Snap Lake Mine

Environmental Monitoring Agreement Report: 2010

De Beers
GROUP OF COMPANIES

PLAIN LANGUAGE SUMMARY

The Snap Lake Mine (Mine) is a diamond mine owned and operated by De Beers Canada Inc. (De Beers), and is located about 220 kilometres (km) northeast of Yellowknife, Northwest Territories (NWT). De Beers received regulatory approval for the Mine in 2004, which included an Environmental Agreement. Mining began in 2007 and is expected to continue for 22 years. We have completed seven years of environmental monitoring since construction started for the Mine. This annual report for the Mine's Environmental Agreement summarizes the monitoring activities and results from 2010.

Since we received regulatory approval for the Mine in 2004, we have written 32 monitoring and management plans for the Mine. In 2010, we submitted 17 reports. We submitted eleven annual reports, three management plans and three reports under the fisheries authorization. A summary of each of these documents can be found in this report.

Here is a summary of what we found in our environmental monitoring studies in 2010.

Air quality: When any fuels are burned, greenhouse gases are produced. We measure the amount of greenhouse gases produced by the Mine because they can add to global warming. Emission rates were generally lower in 2010 from 2009 estimates primarily due to lower power generation and less fleet use at the facility.

Aquatics: We found increases, relative to baseline levels, in dissolved salts, nutrients and a few metals in the water in Snap Lake in 2010. The increases in dissolved salts were greater than expected, and resulted from more loading of dissolved salts from the mine dewatering process in the underground mine than originally planned. These changes are not harmful to fish or other life in Snap Lake. We checked the amount and types of algae, and bugs that live in the water and on the bottom of Snap Lake, to see if there were any changes in food for fish compared to previous years. The amount and types of algae and bugs in the water of Snap Lake have changed from year to year, but this may not be related to the mine alone, because similar changes also occur in all lakes. The number of different types of bugs on the bottom of Snap Lake in 2010 was similar to those in previous years, and the Mine only had a small effect on them. We also checked the mud that the bugs live in at the bottom of the lake and found that two nutrients and a few metals were higher.

Archaeology: None of the sites discovered near the winter road and Mine were disturbed in 2010.

Hydrology: The results indicate that 2010 had low water levels and streamflows compared to previous years. Snap Lake water levels continue to exhibit similar increases and decreases as other monitored lakes in the surrounding area. Water level increases are less than predicted in the EAR and appear more related to climatic conditions than mining influences.

Hydrogeology and Geochemistry: The rock types at the Mine have not changed from what we thought they would be. We have discovered that more water is seeping into the underground mine than we thought there would be and as a result, there are more salts in the water. We are looking into different technology alternatives to solve this issue.

Vegetation: Satellite pictures were taken of the Mine to check the total size of area impacted by the Mine in 2008. We found that the impact on vegetation was less than we thought it would be. All vegetation communities were impacted less than we expected, except for the esker. We thought only 0.5 hectares (ha) of the esker would be disturbed, but 1.6 ha of the esker was disturbed in the winter of 2001. No further disturbance on the esker is expected to happen. Dustfall exceeded the Alberta Ambient Air Quality Objective for commercial and industrial properties at one sampling location for four consecutive months. This is believed to be a result of dumping in close proximity and the switch from the North American Occupational Safety and Health (NAOSH) hygiene standard to an environmental standard for measurement. Overall, dust does not appear to be having an effect on vegetation at the Mine site.

Wildlife: In 2010, monitoring indicators for caribou, grizzly bear and wolverine all indicated low levels of activity, but this is likely related to the recent declines in the Bathurst caribou herd. We continued to monitor peregrine falcon nests in the area, the number of occupied nests was higher than 2009, but the total number of chicks observed was within the range observed during the baseline studies. Incidents in 2010 were mostly related to fox and wolverine at site, and some isolated incidents included caribou and songbirds. Wildlife mortalities have been very rare at Snap Lake, but in 2010, two swallows and a ptarmigan were killed by mine related activities and three fledgling robins and a fox, were all found dead within the mine boundaries.

Compliance: There were twelve inspections conducted by Indian and Northern Affairs (INAC) in 2010. All issues brought up by the Inspector were addressed or are being addressed.

Mitigative Measures: The AEMP annual report demonstrates that the Snap Lake Mine's impact is similar to what was predicted in the Environmental Assessment. This demonstrates that the mitigative measures being used by De

Beers are working effectively. Currently, the main area of investigation for new mitigative measures is in the area of TDS lake concentrations. This work is ongoing.

Adaptive Measures: Adaptive measures adopted in 2010 included the construction of the Main Settling Sump (MSS) in the underground, new cleaning methods for the water treatment plant filters, the commencement of the five year review of the AEMP and the grizzly bear hair snagging program.

TRANSLATIONS

YATI DEZHÌLEA K'È ATÍ'È

The Snap Lake Mine sôömbak'è goæô sii De Beers Canada Inc. gits'ô hôt'e, eyits'ô danîhts'i k'ambatsö ts'ôk'e Sôömbak'è gots'ô 220 gochî goæö. 2004 ekò De Beers sôömbak'è k'e eghàlagìde gha hêæê gogedi t'à la wexè hogîhdè eyixè ndè esawodech'à gha nàowo gehtsî. 2007 k'e dii la wexè hoïwo eyits'ô 22 xo gots'ô gik'e eghàlagìde ha gîwô. Åôhdî xo gots'ö dìi la wexèhoîwo gots'ô ndè esawòdech'à wexoets'ihdì gha wek'e eghàlats'ïda. Dii nîhtå'è ts'ehtsî sii 2010 xo k'e edànì la wek'e eghàlaïts'îda weghô nîhtå'è hôt'e.

2004 gots'ô dii la ts'ö hêæê gots'edi ts'ô 32 edànì dii la wexòedi ha eyits'ô edànì wek'e eghàlats'ìde ha weghô nîhtå'è ts'ehtsî t'à wexòts'ihdi. 2010 k'e, 17 wegondi ts'ehtsî. Xo tât'e gha honôdaòts'ö iåè nîhtå'è ts'ehtsî weghô gondi nîhtå'è ts'ehtsî, k'àodee nîhtå'è tai gehtsî eyits'ô åiwe gha k'àodee nîhtå'è tai sìi gehtsî. Eyìi nîhtå'è nek'öâ t'à atå'è sìi dii nîhtå'è weyìì whehchì.

2010 k'e ndè wexòedi xè wegondi nàts'ehtsî weghô dìi nîhtå'è nek'öâ t'à atå'è t'à hòlî.

Nîhts'i Edànahtso: Tåeh t'ala sìi wek'èk'ö nîdè, wet'à tåehlo gohåî. Sôömbak'è edàtåô tåehlo yehtsî sìi eyìi tåeh wet'à dii ndè whekö ayïwhô sìi wexèts'ihdzà. 2010 ts'ô 2009 ts'ö tåehlo edàtåô wexìdzà sìi yazèa îdoo ajà, satsö etåe eyits'ô satsöbehchîï edàtåô k'edè wets'îæô netåô ajà.

Tich'aàdìi Teè Nàdè: Yazèa îdoo ajà, akweåö dìi wegondi nàts'ehtsî hò ayìi wegòts'îæô ghà ats'edi, dewa ti yìì gohåî sìi, sìì netåô wendì, eyits'ô 2010 Snap Lake teè yìì satsö yazèa wegöt'ô. Dewa sìi ti ta yazèa netåô gôö wegôt'ô, eyits'ô sôömbak'è ndè gotå'a ts'ö ti wek'enàetse kö gots'ô ti weta dewa gohåî nàgihtale. Dìi hanì åadî ade nehò åiwe gha esânîle eyits'ô Snap Lake tì asìi wek'e nàde sìi gigha esânîle. Eyits'ô åiwe wendì åadî hazhô wek'ats'ehtô, eyits'ô tehtsàtsòa teè gotå'a ts'ö nàdè sìi wek'ahòetô, ahsï îdi edlatåô xo gots'ô gindì åadî ajà nìì gha wek'ahòetô, hanìkò sôömbak'è zô wet'à ts'edi ha dìì, tia hazhô hanì lanì hazhô eåexèht'e. 2010 Snap Lake wetå'a ts'ö tehtsà edàtåô åadî nàdè sìi ek'èdaexo ts'ô åadî ajà. Eyits'ô tehtsà hazhô åadî teè gotå'a ts'ö ehtå'è yìì nàdè sìi wek'ats'ehtô eyits'ô wendì nàke eyits'ô satsö môhdaà yazèa nàtso wegogîhæô.

Whàedô Goht'ô Whela K'è: 2010 xo k'e sôömbak'è gà eyits'ô xo tîlî gà whàedô gokök'è gohåî wegogihæô sìi wexèlagihdile.

Ti K'etå'o: 2010 xo k'e edànì ti k'etå'o îzhì ajà gedi eyits'ô îdi xo k'e edànì ti k'etå'o îlè sìi åadî ajà. Snap Lake tì edàtåô île sìi sìì îzhì ajà gedi, îåa îdoo at'î izhì anàt'î, eyìle tì sìi wexòedi ghà.

Ndè esawòdech'à wexòedi gha nîhtå'è hòlî hò ti îdoo ade ha gedi îlè sìi wexèt'ele, môht'aà edàgot'î gha åadî at'î.

Ti eyits'ô edànì ndè wegohåî: Kwe edàwhìt'î eyits'ô akweåö kwe edàtåô gohåî ts'edi îlè sìi eyìi gondi åadî ajàle. Ti edàtåô ndè gotå'a ts'ö k'etå'o ha ts'edi îlè sìi, weeæö ts'ö ts'iìhtà, eyit'à ti ta dewa netåôgôö. Edànì dii sets'ïlalìi ts'edi t'à wedanàts'eta.

Asìi Yàeshe: 2008 hò sôömbak'è edaïcho wexìdi ha honi ts'edi t'à wenîhtå'èchì ts'ihchì. Ndè edaïcho wek'e eghàlats'ìdè yazèa nechalèagôö hôt'e nô wek'ehòts'ihzhà. Edaïcho ts'îwo îlè sìi åadî hôt'e nô, hanìkò what'à zô hanìle nô. 2001 xo k'e 0.5 hectares zô ts'îwo îlè hanìkò, 1.6 t'a what'à wexìdi. Eyìi weèæö what'à k'e esagode hale. Nîhts'i wek'ewehts'i wexèts'ihdzà hò Alberta nîhts'i edàtåô nàeta ha gedi sìi dìi hani la gha eyits'ô dìi hani la k'e eghàlats'ìde nîdè, dî sa ts'ö hazhô eåexè wegondì nàgehtsî. Dìi North American Occupational Safety and Health nàowo weghà ts'ö agejà ts'îæô hôt'e gedi. Hazhô t'à, ewa wek'ewehts'î t'à ndè wexìdile gedi.

Tich'aàdìi: 2010 k'e, ekwö, sahcho eyits'ô nögha netåô wek'ehòewhole wegògîæô, hanìkò Bathhurst ekwö netåôle ajà gedi wets'îæö hôt'e tahkò. Akô sìi det'ôchotsòa wegondi îåa nàgehtsî, 2009 xo k'e netåôgôö îlè, hanìkò, akweåö edàtåô wezha gohåî ha hodi îlè sìi eåexèt'e. 2010 xo k'e nôgeè eyits'ô nögha zô wegaht'î akô ts'ö goïwale gèaæî eyits'ô ekwö môhdaà eyits'ô chïâ môhdaà sii gìaæî. Snap Lake tich'aàdìi åô åadele, hanìkò 2010 xo k'e chïâ nàke, k'àmba îåè, sôömbak'è gà åaïde eyits'ô gohåia tai eyits'ô nôgeè sìi hazhô åaïde sôömbak'è gà wegogîhæô.

Wek'èts'ït'e Ha: Sôömba Nàledô Canada 2010 k'e nàowo honôdàots'ö nàke ghà asìi wek'agehtô îlè. Asìi hazhô weghô haïti sìi wek'e hayagîhti hanìle dè wek'e eghàlagïda.

Edànì Senàgele Ha: Xo tât'e edànì ndè senàgele ha gedi îlè sìi weghà eghàlagìde t'à la hazhô deghà weghàlageda. Eyit'à edànì De Beers eghàlagìde ha gedi îlè sìi nezî wek'e eghàlagìde. Dìi gha, ayìi wedànàgeta ha gedi îlè sìi, ti hazhô nezî weghàlageda ha. Dìi la ats'ô wek'e eghàlahòda.

Edànì Asìi Åadî Aæï: 2010 k'e edànì asìi åadî adle ha nàowo holî hò, adî ti k'etå'o ha ndè gotå'a ts'ö nîït'ìì gha gedi t'à hòlî, edànì ti weniì whehchì xè ti k'etå'o gha senàdle ha, sîlai xo ts'ö edànì wexòedi xè tich'aàdìi teè nàde sìi edànì wegondi nàtsî ha eyits'ô sahcho weghà nàtsî ha sìi îåa wek'e eghàlagìde ha.

That’ɣn yatı t’á Dené hél hadı

Snap Lake tthé luzé k’é hoʔǫ sı De Beers Canada Inc bet’sɣ hél yégháláná ʔat’é(De Beers)Bewuldésché ts’ɣ yuthę ts’én haʔá sı nonǫná ts’én nǫnǫ dechën ʔanéłthá ʔat’é jǫ ʔedzá nené k’eyaghé ʔats’édı. Dé Beers sı hǫ́ héts’édı t’á tsambá k’é nonıʔá xá 2004 ku tth’í ʔaʔıé ts’ɣdhí ch’á badı halya yatı halɣ tsambá k’é hunıdhı xá 2007 ʔeyer ts’ɣ noná ts’én naké xaıyé ts’én gháladá xa hunıdhęn. Dǫ sı łaısdɣ nené ʔasıé ts’ɣdhí ch’á badı sı dırı kǫ́é hałé hunıdher sı tsambá k’é. Dırı jǫ nehél hadı sı ts’ambá k’é nare ʔasıé hadı ts’ɣdhí ch’á t’at’u ʔalyá sı nehél hadı xá dırı 2010 t’at’u bek’ónéłt’á sı ghǫ hanı.

Tsambá k’é nonít’á xá hǫ nuhets’édı sı t’sɣ 2004 ku xaıyé ts’ı kǫnǫná ts’én naké ʔaıé hadı hél tth’ı ts’ekaí bebá sehúlyá t’at’u tsambá k’é gháladá hası.2010 ku łaısdɣ ʔadhél ʔerıtł’ís detł’ís. ʔɣłaʔadhel xaıyé k’ǫnelt’u detł’ís,kaghé sı t’at’u lá k’é hoʔǫ ghǫ honı,tth’ı kaghé ʔerıtł’ıs halɣ łué ghǫ k’oldé bedagharé. Dırı nehél hadı sı jǫ hanı dırı ʔerıtł’ís yethelá ʔat’é.

