Developers Assessment Report
Pine Point Pilot Project

Submitted to:

Mackenzie Valley Environmental Impact Review Board

Prepared by:

Tamerlane Ventures Inc.

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SUMMARY

Tamerlane Ventures Inc. is a publicly traded mining company engaged in the exploration and development of mineral properties in North America and internationally. Tamerlane Ventures Inc. proposes to construct and operate a Zn/Pb pilot plant at the R190 site, located approximately 42 km east of Hay River, Northwest Territories. The proposed project is referred to as the Pine Point Pilot Project (PPPP). The PPPP will confirm the potential to conduct full-scale underground mining of the remaining 34 known deposits. The proposed project will produce a bulk sample of approximately 1,000,000 metric tonnes of lead-zinc ore over the course of 12-15 months. No camp facilities will be required during the life of the PPPP.

Tamerlane commenced exploration activities in the fourth quarter of 2004 and completed a two-phase exploration program in the fall of 2005. In June 2006, Tamerlane Ventures acquired the remaining 40% interest in the Pine Point property. Tamerlane now has 100% interest in the Pine Point property. Tamerlane is finalizing a feasibility study that was undertaken in 2006. Subject to receiving regulatory approvals, construction of the Pilot Project would proceed in 2007 with the objective of advancing the project to a commercial production decision in as soon as possible.

Tamerlane Ventures Inc. has produced this Developers Assessment Report (DAR) in general conformance with the Terms of Reference produced by the Mackenzie Valley Environmental Impact Review Board (MVEIRB 2006).

This DAR provides the information required for the technical review of the project. Tamerlane Ventures Inc. was assisted in the preparation of the DAR by EBA Engineering Consultants Ltd. (lead consultant). Traditional Knowledge was considered and incorporated into the DAR to the extent possible. The DAR identifies the technical aspects of the PPPP, including alternatives that were considered. The DAR also reviews existing environmental and socio-economic conditions and the anticipated environmental and socio-economic interactions (following mitigation) that the PPPP may have during the design, construction, operation and reclamation phases of the project. The appendices provide additional, more detailed supporting information on various key technical subjects covered in the main report.

Development Description

The Tamerlane Pine Point Pilot Project (PPPP) proposes to demonstrate the economic extraction of a one million tonne bulk ore sample from the R190 deposit zinc/lead deposit using a combination of basic and technical mining methods. The mining of the bulk sample will confirm the use of:

- freezing for groundwater control
- shaft sinking for orebody access
- Dense Media Separation (DMS) for upgrading low grade deposits
- vertical conveyance for consistent hoisting of ore
- underground bulk mining methods for use in future mining of lower grade deposits.

Infrastructure construction is estimated to take an additional 12-15 months prior to the commencement of operations. The proposed PPPP will operate 365 days per year. Of the one (1) million tonnes extracted from underground, 40-50 % of the material mined will be returned underground for backfilling purposes. Provided the Pilot Project does not advance into future full scale mining, decommissioning and reclamation of the PPPP site is estimated to take about 3 months following shutdown of the PPPP.

The R190 mineral deposit will be mined with underground open stope and drift and fill methods using a conveyor and rubber tire mobile equipment. The ore will be transported to the surface via vertical conveyor and pre-concentrated in a Dense Media Separation (DMS) circuit at a rate of approximately 2800 metric tonnes per day. Surface access will include a concrete lined shaft. Level drifts will be driven from the shaft to the ore zones.

The PPPP will be dewatered using proven ground freezing technologies to maintain a frozen ring of ice around the project perimeter. The freeze curtain, or frozen ring of ground, will extend from the surface to a depth of approximately 185 m, surrounding and encompassing the entire R190 mineral deposit. The primary purpose of the freeze curtain is to prevent or minimize the intrusion of groundwater from the surrounding area into the underground mine workings. Any excess water underground will be collected in a sump, pumped to the surface and then either reused for the DMS process or discharged to the infiltration basin.

The PPPP R190 ore will produce direct ship ore through crushing and Dense Media Separation (DMS) concentration. Very few and only small amounts of reagents will be used in the DMS circuit. The primary addition will be ferro-silicon which is an inert product. It will be used to make a heavy liquid (dense media) containing 2.95 specific gravity that is similar to but lower than the sulphide minerals that will be separated. The ferrosilicon will be recoverable using magnetic separation and reused in the process. If necessary, lime may be added to stabilize the PH.

The process plant will include facilities to beneficiate the ore. It will also house the processing equipment, maintenance facilities, plant warehouse, laboratory and administration offices for facility supervisors and staff. The floor of the facility will be concrete-lined and sloped to a central drainage sump. All DMS circuit materials and chemicals will be stored in the DMS facility complex or in a separate building.

Concentrate will be stored in a dry, contained enclosure with some heat to prevent freezing. The product will be transported via Territorial Highway 5 to the CNR railhead at Hay River in covered trucks for loading on to rail cars.

No on-site camp will be constructed for the PPPP. The Pilot Project is estimated to require approximately 6,000 Kilowatts of electric power. Power for the Pilot Project will be provided by self-sufficient, on site diesel generation. Sewage and greywater waste from the operation will be processed through a packaged sewage treatment plant. Treated sewage effluent will be combined with the DMS discharge and deposited into the infiltration basin.

All solid non-combustible and non-hazardous waste will be collected and consolidated weekly and disposed of in an approved local area landfill. Waste oil will be used in oil heaters throughout the facility.

Tamerlane is committed to employing northern and Aboriginal residents to the extent possible during the relatively short-term period of the initial PPPP. Tamerlane anticipates that a considerable proportion of the workforce required for the one-year PPPP construction phase and the 12 to 15 month mining operations phase can be filled by residents of the South Slave area.

Approximately 65 jobs/positions are estimated to be available for the one-year construction phase of the PPPP. For the anticipated 10-15 months of PPPP operation, approximately 131 jobs/positions are projected to be available. These numbers include employment generated through the third-party business contract opportunities needed to service the project. Assuming reclamation of the PPPP site commences immediately following completion of the operations phase, approximately 14 jobs/positions will be available during the reclamation phase.

Critical to increasing local participation in the PPPP will be Tamerlane's training initiatives. Tamerlane is committed to training during the short duration of the PPPP. In developing its training programs, a priority of Tamerlane's Human Resources Management Plan will be to focus on providing pre-employment training opportunities. The application of this strategy is expected to contribute to increased opportunities for stakeholders to gain access to jobs and to facilitate employment. The Tamerlane program will initially be designed to fill apprenticeship and technological occupations. In addition, all PPPP contractors will also be required to adhere to Tamerlane's goal of maximizing Northern and Aboriginal employment.

Community Engagement

Tamerlane Ventures Inc. believes and supports the concept that effective and meaningful communication contributes to the development of sound corporate and community relationships. Throughout the baseline data collection, continuous efforts have been made to keep the public, affected First Nations and regulators informed of the project and development activities. Tamerlane's efforts have been communicated through telephone conversations, emails, presentations, site visits, personal visits and meetings.

Since about mid-August 2004, Tamerlane has been making continuous and concerted efforts to engage and consult with potentially affected First Nations and the nearby communities to discuss all aspects of the proposed project, including potential benefits and opportunities associated with the PPPP. To date, all issues have been dealt with in an open, honest, transparent and mutually agreeable manner. Tamerlane believes that all stakeholders including the company have benefited greatly from these ongoing community engagement activities.

In addition to these consultations, Tamerlane, together with the tremendous assistance and cooperation from key community members, participated in several weeks of Traditional Knowledge interviews with a number of Aboriginal community participants in Fort Resolution and Metis participants from the Hay River area during October 2006. The K'atlodeeche Dene opted to conduct a separate Traditional Knowledge study with support from Tamerlane. The results of the K'atlodeeche Dene study will be provided when their study report becomes available.

Tamerlane also participated in numerous meetings and generated correspondence with members of the Legislative Assembly of the Northwest Territories (MLA), Department of Indian Affairs and Northern Development (DIAND), Government of the Northwest Territories (GNWT), Natural Resources Canada (NRC), Environment Canada (EC), Northwest Territory Chamber of Mines, Mackenzie Valley Land and Water board (MVLWB), and the Mackenzie Environmental Impact Review Board (MVEIRB). These activities provided Tamerlane and the regulatory stakeholders with the opportunity to share information, coordinate activities and develop relationships in the proposed PPPP area. Communications with regulatory agencies are planned to continue throughout the permitting process and project's life.

Environmental Overview

The environment in the area of the Tamerlane PPPP is located on the edge of the Boreal Plains and the Taiga Plains Ecozones. It encompasses the Slave River and Hay River Lowland Ecoregions. The area is characterized by short, cool summers and long, cold winters. The mean annual temperature is -17.5 ºC, and annual precipitation ranges from 300 to 400 mm.

The vegetation of these ecoregions and the regional study area (RSA) is characterized by medium to tall, closed stands of jack pine and trembling aspen. White spruce and black spruce dominate later successional stands. Poorly drained fens and bogs in this region are covered with low, open stands of larch, black spruce and ericaceous shrubs. Seasonal fires have been a common occurrence in the South Slave Region. The most frequently mentioned fires during the Traditional Knowledge interviews included the Pine Point fire (early 1970's) and the Hay River/Pine Point fire (1981) that burned from Alberta to Great Slave Lake and from Hay River to Pine Point, including the proposed PPPP area.

The two nearest drainages to the PPPP site are the Buffalo River, located approximately 10 km to the east and Twin Creek located about 7 km to the west. Fish species frequenting the Buffalo River include inconnu, whitefish, northern pike, pickerel and burbot.

The surface water quality for all sites sampled along Twin Creek, Buffalo River and in Great Slave Lake in 2005 and 2006, was generally typical of natural background values for this area of the NWT. The concentrations of most tested parameters were below existing federal guideline criteria and laboratory detection limits.

The results indicated that Great Slave Lake water has naturally elevated background aluminum levels. Aluminum is typically associated with limestone, dolomite, sandstones and shales which occur in the Pine Point area. Aluminum is also the most abundant metallic element present in the earth's crust.

The groundwater quality in the PPPP area (R190) is strongly influenced by the geological characteristics of the underground formations. The groundwater is typically hard, with naturally elevated levels of aluminum, iron and some nutrients. Some of the groundwater layers in the area are salty and/or contain sulphur. The natural groundwater table in the Pine Point area varies in depth below surface from approximately 1 m to 18 m depth.

Moose, woodland caribou and occasionally wood bison are the main ungulates found in the area although none are considered common. Based on the Traditional Knowledge interviews, wildlife identified as living in and being harvested in the vicinity of the PPPP include moose, woodland caribou, lynx, wolf, otter, black bear, rabbit, porcupine, prairie chicken, spruce chicken, ruffed grouse, waterfowl and upland game birds. Migrating wildlife observed from time-to-time include ducks, geese, swans, songbirds, whooping crane, prairie chickens and ptarmigan. The bird life present in the area is typical of the boreal forest. The south shore of Great Slave Lake is considered to be an important concentration site for birds during their annual migrations.

Some of the participants in the MVEIRB scoping sessions indicated that the land and environment of the Pine Point area was perceived to be in the process of "healing", presumably from impacts associated with the former large-scale mining operations and related mineral exploration activities in the region.

Environmental Effects and Mitigation Measures

Tamerlane is committed to minimizing the potential environmental effects associated with the construction and operation of the PPPP. Initially, as part of project planning and design, Tamerlane is proposing to employ underground mining, the least intrusive method for mining the R190 mineral deposit. The proposed PPPP development will be of a limited, small-scale and relatively short-term nature.

The construction of the PPPP buildings and mining support infrastructure (e.g. access roads, stockpile area, freeze line) will involve the clearing of vegetation in limited areas and the levelling of the existing terrain to accommodate the required temporary buildings (structures) and infrastructure. In addition, application of the proposed freeze curtain technique represents the least intrusive method for stabilizing wet, unconsolidated ground, compared with other alternatives such as grouting and dewatering.

Tamerlane is proposing to further minimize the PPPP development footprint by locating PPPP buildings and associated infrastructure on existing disturbed areas to the maximum extent possible. More than 52 % of the PPPP buildings and associated infrastructure footprint will be located on previously disturbed terrain. New disturbance to terrain and associated vegetation in the project footprint area will be limited to approximately 4.3 ha, representing an increase of only 0.37 % of the disturbed terrain present in the Pine Point Regional Study area.

The main ways that the development of the PPPP can affect wildlife is through physical or behavioural disturbance, including displacement and habituation (e.g. attraction). Potential effects on wildlife may also result from the loss or degradation of habitat.

Potential effects related to the PPPP development on all wildlife species will be mainly limited to the timeframes and activities associated with the approximate 3-year duration of the development. The nature of the types of activity and possible effects on wildlife are generally well understood and predictable. This is a very small underground development with a limited footprint and limited surface activities.

To minimize any potential for direct PPPP development-related wildlife mortality, Tamerlane will implement a no hunting policy for all project employees and contractors while working on or off-site for Tamerlane. In addition, the company will require all project-related transportation activities to give the right-of-way to any wildlife that such activities may encounter.

Some wildlife may show minor displacement behaviour and avoid the immediate PPPP development area and/or the Highway during periods of particularly loud and irregular noises. The duration of such exposures are expected to be brief, perhaps lasting a few minutes to a few hours, and are reversible upon cessation of the activity or by moving away from the activity. The number and frequency of such exposures to noise disturbance by wildlife would be expected to be limited and sporadic.

Potential effects on fish and/or fish habitat in the Tamerlane PPPP area could only occur if activities associated with the PPPP were to either directly or indirectly impact on these components of the receiving environment. However, as indicated in the DAR, there will be no direct discharge of any DMS circuit or mine-related water discharges to any surface waters or waterbodies frequented by fish.

The only lakes that support fish populations near the PPPP site are Great Slave Lake and Polar Lake. Both of these lakes are well removed from the site and cannot be affected in any way by the infiltration process and associated mine water.

To minimize possible effects on surface water and groundwater quality, volumes and flows in the PPPP development area, Tamerlane has committed to employ a number of mitigation measures. The limited process water and mine water associated with the PPPP will be directed to the proposed infiltration basin that will be located within the limits of an existing gravel pit. High quality treated sewage effluent will be co-mingled with the process water and mine water for discharge to the infiltration basin.

Tamerlane anticipates that the quality of the process/mine water to be directed to the infiltration basin will comply with Water License criteria without the need for further treatment. However, existing and demonstrated water treatment methods (lime addition) are readily available and will be employed if determined to be necessary to ensure compliance with the Water License.

During the period of time that the freeze curtain is in place and functional, it is anticipated that localized groundwater in the vicinity will be temporarily deflected (detoured) around the perimeter of the freeze curtain (like water moving around a bridge pier in a river) as it continues to flow towards the north/northeast. The presence of the freeze curtain is not expected to block or alter the flow of water around the PPPP area.

The limited air emissions, odours and noise associated with the operation of a few standard internal combustion engines operating on the site and the small amounts of dust generated mainly by moving vehicles and trucks are not anticipated to have a measurable effect on the vegetation or wildlife in the PPPP development area.

With the application of the mitigation measures outlined in this summary, and others identified in the DAR, no significant residual impacts on the biophysical environment are anticipated to occur during the construction, operation, closure and reclamation of the PPPP site.

Socio-Economic Effects and Mitigation Measures

Potential contributions of the Tamerlane PPPP to local, regional and territorial sustainable development will be dictated primarily by the relatively small size and short-term (~3 year) duration of the initial project. As indicated in earlier sections of the DAR, the main purpose of the PPPP is to demonstrate project economics and the success of the proposed underground mining techniques including the application of ground freezing, and the selected ore treatment methodology.

The project will provide preliminary but relatively short-term direct and indirect employment, training, apprenticeship and business opportunities for a number of people. This will include the neighbouring First Nations, specifically Deninu Kue First Nation, K' atlodeechie First Nations and Metis interests, and the communities of Fort Resolution, Hay River, Fort Smith and possibly Enterprise.

Tamerlane is committed to providing training, employment and business opportunities associated with the development of the PPPP consistent with the scale and duration of the relatively short-term initial project. Tamerlane's commitment to training will include site-based on-the-job training and the support of a number of apprenticeships. Assuming project success and longer-term, larger-scale development in the future, these programs will be expanded as appropriate. They will be guided by sustainable development principals to generate further economic and social benefits while ensuring continued responsible environmental stewardship for the benefit of future generations.

Tamerlane is committed to employing northern and Aboriginal residents to the extent possible during the relatively short-term period of the initial PPPP. Tamerlane anticipates that a considerable proportion of the workforce required for the one-year PPPP construction phase and the 12 to 15 month mining operations phase can be filled by residents of the South Slave Region.

Tamerlane is also committed to maintaining a safe, healthy and productive work environment for all employees, contractors, visitors and guests. It is the responsibility of all employees and contractors to report for work in fit condition and to work safely throughout their work period. Tamerlane will provide support consistent with company policy to employees and their immediate families in dealing with personal health and well-being issues.

Tamerlane believes that with the effective implementation of the company's Human Resources Management Plan and the support of the federal and territorial human resources management agencies, the socio-economic issues of concern to the potentially affected communities and residents of the Pine Point area can be effectively managed.

Cumulative Effects

Cumulative effects are changes to the environment that are likely to result from the project in combination with other projects or activities that have been or will be carried out.

For the Tamerlane PPPP, the assessment of cumulative effects involved four basic considerations

- There must be an environmental, social or cultural impact related to the project.
- The effect must be demonstrated to operate cumulatively, additively or synergistically with impacts from other projects or activities.
- The other projects or activities exist or are likely to be carried out and are not hypothetical.
- The cumulative effect is likely to result.

The short-term nature of the PPPP will mean that most of the very limited biophysical environmental effects associated with the development are expected to occur during this relatively short period of time.

Anticipated negative construction and operations-related effects, such as impacts on air quality, the noise environment and wildlife will generally be of an intermittent, very short-term (minutes to hours), highly localized, and rapidly reversible nature.

Longer-term effects of the Tamerlane PPPP on the biophysical environment will be limited to the small physical footprint of the development area, which will be reclaimed in accordance with the reclamation objectives of Tamerlane and the regulatory agencies with responsibility regarding such matters.

Based on the assessment provided in the DAR, none of the intermittent, short-term, highly localized and rapidly reversible PPPP-related environmental and socio-economic effects are anticipated to cause impacts that may contribute to negative cumulative effects.

However, assuming initial project success and longer-term, larger-scale development in the future, Tamerlane's employment, training and human resources support programs will be expanded as appropriate. They will be guided by sustainable development principals to generate further economic and social benefits while ensuring continued responsible environmental stewardship for the benefit of future generations.

Closure and Reclamation

Reclamation planning is an integral component of a sound environmental management system for any development. Tamerlane is committed to achieving a number of goals for the progressive reclamation of the PPPP development area following closure of the project. Tamerlane's goals for reclamation will be consistent with INAC's guidelines for abandonment and restoration planning for mines as well as the requirements of the anticipated Land Use Permit.

Following removal of the PPPP surface facilities, the remaining fill embankments, borrow pits, access roads and development footprint will be re-contoured and scarified as required to ensure surface stability and to facilitate the re-establishment of native vegetation. With the application of the broad suite of available reclamation measures, Tamerlane is confident that the reclamation goals for the PPPP can be effectively achieved.

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
A - Summary			
A-1	Non Technical Summary: A plain language summary in South Slavey, Chipewyan and English		TK/SK
A-2	Concordance Table	I	SK
A-3	Summary table indicating for each subsequent section (B-L) whether Scientific Knowledge, Traditional Knowledge or both was used in the information collection and analysis	II	SK
B – Developer			
B-a	A summary of the company's corporate history in Canada and the Northwest Territories	1.1	SK
B-b	A summary of previous experience of the Project Management Team working in the NWT or other Northern environments;	1.2	SK
B-c	A discussion of Tamerlane's capacity to provide financial security for reclamation liabilities in the event of bankruptcy or other unforeseen failure to complete and reclaim the project.	1.3	SK
B-d	A description of corporate and directors' responsibilities for the PPPP and associated operations.	1.4	SK
B-e	A discussion describing the relationship between Tamerlane and its contractors and subcontractors.	1.5	SK
B-f	A detailed record of Tamerlane's environmental performance record and that of its major contractors during exploratory work in suppor of the PPPP.	1.6	SK
B-g	A description of Tamerlane's environmental performance on other similar mining projects.	1.7	SK
B-h	Any policy, directives or terms of reference concerning Tamerlane's environmental, sustainable development, community engagement and/or workplace health and safety.	1.8	SK
C – Description of the Existing Environment			
C-1	Ambient air quality, background noise levels and climate.	2.3	TK/SK
C-2	Site hydrology, including surface water, shallow subsurface water and groundwater amounts, direction of flow, and a description of associated watersheds.	2.6 2.8	TK/SK
C-3	Existing and historic data on surface and ground water quality and quantity and flow regimes.	2.9	TK/SK
C-4	Aquatic organisms (especially fish) and aquatic habitat of all lakes, streams and rivers in the study area (including the Buffalo River).	2.10	TK/SK
C-5	Wildlife (including migratory birds) and wildlife habitat and migration corridors	2.12	TK/SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
	(including current use and long-term variations).		
C-6	Vegetation and plant communities.	2.11	TK/SK
C-7	Terrain, surficial geology, structural geology, mineralogy, bedrock geology, seismicity, permafrost locations and types, especially of the local study.	2.4	TK/SK
C-8	Physical and chemical makeup of soils, lake and river sediments, including nearby portions of nearshore Great Slave Lake, Buffalo River and other waterbodies within the scope of assessment.	2.10.5	TK/SK
C-9	Physical infrastructure present in the nearby areas, including roads, railways, buildings, quarries, power lines and other industrial works.	4.3	
C -10	An in-depth analysis of Territorial Highway 5 from Hay River to the PPPP site. Territorial Highway 6 from the Territorial Highway 5 turnoff to Fort Resolution and Town of hay River roads along which ore would be trucked must also be considered. This analysis should indicate the daily truckloads currently traveling these corridors.	4.4 5.5	TK/SK
C-11	Regional power infrastructure, generation capacity, and usage levels by season should Tamerlane intend to draw electricity from the existing power grid.	4.3.6 5.4	SK
C-12	Socio-economic conditions, including social services provision capacity among the communities identified in the scope of assessment.	3.0 8.2	TK/SK
C-13	Historic and present past land use, with the identification of traditional land use groups and areas of overlapping land usage.	8.3 8.4 8.5	TK/SK
C-14	Cultural and heritage resources, with the identification of the cultural groups who associate with these resources.	8.3 8.6	TK/SK
D – Development Description			
D-1	The physical footprint of the PPPP, with locations and descriptions of buildings, concrete foundations, boreholes and mine shafts, aboveground infrastructure (e.g., power lines), water pipes, etc.	4.3	TK/SK
D-2	All existing or proposed access roads in the project area that Tamerlane requires for the PPPP, including analysis of necessary improvements and how extensive they may be.	4.4.1	TK/SK
D-3	The exact route by which ore will be transported from the PPPP to Hay River, the expected number of trips per day to and from the PPPP by truck type and weight of load, and where and how it will be stored and handled in Hay River. The duration of the hauling with expected start and end dates and time of the week when hauling is expected to occur should be also described.	4.4	SK
D-4	A discussion of how lead/zinc concentrate dust from truck transport and transfer to railcar will be controlled.	4.3.13.1	SK
D-5	A discussion of how truck weights will be controlled and how the tracking of mud and potentially deleterious materials by trucks entering the highway will be	4.3.13.1	SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
	controlled.		
D-6	The physical works and activities required to put in place and maintain the required "freezewall" technology – a refrigeration plant, generator or substation facility, above ground piping and subterranean piping systems.	4.1.3	SK
D-7	The ore stockpile, temporary waste rock and aggregate storage facilities, any required soil and overburden storage facilities or disposal methods and locations, including water runoff expectations, management and treatment considerations for each location;	4.3.1 4.3.4	TK/SK
D-8	All hazardous materials, process and other chemicals likely to be used on site, including fuels, process additives, oils, and batteries	4.5 5.8	SK
D-9	Aggregate amounts and sources that Tamerlane intends to utilize for construction, operational and reclamation purpose. The description should provide information on the timing of use and predicted amounts of aggregate material required over the life of the PPPP;	4.1 4.1.1	TK/SK
D-10	Solid and hazardous waste facilities and their location, conceptual designs of the facilities and an estimate of the volume of material and whether that volume can reasonably be deposited in the Town of Hay River solid waste site, as proposed. If all materials are to be transported, indicate where to, how they will be transported, and how they will be treated/disposed of at these facilities, and who will be responsible for these activities;	4.5 5.8 7.6 11.0	SK
D-11	The proposed Infiltration Basin, including all applicable environmental considerations, any designs for infrastructure additions to the site including control structures, a description of the pathways and materials used to pump and transport water to the Infiltration Basin, and a description of water quality and quantity monitoring proposed for this site;	4.3.15 7.2.2 7.8	TK/SK
D-12	The total amount of water, in cubic metres, to be pumped into the Infiltration Basin, with indications of changes during the course of the PPPP, and seasonal fluctuations;	4.3.15 7.2.2 7.8	SK
D-13	All the underground facilities, including infrastructure and machinery requirements, explosive storage area, emergency escape routes, ventilation plans, and water management facilities;	4.2	SK
D-14	The mining and backfilling methods to be used in the underground works;	4.2 4.3	SK
D-15	The primary and secondary crushing process, transport to the surface, storage of ore and the operational requirements of the DMS facility and its support infrastructure;	4.2 4.3	SK
D-16	All explosives storage facilities to be used during the project life cycle, along with a description of the types of explosives to be used, their storage, handling and application;	4.3 4.3.14	SK
D-17	All other infrastructure proposed for the PPPP, including all buildings on site, diesel storage facility and generator locations (and energy requirements and	4.3	SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
	sources for the PPPP), perimeter fencing and water treatment considerations;		
D-18	Water sources for the DMS circuit, dust control, and other PPPP activities, including a plan for the location of pipelines and other related infrastructure; and	4.6	SK
D-19	Water management structures, including preliminary plans of diversion and water treatment structures, if applicable.	4.3.15 4.6	TK/SK
D-20	Expected capital costs during the life of the PPPP;	4.8	SK
D-21	Estimated operating costs during the life of the PPPP;	4.8	SK
D-22	The estimated lifespan of the PPPP broken down into construction, operation and post-mining closure and reclamation phases.	4.1 4.1.1	SK
D-23	The number of person years of work associated with the PPPP, broken down by life cycle stage;	8.1 8.1.1	SK
D-24	Worker housing situations, transportation to work, and proposed work scheduling; and	6.2 8.2.1.1	SK
D-25	A list of required ancillary developments that need to be constructed or improved in order for the PPPP to go ahead.	4.7	TK/SK
E – Alternatives			
E-1	Methods and locations of mine- and waste-water release back into the environment. Provide a detailed evaluation and comparison of alternatives to pumping waste into the proposed Infiltration Basin (e.g., a polishing pond or sump), as well as comparison locations for siting of the Infiltration Basin;	5.3	TK/SK
E-2	Evaluate alternatives to transporting ore from the PPPP to the Hay River railhead other than by Territorial Highway #5, and alternative transportation timing to minimize impacts on highway users and Hay River residents. This should include the possibility of loading ore on to railcars at a location south of Hay River near the Highway 2 and 5 intersection;	5.5	SK
E-3	Evaluate alternative power generation methods ("grid" hydroelectric vs. on-site diesel) and suppliers (Power Corp., Tamerlane in-house, or contractor), with particular consideration to potential impacts on regional power supply from tapping in to the existing hydro-electric power grid versus using diesel generators, or a mixture of both. Also consider the capacity of the Taltson Hydro Dam to increase its power generation to meet PPPP needs;	5.4	TK/SK
E-4	Discuss the alternative of having a camp on site as opposed to daily transportation of workers to and from communities, and how work schedules would be affected;	5.6	TK/SK
E-5	Sewage treatment options – onsite management vs. removal to a remote location. Identify the location and capacities of chosen locations, and a comparative assessment of water requirements on-site from each option;	5.7	SK
E-6	A discussion of how Tamerlane selected its proposed mining method and the reasoning behind not choosing alternate mining methods, including open pit,	5.2	TK/SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
	underwater, decline and underground shaft mining methods;		
E-7	Alternative freezing system components – brine versus liquid nitrogen-based;	5.33	TK/SK
E-8	Disposal of hazardous and non-hazardous wastes – Town of Hay River facilities vs. other facilities; and	5.8	SK
E-9	Type of explosives used – ANFO vs. emulsion.	5.9	SK
F – Public Consultation			
F-1	In addition to identifying consultation dates, individuals and organizations consulted with, the mode of communication, and discussion topics, as noted in Section 3 of Tamerlane's Project Description Report, identify and reference the following;	6.0	TK
F-1a	All public methods used to identify, inform and solicit input from potentially-interested parties;	6.0	TK/SK
F-1b	All commitments and agreements made in response to issues raised by the public during these consultations, and how these commitments altered the planning of the proposed PPPP; and	4.0 6.0 7.0 8.0	TK/SK
F-1c	All issues that remain unresolved, and document any further efforts envisioned by the parties to resolve them.	7.0 8.0 10.0 11.0	TK/SK
F-2	Identification of any plans, strategies or commitments of Tamerlane, alone or in combination with any other group, to maintain consultation ties in a set forum during the EA process and throughout the life of the PPPP;	6.0	TK/SK
F-3	A discussion of Tamerlane's consultation plan that specifically focuses upon the holders of aboriginal and Treaty rights in project area. This should consider how the concerns and issues of such right holders will be accommodated; and	6.0 8.1 8.2	TK/SK
F-4	A discussion as to how Tamerlane intends to engage Traditional Knowledge holders in order to collect relevant information for the establishment of baseline conditions, the prediction of possible impacts, as well as the development of mitigation methods, adaptive management plans and monitoring program planning.	6.0 Appendix A	TK/SK
G – Assessment Boundaries			
G-1	A rationale for Tamerlane's establishment of spatial boundaries for the assessment of potential effects noted in the following sub-sections. The spatial boundary should be appropriate to the nature of each VC being assessed. Where the spatial assessment boundaries differ from the Scope of Assessment established in this ToR, please provide a rationale to explain the difference.	7.0 7.1 8.3	SK
G-2	A rationale for setting temporal boundaries for the assessment of effects noted in the following sub-sections. The temporal boundary should be appropriate to the nature of the VC assessed.	7.0 7.1 8.3	SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
H – Human Environment			
Direct and Indirect Employment			
H-1-1	Providing an updated listing of all employment requirements by skills category over the life of the PPPP, based on the most current mine feasibility work;	8.0 8.1 8.1.1	SK
H-1-2	Identifying which employees will be Tamerlane versus contractor employees, and describe whether and how Tamerlane will require its contractors to have similar commitments to maximizing regional and aboriginal employment at the PPPP;	8.0 8.1 8.1.1	SK
H-1-3	Conducting an assessment of the available labour pool, at varying geographic scales, to meet the direct mine labour requirements, including: Fort Resolution, Fort Smith, Hay River (town and Hay River Reserve), the South Slave Region, territorial, and extra-territorial;	8.0 8.1 8.1.1	SK
H-1-4	Providing information on any identified barriers to employment, advancement and retention for Northern workers (with particular emphasis on residents of smaller potentially affected communities and aboriginals), including minimum skill requirements, hiring policies related to criminal records or substance addictions, availability of willing employees, and lack of training opportunities for community members;	8.0 8.1 8.2 8.1.1 8.2.1.4 8.2.4	TK/SK
H-1-5	Assessing the requirements for any training, education, and other improvements necessary to maximize employment of residents of potentially-affected communities in the workforce of the mine, and compare this to existing training initiatives available in the NWT;	8.0 8.1 8.2 8.1.1 8.2.1.4 8.2.4	TK/SK
H-1-6	Discussing Tamerlane's strategies, plans or commitments with respect to maximizing the proportion of direct mine employees that are NWT residents, aboriginal persons, and residents of potentially-affected communities (e.g., through hiring policies, training initiatives, etc.); and	8.0 8.1 8.1.1	TK/SK
H-1-7	Discussing Tamerlane's strategies to retain northern and aboriginal employees and to assist in the transition of employees into other areas if this short term pilot project does not proceed any further into full scale mining.	8.0 8.1 8.1.1	TK/SK
Business Opportunities			
H-1-8	Providing an estimate of required contractor and subcontractor goods and services required through the different stages of the project life cycle, and associated direct and indirect economic effects (e.g., local and regional income multipliers);	8.1 8.1.1 8.1.2 8.1.4	SK
H-1-9	Identifying and assessing the opportunities for – and capacities of – local, regional and territorial businesses to compete for the right to supply required goods and services, both directly to the proposed PPPP, as well as to meet new demand created by economic growth spurred by the PPPP. Include estimates of what percentage of goods and services might feasibly be provided by northern businesses, and discuss any plans, commitments or strategies Tamerlane has for maximizing this percentage;	8.1 8.1.1 8.1.2 8.1.4	TK/SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
H-1-10	Assessing the requirements for any training, education or other improvements necessary to maximize engagement of business of each potentially-affected community in the economic benefits accruable from the PPPP.	8.1.1 8.2.1.9 8.2.4	SK
H-1-11	Assessing how the PPPP will contribute to opportunities to diversify the economic base at the local, regional and territorial level. New local and regional economic development associated with the PPPP, including the production and supply of new goods and services, should be included in this assessment.	8.0 8.1 8.1.4	SK
Distribution of Beneficial and Adverse Economic Impacts			
H-1-12	Particular emphasis shall be placed on identifying public safety and economic impacts of increased usage of Territorial Highway 5 west of the PPPP. The Developer shall describe the estimated number of trips per day, the type of loads, the costs of increased road maintenance and responsibility for same (if applicable), the current and likely traffic loads during different times of day on the Highway, the time of day and time of year that the trucks are expecting to be hauling and provide any proposed mitigation strategies, policies, or commitments to reduce costs and minimize public safety concerns.	5.5 7.5.2 8.2.1.8	SK
H-1-12a	Tamerlane shall list estimates of all predicted economic impacts, both beneficial and adverse, stemming from the PPPP, including but not necessarily limited to impacts caused by: Increased employment numbers, including a prediction of employment multipliers, and the PPP's estimated effects on employment levels in potentially-impacted communities;	8.0 8.1 8.2	TK/SK
H-1-12b	Predicted increases in local income and disposable income levels (identify income multipliers where possible);	8.0 8.1 8.2	SK
H-1-12c	An assessment of the costs and who will bear them of any increases in physical infrastructure predicted to be required as a result of pressures or requirements of the PPPP (NOTE: this must include Territorial Highway 5 and Hay River railspur access roads used by the Developer).	8.0 8.2 8.2.1.3 8.2.1.4 8.2.1.8 8.2.3	SK
H-1-13	Estimating, for each of the items listed above, how the economic effects identified will be distributed among potentially-affected communities. An estimate is required of how much of the economic benefit of the PPPP will accrue to aboriginal groups, individual South Slave communities, the South Slave as a region, other areas of the NWT, and other Canadian jurisdictions.	8.0 8.1 8.2	SK
H-1-14	Including, for each of the above, any plans, strategies or commitments designed to mitigate the identified adverse impacts.	8.0 8.1 8.2	SK
Society and Culture			
H-2-1a	Community/population health and associated indicators such as, but not limited to: Population in- and out-migration;	8.2	TK/SK
H-2-1b	Alcohol and drug access and use	8.2.1.2	TK/SK
H-2-1c	Access to health care	8.2.1.3	TK/SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
H-2-1d	Housing pressures	8.2.1.4	TK/SK
H-2-1e	Crime rates	8.2.1.5	TK/SK
H-2-1f	Access to child care	8.2.1.6	TK/SK
H-2-1g	Increased divisions within or between communities	8.2.1.7	TK/SK
H-2-1h	Public safety, especially in regards to the use of Territorial Highway 5 west of the PPPP.	8.2.1.8	TK/SK
H-2-1i	Educational access and education completion levels	8.2.1.9	TK/SK
H-2-2	The physical, mental, and cultural health of mine workers and mine workers' families.	8.2.1.10 8.2.2	TK/SK
H-2-3	Existing and required social service networks to support community health and wellness	8.2.1.10 8.2.3	TK/SK
H-2-4	The effect of this and other past, present and reasonably foreseeable developments on political and social development, cultural values, traditions and language in potentially-affected communities.	8.1 8.2	TK/SK
H-2-5	A description, for each identified potential effect, as to how the PPPP may affect valued social and cultural components:	8.1 8.2	TK/SK
H-2-5a	At the regional level;	8.1 8.2	TK/SK
H-2-5b	At the local level for each potential-affected community; and	8.1 8.2	TK/SK
H-2-5c	Among particularly vulnerable sub-populations within potentially-impacted communities, such as women, children and elders.	8.2.1.10	TK/SK
H-2-6	An identification of leassons learned from social and cultural impacts of previous mine developments in the NWT and the North, and how they have been incorporated into the impact identification, prediction and mitigation for the PPPP.	8.2.4	TK/SK
H-2-7	A discussion concerning the development of a Human Resources Management Plan and any programs that will be offered at the mine site to identify and mitigate social problems.	8.1 8.2	TK/SK
H-2-8	A comparison of the likely relative distribution of beneficial and adverse cultural and social impacts amonth the different potentially-affected communities.	8.1.3 8.2.1.7	TK/SK
H-3	Heritage Resources	8.3	TK/SK
H-3-1	Identifying all known archaeological and heritage resources, as well as sites or areas of cultural significance in or near the required EA Study Area.	8.3	TK/SK
H-3-2	Identifying any areas within the required EA Study Area that have medium to high probability of containing currently unknown cultural and/or heritage resources.	8.3	TK/SK
H-3-3	Listing all correspondence and consultation with experts (traditional knowledge	8.3	TK/SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
	holders, archaeologists, and anthropologists) used to make the above assessments.		
H-3-4	Listing all recommended mitigation measures identifited for the protection of local known and high potential areas of cultural and heritage resources.	8.3	TK/SK
H-4	Traditional and Contemporary Land Use and Wildlife Harvesting	8.4	TK/SK
H-4-1	Utilizing local and traditional knowledge, identifying the historic and current relative value and usage levels of the EA Study Area by wildlife harvesters.	8.4	TK/SK
H-4-2	Describing any potential direct and indirect effects that the PPPP may, on its own or in combination with other developments, have on hunting, fishing, trapping and other activities for persons and organizations from the potentially-affected communities, including but not limited to;	8.4	TK/SK
H-4-2a	Loss of use of the immediate area for wildlife harvesters;	8.4	TK/SK
H-4-2b	Loss of harvesting success and quality of harvested materials due to any PPP activities;	8.4	TK/SK
H-4-2c	Loss of the use of the area for any leisure activities; and	8.4	TK/SK
H-4-2d	Identifying all measures required, and commitments made, by Tamerlane to mitigate against adverse effects on both traditional land use and resource harvesting from the land, or compensate for losses that cannot be avoided.	8.4	TK/SK
H-5	Protected and Withdrawn Areas		
H-5-1	Identify any locations within, proximate to, or potentially affected by PPPP operatioins, that are currently protected by law, subject to special management rules and regulations, are identified in the NWT Protected Areas Strategy.	8.5	TK/SK
H-5-2	Identify any locations within, prximate to, or potentially affected by PPPP operations been identified as land proposed to be withdreawn in the future. These areas can be identified through consultation with community leaders, land use planners, and staff of the NWT Protected Areas Strategy.	8.5	TK/SK
H-5-3	Discuss any potential impacts the development may have on the Polar Lake recreateional area.	8.5	TK/SK
H-6	Aesthetic Resources and Wilderness Values	8.6	TK/SK
H-6-1	Identify any particular landforms, locations of special interest, or other unique environments that merit special attention in areas potentially affected by the PPPP and discuss any mitigation measures proposed to reduce potential adverse impacts to them.	8.6	TK/SK
H-6-2	Discuss the aesthetic changes the PPPP will have that might impact other users; and	8.6	TK/SK
H-6-3	Identify any other area users who may be economically, socially or culturally affected by potential effects of the PPPP on aesthetic and/or and wilderness values.	8.6	TK/SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
H-7	Human Environment Monitoring commitments, plans and strategies proposed to monitor the following;	8.1 8.2	TK/SK
	Access of local and regional contractors to PPPP-related business opportunities;	8.1	TK/SK
	Employment, continued education and training;	8.1 8.2	TK/SK
	Mitigation of adverse social impacts;	8.2	TK/SK
	Impacts on the land and animals and by extension, traditional harvesting success rates and costs; and	8.4	TK/SK
	Worker and community health and wellness.	8.2	TK/SK
	I – Biophysical Environment		
I-1	Water Resources		
I-1-1	A listing of all applicable water resource permits, licences, and authorizations that will be required from federal, territorial regulatory authorities, as well as all water quality requirements;	7.2 7.3	NA
I-1-2	A discussion of the mineralogy and any components of waste rock or ore from the underground works, the DMS circuit additives, the explosives being used, or any other PPPP component which may be of concern for wastewater discharged into the receiving environment;	2.4 4.3.3.4 4.3.7 4.6.2 5.9 7.2 7.3	TK/SK
I-1-3	A description of the flow directions and volume of ground- and surface-water throughout the Study Area, before, during, and after the time period when the freezewall is in place;	2.6 2.8 2.9 7.2 10.3.1	TK/SK
I-1-4	An assessment of the likelihood of success of the freezewall technology, considering the karst environment and the level of salts and solids in groundwater, as well as a prediction of inflows of water into the mine works in both the success and failure case;	4.1.3 5.3 7.2 10.3.1	TK/SK
I-1-5	An examination of the potential effects of the PPP on water quality and quantity throughout the area. This analysis shall include, but not be limited to:	2.6 2.8 4.6 5.3 7.2 10.3.1	TK/SK
I-1-5a	A prediction of the quality and quantity of wastewater discharged to the receiving environment that shall address all applicable water quality parameters including concentrations of metals, nutrients, major ions, process chemicals and bacteria;	2.6 2.8 4.6 4.3.7 5.3 7.2 10.3.1	SK
I-1-5b	A detailed water balance table indicating major uses of water, and any predictions of alterations of water quality during each phase of its use in the process lifecycle, from underground capture to release into the Infiltration Basin	2.6 2.8 4.6 5.3 7.2 10.3.1	SK
I-1-5c	Mine de-watering effects on the hydrology, groundwater flows and chemistry in the local study area;	2.6 2.8 4.1.3 5.3 7.2 10.3.1	TK/SK
I-1-5d	A discussion regarding the potential effects of the mine working, following closure, on the surrounding ground water regime with specific consideration if	2.6 2.8 4.6 4.1.3 5.3	TK/SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
	paste backfill and concrete capping of the shaft is employed at the site;	7.2 10.3.1	
I-1-5e	A prediction of contaminant loading and dispersion into the receiving environment, from all PPPP sources, furing mine operation and after closure;	2.10.5 4.6 5.3 7.2 7.3 7.7 10.3.1	TK/SK
I-1-5f	A conceptual discussion of treatment and contingency options for effluent concentrations exceeding standard water licence terms and conditions;	4.3.6 4.3.15 4.6 7.2	SK
I-1-5g	The potential effect of PPPP operations on increasing contaminant concentrations in the sediments of Buffalo River, local lakes and Great Slave Lake;	2.10.5 7.2 7.3 10.3.1 10.3.2	TK/SK
I-1-5h	The predicted levels and potential effects from the discharge of nutrients to the receiving environment, which shall include possible trophic changes in downstream water bodies; and	2.9 2.10.5 4.3.7 4.6 5.3 5.7 7.2 7.3 10.3.1 10.3.2	TK/SK
I-1-5i	A detailed conceptual plan of the management and treatment, if necessary, of wastewater emitted from the underground works and DMS circuit to the Infiltration Basin, including identification of all water monitoring stations and when and how they will be operated;	4.3.3 4.3.15 4.6 5.3 7.2 7.8	TK/SK
I-1-6	Identification of any other potential sources of surface or groundwater contamination that will add to effects from the PPPP;	2.6 2.9 7.2.2 10.3.1.2	TK/SK
I-1-7	An assessment of the potential effects of PPPP operations on promoting erosion and sedimentation via the Infiltration Basin and the potential impacts of sedimentation on the ability of the basin to absorb effluents and contingency plans to deal with sedimentation in the event it becomes a concern;	4.1.2 4.3.15 7.5 9.0	SK
I-1-8	The potential effects of PPPP operations on the quality, quantity and behaviour of sub-surface water flows, which must include the underground workings and groundwater throughout the PPPP's physical footprint;	2.6 2.9.2 4.1.3 5.3 7.2.2 10.3.1	SK
I-1-9	The potential effects of PPPP operations on the hydrology and water balance of the areas potentially affected by the PPPP, which shall include, but not be limited to:	2.8 4.6 7.2.1 10.3.1	TK/SK
I-1-9a	Predicted changes in timing, volume and deviation of peak and minimum water flows resulting from the PPPP;	2.6 2.8 4.6 7.2.1 10.3.1	SK
I-1-9b	Water balance effects from the operation of the Infiltration Basin;	2.6 2.8 4.6 7.2.1 10.3.1	SK
I-1-9c	Water drawdown on volume and quantity of surrounding surface water, including water balance considerations; and	2.8 4.6 5.2 5.3 7.2.1 10.3.1	SK
I-1-9a	The potential effects, if any, of the PPPP on the promotion of metal leaching and acid rock drainage.	2.4 4.6 7.2.2 10.3.1	SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
I-1-10	A discussion of potential effect that PPPP activities will have on Twin Creek and the Buffalo River downstream of the PPPP with particular emphasis on likely effects to water quality in Great Slave Lake, and a description of potential adverse impacts stemming from a worst-case scenario.	2.9 2.10.5 4.3.7 4.6 5.3 5.7 7.2 7.3 10.3.1 10.3.2	TK/SK
I-1-11	The sources of all the water requirements for all on-site activities, if there is a need for fresh water withdreawal from any local surface or groundwater sources for mining and camp purposes;	4.6	SK
I-1-12	The provision of a conceptual plan for water quality management that shall include, but not be limited to the following aspects:	4.6	
I-1-12a	The development of a water recycling management plan;	4.6	TK/SK
I-1-12b	The development of an aquatic effects monitoring program that will consider water quality and quantity, fish and aquatic habitat monitoring;	7.8.1 10.3.1	TK/SK
I-1-12c	A discussion around how Traditional Knowledge and other community input was used;	Throughout the DAR as indicated	TK/SK
I-1-12d	A discussion concerning the implementation of an "Adaptive Management" strategy to address adverse impacts to water quality, quantity, aquatic organisms and aquatic habitat that are identified in the course of PPPP operations; and	7.2.3 7.4.6 7.5.3 7.6.8 7.7.4	TK/SK
I-1-12e	A discussion as to whether/how Tamerlane will incorporate NWT residents in environmental monitoring, and report monitoring results to regulatiors and potentially-affected communities.	2.9.1 2.10 7.8.1 10.3.1	TK/SK
I-2	Fish and Aquatic Habitat		
I-2-1	The identification of any fish-bearing water bodies with the Study Area that merit consideration.	2.10 7.3	TK/SK
I-2-2	The potential effects of PPPP operations on the Study Area's aquatic organisms and habitat which shall include, but not be limited to he potential effects of changing water tables on area lakes and rivers, littoral habitat and oxygen concentration.	2.6 2.8 2.10 7.2 7.3	TK/SK
I-2-3	The potential downstream effects of all effluents originating from PPPP operations on aquatic organisms and their habitat.	2.10 7.3 10.3.2	TK/SK
I-2-4	A discussion of whether and how the DFO's No Net Loss Policy will be implemented during the PPP's operation.	7.3 7.3.1	SK
I-2-5	The potential effects that PPPP operations may have in increasing contaminant concentrations in fish.	2.10.1 2.10.5 7.3 10.3.2	TK/SK
I-3	Vegetation		
I-3-1	An estimation of the total amount of land clearing required to facilitate PPPP	4.1.2 7.4	TK/SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
	activities, with estimates of losses of trees, other plants, soil and any "overburdern" materials.	7.5 10.3.3	
I-3-2	An assessment on the potential effects of the PPPP on rare plant communities, particularly Species at Risk Act-listed species.	2.11.4 7.4.4	TK/SK
I-3-3	The potential effects of PPPP operations on culturally significant species.	2.11 7.4.5	TK/SK
I-3-4	The potential effects of vehicle, mine equipment and power plant emissions on vegetation.	7.4 7.5 7.7 10.3.3	TK/SK
I-3-5	The potential effects of dust emissions on vegetation.	7.4 7.7	TK/SK
I-3-6	Local plant life's vulnerability to invasive species, and the likelihood that invasive species will be introduced.	7.4 7.4.6	SK
I-3-7	A list of all mitigation required and committed to, to avoid significant impacts from the activities descreibed above.	7.4.6	TK/SK
I-3-8	A conceptual plan for the adaptive management of effects on vegetation.	7.4.6 9.0	TK/SK
I-4	Wildlife and Wildlife Habitat		
I-4-1	The rationale and methodology for the selection of species as VCs, but the mandatory inclusion of the following species in the Developer's consideration:	7.1 7.1.2	TK/SK
I-4-1a	(SARA-species) – Peregrine falcon	7.1 7.1.2 2.12.4. 2 7.6.7 10.3.4. 5	TK/SK
I-4-1b	(SARA-species_ - Whooping crane	7.1 7.1.2 2.12.4.1 7.6.6 10.3.4.4	TK/SK
I-4-1c	(SARA-species) – Woodland caribou	7.1 7.1.2 2.12.3.1 7.6.1 10.3.4.1	TK/SK
I-4-1d	(SARA-species) – Wood bison	7.1 7.1.2 2.12.3.2 7.6.2 10.3.4.2	TK/SK
I-4-1e	Moose	7.1 7.1.2 2.12.3.3	TK/SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
		7.6.3 10.3.4.3	
I-4-1f	Other fur-bearing mammals that frequent the area	7.1 7.1.2 2.12.3.5 7.6.5	TK/SK
I-4-2	The effects that each PPPP component may have on wildlife and wildlife habitat VCs, which shall include, but not be limited to:		
I-4-2a	Potential direct effects to habitat with a quantification f the effect, "per VC"	7.6 10.3.4	TK/SK
I-4-2b	Potential indirect effect to habitat with quantification of that loss, "per VC"	7.6 10.3.4	TK/SK
I-4-2c	Historic, current and expected wildlife use of potentially-contaminated water sources	7.6 8.4 10.3.4	TK/SK
I-4-2d	Potential effects to VCs from PPPP-related vehicle traffic on Territorial Highway 5	7.6 10.3.4	TK/SK
I-4-2e	Potential effects of dusting, originating from PPPP operations, on wildlife habitat	7.6 10.3.4	TK/SK
I-4-2f	Potential effects of odours on wildlife	7.6 10.3.4	TK/SK
I-4-2g	Potential effects of noise on wildlife	7.6 10.3.4	TK/SK
I-4-2h	Physical barriers to wildlife resulting from construction and operation of the PPPP	7.6 10.3.4	TK/SK
I-4-2i	Disruption, blockage, impediment and sensory disturbance, of daily or seasonal wildlife movements	7.6 10.3.4	TK/SK
I-4-2j	How mine site planning has considered potential effects on wildlife and wildlife habitat	7.4.6 7.5.3 7.6.8 7.8 9.0	TK/SK
I-4-3	The potential effects of PPPP operations on rare, threatened or endangered species including:	7.6 10.3.4	TK/SK
	The species at Risk Act-listed species noted above,	7.6 10.3.4	TK/SK
	Consideration to species listed by the Committee on the Status of Endangered Wildlife in Canada and the Geneeral Status Ranks of Wild Species in the NWT	7.6 10.3.4	TK/SK
I-4-4	The potential effects of PPPP operations in attracting wildlife and discussion as to how Tamerlane intends to manage wildlife access and attraction to the R-190 site.	7.6 10.3.4	TK/SK
I-4-5	A conceptual wildlife management plan including but not limited to:		
I-4-5a	Efforts to be undertaken to monitor wildlife in the vicinity of the PPPP and report the presence of species to the appropriate authorities when necessary.	7.8	TK/SK
I-4-5b	Identification of adaptive management measures to avoid, minimize, and mitigate potential effects to wildlife when detected through wildlife monitoring; and	7.4.6 7.5.3 7.6.8 7.8	TK/SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
		9.0	
I-4-5c	How monitoring results and mitigation efforts will be reported to regulators and potentially-affected communities.	7.6 7.8	TK/SK
I-5	Terrain		
I-5-1	The potential effects of all PPPP operations on the terrain which shall include:		
I-5-1a	Buildings and mining support infrastructure	4.3	SK
I-5-1b	The complete on-site road network	4.4 5.5	SK
I-5-1c	Territorial Highway #5 west of the PPPP	4.4 5.5	SK
I-5-1d	The Infiltration Basin and associated infrastructure	4.3.15	SK
I-5-2	The potential effect of PPPP operations on terrain due to potentially increased sedimentation, erosion, or lowering of the local water table	4.6.1 7.2.2 7.5 10.3.3	TK/SK
I-5-3	The potential impact of PPPP operations on land subsidence in the area of the R-190 deposit	7.2.2 7.5	TK/SK
I-5-4	A discussion of Tamerlane's commitment to minimize the overall footprint of the mine, as well as its consideration for locating its infrastructure on brownfield sites	4.0 5.2 7.4 7.5 7.6	TK/SK
I-5-5	The identification of – and potential effects of PPPP operations on – any surrounding permafrost conditions in the mining area	2.4 2.7 7.2.2 7.5	TK/SK
I-5-6	An adaptive management plan to monitor and mitigate against impacts on local terrain, including:		
I-5-6a	Erosion control measures	7.2.3 7.4 7.5 9.0	TK/SK
I-5-6b	A conceptual outline of the waste rock and aggregate management plan	4.1.2 4.3.4	SK
I-5-6c	A conceptual outline of the method to backfill and seal the underground works	4.1.3 4.2.3 4.3.3 4.3.4 5.3.4 7.5.3	SK
I-5-6d	A discussion of how monitoring results will be reported to regulators and potentially-affected communities.	6.0	TK/SK
I-6	Air Quality and Climate		
I-6-1	A description of air flow and likely levels of particulate matter and other emissions on the PPPP site, with a focus on the underground ventilation system's release of CO, SO2 and NOx, and other areas of on site emissions.	4.2.2.3 4.2.3 7.7.1	SK
I-6-2	The potential effects of PPPP operations on air quality through the atmospheric dispersion of emissions and dust on a local and regional scale to include:	2.3.3 7.7.1	TK/SK
I-6-2a	Dust from construction activities, roads, mine workings, waste rock and ore stockpiles, the infiltration Basin, any quarries utilized, and DMS activities;	2.3.3 7.7.1	TK/SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
I-6-2b	Emissions from vehicles and diesel generators	2.3.3 2.3.4 2.3.5 7.7.1 7.7.2	TK/SK
I-6-3	Identification of any human health impacts from particulate matter or hydrocarbon burning on site.	2.3.3 2.3.4 2.3.5 7.7.1 7.7.2	TK/SK
I-6-4	A discussion of the potential effect of PPPP operations in generating greenhouse gas emissions, which shall include but not be limited to the following:		
I-6-4a	Predicted total annual atmospheric loading of greenhouse gasses in CO2 equivalent values;	2.3.5 7.7.2	SK
I-6-4b	Comparison fo the value determined in a to the total emission generated in NWT	2.3.5 7.7.2	SK
I-6-4c	A discussion of Tamerlane's consideration to minimize greenhouse gas emissions	2.3.5 7.7.2	SK
I-6-5	A discussion of the standards, guidelines and regulations that will be applied to the PPPP operation in all areas related to air quality	7.7.4	SK
I-6-6	A discussion of the technology that will be utilized in PPPP operations to ensure that significant adverse impacts to air quality are not incurred.	7.7.4	SK
I-6-7	A conceptual outline of the air quality adaptive management plan, which shall include a discussion of any proposed monitoring programs, as well as how monitoring results will be reported to regulators and impacted communities.	6.0 7.7.4	SK
I-7	Biophysical Environmental Monitoring	6.0 7.8	TK/SK
J – Closure and Reclamation			
J-1	A description of the policies, regulations and industry standarda that will be considered in the development of the Closure and Reclamation plan	9.0 9.1	SK
J-2	A conceptual Closure and Reclamation Plan for the purpose of this environmental assessment, which shall include, but not be limited to:	9.2	SK
J-2a	A list of Closure and Reclamation components and activities;	9.0	SK
J-2b	A consideration of various reclamation scenarios for the site, including methods and timelines for the completion of mine reclamation based upon the current Development Description;	9.0	SK
J-2c	The rationale for the selection of proposed activities versus alternatives that have been dismissed;	9.0	SK
J-2d	Conceptual outline of details of the methods and location for on-and of-site disposal of materials	9.0	SK
J-2e	A visual and written depiction of the entire work site at several stages of post-mining regeneration under the closure and reclamation plan proposed;	9.0	SK
J-2e-i	Immediate post-closure;	9.0	SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
J-2e-ii	One year later;	9.0	SK
J-2e-iii	Five years later;	9.0	SK
J-2e-iv	15 years later	9.0	SK
J-2f	A cost-estimate component of proposed reclamation activities;	9.0	SK
J-2g	A conceptual post closure monitoring plan, for protection of both the biophysical and human environment, which should also include a discussion of how monitoring results will be reported to regulators and potentially-imnpacted communities.	9.0	SK
J-3	A discussion of how the site will be graded, and any physical or chemical hazards removed.	4.1.2 9.0	SK
J-4	A discussion concerning the feasibility of establishing a self-sustaining vegetation community on the mine site after closure, if re-vegetation is to be considered, which shall include but not be limited to the following;	7.4.6 7.5.3 7.6.8 7.7.4 9.0	TK/SK
J-4a	Proposed re-vegetation techniques including a discussion on what species will be considered for this activity;	7.4.6 7.5.3 7.6.8 7.7.4 9.0	SK
J-4b	Predicted vegetation re-growth rates	7.4.6 7.5.3 7.6.8 7.7.4 9.0	TK/SK
J-5	A discussion regarding Tamerlane's approach to working with potentially-affected local communities and aboriginal groups to ensure that public values are taken into consideration.	6.0 9.0	TK/SK
K – Cumulative Effects			
K-1	An analysis of the VCs to be considered in the cumulative effects assessment and a rationale for VCs for including or not including the VCs in the cumulative effects assessment.	10.0	TK/SK
K-2	Consideration of an expanded Cumulative Study Area that includes all of the areas affected by the historic Pine Point Mine in addition to the EA Study Area and all of the geographic areas considered in the Scope of Assessment as is appropriate for the particular VCs under examination.	10.0 10.1	TK/SK
K-3	Determination of the other past, present and reasonably foreseeable human activities that may affect the same VCs, which should include;	10.0 10.1 10.2	TK/SK
K-3a	The rationale for including the developments that are chosen for examination	10.0 10.1 10.2	SK
K-3b	A discussion of developments that were considered, but were not included in the cumulative effects assessment and the rationale for that decision	10.0 10.1 10.2	SK
K-4	Inclusion of the following developments, at minimum, in the examination of cumulative effects including:		

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
K-4a	The historic Pine Point mine, with an emphasis on cumulative biophysical effects on the Buffalo River watershed, and the lands and waters in the Cumulative Study Area;	10.0 10.1 10.2	SK
K-4b	The proposed Mackenszie Gas Project, focusing only on its identifiable impacts on the Town of Hay River and the Hay River reserve;	10.0 10.1 10.2	SK
K-4c	The reasonabley foreseeable expansion of the Tamerlane mining development to other easterly trending identified ore bodies;	10.0 10.1 10.2	SK
K-4d	Territorial Highway 5, focusing on estimates of past, present and future traffic flows under alternative development scenarios and a determination of its engineering and public safety capacity to deal with potentially increased flows;	10.0 10.1 10.2	SK
K-4e	Any other identified local industrial developments.	10.0 10.1 10.2	SK
K-5	Identification and rationale for the geographic and temporal scale that will be applied to the cumulative effects assessment of the VCs under consideration, in recognition of the minimum geographic parameters set above.	10.0 10.1 10.2	SK
K-6	Discussion of the approach and methodologies used to identify and assess cumulative effects.	10.0 10.1 10.2	SK
K-7	Cumulative effects predictions, which consider, but are not limited to the following:		
K-7a	Potential effects to the VCs likely to result form the PPPP in combination with past, present or reasonably foreseeable developments;	10.3 10.3.1 10.3.2 10.3.3 10.3.4	TK/SK
K-7b	Changes in VC health since the closure of Pine Point Mine in 1987;	10.3 10.3.1 10.3.2 10.3.3 10.3.4	TK/SK
K-7c	The delineation of effects to the biophysical environment which are attributable to either other developments or the PPPP;	10.3 10.3.1 10.3.2 10.3.3 10.3.4	TK/SK
K-7d	Identification of any locations of special intensity of cumulative effects, with a description of the effects and likely reasons behind them.	10.3 10.3.1 10.3.2 10.3.3 10.3.4	TK/SK
K-8	A plan for the monitoring of cumulative effects and the adaptive management of the PPPP's contribution to regional cumulative effects.	10.3.1 10.3.2 10.3.3 10.3.4	TK/SK

CONCORDANCE TABLE

ToR Section	Information Requested by the MVEIRB (ToR and Work Plan issued October 5, 2006)	DAR Section	*TK / SK
L – Accidents and Malfunctions			
L-1	A discussion regarding company policies, industry standards, guidelines or regulations to be considered in the planning and operation of the PPPP.	1.8 8.1 8.2 11.0	SK
L-2	Predict the risks and effects of accidents and malfunctions, with particular consideration to a structural failure of the underground mining works.	11.0	SK
L-3	Discuss emergency response measures/contingency plans, that shall include, but not be limited to:	11.0	SK
L-3a	Storage, transportation and handling system failures of hydrocarbons;	4.3.11 4.4 11.0	SK
L-3b	Sorage, transportation and handling system failures of explosives;	4.2.2.5 4.3.14 5.9 11.0	SK
L-3c	Storage, transportation and handling system failures of process chemicals or other hazardous compounds, including a focus on the refreigerant used in the freezewall;	4.3.4.4 4.5 5.8 11.0	SK
L-3d	Failure of the freezewall to keep groundwater from infiltrating the underground works, and any identifiable drawdown of local water tables as a result.	4.1.3 5.3 11.0	SK
L-3e	Responses to vehicle and industrial accidents;	11.0	SK
L-3f	A copy of the contractor's fuel handling and spill clean-up procedures, and an explanation of how the proponent has ensured that the contractors is cognizant of, and in adherence to permit conditions;	11.0	SK
L-3g	A description of the measures to be used to prevent, prepare for, respond to and recover from any accident or malfunctions identified in the environmental emergency response plans should be included.	8.2.1.8 11.0	SK
L-4	A discussion as to how Tamerlane will prevent or reduce malfunctions associated with activities conducted by its contractors, with particular consideration to use of Territorial Highway 5 and Town of Hay River roads;	4.4 5.5.2 11.0	SK
L-5	A discussion as to how site planning and engineering considerations have been undertaken to prevent or reduce the likelihood of malfunctions and accidents during PPPP operations.	1.8 8.2.1.8 11.0	SK
L-6	A conceptual discussion concerning adaptive management measures in the event that Tamerlane is unable to meet any identified water quality parameters at the point of discharge into the infiltration Basin.	4.3.15 4.6 5.7 7.2	SK

* Denotes use of Traditional Knowledge (TK), Scientific/Technical Knowledge (SK), or both.

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APPENDIX VOLUME - LIST OF APPENDICES

1.0 DEVELOPER

1.1 Corporate History

Tamerlane Ventures Inc. was incorporated under the provisions of the Province of British Columbia on May 16, 2000. The Company's shares trade on the TSX Venture Exchange under the symbol TAM. The Company is engaged in the exploration, development and acquisition of mineral properties and mining assests. Tamerlane's current property positions were staked by Karst Investments LLC. In 2001 and 2002. Shortly thereafter, the property was optioned to Terrastar Incorporated, which became **Pine Point Mines Incorporated. The Property was taken back by Karst Investments LLC. in 2003. In September 2004, Tamerlane Ventures completed the acquisition of an** option and exclusive right to earn an undivided 60% interest in the Pine Point property. Tamerlane commenced exploration activities in the fourth quarter of 2004 and completed a two-phase exploration program in the fall of 2005. In June 2006, Tamerlane Ventures acquired the remaining 40% interest in the Pine Point property. Tamerlane is finalizing a feasibility study in 2006 followed by a bulk sample program with the objective of advancing the project to a commercial production decision in 2008.

The share structure and listing information for the company follow:

Name: Tamerlane Ventures Inc.
Symbol: TAM
Incorporation: May 16, 2000
Records: Lang Michener, Toronto
Authorized Shares: 100,000,000 without par value
Total Shares Issued: 31,914,465
Options: 1,582,000
Warrants: 7,476,947
Fully Diluted Shares: 40,973,412
Date Listed: August 10, 2001
Year End: December 31

Corporate Address:

Tamerlane Ventures Inc.
c/o Lang Michener
BCE Place, P.O. Box 747
181 Bay Street, Suite 2500
Toronto, M5J 2T7
Telephone: (416) 307-4060
Facsimile: (416) 365-7719

Management Address:

Tamerlane Ventures Inc.
441 Peace Portal Drive
Blaine, WA 98230
Telephone: (360) 332-4653
Facsimile: (360) 332-4652
Email: tamerlaneventures.com

Registered NWT Address:

Tamerlane Ventures Inc.
4908 49th Street
P.O. Box 818
Yellowknife, NT
X1A 2N6

1.2 Project Management Team

Tamerlane Ventures Inc. has a well-qualified management team of mining and financial professionals, which collectively have many years of experience in company start-ups, acquisitions, reorganizations, exploration, development, financing, construction and operation of gold and base metal mines.

Ross F. Burns, B.Sc., P.Geo - ***President & CEO; Director***
Ross Burns has served as a director and officer of numerous junior public mining companies in Canada. He held positions of exploration geologist and open pit mine geologist at a major Canadian mining company. Burns has directed exploration programs for gold and base metals throughout North America and has been responsible for the replacement and estimation of ore reserves at several mines.

J. Graham Eacott, B.Sc., M.Sc., P.Eng. – ***Vice President, Investor Relations***
Graham Eacott has extensive experience in corporate communications in the financial markets and was a highly ranked base metals analyst at two major Canadian investment dealers. He has supervisory experience in metallurgical operations at a copper mine and worked as a consultant on feasibility studies and plant design. Mr. Eacott is a graduate of the Canadian Securities Course.

David D. Swisher, B.S. – *Senior Project Manager*
David Swisher has underground and surface mining experience in precious and industrial mineral operations, including the study of underground and surface mining techniques in Sweden. He has held positions of increasing responsibility in all facets of mining at the mine manager level. His experience includes the evaluation and implementation of mining methods, maintenance best practices, operations optimization as a Six Sigma Black Belt, feasibility assessment, environmental, health and safety processes and advanced behavioral instruction. Mr. Swisher has also successfully led numerous Labor Union negotiations to mutually agreeable results. Mr. Swisher is experienced in using various computer software applications for modeling underground and open pit mines.

Brent Jones, B.S. - *Investor Relations Manager*
Brent Jones has extensive experience in communications and investor relations for both private and publicly held companies. During his time at Panasonic, Mr. Jones spent over five years developing and implementing one of the top investor relations programs in Japan, while dramatically expanding foreign ownership through institutional investors in the United States, Europe and the Middle East.

Wolfgang Schleiss, B.S. - *Senior Geologist*
Wolf Schleiss has over 20 years experience in exploration geology and resource analysis within the precious/base metals and industrial minerals sector. Throughout his career he has held positions of increasing responsibility at several major U.S. mining companies. Mr. Schleiss has directed precious/base metal exploration programs and been involved in precious/base metal property acquisition evaluation throughout North America, Europe and Russia. He has also been responsible for the replacement and estimation of resources/reserves at several mines. Mr. Schleiss specializes in exploration geology and evaluation of potential acquisiton targets.

Albert Siega, B.S., M.S. – *Mining Engineer*
Albert Siega has held increasing positions of responsibility as a mining engineer with several Canadian mining companies. He has experience in ore body analysis and determination of project economics. Additionally, he has been involved in the preparation of exploration plans and environmental impact mitigation plans. Mr. Siega also has experience as a data analyst and has worked as a commodities broker. Mr. Siega specializes in underground mine design and development.

Adrian C. McNutt, B.S. – *Engineering Manager*
Adrian McNutt has extensive experience in production and management of both gold and base metal operations. He has carried out feasibility studies, engineering design, procurement and commissioning of plants, including the Kemess South gold-copper mine in British Columbia. He is responsible for the Company's mining operations in Canada and Peru.

Daniel T. Brost, B.S., – *Manager of Resource Geology*
Dan Brost has extensive experience in geology and resource analysis in underground and open pit mines at several locations producing different commodities. He was Chief Geologist for BHP Billiton's Latin American operations. He has been actively involved in mine operations, mine planning and budgeting, and due diligence studies. His specialization is geologic investigation and interpretation, geostatistical analysis, resource/reserve estimation and modeling using a number of computer-based software packages, and economic evaluation of mineral deposits.

1.3 Financial Condition

As reported in April 14, 2006, the following table shows the financial results, derived from the Company's financial statements, for each of the three most recently completed financial years. All dollar amounts are stated in Canadian dollars except where noted:

Year	*Total assets ($)*	*Net Income (loss) ($)*	*Net Income (loss) per share – basic & diluted ($)*
2005	3,048,491	143,979	0.01
2004	3,207,703	(238,387)	(0.04)
2003	820,612	(155,898)	(0.04)

Tamerlane is not currently engaged in mining operations that generate revenue. The Company expects to incur significant development expenses prior to generating any revenues from future mining operations. Before the Company embarks on raising the necessary funding for the Pine Point Pilot Project, land use and water permits must be obtained.

1.4 Corporate Governance

The Board of Directors (Board) and management team of Tamerlane Ventures Inc. (TAM) are committed to a high standard of corporate governance. Effective corporate governance ensures shareholder accountability through the use of specified reporting structures, business processes, a formalized strategic plan, and a commitment to adhere to them.

The Board and management team believes that sound corporate governance practices ensure continued creation of shareholder value and continued shareholder trust and confidence in TAM. The Board is ultimately responsible under law for the stewardship and business affairs of TAM. TAM is a 100% owner of the Pine Point Property.

1.5 Corporate Contractual Relationships

Where necessary, Tamerlane Ventures Inc. will pursue the assistance of contractors and/or subcontractors during the development of its PPPP. Tamerlane holds an equal expectation of its contractors and/or subcontractors to adhere to all company environmental, health and safety policies. In addition, Tamerlane will ensure that all contractors and/or subcontractors comply with all government regulations imposed on the PPPP.

1.6 Environmental Performance Record

Tamerlane Ventures Inc. is a young company and does not have an extensive environmental performance record. Tamerlane commenced exploration activities in the fourth quarter of 2004 when it commissioned a helicopter borne geophysical survey. Drilling commenced in the winter of 2005 at the W-85, G-O3 and R-190 deposits following permitted access routes and drill areas. “Discovery Diamond Drilling” performed the drilling and during the course of the drilling used Polar Lake as a water supply for a few days. The wrong size of screening was used on the intake pump, which resulted in a warning from the land use inspector. Tamerlane requested that the drilling company immediately replace the screen with the proper sized screen and switch to the N-81 pit as its water source, which has no fish. All drill sites were cleaned and approved by the land use inspector after the program was completed.

1.7 Similar Mining Projects

Tamerlane Ventures Inc. is not currently engaged in any other mining projects and, therefore, cannot provide additional environmental performance examples.

1.8 Environmental Policy & Ethics

Tamerlane Ventures Inc. is committed to protecting the environment, health and safety of its employees, their families, their communities and the public. Protection will be ensured through compliance with all applicable laws. Tamerlane Ventures Inc. is dedicated to being a leader in environmental, health and safety matters through continuous performance improvement that benefits employees, the public and shareholders. Presented below is a copy of the company's Code of Ethics:

TAMERLANE VENTURES INC.
CODE OF ETHICS

Purpose

Tamerlane Ventures Inc. is dedicated to high moral and ethical standards of conduct and will conduct its business with honesty, integrity and a strong commitment to compliance with all applicable laws.

This Code of Ethics (the "Code") is based on Tamerlane's commitment to meet its obligations to all who have a personal, professional or financial stake in what Tamerlane does, including the Board of Directors, shareholders, employees, suppliers and host communities. Some obligations are direct and obvious, such as striving to increase value for its shareholders. Other obligations stem from the Company's commitment to comply with all applicable laws.

The Code summarizes the ethical principles that should guide all Tamerlane employees and directors in their daily work. For purposes of this Code, directors are included in the term "Employees" notwithstanding that directors are not necessarily employees. The Code and the Business Conduct Guidelines (the "Guidelines") do not cover every possible subject or situation. They are not intended to provide final answers. If in doubt, consult your supervisor, or the President of the Company, or our Human Resources Department in Blaine, Washington. Wisdom, discretion and sound judgment should guide everyone. The Code and the Guidelines are important to Tamerlane. Failure to comply with them will result in disciplinary action, which may include discharge.

Environmental Protection
To meet Tamerlane environmental standards, every facility is required to demonstrate compliance with all public health and environmental laws pertaining to its operations. Every facility is expected to maintain an open dialogue with local communities on the nature and hazards of its operations. Tamerlane's policy is to participate actively with government authorities, industry groups, and the public in promoting community awareness and emergency response programs to deal with any potential hazards associated with Company facilities. All Employees are expected to assist in these efforts. Tamerlane is committed to protecting the environment and the health and safety of its Employees, their families, their community and the public. Tamerlane will ensure such protection through compliance with all applicable laws. Tamerlane is dedicated to being a leader in environmental, health and safety matters by continuously improving its performance to benefit Employees, the public, and shareholders. To oversee efforts in this area, Tamerlane may establish an Environmental Committee of the Board of Directors. Until such a Committee is established, the full Board will oversee these matters relying on reports provided by management.
Employee Responsibilities Ethical behavior is an individual responsibility. High standards are expected of all Employees, regardless of position or location. No supervisor has the authority to require conduct that is in violation of the Code, the Guidelines, or any law. Every Employee is expected to report any violation of the Code, the Guidelines, or any applicable law to his or her supervisor. The Company will investigate reports in the strictest possible confidence, consistent with the particular situation. Employees who make such reports in good faith need have no fear of reprisal.
Management Responsibilities All managers are accountable for the actions of their Employees. They are also responsible for seeing that policies are followed. Every manager is responsible for informing his or her Employees about Company policies, including those dealing with legal and ethical behavior. Managers and supervisors also are responsible for maintaining a work environment where constructive, frank, and open discussion is encouraged and expected, without fear of retaliation. The Chief Executive Officer and management at all levels throughout the Company are responsible for ensuring adherence to the Code and the Guidelines, and for ensuring there are appropriate ongoing Employee communications and training. They are supported by the Company's management, which normally is responsible for handling many issues outlined in the Code and the Guidelines. Significant violations will be reported to the Board of Directors.

Relationships with Supplier and Contractors
Partners, suppliers, and contractors are to be treated fairly and honestly at all times in a manner conforming to all applicable laws, and consistent with good business practice. Employees should never make false or misleading remarks about other companies or their employees or about their or our projects. In all cases, purchases by Tamerlane should be based on price, product, quality, service, and the consistency and dependability of the basic business relationships underlying each transaction.
Employee Relationships Tamerlane values its diverse Employees. Trust, respect, and ethical business conduct are key to achieving and maintaining sound relationships among Tamerlane Employees. Basic to these relationships is Tamerlane's recognition of the personal value and contribution of every Employee. Tamerlane pledges that every Employee will be judged and treated with dignity and respect. Consistent with applicable laws of the location, Employees will be judged on the basis of his or her performance and qualifications without regard to race, creed, gender, religion, national origin, age, or disability. Employees, regardless of Employee's location, should refer violations of this Company Policy in any of these areas to their supervisor, or our Human Resource Department in Blaine. These different contacts are provided so any Employee can report outside his or her normal chain of control.
Protecting Company Assets Protecting all Tamerlane's assets, including physical property and intangible assets (such as data, software, exploration results and confidential information) against loss, theft and misuse is every Employee's responsibility. Tamerlane's assets may be used only for proper Company purposes. They may not be used for personal benefit, nor may they be sold, loaned, given away, or disposed of without proper authorization. Any individual aware of the loss or misuse of assets shall report it to a supervisor or any Vice-President. Anyone receiving such reports shall handle them in a careful and thorough manner. Investigations will be conducted confidentially and coordinated by Tamerlane's CEO.
Business Information
Tamerlane has developed geologic and process information over many years at considerable expense. Because of this effort, Tamerlane possesses valuable confidential information, including proprietary geologic and exploration file information. Employees must protect Tamerlane's business information as carefully as its physical and other property. Unauthorized disclosure of this information could destroy its value to Tamerlane and give unfair advantage to others. To ensure confidentiality of Company information, Employees must adhere to the following principles:

- Employees must not disclose confidential information, either during or after employment, except when authorized by Tamerlane to disclose it to others who have entered into confidentiality agreements with Tamerlane.
- Similar restrictions, usually spelled out in contracts, apply to information obtained from our partners, suppliers, and others who furnish information to Tamerlane on a confidential basis. Employees must not disclose this confidential information, either during or after employment by Tamerlane, except as provided in such contracts.

Accuracy of Company Records

Employees must record and report information accurately and honestly. This includes accurate reporting of time worked, business expenses incurred, exploration data, revenues and costs, and other business-related activities. All Company records are subject to audit, and financial records should be maintained in accordance with generally accepted accounting principles and industry best practices.

Dishonest reporting, whether for internal or external purposes, will not be tolerated. This includes reporting or organizing information in an attempt to mislead or misinform. No entry will be made on the Company's books and records that intentionally hides or disguises the true nature of any transaction

General Complaint Procedure Regarding an Accounting or Auditing Matter

Anyone may file a complaint regarding an accounting or auditing matter by posting it to the CEO. The CEO will forward the complaint to the Chair of the Audit Committee. The CEO will retain a copy of the complaint until the complaint is addressed at a meeting of the Audit Committee or until such time as the Chair of the Audit Committee confirms that the Audit Committee has satisfactorily addressed the complaint.

Confidential, Anonymous Employee Submissions Regarding an Accounting or Auditing Matter:

In addition to the General Complaint Procedure set out above, an Employee within Tamerlane may submit a confidential, anonymous complaint by forwarding it in a sealed envelope marked and addressed as follows:

Confidential Employee Concern
Tamerlane Ventures Inc.
c/o William Sheridan
Lang Michener LLP
BCE Place, 181 Bay Street, Suite 2500
P.O. Box 747
Toronto, ON M5J 2T7 Canada

Mr. Sheridan will forward the sealed envelope (unopened) to the Chair of the Audit Committee.

Conflict of Interest All business decisions should be made in the best interests of Tamerlane. Conflicts between an Employee's on- or off-the-job activities and Tamerlane's business interests can arise in certain situations. They occur most often where an Employee, or a relative of an Employee, could obtain some personal benefit at the expense of the Company or its shareholders. Under the Code, all Employees must observe the standards established in the Code and the Guidelines at all times and are subject to discipline, up to and including discharge in appropriate cases, if they do not.
Employee Occupational Health and Safety Tamerlane considers maintaining safe and healthy working conditions and preventing accidents to be integral to the operation and the administration of its business. Each Employee has a responsibility to prevent accidents by maintaining a healthy work environment, by following safe work procedures and practices, and by using all prescribed protective equipment. Accident prevention and effective performance go hand in hand.
Compliance with Laws, Agreements and Practices Tamerlane is affected by laws and mores of the countries in which it operates (and sometimes the laws of countries that are affected by the way Tamerlane does business). These laws differ, often widely. It is Tamerlane's policy and each Employee's responsibility to conduct business in compliance with the Code, the Guidelines, and all applicable laws. When conflicts exist, management is available to assist in resolving them There are countries where local laws and common trading or negotiating practices are based on less stringent or different codes of conduct than Tamerlane customarily follows. In such countries, Employees should follow the Code, unless variances that are permitted by applicable law are based on reasonable business judgment have been approved by designated corporate officers. Tamerlane policy prohibits making any payment which is prohibited by applicable law or which could be considered corrupt by normal business standards. The Chief Executive Officer must be consulted before making any substantial gift or any direct or indirect payment of Company funds to a government official or government employee or political party or political candidate.

Violation Reporting
To ensure that the Code is properly implemented, Tamerlane has designated its CEO to be responsible for ensuring that the Code is properly implemented and monitored. Employees who know of violations of the Code or the Guidelines are obligated to report them to their supervisors or the CEO. It is Tamerlane's policy and intent that except for knowingly reporting false accusations, every Employee may report Code, Guidelines, policy or law violations without fear of retaliation.
Compliance and Discipline
The Code and the Guidelines are important to Tamerlane. They apply to Tamerlane, its subsidiaries, affiliates, joint ventures, and all other entities that are directly or indirectly controlled or managed by Tamerlane. Failure to comply with the standards outlined in the Code or the Guidelines will result in disciplinary action, ranging from a reprimand to dismissal. Civil or criminal violations may be prosecuted. Disciplinary action will be taken against: • Violations of the Code or the Guidelines • Any violator's manager or supervisor to the extent that the circumstances of the violation reflect participation, poor supervision, or lack of diligence. • Any supervisor or Employee who retaliates, directly or indirectly, or encourages others to do so, against an Employee who reports a Code, Guidelines, policy or law violation. • Any Employee who knowingly falsely accuses another Employee of a Code, guidelines, policy or law violation, or who raises any ethical or Guidelines issues under false pretenses.

2.0 DESCRIPTION OF EXISTING BIOPHYSICAL ENVIRONMENT

2.1 Environmental Information Sources

This section presents a description of the existing biophysical environmental conditions found in the broader Tamerlane Regional Study Area (RSA – Figure 2.1-1) and the more localized Pine Point Pilot Project (PPPP) Local Study Area (LSA – Figure 2.1-2). Data included in this section have been drawn from various environmental baseline studies undertaken in the general area over the past 35 years; resource agency information sources; studies conducted by EBA Engineering Consultants Ltd. (EBA) on behalf of Tamerlane in 2005 and 2006; and, the most recent Traditional Knowledge interviews conducted by Tamerlane with the cooperation of Aboriginal stakeholders in October, 2006. Complete copies of the Traditional Knowledge study reports are provided in Appendix A of the DAR. Copies of each of the EBA environmental study reports are provided in Appendix B.

The more recent environmental baseline studies of the Tamerlane RSA were initiated by EBA in the fall (September) of 2005. Studies were undertaken to update and document:

- Existing water quality and fish habitat conditions found in the nearby streams/rivers (EBA 2005a).
- Current vegetation/ecosystem distribution and conditions in the RSA and LSA (EBA 2005b).
- Wildlife (mammals, birds, amphibians) presence, diversity and habitat use in the RSA and LSA (EBA 2005c).

A number of additional follow-up environmental studies were conducted during the spring and summer of 2006. These studies focused on documenting prevailing water quality conditions in the vicinity of the proposed PPPP (EBA 2006a), a rare plant survey of the LSA (EBA 2006b) and a series of wildlife surveys pertaining to amphibians, owls and breeding birds in the vicinity of the proposed PPPP (EBA 2006c).

In addition, the most recent information obtained from the Traditional Knowledge interviews that were conducted by Tamerlane in Fort Resolution and Hay River in October 2006 (Tamerlane 2006b, c), has been incorporated as and where appropriate.

2.2 General Ecology

The Regional Study Area covers an area of 36,153 ha and is located on the edge of the Boreal Plains and the Taiga Plains Ecozones. It encompasses the Slave River and Hay River Lowland Ecoregions. The area is characterized by short, cool summers and long, cold winters. The mean annual temperature is -17.5 ºC, and annual precipitation ranges from 300 to 400 mm. These ecoregions are classified as having a subhumid mid-boreal ecoclimate (Environment Canada 2000, as cited in EBA 2005b).

The vegetation of these ecoregions and the RSA is characterized by medium to tall, closed stands of jack pine and trembling aspen. White spruce and black spruce dominate later successional stands. Poorly drained fens and bogs in this region are covered with low, open stands of larch), black spruce and ericaceous shrubs (Environment Canada 2000, as cited in EBA 2005b).

The two nearest drainages to the PPPP (R190) site are the Buffalo River, located approximately 10 km to the east of the LSA and Twin Creek located about 7 km to the west of the LSA. Fish species frequenting the Buffalo River include inconnu, whitefish, northern pike, pickerel and Burbot.

Moose, woodland caribou and occasionally wood bison are the main ungulates found in the RSA although none are considered common. As confirmed by the Traditional Knowledge interviews (Tamerlane 2006b, c), hunting and trapping activities occur in various areas of the RSA. The bird life present in the RSA is typical of the boreal forest, and the south shore of Great Slave Lake is considered to be an important concentration site for birds during their annual migrations.

2.3 Climate

This section of the DAR discusses the existing climatic conditions of the general area, climate change, ambient air quality, emissions, including greenhouse gases and ambient noise conditions.

2.3.1 Existing Climate

The climate of the proposed development area is best described by the weather station located at nearby Hay River, NWT. This station is located approximately 45 kilometres due east of the PPPP area. Summary data from the station were obtained from Environment Canada’s online database and are presented in Tables 2.3-1 and 2.3-2. The climate averages in the chart were calculated from climate data collected during the thirty-year period from 1971 to 2000.

Based on the long-term records available from the Hay River weather station, this location has a mean annual air temperature of -2.9°C and receives approximately 320 mm of precipitation annually. The climate of the area is classed as semi-arid.

Almost all of the participants in the Traditional Knowledge studies (Tamerlane 2006 a, b) reported that severe wind weather sometimes occurs in the region. Some of the respondents noted that the region's wind is due to its geographic location on the 60th parallel. Participants indicated that severe wind typically occurs in the fall and spring in line with the fall and spring equinoxes. March ("big wind" in chipewyan) and September were the months most frequently associated with severe wind weather. Significant wind storms of note included a severe wind storm during the summer of 1949 and a four day storm over New Years in 1959.

2.3.2 Climate Change

Information collected over many years at northern climate stations suggests that the climate in the Northwest Territories may be changing. The general public is concerned about the potential effects of climate change on the northern environment and the economy.

According to the available scientific evidence, the earth's average temperature has increased by about 0.5ºC over the past 100 years (Environment Canada 2000). The 1980s and 1990s have been the warmest decades recorded to date. The Mackenzie River Basin Study (Cohen 1997) concluded that this area has experienced a warming trend of 1.5ºC this century.

Almost all of the participants in the Traditional Knowledge studies (Tamerlane 2006 a, b) indicated that freeze and thaw patterns in the South Great Slave Region have changed during their lifetimes. While participant's specific comments varied, the general consensus was that winters in the South Great Slave Region are shorter and warmer than in the historical past. One participant indicated first noticing freeze/thaw changes as early as the 1950's.

Table 2.3-1
Summary 1 of Weather Data from the Hay River Weather Station

Latitude: 60° 50’ N				Longitude: 115° 46’ W						Elevation: 165.50 m				
Temperature														
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**	*****
Daily Mean	-23.1	-20.2	-14.4	-2.7	6.1	12.6	15.9	14.5	8.5	0.4	-11.9	-20.3	-2.9	A
SDEV	4.8	4.9	3.7	3.3	2.3	1	1.4	1.5	1.8	1.9	4.2	4	1.2	A
Daily Max.	-18.4	-14.7	-8.2	3	11.6	18	21.1	19.6	13.2	4.1	-7.9	-15.8	2.1	A
Daily Min.	-27.6	-25.6	-20.6	-8.4	0.7	7	10.6	9.3	3.8	-3.3	-15.9	-24.8	-7.9	A
Ext. Max.	10.7	13.9	15.6	24.1	33.3	34	35	**36.7**	30	25	15	12.2		
Date (yyyy/dd)	1985/02	1968/28	1944/29	1989/28	1948/30	1989/13	1975/02	**1981/09**	1951/06	1987/02	1949/04	1944/13+		
Ext. Min.	-47.8	**-48.3**	-44.4	-38.9	-18.9	-5.6	1	-1.1	-11.7	-24.3	-40.8	-47.2		
Date (yyyy/dd)	1962/16	**1947/01+**	1945/02+	1954/06	1954/01+	1951/03	1995/10	1948/25	1974/30	1984/30+	1985/25	1946/14		
Precipitation														
Rain/mm	0.1	0.1	0.1	4.2	19.8	32.7	41.9	50.5	37.8	15.3	0.5	0.1	203.1	A
Snow /cm	17.3	15.4	14.5	8.1	5	0.1	0	0	1.7	19.1	26.4	17.5	125	A
Precip./mm	16.4	14.6	13.7	12.2	24.8	32.8	41.9	50.5	39.6	33.8	24.2	16	320.4	A
Mean Snow Depth/cm	36	45	49	25	1	0	0	0	0	2	16	29	17	A
Med. Snow Depth/cm	36	45	49	25	0	0	0	0	0	1	17	30	17	A
Snow Depth Mo. End/cm	41	49	42	7	0	0	0	0	0	7	23	33	17	A
Ext. Daily Rain/mm	1.6	2	3.3	12.2	29.5	48	46.2	58.6	**59.9**	23.2	8.4	5.1		
Date (yyyy/dd)	1981/23	1991/05	1970/16	1957/29	1951/24	1987/22	1959/13	2000/27	**1991/13**	1996/11	1950/03	1963/04		
Ext. Daily Snow/cm	19.6	31.5	18.4	28.4	17.9	3	0	0	12.2	**36.8**	35.1	22.6		
Date (yyyy/dd)	1966/17	1952/12	1986/21	1970/25	1982/04	1960/03	1944/01+	1944/01+	1983/27	**1961/09**	1963/15	1965/24		
Ext. Daily Precip/mm	15	31.5	16.2	28.4	31.4	48	46.2	58.6	**59.9**	36.8	35.1	20.8		
Date (yyyy/dd)	1961/08	1952/12	1986/21	1970/25	1979/27	1987/22	1959/13	2000/27	**1991/13**	1961/09	1963/15	1965/24		
Ext. Snow Depth/cm	**122**	102	107	99	32	0	0	0	20	43	76	99		
Date (yyyy/dd)	**1962/31**	1962/13+	1962/15+	1967/04+	1994/01	1955/01+	1955/01+	1955/01+	1956/28	1961/10+	1961/03+	1961/24+		
Days with Maximum Temperature														
<= 0 °C	30	26.6	24.4	11.5	1.4	0	0	0	0.13	7.1	26.5	29.7	157.2	A
> 0 °C	1	1.7	6.6	18.5	29.6	30	31	31	29.9	23.9	3.6	1.3	208.1	A
> 10 °C	0.03	0.03	0.69	5.9	16.5	27.1	31	30.5	20.7	4.5	0.03	0	136.8	A
> 20 °C	0	0	0	0.36	3.8	11.1	17.1	13.6	3.3	0.21	0	0	49.4	A
> 30 °C	0	0	0	0	0.03	0.4	1.4	0.7	0	0	0	0	2.5	A
> 35 °C	0	0	0	0	0	0	0	0.07	0	0	0	0	0.07	A

“A” indicates no more than 3 consecutive or 5 total missing years of data between the years 1971-2000.
“+” beside an extreme date indicates that this date is the first occurrence of the extreme value.
Highlighted values and dates in bold indicate all-time extremes for the location.

Note: From “Canadian Climate Normals 1971-2000,” by Environment Canada. (n.d.). Retrieved March 21, 2006, from http://www.climate.weatheroffice.ec.gc.ca/climate_normals

Table 2.3-2
Summary 2 of Weather Data from the Hay River Weather Station

Latitude: 60° 50' N					**Longitude: 115° 46' W**					**Elevation: 165.50 m**				
Days with Minimum Temperature														
> 0 °C	0.03	0.03	0.17	3.2	16.9	29.1	31	30.9	25.2	7.2	0.14	0.04	143.9	A
<= 2 °C	31	28.3	31	28.6	19.8	3.3	0.1	0.77	9.8	27.8	30	31	241.4	A
<= 0 °C	31	28.2	30.8	26.8	14.1	0.9	0	0.13	4.8	23.8	29.9	31	221.4	A
< -2 °C	30.9	28.2	30.4	23.8	7.2	0.13	0	0	2	17.5	29.5	31	200.5	A
< -10 °C	30.1	27.2	26.9	11.3	0.77	0	0	0	0.07	3.1	22.6	30.1	152.2	A
< -20 °C	25	20.4	16.6	2.6	0	0	0	0	0	0.18	9	21.4	95.1	A
< -30 °C	12.6	9.7	4.2	0.25	0	0	0	0	0	0	1.6	9.1	37.5	A
Days with Rainfall														
>= 0.2 mm	0.1	0.14	0.23	1.9	7.2	8.6	9.5	11	10.8	6.3	0.7	0.3	56.8	A
>= 5 mm	0	0	0	0.24	1.3	2	2.8	2.8	2.4	0.82	0	0	12.4	A
>= 10 cm	0	0	0	0.03	0.43	0.83	1.4	1.4	0.7	0.25	0	0	5	A
>= 25 cm	0	0	0	0	0	0.17	0.14	0.43	0.07	0	0	0	0.81	A
Days with Snowfall														
>= 0.2 mm	12	9.4	8.5	4.2	1.9	0.1	0	0	0.93	8.5	13.8	12.1	71.4	A
>= 5 mm	0.69	0.69	0.77	0.48	0.3	0	0	0	0.1	1	1.4	0.73	6.2	A
>= 10 cm	0.07	0	0.2	0.1	0.1	0	0	0	0.03	0.25	0.2	0.03	0.98	A
>= 25 cm	0	0	0	0.03	0	0	0	0	0	0	0	0	0.03	A
Days with Precipitation														
>= 0.2 mm	12	9.4	8.5	5.6	8.4	8.6	9.5	11	11.4	13.1	14	12.1	123.6	A
>= 5 mm	0.59	0.62	0.63	0.74	1.5	2	2.8	2.8	2.5	2	1.1	0.57	17.8	A
>= 10 cm	0.03	0.1	0.17	0.11	0.57	0.83	1.4	1.4	0.77	0.61	0.13	0.03	6.1	A
>= 25 cm	0	0	0	0	0.03	0.17	0.14	0.43	0.07	0	0	0	0.84	A
Degree Days														
Above 24 °C	0	0	0	0	0	0.1	0.7	0.3	0	0	0	0	1.2	A
Above 18 °C	0	0	0	0	0.9	7.8	19.7	15.4	0.3	0	0	0	44.2	A
Above 15 °C	0	0	0	0	4	26.8	57.2	43.6	3.1	0.1	0	0	134.8	A
Above 10 °C	0	0	0	1.4	26.1	101.6	181.5	146	31.7	2.1	0	0	490.3	A
Above 5 °C	0	0.1	0.3	12.9	87.7	227.9	335.6	294.5	120.3	14.1	0.1	0	1093.4	A
Above 0 °C	0.5	0.5	5.1	52.3	202.2	376.5	490.6	449.5	257.5	66.8	1.6	0.2	1903.3	A
Below 0 °C	703.3	573.7	448.7	140.9	11.9	0	0	0	1.5	56.4	364.8	630.6	2931.7	A
Below 5 °C	857.8	714.6	598.9	251.5	52.4	1.4	0	0	14.3	158.7	513.2	785.4	3948.2	A
Below 10 °C	1012.8	855.9	753.6	389.9	145.8	25.1	0.9	6.5	75.7	301.6	663.1	940.4	5171.5	A
Below 15 °C	1167.8	997.3	908.6	538.6	278.7	100.4	31.6	59.1	197.2	454.6	813.1	1095.4	6642.3	A
Below 18 °C	1260.8	1082.1	1001.6	628.6	368.7	171.4	87.1	123.9	284.4	547.6	903.1	1188.4	7647.5	A

"A" indicates no more than 3 consecutive or 5 total missing years of data between the years 1971-2000.

"+" beside an extreme date indicates that this date is the first occurrence of the extreme value.

Note: From "Canadian Climate Normals 1971-2000," by Environment Canada. (n.d.). Retrieved March 21, 2006, from http://www.climate.weatheroffice.ec.gc.ca/climate_normals

Focusing in on potential climate change in the Deh Cho region, which includes the Tamerlane PPPP area, recent predictive work undertaken for the proposed Mackenzie Gas Project (Imperial Oil 2004) is most applicable. To carry out the evaluation of potential effects of climate change on the Mackenzie Gas Project, INAC sponsored a multi-stakeholder workshop in Yellowknife (Burn 2003). The workshop was attended by technical specialists representing Environment Canada, INAC, representatives of non-government organizations and the Mackenzie Gas Project. The results of the workshop were presented in Burn (2003) and those relevant to the PPPP are presented in this subsection.

The purpose of that workshop was to develop a process to select appropriate climate change scenarios that could be used to evaluate the potential effects of climate change in various regions of the study area, which included the Deh Cho region. For the workshop, a total of 29 simulations were completed using global climate models approved by the Intergovernmental Panel on Climate Change (IPCC) Table 2.3-3, drawn from Imperial Oil (2004), summarizes the current climatic conditions as well as past and future predicted climate change trends in the Deh Cho Region.

The future predicted trends in average temperature increase for the Deh Cho region for the period 2010 to 2039 range from +1˚ C to +2.5˚ C, which is similar to the +1.7˚ C increase observed between 1971 and 2000. The forecast increases in winter temperatures of +1˚ C to +2.2˚ C are lower than the past predicted trend of +4.4˚ C (Imperial Oil 2004).

The future predicted trends in total precipitation in the Deh Cho region for the period 2010 to 2039 ranged from 0.9 % to 9.6 % above the 1961 and 1990 climate normals. Total precipitation in the Deh Cho region has increased by 5.2 mm during the past 30 years. Current annual total precipitation for the region is 390.8 mm (Imperial Oil 2004).

Table 2.3-3
Climate Conditions and Change in the Deh Cho Region

Parameter	Current[1] Conditions	Trend (1971 to 2000)	Forecast Trend[2] (2010 to 2039)		
			Low	Medium	High
Average annual temperature (°C)	-2.1	+1.7	+1.0	+1.3	+2.1
Average winter temperature[3] (°C)	-20.9	+4.4	+1.0	+1.0	+2.2
Total precipitation[4,5] (mm)	390.8	+5.1	+0.9%	+6.2%	+9.6%

1 Current conditions are based on 1996 to 2000 observations
2 Trend estimate ranges from Burn (2003)
3 Winter temperatures are based on December, January and February
4 Total precipitation is presented as millimetres of equivalent rainfall
5 Future trends are presented as percentage change from the 1961 to 1990 climate normals
Source: Imperial Oil 2004

2.3.3 Ambient Air Quality

The ambient air quality standards adopted by the GNWT from the Canadian Air Quality Objectives are presented in Table 2.3-4. The standards are used to assess ambient air quality and to determine the acceptability of emissions from existing and proposed developments.

