16.6	4.4	78	16,442
	A-4	27,856	13.5	3.9	79	56,417
	Total	55,623	16.4	4.3	79	92,958
Qanaiyaq	Q-1	4,826	23.4	6.3	128	12,925
Total		**86,836**	**18.0**	**4.8**	**90**	**134,654**

A low grade surface stockpile will be developed while mining the Aqqaluk and Qanaiyaq deposits. A marginal cutoff for low grade was estimated by removing the overhead costs which will not be present if low grade were to be processed after the pits had been exhausted. Additional metallurgical test work is required for low grade to improve the economic confidence for processing. This testwork would include the determination of through put rates, recovery and concentrate quality. Approximately 7.1 Mt of low grade ore came from Aqqaluk Pit and 0.6 Mt from Qanaiyaq Pit.

A waste model was constructed to characterize the waste in Aqqaluk and Qanaiyaq Pits. Acid potential (AP), neutralizing potential (NP) and neutralizing potential ratio (NPR) models were developed. The Main Pit will be mined initially allowing for sub-aqueous disposal of high leaching potential waste from Aqqaluk Pit .

3.4.1 Main Pit

Phase design for the Main Pit resulted of two push-backs. The first phase mined two lobes of high grade mineralization on the west side of Red Dog Creek. High lead grade ore from the south lobe was blended with low lead grade ore from the north lobe to achieve zinc/lead ratio blending criteria. Diversion of the Red Dog Creek is planned for 2004 to allow mining to the ultimate pit. The Phase 1 (M1) and ultimate pit (M2) designs are illustrated in Appendix 3.

Mining of the north end of the ultimate Main Pit will be completed in advance of the south end allowing high metal leaching potential waste from Aqqaluk Phase 1 Pit to be placed into the northeast end below elevation 850 feet. The schedule also allows high lead grade, un-weathered ore from the south end of the main deposit to be blended with low-lead grade, weathered ore from Aqqaluk Pit. Phase 1 Main Pit will be completed in 2010 while the ultimate pit is finished in 2012. This will allow for a 3 year transition period between the completion of the Main Pit and full production from Aqqaluk Pit.

3.4.2 Aqqaluk Pit

Mining of the Aqqulak Pit is planned in four push-backs (A1 to A4). Mining of a low strip ratio/high zinc grade starter pit begins in 2010. Stripping of the second Aqqaluk pushback (A2) starts in 2011, while mining of third phase (A3) starts in 2013. The fourth and final pushback phase in Aqqaluk starts in 2015. Both A3 and A4 phases release lower grade reserves with elevated iron levels. Iron grade exceeds 10% for 2021 to 2031 period and Zn/Fe ratio falls below the recommended 2.5 ratio for that period. The four pit outlines are illustrated in Appendix 3.

High metal leaching potential waste is used to back fill the main pit below the elevation of Red Dog Creek. The quantity of waste was determined by calculating how much waste could be placed in the Main Pit below the water elevation of 850 feet. Approximately 34 Mt of high metal leaching material was quantified in the reserve model below a NPR of 0.22 of which 24 Mt could be placed in the mined out Main Pit. The remaining waste was placed at a higher elevation lift into the Main Pit.

In 2020, Red Dog Creek will be relocated slightly south of the 2004 alignment to allow mining of the south surface ore in Aqqaluk. The 2020 status map located in the Appendix 3 illustrates the revised alignment.

3.4.3 Qanaiyaq Pit

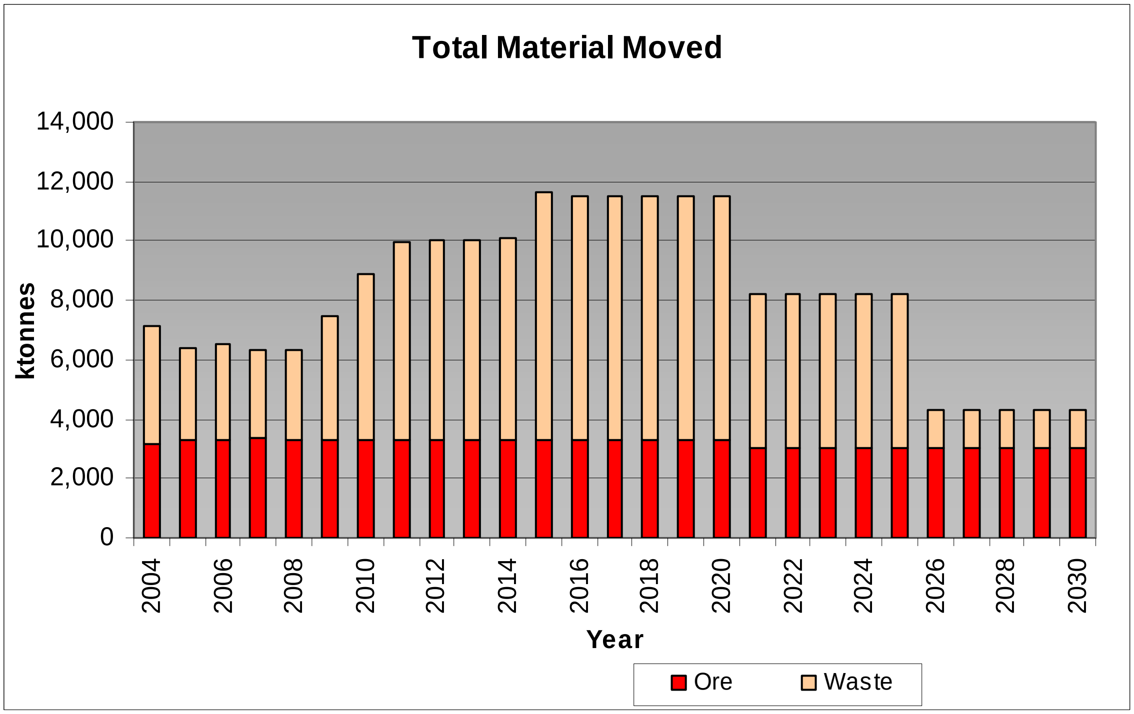
The Qanaiyaq Pit is a heavily weathered deposit with higher average zinc grades than Aqqaluk Pit. The schedule releases the bulk of Qanaiyaq ore over a 5 year period to increase zinc feed grades when mining the lower zinc grade Aqqaluk Pit pushbacks (A3 and A4) and to minimize geotechnical wall concerns. It is recommended to place the waste above water due to the high degree of soluble metals in Qanaiyaq. The waste from Qanaiyaq will be placed on the 1225 elevation of the Main Pit waste dump. The Qanaiyaq Pit outline is illustrated in Appendix 3.

3.4.5 Production Schedule

The life of mine production schedule includes both reserve and resource ore estimates. The schedule was limited by zinc concentrate production (1.04 Mt/year) between 2004 to 2020. Net present value was maximized during this period by maintaining higher zinc grade ore. Beyond 2020, grinding capacity limits production due to lower zinc grades from the Aqqaluk Pit.

The life of mine production schedule is summarized in the following four tables: Total Production Summary; Main Pit Production Summary; Aqqaluk Pit Production Summary and Qanaiyaq Pit Production Summary contained in Appendix 3. The Total Production Summary Table details the equipment operating hours required for the 777 Caterpillar haul trucks, the 992 Caterpillar loaders, and the Ingersoll Rand DM-L drills, and the units required. These production summaries are followed by a graphical representation of the benches mined by period by pit phase.

The following graph presents mill feed and waste mining tonnages to the end of the mine life:



The following table outlines the mine production schedule highlights:

Year	Notes
2005	• Mining on multiple benches in Phase M1 and south of M2 for crusher feed blending
2006	• Start stripping in north of Phase M2 • Connection through Phase M1 to south M2 mining • Ramp used initially to access south M2 near creek mined out
2008	• Mining in south of Phase M2 must be completed for access before mining to final limit Main Pit
2009	• Pioneer access ramp for Aqqaluk A1 Pit
2010	• Completion of mining Phase M1 • Start mining in Phase A1
2011	• Pad waste placement for low grade material • Start back filling in Main Pit (ramp access left in place for mining of remaining material in main pit) with high ARD rock • Start mining in Phase A2 • Start placement of low grade stockpile material • End of placing material in main waste dump other than low grade • Waste material dumped on topography towards Main Pit from 1225 • Placement of waste in Main Pit to top of 850 (reactive waste elevation limit) • Start of ex-pit access to inpit dumping from elevation 1025
2012	• Completion of Main Pit mining
2013	• Start mining in Phase A3
2014	• Start of ex-pit access to inpit dumping from elevation 1025
2015	• Completion of Phase A1 • Start mining in Phase A4 • Pioneer access ramp for Qanaiyaq Pit • Start of lifting waste to dump on 1075 in Main Pit waste dump
2020	• Completion of Phase A2, relocate Red Dog Creek to the south • Start mining in Qanaiyaq • End of Phase A3
2025	• End of mining in Qanaiyaq • Ramp connection through Phase A3 for 5 benches of phase A4 mining • All waste dumped from ex-pit ramping access
2031	• End of Phase A4 – mine life • All waste dumps reclaimed to 2 to 1 slope

3.5 Waste Dumps

3.5.1 Main Waste Dump

Waste rock from the Main Pit is placed in the main waste dump. The waste dump is located on the west side of the ridge between the tailings pond and the Main Pit. 7.6 Mt of low grade will be stockpiled and 33.4 Mt of waste will be placed in the main waste dump. The low grade material will is from Aqqaluk and Qanaiyaq Pits. This material will be stockpiled on a pad at the north end of the main waste dump above elevation 1200 feet.

The final dump design will consist of 25 foot to 50 foot lifts spanning the entire length of the dump at elevations of 1225, 1275 and 1300 feet. The dump is sloped to the south to allow for the take-off envelope of a Boeing 737C jet. The west side of the dump is planned in 50 foot lifts and 50 foot berms. The lift faces will ultimately be re-sloped to a 2H:1V with allowance for a 25 foot access road.

Snow or topsoil is removed from the base of each lift prior to construction. The current lifts that are built on original ground were constructed from the top down with lower lifts wrapping around the upper lifts to key them in place. Rock drains were constructed at the base of the dump and through original topographic drainages.

The construction of the main waste dumps are illustrated in the attached status maps in Appendix 3.

3.5.2 Main Pit Back Fill Waste Dump

Completion of Main Pit mining will result in a natural waste disposal area for Aqqaluk and Qanaiyaq waste into the mined out pit. Segregation of the highly reactive waste (NPR<0.22) and disposal below the lowest point of the Main Pit rim at elevation 850 foot will allow for sub-aqueous storage. A NPR<0.22 was criteria used for segregating approximately 34 Mt of waste that could be placed below the 850 foot elevation. However, approximately 24 Mt of material with a NPR<0.22 can actually placed below the 850 foot elevation as this platform has to advance ahead of the upper platforms thus precluded storing the enitre 34 Mt below 850 foot elevation.

There are three main dumping platforms in the Main Pit for waste from Aqqaluk and Qanaiyaq:

- 850 dump reserved for highly reactive waste from Aqqaluk
- 1025 and ultimately the 1100 dump reserved for less reactive waste from Aqqaluk
- 1225 dump which will contain all of the oxidized waste from Qanaiyaq

The following table summarizes the placement of material in the Main Pit:

Main Pit Dump Lift	Tonnage (kt)	Comments
850	24,060	NPR<0.22
1025	39,592	Other Aqqaluk waste
1075	15,700	Other Aqqaluk waste
1100	1,927	Other Aqqaluk waste
1225	12,357	Qanaiyaq waste

The status maps in Appendix 3 illustrate the development of the Main Pit dump. The end of life status maps show the dump faces reclaimed to 2H:1V.

3.6 Tailings Pond

The tailings pond is located adjacent to the mill and is formed by the existing Main Dam at the north end and the Back Dam to the south, which is currently under construction. All of the tailings will be stored subaqueously in the existing tailings pond in order to minimize metal leaching and fugitive dusting. The total tailings tonnage to the end of the mine life is estimated at 72 Mt.

The crest elevation of the Main Dam is currently 955 feet. Allowing for a minimum of two feet of water cover, storage of runoff, waste rock seepage and mine sump flows, storage of the probable maximum flood and wave run-up, the crest of the Main Dam will ultimately be raised to a final elevation of approximately 980 feet. The impermeable portion of the Back Dam will be raised to the same elevation. Dam construction is planned in five foot lifts over the life of the mine, as required to maintain a minimum operating freeboard of five feet. It will be necessary to continue operation of the water treatment plant after the mine shuts down in order to maintain the pond water balance.

The projected levels of the dam crest and water levels at spring freshet maximums are shown in the following table:

End of period (years)	Dam Crest (ft)	Water Level (ft)
2005 – 2015	955	945
2017	960	949
2020	965	956
2025	975	967
2031	980	975