Jǫ nehél hadı sı dırı ʔasıé hadı hél bek’onétá sı 2010 xaıyé ku ts’ɣ xadí.

Nı’łts’í

Tł’és t’á satsǫn hekoth dé beleré sı nezoɣlé nıłts’í k’a ʔat’ɣ tsambá k’é gháládá dé bet’á tth’ı jǫ ʔedzá nené hunıdhíl ʔát’ɣ snı.2010 ku xaıyé sı tł’és leré natser choılé t’a ʔát’é 2009 ku sı natser nılé ku dǫ hat’é hılé kǫ́é yızɣ bet’ahat’ɣ chó hılé ʔat’é.

Ku yaghé ʔasıé hadı

T’á naı ʔasıé ku ye natser lajá sı 2010 xaıyé k’é yazɣ hǫ́lɣ ʔáłnı déddhay chu satsǫn ts’ɣ ku yé Snap Laké yé. Déddhay ku yé natser ʔajá t’oníłtser xá hónıdhęn ʔazɣ ʔajá. Ku hadzël hél chu tth’ı nı yaghé ts’ɣ tthé ghǫ nats’edé sı chu ʔat’é snı. T’atthé t’at’ú tthé ghǫ nats’edé xá sehulyá nılé sı ʔedǫ ʔajá sı

ts'ı ʔané ʔat'é snı.Dırı sı bet'á hunílá cho haılé t'á keyaghé ʔasıé dáná sı łué tth'ı bebá sat'e haılé Snap lake ku yé hadı.ku ye kedlaré xá níl?ı hél tth'ı t'at'ı hųlı xa net'ı tth'ı gu kétł'aghé nadé sı tth'ı łué benı sı net'ı ʔedǫ ʔajá dé t'atthé net'ı nı gharé chu dǫ dzıné chu ʔadı.Snap Lake ku yé sı xaıyé kanélt'u kedlaré chu gu ʔazé ke nadé sı ʔedǫ ʔat'ı dırı tsambá k'é ho?ą sı bat'éhılé hunıdhęn. Snap lake nare naı ku bek'é ghaladaílé hulí gu chu kedlaré ʔedǫ ʔajá begharé snı. Snap Laké ké tł'aghé t'at'ı gu ʔéłk'ech'á nadé sı 2010 net'ı betthé xaıyé chu hadé ʔedǫ ʔajá hılé snı.Tsambá k'é ho?ą sı bet'á ku yé gu nadé sı bat'éhaılé snı. Ke yaghé hatł'és yé gu nadé net'ı sı gharé satsǫn tsı natser lat'é tth'ı bet'a ʔasıé neyé sı hul?ą.

Dené zás k'é

T'a xaıyé kelų k'é dené zás hul?ą sı tthı tsambá k'é nare sı badı tthı sajaılé snı.

Ku hel gháládá

2010 ku xaıyé sı ku łą hılé beta dé tsël ʔazé natser hılé betthé xaıysé hat'é nılé hılé.Snap Lake keú s nok'é ku łą nok'é łaıle ku benaré thela sı chu ʔéłélt'é bedı gharé.?asıé hadı gharé ku sı łą ʔané hunıdhęn sı badı gharé adı hél tth'ı jǫ ʔedza nené k'é yaghé hunıdhíl chu ʔat'é dırı tsambá k'é ho?ą sı bet'á ʔat'éhılé.

Ku chu tthé ts'ı he ghaladá

T'at'ı tthé hųlı sı tsambá k'é nare ʔedǫ ʔajáılé t'atthé ʔedǫ ʔané xá hunıdhęn nılé.Ku łą nı ye ts'ęn het'ır ʔajá nıdaghé ts'ı ku bet'á kuyé deddhay natser ʔajá. Dırı sı ʔaké bek'onetá xá t'at'u dek'a?ǫ ʔalné hası ghą hadı.

T’anchay dǫnıyé hél gháládá

2008 xaıyé ku satellıte t’a tsambá k’é nı t’aníłyǫ nı ts’ıdhí hası net’ı nılé. T’anchay łǫ ts’ędhı haılé. T’a t’anchay ts’ędhı hadé t’á dǫnıyé sı thaıt’eth lá k’é dé zǫ snı. Tthaıt’eth lá gháladá sı 0.5 ku nı ghaladá xa hunıdhǫn hulı dǫ 1.6 nı haıłyǫ k’é gháladá ʔat’é t’o nılé sı xaıyé ku 2001 xaıyé ʔajá. Dǫ so kut’á thaıt’eth k’e gháladá haılé.Dırı ts’er hél ghálada sı yu naghé Alberta nıłts’í hel gháladá ts’ędhı dé dırı Dené la k’é nonılé sı chu tth’ı tthé ghánatsłédé dé t’at’u dek’aʔǫ ʔasıé ts’ędhı ch’á hél gháladá sı gharé hadı dıghı sá ts’én badı xá.Ku t’á ʔasıé nıdíl sı nedhílé dé hadı ku dırı North Amerıcan Occupatıonal Safety and health bedagharé nı lé sı ts’ı ʔané hadı t’et’u badı sı gharé t’o nezǫlé dé xa. Dırı tsambá k’é nare t’anchay neyé sı bat’é hılé snı.

Kéch’andí

2010 xaıyé ku ʔetthén,sás chogh tth’ı nqghay badı hunıdher gharé dırı k’ech’andı sı ku nare hat’ı cho hılé snı. T’aʔat’é sı dǫ Bathust ʔetthén dek’áʔǫ ʔajá ʔat’é hunıdhǫn.Det’ancho yu tthé ts’ı tth’ı badı hél t’á ʔét’ó thela sı chu gharé dǫ sı ʔet’o thela sı ʔegés beyé thela snı 2009 xaıyé chu hadé.Ku t’á ʔegés yé cheth hadél sı badı t’a nı ghaladá nare sı badı hunıdher sı. Ku t’a nadher nılé sı 2010 ku xaıyé sı nagíth tthoghé chu naghayé chu bet’a hunílá t’á tsambá k’é nare nadé sı ʔa’ní tth’ı beghǫ thǫné ʔetthèn chu ʔıyés nechılé dajén sı snı bebá hunılá. Dǫ ts’én k’ech’andıé thaıdher hǫlıłé tsambá k’é hoʔǫ t’a snı.2010 xaıyé ku naké(swallows) tth’ı łaghé k’ásbá thıqdé la haʔǫ nı k’eyaghá la t’at’é snı tth’ı beghǫ théné kaghé(fledgıng robıns tth’ı nagìth thqıdher búlʔǫ tsambá k’é gháládá nené k’eyaghé ʔats’edı.

ʔake t'at'u la k'é badı gharé gháladá .

Harélyǫ t'à nakéʔadhél ku ts'én tsambá k'é nare ghaladá sı ʔerıtł'ís nedhé gharé gháladá xa bedı̨ tsambá nalé bechëlélu bedagharé t'á nezǫ lat'éhílé sı selyé xá tth'ı t'at'u nezǫ sı ts'én xadí harélyǫ ʔasıé ʔats'edí.

ʔasıe tsı̨dhı badı hel ghǫladá dek'aʔǫ xá

T'á gharé hadı sı ʔasıé tsędhı ch'á hel gháladá ts'ı̨ ʔrıtł'ıs nedhé thela sı gharé Snap Lake gháladá sı yáłnı hoʔǫ. Xaıyé k'anelt'u hanı gharé badı ʔat'é Beghare De Beers ʔaké nezǫ ghálaná ʔasıé ts'ı̨dhı ch'á sı ghǫ.Dǫ sı ku ʔaké badı beyé ʔasıé nezǫle ʔané dé xá dırı la sı k'étł'a ts'én badı ʔat'é.

T'at'u nezǫ ʔasıe hadı ts'én gháládá

2010 ku xaıyé sı t'at'u ku ch'ëlé hel gháladá serı̨dhén sı nı yaghé ts'én chu tth'ı ku delk'al nálʔı̨ sı t'a sı kuserìdhén kué t'á bedarı̨łchuth sı ʔats'édı. ʔeyer ts'ı̨ sǫlaghé xaıyé de nánet'ı̨ xá. Sás chogh beghá hel gháladá xa snı.(AEMP) bedagharé.

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ABBREVIATIONS AND ACRONYMS

AMP	Adaptive Management Plan
ANFO	ammonium nitrate and fuel oil
AQEMMP	Air Quality and Emissions Monitoring and Management Plan
AQMP	Air Quality Monitoring Program
ARD	acid rock drainage
BOD	biochemical oxygen demand
C&R	Closure and Reclamation
CCME	Canadian Council of Ministers of the Environment
De Beers	De Beers Canada Inc.
DFO	Fisheries and Oceans Canada
DO	dissolved oxygen
EAR	Environmental Assessment Report
ELC	ecological land classification
EMP	Emissions Management Plan
EMS	Environmental Management System
ENR	Department of Environment and Natural Resources
ERP	Emergency Response Plan
ERT	Emergency Response Team
GHG	greenhouse gas
GNWT	Government of the Northwest Territories
Golder	Golder Associates Ltd.
INAC	Indian and Northern Affairs Canada
LSA	local study area
Mine	Snap Lake Mine
MSDS	Material Safety Data Sheets
MVEIRB	Mackenzie Valley Environmental Impact Review Board
MVLWB	Mackenzie Valley Land and Water Board
NO_2	nitrogen dioxide
NO_X	oxides of nitrogen
NWT	Northwest Territories
OSWRPKMP	Ore Storage, Waste Rock, and Processed Kimberlite Management Plan
PAG	potentially acid generating
PK	processed kimberlite

PM	particulate matter
PM_{10}	particulate matter nominally less than or equal to 10 micrometres (µm) aerodynamic diameter
$PM_{2.5}$	particulate matter nominally less than or equal to 2.5 µm aerodynamic diameter
Project	Snap Lake Project
PSP	permanent sample plot
QA/QC	quality assurance/quality control
RSA	regional study area
S27	Stream 27
S29	Stream 29
SHE OPs	Safety, Health, and Environment Operational Procedures
SLEMA	Snap Lake Environmental Monitoring Agency
SNP	Surveillance Network Program
SO_2	sulphur dioxide
TDG	transportation of dangerous goods
TDS	total dissolved solids
TSP	total suspended particulate
TSS	total suspended solids
VEC	valued ecosystem component
VMP	Vegetation Monitoring Program
WEMP	Wildlife Effects Monitoring Program

UNITS OF MEASURE

%	percent
µg/L	micrograms per litre
$µg/m^3$	micrograms per cubic metre
µm	micrometres
cm	centimetre
cm/s	centimetres per second
g	grams
ha	hectares
kg	kilograms
kg/yr	kilograms per year
km	kilometres

km^2	square kilometres
kt	kilotonnes
kt/yr	kilotonnes per year
L	litres
L/s	litres per second
m	metres
m/s	metres per second
m^2	square metres
m^3/d	cubic metres per day
$mg/dm^2/30d$	milligrams per square decimetre per 30 days
mg/L	milligrams per litre
mg/station	milligrams per station
mm	millimetre
$organisms/m^2$	organisms per square metre
ppmw	parts per million by weight

1 INTRODUCTION

De Beers Canada Inc. (De Beers) owns and operates the Snap Lake Mine (Mine). The Mine is located in the Northwest Territories (NWT) approximately 220 kilometres (km) northeast of Yellowknife and 30 km south of MacKay Lake (Figure 1-1).

An Environmental Assessment Report (EAR) for the proposed mine (De Beers 2002a) was completed and submitted to the Mackenzie Valley Environmental Impact Review Board (MVEIRB) in February 2002. The MVEIRB in turn completed a review, and recommended that the Mine proceed subject to the implementation of measures to mitigate environmental impacts (MVEIRB 2003). The MVEIRB's report and recommendation was submitted to the Minister of Indian and Northern Affairs (INAC) in July 2003 and received ministerial approval in October 2003. De Beers received the necessary Water License, Land Use Permit, Land Leases, and Environmental Agreement in May 2004 to begin construction and operation of the Mine. Operation of the Mine began in 2008 and is expected to continue for 22 years.

1.1 ANNUAL REPORT REQUIREMENTS

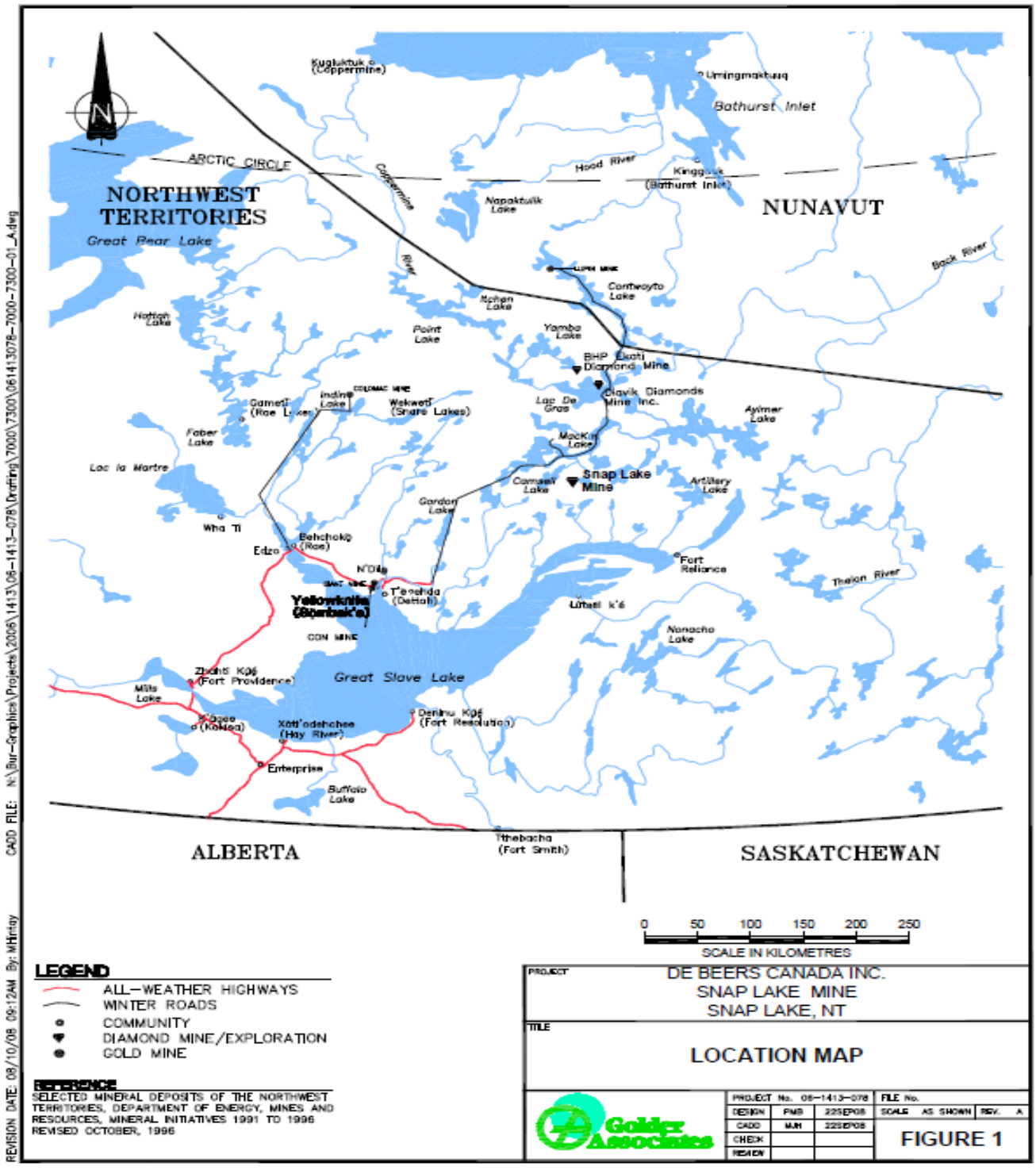
As part of its environmental agreement commitments, De Beers must prepare and submit an annual report outlining the results of the previous year's environmental monitoring programs. This report presents a summary of the results of the 2010 Snap Lake Environmental Monitoring Programs.