Table 2.3-4
GNWT Ambient Air Quality Standards

Contaminant	Averaging Period	Standard ($\mu g/m^3$)
Sulphur Dioxide (SO_2)	1-hour	450
	24-hour	150
	Annual	30
Total Suspended Particulates (TSP)	24-hour	120
	Annual geometric mean	60
Fine Particulate Matter ($PM_{2.5}$)	24-hour	30
Nitrogen Dioxide (NO_2)*	1-hour	400
	24-hour	200
	Annual	100

Note: *The values for NO_2 reflect National Ambient Air Quality Objectives.

2.3.3.1 Ambient Monitoring Data

A review of ambient air quality monitoring data for the Yellowknife area was conducted to establish a basis for consideration of ambient air quality conditions expected to occur in the Tamerlane PPPP Regional Study Area (RSA).

The National Air Pollution Surveillance Network has a station in Yellowknife. Air quality data for sulphur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3) and total suspended particulates (TSP) are measured at this location. Measurements of PM_{10} (suspended particles with aerodynamic diameters less than 10 micro metres) and $PM_{2.5}$ have been taken since 1984. Sample filters are analyzed for 50 elements (including toxic metals such as arsenic, lead and mercury) 14 inorganic and organic anions and 11 inorganic cations. The observations from this program are discussed in more detail in the following sections, as a basis for consideration of air quality conditions expected to occur in the Tamerlane PPPP RSA.

2.3.3.2 *Particulate Matter*

Recent data for PM, taken from the 2002 to 2003 NWT Air Quality Report for Yellowknife (Environmental Protection Service 2004), are summarized in Table 3.5-2. As indicated, the reported data for Total Suspended Particulate (TSP), PM_{10} and $PM_{2.5}$ are generally below the applicable air quality standards for these parameters. Similar, but lower particulate matter values are expected to be found in the air around the Tamerlane PPPP RSA.

Table 2.3-5
NWT Air Quality Data for Yellowknife - 2002 and 2003

Contaminant	Parameter	Air Quality Standard	Concentration 2002	Concentration 2003
TSP	Highest 24-hour	120	229	297
	Lowest 24-hour	120	5	6
	Annual average	60	27	31
PM_{10}	Highest 24-hour	n/a	76	47
	Lowest 24-hour	n/a	2	3
	Annual average	n/a	12	14
$PM_{2.5}$	Highest 24-hour	30	12	15
	Lowest 24-hour	30	0	0
	Annual average	n/a	4	5

Source: Environmental Protection Service 2004.
n/a = not available

2.3.3.3 *Sulphur Dioxide (SO_2)*

Summaries of the SO_2 data measured by Yellowknife in 2002 and 2003 are presented in Figures 2.3-1 and 2.3-2. NWT air quality standards for SO_2 were not exceeded for these reporting periods. Comparable or better conditions would be expected to exist in the proposed PPPP area.

2.3.3.4 Nitrogen Oxides (NO_x)

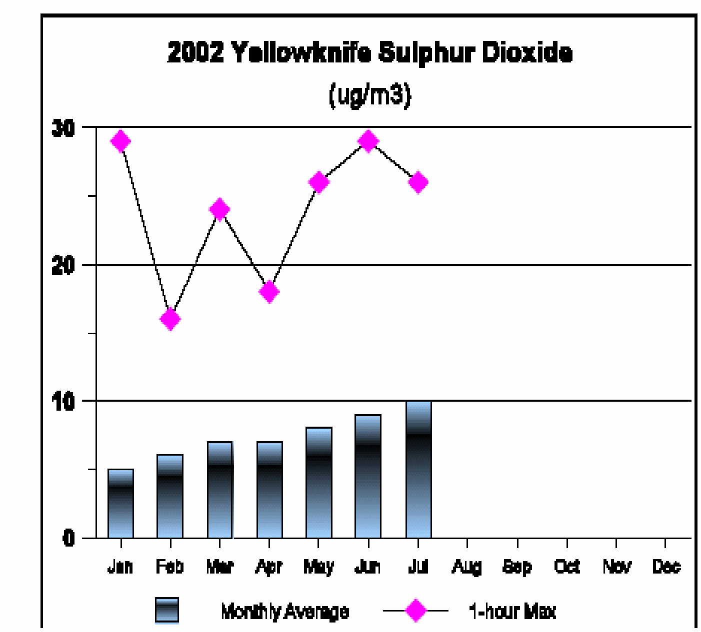
Continuous monitoring for NO_x commenced in Yellowknife in November 2003. The data collected since November 2003 indicated that there were no excursions of the national objectives for the NO_2 component of NO_x during the reported period. The maximum, recorded one-hour NO_2 concentration was 70 µg/ m^3. Comparable or better conditions would be expected to exist in the proposed PPPP area.

2.3.4 Existing Emissions

Existing emissions in the vicinity of the proposed Mackenzie Gas Project (including the Hay River area) in the NWT were estimated by Imperial Oil (2004) by reviewing available maps, and literature sources and the emissions were calculated. Emissions were organized into four main categories:

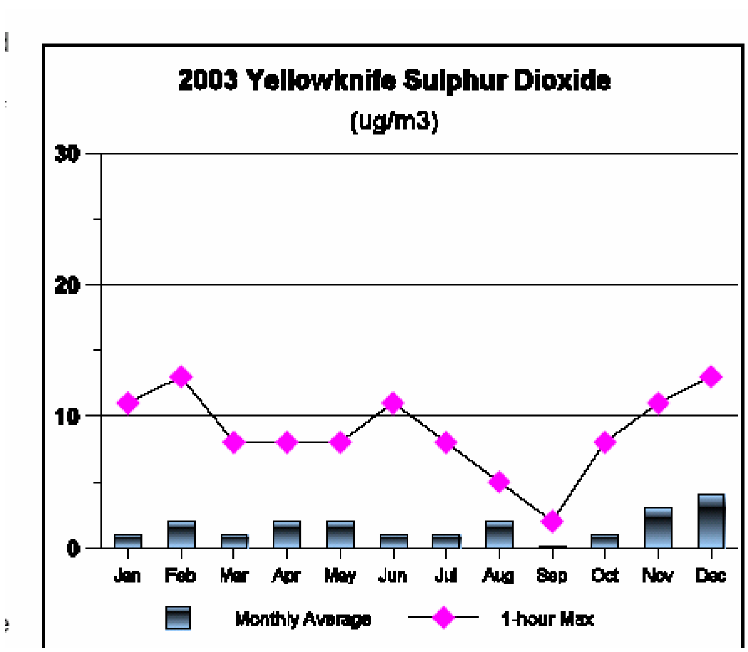
- aviation, including all air traffic, i.e., fixed-wing and rotary-wing aircraft
- marine sources, including seasonal Mackenzie River traffic
- community sources, including local and highway traffic, vehicle refueling and residential heating (including fuel oil, natural gas and wood combustion
- other industrial sources, including existing oil and gas operations

Table 2.3-6, drawn from Imperial Oil (2004) summarizes the existing emissions, in tonnes per day, expected within 50 km of the proposed Mackenzie Gas Project in the Northwest Territories, and includes values for aviation activities, marine sources, communities and other industrial activities.



Source: Environmental Protection Service 2004

Figure 2.3-1
Summary of 2002 SO_2 Data for Yellowknife



Source: Environmental Protection Service 2004

Figure 2.3-2
Summary of 2003 SO_2 Data for Yellowknife

Table 2.3-6
Summary of Existing Air Emissions by Activity

Source	Emission[1]					
	SO_2 (t/d)	NO_X (t/d)	CO (t/d)	$PM_{2.5}$ (t/d)	Benzene (t/d)	BTEX (t/d)
Aviation	0.02	0.38	0.50	0.03	0.003	0.005
Marine	0.06	0.56	0.08	0.01	0.004	0.008
Communities	0.07	0.26	3.58	2.36	0.031	0.082
Power and Industrial	1.11	2.37	0.41	0.06	0.001	0.003
Total	1.26	3.58	4.57	2.46	0.039	0.097

NOTES:
1 Calculated using published emission factors, population data and fuel information
The numbers shown in this table have been rounded for presentation purposes. Therefore, the totals might not appear to equal the sum of the presented values. Source: Imperial Oil 2004

The total emissions for the Deh Cho region were estimated by Imperial Oil (2004) to be:

- SO_2 - 0.04 t/d
- NO_2 - 0.67 t/d
- CO - 0.81 t/d
- $PM_{2.5}$ - 0.43 t/d
- Benzene – 0.008 t/d
- BTEX - 0.018 t/d

2.3.5 Greenhouse Gas Emissions

The baseline levels of greenhouse gas emissions (GHG) in the Northwest Territories and Canada were compiled by Imperial Oil (2004) for the proposed Mackenzie Gas Project. Potential GHG emissions were calculated from regional activities for the same categories of existing emissions sources referred to in Subsection 2.3.4.

GHG emissions include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). By using the relative GHG potentials of these compounds, it is possible to convert them into equivalent carbon dioxide (ECO_2) numbers so that the emissions can be totalled. Equivalent CO_2 (ECO_2) emissions were calculated using GHG potentials of 1 for CO_2, 21 for CH_4 and 310 for N_2O (Environment Canada 2002). Table 2.3-7, drawn from Imperial Oil (2004) presents a summary of the GHG emissions estimated to occur within 50 km of the proposed Mackenzie Gas Project activities in the Northwest Territories.

Table 2.3-7
Summary of Existing Greenhouse Gas Emissions by Activity

Activity	Emission			
	Carbon Dioxide CO_2 (kt/a)	**Methane CH_4** (kt/s)	**Nitrous Oxide N_20** (kt/a)	**Equivalent Carbon Dioxide ECO_2**[1] (kt/a)
Aviation	–	–	–	–
Marine	–	–	–	–
Community	60.5	0.0	0.0	60.5
Power and Industrial	119.5	0.2	0.0	122.7
Total	180.0	0.2	0.0	183.2

Notes: Source: Imperial Oil 2004
– = not available
1 Equivalent CO_2 (ECO_2) emissions were calculated using GHG potentials of 1 for CO_2, 21 for CH_4 and 310 for N_2O) (Environment Canada 2002)
The numbers shown in this table have been rounded for presentation purposes. Therefore, the totals might not appear to equal the sum of the presented values.

Because GHG emissions management is a territorial and a national issue, it is important to know the existing estimated levels of emissions nationally and territorially as summarized in Table 2.3-8, drawn from Imperial Oil (2004). As can be noted, for 2005, the total NWT contribution of GHG emissions was estimated at 1,708 kt/a ECO_2, compared with the total Canadian contribution of 728,000 kt/a ECO_2. Thus the total NWT GHG emissions contribution represented approximately 0.23 % of the estimated national total.

Table 2.3-8
Estimated National and Northwest Territories Greenhouse Gas Emissions

	GHG Emissions	
Reporting Year	**Canada** (kt/a of ECO_2)[1]	**Northwest Territories** (kt/a of ECO_2)
1995	673,000[2]	1,538[3]
2000	730,000[2]	1,607[3]
2005	728,000[3]	1,708[3]

NOTES:

1 Equivalent CO_2 (ECO_2) emissions were calculated using GHG potentials of 1 for CO_2, 21 for CH_4 and 310 for N_2O) (Environmental Canada 2002)

2 Canada's GHG Inventory, 1990 to 2001 (Environment Canada 2003)

3 Canada's Emissions Outlook (NRC 1999)

Source: Imperial Oil 2004

2.3.6 Ambient Noise Levels

The proposed PPPP is located in an area where ambient noise levels are expected to be low, generally in the range of 35 dBA. The acoustic environment is dominated by the sounds of nature, e.g. wind rustling through the foliage.

Man-made sounds that can be heard in the Local Study Area from time to time are those associated with the limited and intermittent existing vehicular traffic on nearby Highway 5, and local off-road ATV and snowmobile traffic and associated hunting that occurs seasonally throughout the Pine Point region.

2.4 Geology

The PPPP (R190) area lies across the central parts of Birch Creek and Twin Creek catchments, which are tributary to Great Slave Lake, and on the west side of Buffalo River catchment, north of Highway No. 5. The land is low-lying and poorly-drained, with a gentle northwesterly slope toward the southern shore of Great Slave Lake. Elevations in the region range from approximately 175 m in the northwest to 232 m in the southeast. Swamp, muskeg, and low gravel ridges are the main topographic features of the area.

Surface expressions of karstic features include intermittent creeks, natural springs, and sinkholes. Some of the sinkholes have been filled with fine sand. Others are generally filled with granite, limestone, and dolomite boulders in sand, gravel and clay (Dames and Moore 1976). One of the participants in the Fort Resolution Traditional Knowledge interviews indicated that was some unstable karst geology in the Pine Point area and that some of the areas where karst occurs could be prone to collapse (Tamerlane 2006 a).

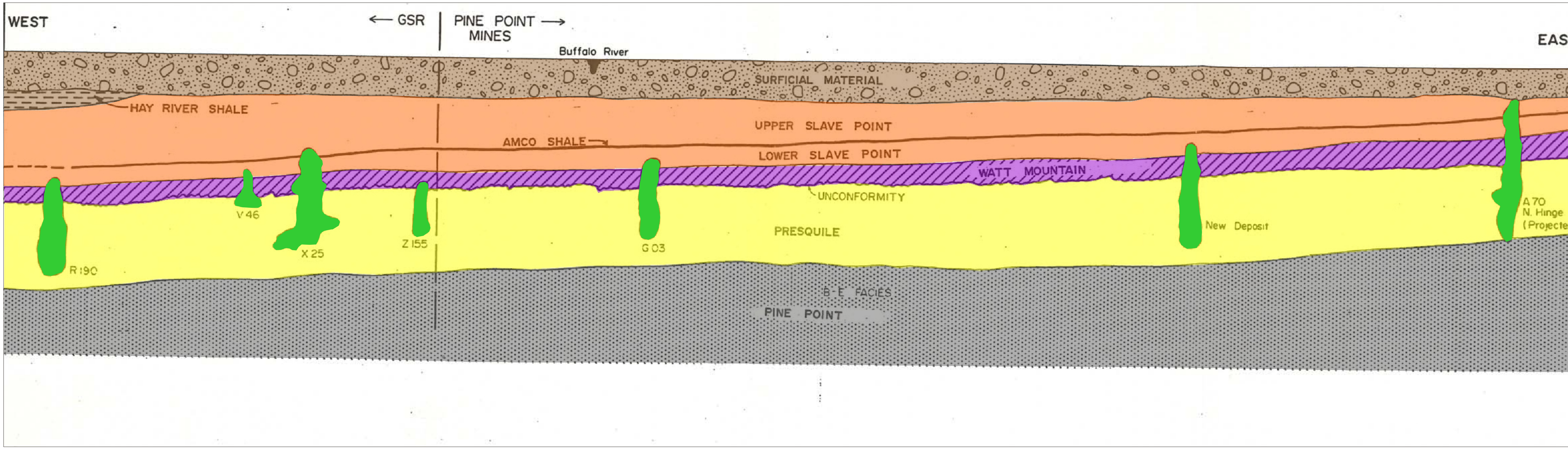
The general area consists mainly of an undulating sandy plain, with some eolian features, underlain with low relief, flat-lying Paleozoic strata. Surficial deposits in the area were largely influenced by the recession of Glacial Lake McConnell. Sand and gravel deposits are common (Day 1972, as cited in EBA 2005).

Surface outcrops are rare in the region. Overburden consists of clayey glacial till with occasional gravel beds and areas of varved clays and cemented fine sands, and varies in thickness from 3 m to 45 m (Durston 1979). The overburden generally becomes finer with depth. The glacial till forms an effective confining layer and has a shallow water table established in it (Stevenson 1983). This material is often overlain by an organic, peaty layer of muskeg that is up to 3 m thick. Lacustrine deposits and beach ridges have also been reported in the area. Permafrost has been reported in some localized areas within the overburden, but is not common and does not occur in the R190 area.

Some of the participants in the Traditional Knowledge studies (Tamerlane 2006 a, b) indicated that the ground in the region generally starts to freeze in October and is frozen hard sometime between November and January. It was noted that the time of year when the ground freezes is largely dependent on the amount of snow. Regarding spring thaw, respondents reported that the ground typically thaws between March and May.

Bedrock in the vicinity of the project site consists of a sequence of gently folded, west-dipping, stratified rocks, associated with a Devonian reef complex. The main stratigraphic units (from top to bottom) as illustrated in Figures 2.4-1 and 2.4-2 (Stevenson 1983) are as follows:

1. The limey Hay River Shale formation forms the subcrop westward from its eastern erosional edge, which lies just east of the R190 ore deposit.
2. Slave Point limestone, which has pitted and scattered vuggy zones toward the base, approximately 60 m thick in the R190 area.
3. Amco Shale-Watt Mountain argillaceous, micritic limestone sequence with green, waxy shale, approximately 15 m thick.



LEGEND

Surficial Materials	Pine Point
Upper Slave Point / Amco Shale / Lower Slave Point	Ore Bodies
Watt Mountain	
Presquile	

NOTES
Source: Source: Stevenson 1983

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PINE POINT PILOT PROJECT

East-West Stratigraphic Section Through the Central Parts of Great Slave Reef (R190) and Pine Point Mines Project Areas

PROJECT NO.	DWN	CKD	REV
1740149.005	KW	RH	2
OFFICE	DATE		
EBA-VANC	December 13, 2006		

Figure 2.4-1

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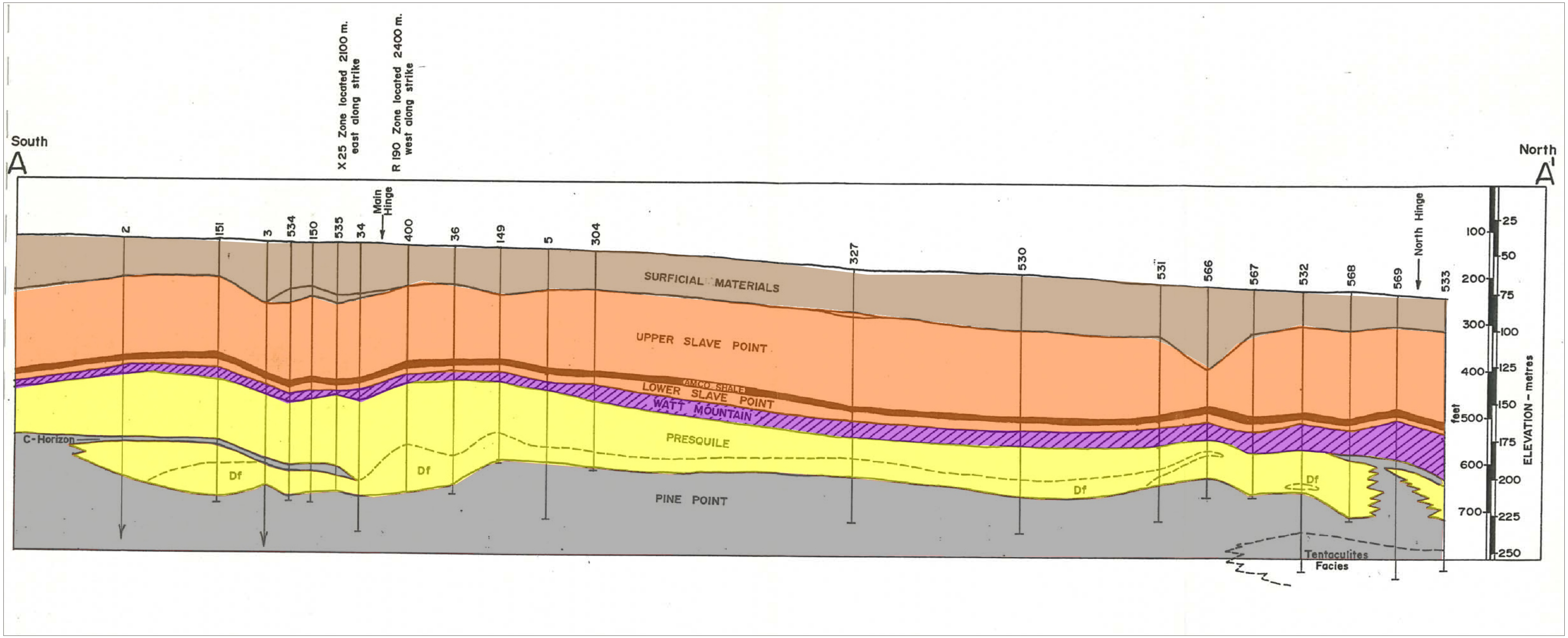

LEGEND

- Surficial Materials
- Upper Slave Point / Amco Shale / Lower Slave Point
- Watt Mountain
- Presquile
- Pine Point

NOTES
Source: Source: Stevenson 1983

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PINE POINT PILOT PROJECT

North-South Stratigraphic Section Through The Great Slave Reef (R190) Project Area

PROJECT NO.	DWN	CKD	REV
1740149.005	KW	RH	1
OFFICE	DATE		
EBA-VANC	December 13, 2006		

Figure 2.4-2

4. Pine Point unit of medium-grained sandstone, dolomite, and limestone that contain scattered vugs and pitted zones. This includes the Presquile subunit, formed of medium to coarse-grained, moderate to extreme vuggy dolomite, approximately 60 m thick in the R-190 area.
5. Keg River Formation, consisting of dense to sucrosic dolostone with varying amounts of argillaceous and carbonaceous material and chert nodules.
6. Chinchaga Formation, consisting predominantly of anhydrite with minor amounts of dense, finely crystalline dolomite.

The main geological structures, other than the gentle western dip of the strata, are the minor folds and major amount of fracturing that have occurred. Folding is generally associated with differential compaction, gentle flexing, and differences in rates of subsidence in the original sediments. Faulting and fracturing in the Devonian are related to tectonic movements in the basement and follow two main directions: northeast to southwest and east to west.

Generally, the Slave Point unit is massive, with low RQD (Rock Quality Designation) values associated with a vuggy zone located near the base of the rock unit. There is a fractured, apparent weak zone located at the base of the shaley Amco Shale-Watt Mountain unit, and at the apparent disconformity at the top of the underlying Presquile unit (Stevenson 1983).

The Presquile unit generally has low RQD values and is structurally weak. Parts of the vugs are infilled with calcite and sulphur crystals, some of which are bitumen coated in the upper part of the rock unit. The basal Pine Point unit appears stronger than the Presquile unit. Some pitted zones with weak vug development are present in the basal unit. Around the R-190 ore deposit, the Presquile zone occurs between approximately 122 m and 183 m depths below ground surface (Stevenson 1983).

The limestone-dominated and dolomitic nature of the stratigraphic units which characterize the geological formations of the Pine Point area indicate that these formations have essentially no potential to generate acid rock drainage (ARD). Historic ARD testing of Pine Point Mine tailings in 1987 determined that the samples tested contained total sulphur values ranging from 2.3 to 2.7 % and neutralization potentials of 704 to 833 kg $CaCO_3$/t (SRK 2006).

These results were consistent with the Mississippi Valley Type mineralization. SRK (2006) surmised that the former Pine Point Mine tailings probably occurred as pyrite and to a lesser degree residual galena and sphalerite. It was concluded that the tailings were probably dominated by carbonate minerals such as calcite and dolomite and had no potential to generate ARD.

2.5 Seismic Hazard

According to Natural Resources Canada (2006), The PPPP area is geologically stable, of low seismic risk and with no natural landslides suggestive of seismic (earthquake) hazard.

The PPPP area lies in a tectonically inactive plate zone west of the Canadian Shield. The region is in the lowest rated seismic zone for peak horizontal ground acceleration. The highest seismicity is associated with the coastal zone (Seismic zone 1) located to the west of the Northwest Territories.

The Canada Seismicity Map from Energy, Mines and Resources Canada plots significant earthquake locations for the years 1568 through 1991. Only two relatively small events have been recorded in the region and both occurred to the west of the PPPP area. No earthquake of Richter Magnitude M6 or greater has occurred with 1,000 km of the PPPP site in recorded history.

The Traditional Knowledge interviews conducted in October 2006 indicated that none of the study participants had any specific knowledge of earthquakes in the South Slave area. However, several of the participants in the Fort Resolution Traditional Knowledge interviews noted that slight tremors had been felt in Fort Smith – once in the 1970's and once in the 1980's on Christmas eve. According to the participants, the epicentre was in the Mackenzie Mountains (Tamerlane 2006b, c).

Seismic hazard values according to the 2005 National Building Code of Canada, as presented in Table 2.5-1 were obtained from Natural Resources Canada (NRC) through the official web site: http://earthquakescanada.nrcan.gc.ca/hazard/interpolator/index_e.php.

These values correspond to a probability of exceedence of 2 % in 50 years (0.000404 per annum) with a return period of 2,475 years and are calculated by interpolating the values available in the vicinity of the site coordinates (60.8166°N, 115.7833°W). Additional values corresponding to events with higher probabilities of occurrence are also presented.

The Peak Ground Acceleration (PGA) of 0.059 g for the 1/2,475-year design earthquake is small and is generally expected not to cause damage to earth or underground structures. Spectral acceleration values for periods 0.2 to 2 seconds are also considered small and should not cause damage to the temporary surface structures (modular trailers) to be installed at the PPPP site.

Table 2.5-1
Seismic Hazard Values: Peak Ground Acceleration (PGA) and Spectral Acceleration (Sa) Values for Different Earthquake Return Periods

Probability of Exceedence		Return Period (Years)	PGA (g)	Spectral Acceleration (g)			
in 50 years	per annum			Sa(0.2)	Sa(0.5)	Sa(1.0)	Sa(2.0)
2%	0.000404	**2475**	**0.059**	0.116	0.056	0.023	0.007
5%	0.001	1000	0.035	0.069	0.036	0.014	0.006
10%	0.0021	475	0.021	0.044	0.024	0.009	0.004
40%	0.01	100	0.007	0.015	0.008	0.003	0.002

2.6 Hydrogeology

2.6.1 General Hydrogeological Conditions

Based on over 15 years of open pit dewatering operations at the former Pine Point mine, the hydrogeology of the Pine Point district is considered reasonably well understood (Brown et al. 1981). Groundwater occurs as both a shallow phreatic water table associated with the overburden and also under confined pressure conditions in the bedrock. The natural groundwater table in the Pine Point area varies in depth below surface from approximately 1 m to 18 m depth Perched water is common within the overburden (Durston 1979). Groundwater sampling conducted by EBA at the R190 site in August 2006 (EBA 2006a) determined that the groundwater table was located at approximately 25 m depth.

Regional groundwater movement in the bedrock is towards the northeast and may be locally modified by changes in geological features. Groundwater flow systems developed in the bedrock are a result of large-scale topographic features to the south and west of the R190 area. The movement of shallow groundwater associated with the overburden depends more on very local topographic relief, but is believed to have an overall direction of movement to the northeast (Brown et al. 1981).

Vertical hydraulic gradients indicate that groundwater movement is downward from the overburden into the bedrock. Linked porosity in the limestones and dolomites is considered very low and groundwater flows mainly through solution channels, bedding planes, and fracture zones. The glacial till and shales form a relatively impervious confining layer over the underlying aquifers.

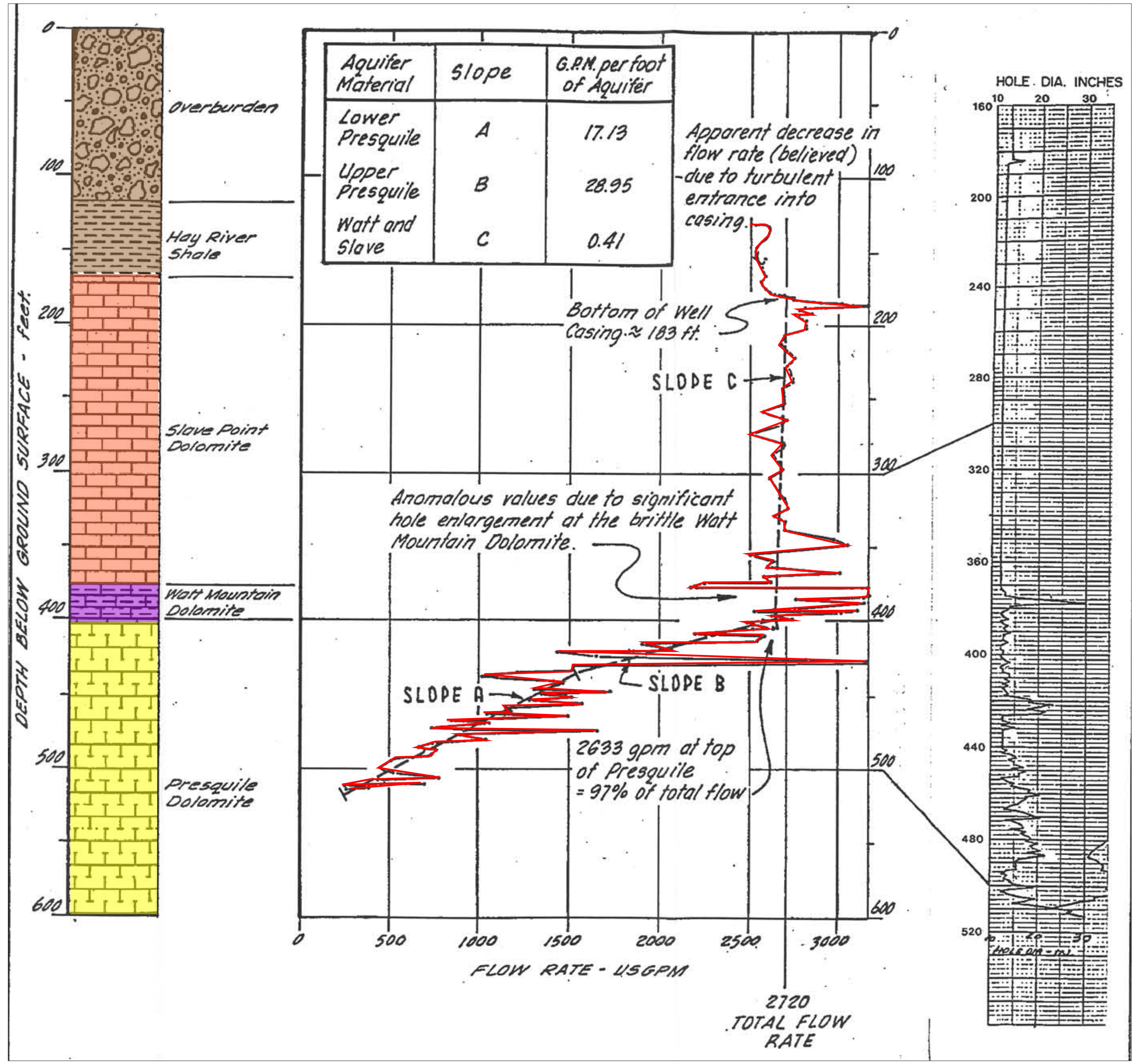
The Presquile formation is by far the most porous local stratigraphic unit (Figure 2.6-1). Laboratory measurements of intact core recovered from this formation indicated porosities ranging from 2.1 to 18.5 % and hydraulic conductivities ranging from 1.7 x 10^{-10} m/s to 1.2 x 10^{-4} m/s (GTC 1983). These measurements do not include fracture conductivity, which may be high.

The main aquifers in the area occur in the bedrock and are mostly present because of fracture permeability, although the Presquile zone is thought to have both vuggy and fracture components in permeability. Bedrock aquifers are under confined conditions and groundwaters occurring in them are therefore under a pressure head (Brown et al. 1981).

Confined conditions have been reported to be the effects of topography, low-permeability clayey overburden and shale units, and elevated recharge areas to the south (Caribou Mountains and, to a lesser extent, Cameron Hills). As the elevation of the land surface drops towards Lesser Slave Lake, flowing artesian conditions and springs are common. The results of a modelling study indicated that flow in the deeper sediments, particularly the barrier reef, was not dominated by the recharge from the Caribou Mountains (GTC 1983).

Aquifer tests at the former Pine Point Mine have shown that the hydraulic conductivity of the bedrock can be anisotropic, meaning that there is a preferred direction of groundwater movement along these features as compared to across them (Brown et al. 1981).

Natural groundwater movement within the bedrock aquifer is reported to be towards the northeast at an average gradient of one foot to 2,200 feet (Brown et al. 1981). Northward groundwater flow under a hydraulic gradient of 1.5 m per km has also been reported (Stevenson 1983).



LEGEND

	Surficial Materials
	Upper Slave Point / Amco Shale / Lower Slave Point
	Watt Mountain
	Presquile
	Pine Point

NOTES
Source: Source: Stevenson 1983

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PINE POINT PILOT PROJECT

Velocity and Caliper Logs of R190 Well - 1983

PROJECT NO.	DWN	CKD	REV
1740149.005	KW	RH	1
OFFICE	DATE		
EBA-VANC	December 13, 2006		

Figure 2.6-1

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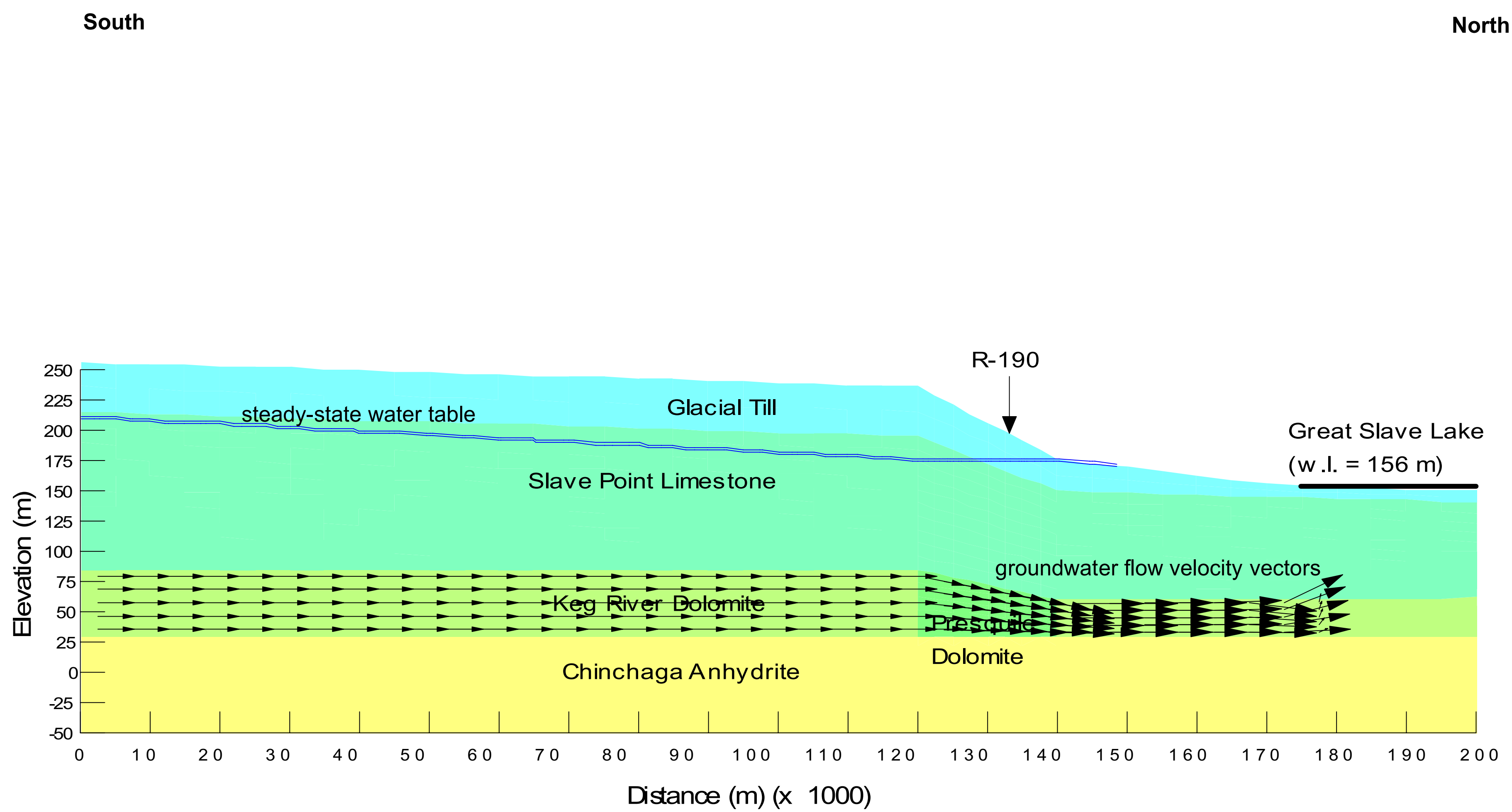
Springs discharging mineralized groundwater have been observed along the south shore of Great Slave Lake (GTC 1983; Stevenson 1983). Sulphurous springs as well as artesian boreholes along the banks of the Buffalo River have also been reported (GTC 1983) and were noted by EBA during the 2005 field study program (EBA 2005a). One participant in the Hay River Traditional Knowledge interviews indicated that he was aware of "artesian wells" in the Pine Point area (Tamerlane 2006b).

While many of the reports reviewed by EBA discuss the results of pumping tests, only one report (GTC 1983), has described a groundwater model developed to estimate steady-state conditions prior to dewatering (EBA 2006d). The calculated hydraulic conductivity for the Presquile unit ranges from 10^{-4} m/s (GTC 1983) to 10^{-3} m/s (Stevenson 1983). The upper-bound hydraulic conductivity is comparable to a clean sand or clean sand and gravel (Stevenson 1983).

2.6.2 Groundwater Modeling

Groundwater modelling was carried out by EBA in 2006 to better understand the regional controls on groundwater flow, as well as to estimate natural, steady-state groundwater flow velocities (EBA 2006d). Analyses were carried out using SEEP/W, a two-dimensional finite element seepage model program developed by Geo-Slope International Ltd. A two-dimensional model was used as opposed to a three-dimensional one because the absence of recent piezometric data and analysis of current groundwater recharge meant that the results of any comprehensive groundwater model would be questionable for current conditions. A simple two-dimensional section would also allow model parameters (e.g., hydraulic conductivity) and boundary conditions (e.g., hydraulic gradient) to be varied and the sensitivity of groundwater flow to these parameters be evaluated.

Details of the groundwater modelling input assumptions and boundary conditions are described in EBA (2006d). Figure 2.6-2 shows the results of EBA's steady-state seepage analysis. All groundwater flow is channeled within the relatively high-permeability Keg River and Presquile units. The maximum calculated velocity through these units is 5 x 10-10 m/s (4 x 10-5 m/day). Sensitivity analyses were conducted, varying the hydraulic conductivities of the Keg River and Presquile units, in addition to the head on the southern (upslope) boundary of the model section. The results indicated that increasing the hydraulic conductivity of the Keg River unit from 10-6 m/s to 10-4 m/s raised the calculated maximum velocity to 6 x 10-8 m/s (5 x 10-3 m/day).



LEGEND

NOTES

CLIENT

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PINE POINT PILOT PROJECT

Results of EBA Groundwater Seepage Analyses - Base Case

PROJECT NO.	DWN	CKD	REV
1740149.005	KW	RH	1

OFFICE	DATE
EBA-VANC	December 14, 2006

Figure 2.6-2

The calculated velocities represent average water flowing through a cross-sectional area normal to the macroscopic direction of flow. The actual seepage velocity (v′) relates the average velocity (v) with porosity (n):

$$v' = \frac{v}{n} \quad [1]$$

Equation [1] indicates that the seepage velocity increases with decreasing porosity. For example, for a given average velocity, the seepage velocity will be greater for a low-porosity rock where water flows through a relatively small-aperture fracture than it would for a more porous rock. As previously described, measured porosities of intact rock core recovered from the Presquile unit ranged from 2.1 % to 18.5 %.

Assuming 2 % porosity, then the maximum seepage velocity due to natural groundwater seepage is estimated to be 6 x 10-8/2 x 10-2 = 3 x 10-6 m/s or 0.26 m/day. However, this estimate is considered to be very conservative, as it is more representative of a low-permeability, un-fractured rock. Since groundwater flow through the Presquile unit is mainly through fractures, faults, and solution channels, the porosity is likely much higher than 2 % and seepage velocities will be less than 0.26 m/day (EBA 2006d).

2.7 Soils

The general area is described in the Soils of the Slave River Lowland as low-lying flat land with numerous lakes and abandoned stream channels. The soil climate is subarctic (humid) with discontinuous permafrost. In much of the area, soil development has been influenced by the presence of water for much of the year. The dominant soils are Humic Gleysols and Regosols (Day 1972, as cited in EBA 2005b). There is little relief, and changes in vegetation communities are not followed with a characteristic change in surface elevation, but rather, a change in the depth to mineral soil (EBA 2005b).

The soils in the study area are primarily Eluviated Eutric Brunisols in upland areas and Terric Organics and Gleysols in lowland areas. Cumulo Organics were encountered; most likely a result of the formation and flooding regimes of Glacial Lake McConnell. The cumulo layers are remnants of past glaciation. These soils will become Terric and Typic organics with the passage of time. Mineral soils vary in texture from gravel to clay. Sand is most common (EBA 2005b).

As previously indicated in Section 2.4, permafrost has been reported in some localized areas within the overburden, but is not common and does not occur in the R190 area.

2.8 Surface Hydrology

The general area around the PPPP site is flat to gently sloping and a considerable area is covered by poorly drained muskeg ranging up to 3 m deep. The area also contains several generally east-west low ridges, which are considered to have been formed by old lake-level beaches. Several small lakes and numerous potholes are located in the area (Beak 1980). As previously indicated, the PPPP site is bounded to the east by the Buffalo River (approximately 10 km to the east of the LSA) and to the west by Twin Creek (about 7 km to the west of the LSA). Both of these streams flow north into Great Slave Lake. Figure 2.8-1 illustrates the location of these waterbodies relative to the Pine Point Project site and LSA.

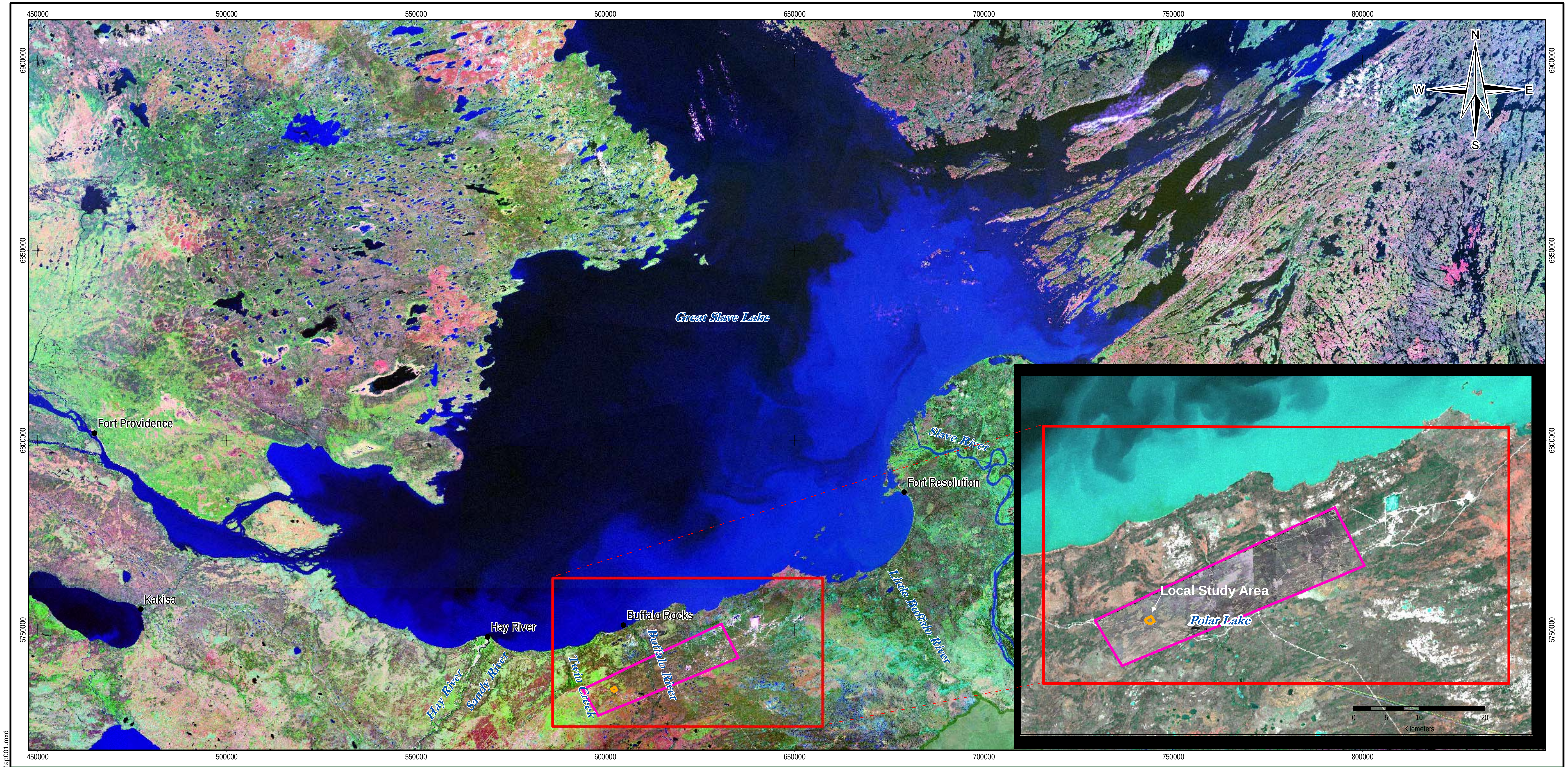
2.8.1 Buffalo River

The lower Buffalo River flows northeasterly out of Buffalo Lake, located approximately 56 km south of Great Slave Lake (Figure 2.7-1). The total drainage area of the Buffalo River is about 18,130 km^2 of which 17,844 km^2 lies upstream of the former Water Survey of Canada Gauging Station at the Highway 5 bridge (Station 07PA001). The Buffalo River is moderately incised into the surrounding terrain at the Highway bridge and drops about 55 m in about 19 km of travel distance to Great Slave Lake (Beak 1980).

Many of the participants in the Traditional Knowledge interviews (Tamerlane, 2006a, b) reported that seasonal spring flooding occurs in specific areas of the South Great Slave Region. No flooding was identified in the proposed PPPP area. Specifically noted events included severe flooding on the Hay River in 1951 and 1963, West Channel in 1972, Birch Creek in about 1980 and Big Buffalo River in about 2000.

Based on discharge records from 1969 to 1978, the mean annual flow of the Buffalo River was 55 m^3 /sec and the mean maximum daily flow for the period of record was 182 m^3 /sec, which usually occurs in May or June, however peak flows have also been recorded in September (Water Survey of Canada, cited in Beak 1980).

Minimum discharge occurs in the winter when for several months, sometimes as early as January, flow can drop to near zero until about mid April, when spring runoff typically begins (Beak 1980). Ice conditions at the former gauging station normally started between early November, with ice conditions ending in late April to late May. Small, open water patches have been observed in the lower Buffalo River in late November. Annual surface runoff in the Buffalo River watershed above the former gauging station was estimated at 17 x 104 hectare-metres per year, representing an equivalent of about 9.6 cm/year. This represented about 20 % of the average annual area precipitation during the period of record (Beak 1980).



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LEGEND

- Local Study Area (LSA)
- Regional Study Area (RSA)
- Wood Buffalo National Park

NOTES
Base data source:
Landsat, Google Earth

PINE POINT PILOT PROJECT

Pine Point Area
Location Map

PROJECTION	DATUM
UTM Zone 11	NAD83

Scale: 1:1,000,000
20 10 0 20
Kilometres

FILE NO.
1740149-005_Map001

PROJECT NO.	DWN	CKD	REV
1740149.005	BGP	RH	1

OFFICE	DATE
EBA-VANC	December 14, 2006

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Figure 2.8-1

2.8.2 Twin Creek

Twin Creek is a small creek system with an estimated drainage area of about 260 km^2 originating in the region about 16 – 25 km south of Highway 5 (Figure 2.7-1). The overall length of Twin Creek is approximately 45 km (EBA 2005a). According to available satellite imagery, NTS maps and EBA's recent fieldwork, the stream channel is often undefined and travels through areas of sphagnum bog. According to Beak (1980), the upper drainage is not confined to a well-developed creek bed until reaching the area near to and for about 2.7 km north of the Highway. At this point it essentially disappears into a large, open, almost treeless, swampy area for about 3.2 km before emerging as a defined creek channel again eventually reaching Great Slave Lake (Beak 1980).

Discharge records do not exist for Twin Creek, nor for any other similar small system in the area. However, Twin Creek is expected to have typical seasonal water flows, with highest flows occurring during the spring runoff period (EBA 2006a). During a fall visit to the creek in September 1979, zero discharge was observed at the Highway crossing of the creek and no noticeable discharge was observed in the pooled channel near the mouth of Twin Creek (Beak 1980).

2.8.3 Great Slave Lake

Great Slave Lake is the final receptor of the drainages from Twin Creek and the Buffalo River systems (Figure 2.8-1). Historic data available on lake levels at the Water Survey of Canada recording station at Hay River (Station 0708002) indicate that the mean lake level has been 156.7 metres above sea level (masl) with normal seasonal variations between 156.59 and 156.93 masl and extreme variations recorded of 157.28 and 156.22. Highest water levels typically occur in mid-summer (Environment Canada 1978, cited in Beak 1980).

2.8.4 Polar Lake

Polar Lake, located approximately 6.4 km to the east of the PPPP site and about 0,8 km north of Highway 5, is a shallow lake with no significant surface feed streams or outlet drainages (Figure 2.7-1). Polar Lake is approximately 1.6 km long, 0.6 km wide and has a surface area of about 0.73 km^2. There is some speculation that the lake is fed by groundwater sources. The estimated lake level of Polar Lake at the time of contour mapping conducted for Western Mines in the summer of 1979 was 214.6 masl (Beak 1980).

2.9 Water Quality

Water quality sampling in the Pine Point area, including portions of the RSA and the LSA has been conducted for more than 30 years by various parties including Environment Canada, DIAND, Western Mines, Teck Cominco, BC Research, Beak Consultants Ltd. and most recently EBA. These data have been previously reported in various reports and publications including BC Research (1977), Weyer and Horwood (1979), Beak (1980), Evans et al. (1998) and annual reports to the former Northwest Territories Water Board and the current Mackenzie Valley Land and Water Board by Western Mines and Teck Cominco.

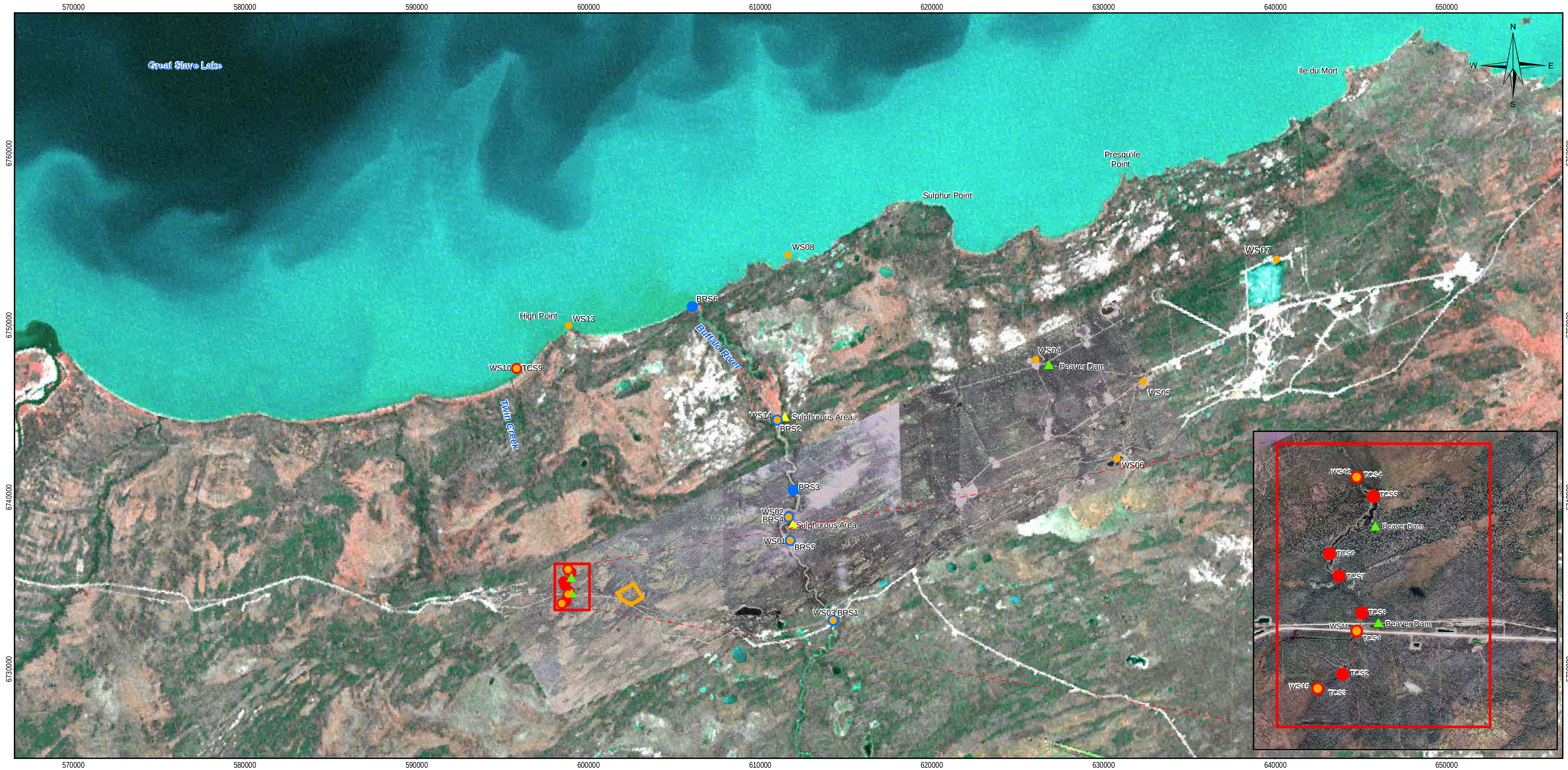
The results throughout the many years of testing have consistently shown that the physical and chemical properties of the surface waters and groundwaters in the region have and continue to be strongly influenced by the regional geology of the area which is dominated by the limestone, dolomite, sandstones and shales that occur in the Pine Point area. The waters tested in the region over the years have been shown to be relatively hard, with high levels of alkalinity and dissolved salts, conductivity and pH, and concentrations of metals that were consistently below existing federal (CEQG) guideline criteria.

Many of the participants in the Traditional Knowledge interviews (Tamerlane 2006b, c) indicated that the water (groundwater and surface water) in the proposed PPPP area is poor. The water was described as alkaline, sulfurous and not drinkable. Several participants offered explanations. Some participants indicated that the water in the project area had been sulfurous but clear and drinkable prior to the start of the historic Pine Point Mine. One participant indicated that the water quality was alkaline and had a high pH even prior to the Pine Point Mine operations. Another participant indicated that the project area's poor water quality is likely due to its being from the same karst formation as the Pine Point Mine.

2.9.1 Surface Water Quality

The surface water quality data collected by EBA in the area for the last two years are comparable to those reported previously by the other referenced parties, thus the following description will be limited to discussion of the more recent results presented in EBA (2005a) and EBA (2006a).

The EBA water quality sample sites were selected and located with GPS to determine existing water quality conditions in various water bodies throughout the Pine Point regional study area, the nearshore area of Great Slave Lake and the former Pine Point mine site. In 2005 EBA (with the assistance of Tom Unka from Fort Resolution) sampled a total of 14 sites in Buffalo River, Twin Creek, Great Slave Lake and abandoned Pine Point mine works (Figure 2.9-1). In 2006, water samples were collected on May 17, June 05, July 21 and August 18 from three sites (Fen Head, Fen Mid and Twin Creek) located within or immediately adjacent to the Tamerlane LSA. The detailed tabulated results of the 2005 and 2006 water quality sampling program are presented in EBA (2005a and 2006a). Complete copies of these reports are provided in Appendix B of this DAR.



LEGEND

- Local Study Area (LSA)
- Buffalo River Stream Assessment
- Twin Creek Stream Assessment
- Water Sampling Stations
- Beaver Dam
- Sulphurous Area

NOTES

Base data source:
Landsat TM bands 7,4,1 (GLFC)
Quickbird Pacific GeoAnalytic

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PINE POINT PILOT PROJECT

Pine Point RSA Water Sampling and Stream Assessment Locations

PROJECTION	DATUM
UTM Zone 11	NAD83

Scale: 1:225,000

4 2 0 4

Kilometres

FILE NO.
1740149-005_Map006

PROJECT NO.	DWN	CKD	REV
1740149.005	KMW	KMW	0

OFFICE	DATE
EBA-VANC	December 14, 2006

Tamerlane Ventures Inc.

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Figure 2.9-1

The following results are discussed and compared against the criteria outlined in the 2005 Canadian Council of Ministers of Environment (CCME), Canadian Environmental Quality Guideline (CEQG) (CCME 2005) and the BC Approved and Working Water Quality Guideline (AWWQG) (BC 1998). The BC guideline values address a number of water quality parameters not covered by the federal CEQG and provide a perspective relative to some other important water quality criteria for fish and aquatic life. The CEQG criteria for total aluminum and iron are 0.005 – 0.1 mg/L and 0.3 mg/L, respectively. The CEQG criteria for total copper, lead and zinc are 0.002 – 0.004 mg/L, 0.001 – 0.007 mg/L, 0.03 mg/L respectively.

In general, the water quality for all sites sampled along Twin Creek, Buffalo River and in Great Slave Lake during 2005 and 2006, with the exception of stations S02 and S14 in the Buffalo River, was typical of natural background values for this area of the NWT. The concentrations of most tested parameters were below existing federal (CEQG) guideline criteria and laboratory detection limits.

The highest recorded total aluminum concentration was 7.67 mg/L measured at Station 2 on the Buffalo River. All three stations in Great Slave Lake exhibited total aluminum values exceeding the existing criteria (1.90, 1.76 and 1.63 mg/L). The results indicate that the water in Great Slave Lake likely has naturally elevated background aluminum levels. Aluminum is typically associated with limestone, dolomite, sandstones and shales which occur in the Pine Point area. Aluminum is also the most abundant metallic element present in the earth's crust.

The highest total iron concentration recorded was 5.9 mg/L at Station 2 in the Buffalo River. Naturally elevated iron levels are commonly linked to the presence of mafic minerals, which also occur throughout this region.

Metals in water samples taken from the Slave River, Little Buffalo River and Great Slave Lake by Evans et al. (1998) were comparable to the EBA (2005a) sample results for Buffalo River, Twin Creek and Great Slave Lake (0.00186 – 0.0332 mg/L total zinc, 0.00015 – 0.0013 mg/L total lead, 0.0013 – 0.0054 mg/L total copper and 0.35 – 10.11 mg/L total iron).

Calcium, magnesium and water hardness, are not included in federal guidelines. However, since they represent important water quality parameters for fish and other aquatic resources, comparisons were made with BC provincial (AWWQC) limits for these parameters. Using this comparison, the BC calcium limit of 4-8 mg/L was exceeded at every site. High levels of calcium and magnesium can be attributed to the geological conditions of the Pine Point area consisting of limestone, dolomite, sandstones and shales.

Water hardness is generally due to the presence of calcium and magnesium in water. High background levels of calcium and magnesium typically produce high water hardness values. General guidelines classify water with 0 to 60 mg/L of calcium carbonate $CaCO_3$ as soft, 61 to 120 mg/L as moderately hard, 121 to 180 mg/L as hard and more than 180 mg/L as very hard.

The 2006 water quality sampling program involved the collection of water samples on May 17, June 05, July 21 and August 18 from three sites (Fen Head, Fen Mid and Twin Creek) located within or immediately adjacent to the Tamerlane LSA (EBA 2006a). The 2006 results indicated that in general, the physical and chemical water quality parameters measured at the three stations during the four sampling periods were low and consistent with the results collected for Twin Creek in 2005.

Consistent with 2005 results for Twin Creek, in 2006, levels of ammonia and trace metals aluminum, chromium and iron were found to be above the CCME FAL Guideline but were indicative of natural background levels in surface waters of the general area.

The 2006 results for physical parameters such as pH (8.2) and electrical conductivity (443µS/cm) were similar to those reported for Twin Creek in 2005. Results for nutrient parameters such as nitrate, and phosphorous were either below the detection limits or very low, which were also consistent with results from 2005.

Ammonia concentrations were above the CCME guideline of 0.00429 mg/L at Twin Creek in both 2005 and 2006. Both the Slave River and the Little Buffalo River are naturally enriched sources of ammonia, chromium and iron, with no evidence that water in this area has been contaminated from past mining activities.

2.9.2 Groundwater Quality

Similar to surface water quality, the groundwater quality in the PPPP area (R190) is strongly influenced by the geological characteristics of the underground formations discussed previously in Section 2.4 and illustrated in Figure 2.4.1. As discussed in that section, groundwater occurs as both a shallow phreatic water table associated with the overburden and also under confined pressure conditions in the bedrock. The natural groundwater table in the Pine Point area varies in depth below surface from approximately 1 m to 18 m depth. Groundwater sampling conducted by EBA at the

R190 site in August 2006 (EBA 2006a) determined that the groundwater table was located at approximately 25 m depth.

Weyer *et al*. (1978, 1979) reported that three basic types of groundwater occur in the Pine Point area, including in the vicinity of the PPPP (R190) site.

- A calcium bicarbonate water, found locally in glacial drifts. Conductivities are less than 1000 µmho/cm. This type of groundwater has been found at a number of locations along the Buffalo River.
- Sulphur water, a sulphate-bicarbonate with Ca++ as the main cation (with S04--). This water is probably derived from the Devonian gypsum layers. Conductivities are usually between 1,000 and 2,000 µmho/cm. This type of groundwater is commonly found in the springs along the south shore of Great Slave Lake from Little Buffalo River to Sulphur Point and across to Windy Point.
- Salty water, sodium chloride brines, derived from groundwater contact with the Devonian evaporite layers. Brandon (1965) reported 420 mg/l chloride in a water sample collected in 1961 at the mouth of the Buffalo River.

The chemistry of most other groundwater samples collected in the Pine Point area over the past 30 years seem to reflect mixing or evolution of these three basic water types.

Analysis of groundwater samples collected in a pump test conducted for Western Mines at the X-25 deposit near Polar Lake by DIAND in 1978 reported the results presented in Table 2.9-1 (cited in Beak 1980).

To gain an understanding of current groundwater quality in the Tamerlane PPPP area, water was sampled from the surface of the R190 Test Well (~25 m depth) in August 2006. Detailed results are presented in EBA (2006a) and key results are presented in Table 2.9-2.

The results of the groundwater analysis should be interpreted with caution as they are not representative of groundwater at greater depths. It is also unknown whether or not these results accurately portray the surficial groundwater conditions, since the chemical make-up of the water reported here may be an artifact of the sampling protocol, leaching from the groundwater pipe, stagnancy of the water and/or predominantly rainwater.

Comparing the 2006 groundwater sample results with the 1978 sampling results obtained for groundwater at the X-25 Deposit near Polar Lake as reported in Beak Consultants

Ltd. (1980), the pH of the water extracted from R190 in 2006 was 7.8, falling within the range of that reported for X-25 in 1978 (7.1 to 8.1). This was the only parameter comparable between the two reported years.

Table 2.9-1
Groundwater Quality from Pump Test at Adjacent X-25 Deposit -1978

Water Quality Parameter	Concentration
pH	7.1 – 8.1
Conductivity (µmho/cm)	3048 - 3122
Turbidity (JTU)	25 – 39
Colour (colour units)	40 - 79
Suspended Solids (mg/l)	160 - 3120
Calcium (mg/l)	407 - 457
Magnesium (mg/l)	167 - 177
Total Hardness (mg/l as $CaC0_3$)	1706 - 1784
Total Alkalinity (mg/l as $CaC0_3$	366 - 420
Sodium (mg/l)	106 - 122
Potassium (mg/l)	<0.1
Cl^{--} (mg/l)	93.5 - 108
SO_4^{--} (mg/l)	145 - 204
Ammonia Nitrogen (mg/l as N)	0.1 - 0.7
Nitrate Nitrogen (mg/l as N)	<0.01
Total Phosphorus (mg/l as P)	<0.005
Total Arsenic (mg/l)	<0.01
Total Cadmium (mg/l)	0.01
Total Copper (mg/l)	0,01 – 0.03
Total Iron (mg/l)	0.48 – 1.59
Total Lead (mg/l)	0.06 – 0.17
Total Mercury (mg/l)	0.01
Total Nickel (mg/l)	0.04 – 0.11
Total Zinc (mg/l)	0.02 – 0.16

Note: Range of data is based on 6 samples taken on August 5, 7, 9, 12, 13, 14, 1978
Source: DIAND 1979 cited in Beak 1980

Conductivity was considerably lower in 2006 (1150 µS/cm) than in 1978 (3048 - 3122 µS/cm). Calcium and magnesium concentrations (mg/L) were lower in 2006 (20.7 and 15.2, respectively) than in 1978 (407 to 457 and 167 to 177, respectively); however sodium and potassium concentrations (mg/L) were higher in 2006 (222 and 8.4, respectively) than in 1978 (106 to 122 and<0.1, respectively).

Total metal concentrations (mg/L) for iron and lead were higher in 2006 (15.5 and 0.0276, respectively) than in 1978 (0.48 to 1.59 and 0.06 to 0.17, respectively). The remaining metals above CCME guidelines for 2006 that were not reported in 1978 are aluminum, chromium and selenium.

Table 2.9-2
Analytes and Trace Metals from Groundwater (R190 Test Well) - August 2006

Analyte	Value	
pH	7.8	
Conductivity (µS/cm)	1150	
Ammonia (mg/L)	3.8	
Nitrate (mg/L)	0.2	
Calcium (mg/L)	20.7	
Potassium (mg/L)	8.4	
Magnesium (mg/L)	15.2	
Sodium (mg/L)	222	
Total Organic Carbon (mg/L)	95	
Metals	**Total Low-level***	**Dissolved Low-level**
Aluminum (mg/L)	0.07	
Chromium (mg/L)		0.0014
Iron (mg/L)	15.5	
Lead (mg/L)	0.0276	
Selenium (mg/L)	0.0012	

*Detection limits are different for total and dissolved low level analysis

Above CCME Guideline

2.10 Aquatic Life

Studies on the aquatic life of major streams and lakes in the Pine Point area, including portions of the regional study area (RSA) and Great Slave Lake have been undertaken since the early 1970's by various parties including the Department of Fisheries and Oceans, Environment Canada, BC Research, Beak, and most recently EBA.

Many of the past studies were undertaken to investigate concerns that the community of Fort Resolution had raised regarding the then operating and/or eventually decommissioned Pine Point Mine. Specifically, the community was (and remains) concerned that the mine had contaminated or was contaminating the water, sediments and fish in the Resolution Bay area with metals released into the environment as a result of past mining operations (Evans *et al.* 1998).

The Traditional knowledge interviews conducted at Fort Resolution and at Hay River (Tamerlane 2006b, c) confirmed that fish are important to the residents of the region. Fish are traditionally harvested in the South Great Slave Region to eat, to feed dogs, to bait traps and to trade. Most of the participants in the interviews indicated that they either historically or currently harvest fish in the South Great Slave Region. Several of the participants indicated having significant experience as commercial fishermen on Great Slave Lake and at the mouth of the Rocher River as far back as the 1950's.

Big Buffalo River was identified as a primary harvesting location. In particular, Big Buffalo River was noted as a traditional harvesting area for whitefish. When asked about Twin Creek, almost all of the participants indicated that it was not used as a harvesting area. Three types of fish were identified as being present at the mouth of Twin Creek including pickerel, suckers and stickleback. Lake trout and pike (jackfish) were identified as being possibly present. Most participants indicated that Polar Lake was a stocked lake that was not used for traditional harvesting.

As previously indicated, the PPPP site is bounded to the east by the Buffalo River (approximately 10 km to the east of the LSA) and to the west by Twin Creek (about 7 km to the west of the LSA). Both of these streams flow north into Great Slave Lake. Figure 2.8-1 illustrated the location of these water bodies relative to the Pine Point Project site and LSA.

A large number of small shallow lakes are scattered throughout the region, particularly between the proposed PPPP (R190) site and Great Slave Lake (Figure 2.8-1). Most of these lakes have no visible drainage, and based on review of the available literature and discussions with fisheries personnel familiar with area (Beak 1980), the only lakes that support fish populations in this area are Great Slave Lake and Polar Lake. The following section of the DAR presents information drawn from the various studies and updated as appropriate by the more recent information collected by EBA (with the assistance of Tom Unka from Fort Resolution) in 2005.

The EBA stream sample sites assessed in 2005 were selected and located with GPS. Stream biophysical sampling consisted primarily of fish habitat assessment. The fish habitat assessment followed the methodology of the Department of Fisheries and Oceans (DFO)/BC Ministry of Environment, Lands and Parks (MELP) Stream Survey Field Guide (1989). Stream survey forms were completed for all sample sites.

Measurements taken at each site included pH, dissolved oxygen (% saturation and mg/L), temperature (°C), and conductivity (µS/cm). Photographs were taken at all sampling sites. Water quality meters (pH: Hanna PHEP3, DO/ Conductivity/ Temp: YSI 85) were calibrated using reference solutions prior to the start of fieldwork. The detailed tabulated results of the 2005 stream sampling program are presented in EBA (2005a). A complete copy of this report is provided in Appendix B of this DAR.

2.10.1 Buffalo River

Buffalo River is a large river originating from Buffalo Lake located in the southernmost portion of the NWT. It receives drainage from many other small lakes and wetlands upstream (south) of the RSA and northward en route to Great Slave Lake. The overall length of Buffalo River is approximately 155 km. From the Highway 5 bridge to the mouth of the river, it is approximately 100 m wide. Water flows strongly, and is generally turbid, with much of the substrate being covered with silt. Much of the river has a mud bottom, with gravel and cobbles present in faster flowing areas (EBA 2005a; Beak 1980). Buffalo River water flows year-round with higher levels of flow occurring during the annual spring melt.

During the 2005 sampling program, aquatic insects were observed in the river at many locations but no fish were observed at any location due to the highly turbid nature of the water (EBA 2005a). A full description of the biophysical characteristics of the Buffalo River sample sites is presented in EBA (2005a).

The Buffalo River is known to be used by inconnu (*Stenodus leucichthys*) to reach spawning areas in Buffalo Lake (G. Low, pers. com, cited in Beak 1980). This migration route is one of very few known migration routes used by this species. Inconnu are typically evident in Buffalo Lake in early September and spawn during late September and early October. Residents of Hay River report a rapid downstream migration following spawning, typically in mid October. Buffalo Lake has supported a domestic fishery for inconnu and Lake Whitefish (Beak 1980)

Other larger fishes found in the Buffalo River include lake whitefish (*Coregonus clupeaformis*), northern pike (*Esox lucius*), pickerel (*Stizostedion vitreum*) and burbot (*Lota lota*) (Beak 1980; Evans *et al.* 1998; Stewart 1999). The mouth of the Buffalo River has been known to support a locally fishery.

2.10.2 Twin Creek

Twin Creek is a small stream that drains several small lakes and wetlands to the south of the Pine Point study area northward into Great Slave Lake. The overall length of Twin Creek is approximately 45 km. According to satellite imagery, maps and onsite field studies, the stream channel is often undefined and travels through sphagnum bogs. Twin Creek has a typical seasonal water flow with higher flows occurring during spring melt.

During the 2005 sampling program, aquatic insects were observed in Twin Creek at many of the sampling locations but no fish were observed at any location. A number of beaver dams are located along the stream between Highway 5 and Great Slave Lake (EBA 2005a). Such dams were also noted by Beak (1980). At that time these dams were reported to support heavy growths of aquatic vegetation including *Potamogeton* sp., *Typha Latifolis*, horsetails (*Equisetaceae* sp.), *Nymphaea* sp., and extensive areas of sedges (likely *Carex* sp.). The creek mouth into Great Slave Lake flows through a low-gradient wetland, which supports a heavy growth of emergent vegetation EBA 2005a). The habitat was judged to be suitable for spawning by northern pike and suckers (EBA 2005a; Beak 1980). A full description of the biophysical characteristics of the Twin Creek sample sites is presented in EBA (2005a).

Fish species known or believed to occur in the Twin Creek drainage include white sucker (*Catostomus commersoni*), longnose sucker (*Catostomus catostomus*) northern pike (*Esox lucius*), and brook stickleback (*Culaea inconstans*) (EBA 2005a).

2.10.3 Great Slave Lake

Great Slave Lake is the second largest lake in the Northwest Territories (behind Great Bear Lake), the deepest lake in North America at 616 m (2,027 ft.), and the sixth largest lake in the world. It is 456 km long and 19 to 109 km wide. It covers an area of 28,400 km^2. It has an approximate volume of 2,090 km^3.

The shoreline area of Great Slave Lake between the mouths of Twin Creek and the Buffalo River is relatively regular in shape and has little terrestrial vegetation. The beach and nearshore area along the shoreline generally consists of fine sand and silt. Localized beds of emergent vegetation occur along the shoreline to about 10 m offshore in the lake. The nearshore lake water is often murky due to the regular suspension of shallow sediments by wave action (as can be seen in satellite imagery, e.g. Figure 2.8-1).

At least 27 species of fish are known to occur in Great Slave Lake (Scott and Crossman 1973; Stewart 1999). The common and scientific names of these fish are presented in Table 2.7-1. The area of the lake nearest the PPPP RSA, and in particular, the area around the mouth of the Buffalo River, has been subject to fishing for inconnu, lake whitefish and lake trout by residents of Fort Resolution during the open water season (Beak 1980, Stewart 1999).

2.10.4 Polar Lake

Polar Lake, located about 6.4 km to the east of the PPPP (R190) site, is a shallow lake with no significant surface feed streams or outlet drainages. Historically this lake was stocked to provide a recreational fishery for a group of sportsmen from the former town of Pine Point. The lake was stocked with brook trout (*Salvelinus fontinalis*) in 1971 and rainbow trout (*Salmo gairdneri*) in 1972, 1977, and 1978. The lake was scheduled for stocking in 1979 but no suitable hatchery stock was available that year. During the years when the former Pine Point mine was operational, the lake was used during the summer and winter by sports fishermen (Beak 1980).

More recently, the lake has been stocked with Arctic char. At this time, the Municipality of Hay River manages and maintains a campground and picnic area at Polar Lake for the use and enjoyment of local residents and tourists. Motorized vessels are not permitted on the lake but the lake is ideal for canoeing. Most participants in the Traditional Knowledge interviews (Tamerlane 2006a,b) confirmed that Polar Lake was a stocked lake that was not used for traditional harvesting.

Table 2.10-1
Fish of Great Slave Lake

Common Name	Scientific Name
lake trout	**Salvelinus namaycush**
lake whitefish	*Coregonus clupeaformis*
Northern pike	*Esox lucius*
pickerel (walleye)	*Stizostedion vitreum*
Inconnu	*Stenodus leucichthys*
chum salmon	*Oncorhynchus keta*
lake cisco (lake herring)	*Coregonus artedii*
round whitefish	*Prosopium cylindraceum*
Shortjaw cisco	*Coregonus zenithicus*
goldeye	*Hiodon alosoides*
Arctic grayling	*Thymallus arcticus*
Arctic lamprey	*Lampetra japonica*
lake chub	*Couesius plumbeus*
flathead chub	*Hybopsis gracilis*
emerald shiner	*Notropis atherinoides*
spottail shiner	*Notropis hudsonius*
longnose dace	*Rhinichthys cataractai*
longnose sucker	*Catostomus catostomus*
white sucker	*Catostomus commersoni*
trout-perch	*Percopsis omiscomaycus*
Burbot	*Lota lota*
brook stickleback	*Culaea inconstans*
ninespine stickleback	*Pungitius pungitius*
yellow perch	*Perca flavescens*
slimy sculpin	*Cottus cognatus*
spoonhead sculpin	*Cottus ricei*
fourhorn (deepwater) sculpin	*Myoxocephalus quadricornis*

Sources: Scott and Crossman 1973; Stewart (DFO) 1999

2.10.5 Physical and Chemical Makeup of Fish, Water and Sediments of Great Slave Lake

The community of Fort Resolution has long been concerned about possible contamination of the environment and it's natural resources in the Pine Point area since the beginning of mining operations in 1965. In response to community, and subsequently, resource agency concerns, beginning in the 1970's a number of environmental assessment studies have been conducted to investigate the possible impact of mining operations on the land and natural resources in the nearshore region of Great Slave Lake (Evans *et al.* 1998).

Stein and Miller (1972) of the Department of Fisheries conducted the first such study on the fish, water and sediments of Great Slave Lake in the vicinity of the Pine Point mine operation. This study was followed by further studies conducted by BC Research on related subjects in 1977 and 1978 on behalf of Pine Point Mines Ltd (BC Research 1978), Allan in 1979 (Allan 1979), DIAND in 1992 and 1993 (DIAND 1997), Klavercamp and Baron (1996) in 1994 and the most recent study results collected in 1996 and reported by Evans *et al.* (1998).

The key results and conclusions of all of these studies were reviewed, along with the latest results, in a National Hydrology Research Institute (NHRI) report co-authored by M.S. Evans of NHRI and the Department of Fisheries (Evans *et al.* 1998).

The Evans *et al.* study was supported by DIAND and was initiated in 1996 after receiving inputs from Patrick Simon and Maurice Boucher, Environmental Officers with Deninu Ku'e First Nation. Lloyd Norn (Fort Resolution) assisted with sampling in Great Slave Lake and Tom and Darwin Unka (Fort Resolution) assisted with fish and river sampling. Gabriel Lafferty (Fort Resolution) and Pamela Taylor (Hay River) helped with the collection of burbot in December 1996 (Evans *et al.* 1998).

Since all of the earlier results and the status of existing knowledge on the health of the environment of Great Slave Lake in the Pine Point area were summarized in the report by Evans *et al.* (1998) the following updated information was drawn directly from this report.

In September 1996, water and surficial sediment samples were collected from 7 sites (5 in Great Slave Lake; one in each of the Slave River and Little Buffalo River). Limnological data (temperature, conductivity, pH, oxygen, water clarity, turbidity, suspended sediments and particulates, chlorophyll, bacteria and plant nutrients) were also collected to provide insight into water movement and dilution in the eastern side of Resolution Bay, Great Slave Lake.

The Evans *et al.* (1998) study determined that the Slave River was an enriched source of iron, manganese and possibly nickel during the study. The Slave River was also identified to be a significant source of suspended sediments, particulates and various plant nutrients. The Little Buffalo River was identified as an enriched source of salinity (salt), dissolved nitrogen, ammonia and possibly iron and manganese during the study.

Other findings of Evans *et al.* (1998) were the following (quoted from the report abstract):

"*there was no evidence that water in the study area was being contaminated by the decommissioned mine. A review of the documentation on the operation and decommissioning of the mine site provided no indication of any mechanism by which water flowing through the study region could be significantly contaminated by the decommissioned mine.*

Metal concentrations in surficial sediments were determined at the same sites where the water column was sampled. Metal concentrations in the sediments sampled were similar to concentrations observed in suspended sediments in the Slave River, and, overall, similar to average concentrations in the earth's crust. There was no evidence of contaminated sediments offshore of the decommissioned mine site.

A review of the documentation on the operation and decommissioning of the mine site provided no indication of any mechanism by which the mine could have significantly contaminated sediments in the study region. While decanted water from the tailings pond was released into the muskeg, this water was apparently rapidly diluted (and adsorbed) into the muskeg. There was no mechanism to transport large, concentrated volumes of suspended sediments to Great Slave Lake.

A sediment core collected in a depositional area offshore of the decommissioned mine site was examined for metals. The time period extended from the late 1880s to the early 1990s. There was no evidence of an increase in metal concentrations in this core during the period in which the mine was operational.

Pike from the Little Buffalo River, and burbot from the Slave River were examined for metals (muscle, liver and kidney) and metallothionein (liver, kidney) concentrations. A small number of inconnu (3) from the Slave River and walleye (1) from each river were also examined.

Metal concentrations were similar to those observed in fish collected from the Slave River, Yellowknife Bay and Leland, Alexie and Trout lakes. Overall there was no evidence that fish in the Resolution Bay area, including the Little Buffalo and Slave rivers, were contaminated with metals by the decommissioned Pine Point Mine.

Metallothionein and arsenic concentrations in burbot kidney were similar to values reported from the Northern River Basin Study (Klavercamp and Baron 1996) *for all study sites except the 1994 sampling of the Slave River delta. Thus, we were unable to verify the elevated metallothionein values in burbot kidney, which were observed in 1994 for the Slave River sampling.*

The reasons for the elevated metallothionein concentration in burbot kidney (and gills) in 1994 cannot be explained. We have, however, determined that these elevated values could not be due to the decommissioned Pine Point Mine. Other studies have determined that Outlet Creek and the Peg Creek *outflow in Yellowknife Bay are contaminated with metals from the gold mines at Yellowknife. However, it is very unlikely that the burbot collected in the Slave River in 1994 originated from these outflows".*

Since the subject of contaminant concentrations in Great Slave Lake fish, water and sediments remains of ongoing concern to residents of the area and resource management agencies, Tamerlane suggests that a complete copy of the National Hydrology Research Institute (NHRI) report co-authored by M.S. Evans of NHRI and the Department of Fisheries (Evans *et al.* 1998) be placed on the public record with the MVEIRB.

2.11 Vegetation

The Regional Study Area (RSA) covers an area of 36,153 ha and is located on the edge of the Boreal Plains and the Taiga Plains Ecozones. It encompasses the Slave River and Hay River Lowland Ecoregions. The area is characterized by short, cool summers and long, cold winters. These ecoregions are classified as having a subhumid mid-boreal ecoclimate (Environment Canada 2000, as cited in EBA 2005b).

The vegetation of these ecoregions and the RSA is typically characterized by medium to tall, closed stands of jack pine and trembling aspen. White spruce and black spruce dominate later successional stands. Poorly drained fens and bogs in this region are covered with low, open stands of larch), black spruce and ericaceous shrubs (Environment Canada 2000, as cited in EBA 2005b).

During the PPPP site tour conducted as part of the MVEIRB scoping sessions in mid August 2006, and the Traditional Knowledge interviews conducted in October 2006 (Tamerlane 2006b, c), a number of the community participants discussed plant species found in the LSA that were of particular importance to the people of the region. These included various berries (strawberry, raspberry, gooseberry, blueberry, cranberry loganberry, juniper berry and saskatoons), Labrador tea and rose hips. Other important plants/trees with medicinal properties include white rat root, spruce gum, Tamarack and birch trees. These plants are all commonly found in suitable sites throughout the RSA and the entire Pine Point region and beyond.

During the Traditional Knowledge interviews, most of the people interviewed indicated that seasonal fires were a common occurrence in the South Slave Region. The most frequently mentioned fires included the Pine Point fire (early 1970's) and the Hay River/Pine Point fire (1981) that burned from Alberta to Great Slave Lake and from Hay River to Pine Point, including the proposed PPPP area.

Vegetation mapping of the general Pine Point area, including the proposed PPPP (R190) area was first undertaken in 1977 by BC Research using black and white aerial photographs and fieldwork. Mapping of the area was carried out again using aerial photographs taken in June 1979 by Beak Consultants Ltd. The plant communities identified from these studies were: jack pine, aspen, mixed jack pine/black spruce, white spruce, black spruce, shrub, fen, muskeg and burn, for a total of nine distinct types.

In September 2005, on behalf of Tamerlane, EBA collected new baseline vegetation and ecosystem data for the 36,153 ha RSA. Two objectives were outlined for the updated baseline study:

1. Define vegetation and ecosystems on the basis of field studies;
2. map and characterize the study area landscape using defined ecosystem units and high resolution satellite imagery

Field data collection occurred from September 19 to 23, 2005. Mapping at a scale of 1:50,000 was completed using Quickbird satellite imagery. Collection of field data followed the standards established in British Columbia for Describing Terrestrial Ecosystems in the Field (DTEIF) (Province of British Columbia, 1998) and for TEM (RIC, 1998a). All plot position coordinates were determined using Global Positioning System (GPS), with an expected accuracy of 6-8 m. The ELC field crew consisted of a two-person team, which undertook a range of field measurements described below.

A total of 19 full plots and 19 visuals were completed for a total of 38 sample plots in 241 polgyons. A sampling ratio of 50:0:50 was achieved for full, GIF and visual plots in the field. The 38 plots sampled within 241 polygons (not including water), resulted in a 16 % sampling intensity for the project. This meets the requirements for a TEM Level 4 survey. The final number of plots sampled was reduced from the pre-field planning target numbers (as mentioned in Section 4.1). This adjustment was due to difficulties in accessing potential sample locations. To make up for the difficulties in access, more full plots were completed to ensure sufficient information was collected to adequately describe the ecosystem types.

In each of the full plots, the following site information was collected: plot number, date, UTM coordinates, elevation, exposure, aspect, slope, macro- and meso-site position, soil moisture, drainage and nutrient regime, ecosystem unit name, successional status, structural stage, and surface substrate (bedrock, rocks, mineral soil, wood, organic matter and water). Notes describing the plot-in-context and variability within the polygon were recorded. The vegetation data collected in the field were used to determine ecosystem classification.

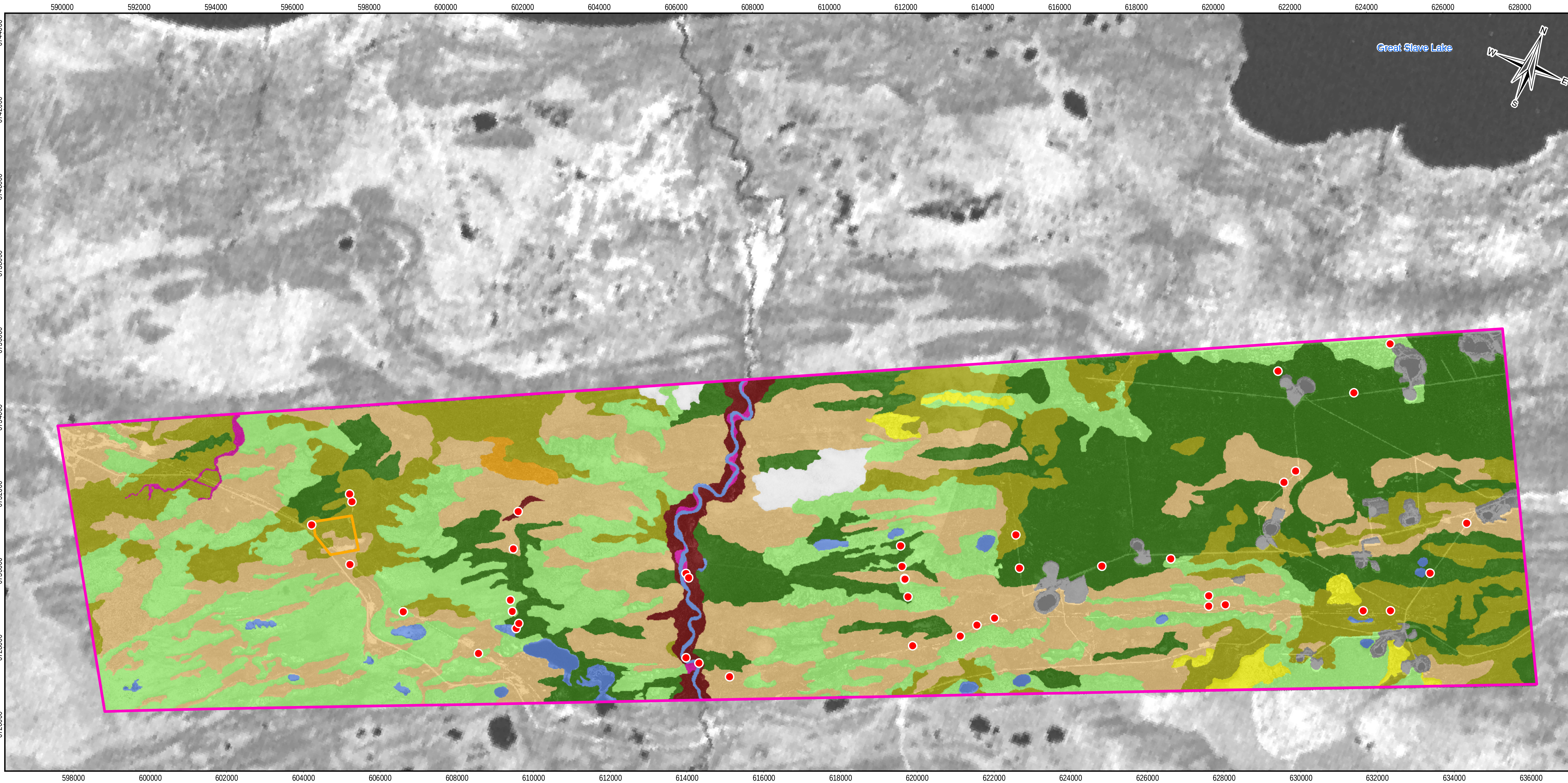
Eleven ecosystem units were classified within the Pine Point study area (Table 2.9-1). Eight of these are naturally vegetated, one is classified as water, one is anthropogenic and one is cloud. The most common ecosystem is the upland, Labrador Tea – Mesic ecosite (28.3 %). The Shrubby and Treed fens are second and third in area (24.6 % and 24.3 %). The Bearberry and Willow / Horsetail ecosites have restricted distribution. Each covers less than 1 % of the study area (EBA Vegetation, 2005).

2.11.1 Ecosites

The eight naturally vegetated ecosites occurring in the Pine Point study area were divided into upland, lowland and riparian general categories. The other three ecosites were categorized as Water, Previous Mined Area and Cloud (Figure 2.11-1). A description of each category from EBA's report follows:

2.11.1.1 Upland

Upland landforms cover 46.9 % of the study area. Upland landforms include Bearberry Pj, Canada Buffalo – Green Alder, Labrador Tea – Mesic, and Labrador Tea – Suhygric ecosites. They are dominated by jack pine, aspen and paper birch in seral communities, and black and white spruce in climax communities. Immediately after fire, the communities are dominated by fast growing deciduous seral species such as paper birch and alder (*Alnus* species). The slower growing jack pine becomes the dominant species a few years after fire. In the study area, numerous successional stages due to fire were observed.



LEGEND

- Local Study Area (LSA)
- Regional Study Area (RSA)
- Sample Point Location

UPLAND
- Bearberry Pj
- Canada Buffalo-Berry-Green Alder
- Labrador Tea-Mesic
- Labrador Tea-Subhygric

LOWLAND
- Treed Fen
- Shrubby Fen
- Graminoid Fen

RIPARIAN
- Willow/Horsetail

OTHER
- Water
- Disturbed
- Unknown (cloud cover)

NOTES

Base data source:
Landsat TM bands 7,4,1 (GLFC)
Quickbird, Pacific GeoAnalytic

PINE POINT PILOT PROJECT

Pine Point RSA Landscape and Ecosite Classification

PROJECTION	DATUM
UTM Zone 11	NAD83

Scale: 1:110,000

2 1 0 2

Kilometres

FILE NO.
1740149-005_Map002

PROJECT NO.	DWN	CKD	REV
1740164	KMW	RH	0

OFFICE	DATE
EBA-VANC	December 14, 2006

Tamerlane Ventures Inc.

EBA Engineering Consultants Ltd.

Figure 2-11.1

Q:\Vancouver\GIS\0701_YEL\1740149-PinePoint\maps\005\1740149-005_Map002.mxd

Table 2.11-1
Ecosites and Distribution within the Regional Study Area

Ecosytem Type	Total Area (ha)	Number of Polygons	Average Polygon Size (ha)	Area as % of Total Area
Upland				
Bearberry Pj	126	1	126	0.3%
Canada Buffalo-Berry - Green Alder	531	8	66	1.5%
Labrador Tea – Mesic	10,249	45	228	28.3%
Labrador Tea – Subhygric	5,456	40	136	15.1%
Riparian				
Willow / Horsetail	112	13	9	0.3%
Lowland				
Treed Fen	8,795	40	220	24.3%
Shrubby Fen	8,895	46	193	24.6%
Graminoid Fen	388	8	49	1.1%
Other				
Open Water	483	22	22	1.3%
Previous Mined Area	710	15	47	2.0%
Cloud	408	3	136	1.1%
Total	**36,153**	**241**	**150**	**100.0%**

2.11.1.2 Lowland

Lowland landforms are the most abundant covering 50.3 % of the study area. They are wetland ecosystems that include Graminoid, Shrubby and Treed Fen ecosites. The fens are generally restricted to areas of poorly drained organic soils. Soils tend to be rich in nutrients. Stand composition varies due to the fire regime. Early successional stands are dominated by an open canopy of bog birch, while mature stands have a closed canopy of black spruce and larch.

2.11.1.3 Riparian

The Willow/Horsetail ecosite is the only riparian landform identified in the study area. It covers less than 1 % of the study area. The ecosite occurs adjacent to streams and rivers and riparian succession. It results in a broad range of structural stages from young seral to mature climatic climax. It has poor drainage and frequently floods. It has a rich nutrient regime. Common species are willow (*Salix* species), river alder (*Alnus incana*), balsam poplar and red osier dogwood (*Cornus stolonifera*). The herb layer is dominated by horsetail (*Equisetum* species), reed grass (*Calamagrostis canadensis*) and sedges (*Carex* species).

2.11.1.4 *Water*

All open water included in the study is classified as Water. It was not possible to distinguish shallow open water from lakes. Water accounts for 1.3 % of the study area.

2.11.1.5 *Previous Mined Area*

Previous Mined Areas are identified as a disturbed non-vegetated ecosite. Other anthropogenic areas such as roads and gravel pits were not identified as part of the baseline report. Previously Mined Areas account for 2 % of the study area.

2.11.1.6 *Cloud*

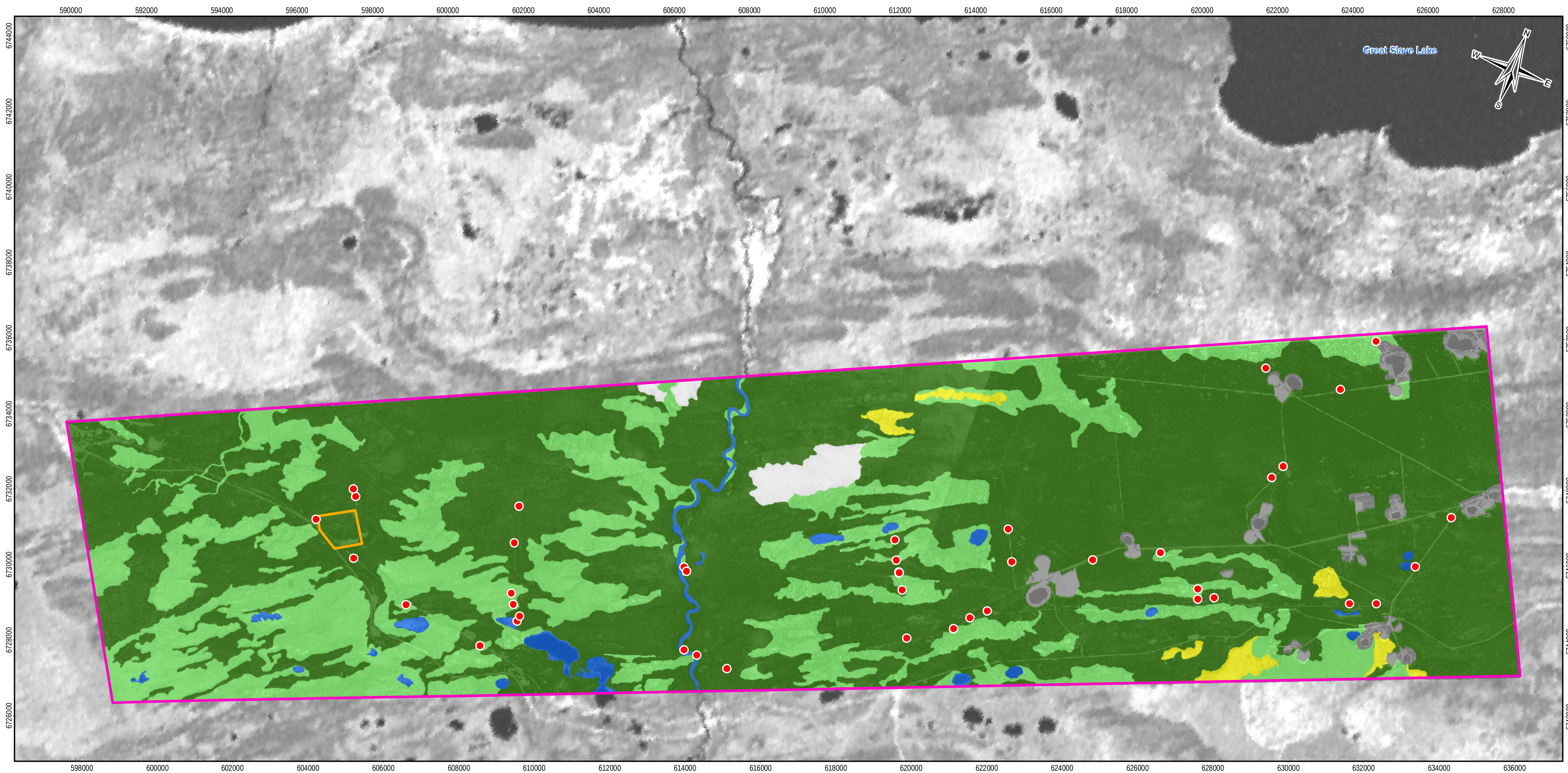
Clouds covered a portion of the study area during the time the satellite imagery was acquired. This portion could not be mapped. Cloud covers 1.1 % of the study area.

Table 2.11-2
Landscape Units within the Regional Study Area

Landforms	Total Area (ha)	Number of Polygons	Area as % of Total Area
Upland	16,362	94	45.2%
Lowland	18,078	94	50.0%
Riparian	112	13	0.3%
Water	483	22	1.3%
Previously Mined Area	710	15	2.0%
Cloud	408	3	1.1%
TOTAL	**36,153**	**241**	**100.0%**

2.11.2 Structural Stages

Vegetation height was used to define and quantify the Pine Point area's structural stages (Table 2.11-3) (Figure 2.11-2). Vegetation greater than 10m was categorized as "forest." Vegetation less than 10m was categorized as "shrub." The majority of the study area is forested (69.6 %). Shrubs (24.9 %) are typically located in riparian zones and lowland areas that have been burnt. Graminoid areas (1.1 %) are often interspersed with shrubs (EBA 2005b).