APPENDIX 3

MINE PLAN PRODUCTION SCHEDULES AND DRAWINGS

Life of Mine Plan Production Schedule - Total summary

Description / Activity	Units	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2004-2031 Total
Mine Production Summary																														
Ore																														
High Grade	kt	3,132	3,312	3,306	3,334	3,319	3,293	3,305	3,304	3,301	3,309	3,321	3,318	3,304	3,304	3,304	3,304	3,304	3,025	3,025	3,025	3,025	3,025	3,025	3,025	3,025	3,025	3,025	511	86,836
Low Grade	kt								32	67	428	225	435	228	228	228	228	228	558	558	558	558	558	492	492	492	492	492	86	7,664
Total Ore	*kt*	*3,132*	*3,312*	*3,306*	*3,334*	*3,319*	*3,293*	*3,305*	*3,336*	*3,368*	*3,737*	*3,546*	*3,753*	*3,532*	*3,532*	*3,532*	*3,532*	*3,532*	*3,583*	*3,583*	*3,583*	*3,583*	*3,583*	*3,517*	*3,517*	*3,517*	*3,517*	*3,517*	*597*	94,500
Waste																														
Total Waste	*kt*	*4,018*	*3,067*	*3,195*	*2,966*	*3,003*	*4,195*	*5,578*	*6,655*	*6,639*	*6,291*	*6,543*	*7,879*	*7,963*	*7,963*	*7,963*	*7,963*	*7,963*	*4,641*	*4,641*	*4,641*	*4,641*	*4,641*	*762*	*762*	*762*	*762*	*762*	*131*	*126,990*
Total Waste/Total Ore Ratio		1.28	0.93	0.97	0.89	0.90	1.27	1.69	1.99	1.97	1.68	1.85	2.10	2.25	2.25	2.25	2.25	2.25	1.30	1.30	1.30	1.30	1.30	0.22	0.22	0.22	0.22	0.22	0.22	1.34
Total Mine Production	***kt***	***7,150***	***6,379***	***6,501***	***6,300***	***6,322***	***7,489***	***8,884***	***9,991***	***10,007***	***10,029***	***10,088***	***11,632***	***11,495***	***11,495***	***11,495***	***11,495***	***11,495***	***8,224***	***8,224***	***8,224***	***8,224***	***8,224***	***4,279***	***4,279***	***4,279***	***4,279***	***4,279***	***728***	***221,490***
Total Mill Feed Summary																														
Mill Feed	kt	3,174	3,312	3,306	3,334	3,319	3,293	3,305	3,304	3,301	3,309	3,321	3,318	3,304	3,304	3,304	3,304	3,304	3,025	3,025	3,025	3,025	3,025	3,025	3,025	3,025	3,025	3,025	511	86,878
Zinc	%	21.50	20.71	20.51	20.21	20.48	20.66	20.31	19.69	19.61	19.40	19.56	19.49	18.11	18.11	18.11	18.11	18.11	15.96	15.96	15.96	15.96	15.96	14.44	14.44	14.44	14.44	14.44	14.44	18.01
Total Lead (PbT)	%	5.90	5.52	5.64	6.34	6.53	6.28	5.45	4.59	4.94	4.74	4.42	4.69	4.63	4.63	4.63	4.63	4.63	4.93	4.93	4.93	4.93	4.93	3.51	3.51	3.51	3.51	3.51	3.51	4.84
Recoverable Lead	%	5.23	4.85	4.82	5.52	5.57	5.38	4.52	3.20	3.92	3.74	3.86	4.01	3.92	3.92	3.92	3.92	3.92	3.77	3.77	3.77	3.77	3.77	2.97	2.97	2.97	2.97	2.97	2.97	4.01
Silver	g/t	97.00	96.34	103.36	116.95	116.95	114.44	108.52	84.12	92.83	76.90	67.82	75.24	83.22	83.22	83.22	83.22	83.22	98.15	98.15	98.15	98.15	98.15	73.17	73.17	73.17	73.17	73.17	73.17	89.77
Zn Concentrate	kt	1,041	1,023	1,017	1,003	1,007	1,018	1,034	1,034	1,022	1,021	1,033	1,024	933	933	933	933	933	718	718	718	718	718	674	674	674	674	674	116	24,016
Pb Concentrate	kt	208	220	219	252	253	243	205	143	177	161	158	160	152	152	152	152	152	143	143	143	143	143	101	101	101	101	101	17	4,395
Zinc Plant Recovery	%	84.65	81.99	82.45	81.78	81.43	82.22	84.59	87.41	86.75	87.43	87.48	87.11	85.71	85.71	85.71	85.71	85.71	80.83	80.83	80.83	80.83	80.83	84.43	84.43	84.43	84.43	84.43	84.43	84.16
Lead Plant Recovery	%	68.58	71.80	71.80	71.80	71.80	71.80	71.80	72.78	74.49	73.94	71.55	70.29	68.12	68.12	68.12	68.12	68.12	63.49	63.49	63.49	63.49	63.49	67.66	67.66	67.66	67.66	67.66	67.66	68.96
Equipment Summary																														
Drills																														
DM-L Drill																														
Units Required	#	1.4	1.3	1.3	1.3	1.3	1.5	1.8	2.0	2.0	2.0	2.0	2.3	2.3	2.3	2.3	2.3	2.3	1.7	1.7	1.7	1.7	1.7	0.9	0.9	0.9	0.9	0.9	0.1	
Hours Available per unit	Op Hrs	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	
Drilling Hours Required	***Op Hrs***	***5,068***	***4,515***	***4,599***	***4,462***	***4,476***	***5,277***	***6,235***	***6,997***	***7,010***	***7,039***	***7,072***	***8,141***	***8,038***	***8,038***	***8,038***	***8,038***	***8,038***	***5,794***	***5,794***	***5,794***	***5,794***	***5,794***	***3,081***	***3,081***	***3,081***	***3,081***	***3,081***	***524***	***155,976***
Physical Availability		80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	
Use of Availability		50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	
Loading Equipment																														
992G Loader																														
Units Required	#	2.5	2.3	2.4	2.3	2.3	2.6	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	2.8	2.8	2.8	2.8	2.8	1.7	1.7	1.7	1.7	1.7	0.3	
Hours Available per unit	Op Hrs	3,986	3,986	3,986	3,986	3,986	3,986	3,986	4,292	4,292	4,292	4,292	4,906	4,906	4,906	4,906	4,906	4,906	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	3,986	
Waste Hours Required	Op Hrs	4,229	3,229	3,363	3,122	3,161	4,416	5,872	7,040	7,059	7,073	7,124	8,751	8,622	8,622	8,622	8,622	8,622	5,473	5,473	5,473	5,473	5,473	1,320	1,320	1,320	1,320	1,320	228	
Ore Hours Required	Op Hrs	5,771	6,021	6,011	6,062	6,034	5,988	6,010	6,007	6,002	6,017	6,038	6,033	6,007	6,007	6,007	6,007	6,007	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	928	
Total Loading Hours Required	***Op Hrs***	***10,000***	***9,250***	***9,374***	***9,184***	***9,195***	***10,404***	***11,882***	***13,046***	***13,061***	***13,090***	***13,161***	***14,784***	***14,629***	***14,629***	***14,629***	***14,629***	***14,629***	***10,973***	***10,973***	***10,973***	***10,973***	***10,973***	***6,820***	***6,820***	***6,820***	***6,820***	***6,820***	***1,157***	***299,700***
Assumed Physical Availability		70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	
Use of Availability		65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	70.0%	70.0%	70.0%	70.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	
Trucks																														
777D Haul Trucks																														
Units Required	#	6.7	7.9	8.0	8.1	7.6	8.2	8.5	8.9	7.4	8.4	8.7	8.9	8.3	8.3	8.3	8.3	8.3	7.9	7.9	7.9	7.9	7.9	5.9	5.9	5.9	5.9	5.9	1.0	
Hours Available per unit	Op Hrs	4,271	4,271	4,271	4,271	4,271	5,256	5,913	5,913	5,913	4,599	4,599	5,256	5,913	5,913	5,913	5,913	5,913	4,599	4,599	4,599	4,599	4,599	4,271	4,271	4,271	4,271	4,271	4,271	
Truck Op Hours Required	***Op Hrs***	***28,465***	***33,893***	***34,017***	***34,456***	***32,376***	***43,015***	***50,547***	***52,815***	***43,556***	***38,429***	***40,156***	***46,648***	***48,910***	***48,910***	***48,910***	***48,910***	***48,910***	***36,512***	***36,512***	***36,512***	***36,512***	***36,512***	***25,143***	***25,143***	***25,143***	***25,143***	***25,143***	***4,279***	***1,035,477***
Physical Availability		75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	
Use of Availability		65.0%	65.0%	65.0%	65.0%	65.0%	80.0%	90.0%	90.0%	90.0%	70.0%	70.0%	80.0%	90.0%	90.0%	90.0%	90.0%	90.0%	70.0%	70.0%	70.0%	70.0%	70.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	

Life of Mine Plan Production Schedule - Main pit summary

Description / Activity	Units	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2004-2031 Total
Mine Production Summary																														
Ore																														
High Grade	kt	3,132	3,312	3,306	3,334	3,319	3,293	3,305	2,131	1,255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26,387
Low Grade	kt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Ore	*kt*	*3,132*	*3,312*	*3,306*	*3,334*	*3,319*	*3,293*	*3,305*	*2,131*	*1,255*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	26,387
Waste																														0
Total Waste	*kt*	*4,018*	*3,067*	*3,195*	*2,966*	*3,003*	*4,195*	*4,257*	*2,746*	*1,323*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*28,771*
Total Waste/Total Ore Ratio		1.28	0.93	0.97	0.89	0.90	1.27	1.29	1.29	1.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.09
Total Mine Production	***kt***	***7,150***	***6,379***	***6,501***	***6,300***	***6,322***	***7,489***	***7,563***	***4,876***	***2,579***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***55,158***
Total Mill Feed Summary																														
Mill Feed	kt	3,174	3,312	3,306	3,334	3,319	3,293	3,305	2,131	1,255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26,429
Zinc	%	21.50	20.71	20.51	20.21	20.48	20.66	20.31	20.73	17.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.48
Total Lead (PbT)	%	5.90	5.52	5.64	6.34	6.53	6.28	5.45	3.60	4.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.69
Recoverable Lead	%	5.23	4.85	4.82	5.52	5.57	5.38	4.52	2.92	3.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.88
Silver	g/t	97.00	96.34	103.36	116.95	116.95	114.44	108.52	74.76	105.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	104.96
Zn Concentrate	kt	1,041	1,023	1,017	1,003	1,007	1,018	1,034	709	342	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8,194
Pb Concentrate	kt	208	220	219	252	253	243	205	85	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,748

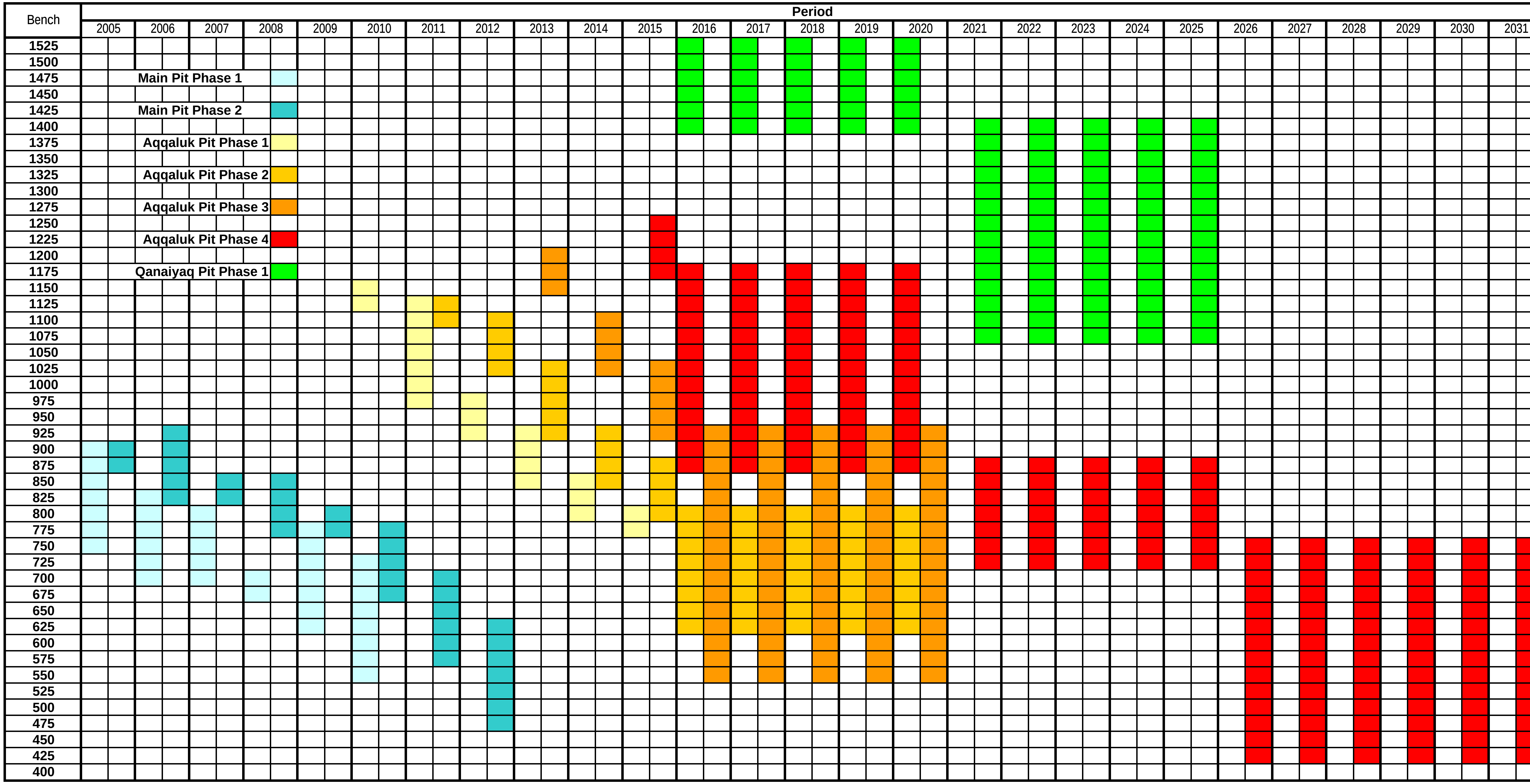
Life of Mine Plan Production Schedule - Aqqaluk pit summary

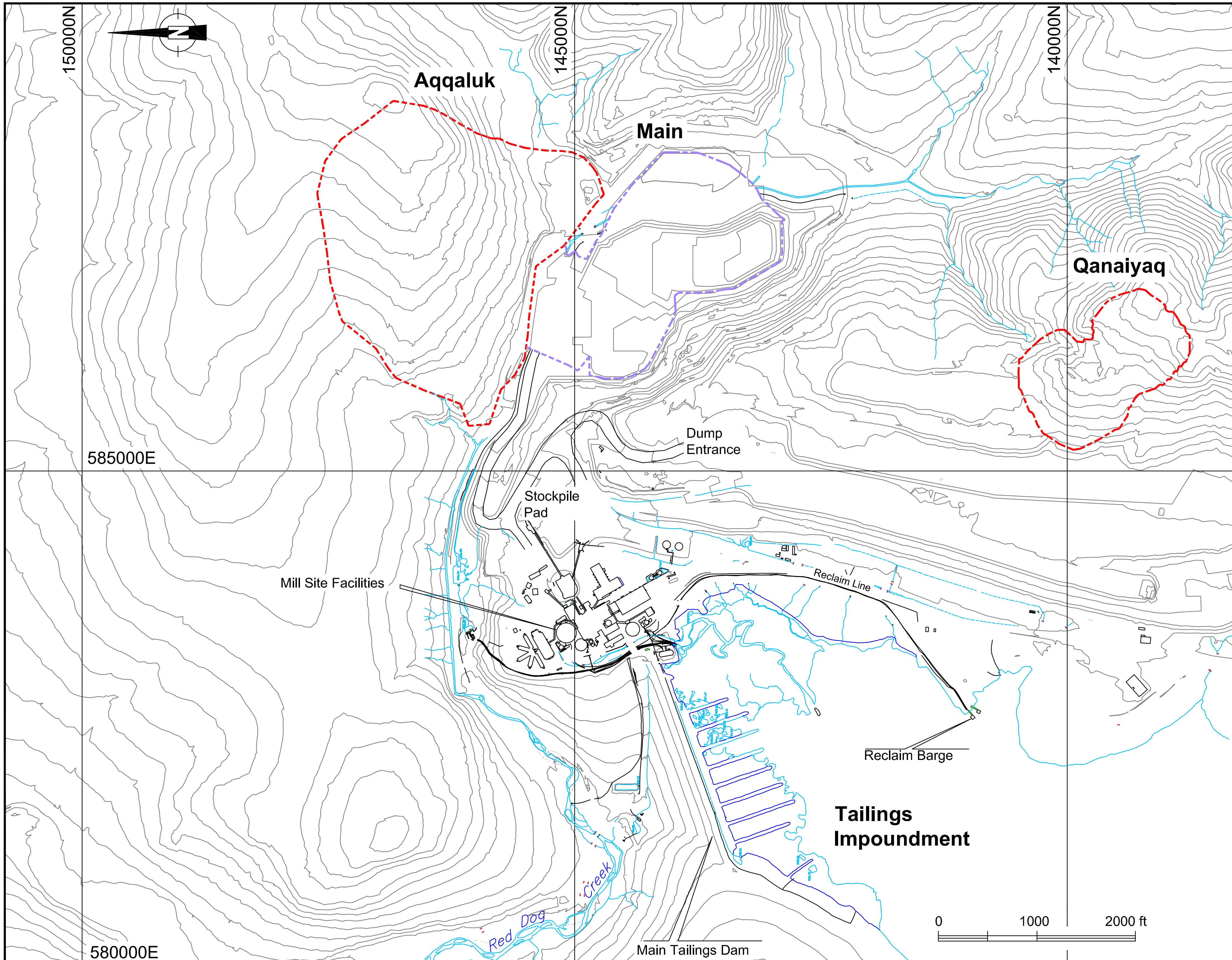
Description / Activity	Units	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2004-2031 Total
Mine Production Summary																														
Ore																														
High Grade	kt	0	0	0	0	0	0	0	1,173	2,046	3,309	3,321	3,318	3,276	3,276	3,276	3,276	3,276	2,088	2,088	2,088	2,088	2,088	3,025	3,025	3,025	3,025	3,025	511	55,623
Low Grade	kt	0	0	0	0	0	0	0	32	67	428	225	435	216	216	216	216	216	456	456	456	456	456	492	492	492	492	492	86	7,096
Total Ore	*kt*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1,206*	*2,113*	*3,737*	*3,546*	*3,753*	*3,492*	*3,492*	*3,492*	*3,492*	*3,492*	*2,544*	*2,544*	*2,544*	*2,544*	*2,544*	*3,517*	*3,517*	*3,517*	*3,517*	*3,517*	*597*	62,718
Waste																														
Total Waste	*kt*	*0*	*0*	*0*	*0*	*0*	*0*	*1,321*	*3,910*	*5,316*	*6,291*	*6,543*	*7,879*	*7,396*	*7,396*	*7,396*	*7,396*	*7,396*	*2,737*	*2,737*	*2,737*	*2,737*	*2,737*	*762*	*762*	*762*	*762*	*762*	*131*	*85,862*
Total Waste/Total Ore Ratio		0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.24	2.52	1.68	1.85	2.10	2.12	2.12	2.12	2.12	2.12	1.08	1.08	1.08	1.08	1.08	0.22	0.22	0.22	0.22	0.22	0.22	1.37
Total Mine Production	***kt***	***0***	***0***	***0***	***0***	***0***	***0***	***1,321***	***5,115***	***7,429***	***10,029***	***10,088***	***11,632***	***10,888***	***10,888***	***10,888***	***10,888***	***10,888***	***5,281***	***5,281***	***5,281***	***5,281***	***5,281***	***4,279***	***4,279***	***4,279***	***4,279***	***4,279***	***728***	***148,581***
Total Mill Feed Summary																														
Mill Feed	kt	0	0	0	0	0	0	0	1,173	2,046	3,309	3,321	3,318	3,276	3,276	3,276	3,276	3,276	2,088	2,088	2,088	2,088	2,088	3,025	3,025	3,025	3,025	3,025	511	55,623
Zinc	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.79	20.86	19.40	19.56	19.49	18.15	18.15	18.15	18.15	18.15	12.46	12.46	12.46	12.46	12.46	14.44	14.44	14.44	14.44	14.44	14.44	16.37
Total Lead (PbT)	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.39	5.24	4.74	4.42	4.69	4.58	4.58	4.58	4.58	4.58	4.35	4.35	4.35	4.35	4.35	3.51	3.51	3.51	3.51	3.51	3.51	4.31
Recoverable Lead	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.72	4.06	3.74	3.86	4.01	3.91	3.91	3.91	3.91	3.91	3.65	3.65	3.65	3.65	3.65	2.97	2.97	2.97	2.97	2.97	2.97	3.59
Silver	g/t	0.00	0.00	0.00	0.00	0.00	0.00	0.00	101.11	85.03	76.90	67.82	75.24	82.11	82.11	82.11	82.11	82.11	85.64	85.64	85.64	85.64	85.64	73.17	73.17	73.17	73.17	73.17	73.17	79.19
Zn Concentrate	kt	0	0	0	0	0	0	0	325	680	1,021	1,033	1,024	927	927	927	927	927	378	378	378	378	378	674	674	674	674	674	116	14,094
Pb Concentrate	kt	0	0	0	0	0	0	0	58	113	161	158	160	150	150	150	150	150	82	82	82	82	82	101	101	101	101	101	17	2,330