Article X, Section 10.1 of the Environment Agreement outlines the requirements for the Annual Report submission as follows:

10.1 Annual Report

a. *De Beers shall prepare and submit an annual report (the "Annual Report") to the Parties and the Monitoring Agency for each calendar year during the term of this Agreement.*

Figure 1-1 Location of Snap Lake Mine, Northwest Territories



b. *Each Annual Report shall include the results of Environmental Monitoring Programs, and a rolling summary and analysis of environmental effects data over the life of the Project to illustrate any trends. The actual performance of the Project shall be compared to the results predicted in the environmental assessment and the MVEIRB Report and an evaluation provided as to how De Beers' Adaptive Management has performed to the date of each Annual Report.*

c. *Each Annual Report shall include, but not be limited to, the following:*

    i. *a comprehensive summary of all supporting information, data and results from the Environmental Monitoring Programs and all studies and research;*

    ii. *a comprehensive summary of all compliance reports required by the Regulatory Instruments;*

    iii. *a comprehensive summary of operational activities during the preceding year;*

    iv. *actions taken or planned to address effects or compliance problems which are set out in the Annual Report;*

    v. *a comprehensive summary of operational activities for the next year;*

    vi. *lists and abstracts of all Environmental Plans and Programs;*

    vii. *verification of accuracy of environmental assessments;*

    viii. *determination of effectiveness of mitigative measures;*

    ix. *a comprehensive summary of all Adaptive Management measures taken;*

    x. *a comprehensive summary of public concerns and responses to public concerns;*

    xi. *a comprehensive summary of the new technologies investigated;*

    xii. *the Minister's comments, including any Minister's Report, on the previous Annual Report;*

    xiii. *a plain English executive summary and translations into Dogrib and Chipewyan using appropriate media.*

d. *In order to prepare each Annual Report and with a view to both ensuring that an opportunity is provided for early disclosure and discussion of problems and that each Annual Report meets with the requirements of this Agreement, De Beers shall Consult with the Minister, the Monitoring Agency, and the GNWT as De Beers compiles the information and data to be included in such Annual Report.*

Table 1-1 provides a summary of where the requirements of the Environmental Agreement are addressed in the 2010 Environmental Agreement Annual Report.

Table 1-1 Summary of the Environmental Agreement Annual Report Requirements and Sections Addressing those Requirements in the Annual Report

Environmental Agreement Section	Requirement in the Environmental Agreement	Section in the 2010 Annual Report
Article X, 10.1, b	Each Annual Report shall include: - the results of Environmental Monitoring Programs - a rolling summary and analysis of environmental effects data over the life of the Mine - the performance of the Mine shall be compared to the results predicted in the environmental assessment and the MVEIRB Report	Section 2 – 2010 Environmental Monitoring Program Summary
Article X, 10.1, b	Each Annual Report shall include: - an evaluation provided as to how De Beers' Adaptive Management has performed to the date of each Annual Report	Section 8 - Summary of Adaptive Measures
Article X, 10.1,c,i	Comprehensive summary of all supporting information, data and results from the Environmental Monitoring Programs and all studies and research	Section 2 - 2010 Environmental Monitoring Program Summary Section 4 - 2010 Report Submissions
Article X, 10.1,c,ii	Comprehensive summary of all compliance reports required by the Regulatory Instruments	Section 5 - Summary of Compliance
Article X, 10.1,c,iii and v	Comprehensive summary of operational activities during the preceding year and next year	Section 6 - Summary of Activities at Snap Lake
Article X, 10.1,c,iv	Actions taken or planned to address effects or compliance problems which are set out in the Annual Report	Section 5 - Summary of Compliance
Article X, 10.1,c,vi	Lists and abstracts of all Environmental Plans and Programs	Section 3 - Summary of Snap Lake Monitoring and Management Plans
Article X, 10.1,c,vii	Verification of accuracy of environmental assessments	Section 2 - 2009 Environmental Monitoring Program Summary
Article X, 10.1,c,viii	Determination of effectiveness of mitigative measures	Section 7 - Summary of Mitigation Measures
Article X, 10.1,c,ix	Comprehensive summary of all Adaptive Management measures taken	Section 8 - Summary of Adaptive Measures
Article X, 10.1,c,x	Comprehensive summary of public concerns and responses to public concerns	Section 9 - Summary of Public Concerns
Article X, 10.1,c,xi	Comprehensive summary of the new technologies investigated	Section 10 - Summary of New Technologies Investigated
Article X, 101.1,c,xii	Minister's Report on the previous Annual Report	Section 1 - Introduction
Article X, 101.1,c,xiii	Plain English executive summary and translations into Dogrib and Chipewyan using appropriate media	Plain Language Summary
Article X, 101.1,d	De Beers shall Consult with the Minister, the Monitoring Agency, and the GNWT as De Beers compiles the information and data to be included in such Annual Report	Section 1.2 - Introduction

Note: MVEIRB= Mackenzie Valley Environmental Impact Review Board; GNWT= Government of the Northwest Territories.

1.2 2010 ANNUAL REPORT

De Beers submitted the 2010 Annual Report to the Minister on March 31, 2011, and distributed it to all Parties and the Snap Lake Environmental Monitoring Agency (SLEMA). Concerns were raised by SLEMA, the Inspector and INAC concerning the water constituent in processed kimberlite slurry being pumped to the north pile. DeBeers Canada Inc. has either responded the concerns raised.

2 2010 ENVIRONMENTAL MONITORING PROGRAM SUMMARY

As required under Article X Section 10.1c (vii) of the Environmental Agreement, this section of the report provides a summary of the 2010 monitoring activities, observations, and comparisons of results with EAR predictions (Table 2-1).

Table 2-1 Summary of 2010 Snap Lake Mine Environmental Monitoring Programs

Program	Purpose of the Monitoring Program	Key Activities	Environmental Assessment Report Predictions	Key Results
Air Quality and Emissions Monitoring	Verify the accuracy of impact predictions made in the EAR and meet regulatory requirements and corporate commitments.	Meteorological and hydro-meteorological monitoring Ambient monitoring of TSP, PM10, and PM2.5 concentrations Ambient monitoring of dustfall GHG emissions calculations	The maximum predicted SO_2 and NO_X concentrations were predicted to be below both the applicable NWT air quality standards and the federal objectives. Since the bulk of mining will occur below ground in a wet environment, the particulate emissions are anticipated to be low relative to open pit mining operations. The maximum 24-hour TSP, $PM_{10,}$ and $PM_{2.5}$ were predicted to be above applicable criteria within and near the active mine area; however, the annual concentrations of these compounds were predicted to be below the respective criteria. Activities and operations at the Project will result in the emission of carbon dioxide and other GHG. The overall GHG emissions (expressed as equivalent CO_2) from the Project were projected to be 102 kt/yr.	Meteorological monitoring – Wind speed, wind direction were within the long-term ranges for the area. Precipitation at Snap Lake was lower than the 30 year Yellowknife climate normals (1971 to 2000) from March to September and December, but was higher than Yellowknife normals during the month of November (Environment Canada 2011a). Annual average temperatures were within the range of those observed in the past five years with the exception of January to March 2010, where the temperature was higher than normal. The relative humidity observed the same pattern as those observed in the past five years, but were higher than normal for most of the year. Particulate monitoring – The maximum monitored TSP concentration was 324.6 micrograms per cubic metre (µg/m³), observed at Dichotomous Partisol 2, south of the ammonium nitrate fuel oil (ANFO) storage area. The average TSP concentration observed across all stations was 15.9 µg/m³. The Northwest Territories (NWT) 24-hour TSP standard of 120 µg/m^3 (GNWT 2011) was exceeded four times during 2010. Of the 117 samples collected, 108 values were above the sample detection limit. The maximum monitored PM_{10} concentration was 40.2 µg/m³, observed at Dichotomous Partisol 2, south of the ANFO storage area. The average PM_{10} concentration observed between both stations was 6.6 µg/m³. Of the 54 samples collected, 41 values were above the sample detection limit. The British Columbia 24-hour PM_{10} objective of 50 µg/m³ was used as there are no PM_{10} guidelines in the NWT. This guideline was not exceeded during the monitoring period. The maximum monitored $PM_{2.5}$ concentration was 26.3 µg/m³, observed at Dichotomous Partisol 2, south of the ANFO storage area. The average $PM_{2.5}$ concentration observed between both $PM_{2.5}$ stations was 3.0 µg/m³. Of the 53 samples collected, 41 values were above the sample detection limit. The 24-hour guideline concentration for the NWT is 30 µg/m³. This guideline was not exceeded during the monitoring period. Passive Monitoring – The highest monthly NO_2 concentration was 17.6 µg/m^3 during February 22, 2010 to March 15, 2010 at the Tank passive monitoring site located just west of the tank farm. This peak concentration falls well below the maximum desirable annual level of 60 µg/m^3 set forth in the National Air Quality Objectives (Environment Canada 1981). The highest SO_2 concentration monitored during 2010 was 0.6 µg/m^3 and was observed three times. Two occurrences were observed February 22, 2010 to March 15, 2010 at the Tank passive monitoring site and the Wetlands passive monitoring site, both located west of the tank farm. The third occurrence was observed November 12, 2010 to December 16, 2010 at the Tank passive monitoring site located just west of the tank farm. This peak concentration falls well below the maximum annual average objective of 30 µg/m^3 regulated by the GNWT (GNWT 2011). The comparison of monthly values to annual criteria is conservative as monthly criteria would be expected to be higher. Snap Lake Mine emissions – Fuel consumption was 23,241,986 litres of diesel with a sulphur content of 15 parts per million by weight. Waste oil consumption was 165,092 litres with an assumed sulphur content of 20,000 ppm by weight. Emission rates were generally lower in 2010 from 2009 estimates primarily due to lower power generation and less fleet use at the facility. SO_2 emissions increased due to the addition of waste oil, but emissions were still below the 2007 Air Modelling Update.
Aquatic Effects Monitoring	Verify the accuracy of impact predictions made in the EAR and meet regulatory requirements and corporate commitments.	Water and sediment quality monitoring Zooplankton and phytoplankton monitoring Benthic invertebrate monitoring Fish health special study Fish tasting Plume characterization special study	The maximum whole lake average concentrations in Snap Lake of all assessed water quality parameters will remain below water quality guidelines or EAR benchmarks. The maximum total area or volume that could be affected by seepage and runoff would be less than 0.5% of Snap Lake area or volume. The effect on sediment quality is expected to be negligible. Concentrations are expected to stay near baseline levels.	**Water Quality** In 2010 water quality measurements for individual parameters in Snap Lake were generally below water quality guidelines and EAR benchmarks, with the exception of a number of fluoride results, and four manganese results. Whole-lake average and maximum concentration of total dissolved solids (TDS) in Snap Lake was below the License limit of 350 milligrams per litre (mg/L) in 2010. The 2010 total phosphorus loading to Snap Lake from the sewage treatment system and water treatment plants was also below the Water License limit of 256 kilograms (kg). The 2010 Snap Lake results for TDS, major ions, nutrients and metals indicate that water quality was within maximum whole-lake average EAR predictions. However, as in 2009, whole-lake average concentration and cumulative load of TDS from 2005 to 2010 were higher than predicted. The concentrations and levels of water quality parameters in treated effluent discharges and site runoff to Snap Lake in 2010 were below EAR predictions, with the exception of flow-weighted average concentrations of sulphate and thallium in the water treatment plant effluent. The higher than predicted concentrations of these parameters in treated effluent did not result in concentrations above guidelines or EAR benchmarks in Snap Lake, and are unlikely to cause whole-lake effects in Snap Lake because of the small volumes that enter the lake over a relatively short time period each year. The EAR predicted increases in concentrations of major ions, nutrients and metals over time in Snap Lake due the discharge of treated effluent (De Beers 2002). In 2010, the parameters that appeared to be increasing in at least one area of Snap Lake were TDS, total alkalinity, total hardness, reactive silica, bicarbonate, calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, all monitored nitrogen parameters, barium, boron, lithium, molybdenum, manganese, nickel, rubidium, strontium, titanium, and uranium. Concentrations of the these parameters have not and are not expected to increase above water quality guidelines, EAR benchmarks, or EAR predictions in the near future, with the exception of fluoride and possibly manganese. Future increases in fluoride are not likely to be a concern in Snap Lake as these increases will be accompanied by increases in calcium and hardness which are expected to reduce the potential for toxic effects from fluoride. Future increases in manganese may exceed the aesthetic drinking water guideline. Although this guideline is not related to human health, implications of exceeding it in the future should be evaluated. The manganese guideline is aesthetic, which means that elevated concentrations might affect the taste, smell, or colour of the water. Manganese at this recommended limit is not considered to represent a threat to health, and drinking water with much higher concentrations has been safely consumed (Health Canada 1987). Generally, only exposure to extremely high levels at concentrations much higher than measured in Snap Lake has resulted in adverse health effects. A maximum acceptable concentration has not been set for manganese. As in 2009, vertical patterns in field conductivity indicate that the plume may no longer be sinking to the bottom of Snap Lake due to a lower density difference between the plume and lake water. Open-water profiles of conductivity indicate that the plume continues to be more evenly mixed throughout the water column during open-water conditions.