LEGEND

- Local Study Area (LSA)
- Regional Study Area (RSA)
- Sample Point Location
- Forest
- Shrub
- Graminoid
- Water
- Disturbed
- Unknown (cloud cover)

NOTES

Base data source:
Landsat TM bands 7,4,1 (GLFC)
Quickbird Pacific GeoAnalytic

PINE POINT PILOT PROJECT

Pine Point RSA Structural Stages

PROJECTION	DATUM
UTM Zone 11	NAD83

Scale: 1:110,000

2 1 0 2

Kilometres

FILE NO.
1740149-005_Map003

PROJECT NO.	DWN	CKD	REV
1740149.005	KMW	RH	0

OFFICE	DATE
EBA-VANC	December 14, 2006

Tamerlane Ventures Inc.

EBA Engineering Consultants Ltd.

Figure 2.11-2

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Table 2.11-3
Structural Stages within Study Area

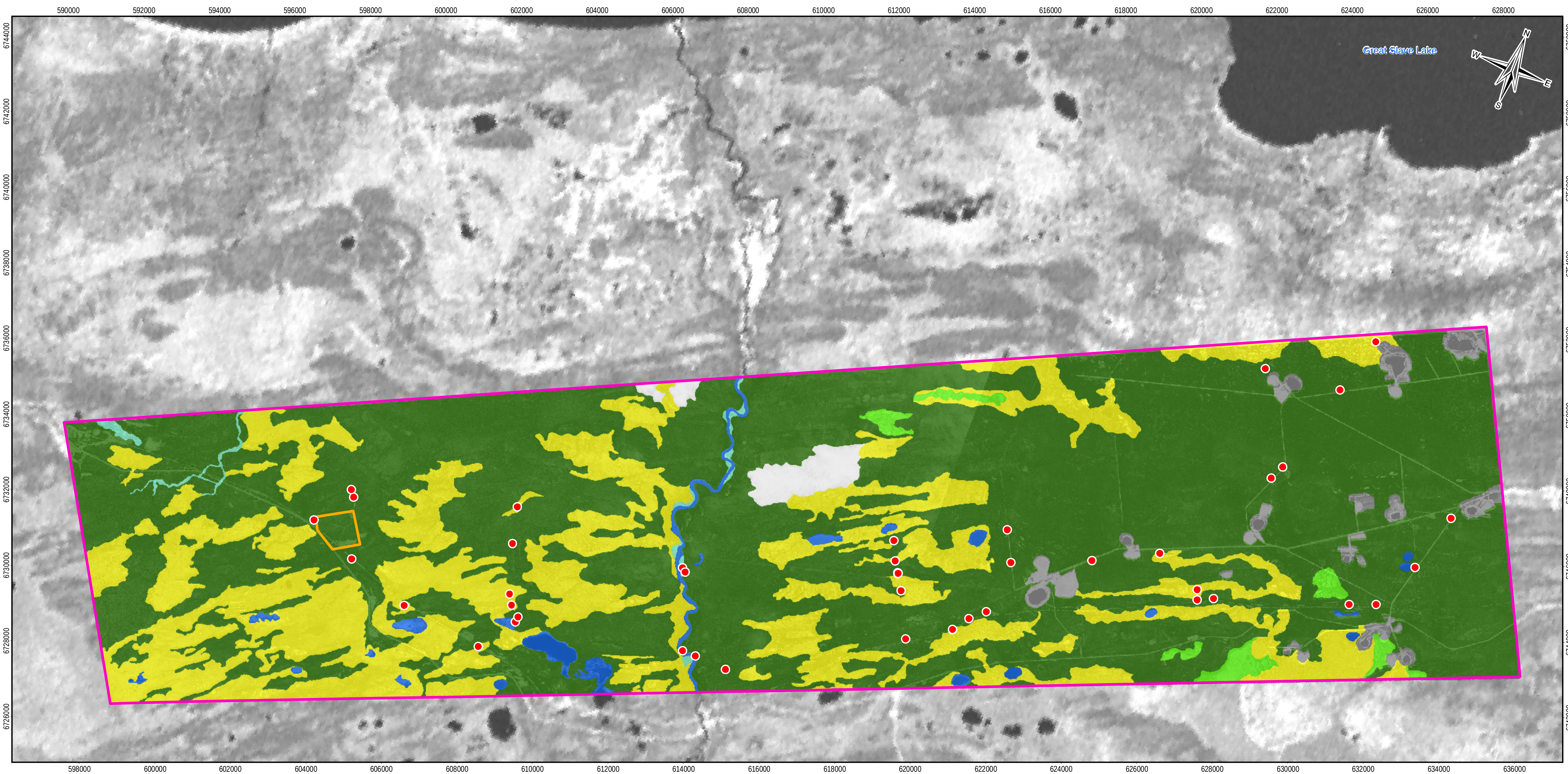
Canopy	Total Area (ha)	Number of Polygons	Area as % Total Area
Forest	25,171	135	69.6%
Shrub	8,993	58	24.9%
Graminoid	388	8	1.1%
Not Applicable[1]	1,601	40	4.4%
TOTAL	**36,153**	**241**	**100.0%**
[1] includes non vegetated, water and cloud			

2.11.3 Stand Composition

Stand composition was also examined. The Pine Point study area was categorized into broadleaf, coniferous, mixed and graminoid categories (Table 2.11-4) (Figure 2.11-3). Results of the study indicated that conifer-dominated stands are the most common stand composition category. They cover approximately 69 % of the study area. The stands cover both upland and lowland units including pine forests, treed fens and white and black spruce forests along the Buffalo River. Mixed stands cover approximately 25 % of the study area. The mixed stands are predominately bog birch (Betula nana) and regeneration of larch and black spruce in lowland areas are a result of historical fire disturbances. A few white spruce (Picea glauca) – balsam poplar (Populus basamifera), aspen or paper birch (Betula papyrifera) forests were observed during the field surveys. However, they were generally too small to map (EBA 2005b).

Table 2.11-4
Stand Composition within Study Area

Stand Composition	Total Area (ha)	Number of Polygons	Area as % Total Area
Broadleaf	126	13	0.3
Coniferous	24,998	132	69.1
Mixed	9,040	48	25.0
Graminoid	388	8	1.1
Not applicable[1]	1,601	40	4.4
TOTAL			
[1]includes non vegetated, water and cloud			



LEGEND

- Local Study Area (LSA)
- Regional Study Area (RSA)
- Sample Point Location
- Coniferous
- Broadleaf
- Mixed
- Graminoid
- Disturbed
- Water
- Unknown (cloud cover)

NOTES

Base data source:
Landsat TM bands 7,4,1 (GLFC)
Quickbird, Pacific GeoAnalytic

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PINE POINT PILOT PROJECT

Pine Point RSA Stand Composition

PROJECTION	DATUM
UTM Zone 11	NAD83

Scale: 1:110,000

2 1 0 2

Kilometres

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FILE NO.			
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PROJECT NO.	DWN	CKD	REV
1740164	KMW	RH	0
OFFICE	DATE		
EBA-VANC	December 14, 2006		

Figure 2.11-3

2.11.4 Rare Plant Survey

During the summer of 2006, a rare plant survey (RPS) was completed for the Local Study Area (LSA), as part of the ongoing environmental baseline investigations being conducted by EBA for Tamerlane (EBA 2006b). As previously discussed, a vegetation resources/ELC field program was completed for the Regional Study Area (RSA) in 2005, however due to timing constraints, the rare plant survey (RPS) was postponed to 2006. The intent of the 2005 vegetation/ELC field program was to map ecosites in the RSA, based on common vegetation characteristics. Rare plants are often found in unique habitats that are not sampled within an ELC program so a RPS is conducted separately but also serves to supplement the ELC program.

The two main objectives of the RPS were to map the ecosites within the LSA and to determine if any rare plants are present in areas that will be directly affected by the proposed development footprint.

Prior to conducting the rare plant survey, a list of rare plants and plant communities of special concern potentially occurring in the LSA, and in similar habitats in the region (Slave River and Hay River Lowland Ecoregions of the Boreal Plains and the Taiga Plains Ecozones, respectively), were obtained from Department of Resources, Wildlife and Economic Development (RWED) and McJannet *et al.* (1995). A rare plant list, appropriate for this landscape, was generated which includes 108 species (EBA 2006b, Appendix B). A variety of vascular plant references (e.g. Anderson 1974; Brodo *et al.* 2001; Douglas *et al*. 1981; Hulten 1968; Kershaw *et al*. 2001; McJannet *et al.* 1995; Porsild and Cody 1980; and, Vitt *et al.* 1988) were consulted for taxonomic diagnostic information.

The RPS survey focused on those areas that would be directly impacted by the proposed Pilot Project footprint. Survey methods followed Alberta Native Plant Council (ANPC) guidelines for qualitative and quantitative rare plant surveys (Lancaster 2000). Other references were consulted in refining the field approach for the rare plant survey. This included identifying ecosites, landscape features and landscape anomalies for field examination.

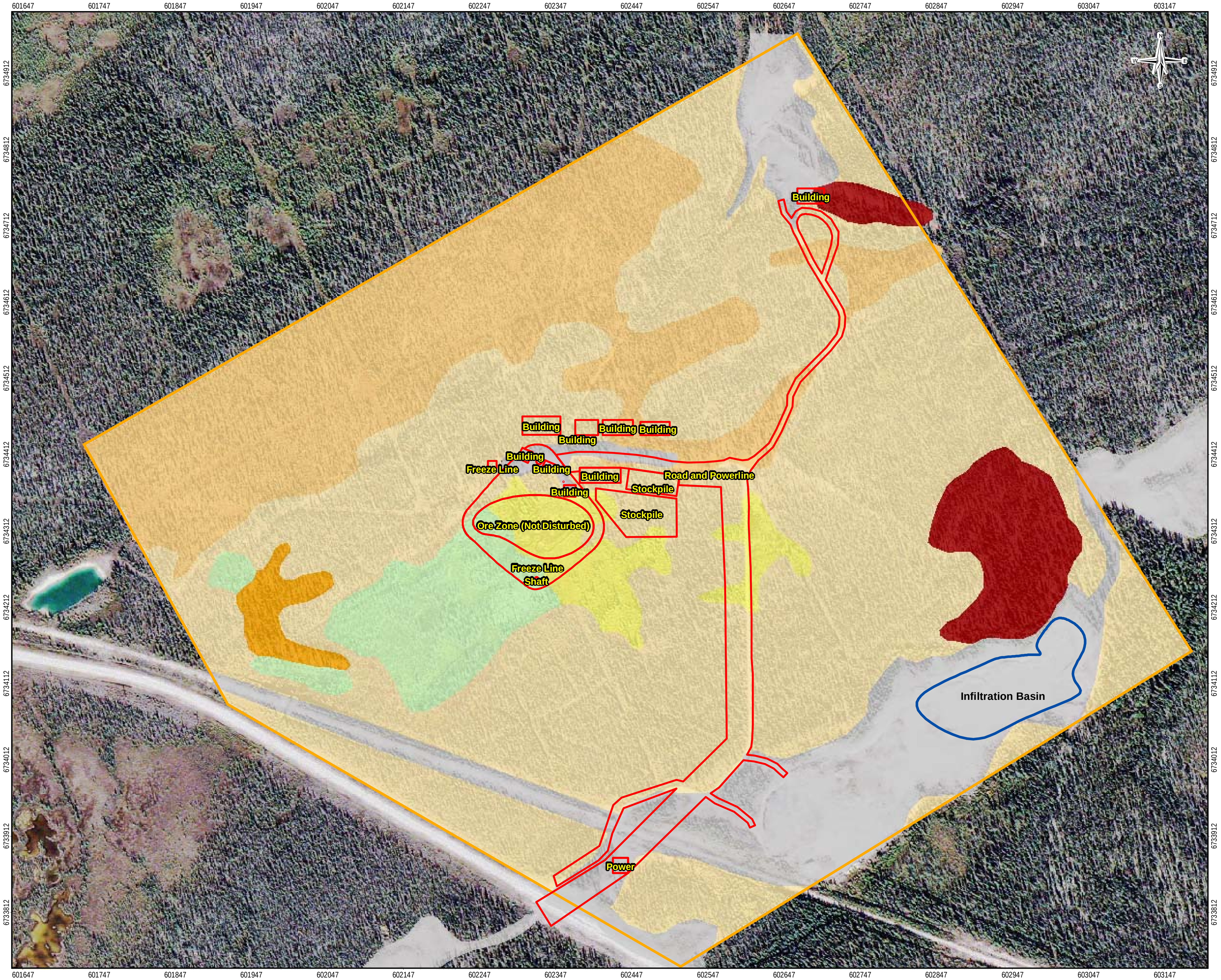
Fieldwork for the RPS was conducted in two parts. The first survey was completed from July 10 and 11, 2006, and the second survey was completed from August 14 and 15, 2006. The survey occurred at two times during the growing season to respond to plants that flower in response to the photoperiod (long, short or neutral day-length). This also allowed for the inclusion of plants with a neutral response to photoperiod.

Along with the RPS, ecosites within the LSA were also identified and mapped. This mapping is supplemental to the 2005 mapping. The 2005 mapping was completed at a 1:50,000 scale. The RPS is completed on a much smaller scale (1:5,000) allowing for a more detailed map product. The identification of the ecosites within the LSA allowed for a focused approach when conducting the RPS.

The 2005 ecological land classification identified the LSA as Labrador tea-mesic (Beckingham and Archibald 1996). The 2006 mapping identified six ecosites within the LSA: bearberry Pj, Canada buffalo berry-green alder, graminoid fen, Labrador tea-mesic, shrubby fen and disturbed as identified in Figure 2.11-4.

A total of 13.1 km of transects were surveyed within the seven ecosites and 3.9 km of transects were surveyed for the proposed development footprint. This represents a survey intensity of 128 m/ha and 560 m/ha, respectively. There are no guidelines for survey intensity, however EBA determined that this represents a high sampling intensity and readily meets the requirements of due diligence. All species observed within the study area were recorded. A complete species list is provided in EBA (2006b, Appendix B).

All proposed PPPP infrastructure sites were surveyed, with the exception of the shaft, which represents a very small portion of the disturbance area. No rare plants were observed in either the July or August survey. It is important to note that a survey of this type cannot confirm the absence of these species - it can only confirm their presence.



LEGEND

- Local Study Area (LSA)
- Footprint

Ecosites

- Bearberry Pj
- Canada Buffalo-Berry-Green Alder
- Labrador Tea-Mesic
- Labrador Tea-Mesic (burnt)
- Shrubby Fen
- Graminoid Fen
- Disturbed
- Infiltration Basin (preferred)

NOTES

Base data source: Quickbird Imagery (Digital Globe) acquired Aug. 31 and Sept. 02, 2005

PINE POINT PILOT PROJECT

Vegetation Ecosites within the LSA

PROJECTION	DATUM
UTM Zone 11	NAD83

Scale: 1:5,000

100 50 0 100

Meters

Tamerlane Ventures Inc.

EBA Engineering Consultants Ltd.

FILE NO.			
1740149-005_Map012			
PROJECT NO.	DWN	CKD	REV
1740149	KMW	SH	1
OFFICE	DATE		
EBA-VANC	December 14, 2006		

Figure 2.11-4

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2.12 Wildlife

2.12.1 Historical Wildlife Studies

Early science-based wildlife studies of the Pine Point area were first conducted during the period 1976 to 1980 by BC Research to evaluate the environmental consequences of Cominco's mining operation at Pine Point (BC Research 1983). Large mammal surveys (i.e. caribou, moose, bison) were first conducted using fixed-wing aircraft in March 1976. The survey covered the area between Buffalo River and Little Buffalo River north to the shores of Great Slave Lake. The southern boundary of the survey area was Wood Buffalo National Park. All large mammal tracks and sightings were recorded (BC Research 1983). A second survey was carried out by BC Research by helicopter, followed by a ground survey in the summer of 1977. All observations of wildlife were recorded.

These early studies indicated that:

> "*large mammals may be less common than in the past due to habitat removal and people pressure, such as vehicular traffic and hunting, whereas there appeared to be little impact on upland furbearers*".

BC Research (1983) also reported that:

> *"the most productive furbearer habitat near Pine Point appeared to be located outside the areas of direct mining activity. Aquatic furbearers may have benefited from the creation of additional habitat, due to discharge of water from the open pits. However, the relatively low temperature of pit water may have reduced the productivity of their habitat, and thus may have degraded habitat that existed before the discharge of pit water began"*.

During the bird-nesting season in 1978, BC research conducted a bird census study. The primary objective of that study was to provide a baseline inventory of aquatic birds which breed north of the Pine Point tailings area, along the shore of Great Slave Lake from Sulfur Point to Paulette Creek, and at several small islands and reefs near Paulette Island (BC Research 1983).

The most abundant aquatic birds observed during the 1978 survey were: Mallard, herring gulls, other unidentified gulls, shorebird species, scaup species, pintail, red-breasted and common merganser, Arctic terns and American wigeon. Effects of the tailings water discharge on the avifauna of the Pine Point region appeared to be minimal and confined to a relatively small area immediately adjacent to the north edige of the Pine Point Mine tailings area (BC Research 1983).

In 1980, Mr. Jim Beaulieu of the former NWT Wildlife Service indicated that moose and woodland caribou were the principal ungulates found in the R190 (Tamerlane PPPP) study area, although neither species was believed to be very abundant (Beak 1980). BC Research (1977) concluded that densities were low in the Pine Point area on the basis of winter surveys between Buffalo and Little Buffalo rivers, and browse and pellet group surveys in summer.

BC Research (1977) determined that carnivores in the study area included black bear, coyote, wolf and red fox. Black bears were reported to be particularly common in the Pine Point area by BC Research. Lynx, marten, fisher, ermine, least weasel, mink, wolverine and river otter were also reported to occur in the area.

Aquatic furbearers such as muskrat and beaver were also reported to be common in the area (BC Research 1977). Active beaver dams were noted by Beak (1980) in the R190 (Tamerlane PPPP) study area along the tributary streams of the Buffalo River, and along much of the length of Twin Creek from Highway 5 downstream to Great Slave Lake. Mr. Beaulieu, as reported in Beak (1980) indicated that trapping was not taking place in the R190 study area at that time, but that a nearby trapline at Birch Creek had caught beaver (10), marten (5) and mink (2) during the winter of 1979-1980.

During the PPPP site tour conducted as part of the MVEIRB scoping sessions in mid August 2006, and the Traditional Knowledge interviews conducted in October 2006, a number of the community participants discussed wildlife species found in the LSA and the general Pine Point region. Wildlife identified as living in and being harvested in the vicinity of the LSA included moose, woodland caribou, lynx, wolf, otter, black bear, rabbit, porcupine, prairie chicken, spruce chicken, ruffed grouse, waterfowl and upland game birds. Migrating wildlife observed from time-to-time include ducks, geese, swans, songbirds, whooping crane, prairie chickens and ptarmigan (Tamerlane 2006b, c).

2.12.2 Recent Wildlife Studies

More recent wildlife studies of the Tamerlane Regional Study Area (RSA) were carried out by EBA in September 2005 and in the Local Study Area (LSA) during the spring, summer and fall of 2006 (EBA 2005c, 2006c). This section presents the results of the 2005 and 2006 wildlife studies conducted in the Tamerlane RSA and the LSA.

The objective of the 2005 wildlife study program was to document biological diversity over the 36,153 ha RSA using plot assessments, which represent the best efficiencies for gathering the greatest breadth of species information over a large area within a limited timeframe. Plot assessments were located in each of the community types initially identified by an ecological land classification specialist. Plot assessments and opportunistic observations were completed in representative habitat types, and were distributed in approximate proportion to the amount of the specific habitat type in the study area.

In addition, information on species presence (actual observation, tracks, burrows, browsing sign, and droppings, or scat) was collected opportunistically while moving about the study area, either by all-terrain vehicles (quads), truck, or on foot. UTM coordinates were recorded for each wildlife observation.

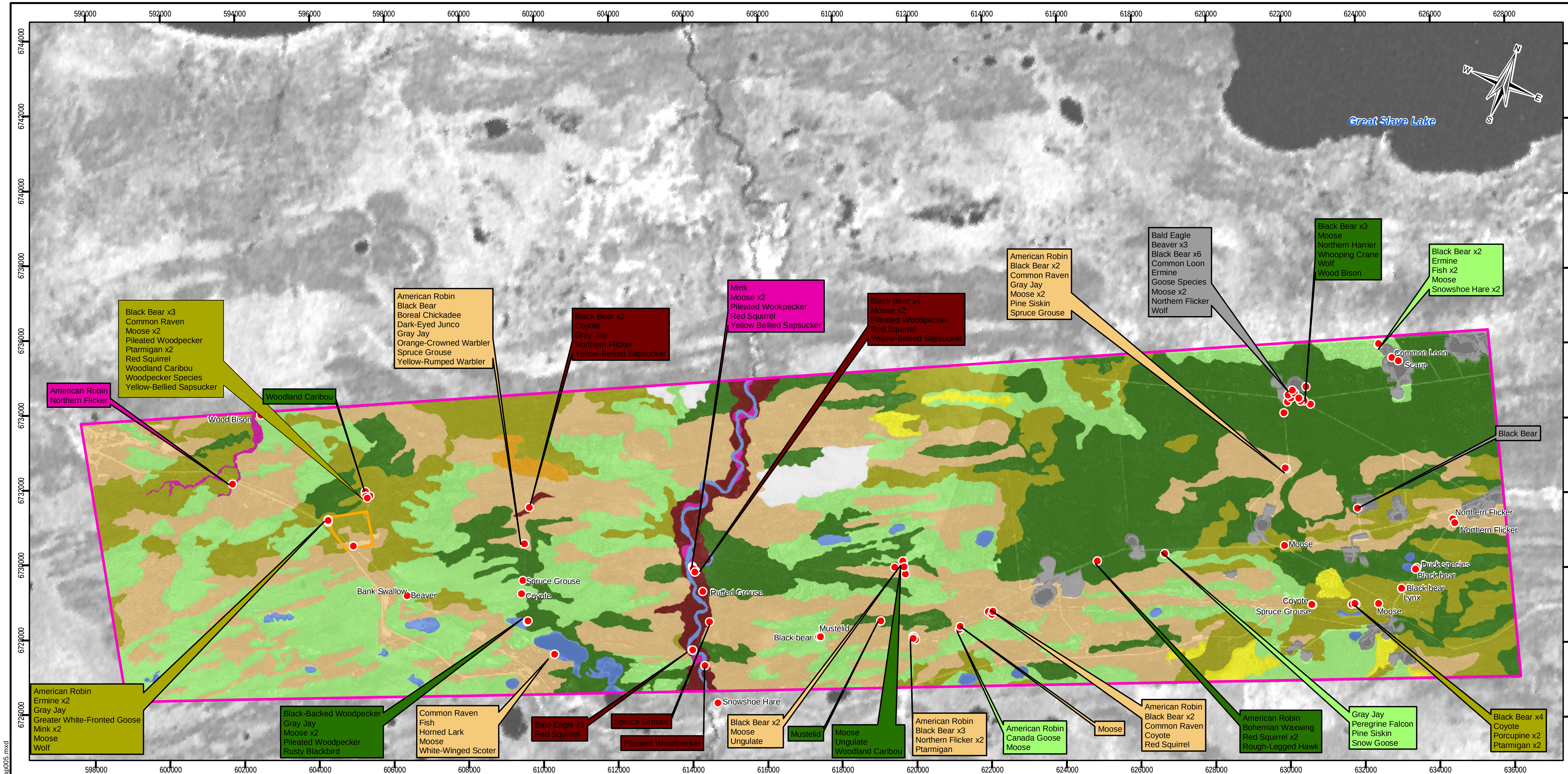
Eleven habitat types (ecosites) were classified within the study area, eight of these were naturally vegetated, one was classified as water, one was anthropogenic (human disturbance) and one was cloud (Figure 2.12-1) (EBA 2005c).

A total of 187 wildlife observations were recorded during the September 2005 field survey. Approximately 43 % of the observations consisted of birds (identified through song, nests, or other sign), and 56 % of the observations consisted of mammals (primarily through tracks, scat/pellets, and evidence of browsing).

Within the different habitat types, a total of 80 bird observations were recorded, comprising 32 different species, including the Whooping Crane and Peregrine Falcon (both of which have special status designations). A single Whooping Crane was recorded in a Treed Fen habitat, and the Peregrine Falcon was noted in a Shrubby Fen.

In addition, a total of 104 mammal observations, comprising 13 different mammal species were documented as occurring in the RSA, including woodland caribou and wood bison (both which have special status designations). Woodland caribou sign was documented in Labrador-tea subhygric and Treed Fens, and wood bison sign was recorded in Shrubby Fen and Treed Fen. Other species of special designation that could occur in the study area were northern leopard frog, Yellow Rail, Short-eared Owl, and wolverine.

Habitat types that exhibited the highest species diversity included Treed Fen and Labrador-tea Subhygric habitat units. These habitat types cover 24 % and 15 % of the RSA, respectively.



LEGEND

Local Study Area (LSA)
Regional Study Area (RSA)
Wildlife Observation Location

UPLAND
- Bearberry Pj
- Canada Buffalo-Berry-Green Alder
- Labrador Tea-Mesic
- Labrador Tea-Subhygric

LOWLAND
- Treed Fen
- Shrubby Fen
- Graminoid Fen

RIPARIAN
- Willow/Horsetail

OTHER
- Water
- Disturbed
- Unknown (cloud cover)

NOTES

Base data source:
Landsat TM bands 7,4,1 (GLFC)
Quickbird Pacific GeoAnalytic

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PINE POINT PILOT PROJECT

Pine Point RSA Wildlife Observations within Habitat Units

PROJECTION	DATUM
UTM Zone 11	NAD83

Scale: 1:110,000

2 1 0 2

Kilometres

FILE NO.
1740149-005_Map005

PROJECT NO.	DWN	CKD	REV
1740149.005	KMW	RH	0

OFFICE	DATE
EBA-VANC	December 14, 2006

Tamerlane Ventures Inc.

EBA Engineering Consultants Ltd.

Figure 2.12-1

Species that appeared to occupy multiple habitat types within the RSA included moose, black bear, and woodpecker species. In contrast, Whooping Crane, Peregrine Falcon, Bald Eagle, beaver, lynx, woodland caribou, and wood bison appeared to be restricted to a few specific habitat types within the RSA.

In 2006 additional wildlife surveys were carried out in closer proximity to the Tamerlane LSA. These include more specific surveys for owls, amphibians and breeding birds. The results of these surveys are reported in further detail in the following subsections.

Other wildlife observations were recorded incidentally during the 2006 owl, breeding bird, and amphibian surveys. Incidental observations of recent use of the study area by six mammal species was recorded including woodland caribou, black bear, red fox, wolf, beaver, and snowshoe hare. Of particular interest, fresh woodland caribou tracks were recorded approximately 1.5 km northwest of Polar Lake during the June breeding bird survey.

2.12.3 Mammals

A preliminary list of all mammal species known or suspected to occur in the study area (i.e. within 200 km of the study area) was generated using Banfield (1977) Mammals of Canada and Beak (1980). A total of 40 mammal species were determined to occur or potentially occur within the study area (EBA 2005c; Appendix B). As previously indicated during the 2005 field study, a total of 104 mammal observations, including actual sightings or sign, were recorded. Based on the experience of the EBA wildlife study team, Traditional Knowledge and these observations, evidence of 13 different mammal species were documented as occurring in the RSA (Table 2.12-1).

The most notable mammal observations during the September survey included evidence of woodland caribou and wood bison sign (hair, pellets, tracks, and feeding areas). The following subsections provide further information on the key mammal species found or expected to occur in the Pine Point area.

Table 2.12-1
Mammal Species Recorded in the Tamerlane RSA - September 2005

Common Name	*Scientific Name*
Snowshoe Hare	*Lepus americanus*
Red Squirrel	*Tamiasciurus hudsonicus*
American beaver	*Castor canadensis*
Common Porcupine	*Erethizon dorsatum*
Coyote	*Canis latrans*
Gray Wolf	*Canis lupus*
Black Bear	*Ursus americanus*
Ermine (Stoat)	*Mustela erminea*
Mink	*Mustela vison*
Lynx	*Lynx canadensis*
Woodland Caribou	*Rangifer tarandus caribou*
Moose	*Alces alces*
Wood Bison	*Bison bison athabascae*

2.12.3.1 Woodland Caribou

Woodland caribou (Boreal population) are listed as threatened under SARA and sensitive by the GNWT. In Canada, woodland caribou populations have generally been decreasing throughout their range (SARA 2006). Woodland caribou are widely distributed throughout the Deh Cho region and beyond. The NWT woodland caribou population is currently estimated at 8,500 individuals (ENR 2006). Recent surveys conducted in 2004 and 2005 estimate population densities in the order of 1 to 3 woodland caribou/100 km^2 in the Northwest Territories, and a considerably lower density of about 2 woodland caribou/1000 km^2 in the Deh Cho region (ENR 2006).

Boreal woodland caribou prefer lichen-rich mature or old growth coniferous forests (greater than 100 years old) associated with bogs, lakes and rivers. (ENR 2006). In winter, woodland caribou tend to favour uplands, bogs and south facing slopes where the snow is not too deep. Their winter diet consists of up to 80 % ground and tree lichens. In summer, they prefer areas such as forest edges, marshes and meadows that provide the fresh green growth of flowering plants and grasses.

Woodland caribou commonly move onto traditional calving grounds, where calves are born by early June. In the Deh Cho region and southern NWT, islands off the northwest shore of Great Slave Lake (ENR 2006), and the mountains along the South Nahanni River serve as calving grounds for woodland caribou (Chetkiewicz and Marshal 1998).

Woodland caribou are also known to calve in small prairies within the Mackenzie Bison Sanctuary, and it is probable that caribou inhabiting the boreal forest throughout the southwestern NWT use similar areas for calving (Gray and Panegyuk 1989).

In the Tamerlane RSA, woodland caribou sign (hair, tracks/trails, and pellets) was observed on four separate occasions within the RSA during the September 2005 survey. Caribou observations were recorded within poor treed fens and mixed woods habitats. During the June 2006 breeding bird survey period, fresh woodland caribou tracks were recorded incidentally at a location approximately 1.5 km northwest of Polar Lake.

2.12.3.2 Wood Bison

Wood bison are recognized as a *threatened* species by SARA, and *at risk* by the Northwest Territories. By definition this is a species likely to become *endangered* if limiting factors are not reversed.

The number of wood bison in the NWT is estimated between 2,500 to 2,850 individuals that are divided up at four locations (ENR 2006). Two wood bison herds (Wood Buffalo National Park and Slave River Lowlands) contain diseased individuals, while the other two herds (Liard River and Mackenzie Bison Sanctuary) are believed to be disease free.

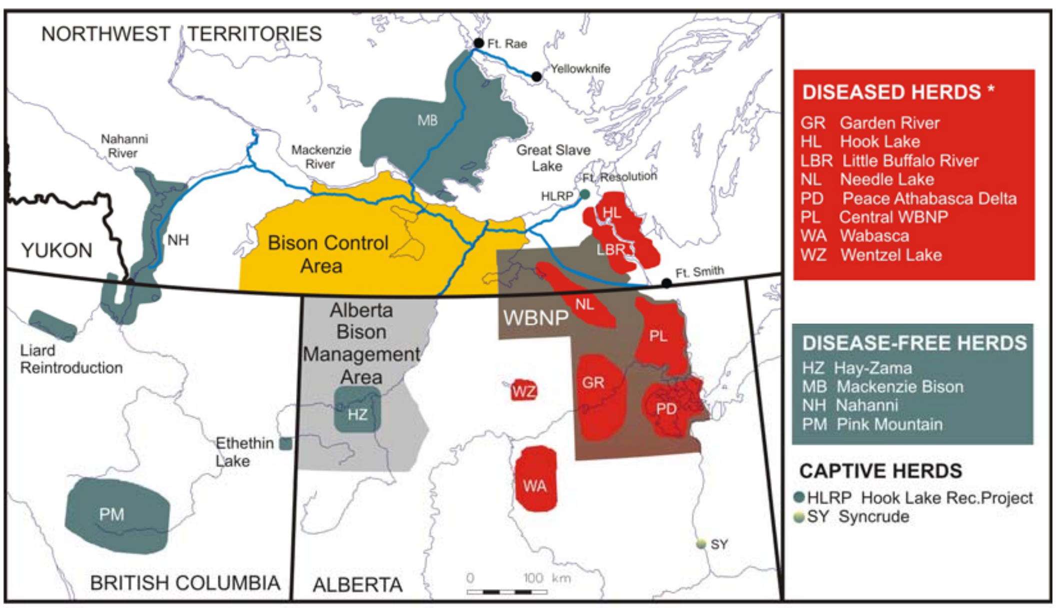
The population trend for wood bison in the NWT is increasing as they are slowly recovering from near extinction. Threats to the population include disease (anthrax, brucellosis, and tuberculosis), predation, highway collision, habitat loss, and drowning during high water seasons and during thin ice conditions (SARA 2006).

The Tamerlane RSA is located within a Bison Control Area (Figure 2.12-2), where all bison are removed to ensure diseased animals from Wood Buffalo National Park do not migrate and infect other disease-free herds, such as at the Mackenzie Bison Sanctuary.

Surveys of the Bison Control Area are carried out on a regular basis during the winter months when the likelihood of movement is greatest because of the freezing of the Mackenzie River and also because of the increased visibility of bison at this time. Aerial surveys are conducted from December through to April out and effort is concentrated in the area along the Mackenzie River from Mills Lake to Little Buffalo River because this is the area with the highest risk of bison movement. In addition to these surveys, public support of the program is very important. Any person seeing bison in the Bison Control Area is encouraged to report the sighting to the nearest ENR office. Any resident hunter seeing a bison in the control area may harvest it and keep the meat, as long as the kill is reported.

Wood bison use different habitats depending on the season. Wood bison are grazers, and rely heavily on grasses and sedges that grow in meadow openings, particularly in the winter. In summer, bison can be found in small willow pastures and uplands where theyfeed on sedges, forbes, and willow leaves and twigs. In the fall, they can be found in forests where they feed on lichens, and in winter, bison move to graminoid fens and lakeshores where they feed on sedges.

Wood bison scat, tracks, and feeding areas were recorded at two locations within the Tamerlane RSA in September 2005: along Twin Creek at the edge of a fen, and along a dirt road near a waste rock pile (approximately 12.5 km west of the former Pine Point town site).



* Health status of bison to the SW of WBNP in Northern Alberta is poorly known relative to tuberculosis and brucellosis but limited testing indicates bovine brucellosis occurs

Figure 2.12-2 Bison Herds and Management Zones in NWT, Alberta and BC

2.12.3.3 Moose

Moose are listed as *secure* in both the Northwest Territories and Alberta (ENR 2006; ASRD 2000). Moose occur throughout the boreal forest of the NWT, and are infrequently observed on arctic or mountain tundra. Their distribution in NWT is believed to be increasing.

The NWT moose population is estimated at 30,000 to 40,000 individuals with density estimates ranging between 5 to 15 per 100 km^2 (ENR 2006). Moose are generally non-migratory and occupy the boreal forest throughout the year. Moose densities in the NWT are low compared to those in other parts of North America. These densities are considerably lower than those in Manitoba, Saskatchewan and Alberta.

Recent studies conducted in 2002 and 2003 for the Mackenzie Gas Project along the proposed gas pipeline corridor through the Deh Cho reported densities of 6 to 10 moose per 100 km^2 in this region (Imperial Oil 2004). The lowest moose densities were documented adjacent to Fort Providence where 7 individuals per 100 km^2 (Bradley *et al.* 1998) were recorded during a fall survey. The difference in densities may reflect the presence of bison (Shank 1992) and the seral stage of fire regeneration.

The GNWT reports that in the Deh Cho region, the moose population in the vicinity of Ft. Providence has been decreasing the most over recent years, but has been increasing in areas that have experienced fires in the last 10 years ENR (2006).

Moose are primarily browsers and they require abundant food supplies juxtaposed with security cover. High quality browse is considered to consist of shrubs and trees and, therefore conifer-dominated landscapes are sub-optimal moose habitat. Riparian willow communities appear to be a major factor determining moose distribution. These communities are used throughout the year, with birch-moss tundra habitat also being heavily utilized during the spring, summer and fall (AMAX ND).

Moose habitats can be broadly categorized as fire-influenced, non- or limited-fire influenced or aquatic (Peek 1998). Within the first two (forested) habitats, moose generally prefer semi-open successional stages with an abundance of browse. Such sites are commonly found on floodplains and in riparian areas or wetlands, as well as in regenerating burns. Use of aquatic habitats may occur during all non-winter months, but generally peaks during late June to early August, when plant nutrition and digestibility are highest (Peek 1998). This period coincides with the peak of insect harassment and moose may seek relief in water for this reason as well.

During the EBA wildlife study conducted in the fall of 2005, a total of 22 signs of moose were observed in the Tamerlane RSA, with about 46 % of the observations being recorded in upland Labrador tea ecosites. These observations are consistent with local knowledge (T. Unka pers. comm.) and existing scientific understanding, which indicates that the entire area south of Great Slave Lake, including the PPPP area is frequented by and used by moose throughout the year.

2.12.3.4 Black Bear

Black bears in the NWT are considered by the GNWT to be *secure*. Black bears occur throughout treed portions of the NWT and are commonly associated with coniferous or deciduous forests, swamps and berry patches (ENR 2006). The number of black bears in the NWT is conservatively estimated to be around 10,000, with estimated densities of 30 to 40 bears per 100 km^2 (ENR 2006). The population trend is unknown but thought to be healthy across its entire range.

Black bears are generally closely associated with treed environments, presumably in response to threats from other predators (Herrero 1978). In areas where adequate escape cover exists, black bear habitat quality is primarily related to the abundance of seasonally important food items. Black bears are functional omnivores. In most areas, their diet is dominated in all seasons by vegetation. However, meat, especially winter-killed ungulates during spring, insects during summer, and possibly fish, can be locally important.

After den emergence, bears gravitate towards areas with early-emerging vegetation such as wetlands dominated by sedges, cottongrass, other grasses and horsetails. Other preferred feeding areas include meadows, where over-wintering berries such as bog cranberry are eaten (Chatalain 1950; Hatler 1972). Winter-killed ungulate carcasses can be important, but are usually scarce and may not be predictably available to bears in the boreal forest.

In summer, bears consume a variety of species of grasses, sedges, horsetails and forbs (Hatler 1972; Pelton 2000). Insect activity peaks during summer, and black bears feed heavily on colonies of ants, bees and wasps. By fall, the nutritional quality of many plants declines but berries become ripe and available. Major berry-producing species of the boreal forest include blueberry, crowberry, bearberry and cloudberry.

During the EBA wildlife study conducted in the fall of 2005, a total of 37 signs of black bear were observed in the Tamerlane RSA, with about 46 % of the observations being recorded in upland Labrador tea ecosites, 16 % in the Canada buffaloberry-green alder ecosite and 19 % in disturbed sites. It is also widely known that black bears are regularly attracted to the landfill sites associated with the local communities in the area.

2.12.3.5 *Other Fur-bearing Mammals*

Based on the EBA (2005c) wildlife study conducted in September 2005, other previous studies and common knowledge, other fur-bearing mammals determined or likely to be present in the Tamerlane RSA from time to time include snowshoe hare, red squirrel, beaver, porcupine, coyote, wolf, red fox, wolverine, ermine, mink and lynx.

During the EBA studies conducted in 2005, a number of beaver dams and lodges were observed along sections of Twin Creek located about 7 km to the west of the PPPP site. In addition, other observations of habitat use by other fur-bearers were reported as follows:

- Coyote 5 observations 60 % located in Labrador tea ecosites
- Wolf 3 observations 33 % located in each of Labrador tea, Treed fen and Disturbed ecosites
- Ermine/Mink 9 observations 44 % located in Labrador tea; 22 % in Shrubby fen; 22 % in Treed fen/Willow horsetail ecosites

These observations are consistent with local knowledge (T. Unka pers. comm.) and existing scientific understanding, which indicate that these animal species are commonly found in preferred habitats throughout much of the Pine Point area and the entire region south of Great Slave Lake.

2.12.4 Birds

In preparation for the 2005 wildlife survey of the Tamerlane RSA, a list of bird species known to occur or those that potentially occur in the study area was developed using Sibley (2003) and government reports. All bird species occurring within a 200 km radius of the study area were included. A total of 210 bird species were identified as confirmed or potentially occurring in the study area, either as breeders or during migration (EBA 2005c; Appendix B).

As previously indicated during the 2005 field study, a total of 80 different bird observations were recorded during this study, comprising 32 different species (Table 2.12-2). These observations included actual sightings, bird calls, or sign. Ten of the most frequently seen bird species observed include the following: American Robin, Tundra Swans, White-winged Scoter, Gray Jay, Common Raven, Spruce Grouse, and Bohemian Waxwings.

Bird species observed were classified as migrant, breeding, transient, resident, or accidental in Table 2.12-2. A migrant occurs regularly as it passes through during spring or fall migration. A breeder is a species that breeds in the area and is usually present during the spring, summer and fall. A transient is a species that can occur irregularly at any time of the year. A resident is a species that occurs in the area throughout the year.

The most notable bird observations during the September survey included a visual recording of a single non-breeding Whooping Crane in a recently flooded beaver pond within the study area and two sightings of Peregrine Falcons. One of the Peregrine Falcon observations occurred along Provincial Highway 5 near the eastern boundary of Hay River Reserve, while the second observation occurred along a dirt road where the falcon was feeding on a recently killed snow goose (approximately 13 km southwest of the former Pine Point town site.

Table 2.12-2
Bird Species Recorded in the Tamerlane RSA - September 2005

Common Name	*Scientific Name*	Classification
Greater White-fronted Goose	*Anser albifrons*	Migrant
Snow Goose	*Chen caerulescens*	Migrant
Canada Goose	*Branta canadensis*	Breeder
Tundra Swan	*Cygnus columbianus*	Migrant
Lesser Scaup	*Aythya affinis*	Breeder
White-winged Scoter	*Melanitta fusca*	Breeder
Ruffed Grouse	*Bonasa umbellus*	Resident
Spruce Grouse	*Falcipennis canadensis*	Resident
Ptarmigan species	*Lagopus lagopus*	Winter Resident
Common Loon	*Gavia immer*	Breeder
Bald Eagle	*Haliaeetus leucocephalus*	Breeder
Northern Harrier	*Circus cyaneus*	Breeder
Rough-legged Hawk	*Buteo lagopus*	Migrant
American Kestrel	*Falco sparverius*	Breeder
Peregrine Falcon	*Falco peregrinus (anatum)*	Migrant or Transient
Whooping Crane	*Grus americana*	Transient
Yellow-bellied Sapsucker	*Sphyrapicus varius*	Breeder
Black-backed Woodpecker	*Picoides arcticus*	Resident
Northern Flicker	*Colaptes auratus*	Breeder
Pileated Woodpecker	*Dryocopus pileatus*	Resident
Gray Jay	*Perisoreus canadensis*	Resident
Common Raven	*Corvus corax*	Resident
Horned Lark	*Eremophila alpestris*	Breeder

Common Name	*Scientific Name*	Classification
Bank Swallow	*Riparia riparia*	Breeder
Boreal Chickadee	*Parus hudsonicus*	Resident
American Robin	*Turdus migratorius*	Breeder
Bohemian Waxwing	*Bombycilla garrulus*	Breeder
Orange-crowned Warbler	*Vermivora celata*	Breeder
Yellow-rumped Warbler	*Dendroica coronata*	Breeder
Dark-eyed Junco	*Junco hyemalis*	Breeder
Rusty Blackbird	*Euphagus carolinus*	Breeder
Pine Siskin	*Carduelis pinus*	Breeder

[1] Species organized in phylogenetic order.

2.12.4.1 Whooping Crane

The Species at Risk Act (SARA) considers Whooping Cranes a *threatened* species. A breeding population of Whooping Cranes is located in Wood Buffalo National Park. Non-breeding individuals are known to inhabit marshes, bogs, and shallow lakes between Wood Buffalo National Park and the Mackenzie Bison Sanctuary (Figures 2.12-3; 2.12-4). The nearest known Whooping Crane nest is located approximately 60 km east and south of the proposed Tamerlane PPPP site.

During the winter of 2004/05, the Wood Buffalo National Park population of Whooping Cranes was 217 counted on the wintering ground. During the summer of 2005, the 58 known nests in and near Wood Buffalo National Park hatched 62 chicks, with 31 fledged young accounted for in mid-August (ENR 2006).

The Mackenzie Bison Sanctuary is considered critical habitat for the non-breeding segment of the Whooping Crane population (Decker, Personal Communication; Anonymous, 1972, as cited in EBA 2005c).

Wild Whooping Cranes are believed to life up to 20 years of age, and reach sexual maturity at approximately age five. They generally lay two eggs a year, but typically only one chick survives to fledge (EBA 2005c).

The Wood Buffalo National Park population migrates to wintering grounds in the Aransas National Wildlife Reserve in Texas beginning in mid-September, and stops en-route throughout the prairies to feed on grain around sloughs and wetlands (SARA 2006). Non-breeding individuals may not occupy traditional nesting grounds until breeding age. Non-breeding Whooping Cranes are known to occur north and west of Wood Buffalo National Park; in particular, the Wood Bison Sanctuary (EBA 2005c).

During the 2005 wildlife study, a single non-breeding Whooping Crane was observed at a recently flooded beaver pond located approximately 26 km from the LSA within and near the east end of the RSA. Wildlife observations carried out over the past two years has determined that the LSA does not contain suitable Whooping Crane nesting habitat, although non breeding cranes could potentially frequent the small fen area within the LSA for seasonal feeding purposes.

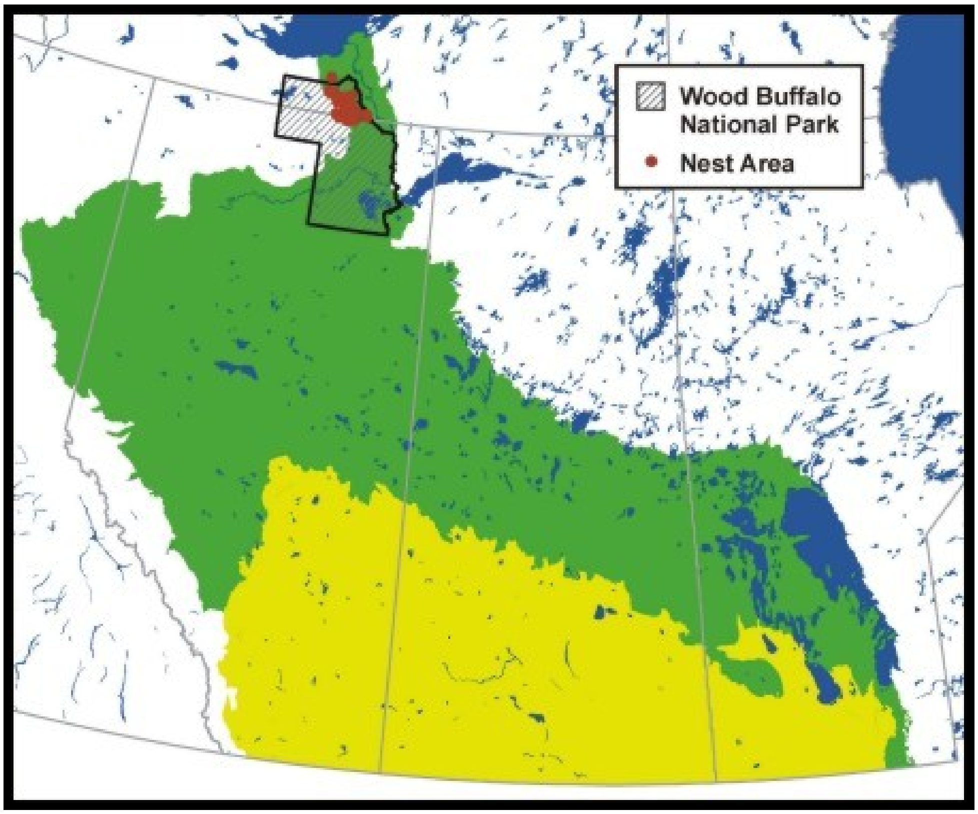


Figure 2.12-3 Known Nesting Area in & Near Wood Buffalo National Park

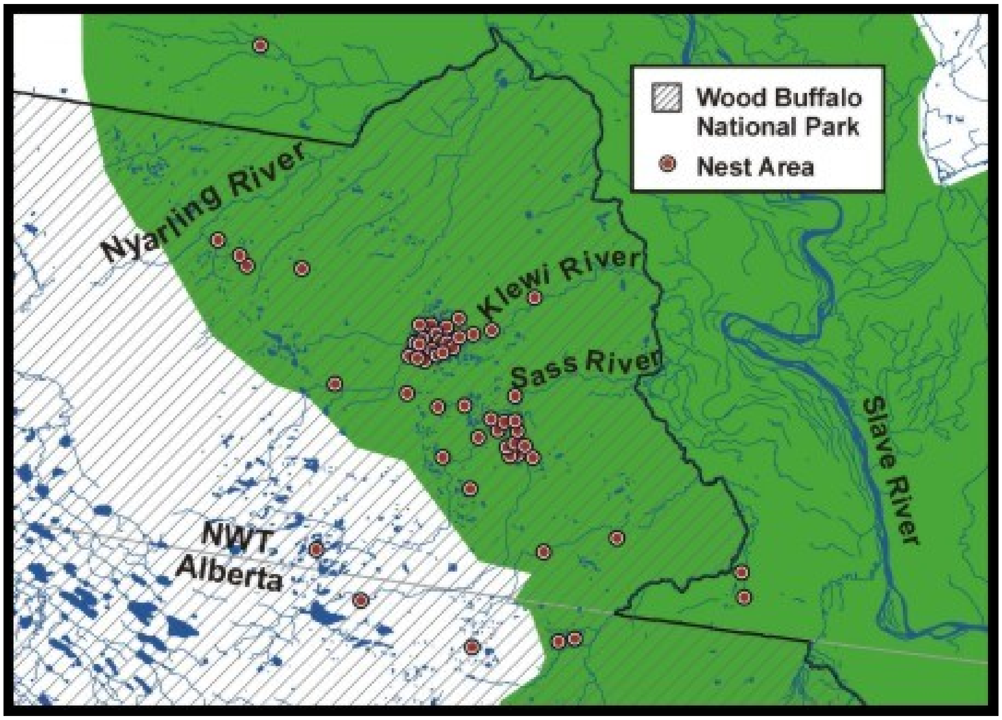


Figure 2.12-4 Known Nest Locals in & Near Wood Buffalo National Park

2.12.4.2 Peregrine Falcon

The Species at Risk Act (SARA) considers Peregrine Falcons a *threatened* species while the GNWT considers this species to be *at risk*. There are over 220 documented breeding pairs of Peregrine Falcons in northern Canada (NWT, Yukon, Nunavut, Northern Quebec) (ENR 2006).

The *Falco Peregrinus anatum* subspecies is distributed generally throughout portions of the NWT below the treeline, with a large population located along the Mackenzie River Valley. Smaller populations can be found nesting in the east arm of Great Slave Lake (along the steep cliffs) and in Wood Buffalo National Park. In the past, ENR conducted periodic Peregrine surveys along the Mackenzie Valley and has documented 83 nests on a linear 600 km transect along the Mackenzie River (Shank 1996). There has been an increasing trend in Peregrine Falcon numbers since 1980 (Shank 1996; Johnstone 1997).

Historically, the use of agricultural pesticides, particularly organochlorides, was a major threat to Peregrine Falcon populations. Currently, the small population size, human interference at nest sites, habitat alteration and habitat loss threaten populations (SARA

2006). Present threats are particularly limited in the NWT due to the remoteness of the country (Shank 1996; Johnstone 1997).

In the NWT, Peregrines live an average of five years and begin breeding in their second year. Between May and early June, two to four eggs are laid in a scrap usually on cliff ledges near water. Peregrines have three main habitat requirements: 1) proper nesting sites, 2) nesting range (actively guarded range approximately 1 km from nest), and 3) a home range that can extend up to 27 km from the nest for hunting (not defended) (ENR 2006). Peregrines mainly hunt other birds in the air. Consequently, open habitats such as tundra, grasslands, prairies and waterways are important (EBA 2005c).

Two Peregrine Falcon sightings were recorded by the EBA wildlife team in the vicinity of and within the RSA in September 2005. One of the Peregrine Falcon observations occurred along Highway 5 near the eastern boundary of Hay River Reserve, while the second observation occurred along a dirt road where the falcon was feeding on a recently killed snow goose (approximately 13 km southwest of the former Pine Point town site (EBA 2005c).

It is expected that the Peregrine(s) observed within the study area were either migrants or non breeders from known populations in the northeast corner of Wood Buffalo National Park or the east arm of Great Slave Lake (S. MacMillagan, Personal Communication, as cited in EBA 2005c). To date, no Peregrine Falcon territories have been documented in the Tamerlane RSA (EBA 2005c).

The proposed Tamerlane PPPP area and the entire RSA do not meet the necessary habitat requirements for Peregrine Falcons. It is concluded that there are no nesting Peregrine Falcons within the lowland area south of Great Slave Lake.

2.12.4.3 Owls

Eight owl species hypothetically occur within the RSA (as breeders, winter residents, and migrants) including the Great Horned, Great Grey, Snowy, Barred, Long-eared, Short-eared, Northern Hawk, and Boreal owls.

All owl species are protected under the NWT Wildlife Act, and the Short-eared Owl is federally classified as a species of Special Concern. However, a reassessment of the Short-eared Owl is required to qualify for full federal protection under the Species at Risk Act (SARA).

Great Horned, Great Grey, Long-eared, Northern Hawk, and Boreal owls are considered breeders and year-round residents to the regional area. Snowy and Short-eared owls are considered seasonal residents only. Barred owls have an undetermined status in the Northwest Territories since there is insufficient information to determine their distribution, abundance, or population trends. Scientific evidence suggests owl populations naturally fluctuate with prey populations (i.e. snowshoe hare, mice, and vole) (Parmelee 1992; Alexander *et al.* 2003).

Snowy Owls are potentially winter residents within the study area, and some evidence suggests that they have a tendency to return to the same winter territories (Parmelee 1992). Winter feeding territories are commonly defended, and evidence suggests adult female Snowy Owls typically over-winter in the most northern portion of the species' winter range (which includes the study area) (Parmelee 1992). Snowy Owls arrive on the breeding grounds in the high Arctic by late April to late May (Parmelee 1992); therefore Snowy Owls were expected to have departed for their breeding range prior to the onset of this survey.

Although many field guides indicate Short-eared owls are summer residents to the regional area (Sibley 2003) and probably breed in the region, they are considered "partial" migrants and some individual Short-eared owls may remain in the region year-round (Wiggins 2006). Short-eared owls have been recorded as year-round residents near Caribou Mountains, Alberta (approximately 200 km south of the study area), near Claire Lake, Wood Buffalo National Park (approximately 280 km southeast of the study area), as well as Fort Vermillion, Alberta (approximately 260 km south of the study area) (Clayton 2000). Some Short-eared owls may also occupy the Regional Study Area during winter months.

Barred owls are believed to occur within the Northwest Territories; however they have rarely been documented (Environment Canada 2002, Sibley 2003). In Alberta, Barred owls are year round residents and are known to nest in old growth forests and swamps, and tend to hunt in more open habitats (SRD 2006). Barred owls have been known to re-use old hawk nests (SRD 2006).

The purpose of the 2006 owl survey was to identify species presence and distributions of breeding territories within a survey area encompassing about 16,551 ha around the LSA.

A total of 16 pre-selected owl stations, including one station within the LSA, were surveyed on April 24 and 25, and the same stations were re-surveyed on May 17 and 18 (Figure 2.12-5). Both owl surveys included a broadcast-call program, which targeted five owl species including Boreal, Long-Eared, Barred, Great Grey, and Great Horned owls. Three additional owl species that may occur in the survey area, Snowy Owl, Northern Hawk Owl (a diurnal owl), and the Short-eared Owl; were surveyed following visual detection methods.

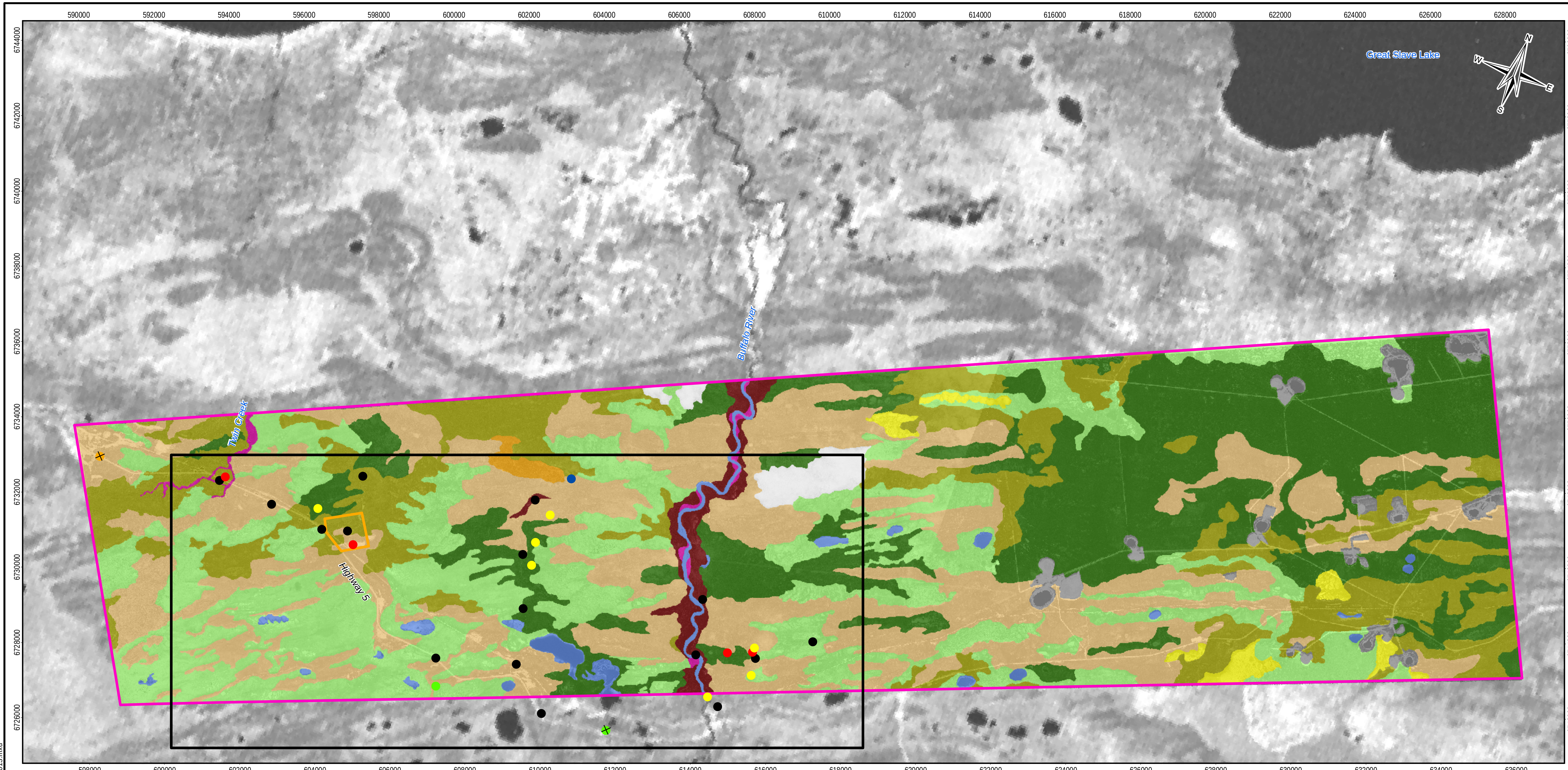
In total the presence of 14 owls was detected at the 2006 survey stations in the 16,551 ha survey area around the LSA, including five Great Horned, one Great Grey, one Long-eared, and seven Boreal owls (Figure 2.12-5). Based on observed distances between intra-species territorial calls, it is assumed there were three Great Horned Owl occupied territories, one Great Grey, one Long-eared, and six possibly seven Boreal Owl occupied territories at the survey stations. Barred, Snowy, Short-eared, and Northern Hawk owls were not detected within the survey area; however, this does not represent the absence of these species.

In the LSA, one Great Horned Owl was recorded within the LSA during the May owl survey. This observation represents 1 occupied territory. The Great Horned Owl was located within a Labrador-tea – mesic habitat type, near the gravel pit. This habitat type is consistent with typical Great Horned Owl nesting habitat.

2.12.4.4 Breeding Birds

Birds are commonly used in baseline inventories and monitoring programs as they represent an abundant and diverse group that are relatively easy to observe and monitor, particularly during peak breeding times.

During 2006, a breeding bird survey was conducted within the 16,551 ha 2006 survey area to document species presence and evidence of breeding territories. A point count survey, a common protocol used throughout North America, was employed. The breeding bird survey focused primarily on passerines, also known as “Perching” birds, which make up the largest and most diverse group of birds occurring in the RSA and LSA. Passerines include a variety of species including the Common Raven, Kinglets, Warblers, and Sparrows. Although passerines were the focus of this breeding bird survey, upland nesting birds (i.e. Grouse, Ptarmigan, and Common Nighthawk), and shorebirds (i.e. Gulls, Sandpipers, and Plovers) were also recorded.



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LEGEND

- Local Study Area (LSA)
- Regional Study Area (RSA)
- 2006 Wildlife Survey Area
- Owl Station

Owl Species Observations

- Boreal Owl
- Great Horned Owl
- Long-eared Owl
- Unknown
- Great Grey Owl
- Unknown (incidental observation)
- Great Grey Owl (incidental observation)

UPLAND

- Bearberry Pj
- Canada Buffalo-Berry-Green Alder
- Labrador Tea-Mesic
- Labrador Tea-Subhygric

LOWLAND

- Treed Fen
- Shrubby Fen
- Graminoid Fen

RIPARIAN

- Willow/Horsetail

OTHER

- Water
- Disturbed
- Unknown (cloud cover)

NOTES

Base data source:
Landsat TM bands 7,4,1 (GLFC)
Quickbird, Pacific GeoAnalytic

PINE POINT PILOT PROJECT

April to June 2006 Owl Observations and Associated Habitats

PROJECTION	DATUM
UTM Zone 11	NAD83

Scale: 1:110,000

2 1 0 2

Kilometres

FILE NO.
1740149-005_Map013

PROJECT NO.	DWN	CKD	1
1740149.001	KMW	KL	0

OFFICE	DATE
EBA-VANC	December 14, 2006

Tamerlane Ventures Inc.

EBA Engineering Consultants Ltd.

Figure 2.12-5

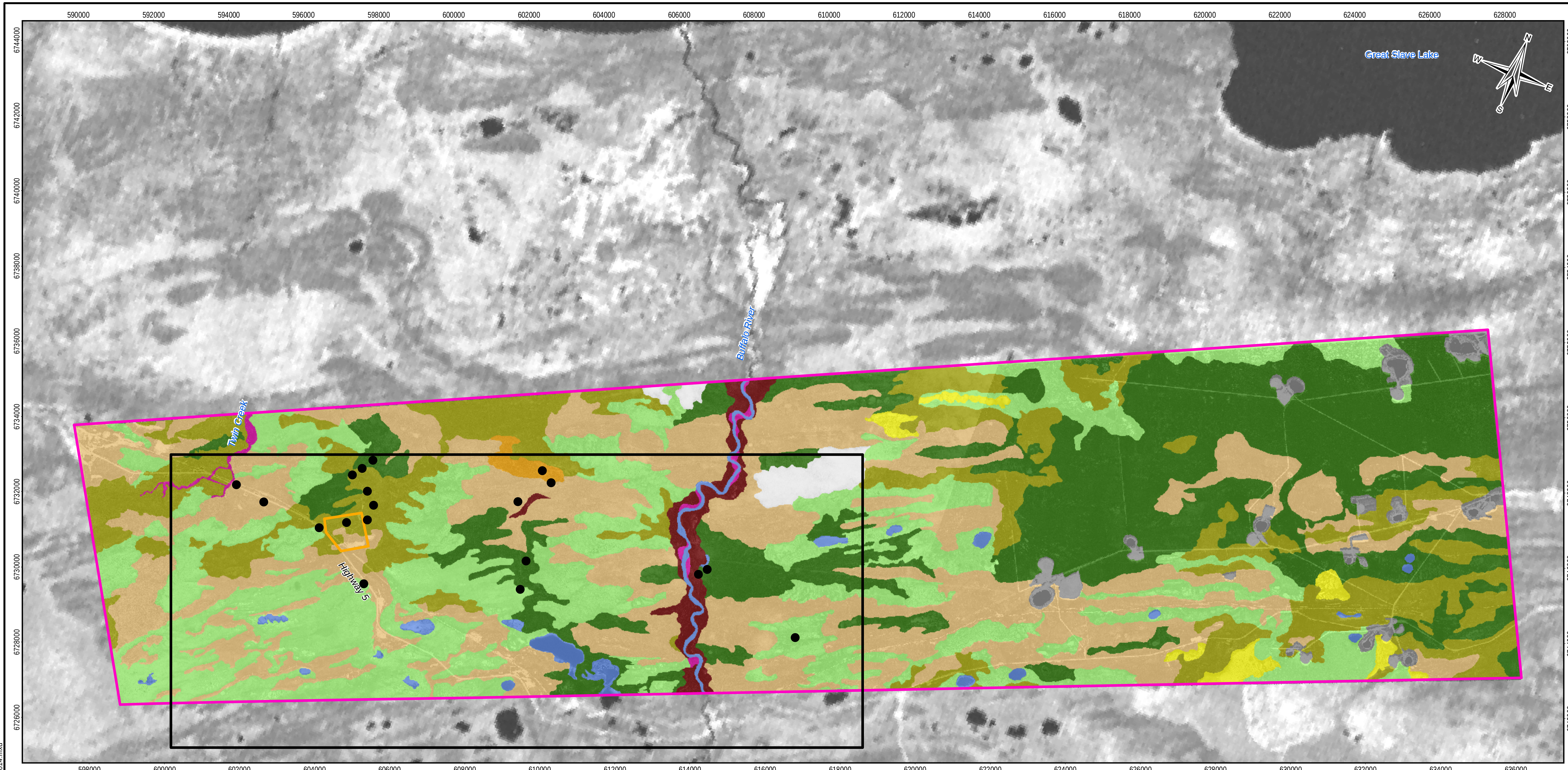
The majority of bird species occurring in the RSA and LSA are migratory and are present only during their reproductive phase; however, some are year-round residents. Bird species are widely distributed throughout all terrestrial habitat types present within the RSA.

Potential survey station locations were pre-selected prior to fieldwork and refined while on-site. Nineteen breeding bird stations were pre-selected in each community type, proportional to available habitat in the 16,551 ha survey area, and were surveyed from June 3– 5, 2006 (Figure 2.12-6). Surveys commenced at 4:10 am and continued until 10:00 am, except on the June 5 when the survey was terminated due to rain.

During the breeding bird survey, a total of 195 birds were recorded at the point count stations, including 31 different passerine species, one upland nesting bird, and four shorebird species. White-winged Crossbill, Ruby-crowned Kinglet, Hermit Thrush, White-throated Sparrow, Yellow-rumped Warbler, Palm Warbler, and Chipping Sparrow were the most common species. The number of individual birds that were recorded in each habitat type and the species richness was calculated. Results from these analyses must be interpreted with caution since sample sizes are low, particularly for bearberry – Jack pine, graminoid fen, and human disturbed/upland complex habitats.

Table 2.12-3
Bird Species Observations Recorded During the 2006 Breeding Bird Survey

Species	Number of Observations	Species	Number of Observations
Lesser Yellowlegs	6	Orange-crowned Warbler	3
Solitary Sandpiper	1	Yellow Warbler	1
Wilson's Snipe	1	Magnolia Warbler	1
Mew Gull	1	Yellow-rumped Warbler	13
Common Nighthawk	1	Palm Warbler	12
Yellow-bellied Sapsucker	1	Blackpoll Warbler	1
Woodpecker species	1	Northern Waterthrush	1
Olive-sided Flycatcher	8	Common Yellowthroat	4
Western Wood Peewee	1	Chipping Sparrow	12
Alder Flycatcher	4	Clay-colored Sparrow	2
Least Flycatcher	3	Le Conte's Sparrow	1
Blue-headed Vireo	1	Nelson's Sharp-tailed Sparrow	1
Gray Jay	1	Lincolns Sparrow	3
Bank Swallow	1	Swamp Sparrow	2
Ruby-crowned Kinglet	24	White-throated Sparrow	15
Swainson's Thrush	1	Dark-eyed Junco	10
Hermit Thrush	18	Rose-breasted Grosbeak	1
American Robin	2	White-winged Crossbill	30
Tennessee Warbler	6		



LEGEND

- Local Study Area (LSA)
- Regional Study Area (RSA)
- 2006 Wildlife Survey Area
- Breeding Bird Station

UPLAND
- Bearberry Pj
- Canada Buffalo-Berry-Green Alder
- Labrador Tea-Mesic
- Labrador Tea-Subhygric

LOWLAND
- Treed Fen
- Shrubby Fen
- Graminoid Fen

RIPARIAN
- Willow/Horsetail

OTHER
- Water
- Disturbed
- Unknown (cloud cover)

NOTES

Base data source:
Landsat TM bands 7,4,1 (GLFC)
Quickbird, Pacific GeoAnalytic

PINE POINT PILOT PROJECT

2006 Breeding Bird Station Locations

PROJECTION	DATUM
UTM Zone 11	NAD83

Scale: 1:110,000

2 1 0 2
Kilometres

FILE NO.
1740149-005_Map014

PROJECT NO.	DWN	CKD	
1740149.001	KMW	KL	1

OFFICE	DATE
EBA-VANC	December 14, 2006

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Figure 2.12-6

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Bearberry – Jack pine habitat had the highest average number of birds, followed by shrubby fens, upland/lowland complex, graminoid fen and disturbed/upland complex, treed fen, and Labrador-tea – mesic (Table 2.12-4). The Labrador-tea – subhygric habitat had the lowest average number of bird observations.

The highest average number of species (species richness) was found in graminoid fens, followed by upland/lowland complex, shrubby fen, bearberry – Jack pine and disturbed/upland complex, Labrador-tea – mesic and Labrador-tea – subhygric. Treed fen habitats had the lowest average species richness (Table 2.12-4).

Table 2.12-4
Analysis of 2006 Breeding Bird Observations by Each Habitat Type

Habitat (Number of Survey Stations in Each Habitat Type)	Total Number of Observations per Station	Average Number of Observations per Station	Total Species Richness per Station	Average Species Richness per Station
Labrador-tea – Mesic (5)	37	7.4	15	3
Labrador-tea – Subhygric (2)	9	4.5	6	3
Bear-berry – Jack Pine (1)	39	39	6	6
Treed Fen (5)	42	8.4	14	2.8
Shrubby Fen (2)	26	13	13	6.5
Graminoid Fen (1)	9	9	9	9
Upland and Lowland Complex (2)	24	12	15	7.5
Human Disturbed and Two Different Uplands Complex (1)	9	9	6	6

A single BBS station was surveyed within the LSA on June 3, 2006. This survey station included a complex community of upland (Labrador-tea – mesic) and lowland (shrubby fen) habitat types. A total of 15 bird observations were recorded at this station during the BBS survey, including 11 different bird species.

2.12.5 Amphibians

The NWT and the Tamerlane PPPP site lies in the extreme northern limit of amphibian species ranges. Four amphibian species hypothetically occur within the Regional Study Area: Boreal Chorus, Wood, and Northern Leopard frog, and Canadian Toad. Little information currently exists on amphibian populations within the NWT; however, there is particular interest in Northern Leopard Frog and Canadian Toad populations due to their uncommon occurrence and restricted distributions within the NWT and southern Canada.

Boreal Chorus and Wood frogs are the most commonly observed frogs within the NWT. These species occur in shallow areas of lakes, rivers, ponds, wetlands, woodlands, and even temporary waterbodies, including roadside ditches and open meadows. In Alberta, Boreal Chorus Frogs may breed from mid April to mid June in small ponds or temporary pools, and Wood Frogs may breed in a short week to two week period from mid April to June in shallow, clear, permanent or temporary ponds (SRD 2005).

Northern Leopard Frogs are classified as a species of *Special Concern* by SARA and *Sensitive* in the NWT. The Canadian Toad is listed under the NWT as *May Be At Risk*. Northern Leopard Frogs are predominantly found in or near permanent waterbodies including lakes, rivers, streams, and wetlands, although they can be found a long distance from water, particularly after a rain. After hibernating at the bottom of ponds, Northern Leopard Frogs emerge and begin mating in early spring; some years prior to complete ice-melt. In Alberta, breeding may occur from early April to early June (SRD 2005). Northern Leopard frogs have been documented near Fort Resolution (Ecology North ND).

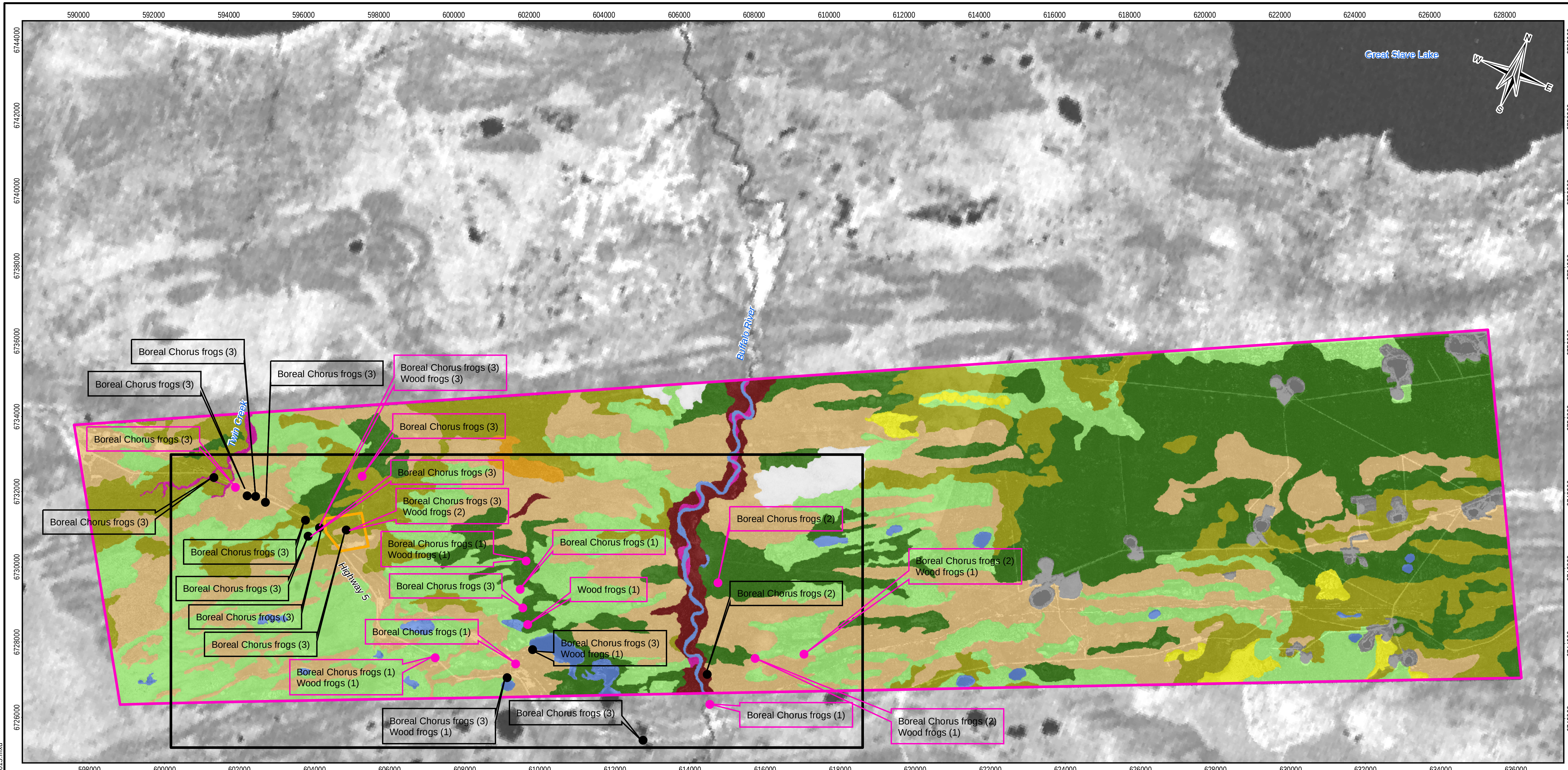
In Alberta, the Canadian Toad is active during the day typically from April to September, and burrows in soil at night. Canadian Toads hibernate in burrows. In the spring, toads migrate to breeding ponds, which include shallow areas in lakes, ponds, and even temporary bodies of water. In Alberta, breeding takes place between early May to early July. The Canadian Toad can be found far from water; however, in Alberta the Canadian Toad is most commonly found in river valleys and along sandy lake margins (SRD 2005). Although Canadian Toad surveys have been limited in the north, Canadian Toads have been documented in southern NWT (Ecology North ND). Since there is limited information available on Canadian Toad distributions in the north, it is assumed that Canadian Toads may occur in the Regional Study Area.

To enhance the limited available information on amphibian distribution and breeding behaviour within the Tamerlane PPPP area, during 2006 a pilot survey was completed to better understand breeding and/or calling behaviour of the four amphibian species hypothetically occurring within the 16,551 ha 2006 survey area. The work program included a single auditory survey at selected habitats in May and documentation of incidental amphibian observations and calling indexes in conjunction with owl surveys in April and May, and the breeding bird survey in June.

Infrequent calls of both Wood and Boreal Chorus frogs were heard during the April owl survey. In April, Wood Frogs were reported at five sites (calling frequency ranged from 1 – 3 at these five sites; average 1.6) and Boreal Chorus Frogs were recorded at four sites (calling indexes reported as 1 and 3; average 1.2). During the May owl survey, Boreal Chorus Frogs were the most commonly heard amphibian species. During the May owl survey, Wood Frogs were not heard; however, a single Wood Frog was observed within a treed fen. Boreal Chorus Frogs were heard at eight sites during the May Owl survey. Calling indexes of the Boreal Chorus Frogs appeared higher during the May Owl survey, than compared to the April Owl survey (calling indexes ranged between 1 and 3; average 2.5).

During the auditory survey, a total of 12 stations were surveyed between May 16 – 18 in the 16,551 ha 2006 survey area (Figure 2.12-7). Auditory stations included a variety of breeding habitats, including: roadside ditches, temporary pools, wetlands, ponds, streams, and lakes that were accessible from the highway, cutlines, and trails. During the auditory surveys, Boreal Chorus Frogs were documented at all of the twelve auditory stations, and a Wood Frog was recorded at two auditory stations (total of two Wood frogs). Boreal Chorus Frog calling indexes at eleven of the stations was at a level where individual frogs could not be counted (calling index 3), and at one station calling indexes were at a level where individuals are distinguishable, but overlap slightly (calling index 2). Calls from the Boreal Chorus Frogs were frequent and high in pitch, and may have concealed other calling species. The Northern Leopard Frog and Canadian Toad were not documented in the study area during the 2006 surveys.

Amphibians were also documented while conducting the breeding bird survey from June 3 – 5. Boreal Chorus Frogs were recorded at three breeding bird stations, and a single Wood Frog was observed in a treed fen within the 2006 survey area. Calling frequencies of Boreal Chorus Frogs ranged between calling index levels 1 and 2 during the breeding bird survey (average calling index 1.3).



LEGEND

- Local Study Area (LSA)
- Regional Study Area (RSA)
- 2006 Wildlife Survey Area
- Amphibian Station
- Incidental Amphibian Observations [1]

UPLAND
- Bearberry Pj
- Canada Buffalo-Berry-Green Alder
- Labrador Tea-Mesic
- Labrador Tea-Subhygric

LOWLAND
- Treed Fen
- Shrubby Fen
- Graminoid Fen

RIPARIAN
- Willow/Horsetail

OTHER
- Water
- Disturbed
- Unknown (cloud cover)

Calling Index Categories (#)

(1) = individual frogs can be counted (no overlapping calls)

(2) = calls of individual frogs are distinguishable, but some calls overlap.

(3) = full chorus, or continuous calls, where individual frogs cannot be distinguished.

NOTES

[1] Incidental Amphibian Observations during the Owl (April and May) and Breeding Bird (June) Surveys.

Base data source:
Landsat TM bands 7,4,1 (GLFC)
Quickbird, Pacific GeoAnalytic

PINE POINT PILOT PROJECT

April to June 2006
Amphibian Observations

PROJECTION: UTM Zone 11	DATUM: NAD83

Scale: 1:110,000

2 1 0 2

Kilometres

FILE NO. 1740149-005_Map015

PROJECT NO.	DWN	CKD	REV
1740149.001	KMW	KL	3

OFFICE	DATE
EBA-VANC	December 14, 2006

Tamerlane Ventures Inc.

EBA Engineering Consultants Ltd.

Figure 2.12-7

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From the 2006 amphibian survey, peak breeding for Wood Frogs either occurred immediately prior to the April owl event (April 24 - 25), or sometime between the April owl survey event and the amphibian survey (May 16 - 18). Since spring arrived earlier than normal in 2006, peak Wood Frog breeding was predicted to have occurred prior to April 24. Although, since peak Wood Frog breeding continues for a short week or two, it can be difficult to time surveys sufficiently to target peak levels. In addition, since Northern Leopard Frogs also over-winter in ponds and may begin calling prior to complete ice melt (similar to Wood Frogs), it is assumed the peak breeding time of the Northern Leopard Frog (if any in the survey area) occurred prior to April 24 (probably due to the early spring arrival). The period of time when the Canadian Toad breeding intensity was at its peak was undetermined. However, it is believed the May 16 – 18 survey event corresponded to the peak breeding time of Boreal Chorus Frogs, or in close proximity.

Breeding behaviour of Boreal Chorus Frogs (i.e. males calling) was documented in many different habitat types within the 2006 survey area including: roadside ditches, old borrow pits, riparian zones, shrubby and treed fens, lakes, and a small graminoid fen within a larger shrubby fen. Wood Frogs were reported calling in roadside ditches, shrubby fens, and lakes. Two visual detections of Wood Frogs occurred in treed fens; however, both individuals did not exhibit breeding behaviour.

A single auditory station was surveyed within the LSA. During the April owl survey, wood frogs (calling index 2) and Boreal Chorus Frogs (calling index 1) were recorded at this station location. However, by the May owl survey, only Boreal Chorus Frogs were reported (calling index 3). Similarly, during the May amphibian survey, only Boreal Chorus Frogs were documented (calling index level 3). In June during the BBS survey, only Boreal Chorus Frogs were recorded within the LSA at the amphibian station (calling index 2).

3.0 DESCRIPTION OF EXISTING SOCIO-ECONOMIC ENVIRONMENT

3.1 Fort Resolution

Fort Resolution (Denínu) is a small community located on the south side of Great Slave Lake southwest of the Slave River Delta on a peninsula on the northeast shore of Resolution Bay (Figure 3.1-1). The community is linked to the NWT road network via Highway 6. It is the oldest documented community in the Northwest Territories, and was a key link in the fur trade's water route north.

Fort Resolution has been designated as a National Historic Site, due to its importance to aboriginal culture and the fur trade history. In 2005, the population of the community was 534, living in 206 households. The average household income for Fort Resolution in 2005 was $45,807. The majority of the community members are of Dene or Metis (88 %) descent, while non-native residents make up 12 % of the population (GNWT Bureau of Statistics 2005; 2006). The predominant languages used in Fort Resolution are English and Chipewyan.

Fort Resolution features Denínu School, offering schooling for children from kindergarten to Grade 12. The town also has a hockey arena, community hall, nursing station, RCMP compound, bed and breakfast, a 'Northern' general store and a 'Quick Stop' convenience store attached to a Shell gas station. The oldest building in town is the historic Catholic Church, built in the early 1800s. The beach along Great Slave Lake is a prime spot for summer swimming, bird watching or relaxing.

Denínu Days in late August celebrate the beginning of moose hunting season with parades, traditional races, games and talent competitions. Recreational opportunities include camping, canoeing and fishing (self-guided, or available through several outfitters). The Little Buffalo River Crossing is a nearby territorial park, with historical and natural attractions, accessible by road and featuring a campground with 12 sites.

3.2 Hay River

The Town of Hay River is located on the south shore of Great Slave Lake, at the mouth of the Hay River (Figure 3.1-1). Hay River is the most northern point in Canada and all of North America that is connected to the continental railway system through the Mackenzie Northern Railway. This railway was recently re-purchased by Canadian National Railway (CNR). The Alaska Railroad is located farther north but is orphaned from the continental network. The first permanent settlement in the area of Hay River was established in what is now the K'atlodeeche Reserve.

In 2005, Hay River had a population of 3,876. The population is comprised of approximately 55 % non-native and 45 % of Aboriginal descent, living in 1,273 households. The average household income for Hay River in 2005 was $85,307 (GNWT Bureau of Statistics 2005; 2006). The town has excellent schools with a number of elementary schools and Diamond Jenness School offering grades 7 to 12.

The town is referred to as the Hub of the North since the town is capable of sending goods by land, air and water. Highway 2 connects Hay River to the south via Highway 1 and Yellowknife to the north via Highway 3. A commercial airport and railway also serve the town, and it is the trans-shipment location for river barges downstream to the Mackenzie Delta and the Arctic Ocean.

3.3 Hay River Reserve

The K'atlodeeche Dene peoples have used the Hay River area since time immemorial. The K'atlodeeche Dene have inhabited the area since the late 1800's when Shaatl'e (a Traditional K'atlodeeche leader) established a settlement on the east side of the mouth of the Hay River (K'atlodeh) for his people. The area was an excellent harvesting ground for a wide variety of fish and was also good for beaver, moose and woodland caribou (K'atlodeeche 2006).

Aside from family cabins, this location (now called Old Village) grew to include both Anglican and Catholic missions, as well as a number of temporary trading posts. Over the years, the population has gradually moved from Old Village, which was subject to flooding, to the new village, which is 16-26 m higher and offers stable ground. Even with the establishment of this settlement, most K'atlodeeche Dene travelled on a regular basis to Buffalo Lake, up K'atlodeh, and to other surrounding land use areas for hunting, gathering and trapping purposes.

In the early 1970's, in anticipation of the increased economic activity associated with the proposed Mackenzie Valley Pipeline, the Town of Hay River attempted to annex land on the east side of the K'atlodeh. In response, to ensure that more traditional lands were not taken over by the Town, the Chief and Council of the K'atlodeeche First Nation (KFN) successfully lobbied the Department of Indian and Northern Affairs to create a reserve, the first of its kind in the Northwest Territories. The Hay River Reserve includes 1,818 hectares and is bounded on the south side by Highway 5.

In 2005, the population of the Hay River Reserve was 299, comprised of 97 % Dene and 3 % Metis residents. The Hay River Reserve has 81 households and the average household income in 2005 was $34,688 (GNWT Bureau of Statistics 2005; 2006). Chief Sunrise School on the reserve offers classes for kindergarten to Grade 12.

3.4 Fort Smith

The Town of Fort Smith is located on the west bank of the Slave River at the NWT/Alberta border immediately below "the Rapids of the Drowned" (Figure 3.1-1). Fort Smith is located approximately 322 air kilometres southeast of Yellowknife and is the GNWT's administrative centre for the Fort Smith Region. It is also the site of the Thebacha campus of Arctic College, the Northern Life Museum, the museum ship Radium King and the park headquarters for Wood Buffalo National Park.

Each year the South Slave Friendship Festival, a music and arts festival, occurs in Fort Smith, usually in August. Musicians and artists from across the Northwest Territories and many other faraway places come to interact with other artists and show off their talents to the public. Fort Smith used to be a major transportation site. Goods were brought up to the nearby community of Fort Fitzgerald, Alberta and portaged on land to avoid four sets of impassable rapids (Pelican, Portage, Casette and the Rapids of the Drowned). The goods were then placed back into the water at the Slave River at Fort Smith where they traveled north, all the way along other rivers (such as the Mackenzie River) to destinations as far away as the Arctic Coast.

The construction of roads (the main one from the south being the Mackenzie Highway) put Fort Smith out of the water transportation business. A commercial airport also serves the town.

In 2005, the population of Fort Smith was 2,385, comprised of 60 % Aboriginal and 40 % non-native residents. The Town of Fort Smith has 810 households with an average annual income of $77,935 (GNWT Bureau of Statistics 2005; 2006). The town has excellent schools with P. W. Kaiser School offering grades 8 to 12.

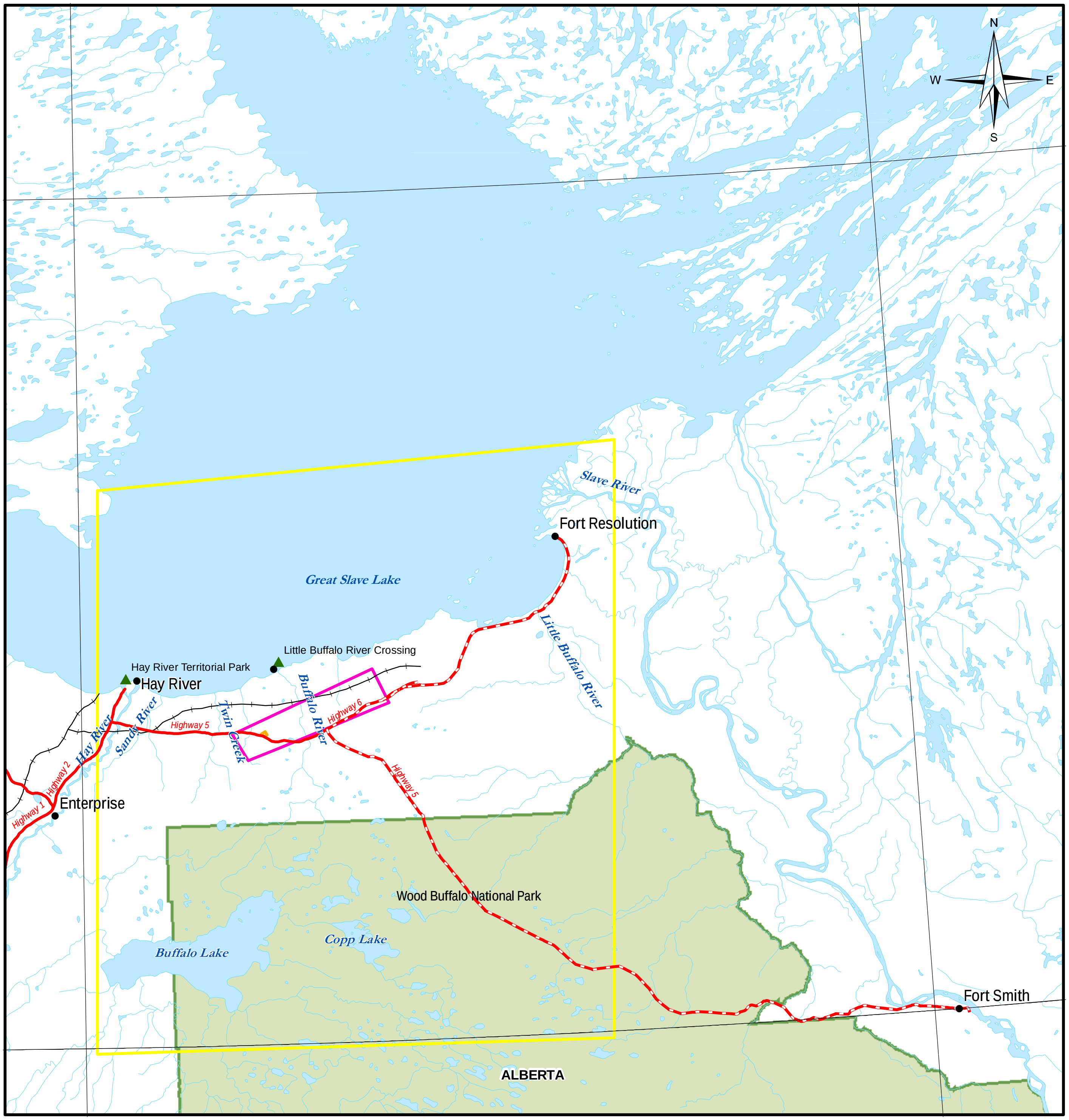
3.5 Enterprise

The community of Enterprise is located at the junctions of the Mackenzie Highway (Highway 1), the Yellowknife Highway (Highway 3) and Highway 2 to Hay River, west of the Hay River Gorge (Figure 3.1-1).

Following the construction of the Mackenzie Highway to Hay River in 1948, two service stations were built at Enterprise to take advantage of the highway trade. A subdivision was surveyed in 1963 in anticipation of the development of the site as a cargo transfer point and overnight stop. CNR constructed railway siding and loading facilities to the west of the community. However, the projected development of Enterprise did not occur and most freight for northern points continued to be handled at Hay River.

Enterprise is the first community Mackenzie Highway travellers visit in the NWT. The economy of Enterprise is centred around the restaurants, licensed premises, gas stations and the Highways Division maintenance yard. In August 1981, Enterprise was threatened with extinction by forest fire. A timely shift in the wind saved both this community and Hay River.

In 2005, the population of Enterprise was 91, comprised primarily of non-native residents. There are 27 households in Enterprise (GNWT Bureau of Statistics 2005; 2006).



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LEGEND

- Local Study Area (LSA)
- Regional Study Area (RSA)
- EA Study Area (ESA)
- Watercourse
- Waterbody
- Wood Buffalo National Park
- Territorial Parks
- Paved Road
- Unpaved Road
- Railroads

NOTES

Base data source:
Dehcho Land Use http://www.dehcholands.org/docs_final_draft_dehcho_land_use_plan_june_02_06.htm.
PAS areas delineated based on http://wildlife.enr.gov.nt.ca/

PINE POINT PILOT PROJECT

Communities of the Pine Point Area

PROJECTION	DATUM
UTM Zone 11	NAD83

Scale: 1:1,500,000

25 12.5 0 25
Kilometres

FILE NO.
1740149-005_Map017

PROJECT NO.	DWN	CKD	REV
1740149.005	KMW	RH	1

OFFICE	DATE
EBA-VANC	December 14, 2006

Tamerlane Ventures Inc.

EBA Engineering Consultants Ltd.

Figure 3.1-1

4.0 DEVELOPMENT DESCRIPTION

4.1 Development Overview

The Tamerlane Pine Point Pilot Project (PPPP) proposes to demonstrate the economic extraction of a one million tonne bulk ore sample from the R-190 deposit lead/zinc deposit, utilizing a combination of basic and technical mining methods. The mining of the bulk sample will confirm the use of:

- freezing for groundwater control
- shaft sinking for orebody access
- Dense Media Separation (DMS) for upgrading low grade deposits
- vertical conveyance for consistent hoisting of ore
- underground bulk mining methods for use in future mining of lower grade deposits.

4.1.1 Schedule

Tamerlane's Pine Point Pilot Project (PPPP) will extract approximately one (1) million tonnes of lead-zinc ores from underground and provide a nominal feed to the DMS circuit for a period of 12-15 months. Infrastructure construction is estimated to take an additional 12-15 months prior to the commencement of operations. The proposed PPPP will operate 365 days per year. Of the one (1) million tonnes extracted from underground, 40-50 % of the material mined will be returned underground for backfilling purposes. Provided the Pilot Project does not advance into future full scale mining, a decommissioning and reclamation schedule is estimated at 3 months following shutdown of the PPPP. Figure 4.1-1 outlines the anticipated PPPP schedule from initial construction, through operations to decommissioning and final reclamation.

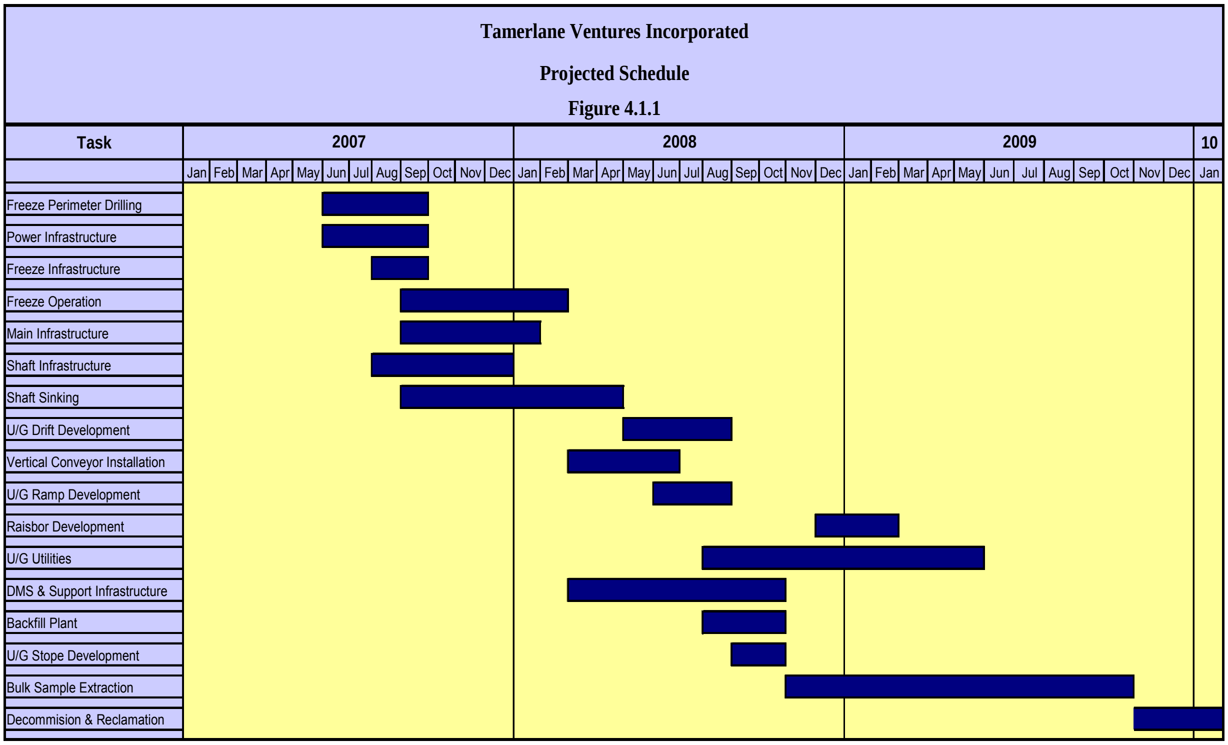


Figure 4.1-1 Pine Point Pilot Project Estimated Schedule

4.1.2 Material Usage

During initial development of the PPPP, existing overburden, gravels and glacial till in the facilities footprint area will be removed and/or graded as necessary to permit infrastructure construction to be undertaken. Organic overburden will be removed and stockpiled nearby in a previously disturbed area for eventual reuse during reclamation. The gravels and glacial till are predominant in the R-190 area and the materials being removed during initial development will be utilized to develop the freeze ring perimeter roadway. Additional construction materials along with shaft development materials will be used to upgrade the existing all weather road to the site. Any material remaining will be used for construction of the berms for the infiltration basin. Table 4.1-1 summarizes the estimated quantities of materials (aggregate, overburden, etc.) to be used by the PPPP.