Life of Mine Plan Production Schedule - Qanaiyaq pit summary

Description / Activity	Units	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2004-2031 Total
Mine Production Summary																														
Ore																														
High Grade	kt	0	0	0	0	0	0	0	0	0	0	0	0	28	28	28	28	28	937	937	937	937	937	0	0	0	0	0		4,826
Low Grade	kt	0	0	0	0	0	0	0	0	0	0	0	0	12	12	12	12	12	102	102	102	102	102	0	0	0	0	0		569
Total Ore	*kt*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*40*	*40*	*40*	*40*	*40*	*1,039*	*1,039*	*1,039*	*1,039*	*1,039*	*0*	*0*	*0*	*0*	*0*		5,395
Waste																														
Total Waste	*kt*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*567*	*567*	*567*	*567*	*567*	*1,905*	*1,905*	*1,905*	*1,905*	*1,905*	*0*	*0*	*0*	*0*	*0*		*12,357*
Total Waste/Total Ore Ratio		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.23	14.23	14.23	14.23	14.23	1.83	1.83	1.83	1.83	1.83	0.00	0.00	0.00	0.00	0.00		2.29
Total Mine Production	***kt***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***607***	***607***	***607***	***607***	***607***	***2,944***	***2,944***	***2,944***	***2,944***	***2,944***	***0***	***0***	***0***	***0***	***0***		***17,751***
Total Mill Feed Summary																														
Mill Feed	kt	0	0	0	0	0	0	0	0	0	0	0	0	28	28	28	28	28	937	937	937	937	937	0	0	0	0	0		4,826
Zinc	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.16	13.16	13.16	13.16	13.16	23.74	23.74	23.74	23.74	23.74	0.00	0.00	0.00	0.00	0.00		23.44
Total Lead (PbT)	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.91	9.91	9.91	9.91	9.91	6.23	6.23	6.23	6.23	6.23	0.00	0.00	0.00	0.00	0.00		6.33
Recoverable Lead	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.57	4.57	4.57	4.57	4.57	4.05	4.05	4.05	4.05	4.05	0.00	0.00	0.00	0.00	0.00		4.06
Silver	g/t	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	212.94	212.94	212.94	212.94	212.94	126.03	126.03	126.03	126.03	126.03	0.00	0.00	0.00	0.00	0.00		128.55
Zn Concentrate	kt	0	0	0	0	0	0	0	0	0	0	0	0	6	6	6	6	6	340	340	340	340	340	0	0	0	0	0		1,728
Pb Concentrate	kt	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	61	61	61	61	61	0	0	0	0	0		317

Benches Mined Life of Mine - Years 2005 - 2031





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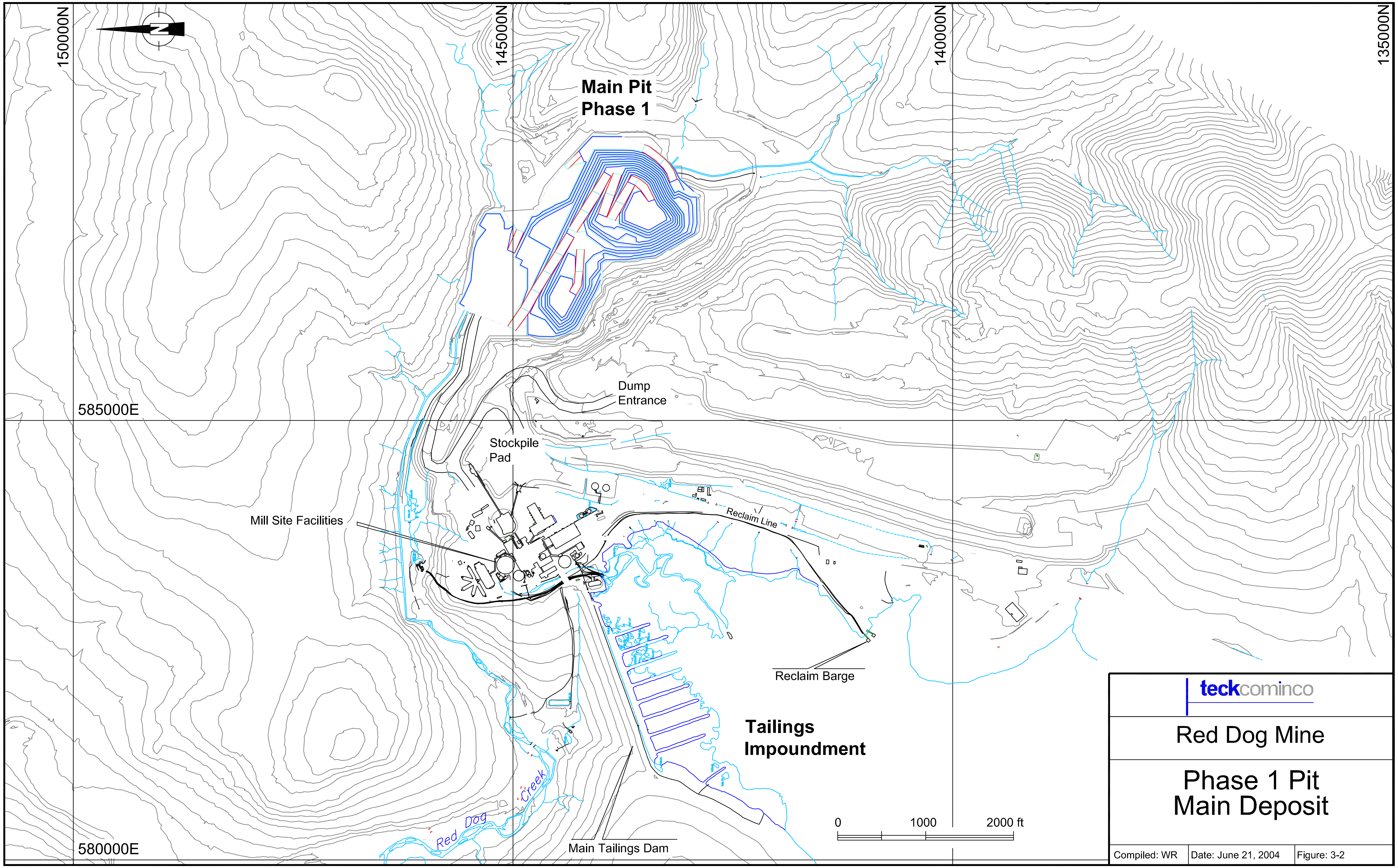
Red Dog Mine

Site Layout Plan

Compiled: WR	Date: June 21, 2004	Figure: 3-1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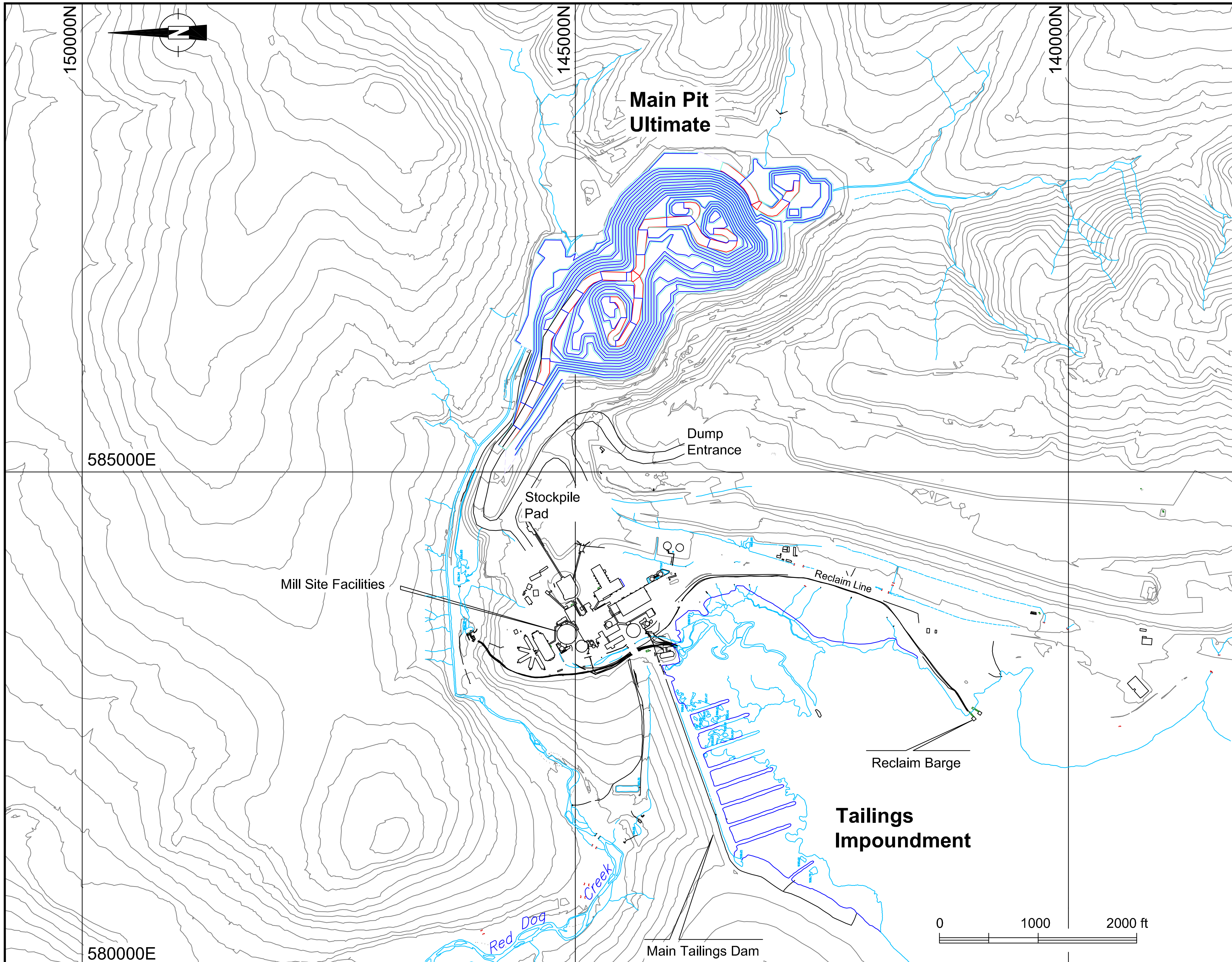
145000N
140000N
135000N
N
Main Pit
Phase 1
Dump
Entrance
585000E
580000E
Stockpile
Pad
Mill Site Facilities
Reclaim Line
Reclaim Barge
Tailings
Impoundment
Red Dog Creek
Main Tailings Dam
0
1000
2000 ft
teckcominco
Red Dog Mine
Phase 1 Pit
Main Deposit
Compiled: WR
Date: June 21, 2004
Figure: 3-2