Table 2-1 Summary of 2010 Snap Lake Mine Environmental Monitoring Programs (continued)

Program	Purpose of the Monitoring Program	Key Activities	Environmental Assessment Report Predictions	Key Results
Aquatic Effects Monitoring (continued)				**Sediment Quality** Evaluation of spatial and temporal trends in sediment quality did not provide clear evidence of an effect on Snap Lake sediments in areas exposed to treated effluent. Concentrations of available phosphate continued to be elevated in the diffuser area following the large increase that occurred in 2008; concentrations decreased with increasing distance from the diffuser but were still higher than in 2007. Available phosphate concentrations should continue to be monitored for further spatial and temporal changes. Overall, evaluation of spatial and temporal patterns in sediment quality did not provide clear evidence of an effect on Snap Lake sediments in areas exposed to treated effluent from the Mine. Ongoing sediment quality monitoring under the AEMP is expected to provide a more reliable indication of any potential effects on sediment quality in Snap Lake as the number of years of available data increases. If potential effects to sediment quality have occurred to date, they have been subtle and not clearly different than natural variability. Inclusion of Northeast Lake as a reference lake should still allow future comparisons of temporal trends between the two lakes, thereby controlling for long-term regional trends. **Phytoplankton/Zooplankton** Significant spatial and temporal variation in total phytoplankton biomass and community composition occur naturally in lakes, and have been observed in Snap Lake between 2004 and 2009. Trend analysis indicated that there has been a shift in phytoplankton community composition, based on biomass over these last 6 years. While a critical effect size for phytoplankton cannot be established, phytoplankton remains a useful tool for monitoring longer-term changes due to nutrient enrichment in Snap Lake. Chlorophyll *a* results to date suggest that the trophic status of Snap Lake has not changed; however, this variable may not be an accurate surrogate of the Snap Lake phytoplankton community. At this time, continued monitoring of chlorophyll *a* concentrations is required by the Water License MV2001L2-0002 (Water License) Part G, Condition 2d. Currently, chlorophyll *a* is not recommended as a surrogate measure of the Snap Lake phytoplankton community, due to the poor correlation between chlorophyll *a* and total phytoplankton biomass. Calanoid copepods remain the dominant zooplankton group within Snap Lake, with seasonal changes occurring in the biomass of the cyclopoid copepods and rotifers. Cladocerans, commonly referred to water fleas, continue to account for a relatively small proportion of the zooplankton community. A shift in biomass-based community composition has been documented in Snap Lake between 2004 and 2009, but no change in zooplankton biomass was detected over time. Although chlorophyll *a* and total phosphorus (TP) concentrations suggest that Snap Lake remains within the range of oligotrophic lakes, concentrations of total nitrogen (TN) were within the range of eutrophic lakes. Although the lake remains severely P-limited, results suggest that the lake is becoming nitrogen enriched with continued discharges of treated effluent. Multivariate analysis and evaluation of trends suggest that the plankton community is experiencing mine-related effects consistent with nutrient enrichment consistent with EAR predictions. Based on the results to date, continuation of the monitoring program is recommended, with adjustments to enhance consistency among AEMP components.
Aquatic Effects Monitoring (continued)			The effect of toxicity from changes in sediment and water quality on benthic invertebrates, phytoplankton and zooplankton were predicted to range form negligible to moderate. Snap Lake was predicted to remain mesotrophic (i.e., moderately productive). The effect of changes to Snap Lake and inland lakes and streams was predicted to be negligible for fish abundance and fish health. The permanent diffuser was expected to result in dilution factors that ranged from 34 to 200 across the range of effluent discharges expected over the life of the Project.	**Benthic Invertebrates** Benthic invertebrate monitoring has proven to be an effective monitoring tool to evaluate the potential biological effects of the Mine to Snap Lake. Differences between Northeast Lake, and the near-field and mid-field exposure areas in Snap Lake were minor and not indicative of an adverse effect on the benthic community. Among-area statistical comparisons between Northeast Lake and exposure areas in Snap Lake in fall 2010 did not provide evidence of an adverse effect on the benthic community of Snap Lake. However, visual evaluation of the differences in abundances of dominant taxa suggests emergence of a Mine-related enrichment effect. Higher total density and densities of dominant taxa Pisidiidae, *Micropsectra*, *Valvata* and *Procladius,* in the near-field and mid-field areas suggest that nutrient enrichment is occurring in these areas. Higher densities of molluscs are also consistent with increased TDS concentration, which provides a greater amount of major ions used for shell development by these organisms. The overall magnitude of the effect on the benthic invertebrate community can be classified as low, because no statistically significant differences were detected in total invertebrate density and richness in the 2010 fall data and the taxonomic composition of the community has not changed appreciably compared to baseline conditions. An effect of low magnitude is consistent with EAR predictions. **Fish Tasting** Fish tasting was conducted on September 15, 2010, by Elders Albert Boucher and Noel Drybones of the Lutsel K'e Dene First Nations. Fish were caught using rod and tackle on September 13 and 14. All participants reported that the fish tasted good and that the fish were very healthy, "Above Average" to "Average" (good).
Archaeology Monitoring	Verify the accuracy of impact predictions made in the EAR and meet regulatory requirements and corporate commitments.	Aerial archaeological survey	The probability that direct and indirect effects would occur to archaeology sites was rated as negligible.	There were no effects to the archaeology sites in the vicinity of the mine and winter access road.

Table 2-1 Summary of 2010 Snap Lake Mine Environmental Monitoring Programs (continued)

Program	Purpose of the Monitoring Program	Key Activities	Environmental Assessment Report Predictions	Key Results
Hydrology Monitoring	Verify the accuracy of impact predictions made in the EAR and meet regulatory requirements and corporate commitments.	Lake water level and site runoff monitoring	The EAR predicted small increases in the mean water elevation of Snap Lake as a result of mining operations. Predicted increases above baseline conditions ranged from 3.3 to 5.5 cm over the period of operations. Increases in peak flow during the spring runoff are predicted to be negligible, with no effect on channel morphology.	The results indicate that 2010 had low water levels and streamflows compared to previous years. This trend was also observed at nearby Water Survey of Canada hydrometric stations and was indicative of a regional trend. Snap Lake water levels continue to exhibit similar increases and decreases as other monitored lakes. The Environmental Assessment Report (EAR) predicted small increases in the mean water elevation of Snap Lake as a result of the mining operations (De Beers 2002). Predicted increases above baseline conditions ranged from 0.033 metres (m) to 0.053 m over the period of operations. Annual changes in Snap Lake water levels remain similar to three other monitored lakes in the region. Changes in lake elevation from 2007 to 2009 were within a range of previously measured changes, and appear to be less than predicted in the EAR for the construction period and early years of operation. During 2010, the lake elevation dropped to its lowest level since 2004 due to very low precipitation and high evaporation. The impact of mine activities on lake elevation remains small.
Hydrogeology and Geochemistry Monitoring	Verify the accuracy of impact predictions made in the EAR and meet regulatory requirements and corporate commitments.	Seepage survey and visual inspection of the site Supplemental sampling of rock	Geochemical characterization completed during the EAR demonstrates that the kimberlite unit at Snap Lake can be classified as non-PAG. During construction and operations, groundwater inflows to the underground mine workings will result in a minor decrease (up to 5%) in deep groundwater levels; however there will be little or no change in the overall quantity of deep groundwater. Groundwater levels will decrease progressively during Project construction and operations, but will be reversed within one month of mine closure. The residual changes in deep groundwater quality due to the underground mine are limited to a small portion (less than 5%) of the LSA during post-closure. There will be no change to deep groundwater quality during construction and operations. Mine affected groundwater was predicted to have a pH of 11.9 and elevated concentrations of aluminum (468 µg/L), chromium (313 µg/L), and molybdenum (81□ µg/L) relative to baseline groundwater quality. The high pH and elevated metal concentrations are expected to decline in the long-term; however, the duration is uncertain and could be much greater than 100 years. Changes in shallow groundwater quality will result from a small volume of seepage from the North Pile and the water management pond, resulting in localized effects, originating on the northwest peninsula and seeping into Snap Lake which will be greatest during operations, and decreasing after decommissioning as reclamation proceeds.	The results of geochemical analysis of mine rock samples and water quality samples collected from the Snap Lake Mine did not identify significant changes in A/ARD conditions in 2010 relative to trends observed during previous annual reporting periods. No visible signs of acidic drainage were observed during the site inspections conducted during the 2010 monitoring period. The geochemical evaluation of the main rock types at the Mine (i.e., granite, metavolcanic and kimberlite) has not changed as a result of the visual surveys and geochemical analysis of Mine rock and confirmation geochemistry samples conducted in 2010. New construction, such as rock placement, that took place during the 2010 monitoring period included ongoing construction of the East Cell perimeter access road and sumps, construction of a walking path near the diffuser road, and addition of a 0.5 metre (m) thick layer of granite to the outside face of Dam 1 at the WMP. Granitic rock samples collected from areas of new construction contained less than 0.17% sulphide sulphur. The perimeter embankments of the North Pile continued to be raised with PK coarse and grits. Samples of PK coarse and grits collected from the North Pile contained less than 0.17% sulphide sulphur. Metavolcanic rock at the FAR was iron-stained, and had visible signs of sulphide oxidation. Metavolcanic rock samples collected from the FAR contained greater than 0.17% sulphide sulphur. Ongoing monitoring of metavolcanic rock exposed at the FAR is recommended, as is monitoring of downstream water quality. With the exception of rock observed at the FAR, no visible signs of sulphide oxidation or incipient ARD were observed in rock exposed in rock pads, roads, building foundations, and laydowns during the September 2010 site inspection (Golder 2010). A layer of PK coarse and grits formed on the route used to transport PK by truck between the processing plant and the North Pile (De Beers 2009). De Beers has made efforts to minimize the spillage from haul trucks on the road since 2009, and has made efforts to remove the PK from the haul road. The results of geochemical characterization of mine rock samples collected by De Beers and samples collected from site infrastructure during the September 2010 site visit were consistent with the observed ARD results and trends in mine rock/construction rock geochemistry in the EAR and previous annual reporting periods. The geochemical evaluation of the main rock types at the Mine, i.e., granite, metavolcanic, and kimberlite, has not changed as a result of the visual surveys or geochemical analysis of mine rock and confirmation geochemistry samples conducted in 2010.

Table 2-1 Summary of 2010 Snap Lake Mine Environmental Monitoring Programs (continued)

Program	Purpose of the Monitoring Program	Key Activities	Environmental Assessment Report Predictions	Key Results
Vegetation Monitoring	Verify the accuracy of impact predictions made in the EAR and meet regulatory requirements and corporate commitments.	Calculation of direct impacts to total area and ELC area Satellite data interpretation Soil sampling Dust fall deposition monitoring	At full development, the EAR predicted a total disturbance of 218.8 ha in the LSA and 83.7 ha in the RSA (excluding the LSA). 39% of ELC units were predicted to be lost or altered in the LSA. Effects from habitat loss or alteration to rare plant potential were considered to be moderate, and effects on traditional plant potential were considered to be low. The effect of air emissions, including dust, on vegetation health were predicted to be low for the ELC components assessed and for rare and traditional plant health. The effect of the Project on vegetation biodiversity was predicted to be low for all vegetation communities assessed.	A QuickBird satellite image was used to compare the total disturbance area in 2008 with predictions made in the EAR. Disturbance of the LSA and esker complex, as of July 2008, was 155.4 ha (11% of the LSA), which, to date, is below the predicted disturbance area, and therefore the Detailed ELC Monitoring Program is not triggered and modifications to the monitoring program are not needed at this time. Estimates of the disturbance to ELC units were calculated by using both Landsat Thematic Mapper in 2002 and QuickBird satellite imagery in 2008 to compare the Mine footprint with the vegetation types known to be present before start-up construction of the Mine. At full development, there is a predicted total disturbance of 218.8 ha in the LSA and 83.7 ha in the RSA, excluding the LSA. The RSA disturbance consists of the impact to the esker borrow site and associated winter esker access road, and the 35 km winter access Snap Lake Spur Road to the Tibbitt-to-Contwoyto winter road. The total area occupied or impacted by the LSA on July 2008 was 155.4 ha, which represents 71% of the maximum predicted extent of the Mine. For the RSA, construction activities have impacted 2.5 ha or 3% of the expected disturbed area. None of the ELC units have received a greater proportionate disturbance than predicted in the EAR as of July 2008, with the exception of the esker complex. As reported in previous VMP's, the area of disturbance to the esker was expected to be 0.5 ha; however, the actual disturbance was 1.6 ha. Granular material was removed from this esker in the winter of 2000-2001. No further disturbance to this esker is anticipated and none was recorded as occurring up to 2008. Overall, the disturbance covers 11% of the LSA which is below the predicted 15%. The Detailed ELC Monitoring Program is not triggered and modifications to the monitoring program are not needed at this time. During the 2004 and 2005 field surveys, 11 PSPs were established at existing disturbed sites to determine the rate and effectiveness of natural recovery as a revegetation method (i.e., natural revegetation relying on invasion or colonization by local species). Disturbed sites included the quarry at the esker, the air strip, and the old base camp. The established PSPs were assessed in 2008 and a total of 59 plant species naturally colonized the reclamation PSPs; an increase of five additional species from 2006. These plant species were similar to the plant species observed in the control and treatment PSPs for the Triggered Monitoring Programs. Due to the slow growth rates and colonization of vegetation in the arctic, reclamation surveys are not required annually. Reclamation PSPs were surveyed in 2008 and will be surveyed every five years thereafter. They will be assessed for changes in vegetation community composition and changes in soil properties or chemistry over time.
Vegetation Monitoring (continued)				Monthly dustfall samples were collected in the months of January to December, excluding May. The maximum deposition rate of 312 milligrams per square decimetre per 30 days (mg/dm^2/30d) was recorded at DF012 in January 2010. The rest of the dustfall deposition rates were low in January and were within the Alberta Ambient Air Quality Objective (AAAQO) (AENV 2005). Four samples exceeded the 158 mg/dm^2/30d guideline for commercial and industrial properties. These results cannot be used solely to ascertain whether dustfall is affecting vegetation communities. The Alberta dustfall criteria were developed in 1975 to address aesthetic concerns associated with elevated dustfall levels (Fu 2006, pers. comm.). However, there are no scientifically defensible relationships between these dustfall criteria and discernible effects on vegetation communities. Vegetation is inspected visually to assess impacts of dustfall on vegetation. However, a structured and focused visual inspection of dustfall on vegetation was not conducted in 2010. A comprehensive study will be conducted again in 2013 or earlier if De Beers observes substantial dust accumulation and/or stressed vegetation in the interim.
Wildlife Effects Monitoring	Verify the accuracy of impact predictions made in the EAR and meet regulatory requirements and corporate commitments.	A comprehensive analysis conducted on data conducted to date (2004 to 2007) Surveys specific to each of the VEC species to assess changes to abundance and distribution On-site monitoring and wildlife management to avoid and document wildlife injuries and mortalities	Based on estimates of home range size and the area of the Project lease in which wildlife habitat will be disturbed, the effect of direct habitat loss was predicted to be low for each of the current VEC species (i.e., <1% for caribou, grizzly bears, and wolves, <5% for waterfowl, <10% for wolverines and 22% for falcons). The effect of indirect habitat loss on VEC species from dust was predicted to be low. The effects of blasting, human, vehicle and aircraft traffic, habitat fragmentation and increased access on wildlife movement and behaviour was expected to be negligible to low for all VEC species. The effects of wildlife attraction, wildlife-human interactions, vehicle collisions, toxic spills, and increased access for hunting and trapping on wildlife abundance were predicted to range from negligible to moderate for VEC species. Moderate effects were predicted for raptors, wolverines and barren ground grizzly bears.	So far, the effects of the Snap Lake Mine to wildlife have been within the range predicted in the Environmental Assessment Report (De Beers 2002). In 2010, the measures for caribou and bears indicated low levels of activity by these species. Further data collection and more comprehensive data analyses in the next comprehensive report will help to determine if these changes are related to the Mine, or natural factors. It is likely that some of these changes are influenced by the decline in the Bathurst caribou herd, and the bears, wolverine, and wolves that depend on caribou. Wildlife habitat loss due to the expanding Mine footprint mine has occurred as expected, and the Mine is currently about 71 percent (%) of its total predicted size. Further habitat loss will occur as the waste rock storage at the North Pile expands but this expansion is not expected to increase the size of the footprint. Incidents are any wildlife interaction that requires a response by Mine personnel, and may range from simple deterrent actions to the injury or death of an animal. De Beers environmental staff report all wildlife incidents, and follow written procedures. A total of 11 wildlife incidents were recorded at the Mine in 2010. These incidents were mostly related to fox and wolverine at site. Wildlife mortalities have been very rare at the Mine. In 2010, a red fox, a ptarmigan, and two songbirds were all found dead within the Mine footprint. Worker education and good waste management are considered essential in limiting wildlife incidents.