Table 4.1-1
PPPP Estimated Materials Usage

Materials Generation	Estimated Tonnage
All Infrastructure North of Project Road	29,600
Shaft Sinking	16,300
Development	32,430
Raisebore	2,000
SUBTOTAL	**80,330**
Materials Utilization	**Estimated Tonnage**
All Infrastructure South of Project Road	31,780
Freeze Road	9,994
Main Road Upgrades	15,256
Infiltration Basin	23,300
SUBTOTAL	**80,330**
Topsoil for Reclamation	7,219

4.1.3 Freezing

Tamerlane proposes to utilize ground freezing techniques at the PPPP as a primary means to control the groundwater. Freezing has been an effective method of stabilizing wet, unconsolidated ground and controlling groundwater inflows since the early 1900's. Freezing was utilized at the old Pine Point mine in 1985 for the purpose of developing a ventilation shaft by raiseboring (Thyssen Mining 2006). The successful earlier application of freezing in the Pine Point rock strata provides confidence that a similar technique can be successfully employed at the R-190 site.

In conjunction with dewatering and grouting, Tamerlane also investigated the viability of freezing the ground to contain the groundwater. Tamerlane pursued the assistance of Layne Christensen Company for their freezing expertise. Layne Christensen is the foremost expert in ground freezing throughout North America. Some of the key projects which Layne Christensen has successfully undertaken that involved ground freezing include:

- Russia Wharf Tunnel – Boston, Massachusetts
- Verglas Crown Pillar Excavation – Rouyn-Noranda, Quebec
- Aquarius Mine Frozen Earth Barrier – Timmins, Ontario
- South Bay Ocean Outfall Dropshaft – San Diego, California
- Bushwick Shaft 20B – New York, New York

Artificial ground freezing is a technique that has been successfully used in the mining and underground construction industry for over 100 years. The original technology was developed by F.H. Poetsch in 1883. The process of circulating a refrigerated coolant through a series of subsurface pipes to extract heat converts the soil water to ice. The resulting frozen material is extremely strong, making it the primary method of ground water control and soil support for the construction of shafts extending hundreds of feet into water bearing soils.

A typical ground freezing system consists of a series of freeze pipes installed around the perimeter of the proposed excavation, extending into the subsurface strata. Within each of the freeze pipes a smaller diameter feed pipe is installed, permitting the downward circulation of the cooling medium which then flows back to the surface through the annulus of the larger pipe as illustrated in Figure 4.1-2.

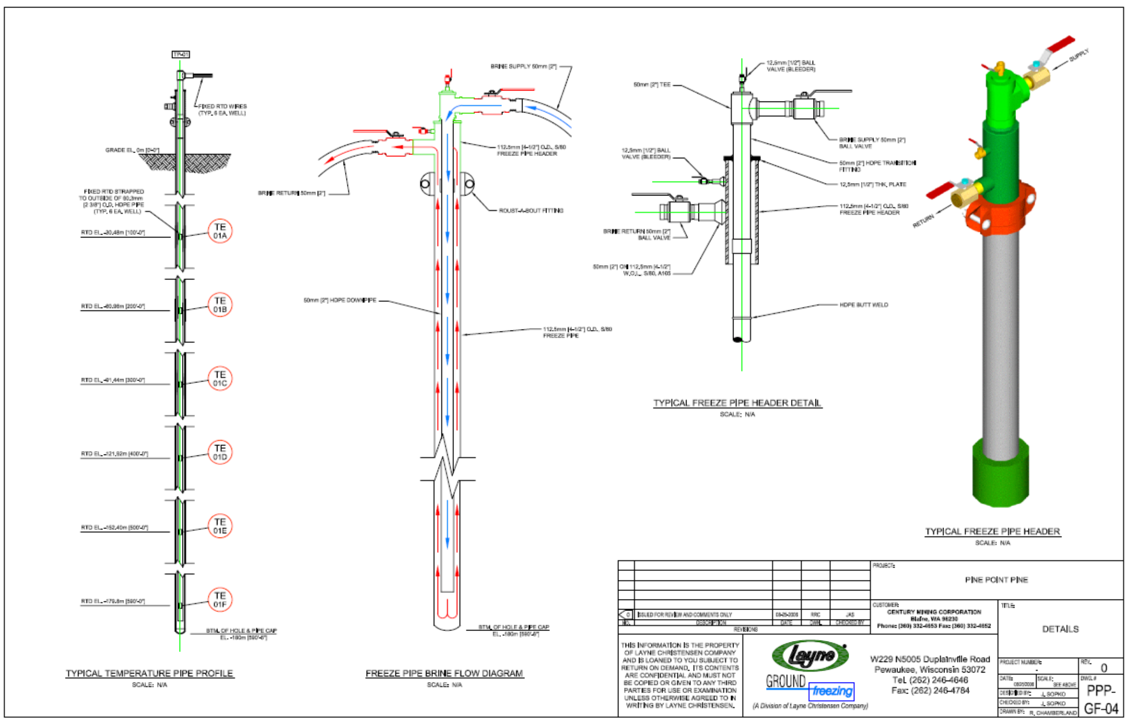


Figure 4.1-2 PPPP Freeze Pipe Diagram

A water-based calcium chloride solution (brine) is chilled by a series of electrically-powered refrigeration plants (Figure 4.1-3). As the circulation of the brine progresses, cylindrical columns of soil and ground freeze around each pipe. The size of these frozen soil columns increase with time, forming a virtually watertight, impermeable barrier.

The frozen earth perimeter barrier for the PPPP is illustrated in Figure 4.1-4. The estimated frozen barrier will extend to a depthe of approximately 585 metres (2000'). Based on previous studies of the applicability of freezing for the Pine Point Pilot Project reviewed by EBA (2006e – Appendix C), Tamerlane is confident that the proposed freeze ring perimeter will be successful in controlling groundwater ingress into the underground mine workings.

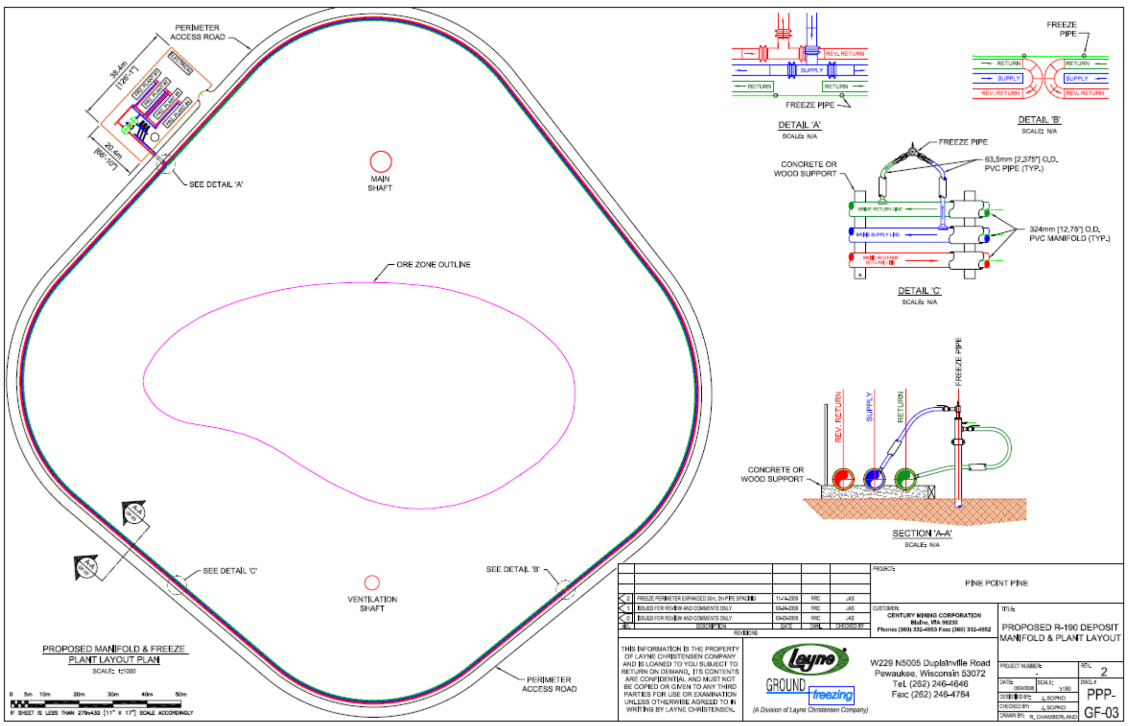


Figure 4.1-3 PPPP Freeze Plant & Piping Diagram

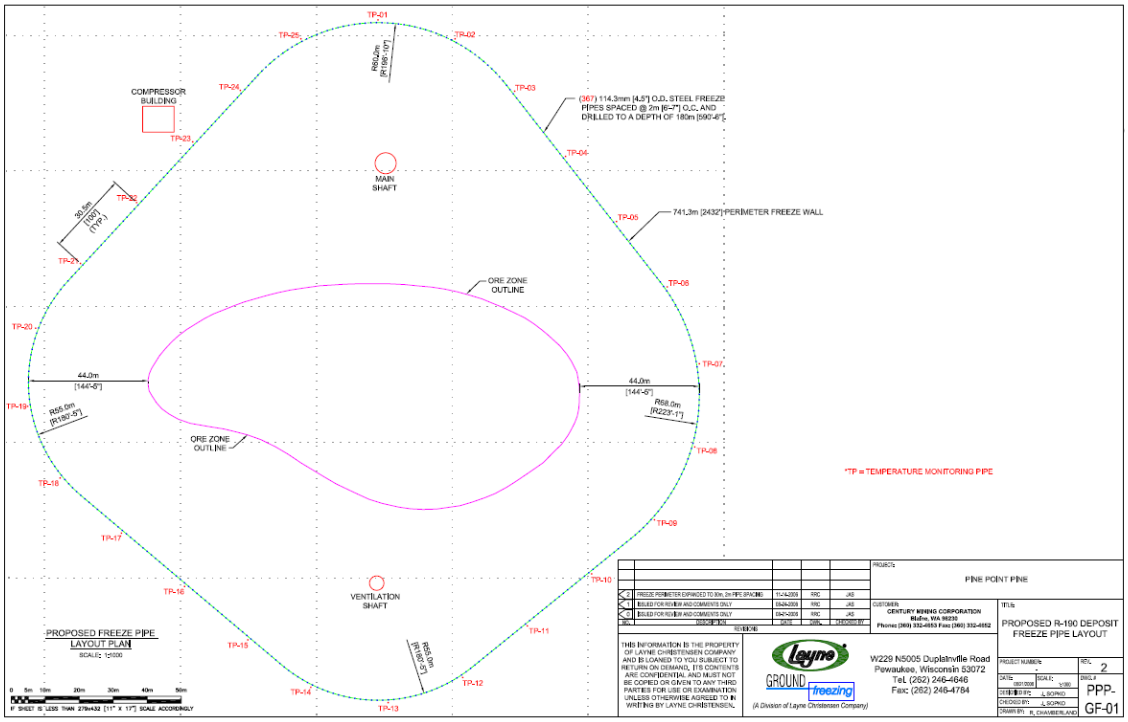


Figure 4.1-4 PPP Freeze Perimeter Diagram

With specific information supplied by EBA Engineering Consultants and Tamerlane, Layne Christensen Company determined that the freeze perimeter hole spacing should be 2 metres (6.58 ft). Considering the size of the freeze ring needed for the PPPP, a total of 300 freeze pipes and 30 ground temperature monitoring pipes will be required. Figure 4.1-5 illustrates a typical down-hole freezing diagram.

The drilling program is the most significant and critical component of any ground freezing system. When determining the freeze pipe spacing at the ground surface for the PPPP, consideration was given to anticipated deviation with depth based on Layne's experience in drilling and installing thousands of freeze pipes. In order to maintain the required verticality on this project of 180 metres (600'), Layne Christensen will be drilling using a combination of a faster "blind drilling" to a specific depth; followed with a slower directional or vertically seeking method to drill to the completed depth. As the project moves forward, Layne Christensen will establish a drilling program that is tailored to the subsurface conditions.

As indicated by Layne Christensen, the installation of each individual freeze pipe will be pressure tested and surveyed for verticality. The pressure test will be conducted by filling each pipe with water and applying 200 psi of air pressure while ensuring that the pipe holds this pressure for at least one hour. Each pipe will be checked for verticality using gyroscopic surveying methods.

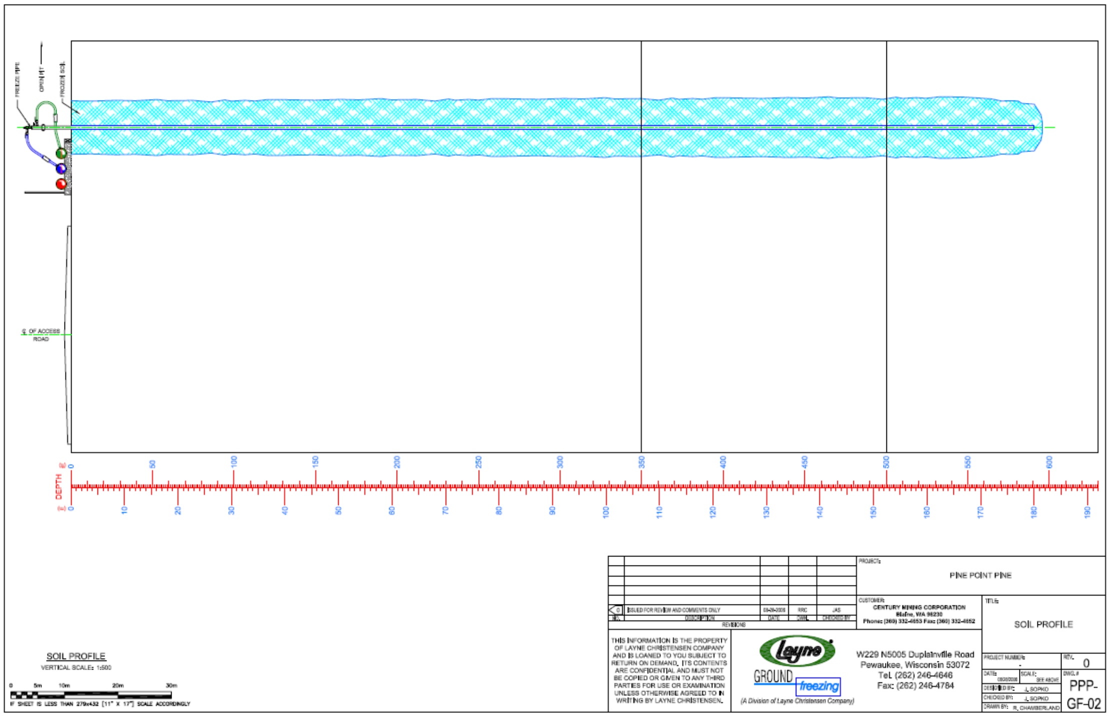


Figure 4.1-5 PPPP Down-hole Freezing Diagram

The coolant distribution manifold illustrated in Figure 4.1-3, has been designed to ensure that at least 30 gallons per minute of refrigerated calcium chloride solution flows through each freeze pipe. The ground freezing system proposed is a closed-loop system. Cold brine at -25° C (-13° F) is pumped from the refrigeration plant to each freeze pipe from a supply line that connects each pipe. As the warmer brine returns from the freeze pipes it flows into a return manifold which permits flow back to the refrigeration plant.

Due to the relatively large perimeter of this project, it may be necessary to add the reverse return line as illustrated to ensure balanced flow. The coolant distribution manifold is constructed of High Density Poly Ethylene (HDPE). Each joint is fusion welded, with a limited number of mechanical or bolted joints. Layne Christensen anticipates manifold construction to commence following the drilling of the first 100 freeze pipes and continue concurrently with the drilling operation.

Layne Christensen will supply an instrumentation system integrated with ground, distribution manifold and the refrigeration plant. The system will measure, record and reduce the data for the following components:

- Ground temperatures will be measured at 30 different temperature pipes equally located throughout the site. A typical temperature pipe is illustrated in Figure 4.1-2, showing the individual monitoring devices within each pipe;
- Coolant return temperatures will be measured at each freeze pipe at the connection to the return manifold. This coolant measurement ensures that each pipe has complete circulation;
- Groundwater levels will be continuously measured using transducers installed in each of the piezometers or monitoring wells installed during the initial engineering; Any significant drop in these levels could indicate potential inflows into the excavated zone;
- Coolant flow and pressure are constantly monitored and connect to an alarm system. Any decrease in flow or pressure could indicate a broken line or leak, requiring immediate repair operations; and
- Refrigeration plant data are built within the compressor system. These data, as well as other data from the plant, will be incorporated into the central monitoring system that records all other data.

Each of the described sensors are connected to control points that are monitored by a specifically designed software system. This system can be monitored from any location that has internet access. Layne Christensen engineers will establish a monitoring program including appropriate alarms and response actions.

Upon completion of a contract between Tamerlane and Layne Christensen Corporation, an HSE plan will be prepared by Layne Christensen for the ground freezing system. In addition Layne Christensen will be providing on-site management and inspection services during construction and operations.

4.1.4 Alternatives

As a possible alternative to ground freezing, Tamerlane considered the option of pumping groundwater directly out of the ground, as had been employed at the former Pine Point Mine. The use of this option was rejected early in the planning process for the following reasons. Based on historical pumping records for the Pine Point Mine operations, Tamerlane estimated that it would be necessary to pump approximately 20 million gallons of groundwater a day for a time period of 12-24 months to effectively dewater the R-190 deposit. This alternative was considered to be cost-prohibitive and impractical undertaking (more so than freezing), and would require a very large drawdown of the local groundwater. In addition, the time that would be required to draw down the aquifer would make the Pilot Project un-economic due to the currently attractive commodity pricing and market demands.

Tamerlane also investigated the alternative of developing a grout curtain around the deposit to control the inflow of groundwater. This method was also used by the former Pine Point operations with inconclusive results. Grouting requires twice as many drill holes as does the freeze technology and does not provide a complete seal from the surrounding aquifer.

As experienced in several underground grouting programs, in order to penetrate the fractures in the ground completely, increased pumping pressure is required. When increases in pumping pressure occur, existing unconsolidated ground tends to fracture more readily, creating even more avenues for groundwater flows. Although grouting will permeate the ground, it is not typically sufficient to contain the water and at best will only reduce in the order of 60 % of the groundwater flows. As a result, the use of grouting was discounted as a means to control groundwater.

4.1.5 Reclamation

Following project completion, the PPPP freeze plants will be turned off and the brine completely removed from the system. The freeze pipes will be reclaimed and the holes filled with grout. The frozen ground will thaw and return to its normal state within a short period (Thyssen Mining 2006).

4.2 Underground Infrastructure

Tamerlane proposes to extract a one million tonne bulk lead-zinc sample from the R-190 deposit utilizing conventional underground mining methods. Mining will be undertaken with sublevel stoping methods with internal ramp and drift access. Access will be via a vertical shaft complete with a “men and material cage” and a vertical conveyor for continuous hoisting of ore. A ventilation raise will be installed at the opposite end of the deposit to allow flow-through ventilation during mining activities. Primary emergency escape will be through the main shaft while secondary emergency escape will be through the ventilation raise.

Three levels will be developed for the extraction of the ore to allow top, middle and bottom access of the orebody. A sump access will be established from the bottom level of the mine workings to the shaft bottom for clean up and the installation of a dewatering pumping station. An internal ramp will be driven near the main shaft to tie in the top, middle and bottom shaft access locations. A powder magazine, maintenance bay and a fuel/lube bay will be developed near the shaft location so as not to impede the operations.

Mobile diesel equipment will be the primary equipment used underground along with a single run-of-mine crushing station prior to hoisting. All underground infrastructure will be contained inside the proposed freeze ring and a safety margin of approximately 15 metres (50 ft) will be recognized.

4.2.1 Shaft Sinking

Tamerlane plans to hire an experienced shaft sinking contractor for the shaft development. The shaft will be 6.7 metres (22') in diameter and extend vertically below the surface some 185 metres (607'). The shaft will be constructed utilizing conventional shaft sinking techniques. The surface collar of the shaft will be a reinforced concrete foundation to which the sinking head-frame will be attached. The shaft foundation will provide an unobstructed opening for downcast ventilation. The area immediately around the shaft and at a depth not exceeding the gravel and glacial till zone (~ 30 m or 100'), will be frozen.

During shaft sinking, a reinforced concrete liner will be installed the full 185 metre depth of the shaft. The concrete liner in the shaft allows for the installation of the men and materials cage infrastructure and provides a safe means of ingress and egress. The liner also adds strength and stability to the opening as well as an impenetrable layer that will keep any water leakage from entering (Figure 4.2-1).

Upon completion of the PPPP and assuming no other mining activities take place reclamation will begin. Reclamation will consist of removing all piping and support sets from the shaft. The head-frame will be removed and the concrete pad can be lifted if necessary. Once the shaft is cleared, a concrete plug will be installed at ground level that will extend several feet into the shaft.

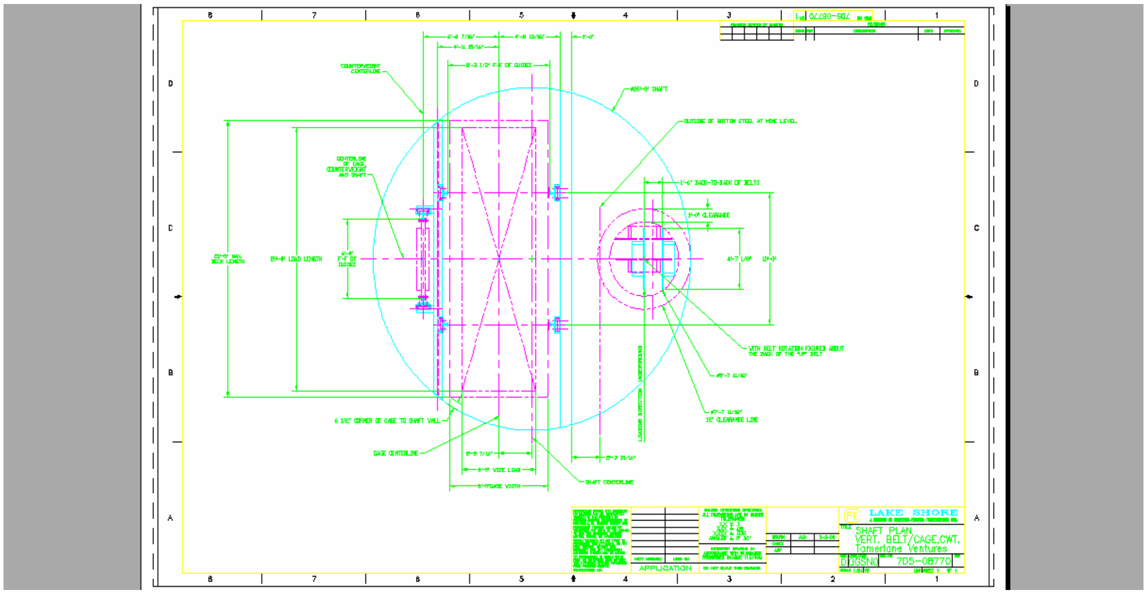


Figure 4.2-1 PPPP Shaft Plan

4.2.1.1 Vertical Conveyor

Tamerlane intends to utilize vertical conveyance for the consistent hoisting of lead-zinc ore from the underground excavations. Tamerlane will utilize a specialized vertical conveyance contractor for the design and fabrication of the system. Vertical conveyors are successfully used throughout North America in both civil and mining applications.

The proposed vertical conveyor would incorporate a fire resistant quality steel cord belt complete with surface and underground infrastructure. The vertical belt system includes a Metso flexowell® belt manufactured in Moers Germany in an "S"-shaped configuration, two drives of 250 HP, head pulley, roller curve pulleys, top bend unloaded side discs, underground bend pulley, take up pulley and two lower deflection loaded side discs.

Supporting steelwork at the top of the conveyor will incorporate the discharge chute and rock boxes and heavy duty base plates for the motors and reducers. The head pulley center will be approximately 18 metres above the base of the steelwork. The necessary support for all pulleys and the drive arrangements will be provided. The steel will be A36 type and includes walkways and platforms with toe plates and handrails for access to the machinery. Ladders with cages will be included as necessary. The surface structure will be covered and insulated.

For the underground portion of the conveyor, the necessary support steel for the lower deflection wheel assemblies, bend pulley and take up pulley will be installed. The framework will incorporate a screw type take-up to allow for belt tensioning. The structural steel will be A36 type and includes walkways and platforms with toe plates and handrails for access to machinery. An A36 chute assembly lined with AR plate will be located above the structure to divert the material from the feed system to the working area of the Flexowell belting.

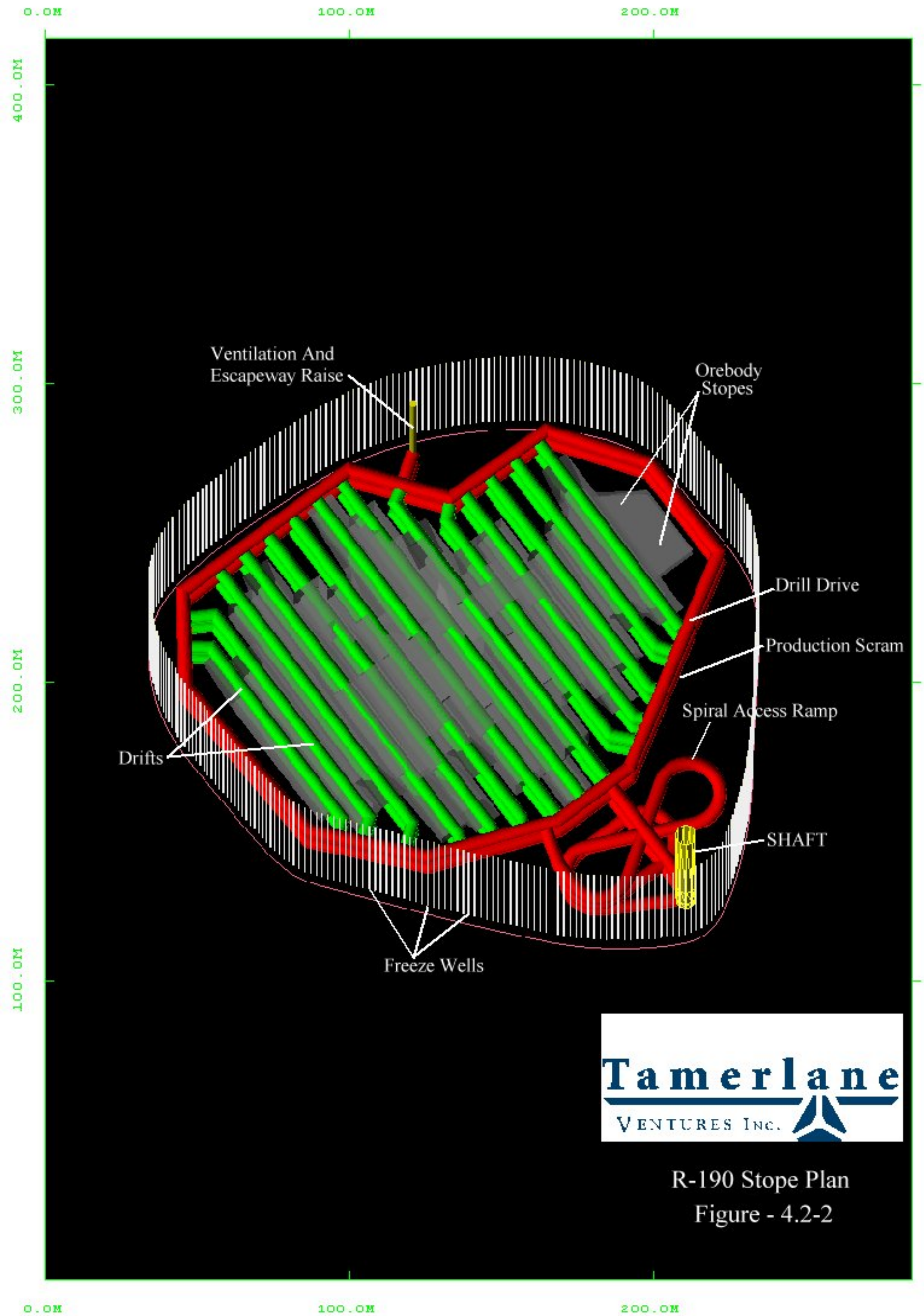
Upon completion of the PPPP and assuming no other mining activities take place reclamation will begin. Reclamation will consist of removing all surface and underground conveyor components and belting. The surface structure will be dismantled and removed from site.

4.2.1.2 Men & Materials Cage

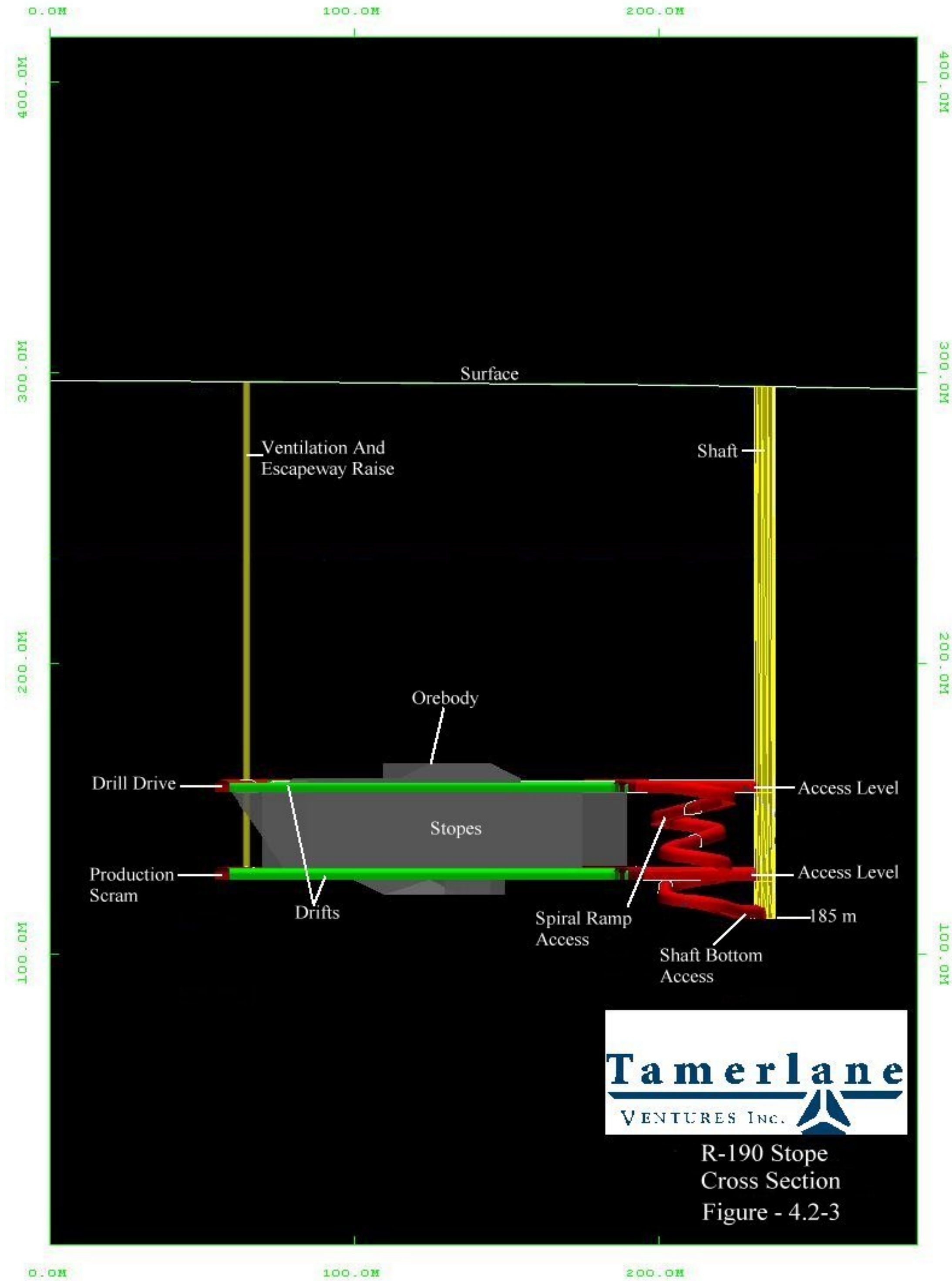
Tamerlane intends to utilize the proposed shaft for the installation of sets that will support a single cage immediately adjacent to the vertical conveyor compartment. The cage dimensions will be 2.4 x 3.6 m (8' x 12'). Tamerlane estimates the cage will have the capacity to hold up to 25 employees. The cage will be also be used to lower equipment and materials into the mine.

4.2.2 Development Headings

Tamerlane anticipates the development headings to be driven by conventional mining methods. Tamerlane plans to utilize an experienced contractor to excavate the proposed development headings. Tamerlane will encourage the selected contractor to hire and train local personnel as an opportunity to learn mining skills, as well as provide a smooth transition from development to operations once the contractors work is complete. Figures 4.2-2 and 4.2-3 provide plan and cross-section views of the R-190 showing how the underground mine will be developed.



R-190 Stope Plan
Figure - 4.2-2



R-190 Stope
Cross Section
Figure - 4.2-3

4.2.2.1 Shaft Bottom Access

Once the shaft is sunk to the lowest working level near 165 metres, a main development drift will be driven approximately 180 metres to intersect the ventilation raise location. Along this main access, a decline will be driven to intersect the shaft bottom. Accessibility to the shaft bottom is important for cleanup and the diversion of excess water.

4.2.2.2 Internal Ramps

Tamerlane intends to develop a single ramp system off the main development drift near the 165 metre level. The ramp will be developed at approximately 14-15% grade to allow alternative access to the upper levels of the orebody. The ramp will also be used for the haulage of ore from the upper levels to the crusher located near the 165 metre level. It is not anticipated that a second ramping system will be required at this time.

4.2.2.3 Ventilation Raise

Tamerlane anticipates retaining a specialized contractor for the excavation of the proposed ventilation raise. For proper ventilation, the raise will be 2.4 metres (8 ft) in diameter. This will accommodate a variable pitch axial van fan with an output capacity of 300,000 cubic feet per second. The ventilation raise will be lined for stability and a staggered ladder system with platforms will be installed for a secondary escapeway.

4.2.2.4 Ore Access

Ore will be accessed from three different levels off the main production shaft. A single ramp will connect these levels for the ease of equipment mobility. Tamerlane plans to access the orebody by driving a crosscut North-South through the orebody, followed by the development of East-West access drifts over each proposed stope.

4.2.2.5 Powder Magazine

An explosives magazine will be installed underground to eliminate the need for daily transport of explosives material from the surface and to reduce handling time. Two short drifts will be excavated near the south end of the main development drift off the 165 metre level. The explosives storage drifts will be located on the exhaust side of the mine nearer the ventilation raise. Both storage drifts will be gated and locked with access keys given only to designated responsible employees. The two drifts will be separated by at least 4.5 metres (15 ft) of unconsolidated rock. One drift will be used for the safe storage of ANFO and Emulsion and the second drift will be utilized for all Detonators. Only properly trained and certified employees or contractors will be permitted to handle explosives.

4.2.2.6 *Maintenance Bay*

Tamerlane will develop an underground mobile equipment maintenance bay on the mid-level (~ 140 metres below surface) of the mine. This location will allow uniform accessibility to and from all mobile equipment. The maintenance bay will consist of an excavated area to be located near the main shaft. Maintenance activities will include scheduled preventative and predictive maintenance, troubleshooting, short & long term rebuilds and equipment installations. Most consumable parts will be kept on the surface with a small rotating supply underground.

4.2.2.7 *Fuel & Lube Bay*

A fuel and lubrication bay will be located near the proposed maintenance bay to allow for quick and easy preventative maintenance and a uniform accessibility for all mobile equipment. It is anticipated that fuel will be transported through an enclosed piping system from the surface to an underground storage tank sized for a week of production usage. The lubrication supplies will be supplied in bulk totes and transported underground via the materials cage.

4.2.2.8 *Dewatering Station*

A dewatering station will be installed to pump water from the shaft bottom sump to the surface for use in the DMS process and backfill plants. The water handling equipment at the surface will include a surge tank to provide consistent feed into the facility. Based on EBA's reports (2006d and 2006e – Appendix C) and their review of prior dewatering studies of the R-190 deposit, Tamerlane anticipates groundwater seepage into the shaft bottom sump at a rate of 55 m^3 per hour. The dewatering station will be located near the shaft on the 165 m (550') level and be equipped with a 4-stage positive pressure pumping system with a maximum capacity of 2,273 m^3 per hour (10,000 gpm). Tamerlane does not anticipate needing to utilize the full capacity of the pumping station, but has sized it for any unforeseen inflows of water.

4.2.2.9 *Crushing & Loading*

Run-of-mine ore from the stopes is expected to range in sizes from over 305 mm (12”) to less than 9 mm (⅜”). The vertical conveyor is expected to hoist all materials less than 102 mm (4”), therefore, an underground run-of-mine conditioner (crusher) will be used to crush the ore before placement of the feed onto the vertical conveyor. The conditioner will be located on the lower level of the mine (165 m) near the shaft and just prior to the vertical conveyor. Loading from the stopes to the conditioner will employ diesel power self-propelled mobile underground mining equipment (Load-Haul-Dump vehicles - LHD’s) sized to provide a consistent feed to the conveyor for a daily output of 2,800 tonnes.

4.2.3 Mining Method

The R-190 deposit is characterized as a Mississippi Valley Type (MVT) deposit that was formed through Karst methods. The deposit is a prismatic deposit, as opposed to many of the tabular deposits in the area, and has vertical uniformity ideal for basic sublevel stoping techniques. The top of the deposit is located approximately 120 m (393 ft) below the surface and extends 165 m (541 ft) below the surface. Tamerlane envisions extracting stopes from the lower half of the deposit first followed by the upper half of the deposit. Stope sizes will range from 6-9 m (20-30 ft) in width and 9-15 m (30-50 ft) in height.

Stopes will be planned in a primary-secondary sequence with the primary stopes being filled by the backfill plant at an estimated 6 % cemented mixture. The cemented backfilled stopes will allow for the safe extraction of the secondary pillars. The secondary pillars will be backfilled with untreated waste rock. Once the lower levels are mined, the upper levels will be extracted utilizing the same stoping procedures.

A stringent property-wide ground control standard will be utilized to ensure the safety of personnel, protect equipment, and assure continuity of operations. The support system will vary according to the nature of the excavations and local ground conditions. Because the mining portion of the PPPP will be relatively short-term in duration, ground control will be designed accordingly. Tamerlane envisions the ground control methods to encompass either resin/grout set rebar or cable bolts followed by a layer of reinforced shotcrete if necessary.

4.2.3.1 Primary & Secondary Escapeways

Tamerlane will ensure that a safe means of access will be provided and maintained to all working places. In the event of an unforeseen natural, man-made or medical emergency, employees will utilize the main shaft as a primary means of exit from the mine. The main shaft is downcast fresh air. In the event the primary escape-way (main shaft) is unusable, then employees will have the option of utilizing the ventilation shaft as the secondary escape-way.

All escape routes will be inspected on a regular interval and maintained in a safe, travelable condition. Both the primary and secondary escape-ways will be marked with conspicuous and easily read direction signs that clearly indicate the ways of escape. Prior to entering the mine, all personnel will be trained and oriented to the proper method of escape from the mine.

4.2.3.2 Ventilation

Mine ventilation is a necessity to provide clean fresh air for all employees while working underground in each work location. It is envisioned that 8,500 m^3/minute (300,000 cfm) will travel downcast via the main production shaft. Ventilating curtains, seals and airlocks will be used throughout the mine to divert air to all active working locations. Booster fans will be located in key locations to help divert fresh air to the main working locations.

The ventilation shaft will be used as an up-cast shaft to exhaust all used air in the mine and allow for the continuous renewal of fresh air to the active working locations. A designated responsible employee will be assigned to monitor the air quality at each working location, during each shift, on a daily basis and maintain records of the air quality monitoring information.

4.2.3.3 Mobile Underground Mining Equipment

Tamerlane envisions using self-propelled diesel-powered mobile underground mining equipment. Loading material from the working stopes to the crushers will be done by specialized underground mining LHDs, which are a combination of a loader and a truck. Drilling activities will be completed by diesel/hydraulic vertical and horizontal drilling machines. Ground support will be installed by mechanical rock bolting and shotcrete machines. Personnel carriers will provide transport to and from the working locations.

4.3 Surface Infrastructure

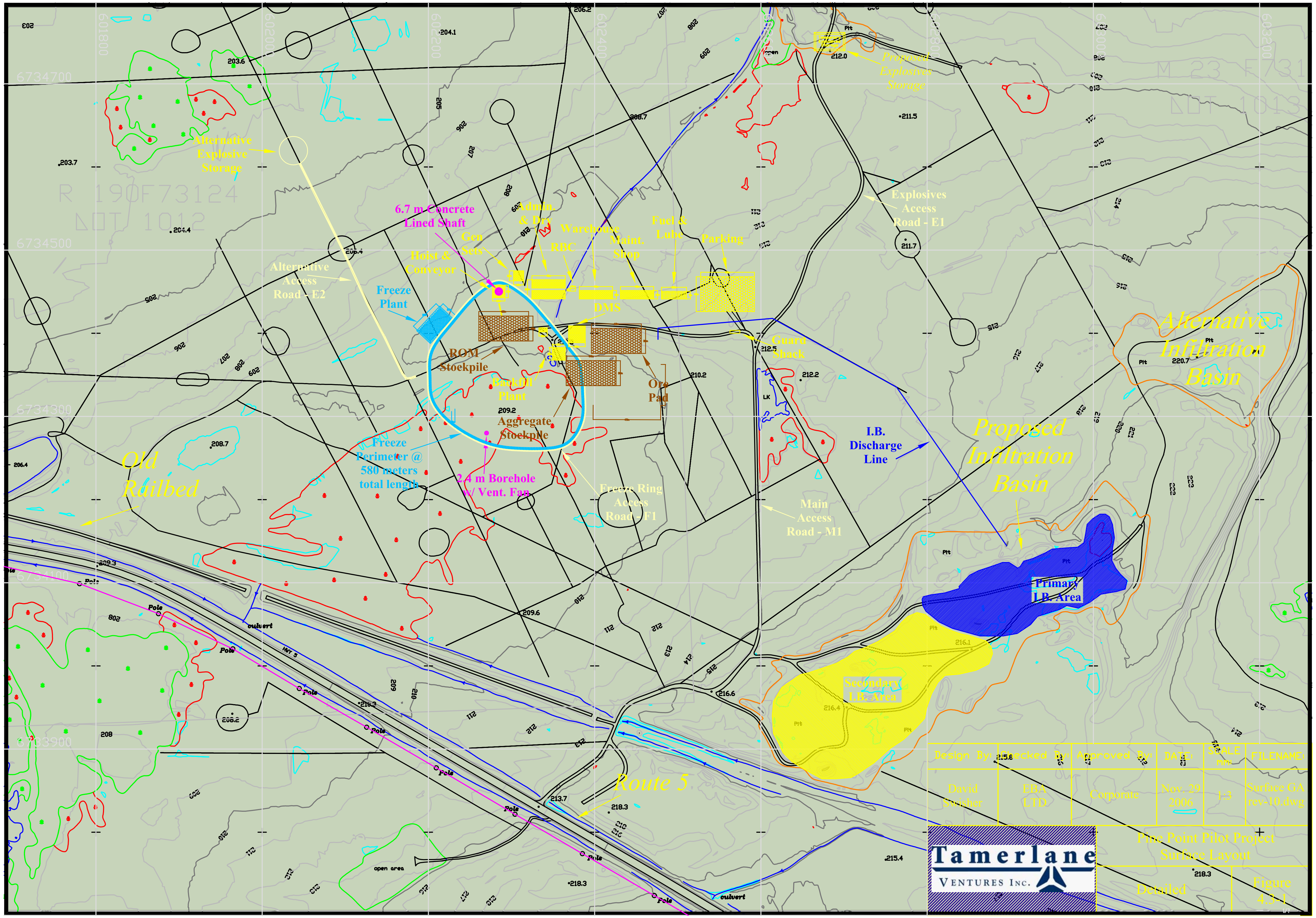
The Pine Point Pilot Project (PPPP) property is located 42 km (26 miles) east of Hay River and 140 km (87 miles) west of Fort Resolution. The property encompasses an area of approximately 6 hectares 14.8 acres. The PPPP facilities footprint area will encompass approximately 2.5 hectares (6.2 acres). The property's R-190 deposit is located approximately 0.5 km north of Territorial Highway 5 (Figure 4.3-1). The Highway links the communities of Hay River, Fort Resolution and Fort Smith.

Figure 4.3-1 outlines the complete footprint of the PPPP and surrounding area, inclusive of physical structures (facilities), stockpiles, freeze perimeter, above ground mine workings, water discharge lines, power line, old rail bed, temporary explosive storage, aggregate stockpile, parking, adjacent quarries and roads. The power line is located on the south side of Highway 5. The proposed PPPP facilities will include several temporary structures as itemized in Table 4.3-1.

The temporary structures will be removed at the completion of the bulk sampling program unless future full-scale mining is deemed viable. Nine solid structures and three tent structures will be located near the shaft (Figure 4.3-1). The temporary solid structures will include a compressor building, hoist house, vertical conveyor facility, batch plant, office, dry, warehouse, maintenance shop, fuel and lube facility and dense media separation plant.

The tent structures will be located near the dense media separation plant. One will receive run-of-mine material from underground prior to secondary crushing. One will be an aggregate storage area for material that will be recycled underground. Another structure will serve to shelter and temporarily store product at the PPPP site while awaiting shipment to the railhead.

With the exception of the temporary explosives storage facilities, all PPPP facilities will be located over 400 metres from Provincial Route 5 and within 200 metres of the shaft. A guard shack and a parking area will also be located within the PPPP footprint area (Figure 4.3-1).



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PINE POINT PILOT PROJECT

Surface Layout

PROJECT NO.	DWN	CKD	REV
1740149.005	KW	RH	0
OFFICE	DATE		
EBA-VANC	December 13, 2006		

Figure 4.3-1

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Table 4.3-1
Dimensions of PPPP Surface Structures

Structure	Estimated Dimensions						Concrete Slab
	Width		Length		Height		
	(m)	(ft)	(m)	(ft)	(m)	(ft)	
Administration	10	32	40	131	2.4	8	No
Dry	10	32	40	131	2.4	8	No
Warehouse	10	32	40	131	8	26	Yes
Maintenance Shop	10	32	40	131	8	26	Yes
DMS Plant	20	65	20	65	16	52	Yes
Secondary Crusher	5	16	10	32	8	26	Yes
Backfill Plant	15	49	15	49	10	33	No
Head-frame & Vertical Conv.	15	49	15	49	30.5	100	Yes
Generator Building	12	39	12	39	4	13	Yes
Freeze Plant	20	65	38	124	4	13	Yes
Sewage Treatment Plant	3	10	6	20	4	13	No
Fuel & Lube Structure	9	29	30	98	4	13	No
Guard Shack	3.5	12	12	40	2.4	8	No
Parking Area	40	131	60	196			No
ROM Stockpile	30	98	60	196			No
Product Stockpile	30	98	60	196	8	26	No
Aggregate Stockpile	30	98	60	196	8	26	No
Railhead Product Stockpile	30	98	60	196	8	26	No

4.3.1 ROM Stockpile

The Run-of-Mine (ROM) stockpile will be located at the discharge side of the vertical conveyor. The stockpile dimensions are roughly 60 metres length by 30 metres width and will receive underground material no larger than 102 mm (4"). The stockpile will be leveled, graded and covered with an insulated tent structure to keep out moisture and minimize freezing in the winter.

4.3.2 Secondary Crushing

Secondary crushing will be required from the ROM stockpile before entering the DMS circuit. The ROM stockpile will be 30 x 60 metres (98' x 196') and sized to accept 4-5 day surges from underground in the event there are mechanical problems downstream. ROM ore will be reclaimed from the ROM stockpile and fed into the secondary crusher in a closed circuit with sizing screen.

The secondary crusher will be housed on a concrete foundation in a structure 5 x 10 metres (16' x 32'). Screen oversize of 16 mm (+⅝") will return to the cone crusher feed. Screen undersize will report to the DMS circuit. If necessary, dust generated from the crusher area may be controlled at transfer points by utilizing reclaim water from the production shaft sump and using it in misting systems.

4.3.3 Dense Media Separation

At the Pine Point Pilot Project (PPPP) the lead, zinc and iron sulphides are present as veins, mass sulphides occurrences and remnants in a limestone host rock association. The dilution in the ROM ore will be limestone which has a significantly lower specific gravity (s.g.) than the sulphides. The s.g. of the limestone is 2.7 while the s.g. of the sulphides vary from 4.1 to 7.6. Crushing the ROM ore can optimize the liberation of the host rock from the sulphides present.

A pre-concentration process like Dense Media Separation (DMS) can take advantage of the significant difference in the specific gravity (s.g.) of the liberated host rock and remove it from the crushed ROM ore with minimal loss of sulphides. This pre-concentration process will save capital and operating costs and energy consumption for the project; in fact, it will make the project more economic and give the project a longer operating life. Figure 4.3-2 illustrates the general layout of the ore processing and dense media circuit for the PPPP.

The ROM ore from the R190 mineralized deposit will be crushed to 100 % passing one inch. The crushed product will be washed on a 28-mesh vibrating, pre-screen which will remove the minus 28 mesh undersize screen fraction. These fines will be removed so they do not contaminate the ferrosilicon {dense media} used to develop the "2.95 s.g. Slurry" that will separate the liberated + 28 mesh, pre-screen fraction, waste product from the sulphide product.

The DMS plant comprises pumps, cyclones, sieve bends, vibrating drain/wash screens, a magnet separator and "dense medium slurry" adjustment equipment to facilitate the separation of the high and low specific gravity particles in a continuous process. The pre-screen +28 mesh fraction will discharge into a pump box to which 2.95 s.g. slurry has already been added. This screen product and the 2.95 s.g. dense medium slurry (water and ferrosilicon) mix and will be pumped to the s.g. density medium, separation cyclone(s).

The higher, s.g. particles and associated dense medium slurry will leave the cyclone chamber as underflow (called the "Sink" product) while the lower, s.g. particles and associated dense medium slurry will leave the cyclone chamber as overflow (called the "Float" product).

The cyclone underflow and overflow products will pass over identical but separate drain/rinse sieve bends and vibrating screens. The sieve bends and feed end of the vibrating screens (28 mesh screen cloth) will drain dense medium slurry at the operating s.g. of 2.95 directly to the wash, pre-screen oversize pumpbox for reuse. The latter sections of the drain/rinse vibrating screens will be vigorously washed to remove the remaining ferrosilicon from the sulphide and host rock particle surfaces.

The drain/rinse screen, recovered ferrosilicon media will have to be densified to the correct medium slurry density of 2.95 so it can be returned to the DMS separation circuit. The ferrosilicon is magnetic and can be selectively recovered on a magnet. Then the ferrosilicon will be scraped from the surface of the magnet and mixed with a measured amount of water to produce the correct dense medium slurry of 2.95.

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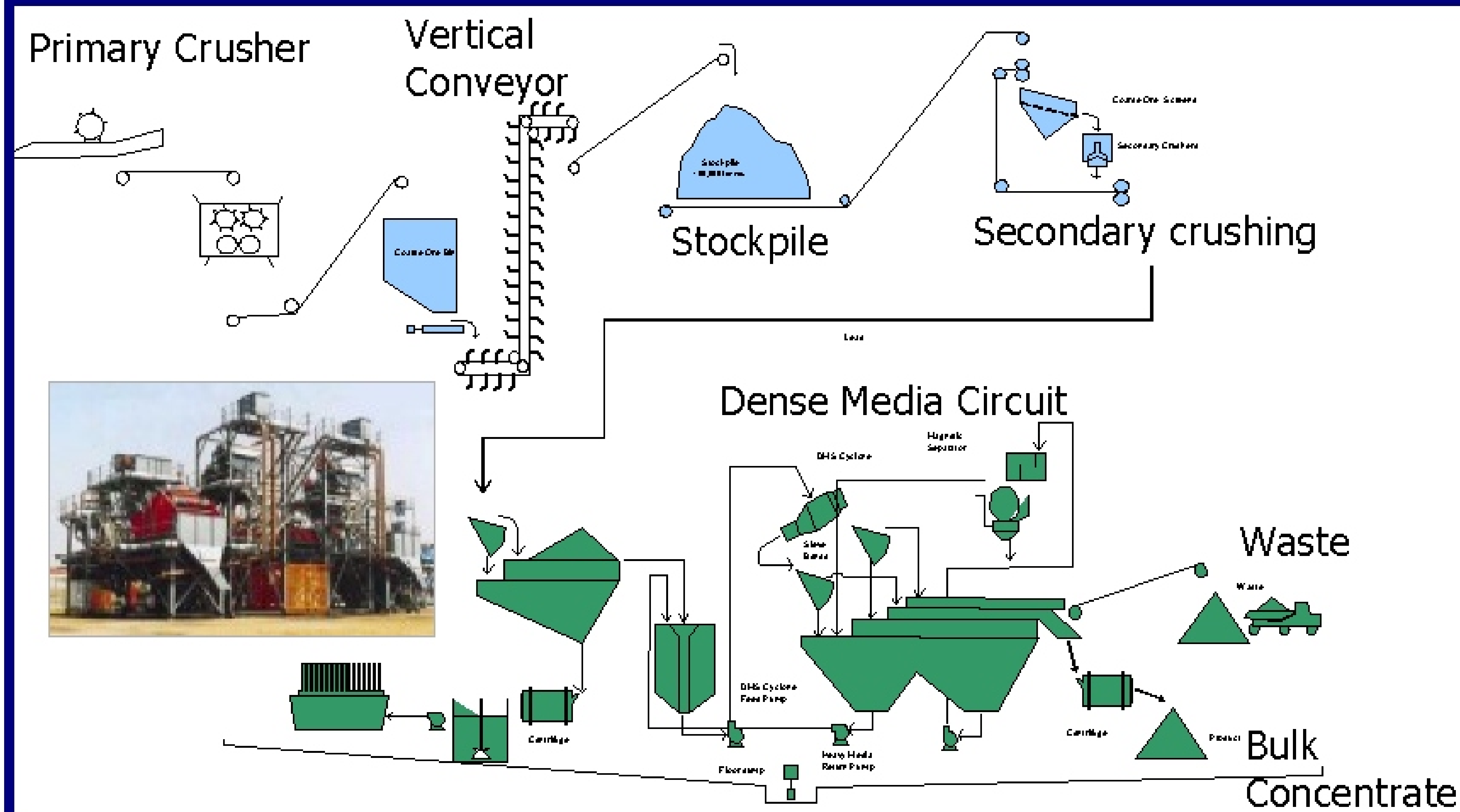

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PINE POINT PILOT PROJECT

General Layout of the Pine Point Pilot Project Ore Processing and Media Circuit

PROJECT NO.	DWN	CKD	REV
1740149.005	KW	RH	1
OFFICE: EBA-VANC	DATE: December 13, 2006		

Figure 4.3-2

The washed DMS "Float" product will be conveyed to a storage pile and subsequently used to backfill mined-out openings and stopes underground. The washed DMS "Sink" product (Direct Shipment Ore) will be conveyed to a temporary storage area and subsequently hauled by truck to the railhead at Hay River. The washed fines (-28 mesh) will be dewatered and then stockpiled for subsequent mixing with the DMS "Sink".

The process for the handling of the ROM ore and associated water at the surface DMS plant will be as follows:

- Washed pre-screen fines (-28 mesh) to storage area for Shipping.
- Washed pre-screen coarse (+28 mesh) to the DMS circuit –Float to underground backfill. -Sink to Direct Shipment Ore.
- Ferrosilicon – recycled to the DMS circuit.
- Process Water – all will be recycled to the DMS process except for a small loss on the surfaces of the DMS products.
- Underground Water – make-up water for the DMS circuit (water loss on surfaces of the DMS products); excess underground water will be pumped to the infiltration basin.

4.3.3.1 DMS Facility

The DMS process plant will include facilities to beneficiate the ore. It will also house the processing equipment, maintenance facilities, plant warehouse, laboratory and administration offices for facility supervisors and staff. The floor of the facility will be concrete-lined and sloped to a central drainage sump. All DMS circuit materials and chemicals will be stored in the DMS facility complex or in a separate building. Drainage will be included in the design to ensure that any spills are contained within the DMS circuit area can be effectively contained and cleaned up. The DMS circuit will be housed in a physical plant structure estimated at 20 x 20 metres (65 ft x 65 ft).

4.3.3.2 Gravity Concentration

Gangue discharge from cleaning, with added reagents, will report to a centrifuge to remove slime. A concentrate containing sulphides of zinc and lead plus minor amounts of gold and silver will be produced. The concentrate will then be dewatered and blended with the coarse DMS concentrate.

4.3.3.3 *Concentrate Handling*

Concentrate will be stored in a dry, contained enclosure with sufficient heat to prevent or minimize freezing. Any spilled concentrate will be recovered and returned to the process. The loading area will be separated from trucks and/or railcars by a containment wall to minimize cross contamination and to prevent the concentrate from spreading outside the building. The concentrate storage tent facility will be in an area estimated at 30 x 60 metres (98 ft x 196 ft). The concentrate product will be transported from the PPPP site to the Hay River railhead in covered trucks for subsequent loading into rail cars.

4.3.3.4 *Additives*

The Dense Media Separation process will need to use only one primary additive. This additive is ferro-silicon, which is a chemically inert but very dense product. It will be used to make the required heavy liquid (dense media) with a specific gravity of 2.95. This will permit separation of the target sulphide minerals containing the lead and zinc. The ferro-sillicon material will be recovered from the concentrate product using magnetic separation and will subsequently be re-circulated in the DMS process. If necessary, lime may need to be added to stabilize the PH.

4.3.4 Waste Rock Storage

Underground waste rock will remain underground as backfill in either the primary or secondary stopes where possible. All waste rock (float) generated from the DMS circuit will be temporarily stockpiled on a graded and leveled pad approximately 30 x 60 metres (98' x 196'). The waste material will be reclaimed and introduced into an onsite cement batching facility. The waste rock storage facility will be covered with a tent structure to protect the material from weather and minimize any freezing during the winter.

4.3.5 Backfill Plant

Several backfill options have been considered from a full scale batching facility to a complex slurry paste fill. Tamerlane has considered these options and in light of this being a pilot project (advanced exploration project) versus full scale mining, a lower cost approach will be employed. Tamerlane expects to bulk batch the material from the DMS waste discharge into a 6-8 % cemented aggregate backfill mixture. The backfill will then be transported to an existing 305 mm (12") cased borehole and sent to the underground. Loaders will retrieve the material underground for placement in the primary stopes to full depth. The backfill plant dimensions are 15 x 15 metres (49 ft x 49 ft).

4.3.6 Power Generation

The power requirement for the Pine Point Pilot Project is projected to not exceed a maximum of 6,000 kW during both the construction and operating phases of the project life. The town of Hay River is supplied from the Talston Dam via a power pole line that runs alongside Highway 5. Currently, Northland Utilities, out of Hay River, manages the power along this line and has indicated to Tamerlane that there is an additional 6,000 kW that can be added to this power line from the Talston Dam. Additionally, the town of Hay River has back-up power supply via diesel generators.

Tamerlane considered the viability of utilizing power from this line and determined that the time schedule, economics and the fact that this is a Pilot Project do not justify the need for a long term power supply at this time. Therefore, Tamerlane will be installing self-contained on-site diesel generators to meet the capacity and back-up power needs throughout the relatively short duration of the PPPP. The diesel generators will be housed in an enclosed, insulated building with a concrete foundation approximately 12 x 12 metres (39 ft x 39 ft). Heat generated from the diesel power units will be captured and re-used throughout the facility. Since the PPPP will be generating its own power, the existing power supply of the Pine Point area and South Slave Region will not be affected by the PPPP.

4.3.7 Greywater & Sewage Treatment

Due to the close proximity of the PPPP to Hay River and Fort Resolution, no on-site camp will be required for the short-term duration of the project. For the underground operations, Tamerlane envisions subcontracting out the use of either port-a-potties or self-contained mini-sewage treatment toilets. For the surface construction and operations, Tamerlane plans to employ a self-contained, packaged, RBC sewage treatment plant developed by Biodisk Corporation. The packaged sewage treatment plant will be located between the administration/dry and warehouse structures (Figure 4.3-1).

The plant is readily transportable and will be contained in a 3 x 6 metre (10 ft x 20 ft) structure. The treated effluent will be suitable for discharge to the receiving environment and will be comingled with the discharge line reporting to the infiltration basin. The Biodisk treatment system has proven field experience and the advantages of the system have been demonstrated many times throughout the Northwest Territories.

4.3.8 Administration & Dry Facilities

Due to the relatively small size and short-term nature of the project, the administration and dry facilities will be housed next to each other for accessibility. Tamerlane envisions both buildings to have a solid foundation with an estimated dimension of 10 x 40 metres (32’ x 131’). Due to the continued pursuit of more cost effective alternatives, the buildings may consist of temporary mobile structures on temporary foundations. The buildings will provide working offices for management and key personnel. The buildings will also contain change room facilities. All greywater and sewage will be plumbed to the RBC plant located immediately outside the buildings.

4.3.9 Warehouse

A small warehouse will be located on the surface next to the RBC plant and the administration and dry facilities. It is estimated that the warehouse dimensions will be 10 x 40 metres (32 ft x 131 ft). It is anticipated that the warehouse will have a solid foundation so as to keep parts and inventory dry. The building will be insulated and heated and may house miscellaneous items that will need to be stored out of the weather. Due to the small number of surface equipment, the warehouse will mainly be utilized as a flow-through parts warehouse for underground supplies.

4.3.10 Maintenance Shop

Tamerlane proposed to construct a small maintenance facility on the surface for the predictive and preventative maintenance programs necessary for all surface mobile and stationary equipment. The maintenance facility will be located between the proposed warehouse and fuel & lubrication structures. It is envisioned that the maintenance structure will have a solid concrete foundation and an enclosed, insulated dimension of 10 x 40 metres (32 ft x 131 ft).

4.3.11 Fuel & Lube Cache

All fuel and lubricants will be stored on site in approved storage tanks and containers in an engineered and lined enclosure capable of holding 110% of the capacity of the largest tank in accordance with CCME criteria (Figure 4.3-3). The area designated for fuel and lube storage will be located adjacent to the maintenance shop for ease of access. The fuel and lube area will encompass an area of 9 x 30 metres (29 ft x 98 ft). Fuel and lubricants will be supplied via tanker truck from a local supply depot. Fuel consumption is estimated to be 570,000 litres per month. On-site fuel storage requirements are estimated to be 79,000 litres; enough to maintain PPPP operations for four days (Figure 4.3-3). The daily fuel requirements will be stored in four 20,000 litre tanks. Appropriate spill response equipment will be stored at the tank farm facility.

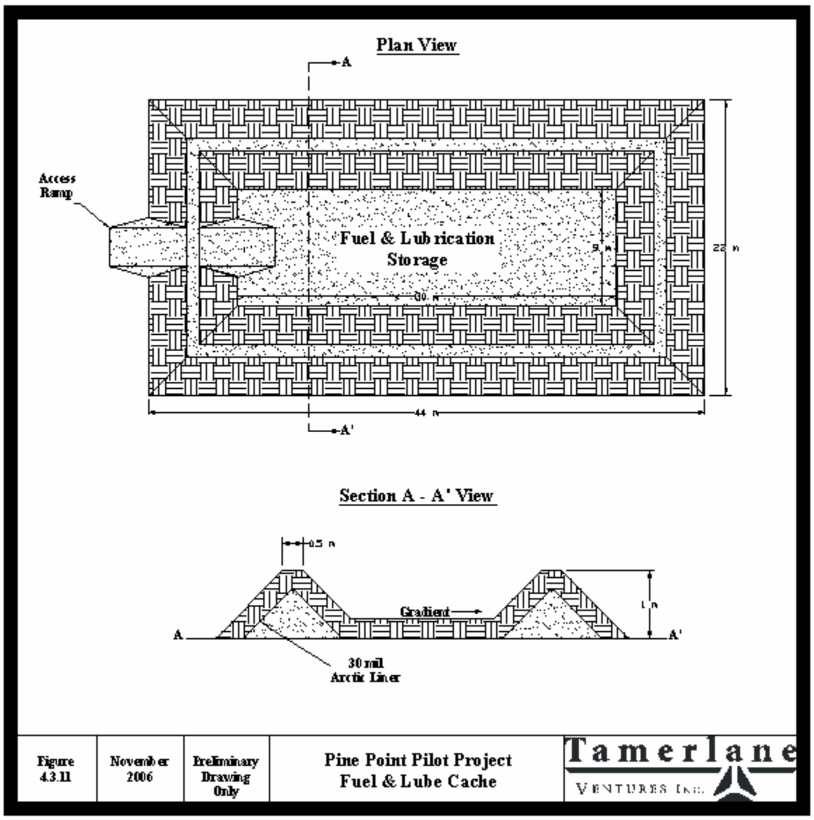


Figure 4.3-3 PPPP Fuel & Lube Containment Facility

4.3.12 Parking

Tamerlane will provide a small parking area for all employee's or contractors working or visiting the site. The purpose of the parking area is to minimize congestion in the working areas of the PPPP and provide security and safety against unauthorized personnel. The parking area will cover approximately 40 x 60 metres (131 ft x 196 ft) and be bermed on all sides so that foot traffic from the lot will pass through the guard shack before entering the operations.

4.3.13 Guard Shack

Tamerlane is committed to a high standard of safety for its employee's, contractors and sub-contractors. To ensure safety and security Tamerlane will operate a small manned guard shack to ensure that only authorized people are entering and leaving the facility. The guard shack will be located adjacent to the parking area and at the entry access to the PPPP site.

The security personnel will also be providing shipping logistics support for haulage equipment coming and going. Empty concentrate trucks will be weighed before entering the concentrate load-out area. Once the trucks are loaded, they will report to the outgoing weight scales where the security guard will confirm the proper truck weight for travel. The security guard will allow the truck to leave the site. All haul trucks will undergo an external inspection and clean up, if necessary, before departing from the PPPP site. If the security guard deems a truck to be overloaded, the truck will be returned to the concentrate loadout area to have its load adjusted.

Due to the high specific gravity of the concentrate, a full truck load will appear well below the truck side rails as opposed to the same truck hauling sand & gravel heaped at or near the trucks side rails. Truck drivers will be required to cover their trucks before leaving the site to ensure clean transfer to the railhead in Hay River. Territorial traffic rules and regulations and road safety guidelines will be adhered to at all times.

4.3.14 Temporary Powder Magazine

During the construction phase of the PPPP, Tamerlane plans to have a temporary powder magazine for sinking of the shaft and developing the underground headings. The proposed magazine location will be in an existing quarry that will provide added shelter on three sides. Two magazines will be located in this area to separately store the explosives and the detonators. A primary lock will secure the magazines while a secondary lock will be used for a chain link fence to be installed at the magazine access.

The magazines will be located approximately 600 metres northeast of the PPPP facilities and 800 metres north of Territorial Highway 5 (Figure 4.3-1). An alternate location for the temporary magazine has been identified approximately 300 metres northwest of the PPPP facilities and 600 metres north of Territorial Highway 5. The alternative temporary explosive storage will also be bermed on three sides and secured.

4.3.15 Infiltration Basin

Tamerlane proposes the use of an infiltration basin for excess groundwater and treated RBC effluent generated by the PPPP. The infiltration basin was chosen as a preferred alternative to direct discharge from ground to ground. The proposed infiltration basin is located approximately 400 metres east of the PPPP infrastructure in an abandoned gravel quarry previously operated by the GNWT Department of Transportation (Figure 4.3-4). The proposed infiltration basin is currently under lease to DOT under Transportation Reserve #85B/11-4. A 600-metre long, insulated and heat-traced plastic pipe will run from the PPPP to the infiltration basin. The infiltration basin has an estimated storage capacity of 950,000 m^3 and an infiltration rate of 100 m^3 per hour.

The estimated total discharge for the life of the PPPP into the infiltration basin is 385,500 m^3 or 33.86 m^3 per hour. In the event that the infiltration basin does not exfiltrate according to the percolation test rates, the storage capacity is more than sufficient to accommodate the entire volume of water to be discharged over the life of the PPPP. To ensure success of the infiltration basin, an inverted perforated culvert (wet drain) will be installed in the middle of the basin to help facilitate proper percolation rates.

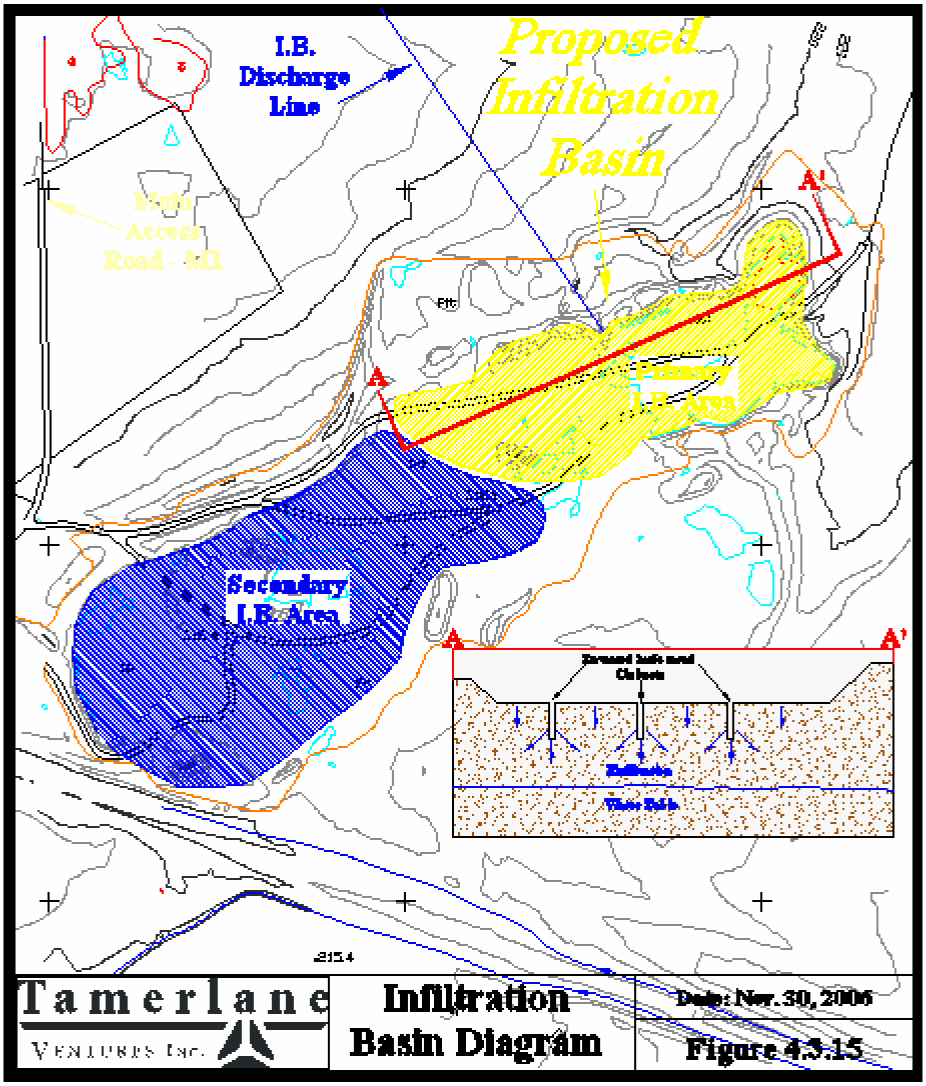


Figure 4.3-4 PPPP Infiltration Basin Diagram

4.4 Transportation

The PPPP will produce a daily concentrate that will be transferred approximately 45 km over Territorial Highway 5 from the project site to the CNR rail siding located outside the town of Hay River.

Territorial Highway 5 is classified as an all-weather highway by the GNWT Department of Transportation (DOT), and the 42 km stretch of highway between Hay River and the Tamerlane PPPP area is paved. The highway is rated for year-round use by commercial vehicles with no load restrictions for haul truck traffic. Throughout the operational life of the historic Pine Point Mine (1964 to 1988), this highway was used for all of the commercial trucking and hauling activities associated with this large-scale mine development. Thus the historic traffic volumes and weights experienced on this highway were considerably higher that those occurring at this time or in the future as a result of development of the Tamerlane PPPP.

DOT traffic counters located along Highway 5 east of Hay River and along Highway 6 to Fort Resolution reported the estimated Average Annual Daily Traffic (AADT) and Peak Summer Average Daily Traffic (PSADT) volumes presented in Table 4.4-1.

The Tamerlane project plans to use approximately 10 trucks to transport the lead/zinc product to the Hay River railhead. The average weight of the loaded trucks will be 20 to 30 tonnes. The typical average number of truck trips from the PPPP site to Hay River will be 50-65 return trips per day over the course of a 12 hour workday. Trucking schedules are flexible and can be made to accommodate either dayshift or graveyard shift hours. Tamerlane envisions trucking to occur over the production life of the Pilot Project which encompasses 12-15 months starting after construction is complete. According to the project schedule, concentrate trucking will begin sometime during the first quarter of 2008.

Based on the fact that there are no load restrictions on Highway 5 for commercial hauling traffic and discussions with DOT (DOT pers comm. 2006), the anticipated 1-2 year level of increased heavier traffic is not expected to have any measurable effect on the integrity of Highway 5 or the terrain occupied by the existing road.

Table 4.4-1
Estimated Traffic on Highways 5 and 6: 2001-2003

Counter ID	Description	AADT			PSADT		
		2003	2002	2001	2003	2002	2001
5-1	1 km east of Highway 2 & 5 intersection	660	630	520	740	710	690
5-19	19 km east of Highway 2 & 5 intersection	170	160	150	230	220	220
5-65	5 km south of Highway 5 & 6 intersection	80	70	70	110	100	100
6-30	8.5 km east of Pine Point access	80	80	80	100	110	100
6-74	16 km west of Fort Resolution	110	100	110	140	140	130

Source: DOT 2005

4.4.1 Existing Access

Tamerlane plans to utilize an existing all weather access road (Labeled M1 in Figure 4.3-1) to the Pine Point Pilot Project site. The access entry is off Territorial Highway 5 at marker 41.6 km. The existing road was originally installed to access gravel quarries managed by the Department of Transportation. The access road extends north beyond the Pilot Project site toward the proposed explosives storage area (Labeled E1in Figure 4.3-1). The main (M1) access road will be widened approximately 5 metres (16 ft) to allow two- way truck traffic entering and exiting the site. Approximately 15,256 metric tonnes of aggregate material generated during the PPPP site preparation phase will be used to widen and improve the main (M1) access road.

During project construction, freeze ring drilling will take place around the perimeter of the main R-190 deposit. Uniformity is the key for the directional drilling required for the freeze perimeter. Thus, a 5 metre (16 ft) access road (Labeled F1 in Figure 4.3-1) will be developed for the timely completion of the freeze ring drilling. Approximately 9,994 metric tonnes of existing gravels and glacial till will be utilized from the project site to develop the freeze perimeter access road.

In the event the preferred explosives storage area is unavailable, an alternate site will be used located northwest of the PPPP site. An existing drill road (Labeled E2 in Figure 4.3-1) installed in the late 1970's would be the primary access for the alternative explosive storage area. It is not anticipated that any additional materials would be required to use this alternative access.

Construction, materials, repair and maintenance of all roads pertaining to the Pilot Project, will be undertaken by Tamerlane to ensure year round, safe access for the PPPP and local land users.

4.5 Hazardous Materials

Tamerlane does not expect to use many hazardous materials due to the short-term duration and small scope of the Pilot Project. Tamerlane anticipates hazardous materials to consist primarily of diesel fuel, motor oil, hydraulic oil, lubricant, propane and batteries for both surface and underground mobile and stationary equipment. Table 4.5-1 provides a list of the expected hazardous materials used for the life of the PPPP.

The transporation of all hazardous materials transported to and from the site will be conducted in acccordance with existing territorial and federal regulations, including the

Transportation of Dangerous Goods guidelines and will most likely be carried out by a qualified third-party contractor.

Table 4.5-1
Hazardous Materials Usage Estimate for the PPPP

Hazardous Materials	Usage Estimate		Disposal
	Metric	Standard	
Diesel Fuel	40,000 lpd	10,500 gpd	Will be consumed in mobile and stationary equipment
Motor Oil	24,200 lpy	6,400 gpy	Usage through 250 hour PM's & used in oil heaters
Hydraulic Oil	30,200 lpy	8,000 gpy	Usage through 500 hour PM's & used in oil heaters
Grease	750 lpy	200 gpy	Used up in equipment
Cap Lamps	10/yr		Hay River Hazardous Waste Facility
Mobile & Stationary Equipment Batteries	20/yr		Hay River Hazardous Waste Facility

4.6 Water Management

The primary objectives of the PPPP water management plan are:

- Provide potable water for surface facilities.
- Provide the DMS circuit with a reliable water supply throughout the pilot project.
- Dewater the PPPP mining areas to maintain stability and facilitate bulk ore sample extraction.
- Minimize disruption and damage to mine development caused by potential flood events.
- Capture all discharge water in the proposed infiltration basin.

4.6.1 Water Balance

Information obtained from the Traditional Knowledge interviews conducted in October 2006 (Tamerlane 2006b, c) and from the EBA water sampling program (EBA 2006a) have confirmed that existing groundwater quality at the R-190 Pilot Project site is poor. As a result, the potable water supply for the PPPP will need to be sourced from an external supply. Tamerlane plans to use a potable water tank that will be placed in the warehouse to prevent contamination and freezing. Tamerlane envisions re-supply of water on a bi-weekly basis for the surface facilities. Most of the potable water will be used for the administration and dry facilities for drinking and showers.

Tamerlane anticipates that all make-up water for the PPPP will come from the underground sump pumping location at the bottom of the production shaft. Figure 4.6-1 illustrates the overall water balance for the PPPP.

Based on the 1983, hydrogeology report of R190, conducted by Stevenson International Groundwater Consultants LTD., the groundwater seepage 185 metres (600') depth will be on the magnitude of 55 m^3 per hour. The make up water necessary for the DMS and backfill plants are approximately 28 m^3 and 15 m^3 per hour respectively. A very small amount of water will be needed for dust control and would account for approximately 1 m^3 per hour.

The residual water from the underground shaft is approximately 10 m^3 and will report directly to the infiltration basin. The PPPP will report a total discharge of approximately 34 m^3 of water into the infiltration basin to be exfiltrated into the groundwater system (Figure 4.6-1).

Tamerlane does not anticipate installing any structures at or near the proposed infiltration basin. Based on the anticipated quality of the limited process water generated by the DMS circuit, as presented in Table 4.6-1, Tamerlane does not anticipate the need to treat any discharge waters prior to entering the infiltration basin.

Table 4.6-1
Anticipated Quality of PPPP Effluent - SGS SA Group, Water Analysis*

Element	ROM Ore + Water + Ferrosilicon	Water + Ferrosilicon	Water Only
Lead	Not Detected	Not Detected	Not Detected
Zinc	0.20 ppm	0.10 ppm	0.03 ppm
Copper	Not Detected	Not Detected	Not Detected
Iron	0.55 ppm	0.39 ppm	0.01 ppm
Calcium	0.23 g/l	0.05 g/l	0.06 g/l
Magnesium	15.0 ppm	11.0 ppm	10.0 ppm

* All samples leached for 20 minutes which is more than the contact time of the Run-of-Mine ore in the DMS circuit

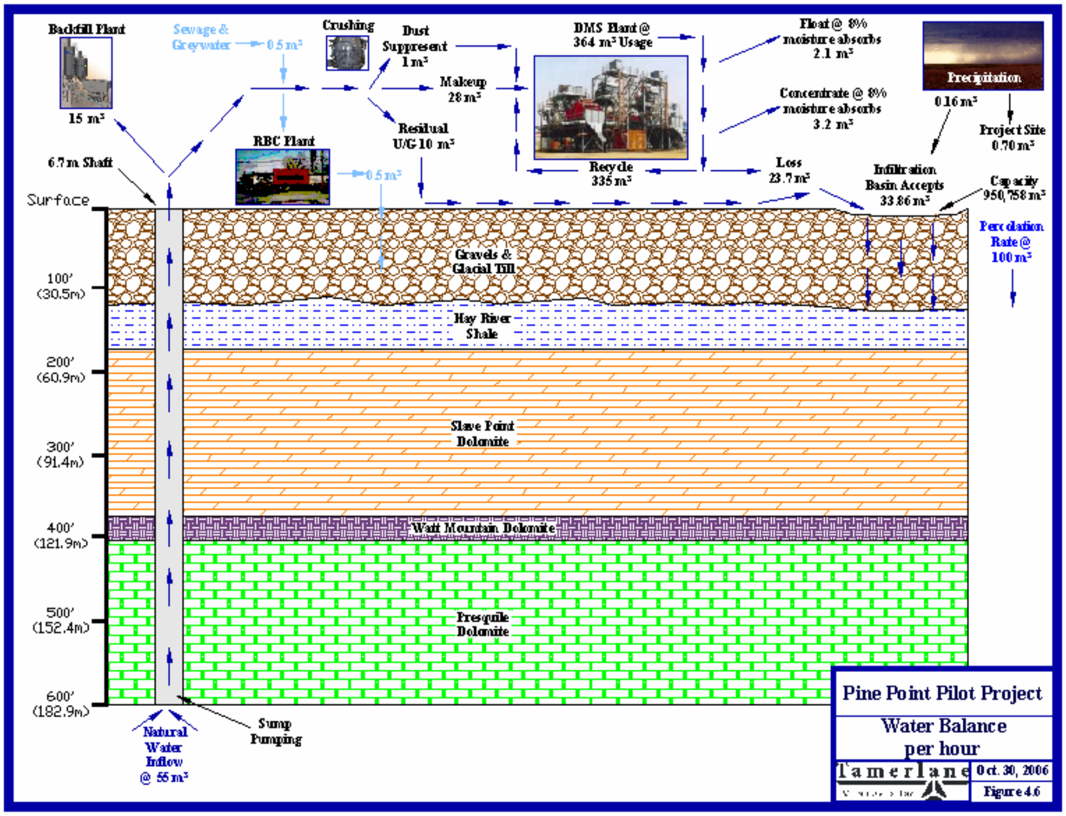


Figure 4.6-1 Pine Point Pilot Project Water Balance Diagram

4.6.2 Water Releases

All water released from the infiltration basin will meet MVLWB license criteria.

4.7 Ancillary Developments

Tamerlane is currently working with Canadian National Railways (CNR) and other parties to determine the best location for concentrate loading. Tamerlane envisions the load-out area to contain a temporary storage area under a tent structure to protect the concentrate from the weather. Tamerlane is working to ensure the rail loading area is located South, West or East of the Highway 2 & 5 intersections.

4.8 Cost Estimations

Tamerlane feels that this information is highly confidential and will only release information to its shareholders and public when all analysis has been completed.

4.9 History and Future Development

4.9.1 History

Geologic exploration of lead-zinc showings south of Great Slave Lake dates from 1898. Prospectors heading for the Klondike gold rush staked claims on outcrops of oxidized sulfides. Intermittent exploration continued until 1948 when Cominco Ltd. began major exploration programs that continued until 1955. Large-scale mining commenced in 1965, with reported reserves of 21.5 million tonnes, averaging 4% lead 7.2% zinc (Giroux & McCartney 2001).

Cominco Ltd. operated the Pine Point Mine from 1964 to 1987. The mine produced a total of 64,259,570 tonnes of ore grading 3.1 % lead and 7.0 % zinc from 52 open pits and two underground deposits. Low base metal prices, high power consumption related to pumping water, and acquisition of another deposit with better grades and mining characteristics prompted Cominco to close the Pine Point Mine in 1987 (R. F. Burns, Personal Communication, November 2004) . Restoration of the mine was completed in 1991. Restoration included removal of the town site and railroad (Giroux & McCartney 2001).

In 2001, the mining leases expired and Mr. Burns staked both a large part of the former Pine Point Mine property and the down plunge extension to the west (Great Slave Reef property) which were formerly held by Westmin/Dupont/Boliden. Shortly thereafter, the property was optioned to Terrastar Incorporated, which became Pine Point Mines Incorporated.

The Property was taken back by Karst Investments LLC. in 2003 (Giroux & McCartney 2001). In September, 2004, Tamerlane Ventures acquired an option to earn 60 % interest in the Pine Point property from Karst Investments LLC. In 2006, Tamerlane acquired the remaining 40 % interest in the Pine Point property making Tamerlane a 100 % owner.

4.9.2 Western Mine Great Slave Reef Project

Western Mines (Westmin) acquired a large amount of ground by staking west of Cominco's Pine Point Property in 1975. Exploration and drilling using Induced Polarization (IP) was very successful. Nine deposits were outlined between 1976 and the early 1980's. The nine deposits are named from west to east: O555, O556, P449, R190, T799, V48, W19, X25, and Z155. The X25 is the largest deposit and the R190 and Z155 are very high grade. The Pine Point Mine considered milling the deposits in its concentrator. However, the deposits were located up to 50 km by road from the concentrator and were deep; requiring a large strip ratio and extensive dewatering. None of the deposits were mined (Giroux & McCartney, 2001). Westmin's mining leases lapsed in August, 2001. The ground was subsequently staked by Mr. Burns (Giroux & McCartney 2001).

4.9.3 Previous Exploration

During the Pine Point Mine's years of operation, Cominco defined 63,473,230 tonnes of indicated and inferred resources grading 1.3% lead and 3.8% zinc in a total of 68 deposits.

Western Mines (Westmin) conducted exploration drilling west of the Buffalo River from 1975 to 1981. They identified and located a total of 9 deposits. Three of the deposits have a combined 5,240,000 tonnes grading 11.8% combined lead plus zinc. No additional exploration has occurred since the mine's closure in 1987

4.9.4 Recent Exploration

Tamerlane Ventures Inc. conducted drill testing in three of the un-mined mineral deposits between the months of February and September, 2005. Two of the deposits are located in the former Pine Point Mines area (W85 and G03). The third deposit is located in the area Westmin referred to as the Great Slave Reef property (the R190 deposit). Ten holes were targeted within each deposit. Due to climate and drilling difficulties, eighteen holes were completed. Eight holes were completed within the W85 deposit, three within the G03 deposit and seven within the R190 deposit. The drill was unable to complete one hole at W85 and the tenth hole was not drilled. Two holes were cased and drilled to levels just above the orebody at G03. They remain to be completed. Three holes were abandoned at R190 because the drill was unable to continue beyond the upper levels of the collapse structure.

Assay results for the sampled holes were within ranges that confirmed the deposits' historic grades. Thicknesses of intervals with combined lead and zinc grades above 2.0% also confirmed the historic data.

4.9.5 Future Development

Based on the historic potential of the old Pine Pont area and subject to the successful completion of the PPPP, Tamerlane hopes to pursue longer term development. This is contingent on the successful completion of the PPPP economically confirming the extraction of a one (1) million tonne bulk sample.

If successful, Tamerlane intends to utilize the existing infrastructure of the PPPP to access other deposits underground. A number of additional deposits are located on the West side of the Buffalo River (Table 4.9-1). These deposits are assessable underground because of their close proximity to the R-190 site. It is anticipated that these deposits could be developed utilizing the PPPP infrastructure to minimize future surface disturbances.

Tamerlane intends to first focus its efforts on the PPPP before expending time, effort and funds on potential future mining.

Table 4.9.1

Underground Potential near R-190 Pilot Project*

Deposit	Direction from Deposit	Historical Resource Tonnes	Combined Zn-Pb%
P-499	Southwest	877,000	9.4%
O-556	Northwest	861,000	8.5%
V-46	Northeast	522,000	8.8%
W-19	Southeast	141,000	6.3%
X-25	Southeast	3,124,000	8.5%
Z-155	Northeast	605,000	12.7%

* Historic records only. No current NI 43-101 compliant resource calculation has been completed on these deposits.

5.0 ALTERNATIVES

5.1 Summary

Tamerlane Ventures Inc. investigated many aspects of developing the Pine Point Pilot Project in the South Slave Region including, but not limited to, potential community impacts, environmental mitigation, past mining practices, socio-economics and feasible economics. Tamerlane's objective during the pre-feasibility stage of the project was to ensure that no negative impacts on the environment or the nearby communities of Fort Resolution, Hay River, Enterprise and Fort Smith would occur. The following sections review the alternatives considered for various aspects of the PPPP.

5.2 Mining Methods

During the pre-feasibility stage, Tamerlane investigated various mining methods including utilizing underwater mining techniques, conventional open pit and underground mining by either decline or shaft access. Resources utilized to determine the most environmentally and economic mining method were information gathered from experienced mining contractors, the former Pine Point Mine and similar zine-lead operations at Ireland's Lisheen and Galmoy mines, industry standard mining best practices and various references.

5.2.1 Historical Mining Challenges

During a twenty-three (23) year period from 1964 to 1987, Pine Point Mines Ltd. (PPML), operated by Cominco Ltd., extracted over sixty-four (64) million tonnes of ore through fifty-two (52) open pits. Dewatering the orebodies was a major part of Cominco's operations to ensure pit floors were dry. Conventional open pit mining techniques were employed using electric shovels and 80 to 150 ton haul trucks. PPML would typically conduct dewatering operations 5 to 8 months in advance of mining and would keep between 8 and 10 open pits active to supply the 10,000 tonne per day mill feed. Perimeter pumping wells were located around the orebodies to draw down the water table in advance of mining to ensure safe dry conditions. Approximately 200 million gallons per day of water was pumped to by-pass ditches to direct it around the mined area and minimize pumping distances (Vogwill 1976).

As mining progressed, the ore deposits plunged to the west, resulting in an increase in stripping ratio and a deeper cone of depression for dewatering. New orebodies were being discovered further west and further away from the milling facilities with an estimated distance of 1.5 kilometres of ore body per strike length. Ore grades in the near surface deposits steadily decreased, requiring deeper developments to sustain planned mill feed grades. With limited power available from the Taltston dam, PPML was forced to try other mining methods to reduce dewatering costs and increase ore grade. These methods included open pit mining with large draglines to reduce stripping costs, grout curtains to reduce the inflow of groundwater and dewatering costs and underground mining to increase the ore grades sent to the mill.

Utilizing the dragline for overburden stripping proved to be unsuccessful due to the depths of the deposits to the west and was used for stripping the tabular deposits on the North trend. The attempt at constructing a grout curtain minimized some of the inflows of groundwater but proved to be relatively unsuccessful by not drastically reducing the dewatering costs. PPML was successful mining underground utilizing an electric continuous miner but eventually the effort was stopped to direct more power to pit dewatering. Finally, PPML brought operations at Pine Point to a close in 1987, leaving millions of tons of resources in the ground as they had no method to keep the water from flooding the pits. At this time, Cominco focused its efforts on the newly emerging Polaris mine.

5.2.2 Underwater Miner

During 2002, an investigation was initiated to determine the best way to extract the remaining Pine Point resources while keeping in mind the past issues surrounding groundwater and depth of deposits plunging west. Initially a conceptual approach was to utilize underwater mining technology used for exploiting diamond ores from the ocean floor in Namibia by De Beers and Diamond Fields, Inc. The approach was to use large dredge operations using continuous excavators sized to move 10,000 to 20,000 tonnes per hour from depths up to 45 metres. This would strip off the near 30 metres of overburden comprised of gravels and glacial till. Working with Joy Manufacturing (Industry leaders in continuous mining), a continuous miner would be fabricated capable of mining the remaining 150 metres to extract the orebody. As the orebody was being mined underwater, large suction pumps would transport the material to the surface were the material would be passed through a Dense Media Separation (DMS) process (Figures 5.2-1 and 5.2-2).

Conceptually, the underwater miner technique is good, however, there were many uncertainties and a high level of risk associated with it. The uncertainties focused around adapting the underwater miner from mining loose ocean floors to harder limestone and dolomites. There were many uncertainties around stabilizing the unit once in harder rock conditions. Additionally, it was anticipated that a large amount of time would be lost raising and lowering the unit from the working area to the barge for necessary daily maintenance. The risks associated with the underwater miner was the bleeding edge, unproven technology associated with manufacturing a machine with no guarantees that it would work as envisioned. More importantly, there were safety concerns around potential highwall failures of the surrounding lower grade material which might bury the machine, making it difficult to recover, and contributing lost production.

Other important factors in determining the viability of the underwater mining techniques involved consideration of environmental implications. A large surface area would have been required for the dredging operations for the open pit development. As there was uncertainty with dredging within the water table at depth, it was assumed that additional dewatering would be required. This would require similar pumping rates seen during past mining that would discharge up to 200 million gallons of water a day.

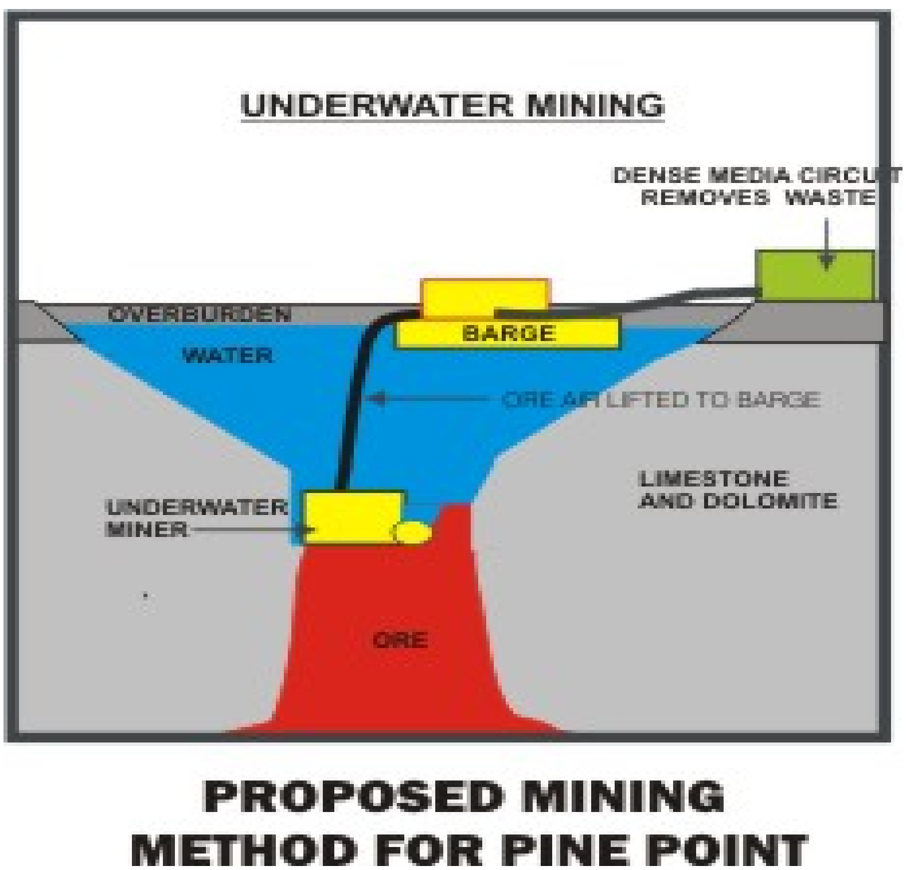


Figure 5.2-1 Alternative Proposed Mining Method for Pine Point

Although this would involve ground to ground discharge, this was not considered to be the preferable mining technique by Tamerlane. Further investigation into the manufacturing of a new underwater mining machine yielded uncertainties around development times. Along with a huge up front investment, it was envisioned that the engineering of a new miner would take 12 to 15 months and the fabrication could take as long as 24 months. The long lead times were not favourable for taking advantage of the present zinc and lead prices.

Figure 5.2-2 Example of an Existing Underwater Miner

5.2.3 Open Pit

Conventional open pit mining has certainly been around for many years. However, when investigating the viability of obtaining a bulk sample by open pit methods, a number of concerns arose. Based on previous pumping rates during Cominco's operations from 1964 to 1987, each proposed open pit required a significant amount of dewatering many months before mining. In addition to the long pumping times, Cominco mined fairly shallow deposits (Less than 150 ft), with pumping rates reaching over 200 million gallons discharged per day (Vogwill 1976). The R-190 orebody is situated at a depth of between 137 & 168 metres (450 ft & 550 ft). Open pit mining at this depth would require the removal and redeposition of enormous quantities of overburden. In addition, to dewater the water table down to these depths, numerous large diameter perimeter wells with high volume and high head capacity pumps would be required . It was estimated that drawing the water table down over 3-4 times deeper than achieved in the past, would require years not months of pre-pumping before extracting the bulk sample. In addition, a much larger surface area would be required to develop an open pit large enough to access ore at those depths (See Figure 5.2-3).

Figure 5.2-3 Pine Point, N-81 Pit

When analyzing the above factors, it became evident that conventional open pit methods would require long lead times and a high amount of initial capital and operating costs prior to extraction of a bulk sample such as being planned for the PPPP site.