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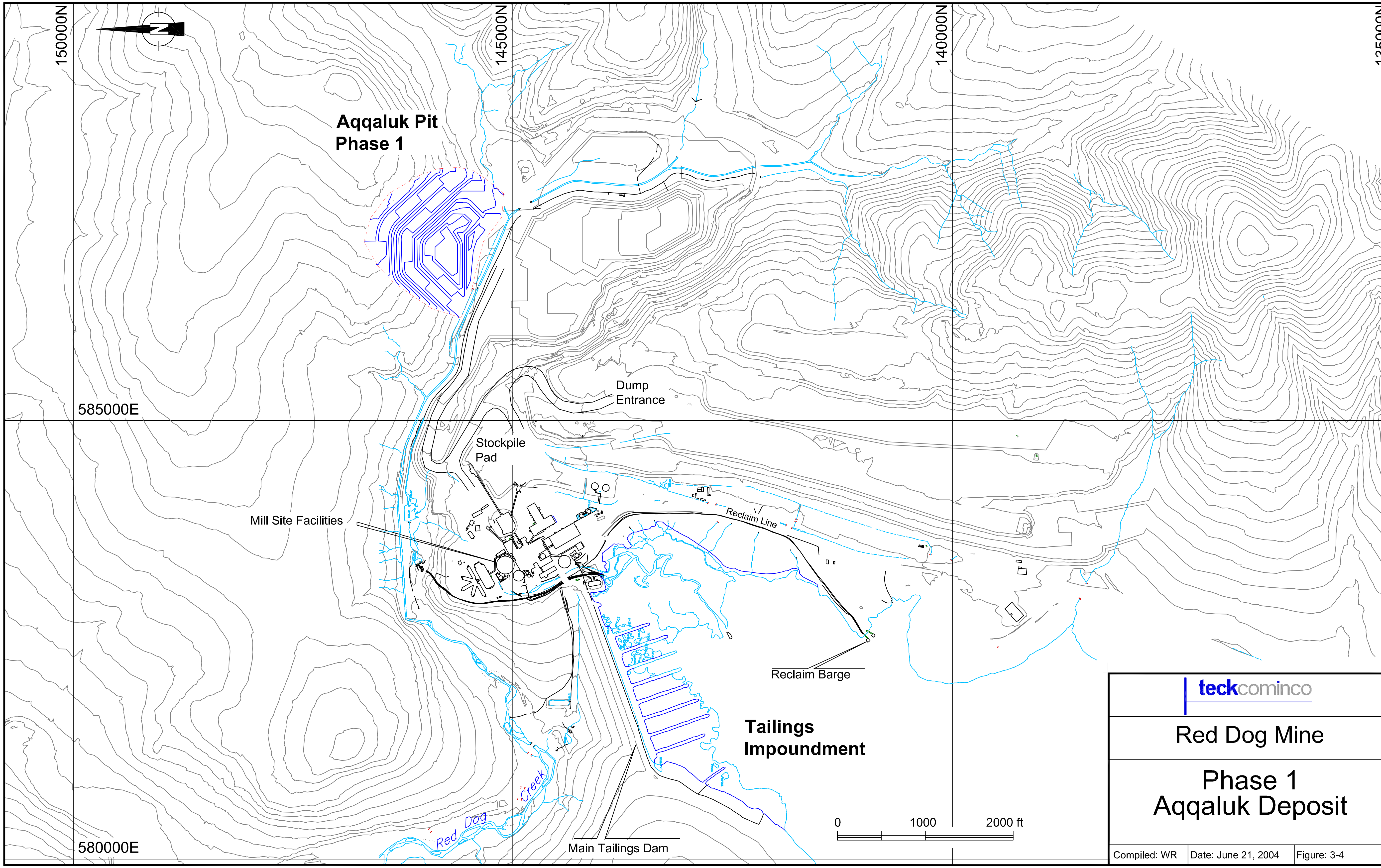
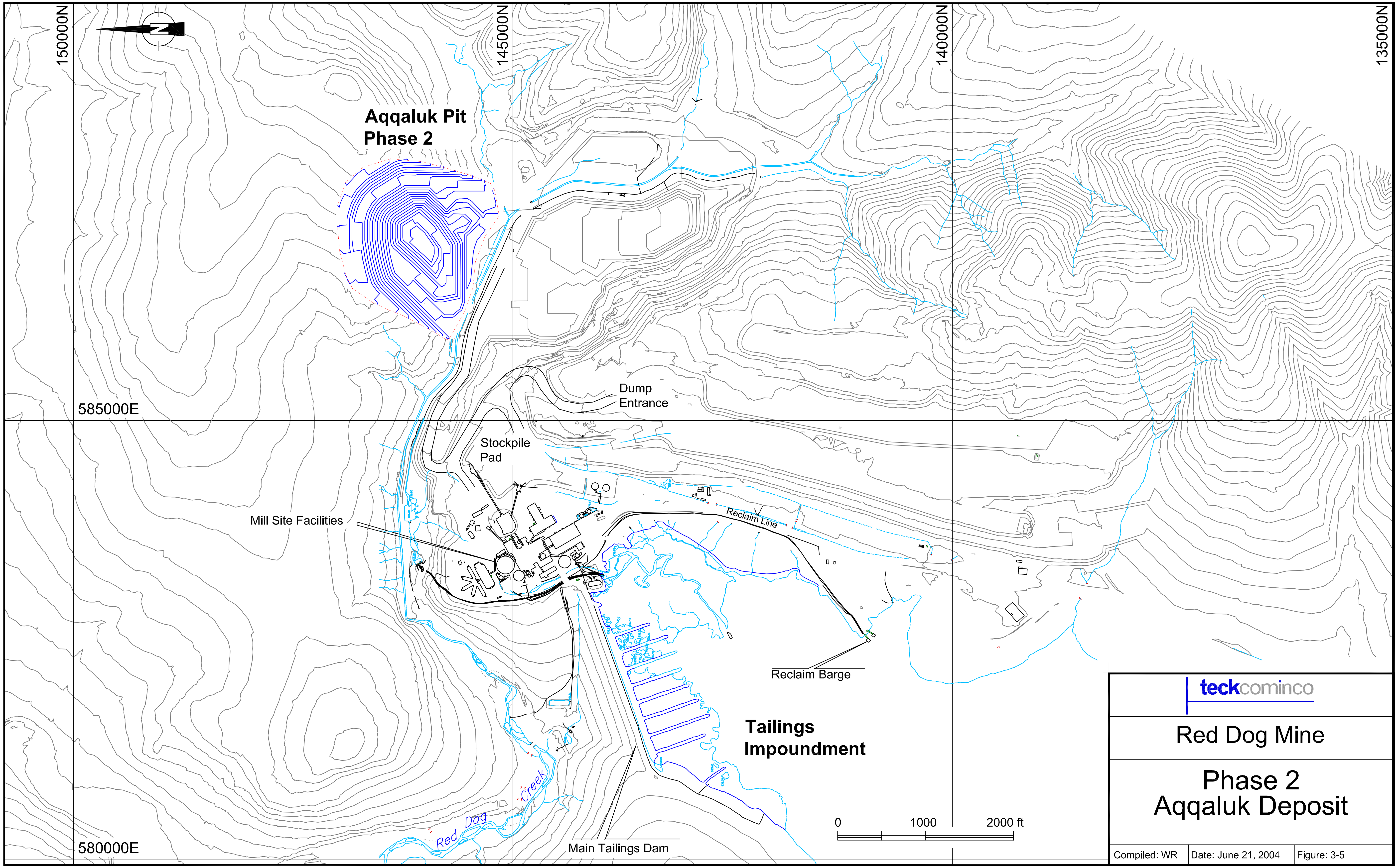
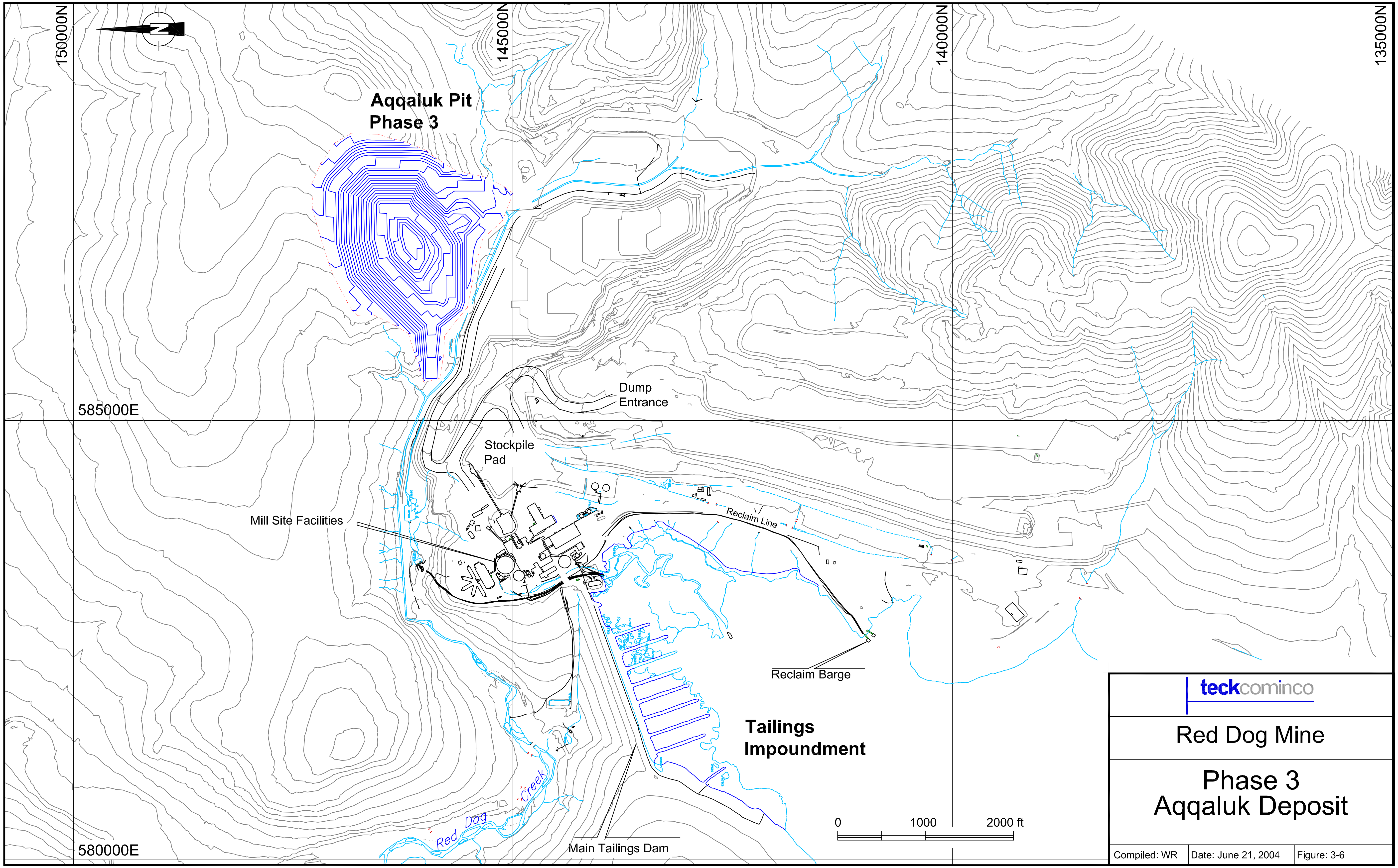
Red Dog Mine

Ultimate Pit
Main Deposit

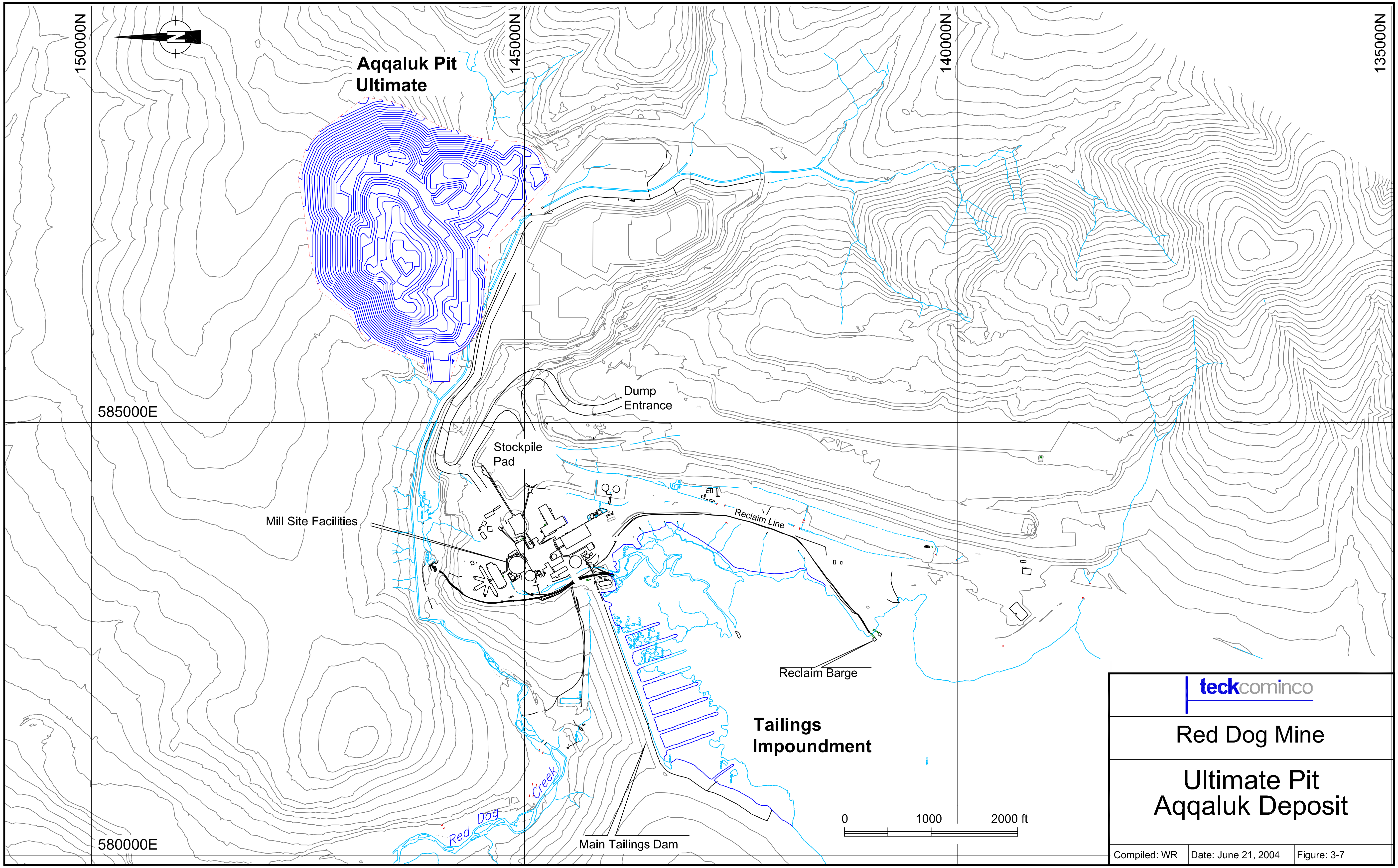
Compiled: WR	Date: June 21, 2004	Figure: 3-3


150000N
145000N
140000N
135000N
Aqqaluk Pit
Phase 1
Dump
Entrance
585000E
Stockpile
Pad
Mill Site Facilities
Reclaim Line
Reclaim Barge
Tailings
Impoundment
Red Dog Creek
580000E
Main Tailings Dam
0
1000
2000 ft
teckcominco
Red Dog Mine
Phase 1
Aqqaluk Deposit
Compiled: WR
Date: June 21, 2004
Figure: 3-4


150000N
145000N
140000N
135000N
N
Aqqaluk Pit
Phase 2
585000E
Dump
Entrance
Stockpile
Pad
Mill Site Facilities
Reclaim Line
Reclaim Barge
Tailings
Impoundment
Red Dog Creek
580000E
Main Tailings Dam
0
1000
2000 ft
teckcominco
Red Dog Mine
Phase 2
Aqqaluk Deposit
Compiled: WR
Date: June 21, 2004
Figure: 3-5