Note:

A/ARD = acid/alkaline rock drainage
AN = Ammonium Nitrate
AEMP = Aquatic Effects Monitoring Program
ANFO = ammonium nitrate and fuel oil
CCME = Canadian Council of Ministers of the Environment
CO_2 = carbon dioxide ;
kt/yr = kilotonnes per year
L = litre
LSA = local study area
m = metre
mg/dm^2/30d = milligrams per square decimetre per 30 days
mg/L = milligrams per litre
RSA = regional study area
SO_2 = sulphur dioxide
TDS = total dissolved solids
TKN = Total Kjeldahl Nitrogen
TOC= total organic carbon
TSP = total suspended particulate

Table 2-1 Summary of 2010 Snap Lake Mine Environmental Monitoring Programs (continued)

DO= dissolved oxygen
EAR = Environmental Assessment Report
ELC = ecological land classification
FAR = fresh air raise
GHG = greenhouse gas
ha = hectares ;
ISQG = Interim Sediment Quality Guidelines
kg = kilograms
PM_{10} = particulate matter with particle diameter nominally smaller than 10 micrometres (µm)
$PM_{2.5}$ = particulate matter with particle diameter nominally smaller than 2.5 µm
ppmw = parts per million by weight
NO_2 = nitrogen dioxide
PAG = potentially acid generating
PK= processed kimberlite
PSPs = permanent sample plots
VMP = Vegetation Monitoring Program
WMP = Water Management Pond
WTP = Water Treatment Plant
< = less then
% = percent.
µg/L = micrograms per litre
$µg/m^3$ = micrograms per cubic metre

3 SUMMARY OF SNAP LAKE MONITORING AND MANAGEMENT PLANS

De Beers Canada Inc. (De Beers) has developed a total of 25 compliance reports (11 Monitoring Programs [Section 3.1] and 14 Management Plans [Section 3.2]) for the Mine to meet the requirements under its regulatory approvals and corporate commitments. The monitoring programs were developed to verify the impact predictions made in the Mine's EAR (De Beers 2002a) for the construction, operation, and closure phases of the Mine. The management plans were developed to outline operational practices and procedures for mitigating impacts associated with the Mine.

This section contains a brief summary of each of the monitoring and management plans that De Beers has produced as part of their regulatory and corporate commitments. Table 3-1 provides a list of all monitoring and management requirements, submission dates, approvals, and status.

Table 3-1 Summary of Compliance Reports Required Under the Snap Lake Mine's Regulatory Approvals

Compliance Reports	Source of Requirement	Current Submission Date	Approval Date	Status	Annual Report Section
Adaptive Management Plan (AMP)	Water License Part B, Item 5u, Item 12, and Item 13	27-Aug-04	N/A	In compliance. Updates to the AMP are to be provided in the Water License Annual Report. To date, updates have not been necessary.	Section 3.2.1
Air Quality Monitoring Program (AQMP) and Emissions Management Plan (EMP)	Environmental Agreement, Article VI, Section 6.3d and e and Article VII, Section 7.2a Water License, Surveillance Network Program (SNP), Section D, Item 1, 2 and 3	02-Nov-09	25-Aug-08	In compliance. This document was submitted to the GNWT (ENR), INAC, SLEMA and Environment Canada as one Plan known as the Air Quality and Emissions Monitoring and Management Plan (AQEMMP). Comment was received in February 2007. A meeting between Golder, De Beers and ENR occurred on March 6, 2007. Final revisions are being completed.	Section 3.1.1 and Section 3.2.2
Aquatic Effects Monitoring Program (AEMP)	Water License, Part B, Item 5t, and Part G Environmental Agreement, Article VII, Section 7.2h	March 2019	No response	In compliance. Under the Water License, the AEMP will be reviewed every five years.	Section 3.1.2
Best Management Practices Plan for Ammonia Source Control	Water License, Part F, Item 23	29-Nov-04	N/A	In compliance. De Beers submitted a letter to the MVLWB outlining the Best Management Practices for Ammonia Source Control. This plan is currently under review by DeBeers Canada.	Section 3.2.3
Interim Closure and Reclamation (C&R) Plan "Revision A"	Water License, Part I, Item 1 and 2 Land Use Permit, Part C, Item 74	28-Jan -06	31-May-06	In compliance. The C&R Plan will continue to be updated and refined as the Mine approaches final closure in approximately 2027.	Section 3.2.4
Compensation Design Plan and TSS Monitoring Program for the Water Intake and Mine water Outlet	Fisheries Authorization 4.3	07-Jun-05	23-July-05	In compliance. No update or changes required at this time.	Section 3.1.3
Construction and Monitoring Program for S27	Fisheries Authorization 4.3	02-Mar-06	05-Apr-06	In compliance. No update or changes required at this time.	Section 3.1.4
Domestic Waste and Sewage Management Plan	Water License, Part E, Item 10 Environmental Agreement, Article VI, Section 6.3a(v)	05-Feb-10	29-Mar-10	In compliance. Plan was submitted in January and reviewer comments will be incorporated into the document as required.	Section 3.2.5
Emergency Response Plan (ERP)	Water License, Part H, Item 1 Land Use Permit, Part C, Item 77 Environmental Agreement, Article VI, Section 6.3a(iii)	12-Jun-2009	No response	In compliance. The ERP is reviewed annually. Modified ERPs will be submitted as necessary to reflect new developments and comments from reviewers. This plan is currently under review by DeBeers Canada.	Section 3.2.6

Compliance Reports	Source of Requirement	Current Submission Date	Approval Date	Status	Annual Report Section
Environmental Health Monitoring Program	Environmental Agreement, Article VII, Section 7.2d	30-Sept-03	N/A	This Plan currently does not require approval. It is a trigger program that will not be activated unless dustfall amounts monitored through the AQEMMP are greater than EAR predictions for three consecutive months.	Section 3.1.5
Fish Health Monitoring Plan	Fisheries Authorization 5.8	14-Jul-09	Mar-10	The Fish Health Monitoring Plan was incorporated into the AEMP. Discussions regarding the path forward with fish health are in progress with DFO.	Section 3.1.2
Groundwater Quantity and Quality Monitoring Program	Water License, Part F, Item 5 and 6	15-Sept-05	24-Oct-05	In compliance. Updates to Groundwater Quantity and Quality Monitoring Program are to be provided in the Water License Annual Report. To date, no updates have been necessary.	Section 3.1.6
Hazardous Materials Management Plan	Water License, Part E, Item 14	09-Jun-10	09-Jun-10	Plan was submitted in November and reviewer comments will be incorporated into the document as required.	Section 3.2.7
High TDS Response Plan	Fisheries Authorization 5.6.5	N/A	N/A	Not required unless TDS exceeds 350 mg/L in Snap Lake at any depth during three consecutive sampling events.	N/A
Hydrology Monitoring Program	Environmental Agreement, Article VII, Section 7.2g	Jul-09	N/A	This Plan is currently under De Beers review to reflect the hydro-meteorological program.	Section 3.1.7
North Pile Monitoring Program	Environmental Agreement, Article VII, Section 7.2e	N/A	N/A	This Plan is included as part of the Ore Storage, Waste Rock and Processed Kimberlite Management Plan. Currently being updated by De Beers.	Section 3.2.8
Ore Storage, Waste Rock and Processed Kimberlite Management Plan	Water License, Part E, Items 3-8 Environmental Agreement, Article VI, 6.3a (vii)	21-Jan-10	05-Feb-10	This Plan is currently being reviewed by De Beers. A revised plan was submitted, and DeBeers Canada is currently incorporating reviewer comments as required.	Section 3.2.8
Quality Assurance/Quality Control Management Plan	Water License- SNP- Part B- Items 23 to 25	22-Mar-06	30-Apr-06	In compliance. This Plan is reviewed annually and modified as necessary under the SNP Program.	Section 3.2.9
Quarry Management Plan	Environmental Agreement, Article VI, Section 6.3a (vi) Land Use Permit Part C Item 6	N/A	N/A	The Quarry Management Plan was submitted as part of the EAR (Appendix III.5). To date the Quarry Management Plan has not been updated because De Beers does not intend to quarry the esker. A Quarry Management Plan will be designed prior to excavation of the esker.	Section 3.2.10
Reclamation Research Plan	Water License - part I, Item 6	28-Jan -06	31-May-06	In compliance. Submitted as part of the C&R Plan.	Section 3.2.4
Restoration Plan	Land Lease Item 15	28-Jan -06	31-May-06	In compliance. Submitted as part of the C&R Plan.	Section 3.2.4
Sampling Plan for TDS, calcium, and chloride	Fisheries Authorization 5.6 Water License, Part F, Item 12	17-Mar-05	21-Feb-06	In compliance.	Section 3.2.11

Compliance Reports	Source of Requirement	Current Submission Date	Approval Date	Status	Annual Report Section
Spill Contingency Plan	Water License, Part H- Item 1 Land Lease, Item 45 Land Use Permit, Part C, Item 77 Environmental Agreement, Article VI, Section 6.3a (ii)	Nov-10	No formal response	In compliance. The latest Spill Contingency Plan was submitted as part of the renewal of the Land Use Permit. Comments form the Inspector and stakeholders agreed it was an improvement from earlier versions. The Spill Contingency Plan is reviewed annually. Modified Spill Contingency Plans will be submitted as necessary.	Section 3.2.12
Vegetation Monitoring Program	Environmental Agreement, Article VII, Section 7.2b	01-Apr-05	Nov-09	The VMP has never been approved. De Beers is in the process of updating the document to incorporate changes suggested by the GNWT and Environment Canada for the AQEMMP that directly link to the VMP.	Section 3.1.9
Water Intake Monitoring Program	Fisheries Authorization 5.0	31-May-05	22-July-05	In compliance. This Plan was approved by DFO.	Section 3.1.10
Water Management Plan	Water License- Part F, Item 4 Environmental Agreement, Article VI, Section 6.3a(iv)	3-Jun-10	23-Jul-10	In Compliance this Plan was approved last July.	Section 3.2.13
Wildlife Management Plan	Environmental Agreement, Article VI, Section 6.3a(ix), f, and g	30-Nov-07	Under De Beers review	De Beers re-submitted in November 2007 after responding to comments received in February 2007. Additional comments were received in February 2007. These are currently under De Beers review.	Section 3.2.14
Wildlife Effects Monitoring Program	Land Use Permit, Part C, Item 36 Environmental Agreement, Article VII, Section 7.2c	Nov-2009	N/A	The Plan has not received comment from the GNWT.	Section 3.1.11

Note: GNWT = Government of the Northwest Territories; INAC= Indian and Northern Affairs Canada; SLEMA= Snap Lake Environmental Monitoring Agency; MVLWB = Mackenzie Valley Land and Water Board; S27 = Stream 27; TSS = total suspended solids; EAR = Environmental Assessment Report; DFO = Fisheries and Oceans Canada; TDS = total dissolved solids; mg/L = milligrams per litre.

(a) Regulatory Requirements are as follows :Mackenzie Valley Land and Water Board Class A Water License MV20001L2-0002 (issued April 2004); Environmental Agreement (issued May 2004); Type “A” Land Use Permit (issued June 2004); Northwest Territories Land Lease #75m/10-1-2, #75m/10-2-2; 75 m/10-3-2; #75m/10-4-2 (issued June 2004); DFO Fisheries Authorization SC00196 (updated August 2006); DFO Approval of Fish Screen for the Temporary Water Intake SC99123-A2 (issued September 2004); DFO Approval for Permanent Water Intake SC00196-7.1 (issued August 2004).

3.1 MONITORING PROGRAMS

3.1.1 Air Quality Monitoring Program

The Air Quality Monitoring Program (AQMP) is a requirement of Article VI, Section 7.2 a) of the Environmental Agreement and Section D (Surveillance Network Program [SNP]), of the Mine's Water License.

The initial draft of the AQMP was prepared in September 2003 and updated in September 2005 based on feedback from the GNWT and Environment Canada. A draft of an Emissions Management Plan (EMP) was submitted to the GNWT ENR and Environment Canada in February 2006 and upon receipt of feedback on this draft document from GNWT ENR and Environment Canada in April and August 2006, these two documents have been harmonized into one document, the Air Quality and Emissions Monitoring and Management Plan (AQEMMP) to demonstrate the linkages between the two programs. The data from the two programs will be presented together each year in the annual report. This plan was submitted in November 2009 to GNWT, Indian and Northern Affairs Canada (INAC), and SLEMA. Comments on this draft have yet to be received.