5.2.4 U/G Decline vs. Shaft

Based on the examination of the available alternatives, it became clear to Tamerlane that the most viable option for extracting a bulk sample from the R-190 deposit would be to utilize underground mining methods. Accessing the bulk sample underground resulted in much less surface disturbance, higher ore extraction success with minimal dilution, much less sound disturbances created by surface equipment and blasting, much less dust disturbance created by a large surface area being stripped, a visually more appealing

operation, easier reclamation at the end of the project and simple non-impacting groundwater control utilizing freezing techniques (Section 5.3.3).
The only remaining uncertainty was whether to access the deposit via a 12-15 % decline or via a vertical shaft. With the help of specialized underground Canadian mining contractors, an investigation was initiated to examine the main differences between driving a long decline from the surface, versus sinking a vertical shaft. The key factors involved were time, economics and rock mechanics (ground conditions). To access the underground workings via a decline, approximately 1,524 metres (5,000 ft) of development drift would have to be driven versus 185 metres (600 ft) of vertical shaft. Because there is over 30 metres (100 ft) of gravels and glacial till, driving a decline would require extensive and expensive ground support structures for approximately 245 metres (820 ft).

In addition to added ground support using either timber sets, steel sets or culverts, there would be great uncertainty in advancement rates per day driving a decline (Figure 5.2-4). Conversely, sinking a shaft would allow a consistent schedule to be met and would not be contingent on the rock mechanics (ground conditions). Other considerations involved the operations hauling 3.2 kilometres (2 miles) up and down a decline each day. Assuming a mobile equipment availability of 75 % for the truck fleet, providing the Dense Media Separation circuit with consistent ore feed would require a large truck fleet and a higher potential exposure to accidents or incidents. The vertical conveyor in the shaft would allow consistent ore feed and minimal mobile equipment to consistently feed it.

Tamerlane determined that underground mining utilizing a vertical shaft was the best approach for obtaining the one (1) million tonne bulk sample necessary to economically test the viability for future mining potential. Upon the success of the underground bulk sample and the appropriate permitting, additional full scale mining can ensue.

Figure 5.2-4 Pine Point Underground Mine Project, 1984

5.3 Water Control

Largely to the long history of open pit dewatering operations carried out at Pine Point Mines Ltd. from 1964 to 1987, the hydrogeology of the Pine Point region is reasonably well understood. Since the R-190 deposit occurs well below the water table and because of the large permeability of certain zones in the bedrock, all proposed mining methods would require extensive water control to ensure safe and dry mining conditions (Brown *et al.* 1981). Three hydrogeologic reports were prepared specifically on the R-190 deposit. The three reports are listed below:

- Brown, Erdman & Associates Ltd., (1981), *R-190 Aquifer Test Analysis and Preliminary Dewatering Design,* Vancouver, B.C., International Groundwater Consultants, Geologists and Engineers.
- Stevenson International Groundwater Consultants Ltd., (1983), *Hydrogeology of R190 Mineralized Region Great Slave Reef Project Westmin Resources Limited,* Vancouver, B.C.
- GTC Geologic Testing Consultants, (1983, March), *Hydrogeologic Evaluation of the Pine Point – Great Slave Lake Region,* Ottawa, ON, National Hydrology Research Institute, Environment Canada.

Research concluded that the R-190 deposit groundwater was derived from the Presqu'ile zone between 137 – 168 metres (450 ft – 550 ft) depth. In fact, approximately 97 % of all groundwater in the R-190 deposit area is derived within this zone.

Tamerlane approached the local and regional water challenges by examining all alternatives available within civil, mechanical and mining industries. In determining the best method of groundwater control, Tamerlane considered key components consisting of the effects on environment, the amounts of water discharged, time and economics. The remaining subsections outline the thought process in determining that freezing, along with the use of an infiltration basin, was the best method to minimize and eliminate the key components of groundwater control.

5.3.1 Dewatering

Tamerlane investigated the conventional dewatering systems previously used by Cominco from 1964 to 1987. Tamerlane determined that at least sixteen (16) dewatering wells would be required around the perimeter of the R-190 deposit. These wells would produce an average daily discharge of 75,000 – 150,000 m³ (20,000,000 – 40,000,000 gallons) per day (Brown *et al.* 1981). In addition to these massive groundwater removal requirements, the water table would be drawn down in the local area to 185 metres (600 ft) and take anywhere from 12-24 months before the mine was completely dewatered. Diversion ditches would be required for the ground to ground discharge which would result in a greater area of disturbance to the R-190 local area.

Tamerlane determined that although dewatering was achievable for the Pilot Project, it proved to be unfavorable environmentally and resulted in an extremely large capital investment. The estimated operating cost of the dewatering perimeter exceeded the capital costs and proved to be completely uneconomical. Further investigation by Tamerlane revealed a high risk assessment based on power outages. Because the groundwater has an extremely high recharge rate, constant, uninterrupted power would be required for successful dewatering and maintaining dry working conditions. In order to achieve this, Tamerlane would need to utilize local line power in conjunction with on-site diesel generation.

The potential environmental impacts, water inflow risks to underground mining activities, potential community impacts and unfavorable economics, led Tamerlane to the conclusion that conventional dewatering was not the preferred approach.

5.3.2 Grouting

In conjunction with determining the viability of dewatering, a parallel investigation was conducted to determine the viability of developing a grout ring around the R-190 deposit. Tamerlane learned of Cominco's attempt to develop a grout perimeter to control groundwater inflow around one of its open pits. Tamerlane contacted several prior employees who had worked at Pine Point during the time that Cominco tested the viability of grouting. Through their recollections, the grouting was unsuccessful at stopping the groundwater flows and marginally successful at reducing the amount of inflows. Cominco's cost of installing the grout perimeter in conjunction with dewatering was deemed to be more cost prohibitive than grouting itself.

Tamerlane went through the steps to investigate present day technologies associated with grouting to determine its viability. After consultation with experts in the grouting field, the following observations were made:

- Grouting is permanent and can affect the long term aquifer characteristics.
- Grouting requires a minimum of two perimeter rings in order to provide the greatest opportunity for success in controlling groundwater.
- Grouting is pumped through holes under pressure which can lead to further fracturing of the ground, thus creating additional fissures for groundwater flows.
- Grouting will not prevent groundwater flow and, at best, reduce the ground water flows to more manageable levels for pumping.

After assessing the concerns in more detail, Tamerlane calculated the costs associated with grouting and determined that it was not an economically viable option. Additionally, grouting could potentially create issues with the groundwater aquifer that would require further investigation.

5.3.3 Freezing

While dewatering wells and grouting are executable options, Tamerlane opted to reduce its risk to the environment and installation costs by choosing to freeze the ground around the R-190 deposit. Ground freezing will effectively cut off the groundwater flows into the proposed workings and virtually eliminate dewatering. The freeze perimeter only needs one row of holes whereas, grouting needs two or more. Drilling of one row of holes is much less time consuming and more feasible. Unlike grouting, freezing works in all types of soil and groundwater conditions. Because the R-190 deposit is located in five (5) key rock formations, freezing will not be inhibitive and have the ability to focus on the main pine point formation which produces 97 % of the ground water.

Unlike dewatering, operating costs for freezing are minimal because once the ground is frozen, it takes much less energy to maintain the freeze curtain. Once the construction phase of the freeze perimeter is complete and the frozen ground is established, the amount of power required to maintain the frozen wall will be half of that utilized during construction. Additionally, freezing is not affected by planned or unplanned power outages as it will maintain its frozen state while allowing time for repairs. The freeze wall provides operational flexibility and a much safer environment for the underground work force. As opposed to employing dewatering, where, if power is lost and the pumps are shut down, immediate underground evacuation would be required to ensure the safety of all employee’s because of the high groundwater recharge rates.

Tamerlane assessed the main differences between dewatering wells, grouting and freeze perimeter and determined that freezing was the clear method of choice. Not only from a financial aspect but more importantly, it was safer and environmentally more appealing. When consulting with Layne Christensen Company, it was clear that freezing the ground *in situ* has minimal effects and certainly less effects than the natural freeze/thaw cycles on the surface each year.

5.3.3.1 Brine vs. Liquid Nitrogen

Upon reaching the decision to pursue freezing as a primary means of controlling the groundwater in the immediate vicinity of the underground mine workings, Tamerlane initiated contact with professionals in the freezing technology field. The main contact for Tamerlane has been Layne Christensen Company located in Pewaukee, Wisconsin. Tamerlane provided Layne Christensen with details of its Pilot Project for a technical assessment. The principle for Layne Christensen provided useful information and reasoning for the differences in using Nitrogen versus Brine as a cooling medium. The key differences are described below, based on Layne Christensen’s extensive experience in the freezing technology field.

Liquid Nitrogen is considered a hazardous and dangerous substance which is colorless, odorless, and an extremely cold liquid and gas under pressure. It can cause rapid suffocation when concentrations in the air are sufficient to reduce oxygen levels to below 19.5 % and would require the use of Self Contained Breathing Apparatus (SCBA) when handling this product. Care must be taken when handling, otherwise skin contact could cause tissue freezing and severe cryogenic burn. Liquid Nitrogen is also considered an asphyxiant, by vaporizing rapidly in the environment and displacing oxygen, thereby creating a depleted oxygen environment.

In most ground freezing applications, liquid Nitrogen is used where very rapid freezing is required for applications such as containment after a spill. Liquid Nitrogen is used for freezing with temperatures well below -150° C (- 238° F). For the Pine Point Pilot Project, Liquid Nitrogen is not the preferred cooling medium and is not necessary for the success of the proposed freeze ring.

Brine (a thick solution of salt water) is not dangerous and is not regulated as a hazardous material for transportation. Brine is a clear to cloudy white liquid with no odor which may be irritating to the eyes and skin that could cause drying and irritation. Brine is corrosive to metal in the presence of air. Brine is nothing more than water that is saturated with salt and when used for freezing purposes, is fully saturated at approximately 20 % salt.

Brine is commonly used in many industries ranging from pharmaceutical, food preservation and winter de-icing of highways. Brine is a common fluid used in the transport of heat from place to place. It is used because the addition of salt to water reduces the freezing temperature of the solution and a relatively great efficiency in the transport can be obtained for the low cost of the product. According to the Material Safety Data Sheets, Brine is considered to have minimal effects on health, fire and physical hazard.

In most ground freezing applications, brine is the preferred cooling medium because it works well and presents low risks to human health. Being used in a closed-loop system, it is also least intrusive to the surrounding environment and is more cost effective. The brine solution is chilled using large portable refrigeration plants that are typically mounted on conventional over-the-road trailers and are electrically-powered using commercially available electricity or diesel generators. The system operates continuously as a closed system requiring constant monitoring with occasional plant adjustment and coolant flow modifications. After initial freezing has been completed and the frozen barrier in place, the required refrigeration capacity is significantly reduced to maintain the frozen barrier.

Tamerlane considered the key advantages, disadvantages and differences between the use of liquid nitrogen and brine and mutually concluded with Layne Christensen that the use of brine was the preferred choice.

5.3.4 Infiltration Basin

An infiltration basin is a shallow impoundment that is designed to infiltrate storm or ground water. Infiltration basins use the natural filtering ability of the soil and are very effective in removing constituents such as, sediment, nutrients, metals, bacteria, oil and grease or organics. Infiltration facilities store the water until it gradually exfiltrates through the soil and eventually into the water table.

Tamerlane investigated the use of either an infiltration basin, a tailings dam or diversion ditches. Considering that this is only a Pilot Project, Tamerlane was cautious about utilizing a tailings dam that could potentially create more disturbance in the area than is necessary. Tamerlane decided to investigate the use of an infiltration basin or diversion ditch as an alternative to keep the Pilot Project footprint at a minimum. Since all of the mined waste from underground will be returned for backfill, the only remaining discharge would be un-used excess ground water. As Cominco utilized diversion ditches for its dewatering application, Tamerlane considered the same, particularly since there is an existing ditch already at the Pilot Project site. Tamerlane's concerns with utilizing a diversion ditch was related to the limited amount of time available to monitor the discharge water in the event that there may be issues about quality. The decision was quickly narrowed down to utilizing the infiltration basin as a means of discharging excess water. The application of this approach allows more time for monitoring and responding to water quality issues, should they arise, while the water exfiltrates back into the ground water table.

Tamerlane then investigated the prime locations for an infiltration basin and found three potential candidate sites. The first and preferred site is an abandoned quarry located immediately adjacent to the proposed PPPP site. After further investigation, Tamerlane found that this site was currently under lease to GNWT DOT under Transportation Reserve #85B/11-4. The second candidate site is located approximately 150 metres northeast of the PPPP site and is significantly smaller in size. There is no outstanding reserve for this secondary option, however, a significant amount of surface clearing would be required to ensure the quarry could hold the entire amount of water discharged throughout the life of the Pilot Project. This would only be done to ensure a worst case scenario was considered and designed into the project. The third candidate site was the northern-most and furthest away quarry which is presently in use and operated by Mr. Les Norn of Hay River.

Tamerlane concluded that the abandoned quarry located immediately adjacent to the PPPP site would be the most suitable and preferred site for the infiltration basin. The use of this site would: minimize surface disturbance by utilizing an adequately-sized existing disturbed area; provide sufficient monitoring time; and, meet Tamerlane's worst case design criteria.

The selected infiltration basin has an estimated storage capacity of 950,000 m^3 and an infiltration rate of 100 m^3 per hour. The estimated total discharge for the life of the PPPP into the infiltration basin is 385,500 m^3 or 33.86 m^3 per hour. In the event the infiltration basin is not exfiltrating according to the percolation test rates, then the storage capacity more than accounts for the volume discharged over the life of the Pilot Project (See Figure 4.6). To ensure success of the infiltration basin, an inverted perforated culvert (wet drain) will be placed in the middle of the basin to help facilitate proper percolation rates and eliminate any lateral water movement (Figure 4.3-3).

5.4 Power Generation

Tamerlane investigated the options of utilizing line power from the Talston Dam or self-contained diesel generation. According to Northland Utilities out of Hay River, the Talston Dam has approximately 5,000 KW available for use near the proposed R-190 PPPP site. However, the maximum estimated PPPP consumption during construction and operation is 6,000 KW. Although the Talston Dam has the ability to increase its power generation, it would be impractical to do so for only the PPPP. The Pilot Project is a short-duration advanced exploration project, which could not justify the means to increase power output from the Talston Dam. Additionally, the Talston Dam would not have sufficient time to ramp up their power output before the estimated initiation of Tamerlane's PPPP began. Tamerlane had no choice but to investigate the viability of using both existing line power, in conjunction with diesel generation.

Tamerlane then invoked the help of Northwest Territories Power Corporation (NTPC) to provide a better understanding of the power situation near the R-190 deposit. NTPC outlined their power routes in proximity to the proposed Pilot Project. The NTPC power supply extends to the old Pine Point substation, located approximately 45 kilometres (28 miles) Northeast of the R-190 deposit site. NTPC was very helpful in outlining the estimated time and cost to build a transmission line to the R-190 site, along with providing an alternative power supply through diesel generation. Tamerlane reviewed the proposed time and costs to build a transmission line and concluded that it was too costly and time consuming for the purposes of the PPPP. NTPC's conclusion was that given the tight time frame for the proposed PPPP phases, NTPC would not have the resources available to meet the timelines indicated. It would also be more costly than if Tamerlane were to go directly to the same suppliers that NTPC would use for diesel generation. NTPC identify the owners of the nearby power line along Highway 5 as Northland Utilities Limited out of Hay River.

Tamerlane contacted with Northland Utilities Limited (NUL) to determine the availability of utilizing the power line along Highway 5 only 0.5 kilometre from the Pilot Project site. Northland Utilities were very gracious and helpful in outlining the power available along this line and the potential effects to the town of Hay River. NUL modeled the usage of 5,000 KW of load for the PPPP and found that it would reduce the voltage supplied to Hay River by about 1 % or 1.5 V on a 120 V service, which was acceptable. Additionally, NUL explained that adding a 100 HP motor at the site would create about 10.1 % flicker on the Tamerlane 600 V service and a 9.4 % flicker in Hay River.

The industry standard is to limit the flicker to neighbouring customers to approximately 5 % flicker or less. However, adding a 50 HP motor would accommodate the acceptable flicker percentages. NUL also provided an estimated capital cost and time-frame for installing a substation and power line for the Pilot Project. NUL also pointed out that in the event of a power outage from the Talston Dam, they would not be capable of supplying the necessary power from the backup generation system in Hay River.

Tamerlane concluded that mixing line power in conjunction with diesel generation would not be the most economic and time-friendly option for the PPPP. Additionally, Tamerlane will be utilizing motors of +200 HP, which would not meet the acceptable flicker requirements. As a result, Tamerlane chose to provide self-sufficient diesel generation on site for the purposes of the PPPP. Tamerlane may, however, choose to work with NUL and NTPC in the future mining of the resources provided the success of the initial PPPP.

5.5 Transportation

During the pre-feasibility stages of the PPPP, bulk ore transport from the R-190 site to Hay River was considered via either over-the-road trucking using Highway 5, or refurbishing the old Pine Point rail bed for either railing or trucking. The main factors involved in determining these options were cost of transport, cost of refurbishment, time and risks associated with increased traffic to the area. Resources for understanding the technical challenges or concerns for these options came through expert discussions with the Deninu Ku´e and K' atlodeeche First Nations, NWT Métis Nation, GNWT Transportation (DOT), the Town of Hay River and CNR.

5.5.1 Rail

Tamerlane investigated the option of utilizing rail from the R-190 Pilot Project site to the Hay River railhead located on the North side of Hay River and an alternative railhead location near Hay River. CNR has been very helpful in defining costs and time for refurbishing the rail line from the Hay River Spur (near the junction of Highways 2 & 5).

For the purposes of the PPPP, Tamerlane decided that it is not time-friendly nor financially feasible to refurbish the rail line to the R-190 deposit. According to CNR, challenges to this option include the costs and time associated with refurbishing and reinstallation of bridges, rail bed and culverts. Although this may be an option for Tamerlane to investigate for the longer term mining of the remaining resources provided the success of the Pilot Project.

Tamerlane was, and is still in discussions with CNR and other parties over the preferred rail loading location near Hay River. Tamerlane intends to work with these parties to ensure the loading area be located East, West or South of the Highway 2 & 5 intersection. Currently, options are available to enable Tamerlane to accommodate this intention. Tamerlane will make this information available upon completion of a finalized rail loading location.

5.5.2 Roads

The PPPP is situated ~0.5 kilometres from Highway 5. Tamerlane initially considered Highway 5 as the obvious choice for hauling concentrate, however, in discussions with the local communities it became clear that Tamerlane needed to investigate all alternatives for shipping its ore from the R-190 site. Therefore, consideration was given to using either Highway 5 and/or the refurbishment of the old rail bed for trucking.

The old Pine Point rail bed is still in existence. However, as part of Cominco's reclamation in 1991, all of the culverts were removed, as were the bridges over Buffalo River, Twin Creek, Birch Creek and Sandy Creek. In addition, over the past fifteen (15) years, the rail bed has served as a convenient gravel source for many people and businesses in the region. As a result, the gravel of the former rail bed has been either disturbed or completely removed in many places along the rail bed between the R-190 site and Hay River.

Tamerlane investigated the cost and time associated with refurbishing the rail bed, to allow two-way truck traffic from the R-190 site to Hay River. Tamerlane and determined that the refurbishing costs would be too extensive for the relatively small and short-term nature of the initial PPPP. More importantly, to utilize the rail bed for two-way truck traffic, considerable additional land disturbance would be required along the full 45 kilometre (28 miles) of rail bed to Highway 2. The total estimated disturbance would encompass 20.6 hectares (50.9 acres).

Furthermore, all culverts and bridges would need to be reinstalled and additional gravel crushed for the rail bed. Although utilizing the rail bed is not feasible for the PPPP, Tamerlane will reconsider use of this option in the future, should the successful completion of the PPPP lead to full scale mining of the remaining resources.

Tamerlane's only viable and logical option for hauling ore from the R-190 deposit to a rail loading site near Hay River, is to utilize Highway 5. In investigating this option, Tamerlane considered the traffic patterns and considered alternative scheduling that would minimize any perceived disruption or risks to existing traffic.. Tamerlane also discussed this alternative with GNWT Transportation. GNWT Transportation was very helpful in supplying information pertaining to traffic studies for this area (Sections 4.4, 7.5.2 and 8.2.1.8).

Territorial Highway 5 is classified as an all-weather highway by the GNWT Department of Transportation (DOT), and the 42 km stretch of highway between Hay River and the Tamerlane PPPP area is paved. The highway is rated for year-round use by commercial vehicles with no load restrictions for haul truck traffic. Throughout the operational life of the historic Pine Point Mine (1964 to 1988), this highway was used for all of the commercial trucking and hauling activities associated with this large-scale mine development. Thus the historic traffic volumes and weights experienced on this highway were considerably higher than those occurring in the future as a result of development of the Tamerlane Pilot Project. If necessary, Tamerlane would be willing to modify haulage schedules to staggered, or graveyard shift hauling.

5.6 Site Logistics

When Tamerlane decided to test the mining of a bulk sample through the proposed PPPP, consideration was given to having an on-site camp available for the employees. The alternative to having an on-site camp was to transport employees on a daily basis from the nearby communities of Fort Resolution and Hay River.

Primary reasons for the shutdown of Cominco's operations in 1987 were rapidly escalating costs and diminishing zinc and lead prices. Contributing to the increase in costs were many factors, including the maintenance of the town of Pine Point. Since the construction phase of the PPPP would only require approximately 50 people and the operations phase would involve over 120 people, Tamerlane considered the infrastructure to accommodate these numbers and the proximity of the nearby communities.

Tamerlane concluded that significantly higher costs and potentially greater socio-economic impacts would be associated with providing on-site accommodation (a camp) for employees and contractors. In addition, the use of a camp for the PPPP would lead to fewer business opportunities for Fort Resolution and Hay River. Tamerlane concluded that providing an on-site camp for the PPPP was not practical or preferrable for the short duration of the PPPP.

Tamerlane investigated providing bus or van transportation to and from the R-190 site from the communities of Fort Resolution and Hay River. In today's socio-economic climate, whether it be for a mining project or for some other industrial undertaking, companies prefer to transport their employees to and from the work sites on a daily basis, rather than to develop camps.

By supplying daily transportation for personnel, employees can return to their families and communities at the end of each work day. The alternative would be to spend weeks, or sometimes months, without seeing one another. Transportation services also provide the communities of Fort Resolution and Hay River opportunities for convenient employment and housing for non residents. Tamerlane envisions transportation schedules accommodating employees shifts which may be 11-12 hour shifts during the week. Transportation times would vary depending on the season but would average 35 minutes from Hay River and 90 minutes from Fort Resolution. Personnel transportation services would be provided and funded by Tamerlane.

5.7 Sewage Treatment

Tamerlane investigated various sewage treatment options, including portable RBC sewage treatment plants, port-a-potties, U/G mini-sewage treatment toilets, off-site shipping and a septic field. Tamerlane is planning to utilize a RBC sewage treatment plant for all surface facilities with an estimated usage of 12 m^3 per day. The RBC plant was chosen over a septic field because of its mobility, ease of use and the high quality of treated effluent produced. A decision has not been made underground whether to utilize the mini-sewage treatment toilets or contract the use of port-a-potties. If the mini-sewage treatment toilets are used underground, they are self-contained units that only require cleaning about once per year. Such units would be raised to the surface and cleaned out into the RBC plant before being returned underground. If Tamerlane chooses to contract port-a-potties for its underground sewage, then a contractor would be required to maintain responsibility for cleaning and disposal. No off-site shipping of sewage was considered by Tamerlane as this would require unnecessary Tamerlane resources for the PPPP.

5.8 Hazardous & Non-hazardous Wastes

Tamerlane's approach to waste management is important for the life of the Pilot Project to ensure a clean and safe working environment and responsible environmental protection. Tamerlane investigated the use of on-site incinerators and the haulage of waste to Hay River, Yellowknife or Edmonton. Because Yellowknife and Edmonton are several hours drive from the PPPP site, these locations were deemed not to be preferred options for the management and disposal of most wastes.

Tamerlane then focused on the application of either on-site incinerators or the use of existing facilities in Hay River. facilities. On-site incinerators are predominately used for large mining operations in extremely remote locations. Incinerators were also found to be cost prohibitive for the purposes of Tamerlane's short duration PPPP. The PPPP is a small scale project readily accessible to existing waste disposal services in Hay River. Therefore, Tamerlane intends to use the Hay River facilities for the short duration of the PPPP.

5.9 Explosives

For the purposes of extracting a one (1) million tonne bulk sample from the R-190 deposit, Tamerlane will employ conventional mining techniques utilizing both emulsion and ANFO as its explosive agents. Emulsion will be the primary explosive agent. The use of emulsion generates higher explosive efficiencies, resulting in lower levels of residual combustion products, including nitrates. Emulsion is a hard hitting, confined explosive that also minimizes fracturing beyond the area of extraction. All development drifts near the freeze ring will utilize Emulsion as a precautionary measure to protect the integrity of the freeze perimeter. However, for extraction of the stopes, ANFO will also be utilized. ANFO is less costly than emulsion and difficult to use in wet conditions, therefore, Tamerlane intends to utilize ANFO for extracting the stopes versus development.

Other alternatives considered were the use of stick powder and gels. However, these alternatives are less economic and require more handling and contact by employees. The use of stick powder is also time consuming when loading individual holes and does not provide a 100 % fill downhole, therefore, energy is often lost.

6.0 PUBLIC CONSULTATION

6.1 Community Engagement

Tamerlane Ventures Inc. believes and supports the concept that effective and meaningful communication contributes to the development of sound corporate and community relationships. Throughout the baseline data collection, continuous efforts have been made to keep the public, affected First Nations and regulators informed of the project and development activities. Tamerlane's efforts have been expressed through telephone conversations, emails, presentations, site visits and personal visits.

6.2 Aboriginal Communities

Since about mid-August 2004, Tamerlane has been making continuous and concerted efforts to engage and consult with potentially affected First Nations and the nearby communities to discuss all aspects of the proposed project, including potential benefits and opportunities associated with the PPPP. To date, all issues have been dealt with in an open, honest, transparent and mutually agreeable manner.

Efforts have included ongoing meetings and correspondence with Pine Point area First Nations and Aboriginal interests listed below.

Deninu K´ue First Nations
P.O. Box 1921
Fort Resolution, NT
X0E 0M0
Telephone: (867) 394-4335
Fax: (867) 394-5122

Fort Resolution Metis Council
P.O. Box 1921
Fort Resolution, NT
X0E 0M0
Telephone: (867) 394-4151
Fax: (867) 394-3322

Northwest Territory Metis Nation
P.O. Box 720, 206 McDougal Road
Fort Smith, NT
X0E 0P0
Telephone: (867) 872-2770
Fax: (867) 872-2772

West Point First Nation
#1, 47031 Mackenzie Highway
Hay River, NT
X0E 0R9
Telephone: (867) 874-6677
Fax: (867) 874-2486

K´atlodeeche First Nation P.O. Box 3060 Hay River Reserve, NT XOE 1G4 Telephone: (867) 874-6701 Fax: (867) 874-3229	Akaitcho Interim Measures Agreement General Delivery Fort Resolution, NT X0E 0M0 Telephone: (867) 394-3313 Fax: (867) 394-3413
Hay River Metis Nation 1-8 Gagnier Street Hay River, NT X0E 1G1 Telephone: (867) 874-2583 Fax: (867) 874-6888	Hay River Metis Council 102-31 Capital Dr. Hay River, NT X0E 1G2 Telephone: (867) 874-4470 Fax: (867)874-4472

Table 6.2-1 summarizes the community engagement events undertaken by Tamerlane with Pine Point area First Nations and Aboriginal interests to date. These efforts will continue now and throughout the project's construction and life.

In addition to these consultations Tamerlane, together with the tremendous assistance and cooperation from key community members, participated in several weeks of Traditional Knowledge interviews with a number of Aboriginal community participants in Fort Resolution and Metis participants from the Hay River area during October 2006. The K'atlodeeche Dene opted not to participate in the Traditional Knowledge interviews arranged for the Tamerlane PPPP. Instead, they chose to conduct their own Traditional Knowledge study with the financial support of Tamerlane. The results of the K'atlodeeche Dene study will be provided when their study report becomes available.

Key information and results from the Traditional Knowledge work conducted with the commuity of Fort Resolution and the Metis of Hay River have been considered and incorporated as appropriate in various sections of this DAR. Complete copies of the Traditional Knowledge study summary reports are provided in Appendix A of the DAR.

6.3 Regulatory Agencies

Meetings and correspondence with members of the Legislative Assembly of the Northwest Territories (MLA), Department of Indian Affairs and Northern Development (DIAND), Government of the Northwest Territories (GNWT), Natural Resources Canada (NRC), Environment Canada (EC), Northwest Territory Chamber of Mines, Mackenzie Valley Land and Water board (MVLWB), and the Mackenzie Environmental Impact Review Board (MVEIRB) were initiated by Tamerlane Ventures Inc. throughout all or portions of the baseline data collection period (Table 6.3-1). The engagement provided Tamerlane Ventures Inc. the opportunity to share information, coordinate activities and develop relationships in the proposed PPPP area. Communications with regulatory agencies are planned to continue throughout the permitting process and project's life.

Table 6.2-1
Aboriginal Community Engagement Events Initiated by Tamerlane Ventures Inc.

Date	Stakeholder	Mode	Action / Topic
08/27/04	Deh Cho Land Use Planning Committee	Meeting	Attended mining community consultation meeting.
09/17/04	Deh Cho Land Use Planning Committee	Letter	Developed and submitted responses to land-use questionnaire.
01/05/05	Ehdah Cho Food Town, Hay River; Northern Store, Fort Resolution	Phone Call	Requested credit application for purchase and delivery of groceries.
02/04/05	Andrew Butler, Nuni Construction	Phone Call	Requested help to locate and employ camp cook with Level II St. John's Ambulance certification for Tamerlane drilling program.
02/16/05	Deninu K´ue First Nations; Fort Resolution Metis Council	Public Meeting	Held public meeting to provide information regarding: • Tamerlane Ventures Inc. • Historical Pine Point Information • Proposed Pine Point Pilot Project • New Technology • Current Work Area • 2005 Work Program and Costs • Potential Community Benefits
02/18/05	Fort Resolution Community	Visit	Traveled to Fort Resolution to tour community and develop business contacts.
02/18/05	Chief Robert Sayine, Deninu K´ue First Nation; President Lloyd Cardinal, Fort Resolution Metis Council	Letter	Discussed the following items: • Temporary cessation of activities in the Pine Point area. • Desired completion of a Protocol Agreement framework. • Compensation from Tamerlane for trapping disturbance. • Economic opportunities for aboriginal businesses to provide services /products to the PPPP. • Designation of a mutually agreed upon liaison for communications.
02/19/05	Chief Robert Sayine, Deninu K´ue First Nation; President Lloyd Cardinal, Fort Resolution Metis Council	Phone Call	Discussed the following items: • Supplies • Work
02/21/05	Chief Robert Sayine, Deninu K´ue First Nation; President Lloyd Cardinal, Fort Resolution Metis Council	Phone Call	Discussed the following items: Tour of drill area. • List of council members and contractors for future communications (requested but did not receive).
02/21/05	Office of Chief Robert Sayine, Deninu K´ue First	Faxed	Requested the following information:

Date	Stakeholder	Mode	Action / Topic
	Nation	Memo	• List of council members. • List of tribal elders. • List of contractors with WCB numbers. • Phone and email contact information.
02/22/05	Deninu K´ue First Nations; Fort Resolution Metis Council	Tour	Toured the PPPP project area.
02/22/05	Chief Robert Sayine, Deninu K´ue First Nation; President Lloyd Cardinal, Fort Resolution Metis Council	Email	Requested input and feedback for future discussions.
02/22/05	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Left message requesting permission to survey (no disturbance).
02/22/05	President Lloyd Cardinal, Fort Resolution Metis Council	Phone Call	Discussed the following items: • Permission to survey (no disturbance). • Received permission and was told President Cardinal could speak for both the Deninu K´ue First Nation and the Fort Resolution Metis Council.
02/24/05	Chief Robert Sayine, Deninu K´ue First Nation	Pone Call	Discussed the following items: • Employment opportunities for Deninu K´ue and Metis people. • Potential economic opportunities for Deninu K´ue and Metis businesses. • Offer by Chief Sayine to joint venture with Tamerlane. • Cessation of project-related work on (Tamerlane crew sat idle 2/24-3/1). • Request by Chief Sayine for copies of permits and plan of operation.
02/26/05	Chief Robert Sayine, Deninu K´ue First Nation; President Lloyd Cardinal, Fort Resolution Metis Council	Letter	Discussed councils' frustration over Tamerlane's proposal of the following items: • Preferred supplier agreement with Fort Resolution • Negotiations within the community of Fort Resolution for housing, meals, transportation and labor. • Commitment to establish liaison contacts. • Series of meetings with the principals of Tamerlane.
02/28/05	Chief Robert Sayine, Deninu K´ue First Nation; President Lloyd Cardinal, Fort Resolution Metis Council	Letter	Discussed the following items: • Proposals. • Commencement of drilling March 1, 2005

Date	Stakeholder	Mode	Action / Topic
03/01/05	Chief Robert Sayine, Deninu K´ue First Nation; President Lloyd Cardinal, Fort Resolution Metis Council	Letter	Provided notification of drill program start-up.
04/21/05	De Cho Land Use Planning Committee	Letter	Discussed the following items: • Claims indicated as areas of exclusion by De Cho Land Use Planning Committee • Need to access affected ore areas and ability to cross the Buffalo River.
04/27/05	Chief Robert Sayine, Deninu K´ue First Nation; President Lloyd Cardinal, Fort Resolution Metis Council	Letter	Discussed the following items: • Request for meeting between Tamerlane and Council. • Need for proposal from Council to review with Tamerlane
05/24/05	Irvin Norn, Business Mgr., Deninu K´ue First Nation	Letter	Discussed the following items: • Requirements for potential camp at N81. • Estimate request for goods and services.
06/06/05	Paul Boucher, Tu Nedhe Tours	Letter	Outlined offer to contract with Tu Nedhe Tours for the Pine Point drill camp.
06/15/05	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Discussed the Deninu K´ue First Nation's concerns over Paul Boucher's control of the camp contract.
06/16/05	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Discussed the following items: • Problems with the contract. • Concerns about council members who had inside information and used it to obtain the camp contract. • Lunch meeting set for 06/17/05.
06/17/05	Chief Robert Sayine, Deninu K´ue First Nation	Lunch	Discussed the following items: • Drill camp issues. • Agreement to send all future jobs through Chief Sayine's office.
07/11/05	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Discussed the following items: • Request to post a driller's help position at Chief Sayine's office. • Notification of meeting to be held at 6:00p.m.to discuss council concerns regarding Tamerlane.
07/11/05	Chief Robert Sayine, Deninu K´ue First Nation; Deninu K´ue First Nation Council; President Lloyd Cardinal, Fort Resolution Metis Council; Fort Resolution Metis Council; Fort Resolution Residents	Meeting	Discussed the following items: • Concern that Tamerlane was not negotiating in good faith. • Frustration that C. Watts was unable to break Tamerlane's existing camp contract and sign a new contract. • Desired compensation for trapper's alleged trap damages…trapper

Date	Stakeholder	Mode	Action / Topic
			compensated • Tamerlane management's absence from the meeting (Tamerlane's management did not receive any meeting notification). • History of treaty grievances.
07/14/05	Chief Robert Sayine, Deninu K´ue First Nation; President Lloyd Cardinal, Fort Resolution Metis Council	Letter	Discussed the following items: • Inclusion of both the Deninu K´ue and Metis in future proposals. • Request for liaison and Council input. • Council concerns regarding drilling camp contract.
08/05/05	Chief Roy Fabian, K´atlodeeche First Nation	Phone Call	Attempted to resolve dispute regarding drill and camp location.
08/09/05	Chief Roy Fabian, K´atlodeeche First Nation	Phone Call	Followed-up with attempt to resolve dispute regarding drill and camp location.
09/10/05	Chief Roy Fabian, K´atlodeeche First Nation	Phone Call	Followed-up with attempt to resolve dispute over drill and camp location.
09/21/05	Bobby Villeneuve, MLA, Tu Nedhe	Letter	Discussed compensation from Tamerlane for alleged trapping disturbance….trapper compensated
09/30/05	Paul Boucher, Tu Nedhe Tours	Letter	Requested bill reduction for the Pine Point drill camp based on the following discussion items: • Tu Nedhe Tours led Tamerlane to believe it was in good standing with the First Nations when in fact it was not; resulting in unwanted conflict with the First Nations. • Camp construction was completed two weeks after the agreed deadline. • Camp water and electricity were unreliable throughout the environmental survey and drilling campaign. • The washer and dryer were never delivered. • The screen porch and table were never constructed. • A rifle rental included in the bill was neither negotiated nor agreed to in the contract. • Grocery delivery charges were neither negotiated nor agreed to in the contract. Trips to the camp were standard camp maintenance on Tu Nedhe Tour's part and not billable charges to Tamerlane.

Date	Stakeholder	Mode	Action / Topic
			• Tu Nedhe Tours unavailable to resolve camp issues during the drill campaign.
10/05/05	Chief Robert Sayine, Deninu K´ue First Nation; President Lloyd Cardinal, Fort Resolution Metis Council	Letter	Requested meeting for November 16, 2005 to present comments.
02/08/06	Deninu K´ue First Nation Representatives; Fort Resolution Metis Council Representatives	Meeting	Discussed the following items: • Meeting schedule going forward. • Compensation for trapper's lost compensation. • Deninu K´ue and Metis meeting expenses. • K´atlodeeche meeting. • Deh Cho land use ramifications.
03/24/06	Chris Johnson, K´atlodeeche First Nation Corp. Mgr.	Email	Confirmed feasibility study development and intent to apply for MVLWB land and water permits.
04/04/06	Irvin Norn, Business Mgr., speaking for Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Discussed setting date for a Tamerlane update meeting.
04/04/06	President Lloyd Cardinal, Fort Resolution Metis Council	Phone Call	Left message regarding setting date for Tamerlane update meeting. Call was returned later in the day.
04/04/06	Chief Roy Fabian, K´atlodeeche First Nation	Phone Call	Left message regarding setting date for Tamerlane update meeting.
04/07/06	Paul Boucher, Deninu K´ue First Nation Council	Phone Call	Discussed setting date for Tamerlane update meeting.
04/12/06	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Discussed the following items: • Date for Tamerlane update meeting. • Letter from Tamerlane to be faxed 04/14/06.
04/12/06	Chief Roy Fabian, K´atlodeeche First Nation; Chris Johnson, K´atlodeeche First Nation Corp. Mgr.; President Lloyd Cardinal, Fort Resolution Metis Council	Phone Call	Left message regarding the following items: • Date for Tamerlane update meeting. • Letter from Tamerlane to be faxed 04/14/06.
04/13/06	President Lloyd Cardinal, Fort Resolution Metis Council	Phone Call	Followed-up with calls to office and home regarding the following items: • Date for Tamerlane update meeting. • Letter from Tamerlane to be faxed 04/14/06.
04/13/06	Chief Roy Fabian, K´atlodeeche First Nation	Phone Call	Followed-up with calls to office and cell regarding the following items: • Date for Tamerlane update meeting. • Letter from Tamerlane to be faxed 04/14/06; K´atlodeeche office advised fax is out of order.
04/14/06	Chief Robert Sayine, Deninu K´ue First Nation;	Letter	Provided notice that Tamerlane's update

Date	Stakeholder	Mode	Action / Topic
	President Lloyd Cardinal, Fort Resolution Metis Council; Chief Roy Fabian, K´atlodeeche First Nation		letter would not be faxed until 04/15/06.
04/15/06	Chief Robert Sayine, Deninu K´ue First Nation; President Lloyd Cardinal, Fort Resolution Metis Council; Chief Roy Fabian, K´atlodeeche First Nation	Letter	Discussed the following Tamerlane updates: • Proposed project methods. • Potential economic and community impacts. • Preliminary project activities. • Project contacts.
04/18/06	Chief Robert Sayine, Deninu K´ue First Nation; President Lloyd Cardinal, Fort Resolution Metis Council; Chief Roy Fabian, K´atlodeeche First Nation	Phone Call	Left message regarding Tamerlane update meeting.
04/19/06	Chief Robert Sayine, Deninu K´ue First Nation; President Lloyd Cardinal, Fort Resolution Metis Council	Phone Call	Left message regarding Tamerlane update meeting.
04/19/06	Chief Roy Fabian, K´atlodeeche First Nation	Phone Call	Set meeting date for Tamerlane update meeting.
04/19/06	Chief Karen Felker, West Point First Nation; Grand Chief Herb Norwegian, Deh Cho First Nation; President Dana Cross, Hay River Metis Nation; President Danny Beck, Hay River Metis Council; President Robert Tordiff, NW Territory Metis Nation; Dora Enzoe/Stephen Ellis, Akaitcho Interim Measures Agreement Office	Letter	Discussed the following Tamerlane updates: • Proposed project methods. • Potential economic and community impacts. • Preliminary project activities. • Project contacts.
04/20/06	President Lloyd Cardinal, Fort Resolution Metis Council	Phone Call	Left message regarding Tamerlane Update Meeting.
04/20/06	Irvin Norn, Business Mgr., speaking for Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Confirmed date for Tamerlane update meeting 04/27/06.
04/21/06	Chief Robert Sayine, Deninu K´ue First Nation; President Lloyd Cardinal, Fort Resolution Metis Council; Chief Roy Fabian, K´atlodeeche First Nation	Phone Call	Called to verify receipt of two letters faxed 04/14/06 and 04/15/06.
04/21/06	Chief Karen Felker, West Point First Nation; Grand Chief Herb Norwegian, Deh Cho First Nation; President Dana Cross, Hay River Metis Nation; President Danny Beck, Hay River Metis Council; President Robert Tordiff, NW Territory Metis Nation;	Phone Call	Called to verify receipt of the letter faxed 04/19/06.

Date	Stakeholder	Mode	Action / Topic
	Dora Enzoe/Stephen Ellis, Akaitcho Interim Measures Agreement Office		
04/25/06	Irvin Norn, Business Mgr., Deninu K´ue First Nation	Phone Call	Discussed Tamerlane update meeting in Hay River 04/27/06.
04/26/06	Irvin Norn, Business Mgr., Deninu K´ue First Nation	Phone Call	Discussed Tamerlane update meeting in Hay River 04/27/06.
04/26/06	President Lloyd Cardinal, Fort Resolution Metis Council	Phone Call	Left message requesting update meeting with Fort Resolution Metis Council sometime between 04/26/06 and 04/28/06.
04/26/06	President Danny Beck, Hay River Metis Council; Fay Johns, Hay River Metis Council; Paul Harrington, Negotiator, Hay River Metis Council; Frederick Beaulieu, Hay River Metis Council; George Lafferty, Community Field Worker, Hay River Metis Council	Meeting	Discussed the following items: • Introduction of David Swisher, Sr. Project Mgr. for PPPP. • Metis inquiry of potential business opportunities. • Various methods Tamerlane considered to extract bulk sample. • Tamerlane's desire to use local resources where possible. • Date for next update meeting.
04/26/06	Chief Roy Fabian, K´atlodeeche First Nation; Simon Waquin, K´atlodeeche First Nation; Les Norn, K´atlodeeche First Nation; Robert Lamalile, K´atlodeeche First Nation; Fred Martez, K´atlodeeche First Nation; Alec Sunrise, K´atlodeeche First Nation	Meeting	Discussed the following items: • Introduction of David Swisher, Sr. Project Mgr. for PPPP. • Various methods Tamerlane considered to extract the bulk sample. • Chief Roy Fabian's offer to build a rail spur. • K´atlodeeche reserve proposal. • Request from Chief Roy Fabian for letter of potential usage. • K´atlodeeche assertion that the Metis have no land rights and should be limited from participation in the PPPP. • K´atlodeeche concerns over not receiving contracts for Tamerlane's 2005 drilling program. • Tamerlane agreement to respond to reserve proposal, supply detailed project map and investigate rail proposal.
04/27/06	President Lloyd Cardinal, Fort Resolution Metis Council	Phone Call	Called as follow-up to 04/26/06 request for update meeting. L. Cardinal was unable to meet during 04/26/06 and 04/28/06. Both parties agreed to meet at the end of May.
04/27/06	President Robert Tordiff, NW Territory Metis Nation	Phone Call	Tamerlane requested update meeting 04/27/06 or 04/28/06. Both parties were unable to coordinate a mutually available

Date	Stakeholder	Mode	Action / Topic
			time and agreed to meet at the end of May.

04/27/06	Chief Robert Sayine, Deninu K´ue First Nation;
	Dave Pierrot, Deninu K´ue First Nation;
	Jim Villineuve, Deninu K´ue First Nation;
	Raymond Simon, Deninu K´ue First Nation;
	Irvin Norn, Deninu K´ue First Nation;
	Rocky Lafferty, Deninu K´ue First Nation;
	Leonard Beaulieu, Deninu K´ue First Nation;
	Henry Calumet, Deninu K´ue First Nation;
	Tom Beaulieu, Deninu K´ue First Nation;
	Chris Collins, Deninu K´ue First Nation;
	Lois Balsille, Deninu K´ue First Nation;
	Chantal Beck, Recorder, Deninu K´ue First Nation
		Meeting	Discussed the following items:
			• Introduction of David Swisher, Sr. Project Mgr. for PPPP.
			• Various methods Tamerlane considered to extract the bulk sample.
			• First Nation involvement.
			  ◦ Deninu K´ue asserted that R. Burns did not act in good faith with the DKFN.
			  ◦ Deninu K´ue stated that Tamerlane must communicate with and involve only the DKFN.
			  ◦ Deninu K´ue asserted that the Metis do not have an approved Interim Measures Agreement.
			  ◦ Tamerlane’s stated its desire to develop relationships with all communities in the area.
			  ◦ Tamerlane’s indicated that the Deninu K´ue may not be in favor of some of Tamerlane’s direction.
			• Proposal
			  ◦ Deninu K´ue stated that the proposal must be agreed before Tamerlane can pursue any action with the PPPP.
			  ◦ Tamerlane asserted that the proposal addresses full-scale mining not the exploration stage.
			  ◦ Deninu K´ue stated Tamerlane owes $13,000 for previous meetings.
			  ◦ Tamerlane requested all expense documentation be forwarded to Tamerlane for review.
			• Deninu K´ue requests.
			  ◦ Tamerlane to provide detailed project map.
			  ◦ Schedule of EBA work schedule.
			• Deninu K´ue reiteration of alleged trap line issue.
			• Ongoing monthly updating meeting schedule.

05/03/06	President Dana Cross, Hay River Metis Nation	Letter	Discussed the following Tamerlane updates: • Proposed project methods. • Potential economic and community

Date	Stakeholder	Mode	Action / Topic
			impacts. • Preliminary project activities. • Project contacts.
05/03/06	Chief Robert Sayine, Deninu K´ue First Nation; President Lloyd Cardinal, Fort Resolution Metis Council; Chief Roy Fabian, K´atlodeeche First Nation; Chief Karen Felker, West Point First Nation; Grand Chief Herb Norwegian, Deh Cho First Nation; President Dana Cross, Hay River Metis Nation; President Danny Beck, Hay River Metis Council; President Robert Tordiff, NW Territory Metis Nation; Dora Enzoe/Stephen Ellis, Akaitcho Interim Measures	Letter	Discussed the following items: • Topic review of previous week's meetings. • Upcoming EBA environmental surveys • Contact information for any questions. • Plan to conduct future update meetings
05/03/06	President Dana Cross, Hay River Metis Nation	Phone Call	Verified receipt of letters faxed earlier 05/03/06.
05/04/06	Chris Johnson, K´atlodeeche First Nation; Corp. Mgr.	Phone Call	Discussed the following items: • Development opportunities. • Follow-up information requested by Chief Roy Fabian to be provided by Tamerlane at a future date. • Potential 05/30/06 date for next Tamerlane update meeting.
05/08/06	President Danny Beck, Hay River Metis Council; Chief Robert Sayine, Deninu K´ue First Nation; Chief Roy Fabian, K´atlodeeche First Nation	E-Mail	Emailed the following requested information: • PPPP general arrangement outline drawing. • Map of entire Pine Point property in relation to the R190 deposit.
05/09/06	Chief Robert Sayine, Deninu K´ue First Nation	Letter	Discussed the status of the following outstanding Deninu K´ue and Tamerlane items from 04/27/06 update meeting: • Tamerlane faxed Deninu K´ue requested 2006 baseline survey schedule 05/02/06. • Tamerlane emailed Deninu K´ue requested pilot plan area map 05/08/06. • Tamerlane will provide Deninu K´ue requested DMS process information no later than 05/12/06. • Tamerlane will review Deninu K´ue requested proposal and prepare response for next update meeting in May. • Tamerlane requested Deninu K´ue to provide minutes from 04/27/06

Date	Stakeholder	Mode	Action / Topic
			meeting. Information not received to date. • Tamerlane requested Deninu K´ue to provide back-up documentation for outstanding ~$13,000.00 bill. Information not received to date. • Tamerlane requested Deninu K´ue to provide 04/27/06 meeting bill information for the five planned council member attendees. Information not received to date. • The Deninu K´ue requested Tamerlane state its responsibility for previous Pine Point mining activity. Tamerlane cannot and will not be responsible for previous Pine Point mining activity.

05/09/06	Chief Roy Fabian, K´atlodeeche First Nation	Letter	Requested information regarding the following items:
			• The K´atlodeeche proposed Rail Spur
			  • Location of proposed spur and staging area.
			  • Timeframe for construction and completion.
			  • Regulatory approvals (governmental/local)
			  • K´atlodeeche expectations of Tamerlane commitment.

05/09/06	Gary Bohnet, Special Advisor Intergovernmental Form Executive Office	Phone Call	Was unable to reach Gary Bohnet; did not leave a message
05/11/06	Chief Robert Sayine, Deninu K´ue First Nation; President Lloyd Cardinal, Fort Resolution Metis Council; Chief Roy Fabian, K´atlodeeche First Nation	Letter	Requested assistance in identifying local labor for EBA's 2006 follow-up environmental studies.
05/11/06	Chief Robert Sayine, Deninu K´ue First Nation; Pres. Lloyd Cardinal, Fort Resolution Metis Council; Chief Roy Fabian, K´atlodeeche First Nation; Pres. Danny Beck, Hay River Metis Council; Pres. Robert Tordiff, NW Territory Metis Nation	Phone Call	Called to confirm Tamerlane update meetings the week of 05/29/06.
05/15/06	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Called Chief Sayine as follow-up to an earlier call from the Chief regarding Ollerhead and Associates' termination of two DKFN members. The following items were discussed: • Failure to communicate with Chief Sayine prior to the termination of the two DKFN members.

Date	Stakeholder	Mode	Action / Topic
			• Commitment by Tamerlane to communicate all future DKFN matters through Chief Sayine. • Tamerlane proposal to hire two DKFN members to assist with line cutting. • Production expectations for line cutting.
05/24/06	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Called and left message regarding line cutting activities including: • Line cutting progress status. • The need to level a berm to gain access to the W85 site.
05/30/06	Chief Robert Sayine, Deninu K´ue First Nation	Email	Emailed draft proposal.
05/31/06	Chief Robert Sayine, Deninu K´ue First Nation; David Pierrot, Deninu K´ue First Nation; Robert Boucher, Deninu K´ue First Nation; Loiuis Balsillie, Deninu K´ue First Nation;	Meeting	Discussed the following items: • Community concerns. • MDAG meeting. • EBA studies. • Project description. • Permitting • Outstanding invoices • Next update tentatively scheduled in the next 2 to 3 weeks. • DKFN request for youth uniform money. Money provided. • DKFN request for financial assistance for Leonard Beaulieu's wife…assistance provided.
05/31/06	Chief Robert Sayine, Deninu K´ue First Nation	Letter	The letter was explained and given to Chief Sayine during the 05/31/06 meeting. The letter discussed the following items: • Tamerlane concern regarding monetary grievances made by DKFN members without providing proof of loss. • Tamerlane acknowledgement of payment to Eddie Lafferty for alleged trapping losses without being provided proof of loss. • Tamerlane agreement to similarly pay George Larocque for alleged trapping losses without being provided proof of loss. • Tamerlane assertion that it absolutely will not make future payments of this nature. • Tamerlane desire for a mutually beneficial relationship with the DKFN.

Date	Stakeholder	Mode	Action / Topic
			• Tamerlane request to communicate future concerns exclusively through Chief Sayine.
05/31/06	Tamerlane arrived at the Metis office at 3:30pm. Violet ?, Fort Resolution Metis Secretary, informed Tamerlane representatives that President Lloyd Cardinal had gone to Hay River and was unavailable to meet. Violet also indicated that the other council members who were confirmed for the meeting (Arthur Beck, Cara Carriere, Wayne Delorme, Kenneth Delorme, James Sanderson) were not available.	Meeting	The meeting was cancelled due to absence of all Fort Resolution Metis attendees.
06/01/06	Irvin Allen, Forth Smith INAC Wayne Starling, Fort Smith INAC	Meeting	Discussed the following items: • Tamerlane's proposed exploration. • Project description • Timelines.
06/01/06	President Robert Tordiff, NW Territory Metis Nation; Shannon Cumming, NWT Metis Nation; Ursula Vogt, NWT Metis Nation	Meeting	Discussed the following items: • Tamerlane updates. • Community concerns. • MDAG meeting. • EBA studies. • Project Description. • Permitting. • General inquiries by Mr. Tordiff regarding traffic, trapping, harvesting, woodland caribou, power, fueling and effects on waterfowl in discharge pit. • Potential Metis economic development opportunities. • Regional Metis membership meeting June 27-28 in Hay River.
06/01/06	Chief Roy Fabian, K´atlodeeche First Nation; Alec Sunrise, K´atlodeeche First Nation; Chris Johnson, K´atlodeeche First Nation Corp. Mgr.; Verta ?, K´atlodeeche First Nation	Meeting	Discussed the following items: • Tamerlane updates. • Community concerns. • MDAG meeting • EBA studies. • Project description. • Permitting. • Chief Fabian discussion regarding potential rail opportunity, trucking, CNR cooperation, and land designation of industrial by KFN. • KFN concern regarding potential for increased traffic on highway.
06/02/06	Mike Mayer, Hay River Deputy Mayor Paul Gammon, Hay River SAO Robert Bouchard, Hay River Economic Advisor	Meeting	Discussed the following items: • Tamerlane's proposed exploration. • Project description. • Timelines. • Town of Hay River concerns regarding housing and power

Date	Stakeholder	Mode	Action / Topic
			availability. • Town of Hay River's desire for development and/or business opportunities that could not be provided by the First Nations.
06/02/06	Chief Robert Sayine, Deninu K´ue First Nation	Email	Emailed the draft proposal a second time.
06/06/06	Ursula Vogt, NWT Metis Nation	Phone Call	Called to discuss potential dates for next update meeting.
06/07/06	President Vern Jones, Hay River Metis Council	Phone Call	Vern Jones was not in the office. Left a message with Geo Lafferty requesting Vern Jones to call back.
06/07/06	Chief Robert Sayine, Deninu K´ue First Nation	Email	Emailed the draft proposal a third time. Received receipt confirmation.
06/07/06	Chief Robert Sayine, Deninu K´ue First Nation	Fax	Faxed proposal to ensure receipt.

06/09/06	Paul Boucher, Deninu K´ue First Nation Council	Phone Call	Returned call from Paul Boucher and discussed the following items:
			• DKFN draft proposal Anticipated completion date 06/14/06.
			• Article in News North stating Tamerlane will work through Hay River for the PPPP.
			  • Tamerlane was not interviewed.
			  • As per all of Tamerlane's engagement activities, Tamerlane intends to work through all of the area communities.

06/12/06	President Vern Jones, Hay River Metis Council	Email	Forwarded to newly elected President Vern Jones all of the correspondence previously sent to President Denny Beck.
06/12/06	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Discussed potential meeting dates and location for next meeting to discuss proposal.
06/19/06	Chief Robert Sayine, Deninu K´ue First Nation; Paul Boucher, Deninu K´ue First Nation Council	Email	Discussed the following items: • Thanked the First Nations for meeting with Tamerlane the week of 06/19. • Forwarded requested land and water permit #s. • Provided requested MSDS sheets for ferrosilicon.
06/20/06	President Vern Jones, Hay River Metis Council; Fay Johns, Hay River Metis Council	Meeting	Discussed the following items: • Project description. • Potential economic opportunities for Hay River Metis.
06/20/06	Chief Robert Sayine, Deninu K´ue First Nation; Louis Balsille, Deninu K´ue First Nation; Dave Pierrot, Deninu K´ue First Nation;	Meeting	Discussed the following items: • Project updates. • Permitting timelines.

Date	Stakeholder	Mode	Action / Topic
	Lawrence ?, Deninu K´ue First Nation; Paul Boucher, Deninu K´ue First Nation Council		• Proposal. • Deninu K´ue request for Tamerlane to research Aurora College mining course.. researched. • Deninu K´ue request for Tamerlane to forward Tamerlane annual statement…provided.
07/10/06	President Lloyd Cardinal, Fort Resolution Metis Council	Phone Call	Discussed upcoming meeting in Hay River. Cardinal indicated he would coordinate the meeting with Robert Tordiff.
07/11/06	President Lloyd Cardinal, Fort Resolution Metis Council	Phone Call	Called. Cardinal was not in the office.
07/11/06	President Robert Tordiff, NW Territory Metis Nation	Phone Call	Confirmed meeting scheduled for 07/12/06.
07/13/06	Robert Bouchard, Hay River Economic Advisor	Meeting	Discussed the K´atlodeeche request to have the Hay River scoping session on the reserve. Bouchard was amenable to the request.
07/13/06	New Chief Alec Sunrise, Amos, Ray, Les, Robert, Pat Keith, Katlodeeche First Nation	Meeting	Discussed the following items: • Environmental assessment. • Timelines. • Updates. • Scoping meetings. • Opportunities. • KFN desire to have collective meeting with DKFN, KFN and Metis.
07/13/06	President Robert Tordiff, NW Territory Metis Nation	Meeting	Waited for Lloyd Cardinal then proceeded without his Cardinal in attendance. The following items were discussed: • Environmental assessment. • Possible support. • Tamerlane contact for responding to Metis concerns. • Desire to hold collective meeting with DKFN, KFN and Metis.
07/13/06	President Lloyd Cardinal, Fort Resolution Metis Council Julie ?, Fort Resolution Metis Council	Meeting	Discussed the following items: • Environmental assessment. • Opportunities. • Next meeting before scoping session in Fort Resolution with the Fort Resolution Metis Council.
07/14/06	Dora Enzoe, Akaitcho Interim Measures Agreement Office	Email	Provided update regarding Tamerlane's presentation to INAC and Environment Canada 07/12/06. A copy of the presentation was attached to the message.

Date	Stakeholder	Mode	Action / Topic
07/14/06	Chief Karen Felker, West Point First Nation	Email	Provided update regarding Tamerlane's presentation to INAC and Environment Canada 07/12/06. A copy of the presentation was attached to the message.
07/14/06	President Vern Jones, Hay River Metis Council	Email	Provided update regarding Tamerlane's presentation to INAC and Environment Canada 07/12/06 and meeting with Robert Tordiff 07/12/06. A copy of the presentation was attached to the message.
07/14/06	President Robert Tordiff, NW Territory Metis Nation	Email	Provided updates regarding Tamerlane's presentation to INAC and Environment Canada 07/12/06. A copy of the presentation was attached to the message.
07/14/06	Chief Robert Sayine, Deninu K´ue First Nation	Email	Provided updates regarding Tamerlane's presentation to INAC and Environment Canada 07/12/06. A copy of the presentation was attached to the message.
07/14/06	Keith Marshall, K´atlodeeche First Nation CFO	Email	Provided updates regarding Tamerlane's presentation to INAC and Environment Canada 07/12/06. A copy of the presentation was attached to the message.
07/18/06	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Discussed the following items: • Misunderstanding regarding potential meeting in Vancouver. • Tamerlane request to have meeting with Deninu K´ue prior to scoping session meeting. • Deninu K´ue desire to finalize proposal
07/20/06	Trent Parker, Fort Resolutio	Letter	Sent $100.00 in personal funds from David Swisher to Fort Resolution for 9-14 year old softball team.
07/20/06	Alec Sunrise, K´atlodeeche First Nation; Keith Marshall, K´atlodeeche First Nation CFO	Phone Call	Discussed the K´atlodeeche funding proposal emailed 07/17/06. Several Tamerlane concerns were discussed including: • Tamerlane's limited finances due to the environmental assessment. • The amount of funding requested without any K´atlodeeche accountability. • Tamerlane agreed to fund one meeting with the DKFN and one meeting with the KFN

Date	Stakeholder	Mode	Action / Topic
			membership. • The outcome of the two funded meetings will determine whether additional meetings will be needed.
07/20/06	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Discussed the following items: • Scoping sessions scheduled in Hay River 08/16/06 and Fort Resolution 08/17/06. • Tamerlane's introductory meeting with Chief Alec Sunrise. • Sayine's desire to complete the proposal prior to the end of his term as chief.

08/02/06	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Discussed the following items:
			• Upcoming scoping session
			  • Sayine indicated he would call back before 08/07/06 to set location for 08/15/06 meeting in Hay River or Fort Resolution.
			  • Sayine indicated preference for Fort Resolution.
			  • Tamerlane agreed to pick-up reasonable expenses for Hay River meeting.
			  • Sayine said he would speak with Paul Boucher and make sure he contacted Tamerlane
			  • Sayine indicated that he is looking for the best deal for the community.
			  • Sayine said he sees no real environmental issues.

08/09/06	Paul Boucher, Deninu K´ue First Nation Council	Phone Call Incoming	Paul Boucher called David Swisher and discussed the following items: • DKFN's intent to give presentation at environmental assessment to address key concerns. • DKFN's desire to have questions answered • Emailed copy of revised proposal from DKFN to Jerry DeMarco.
08/09/06	Irvin Norn, Business Mgr., Deninu K´ue First Nation	Phone Call	Discussed the proposed scoping session meeting to be held 08/17/06. Norn said he would ask Chief Sayine to call Tamerlane to discuss the meeting.
08/09/06	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call Incoming	Chief Sayine called Jerry DeMarco to confirm scoping session meeting 08/15/06 in Fort Resolution.
08/09/06	Keith Marshall, K´atlodeeche First Nation CFO	Phone Call	Discussed the proposed scoping session

Date	Stakeholder	Mode	Action / Topic
			and agreed to call back to arrange the meeting 08/14/06 or 08/15/06.
08/11/06	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Discussed new document proposed by DKFN, Chief Sayine acknowledged that the new document was a new document and not a revision of the document discussed 06/20/06 at the Homesteader Inn in Hay River.
08/11/06	Paul Boucher, Deninu K´ue First Nation Council	Phone Call Incoming	Paul Boucher called Jerry DeMarco and left a message indicating he emailed a new proposal to Tamerlane to be discussed during the scoping session in Fort Resolution 08/17/06.
08/11/06	Julie Jackson, INAC	Phone Call Incoming	Julie Jackson called Jerry DeMarco to notify Tamerlane that the DKFN authorized Tamerlane's LUP extension.
08/11/06	Alec Sunrise, K´atlodeeche First Nation; Keith Marshall, K´atlodeeche First Nation CFO	Meeting	Discussed the following items: • Scoping session update • Follow-up meeting planned for 08/15/06.
08/15/06	Chief Robert Sayine, Deninu K´ue First Nation; Paul Boucher, Deninu K´ue First Nation Council; Irvin Norn, Business Mgr., Deninu K´ue First Nation; Dave Pierrot, Deninu K´ue First Nation; Jim Villineuve, Deninu K´ue First Nation; Raymond Simon, Deninu K´ue First Nation; Chantal Beck, Recorder, Deninu K´ue First Nation; Mary Pierrot, Elder, Deninu K´ue First Nation; Marcel Norn, Elder, Deninu K´ue First Nation; Edward ?, Elder, Deninu K´ue First Nation	Meeting	Discussed the following items: • Proposal • Project Update • New Items • Community happenings
08/15/06	President Lloyd Cardinal, Fort Resolution Metis Council	Phone Call Incoming	President Lloyd Cardinal called Jerry DeMarco and discussed the following items: • Chief Cardinal requested funds for site visit scheduled 08/17/06. • Tamerlane declined. Funding is not available for R-190 site visit attendees, MVEIRB driven. • Demarco offered to meet at a later date and fund a specific meeting for the Metis since the scoping session would not directly address Fort Resolution Metis concerns. • Demarco indicated to Chief Cardinal that Robert Tordiff was working on Fort Resolution's behalf.

Date	Stakeholder	Mode	Action / Topic
08/16/06	Deninu K´ue First Nation Community; Metis Community; K´atlodeeche First Nation Community	Scoping Session	Held MVEIRB scoping session in Hay River. Numerous related items were discussed with the DKFN, KFN and Metis representatives.
08/16/06	President Lloyd Cardinal, Fort Resolution Metis Council	Discussion During Scoping Session	Attempted to discuss potential future meeting with Metis during scoping session. President Cardinal did not respond.
08/17/06	Deninu K´ue First Nation; Metis; K´atlodeeche First Nation; MVEIRB; Pine Point Area Communities	Site Visit	Held R-190 site visit to view proposed PPPP site.
08/17/06	Deninu K´ue First Nation; Metis	Scoping Session	Held MVEIRB scoping session in Fort Resolution. Numerous related items were discussed with the DKFN and Metis representatives.
09/05/06	Chief Robert Sayine, Deninu K´ue First Nation; Chief Alec Sunrise, K´atlodeeche First Nation; President Robert Tordiff, NW Territory Metis Nation	Letters	Discussed the archaeological survey scheduled for 09/12/06.
09/11/06	Chief Robert Sayine, Deninu K´ue First Nation; Chief Alec Sunrise, K´atlodeeche First Nation	Phone Call	Discussed the following items: • Representative for Archaeological inspection. • Possibility of jointly submitting a letter to the MVEIRB. • Recent interviews in which Sayine indicated he supported Tamerlane's project as long the community benefits.
09/11/06	Chief Alec Sunrise, K´atlodeeche First Nation	Phone Call	Discussed the following items: • Representative for Archaeological inspection. • Upcoming planning council session and community update. • Potential meeting with Tamerlane and KFN council in Edmonton during September.
09/13/06	Chief Robert Sayine, Deninu K´ue First Nation;	Phone Call Incoming	Discussed the following items: • Sayine's concern that progress is delayed • Sayine's concern that the MVEIRB's extensive ToR were delaying the project and the DKFN's desire to expedite the process. • Sayine's desire to draft a letter by 09/21/06 supporting Tamerlane's project.

Date	Stakeholder	Mode	Action / Topic
09/14/06	Chief Robert Sayine, Deninu K´ue First Nation; Chief Alec Sunrise, K´atlodeeche First Nation; President Vern Jones, Hay River Metis Council	Letter	Thank you letter expressing appreciation for participation in Tamerlane's Archaeological inspection.
09/15/06	Keith Marshall, K´atlodeeche First Nation CFO	Phone Call	Discussed the following items: Proposed KFN meeting with David Swisher during the last week of September. The KFN's concern that the MVEIRB's ToR were very extensive and were being used as delay tactics. Chief Sunrise's desire to write the MVEIRB a letter and his intent to talk with the Minister.
09/22/06	Chief Robert Sayine, Deninu K´ue First Nation; President Robert Tordiff, NW Territory Metis Nation; President Lloyd Cardinal, Fort Resolution Metis Council	Letter	Discussed the following items: Introduced Sara Swisher as consulting research analyst for Tamerlane's Traditional Knowledge survey. Proposed study dates. Request for questions or comments regarding the study by September 26th, 2006.
09/22/06	Tom Unka, Deninu K´ue First Nation	Phone Call	Called to introduce TKS consulting research analyst Sara Swisher. Unka provided specific feedback regarding several questions in the survey. Appropriate changes were made.
09/25/06	Chief Alec Sunrise, K´atlodeeche First Nation; President Vern Jones, Hay River Metis Council; President Robert Tordiff, NW Territory Metis Nation	Letter	Discussed the following items: • Introduced Sara Swisher as consulting research analyst for Tamerlane's Traditional Knowledge survey. • Proposed study dates. • Request for questions or comments regarding the study by September 26th, 2006.
09/25/06	Keith Marshall, K´atlodeeche First Nation CFO	Email	Discussed the following items: • Introduced Sara Swisher as consulting research analyst for Tamerlane's Traditional Knowledge survey. • Request by Swisher to forward the attached cover letter and survey document to Lyle Fabian and Chief Sunrise.
09/25/06	Lyle Fabian, K´atlodeeche First Nation	Email	Discussed the following items regarding the TKS: • Request for Lyle to review the TKS and contact Sara Swisher with any

Date	Stakeholder	Mode	Action / Topic
			content concerns/revisions. • Fabian's recommendation to conduct the interviews in two days. • Fabian's role as Community Representative. • Honorarium for participants and Community Representative. • Request by J. Demarco for feedback regarding any concerns Fabian may have with the email.

09/25/06	Lyle Fabian, K´atlodeeche First Nation	Phone Call	Discussed the following items regarding the TKS:
			• TKS timeframe
			  • Fabian's indicated that he thought that the KFN study could be completed.
			• TKS logistics.
			  • Fabian's indicated he was well-equipped to handle all logistics associated with the study.
			• TKS content.
			  • DeMarco requested Fabian to contact Swisher with feedback once he reviewed the document.

09/25/06	Lyle Fabian, K´atlodeeche First Nation	Phone Call	Discussed the following items regarding the TKS:
			• Fabian's receipt of the faxed cover letter and TKS.
			• TKS
			  • Questions.
			  • Introduction.
			  • Research Analyst and Community Representative qualifications and experience.
			  • Proprietary concerns.
			  • TKS methodology.
			  • Community Representative role and responsibilities.
			  • Sample

09/25/06	Lyle Fabian, K´atlodeeche First Nation	Phone Call	Discussed the following items regarding the TKF:
			• Fabian's TKS concerns..
			  • Two days was not an adequate amount of time to conduct the study.
			  • Fabian's asserted that he should conduct Tamerlane's TK study because he has been involved in many TK studies.

09/26/06	Chief Alec Sunrise, K´atlodeeche First Nation;	Meeting	Held meeting in Edmonton to provide

Date	Stakeholder	Mode	Action / Topic
	Council, K´atlodeeche First Nation		answers to questions & concerns: • Discussed tax options. • Discussed unity within the First Nations in the community. • Discussed Traditional Knowledge study and methodology. • Very good & productive meeting
09/25/06	President Vern Jones, Hay River Metis Council	Phone Call	Called and left message regarding TKS logistics.
09/26/06	President Vern Jones, Hay River Metis Council	Phone Call	Discussed the TKS and requested Jones to recommend a Hay River Metis Community Representative for the TKS.
09/26/06	President Robert Tordiff, NW Territory Metis Nation	Phone Call	Provided update regarding the TKS. Tordiff indicated that Cec Heron would provide input regarding the proposed study.
09/27/06	Cec Heron, NW Territory Metis Nation IMA Coordinator	Phone Call	Lefft message regarding TKS.
09/27/06	President Lloyd Cardinal, Fort Resolution Metis Council	Phone Call	Left message regarding TKS and proposed meeting with Cardinal and the Fort Resolution Metis Council.
09/28/06	Cec Heron, NW Territory Metis Nation IMA Coordinator	Phone Call	Discussed the TKS format and indicated that feedback regarding the proposed questionnaire should be referred to Sara Swisher.
09/28/06	President Lloyd Cardinal, Fort Resolution Metis Council	Phone Call	Discussed the following items: • Proposed meeting with Cardinal and Council 10/12/06. • Billing logistics for the meeting. • Confirmation of the proposed meeting the following week.
09/30/06	Lyle Fabian, K´atlodeeche First Nation	Phone Call Incoming	Called Jerry Demarco to inform him that the KFN could,should and would conduct the TKS in a timely fashion.
09/30/06	Chief Alec Sunrise, K´atlodeeche First Nation; Keith Marshall, K´atlodeeche First Nation CFO	Email	Sent email as a follow-up to 09/26/06 meeting. Forwarded Tamerlane's community engagement log via email as per the KFN's request.
10/03/06	Cec Heron, NW Territory Metis Nation IMA Coordinator; Tom Unka, Deninu K´ue First Nation	Phone Call and Follow-Up Fax	Called regarding the revised TK study proposal and provided notice that the revised proposal was being faxed for review and/or any final input.
10/06/06	Cec Heron, NW Territory Metis Nation IMA Coordinator; Tom Unka, Deninu K´ue First Nation	Phone Call	Called to obtain and/or incorporate any final input into the TKS survey. Tom Unka had no additional edits. Cec Heron was out of the office. A second call was made later in the day and a message was left with Ursula, Cec Heron's assistant.

Date	Stakeholder	Mode	Action / Topic
10/10/06	Chief Alec Sunrise, K´atlodeeche First Nation; Council, K´atlodeeche First Nation	Meeting	Discussed the TKS formant and potential dates for a community meeting with the KFN.
10/10/06	K´atlodeeche First Nation Community Members; Fort Resolution Metis Council Community Members	TKS Study	TKS study conducted by Tamerlane's independent consultant Sara Swisher in collaboration with Tom Unka and Arthur Beck 10/10/06 – 10/16/06.
10/10/06	Lyle Fabian, K´atlodeeche First Nation	Phone Call Incoming	Requested meeting to discuss TKS.
10/10/06	Chief Alec Sunrise, K´atlodeeche First Nation; Council, K´atlodeeche First Nation; Lyle Fabian, K´atlodeeche First Nation; Victoria ?, K´atlodeeche First Nation; Verta ?, K´atlodeeche First Nation	Meeting	Discussed the following items: • The TKF TKS will be conducted by the KFN internally. • The budget for the TKS will be mutually agreed to by Tamerlane and the KFN. • Community meeting finalized for 10/16/06.
10/10/06	President Lloyd Cardinal, Fort Resolution Metis Council Council Members, Fort Resolution Metis Council	Meeting	Discussed the following items: • Project update. • TKS update. • Increased sample size and nomination of Arthur Beck as Fort Resolution Metis Community Representative for TKS.
10/16/06	Cec Heron, NW Territory Metis Nation IMA Coordinator; Pearl Bird, NW Terriitory Metis Nation; Earl Jacobson, NW Territory Metis Nation	Meeting	Discussed the following items: • Project update. • Potential opportunities for NWT Metis to assist in project related training, translation and business opportunities.
10/16/06	Lyle Fabian, K´atlodeeche First Nation	Phone Call Incoming	Community Meeting cancelled by Chief Alec Sunrise and Keith Marshall due to an accident in the community.
10/17/06	Hay River Metis Council Community Members	TKS Study	TKS study conducted by Tamerlane's independent consultant Sara Swisher in collaboration with Paul Harrington 10/17/06 – 10/19/06.
10/19/06	Chief Karen Felker, West Point First Nation	Phone Call Incoming	Requested meeting with Tamerlane the next time Tamerlane representatives were in town. Preferred meeting dates were the week of 11/20/06.
10/23/06	Tom Unka, Deninu K´ue First Nation; Betty ?, Hay River Metis Council Secretary Arthur Beck, Fort Resolution Metis Council	Phone Call	Discussed the following items: • Thank you for hospitality and collaboration with Tamerlane for the TKS study. • Payment for services (payments processed and in the mail).
10/23/06	Chief Robert Sayine, Deninu K´ue First Nation	Letter w/	Discussed the following items:

Date	Stakeholder	Mode	Action / Topic
		follow-up Phone Call	• Thank you for direction and cooperation with the TKS. • Tamerlane request to schedule DKFN community meetings to provide a project update. • Tamerlane request to schedule meeting • Notification of visit to R190 site by an engineering consultant and Tamerlane's Ross Burns and Dan Brost 10/23/-06-10/24/06.
10/23/06	President Alec Sunrise, K´atlodeeche First Nation	Letter w/ follow-up Phone Call	Notified Marshall of visit to R190 site by an engineering consultant and Tamerlane's Ross Burns and Dan Brost 10/23/-06-10/24/06.
10/23/06	Cec Heron, NW Territory Metis Nation, IMA Coordinator	Letter w/ follow-up Phone Call	Received faxed copies of the letters sent to President Vern Jones and President Loyd Cardinal. Provided notification of visit to R190 site by an engineering consultant and Tamerlane's Ross Burns and Dan Brost 10/23/-06-10/24/06.
10/23/06	President Lloyd Cardinal, Fort Resolution Metis Council	Letter w/ follow-up Phone Call	Discussed the following items: • Thank you for direction and cooperation with the TKS. • Tamerlane request to schedule Fort Resolution Metis community meetings to provide a project update. • Tamerlane request to schedule meeting • Notification of visit to R190 site by an engineering consultant and Tamerlane's Ross Burns and Dan Brost 10/23/-06-10/24/06.
10/23/06	President Vern Jones, Hay River Metis Council	Letter w/ follow-up Phone Call	Discussed the following items: • Thank you for direction and cooperation with the TKS. • Tamerlane request to schedule Hay River Metis community meetings to provide a project update. • Tamerlane request to schedule meeting • Notification of visit to R190 site by an engineering consultant and Tamerlane's Ross Burns and Dan Brost 10/23/-06-10/24/06.
10/24/06	Tom Unka, Deninu K´ue First Nation; Arthur Beck, Fort Resolution Metis Council; Paul Harrington, Hay River Metis Council; Cec Heron, NW Territory Metis Nation IMA Coordinator	Card	Sent thank you cards for collaboration and involvement in the TK study.

Date	Stakeholder	Mode	Action / Topic
11/14/06	Keith Marshall, K´atlodeeche First Nation CFO	Call	Left message requesting a meeting with the K´atlodeeche community during Tamerlane's next trip to NWT.
11/14/06	Cec Heron, NW Territory Metis Nation IMA Coordinator	Call	Confirmed meeting with Heron later in the day on 11/14/06.
11/14/06	Chief Robert Sayine, Deninu K´ue First Nation	Call	Requested meeting with Deninu K´ue Council during Tamerlane's next trip to NWT. Chief Sayine agreed to talk to the Council to set date and contact Tamerlane.
11/14/06	Cec Heron, NW Territory Metis Nation IMA Coordinator	Meeting	Discussed the following items: • NWT Metis Council election updates. • Heron's intent to leave her position with the NWT Metis Council.
11/09/06	Chief Alec Sunrise, K´atlodeeche First Nation;	Letter	Responded to KFN letter dated 10/24/06 and discussed the KFN liaison position for the PPPP.
11/09/06	Chief Alec Sunrise, K´atlodeeche First Nation;	Letter	Responded to KFN letter dated 10/24/06 and discussed the following items regarding the potential for mining operations on KFN reserve lands: • Tamerlane must consider all aboriginal communities and groups in the region. • Tamerlane does not have a long-term mining plan at this point. • Any future mining must be located near the mine operations. • Request to KFN to provide a map of possible reserve lands available to the KFN. • Tamerlane's inability to enter into a non-binding agreement with the KFN regarding future mining projects at this time.
11/09/06	Cec Heron, NW Territory Metis Nation IMA Coordinator	Phone Call	Out of the office. Called to request permission to forward a copy of the final Hay River and Fort Resolution TKS reports to the Aurora Research Institute as per the Institute's request.
11/09/06	Rosy Bjornson, Deninu K´ue First Nation IMA Coordinator	Phone Call and Fax	Called and requested permission to forward a copy of the final Fort Resolution TKS report to the Aurora Research Institute as per the Institute's request. Faxed a copy of the letter from the Institute to Sara Swisher for Bjornson's review.
11/20/06	Keith Marshall, K´atlodeeche First Nation CFO	Phone Call	Left message regarding community

Date	Stakeholder	Mode	Action / Topic
			meeting.
11/21/06	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Followed-up regarding Tamerlane's requested meeting with the Council. Chief Sayine indicated he would look at possible dates with his Council, talk to Paul Boucher regarding the ATEA and then call-back to arrange a schedule.
11/21/06	Earl Jacobson, NW Territory Metis Nation	Phone Call	Discussed the following items: • Election updates. • Jacobson indicated Tamerlane should contact Cec moving forward regarding project related training etc.
11/21/06	Keith Marshall, K´atlodeeche First Nation CFO	Phone Call	Left message regarding community meeting.
11/24/06	Chief Alec Sunrise, K´atlodeeche First Nation;	Phone Call	Confirmed community meeting 12/06/06.
11/24/06	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Called to discuss potential community meeting. Chief Sayine was unavailable due to a death in his family.
11/28/06	Keith Marshall, K´atlodeeche First Nation CFO	Phone Call	Called to discuss community meeting. Marshall indicated the meeting would be included in that evening's Council agenda.
11/28/06	Cec Heron, NW Territory Metis Nation IMA Coordinator	Phone Call	Discussed training and NW Territory Metis election results.
11/28/06	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Called to request meeting with Deninu K´ue community week of 12/04/06.
11/29/06	Keith Marshall, K´atlodeeche First Nation CFO	Phone Call	Confirmed 12/06/06 community meeting.
11/29/06	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Left message for Chief Sayine requesting a call-back regarding the community meeting.
12/01/06	Arthur Beck, Fort Resolution Metis Council	Phone Call	Called to advise Beck that the draft summary TK report was complete. Beck agreed to review the report for accuracy and provide feedback before Sara Swisher finalizes the report.
12/01/06	Tom Unka, Deninu K´ue First Nation	Phone Call	Called to advise Unka that the draft summary TK report was complete and to request feedback. Unka was not at home.
12/04/06	Tom Unka, Deninu K´ue First Nation	Phone Call	Called to advise Unka that the draft summary report was complete and that David Swisher would leave the draft report at the Band Office 12/06/06 with Chief Sayine to be picked-up by him for review.

Date	Stakeholder	Mode	Action / Topic
12/04/06	Keith Marshall, K´atlodeeche First Nation CFO	Meeting	Discussed upcoming afternoon Community meeting 12/04/06.
12/04/06	Victoria, K´atlodeeche First Nation	Meeting	Discussed upcoming afternoon Community meeting 12/04/06.
12/04/06	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Left message regarding possible meeting 12/05/06.
12/04/06	Les Norn, K´atlodeeche First Nation CFO	Informal Discussion	Had an informal conversation Les Norn at the Homesteader Inn and discussed the upcoming meeting.
12/04/06	K´atlodeeche First Nation Community	Meeting	Presented the PPPP project description and updates followed by a Q & A.
12/05/06	Deninu K´ue First Nation Council and Elders	Meeting	Presented project update followed by discussion with the Council and Elders.
12/11/06	Chief Robert Sayine, Deninu K´ue First Nation	Phone Call	Chief Sayine was out of the office. Left message.
12/11/06	Paul Harrington, Hay River Metis Council	Phone Call	Discussed potential Metis Community meeting dates.
12/11/06	George Lafferty, Hay River Metis Council	Phone Call	Community meeting was cancelled; trying to reschedule meeting in January.
12/11/06	Keith Marshall, K´atlodeeche First Nation CFO	Phone Call	Marshall was not available. Left Message.
12/12/06	Tom Unka, Deninu K´ue First Nation	Phone Call	Called Unka to discuss TK study feedback and/or edits. Unka indicated that the Band Office misplaced the report but that he was going to look for it.
12/13/06	Tom Unka, Deninu K´ue First Nation	Phone Call	Called Unka and discussed the TK study and incorporated requested edits. Unka verbally approved the report finalization and indicated that he would forward the draft to Beck for his review.
12/14/06	Paul Harington, Hay River Metis Council	Phone Call w/Email	Notified Harrington that the draft Hay River Metis Traditional Knowledge study was complete and ready for review. Emailed draft copy of the report to Harrington for review and any edits.
12/15/06	Paul Harrington, Hay River Metis Council	Phone Call	Called to follow-up with Harrington regarding feedback and/or edits for the Hay River TK study. Harrington verbally approved the draft without any edits and authorized finalization of the Hay River TK study.
12/15/06	Tom Unka, Deninu K´ue First Nation	Phone Call	Called Unka to schedule a time when Sara Swisher could call to follow-up and receive feedback from Beck regarding the Fort Resolution TK study.

Date	Stakeholder	Mode	Action / Topic
12/20/06	Arthur Beck, Fort Resolution Metis Council	Phone Call	Called to follow-up with Beck regarding feedback and edits for the Fort Resolution TK study. Beck indicated that he had not yet reviewed the draft report and requested that Sara Swisher call the following day.
12/21/06	Arthur Beck, Fort Resolution Metis Council	Phone Call	Called Beck and discussed the TK study and incorporated requested edits. Beck verbally approved finalization of the report and verified that an original copy of the report would be sent to the Fort Resolution Metis Community.

Table 6.3-1
Regulatory Engagement Events Initiated by Tamerlane Ventures Inc.

DATE	Individual / Group	Mode	Topic	Action
Jan-Oct 2006	Sara Baines & Lynn Carter, MVLWB	Visits Letters Phone	Numerous discussions regarding Pilot Project Permitting Process & Requirements	All information shared was utilized for Pilot Project
1/17/06	Ervin Allen, Resource Management Officer, Fort Smith, NT	Phone email	Provided David Swisher with guidance pertaining to land and water permitting	TAM followed recommendations
2/2/06	Sara Baines, Regulatory Officer, MVLWB	Phone email	Provided TAM with Community Engagement List & recommended individuals for TAM's Yellowknife visit	TAM contacted all individuals on list & met individuals in Yellowknife
2/6/06	Malcolm Robb, Manager Mineral Development, INAC	Visit	TAM provided overview of Pilot Project	Introduction for David Swisher
2/6/06	Gary Bohnet, Special Advisor, INAC	Visit	Introduction	Future Contact
2/6/06	Sara Baines, Regulatory Officer, MVLWB	Visit	TAM provided overview of Pilot Project and received information pertaining to permitting	TAM utilized information
2/6/06	Deborah Archibald & Kelly Mahoney, GNWT	Visit	Provided Pilot Project update and answered questions	Introduction for David Swisher
2/6/06	Hendrik Falck, Geologist, NRC	Visit	Provided Pilot Project update	Introduction for David Swisher
2/6/06	Steve Goff, District Geologist, INAC	Visit	Provided Pilot Project update	Introduction for David Swisher
2/6/06	Luke Ootes, Project Geologist, Geoscience office	Visit	Investigating access to historic Pine Point records	Some Information available & utilized by TAM
2/7/06	Andrew Forbes & Norman McCowan, INAC	Visit	Pilot Project update and reviewed maps around the R-190 deposit site	Utilized information revieved
2/9/06	Deh Cho Planning Committee	Visit	Attended meetings	Utilized land use information
2/9/06	Wayne Starling, Water Resources Manager, Fort Smith, NT	Email	Provided historical water information of the Pine Point area and suggestions where to locate reports	TAM followed recommendations
2/10/06	Sara Baines, Regulatory	Email	Informed TAM of historical Cominco	Thanked Sara for

DATE	Individual / Group	Mode	Topic	Action
	Officer, MVLWB		water quality information being mailed to TAM	information and reviewed upon arrival
2/10/06	Ervin Allen, Resource Management Officer, Fort Smith, NT	Email	Attempted to assist TAM for information of any water testing experts in area.	Utilized information and pursued options
2/13/06	Sara Baines, Regulatory Officer, MVLWB	Email	Pumping test permit requirements	Utilized information for future planning
2/13/06	Wayne Starling, Water Resources Manager, Fort Smith, NT	Email	Underground miner contacts at old Pine Point Operations	No contacts were found
2/16/06	Charlene Coe, INAC	Phone	Discussed status of Tamerlanes LUP extention status	Awaiting follow-up by DIAND
2/16/06	Alf Randal, Former Pine Point Geologist	Phone	Alf was involved in R-190 & X-25 pump tests. Discussed rates, ground and reports	N/A
2/20/06	Tom Healy, Former Pine Point Engineer	Phone	Discussed Pilot Project and underground application	N/A
3/24/06	Jack Rowe, Business Owner in Hay River, NT	Phone	Discussed Dynamics in town of Hay River	N/A
3/28/06	Jennifer Bailey, Systems Officer, Prince of Wales Northern Heritage	Email	Archaeological site request in vicinity of R-190 deposit	TAM retained information
3/28/06	Lisheen Mine & Galmoy Mine Visit, Ireland	Visit	David Swisher toured underground to observe best practices mining in MVT deposit similar to R-190	TAM utilized information for underground planning
4/3/06	Sara Baines, Regulatory Officer, MVLWB	Email	Land and Water License Permit thresholds	TAM reviewed information
5/1/06	Gary Bohnet, Special Advisor, INAC	Phone	Discussion of TAM current community engagement	TAM forwarded information
5/1/06	Malcolm Robb, Manager Mineral Development, INAC	Phone	INAC has mechanism to assist involving all regulatory bodies, for ease of permtting There are no settled claims in the area	TAM utilized information
5/11/06	Kelli Emon, Mineral Development Advisor, INAC	Email	Confirmation of MDAG meeting May 30, 2006, 1:15-4:30 pm, 1st floor boardroom, Bellanca Bld	TAM prepared presentation
5/12/06	Kelli Emon, Mineral Development Advisor, INAC	Email	Forwarded Terms of Reference for MDAG meeting	Reviewed and prepared

DATE	Individual / Group	Mode	Topic	Action
5/24/06	Kelli Emon, Mineral Development Advisor, INAC	Email	Forwarded TAM MDAG presentation	Kelli passed onto participants
5/30/06	**MDAG Meeting**	Visit	Review of Pilot Project	Follow-up ensued
	Attendees	**Organization**	**Phone/Email**	
	Al McDonald	MVEIRB	766-7052/ amacdonald@mvirb.nt.ca	
	David Smith		eastarm@ssimicro.com	
	Jack Bird	ENR	Jack_Bird@gov.nt.ca	
	Jason McNeill	ENR	Jason_McNeill@gov.nt.ca	
	Julie Jackson	INAC	Jacksonjl@inac.gc.ca	
	Lorraine Seal	INAC	Sealel@inac.gc.ca	
	Colleen Roche	ENR, GNWT	Colleen_roche@gov.nt.ca	
	Ernie Watson	DFO	Watsone@dfo-mpo.gc.ca	
	Natasha Brotherston	GNWT – ITI	Natasha_brothers@gov.nt.ca	
	Lynn Carter	MVLWB	lcarter@mvlwb.com	
	Sarah Bain	MVLWB	sbaines@mvlwb.com	
	Brent Edmunds	WCB	brente@wcb.nt.ca	
	Kellie Emou	INAC – MDD	emonk@inac.gc.ca	
	Jerry DeMario	Tamerlane	jdemarco@centurymining.com	
	David Swisher	Tamerlane	dswisher@centurymining.com	
	Lionel Marcinkoski	INAC	marcinkoski@inac.gc.ca	
	Denise Mazur	INAC/Lands	mazurd@inac.gc.ca	
	Fraser Fairman	INAC/E & C	Fairmanf@inac.gc.ca	
	Anne Wilson	Environment Canad	Anne.wilson@ec.gc.ca	
	Alex Debogorski	Eagle North Con.	873-8727 / 444-2498	
5/30/06	Colleen Roche, Industrial Specialist, GNWT	Email	Request for additional information from MDAG meeting	TAM provided information
6/1/06	Ervin Allen, Resource Management Officer, Fort Smith, NT	Visit	Provided update on Pilot Project	N/A
6/1/06	Wayne Starling, Water Resources Manager, Fort Smith, NT	Visit	Provided update on Pilot Project, discussed any water issues	N/A
6/2/06	Hay River City Council	Visit	Introduction meeting and review of Pilot Project	N/A
6/6/06	MVLWB	Letter	Forwarded Milling vs. DMS letter	N/A
6/6/06	Alistair MacDonald, Env. Ass. Officer, MVEIRB	Phone	Discussions around a possible meeting and presentation to MVEIRB	TAM provides travel dates & presentation

DATE	Individual / Group	Mode	Topic	Action
6/8/06	Lynn Carter, Regulatory Officer, MVLWB	Email	Request 3 paper copies of Project Description from MVEIRB	Supplied copies to Lynn during next trip North
6/8/06	MDAG participants	Phone	Called Anne Wilson, Ernie Watson, Brent Edmunds, Colleen Roche and Natasha Brotherston for any follow-up questions they may have	Not a lot of questions and no follow-up information needed
6/9/06	Mary Tapsell, Manager, MVEIRB	Phone	Received call from Janice indicating the Mary Tapsell doesn't want to schedule meeting	Returned call on Monday 6/12/06
6/12/06	Mary Tapsell, Manager, MVEIRB	Phone	MVEIRB should not have formal meeting with developer as they maintain impartiality	No meeting scheduled
6/21/06	Lynn Carter, Regulatory Officer, MVLWB	Visit	Discussion around TAM responsibilities and any additional info. needed.	N/A
6/28/06	Lynn Carter, Regulatory Officer, MVLWB	Email	MVLWB review comments forwarded to TAM	TAM reviewed
6/29/06	Anne Wilson, Water Pollution Specialist, EC	Phone	TAM requested meeting to provide presentation of concerns	EC helped set up meeting
6/30/06	Alistair MacDonald, Env. Ass. Officer, MVEIRB	Email	Request for 15 hard copies of Project Description Report.	TAM complied
7/5/06	Michael Palmer, Pollution Control Specialist, INAC	Email	At TAM request, scheduling meeting with regulators to review EC enviro. Concerns	TAM developing presentation
7/5/06	Alistair MacDonald, Env. Ass. Officer, MVEIRB	Email	TAM Forwarded copy of MDAG presentation	For Public Registry
7/5/06	Malcolm Robb, Manager Mineral Development, INAC	Phone	Discussion of environmental process and suggestions	TAM complied with suggestions
7/5/06	Lynn Carter, Regulatory Officer, MVLWB	Phone	TAM soliciting advice from MVLWB pertaining to process	TAM complied with suggestions
7/5/06	Alistair MacDonald, Env. Ass. Officer, MVEIRB	Email	Informing MVEIRB's absence from 7/12/06 presentation	N/A
7/6/06	Anne Wilson, Water Pollution Specialist, EC	Email	7/12/06 meeting agenda sent by TAM to EC	EC distributed accordingly
7/6/06	Julie Jackson, Policy Advisor, INAC	Phone	TAM inquired about current LUP extension	TAM retained information
711/06	Andrew McAllister,	Email	Referral from MVEIRB for NRC to	TAM complied

DATE	Individual / Group	Mode	Topic	Action
	Assessment Officer, NRC		have TAM fill out explosives questionnaire	
7/12/06	Kelly Mahoney, GNWT	Visit	Reviewed project status	N/A
7/12/06	Regulators Concerns addressed to MVLWB	Visit	TAM provided presentation answering EC's environmental concerns w/ Pilot Project	Follow-up with supporting documentation
	Attendees	**Organization**		
	Anne Wilson	EC		
	Mike Palmer	INAC		
	Shane Lebouthillier	GNWT		
	Rick Hoos	EBA		
	David Swisher	TAM		
	Jerry DeMarco	TAM		
	Joel Holder	GNWT-ENR		
	Katharine Corriveau	GNWT-ENR		
	Colleen Roche	GNWT-ENR		
	Karin Clark	GNWT-ENR		
	Lionel Marcinkoski	INAC-EC		
	Malcolm Robb	INAC		
	Lindsay Ewchuk	INAC-EC		
7/14/06	Lindsay Ewchuk, INAC-EC	Email	TAM forwarded copy of 7/12/06 presentation	N/A
7/14/06	Alistair MacDonald, Env. Ass. Officer, MVEIRB	Email	TAM forwarded copy of 7/12/06 presentation	N/A
7/18/06	Michael Palmer, Pollution Control Specialist, INAC	Email	Received draft meeting minutes from 7/12/06 presentation	TAM reviewed
7/19/06	Andrew McAllister, Assessment Officer, NRC	Email	TAM responds to NRC explosives questionnaire	N/A
7/19/06	Alistair MacDonald, Env. Ass. Officer, MVEIRB	Phone	Inform TAM of scheduling of scoping sessions in Fort Resolution & Hay River	TAM preparing presentations
7/20/06	Anne Wilson, Water Pollution Specialist, EC	Email	TAM Forward Hydrology reports	EC to review
7/22/06	Alistair MacDonald, Env. Ass. Officer, MVEIRB	Phone Email	TAM R-190 site visit invitation	Scheduled
7/25/06	Anne Wilson, Water Pollution Specialist, EC	Email	7/12/06 TAM presentation meeting notes finalized	TAM reviewed
7/28/06	Wayne Starling, Water	Email	TAM response to Wayne written	N/A

DATE	Individual / Group	Mode	Topic	Action
	Resources Manager, Fort Smith, NT		concerns submitted to MVLWB 6/21/06	
7/31/06	Jason McNeil, GNWT	Email	TAM response to GNWT written concerns submitted to MVLWB 6/27/06	N/A
8/1/06	Alistair MacDonald, Env. Ass. Officer, MVEIRB	Phone Email	Forwarded Tyhee Gold corp. scoping presentation to TAM as example	TAM reviewed and complied
8/2/06	Alistair MacDonald, Env. Ass. Officer, MVEIRB	Phone Email	Suggested maps for TAM to provide for scoping sessions	TAM complied
8/16/06	MVEIRB	Visit	Hay River Reserve Scoping Sessions	TAM presented & answer questions
8/17/06	MVEIRB	Visit	Fort Resolution Scoping Sessions	TAM presented & answer questions
8/17/06	TAM	Visit	TAM hosted voluntary site visit of R-190 site & proposed Infiltration Basin	Follow-up addressed
8/22/06	Alistair MacDonald, Env. Ass. Officer, MVEIRB	Phone Email	TAM sent Hydrogeology & CS Lord files to MVEIRB	Posted on Public Registry
822/06	Anne Wilson, Water Pollution Specialist, EC	Email	TAM sent Hydrogeology & CS Lord files to MVEIRB	Reviewed by EC
8/24/06	Alistair MacDonald, Env. Ass. Officer, MVEIRB	Email	TAM suggested changes to draft scoping session notes	MVEIRB took into consideration
8/23/06	Mike Vaydik Chamber of mines	Visit	Discussed MVEIRB process and Geo Science conference.	TAM took into consideration
9/7/06	Alistair MacDonald, Env. Ass. Officer, MVEIRB	Email	Draft Terms of Reference submitted	TAM reviewed & commented
9/8/06	Alistair MacDonald, Env. Ass. Officer, MVEIRB	Email	Final Scoping Session reports submitted	TAM reviewed
9/11/06	Jean Bussey	Visit R-190	Archaeology overview of R-190 Site area.	No findings
9/12/06	Archeological Recon	Site Recon	Louis Balsilie (DKFN) Amos Cardinal(KFN) Paul Harrington(NWT Metis) Jean Bussey	Completed recon Jean forwarded report.
9/12/06	Art Barnes DOT Hay River	Visit	Discussed traffic and road implications as well as possible quarry use.	TAM retained information

DATE	Individual / Group	Mode	Topic	Action
9/12/06	Mike Mageean GNWT IT&I	Visit	Discussed training and employment.	Follow-up with Karen Cooper
9/12/06	Paul Delorey MLA Hay River	Visit	Project update and permit process.	Follow-up with power point presentation next visit.
9/12/06	Alistair MacDonald, Env. Ass. Officer, MVEIRB	Email	TAM response to Draft ToR	N/A
9/12/06	Andrew McAllister, Assessment Officer, NRC	Email	Response to MVEIRB that NRC is not responsible minister for assessment	N/A
9/14/06	Patrick Duxbury, Env. Ass. Officer, MVEIRB	Email	Reminder for comments is 9/21/06	N/A
10/5/06	Patrick Duxbury, Env. Ass. Officer, MVEIRB	Email	Final ToR	TAM working on DAR
10/16/06	Bob Sanderson GNWT Directorate Forth Smith	Visit	Project status and meeting with full board	Meeting scheduled Nov 14, 2006
10/16/06	Jane Groenewegan MLA Hay River	Visit	Project update and meeting possibility with Standing Committee on Governance and Economic Development	Jane to arrange meeting
10/17/06	Art Barnes DOT Hay River	Visit	Discus details of infiltration basin	Art referred us to Norm McGowan
10/17/06	Norm Mc Gowan	Visit	Infiltration basin logistics were discussed,	Norm referred us to Darleen Norman
10/17/06	Darlene Normal Land Administration	Phone call	Not available left message	Darlene returned call and identified quarry usage
10/20 06	John Pollard	Visit	Project status and elections.	Follow-up after elections
10/27/06	Lynn Carter, Regulatory Officer, MVLWB	Phone	LUP extension request granted to TAM	N/A
11/14/06	Bob Sanderson And all Superintendents and Directors Richard Mercredi	Meeting Aurora College	Project description and update to full board including Hay River representatives on conference call Public Works	

DATE	Individual / Group	Mode	Topic	Action
	Curtis Brown Paul Taylor Lorraine Tordiff Jack Bird Lloyd Jones Bernie Sheehan Pearl Herron-Macdonald Tom Makepeace Art Barnes Dana Rasiah Mike Miltenberger Kyle Reid Ian Butters Maurice Evans Jeff O'Keefe		South Slave Education council Career and development Municipal & community Environ. And Nat Res Industry Tourism and Invest. Human Resources Financial Management Board Secretariat NWT Housing Corp. Transportation-South Slave Administration MLA Thebachu Riding Liquor Commission Mackenzie Pipeline Office President Aurora College Aurora Campus Director	
11/14/06	Maurice Evans President Aurora College	Meeting	Brief meeting to discuss training and employment.	Follow-up with Jeff OKeefe
11/15/06	Jane Groenewegan MLA Hay River	Meeting Hay River office	Project description (Q&A) also present Wendy Morgan, Gary Bolt(NTCL)	N/A
11/15/06	Paul Delorey MLA hay River	Phone	Not available for presentation	N/A
11/15/06	John Pollard Mayor Hay River	Visit	Discussed Town planning and traffic issues	N/A
11/15/06	John Pollard and 4 Town Councilors	Visit	Mike McMeekin,Kevin Wallingham, and Ron Karp reviewed presentation	Scheduled full council presentation next visit.
12/04/06	John Pollard and entire Hay River Council	Meeting	Gave full presentation to Council. Addressed all previous Council concerns. A follow-up Hay River public Town meeting was recommended. Tamerlane will arrange the meeting.	Follow-up regarding the requested public information meeting.
12/07/06	Dean McMeekin	Phone Call	Left message regarding Town meeting	Follow-up with call at later date.
12/12/06	Dean McMeekin	Phone Call	Left message regarding Town meeting	Follow-up with call at later date
12/13/06	Dean McMeekin	Phone Call	Discussed Town meeting	N/A
12/18/06	Art Barnes, Rhonda Batchelor, Patricia Hogg GNWT DOT	Conference Call	Discussed Tamerlane's potential use of Land Reserve KM42 Hwy 5 NWT as PPPP infiltration basin.	Answers to DOT questions will be provided in Tamerlane's DAR

7.0 ENVIRONMENTAL ASSESSMENT

7.1 Environmental and Socio-economic Assessment Methodology

The environmental assessment for the Tamerlane PPPP has been prepared in general accordance with the Terms of Reference of the MVEIRB (2006), to assist the MVEIRB, regulatory agencies, First Nations organizations and other interested parties in understanding the anticipated environmental consequences of the proposed Tamerlane PPPP development. As a result, this section of the DAR examines the predicted effects of the proposed development on the biophysical components of the environment in the proposed development area and the region.