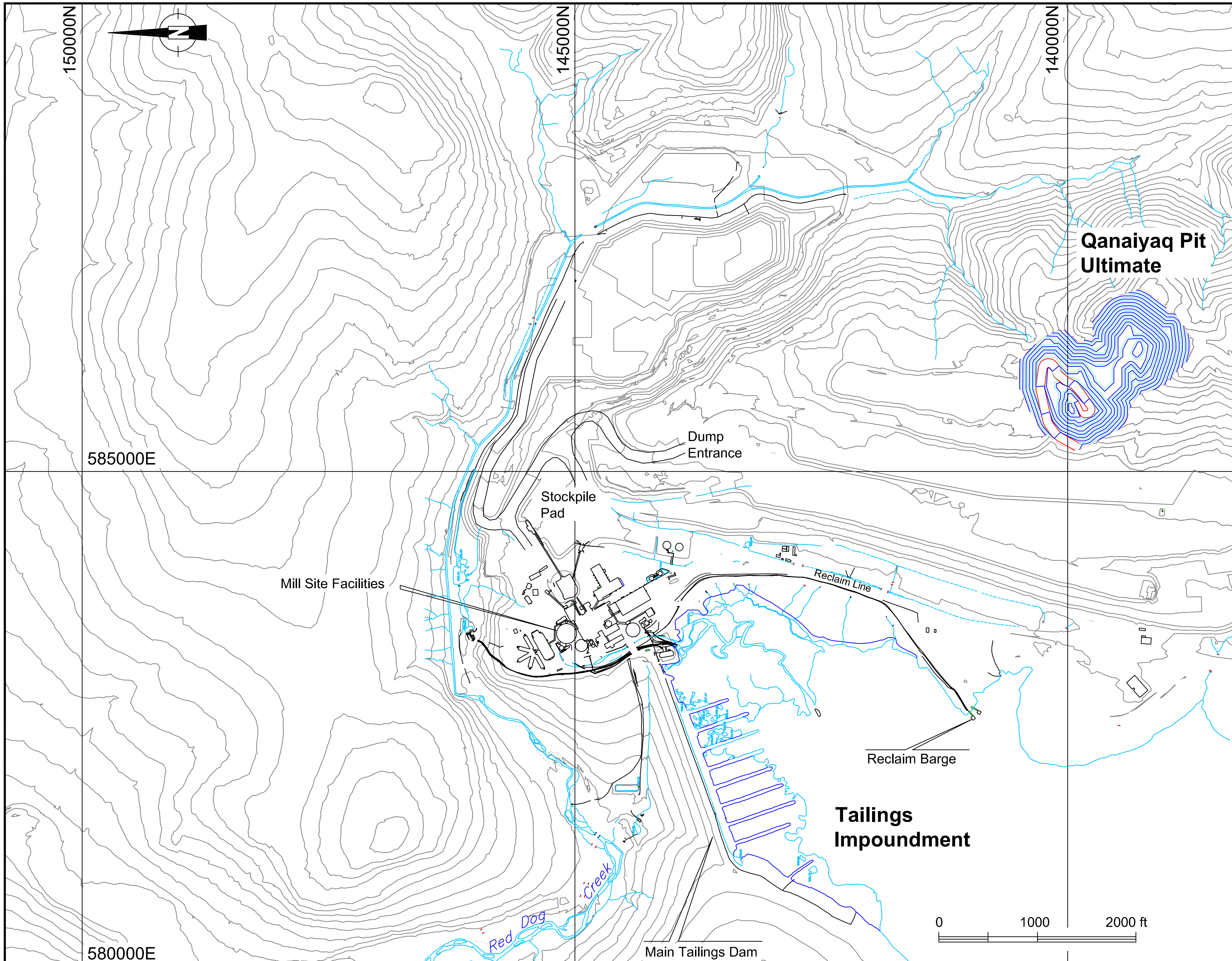
150000N
145000N
140000N
135000N
Aqqaluk Pit
Phase 3
Dump
Entrance
585000E
Stockpile
Pad
Mill Site Facilities
Reclaim Line
Reclaim Barge
Tailings
Impoundment
Red Dog Creek
580000E
Main Tailings Dam
0
1000
2000 ft
teckcominco
Red Dog Mine
Phase 3
Aqqaluk Deposit
Compiled: WR
Date: June 21, 2004
Figure: 3-6



Red Dog Mine

Ultimate Pit
Aqqaluk Deposit

Compiled: WR | Date: June 21, 2004 | Figure: 3-7



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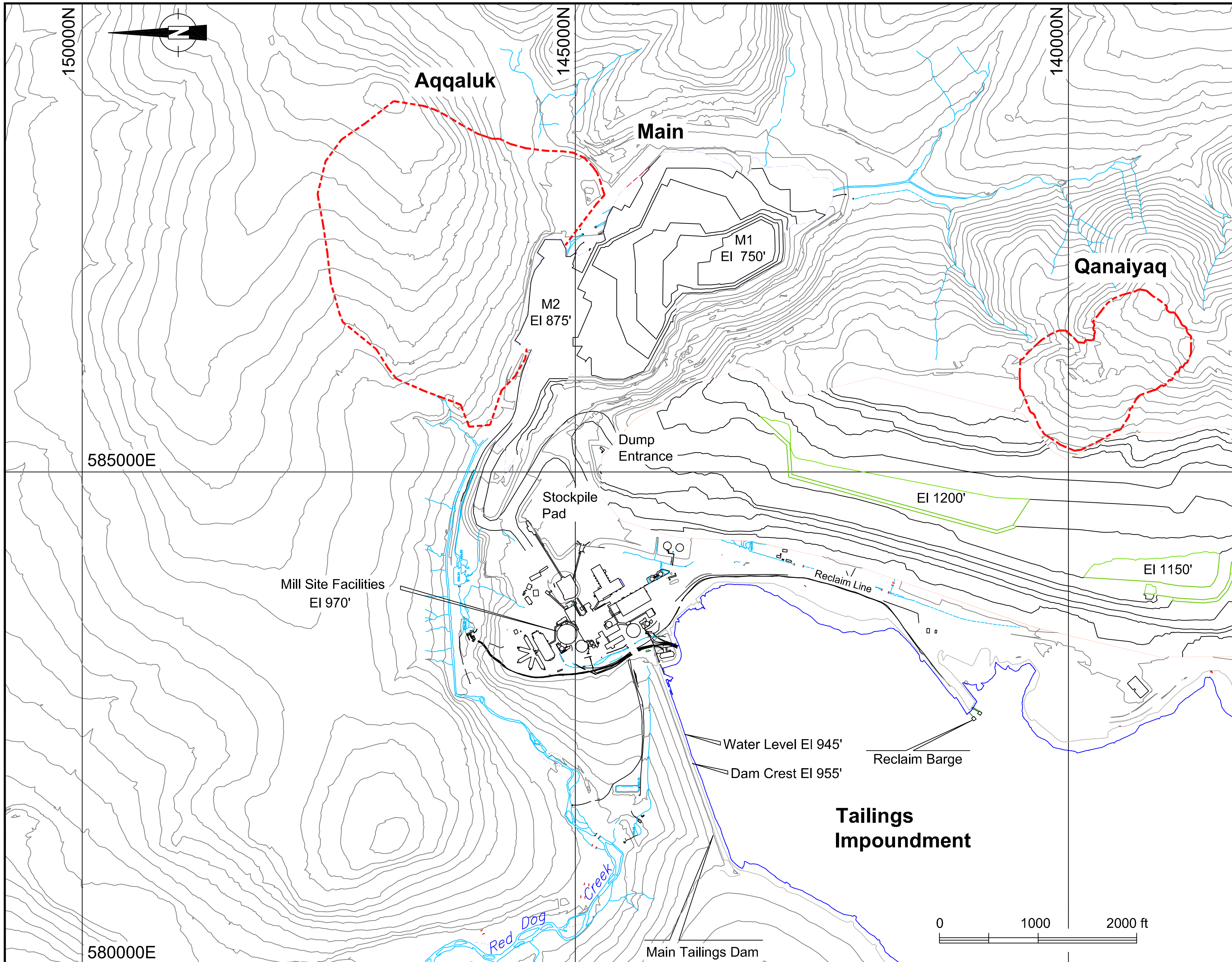
Red Dog Mine

Ultimate Pit
Qanaiyaq Deposit

Compiled: WR	Date: June 21, 2004	Figure: 3-8



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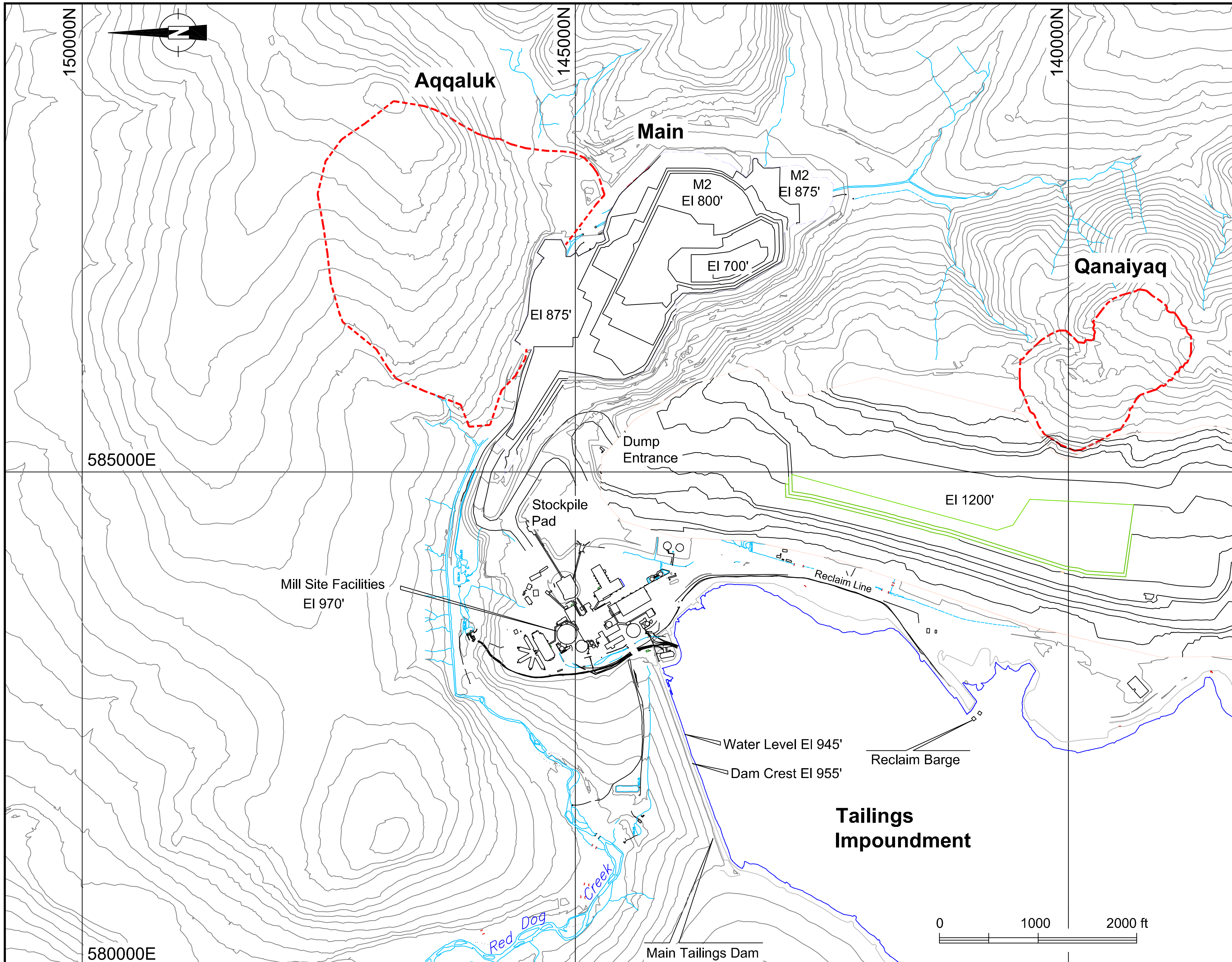
Red Dog Mine