3.1.2 Aquatic Effects Monitoring Program

The Aquatic Effects Monitoring Program (AEMP) is a requirement of the Water License and Environmental Agreement. A draft AEMP was submitted to the Mackenzie Valley Land and Water Board (MVLWB) in July 2004 and an updated AEMP was submitted in June 2005. This Plan was approved in July 2005.

The purpose of the AEMP is to meet requirements in Part G of the Water License, Section 7.2h) of the Environmental Agreement, related corporate commitments, and to compare Mine-related effects with EAR predictions. Mine monitoring will measure future changes in water and sediment quality, including dissolved oxygen (DO) concentrations within Snap Lake, and effects to the following biological receptors:

- fish health;
- fish taste;
- benthic invertebrate community;
- phytoplankton and zooplankton communities; and
- fish habitat.

The primary study area is Snap Lake, which receives treated effluent from the combined water treatment plant and sewage treatment plant discharges. A reference lake (Northeast Lake) was selected in November 2005 and was approved by the MVLWB in May 2006. It is sampled as part of the annual AEMP field program.

De Beers submits an Annual Report for the AEMP as part of the Water License Annual Report to the MVLWB and Fisheries and Oceans Canada (DFO) by March 31 of each year. This Annual Report describes the AEMP activities that took place in the previous year, including monitoring results for all components listed above and any special studies as required.

3.1.2.1 Water and Sediment Quality

The principal objective of the water and sediment quality component of the AEMP is to provide information that will allow De Beers to evaluate changes in water quality of Snap Lake resulting from the construction, operation, and closure of the Mine. This component of the AEMP focuses on monitoring and analysis of changes in concentrations of specific parameters in the water column (water quality) and lake bottom sediments (sediment quality).

The focus of the water quality program is changes in the following four parameter types:

- nutrients;
- DO;
- total dissolved solids (TDS) and major ions; and
- metals, ammonia, nitrate, and other contaminants.

The sediment quality program monitors for changes in the following parameters in lake bottom sediments:

- nutrients;
- total metals; and
- particle size.

3.1.2.2 Fish Health

The principal objective of the fish health component of the AEMP for the Mine is to answer the study question: “Will fish health be affected by the changes in

water quality in Snap Lake and will any change be greater than that stated in the EAR?" This question is related to the following direct effects:

- lake-wide increases in TDS;
- slight increases in the concentration of hexavalent chromium in the mixing zone and, potentially, in sediments; and
- reduced DO concentrations during winter in deeper areas of Snap Lake.

Fisheries and Oceans Canada has requested that De Beers investigate fish health using non-lethal sampling of juvenile fish to augment adult fish health results. Two special studies have been designed to determine if a non-lethal juvenile fish health study is feasible:

- adult fish health monitoring using Environment Canada's Environmental Effects Monitoring program protocols for metal mining; and
- a juvenile fish special study using non-lethal sampling methods.

The decision whether to use juvenile lake trout and round whitefish for fish health monitoring will be based on:

- the catchability of the fish;
- the effect size to be detected and statistical power; and
- discussions with DFO about the ecological relevance of Lake Trout, Round Whitefish and Lake Chub versus other fish species.

3.1.2.3 Benthic Invertebrates

The principal objective of the benthic invertebrate community component of the AEMP for the Mine is to answer the question: "Will the benthic invertebrate community be affected by the changes in water and sediment quality in Snap Lake and will any change be greater than those stated in the EAR?" This question is related to the same direct effects as fish health.

Effects monitoring for benthic invertebrates will include comparisons of Snap Lake with a reference lake, evaluation of trends over time, and evaluation of spatial trends within Snap Lake in relation to the effluent diffuser. Temporal trends in Snap Lake will be examined to evaluate whether observed trends in the benthic invertebrate community are consistent with mine discharge-related effects.

3.1.2.4 Phytoplankton and Zooplankton

Both phytoplankton and zooplankton (plankton) communities can be useful indicators of environmental stress because of their rapid turnover times. However, the inherent variability within the plankton community poses a challenge and a limitation to its usefulness as a monitoring tool. The existing dynamics of the Snap Lake plankton communities, like all Arctic lakes, are not well understood. Therefore, the purpose of the plankton component of the AEMP is to collect data annually, with particular emphasis on assessing the following variables within Snap Lake during the open-water season:

- community composition (abundance and percent composition);
- biomass; and
- concentrations of microcystin, which is a cyanotoxin.

3.1.2.5 Fish Tasting

Fish tasting is an informal annual gathering of members of Aboriginal organizations and De Beers' staff at the Mine site to taste fish from Snap Lake. The principal objective of the fish tasting is to determine if the flavour and texture of the fish in the lake is acceptable to community members.

3.1.3 Compensation Design Plan and Construction Total Suspended Solids Monitoring Plan for the Water Intake and Mine water Outlet at Snap Lake

As part of the Mine, De Beers constructed two structures in Snap Lake on the northwest peninsula:

- a water intake to draw freshwater from Snap Lake for camp use; and
- a mine water outlet to discharge effluent treated from the water treatment plant and the sewage treatment plant into Snap Lake.

Fisheries and Oceans Canada issued an Authorization for Works or Undertakings Affecting Fish Habitat (SC00196) for the Mine in 2004, which was subsequently updated in 2006. This Fisheries Authorization (SC00196) contains requirements for addressing the fish habitat losses and gains during the Mine's construction. Section 4.3 of the Fisheries Authorization requires that De Beers submit a Compensation Design Plan for each of the fish compensation works for the Mine. The Compensation Design Plan is to contain the following elements:

- a description of activities for the construction of the water intake and mine water outlet in relation to fish habitat compensation works;
- detailed engineering designs;
- general schematics of final designs;
- construction schedule;
- contingencies for construction activities; and
- a summary of how De Beers has incorporated comments from Aboriginal groups into the Plan.

Section 3.0 of the Fisheries Authorization requires that De Beers mitigate against the harmful alteration, disruption or destruction of fish habitat beyond that which is named in the Fisheries Authorization. Construction activities that take place in and near water may have the potential to increase total suspended solids (TSS), which may affect fish habitat as silt is deposited on the lake bottom (a process referred to as sedimentation). Sections 18 and 19 of the SNP of the Water License requires that TSS and turbidity be monitored during construction of the water intake and mine water outlet in the vicinity of SNP Station 02-22 (mine water outlet) and SNP Station 02-23 (water intake). These sections of the Water License also specify that the manner and frequency of sampling be established by DFO.

These monitoring requirements are addressed in the Construction TSS Monitoring Plan, which is part of the Compensation Design Plan for the water intake and mine water outlet. This plan outlines the approach to measure and monitor the level of suspended sediments in Snap Lake near the water intake and mine water outlet during construction, including monitoring the effectiveness of TSS control measures (silt curtains). It also identifies conditions under which additional mitigation measures are required. This consolidated plan was submitted to DFO in June 2005 and was subsequently approved in July 2005.

Data sheets and photographs obtained to document functioning of the silt curtains will be retained on-site. Water quality data collected at these SNP stations will be reported to the MVLWB in the De Beers monthly SNP report.

3.1.4 Construction and Monitoring Plan for Stream 27

As discussed in Section 3.1.3, compensation for habitat losses is required under Section 4.3 of the Fisheries Authorization (SC00196) for the Mine. The construction of a sedimentation pond berm for the North Pile will eliminate the flow from Inland Lake 6 to Stream 29 (S29) for the life of the Mine; with flow being restored at Mine closure.

To compensate for the temporary loss of habitat in S29, De Beers has proposed undertaking habitat compensation activities in Stream 27 (S27). Activities proposed in S27 (i.e., removal of fish migration barrier), would result in the creation of access to new stream habitat to fish from Snap Lake, and would minimize the disturbance to existing fish habitat. An increase in foraging, spawning, rearing, and nursery habitat for Arctic Grayling is expected with the removal of the blockage, for a total increase of 225 habitat units. The proposed habitat compensation at S27 was the option preferred by Aboriginal groups that visited the site in July 2004 and was also acceptable to DFO during a site visit in August 2005.

The Construction and Monitoring Plan for S27 was submitted March 2006 to DFO and approved in April 2006. This plan contains a description of the pre-construction monitoring of S27, construction activities in the stream, and post-construction monitoring to achieve the physical and ecological criteria for the habitat compensation program success (as outlined in Appendix I of Construction and Monitoring Plan for S27). The physical habitat alteration will be deemed successful if:

- the blockage is manually removed such that there is surface water sufficient for fish passage along the area of the blockage of S27 from IL10 to Snap Lake for a period greater than 5 days during freshet; and
- the channel size in the area of the blockage is approximately 0.25 m wide (wide enough for an adult fish to pass).

The removal of the blockage in S27 will be considered to be successful in creating fish habitat from an ecological perspective if:

- Arctic Grayling, identified by life stage if possible, are found above the former area of the barrier after the initial 5 days of freshet or other life stages of fish are identified during other periods; and
- no adult Arctic grayling are observed stranded above the blockage during the late June survey.

The blockage in S27 was removed manually in September 2006 and plant material and rocks were removed from the stream bed and/or relocated within the stretch of the stream to construct a channel that is approximately 0.25 metres (m) wide to allow adult fish passage. Section 4.6 of the Mine's Fisheries Authorization, requires that an as-built report be submitted within six months of the completion of the construction works in the stream. The as-built report for S27 was submitted in July, 2007.

The blockage to S27 was successfully removed in September 2006. At the same time, channel modifications were made above the blockage and a rock weir at the outlet of IL10 was constructed. This weir will serve to prolong the period of freshet and ensure adequate flows during grayling spawning, incubation and early life stages. Post-construction monitoring occurred during the spring of 2007. Results of pre-and post-construction monitoring were reported to DFO in October 2007. In 2008, DeBeers monitored Stream 27 to ensure there were no obstructions.

3.1.5 Environmental Health Monitoring Program

The draft Environmental Health Monitoring Program was submitted to the GNWT and Environment Canada in September 2003. The objective of the Environmental Health Monitoring Program is to respond to triggers initiated from the air quality component. If dustfall monitoring conducted as part of the AQMP (i.e., the updated AQEMMP) shows dust amounts greater than predicted in the EAR and the Alberta guideline (since there is no NWT standard for dustfall) for more than three consecutive months, the Environmental Health Monitoring Program would be activated. If triggered, the Program is also designed to evaluate the potential uptake of chemicals from dust into plants and snow and subsequent ingestion by wildlife (the chemical analysis is collected as part of the VMP.

The following components are included in the Environmental Health Monitoring Program:

- uptake of metals and polycyclic aromatic hydrocarbons in vascular plants and deposition to lichens;
- deposition of dust on snow; and
- a wildlife health risk assessment.

At this time the Environmental Health Monitoring Program has not been triggered and therefore, the Plan has not been updated. The results of the Environmental Health Monitoring Program will be part of the annual environmental monitoring report for the Environmental Agreement for the year in which monitoring activities are conducted.

3.1.6 Groundwater Quantity and Quality Monitoring Program

As required by the Water License, the Groundwater Quantity and Quality Monitoring Program was submitted to the MVLWB in August 2004, and

subsequently updated from regulatory feedback in September 2005. It was approved in October 2005.

This monitoring plan has three primary objectives:

- to provide information that will allow De Beers to assess the mine water and seepage water quality for comparison against predictions made in the EAR;
- to comply with groundwater-related requirements in Part F, Section 5 and Part E, Section 9 of the Water License; and
- to meet corporate commitments and the terms of the Environmental Agreement related to groundwater monitoring.

The monitoring program monitors groundwater from three sources:

- mine water;
- seepage from the water management pond; and
- seepage from the North Pile.

This plan also includes a seepage survey, which is a semi annual survey of seepage from storage areas and the Water Management Pond.

Consistent with the other environmental monitoring requirements under the Water License, the annual groundwater requirements as part of the Water License Annual Report will be submitted by March 31 of each calendar year.

3.1.7 Hydrology Monitoring Program

Section 7.2 (g) of the Environmental Agreement for the Mine includes a requirement for a Hydrology Monitoring Program. Hydrology-related requirements of the Mine's Water License are as follows:

- provide data for components of the overall Mine water balance, specifically, estimates and measurements of precipitation and runoff;
- monitor water elevations in Snap Lake during the open-water season;
- provide flow or water level data for selected locations under Parts A, B, and C of the SNP;
- provide quality assurance/quality control (QA/QC) for selected equipment used for flow or water level measurements;

- evaluate Mine impacts to Snap Lake by monitoring outflow from Snap Lake; and
- collect meteorological data (precipitation and evaporation).

A draft Hydrology Monitoring Program document was prepared in December 2004. This document is in the process of being updated to reflect the hydro-meteorological monitoring program component that was added in the spring of 2005.

Water elevation and streamflow are monitored near the Mine to meet three principal objectives as follows:

- confirm EAR predictions related to changes in lake water levels and streamflows;
- provide flow and water level information for fish habitat compensation monitoring and to provide an annual water balance and lake level data for water quality monitoring; and
- fulfill requirements of the Mine's Water License and the Environmental Agreement.

Consistent with the other environmental monitoring requirements under the Water License, the annual hydrology requirements as part of the Water License Annual Report will be submitted by March 31 of each calendar year.

3.1.8 North Pile Monitoring Program

The North Pile Monitoring Program (geotechnical stability and deformation, and temperature monitoring) was incorporated into the Ore Storage, Processed Kimberlite, and Waste Rock Management Plan (OSPKWRMP) as outlined in Section 3.2.8 of this report.

3.1.9 Vegetation Monitoring Program

This Vegetation Monitoring Program (VMP) is a requirement of the Mine's Environmental Agreement (Article VII, 7.2b) and provides support for the C&R research and monitoring requirements outlined in Part I of the Mine's Water License. This Plan also provides research and monitoring details, linked to the C&R Plan. A draft VMP was prepared for the Mine in April 2005 and submitted with the 2005 Environmental Agreement Annual Report Supplement in May 2007. This Plan is currently being updated.

To comply with regulatory requirements, De Beers has designed the VMP to address the following objectives:

- verify the accuracy of impact predictions made in the EAR;
- implement, through the Environmental Management System (EMS), operational practices that mitigate disturbance to native vegetation;
- determine the effectiveness of mitigation measures implemented through the EMS;
- consider and incorporate where possible, traditional knowledge;
- establish action levels or triggers for early warning signs to implement adaptive management and mitigation measures where appropriate;
- provide opportunities for the involvement and active participation of aboriginal parties in the implementation of the VMP; and
- design studies and data collection techniques that are consistent with, and will contribute to, understanding and managing vegetation effects and ensuring effective reclamation.

To meet these objectives, three vegetation monitoring studies will be conducted as follows:

1) Area of Impact Monitoring Program (monitoring the total area of direct impact due to the Mine);
2) Ecological Land Classification (ELC) Area Monitoring Program (monitoring the change in the ELC area due to the Mine); and
3) Reclamation Monitoring Program (monitoring the success of revegetation and reclamation activities).