Potential effects of the proposed Tamerlane PPPP on the socio-economic environment are discussed in Section 8.0 of this DAR, while potential cumulative effects on the biophysical and socio-economic environment are discussed in Section 10.0. Potential effects of accidents and malfunctions related to the PPPP and associated activites are discussed in Section 11.0.

The environmental (and socio-economic) impact assessment process employed for the proposed Tamerlane PPPP followed a typical EIA approach consistent with MVEIRB and Canadian environmental and socio-economic assessment guidelines and methodologies and involved the following phases:

<u>Project Scoping</u> – Scoping involves the identification of key issues of concern and the more important environmental and/or socio-economic components within the area of influence that may be affected by the proposed development (PPPP). These components are commonly referred to as Valued Components (VCs). VCs are components of the natural and human world that are considered valuable by participants in a public review process (Beanlands and Duinker 1983). VCs need not be restricted to being of an environmental nature. Value may be attributed for economic, social, environmental, aesthetic or ethical reasons (CEAA 1999).

Scoping serves to focus the assessment on the more significant issues. The development of appropriate temporal and spatial boundaries for the various environmental and socio-economic components of concern is also part of the scoping process.

<u>Baseline Conditions</u> – This phase involves the characterization of the existing environmental and socio-economic conditions (baseline) in the proposed development (PPPP) area and includes additional site-specific field investigations, as necessary, to

address relevant data deficiencies. The type and level of information required is typically related to the type or importance of an issue, the assessment boundaries and the potential effects predicted to occur.

Impact Assessment and Prediction – Using the baseline data, an understanding of the proposed development (PPPP) and available mitigation measures to prevent or minimize impacts, standard assessment tools and professional judgement are employed to assess potential environmental and socio-economic effects (including residual and cumulative effects) associated with the construction and operation of the proposed development (PPPP). As indicated in the MVEIRB Terms of Reference (MVEIRB 2006), project-related effects are typically characterized in terms of criteria, such as:

- The nature or type of the effect.
- The direction of the effect (i.e., beneficial vs. adverse).
- The magnitude of the effect, taking into consideration any tradeoffs between beneficial and adverse effects.
- The geographic range of the effect and a list of affected groups/individuals.
- The identification of any communities, locations or groups especially sensitive to effects on the particular VC.
- The duration and frequency of the effect occurring.

For socio-economic parameters, the capacity of potentially affected groups, responsible authorities and/or the developer to manage the effect is an additional criterion that is commonly considered.

Mitigation Planning – Appropriate environmental/socio-economic management and mitigation measures, where applicable, are described and directly integrated into the assessment of the proposed development (PPPP)-related effects.

Evaluation of Significance – The significance of potential residual effects of the proposed development (PPPP) - effects remaining after the application of appropriate mitigation measures on the biophysical and socio-economic components of concern are determined using the significance attributes or criteria previously employed for the impact assessment.

Follow-up – Assuming that the PPPP in approved and implemented, specific types of monitoring will be undertaken to confirm the accuracy of environmental and socio-economic predictions made during the assessment phase and to implement corrective actions if, and as may be warranted.

7.1.1 Project Scoping

Pursuant to Section 117(1) of the *MVRMA*, the MVEIRB (2006) determined that the Scope of Development was that generally described in the *Project Description Report* submitted by Tamerlane to the Mackenzie Valley Land and Water Board. It was to consist of all the physical works and activities required to extract, initially concentrate, and ship to a refinery, the economically valuable portion of a single 1,000,000 tonne ore deposit (the R190 deposit).

Other potential deposits requiring further licenses and permits were not to be a consideration in this Environmental Assessment (EA - DAR). Alternatives identified in the MVEIRB Term of Reference were also to be considered part of the Scope of Development to be considered by the developer (Tamerlane).

More specifically, the MVEIRB Terms of Reference (2006) defined the Scope of Development to consist at minimum of the following physical works or activities that are anticipated to occur during the construction, operation and closure phases:

Mining Process

- Construction and maintenance of a frozen perimeter around the mine shaft and R190 orebody, using “freezewall” technology and an active refrigeration unit.
- Development of underground workings, portals, adits, raises, drifts, stopes and all other mine workings, including a main vertical shaft and a main ventilation shaft.
- Management of ore stockpiles, including associated water treatment and management.
- Transport, storage and use of explosives.
- Mine dewatering and the management and treatment of mine water.
- Mining equipment operation, including the vertical conveyance system.

Milling Process

- Construction and operation of a Dense Media Separation (DMS) circuit.
- Consumption of water extracted from the mine workings by the DMS circuit and other on-site activities.
- Storage, handling, use and disposal of DMS process additives and chemicals.
- Construction and operation of an Infiltration Basin.
- Transport, recycling and disposal of process water, as well as its treatment and discharge to the receiving environment.

Support/Ancilliary Facilities and Activities

- “Direct ship” transport of ore from the R190 site to the railhead at Hay River, temporary storage and rail transportation south to a zinc-lead refinery.
- Transportation activities that support the PPPP’s operation, including transportation of goods, contractors and direct employees from nearby communities.
- Any required upgrades to Territorial Highway 5 for the purpose of supporting PPPP operations.
- Construction and/or upgrading of spur and connecting roads between project components on the R190 property, including any potential stream crossing.
- Construction and use of drainage control structures and process/waste water pipelines from the mine to the surface, and from the DMS circuit to the Infiltration Basin, including pumping systems.
- Development and use of borrow sources for aggregate production, or contracting out of same.
- Construction and operation of power plant, substation and power transmission infrastructure.
- Construction and operation of the change house, compressor house, refrigeration unit, offices, lunchrooms, warehouses, storage yards, maintenance shops, laboratory and all support buildings.
- Construction and operation of hydrocarbon storage and handling facilities.
- Treatment facilities (and/or transportation to another site for treatment) for wastewater.
- Solid and hazardous waste management and construction and operation of containment areas.

Closure and Reclamation Activities

- Removal of structures and equipment.
- Reclamation of the Infiltration Basin.
- Reclamation of the road network.
- Reclamation of the infrastructure foundations.
- Re-vegetation of areas affected by mining or support activities.
- Reclamation of waste rock and aggregate stockpile locations.
- Backfilling and capping of the underground works, including backfilling during the operating phase.

Related to the Scope of Assessment, the MVEIRB, after having reviewed Tamerlane's *Project Description Report* and supporting appendices, consultation of the Public Records of the Preliminary Screening and ongoing EA, and the hosting scoping sessions, determined that it required more information on the potential social, economic, cultural and biophysical effects of the PPPP (MVEIRB 2006).

The Review Board determined that the minimum geographical scope of the EA should include Tamerlane's mineral leases, mining claims, the "Local Study Area (LSA)", and all lands west of the Buffalo River that are considered part as part of the "Tamerlane Study Area (RSA)". It should also consider project effects on all areas that may be affected in some identifiable way by the PPPP, including the Buffalo River downstream of the PPPP, nearshore Great Slave Lake wherever groundwater potentially impacted by the PPPP enters it, the ranges of wildlife using the area, and the areas potentially affected by transportation activities, particularly the Territorial Highway 5 and municipal truck routes to the Hay River railhead. All of these areas together were to be considered as the "EA Study Area" (MVEIRB 2006).

The geographical scope for assessing effects to the human environment were to include, but not necessarily be limited to the communities of Hay River (including the Hay River Reserve), Fort Resolution, Fort Smith and Enterprise. The concerns of culturally-defined communities who use the land in the Study Area were also considered to merit consideration (MVEIRB 2006).

The Review Board also determined that the scope of the EA was to include an examination of the cumulative effects of past, present and reasonably foreseeable future developments. The Review Board recognized that the determination of baseline conditions for this EA was complicated by the history of heavy industrial activity in the Tamerlane Study Area, especially the Pine Point lead-zinc mine operated by Cominco Ltd. from 1964 to 1987. The R190 area has seen fewer disturbances from past industrial activity, but nonetheless may also have been affected in a quantifiable way by exploration, railroad, highway and quarrying activities (MVEIRB 2006).

The Review Board recognized that it may be difficult to use quantitative methods to assess the effects of developments or activities that occurred in the distant past, particularly as it applied to establishing "baseline conditions". It was suggested by the Review Board that older developments, for which insufficient data were available, could be treated in a more qualitative fashion where the best professional judgement or expert opinion could be used, from either Traditional Knowledge or scientific sources. Such cumulative effects were to be assessed at a geographic and temporal scale appropriate to the particular environmental component under consideration (MVEIRB 2006).

Regarding temporal boundaries, the Review Board determined that temporal boundaries should be set according to the potential long-term effects, rather than just the duration of PPPP operations. Therefore, the temporal scope was determined to include all phases of the PPPP, from construction to post-closure, until such time that no "*potential significant adverse impacts*" attributable to the PPPP were predicted to occur (MVEIRB 2006).

7.1.2 Selection of Valued Components

The assessment methodology used to evaluate the potential environmental/socio-economic effects of the proposed Tamerlane PPPP on the natural and socio-economic environment of the Pine Point area has employed Valued Ecosystem Components (VECs) or Valued Social Components (VSCs) as the primary focus for evaluating the possible effects of proposed project activities on the more important components of the biophysical and/or socio-economic environment in the development area and, as appropriate, the region. VECs can be defined as "the environmental attributes or components identified as a result of a social scoping exercise as having legal, scientific, cultural, economic, or aesthetic value" (Sadar 1994).

The selection of VECs was based on a combination of the directions provided in the MVEIRB Terms of Reference (2006) and Tamerlane's understanding of biophysical components, species, or species groups, that were identified as being important, either by residents, resource management agencies or by Tamerlane during the MVEIRB scoping sessions held for the proposed PPPP in Hay River and Fort Resolution in August, 2006.

Potential VECs were screened using the following considerations:

- Species listed as rare, threatened, endangered or vulnerable by COSEWIC;
- Species considered culturally important (i.e. important food source such as moose);
- Species considered sensitive to exogenous disturbance; and
- Species which are dependent upon major vegetation community types in the study area.

Not all species/habitats selected as potential VECs encompassed all of the above criteria; some were selected on the basis of one category only. In addition, a species, or species groups, considered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as being endangered, threatened or vulnerable were automatically considered as potential VECs. VECs selected for this environmental assessment are listed in Table 7.1-1.

7.1.3 Assessment Boundaries

Evaluating the significance of each potential effect associated with the Tamerlane PPPP requires that appropriate spatial and temporal boundaries (space and time limits of potential effects) be defined.

As indicated by the MVEIRB (2006) the spatial and temporal boundaries for the Tamerlane PPPP environmental assessment should be set according to appropriate boundaries for the VEC being assessed. The relatively small-scale and short-term nature of the proposed PPPP, are considered by Tamerlane to be other important considerations for determining the appropriate spatial and temporal boundaries for this environmental assessment.

Table 7.1-1
Selected Valued Ecosystem Components

VEC Grouping	Species or Environmental Parameter
Air Quality/Noise	Air Quality/ Noise Indicators
Water Quality	Surface/Groundwater Quality Indicators
Vegetation	Traditional Use Plants/Rare Plants
Wildlife	Moose
	Woodland Caribou
	Wood Bison
	Fur-bearing mammals (treated collectively)
Birds	Peregrine Falcon (anatum) Whooping Crane

7.1.3.1 *Geographic/ Spatial Boundaries*

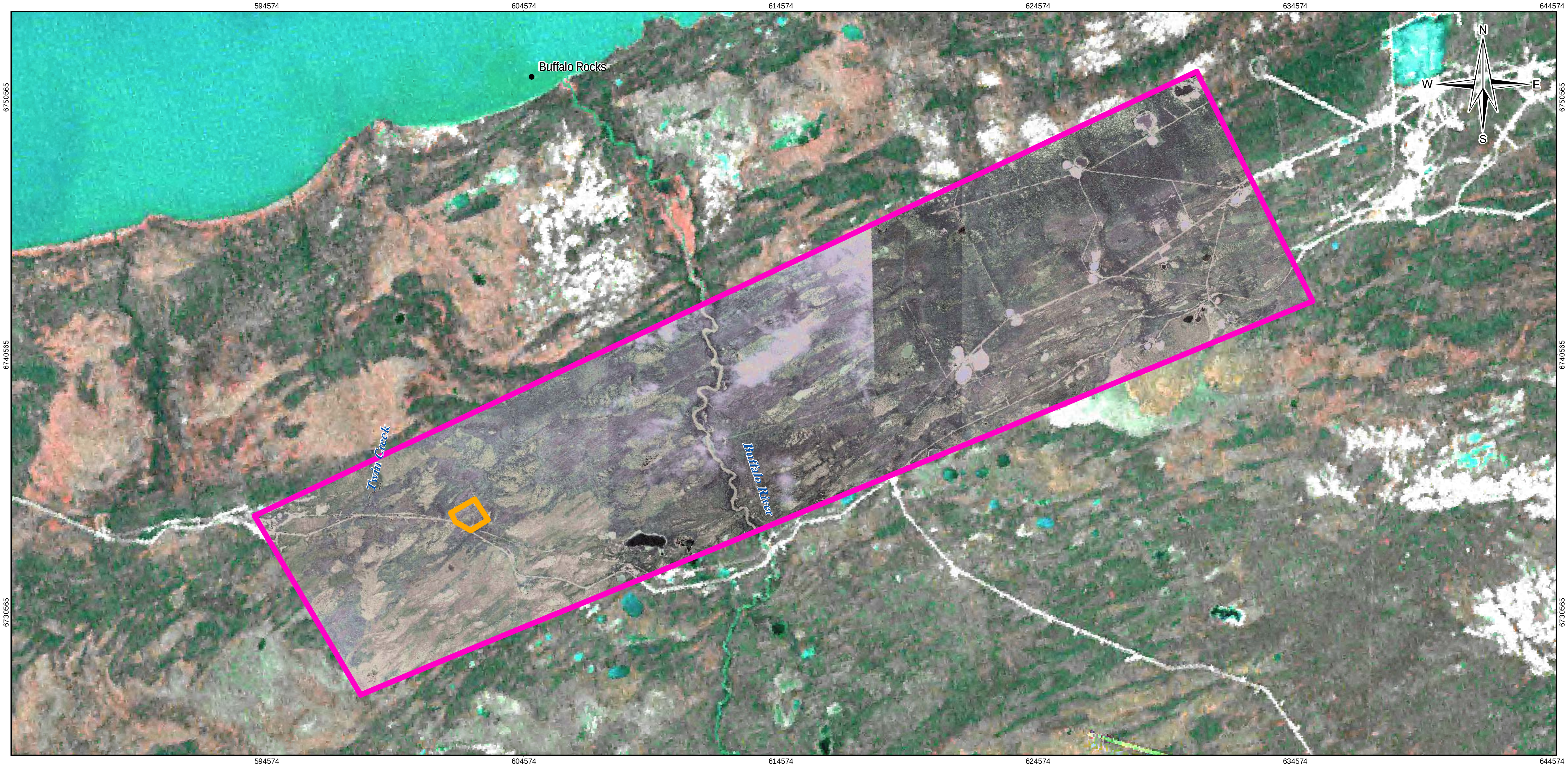
Local and regional spatial boundaries were determined for environmental and socio-economic components of concern based on their respective characteristics and anticipated interactions with PPPP activities. The spatial boundaries were primarily based on the zone of PPPP influence beyond which the effects of the PPPP were expected to be non-detectable. For the biophysical components, three assessment areas were defined.

<u>Local Study Area (LSA)</u> – The LSA, with approximate dimensions of 1 km x 1 km, covers approximately 97.4 hectares and includes all of the proposed Tamerlane PPPP footprint. The configuration of the LSA in relation to the various infrastructure components of the PPPP footprint and the adjacent Highway 5 is illustrated in Figure 7.1-1.

<u>Regional Study Area (RSA)</u> – The RSA, with approximate dimensions of 10 km x 40 km, covers 36,153 hectares, encompasses all of Tamerlane's mineral leases and the likely home ranges of most of the wildlife species (with the exception of migratory birds) that utilize portions of the RSA (Figure 7.1-1).

EA Study Area (ESA) – The ESA, with approximate dimensions of 135 km x 150 km, covers an area of approximately 20,700 km^2 and extends from the Hay River/Enterprise area in the west to Fort Resolution in the east, the southern-most portion of Great Slave Lake to the north and the NWT border to the south (Figure 7.1-2). This area encompasses all of the historic Pine Point mining area, portions of the Deh Cho and South Slave Regions and the known home ranges of all of the wildlife species (with the exception of migratory birds) that may utilize portions of the Tamerlane RSA, as proposed by the MVEIRB (2006). The ESA was also considered to be of an appropriate size for cumulative effects assessment purposes.

Table 7.1-2 summarizes the biophysical assessment boundaries employed for specific VECs that may or will be affected by the development and operation of the Tamerlane PPPP.



LEGEND

Local Study Area (LSA)

Regional Study Area (RSA)

NOTES

Base data source:
Landsat, Google Earth

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PINE POINT PILOT PROJECT

Location Map Showing LSA and RSA

PROJECTION	DATUM
UTM Zone 11	NAD83

Scale: 1:150,000

3 1.5 0 3

Kilometres

FILE NO.
1740149-005_Map008

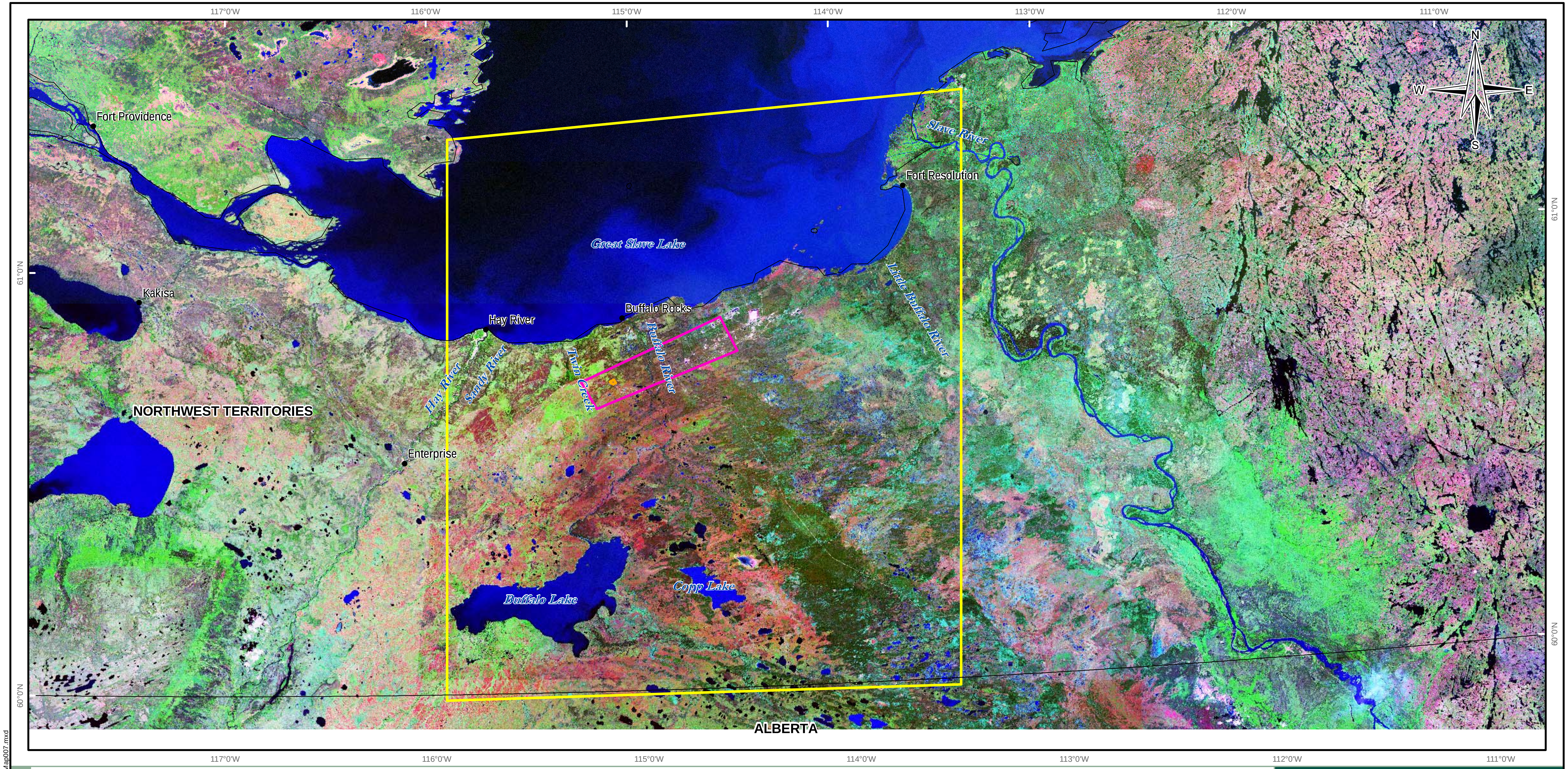
PROJECT NO.	DWN	CKD	REV
1740208	BGP	RH	1

OFFICE	DATE
EBA-VANC	December 14, 2006

Tamerlane Ventures Inc.

EBA Engineering Consultants Ltd.

Figure 7.1-1



LEGEND

- Local Study Area (LSA)
- Regional Study Area (RSA)
- EA Study Area (ESA)
- Wood Buffalo National Park

NOTES
Base data source:
Landsat, Google Earth

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PINE POINT PILOT PROJECT

Location Map Showing ESA and RSA

PROJECTION: UTM Zone 11		DATUM: NAD83	
Scale: 1:1,000,000 (20 10 0 20 Kilometres)			
FILE NO.: 1740149-005_Map007			
PROJECT NO.: 1740208	DWN: BGP	CKD: RH	REV: 1
OFFICE: EBA-VANC	DATE: December 14, 2006		

Tamerlane Ventures Inc.

EBA Engineering Consultants Ltd.

Figure 7.1-2

Table 7.1-2 Biophysical Assessment Boundaries for Specific VECs

Component	LSA	RSA	ESA
Air Quality / Noise	X	X	
Soils/Surficial Geology	X		
Water Quality	X	X	X
Vegetation	X	X	
Wildlife	X	X	X
Cumulative effects	X	X	X

7.1.3.2 *Temporal Boundaries*

The Review Board determined that temporal boundaries should be set according to the potential long-term effects, rather than just the duration of PPPP operations. Therefore, the temporal scope was determined to include all phases of the PPPP, from construction to post-closure, until such time that no "*potential significant adverse impacts*" attributable to the PPPP were predicted to occur (MVEIRB 2006). However, as previously indicated, the relatively small-scale and short-term nature of the proposed PPPP, are considered by Tamerlane to be other important considerations for determining the appropriate temporal boundaries for this environmental assessment.

As a result, potential effects specific to the PPPP have been assessed based on the three anticipated time-related phases of the PPPP. These include those activities related to the construction phase (first year), those related to the subsequent operations phase (years 2 and 3) and those related to the closure and reclamation phase (years 4 and 5 and beyond for some VECs).

7.1.4 Issue Identification

Potential environmental issues and/or concerns associated with the development of the proposed PPPP were initially identified by Tamerlane in the Project Description Report submitted to the MVLWB. Issues identified related to potential for effects on groundwater, effects on vegetation cover and terrain, effects on wildlife and effects related to noise from the development.

These issues, and proposed mitigation measures for effectively managing them, were initially discussed with members of the Minerals Development Advisory Group (MDAG) in Yellowknife in late May 2006. On June 27, 2006, Environment Canada referred the PPPP to Environmental Assessment (EA), citing that the PPPP "*might have significant adverse impacts on the environment*". Their specific concerns included but were not limited to:

- the use of new technology to establish a frozen core perimeter around the underground works
- potential for groundwater contamination
- the existence of SARA-listed species in the area that merit consideration.

These key issues and proposed mitigation measures were further reviewed and discussed with Environment Canada and other regulatory and resource agency interests at a follow-up meeting in Yellowknife in mid July, 2006.

Subsequently, during the MVEIRB scoping sessions held on August 16 in Hay River and August 17 in Fort Resolution, potential environmental issues and concerns were raised and discussed by various participants in these sessions. All of the issues and concerns raised during the scoping sessions were recorded and were subsequently incorporated into the MVEIRB Terms of Reference for this DAR. In particular, the MVEIRB (2006) indicated that the following items were to be given special consideration by Tamerlane in the DAR:

- All water quality and quantity issues related to the Development.
- Impacts on transportation infrastructure and public safety of increasing truck traffic.
- Factors affecting the successful establishment and maintenance of the "freeze wall curtain".
- Impacts on Species at Risk Act (SARA)-listed species frequenting the area.
- Employment, training and business opportunities for local residents and aboriginal groups.

7.1.5 Impact Assessment

Using the VECs as the primary focus for the analysis, the assessment of potential effects for each environmental component begins with a review of the main project activities that could cause environmental disturbances during the proposed exploration program.

The evaluation of impacts for each environmental component is addressed in terms of the type or nature of effects that may occur following the application of appropriate environmental management and mitigation measures.

As indicated in the MVEIRB Terms of Reference (MVEIRB 2006) potential environmental effects and residual effects are typically described in terms of a number of possible impact criteria including:

- The nature or type of the effect.
- The direction of the effect (i.e., beneficial vs. adverse).
- The magnitude of the effect, taking into consideration any tradeoffs between beneficial and adverse effects.
- The geographic range of the effect and a list of affected groups/individuals.
- The identification of any communities, locations or groups especially sensitive to effects on the particular VC.
- The duration and frequency of the effect occurring.
- The capacity of potentially affected groups, responsible authorities and/or the developer to manage the effect.

Table 7.1-3 provides definitions for the impact assessment and significance criteria used for the Tamerlane PPPP environmental and socio-economic assessment.

Table 7.1-3
Tamerlane PPPP Impact Assessment and Significance Criteria

Criterion	Descriptor	Definition
Nature/ Geographic Scope	Site Local Regional	• Effect restricted to the PPPP footprint or LSA • Effect restricted to the RSA • Effect restricted to the ESA
Direction	Positive Neutral Negative	• Net Beneficial effect • No net change • Adverse effect
Magnitude	Low Moderate High	• Minimal or no impairment of resource's function or process; where measurable effects occur, impact will represent a less than 1 % change in the selected parameter within the appropriate Study Area. • Partial impairment of a resource's function or process, however, recovery is expected to a pre-Project level: where measurable effects occur impact will represent a 1 % to 10 % change in the selected measurable parameter within the appropriate Study Area. • Severe impairment of a resource's function or process, recovery is not expected to a pre-Project level; where measurable effects occur, impact will represent a greater than 10 % change in the selected parameter within or potentially beyond the appropriate Study Area.
Timing/ Duration	Short-term Medium-term Long-term	• Effects occur for short periods of time – hours, weeks, months • Effects occur for project life - up to 3 years • Effects extend beyond 3 years
Frequency	Once Sporadic Continuous	• Occurs once only • Occurs on occasion and at irregular intervals • Occurs on a regular basis and at regular intervals
Reversibility	Reversible	• Fully reversible • Partially reversible • Not reversible
Likelyhood/ Confidence	Low Moderate High	• Direct supporting or related information is lacking and best professional judgement cannot be made without evidence. • Direct supporting information is lacking but conclusions can be made on related evidence and professional judgement. • Assessment based on reliable site specific or regional data and well documented cause-effect relationships.
Significance	Insignificant Significant	• Based on the analysis and best professional judgement, is the effect on the biophysical or socio-economic component of concern significant? – see Figure 7.1-3 for approach to determining significance.

7.1.6 Residual Effects

Potential residual effects of the PPPP (those remaining after the application of appropriate mitigation) on the biophysical and socio-economic components of concern were determined. These were subsequently characterized in terms of the assessment criteria: nature/type, direction, magnitude, frequency, timing/duration, geographic/spatial scope, reversibility, likelihood/confidence and significance.

7.1.7 Assessing Impact Significance

To determine the significance of residual effects associated with the implementation of the Tamerlane PPPP, a decision framework consistent with guidance provided by CEAA (2003) was employed by the assessment team. Figure 7.1-3 illustrates the general series of questions considered and the decision pathways followed in determining impact significance for the residual effects associated with the PPPP.

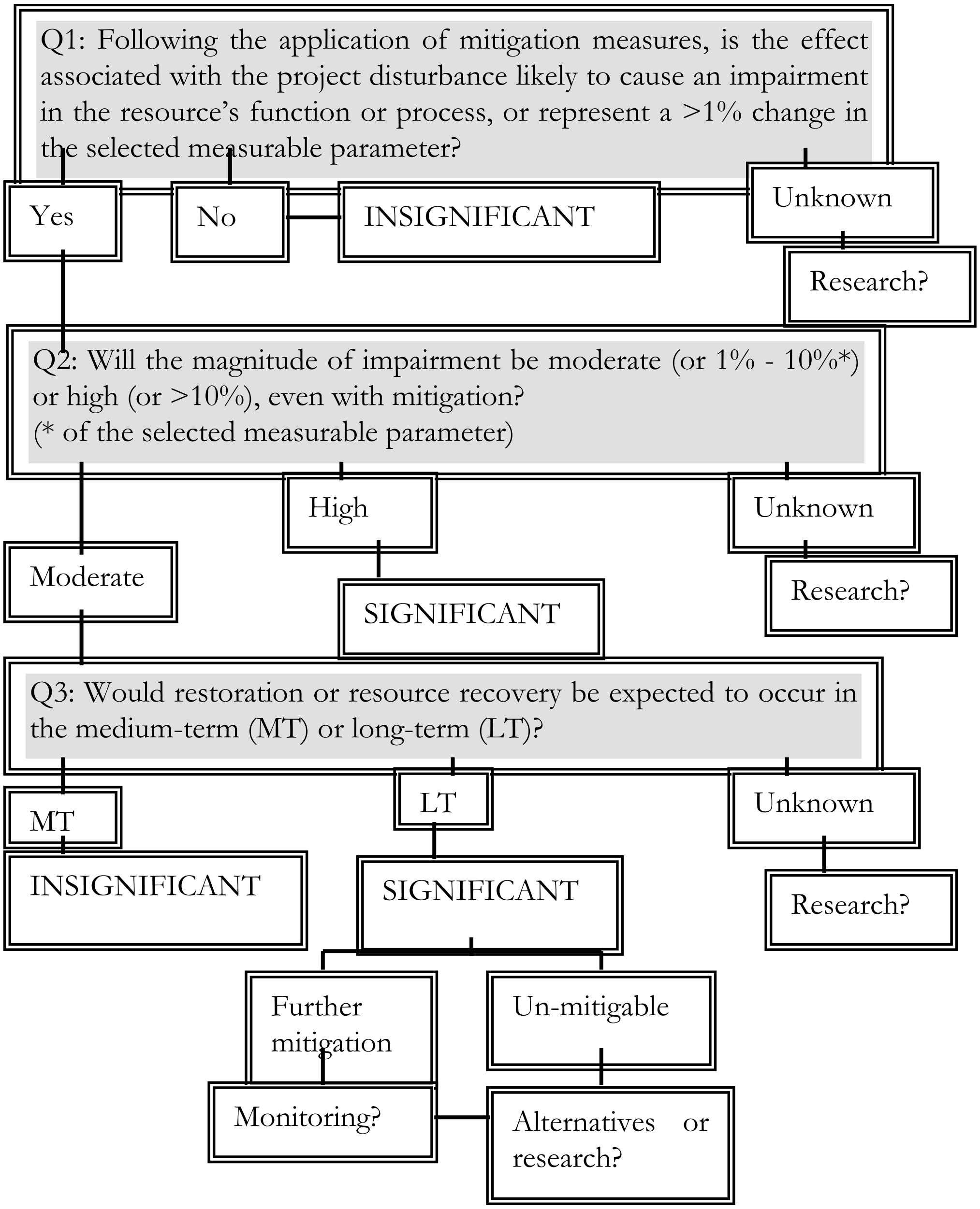


Figure 7.1-3 Methodology for Determining Significance of Residual Effects

7.2 Water Resources

Potential effects of the proposed Tamerlane PPPP on water quality, quantity and flow were identified as major issues of concern during the MVEIRB Preliminary Screening and the Review Board's scoping sessions (MVEIRB 2006). Regarding specific concerns, the issue of effects to water (groundwater) occurring due to the use of freeze wall technology was identified. Potential effects related to the discharge of waste water from the mine and the DMS circuit were also raised. Other concerns were associated with the use of explosives and possible adverse effects (of nitrates) to the drinking water of animals and potential cumulative effects on water of a variety of industrial activities.

This section of the DAR addresses the concerns outlined in the MVEIRB Terms of Reference (MVEIRB 2006) for surface water and groundwater-related issues. Tamerlane's proposed strategies for monitoring water quality in the PPPP area are discussed in Section 7.8. Possible cumulative effects concerns on the water of the Pine Point region are addressed in Section 10.0 of this DAR.

7.2.1 Surface Water

As previously identified in Section 7.1.2, water quality is considered to be a VEC in this DAR even though many of the participants in the Traditional Knowledge interviews (Tamerlane 2006b, c) indicated that the water (groundwater and surface water) in the proposed PPPP area is poor. The water was described as alkaline, sulfurous and not drinkable. Several participants offered explanations. Potential effects on surface water quality in the Tamerlane PPPP area could only occur if activities associated with the PPPP were to either directly or indirectly impact on surface waters of the area.

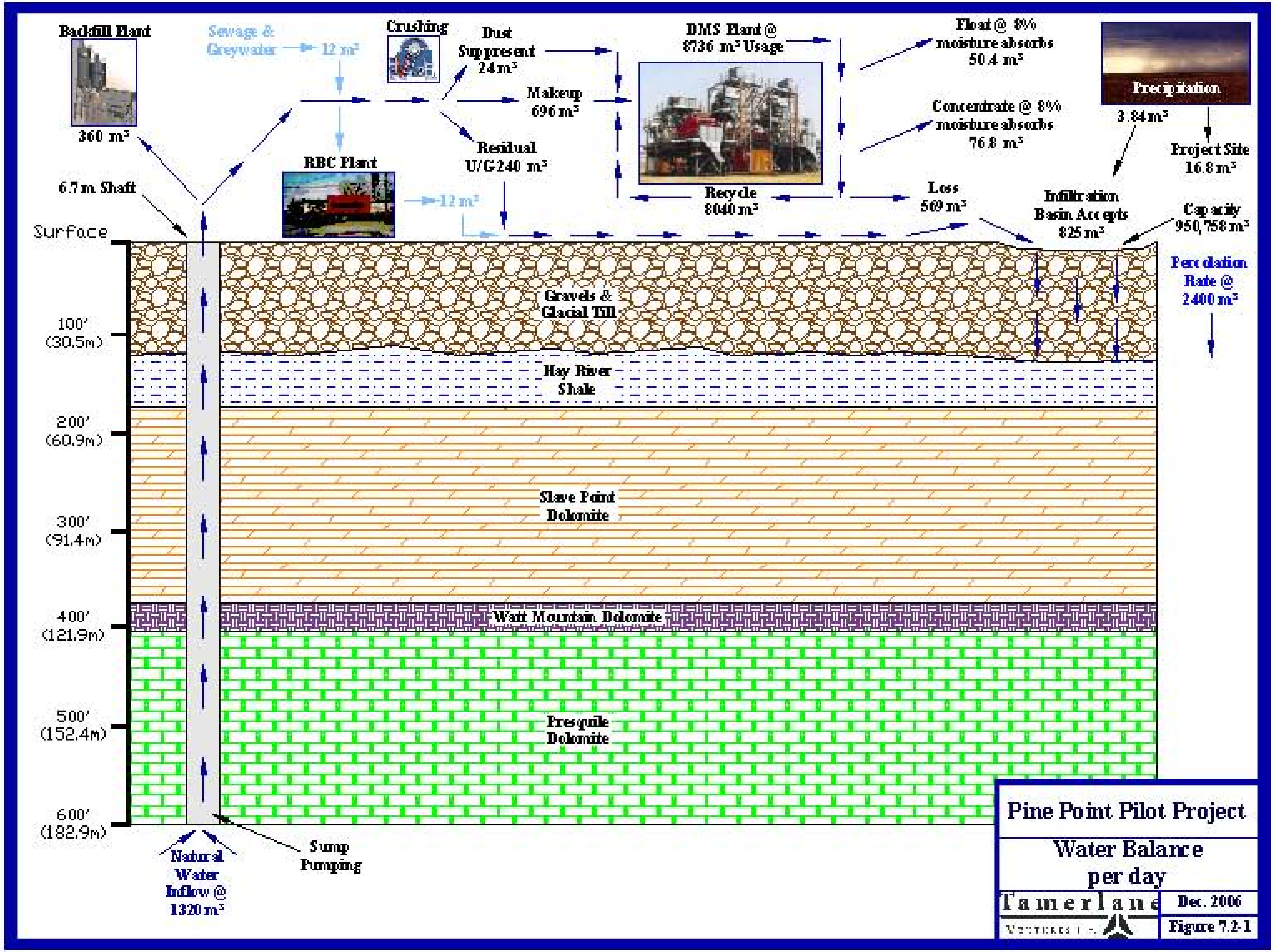
However, as noted in Section 4.0 of this DAR, there will be no direct discharge of any DMS circuit or mine-related water discharges to any surface water such as area streams or lakes. All process water and mine water associated with the PPPP will be directed to the proposed infiltration basin that will be located within the limits of an existing gravel pit (see Figure 4.3.3.) in compliance with conditions of an anticipated Water License to be issued by the MVLWB. This license is the only regulatory instrument that will be required related to water use and disposal for the Tamerlane PPPP. High quality treated sewage effluent will be co-mingled with the process water and mine water for discharge to the infiltration basin.

The limited amount of water (~1,056 m^3/day) used for the Tamerlane PPPP will be sourced from existing groundwater present in the area. Table 7.2-1 summarizes the estimated volumes of groundwater to be used by the PPPP and anticipated groundwater seepage. Figure 7.2-1 schematically illustrates the overall water balance for the PPPP.

Table 7.2-1
Pine Point Pilot Project Preliminary Water Balance

Water Balance Locations	Average Annual Volume (m^3)
Natural & Ground Water	
Shaft Bottom	481,800 (~1,320 m^3/day)
Precipitation @ Infiltration Basin	1,369
Precipitation @ project site	6,096
Total	**489,265**
Project Usage	
Dense Media Separation Makeup	245,280
Backfill Plant	131,400
Dust Suppression	8,760
Total	**385,440**
To Infiltration Basin	
Excess Shaft Bottom	87,600 (~ 570 m^3/day)
Dense Media Separation Loss	207,612 (~ 240 m^3/day)
Total	**295,212**
Infiltration Basin Statistics	
Capacity	950,758 m^3
Percolation Rate (hydraulic conductivity)	> 100 m^3/hr
Imported Fresh Water	
Usage	8,760
Treated Effluent from RBC to Ground	**8,760**

The only water from the PPPP process that will be discharged to the infiltration basin will be the Dense Media Separation Loss water (~570 m^3/day). The remainder of the water directed to the infiltration basin will be the limited excess (to process needs) groundwater (~240 m^3/day) that is anticipated to seep into the underground mine area from below the freeze curtain. This water will be directed to the infiltration basin for recharge to the groundwater of the area.



Backfill Plant
360 m³
Sewage & Greywater
12 m³
Crushing
Dust Suppresent
24 m³
Makeup
696 m³
Residual U/G 240 m³
RBC Plant
12 m³
DMS Plant @ 8736 m³ Usage
Recycle
8040 m³
Float @ 8% moisture absorbs
50.4 m³
Concentrate @ 8% moisture absorbs
76.8 m³
Loss
569 m³
Precipitation
3.84 m³
Project Site
16.8 m³
Infiltration Basin Accepts
825 m³
Capacity
950,758 m³
Percolation Rate @
2400 m³
6.7 m Shaft
Surface
100′ (30.5m)
200′ (60.9m)
300′ (91.4m)
400′ (121.9m)
500′ (152.4m)
600′ (182.9m)
Gravels & Glacial Till
Hay River Shale
Slave Point Dolomite
Watt Mountain Dolomite
Presquile Dolomite
Natural Water Inflow @
1320 m³
Sump Pumping
Pine Point Pilot Project
Water Balance per day
Tamerlane Ventures Inc.
Dec. 2006
Figure 7.2-1

Indirect releases of runoff from the PPPP area to the adjacent fen could potentially affect the surface water quality of the fen area. However, due to the generally flat and low relief of the PPPP development footprint area, no erosion problems are expected to occur and any seasonal runoff in the footprint area is expected to percolate directly into the porous terrain that is characteristic of the surficial overburden material found in the area.

The surface water present in the small portion of the existing fen (3.38 ha) within the footprint area will be temporarily (~3 years) impacted by the installation of the freeze ring infrastructure. However, this water will be rapidly returned to the fen following the decommissioning and removal of the freeze curtain infrastructure and the thawing of the temporarily frozen surface area. The frozen ground and associated surface water is expected to thaw and return to its normal state within a period of weeks (Thyssen Mining 2006).

As previously indicated in Section 2.10 of this DAR, the nearest flowing surface waters to the PPPP site are Twin Creek, located about 7 km to the west of the PPPP footprint, and the Buffalo River located approximately 10 km to the east of the project footprint. Both of these streams flow north into Great Slave Lake.

A number of small shallow lakes are scattered throughout the region, particularly between the proposed PPPP (R190) site and Great Slave Lake. However, most of these lakes have no visible drainage. The most important nearby lakes are Great Slave Lake and Polar Lake. However, both of these lakes are well removed from the PPPP site and cannot be affected in any way by the infiltration of process and associated mine water in accordance with licensed conditions back into the groundwater at the PPPP site.

Supporting information for this opinion can be drawn from the Evans et al. (1998) study conducted on effluent and mine water discharges from the former Pine Pont Mine. That study, cited in more detail in Section 2.10.5 of this DAR, determined that:

> *"there was no evidence that water in the study area* (Great Slave Lake) *was being contaminated by the decommissioned mine. A review of the documentation on the operation and decommissioning of the mine site provided no indication of any mechanism by which water flowing through the study region could be significantly contaminated by the decommissioned mine.*

It should also be noted that receiving water quality monitoring has been conducted in relation to ongoing annual discharges of treated water from the former Pine Point Mine tailings disposal area directly to the downstream receiving environment (muskeg area) for many years. It is apparent from the data reported annually to the MVLWB by Teck

Cominco Metals Ltd. (2001-2005) that the concentrations of total metals in the water of the receiving environment remain stable at low and environmentally acceptable levels.

Based on this assessment, it is concluded that there is no viable mechanism for process and associated mine water generated by the proposed Tamerlane PPPP to affect the surface waters or surface water quality of the nearest flowing streams or lakes in the Pine Point area. As a result, no residual effects on the quality of surface waters of the area are expected to occur.

7.2.2 Groundwater

The potential effects of the Tamerlane PPPP on the existing groundwater regime of the development area represents one of the major concerns of the MVEIRB and the participants in the Review Board's scoping sessions. Many of the participants in the Traditional Knowledge interviews (Tamerlane 2006b, c) indicated that the water (groundwater and surface water) in the proposed PPPP area is poor. The water was described as alkaline, sulfurous and not drinkable.

Several participants offered explanations. Some participants indicated that the water in the project area had been sulfurous but clear and drinkable prior to the start of the historic Pine Point Mine. One participant indicated that the water quality was alkaline and had a high pH even prior to the Pine Point Mine operations. Another participant indicated that the project area's poor water quality is likely due to its being from the same karst formation as the Pine Point Mine.

As previously noted in Section 4.0 of this DAR, all process water and mine water associated with the PPPP will be directed to the proposed infiltration basin that will be located within the limits of an existing gravel pit (see Figure 4.3-3.) in compliance with conditions of an anticipated Water License to be issued by the MVLWB. This license is the only regulatory instrument that will be required related to water use and disposal for the Tamerlane PPPP. High quality treated sewage effluent will be co-mingled with the process water and mine water for discharge to the infiltration basin.

The limited amount of water (~1,056 m^3/day) used for the Tamerlane PPPP will be sourced from existing groundwater present in the area (Table 7.2-1 and Figure 7.2-1). The only water from the PPPP process that will be discharged to the infiltration basin will be the Dense Media Separation Loss water (~570 m^3/day).

The remainder of the water directed to the infiltration basin will be the limited excess (to process needs) groundwater (~240 m^3/day) that is anticipated to seep into the underground mine area from below the freeze curtain. This water will be directed to the infiltration basin for recharge to the groundwater of the area.

7.2.2.1 *Groundwater Quality*

As noted in Sections 2.4 and 2.9.2 and illustrated in Figure 2.4.1, the groundwater quality in the PPPP area (R190) is strongly influenced by the geological characteristics of the underground formations. The groundwater occurs as both a shallow phreatic water table associated with the overburden and also under confined pressure conditions in the bedrock. The natural groundwater table in the Pine Point area varies in depth below surface from approximately 1 m to 18 m depth. Groundwater sampling conducted by EBA at the R190 site in August 2006 (EBA 2006a) determined that the groundwater table was located at approximately 25 m depth.

Weyer *et al.* (1978, 1979) reported that three basic types of groundwater occur in the Pine Point area, including in the vicinity of the PPPP (R190) site.

- A calcium bicarbonate water, found locally in glacial drifts. Conductivities are less than 1000 µmho/cm. This type of groundwater has been found at a number of locations along the Buffalo River.
- Sulphur water, a sulphate-bicarbonate with Ca++ as the main cation (with S04--). This water is probably derived from the Devonian gypsum layers. Conductivities are usually between 1,000 and 2,000 µmho/cm. This type of groundwater is commonly found in the springs along the south shore of Great Slave Lake from Little Buffalo River to Sulphur Point and across to Windy Point.
- Salty water, sodium chloride brines, derived from groundwater contact with the Devonian evaporite layers. Brandon (1965) reported 420 mg/l chloride in a water sample collected in 1961 at the mouth of the Buffalo River.

The chemistry of most other groundwater samples collected in the Pine Point area over the past 30 years seem to reflect mixing or evolution of these three basic water types.

Springs discharging mineralized groundwater have been observed along the south shore of Great Slave Lake (GTC 1983; Stevenson 1983). Sulphurous springs as well as artesian boreholes along the banks of the Buffalo River have also been reported (GTC 1983) and were noted by EBA during the 2005 field study program (EBA 2005a).

To gain an understanding of current groundwater quality in the Tamerlane PPPP area, the results of historic groundwater sampling conducted at the X-25 Deposit near Polar Lake as reported in Beak Consultants Ltd. (1980) were compared with water sampled from the surface of the R190 Test Well (~25 m depth) in August 2006 (Section 2.9.2).

Although the results of the recent groundwater analysis should be interpreted with caution due to a number of reasons outlined in Section 2.9.2, the pH of the water extracted from R190 in 2006 was 7.8, falling within the range of that reported for X-25 in 1978 (7.1 to 8.1). This was the only parameter comparable between the two reported years.

Conductivity was considerably lower in 2006 (1150 µS/cm) than in 1978 (3048 – 3122 µS/cm). Calcium and magnesium concentrations (mg/L) were lower in 2006 (20.7 and 15.2, respectively) than in 1978 (407 to 457 and 167 to 177, respectively); however sodium and potassium concentrations (mg/L) were higher in 2006 (222 and 8.4, respectively) than in 1978 (106 to 122 and<0.1, respectively).

Total metal concentrations (mg/L) for iron and lead were higher in 2006 (15.5 and 0.0276, respectively) than in 1978 (0.48 to 1.59 and 0.06 to 0.17, respectively). The remaining metals above CCME guidelines for 2006 that were not reported in 1978 are aluminum, chromium and selenium.

As previously indicated, all process water and mine water associated with the PPPP will be directed to the proposed infiltration basin that will be located within the limits of an existing gravel pit in compliance with conditions of an anticipated Water License to be issued by the MVLWB. High quality treated sewage effluent will be co-mingled with the process water and mine water for discharge to the infiltration basin. The licensed discharge criteria and associated groundwater monitoring program that will form conditions of the License will be intended to ensure protection of existing groundwater quality in the vicinity of the infiltration basin.

The ore to be mined is located in a limestone formation which is alkaline and the DMS circuit will be operated at a pH >9.0. As a result no soluble (potentially harmful) metal ions are anticipated to be present in the DMS Loss water that will be directed to the infiltration basin.

Preliminary laboratory bench-scale process water discharge analyses undertaken for Tamerlane indicate that total zinc (0.03-0.2 mg/l), lead (non detect) and copper (non detect) levels were well below existing Water License criteria for the continuing annual releases of water from the former Pine Point Mine Tailings Pond. As a result, Tamerlane anticipates that the quality of the process/mine water to be directed to the infiltration basin will comply with Water License criteria without the need for further treatment. However, existing and demonstrated water treatment methods (lime addition) are readily available and will be employed if determined to be necessary to ensure compliance with the Water License.

Any nutrients associated with the process/mine water such as nitrates and ammonia are expected to be rapidly assimilated by the natural biological processes operating in the surface and shallow subsurface overburden of the area. These natural processes would be similar to the natural biological processes operating in standard domestic septic fields in other areas of Canada. This prediction is anticipated to be confirmed through the discharge water and ground water monitoring program that will be implemented as part of the overall Tamerlane PPPP approvals and permitting process.

With the successful application of the mitigation measures as outlined and compliance with the anticipated Water License, the discharge of the limited process water and mine water to the infiltration basin for recharge to the groundwater is not expected to have a measurable effect on the quality of the groundwater in the area. As a result no residual effect on the groundwater quality of the area is expected to occur.

7.2.2.2 Groundwater Flows

Regarding groundwater flows in the R190 area, as indicated in Section 2.6 of this DAR, historic aquifer tests conducted at the former Pine Point Mine reported that natural groundwater movement within the bedrock aquifer was towards the northeast at an average gradient of one foot to 2,200 feet (Brown *et al.* 1981). Northward groundwater flow under a hydraulic gradient of 1.5 m per km was also reported (Stevenson 1983).

While many of the reports reviewed by EBA discuss the results of pumping tests, only one report (GTC 1983), described a groundwater model developed to estimate steady-state conditions prior to dewatering (EBA 2006d). The calculated hydraulic conductivity for the Presquile unit ranges from 10 4 m/s (GTC 1983) to 10-3 m/s (Stevenson 1983). The upper-bound hydraulic conductivity is comparable to a clean sand or sand and gravel (Stevenson 1983).

Recent groundwater modelling carried out by EBA (2006d) for the R190 area noted that all groundwater flow is channelled within the relatively high-permeability Keg River and Presquile units. The maximum calculated velocity through these units is 5 x 10-10 m/s

(4 x 10-5 m/day). Sensitivity analyses were conducted, varying the hydraulic conductivities of the Keg River and Presquile units, in addition to the head on the southern (upslope) boundary of the model section. The results indicated that increasing the hydraulic conductivity of the Keg River unit from 10-6 m/s to 10-4 m/s raised the calculated maximum velocity to 6 x 10-8 m/s (5 x 10-3 m/day).

The calculated velocities represent average water flowing through a cross-sectional area normal to the macroscopic direction of flow. Based on the recent modelling conducted by EBA, assuming 2 % porosity, the maximum seepage velocity due to natural groundwater seepage is estimated to be 6 x 10-8/2 x 10-2 = 3 x 10-6 m/s or 0.26 m/day. However, this estimate is considered to be very conservative, as it is more representative of a low-permeability, un-fractured rock. Since groundwater flow through the Presquile unit is mainly through fractures, faults, and solution channels, the porosity is likely much higher than 2 % and seepage velocities will be less than 0.26 m/day (EBA 2006d).

The freeze curtain technique to be employed for the Tamerlane PPPP is considered by the mining community to be the least intrusive method for stabilizing wet, unconsolidated ground, compared with other alternatives such as grouting and dewatering (Thyssen Mining 2006). As described in Section 4.0 of this DAR, the freeze curtain, or frozen ring of ground, will extend from the surface to a depth of approximately 185 m, surrounding and encompassing the entire R190 mineral deposit. The primary purpose of the freeze curtain is to prevent or minimize the intrusion of groundwater from the surrounding area into the underground mine workings during the estimated 12-15 month mining period.

During the period of time that the freeze curtain is in place and functional, it is anticipated that localized groundwater in the vicinity will be temporarily deflected (detoured) around the perimeter of the freeze curtain (like water moving around a bridge pier in a river) as it continues to flow towards the north/northeast as reported by Brown *et al.* (1981) and Stevenson (1983). The presence of the freeze curtain is not expected to block or alter the flow of water around the PPPP area.

After completion of mining and backfill of the underground mine area, the freeze plant will be turned off and the frozen ground is expected to thaw and return to its normal (pre development) state within a period of weeks or months. The absence of permafrost and the actively moving groundwater in the area is expected to expedite the thawing of the freeze curtain.

The backfill of the R190 mineral deposit with waste rock and concrete will serve to replace the mined-out mineral deposit and will ensure that subsidence of this area cannot occur.

Regarding groundwater extraction, as previously indicated, the limited amount of water (~1,056 m^3/day) used for the Tamerlane PPPP will be sourced from existing groundwater present in the area (Table 7.2-1 and Figure 7.2-1). The only water from the PPPP process that will be discharged to the infiltration basin will be the Dense Media Separation Loss water (~570 m^3/day).

The remainder of the water directed to the infiltration basin will be the limited excess (to process needs) groundwater (~240 m^3/day) that is anticipated to seep into the underground mine area from below the freeze curtain. This water will be directed to the infiltration basin for recharge to the groundwater of the area.

To confirm the permeability (hydraulic conductivity – symbolically represented as K) of the proposed infiltration basin, EBA (2006f) conducted a particle size analysis of a 25 kg sample of material obtained from the site to provide a basis for empirical assessment of the soil permeability. Several empirical methods were used including the Hazen Formula, Moulton Equation, Moretrench American Corp Nomographs. The results are summarized in Table 7.2-2.

Table 7.2-2
Infiltration Basin Permeability Estimates

Estimate Method	Hydraulic Conductivity K (m/s)
Hazen Formula	1.7×10^{-2}
Moulton Equation	9.0×10^{-3}
Moretrench American Corp Nomograph for Dense Soil	$> 1.0 \times 10^{-3}$
Moretrench American Corp Nomograph for Medium Dense Soil	$> 2.0 \times 10^{-3}$
Typical Range for Fine Gravel (after R.A. Freeze)	1.0×10^{-2} to 1.0×10^{-3}
Typical Range for Silty Sand / Sand (after R.A. Freeze)	1.0×10^{-3} to 1.0×10^{-5}

The hydraulic conductivity of a soil is primarily governed by the finer grained portion of the particle size distribution as well as the density of the soil. The Hazen Formula, which is intended for sand with a uniform particle size distribution, tends to overestimate the hydraulic conductivity for most natural soils. The Moulton Equation improves on this to some degree but can still give a poor estimate for a well graded soil.

The Moretrench American Corporation Nomographs are based on empirical data for numerous samples and consider both the uniformity coefficient of the soil sample as well as the relative in-situ density. As such, they tend to provide a better estimate of hydraulic conductivity for well graded soils than either the Hazen or Moulton methods. Although the empirical data summarized by Freeze gives a range of hydraulic conductivity values for various soils without specific correlation to density or uniformity, these ranges generally agree well the Moretrench nomographs and provide a reasonable upper and lower bound of hydraulic conductivity in the absence of more detailed information.

In nature, relatively clean fluvial or glacio-fluvial deposits tend to exhibit anisotropic permeability, with the horizontal hydraulic conductivity being greater than the vertical conductivity. Based on consideration of the foregoing hydraulic conductivity estimates and the limitations of the methods used, the following hydraulic conductivity estimates were recommended by EBA for preliminary design of the infiltration basin:

K_H = 1.0 x 10-3 m/s (Horizontal Hydraulic Conductivity)
K_V = 1.0 x 10-4 m/s (Vertical Hydraulic Conductivity)

The foregoing hydraulic conductivity estimates indicate a deposit with moderate to high permeability that is favourable for construction of an infiltration basin. Based on some conservative assumptions regarding the existing hydrogeological conditions of the site, EBA (2006f) estimated that the steady state discharge capacity of the proposed 1.8 ha infiltration basin will be at least 100 m^3/hour, and likely greater. The instantaneous discharge capacity (e.g. for a short duration only) may be much higher.

The combination of limited extraction of groundwater for the Tamerlane PPPP, combined with the continuous recharge of all excess groundwater and process waste water back into the underground via the infiltration basin, will ensure that existing groundwater volumes and flows in the LSA will be fully maintained and operational. No measurable effects on the groundwater regime of the LSA are anticipated to occur. As a result no residual effects on groundwater volumes and flows of the area are expected to occur.

7.2.3 Mitigation Measures

To minimize possible effects on surface water and groundwater quality, volumes and flows in the PPPP development area, Tamerlane has committed to employ an adaptive management approach including a number of mitigation measures.

As previously noted, there will be no direct discharge of any DMS circuit or mine-related water discharges to any surface water such as area streams or lakes. All process water and mine water associated with the PPPP will be directed to the proposed infiltration basin that will be located within the limits of an existing gravel pit. High quality treated sewage effluent will be co-mingled with the process water and mine water for discharge to the infiltration basin.

Tamerlane anticipates that the quality of the process/mine water to be directed to the infiltration basin will comply with Water License criteria without the need for further treatment. However, existing and demonstrated water treatment methods (lime addition) are readily available and will be employed if determined to be necessary to ensure compliance with the Water License.

Tamerlane is proposing to employ the least intrusive method for stabilizing wet, unconsolidated ground, compared with other alternatives such as grouting and dewatering.

The freeze curtain, or frozen ring of ground, will extend from the surface to a depth of approximately 185 m, surrounding and encompassing the entire R190 mineral deposit. The primary purpose of the freeze curtain is to prevent or minimize the intrusion of groundwater from the surrounding area into the underground mine workings during the estimated 12-15 month mining period.

During the period of time that the freeze curtain is in place and functional, it is anticipated that localized groundwater in the vicinity will be temporarily deflected (detoured) around the perimeter of the freeze curtain (like water moving around a bridge pier in a river) as it continues to flow towards the north/northeast. The presence of the freeze curtain is not expected to block or alter the flow of water around the PPPP area.

Other mitigation measures that will be employed to minimize possible effects on surface waters and groundwater in the PPPP development area include:

- Full compliance with Water License and license conditions to be issued by the MVLWB.
- Use of limited groundwater only for PPPP process needs.
- Optimized recycling/reuse of process water.
- Recharge of excess groundwater for PPPP process needs back into the underground via infiltration.
- Implementation of erosion control measures if and as warranted - not anticipated to be required due to the generally level and porous nature of the terrain at the development site.
- Application of dust suppressants - e.g. water or approved dust suppressant products.
- Disposal of all hazardous wastes in an approved manner.

With the application of these mitigation measures and in consideration of the other aspects of the assessment presented in this section of the DAR, no measurable effects on the groundwater regime of the LSA are anticipated to occur. As a result no residual effects on groundwater volumes and flows of the area are expected to occur. The residual impact of the PPPP development on groundwater volumes and flows of the area is expected to be negligible.

Similarly, based on this assessment, it is concluded that there is no viable mechanism for process and associated mine water generated by the proposed Tamerlane PPPP to affect the surface waters or surface water quality of the nearest flowing streams or lakes in the Pine Point area. As a result, no residual effects on these surface waters are expected to occur. The residual impact of the PPPP development on these surface waters is expected to be negligible.

7.3 Fish & Fish Habitat

Potential effects of the proposed Tamerlane PPPP on fish and their habitat were identified as issues of concern during the MVEIRB scoping sessions (MVEIRB 2006). However, it was also noted by the MVEIRB that the Department of Fisheries and Oceans had not identified any fish bearing lakes in the immediate vicinity of the proposed PPPP. Public concern focused on the potential for the PPPP to contribute to the contamination of local fish stocks, a concern at least partially attributable to the historic Pine Point Mine's legacy (MVEIRB 2006).

Most of the participants in the Traditional Knowledge interviews (Tamerlane 2006b, c) said that they did not think the project would impact fishing. Within this group, participants indicated that the lack of water in the project area, the distance of the PPPP from Great Slave Lake, and the use of freezing technology would preclude impacts on traditional fishing activities.

Many of the participants qualified their comments by saying that fishing activities would not be impacted as long as effluent, mine water and/or wastewater were not discharged into the area's waterways. The overriding concern was potential water contamination either from effluent discharges and/or blasting ammonium nitrates that may be absorbed into the aquifer once the project is over and the freeze perimeter is thawed.

Potential effects on fish and/or fish habitat in the Tamerlane PPPP area could only occur if activities associated with the PPPP were to either directly or indirectly impact on these components of the receiving environment. However, as previously noted in Section 4.0 of this DAR, there will be no direct discharge of any DMS circuit or mine-related water discharges to any waters frequented by fish or associated fish habitat.

All process water and mine water associated with the PPPP will be directed to the proposed infiltration basin that will be located within the limits of an existing gravel pit (see Figure 4.3-4.) in compliance with conditions of an anticipated Water License to be issued by the MVLWB. High quality treated sewage effluent will be co-mingled with the process water and mine water for discharge to the infiltration basin.

The limited amount of water (~1,056 m^3/day) used for the Tamerlane PPPP will be sourced from existing groundwater present in the area. The only water from the PPPP process that will be discharged to the infiltration basin will be the Dense Media Separation Loss water (~570 m^3/day).

The remainder of the water directed to the infiltration basin will be the limited excess (to process needs) groundwater (~240 m^3/day) that is anticipated to seep into the underground mine area from below the freeze curtain. This water will be directed to the infiltration basin for recharge to the groundwater of the area.

The ore to be mined is located in a limestone formation which is alkaline and the DMS circuit will be operated at a pH >9.0. As a result no soluble (potentially harmful) metal ions are anticipated to be present in the DMS Loss water that will be directed to the infiltration basin. This condition, combined with the fact that the water being directed to and infiltrated back into the ground will be in compliance with Water License conditions, will ensure that contamination of the groundwater in the vicinity of the infiltration basin is not expected to occur. This prediction is anticipated to be confirmed through the discharge water and ground water monitoring program that will be implemented as part of the overall Tamerlane PPPP approvals and permitting process.

As previously indicated in Section 2.10 of this DAR, the nearest flowing waters frequented by fish to the PPPP site are Twin Creek, located about 7 km to the west of the PPPP footprint and the Buffalo River, located approximately 10 km to the east of the project footprint. Both of these streams flow north into Great Slave Lake.

A number of small shallow lakes are scattered throughout the region, particularly between the proposed PPPP (R190) site and Great Slave Lake. However, most of these lakes have no visible drainage, and based on review of the available literature and discussions with fisheries personnel familiar with the area (Beak 1980), the only lakes that support fish populations in this area are Great Slave Lake and Polar Lake. Both of these lakes are well removed from the PPPP site and cannot be affected in any way by the infiltration of process and associated mine water in accordance with licensed conditions back into the groundwater at the PPPP site.

Further supporting information for this conclusion can be drawn from the Evans et al. (1998) study conducted on effluent and mine water discharges from the former Pine Pont Mine. That study, cited in more detail in Section 2.10.5 of this DAR, determined that:

> *"there was no evidence that water in the study area* (Great Slave Lake) *was being contaminated by the decommissioned mine. A review of the documentation on the operation and decommissioning of the mine site provided no indication of any mechanism by which water flowing through the study region could be significantly contaminated by the decommissioned mine.*
>
> *Metal concentrations in surficial sediments* (of Great Slave Lake) *were determined at the same sites where the water column was sampled. Metal concentrations in the sediments sampled were similar to concentrations observed in suspended sediments in the Slave River, and, overall, similar to average concentrations in the earth's crust. There was no evidence of contaminated sediments offshore of the decommissioned mine site".*

Based on this assessment, it is concluded that there is no viable mechanism for process and associated mine water generated by the proposed Tamerlane PPPP to affect the fish or aquatic habitats of the nearest fish-bearing streams or lakes in the Pine Point area. Similarly, since no fish habitat is affected in any way by the PPPP, the DFO No Net

Loss Policy is not applicable to this project. As a result, there can be no residual impact of the PPPP development on fish and fish habitat.

7.3.1 Mitigation Measures

Potential effects on fish and/or fish habitat in the Tamerlane PPPP area could only occur if activities associated with the PPPP were to either directly or indirectly impact on these components of the receiving environment. However, as previously noted there will be no direct discharge of any DMS circuit or mine-related water discharges to any waters frequented by fish or associated fish habitat.

The nearest flowing waters frequented by fish to the PPPP site are Twin Creek, located about 7 km to the west of the PPPP footprint and the Buffalo River, located approximately 10 km to the east of the project footprint. Both of these streams flow north into Great Slave Lake.

A number of small shallow lakes are scattered throughout the region, particularly between the proposed PPPP (R190) site and Great Slave Lake. However, most of these lakes have no visible drainage. During the MVEIRB scoping process, the Department of Fisheries and Oceans indicated that there were no fish bearing lakes in the immediate vicinity of the proposed PPPP. The only lakes that support fish populations in this area are Great Slave Lake and Polar Lake. Both of these lakes are well removed from the PPPP site and cannot be affected in any way by the infiltration of process and associated mine water in accordance with licensed conditions back into the groundwater at the PPPP site.

All process water and mine water associated with the PPPP will be directed to the proposed infiltration basin that will be located within the limits of an existing gravel pit. Tamerlane anticipates that the quality of the process/mine water to be directed to the infiltration basin will comply with Water License criteria without the need for further treatment. However, existing and demonstrated water treatment methods (lime addition) are readily available and will be employed if determined to be necessary to ensure compliance with the Water License.

The foregoing assessment concluded that there is no viable mechanism for process and associated mine water generated by the proposed Tamerlane PPPP to affect the fish or aquatic habitats of the nearest fish-bearing streams or lakes in the Pine Point area. Similarly, since no fish habitat will be affected in any way by the PPPP, the DFO No Net Loss Policy is not applicable to this project.

Nevertheless, a number of other mitigation measures will be employed to minimize possible effects on surface waters and groundwater in the PPPP development area that will be of benefit to the general aquatic environment of the Pine Point region. These include:

- Full compliance with Water License and license conditions to be issued by the MVLWB.
- Use of limited groundwater only for PPPP process needs.
- Optimized recycling/reuse of process water.
- Recharge of excess groundwater for PPPP process needs back into the underground via infiltration.
- Implementation of erosion control measures if and as warranted - not anticipated to be required due to the generally level and porous nature of the terrain at the development site.
- Application of dust suppressants - e.g. water or approved dust suppressant products.
- Disposal of all hazardous wastes in an approved manner.

With the application of these mitigation measures and in consideration of the other aspects of the assessment presented in this section of the DAR, there can be no residual impact of the PPPP development on fish and fish habitat.

7.4 Vegetation

Potential effects of the proposed Tamerlane PPPP on the vegetation of the area will be mainly associated with the construction of the buildings and mining support infrastructure, the infiltration basin and the on-site access roads.

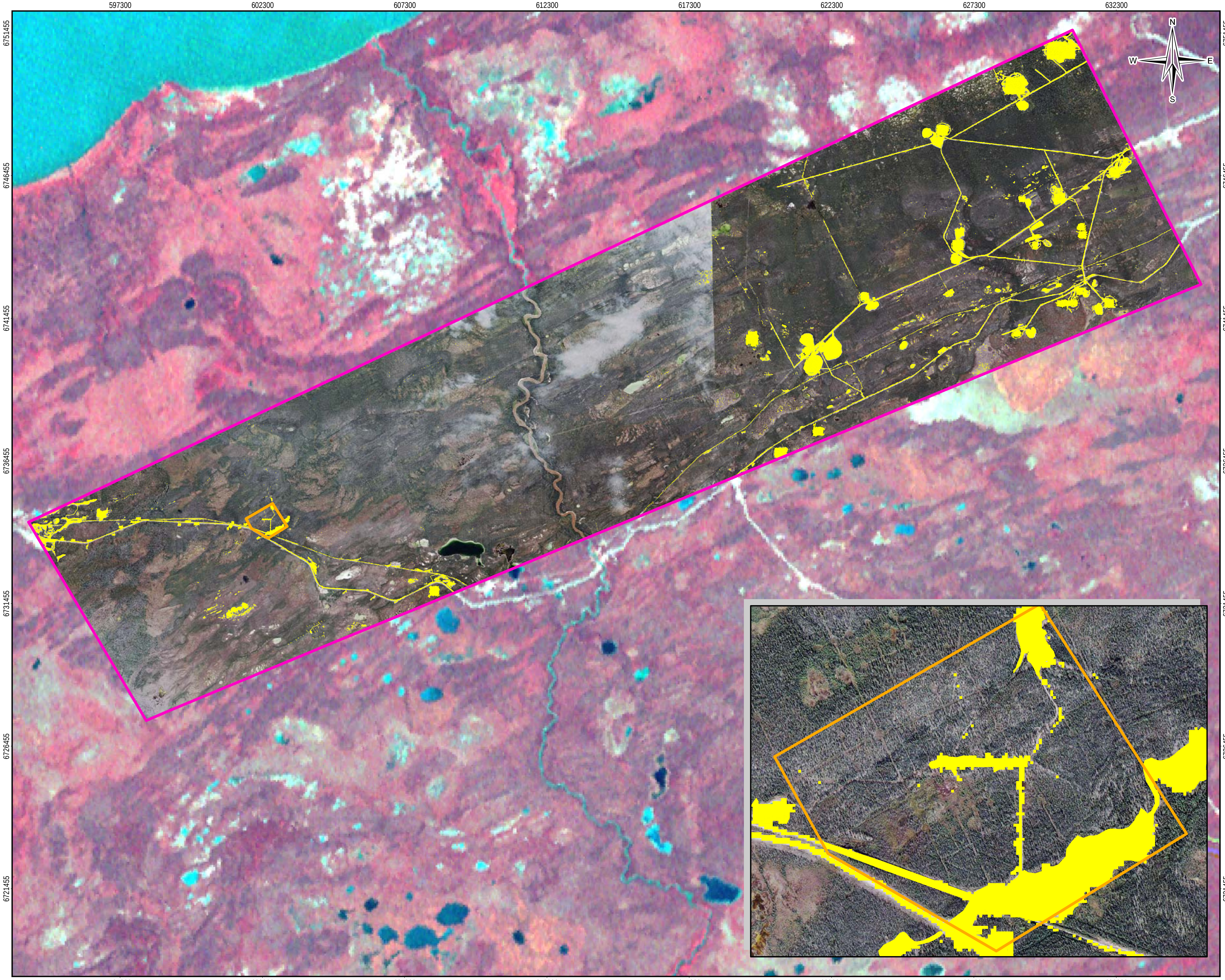
Other possible effects on the vegetation of the area could be associated with air emissions and dust generation. However, the limited air emissions associated with the operation of a few standard internal combustion engines operating on the site and the small amounts of dust generated mainly by moving vehicles and trucks (Section 7.7) are not anticipated to have a measurable effect on the vegetation of the PPPP development area. As a result, the following assessment focuses primarily on the physical effects associated with the clearing and construction of the PPPP facilities.

The construction of the PPPP buildings and mining support infrastructure (e.g. access roads, stockpile area, freeze line) will involve the clearing of vegetation in limited areas and the levelling of the existing terrain to accommodate the required buildings and infrastructure. Most of the PPPP buildings and access roads will be located on existing upland terrain, much of which has been disturbed by historic mineral exploration activities.

As shown in Figures 7.4-1 and 7.4-2, at the present time, approximately 18 ha (18.48 %) of the terrain and associated vegetation in the 97.4 ha LSA has been disturbed by historic activities which have occurred in this area. Within the larger 36,153 ha RSA, approximately 1,163.8 ha (3.2 %) of the terrain and associated vegetation has been disturbed by such historic activities.

The total estimated footprint of the Tamerlane PPPP buildings and associated mining support infrastructure is 8.98 ha (Table 7.4-1).

To minimize new disturbance to existing vegetation in the development area, approximately (4.65 ha) of the PPPP buildings and associated infrastructure footprint (52 %) will be located on previously disturbed terrain. As a result, new disturbance to terrain and associated vegetation in the project footprint area will be limited to approximately 4.3 ha, representing a 19.2 % increase in the total amount of disturbed terrain present in the LSA and an increase of 0.37 % of disturbed terrain present in the RSA.



LEGEND

- Disturbed Areas
- Local Study Area (LSA)
- Regional Study Area (RSA)

Approximate Disturbed Area

RSA	1163.81 ha	3.2%
LSA	18 ha	18.48%

NOTES

Base data source: Landsat TM Bands 7,4,1 (GLFC), Quickbird-Pacific GeoAnalytic

PINE POINT PILOT PROJECT

Esitmate of Existing Terrain Disturbance in the Tamerlane RSA and LSA

PROJECTION: UTM Zone 11

DATUM: NAD83

Scale: 1:135,000

2 1 0 2 4

Kilometres

Tamerlane Ventures Inc.

EBA Engineering Consultants Ltd.

FILE NO.: 1740149-005_Map010

PROJECT NO.	DWN	CKD	REV
1740149	KW	RH	0

OFFICE: EBA-VANC

DATE: December 14, 2006

Figure 7.4-1

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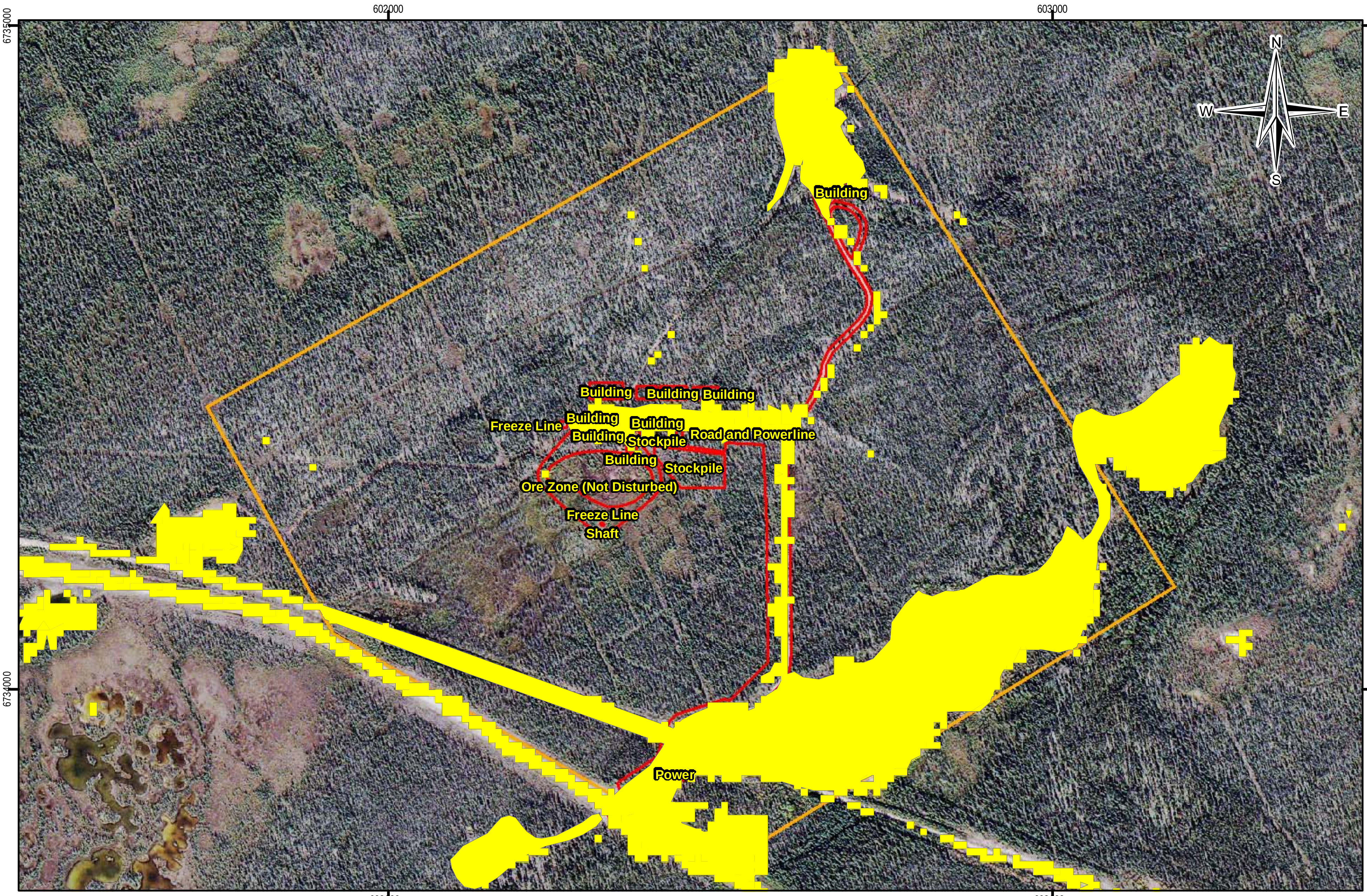

LEGEND

- Local Study Area (LSA)
- Footprint

Ecosites

- Bearberry Pj (area = 1.02 ha)
- Canada Buffalo-Berry-Green Alder (area = 3.82 ha)
- Labrador Tea-Mesic (area = 49.10 ha)
- Labrador Tea-Mesic (burnt) (area = 18.41 ha)
- Shrubby Fen (area = 4.77 ha)
- Graminoid Fen (area = 2.90 ha)

- Existing Disturbance (area = 18 ha)

NOTES

Base data source:
Quickbird, Pacific GeoAnalytic

PINE POINT PILOT PROJECT

Refined Estimate of Existing & Project-Related Terrain Disturbance within the LSA

PROJECTION	DATUM
UTM Zone 11	NAD83

Scale: 1:8,000

100 50 0 100 200

Metres

Tamerlane Ventures Inc.

EBA Engineering Consultants Ltd.

FILE NO.			
1740149-005_Map011			
PROJECT NO.	DWN	CKD	REV
1740149.005	KMW	RH	1
OFFICE	DATE		
EBA-VANC	December 14, 2006		

Figure 7.4-2

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Table 7.4-1

Tamerlane PPPP Footprint

Footprint	Total Area (ha)
Buildings	0.57
Freeze Line	1.21
Ore Zone (minimal disturbance)	0.97
Roads and Powerline	3.73
Shaft	0.006
Stockpile	0.69
Infiltration Basin	1.80
Total	**8.98**

Table 7.4-2 summarizes the vegetation types (ecosites) and numbers of square metres of each vegetation type that will be directly impacted by the site clearing and installation of PPPP buildings and associated infrastructure.

Table 7.4-2
Estimate of Total Vegetation
Directly Impacted by the PPPP Footprint

ELC Type	Area (m^2)	Area (ha)
Canada Buffalo-Berry-Green Alder	10.37	0.001
Graminoid Fen	12662.47	1.27
Labrador Tea-mesic	23807.43	2.38
Labrador Tea-mesic burnt	2084.87	0.21
Shrubby Fen	4758.58	0.48
Total Vegetation Impacted	43323.72	4.33

The site clearing and construction of PPPP buildings and associated infrastructure will primarily impact the Labrador Tea-mesic, Graminoid fen and Shrubby fen vegetation communities located within the LSA. Figures 7.4-3 and 7.4-4 show the typical appearance of the Labrador Tea-mesic and fen communities that make up most of the vegetation cover in the Tamerlane LSA.

Figure 7.4-3 Typical Upland Labrador Tea-mesic Vegetation Community Present in the PPPP Local Study Area

Figure 7.4-4 Typical Lowland Fen Vegetation Community Present in the PPPP Local Study Area

7.4.1 Labrador Tea-Mesic Vegetation Community

Approximately 60 % of the PPPP footprint will be located in Labrador Tea-mesic (2.38 ha) or burnt Labrador Tea-mesic (0.21 ha) habitat. This vegetation community is the most commonly occurring within both the LSA and RSA (EBA 2005b, 2006b). Black spruce is most common in mature stands and jack pine dominates mature seral (previously burnt) vegetation communities (EBA 2005b). Approximately 68 ha of Labrador Tea-mesic vegetation is present within the boundaries of the LSA.

Thus, the site clearing and installation of PPPP buildings and associated infrastructure will result in the relatively long-term (>3 years) but reversible loss (following reclamation) of approximately 3.8 % of the existing Labrador Tea-mesic vegetation community within the LSA and approximately 0.03 % of the 10,249 ha of Labrador Tea-mesic vegetation community estimated to be present in the RSA. As a result of these considerations, no significant residual impact on the Labrador Tea-mesic vegetation community is expected to occur.

7.4.2 Graminoid Fen Vegetation Community

A further 29 % of the PPPP footprint (freeze ring) will be temporarily located in Graminoid fen (1.27 ha) habitat. Graminoid fens are found in poorly-drained moist areas and account for about 3 % of the vegetation community found in the LSA and 1 % of the vegetation community found in the RSA (EBA 2005b, 2006b).

The installation of the freeze ring infrastructure will result in the temporary (~3 years) loss but rapidly reversible recovery (following reclamation) of approximately 43.8 % of the small Graminoid fen (2.9 ha) located within the LSA and approximately 0.7 % of the estimated 388 ha of Graminoid fen vegetation estimated to be present in the RSA. As a result of these considerations, no significant residual impact on the Graminoid fen vegetation community is expected to occur.

7.4.3 Shrubby Fen Vegetation Community

The remaining 11 % of the PPPP footprint (freeze ring) will be temporarily located in Shrubby fen (0.48 ha) habitat. Shrubby fens are found throughout the RSA typically near open water areas, within larger fen complexes or in drainage areas where there is some water movement (EBA 2005b). Shrubby fen accounts for approximately 4.9 % of the vegetation community found in the LSA and 0.05 % of the estimated 8,895 ha Shrubby fen vegetation estimated to be present in the RSA.

The installation of the freeze ring infrastructure will result in the temporary (~3 years) loss but rapidly reversible recovery (following reclamation) of approximately 10 % of the Shrubby fen (4.77 ha) located within the LSA and approximately 0.005 % of the estimated 8,895 ha of Shrubby fen vegetation estimated to be present in the RSA. As a result of these considerations, no significant residual impact on the Shrubby fen vegetation community is expected to occur.

7.4.4 Rare Plants

The rare plant survey completed by EBA in the summer of 2006 (EBA 2006) reported that no rare plants were observed in either the July or August survey. EBA also noted that a survey of this type cannot confirm the absence of these species it can only confirm their presence. All proposed PPPP infrastructure sites were surveyed, with the exception of the shaft, which represents a very small portion of the disturbance area.

On the basis of these results, it is considered to be unlikely that rare plants exist within the PPPP footprint area and thus potential impacts to rare plants are not anticipated to occur.

7.4.5 Culturally Significant Plant Species

During the PPPP site tour conducted as part of the MVEIRB scoping sessions in mid August 2006, and the Traditional Knowledge interviews conducted in October 2006 (Tamerlane 2006b, c), a number of the community participants discussed plant species found in the LSA that were of particular importance to the people of the region. These included various berries (strawberry, raspberry, gooseberry, blueberry, cranberry loganberry, juniper berry and saskatoons), Labrador tea and rose hips. Other important plants/trees with medicinal properties include white rat root, spruce gum, Tamarack and birch trees. These plants are all commonly found in suitable sites throughout the RSA and the entire Pine Point region and beyond.

Site clearing and construction of the PPPP and associated infrastructure will impact small amounts of these plants in specific areas. However, given their common occurrence throughout the Pine Point region, and the fact that these plants are expected to return to the PPPP area following reclamation of the site following the end of project life, no significant residual impacts on these species are expected to occur.

7.4.6 Mitigation Measures

To minimize impacts on the terrain and vegetation communities of the PPPP development area, Tamerlane has committed to employ an adaptive management approach including a number of mitigation measures.

Initially, as part of project planning and design, Tamerlane is proposing to employ underground mining, the least intrusive method for mining the R190 mineral deposit. In addition, application of the proposed freeze curtain technique represents the least intrusive method for stabilizing wet, unconsolidated ground, compared with other alternatives such as grouting and dewatering.

Furthermore, Tamerlane is proposing to minimize the PPPP development footprint by locating PPPP buildings and associated infrastructure on existing disturbed areas to the maximum extent possible.

As previously indicated more than 52 % of the PPPP buildings and associated infrastructure footprint will be located on previously disturbed terrain. New disturbance to terrain and associated vegetation in the project footprint area will be limited to approximately 4.3 ha, representing an increase of only 0.37 % of the disturbed terrain present in the RSA.

Other mitigation measures that will be employed to minimize impacts on the terrain and vegetation of the PPPP development area will include:

- Full compliance with Land Use Permit conditions to be issued by the MVLWB.
- Salvage of organic and mineral top soils for future reapplication during reclamation of the site.
- Implementation of erosion control measures if and as warranted - not anticipated to be required due to the generally level and porous nature of the terrain at the development site.
- Avoidance of development on rare ecosystem types – none present in the development area.
- Application of dust suppressants - e.g. water or approved dust suppressant products.
- Disposal of all hazardous wastes in an approved manner.
- Salvage of organic and mineral top soils for future reapplication during reclamation and revegetation of the site.

- Re-contouring, scarification, and reseeding of disturbed areas with appropriate and approved native seed mixes.

With the application of these mitigation measures and in consideration of the other aspects of the assessment presented in this section of the DAR, no significant residual impacts on the vegetation communities of the Tamerlane development footprint are anticipated to occur following reclamation and restoration of the site. The residual impact of the PPPP development on the vegetation communities of the footprint area is expected to be negligible.

7.5 Terrain

Potential effects of the proposed Tamerlane PPPP on the terrain of the area will be associated with the construction of the buildings and mining support infrastructure, the infiltration basin and the on-site access roads. Possible effects of the trucking operation on the integrity of existing Territorial Highway 5 was also identified as an important concern during the MVEIRB scoping sessions (MVEIRB 2006) and during the Traditional Knowledge interviews (Tamerlane 2006b, c).

Participants in the interviews were asked about their knowledge of the terrain in both the South Great Slave Region and the proposed PPPP area. Most of the participants said they had walked or traveled through the proposed PPPP area in recent years. Many of the participants said they actively snowmobile in the South Slave Region for work-related activities including: trapping, hunting, cutting firewood and cutting lines.

Participants in the Traditional Knowledge interviews were also asked about their knowledge of land disturbance in the proposed PPPP area. The most frequently cited sources of land disturbance were exploration/drilling activity and line cutting. Other identified land disturbance in the proposed project area included roads, gravel quarries, shacks and cabins, and evidence of trapping activity.

As previously illustrated in Figure 2.4-1, the surficial material in the area of the PPPP and along Highway 5 consists mainly of glacial till with occasional gravel beds and areas of varved clays and cemented fine sands, and varies in thickness from 3 m to 45 m. The overburden generally becomes finer with depth. In low-lying areas (such as fens) this material is often overlain by an organic, peaty layer of muskeg that is up to 3 m thick. Permafrost has been reported in some localized areas within the overburden, but is not common and does not occur in the PPPP (R190) area.

7.5.1 PPPP Development Footprint

Initially, as part of project planning and design, Tamerlane is proposing to employ underground mining, the least intrusive method for mining the R190 mineral deposit. In addition, application of the proposed freeze curtain technique represents the least intrusive method for stabilizing wet, unconsolidated ground, compared with other alternatives such as grouting and dewatering.

The construction of the PPPP buildings and mining support infrastructure (e.g. access roads, stockpile area, freeze line) will involve the clearing of vegetation in limited areas and the levelling of the existing terrain to accommodate the required buildings and infrastructure. Most of the PPPP buildings and access roads will be located on existing upland terrain, much of which has been disturbed by historic mineral exploration activities. As previously shown in Figures 7.4-1 and 7.4-2, at the present time, approximately 18 ha of the terrain in the 97.4 ha LSA (18.48 %) has been disturbed by the historic activities which occurred in this area. Within the larger 36,153 ha RSA, approximately 1,163.8 ha (3.2 %) of the terrain has been disturbed by such previous activities.

The total estimated footprint of the Tamerlane PPPP buildings and associated mining support infrastructure is 8.98 ha as previously shown in Table 7.5-1.

To minimize new terrain disturbance in the development area, approximately (4.65 ha) of the PPPP buildings and associated infrastructure footprint (52 %) will be located on previously disturbed terrain. As a result, new terrain disturbance in the project footprint area will be limited to approximately 4.3 ha, representing a 19.2 % increase in the total amount of disturbed terrain present in the LSA and an increase of 0.37 % of disturbed terrain present in the RSA.

Regarding the infiltration basin, although the precise dimensions of this basin have not yet been determined, the entire footprint of the infiltration basin will be located within the limits of the disturbed terrain present in the existing depleted gravel pit. As a result, construction of the infiltration basin will not contribute to an increase in terrain disturbance within the LSA.

The glacial till overburden present in the Tamerlane PPPP development footprint area provides excellent foundation material for the necessary buildings and associated infrastructure that can be readily levelled and prepared using standard construction equipment such as bulldozers, excavators and trucks. In addition, as previously indicated, there is no permafrost to contend with in the PPPP development footprint area.

Due to the generally flat and low relief of the PPPP development footprint area, no erosion problems are expected to occur and any seasonal runoff in the footprint area is expected to percolate directly into the porous terrain that is characteristic of the surficial overburden material found in the area.

Regarding land subsidence concerns, the geological information available for the Tamerlane PPPP (R190) area indicates that there is a low potential for subsidence to occur in this area. Furthermore, the application of freeze-wall technology to freeze the ground around the subsurface mineral deposit from the surface to the depth of the deposit at around 185 m, will further reduce any potential for subsidence to occur. Finally, the proposed backfilling of the mined out area with a waste rock/concrete mix (discussed in Section 4.0) will ensure that subsidence simply cannot occur in relation to the operation of the Tamerlane PPPP.

Due to Tamerlane's commitment to minimize the overall footprint of the PPPP by locating as much of the building and associated infrastructure footprint on previously disturbed terrain, the absence of permafrost, and the generally conducive nature of the glacial till overburden present in the Tamerlane PPPP development footprint area for facility construction purposes, no significant effects on the physical terrain of the development area are anticipated to occur. Moreover, following reclamation of the PPPP development footprint area (as discussed in Section 9.0) and the implementation of the mitigation measures previously identified in Section 7.4.6, the residual impact of the PPPP development on the terrain of the footprint area is expected to be negligible.

7.5.2 Territorial Highway 5

As indicated earlier, possible effects of the proposed trucking operation on the integrity of existing Territorial Highway 5 was identified as an important concern during the MVEIRB scoping sessions (MVEIRB 2006) and during the Traditional Knowledge interviews (Tamerlane 2006b, c).

Territorial Highway 5 is classified as an all-weather highway by the GNWT Department of Transportation (DOT), and the 42 km stretch of highway between Hay River and the Tamerlane PPPP area is paved. The highway is rated for year-round use by commercial vehicles with no load restrictions for haul truck traffic. Throughout the operational life of the historic Pine Point Mine (1964 to 1987), this highway was used for all of the commercial trucking and hauling activities associated with this large-scale mine development. Thus the historic traffic volumes and weights experienced on this highway were considerably higher that those occurring at this time or in the future as a result of development of the Tamerlane PPPP.

DOT traffic counters located along Highway 5 east of Hay River and along Highway 6 to Fort Resolution reported the estimated Average Annual Daily Traffic (AADT) and Peak Summer Average Daily Traffic (PSADT) volumes presented in Table 7.5-1.

The Tamerlane project plans to use approximately 10 trucks to transport the lead/zinc product to the Hay River railhead. The average weight of the loaded trucks will be 20 to 30 tonnes. The typical average number of truck trips from the PPPP site to Hay River will be 50-65 return trips per day over the course of a 12 hour workday.

Based on the fact that there are no load restrictions on Highway 5 for commercial hauling traffic and discussions with DOT (DOT pers comm. 2006), the anticipated 1-2 year level of increased heavier traffic is not expected to have any measurable effect on the integrity of Highway 5 or the terrain occupied by the existing road.

Table 7.5-1
Estimated Traffic on Highways 5 and 6: 2001-2003

Counter ID	Description	AADT			PSADT		
		2003	2002	2001	2003	2002	2001
5-1	1 km east of Highway 2 & 5 intersection	660	630	520	740	710	690
5-19	19 km east of Highway 2 & 5 intersection	170	160	150	230	220	220
5-65	5 km south of Highway 5 & 6 intersection	80	70	70	110	100	100
6-30	8.5 km east of Pine Point access	80	80	80	100	110	100
6-74	16 km west of Fort Resolution	110	100	110	140	140	130

Source: DOT 2005

7.5.3 Mitigation Measures

To minimize impacts on the terrain of the PPPP development area, Tamerlane has committed to employ an adaptive management approach including a number of mitigation measures.

Initially, as part of project planning and design, Tamerlane is proposing to employ underground mining, the least intrusive method for mining the R190 mineral deposit. In addition, application of the proposed freeze curtain technique represents the least intrusive method for stabilizing wet, unconsolidated ground, compared with other alternatives such as grouting and dewatering.

Furthermore, Tamerlane is proposing to minimize the PPPP development footprint by locating PPPP buildings and associated infrastructure on existing disturbed areas to the maximum extent possible.

As previously indicated more than 52 % of the PPPP buildings and associated infrastructure footprint will be located on previously disturbed terrain. New disturbance to terrain in the project footprint area will be limited to approximately 4.3 ha, representing an increase of only 0.37 % of the disturbed terrain present in the RSA.

Other mitigation measures that will be employed to minimize impacts on the terrain of the PPPP development area will include:

- Full compliance with Land Use Permit conditions to be issued by the MVLWB.
- Salvage of organic and mineral top soils for future reapplication during reclamation of the site.
- Implementation of erosion control measures if and as warranted - not anticipated to be required due to the generally level and porous nature of the terrain at the development site.
- Use of existing highways for all PPPP-related vehicle traffic.
- Return of PPPP process-related waste rock as backfill into the mined-out R190 mineral deposit.
- Re-contouring of disturbed areas to ensure stable landforms during reclamation.
- Salvage of organic and mineral top soils for future reapplication during reclamation and revegetation of the site.

With the application of these mitigation measures and in consideration of the other aspects of the assessment presented in this section of the DAR, no significant residual impacts on the terrain of the Tamerlane development footprint are anticipated to occur following reclamation and restoration of the site. The residual impact of the PPPP development on the terrain of the footprint area is expected to be negligible.