Site Layout
End of Year 2005

Compiled: WR | Date: June 21, 2004 | Figure: 3-9

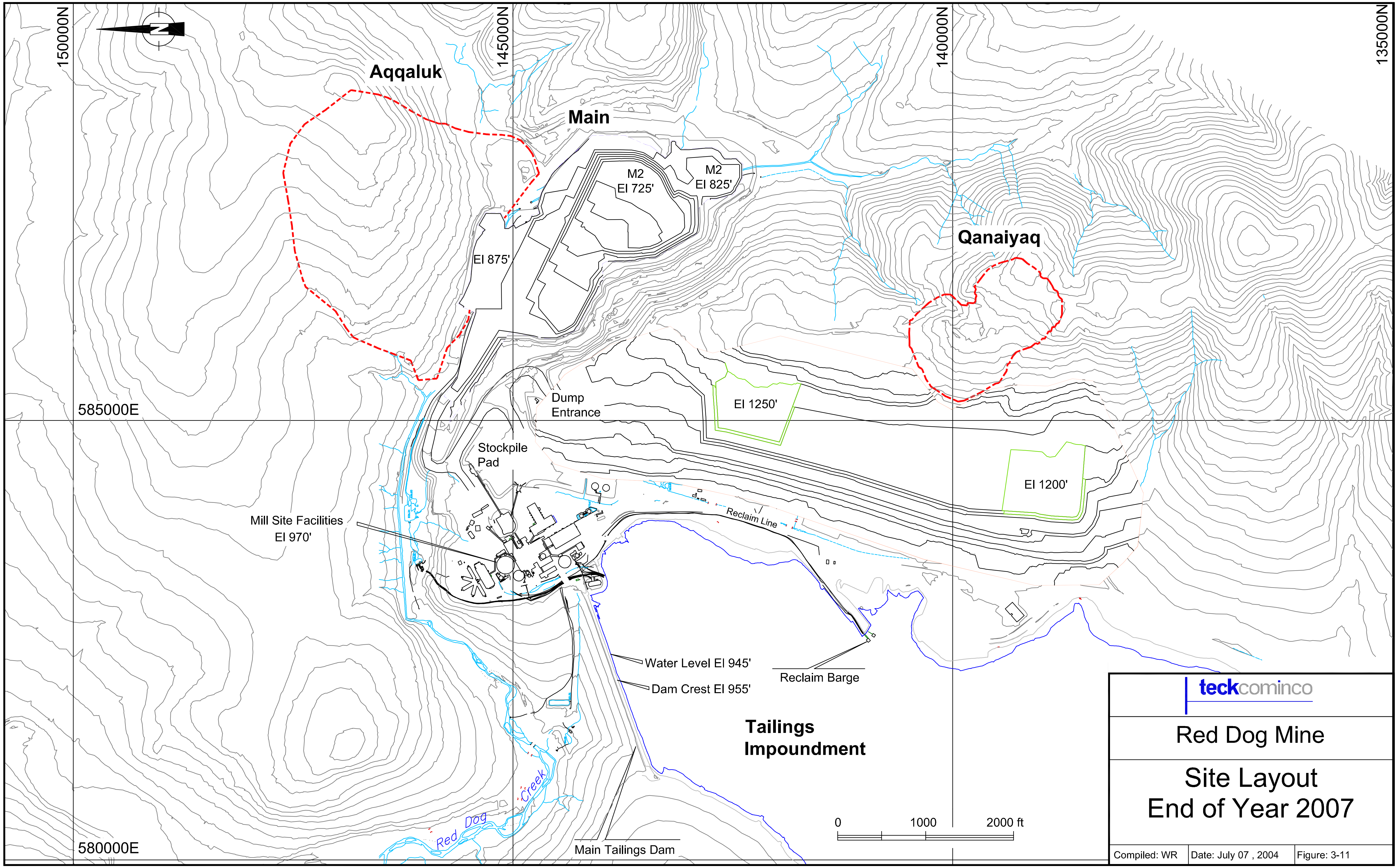


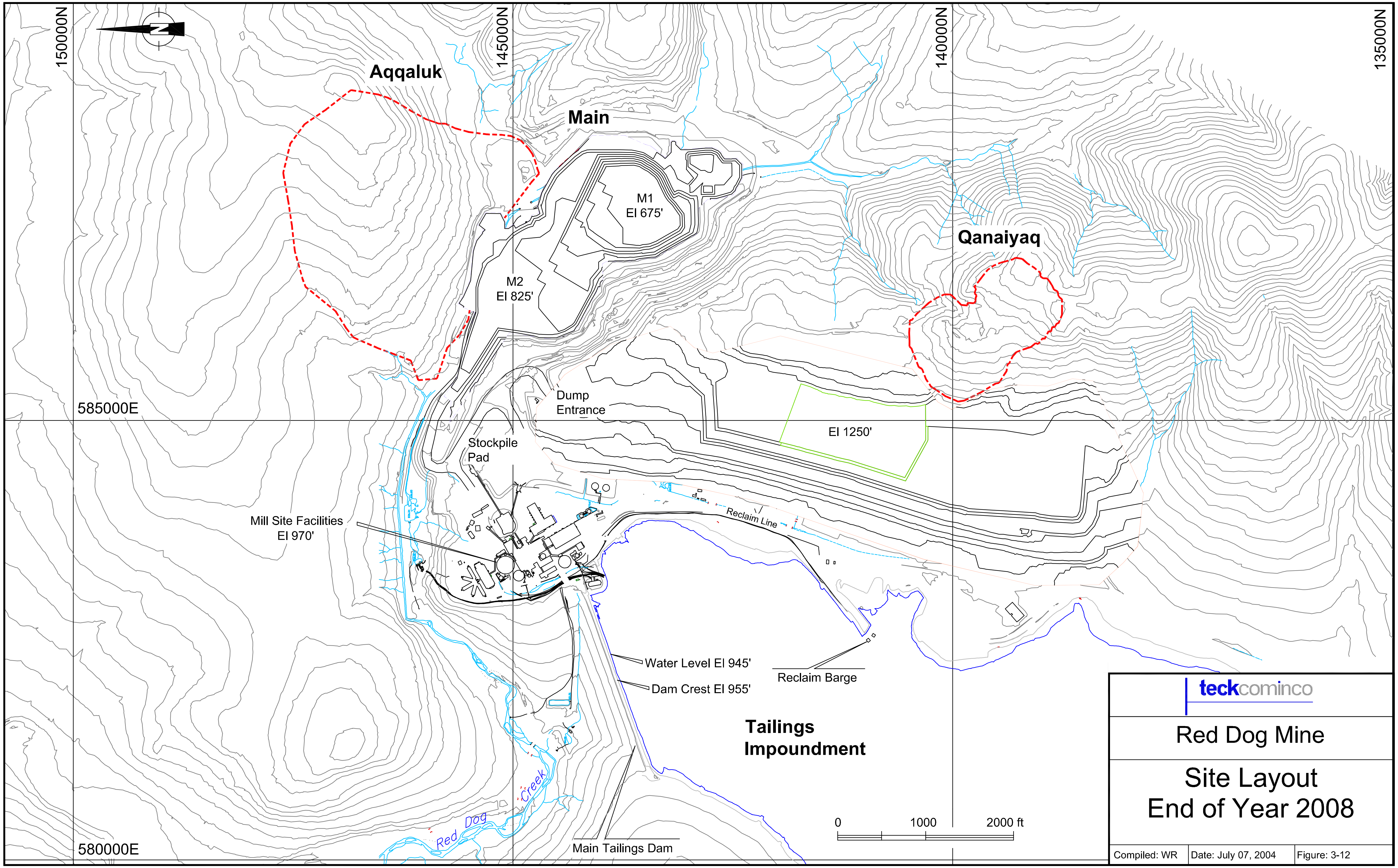
teckcominco

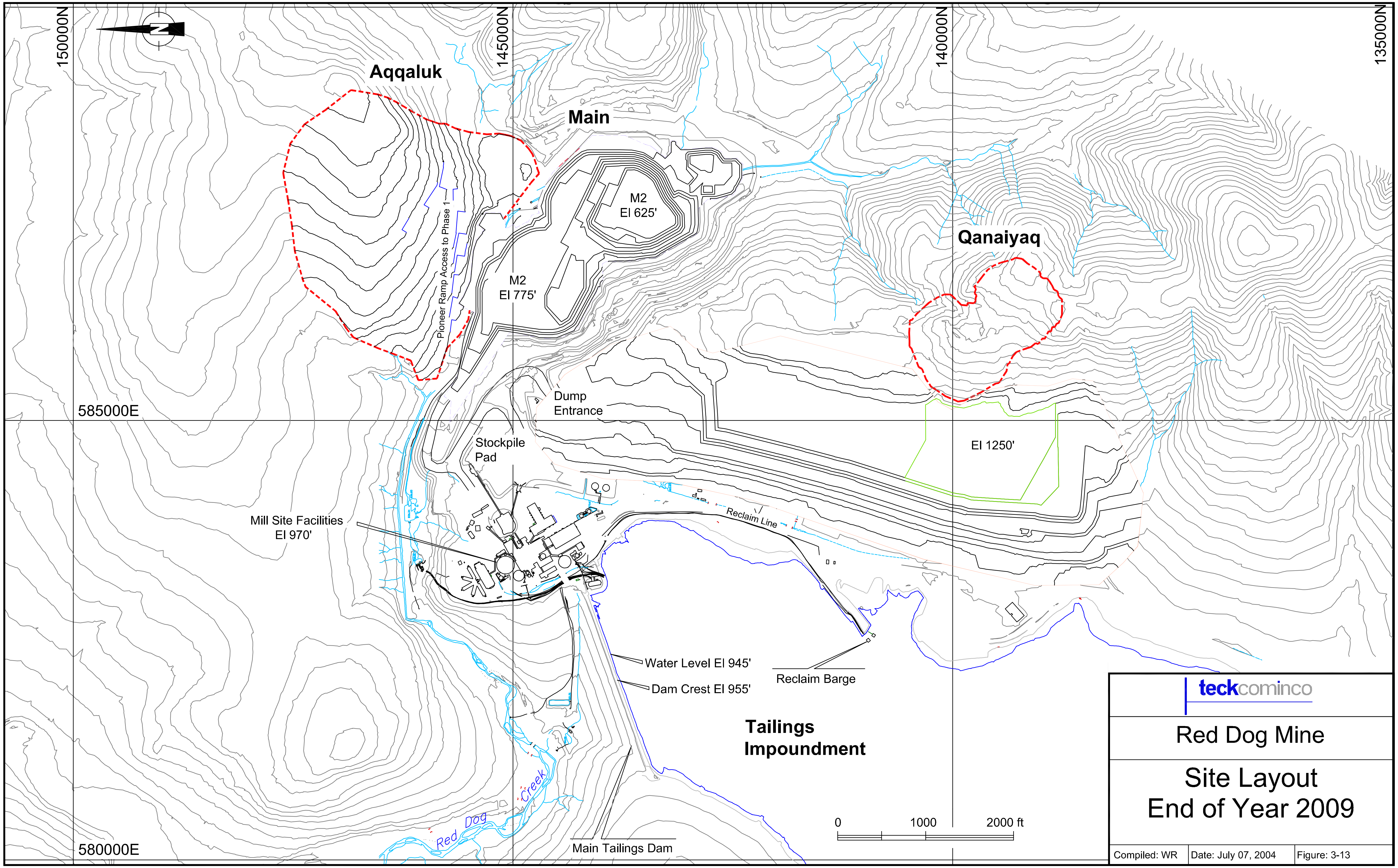
Red Dog Mine

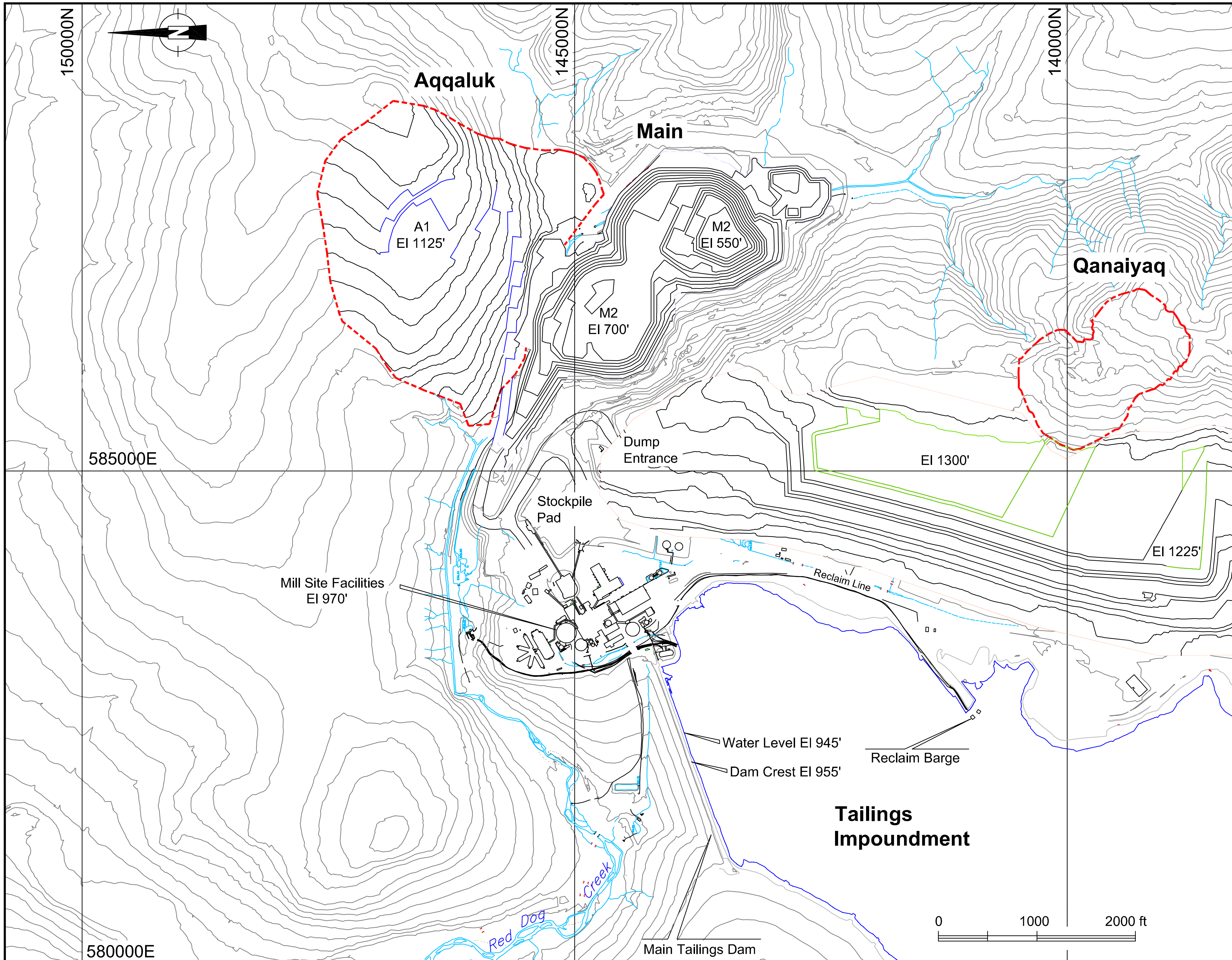
Site Layout
End of Year 2006

Compiled: WR	Date: June 21, 2004	Figure: 3-10


150000N
145000N
140000N
135000N
Aqqaluk
Main
M2
El 725'
M2
El 825'
El 875'
Qanaiyaq
Dump
Entrance
El 1250'
585000E
Stockpile
Pad
El 1200'
Reclaim Line
Mill Site Facilities
El 970'
Water Level El 945'
Reclaim Barge
Dam Crest El 955'
Tailings
Impoundment
Red Dog Creek
0
1000
2000 ft
580000E
Main Tailings Dam
teckcominco
Red Dog Mine
Site Layout
End of Year 2007
Compiled: WR
Date: July 07 , 2004
Figure: 3-11


150000N
145000N
140000N
135000N
Aqqaluk
Main
M1
El 675'
M2
El 825'
Qanaiyaq
Dump
Entrance
585000E
El 1250'
Stockpile
Pad
Mill Site Facilities
El 970'
Reclaim Line
Water Level El 945'
Dam Crest El 955'
Reclaim Barge
Tailings
Impoundment
Red Dog Creek
580000E
Main Tailings Dam
0
1000
2000 ft
teckcominco
Red Dog Mine
Site Layout
End of Year 2008
Compiled: WR
Date: July 07, 2004
Figure: 3-12


150000N
145000N
140000N
135000N
585000E
580000E
Aqqaluk
Main
M2
El 625'
M2
El 775'
Pioneer Ramp Access to Phase 1
Qanaiyaq
Dump
Entrance
Stockpile
Pad
El 1250'
Mill Site Facilities
El 970'
Reclaim Line
Water Level El 945'
Dam Crest El 955'
Reclaim Barge
Tailings
Impoundment
Red Dog Creek
Main Tailings Dam
0
1000
2000 ft
teckcominco
Red Dog Mine
Site Layout
End of Year 2009
Compiled: WR
Date: July 07, 2004
Figure: 3-13