Two additional triggered monitoring programs may be implemented, when necessary, if specific action levels set out in the VMP are exceeded:

1) Detailed ELC Monitoring Program; and
2) Effects of Dustfall on the VMP.

3.1.10 Water Intake Monitoring Program

The water intake screen was authorized by DFO on August 27, 2004 pursuant to the Mine's Fisheries Authorization (SC00196). A number of conditions were listed in the approval, including the development of a fish screen monitoring program and reporting schedule, which is subject to DFO approval prior to

implementation, and is required within three months of the issuance of the approval. The Water Intake Monitoring Program was submitted in May 2005 and approved by DFO on July 22, 2005.

The fish screen monitoring program is comprised of two components: a physical component and a biological component.

The physical monitoring of the intake screen includes two steps:

- construction/post-construction monitoring, which includes documenting the fabrication details for the screen, and ensuring there are no gaps greater than 2.5 millimetres (mm) between the screen and the intake pipe; and
- operational monitoring, which includes monitoring approach velocity and to determining if any fouling of the screen is occurring.

The biological monitoring component is species and life-stage dependent. The objective of the biological monitoring program is to demonstrate that 25 mm burbot (the target species and life stage for this monitoring program) are not being impinged or entrained by the screen during its operation. The biological monitoring component involves two steps:

- monitoring for the presence of larval burbot in Snap Lake in the area of the screen; and
- monitoring behind the screen to determine if fish are being entrained.

The proposed duration of the monitoring program is two years, with the objective that all of the necessary physical and biological measurements would be carried out in the first year. The first year of monitoring occurred in 2007.

3.1.11 Wildlife Effects Monitoring Program

A Wildlife Effects Monitoring Program (WEMP) was submitted to the GNWT in July 2004. The principal purpose of the WEMP for the Mine is to meet Condition 36 of the Land Use Permit and to comply with relevant Articles in the Environmental Agreement (e.g., Articles VII and VIII) and related corporate commitments. To comply with the relevant terms and conditions stated in the Land Use Permit and Environmental Agreement, De Beers has designed the WEMP to address the following objectives:

- verify the accuracy of impact predictions made in the EAR;

- implement, through the EMS, operational practices that mitigate disturbance to wildlife and wildlife habitat, including migratory birds and their nesting areas, species at risk, and caribou;
- determine the effectiveness of mitigation measures implemented through the EMS;
- consider and incorporate where possible, traditional knowledge;
- establish action levels or triggers for early warning signs to implement adaptive management and mitigation measures where appropriate;
- provide opportunities for the involvement and active participation of aboriginal parties in the implementation of the WEMP;
- design studies and data collection techniques that are consistent with, and will contribute to, understanding and managing regional cumulative effects; and
- develop and review the WEMP in collaboration with the GNWT ENR.

To achieve the principal purpose of the WEMP, monitoring of Mine-related effects will include measuring the following environmental components grouped under three main headings:

- Wildlife Habitat
  - direct change of habitat types associated with the mine footprint;
  - indirect change of habitat value for caribou and grizzly bears within the zone of influence of the Mine;
- Disturbance to Wildlife
  - caribou number, movement, distribution, behaviour, and group composition during the northern and post-calving migrations;
  - seasonal use of preferred grizzly bear habitat within the study area;
  - relative abundance of wolverines in the study area;
  - presence of wolf dens and raptor nest sites within 2 kilometres (km) of the Mine;
  - occupancy and nest success of falcons within the study area; and
- Wildlife Incidents
- number of mine-related incidents with wildlife.

During the WEMP, De Beers will record all incidental observations of rare or new species (i.e., species that have expanded their range to include the study area). De Beers will provide an annual monitoring report that summarizes the data

collected under the WEMP during each year. As experience has shown that significant patterns associated with effects from mining operations and natural factors are typically not apparent with data collected during one- to two-year periods, the annual monitoring report will be expanded every three years to include a discussion of the cumulative results for each component of the monitoring program.

3.2 MANAGEMENT PLANS

3.2.1 Adaptive Management Plan

Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. The Adaptive Management Plan (AMP) is a requirement of Part B Items 12 and 13 of the Water License. An AMP was submitted in August 2004 to the MVLWB. Environmental Management Programs are key mechanisms of the Mine's EMS through which the Mine achieves environmental objectives and targets, focuses and coordinates staff efforts on key issues of concern, and demonstrates environmental performance. Gradually the components of the AMP will become programs within the EMS, ensuring that adaptive management will be captured in the Mine's formal management process.

The five functional areas of the EMS are defined in the International Organization for Standardization as Environmental Policy, Planning, Implementation and Operation, Checking and Corrective Action, and Management Review. The AMP is a critical component of the overall structure of Checking and Corrective Actions.

The AMP component of Checking and Corrective Action activities within the EMS include:

- the development of procedures for monitoring and tracking the key characteristics of operations that can have a significant impact on the environment;
- the review and assessment of operational success in meeting established targets that had been created to minimize environmental risk as a result of internal review and those stemming from third part external review (e.g., EAR, auditing); and
- the establishment of a process for investigating and correcting non-conformances and taking corrective and preventive action to ensure that they do not re-occur.

The Water License also requires that the AMP include details pertaining monitoring, thresholds, and mitigation measures for the following:

- uncertainty in lake mixing and density stratification;
- geotechnical performance of the North Pile;
- nutrient enrichment of Snap Lake; and
- increase in TSS.

Monitoring is integral to the AMP, both as a means of identifying potential risks initially, but also as a tool to assess the effectiveness of solutions and further revisions to these solutions. The Plan will be incorporated into the EMS, and as such, will be subject to periodic review within the adaptive framework of the EMS. The next review of the AMP plan will be complete by June 2010.

3.2.2 Air Quality and Emissions Monitoring and Management Plan

As outlined in Section 3.1.1 (Air Quality Monitoring Program), a draft of an EMP was submitted to the GNWT and Environment Canada in February 2006. Upon receipt of feedback on this draft document from GNWT and Environment Canada in April and August 2006, this document was harmonized with the AQMP into one document, the AQEMMP, to demonstrate the linkages between the two programs. The data from the two programs will be presented together each year in the annual report. The original EMP portion of the AQEMMP meets the requirements as outlined in Article VI, Section 6.3 items d) and e) and Article VII, Section 7.2a(i) of the Environment Agreement. The AQEMMP was submitted to the GNWT and Environment Canada in November 2007. De Beers received comment in February 2007. A meeting occurred between GNWT (ENR), De Beers and Golder Associates Ltd. (Golder) on March 6, 2007 to improve and agree to a final AQEMMP. The AQEMMP was submitted August 25, 2007.

The AQMP concentrates on the following five main components:

1. on-site meteorological monitoring, which consists of hourly measurements of wind speed, wind direction, solar radiation, temperature, relative humidity, and rainfall;
2. on-site hydro-meteorological monitoring, which calculates and records lake evaporation rates to calculate the Snap Lake water balance;
3. ambient monitoring of total suspended particulate (TSP) and fine particulate matter (PM_{10} and $PM_{2.5}$) that consists of 24-hour average values;

4. ambient monitoring of dustfall; and

5. passive monitoring of SO_2 and NO_2.

The EMP focuses on the following three main components:

1. emissions estimates of NO_X, SO_2 particulate matter (PM), and greenhouse gases (GHGs) were calculated based on annual fuel consumption;

2. annual fuel use summary; and

3. emissions mitigation strategies, which includes the fugitive dust abatement program.

De Beers will provide an annual report that summarizes the air quality monitoring and air emissions data collected during each year. To ensure that the AQEMMP is effective, it will be reviewed every 5 years in cooperation with the signatories to the Environmental Agreement.

3.2.3 Best Management Practices Plan for Ammonia Source Control

As per the requirement of the Water License under Part F, Item 23 for a plan to control the source of ammonia in effluent discharge; Safety, Health and Environment Operational Procedures (SHE OPs) and action plans have been designed by De Beers to control and monitor ammonia discharge in current mine water effluent from the Snap Lake underground mine. This plan will be updated in 2010.

The Explosive Conservation Procedure highlights the general nature of the overall operational monitoring controls in place within the EMS, while the Environmental Monitoring Program highlights the adaptive management protocol within the EMS to both monitor and respond to fluctuating ammonia levels in mine water discharge samples. Both programmes were scheduled for expansion in 2005, in conjunction and in time with the North Pile construction and development activities to include routine monitoring of sump collection water and diversion to the water management pond and finally the water treatment plant.

3.2.4 Interim Mine and Closure and Reclamation Plan

Mining is considered to be a temporary use of the land. At closure, the mine site and the land affected by the mining operations are to be reclaimed to achieve the following objectives, in order of priority:

- protect public health and safety;
- prevent or mitigate environmental degradation caused by mining related activities at the Mine; and
- ensure that upon the end of mining and processing activities, the Mine site is returned to site's original use or an acceptable alternative that considers community input and values and can be used by future generations.

A Preliminary Mine C&R Plan was submitted to the MVLWB in February 2003. This Plan was updated with the Interim Mine C&R Plan to meet the specific requirements contained in Part I, Item 1 of the Water License. This C&R Plan was submitted in February 2005 and following regulators' comments was re-submitted in January 2006 and approved in May 2006. This plan was updated in 2010.

Reclamation cannot totally remove the entire disturbance caused by development and operation of the mine, but it prevents degradation of the surrounding water, air and land after mine closure. The targeted post-closure land use for the Mine is wildlife habitat. This end land use is a reflection of the current use of the tundra area surrounding the Mine site by wildlife (both resident and migratory) and traditional activities of the local communities and First Nations.

As such, the C&R Plan is considered to be a "living" document. It is anticipated that the plan will undergo several further major revisions over the next 22 years. While meeting Water License requirements, it will continue to be updated and refined as the Mine moves through construction, commissioning, into operation and approaches final closure in 2027. The level of detail of C&R planning contained within the Plan will continue to increase with each revision. Those revisions will incorporate the lessons learned from the planned reclamation research and from progressive reclamation of the North Pile as the initial cells are completed. In addition, the revisions will also reflect the input from local communities, First Nations and other stakeholders who have an interest in how the Mine is ultimately reclaimed.

3.2.5 Domestic Waste and Sewage Management Plan

A Domestic Waste and Sewage Management Plan for the Mine was submitted to the MVLWB in June 2004 as a requirement of the Water License (Part E, Section 10) and the Environmental Agreement (Article VI, Section 6.3a[v]). A subsequent update of the Plan was submitted in December 2006 and was approved in February 2007. In line with the De Beers EMS and the AMP, this Plan is iterative in nature and is subject to revision due to operational changes and or continual improvement(s). This plan was updated and resubmitted in February 2010.

The overall goal of this Plan is to create a framework for the proper handling and disposal of wastes, the minimization of potentially adverse impacts on the environment, and compliance with the Mine's Water License and other regulatory guidelines for waste management. To meet this overall goal, the Plan has been developed to address the following three specific objectives:

- to describe domestic wastes generated at the Mine;
- to outline practices and procedures for the collection, storage, transport, and disposal of those wastes; and
- to present monitoring and mitigation procedures for domestic wastes.

As the Mine is located in a remote site, considerable volumes of materials are transported and stored on-site to ensure availability of supplies during the periods when winter road access is not available. To address this volume of waste, the waste management strategy for construction and operations will continue to focus on the following:

- reduction of the amount of material consumed wherever possible. These measures include the following:
  - use of bulk containers for items used in large quantities (i.e., lube oil, cooking oil, beverages);
  - tire recycling (where opportunities exist);
  - use of waste oil for heat generation; and
  - appropriate separation of waste for on-site and off-site disposal;
- replacing hazardous solvents with less hazardous soy-based solvents that reduce occupational exposure to solvent vapour (i.e., using refillable pump bottles instead of aerosol cans and using rechargeable batteries);

- effective and efficient disposal of waste on-site;
- appropriate storage of waste awaiting removal from site; and
- transportation of waste to an appropriate off-site facility for reuse, recycling, or disposal.

As part of the overall continuous improvement process for the Mine site, De Beers has SHE OPs integrated within the Mine EMS system. These operational procedures are reviewed on a regular basis and updates are completed as required on an ongoing basis. The Plan will be incorporated into the EMS, and as such, is being subject to periodic review within the adaptive framework of the EMS.

3.2.6 Emergency Response Plan

As per Part H, Item 1 of the Water License and Article VI, Section 6.3a [iii], the Emergency Response Plan (ERP) was submitted to the MVLWB in September 2005, and approved in October 2005. It was updated and re-submitted in June 2007 and approved in August 2007. It will be reviewed and updated in 2010. The ERP contains specific procedures for potential emergency situations at the Mine. In the ERP each procedure is a stand-alone document, below is a list of the procedures in the ERP:

- Announcing Emergencies by Radio: Radio Procedure for Announcing Emergencies.
- Alarms: Alarms at the Mine.
- Medical: Medevac Procedure.
- Emergency Communications Protocol for Site: Procedure for IT personnel.
- Medical Emergencies on Site – Surface and Underground: Trained Emergency Response Team (ERT) List.
- Trained First Aid Personnel List: Underground Emergencies:
  - Emergency Preparedness and Response Plan for Underground.
- Water Treatment Plant Emergencies: Water Treatment Plant Emergencies – Medical, Fire or Spill.
- Fire: Fire Evacuation Procedures for the Snap Lake Main Camp Complex; Fire in the Main Camp Complex - Management & ERT Duties; Fires On-Site (not including the Main Camp or Skid Camp Complex) – Management and ERT Duties; Fires Off-Site – Management Duties.

- Aircraft –Helicopter Crash at Site: Aircraft or Helicopter Crash at Site – Management and ERT Duties.
- Spill Response: Short Form – Spill Response Procedure (for posting).
- Wildlife: Wildlife Encounters; Caribou on Roads or Runway; Dealing with Bear Sightings, Encounters or a Bear in Camp – ERT; Encountering Wildlife Carcasses.
- Ice Road Emergencies: Emergency Response Procedures for Medical, Fire, and Spill Response; Emergencies on the Mine Spur Ice Road; Vehicle Through the Ice.
- Weather Procedures: Cold Weather Safety; Ice/Winter Road, Reduced Visibility and White-Outs.

3.2.7 Hazardous Materials Management Plan

Waste management is an important component of the De Beers' EMS and Environmental Policy. As per Part E, Item 14 of the Water License, the Hazardous Materials Management Plan was submitted to the MVLWB in June 2004. It was revised and then re-submitted in January 2005. The plan was approved in February 2005. The document was reviewed by De Beers, and was resubmitted to the MVLWB in November 2009. The newest version of the plan was submitted to the board in June 2010.