7.6 Wildlife and Wildlife Habitat

The referral of the Tamerlane PPPP to the MVEIRB for Environmental Assessment by Environment Canada was due in part to perceived potential impacts on *SARA*-listed wildlife species (MVEIRB 2006). Concerns over potential adverse impacts to wildlife and wildlife habitat were also noted in the scoping sessions, as was a lack of confidence that wildlife studies have been extensive enough to properly characterize wildlife and habitat in the area (MVEIRB 2006). Specific concerns were related to the possible effects on wildlife distribution due to noise, emissions, and changes in water quality and quantity, and lack of consultation with local and Traditional Knowledge holders (MVEIRB 2006).

One particularly important Traditional Knowledge message that was raised a number of times during the scoping sessions by several community members was that the land and environment of the Pine Point area was perceived to be in the process of "healing", presumably from impacts associated with the former large-scale mining operations and related mineral exploration activities in the region.

Participants in the Traditional Knowledge interviews (Tamerlane 2006b, c) were asked if they thought the proposed PPPP would affect the area's wildlife. More than half of the participants in both Fort Resolution and in Hay River said they did not think the project would impact the wildlife.

Within this group, participants indicated that the proposed project's small size and short term duration were too small and limited to notably affect the wildlife. A smaller number of the participants indicated that they thought the PPPP either may or would affect the wildlife. These participants indicated that increased traffic, more people, possible pollution, habitat loss, noise and dewatering issues may drive the wildlife away.

As directed by the MVEIRB, the following assessment focuses on the VECs identified for assessment by the MVEIRB Terms of Reference, (2006). Specifically, these species include woodland caribou, wood bison, moose, fur-bearing mammals frequenting the area, Whooping Crane and Peregrine Falcon (*anatum* subspecies).

Section 2.12 of the DAR summarized the results of various wildlife studies carried out in the Pine Point area from the mid 1970s to the present. Of particular interest from those earlier studies were the following statements made by BC Research (1983). Wildlife studies carried out during the period 1976 to 1980 indicated that during that time:

> "*large mammals may be less common than in the past due to habitat removal and people pressure, such as vehicular traffic and hunting, whereas there appeared to be little impact on upland furbearers*".

BC Research (1983) also reported that:

> *"the most productive furbearer habitat near Pine Point appeared to be located outside the areas of direct mining activity. Aquatic furbearers may have benefited from the creation of additional habitat, due to discharge of water from the open pits. However, the relatively low temperature of pit water may have reduced the productivity of their habitat, and thus may have degraded habitat that existed before the discharge of pit water began"*.

These and other studies reported in Section 2.12 confirm the commonly held Traditional Knowledge indicating that the wildlife and wildlife habitats of the Pine Point area have been impacted by a variety of human activities over a relatively long period of time. The commonly expressed view that the land and environment of the Pine Point area is perceived to be in the process of "healing" is therefore entirely understandable.

Potential effects on wildlife and wildlife habitat may take place during PPPP construction, operation, closure or reclamation. The main ways that the development can affect wildlife is through physical or behavioural disturbance, including displacement and habituation (e.g. attraction). Potential effects on wildlife may also result from the loss or degradation of habitat.

Other possible effects on wildlife and wildlife habitat of the area could be associated with air emissions, odours, noise and dust generation. However, the limited air emissions, odours and noise associated with the operation of a few standard internal combustion engines operating on the site and the small amounts of dust generated mainly by moving vehicles and trucks (Section 7.7) are not anticipated to have a measurable effect on wildlife or wildlife habitat in the PPPP development area.

As a result, the following assessment focuses primarily on potential physical/behavioural effects to wildlife and wildlife habitat loss associated with the clearing and construction of the PPPP facilities.

Potential effects related to the PPPP development on all wildlife species will be mainly limited to the timeframes and activities associated with the 2-3 year duration of the development.

The nature of the types of activity and possible effects on wildlife are generally well understood and predictable. This is a very small underground development with a limited footprint and limited surface activities. Potential effects that may be experienced are expected to be similar for most wildlife species. Table 7.6-1 summarizes the potential effects of the PPPP on wildlife species and wildlife habitat as it relates to the assessment criteria employed including spatial scope, direction, magnitude, duration, frequency, reversibility, confidence and significance.

7.6.1 Woodland Caribou

Woodland caribou (Boreal population) are listed as threatened under SARA and sensitive by the GNWT. In Canada, woodland caribou populations have generally been decreasing throughout their range (SARA 2006). Woodland caribou are widely distributed throughout the Deh Cho region and beyond. The NWT woodland caribou population is currently estimated at 8,500 individuals (ENR 2006). Recent surveys conducted in 2004 and 2005 estimate population densities in the order of 1 to 3 woodland caribou/100 km^2 in the Northwest Territories, and a considerably lower density of about 2 woodland caribou/1000 km^2 in the Deh Cho region (ENR 2006).

Table 7.6-1
Summary of Predicted Impact Significance for All Wildlife Species

Criterion	Descriptor	Definition
Spatial Scope	Site Local Regional	Disturbance-related effects will primarily be limited to the LSA and the Highway 5 transportation corridor Habitat-related effects will be localized to PPPP footprint.
Direction	Positive Neutral Negative	Disturbance-related effects will likely be negative but could be neutral in some instances. Habitat-related effects will range from neutral to negative.
Magnitude	Low Moderate High	The PPPP development is expected to have a low level of impact on the wildlife resources of the LSA, RSA and ESA.
Duration	Short-term Medium-term Long-term	Construction/operations/reclamation disturbance-related effects will generally be of a short-term (hours, weeks, months nature. Habitat-related effects will extend for the medium-term ~3 year life of the development.
Frequency	Once Sporadic Continuous	Construction/reclamation-related disturbance effects will occur sporadically for relatively short periods of time. Operations-related disturbance will occur continuously for the duration of the development.
Reversibility	Reversible	Disturbance-related effects will typically be fully reversed, *i.e.* returned to pre-disturbance state within hours or days of cessation of disturbance-generating activities. Habitat-related effects will be partially to fully reversible following closure and reclamation of the development.
Confidence	Low Moderate High	Assessment based on reliable site specific and regional data and well documented cause-effect relationships and professional judgement.
Significance	Insignificant Significant	Disturbance and habitat-related effects on all wildlife species will generally be of a negligible and insignificant nature with no significant residual impacts expected to occur.

Boreal woodland caribou prefer lichen-rich mature or old growth coniferous forests (greater than 100 years old) associated with bogs, lakes and rivers (ENR 2006). In winter, woodland caribou tend to favour uplands, bogs and south facing slopes where the snow is not too deep. Their winter diet consists of up to 80 % ground and tree lichens. In summer, they prefer areas such as forest edges, marshes and meadows that provide the fresh green growth of flowering plants and grasses.

In the Tamerlane RSA, woodland caribou sign (hair, tracks/trails, and pellets) was observed on four separate occasions within the RSA during the September 2005 survey. Caribou observations were recorded within poor treed fens and mixed woods habitats. During the June 2006 breeding bird survey period, fresh woodland caribou tracks were recorded incidentally at a location approximately 1.5 km northwest of Polar Lake.

The main ways that the PPPP, associated infrastructure and activities can affect woodland caribou is through physical or behavioural disturbance, including displacement and habituation (e.g. attraction). Potential effects on woodland caribou could also result from the loss or degradation of habitat.

Although few woodland caribou are reported to occur in the Deh Cho region, and by inference, the Pine Point area, the EBA wildlife studies observed woodland caribou sign on a number of occasions within the RSA. On this basis, a few woodland caribou may be expected to be present in the vicinity of the PPPP footprint area on occasion and may potentially directly encounter or be disturbed by localized development-related noise or activities. Similarly woodland caribou are known to occasionally occur in the vicinity of Highway 5 where they would be exposed to vehicle traffic and potentially associated activities such as hunting.

Caribou encountering such activities may show minor displacement behaviour and avoid the immediate PPPP development area and/or the Highway. The duration of such exposures are expected to be brief, perhaps lasting a few minutes to a few hours, and are reversible upon cessation of the activity or by moving away from the activity. The number and frequency of such exposures to disturbance by woodland caribou would be expected to be limited and sporadic.

To minimize any potential for direct PPPP development-related caribou mortality, Tamerlane will implement a no hunting policy for all project employees and contractors while working on or off-site for Tamerlane. In addition, the company will require all project-related transportation activities to give the right-of-way to any wildlife including woodland caribou that such activities may encounter.

Regarding preferred woodland caribou habitat, as previously indicated, the proposed PPPP development will be of a limited, small-scale and relatively short-term nature. The construction of the PPPP buildings and mining support infrastructure (e.g. access roads, stockpile area, freeze line) will involve the clearing of vegetation in limited areas and the levelling of the existing terrain to accommodate the required buildings and infrastructure.

Most of the PPPP buildings and access roads will be located on existing upland terrain, much of which has been disturbed by historic mineral exploration activities. As shown in Figures 7.4-1 and 7.4-2, at the present time, approximately 18 ha (18.48 %) of the terrain and associated vegetation in the 97.4 ha LSA has been disturbed by historic activities which have occurred in this area. Within the larger 36,153 ha RSA, approximately 1,163.8 ha (3.2 %) of the terrain and associated vegetation has been disturbed by such historic activities.

To minimize new disturbance to existing vegetation (caribou forage) in the development area, approximately (4.65 ha) of the PPPP buildings and associated infrastructure footprint (52 %) will be located on previously disturbed terrain. As a result, new disturbance to terrain and associated vegetation in the project footprint area will be limited to approximately 4.3 ha, representing a 19.2 % increase in the total amount of disturbed terrain present in the LSA and an increase of 0.37 % of disturbed terrain present in the RSA.

Approximately 60 % of the PPPP footprint will be located in Labrador Tea-mesic (2.38 ha) or burnt Labrador Tea-mesic (0.21 ha) habitat preferred by woodland caribou. This vegetation community is the most commonly occurring within both the LSA and RSA. Approximately 68 ha of Labrador Tea-mesic vegetation is present within the boundaries of the LSA.

Thus, the site clearing and installation of PPPP buildings and associated infrastructure will result in the relatively long-term (>3years) but reversible loss (following reclamation) of approximately 3.8 % of the existing Labrador Tea-mesic vegetation community within the LSA and approximately 0.03 % of the 10,249 ha of Labrador Tea-mesic vegetation community estimated to be present in the RSA.

This temporary but reversible loss of such a small amount of habitat that may be utilized by woodland caribou from time to time is considered to be insignificant at both the local and regional scale.

Given the limited and relatively short-term nature of the project and with the implementation of the additional mitigation measures as described, Tamerlane PPPP development-related activities are not expected to affect the overall health or well-being of the woodland caribou population inhabiting the RSA or the ESA.

As summarized in Table 7.6-1, disturbance and habitat-related effects on all wildlife species including woodland caribou will be of a negligible and insignificant nature with no significant residual impacts expected to occur.

7.6.2 Wood Bison

Wood bison are recognized as a threatened species by SARA, and at risk by the Northwest Territories. By definition this is a species likely to become endangered if limiting factors are not reversed.

The number of wood bison in the NWT is estimated between 2,500 to 2,850 individuals that are divided up at four locations (ENR 2006). Two wood bison herds (Wood Buffalo National Park and Slave River Lowlands) contain diseased individuals, while the other two herds (Liard River and Mackenzie Bison Sanctuary) are believed to be disease free.

The population trend for wood bison in the NWT is increasing as they are slowly recovering from near extinction. Threats to the population include disease (anthrax, brucellosis, and tuberculosis), predation, highway collision, habitat loss, and drowning during high water seasons and during thin ice conditions (SARA 2006).

As previously indicated, the Tamerlane RSA is located within a Bison Control Area where all bison are removed to ensure diseased animals from Wood Buffalo National Park do not migrate and infect other disease-free herds, such as at the Mackenzie Bison Sanctuary.

Any person seeing bison in the Bison Control Area is encouraged to report the sighting to the nearest ENR office. Any resident hunter seeing a bison in the control area may harvest it and keep the meat, as long as the kill is reported.

Wood bison scat, tracks, and feeding areas were recorded at two locations within the Tamerlane RSA in September 2005: along Twin Creek at the edge of a fen, and along a dirt road near a waste rock pile (approximately 12.5 km west of the former Pine Point.

Based on Tamerlane's understanding of the important wood bison management issues being managed by GNWT ENR, Tamerlane would be willing to cooperate with and report any wood bison sightings seen in the Bison Control Area to the nearest ENR office as and when such sightings occur.

Nevertheless, to minimize any potential for direct PPPP development-related wood bison mortality, Tamerlane will implement a no hunting policy for all project employees and contractors while working on or off-site for Tamerlane. In addition, the company will require all project-related transportation activities to give the right-of-way to any wildlife, including wood bison that such activities may encounter.

Given the limited and relatively short-term nature of the Tamerlane PPPP and with the implementation of the mitigation measures as described for other ungulates including woodland caribou and moose, Tamerlane PPPP development-related activities are not expected to affect the overall health or well-being of the wood bison population of the southern NWT.

As summarized in Table 7.6-1, disturbance and habitat-related effects on all wildlife species including wood bison will be of a negligible and insignificant nature with no significant residual impacts expected to occur.

7.6.3 Moose

Moose are listed as secure in both the Northwest Territories and Alberta (ENR 2006; ASRD 2000). Moose occur throughout the boreal forest of the NWT, and are infrequently observed on arctic or mountain tundra. Their distribution in NWT is believed to be increasing.

The NWT moose population is estimated at 30,000 to 40,000 individuals with density estimates ranging between 5 to 15 per 100 km^2 (ENR 2006). Moose are generally non-migratory and occupy the boreal forest throughout the year. Moose densities in the NWT are low compared to those in other parts of North America. These densities are considerably lower than those in Manitoba, Saskatchewan and Alberta.

Recent studies conducted in 2002 and 2003 for the Mackenzie Gas Project along the proposed gas pipeline corridor through the Deh Cho reported densities of 6 to 10 moose per 100 km^2 in this region (Imperial Oil 2004). The lowest moose densities were documented adjacent to Fort Providence where 7 individuals per 100 km^2 (Bradley et al.

1998) were recorded during a fall survey. The difference in densities may reflect the presence of bison (Shank 1992) and the seral stage of fire regeneration.

The GNWT reports that in the Deh Cho region, the moose population in the vicinity of Ft. Providence has been decreasing the most over recent years, but has been increasing in areas that have experienced fires in the last 10 years ENR (2006).

Moose are primarily browsers and they require abundant food supplies juxtaposed with security cover. High quality browse is considered to consist of shrubs and trees and, therefore conifer-dominated landscapes are sub-optimal moose habitat.

Moose habitats can be broadly categorized as fire-influenced, non- or limited-fire influenced or aquatic. Within the first two (forested) habitats, moose generally prefer semi-open successional stages with an abundance of browse. Such sites are commonly found on floodplains and in riparian areas or wetlands, as well as in regenerating burns. Use of aquatic habitats may occur during all non-winter months, but generally peaks during late June to early August, when plant nutrition and digestibility are highest. This period coincides with the peak of insect harassment and moose may seek relief in water for this reason as well.

During the EBA wildlife study conducted in the fall of 2005, a total of 22 signs of moose were observed in the Tamerlane RSA, with about 46 % of the observations being recorded in upland Labrador tea ecosites. These observations are consistent with local knowledge (T. Unka pers. comm.) and existing scientific understanding, which indicates that the entire area south of Great Slave Lake, including the PPPP area is frequented by and used by moose throughout the year.

Similar to caribou, the main ways that the PPPP, associated infrastructure and activities can affect moose is through physical or behavioural disturbance, including displacement and habituation (e.g. attraction). Potential effects on moose could also result from the loss or degradation of habitat.

Based on EBA's regular observations of moose sign within the RSA, moose may be expected to be present in the vicinity of the PPPP footprint area quite regularly and may potentially directly encounter or be disturbed by localized development-related noise or activities. Similarly, moose are known to occur in the vicinity of Highway 5 where they would be exposed to vehicle traffic and potentially associated activity such as hunting.

Moose encountering such activities may show minor displacement behaviour and avoid the immediate PPPP development area and/or the Highway. The duration of such exposures are expected to be brief, perhaps lasting a few minutes to a few hours, and are reversible upon cessation of the activity or by moving away from the activity. The number and frequency of such exposures to disturbance by moose would be expected to be limited and sporadic.

To minimize any potential for direct PPPP development-related moose mortality, Tamerlane will implement a no hunting policy for all project employees and contractors while working on or off-site for Tamerlane. In addition, the company will require all project-related transportation activities to give the right-of-way to any wildlife including moose that such activities may encounter.

Regarding preferred moose habitat, as previously indicated, the proposed PPPP development will be of a limited, small-scale and relatively short-term nature. The construction of the PPPP buildings and mining support infrastructure (e.g. access roads, stockpile area, freeze line) will involve the clearing of vegetation in limited areas and the levelling of the existing terrain to accommodate the required buildings and infrastructure.

Most of the PPPP buildings and access roads will be located on existing upland terrain, much of which has been disturbed by historic mineral exploration activities. At the present time, approximately 18 ha (18.48 %) of the terrain and associated vegetation in the 97.4 ha LSA has been disturbed by historic activities which have occurred in this area. Within the larger 36,153 ha RSA, approximately 1,163.8 ha (3.2 %) of the terrain and associated vegetation has been disturbed by such historic activities.

To minimize new disturbance to existing vegetation (moose habitat) in the development area, approximately (4.65 ha) of the PPPP buildings and associated infrastructure footprint (52 %) will be located on previously disturbed terrain. As a result, new disturbance to terrain and associated vegetation in the project footprint area will be limited to approximately 4.3 ha, representing a 19.2 % increase in the total amount of disturbed terrain present in the LSA and an increase of 0.37 % of disturbed terrain present in the RSA.

Approximately 60 % of the PPPP footprint will be located in Labrador Tea-mesic (2.38 ha) or burnt Labrador Tea-mesic (0.21 ha) habitat. This vegetation community is the most commonly occurring within both the LSA and RSA. Approximately 68 ha of Labrador Tea-mesic vegetation is present within the boundaries of the LSA. The remaining 52 % of the PPPP footprint (freeze ring) will be temporarily located in Graminoid fen (1.27 ha) and Shrubby fen (0.48 ha) habitats.

Graminoid fens are found in poorly-drained moist areas and account for about 3 % of the vegetation community found in the LSA and 1 % of the vegetation community found in the RSA. Shrubby fens are found throughout the RSA typically near open water areas, within larger fen complexes or in drainage areas where there is some water movement. Shrubby fen accounts for approximately 4.9 % of the vegetation community found in the LSA and 0.05 % of the estimated 8,895 ha Shrubby fen vegetation estimated to be present in the RSA.

Thus, the site clearing and installation of PPPP buildings and associated infrastructure will result in the relatively long-term (>3years) but reversible loss (following reclamation) of approximately 3.8 % of the existing Labrador Tea-mesic vegetation community within the LSA and approximately 0.03 % of the 10,249 ha of Labrador Tea-mesic vegetation community estimated to be present in the RSA.

In addition, the installation of the freeze ring infrastructure will result in the temporary (~3 years) loss but rapidly reversible recovery (following reclamation) of approximately 43.8 % of the small Graminoid fen (2.9 ha) located within the LSA and approximately 0.7 % of the estimated 388 ha of Graminoid fen vegetation estimated to be present in the RSA, and a similar loss/recovery of approximately 10 % of the Shrubby fen (4.77 ha) located within the LSA and approximately 0.005 % of the estimated 8,895 ha of Shrubby fen vegetation estimated to be present in the RSA.

These temporary but reversible losses of such small amounts of Labrador Tea-mesic, Graminoid fen and Shrubby fen habitats that may be utilized by moose from time to time are considered to be insignificant at both the local and regional scale.

Given the limited and relatively short-term nature of the project and with the implementation of the additional mitigation measures as described, Tamerlane PPPP development-related activities are not expected to affect the overall health or well-being of the Moose population inhabiting the RSA or the ESA.

As summarized in Table 7.6-1, disturbance and habitat-related effects on all wildlife species including moose will be of a negligible and insignificant nature with no significant residual impacts expected to occur.

7.6.4 Black Bear

Black bears in the NWT are considered by the GNWT to be *secure*. Black bears occur throughout treed portions of the NWT and are commonly associated with coniferous or deciduous forests, swamps and berry patches (ENR 2006). The number of black bears in the NWT is conservatively estimated to be around 10,000, with estimated densities of 30 to 40 bears per 100 km^2 (ENR 2006). The population trend is unknown but thought to be healthy across its entire range.

Black bears are generally closely associated with treed environments. In areas where adequate escape cover exists, black bear habitat quality is primarily related to the abundance of seasonally important food items. Black bears are functional omnivores. In most areas, their diet is dominated in all seasons by vegetation. However, meat, especially winter-killed ungulates during spring, insects during summer, and possibly fish, can be locally important.

After den emergence, bears gravitate towards areas with early-emerging vegetation such as wetlands dominated by sedges, cottongrass, other grasses and horsetails. Other preferred feeding areas include meadows, where over-wintering berries such as bog cranberry are eaten.Winter-killed ungulate carcasses can be important, but are usually scarce and may not be predictably available to bears in the boreal forest.

In summer, bears consume a variety of species of grasses, sedges, horsetails and forbs. Insect activity peaks during summer, and black bears feed heavily on colonies of ants, bees and wasps. By fall, the nutritional quality of many plants declines but berries become ripe and available. Major berry-producing species of the boreal forest include blueberry, crowberry, bearberry and cloudberry.

During the EBA wildlife study conducted in the fall of 2005, a total of 37 signs of black bear were observed in the Tamerlane RSA, with about 46 % of the observations being recorded in upland Labrador tea ecosites, 16 % in the Canada buffaloberry-green alder ecosite and 19 % in disturbed sites. It is also widely known that black bears are regularly attracted to the landfill sites associated with the local communities in the area.

Similar to other large mammals the main ways that the PPPP, associated infrastructure and activities can affect black bears are through physical or behavioural disturbance, including displacement and habituation (e.g. attraction). Potential attraction and habituation of black bears to waste foods and human garbage is of particular concern.

Potential effects on black bears could also result from the loss or degradation of preferred habitats.

Based on EBA's regular observations of black bear sign within the RSA, bears may be expected to be present in the vicinity of the PPPP footprint area quite regularly and may potentially directly encounter or be disturbed by localized development-related noise or activities. Similarly, black bears are known to occur in the vicinity of Highway 5 where they would be exposed to vehicle traffic and potentially associated activity such as hunting.

Black bears encountering such activities may show minor displacement behaviour and avoid the immediate PPPP development area and/or the Highway. The duration of such exposures are expected to be brief, perhaps lasting a few minutes to a few hours, and are reversible upon cessation of the activity or by moving away from the activity. The number and frequency of such exposures to disturbance by black bears would be expected to be limited and sporadic.

To minimize any potential for direct PPPP development-related black bear mortality, Tamerlane will implement a no hunting policy for all project employees and contractors while working on or off-site for Tamerlane. In addition, the company will require all project-related transportation activities to give the right-of-way to any wildlife including black bears that such activities may encounter.

To minimize potential attraction/habituation of black bears to the PPPP, all waste foods and human garbage will be stored in bear-proof containers prior to offsite disposal in an approved manner. No landfilling of such wastes will be conducted on site.

Regarding preferred black bear habitat, as previously indicated, the proposed PPPP development will be of a limited, small-scale and relatively short-term nature. The construction of the PPPP buildings and mining support infrastructure (e.g. access roads, stockpile area, freeze line) will involve the clearing of vegetation in limited areas and the levelling of the existing terrain to accommodate the required buildings and infrastructure.

Most of the PPPP buildings and access roads will be located on existing upland terrain, much of which has been disturbed by historic mineral exploration activities. To minimize new disturbance to existing vegetation (bear habitat) in the development area, approximately (4.65 ha) of the PPPP buildings and associated infrastructure footprint (52 %) will be located on previously disturbed terrain. As a result, new disturbance to terrain and associated vegetation in the project footprint area will be limited to approximately 4.3 ha, representing a 19.2 % increase in the total amount of disturbed terrain present in the LSA and an increase of 0.37 % of disturbed terrain present in the RSA.

Approximately 60 % of the PPPP footprint will be located in Labrador Tea-mesic (2.38 ha) or burnt Labrador Tea-mesic (0.21 ha) habitat. This vegetation community is the most commonly occurring within both the LSA and RSA. Approximately 68 ha of Labrador Tea-mesic vegetation is present within the boundaries of the LSA. The remaining 52 % of the PPPP footprint (freeze ring) will be temporarily located in Graminoid fen (1.27 ha) and Shrubby fen (0.48 ha) habitats.

These temporary but reversible losses of such small amounts of Labrador Tea-mesic, Graminoid fen and Shrubby fen habitats that may be utilized by black bear from time to time are considered to be insignificant at both the local and regional scale.

Given the limited and relatively short-term nature of the project and with the implementation of the additional mitigation measures as described, Tamerlane PPPP development-related activities are not expected to affect the overall health or well-being of the black bear population inhabiting the RSA or the ESA.

As summarized in Table 7.6-1, disturbance and habitat-related effects on all wildlife species including black bears will be of a negligible and insignificant nature with no significant residual impacts expected to occur.

7.6.5 Other Fur-Bearing Mammals

Based on the EBA (2005c) wildlife study conducted in September 2005, other previous studies and common knowledge, other fur-bearing mammals determined or likely to be present in the Tamerlane LSA and RSA from time to time include snowshoe hare, red squirrel, beaver, porcupine, coyote, wolf, red fox, wolverine, ermine, mink and lynx.

During the EBA studies conducted in 2005, a number of beaver dams and lodges were observed along sections of Twin Creek located about 7 km to the west of the PPPP site. In addition, other observations of habitat use by other fur-bearers were reported as follows:

- Coyote 5 observations 60 % located in Labrador tea ecosites
- Wolf 3 observations 33 % located in each of Labrador tea, Treed fen and Disturbed ecosites
- Ermine/Mink 9 observations 44 % located in Labrador tea; 22 % in Shrubby fen; 22 % in Treed fen/Willow horsetail ecosites

These observations are consistent with local knowledge (T. Unka pers. comm.) and existing scientific understanding, which indicate that these animal species are commonly found in preferred habitats throughout much of the Pine Point area and the entire region south of Great Slave Lake.

As previously noted, wildlife studies carried out by BC Research (1983) during the period 1976 to 1980 indicated that during that time there appeared to be little impact (of former mining and other human activities such as vehicular traffic and hunting) on upland furbearers of the Pine Point region. BC Research (1983) also reported that:

> *"the most productive furbearer habitat near Pine Point appeared to be located outside the areas of direct mining activity. Aquatic furbearers may have benefited from the creation of additional habitat, due to discharge of water from the open pits. However, the relatively low temperature of pit water may have reduced the productivity of their habitat, and thus may have degraded habitat that existed before the discharge of pit water began."*

The main ways that the PPPP, associated infrastructure and activities can affect upland and aquatic fur-bearers are through physical or behavioural disturbance, including displacement and habituation (e.g. attraction). Potential attraction and habituation of upland fur-bearers such as wolf, coyote, red fox, wolverine and porcupine to waste foods and human garbage is of particular concern. Potential effects on upland and aquatic fur-bearers could also result from the loss or degradation of preferred habitats.

Based on EBA's observation of a variety of upland fur-bearer sign within the RSA and Traditional Knowledge, various species of upland fur-bearers may be expected to be present in the vicinity of the PPPP footprint area from time-to-time and may potentially directly encounter or be disturbed by localized development-related noise or activities. Similarly, most of these fur-bearer species are known to occur in the vicinity of Highway 5 where they would be exposed to vehicle traffic and potentially associated activity such as hunting.

Fur-bearers encountering such activities may show minor displacement behaviour and avoid the immediate PPPP development area and/or the Highway. The duration of such exposures are expected to be brief, perhaps lasting a few minutes to a few hours, and are reversible upon cessation of the activity or by moving away from the activity. The number and frequency of such exposures to disturbance by fur-bearers would be expected to be limited and sporadic.

To minimize any potential for direct PPPP development-related fur-bearer mortality, Tamerlane will implement a no hunting policy for all project employees and contractors while working on or off-site for Tamerlane. In addition, the company will require all project-related transportation activities to give the right-of-way to any wildlife including fur-bearers that such activities may encounter.

To minimize potential attraction/habituation of wolves, coyotes, red foxes, wolverines and porcupines to the PPPP, all waste foods and human garbage will be stored in wildlife-proof containers prior to offsite disposal in an approved manner. No landfilling of such wastes will be conducted on site.

Regarding preferred habitats for the various fur-bearer species, as previously indicated, the proposed PPPP development will be of a limited, small-scale and relatively short-term nature. The construction of the PPPP buildings and mining support infrastructure (e.g. access roads, stockpile area, freeze line) will involve the clearing of vegetation in limited areas and the levelling of the existing terrain to accommodate the required buildings and infrastructure.

Most of the PPPP buildings and access roads will be located on existing upland terrain, much of which has been disturbed by historic mineral exploration activities. To minimize new disturbance to existing vegetation (fur-bearer habitat) in the development area, approximately (4.65 ha) of the PPPP buildings and associated infrastructure footprint (52 %) will be located on previously disturbed terrain. As a result, new disturbance to terrain and associated vegetation in the project footprint area will be limited to approximately 4.3 ha, representing a 19.2 % increase in the total amount of disturbed terrain present in the LSA and an increase of 0.37 % of disturbed terrain present in the RSA.

Approximately 60 % of the PPPP footprint will be located in Labrador Tea-mesic (2.38 ha) or burnt Labrador Tea-mesic (0.21 ha) habitat. This vegetation community is the most commonly occurring within both the LSA and RSA. Approximately 68 ha of Labrador Tea-mesic vegetation is present within the boundaries of the LSA. The remaining 52 % of the PPPP footprint (freeze ring) will be temporarily located in Graminoid fen (1.27 ha) and Shrubby fen (0.48 ha) habitats.

These temporary but reversible losses of such small amounts of Labrador Tea-mesic, Graminoid fen and Shrubby fen habitats that may be utilized by upland and/or aquatic fur-bearer species from time to time are considered to be insignificant at both the local and regional scale.

Given the limited and relatively short-term nature of the project and with the implementation of the additional mitigation measures as described, Tamerlane PPPP development-related activities are not expected to affect the overall health or well-being of the upland and aquatic fur-bearer populations inhabiting the RSA or the ESA.

As summarized in Table 7.6-1, disturbance and habitat-related effects on all wildlife species including upland and aquatic fur-bearers will be of a negligible and insignificant nature with no significant residual impacts expected to occur.

7.6.6 Whooping Crane

The Species at Risk Act (SARA) considers Whooping Cranes a *threatened* species. As reported in Section 2.12.4 of this DAR, a breeding population of Whooping Cranes is located in Wood Buffalo National Park. Non-breeding individuals are known to inhabit marshes, bogs, and shallow lakes between Wood Buffalo National Park and the Mackenzie Bison Sanctuary. The nearest known Whooping Crane nest is located approximately 60 km east and south of the proposed Tamerlane PPPP site.

During the winter of 2004/05, the Wood Buffalo National Park population of Whooping Cranes was 217 counted on the wintering ground. During the summer of 2005, the 58 known nests in and near Wood Buffalo National Park hatched 62 chicks, with 31 fledged young accounted for in mid-August (ENR 2006).

The Wood Buffalo National Park population migrates to wintering grounds in the Aransas National Wildlife Reserve in Texas beginning in mid-September, and stops en-route throughout the prairies to feed on grain around sloughs and wetlands (SARA 2006). Non-breeding individuals may not occupy traditional nesting grounds until breeding age. Non-breeding Whooping Cranes are known to occur north and west of Wood Buffalo National Park; in particular, the Wood Bison Sanctuary (EBA 2005c).

During the 2005 wildlife study, a single non-breeding Whooping Crane was observed at a recently flooded beaver pond located approximately 26 km from the LSA within and near the east end of the RSA. Wildlife observations carried out over the past two years has determined that the LSA does not contain suitable Whooping Crane nesting habitat, although non breeding cranes could potentially frequent the small fen area within the LSA for seasonal feeding purposes.

The main way that the PPPP, associated infrastructure and activities could potentially affect non-breeding Whooping Crane is through behavioural disturbance, in particular displacement from seasonal feeding habitat. Potential effects on Whooping Crane could also result from the loss or degradation of preferred seasonal feeding habitat.

Based on EBA's observation of a single non-breeding Whooping Crane approximately 26 km from the LSA in 2005, Whooping Crane may conceivably be present in the vicinity of the PPPP footprint area on occasion and may potentially be disturbed by localized development-related noise or activities. Similarly, non-breeding Whooping Cranes may occasionally fly over or feed in marshes, bogs, or shallow lakes adjacent to Highway 5 and throughout the Pine Point region.

A Whooping Crane encountering such activities may show minor displacement behaviour and avoid the immediate PPPP development area and/or the Highway. The duration of such exposures are expected to be brief, perhaps lasting a few minutes to a few hours, and are reversible upon cessation of the activity or by moving away from the activity. The number and frequency of such exposures to disturbance by non-breeding Whooping Crane would be expected to be limited and sporadic.

Regarding preferred habitats for nesting or non-breeding Whooping crane, as previously indicated, the LSA does not contain suitable Whooping Crane nesting habitat, although non breeding cranes could potentially frequent the small fen area for seasonal feeding purposes.

The proposed PPPP development will be of a limited, small-scale and relatively short-term nature. The construction of the PPPP buildings and mining support infrastructure (e.g. access roads, stockpile area, freeze line) will involve the clearing of vegetation in limited areas and the levelling of the existing terrain to accommodate the required buildings and infrastructure.

Most of the PPPP buildings and access roads will be located on existing upland terrain, much of which has been disturbed by historic mineral exploration activities. To minimize new disturbance to existing vegetation in the development area, approximately (4.65 ha) of the PPPP buildings and associated infrastructure footprint (52 %) will be located on previously disturbed terrain. As a result, new disturbance to terrain and associated vegetation in the project footprint area will be limited to approximately 4.3 ha, representing a 19.2 % increase in the total amount of disturbed terrain present in the LSA and an increase of 0.37 % of disturbed terrain present in the RSA.

Approximately 60 % of the PPPP footprint will be located in Labrador Tea-mesic (2.38 ha) or burnt Labrador Tea-mesic (0.21 ha) habitat which is of no interest to Whooping Crane. This vegetation community is the most commonly occurring within both the LSA and RSA. Approximately 68 ha of Labrador Tea-mesic vegetation is present within the boundaries of the LSA. The remaining 52 % of the PPPP footprint (freeze ring) will be temporarily located in Graminoid fen (1.27 ha) and Shrubby fen (0.48 ha) habitats which may potentially be utilized by non-breeding Whooping Cranes for seasonal feeding.

The installation of the freeze ring infrastructure will result in the temporary (~3 years) loss but rapidly reversible recovery (following reclamation) of approximately 43.8 % of the small Graminoid fen (2.9 ha) located within the LSA and approximately 0.7 % of the estimated 388 ha of Graminoid fen vegetation estimated to be present in the RSA, and a similar loss/recovery of approximately 10 % of the Shrubby fen (4.77 ha) located within the LSA and approximately 0.005 % of the estimated 8,895 ha of Shrubby fen vegetation estimated to be present in the RSA.

These temporary but rapidly reversible losses of such small amounts of Graminoid fen and Shrubby fen habitats within the LSA that may be utilized by non-breeding Whooping Crane for seasonal feeding on occasion are considered to be insignificant at both the local and regional scale.

Given the limited and relatively short-term nature of the project and with the implementation of the additional mitigation measures as described, Tamerlane PPPP development-related activities are not expected to affect the overall health or well-being of the non-breeding Whooping Cranes seasonally present in marshes, bogs and shallow lakes in the RSA or the ESA.

As summarized in Table 7.6-1, disturbance and habitat-related effects on all wildlife species including Whooping Crane will be of a negligible and insignificant nature with no significant residual impacts expected to occur.

7.6.7 Peregrine Falcon (*anatum* subspecies)

The Species at Risk Act (SARA) considers Peregrine Falcons a *threatened* species while the GNWT considers this species to be *at risk*. There are over 220 documented breeding pairs of Peregrine Falcons in northern Canada (NWT, Yukon, Nunavut, Northern Quebec) (ENR 2006).

The *Falco Peregrinus anatum* subspecies is distributed generally throughout portions of the NWT below the treeline, with a large population located along the Mackenzie River Valley. Smaller populations can be found nesting in the east arm of Great Slave Lake (along the steep cliffs) and in Wood Buffalo National Park. In the past, ENR conducted periodic Peregrine surveys along the Mackenzie Valley and has documented 83 nests on a linear 600 km transect along the Mackenzie River (Shank 1996).
In the NWT, Peregrines live an average of five years and begin breeding in their second year. Between May and early June, two to four eggs are laid in a scrap usually on cliff ledges near water. Peregrines have three main habitat requirements: 1) proper nesting sites, 2) nesting range (actively guarded range approximately 1 km from nest), and 3) a home range that can extend up to 27 km from the nest for hunting (not defended) (ENR 2006). Peregrines mainly hunt other birds in the air. Consequently, open habitats such as tundra, grasslands, prairies and waterways are important (EBA 2005c).

Two Peregrine Falcon sightings were recorded by the EBA wildlife team in the vicinity of and within the RSA in September 2005. One of the Peregrine Falcon observations occurred along Highway 5 near the eastern boundary of Hay River Reserve, while the second observation occurred along a dirt road where a falcon was feeding on a recently killed snow goose (approximately 13 km southwest of the former Pine Point town site (EBA 2005c).

It is expected that the Peregrine(s) observed within the study area were either migrants or non-breeders from known populations in the northeast corner of Wood Buffalo National Park or the east arm of Great Slave Lake (S. MacMillagan, Personal Communication, as cited in EBA 2005c). To date, no Peregrine Falcon territories have been documented in the Tamerlane RSA (EBA 2005c).

The proposed Tamerlane PPPP area and the entire RSA do not meet the necessary habitat requirements for Peregrine Falcons. It is concluded that there are no nesting Peregrine Falcons within the lowland area south of Great Slave Lake.

The Peregrine Falcons observed in the RSA were determined to be migrants or non-breeders that use the RSA on an opportunistic basis for aerial hunting. As a result, it is most unlikely that Peregrine Falcons can be affected either directly or indirectly in any reasonable way by the development of the PPPP, associated infrastructure and related transportation activities.

Given the limited and relatively short-term nature of the project and with the implementation of the mitigation measures as described, Tamerlane PPPP development-related activities are not expected to affect the overall health or well-being of any Peregrine Falcons that utilize the RSA for opportunistic aerial hunting or those which nest in known but far removed areas of the ESA.

As summarized in Table 7.6-1, disturbance and habitat-related effects on all wildlife species including Peregrine Falcon will be of a negligible and insignificant nature with no significant residual impacts expected to occur.

7.6.8 Mitigation Measures

Potential effects on wildlife and wildlife habitat may take place during PPPP construction, operation, closure or reclamation. Tamerlane has committed to employ an adaptive management approach including a number of mitigation measures.

The main ways that the development can affect wildlife is through physical or behavioural disturbance, including displacement and habituation (e.g. attraction). Potential effects on wildlife may also result from the loss or degradation of habitat.

Other possible effects on wildlife and wildlife habitat of the area could be associated with air emissions, odours, noise and dust generation. However, the limited air emissions, odours and noise associated with the operation of a few standard internal combustion engines operating on the site and the small amounts of dust generated mainly by moving vehicles and trucks are not anticipated to have a measurable effect on wildlife or wildlife habitat in the PPPP development area.

Potential effects related to the PPPP development on all wildlife species will be mainly limited to the timeframes and activities associated with the 2-3 year duration of the development.

To minimize any potential for direct PPPP development-related wildlife mortality, Tamerlane will implement a no hunting policy for all project employees and contractors while working on or off-site for Tamerlane. In addition, the company will require all project-related transportation activities to give the right-of-way to any wildlife that such activities may encounter.

To minimize potential attraction/habituation of certain wildlife species such as black bears, wolves, coyotes, red foxes, wolverines and porcupines to the PPPP, all waste foods and human garbage will be stored in wildlife-proof containers prior to offsite disposal in an approved manner. No landfilling of such wastes will be conducted on site.

To minimize impacts on wildlife habitats of the PPPP development area, Tamerlane has and/or will employ a number of specific mitigation measures. Initially, as part of project planning and design, Tamerlane is proposing to employ underground mining, the least intrusive method for mining the R190 mineral deposit. In addition, application of the proposed freeze curtain technique represents the least intrusive method for stabilizing wet, unconsolidated ground, compared with other alternatives such as grouting and dewatering.

Furthermore, Tamerlane is proposing to minimize the PPPP development footprint by locating PPPP buildings and associated infrastructure on existing disturbed areas to the maximum extent possible.

As previously indicated more than 52 % of the PPPP buildings and associated infrastructure footprint will be located on previously disturbed terrain. New disturbance to wildlife habitat in the project footprint area will be limited to approximately 4.3 ha.

Other mitigation measures that will be employed to minimize impacts on wildlife habitat of the PPPP development area will include:

- Full compliance with Land Use Permit and Water License and license conditions to be issued by the MVLWB.
- Use of limited groundwater only for PPPP process needs.
- Optimized recycling/reuse of process water.
- Recharge of excess groundwater for PPPP process needs back into the underground via infiltration.
- Salvage of organic and mineral top soils for future reapplication during reclamation of the site.

- Implementation of erosion control measures if and as warranted - not anticipated to be required due to the generally level and porous nature of the terrain at the development site.
- Use of existing highways for all PPPP-related vehicle traffic.
- Return of PPPP process-related waste rock as backfill into the mined-out R190 mineral deposit.
- Application of dust suppressants - e.g. water or approved dust suppressant products.
- Disposal of all hazardous wastes in an approved manner.
- Salvage of organic and mineral top soils for future reapplication during reclamation and revegetation of the site.
- Re-contouring, scarification, and reseeding of disturbed areas with appropriate and approved native seed mixes to restore productive wildlife habitat.

With the application of these mitigation measures and in consideration of the other aspects of the assessment presented in this section of the DAR, no significant residual impacts on the wildlife resources of the Tamerlane development footprint are anticipated to occur following reclamation and restoration of the site. The residual impact of the PPPP development on the wildlife resources of the LSA, RSA and ESA is expected to be negligible.

7.7 Air Quality and Climate

The MVEIRB Terms of Reference (MVEIRB) noted that in the Northwest Territories there is presently no enforceable regulatory regime for air quality. However, the MVEIRB Terms of Reference directed Tamerlane to assess the potential impacts of the PPPP on local and regional air quality. The MVEIRB also requested an assessment of noise and greenhouse gas emissions and proposed mitigation measures to effectively manage potential air quality issues.

7.7.1 Air Quality

Existing air quality at the Tamerlane PPPP site has not been monitored but as indicated previously in Section 2.3.3 of this DAR, current air quality conditions at the PPPP site would be expected to be comparable to or better than those reported for the general Yellowknife area.

Ambient air quality monitoring conducted at the National Air Pollution Surveillance Network station at Yellowknife for the past several years has shown that air quality data for sulphur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3) and total suspended particulates (TSP) have consistently been below the NWT air quality standards which have been adopted from the Canadian Air Quality Objectives.

Mining equipment and activities associated with the PPPP development will release gaseous and particulate emissions for the relatively short 3-year life of the project. Emissions will emanate from fuel combustion, vehicle exhausts, and other sources associated with operation of the project. Particulate emissions (dust) will be generated during site construction and by vehicles driving on the short access road to the PPPP site during the period of operations.

To gain a perspective on anticipated emissions associated with the Tamerlane PPPP, The following emission estimates have been derived from the recent and applicable air quality assessment conducted for the Snap Lake Diamond Project (De Beers 2002) which employed widely accepted factors published by the U.S. EPA (1995). When available, equipment manufacturer's data were used in that assessment in preference to emission factors.

The Snap Lake Project assessment was considered to be appropriate for estimating Tamerlane PPPP emissions because the daily production from the two projects is of a similar magnitude (Snap Lake - 3,000 t/d; Tamerlane PPPP - 2,800 t/d), both are underground mines and both employ DMS circuits.

The main stationary source of emissions at the Tamerlane PPPP will be related to the diesel-fired power plant, which will consist of a set of generators capable of producing up to 6,000 kilowatts (kW) of power when all are in operation. The actual number and size of the individual generators remains to be determined. This power plant will generate all of the electrical power required at the site. Table 7.7-1 summarizes the estimated emissions to be generated by the power plant and for all of the other major sources related to the PPPP and associated activities.

Waste oil heaters, mine air heater(s) and underground mining activities will also contribute to emissions from the PPPP (Table 7.7-1). The underground activities will include a combination of combustion sources (e.g. drilling, blasting, excavation) and materials handling operations. However, the emissions from the materials handling operations at the mine are anticipated to be particularly low due to the high levels of moisture underground. These wet conditions will effectively minimize the generation of particulate emissions (dust) from the underground activities.

The processing plant will include activities such as secondary crushing, screening, dense media separation, and materials conveyance that are potential sources of particulate emissions (Table 7.7-1). However, these emissions will also be minimal as the PPPP will use be employing a wet treatment process. As there is no combustion in the process plant, there will be no direct emissions of SO_2 or NO_x from this activity.

Mobile surface emissions will be generated by the surface mobile equipment required to construct and/or operate the PPPP and associated infrastructure including 10-12 haul trucks, two buses, one bulldozer, one loader, 1 crane, several pickup trucks/SUVs and other miscellaneous mobile equipment (Table 7.7-1).

Table 7.7-1
Summary of Estimated PPPP Emissions

Source	Emission Rates (t/d)				
	SO_2	NO_x	TSP	PM_{10}	$PM_{2.5}$
Power plant	0.032	1.730	0.063	0.035	0.029
Waste oil/Mine heaters	0.064	0.182	0.028	0.016	0.014
Underground activities	0.035	1.460	0.120	0.037	0.011
Process plant	0.000	0.000	0.042	0.009	0.006
Mobile surface equipment	0.010	0.210	0.210	0.070	0.020
Total	**0.141**	**3.582**	**0.463**	**0.167**	**0.080**

The overall emissions of SO_2, NO_x, TSP, PM_{10} and $PM_{2.5}$ for all PPPP-related activities are estimated to be in the order of 0.141, 3.582, 0.463, 0.167 and 0.080 tonnes per day (t/d), respectively.

To gain a perspective on the size of the estimated Tamerlane PPPP emissions relative to those of some other existing mines in the NWT, Table 7.7-2 provides a comparison with emissions reported in the relatively recent environmental impact assessments completed for the EKATI, Diavik and Snap Lake diamond mine projects.

Table 7.7-2
Comparison of Various Existing NWT Mine and PPPP Emissions Estimates

Emissions Parameter	EKATI Diamond Mine[1]	Diavik Diamond Mine[2]	Snap Lake Diamond Mine[3]	Tamerlane PPPP
SO_2 emissions (t/d)	0.469	0.200	0.179	0.141
NO_x emissions (t/d)	5.923	16.500	5.684	3.582
TSP emissions (t/d)	21.388	8.900	0.555	0.463
PM_{10} emissions (t/d)	_[4]	2.800	0.209	0.167
$PM_{2.5}$ emissions (t/d)	_[4]	0.600	0.113	0.080

(1) Data obtained from the BHP EKATI ™ Project EIA (BHP 1995)
(2) Data obtained from the Diavik Diamond Mine EIA (Diavik 1998)
(3) Data obtained from the Snap Lake Diamond Mine EIA (De Beers 2002)
(4) Neither PM_{10} nor $PM_{2.5}$ emissions data available for the BHP EKATI ™ Project

As can be noted, the estimated daily emissions for the Tamerlane PPPP are considerably lower than the daily emissions estimated for any of these larger existing mines for which data have been presented. It should also be noted that the Tamerlane PPPP will only be in operation for a period of 12-15 months following construction, compared to 20 years or more for each of the other mines considered.

The relative magnitude of estimated emissions from the Tamerlane PPPP give some indication of potential effects on air quality, but the effects that these emissions will have on ground level concentrations are considered to be a more direct indicator.

CALPUFF dispersion modelling conducted for the 3,000 t/d Snap Lake underground Diamond Project (De Beers 2002), which is of a similar magnitude and nature to Tamerlane's 2,800 t/d PPPP indicated the following:

- *"The maximum predicted 1-hour, 24-hr and annual ground-level $S0_2$ concentrations were well below the applicable NWT standards both outside and within the active mining area.*
- *The maximum predicted 1-hour, 24-hour and annual NO_2 concentrations were below the applicable acceptable federal objectives both outside and within the active mine area.*

- *The maximum 24-hour TSP (dust) concentrations were predicted to exceed the applicable NWT standards within the active mine area. The standard was also exceeded over a small area just outside the immediate mining area. The maximum annual TSP predictions in the RSA (for Snap Lake) were below the applicable NWT standards outside the active mine area.*
- *The maximum predicted 24-hour concentrations of PM_{10} in the active mine area were predicted to exceed the interim guidelines adopted in British Columbia, Ontario, and Newfoundland (the NWT has yet to adopt a PM_{10} standard). All of the annual PM_{10} predictions were below the U.S. EPA primary standard.*
- *The maximum predicted 24-hour $PM_{2.5}$ concentrations exceed 30 µg/ m^3 within the active mine area. The 30 µg/m^3 concentration is the level adopted by the Canadian Council of Ministers of the Environment (CCME) for the Canada-Wide Standard (CWS). However, compliance with the CWS for $PM_{2.5}$ is based on the 98th percentile of the observed/predicted values. On this basis, none on the prediced 24-hr $PM_{2.5}$ concentrations in the RSA (for Snap Lake) would exceed the Canada-Wide Standard. The maximum annual $PM_{2.5}$ concentration was below the applicable U.S. EPA primary standard of 15 µg/m^3".*

These predicted ground level concentrations that were modelled for the Snap Lake project are considered of relevance to and generally applicable to the Tamerlane PPPP. Similar ground level concentrations are anticipated to be achieved at the Tamerlane PPPP and will be achieved with strict adherence to the GNWT Guideline for Ambient Air Quality Standards in the Northwest Territories, the GNWT Guideline for Dust Suppression and the GNWT and Worker's Compensation Board standards for mine air quality.

Regarding the anticipated emissions related to the 12-15 month concentrate hauling operation, experience from southern Canada indicates that far greater volumes of truck and other vehicle traffic on other Canadian highways have not been known to cause exceedences of regional ambient air quality objectives (BHP 2000). As a result, the relatively low levels of truck and other vehicle emissions related to the Tamerlane PPPP are not expected to have a measurable effect on the existing air quality of the Highway 5 transportation corridor, or the general Pine Point region.

To prevent dust from the concentrate from being released to the environment during transportation of the concentrate product by truck to the Hay River railhead, the concentrate will be maintained in a "moist" condition and the truck boxes and product will be covered.

Based on the available information, the limited air emissions associated with the operation of the relatively few standard internal combustion engines operating at the PPPP site for approximately 3 years and the small amounts of dust generated mainly by moving vehicles and trucks for this same time period are not anticipated to have a measurable effect on the vegetation, wildlife and wildlife habitats of the PPPP development area or associated activities.

7.7.2 Greenhouse gases

Tamerlane PPPP and associated activities will result in the emission of carbon dioxide (CO_2) and other greenhouse gases (GHG). The release of GHGs has been linked to global warming and is of concern to regulators and other stakeholders. As previously reported in Section 2.3.5 of this DAR, the baseline levels of estimated greenhouse gas emissions in the Northwest Territories and Canada were recently compiled by Imperial Oil (2004) for the proposed Mackenzie Gas Project.

GHG emissions include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). By using the relative GHG potentials of these compounds, it is possible to convert them into equivalent carbon dioxide (ECO_2) numbers so that the emissions can be totalled. Equivalent CO_2 (ECO_2) emissions were calculated using GHG potentials of 1 for CO_2, 21 for CH_4 and 310 for N_2O (Environment Canada 2002).

Because GHG emissions management is a territorial and a national issue, it is important to know the existing estimated levels of emissions nationally and territorially. Imperial Oil (2004) estimated that for 2005, the total NWT contribution of GHG emissions was estimated at 1,708 kilotonnes per year (kt/a) ECO_2, compared with the total estimated Canadian contribution of 728,000 kt/a ECO_2. Thus the total estimated NWT GHG emissions contribution in 2005 represented approximately 0.23 % of the estimated national total.

De Beers (2002) estimated the overall GHG emissions from the 3,000 t/d Snap Lake underground Diamond Project, which is of a similar magnitude and nature to Tamerlane's 2,800 t/d PPPP to be in the order of 102 kt/a. Of this total, 70 % (71.26 kt/a) was attributed to GHG emissions from the Snap Lake project primary diesel power generators with a generating capacity of 13,000 kW.

The diesel-fired power plant for the Tamerlane PPPP will consist of a comparitively smaller set of generators capable of producing 6,000 kW when all are in operation. The actual number and size of the individual generators remains to be determined. Pro-rating the size and power difference between the Snap Lake and PPPP power plants would indicate that the smaller Tamerlane PPPP diesel power plant would be projected to produce approximately 55.59 kt/a, representing a reduction of 15.67 kt/a relative to the larger Snap Lake power plant.

Pro-ration of the remainder of the predicted Snap Lake GHG emissions on the basis of underground mine production and operational differences (Snap Lake - 3,000 t/d versus PPPP - 2,800 t/d), would indicate that the Tamerlane PPPP would produce approximately 87.27 kt/a of GHG for the first year of the 12-15 months that the project will be fully operational.

This estimated annual amount of GHG to be generated by the Tamerlane PPPP represents a 5.1 % increase over the estimated 2005 “business as usual” NWT GHG emissions of 1,708 kt/a and a 0.012 % increase over the estimated 2005 Canadian GHG emissions of 728,000 kt/a.

The release of GHG and the issue of climate change are beyond regional in geographic extent since it is a national and global concern (De Beers 2002). The Tamerlane PPPP-related GHG emissions will be of a relatively short-term nature. In addition, there is a high degree of uncertainty in predicting impacts associated with project-specific emissions and controversy pertaining to the reversibility of GHG emissions and global warming. As a result no environmental consequence has been attributed to the Tamerlane PPPP GHG emissions estimate provided.

7.7.3 Noise

The proposed PPPP is located in an area where ambient noise levels are expected to be low, generally in the range of 35 decibels (dBA). The acoustic environment is dominated by the sounds of nature, e.g. wind rustling through the foliage.

Man-made sounds that can be heard in the Local Study Area from time to time are those associated with the limited and intermittent existing vehicular traffic on nearby Highway 5, and local off-road ATV and snowmobile traffic and associated hunting that occurs seasonally throughout the Pine Point region. Table 7.7-3 from Harris (1991) identifies typical sound levels associated with common sources of noise that are familiar to the residents of the communities in the Pine Point region.

Table 7.7-3
Typical Sound Levels of Common Noises

Description	Type of Noise	Sound Level (dBA)
Rural area – background noise	Continuous	30 - 35
Small town residential – background noise	Continuous	35 - 40
Snowmobile at 15 m	Intermittent	75 (peak)
Snowmobile at 1 km	Intermittent	50 (peak)
Truck at 15 m	Intermittent	85 (peak)
Truck at 1 km	Intermittent	65 (peak)

Mining equipment and activities associated with the PPPP development will produce various kinds of intermittent and/or continuous sounds throughout the relatively short 3-year life of the project. The main source of steady, continuous source of noise during the operations phase will be produced by the power plant.

Short-term, intermittent noise will be generated by the mobile equipment required to construct and/or operate the PPPP and associated infrastructure including 10-12 haul trucks, two buses, one bulldozer, one loader, 1 crane, several pickup trucks/SUVs and other miscellaneous mobile equipment.

The noise levels presented in Table 7.7-3 can be compared with typical maximum sound level values for noise from PPPP construction and operation as summarized in Table 7.7-4, in order to obtain a subjective impression of the noise impact of the development.

Table 7.7-4
Typical Maximum Construction and Mining Equipment Sound Levels

Noise Source	Sound Level (dBA) at Various Distances			
	15 m	30 m	60 m	120 m
Bulldozers (1)	85	79	73	67
Loader (1)	85	79	73	67
Crane (2)	83	77	71	65
Moving dump or haul truck (2)	88	82	76	70
Idling dump truck (2)	65	59	53	47
Diesel generator (3)	70	64	58	52

Notes:
(1) Reference sound level obtained from OMOE Publication NPC-115, contained in the OMOE *Model Municipal Noise Control By-Law* 1977
(2) Reference sound levels obtained from US Department of Transportation , *Transit Noise and Vibration Impacts Assessment*, Chapter 12: Noise and Vibration
(3) Reference sound level obtained from British Standards No. 5228, Second Edition, May 1997

When comparing sound level values, the following general rules (De Beers 2002) may be used:

- a difference in sound level of less than 3 dBA is barely perceptible to the human ear
- a difference of 5 dBA is noticeable
- a difference of 10 dBA corresponds to a halving or doubling in perceived loudness
- a 20 dBA difference corresponds to a four-fold difference in perceived loudness.

It is also important to note that sound propagation between a noise source and receptor (e.g. person or animal listening) is affected by several sound attenuation (reducing) mechanisms. These include the following:

- Distance dissipation - sound naturally decreased with increasing distance from the source.
- Ground attenuation - sound is absorbed by the ground that it passes over.
- Atmospheric absorption – sound is absorbed by the atmosphere it passes through.

- Barrier attenuation – sound can be blocked by physical barriers (e.g. buildings, hills or forest.
- Sound is affected by wind conditions (ie. a distant noise source will be louder under downwind conditions than it will be under calm conditions. Conversely, a distant source will be quieter under upwind conditions that it will be under calm conditions).
- Sound is affected by temperature conditions in the atmosphere (ie. a distant noise source will be louder under atmospheric inversion conditions that it will be under neutral atmospheric conditions).

Sound level attenuation predictions and modelling of construction and operations-related activities, as reported in the recent environmental assessment conducted for the Snap Lake Project (De Beers 2002) are considered to be relevant and directly applicable to evaluating anticipated noise levels associated with the Tamerlane PPPP.

De Beers (2002) determined that “worst case” site construction noise would be at a level of less than 40 dBA at a distance of 1.5 km from the site. As a result of the natural attenuation of outdoor sound with distance, continuous noise from the site would be close to, or less than ambient sound levels at distances of about 6 km from the site.

For the operations phase of the Snap Lake Project average values for continuous noise emanating from the site were also predicted to be less than 40 dBA at a distance of 1.5 km from the site. It was noted that this sound level was similar to the level of continuous background noise that would occur in a small town residential area.

Although the continuous noise produced by the site at this distance was identified to be greater than pre-existing ambient sound levels during calm conditions, the predicted sound level met the guideline criteria of the Alberta EUB Noise Control Directive (EUB 1999) for industrial facilities in remote locations.

For truck-related traffic, De Beers (2002) noted that regular truck traffic (on the Tibbitt to Contwoyto Winter Road) would result in short-term higher sound levels occurring on an intermittent basis. It was determined that during calm conditions in winter, trucks passing by a particular point could be heard at a distance of approximately 10 km from the roadway. However, no increase in average ambient noise was predicted for distances greater than 1.5 km from the roadway. The subjective effect of the truck traffic was indicated to be similar to snowmobile pass-by noise at slightly closer distances (De Beers 2002).

The construction and operations phase of the Tamerlane PPPP and associated activities, including truck traffic, are expected to generate similar noise levels to those discussed in this section for the Snap Lake Project but for a much more limited time-frame of approximately 3 years.

Based on the available information, noise levels emanating from the Tamerlane PPPP development area during all phases of the project are predicted to be less than 40 dBA at a distance of 1.5 km from the site. The noise environment of this is already influenced by existing traffic utilizing Highway 5. Noise generated by the Tamerlane PPPP and associated activities will contribute to and be masked to some extent by the existing traffic on the Highway.

As discussed, noise generated by the PPPP and associated activities will be variable and will continue for the relatively short 3 year life of the project. Following cessation of project-related activities noise levels will immediately return to existing ambient conditions.

Some wildlife may show minor displacement behaviour and avoid the immediate PPPP development area and/or the Highway during periods of particularly loud and irregular noises. The duration of such exposures are expected to be brief, perhaps lasting a few minutes to a few hours, and are reversible upon cessation of the activity or by moving away from the activity. The number and frequency of such exposures to noise disturbance by wildlife would be expected to be limited and sporadic.

The overall environmental consequences of noises generated by the Tamerlane PPPP development and associated activities are expected to be low and the residual impact on the existing noise environment of the LSA, RSA and ESA is expected to be negligible.

7.7.4 Mitigation Measures

Mining equipment and activities associated with the PPPP development will release gaseous and particulate emissions and generate varying degrees and types of noise for the relatively short 3-year life of the project. Emissions will emanate from fuel combustion, vehicle exhausts, and other sources associated with operation of the project.

Tamerlane has committed to employ an adaptive management approach including a number of mitigation measures. To minimize potential effects on local and regional air quality the existing noise environment and to control greenhouse gas emissions, mitigation measures that will be employed by the Tamerlane PPPP will include:

- Full compliance with Land Use Permit and Water License and license conditions to be issued by the MVLWB.
- Conformance with the Guidelines for Ambient Air Quality Standards in the NWT.
- Use of low sulphur diesel fuel and regular equipment and engine maintenance.
- Conformance with GNWT Guideline for Dust suppression through the application of dust suppressants - e.g. water or approved dust suppressant products.
- Use of existing highways for all PPPP-related vehicle traffic.
- Secure containment of concentrate product during transportation to the Hay River railhead.
- Conformance with GNWT and WCB standards for mine air quality.
- Salvage of organic and mineral top soils for future reapplication during reclamation and revegetation of the site.
- Disposal of all hazardous wastes in an approved manner.

With the application of these mitigation measures and in consideration of the other aspects of the assessment presented in this section of the DAR, no significant residual impacts on local and regional air quality or on the existing noise environment of the area are anticipated to occur.

Furthermore, based on the available information, the limited air emissions and noise associated with the operation of the relatively few standard internal combustion engines operating at the PPPP site for approximately 3 years and the small amounts of dust generated mainly by moving vehicles and trucks for this same time period are not anticipated to have a measurable effect on the vegetation or wildlife of the PPPP development area or associated activities. The residual impact of the PPPP development on existing air quality and the noise environment of the LSA, RSA and ESA is expected to be negligible.

7.8 Biophysical Environmental Monitoring

Assuming that the PPPP in approved and implemented, specific types of follow-up monitoring will be undertaken to confirm the accuracy of environmental predictions made during the assessment phase and to implement corrective actions if, and as may be warranted. In particular, specific ongoing monitoring is anticipated to be conducted in relation to surface and groundwater quality, underground mine air quality, freeze curtain performance and wildlife monitoring. Brief descriptions of the anticipated environmental monitoring programs follow.

7.8.1 Surface and Groundwater Quality Monitoring

Tamerlane anticipates that the quality of the process/mine water to be directed to the infiltration basin will comply with Water License criteria without the need for further treatment. However, existing and demonstrated water treatment methods (lime addition) are readily available and will be employed if determined to be necessary to ensure compliance with the Water License.

Tamerlane also understands that the MWLWB Water License will specify the requirements for PPPP effluent and groundwater quality monitoring to confirm compliance with the Water License and to ensure full protection of the receiving environment.

Tamerlane is committed to carrying out the monitoring conditions that will be specified in the Water License for the PPPP. Tamerlane will consider opportunities for utilizing locally-based personnel to assist in conducting the necessary water quality monitoring activities.

7.8.2 Underground Air Quality Monitoring

Mine ventilation is a necessity to provide clean fresh air for all employees while working underground in each work location. It is envisioned that 8,500 m^3/minute (300,000 cfm) of air will travel downcast via the main production shaft. Ventilating curtains, seals and airlocks will be used throughout the mine to divert air to all active working locations. Booster fans will be located in key locations to help divert fresh air to the main working locations.

The ventilation shaft will be used as an up-cast shaft to exhaust all used air in the mine and allow for the continuous renewal of fresh air to the active working locations. A designated responsible employee will be assigned to monitor the air quality at each working location, during each shift, every day and maintain daily records of the air quality monitoring results.

7.8.3 Freeze Curtain Performance Monitoring

To ensure the success and integrity of the freeze curtain throughout the life of the PPPP, a comprehensive freeze curtain system performance monitoring program will be implemented. Layne Christensen Corporation, the designers and suppliers of the system, will be supplying a full instrumentation system integrated with ground, distribution manifold and the refrigeration plant. The system will be designed to measure, record and reduce data for the following components:

- Ground temperatures will be measured at 30 different temperature pipes equally located throughout the site. A typical temperature pipe was previously illustrated in Figure 4.1-2, showing the individual monitoring devices within each pipe;
- Coolant return temperatures will be measured at each freeze pipe at the connection to the return manifold. This coolant measurement ensures that each pipe has complete circulation;
- Groundwater levels will be continuously measured using transducers installed in each of the piezometers or monitoring wells installed during the initial engineering; Any significant drop in these levels could indicate potential inflows into the excavated zone;
- Coolant flow and pressure are constantly monitored and connect to an alarm system. Any decrease in flow or pressure could indicate a broken line or leak, requiring immediate repair operations; and
- Refrigeration plant data are built within the compressor system. These data, as well as other data from the plant, will be incorporated into the central monitoring system that records all other data.

Each of the described sensors will be connected to control points that are monitored by a specifically designed software system. This system can be monitored from any location that has internet access. Layne Christensen engineers will establish a monitoring program including appropriate alarms and response actions.

Layne Christensen has a Health and Safety Department dedicated to ground freezing operations. Upon completion of a contract between Tamerlane and Layne Christensen Corporation, an HSE plan by Layne Christensen will be provided along with on-site management and inspection during operations.

7.8.4 Wildlife Monitoring

Potential effects on wildlife and wildlife habitat may take place during PPPP construction, operation, closure or reclamation. The main ways that the development can affect wildlife is through physical or behavioural disturbance, including displacement and habituation (e.g. attraction). Potential effects on wildlife may also result from the loss or degradation of habitat.

To minimize any potential for direct PPPP development-related wildlife mortality, Tamerlane will implement a no hunting policy for all project employees and contractors while working on or off-site for Tamerlane. In addition, the company will require all project-related transportation activities to give the right-of-way to any wildlife that such activities may encounter.

To minimize potential attraction/habituation of certain wildlife species such as black bears, wolves, coyotes, red foxes, wolverines and porcupines to the PPPP, all waste foods and human garbage will be stored in wildlife-proof containers prior to offsite disposal in an approved manner. No landfilling of such wastes will be conducted on site.

Tamerlane anticipates that with the implementation of the various mitigation measures discussed in Section 7.7.4, the residual impact of the PPPP development on the wildlife resources of the LSA, RSA and ESA are expected to be negligible. Nevertheless, Tamerlane is prepared to conduct limited wildlife monitoring in the immediate vicinity of the PPPP development area.

In particular, Tamerlane is prepared to record all significant wildlife observations made by PPPP personnel while in the project area. As previously indicated, Tamerlane would also be willing to cooperate with and report any wood bison sightings seen in the Bison Control Area to the nearest ENR office as and when such sightings occur.

8.0 HUMAN ENVIRONMENT ASSESSMENT

The MVEIRB, after reviewing Tamerlane's *Project Description Report* and supporting appendices, consultation of the Public Records of the Preliminary Screening and ongoing EA, and the hosting scoping sessions determined that more information on the potential social, economic, cultural and biophysical effects of the PPPP was required (MVEIRB 2006).

The geographical scope for assessing effects to the human environment was to include, but not necessarily be limited to the communities of Hay River (including the Hay River Reserve), Fort Resolution, Fort Smith and Enterprise. The concerns of culturally-defined communities who use the land in the Study Area were also considered to merit consideration (MVEIRB 2006).

The following sections of the DAR serve to address the socioeconomic information requested by the MVEIRB Terms of Reference. The results of the Traditional Knowledge studies conducted in October, 2006 were considered and incorporated as appropriate throughout this section (Traditional Knowledge 2006a, b). The subject matter is presented under the primary headings:

- Economy – Section 8.1
- Society and Culture – Section 8.2
- Heritage Resources - Section 8.3
- Traditional & Contemporary Land Use & Wildlife Harvesting - Section 8.4
- Protected and Withdrawn Areas – Section 8.5
- Aesthetic Resources and Wilderness Values – Section 8.6.

Table 8.0-1 summarizes the key predictions of the socioeconomic assessment for the Tamerlane PPPP using the impact criteria outlined by the MVEIRB in the Terms of Reference. Discussion and analysis of the assessment predictions summarized in Table 8.0-1 follows in each of the sections as outlined above.

Table 8.0-1
Summary of Key Socioeconomic Assessment Predictions

Impact	Beneficial Adverse	Magnitude (+ -)	Range	Affected Community	Duration	Likelihood	Capacity of Developer to Manage Impact
Direct and Indirect Employment	Beneficial	Moderate (+)	Aboriginal stakeholders and communities in the Region	Aboriginal Stakeholders and most or all communities in the region	Initially 3 years	High	Developer and Territorial human resource management agencies have the capacity to manage
Business Opportunities	Beneficial	Moderate (+)	Aboriginal stakeholders and communities in the Region	Aboriginal Stakeholders and most or all communities in the region	Initially 3 years	High	Developer and Territorial business management agencies have the capacity to manage
Distribution of Beneficial and Adverse Impacts	Beneficial	Moderate (+)	Aboriginal stakeholders and communities in the Region	Aboriginal Stakeholders and most or all communities in the region	Initially 3 years	High	Developer and Territorial human resource management agencies have the capacity to manage
Contribution to Sustainable Development	Beneficial	Moderate (+)	Aboriginal stakeholders and communities in the Region	Aboriginal Stakeholders and most or all communities in the region	Initially 3 years	High	Developer and Territorial human resource management agencies have the capacity to manage
Population in- and out-Migration	Neutral	Negligible	Primarily Hay River	Primarily Hay River	Initially 3 years	High	Developer and Town of Hay River have the capacity to manage

Impact	Beneficial Adverse	Magnitude (+ -)	Range	Affected Community	Duration	Likelihood	Capacity of Developer to Manage Impact
Alcohol & Drug Access and Use	Neutral	Negligible	Aboriginal stakeholders and communities in the Region	Aboriginal Stakeholders and most or all communities in the region	Initially 3 years	High	Developer and Territorial social services agencies have the capacity to manage
Access to Health Care	Neutral	Negligible	Aboriginal stakeholders and communities in the Region	Aboriginal Stakeholders and most or all communities in the region	Initially 3 years	High	Developer and Territorial health care agencies have the capacity to manage
Housing Pressures	Neutral	Negligible	Primarily Hay River	Primarily Hay River	Initially 3 years	High	Developer and Town of Hay River have the capacity to manage
Crime Rates	Neutral	Negligible	Aboriginal stakeholders and communities in the Region	Aboriginal Stakeholders and most or all communities in the region	Initially 3 years	High	Developer and Territorial social services agencies have the capacity to manage
Access to Child Care	Neutral	Negligible	Aboriginal stakeholders and communities in the Region	Aboriginal Stakeholders and most or all communities in the region	Initially 3 years	High	Developer and Territorial social services agencies have the capacity to manage
Divisions within/between Communities	Neutral	Negligible	Aboriginal stakeholders and communities in the Region	Aboriginal Stakeholders and most or all communities in the region	Initially 3 years	High	Developer and Territorial social services agencies have the capacity to manage

Impact	Beneficial Adverse	Magnitude (+ -)	Range	Affected Community	Duration	Likelihood	Capacity of Developer to Manage Impact
Public Safety	Neutral	Negligible	Hay River to 42km on Hwy 5	Aboriginal Stakeholders and local communities using Hwy 5	Initially 3 years	High	Developer and DOT have the capacity to manage
Education Access and Completion Levels	Beneficial	Minor (+)	Aboriginal stakeholders and communities in the Region	Aboriginal Stakeholders and most or all communities in the region	3+ years	High	Developer and Territorial education delivery agencies have the capacity to manage
Impacts on Women, Children and Elders	Neutral	Negligible	Aboriginal stakeholders and communities in the Region	Aboriginal Stakeholders and most or all communities in the region	Initially 3 years	High	Developer and Territorial social services agencies have the capacity to manage
Physical, Mental and Cultural Health	Neutral	Negligible	Aboriginal stakeholders and communities in the Region	Aboriginal Stakeholders and most or all communities in the region	Initially 3 years	High	Developer and Territorial social services agencies have the capacity to manage
Social Services	Neutral	Negligible	Aboriginal stakeholders and communities in the Region	Aboriginal Stakeholders and most or all communities in the region	Initially 3 years	High	Social services agencies have the capacity to manage
Social and Cultural Lessons	Beneficial	Moderate (+)	Aboriginal stakeholders and communities in the Region	Aboriginal Stakeholders and most or all communities in the region	Initially 3 years	High	Developer and Territorial social services agencies have the capacity to manage

Impact	Beneficial Adverse	Magnitude (+ -)	Range	Affected Community	Duration	Likelihood	Capacity of Developer to Manage Impact
Heritage Resources	Neutral	Not applicable	Within PPPP footprint area	Aboriginal Stakeholders	Construction Phase	High	Developer has the capacity to manage
Land Use and Wildlife Harvesting	Neutral	Negligible	Within 1 km of PPPP	Aboriginal Stakeholders	Initially 3 years	high	Developer and Aboriginal Stakeholders have the capacity to manage
Protected and Withdrawn Areas	Neutral	Negligible	Pine Point area and South Slave Region	Aboriginal Stakeholders and most or all communities in the region	Initially 3 years	High	Developer has the capacity to manage
Aesthetic Resources and Wilderness Values	Neutral	Negligible	Within 1 km of PPPP	Aboriginal Stakeholders and local communities	Initially 3 years	High	Developer has the capacity to manage

8.1 Economy

The MVEIRB (2006) noted that the Review Board is required under the *MVRMA* to among other things, have regard for the economic well-being of the residents and communities of the Mackenzie Valley. On this basis, the MVEIRB specified that Tamerlane needed to assess the potential effects of the PPPP on the economies of the South Slave Region and each of the identified potentially-affected communities.

Specific consideration was to be given to the effects of the PPPP on direct and indirect employment, business opportunities and the distribution of beneficial and adverse economic impacts. In addition, Tamerlane was to describe how the PPPP would contribute to local, regional and territorial sustainable development.

Potential contributions of the Tamerlane PPPP to local, regional and territorial sustainable development will be dictated primarily by the relatively small size and short-term (~3 year) duration of the initial project. As indicated in earlier sections of the DAR, the main purpose of the PPPP is to demonstrate project economics and the success of the proposed underground mining techniques including the application of ground freezing, and the selected ore treatment methodology.

The project will also provide preliminary but relatively short-term direct and indirect employment, training, apprenticeship and business opportunities for a number of people. This will include the neighbouring First Nations, specifically Deninu Kue First Nation, K' atlodeechie First Nations and Metis interests, and the communities of Fort Resolution, Hay River, Fort Smith and possibly Enterprise.

Assuming that the results of the PPPP program are economically and technically positive, Tamerlane is hoping to pursue the longer-term and larger-scale development of a number of other known ore bodies located within the Tamerlane claims area in the Pine Point region. In total, approximately 70 million tonnes of un-mined mineral resources remain in 34 deposits that are potentially available for future mineral extraction purposes.

The intent of the initial Tamerlane PPPP is to evaluate the proposed new mining and milling techniques to deal with the technical and operational challenges.

Tamerlane is committed to providing training, employment and business opportunities associated with the development of the PPPP consistent with the scale and duration of the relatively short-term initial project. Tamerlane's commitment to training will include site-based on-the-job training and the support of a number of apprenticeships. Assuming project success and longer-term, larger-scale development in the future, these programs will be expanded as appropriate. They will be guided by sustainable development principals to generate further economic and social benefits while ensuring continued responsible environmental stewardship for the benefit of future generations.

The following sections of the assessment discuss the direct and indirect employment, business development and training opportunities anticipated to be provided by the PPPP. How these opportunities are expected to be of benefit to the Aboriginal stakeholders and communities of the Pine Point region and the economy of the southern NWT will also be discussed.

8.1.1 Direct and Indirect Employment

Recent GNWT Bureau of Statistics (2005) data reported in News/North (2006) indicate that people working in the NWT remain the highest paid in the country. The average weekly NWT wage hit $977.72 in January 2006, up from $933.94 one year earlier. The Canadian average weekly wage was $744.11.

Health and social services professionals were the highest paid at $1,192.67 on average each week. Goods producing industries such as mining and oil and gas were second at $1,127.18 weekly. At 76.1 %, the NWT had the second highest workforce participation rate in Canada in 2005.

Only 1,300 of the 23,900 strong NWT labour force could not find work in 2003, down from 1,900 residents who did not have a job in 2001. The territory's 5.4 % unemployment rate was lower than the Canadian average of 6.8 %. In total, 51.1 % of the NWT's workforce worked for the private sector in 2005, up 5.2 % from 2001. The public sector provided 39.6 % of jobs, while 8.8 % of people were self-employed.

Table 8.1-1 summarizes current local population and employment statistics for the communities of the Pine Point region, including the Hay River Reserve.

Table 8.1-1
Population and Employment Statistics for Pine Point Region Communities

Statistical Parameter	Enterprise	Town of Hay River	Ft. Resolution	Hay River Reserve	Ft. Smith	NWT Totals
Population in 2005	91	3,876	534	299	2,385	42,982
Population in 2001	66	3,724	569	290	2,328	40,822
Aboriginal identity population in 2005	-	1746	469	299	1,413	21,413
Non-Aboriginal population in 2005	-	2,079	65	0	972	21,569
2004 Labour Force Participation rate (%)	78.1	77.2	54.7	60.6	68.2	75.6
2004 Employment rate (%)	67.2	69.6	44.6	42.7	62.6	67.8
2004 Unemployment rate (%)	14	9.9	18.5	28.8	8.3	10.4

Source: GNWT Bureau of Statistics (2006) - http://www.stats.gov.nt.ca/Profile/Sum_ofNWTCommunity%20Stats.pdf

Tamerlane is committed to employing northern and Aboriginal residents to the extent possible during the relatively short-term period of the initial PPPP. Tamerlane anticipates that a considerable proportion of the workforce required for the one-year PPPP construction phase and the 12 to 15 month mining operations phase can be filled by residents of the South Slave area.

As noted in Table 8.1-2, approximately 65 jobs/positions are estimated to be available for the one-year construction phase of the PPPP. For the anticipated 10-15 months of PPPP operation, approximately 131 jobs/positions are projected to be available. These numbers include employment generated through the third-party business contract opportunities needed to service the project. Assuming reclamation of the PPPP site commences immediately following completion of the operations phase, approximately 14 jobs/positions will be available during the reclamation phase.

Table 8.1-2
Anticipated PPPP Employment Opportunities

	Contract Opportunities/ Positions	Skilled labour	Unskilled Labour	Construction phase	Operation Phase	Reclamation
	Hauling	10			10	1
	Lt. duty delivery		2	2	2	
	Fuel delivery	2		2	2	
	Lubricant delivery	1		1	1	
	Bus service	2		1	2	
	Waste disposal		1	1	1	
	Road maintenance	1		1	1	1
	Construction Manpower	2	2	4		4
	Janitorial		1	1	1	1
Subtotal		**18**	**6**	**13**	**20**	**7**
ADMIN	General Manager			1	1	
	HR				1	
	Training	1		1	1	
	Accounting	2			2	
	Payroll Administrator	1		1	1	
	Clerk/Switchboard		1		1	
	Purchasing Agent	1			1	
	Warehouse	2		1	2	
	Health & Safety	1		1	1	
	Security/First Aid	1		1	1	
	Environmental Manager	1		1	1	1
Subtotal		**10**	**1**	**7**	**13**	**1**
DMS	Superintendent	1		1		
	Metallurgist	1		1		
	Shift Supervisor	4			4	
	DMS Operator	4			4	
	Helpers		4		4	2
	Mechanics	4		1	4	2
	Maint. Apprentice		3	1	3	
	Electricians	4		1	4	1
Subtotal		**18**	**7**	**5**	**23**	**5**

	Contract Opportunities/ Positions	Skilled labour	Unskilled Labour	Construction phase	Operation Phase	Reclamation
MINE	Superintendent	1			1	1
	General Supervisor	1			1	
	Engineer	2		1	2	
	Geologist	1			1	
	Surveyors/Tech.	1	1		2	
	Shift Supervisor	4			2	
	Maint. Superintendent	1			1	
	Maint. Supervisor	4		2	4	
	Maint. Planner	1			1	
	Drilling	16		8	8	
	Blasting	8		4	4	
	Mucking	12		6	6	
	Scaling	4		2	2	
	Bolting	4		2	2	
	Shotcrete	6		3	3	
	Backfill	4		2	2	
	Laborers/Sup. Equip	6		3	3	
	Mechanics	16		2	14	
	Maint. Support		8	2	8	
	Maint. Apprentice		4	2	4	
	Electricians	4		1	4	
Subtotal		**96**	**13**	**40**	**75**	**1**
TOTALS		**142**	**27**	**65**	**131**	**14**

As also noted in Table 8.1-2, the majority of the available jobs/positions are expected to require skilled or experienced labour. Critical components of the project, such as freeze curtain installation, head frame and mine shaft construction, underground mining and DMS plant operation will initially require specialist technical expertise to efficiently implement project construction and operation.

The majority of participants in the Traditional Knowledge Study interviews said that they thought job opportunities would result from the project. These participants indicated that project-related opportunities are desired and would be beneficial for the Fort Resolution and Hay River communities. Within this group, many participants also noted that they thought the proposed project would generate economic development and increase revenues for community businesses.

Critical to increasing the local participation rate will be Tamerlane's training initiatives. Tamerlane is committed to training during the short duration of the PPPP. In developing its training programs, a priority of Tamerlane's Human Resources Management Plan will be to focus on providing pre-employment training opportunities. The application of this strategy is expected to contribute to increased opportunities for stakeholders to gain access to jobs and to facilitate employment. The Tamerlane program will initially be designed to fill apprenticeship and technological occupations. In addition, all PPPP contractors will also be required to adhere to Tamerlane's goal of maximizing Northern and Aboriginal employment.

Tamerlane will consult and collaborate with local Aboriginal interests and communities to encourage effective development and delivery of the training programs. The Government of Canada and the Government of the Northwest Territories are also committed to enhancing training opportunities through the support of a number of initiatives. These include the provision of training allowances and support services, career counselling, and training program delivery.

The federal government has recognized that certain areas of the country are experiencing significant demands for skilled labour and that many of these areas include Aboriginal communities which can benefit from the potential employment opportunities.

Consequently, the federal government, through Human Resources and Skills Canada, launched the Aboriginal Skills and Employment Partnership (ASEP) program in 2004. ASEP is a partnership of Aboriginal groups, businesses and governments.

The purpose of ASEP is to secure and increase Aboriginal participation in economic developments in and near their communities. The NWT Mine Training Society administers ASEP funding in the NWT. ASEP's overall objective is sustainable employment for Aboriginal people in economic activities, leading to lasting benefits for Aboriginal communities. Tamerlane anticipates receiving support from ASEP for its training initiatives.

Another priority of Tamerlane's Human Resources Management Plan will be to focus training efforts on site-based programs to train northerners on specific equipment for safe and productive employment. Anticipated training areas will be related to:

- construction equipment operation and maintenance
- mining equipment operation and maintenance
- freeze curtain installation, operation and maintenance
- process plant operation and maintenance
- administration functions
- safety systems and safe work practices
- first aid and emergency response
- environmental and waste management

As previously indicated, Tamerlane is committed to employing northern and Aboriginal residents to the extent possible during the relatively short-term period of the initial PPPP. Tamerlane anticipates that a considerable proportion of the workforce required for the one-year PPPP construction phase and the 12 to 15 month mining operations phase can be filled by residents of the South Slave Region.

Tamerlane has committed to treating all key stakeholder groups as fairly as possible within the limits of their capacity to participate in various aspects of the PPPP, including those associated with direct and indirect employment.

Tamerlane believes that with the effective implementation of the company's Human Resources Management Plan and the support of the federal and territorial human resources management agencies, the PPPP will generate a considerable number of employment and training opportunities for residents of the South Slave Region.

8.1.2 Business Opportunities

Tamerlane recognizes the role that it can play in creating new business opportunities, which if continued, can lead to increased capacity for the business community, particularly in the southern NWT. To assist in raising local northern business capacity, Tamerlane will outsource its workforce requirements to northern businesses as and when appropriate.

Through these contract opportunities, northern firms will gain valuable direct and indirect experience and will be better positioned to grow their business into other areas (not just mining) to serve the NWT economy. Tamerlane will work closely with all contractors to ensure that their business policies and procedures are aligned with those of the company.

Table 8.1-3 provides a summary of the preliminary third-party contract services and associated estimated employment requirements anticipated to be required to support the construction, operations and reclamation phases of the PPPP.

Table 8.1-3
Preliminary Anticipated PPPP Third-Party Contract Opportunities

Contract Opportunities	Skilled labour	Unskilled Labour	Construction phase	Operation Phase	Reclamation
Hauling	10			10	1
Lt. duty delivery		2	2	2	
Fuel delivery	2		2	2	
Lubricant delivery	1		1	1	
Bus service	2		1	2	
Waste Disposal		1	1	1	
Road Maintenance	1		1	1	1
Construction Manpower	2	2	4		4
Janitorial		1	1	1	1
Contract Employment Total	**18**	**6**	**13**	**20**	**7**

In considering contract bids, Tamerlane will prioritize Aboriginal and northern (South Slave) businesses, and will take a number of measures to maximize project-related business opportunities. These measures will include:

- Preparing an annual business opportunities forecast to identify foreseeable procurement requirements for mining equipment, operations and maintenance support services.
- Providing technical support and assistance in accessing sources of commercial capital.
- Working closely with local First Nations interests and communities to co-operatively achieve success in creating longer-term business and employment opportunities and in increasing business capacity.
- Identifying project components at all stages of development and operations that should be targets for a northern business development strategy.
- Facilitating subcontracting opportunities for northern businesses; and identifying possible opportunities for joint ventures with Aboriginal and northern businesses.

As previously indicated, Tamerlane is committed to providing business opportunities and associated training and employment consistent with the scale and duration of the relatively short-term initial PPPP. Assuming success of the initial PPPP and longer-term, larger-scale development in the future, its business development programs and the opportunities they are anticipated to provide will be expanded as appropriate.

Tamerlane has committed to treating all key stakeholder groups as fairly as possible within the limits of their capacity to participate in various aspects of the PPPP, including those associated with business opportunities.

Several of the Traditional Knowledge Study participants indicated that project-related business opportunities are desired and would be beneficial for the Fort Resolution and Hay River communities. Within this group, some participants also noted that they thought the proposed project would generate economic development and increase revenues for community businesses.

Tamerlane believes that with the effective implementation of the company's business development strategies and the support of the federal and territorial business development agencies, the PPPP will generate a considerable number of attractive third-party service contract opportunities for existing or potentially new businesses in the South Slave Region.

The generation of the anticipated business opportunities are expected to initially contribute economic and social benefits, primarily to the South Slave Region and will hopefully contribute to future more sustainable development in the Region over the longer term.

8.1.3 Distribution of Beneficial and Adverse Economic Impacts

In responding to this section of the MVEIRB Terms of Reference, Tamerlane considered long and hard the information that the Review Board was requesting be provided. In doing so, Tamerlane determined that most of the requested information is provided in other sections of the DAR. Accordingly, in the discussion which follows, reference is made as appropriate to the relevant sections of the DAR.

Historic and current traffic information and anticipated future traffic projections are discussed in Sections 4.4 and 7.5.2. Implications for public safety are addressed in Section 8.2.1.8. The lead/zinc concentrate trucking operation is expected to generate employment and business opportunities during the initial relatively short-term (10-15 months) duration of the PPPP for one or more local trucking contractors and their employees. These contracts and the resulting benefits are expected to generate positive economic implications for the short duration of the PPPP. Success of the PPPP can be expected to lead to further and potentially expanded economic opportunities as referenced in various other sections of Section 8.0.

Potential PPPP-related employment and training opportunities are discussed in Section 8.1.1. Anticipated business development opportunities are discussed in Section 8.1.2.

As previously indicated, the potential employment, training and business opportunities generated by the Tamerlane PPPP will be dictated primarily by the relatively small size and short-term (~3 year) duration of the initial project.

The PPPP will provide preliminary but relatively short-term direct and indirect employment, training, apprenticeship and business opportunities for a number of people. Beneficiaries will include the neighbouring First Nations, specifically Deninu Kue First Nation, K' atlodeechie First Nations and Metis interests, and the communities of Fort Resolution, Hay River, Fort Smith and possibly Enterprise.

Detailed discussion of potential economic opportunities and benefits and the possible distribution of such opportunities with the key stakeholder groups will occur pending receipt of positive recommendations arising from the Review Board.

Tamerlane is committed to treating all key stakeholder groups as fairly as possible within the limits of their capacity to participate in various aspects of the PPPP, including the sharing of potential benefits and opportunities. Tamerlane believes that the economic effects associated with construction and operation of the PPPP will be of a positive (beneficial) nature.

Tamerlane does not anticipate that any potentially negative (adverse) economic effects of consequence will occur as a result of the development of the PPPP. Tamerlane also believes that development of the PPPP will not affect ongoing political and social development, cultural values, traditions and language in the adjacent communities.

8.1.4 Contribution to Local, Regional and Territorial Sustainable Development

Potential contributions of the Tamerlane PPPP to local, regional and territorial sustainable development are dictated primarily by the relatively small size and short-term (~3 year) duration of the initial project. As indicated in earlier sections of the DAR, the main purpose of the PPPP is to demonstrate project economics and the success of the proposed underground mining techniques including the application of ground freezing, and the selected ore treatment methodology.

Assuming that the results of the PPPP program are economically and technically positive, Tamerlane is hoping to pursue the longer term and larger-scale development of a number of other known ore bodies located within the Tamerlane claims area in the Pine Point region. In total, approximately 70 million tonnes of un-mined mineral resources remain in 34 deposits that are potentially available for future mineral extraction purposes.

These other deposits were not developed previously for a variety of reasons including the following:

- the haulage distance to the mill
- the cost of supporting the town of Pine Point
- increased depths of deposits
- excessive groundwater flows to permit conventional open pit mining.

The intent of the initial Tamerlane PPPP is to evaluate the proposed new mining and milling techniques to deal with these technical and operational challenges. The project will also provide preliminary but relatively short-term direct and indirect employment, training, and business opportunities for a number of people in the Pine Point region. These will include the neighbouring First Nations, specifically Deninu Kue First Nation, Katlodeechie First Nations and Metis interests, and the communities of Fort Resolution, Hay River, Fort Smith and possibly Enterprise.

Tamerlane sincerely hopes that positive results from the Tamerlane PPPP will lead to the development of a new era of mining in the Pine Point region. Continued development of the remaining mineral deposits have the potential to contribute to a more economically and environmentally sustainable future for the economies of the local area, the region and the southern portion of the Northwest Territories.

8.2 Society and Culture

The MVEIRB Terms of Reference (MVEIRB 2006) noted that the MVRMA requires the identification and mitigation of adverse impacts on the social and cultural environment as part of the EA process. This includes direct and indirect effects of the PPPP itself, including the relationship between PPPP-related economic changes and social and cultural outcomes.

Participants in the Fort Resolution Traditional Knowledge Study (Tamerlane 2006a, b) were asked if they foresaw social effects resulting from the proposed project. Each participant had at least one response.

Seven of the 17 participants generally indicated that they did not foresee any social effects resulting from the project. Within this group, several noted that adverse effects such as drugs and alcohol already exist as a result of the historic Pine Point Mine. Four other participants noted that more money and outside influence may result in more drugs, alcohol and disease in the community. Participants within this group said that they did not want to see a "repeat" of Pine Point in terms of drugs, alcohol and negative outsider influence on the community's young people.

Three participants cited positive financial social effects. Within this group, one person indicated that more money in the community could create development opportunities. Another individual noted that any project-related financial benefits should be put into the community and not individual people's pockets. Three participants said that project-related jobs would result in positive social effects. Within this group, individuals noted that they would like to see equal opportunities for jobs, and that employment would create opportunities for the community's young people. One participant cited the area's water quality as a social effect. This individual said that it was important to understand how the project could potentially impact surrounding water bodies.

Participants in the Hay River Traditional Knowledge Study (Tamerlane 2006a, b) were also asked if they foresaw social effects resulting from the proposed project. Once again, each participant had at least one response.

Six participants noted that more money and outside influence may result in more drugs, alcohol and/or crime in the community. Within this group one participant noted that these effects already exist in the community as a result of the historic Pine Point Mine.

Four participants cited population-related effects. These participants expressed concern that project-related population growth would increase the cost of living and limit the community's access to Hay River resources. Within this group, one individual noted that an increase in population may result in more doctors coming to the community. Another participant said that any project-related social effects would depend on the people "brought in" to do the work. This individual noted that in-coming people's level of respect for the area would be a critical determining factor.

Three participants cited positive financial social effects. Participants in this group indicated that they thought the project would generate jobs, economic development and increase revenues for existing Hay River businesses.

Two participants generally indicated that they did not foresee any social effects resulting from the project. Within this group, participants noted that adverse effects such as drugs and alcohol are already present in the community. One other individual said that increased traffic associated with the project would be bad for the community.

The following sections of the assessment address the various components/indicators identified in the MVEIRB Terms of Reference.

8.2.1 Community and Population Health

Components/indicators of community and population health to be considered in the socio-economic assessment include:

- Population in- and out-migration
- Alcohol and drug access and use
- Access to health care
- Housing pressures
- Crime rates
- Access to child care
- Increased divisions within or between communities
- Public safety, especially in regard to the use of Territorial Highway 5 west of the PPPP
- Educational access and education completion levels
- Effects on vulnerable populations – women, children and elders.

8.2.1.1 Population In- and Out-Migration

As previously indicated in Section 8.1.1, Tamerlane is committed to employing northern and Aboriginal residents to the extent possible during the relatively short-term period of the initial PPPP. Tamerlane anticipates that a considerable proportion of the workforce required for the one-year PPPP construction phase and the 12 to 15 month mining operations phase can be filled by residents of the South Slave Region.

The communities in the Pine Point region are all located within relatively easy driving distance from the PPPP site. Tamerlane anticipates that all local employees or contractors hired for the PPPP project will be commuting from their existing communities on a daily basis.

Employees and contractors brought in from the south are expected to find suitable short-term accommodation as necessary in Hay River or Fort Resolution. Recent communications between Tamerlane and the Towns of Hay River and Fort Resolution indicate that sufficient housing exists to accommodate southern employees and contractors needed for the construction, operation and eventual closure of the PPPP.

The Fort Resolution Traditional Knowledge participants did not express much concern about this issue. However, four participants in the Hay River Traditional Knowledge study expressed concern that project-related population growth would increase the cost of living and limit the community's access to Hay River resources. Within this group, one individual noted that an increase in population may result in more doctors coming to the community. Another participant said that any project-related social effects would depend on the people "brought in" to do the work. This individual noted that in-coming people's level of respect for the area would be a critical determining factor.

Given the relatively small size and short-term nature of the PPPP and the close proximity of the local communities to the PPPP site, Tamerlane believes that the construction, operation and closure of the PPPP will not have a significant impact on population in- and out- migration in the South Slave Region.

8.2.1.2 Alcohol and Drug Access and Use

Tamerlane is committed to maintaining a safe, healthy and productive work environment for all employees, contractors, visitors and guests. Every employee and contractor has a role to play in meeting this commitment. It is the responsibility of all employees and contractors to report for work in fit condition and to work safely throughout their work period. To this end, Tamerlane has zero tolerance for the possession and/or use of drugs or alcohol at any Tamerlane project or work location.

Tamerlane also understands that alcohol and/or drug dependencies are preventable and treatable conditions. As part of Tamerlane's policy regarding these matters, employee privacy will be respected.

Tamerlane is aware that problems related to alcohol and drug access and use in many communities throughout the NWT, including the South Slave Region remain a continuing source of concern to the affected communities and the social services agencies (GNWT Bureau of Statistics 2006 – Appendix D).

Seven of the 17 participants in the Fort Resolution Traditional Knowledg study noted that adverse effects such as drugs and alcohol already exist as a result of the historic Pine Point Mine. Four other participants noted that more money and outside influence may result in more drugs, alcohol and disease in the community. Participants within this group said that they did not want to see a "repeat" of Pine Point in terms of drugs, alcohol and negative outsider influence on the community's young people.

Six of the 12 participants in the Hay River Traditional Knowledge Study noted that more money and outside influence may result in more drugs, alcohol and/or crime in the community. Within this group one participant noted that these effects already exist in the community as a result of the historic Pine Point Mine.

Tamerlane will provide support consistent with company policy to employees and their immediate families in dealing with personal health and well-being issues including issues related to alcohol and drug use. However, Tamerlane cannot control ongoing issues related to these matters within the communities of the South Slave Region and will defer to the social services authorities of the respective communities and region to assist with managing these ongoing issues.

Given the relatively small size and short-term nature of the PPPP and Tamerlane's strong commitment to maintaining a safe and healthy environment for its employees and contractors, Tamerlane believes that the construction, operation and closure of the PPPP will not have a significant impact on issues related to alcohol and drug access and use in the communities of the South Slave Region.

8.2.1.3 Access to Health Care

The H.H. Williams Memorial Hospital in Hay River, the Fort Smith Health Centre in Fort Smith and Stanton Territorial Hospital in Yellowknife provide the key medical and health care services for the communities and residents of the South Slave Region. The Fort Resolution Health Centre and the Hay River Reserve Health Station provide initial and routine medical and health care services to the residents of Fort Resolution and the Hay River Reserve, respectively.

Tamerlane is committed to maintaining a safe, healthy and productive work environment for all employees, contractors, visitors and guests. It is the responsibility of all employees and contractors to report for work in fit condition and to work safely throughout their work period. Tamerlane will also provide support consistent with company policy to employees and their immediate families in dealing with personal health and well-being issues.

Tamerlane considers maintaining safe and healthy working conditions and preventing accidents to be integral to the operation and the administration of its business. Each Employee has a responsibility to prevent accidents by maintaining a healthy work environment, by following safe work procedures and practices, and by using all prescribed protective equipment. Accident prevention and effective performance go hand in hand.

The Fort Resolution Traditional Knowledge participants did not express much concern about this issue. Four participants in the Hay River Traditional Knowledge study expressed concern that project-related population growth would limit the community's access to Hay River resources. Within this group, one individual noted that an increase in population may conversely result in more doctors coming to the community.

Given the relatively small size and short-term nature of the PPPP and Tamerlane's strong commitment to maintaining a safe and healthy environment for its employees and contractors, Tamerlane believes that the construction, operation and closure of the PPPP will not have a significant impact on issues related to health care access in the communities of the South Slave Region.