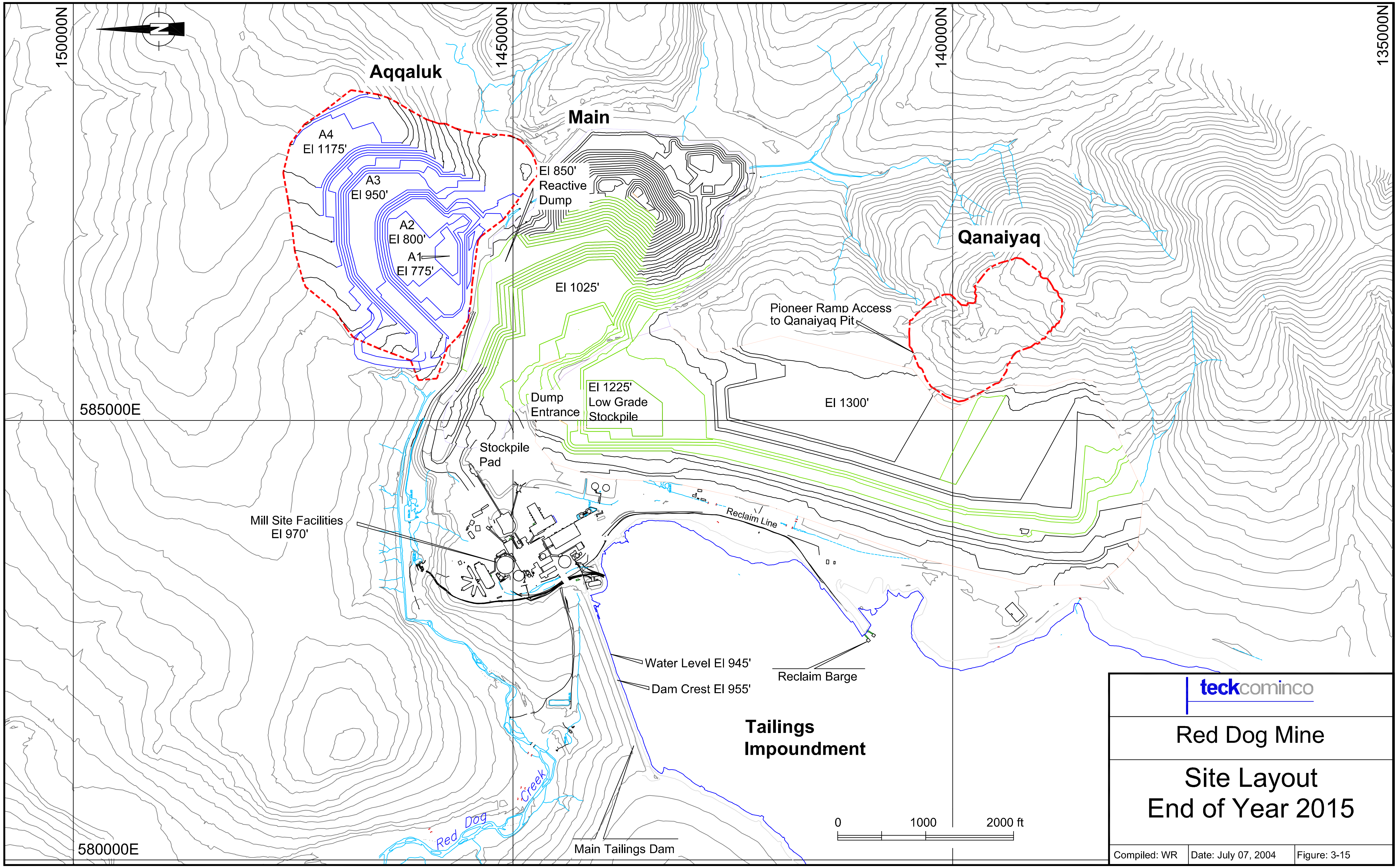


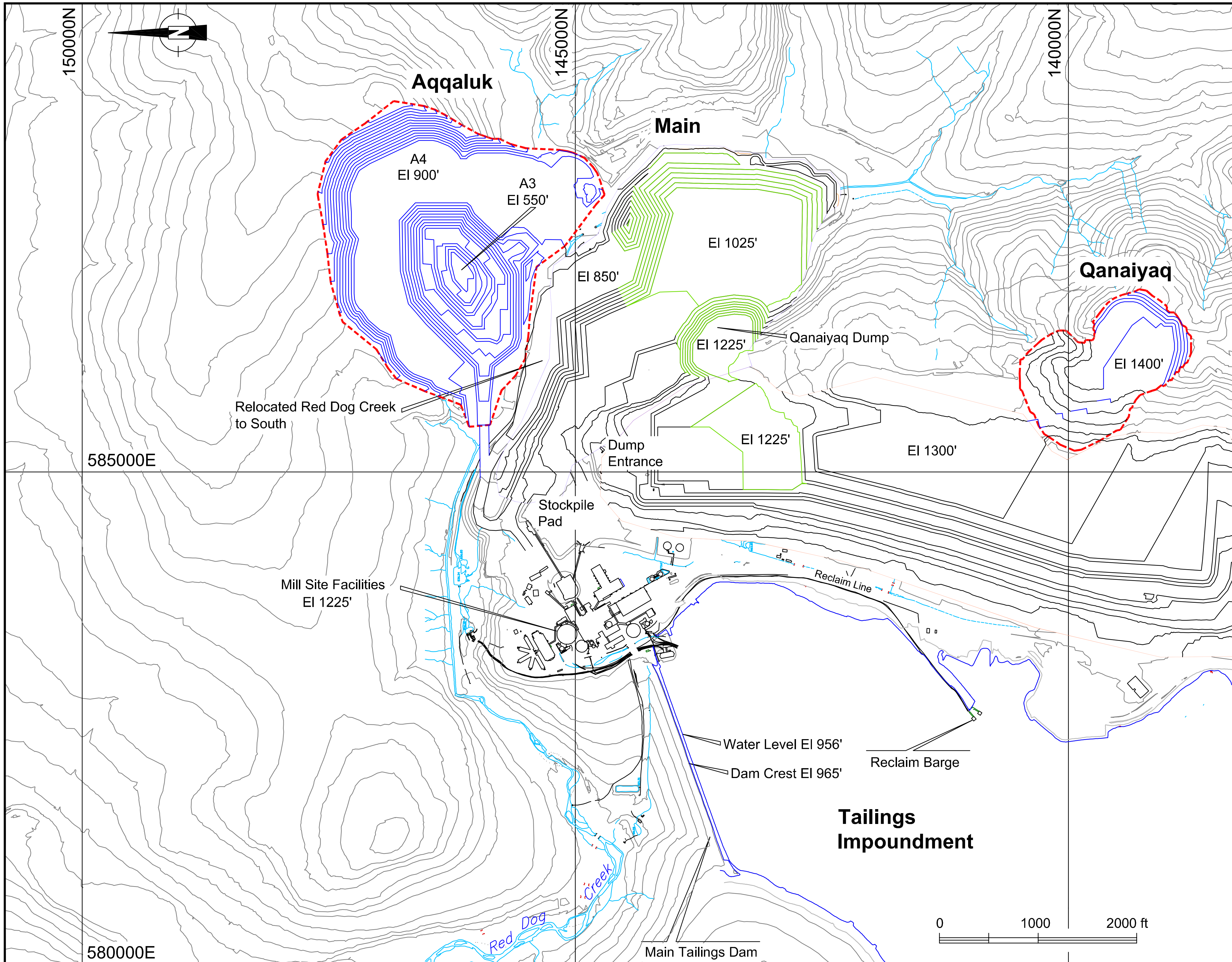
teckcominco

Red Dog Mine

Site Layout
End of Year 2010

Compiled: WR	Date: July 07, 2004	Figure: 3-14


150000N
145000N
140000N
135000N
585000E
580000E
Aqqaluk
Main
Qanaiyaq
A4
El 1175'
A3
El 950'
A2
El 800'
A1
El 775'
El 850'
Reactive
Dump
El 1025'
Pioneer Ramp Access
to Qanaiyaq Pit
El 1300'
Dump
Entrance
El 1225'
Low Grade
Stockpile
Stockpile
Pad
Mill Site Facilities
El 970'
Reclaim Line
Water Level El 945'
Dam Crest El 955'
Reclaim Barge
Tailings
Impoundment
Red Dog Creek
Main Tailings Dam
0
1000
2000 ft
teckcominco
Red Dog Mine
Site Layout
End of Year 2015
Compiled: WR
Date: July 07, 2004
Figure: 3-15

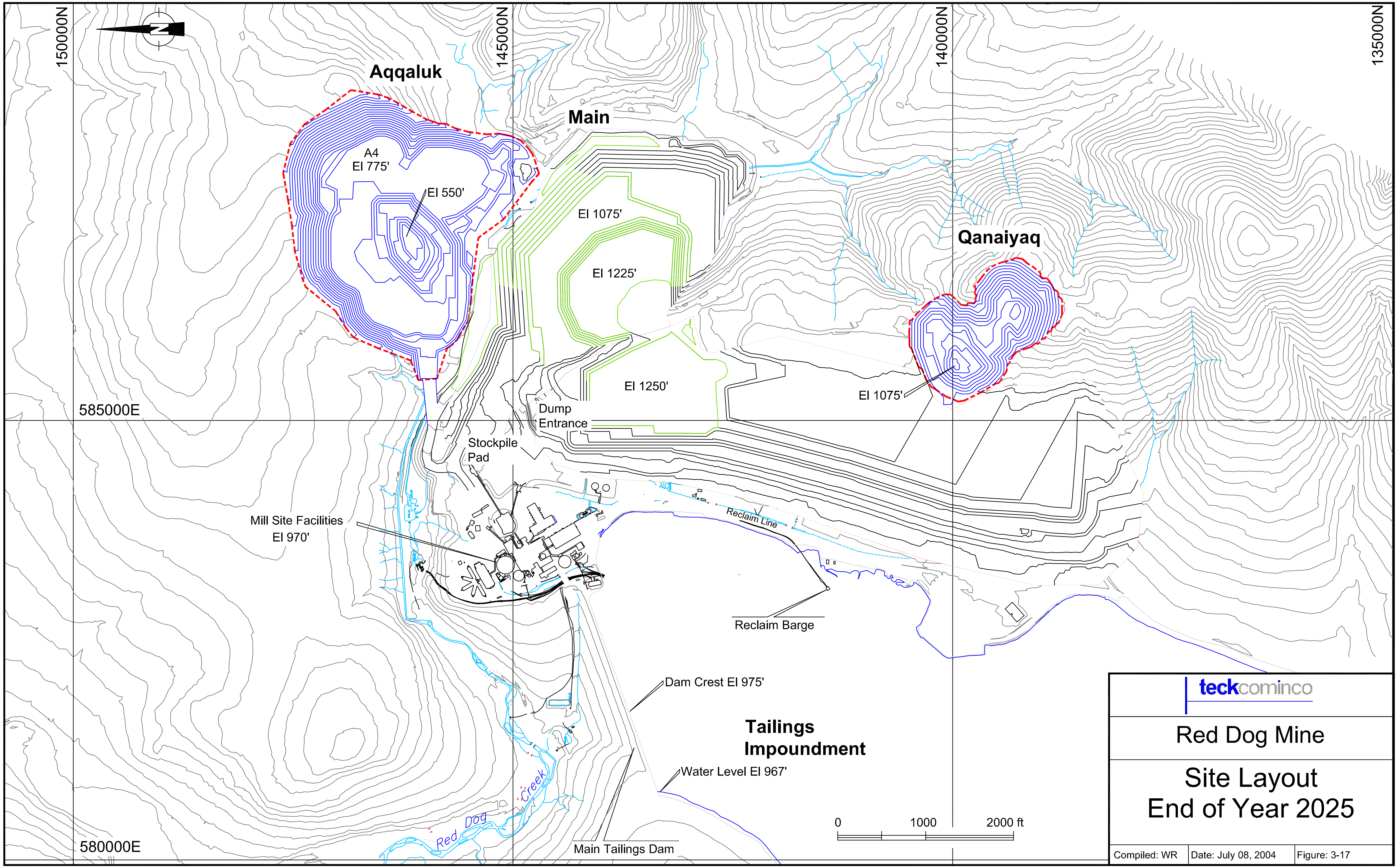


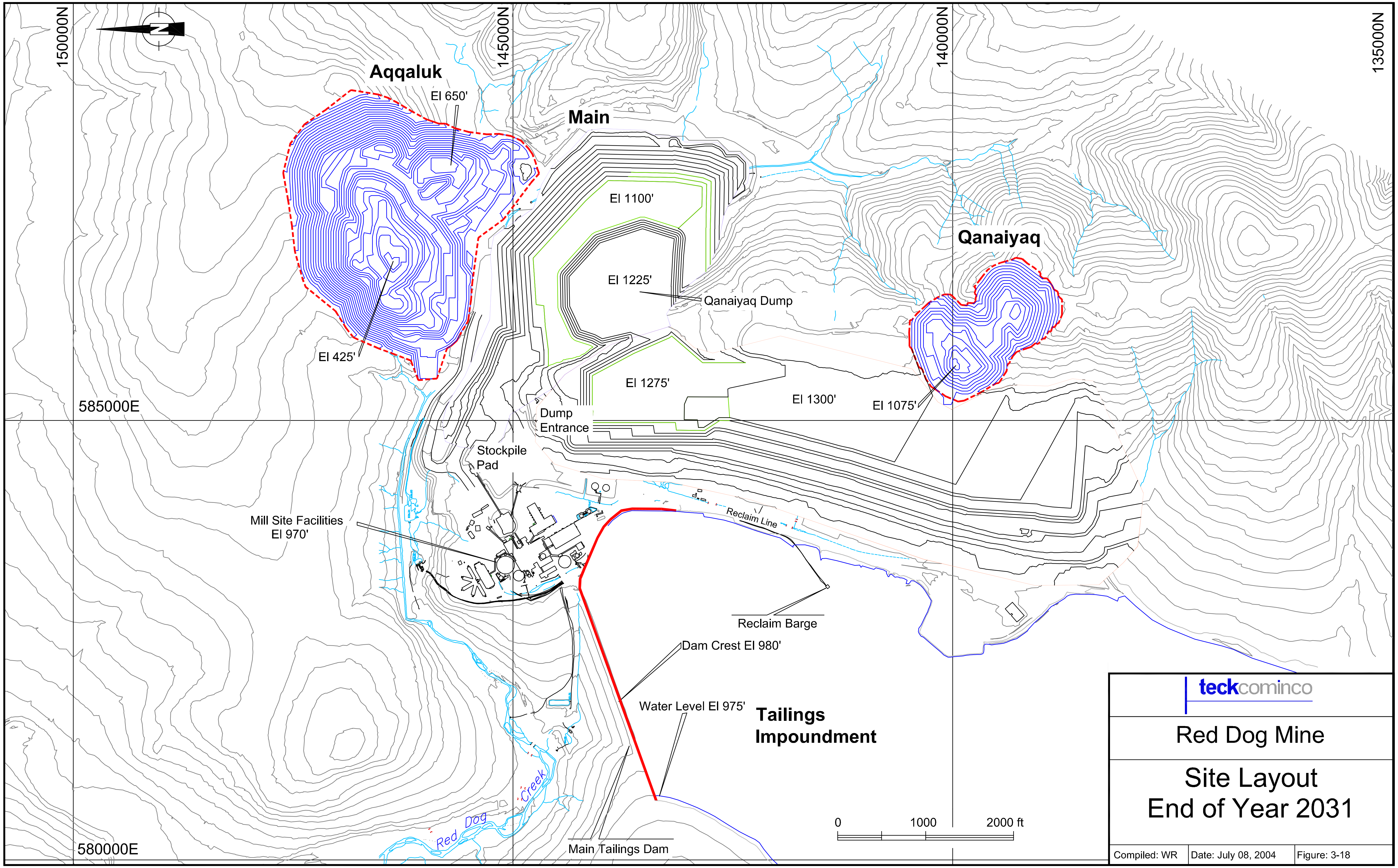
teckcominco

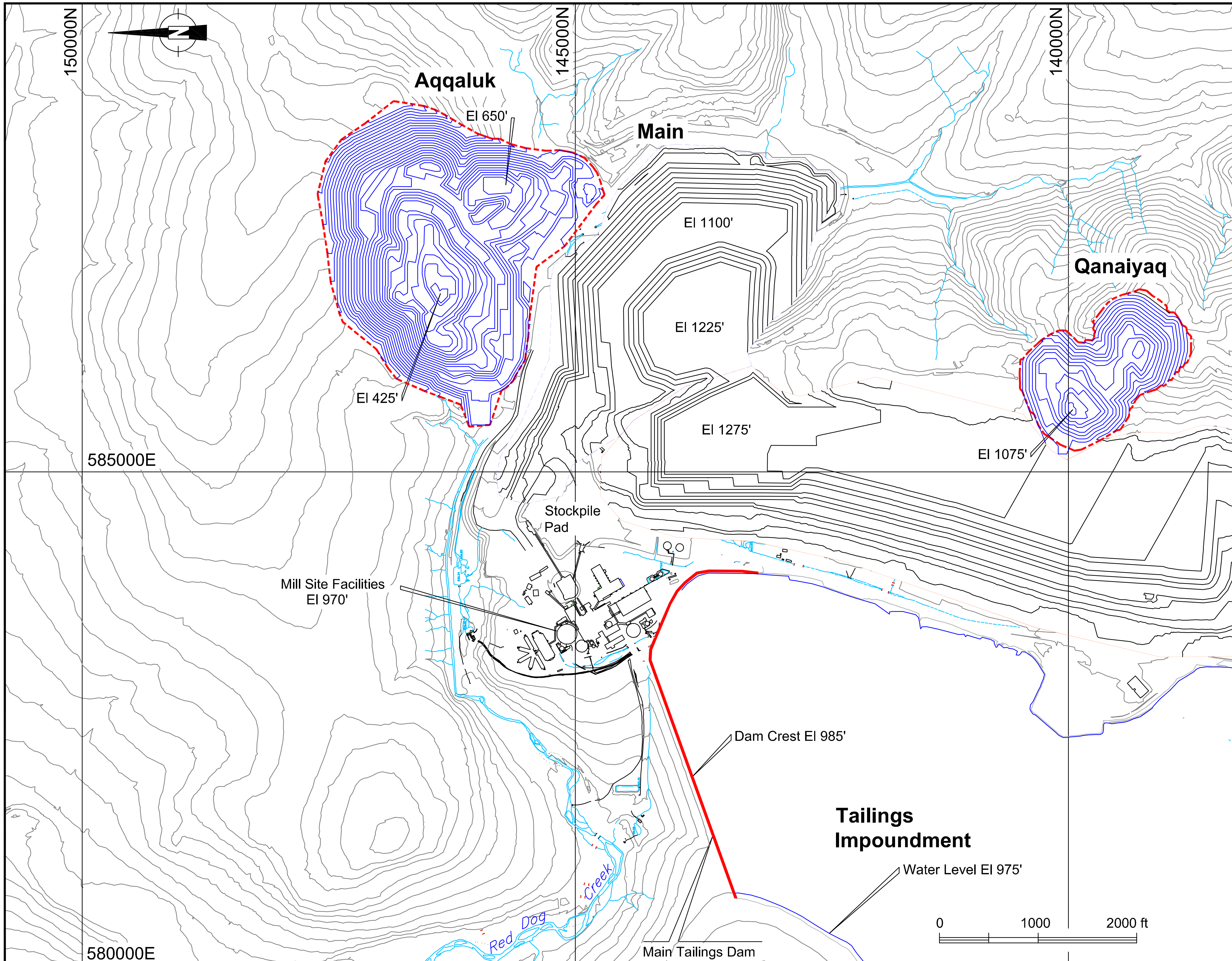
Red Dog Mine

Site Layout
End of Year 2020

Compiled: WR	Date: July 07, 2004	Figure: 3-16


150000N
145000N
140000N
135000N
Aqqaluk
Main
Qanaiyaq
A4
El 775'
El 550'
El 1075'
El 1225'
El 1250'
El 1075'
585000E
580000E
Dump
Entrance
Stockpile
Pad
Mill Site Facilities
El 970'
Reclaim Line
Reclaim Barge
Dam Crest El 975'
Tailings
Impoundment
Water Level El 967'
Red Dog Creek
Main Tailings Dam
0
1000
2000 ft
teckcominco
Red Dog Mine
Site Layout
End of Year 2025
Compiled: WR
Date: July 08, 2004
Figure: 3-17


150000N
145000N
140000N
135000N
Aqqaluk
El 650'
Main
El 1100'
El 1225'
Qanaiyaq Dump
Qanaiyaq
El 425'
El 1275'
El 1300'
El 1075'
585000E
Dump
Entrance
Stockpile
Pad
Mill Site Facilities
El 970'
Reclaim Line
Reclaim Barge
Dam Crest El 980'
Water Level El 975'
Tailings
Impoundment
Red Dog Creek
580000E
Main Tailings Dam
0
1000
2000 ft
teckcominco
Red Dog Mine
Site Layout
End of Year 2031
Compiled: WR
Date: July 08, 2004
Figure: 3-18



teckcominco

Red Dog Mine

Site Layout
End of Life
Dumps Re-contoured

Compiled: WR	Date: July 08, 2004	Figure: 3-19

SECTION 4: OPERATING COSTS

4.1 Summary

Operating costs were developed from a combination of fixed and variable cost standards for all aspects of mine operations and applied to future production plans to forecast total mine site operating costs. Historical consumption, productivity, and cost information was modified for expected changes which was then used as a basis for forecasting.

Mine operating costs are determined from standard mobile equipment hourly costs and then applied against required operating hours determined from the mine plan and forecasted equipment productivities. Mine blasting costs were estimated based on planned consumption rates for ore and waste (powder factors) which were then applied against planned annual production. Fixed manpower requirements for mine support and heavy equipment shop were forecast.

Mill supply costs were determined from consumption standards established for consumables such as mill reagents, grinding media, and power which were then applied against planned annual production. Fixed manpower requirements for mill operations and support were forecasted as well as mill maintenance manpower and supplies.

Administration costs were primarily based on manpower forecasts for accounting/MIS, human resources, materials management, and environment along with estimates for major expense types such as insurance, payments in lieu of property taxes, and consultants.

SECTION 5: CAPITAL COSTS

5.1 Summary

Capital cost estimates were developed for four primary areas – infrastructure, mobile equipment, exploration, and permitting as well as miscellaneous expenditures required to maintain production. Historical costs in combination with the mine plan schedule were used as a basis for forecasting capital expenditures.

Infrastructure requirements were limited to maintaining the existing production capacity with no planned expansions. The primary infrastructure requirements are the relocation of Red Dog Creek, which currently bisects the main pit, raising the tailings dams as required by the production schedule, and the installation of larger motors on two of the SAG mills to maintain mill throughput. The mobile equipment replacement schedule is established by replacing major equipment when cumulative operating hours attained reach a set limit. The operating hours required were determined from the mine plan.

Exploration expenditures to complete infill drilling for short-term mine planning requirements were determined by the planned development sequence. Additional metallurgical testing is planned for new deposits to refine short-term planning criteria. The main pit is fully permitted, however, future pit areas will require environmental impact assessments and baseline studies prior to development. Timing of expenditures was determined by the planned development sequence.

5.2 Infrastructure

Infrastructure expenditures are limited to those necessary to maintain existing production capacity.

5.2.1 Red Dog Creek Diversion

Red Dog Creek transects the main pit in a lined channel that also carries clean water flows from Rachel, Connie, and Shelly Creeks. A planned pushback on the east side of the main pit will require the relocation of Red Dog Creek in 2004. The diversion is planned partly as an open, lined channel, and partly as a large culvert. It will be permanently relocated to the main pit east high-wall. About 1,700 feet of the channel will again have to be relocated in 2020 in order to complete mining Aqqaluk.

Description	Work	Year	Comments
Red Dog Creek	Relocation	2004	n/a
	Relocation	2020	n/a

5.2.2 Tailings Dam/Deposition

Tailings deposition is sub-aqueous and requires two dams for containment. The main dam, which is immediately adjacent to the mill, has a current crest elevation of 955 feet. Five feet of freeboard is required for flood protection and wave run-up. The main dam will require several 5 foot raises to the ultimate dam crest elevation of 985 feet. The next planned raise is in 2017. In addition, a small dam located at the south end of the tailings pond at the headwaters to Bons Creek will require construction to 960 elevation in 2004. The next 5 foot raise planned after that is in 2019, and it will also eventually be built to an ultimate operating crest elevation at 985 feet. Installation of a spillway after closure will require an additional 5 foot lift.

Sub-aqueous tailings disposal will require extension of the west tailings line road and pipe in 2004 to access the south end of the tailings pond. After 2021, the west tailings line road will either need to be raised or relocated. The water treatment plant sand filters, which are used for the final polishing step prior to discharge, are located adjacent to the mill on the north east side of the tailings pond at an elevation of 948 feet. The sand filters will require relocation in 2010 as the pond level rises. All estimates are based on previous dam construction experience.

Description	Work	Year	Comments
Main Dam	Raise	2017	960’
	Raise	2019	965’
	Raise	2021	970’
	Raise	2024	975’
	Raise	2028	980’
	Raise	2031	985’
Back Dam (Bons Creek)	Construct	2004	960’
	Raise	2019	965’
	Raise	2021	970’
	Raise	2024	975’
	Raise	2028	980’
	Raise	2031	985’
Tailings Line	Extension	2004	n/a
Sand Filters	Relocate	2010	n/a
West Tailings Road	Relocate	2021	n/a

5.2.3 SAG Mill Modifications

Current estimates are that mill throughput would decrease after 2021 due to increasing ore hardness in Aqqaluk. A scoping level study has been done that indicates mill throughput can largely be maintained by increasing the motor size on two of the SAG mills from 2,000 hp to 2,750 hp (plus some associated modifications).

5.2.4 Miscellaneous

An emulsion plant will be installed at site during the second half of 2004, and is scheduled to be started up in November. The estimated cost is $1,664,000. In order to stay in compliance with the TDS limits in the most recent NPDES permit, it will be necessary to install a third water treatment plant (WTP 3). The plant is currently being designed, and will be shipped to site on the second barge in September. Installation should be mostly complete by year-end and commissioning is scheduled for April, 2005. Miscellaneous capital expenditures are included in the forecast to cover spending on container replacements, support equipment replacement, and other items required to maintain production.

Description	Work	Year	Comments
Emulsion plant	Construct	2004	n/a
WTP 3	Construct	2004	n/a
Miscellaneous	Replacement	Annually	n/a

5.3 Mobile Equipment

The mine mobile equipment replacement schedule is based on replacing equipment when the cumulative operating hours reach the estimated useful life.

Equipment	Model	Operating Hours	Comments
Haul Truck	CAT 777D	70,000	n/a
Loader	CAT 992G	50,000	n/a
Drill	IR DM-L	50,000	n/a
Dozer	CAT 9R	36,000	n/a
Grader	CAT 16G	60,000	n/a

The equipment replacement schedule is detailed in the following table:

Year	Equipment Replacement Schedule				
	Truck	Loader	Drill	Dozer	Grader
2004	3	1		2	2
2005	1				
2006					
2007					
2008					
2009					
2010					
2011	1	2			
2012					
2013				1	
2014					
2015	2		2		
2016					
2017	2			2	
2018					2
2019	3				1
2020	1				
2021		1			
2022					
2023 - 31		1		1	
Total	13	5	2	6	5

5.4 Exploration

Infill drilling to 100 foot centers from 200 foot centers is required in both Aqqaluk and Qanaiyaq for short-term mine planning requirements. The timing of drilling is determined by the mine plan.

In addition, it is planned to conduct detailed metallurgical testing on Aqqaluk and Qanaiyaq for short-term mine planning.

5.5 Permitting

5.5.1 Aqqaluk Permitting

The primary permitting assumption for Aqqaluk is that it will be considered a new mine. No additional infrastructure or support facility will be required. The amount of water from this development is expected to be minimal and, therefore, treatment will be accomplished by the existing treatment system. The deposit is located entirely on NANA land. Aqqaluk's close proximity to the existing main pit is expected to significantly minimize permitting requirements. There is the potential that an environmental assessment would be all that is warranted, particularly if the existing water discharge permit does not have to be modified. Wetlands permitting will be significant with large tracts of wetlands to the north and west. The baseline program will be targeted toward the more extensive EIS needs due to the possibility that an EIS is required. The baseline data needs are as follows:

- Minimum of three years of characterizing surface water hydrology and chemical composition.
- One year of complete meteorological data collection - completed.
- Groundwater characterization for quality and quantity.
- Minimum of three years aquatic biology characterization.
- Vegetation survey.
- Wildlife and wildlife use survey.
- Archaeological survey – complete.
- Wetlands survey – a total delineation is required, some work has been done.
- Material characterization of ore/tailings, and waste rock. This has been partially addressed through the main pit ARD study.

Once the majority of this data has been collected, the following permit applications can be completed.

- COE Wetlands
- ADF&G Habitat
- ADEC Construction Air Permit
- ADGC Coastal Projects Questionnaire

The permit applications, baseline data, and a detailed operation and reclamation plan for mining would be submitted to the relevant agencies. Minor facility permits for drinking water system and wastewater are not anticipated since these functions will be provided within existing infrastructure. A breakdown of the various permits and associated costs are as follows:

Agency	Permit	Schedule (months)
ADNR	Reclamation Plan Update	8
ADNR	Environmental Assessment (EA)	18
USEPA	EA Consultation	-
ADEC	Construction Air Permit	8
ADEC	Operation Air Permit Modification	4
USF&G	Habitat Consultation	-
NMFS	Habitat Consultation	-
COE	Wetlands Permitting	6
NAB	Land Use Permitting	3
SHPO	Archaeological Clearance	8
NPS	EA Consultation.	-
	Baseline Studies	24
Total		54

5.5.2 Qanaiyaq Permitting

The primary permitting assumption for Qanaiyaq is that it's footprint is in a non-wetlands area and the drainage from the deposit is entirely within the existing water containment system. No additional infrastructure or support facility is required. The quantity of water from this development is expected to be minimal and, therefore, treatment will be accomplished by the existing treatment system. The deposit is located entirely on NANA land.

Qanaiyaq's close proximity to the existing pit and containment of its drainage should minimize the permitting requirements. No wetland permitting is anticipated. A baseline program should be minimal. The baseline data needs are as follows:

- Water hydrology and chemical composition characterization should be minimal. Impact to the existing water and chemical balance will need to be determined.
- One year of complete meteorological data collection maybe necessary as existing data is derived from distant stations.
- Groundwater characterization.
- Aquatic life stream characterization would not be required if the Red Dog Creek diversion were extended. The upper middle fork of Red Dog Creek has extensive aquatic biology characterization.
- Vegetation survey – virtually nothing will be required due to the lack of vegetative cover.
- Wildlife and wildlife use survey.
- Archaeological survey – complete.
- Wetlands survey – confirmation of no wetland impact.
- Material characterization of ore/tailings, and waste rock.

Once the majority of this data has been collected, the following permit applications can be completed.

- Reclamation plan update
- ADEC Construction Air Permit – fugitive modeling
- ADGC Coastal Projects Questionnaire

The permit applications, baseline data, and a detailed operation and reclamation plan for mining would be submitted to the relevant agencies. Minor facility permits for drinking water system and wastewater are not anticipated since these functions will be provided within existing infrastructure. The various permits requirements and costs are as follows:

Agency	Permit	Schedule (months)
ADNR	Reclamation Plan Update	8
USEPA	EA Consultation	-
ADEC	Construction Air Permit	6
ADEC	Operation Air Permit Modification	4
USF&G	Habitat Consultation	-
NMFS	Habitat Consultation	-
COE	Wetlands Permitting	1
NAB	Land Use Permitting	3
SHPO	Archaeological Clearance	4
NPS	Mine Plan Consultation	-
	Baseline Studies	12
Total		24

SECTION 6: ECONOMIC ANALYSIS

6.1 Summary

An economic analysis was completed to determine the net present value of Red Dog open pit operations under a revised open pit development plan. The three pit areas included in the plan were Main, Aqqaluk, and Qanaiyaq, which are all in close proximity to the existing infrastructure.

The valuation is based on discounted net cash flow methodology, with an adjustment for working capital value at mid-year due to the atypical shipping season. The after-tax net cash flows are estimated for the mine life of the known reserves. The principal features of the economic analysis are:

- Mine plan revised to incorporate a phased development sequence to optimize ore grade and throughput to maximize net present value.
- Operating and sustaining capital costs developed by Red Dog operations based on historical results adjusted for expected changes.
- Contractual distribution costs utilized for concentrate haul to the port, AIDEA port rates, and concentrate lightering to ocean freighters. Ocean freight and off-site storage fee component of distribution costs based on operation's five year plan.
- Contractual NANA royalty payments.
- Contractual smelting fees extended for known trends.
- Long-term estimated metal prices.