8.2.1.4 Housing Pressures

As previously indicated, Tamerlane is committed to employing northern and Aboriginal residents to the extent possible during the relatively short-term period of the initial PPPP. Tamerlane anticipates that a considerable proportion of the workforce required for the one-year PPPP construction phase and the 12 to 15 month mining operations phase can be filled by residents of the South Slave Region.

The communities in the Pine Point region are all located within relatively easy driving distance from the PPPP site. Tamerlane anticipates that all local employees or contractors hired for the PPPP project will be commuting from their existing communities on a daily basis.

Employees and contractors brought in from the south are expected to find suitable short-term accommodation as necessary, primarily in Hay River. Recent communications between Tamerlane and the Town of Hay River indicate that sufficient housing exists in Hay River to accommodate southern employees and contractors needed for the construction, operation and eventual closure of the PPPP.

The Fort Resolution Traditional Knowledge participants did not express much concern about this issue. Four of the Hay River Traditional Knowledge study participants expressed concern about population-related effects. These participants expressed concern that project-related population growth would increase the cost of living (including housing) and limit the community's access to Hay River resources.

Given the relatively small size and short-term nature of the PPPP and the close proximity of the local communities to the PPPP site, Tamerlane believes that the construction, operation and closure of the PPPP will not have a significant impact on housing pressures in the South Slave Region.

8.2.1.5 Crime Rates

Tamerlane is aware that incidents of violent crimes, property crimes and other crimes related to the criminal code occur throughout Canada, as well as in the communities of the South Slave Region. GNWT Bureau of Statistics (2006) data (Appendix D) indicate that during the period 2000 to 2004, crime rates for the three primary reported categories typically increased on an annual basis in all of the South Slave communities for which data were available.

Tamerlane recognizes that the creation of jobs, the generation of money and income, and the resultant purchase of goods may potentially indirectly influence current crime rates in the South Slave communities. As previously indicated, for its employees and families, Tamerlane will provide support consistent with company policy in dealing with personal health and well-being issues.

However, Tamerlane cannot control ongoing issues related to the incidents of crime that are likely to continue to occur in the communities of the South Slave Region and elsewhere in the NWT. The company will therefore defer to the existing social services authorities and law enforcement agency (RCMP) present in each of the South Slave communities to assist with managing this ongoing concern.

Many participants in both the Fort Resolution and Hay River Traditional Knowledge studies expressed concern about potential increases in crime. Participants noted that more money and outside influence may result in more drugs, alcohol and/or crime in the community. Several participants noted that these effects already exist in the community as a result of the historic Pine Point Mine.

Given the relatively small size and short-term nature of the PPPP and Tamerlane's strong commitment to maintaining a safe and healthy environment for its employees and contractors, Tamerlane believes that the construction, operation and closure of the PPPP will not have a significant impact on crime rates in the communities of the South Slave Region.

8.2.1.6 Access to Child Care

Tamerlane is aware through the company's participation in the MVEIRB scoping sessions that some community participants were concerned about possible access to child care in the event that they became employed by the PPPP.

As previously indicated, Tamerlane is committed to employing northern and Aboriginal residents to the extent possible during the relatively short-term period of the initial PPPP. Tamerlane anticipates that a considerable proportion of the workforce required for the one-year PPPP construction phase and the 12 to 15 month mining operations phase can be filled by residents of the South Slave Region.

The communities in the Pine Point region are all located within relatively easy driving distance of the PPPP site. Tamerlane anticipates that all local employees or contractors hired for the PPPP project will be commuting from their existing communities on a daily basis. Tamerlane also anticipates that most employees with child care needs during work periods will be able to address those needs within their community through their existing family and/or social support networks.

As also indicated, Tamerlane will provide support consistent with company policy to employees and their families in dealing with personal health and well-being issues, including possible concerns related to child care. Through the provision of such support as may be necessary, Tamerlane believes that child care-related concerns for specific employees who may be facing this problem can be effectively addressed.

8.2.1.7 *Increased Divisions Within or Between Communities*

The potential for increasing existing divisions that exist within or between key stakeholder groups (First Nations and communities) in the Pine Point area is a concern recognized by Tamerlane. Through its regular dialogue and consultations with the local First Nations and the communities of Hay River and Fort Resolution, Tamerlane has become aware that each of these key stakeholder groups share common views on a number of interests and aspirations, but differ on, and at times, compete with each other on certain items.

Divisions within or between stakeholder groups is a common circumstance encountered in other areas of the North and indeed throughout Canada. Potentially affected stakeholders in a proposed development commonly share similar views on matters such as environmental and cultural values protection. However, at the same time, they may compete with each other on other aspects of a proposed development such as the sharing of employment and business opportunities or other perceived benefits.

As detailed in Section 6.0 of the DAR, Tamerlane has been making continuous and concerted efforts to engage and consult with potentially affected First Nations and the nearby communities. Since about mid-August, 2004, Tamerlane has been discussing all aspects of the proposed project, including potential benefits and opportunities associated with the PPPP, with interested stakeholders. To date, all issues have been dealt with in an open, honest, transparent and mutually agreeable manner.

Potential benefits and opportunities for key stakeholders associated with the Tamerlane PPPP will be dictated primarily by the relatively small size and short-term (~3 year) duration of the initial project. As indicated in earlier sections of the DAR, the main purpose of the PPPP is to demonstrate project economics and the success of the proposed underground mining techniques including the application of ground freezing, and the selected ore treatment methodology.

The project will provide preliminary, but relatively short-term direct and indirect employment, training, apprenticeship and business opportunities for a number of people. Beneficiaries will include the neighbouring First Nations, specifically Deninu Kue First Nation, K' atlodeechie First Nations and Metis interests, and the communities of Fort Resolution, Hay River, Fort Smith and possibly Enterprise.

Assuming that the results of the PPPP program are economically and technically positive, Tamerlane is hoping to pursue the longer-term and larger-scale development of a number of other known ore bodies located within the Tamerlane claims area in the Pine Point region. Should such developments unfold, the potential benefits and business opportunities are anticipated to expand, guided by sustainable development principals to generate further economic and social benefits while ensuring continued responsible environmental stewardship for the benefit of future generations.

Tamerlane has committed to treating all key stakeholder groups as fairly as possible within the limits of their capacity to participate in various aspects of the PPPP, including the sharing of potential benefits and opportunities. Tamerlane is optimistic that the continued implementation of this approach will contribute to minimizing any divisions that may or do currently exist within and between the key stakeholder groups.

8.2.1.8 Public Safety

Tamerlane is committed to maintaining a safe, healthy and productive work environment for all employees, contractors, visitors and guests. Tamerlane considers maintaining safe and healthy working conditions and preventing accidents to be integral to the operation and the administration of its business. Each employee has a responsibility to prevent accidents by maintaining a healthy work environment, by following safe work procedures and practices, and by using all prescribed protective equipment. Accident prevention and effective performance go hand in hand.

Tamerlane is equally committed to the safety of the general public that will interact with PPPP-related activities. Tamerlane understands and appreciates concerns voiced by members of the general public during the MVEIRB scoping sessions and during the Traditional Knowledge interviews (Tamerlane 2006b, c) regarding risks to public safety associated with increased PPPP-related traffic using Highway 5 enroute Hay River and the CNR railhead. In particular, a number of participants in both Traditional Knowledge studies indicated that increased traffic associated with the project may damage the roads and/or pose a hazard to drivers.

As previously discussed in Sections 4.4 and 7.5.2, Territorial Highway 5 is classified as an all-weather highway by the GNWT Department of Transportation (DOT), and the 42 km stretch of highway between Hay River and the Tamerlane PPPP area is paved. The highway is rated for year-round use by commercial vehicles with no load restrictions for haul truck traffic. Throughout the operational life of the historic Pine Point Mine (1964 to 1987), this highway was used for all of the commercial trucking and hauling activities associated with this large-scale mine development. Thus the historic traffic volumes and weights experienced on this highway were considerably higher that those occurring at this time or in the future as a result of development of the Tamerlane PPPP.

The most recent available DOT (2005) statistics indicate that an estimated average of 170 vehicles/day were recorded as travelling on Highway 5 in 2003, as measured at counter 5-19, located 19 km east of the Highway 2 and 5 intersection. At counter 5-1, located 1 km east of the Highway 2 & 5 intersection, that number increased to an average of 660 vehicles/day, reflecting daily traffic to and from the Hay River Reserve.

The Tamerlane project plans to use approximately 10 trucks to transport the lead/zinc product to the Hay River railhead. The typical average number of truck trips from the PPPP site to Hay River will be 50-65 return trips per day over the course of a 12 hour workday. This traffic will add to the existing traffic load using the Highway.

PPPP-related traffic will be complying with all DOT traffic regulations. Tamerlane will reinforce this expectation with all employees and contractors involved in travelling along the highway or any other roads in the Pine Point area. In accordance with Tamerlane policy, PPPP-related traffic will also be required to give the right-of-way to any wildlife that such activities may encounter.

Tamerlane fully recognizes its responsibility in ensuring the safety of the general public in relation to any and all of its PPPP-related activities. With strict adherence to the traffic regulations and the company’s safety policies, Tamerlane is confident that the safety of the general public will be maintained.

8.2.1.9 Educational Access and Education Completion Levels

As previously noted in Section 3.0 of this DAR, each of the communities in the Pine Point area offer kindergarten to Grade 12 schooling. NWT Bureau of Statistics data (GNWT 2006) (Appendix D) indicate that the percent of students completing Grade 12 and receiving high school diplomas in the NWT has been steadily increasing, from 59.9 % of students in 1991, to 67.5 % of students in 2004. Similarly, in the South Slave Region, the percent of students completing Grade 12 and receiving high school diplomas has increased from 59.0 % in 1999, to 67.7 % in 2004.

This improving trend is considered to be very encouraging and important, as the NWT Bureau of Statistics also reports that for the NWT, the 2004 employment rate for persons with a high school diploma or greater was 81.7 %, compared to only 38.8 % for persons with less than a high school diploma. For the South Slave Region, the comparable values for 2004 employment rates were 75.8 % for persons with a high school diploma or greater and 40.7 % for persons with less than a high school diploma.

Beyond High School, Aurora College (2006) continues to offer a wide variety career-oriented certificate and diploma programs designed to meet the unique employment needs of Canada's North, particularly the Northwest Territories. (http://www.canadian-universities.net/Community-Colleges/Aurora_College_-_Thebacha_Campus.html)

These programs have beeen limited to developed from information, supplied by business, government, and labour, regarding current economic trends in order to educate and train students in the skills necessary to be successful in the modern economy. The College also offers apprenticeships in Carpentry, Electrical, Heavy Duty Mechanics, and Housing Maintainer; for the duration of an apprenticeship program, the student will receive on the job experience mixed with intervals of 6-8 weeks of on-campus technical training.

In addition, the College, through its Basic Adult Education program, provides adult students with the opportunity to acquire basic educational skills, such as literacy or high school credits, and/or attain the necessary prerequisites to enter a college program.

Tamerlane is committed to employing as many persons as it can from the limited, locally available labour pool. The criteria for employee selection will recognize the value of years of experience in the work world. However, it needs to be emphasized that particularly for the more skilled positions to be offered by the PPPP, completion of Grade 12 will typically be a minimum requirement.

The Fort Resolution Traditional Knowledge participants did not express much concern about this issue. Four of the Hay River Traditional Knowledge study participants expressed concern about population-related effects. These participants expressed concern that project-related population growth would limit the community's access to Hay River resources (including schools).

Although the initial Tamerlane PPPP will be of a relatively small size and short-term nature, the project will offer a number of employment and business opportunities. Residents of the Pine Point area and South Slave Region with Grade 12 and/or post-secondary education will be in an advantageous position to take advantage of these opportunities. On this basis, Tamerlane believes that the construction, operation and closure of the PPPP may provide further incentive for people to stay in school, complete Grade 12 and perhaps even pursue post-secondary education through programs such as those offered at the nearby Thebacha Campus of Aurora College.

8.2.1.10 Effects on Vulnerable Populations – Women, Children and Elders

Tamerlane is aware through the company's participation in the MVEIRB scoping sessions and during the Traditional Knowledge interviews (Tamerlane 2006b, c), that some community participants were concerned about possible effects of the PPPP on the health and well-being of women, children and elders with family ties to community residents who may become employed by the PPPP.

Employment and business opportunities generated by the PPPP will provide significant sources of income for prospective employees and contractors during the approximate 3-year life of the initial project. During the life of the PPPP, Tamerlane will encourage its employees and contractors to direct income and benefits generated from their employer to positive uses for themselves, their spouses, children and family elders.

As previously indicated, maintaining or enhancing the health and well-being of PPPP workers and their families is a key consideration for Tamerlane. Tamerlane is committed to maintaining a safe, healthy and productive work environment for all employees and contractors. As part of this commitment, Tamerlane will provide support consistent with company policy to employees and their immediate families in dealing with personal health and well-being issues, including, to the extent possible, issues related to the health and well-being of their families.

Tamerlane will encourage local employees and contractors to consider and assist in dealing with the personal health and well-being needs of their spouses, children and family elders. Tamerlane also anticipates that other family members and existing community-based social support networks will continue to be available to help to address such needs should they arise.

Tamerlane anticipates that all local employees or contractors hired for the PPPP project will be commuting from their existing communities on a daily basis. Although community residents working at the PPPP project will be away from their homes and families during the work days, they will return to their homes after each work day. This will give the employees the opportunity to assist in taking care of any family issues that may arise.

Tamerlane believes that daily commuting is preferable to establishing a camp at the PPPP site to accommodate personnel for extended shift work periods. Having an accommodations camp would result in local PPPP employees and contractors being away from their home communities and families for 2 to 3 weeks at a time. This, in turn would make it more difficult for these personnel to assist in taking care of important family-related health and well-being issues.

Tamerlane will provide support consistent with company policy to employees and their families in dealing with personal health and well-being issues. Through the provision of such support as may be necessary, Tamerlane believes that the health and well-being PPPP workers and their immediate families, including their spouses, children and elders can be maintained and hopefully enhanced.

8.2.2 Physical, Mental and Cultural Health

Maintaining or enhancing the physical, mental and cultural health and well-being of mine workers and their families is a key consideration for Tamerlane. As previously indicated, Tamerlane is committed to maintaining a safe, healthy and productive work environment for all employees and contractors. As part of this commitment, Tamerlane will provide support consistent with company policy to employees and their immediate families in dealing with personal health and well-being issues, including, to the extent possible, issues related to cultural health.

Through the provision of such support as may be necessary, Tamerlane believes that the physical, mental and cultural health and well-being of PPPP workers and their families can be maintained and hopefully enhanced.

8.2.3 Social Services

Currently, the existing social services in each of the communities located near the PPPP site provide very important support for community-based health and wellness programs to serve the needs of their respective community members.

As previously indicated, maintaining or enhancing the health and well-being of PPPP workers and their families is a key consideration for Tamerlane. Tamerlane is committed to maintaining a safe, healthy and productive work environment for all employees and contractors. As part of this commitment, Tamerlane will provide support consistent with company policy to employees and their immediate families in dealing with personal health and well-being issues, including, to the extent possible, issues related to the health and well-being of their families.

The Fort Resolution Traditional Knowledge participants did not express much concern about this issue. Four of the Hay River Traditional Knowledge study participants expressed concern about population-related effects. These participants expressed concern that project-related population growth would limit the community's access to Hay River resources.

Given the relatively small size and short-term nature of the PPPP and Tamerlane's strong commitment to the health and well-being its employees, contractors and their families, , Tamerlane believes that the construction, operation and closure of the PPPP will not have a significant impact on the existing social services in the communities of the South Slave Region.

8.2.4 Social and Cultural Lessons Learned

The MVEIRB Terms of Reference (MVEIRB 2006) requested that some discussion be provided on:

> *"lessons learned from the social and cultural impacts of previous mine developments in the NWT and the North and how they have been incorporated into the impact identification, prediction and mitigation for the PPPP"*.

Tamerlane is fully aware that historically, the resource extraction industry in the North, as well as elsewhere in Canada, has at times had a less that stellar record of social and cultural performance. Participants in both the Traditional Knowledge studies indicated that they did not want to see a "repeat" of Pine Point in terms of drugs, alcohol and negative outsider influence on the community's young people.

Tamerlane is also aware that the more recent generations of new mines, that have been developed in the NWT, Nunavut and elsewhere have set new standards for social, cultural and environmental responsibility and performance. The subject of lessons learned in relation to mining in Canada has been embraced by the Mining Association of Canada (MAC) on behalf of its member companies, as well as provincial and territorial mining associations and chambers for more than 15 years. In September 1992, at the *49th Annual Mines Ministers Conference* in Whitehorse, Yukon, these stakeholders presented a brief reviewing the serious challenges facing the mining industry in Canada (WMI 1994).

Recognizing the need for the mining industry "to earn the trust of Canadians and to prove that can operate in an environmentally sensitive and sustainable fashion", the MAC proposed the launch of a multi-stakeholder process to develop a common vision and strategic plan to lead the metals and minerals sector into the next century (WMI 1994).

The proposal was endorsed by the Mines Ministers, and on March 30, 1993, the Whitehorse Mining Initiative (WMI) was launched. Other stakeholders who had ben identified and who had agreed to participate included: federal, provincial and territorial governments; business, including the banking community; Aboriginal groups; environmentalists; and labour. The immediate objective was to design a consultative process to address key issues affecting both the industry and other stakeholders.

The main objective of the WMI was to move toward a socially, economically and environmentally sustainable mining industry, underpinned by political and community consensus (WMI 1994). Further details on the Whitehorse Mining Initiative can be found at: http://www.nrcan.gc.ca/ms/poli/wmi_e.htm.

More recently, the Aboriginal – Mining Industry Round Table took place in March 2004 in Edmonton, Alberta (MAC/CAMA 2004). The leading partners in the event were the Mining Association of Canada (MAC) and the Canadian Aboriginal Minerals Association (CAMA). The event was held in collaboration with the Minerals and Metals Sector, Natural Resources Canada (NRCan).

The objective of the Round Table was to provide a forum to share experiences, best practices and lessons learned and to identify future goals. MAC member companies were invited to co-present case study presentations with Aboriginal representatives from the communities where they operate. Additional presentations where given by government and Aboriginal associations (MAC/CAMA 2004).

Citing from the MAC/CAMA (2004) Round Table Report:

> *"The presentations underscored the importance of early and ongoing dialogue throughout the mine cycle as vital to developing relationships. When Aboriginal communities are engaged and empowered from the start of the mining process, they are better able to define their involvement and be part of the decision-making process. Sustained commitment and leadership by industry senior management is, in all instances, a prerequisite for success, as is strong Aboriginal leadership, by elders, chiefs or others in the community.*
>
> *Increased participation and opportunities for direct employment or related economic or business opportunities allow for a sustainable work force with growth potential. Access to K-12 and post-secondary education was also identified as vital to ensuring Aboriginal youth can attain positions of greater responsibility."*

Further details on the Aboriginal – Mining Industry Round Table report can be found at: http://www.mining.ca/miningworks/media_lib/documents/MACroundtable_Final_Report3first.pdf.

Tamerlane is fully committed to supporting the basic principles and directions described in this section, as reflected in the policies and commitments that have been presented and incorporated throughout this DAR. Tamerlane also believes that development of the PPPP will not affect ongoing political and social development, cultural values, traditions and language in the adjacent communities.

Assuming success of the initial PPPP and longer-term, larger-scale development in the future, Tamerlane's ongoing commitments and programs will be expanded as appropriate. As previously indicated, these initiatives will be guided by sustainable development principals to generate further economic and social benefits, while ensuring continued responsible environmental stewardship for the benefit of future generations.

8.3 Heritage Resources

As noted by the MVEIRB (2006) the protection of known or potential heritage resources is an essential element of EA in the Mackenzie Valley. The Terms of Reference (MVEIRB 2006) requested that consideration be given to identifying all known archaeological and heritage resources, as well as sites of cultural significance in and or near the EA Study Area (ESA).

Tamerlane appreciates and shares the MVEIRB's and public's interest in protecting the heritage resources of the entire region and the ESA. However, because potential impacts of the Tamerlane PPPP can only be associated with the limited footprint of disturbance related to the proposed development, the following discussion of archaeological values is limited to this much smaller "zone of influence" area.

Initially, as reported in the Project Description Report for the Tamerlane PPPP (Tamerlane 2006a), the Prince of Wales Northern Heritage Centre (PWNHC) was contacted to obtain archaeological records for the PPPP R-190 area. Correspondence received from Ms. Jennifer Bailey indicated that no known archaeological sites had been located or recorded within 150 m of the proposed PPPP site. However, it was also noted that although no sites had been recorded, the area may be unexplored and archaeological sites may exist (Personal Communication, J. Bailey, March 28, 2006).

In early September, 2006, Ms. Jean Bussey of Points West Heritage Consulting (Points West), on behalf of Tamerlane, with the assistance of a number of First Nations representatives, conducted a preliminary archaeological assessment. The purpose of the assessment was to determine if the PPPP area contained terrain that was suggestive of sufficient archaeological potential to justify more detailed archaeological investigations. Participants in the preliminary assessment included Messrs Amos Cardinal of the Katlodeeche First Nations, Louis Balsillie of the Deninu Ku'e First Nation, Paul Harrington of the Hay River Metis Council and Jerry DeMarco of Tamerlane.

The complete results of the preliminary archaeological assessment were presented in Points West (2006), a copy of which is provided in Appendix E of this DAR. During the course of the assessment, the participants walked over and examined all of the areas associated with the proposed PPPP footprint. This included the abandoned and active gravel pits, the existing roads, seismic lines, the abandoned railway and the proposed footprint of the freeze ring and underground mine shaft.

It was noted that the existing roads and gravel pits were situated on the highest terrain in the area. The elevated terrain was observed to be undulating and/or sloped with no well-defined edges. Considerable evidence of historic seismic line construction and fire-fighting activity (approximately 20 years ago) was observed and the surface disturbance was considered to be extensive although it has been naturally reforested.

In light of the extensive disturbance and previous use of much of the area assessed, it was concluded that it is unlikely that intact archaeological remains are present in the project area. Considerable evidence of recent use was encountered and Mr. Harrington indicated that a portion of the access road was part of an earlier road from Pine Point that was constructed along an even earlier aboriginal trail. Since the terrain is higher and dryer than surrounding areas, it represents a likely travel route. It was also evident that the area had experienced more recent use, possibly for hunting. However, the degree of disturbance over a number of years from a variety of uses, the existence of heavy vegetation cover and lack of well-defined terrain edges would make it difficult to locate the types of archaeological sites that would likely result from transitory use. Such sites are predicted to be very small and characterized by few artifacts.

It was therefore suggested that there were no archaeological impediments to the proposed PPPP activities. Points West (2006) determined that there was not sufficient archaeological potential to justify a more detailed archaeological investigation of the PPPP area. However, as a precaution, Points West recommended that if unexpected archaeological materials were encountered during any phase of this development, all activity in the area must cease and the Prince of Wales Northern Heritage Centre must be contacted.

Based on the available information and the results of the preliminary archaeological assessment, Tamerlane believes that the construction of the PPPP and associated activities will not have any effects on the archaeological and heritage resources of the Pine Point region.

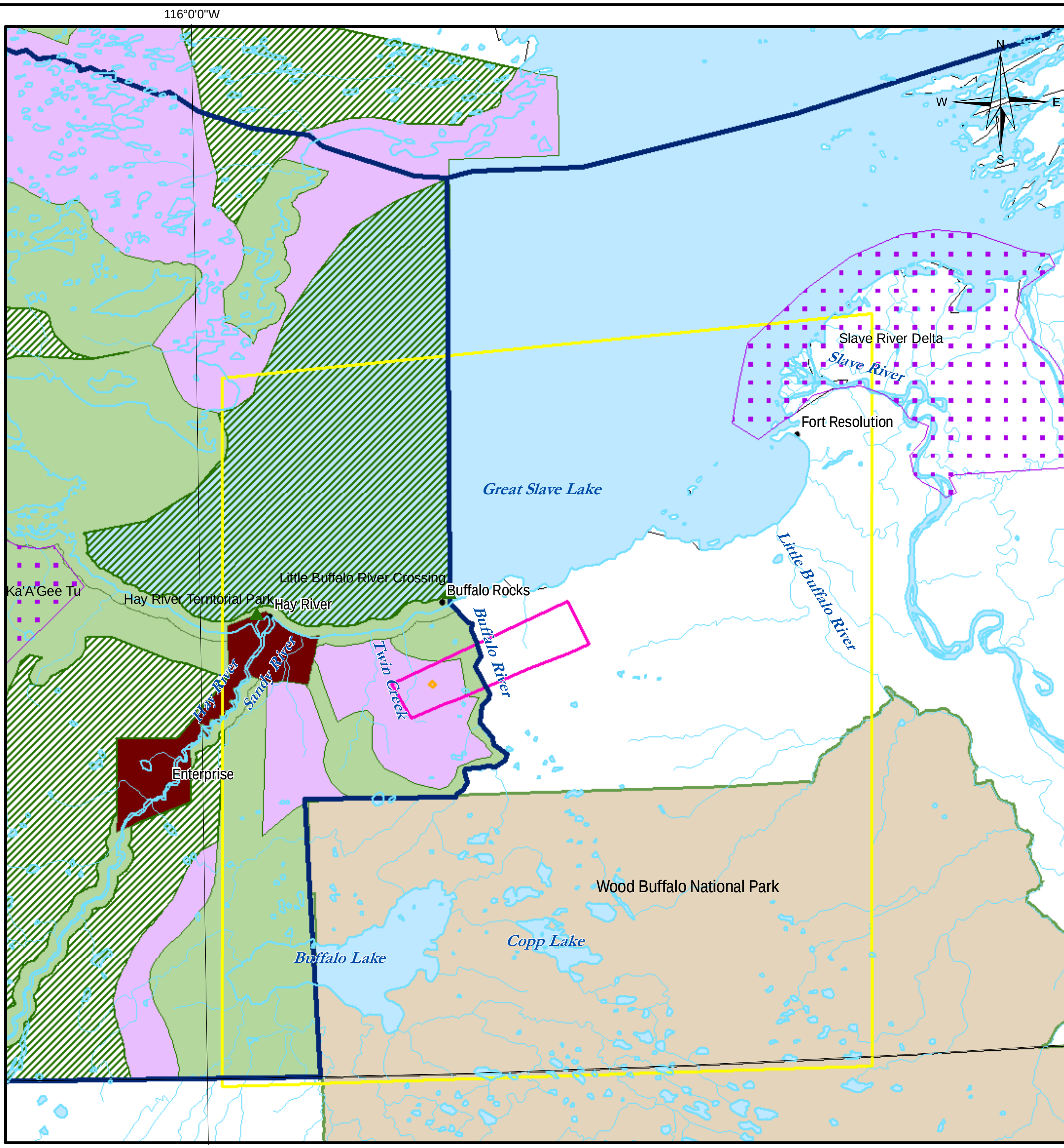
8.4 Traditional & Contemporary Land Use & Wildlife Harvesting

Effects on wildlife harvesting are recognized by the MVRMA as an "impact on the environment" that must be considered by the Review Board during an EA (MVEIRB 2006). Concerns about access to land and harvesting success were highlighted by aboriginal groups during the scoping sessions.

Traditional knowledge was obtained for the Tamerlane PPPP area with the cooperation and assistance of Dene and Metis representatives. This information has been of great assistance in helping to identifying the historic and current relative value and usage levels of the EA study area (ESA) for wildlife harvesters and is reviewed as appropriate in this section of the assessment.

In addition, the recent work of the Dehcho Land Use Planning Committee has been very applicable as the Committee's draft Dehcho Land Use Plan (2006) covers the geographic area in which the Tamerlane PPPP is located. Figure 8.4-1 illustrates the designated land use zones within the applicable portion of the Dehcho Region, including the area of the Tamerlane PPPP.

As indicated, the Tamerlane PPPP is located within the Lower Big Buffalo Special Management Zone. In conformance with the draft Dehcho Land Use Plan, mining, oil and gas and forestry-related activities are permitted to take place within this Special Management Zone.



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LEGEND

- Local Study Area (LSA)
- Regional Study Area (RSA)
- EA Study Area (ESA)
- Watercourse
- Waterbody
- Plan Area Interim Measures Agreement Boundary
- Wood Buffalo National Park

Land Use

- Community Boundary
- Conservation Zone
- General Use Zone
- Special Management Zone

PAS Areas of Interest

- Ka'A'Gee Tu
- Slave River Delta
- Territorial Parks

NOTES

Base data source:
Dehcho Land Use http://www.dehcholands.org/docs_final_draft_dehcho_land_use_plan_june_02_06.htm.
PAS areas delineated based on http://wildlife.enr.gov.nt.ca/

PINE POINT PILOT PROJECT

Designated Land Use Zones, Parks, Protected and Special Areas

PROJECTION	DATUM
UTM Zone 11	NAD83

Scale: 1:1,200,000

20 10 0 20

Kilometres

FILE NO.
1740149-005_Map016

PROJECT NO.	DWN	CKD	REV
1740149.005	KMW	RH	0

OFFICE	DATE
EBA-VANC	December 14, 2006

EBA Engineering Consultants Ltd.

Figure 8.4-1

During the PPPP site tour conducted as part of the MVEIRB scoping sessions in mid August 2006, and the Traditional Knowledge interviews conducted in October 2006, a number of the community participants discussed plant species found in the LSA that were of particular importance to the people of the region. These included various berries (strawberry, raspberry, gooseberry, blueberry, cranberry loganberry, juniper berry and saskatoons), Labrador tea and rose hips. Other important plants/trees with medicinal properties include white rat root, spruce gum, Tamarack and birch trees. These plants are all commonly found in suitable sites throughout the RSA and the entire Pine Point region and beyond.

The Traditional Knowledge interviews also reported that wildlife identified as living in and being harvested in the vicinity of the LSA included moose, woodland caribou, lynx, wolf, otter, black bear, rabbit, porcupine, prairie chicken, spruce chicken, ruffed grouse, waterfowl and upland game birds. Migrating wildlife observed from time-to-time include ducks, geese, swans, songbirds, whooping crane, prairie chickens and ptarmigan (Tamerlane 2006b, c).

Most of the participants in the Traditional Knowledge interviews indicated that harvesting practices have changed during their lifetimes. The most frequently mentioned change was the fluctuation and cycles of animal changes over time. Some participants noted increased populations for specific species and areas while others noted decreases. Participants also made several observations regarding changes in harvesting lifestyles, and methods, as well as the economics of traditional harvesting.

- Some of the key observations noted during the Traditional Knowledge interviews (Tamerlane 2006b, c) included:
- Fewer people harvest now than in the past.
- Harvesting is much easier now with easily accessible roads and motorized equipment.
- Bears are not hunted much now because they have become garbage eaters.
- The price of fur has increased.
- Gas is more expensive now than in the past.
- Harvesting is cyclic; food and vegetation likely affect the cycle.
- New species such as marten, cougar, whitetail deer and magpies have come into the region.
- Caribou were historically more prevalent in the Pine Point region
- Barrenland caribou used to be prevalent in the region; after the fires, they changed their migration pattern.

- Moose were more prevalent when Pine Point was open than they are now.

For more complete details of all of the information collected during the Traditional Knowledge interviews, please refer to Tamerlane (2006b, c). Complete copies of each of the two Traditional Knowledge study reports produced in the fall of 2006 are provided in Appendix A.

Tamerlane is also aware and was informed again during a number of the Traditional Knowledge interviews, that hunting and trapping has occurred in the immediate area of the PPPP site. Tamerlane is not in a position to influence the nature of future hunting, trapping or berry-picking activities that residents of the area may wish to pursue in the vicinity of the PPPP site.

However, to minimize any potential for direct PPPP development-related effects on wildlife, including wildlife mortality, Tamerlane will implement a no hunting policy for all project employees and contractors while working on or off-site for Tamerlane. In addition, the company will require all project-related transportation activities to give the right-of-way to any wildlife that such activities may encounter.

Site clearing and construction of the PPPP and associated infrastructure will impact small amounts of berries and other culturally important plants in specific areas. However, given their common occurrence throughout the Pine Point region, and the fact that these plants are expected to return to the PPPP area following reclamation of the site following the end of project life, no significant residual impacts on these plants or the residents who wish to harvest such berries or plants are expected to occur.

Tamerlane also believes that the relatively small size and short-term nature of the PPPP and the mitigation measures to be employed will not have any measurable effect on overall harvesting success, the quality of harvested materials or use of the general area for potential leisure activities.

8.5 Protected and Withdrawn Areas

The MVEIRB Terms of Reference (MVEIRB 2006) specifically requested that any locations within, proximate to, or potentially affected by PPPP operations, that are currently protected by law, or subject to special management rules and regulations be identified.

Figure 8.4-1 illustrates the designated land use zones within the Dehcho Region, including the area of the Tamerlane PPPP. This figure also identifies the existing and proposed protected and withdrawn areas, territorial or municipal parks and that portion of Wood Buffalo National Park which is located within the ESA and in the vicinity of the PPPP.

Two NWT Protected Areas Strategy (PAS) areas of interest occur within the vicinity of the Tamerlane PPPP site and within the ESA. These are the Slave River Delta area (Deninu K'ue) located approximately 86 km northeast of the Tamerlane PPPP site and the Ka'A'Gee Tu area (Kakisa) located approximately 100 km due west of the PPPP site.

The Tamerlane PPPP is also located approximately 13 km due north of the westernmost portion of Wood Buffalo National Park. At 44,807 km^2, Wood Buffalo National Park is Canada's largest national park and one of the largest in the world. The park was established in 1922 to protect the free-roaming bison herds of the area. Today, the park supports and protects many unique natural and cultural resources, from diverse ecosystems and species at risk to the traditional activities of aboriginal residents. As a remote wilderness park and World Heritage Site, Wood Buffalo National Park attracts Canadian and international visitors who wish to experience and learn about the unique cultures, landscapes and wildlife of the boreal north (Parks Canada 2006).

Two territorial parks occur in the vicinity of the Tamerlane PPPP site. They are the Little Buffalo River Crossing which offers camp-sites, picnic and day use and a boat launch and Hay River Territorial Park which offers a broader range of camping, boating, swimming and other recreational opportunities (see Figure 8.4-1 for locations). One other nearby park, administered by the Town of Hay River, is a campground and picnic area located at Polar Lake. This park is being maintained for the use and enjoyment of local residents and tourists. Motorized vessels are not permitted on the lake but the lake is ideal for canoeing.

Tamerlane's PPPP is of a relatively small size and short-term nature. The mitigation measures to be employed will ensure that the project and associated activities will have no effect on any of the NWT PAS areas of interest, Wood Buffalo National Park, or the nearby territorial parks and the municipal park located at Polar Lake.

8.6 Aesthetic Resources and Wilderness Values

The MVEIRB Terms of Reference (MVEIRB 2006) specifically requested that the DAR identify any particular landforms, locations of special interest or other unique environments that merit special attention in areas potentially affected by the PPPP. In addition, the need for an analysis of the wilderness values of Twin Creek, Polar Lake the

Buffalo River and the portion of Great Slave Lake in Proximity to the PPPP was identified.

During the PPPP site tour conducted as part of the MVEIRB scoping sessions in mid August 2006, and the Traditional Knowledge interviews conducted in October 2006, Tamerlane was informed that the Pine Point area continues to retain aesthetic and wilderness values that are enjoyed by local residents for hunting, trapping, berry and plant harvesting and general recreational activities. The continuing aesthetic and wilderness values of Great Slave Lake, the Slave, Little Buffalo and Buffalo rivers and Twin Creek were emphasized as being of particular ongoing importance.

Tamerlane is encouraged by these views, considering that in particular, according to a number of local residents, the land and environment of the Pine Point area is still perceived to be in the process of "healing", presumably from impacts associated with the former large-scale mining operations and related mineral exploration activities in the region.

Tamerlane recognizes and respects the considerable importance that the residents of the neighbouring communities continue to place on these existing aesthetic resources and wilderness values.

Tamerlane's PPPP is of a relatively small size and short-term nature. The mitigation measures to be employed will ensure that the project and associated activities will not have any effect on the existing aesthetic resources and wilderness values of the Pine Point region. In particular, the project and associated activities will not have any effect on the existing aesthetic and wilderness values of Great Slave Lake, the Slave, Little Buffalo and Buffalo rivers, Twin Creek and Polar Lake.

9.0 CLOSURE AND RECLAMATION

Provided no further steps are taken to expand the PPPP sampling program to a full-scale mining operation, reclamation activities will begin prior to completion of the PPPP and in full when the program ends. The reclamation plan for the Pilot Project has the objective of minimizing the environmental impact of the bulk sample extraction to the extent practical, and of maintaining the overall present productivity of the site. The end-land use will be to leave disturbed areas so that they may retrun as quickly as possible to productive wildlife habitat. Tamerlane intends to work with members of the Deninu K´ue, Katlodeeche and Métis Nation during the entire scope of the Pilot Project through the completion of Tamerlane's reclamation activities.

9.1 Regulatory Environment

Reclamation planning represents an integral component of a sound environmental management system for any development. Tamerlane is committed to achieving a number of goals for the progressive reclamation of the PPPP development area following closure of the project. In August 2002, the Water resources division of Indian and Northern Affairs Canada (INAC) released updated "*Mine Reclamtion Guidelines for the Northwest Territories and Nunavut*". These guidelines are intended to update a 1990 NWT Water Board publication "*Guidelines for Abandonment and Restoration Planning for Mines in the Northwest Territories*". The guidelines acknowledge that there are also land owners and other agencies, such as First Nations, Environment Canada, Natural Resources Canada, Government of the Northwest Territories and various co-management boards who play a role in the reclamation of lands affected by mining activities. Tamerlane's goals for reclamation are consistent with INAC's guidelines and include:

- To ensure that PPPP facilities associated infrastructure and wastes are abandoned in such a manner that the requirement for long-term maintenance and monitoring is minimized
- To prevent continued loadings of contaminants and wastes to the environment
- To return affected areas to states compatible with the original undisturbed conditions, giving due consideration to practical factors including economics, aesthetics, future productivity and future users.

In addition to Tamerlane's reclamation goals, the anticipated Land Use Permit for the PPPP will specify reclamation conditions that must be met by the licensee. Examples of such conditions, drawn from other existing permits may include:

- The Permittee shall complete all clean-up and restoration of the lands used prior to the expiry date of this permit.
- Progressive reclamation will be undertaken as and when opportunities are presented.
- During the final abandonment phase, fill embankments, borrow pits, roads and development sites will be re-contoured and scarified as required to ensure surface stability and to facilitate the re-establishment of native vegetation.

With the application of the broad suite of available reclamation measures, Tamerlane is confident that the reclamation goals for the PPPP will be effectively achieved.

9.2 Objectives

Tamerlane's short duration Pilot Project is considered to be a temporary use of the land. At closure, the project site and the land affected by the operations will be reclaimed to achieve the following closure objectives:

- Protection of public health and safety through the use of safe and responsible reclamation practices;
- Reduction or elimination of physical environmental effects once the mine ceases operation;
- Re-establishment of conditions that permit the land to return to similar pre-mining land uses; and
- Eliminate the need for long-term monitoring and maintenance by establishing physical and chemical stability of disturbed areas.

The Reclamation Plan will comply with the conditions of the PPPP permits, regulations, and industry standards.

9.3 Approach

Tamerlane is committed to reducing the residual environmental effects at the Pine Point Pilot Project at closure. Consequently, the Pilot Project has been developed keeping in mind the future reclamation requirements. Reclamation considerations have formed an integral part of the bulk sample extraction plan. Furthermore where practical, reclamation will be carried out progressively during the short term duration of the Pilot project.

Pilot Project decommissioning and restoration will be carried out using conventional best practices for northern mine construction and reclamation techniques. Tamerlane plans to select closure technologies and design elements that comply with accepted protocols and standards.

9.4 Re-vegetation Considerations

Re-vegetation considerations for northern areas need to meet the challenges and limitations associated with cool, short summers, low precipitation levels and long cold winters. The reclamation initiatives will encourage the natural succession of indigenous plant species in disturbed areas. Tamerlane will select appropriate native seed mixes that have been successfully employed in the areas of the Northwest Territories.

9.5 Infrastructure

During the construction and operational phases of the short duration Pilot Project, Tamerlane will employ a progressive reclamation approach. This will serve to ensure a proactive reclamation approach at the end of the PPPP which is smooth, efficient and aesthetically appealing. To minimize impacts on the terrain of the PPPP development area, Tamerlane has and/or will employ a number of mitigation measures.

Initially, as part of project planning and design, Tamerlane is proposing to employ underground mining, the least intrusive method for mining the R190 mineral deposit. In addition, application of the proposed freeze curtain technique represents the least intrusive method for stabilizing wet, unconsolidated ground, compared with other alternatives such as grouting and dewatering.

Tamerlane is proposing to minimize the PPPP development footprint by locating PPPP buildings and associated infrastructure on existing disturbed areas to the maximum extent possible.

As previously indicated more than 52 % of the PPPP buildings and associated infrastructure footprint will be located on previously disturbed terrain. New disturbance to terrain in the project footprint area will be limited to approximately 4.3 ha, representing an increase of only 0.37 % of the disturbed terrain present in the RSA.
Other mitigation measures that will be employed to minimize impacts on the terrain of the PPPP development area will include:

- Full compliance with Land Use Permit conditions to be issued by the MVLWB.
- Salvage of organic and mineral top soils for future reapplication during reclamation of the site.
- Implementation of erosion control measures if and as warranted - not anticipated to be required due to the generally level and porous nature of the terrain at the development site.
- Use of existing highways for all PPPP-related vehicle traffic.
- Return of PPPP process-related waste rock as backfill into the mined-out R190 mineral deposit.
- Re-contouring of disturbed areas to ensure stable landforms during reclamation.

With the application of these mitigation measures and in consideration of the other aspects of the assessment presented in this section of the DAR, no significant residual impacts on the terrain of the Tamerlane development footprint are anticipated to occur following reclamation and restoration of the site. The residual impact of the PPPP development on the terrain of the footprint area is expected to be negligible.

Following project completion, the freeze plants will be turned off and the brine completely removed from the system. The freeze pipes will be reclaimed and the holes filled with grout. All infrastructure related to the freeze ring, will be loaded on truck and shipped off site. Any temporary foundations and leakage barriers will be removed and hauled off site. The abandoned area where the freeze infrastructure once lay will be leveled and reclaimed in a manner consistent with INAC and Land Use Permit conditions according to the MVLWB. The frozen ground will thaw and return to its normal state within a short period (Thyssen Mining 2006).

The main and ventilation shafts will require removing all piping and support sets. The head-frame will be removed and the concrete pad can be lifted if necessary. Once both shafts are cleared, a concrete plug will be installed at ground level that will extend several feet into the shaft to insure stability and restrict access.

The vertical conveyor infrastructure will be inventoried, packaged and shipped off-site via truck. The support infrastructure immediately adjacent to the shaft will be removed piece by piece and shipped off-site. The foundations will be removed. The area remaining will be leveled and reclaimed in a manner consistent with INAC and Land Use Permit conditions according to the MVLWB.

The remaining temporary buildings to be removed will consist of the following:

- Administration and Dry
- Generator Building
- Warehouse
- Maintenance Shop
- Guard Shack
- Backfill Plant
- DMS facility

All of these structures will be stripped down and prepared for off-site transport. Any remaining foundations will be removed or burried. The area remaining will be leveled and reclaimed in a manner consistent with INAC and Land Use Permit conditions according to the MVLWB.

The remaining temporary protective structures will be dismantled and shipped off-site and consist of the following:

- ROM Stockpile Structure
- Concentrate Structure
- Temporary Aggregate Stockpile Structure
- Fuel and Lube Structure

All disturbed surfaces will be leveled, scarified and reclaimed in a manner consistent with INAC and MVLWB Land Use Permit conditions.

The infiltration basin will require the use of 1-3 perforated culverts to provided added assurance of the exfiltration process. These culverts will be dug up and removed from the site. Additionally, a discharge line from the Pilot Project site to the infiltration basin will be reclaimed and shipped off site. The infiltration basin will be levelled and graded according to INAC and Land Use Permit conditions and to the satisfaction of GNWT DOT.

The fuel and lube tanks and associated piping will be drained, washed, cleaned and then dismantled. All infrastructure will be reomoved from site. The catchment containment berms will be breached or re-contoured to encourage natural drainage. Waste oils will be shipped off site or consumed in the used oil heaters. Unused explosives will be shipped off site or burned or destroyed on site and unused chemicals as well as any other hazardous waste material will be either treated on site or shipped off-site for disposal.

All non-combustible, non-hazardous waste will be disposed of in the permanent non-hazardous solid waste disposal facility located in Hay River.

The existing all-weather roads will remain in place after closure. Peripheral equipment like lighting and signposting will be removed.

9.6 Post Closure Monitoring

It is understood that environmental monitoring will continue through the post-closure phase until such time as it can be established that licensed discharge criteria have been met, based on discussions with the regulatory agencies. Once this has been achieved, Tamerlane would seek final clearance to permanently abandon the project area.

The amount and frequency of post closure monitoring required is expected to diminish as reclamation is complete and the results of monitoring indicate that environmental performance is meeting the objectives of protecting the surrounding environment. It is expected that monitoring would be ongoing at a reduced frequency for several months after reclamation is complte to allow sufficient data to be collected to demonstrate that the site is not causing environmental degradation and that reclamation has met its objective.

Due to the small and short duration of the Pilot Project, the reclamation activities are estimated at 3 months after final bulk sample shipment. Labor will be required for removing all infrastructure during the 3 month period and is estimated at $182,000. Leveling and grading the area of disturbance is estimated at $6,000/hectare. Given that the Pilot Project footprint encompasses an area of 4.3 hectares, this equates to approximately $25,800. Tamerlane's total estimated reclamation cost is $207,800. There will be no stockpiles necessary for reclamation for the purposes of the PPPP, therefore, final reclamation activities will begin at the conclusion of the bulk sample extraction. Tamerlane envisions all materials transported off-site during reclamation will be stored for sale or use on other projects. The re-use of these materials will most likely not occur in the Northwest Terrirtories

10.0 CUMULATIVE EFFECTS

Cumulative effects are changes to the environment that *"are likely to result from the project in combination with other projects or activities that have been or will be carried out"* (Government of Canada 2003). The project's contribution to cumulative effects is assessed based on its effects on a valued component (VC) that is also affected by other land uses. Communities, roads, other developments and hunting are examples of land uses. Overall cumulative effects are effects of all land uses on a VC, including effects caused by the project.

An assessment of cumulative effects provides a more complete understanding of what might happen to VCs beyond the influence of the project alone. This is useful for regulatory decision-makers and land and resource managers as they review and plan future development. Thus, an assessment of cumulative effects provides a glimpse into environmental and socio-economic conditions now and how they may change in the future. This contributes to a better understanding of what might or might not happen if the project proceeds.

The MVEIRB Terms of Reference noted that during the scoping sessions, major concerns were identified in relation to:

- Potential local cumulative effects of rapid population growth and increased traffic in the Town of Hay River and on Territorial Highway 5, especially if the Mackenzie Gas Project goes ahead.
- Cumulative biophysical effects from historic and current industrial development on the pine Point area on both sides of the Buffalo River. In particular, the effects of the Pine Point lead-zinc mine run by Cominco from 1964-1987, and the implications of such effects on water quality, quantity, wildlife habitat and wildlife numbers, and traditional land use by aboriginal peoples.

Typically, cumulative effects assessments address effects that:

- extend over a larger area
- are of longer term duration
- act in conjunction with other projects/activities on the same VCs
- are reasonably probable, considering possible future projects/activities and impacts.

For the Tamerlane PPPP, the assessment of cumulative effects involved the application of four basic considerations (CEAA 1999):

- There must be an environmental, social or cultural impact related to the project.
- The effect must be demonstrated to operate cumulatively, additively or synergistically with impacts from other projects or activities.
- The other projects or activities exist or are likely to be carried out and are not hypothetical.
- The cumulative effect is likely to result.

As noted earlier in this DAR, the Tamerlane PPPP is a relatively short term project involving a one year construction period and 12-15 months of operation, followed by reclamation of the development footprint. Most of the very limited biophysical environmental effects associated with the development are expected to occur during this relatively short period of time.

Similarly, no effects (including cumulative effects) on existing traditional land uses in the Pine Point region by aboriginal peoples are anticipated to occur.

Anticipated negative construction and operations-related effects, such as impacts on air quality, the noise environment and wildlife will generally be of an intermittent, very short-term (minutes to hours), highly localized, and rapidly reversible nature.

Longer-term effects of the Tamerlane PPPP on the biophysical environment will be limited to the small physical footprint of the development area, which will be reclaimed in accordance with the reclamation objectives of Tamerlane and the regulatory agencies with responsibility regarding such matters.

In terms of possible cumulative implications, none of the intermittent, short-term, highly localized and rapidly reversible PPPP-related effects are anticipated to cause impacts that may contribute to cumulative effects for any of the VCs assessed in sections 7.0 (Biophysical Environment Assessment) or 8.0 (Human Environment Assessment).

Nevertheless, because of the stakeholder concerns as conveyed in the MVEIRB Terms of Reference, the following cumulative effects assessment was carried out.

10.1 Spatial Boundaries

For purposes of cumulative effects assessment, the boundaries of the Environmental Assessment Study Area (ESA) were considered to be appropriate. The ESA, with approximate dimensions of 135 km x 150 km, covers an area of approximately 20,700 km^2 and extends from the Hay River/Enterprise area in the west to Fort Resolution in the east, the southern-most portion of Great Slave Lake to the north and the NWT border to the south (see Figure 7.1-2).

This area encompasses all of the historic Pine Point mining area, portions of the Deh Cho and South Slave Regions and the known home ranges of all of the wildlife species (with the exception of migratory birds) that may utilize portions of the Tamerlane RSA, as proposed by the MVEIRB (2006).

This large area does not incorporate the proposed Mackenzie Gas Project pipeline corridor, which is located approximately 230 km to the west of Hay River and approximately 260 km west of the Tamerlane PPPP. The decision to exclude this proposed project from the Tamerlane PPPP cumulative effects assessment was considered to be appropriate as applicable conclusions of the Mackenzie Gas Project cumulative effects assessment (Imperial Oil 2004) were that:

- *"The Mackenzie Gas Project does not contribute significant cumulative effects.*
- *There are no significant overall cumulative effects.*
- *Based on the project footprint (Mackenzie Gas Project) the project will disturb a negligible proportion of the regional study area and therefore also a negligible proportion of the NWT.*
- *The project might encourage other development, particularly gas exploration and production in the NWT; however information to adequately assess potential cumulative effects contributions from such developments is not yet available.*
- *Demand for qualified northern content in projects is expected to use all available northern capacity, which will limit the extent of potential increased benefit and social costs among northern residents."*

These conclusions indicate that despite the size and duration of operations, the contribution to cumulative effects by the Mackenzie Gas Project on the regions and communities of the NWT are not expected to be significant (Imperial Oil 2004).

These conclusions would also indicate that there is no potential for a potentially cumulative condition to exist between the Tamerlane PPPP and the Mackenzie Gas Project.

10.2 Temporal Boundaries

Current and past land uses are projects and activities near the Tamerlane PPPP and surrounding region as of 2006. To be included in the assessment a land use must in some way be represented on a map or be recognized by observable evidence. Applicable effects associated with the historic Pine Point Mine, which operated from 1964 to 1987 and which continues to discharge treated tailings pond runoff water on an annual basis were considered in the PPPP cumulative effects assessment. Effects associated with historical and current communities and related activities were also considered, as was the past, current and projected future use of Territorial Highway 5.

Future land uses include the reasonably foreseeable land uses, which within the limits of the RSA and ESA include potential underground mining of immediately adjacent mineral resource deposits.

If successful, Tamerlane intends to utilize the existing infrastructure of the Pilot Project to access other deposits underground. As indicated in Section 4.9.5, a number of additional deposits are located on the West side of the Buffalo River. These deposits are assessable underground because of their close proximity to the R-190 Pilot Project. It is anticipated that these deposits could be developed utilizing the R-190 infrastructure to minimize future surface disturbances.

Tamerlane is not aware of any other reasonably foreseeable land uses that may occur in the RSA or ESA over the next 10 years.

10.3 Cumulative Effects Assessment

Sections 7.0 and 8.0 of this DAR assessed the potential effects of the Tamerlane PPPP on all of the key biophysical environmental and socio-economic VCs in terms of anticipated residual effects, and their defining characteristics including nature/geographic scope, direction, magnitude, timing/duration, frequency, reversibility, likelihood/confidence and significance.

The assessment determined that for all VCs, given the relatively small and short-term nature of the Tamerlane PPPP and with the application of the proposed mitigation measures, the residual socio-economic and environmental effects of the Tamerlane PPPP were anticipated to be negligible and insignificant. Furthermore, any identified environmental effects were generally limited to the immediate project footprint area, the LSA or the Highway 5 transportation corridor and most were rapidly reversible once activities ceased. As such, effects of this nature cannot typically operate in a cumulative manner. Tamerlane therefore believes that it would appear to be unnecessary to develop a plan for the monitoring of cumulative effects from the PPPP since none are anticipated to occur.

However, while individually no significant effects are anticipated, it is the role of the cumulative effects assessment to still consider the potential additive and synergistic effects of overall residual effects, in combination will past, existing or known planned activities in the vicinity of the Tamerlane PPPP site and the Highway 5 transportation corridor.

10.3.1 Water Resources

Section 7.2 of this DAR assessed the potential effects of the proposed Tamerlane PPPP on surface and groundwater quality, quantity and flows.

10.3.1.1 Surface Water Quality

It was noted that there will be no direct discharge of any DMS circuit or mine-related water discharges to any surface water such as area streams or lakes. The nearest flowing surface waters to the PPPP site are Twin Creek, located about 7 km to the west of the PPPP footprint, and the Buffalo River located approximately 10 km to the east of the project footprint. Both of these streams flow north into Great Slave Lake. The most important nearby lakes are Great Slave Lake and Polar Lake. However, both of these lakes are well removed from the PPPP site.

All process water and mine water associated with the PPPP will be directed to the proposed infiltration basin that will be located within the limits of an existing gravel pit. Treated sewage will be discharged into an approved septic field.

Tamerlane anticipates that the quality of the process/mine water to be directed to the infiltration basin will comply with Water License criteria without the need for further treatment. However, existing and demonstrated water treatment methods (lime addition) are readily available and will be employed if determined to be necessary to ensure compliance with the Water License.

The assessment concluded that there is no viable mechanism for process and associated mine water generated by the proposed Tamerlane PPPP to affect the surface waters or surface water quality of the nearest flowing streams or lakes in the Pine Point area. As a result, no residual effects on these surface waters are expected to occur and the residual impact of the PPPP development on these surface waters is expected to be negligible.

Regarding possible effects on surface water quality from the historic Pine Point Mine, studies conducted by Evans *et al.* (1998) in the mid to late 1990s determined that:

> *"there was no evidence that water in the study area* (Great Slave Lake) *was being contaminated by the decommissioned mine. A review of the documentation on the operation and decommissioning of the mine site provided no indication of any mechanism by which water flowing through the study region could be significantly contaminated by the decommissioned mine".*

More recent and continuing receiving water quality monitoring being conducted by Teck Cominco Minerals (2001-2005) in relation to annual discharges of treated water from the former Pine Point Mine tailings disposal area directly to the downstream receiving environment (muskeg area) indicate that the concentrations of total metals in the water of the receiving environment remain stable at low and environmentally acceptable levels.

Based on the absence of a viable mechanism for process and associated mine water generated by the proposed Tamerlane PPPP to affect the surface waters or surface water quality of the nearest flowing streams or lakes in the Pine Point area and the results of studies pertaining to the historic Pine Point Mine, there is no opportunity for a cumulative effect on surface water quality of the Tamerlane PPPP area, the RSA or the ESA to occur. Accordingly, it would appear to be unnecessary to develop a plan for the monitoring of cumulative effects from the PPPP on the surface waters or surface water quality since none are anticipated to occur.

10.3.1.2 Groundwater Quality

All process water and mine water associated with the PPPP will be directed to the proposed infiltration basin that will be located within the limits of an existing gravel pit. Treated sewage will be discharged into an approved septic field.

Tamerlane anticipates that the quality of the process/mine water to be directed to the infiltration basin will comply with Water License criteria without the need for further treatment. However, existing and demonstrated water treatment methods (lime addition) are readily available and will be employed if determined to be necessary to ensure compliance with the Water License.

The ore to be mined is located in a limestone formation which is alkaline and the DMS circuit will be operated at a pH >9.0. As a result no soluble (potentially harmful) metal ions are anticipated to be present in the DMS Loss water that will be directed to the infiltration basin.

Any nutrients such as nitrates and ammonia associated with the process/mine water discharge to the infiltration basin and the treated sewage discharge to the septic field are expected to be rapidly assimilated by the natural biological processes operating in the surface and shallow subsurface overburden of the area. These natural processes would be similar to the natural biological processes operating in standard domestic septic fields in other areas of Canada. This prediction is anticipated to be confirmed through the discharge water and ground water monitoring program that will be implemented as part of the overall Tamerlane PPPP approvals and permitting process.

With the successful application of the mitigation measures as outlined and compliance with the anticipated Water License, the discharge of the limited process water and mine water to the infiltration basin for recharge to the groundwater and the very small amount of treated sewage effluent discharged to the septic field are not expected to have a measurable effect on the quality of the groundwater in the area. As a result no residual effect on the groundwater quality of the area is expected to occur.

There are currently no other known past, present or future projects or activities that may be contributing to effects on the groundwater quality of the Tamerlane PPPP area. Based on the foregoing assessment, there is no opportunity for a cumulative effect on the existing groundwater quality of the Tamerlane PPPP area, the RSA or the ESA to occur. Accordingly, it would appear to be unnecessary to develop a plan for the monitoring of cumulative effects from the PPPP on groundwater quality since none are anticipated to occur.

10.3.1.3 Groundwater Flow

Tamerlane is proposing to employ the least intrusive method for stabilizing wet, unconsolidated ground, compared with other alternatives such as grouting and dewatering.

The freeze curtain, or frozen ring of ground, will extend from the surface to a depth of approximately 185 m, surrounding and encompassing the entire R190 mineral deposit.

The primary purpose of the freeze curtain is to prevent or minimize the intrusion of groundwater from the surrounding area into the underground mine workings during the estimated 12-15 month mining period.

During the period of time that the freeze curtain is in place and functional, it is anticipated that localized groundwater in the vicinity will be temporarily deflected (detoured) around the perimeter of the freeze curtain (like water moving around a bridge pier in a river) as it continues to flow towards the north/northeast. The presence of the freeze curtain is not expected to block or alter the flow of water around the PPPP area.

The limited amount of water (~1,056 m^3/day) used for the Tamerlane PPPP will be sourced from existing groundwater present in the area. The only water from the PPPP process that will be discharged to the infiltration basin will be the Dense Media Separation Loss water (~570 m^3/day).

The remainder of the water directed to the infiltration basin will be the limited excess (to process needs) groundwater (~240 m^3/day) that is anticipated to seep into the underground mine area from below the freeze curtain. This water will be directed to the infiltration basin for recharge to the groundwater of the area.

There are currently no other known projects or activities that are withdrawing groundwater in the Pine Point region. Historically, during the 1970s and 1980s, large volumes of groundwater were continuously pumped out of the ground around specific "mine dewatering regions" to permit open pit mining to occur in those areas of the former Pine Point Mine.

Throughout much of this period the Pine Point Mine was licensed by the former Northwest Territories Water Board to withdraw up to 170,500,000 m^3 per year from the local aquifers for discharge to surface in compliance with specific effluent quality requirements (INAC 1983). Data presented by the company to INAC in 1983 indicated that over the period of the Water License that was in effect at that time, the annual quantity of groundwater pumped from the aquifers had never exceeded 92,109,000 m^3 (INAC 1983).

The zones of influence of the former Pine Pont Mine "mine dewatering regions" were estimated and delineated on maps that were formally submitted for approval to the Northwest Territories Water Board during the time when those activities were ongoing (INAC 1983). According to INAC (1983), Pine Point Mines Limited had stated that a dewatering region existed as an individual entity in which most of the effects of dewatering, both in the groundwater and the surface ecosystems were contained.

Following closure of the Pine Point Mine and shut down of the dewatering pumps, recharge of the groundwater in the affected areas occurred rapidly. As an example, information provided by INAC (2006) indicated that within four days of shutting off all of the pumps at the N-81 pit area in January, 1987 the recharge was about 125 ft. (38 m). By the end of the year the recovery was +/- 335 ft (102 m), most of which likely occurred during the next couple of weeks. This information indicated that once pumping ceased, the ground water levels in this area recharged very quickly (INAC 2006).

On the basis of information of this nature, it is apparent that ground water levels around the former Pine Point Mine have been restored to their pre development state, and there is no linkage between these historic dewatering activities and current groundwater flow conditions at the R190 site.

The combination of limited extraction of groundwater for the Tamerlane PPPP, combined with the continuous recharge of all excess groundwater and process waste water back into the underground via the infiltration basin, will ensure that existing groundwater volumes and flows in the LSA will be fully maintained and operational. No measurable effects on the groundwater regime of the LSA are anticipated to occur. As a result no residual effects on groundwater volumes and flows of the area are expected to occur. The residual impact of the PPPP development on groundwater volumes and flows of the area is expected to be negligible.

Based on the foregoing assessment, there is no opportunity for a cumulative effect on existing groundwater flows of the Tamerlane PPPP area, the RSA or the ESA to occur. Accordingly, it would appear to be unnecessary to develop a plan for the monitoring of cumulative effects from the PPPP on the groundwater flow regime since none are anticipated to occur.

10.3.2 Fish and Fish Habitat

Section 7.3 of this DAR assessed the potential effects of the proposed Tamerlane PPPP on fish and fish habitat.

It was noted that potential effects on fish and/or fish habitat in the Tamerlane PPPP area could only occur if activities associated with the PPPP were to either directly or indirectly impact on these components of the receiving environment. It was also noted there will be no direct discharge of any DMS circuit or mine-related water discharges to any waters frequented by fish or associated fish habitat.

The nearest flowing waters frequented by fish to the PPPP site are Twin Creek, located about 7 km to the west of the PPPP footprint and the Buffalo River, located approximately 10 km to the east of the project footprint. Both of these streams flow north into Great Slave Lake.

A number of small shallow lakes are scattered throughout the region, particularly between the proposed PPPP (R190) site and Great Slave Lake. However, most of these lakes have no visible drainage. During the MVEIRB scoping process, the Department of Fisheries and Oceans indicated that there were no fish bearing lakes in the immediate vicinity of the proposed PPPP. The only lakes that support fish populations in this area are Great Slave Lake and Polar Lake. Both of these lakes are well removed from the PPPP site and cannot be affected in any way by the infiltration of process and associated mine water in accordance with licensed conditions back into the groundwater at the PPPP site.

All process water and mine water associated with the PPPP will be directed to the proposed infiltration basin that will be located within the limits of an existing gravel pit. Tamerlane anticipates that the quality of the process/mine water to be directed to the infiltration basin will comply with Water License criteria without the need for further treatment. However, existing and demonstrated water treatment methods (lime addition) are readily available and will be employed if determined to be necessary to ensure compliance with the Water License.

In terms of potential past effects of the former Pine Point Mine on the fisheries resources of the area, Evans *et al*. (1998) determined that:

> *"there was no evidence that water in the study area* (Great Slave Lake) *was being contaminated by the decommissioned mine. A review of the documentation on the operation and decommissioning of the mine site provided no indication of any mechanism by which water flowing through the study region could be significantly contaminated by the decommissioned mine.*
>
> *Metal concentrations in surficial sediments* (of Great Slave Lake) *were determined at the same sites where the water column was sampled. Metal concentrations in the sediments sampled were similar to concentrations observed in suspended sediments in the Slave River, and, overall, similar to average concentrations in the earth's crust. There was no evidence of contaminated sediments offshore of the decommissioned mine site.*
>
> *Pike from the Little Buffalo River, and burbot from the Slave River were examined for metals (muscle, liver and kidney) and metallothionein (liver, kidney) concentrations. A small number of inconnu (3) from the Slave River and walleye (1) from each river were also examined.*

Metal concentrations were similar to those observed in fish collected from the Slave River, Yellowknife Bay and Leland, Alexie and Trout lakes. Overall there was no evidence that fish in the Resolution Bay area, including the Little Buffalo and Slave rivers, were contaminated with metals by the decommissioned Pine Point Mine".

Based on the foregoing assessment, it was concluded that there was no viable mechanism for process and associated mine water generated by the proposed Tamerlane PPPP to affect the fish or aquatic habitats of the nearest fish-bearing streams or lakes in the Pine Point area. On this basis it follows that there is no opportunity for a possible cumulative effect on the fisheries resources or fish habitat of the RSA or the ESA to occur. Accordingly, it would appear to be unnecessary to develop a plan for the monitoring of cumulative effects from the PPPP on fish or aquatic habitats since none are anticipated to occur.

10.3.3 Terrain and Vegetation

Sections 7.4 and 7.5 of this DAR assessed the potential effects of the proposed Tamerlane PPPP on existing vegetation and terrain, respectively.

Potential effects of the proposed Tamerlane PPPP on the terrain and vegetation of the area will be mainly associated with the construction of the buildings and mining support infrastructure, the infiltration basin and the on-site access roads.

The construction of the PPPP buildings and mining support infrastructure (e.g. access roads, stockpile area, freeze line) will involve the clearing of vegetation in limited areas and the levelling of the existing terrain to accommodate the required buildings and infrastructure. Most of the PPPP buildings and access roads will be located on existing upland terrain, much of which has been disturbed by historic mineral exploration activities.

At the present time, approximately 18 ha (18.48 %) of the terrain and associated vegetation in the 97.4 ha LSA has been disturbed by historic activities which have occurred in this area. Within the larger 36,153 ha RSA, approximately 1,163.8 ha (3.2 %) of the terrain and associated vegetation has been disturbed by such historic activities.

The total estimated footprint of the Tamerlane PPPP buildings and associated mining support infrastructure is 8.98 ha. By comparison, the estimated footprint of the former Pine Point Mine was estimated by EBA to be in the order of 3,900 hectares.

To minimize new disturbance to existing vegetation and terrain in the development area, approximately (4.65 ha) of the PPPP buildings and associated infrastructure footprint (52 %) will be located on previously disturbed terrain. As a result, new disturbance to terrain and associated vegetation in the project footprint area will be limited to approximately 4.3 ha, representing a 19.2 % increase in the total amount of disturbed terrain present in the LSA and an increase of 0.37 % of disturbed terrain present in the RSA.

Approximately 60 % of the PPPP footprint will be located in Labrador Tea-mesic (2.38 ha) or burnt Labrador Tea-mesic (0.21 ha) habitat. This vegetation community is the most commonly occurring within the LSA, and RSA. Black spruce is most common in mature stands and jack pine dominates mature seral (previously burnt) vegetation communities.

A further 29 % of the PPPP footprint (freeze ring) will be temporarily located in Graminoid fen (1.27 ha) habitat. Graminoid fens are found in poorly-drained moist areas and account for about 3 % of the vegetation community found in the LSA and 1 % of the vegetation community found in the RSA.

The remaining 11 % of the PPPP footprint (freeze ring) will be temporarily located in Shrubby fen (0.48 ha) habitat. Shrubby fens are found throughout the RSA typically near open water areas, within larger fen complexes or in drainage areas where there is some water movement Shrubby fen accounts for approximately 4.9 % of the vegetation community found in the LSA and 0.05 % of the estimated 8,895 ha Shrubby fen vegetation estimated to be present in the RSA.

The rare plant survey completed by EBA in the summer of 2006 reported that no rare plants were observed in either the July or August survey. EBA also noted that a survey of this type cannot confirm the absence of these species it can only confirm their presence. All proposed PPPP infrastructure sites were surveyed, with the exception of the shaft, which represents a very small portion of the disturbance area. On the basis of these results, it is considered to be unlikely that rare plants exist within the PPPP footprint area.

With the application of the proposed mitigation measures and in consideration of the other aspects of the assessment presented in the DAR, no significant residual impacts on the terrain or associated vegetation communities of the Tamerlane development footprint are anticipated to occur following reclamation and restoration of the site. The residual impact of the PPPP development on the terrain and vegetation of the footprint area is expected to be negligible.

There are no other known developments proposed to take place within the boundaries of the ESA that could impact upon the terrain or vegetation communities of this larger assessment region. Based on the foregoing assessment and with the anticipated reclamation and restoration of the site, there is no opportunity for a cumulative effect on the existing terrain or vegetation communities of the Tamerlane PPPP area, the RSA or the ESA to occur. Accordingly, it would appear to be unnecessary to develop a plan for the monitoring of cumulative effects from the PPPP on terrain or vegetation since none are anticipated to occur.

10.3.4 Wildlife

Section 7.6 of this DAR assessed the potential effects of the proposed Tamerlane PPPP on wildlife. The wildlife VECs assessed included woodland caribou, wood bison, moose, fur-bearing mammals frequenting the area, Whooping Crane and Peregrine Falcon (*anatum* subspecies).

As noted earlier in this DAR, the Tamerlane PPPP is a relatively short term project involving a one year construction period and 12-15 months of operation, followed by reclamation of the development footprint. Most of the very limited biophysical environmental effects associated with the development are expected to occur during this relatively short period of time.

Anticipated negative construction and operations-related effects, such as impacts on air quality, the noise environment and wildlife will generally be of an intermittent, very short-term (minutes to hours), highly localized, and rapidly reversible nature.

Longer-term effects of the Tamerlane PPPP on the biophysical environment will be limited to the small physical footprint of the development area, which will be reclaimed in accordance with the reclamation objectives of Tamerlane and the regulatory agencies with responsibility regarding such matters.

The environmental assessment concluded that disturbance and habitat-related effects on all wildlife species would be of a negligible and insignificant nature with no significant impacts expected to occur. In terms of possible cumulative implications, none of the intermittent, short-term, highly localized and rapidly reversible PPPP-related effects are anticipated to cause impacts that may contribute to cumulative effects on any of the wildlife species that use or may be present in the area of the Tamerlane PPPP.

Nevertheless, as directed by the MVEIRB (2006) a cumulative effects assessment was conducted for woodland caribou and other key VECs including wood bison, moose, Whooping Crane and Peregrine Falcon. Fur-bearer species were excluded from the current cumulative effects assessment because as previously noted, wildlife studies carried out during the period when the former Pine Point mine was operational indicated that there appeared to be little impact (of former mining and other human activities such as vehicular traffic and hunting) on upland furbearers of the Pine Point region.

10.3.4.1 Woodland Caribou

Woodland caribou are widely distributed throughout the Deh Cho region and beyond. The NWT woodland caribou population is currently estimated at 8,500 individuals. Recent surveys conducted in 2004 and 2005 estimate population densities in the order of 1 to 3 woodland caribou/100 km^2 in the Northwest Territories, and a considerably lower density of about 2 woodland caribou/1000 km^2 in the Deh Cho region (ENR 2006).

Boreal woodland caribou prefer lichen-rich mature or old growth coniferous forests (greater than 100 years old) associated with bogs, lakes and rivers. (ENR 2006). In winter, woodland caribou tend to favour uplands, bogs and south facing slopes where the snow is not too deep. Their winter diet consists of up to 80 % ground and tree lichens. In summer, they prefer areas such as forest edges, marshes and meadows that provide the fresh green growth of flowering plants and grasses.

Woodland caribou commonly move onto traditional calving grounds, where calves are born by early June. In the Deh Cho region and southern NWT, islands off the northwest shore of Great Slave Lake (ENR 2006), and the mountains along the South Nahanni River serve as calving grounds for woodland caribou (Chetkiewicz and Marshal 1998).

In the Tamerlane RSA, woodland caribou sign (hair, tracks/trails, and pellets) was observed on four separate occasions within the RSA during the September 2005 survey. Caribou observations were recorded within poor treed fens and mixed woods habitats. During the June 2006 breeding bird survey period, fresh woodland caribou tracks were recorded incidentally at a location approximately 1.5 km northwest of Polar Lake.

The main ways that the PPPP, associated infrastructure and activities can affect woodland caribou is through physical or behavioural disturbance, including displacement and habituation (e.g. attraction). Potential effects on woodland caribou could also result from the loss or degradation of habitat.

Based on the available information, a few woodland caribou may be expected to be present in the vicinity of the PPPP footprint area on occasion and may potentially directly encounter or be disturbed by localized development-related noise or activities.

Similarly woodland caribou are known to occasionally occur in the vicinity of Highway 5 where they would be exposed to vehicle traffic and potentially associated activities such as hunting.

Caribou encountering such activities may show minor displacement behaviour and avoid the immediate PPPP development area and/or the Highway. The duration of such exposures are expected to be brief, perhaps lasting a few minutes to a few hours, and are reversible upon cessation of the activity or by moving away from the activity. The number and frequency of such exposures to disturbance by woodland caribou would be expected to be limited and sporadic.

To minimize any potential for direct PPPP development-related caribou mortality, Tamerlane will implement a no hunting policy for all project employees and contractors while working on or off-site for Tamerlane. In addition, the company will require all project-related transportation activities to give the right-of-way to any wildlife including woodland caribou that such activities may encounter.

Regarding preferred woodland caribou habitat, as previously indicated, the proposed PPPP development will be of a limited, small-scale and relatively short-term nature. The construction of the PPPP buildings and mining support infrastructure (e.g. access roads, stockpile area, freeze line) will involve the clearing of vegetation in limited areas and the levelling of the existing terrain to accommodate the required buildings and infrastructure.

Most of the PPPP buildings and access roads will be located on existing upland terrain, much of which has been disturbed by historic mineral exploration activities. To minimize new disturbance to existing vegetation (caribou forage) in the development area, approximately (4.65 ha) of the PPPP buildings and associated infrastructure footprint (52 %) will be located on previously disturbed terrain. As a result, new disturbance to terrain and associated vegetation in the project footprint area will be limited to approximately 4.3 ha.

The site clearing and installation of PPPP buildings and associated infrastructure will result in the relatively long-term (>3years) but reversible loss (following reclamation) of approximately 3.8 % of the existing Labrador Tea-mesic vegetation community within the LSA and approximately 0.03 % of the 10,249 ha of Labrador Tea-mesic vegetation community estimated to be present in the RSA.

This temporary but reversible loss of such a small amount of habitat that may be utilized by woodland caribou from time to time is considered to be insignificant at both the local and regional scale.

Given the limited and relatively short-term nature of the project and with the implementation of the additional mitigation measures as described, Tamerlane PPPP development-related activities are not expected to affect the overall health or well-being of the woodland caribou population inhabiting the RSA or the ESA. Accordingly, it would appear to be unnecessary to develop a plan for the monitoring of cumulative effects from the PPPP on woodland caribou since none are anticipated to occur.

Disturbance and habitat-related effects on woodland caribou are expected to be of a negligible and insignificant nature with no significant residual impacts expected to occur. In terms of possible cumulative implications, none of the intermittent, short-term, highly localized and rapidly reversible PPPP-related effects are anticipated to cause impacts that may contribute to a cumulative effect on woodland caribou that may use or be present in the area of the Tamerlane PPPP.

Hunting will continue to have the greatest potential for impacts on the woodland caribou population of the ESA and Deh Cho region. However, the development of the Tamerlane PPPP is not expected to contribute to increased caribou hunting opportunity for the people of the region.

10.3.4.2 Wood Bison

The number of wood bison in the NWT is estimated between 2,500 to 2,850 individuals that are divided up at four locations (ENR 2006). Two wood bison herds (Wood Buffalo National Park and Slave River Lowlands) contain diseased individuals, while the other two herds (Liard River and Mackenzie Bison Sanctuary) are believed to be disease free.

The population trend for wood bison in the NWT is increasing as they are slowly recovering from near extinction. Threats to the population include disease (anthrax, brucellosis, and tuberculosis), predation, highway collision, habitat loss, and drowning during high water seasons and during thin ice conditions.

The Tamerlane RSA is located within a Bison Control Area where all bison are removed to ensure diseased animals from Wood Buffalo National Park do not migrate and infect other disease-free herds, such as at the Mackenzie Bison Sanctuary.

Surveys of the Bison Control Area are carried out on a regular basis by resource management agencies during the winter months and any person seeing bison in the Bison Control Area is encouraged to report the sighting to the nearest ENR office. Any resident hunter seeing a bison in the control area may harvest it and keep the meat, as long as the kill is reported.

Wood bison use different habitats depending on the season. Wood bison are grazers, and rely heavily on grasses and sedges that grow in meadow openings, particularly in the winter. In summer, bison can be found in small willow pastures and uplands where theyfeed on sedges, forbes, and willow leaves and twigs. In the fall, they can be found in forests where they feed on lichens, and in winter, bison move to graminoid fens and lakeshores where they feed on sedges.

Wood bison scat, tracks, and feeding areas were recorded at two locations within the Tamerlane RSA in September 2005: along Twin Creek at the edge of a fen, and along a dirt road near a waste rock pile (approximately 12.5 km west of the former Pine Point town site).

Based on Tamerlane's understanding of the important wood bison management issues being managed by GNWT ENR, Tamerlane would be willing to cooperate with and report any wood bison sightings seen in the Bison Control Area to the nearest ENR office as and when such sightings occur.

Nevertheless, to minimize any potential for direct PPPP development-related wood bison mortality, Tamerlane will implement a no hunting policy for all project employees and contractors while working on or off-site for Tamerlane. In addition, the company will require all project-related transportation activities to give the right-of-way to any wildlife, including wood bison that such activities may encounter.

Given the limited and relatively short-term nature of the Tamerlane PPPP and with the implementation of the mitigation measures as described for other ungulates, Tamerlane PPPP development-related activities are not expected to affect the overall health or well-being of the wood bison population of the southern NWT. Accordingly, it would appear to be unnecessary to develop a plan for the monitoring of cumulative effects from the PPPP on wood bison since none are anticipated to occur.

Disturbance and habitat-related effects on wood bison are expected to be of a negligible and insignificant nature with no significant residual impacts expected to occur. In terms of possible cumulative implications, none of the intermittent, short-term, highly localized and rapidly reversible PPPP-related effects are anticipated to cause impacts that may contribute to a cumulative effect on wood bison that may use or be present in the area of the Tamerlane PPPP.

10.3.4.3 Moose

The NWT moose population is estimated at 30,000 to 40,000 individuals with density estimates ranging between 5 to 15 per 100 km^2 (ENR 2006). Moose are generally non-migratory and occupy the boreal forest throughout the year. Moose densities in the NWT are low compared to those in other parts of North America. These densities are considerably lower than those in Manitoba, Saskatchewan and Alberta.

Recent studies conducted in 2002 and 2003 for the Mackenzie Gas Project along the proposed gas pipeline corridor through the Deh Cho reported densities of 6 to 10 moose per 100 km^2 in this region. The lowest moose densities were documented adjacent to Fort Providence where 7 individuals per 100 km^2 were recorded during a fall survey (Bradley *et al.* 1998). The GNWT reports that in the Deh Cho region, the moose population in the vicinity of Fort Providence has been decreasing the most over recent years, but has been increasing in areas that have experienced fires in the last 10 years ENR (2006).

Moose habitats can be broadly categorized as fire-influenced, non- or limited-fire influenced or aquatic (Peek 1998). Within the first two (forested) habitats, moose generally prefer semi-open successional stages with an abundance of browse. Such sites are commonly found on floodplains and in riparian areas or wetlands, as well as in regenerating burns. Use of aquatic habitats may occur during all non-winter months, but generally peaks during late June to early August, when plant nutrition and digestibility are highest (Peek 1998). This period coincides with the peak of insect harassment and moose may seek relief in water for this reason as well.

During the EBA wildlife study conducted in the fall of 2005, a total of 22 signs of moose were observed in the Tamerlane RSA, with about 46 % of the observations being recorded in upland Labrador tea ecosites. These observations are consistent with local knowledge (T. Unka pers. comm.) and existing scientific understanding, which indicates that the entire area south of Great Slave Lake, including the PPPP area is frequented by and used by moose throughout the year.

Similar to caribou, the main ways that the PPPP, associated infrastructure and activities can affect moose is through physical or behavioural disturbance, including displacement and habituation (e.g. attraction). Potential effects on moose could also result from the loss or degradation of habitat.

Based on EBA's regular observations of moose sign within the RSA, moose may be expected to be present in the vicinity of the PPPP footprint area quite regularly and may potentially directly encounter or be disturbed by localized development-related noise or activities. Similarly, moose are known to occur in the vicinity of Highway 5 where they would be exposed to vehicle traffic and potentially associated activity such as hunting.

Moose encountering such activities may show minor displacement behaviour and avoid the immediate PPPP development area and/or the Highway. The duration of such exposures are expected to be brief, perhaps lasting a few minutes to a few hours, and are reversible upon cessation of the activity or by moving away from the activity. The number and frequency of such exposures to disturbance by moose would be expected to be limited and sporadic.

To minimize any potential for direct PPPP development-related moose mortality, Tamerlane will implement a no hunting policy for all project employees and contractors while working on or off-site for Tamerlane. In addition, the company will require all project-related transportation activities to give the right-of-way to any wildlife including moose that such activities may encounter.

Regarding preferred moose habitat, as previously indicated, the proposed PPPP development will be of a limited, small-scale and relatively short-term nature. The construction of the PPPP buildings and mining support infrastructure (e.g. access roads, stockpile area, freeze line) will involve the clearing of vegetation in limited areas and the levelling of the existing terrain to accommodate the required buildings and infrastructure.

Most of the PPPP buildings and access roads will be located on existing upland terrain, much of which has been disturbed by historic mineral exploration activities. To minimize new disturbance to existing vegetation (moose forage) in the development area, approximately (4.65 ha) of the PPPP buildings and associated infrastructure footprint (52 %) will be located on previously disturbed terrain. As a result, new disturbance to terrain and associated vegetation in the project footprint area will be limited to approximately 4.3 ha.

The site clearing and installation of PPPP buildings and associated infrastructure will result in the relatively long-term (>3years) but reversible loss (following reclamation) of approximately 3.8 % of the existing Labrador Tea-mesic vegetation community within the LSA and approximately 0.03 % of the 10,249 ha of the Labrador Tea-mesic vegetation community estimated to be present in the RSA.

In addition, the installation of the freeze ring infrastructure will result in the temporary (~3 years) loss but rapidly reversible recovery (following reclamation) of approximately 43.8 % of the small Graminoid fen (2.9 ha) located within the LSA and approximately 0.7 % of the estimated 388 ha of Graminoid fen vegetation estimated to be present in the RSA, and a similar loss/recovery of approximately 10 % of the Shrubby fen (4.77 ha) located within the LSA and approximately 0.005 % of the estimated 8,895 ha of Shrubby fen vegetation estimated to be present in the RSA.

These temporary but reversible losses of such small amounts of Labrador Tea-mesic, Graminoid fen and Shrubby fen habitats that may be utilized by moose from time to time are considered to be insignificant at both the local and regional scale.

Given the limited and relatively short-term nature of the project and with the implementation of the additional mitigation measures as described, Tamerlane PPPP development-related activities are not expected to affect the overall health or well-being of the moose population inhabiting the RSA or the ESA. Accordingly, it would appear to be unnecessary to develop a plan for the monitoring of cumulative effects from the PPPP on moose since none are anticipated to occur.

Disturbance and habitat-related effects on moose are expected to be of a negligible and insignificant nature with no significant residual impacts expected to occur. In terms of possible cumulative implications, none of the intermittent, short-term, highly localized and rapidly reversible PPPP-related effects are anticipated to cause impacts that may contribute to a cumulative effect on moose that may use or be present in the area of the Tamerlane PPPP.

Hunting will continue to have the greatest potential for impacts on the moose population of the ESA and Deh Cho region. Moose are present in greater numbers than the other ungulate species and are therefore easier to hunt. For these reasons, moose is usually the preferred game over woodland caribou. However, the development of the Tamerlane PPPP is not expected to contribute to increased moose hunting opportunity for the people of the region.

10.3.4.4 Whooping Crane

A breeding population of Whooping Cranes is located in Wood Buffalo National Park. Non-breeding individuals are known to inhabit marshes, bogs, and shallow lakes between Wood Buffalo National Park and the Mackenzie Bison Sanctuary. The nearest known Whooping Crane nest is located approximately 60 km east and south of the proposed Tamerlane PPPP site near Wood Buffalo National Park.

During the summer of 2005, the 58 known nests in and near Wood Buffalo National Park hatched 62 chicks, with 31 fledged young accounted for in mid-August (ENR 2006). During the winter of 2004/05, the Wood Buffalo National Park population of Whooping Cranes counted on the wintering ground in the Aransas National Wildlife Reserve in Texas was 217.

The Wood Buffalo National Park population migrates to the wintering grounds in Texas beginning in mid-September, and stops en-route throughout the prairies to feed on grain around sloughs and wetlands (SARA 2006). Non-breeding individuals may not occupy traditional nesting grounds until breeding age. Non-breeding Whooping Cranes are known to occur north and west of Wood Buffalo National Park; in particular, the Wood Bison Sanctuary (EBA 2005c).

During the 2005 wildlife study, a single non-breeding Whooping Crane was observed at a recently flooded beaver pond located approximately 26 km from the LSA within and near the east end of the RSA. Wildlife observations carried out over the past two years has determined that the LSA does not contain suitable Whooping Crane nesting habitat, although non breeding cranes could potentially frequent the small fen area within the LSA for seasonal feeding purposes.

The main way that the PPPP, associated infrastructure and activities could potentially affect non-breeding Whooping Crane is through behavioural disturbance, in particular displacement from seasonal feeding habitat. Potential effects on Whooping Crane could also result from the loss or degradation of preferred seasonal feeding habitat.

Based on EBA's observation of a single non-breeding Whooping Crane approximately 26 km from the LSA in 2005, Whooping Crane may conceivably be present in the vicinity of the PPPP footprint area on occasion and may potentially be disturbed by localized development-related noise or activities. Similarly, non-breeding Whooping Cranes may occasionally fly over or feed in marshes, bogs, or shallow lakes adjacent to Highway 5 and throughout the Pine Point region.

A Whooping Crane encountering such activities may show minor displacement behaviour and avoid the immediate PPPP development area and/or the Highway. The duration of such exposures are expected to be brief, perhaps lasting a few minutes to a few hours, and are reversible upon cessation of the activity or by moving away from the activity. The number and frequency of such exposures to disturbance by non-breeding Whooping Crane would be expected to be limited and sporadic.

Regarding preferred habitats for nesting or non-breeding Whooping crane, as previously indicated, the LSA does not contain suitable Whooping Crane nesting habitat, although non breeding cranes could potentially frequent the small fen area for seasonal feeding purposes.

The proposed PPPP development will be of a limited, small-scale and relatively short-term nature. The construction of the PPPP buildings and mining support infrastructure (e.g. access roads, stockpile area, freeze line) will involve the clearing of vegetation in limited areas and the levelling of the existing terrain to accommodate the required buildings and infrastructure.

Most of the PPPP buildings and access roads will be located on existing upland terrain, much of which has been disturbed by historic mineral exploration activities. To minimize new disturbance to existing vegetation in the development area, approximately (4.65 ha) of the PPPP buildings and associated infrastructure footprint (52 %) will be located on previously disturbed terrain. As a result, new disturbance to terrain and associated vegetation in the project footprint area will be limited to approximately 4.3 ha, representing a 19.2 % increase in the total amount of disturbed terrain present in the LSA and an increase of 0.37 % of disturbed terrain present in the RSA.

Approximately 60 % of the PPPP footprint will be located in Labrador Tea-mesic (2.38 ha) or burnt Labrador Tea-mesic (0.21 ha) habitat which is of no interest to Whooping Crane. This vegetation community is the most commonly occurring within both the LSA and RSA. Approximately 68 ha of Labrador Tea-mesic vegetation is present within the boundaries of the LSA. The remaining 52 % of the PPPP footprint (freeze ring) will be temporarily located in Graminoid fen (1.27 ha) and Shrubby fen (0.48 ha) habitats which may potentially be utilized by non-breeding Whooping Cranes for seasonal feeding.

The installation of the freeze ring infrastructure will result in the temporary (~3 years) loss but rapidly reversible recovery (following reclamation) of approximately 43.8 % of the small Graminoid fen (2.9 ha) located within the LSA and approximately 0.7 % of the estimated 388 ha of Graminoid fen vegetation estimated to be present in the RSA, and a similar loss/recovery of approximately 10 % of the Shrubby fen (4.77 ha) located within the LSA and approximately 0.005 % of the estimated 8,895 ha of Shrubby fen vegetation estimated to be present in the RSA.

These temporary but rapidly reversible losses of such small amounts of Graminoid fen and Shrubby fen habitats within the LSA that may be utilized by non-breeding Whooping Crane for seasonal feeding on occasion are considered to be insignificant at both the local and regional scale.

Given the limited and relatively short-term nature of the project and with the implementation of the additional mitigation measures as described, Tamerlane PPPP development-related activities are not expected to affect the overall health or well-being of the non-breeding Whooping Cranes seasonally present in marshes, bogs and shallow lakes in the RSA or the ESA. Accordingly, it would appear to be unnecessary to develop a plan for the monitoring of cumulative effects from the PPPP on Whooping Cranes since none are anticipated to occur.

Disturbance and habitat-related effects on Whooping Crane are expected to be of a negligible and insignificant nature with no significant residual impacts expected to occur. In terms of possible cumulative implications, none of the intermittent, short-term, highly localized and rapidly reversible PPPP-related effects are anticipated to cause impacts that may contribute to a cumulative effect on the occasional non-breeding Whooping Crane that may use or be present in the area of the Tamerlane PPPP or in the vicinity of Highway 5.

10.3.4.5 Peregrine Falcon

There are over 220 documented breeding pairs of Peregrine Falcons in northern Canada (NWT, Yukon, Nunavut, Northern Quebec) (ENR 2006).

The *Falco Peregrinus anatum* subspecies is distributed generally throughout portions of the NWT below the treeline, with a large population located along the Mackenzie River Valley. Smaller populations can be found nesting in the east arm of Great Slave Lake (along the steep cliffs) and in Wood Buffalo National Park. In the past, ENR conducted periodic Peregrine surveys along the Mackenzie Valley and has documented 83 nests on a linear 600 km transect along the Mackenzie River. There has been an increasing trend in Peregrine Falcon numbers since 1980 (Shank 1996; Johnstone 1997).]

Historically, the use of agricultural pesticides, particularly organochlorides, was a major threat to Peregrine Falcon populations. Currently, the small population size, human interference at nest sites, habitat alteration and habitat loss threaten populations (SARA 2006). Present threats are particularly limited in the NWT due to the remoteness of the country (Shank 1996; Johnstone 1997).

In the NWT, Peregrines live an average of five years and begin breeding in their second year. Between May and early June, two to four eggs are laid in a scrap usually on cliff ledges near water. Peregrines have three main habitat requirements: 1) proper nesting sites, 2) nesting range (actively guarded range approximately 1 km from nest), and 3) a home range that can extend up to 27 km from the nest for hunting (not defended) (ENR

2006). Peregrines mainly hunt other birds in the air. Consequently, open habitats such as tundra, grasslands, prairies and waterways are important.

Two Peregrine Falcon sightings were recorded by the EBA wildlife team in the vicinity of and within the RSA in September 2005. One of the Peregrine Falcon observations occurred along Highway 5 near the eastern boundary of Hay River Reserve, while the second observation occurred along a dirt road where the falcon was feeding on a recently killed snow goose (approximately 13 km southwest of the former Pine Point town site.

It is expected that the Peregrine(s) observed within the study area were either migrants or non breeders from known populations in the northeast corner of Wood Buffalo National Park or the east arm of Great Slave Lake (S. MacMillagan, Personal Communication, as cited in EBA 2005c). To date, no Peregrine Falcon territories have been documented in the Tamerlane RSA.

The proposed Tamerlane PPPP area and the entire RSA do not meet the necessary habitat requirements for Peregrine Falcons. It is concluded that there are no nesting Peregrine Falcons within the lowland area south of Great Slave Lake.

The Peregrine Falcons observed in the RSA were determined to be migrants or non-breeders that use the RSA on an opportunistic basis for aerial hunting. As a result, it is most unlikely that Peregrine Falcons can be affected either directly or indirectly in any reasonable way by the development of the PPPP, associated infrastructure and related transportation activities.

Given the limited and relatively short-term nature of the project and with the implementation of the mitigation measures as described, Tamerlane PPPP development-related activities are not expected to affect the overall health or well-being of any Peregrine Falcons that utilize the RSA for opportunistic aerial hunting or those which nest in known but far removed areas of the ESA. Similarly, there is no reasonable basis for assuming that a possible cumulative effect on the Peregrine Falcon population of the ESA could occur. Accordingly, it would appear to be unnecessary to develop a plan for the monitoring of cumulative effects from the PPPP on Peregrine Falcons since none are anticipated to occur.

11.0 ACCIDENTS AND MALFUNCTIONS

The MVEIRB Terms of Reference (MVEIRB 2006) requested information on the potential effects of accidents and malfunctions that could occur in connection with the PPPP. Tamerlane corporate policies, industry standards, regulations and/or guidelines to minimize the potential occurrence and magnitude of possible accidents and malfunctions have been previously reviewed in earlier sections of the DAR (Sections 1.0, 4.0 and 7.0).

Accidents or malfunctions can be associated with any human activities related to the short-term construction period and/or the equally short-term operations and reclamation periods of the Tamerlane PPPP. Environmental consequences of potential accidents or malfunctions associated with the Tamerlane PPPP and associated activities would be primarily limited to those related to:

- Fuel storage, transportation and handling system failures
- Explosive materials storage, transportation and handling system failures
- Refrigerant storage, transportation and handling system failures
- Concentrate storage, transportation and handling system failures
- Failure of the freezewall to minimize groundwater infiltration into the underground mine works.
- Vehicle and industrial accidents.

As indicated previously in Sections 1.0, 4.0 and 7.0 to minimize risks of accidents or malfunctions occurring and to minimize possible risks to the environment from such potential accidents or malfunctions, a number of preventative and mitigation measures will be employed. The overriding preventative and mitigation measures to be employed include:

- Implementation of best management and industry practices as appropriate to prevent or minimize the occurrence of accidents or malfunctions.
- Compliance with Land Use Permit and Water License requirements and conditions.
- Conformance with existing applicable GNWT and WCB standards.
- Compliance of all PPPP-related traffic with existing NWT traffic laws.
- Effective application of Tamerlane's Hazardous Materials Spill Contingency Plan.

Tamerlane's Plan is designed to efficiently and effectively respond to any medical or environmental emergency and/or accidental spill that may be associated with the construction, operation or decommissioning of the Tamerlane PPPP.

The scope of the Plan encompasses the overall range of types of accidents or malfunctions that may require the initiation of an emergency, medical or environmental response. The Plan also considers the possibility that more than one type of response may be required for any one incident. Response preparedness will be maintained for incidents involving medical, fire, underground flooding, fuel, refrigerant or concentrate spills or other environment related incidents (e.g. wildlife collisions).

PPPP Construction Phase:

- Fuel for the construction equipment will be transported to the site from local distributors with a purpose-specific fuel truck.
- All PPPP traffic will comply with existing NWT traffic laws.
- Fuel and other hydrocarbons will be stored in accordance with the existing CCME environmental code of practice for storage of these products (CCME 2003).
- All vehicles and equipment will be refueled at a safe distance from the standing water in the nearby fen.
- Any spills will be immediately reported to the 24-hour Spill Report Line (867) 920 8130 and spill containment and cleanup activities will be implemented in accordance with Tamerlane's Hazardous Materials Spill Contingency Plan (Appendix F).

PPPP Operations Phase:

- Fuel for the operations phase will be transported to the site from local distributors with a purpose-specific fuel truck.
- All PPPP traffic will comply with existing NWT traffic laws.
- Fuel and other hydrocarbons will be stored in accordance with the existing CCME environmental code of practice for storage of these products (CCME 2003).
- All vehicles and equipment will be refueled at a safe distance from the standing water in the nearby fen.
- Explosives ingredients (e.g. Ammonium Nitrate, diesel) will be transported to the site from local distributors in accordance with federal *Transportation of Dangerous Goods* (TDG), *Workplace Hazardous Materials Information System* (WHMIS) and *Explosives Act* requirements.

- Concentrate product will be transported from the PPPP site to the Hay River railhead in designated trucks equipped with covers.
- The PPPP operation will comply with Land Use Permit and Water License requirements and conditions.
- The PPPP operation will conform with existing applicable GNWT and WCB standards.
- All hazardous wastes recovered from spill incidents will be treated and/or disposed of in an approved manner.
- Any spills will be immediately reported to the 24-hour Spill Report Line (867) 920 8130 and spill containment and cleanup activities will be implemented in accordance with Tamerlane's Hazardous Materials Spill Contingency Plan (Appendix F).

With the application and implementation of the preventative and mitigation measures as outlined, it is unlikely that any significant fuel, chemical or concentrate spills will occur. As a result, it is equally unlikely that any potential negative effects on the terrestrial or aquatic environments of the Pine Point area will arise.

Regarding the possibility of freeze wall failure, resulting in rapid flooding of the underground mine workings, such a condition is not expected to arise due to the nature of the freeze wall technique being employed. As previously discussed in Section 4.0 of the DAR, the application of this freezing technique will result in the development of a cylindrical ring of frozen ground approximately 5-10 m thick around the entire underground mine works area to prevent the ingress of water into the mine works from the vertical sides of the freeze wall. Continuous monitoring of the condition of the frozen wall will be undertaken to ensure that its integrity is maintained throughout the period of underground mining activities.

The limited groundwater that is anticipated to seep into the underground mine area from below the freeze curtain will be used for PPPP process needs or will be directed to the infiltration basin for recharge to the groundwater of the area.

Following completion of underground mining operations, the freeze plant will be turned off, the brine will be removed from the system and the freeze pipes will be filled with grout. The frozen ground is expected to thaw and return to its normal state within a period of weeks or months, depending on the scale of the freeze operation and local underground conditions.

Another concern relates to the possible leakage of brine from the freeze pipes in the ground. To minimize risks associated with freeze pipe failure, each freeze pipe is pressure tested prior to installation (Thyssen 2006). The integrity of the closed-loop network of surface and vertical freeze pipes will be continuously monitored and any leakage can be immediately detected as a drop in the amount of the return brine. The source of the leak can then be isolated and repaired. Thyssen (2006) indicated that based on previous experience, leaked brine usually tends to migrate into the shaft where it can be contained and removed. Any brine that leaks into the underground around the freeze curtain will be locally diluted to the extent that it is not anticipated to have a measurable effect on the groundwater environment.

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