De Beers' overall waste management policy is based on the following principles:

- health and safety of all site employees and visitors is paramount;
- reduction, reuse and recycling of waste materials;
- adherence to applicable regulations and waste handling guidelines required under the *Environmental Protection Act* (GNWT Department of Resources, Wildlife and Economic Development) is mandatory;
- treatment, disposal, and management of waste will be performed on-site to the maximum practical and economic extent in order to minimize the volume of waste shipped off-site;
- proactive management of wastes that may attract wildlife and to minimize the interaction between humans and wildlife;
- a materials procurement policy that stipulates which types of materials are prohibited on site, due to known unacceptable waste products, and will require that products with minimal waste generation be given priority over alternatives where economic and practical; and
- waste management principles and procedures will form a fundamental component of personnel site orientation and education. Environmental

awareness training and waste management training will form part of the EMS.

Procedures outlined in this program are enforced by site management personnel, through regular site inspections and auditing. Construction and services contracts also include contractual requirements to comply with site waste management procedures.

The majority of hazardous materials that will be used during the construction phases of the Mine can be grouped into the following three site categories:

- petroleum, oils and lubricants;
- explosives; and
- other hazardous chemicals.

An inventory control of all hazardous materials is conducted on-site by Materials Management. Logistics is responsible for insuring that Transportation of Dangerous Goods (TDG) paperwork is completed as required by TDG legislation. This includes shipments of hazardous materials received at the Snap Lake mine, as well as hazardous waste materials that are shipped off-site for disposal. Contractors are required to submit copies of Material Safety Data Sheets (MSDS) to Materials Management for all hazardous materials prior to, or accompanying all shipments to the Mine. Material Safety Data Sheets are submitted to a service provider who uploads the MSDS to a customized on-line collection which can be easily accessed by contractors and employees. Contractors are also required to maintain copies of MSDS applicable to their contracts and ensure copies are available to their crews.

Compliance with all environmental laws, regulations, guidelines, and best management practices as well as the Mine EMS, will be monitored using the following mechanisms:

- environmental inspections;
- environmental audits (internal and external);
- communication with regulatory authorities (federal, provincial, regional, and municipal); and
- communication with De Beers' Corporate Legal Department and other De Beers' facilities.

3.2.8 Ore Storage, Waste Rock, and Processed Kimberlite Management Plan

The Ore Storage, Waste Rock, and Processed Kimberlite Management Plan (OSWRPKMP) is a requirement of the Mine's Water License (Part E items 3 to 8). The OSWRPKMP was initially submitted in December 2004 and was updated with the planning and development of three phases of the Mine's North Pile Waste Rock and Processed Kimberlite Storage Facility, which includes the schedule, location and quantities of stockpiles, operational procedures for the pile development, waste management (hydrocarbon contaminated soils and solid waste management) and monitoring programs in October 2005. It was also approved in October 2005. The OSWRPKMP was revised by DeBeers in 2009, and was resubmitted to the MVLWB in November 2009. It was revised again in January 2010 and approved in February 2010.

The OSWRPKMP consists of the following monitoring programs related to the North Pile:

- geotechnical stability and deformation;
- temperature monitoring (thermal conditions of the waste rock pile using thermistors);
- hydrology (measuring surface runoff); and
- hydrogeology and geochemistry (evaluation of flow and geochemistry of seepage from the North Pile Starter Cell).

The OSWRPKMP includes the Acid Rock Drainage and the Geochemical Characterization Plan as an appendix, which discusses the assessment of potentially acid generating (PAG) rock and the monitoring and managing of this rock. This Plan is reviewed annually and is currently being updated.

3.2.9 Quality Assurance Quality Control Management Plan

This QA/QC Plan is a requirement of the Water License SNP Section (Part B, Items 23 to 25). The Plan addresses the analysis of blanks and certified reference material and replicate sampling to assess accuracy, precision and field contamination during environmental effects monitoring. The Plan was submitted in July 2004, revised and re-submitted in March 2006 and approved in April 2006. The plan was updated in October 2008. This plan will be reviewed and resubmitted to the MVLWB in 2010.

Field sampling procedures including sample site locations and designations, sampling equipment and methods along with sample handling procedures including preservation, sample identification, and shipping protocols are discussed. Water sampling frequency, monitoring requirements, laboratory requirements (including laboratory accreditation, detection limits, methodology and reporting procedures), and SNP reporting requirements are also described.

The AEMP and the Monitoring Plan for TDS, calcium, and chloride include all SNP Stations located within Snap Lake, specifically SNP Stations 02-18, 02-20, and 02-21. Because sampling, including QA/QC is described in detail in these and other plans, details related to SNP Stations 02-18, 02-20 and 02-21 are not included in the QA/QC Plan.

The QA/QC Plan is reviewed annually and modified as necessary, as per Part B, item 24 of the Water License SNP.

3.2.10 Quarry Management Plan

The Quarry Management Plan is a required under the Environmental Agreement (Article VI, Section 6.3a, [vi]) and under the Land Use Permit (Part C, Item 6). A Quarry Management Plan was submitted as part of the EAR (Appendix III.5). As there are no plans to quarry the esker, this plan has not been updated. A Quarry Management Plan will be designed prior to excavation of the esker.

3.2.11 Sampling Plan for Total Dissolved Solids, Calcium, and Chloride

The Sampling Plan for Total Dissolved Solids, Calcium, and Chloride is a requirement of the Water License (Part F, Item 12) and the Fisheries Authorization (Section 5.6). This plan was submitted to the MVLWB and DFO in August 2004. It was revised in March 2005 and it received approval in May 2005. This plan is currently under review by DeBeers.

The primary objective of this document is to outline a sampling plan that will allow De Beers to monitor for compliance with the whole-lake average TDS limit (350 milligrams per litre [mg/L]) and include a framework for forecasting TDS, calcium and chloride concentrations in Snap Lake that will allow De Beers to anticipate future concentrations in Snap Lake, and implement mitigation measures as early as possible, should they be required. The Plan also includes sampling electrical conductivity since it is strongly correlated with TDS, calcium, and chloride.

A mass balance model will also be used to forecast the maximum whole-lake average TDS concentrations in Snap Lake that could occur over the life of operations. The mass balance model forecasts will be updated annually. The maximum forecast TDS concentrations will provide an early warning indicator for the management of TDS levels as part of the AMP and the Mine's EMS.

Results of the TDS, Calcium, and Chloride Sampling Plan will be reported annually to the MVLWB as part of the AEMP Annual Report on March 31 and to DFO in the Annual TDS Monitoring Report, submitted July 31.

3.2.12 Spill Contingency Plan

The Spill Contingency Plan is a requirement of the Mine's Environmental Agreement (Article VI, Section 6.3a [ii]), Water License (Part H Item 1), and Land Leases. This Plan was initially submitted in 2004 and was approved in July 2005. It has been reviewed and updated annually, and was revised and resubmitted to the MVLWB in 2009.

The purpose of this Spill Contingency Plan is to:

- facilitate the prompt, efficient and safe clean-up of materials used during the construction and operation of the Mine;
- identify the members, responsibilities and reporting procedures of the Snap Lake ERT in the event of an emergency or spill; and
- provide support and information on available resources, facilities and trained personnel in the event that a spill or an emergency occur.

This plan deals with the following types of materials that are handled on the Mine site:

- fuels, oils, lubricants and other petroleum products;
- compressed gases;
- explosives;
- process and water treatment chemicals; and
- effluents and slurries.

The Spill Contingency Plan outlines contact information, response organization, training courses taken by spill response teams, and reporting responsibilities. An overview of spill response exercises for the response team is also included. It

provides a brief description of the major facilities found at the site that have the greatest potential to have a large or environmentally significant spill and preventative measures to avoid environmental incidents, including clean-up strategies. Basic emergency response actions and procedures and basic spill response theory and actions are also outlined in the Spill Contingency Plan. The Spill Contingency Plan provides a list of all spill response equipment and a list of support documents used in preparation of this plan.

Of all the facilities at the site, those having the greatest potential for spills include the following:

- fuel storage and transfer systems;
- chemical and explosives storage and transfer systems;
- hazardous materials handling and storage facility;
- water treatment and management systems;
- sewage treatment system; and
- auxiliary systems (pipelines).

Basic procedures and decontamination steps during any spill response have been established, and Action Plans and SHE OPs have been developed for liquid and fuel spills on land, water, snow, and ice. General spill response equipment, including small and large kits are available on-site to assist in spill response. The Spill Contingency Plan is reviewed annually and updated as needed.

3.2.13 Water Management Plan

The Water Management Plan is a requirement of the Mine's Water License and Environmental Agreement. A Plan was submitted initially in August 2004 and was updated in March 2005 for the Phase 1 Pre-production Program, commencing in 2004, through construction in 2006 and up to, but not including commissioning of the permanent water treatment plant. The Plan was revised and resubmitted to the MVLWB in November 2009. The Water Management plan will be revised and resubmitted in June 2010.

The Water Management Plan has two principal objectives:

- to minimize the impacts of the Mine on the quantity of surface water; and

- to minimize the impacts of the Mine on the quality of surface and groundwater.

The Water Management Plan contains three sections:

- a listing of water management objectives, strategies to implement objectives, and minimum water management standards;
- a tabulated estimate of the water balance (gains and losses of water on-site) and a brief description of each component of the water balance; and
- an outline of the water management system.

As water management planning requires a multidisciplinary understanding of water-related issues (e.g., water quality, water quantity, contingency planning, and environmental monitoring), aspects of its management are found in other monitoring plans including the OSWRPKMP, Sampling Plan for Total Dissolved Solids, Calcium, and Chloride, Groundwater Quantity and Quality Monitoring Program, the Hydrology Monitoring Program and the AEMP. This Plan was updated with the water balance information for operations.

3.2.14 Wildlife Management Plan

The Environmental Agreement (Article VI, Section 6.3f) requires that a Wildlife Management Plan be developed for the Mine. The draft Wildlife Management Plan was submitted in December 2006. Responses from regulators and other parties were received in February 2007. Responses were incorporated into the Plan and re-submitted November 8, 2007. Comments were received in February 2007, which are currently under De Beers review. The intent of the plan is to highlight mitigation measures used by De Beers to limit potential impacts on wildlife, and promote and facilitate wildlife safety. Mitigation measures associated with the various stages of the Mine are emphasized to illustrate the connection between Mine activities, potential effects on wildlife, and the various adaptive management and mitigation measures. To meet the requirements of the Environmental Agreement, on-site wildlife management, waste and odour management and caribou protection are addressed in this document.

The plan has been developed in consultation with the GNWT and SLEMA as per the Environmental Agreement specifications. The Agreement also states there should be an environmental monitoring program to support the process of adaptive management. The WEMP (Section 3.1.11) was submitted to the GNWT in July 2004, and has been on-going since March 2001.

De Beers is committed to maintaining wildlife safety on the Mine site and will continuously evaluate and update mitigation strategies as necessary.

4 2010 REPORT SUBMISSIONS

De Beers Canada Inc. (De Beers) submitted 17 reports and technical memorandums in 2010 as required under their Water License, Land Use Permit, Environmental Agreement, Fisheries Authorization and Land Lease. Table 4-1 provides the full list of Reports and Plans submitted in 2010. This section provides abstracts of the Annual Reports and Non-Annual Reports (i.e., As-Built and Detailed Design Reports and monitoring reports under the Fisheries Authorization related to habitat compensation). Abstracts have not been included for the updates to the monitoring and management plans as these are outlined in Section 3.

Table 4-1 Summary of 2010 Report Submissions for the Snap Lake Mine

Submission Title	Date of Submission	Report Section
2010 Hydrology Monitoring Program Annual Report	June 2011	4.1.3
2010 Vegetation Monitoring Program Annual Report	June 2011	4.1.4
2010 Wildlife Effects Monitoring Program Annual Report	June 2011	4.1.5
2010 Type A Water License Water License Annual Report	March 2011	4.1.6
2010 Acid Rock Drainage and Geochemistry Annual Monitoring Report	March 2011	4.1.7
2010 Dam Inspection Report	March 2011	4.1.8
2010 Aquatic Effects Monitoring Program Annual Report	March 2011	4.1.9
2010 Dissolved Oxygen Annual Monitoring Report	August 2010	4.1.10
2010 Total Dissolved Solids Monitoring Near Fish Habitat Compensation Areas in Snap Lake	August 2010	4.1.11

4.1 ANNUAL SUBMISSIONS

4.1.1 2010 Environmental Agreement Annual Report

The Snap Lake Mine (Mine) is a diamond mine owned and operated by De Beers Canada Inc. (De Beers), and is located about 220 kilometres (km) northeast of Yellowknife, Northwest Territories (NWT). De Beers received regulatory approval for the Mine in 2004, which included an Environmental Agreement. Mining began in 2007 and is expected to continue for 22 years. We have completed seven years of environmental monitoring since construction started for the Mine. This annual report for the Mine's Environmental Agreement summarizes the monitoring activities and results from 2010.

Since we received regulatory approval for the Mine in 2004, we have written 32 monitoring and management plans for the Mine. In 2010, we submitted 17 reports. We submitted eleven annual reports, three management plans and three reports under the fisheries authorization. A summary of each of these documents can be found in this report.

Here is a summary of what we found in our environmental monitoring studies in 2010.

Air quality: When any fuels are burned, greenhouse gases are produced. We measure the amount of greenhouse gases produced by the Mine because they can add to global warming. Emission rates were generally lower in 2010 from 2009 estimates primarily due to lower power generation and less fleet use at the facility.

Aquatics: We found increases, relative to baseline levels, in dissolved salts, nutrients and a few metals in the water in Snap Lake in 2010. The increases in dissolved salts were greater than expected, and resulted from more loading of dissolved salts from the mine dewatering process in the underground mine than originally planned. These changes are not harmful to fish or other life in Snap Lake. We checked the amount and types of algae, and bugs that live in the water and on the bottom of Snap Lake, to see if there were any changes in food for fish compared to previous years. The amount and types of algae and bugs in the water of Snap Lake have changed from year to year, but this may not be related to the mine alone, because similar changes also occur in all lakes. The number of different types of bugs on the bottom of Snap Lake in 2010 was similar to those in previous years, and the Mine only had a small effect on them. We also checked the mud that the bugs live in at the bottom of the lake and found that two nutrients and a few metals were higher.

Archaeology: None of the sites discovered near the winter road and Mine were disturbed in 2010.

Hydrology: The results indicate that 2010 had low water levels and streamflows compared to previous years. Snap Lake water levels continue to exhibit similar increases and decreases as other monitored lakes in the surrounding area. Water level increases are less than predicted in the EAR and appear more related to climatic conditions than mining influences.

Hydrogeology and Geochemistry: The rock types at the Mine have not changed from what we thought they would be. We have discovered that more water is seeping into the underground mine than we thought there would be and

as a result, there are more salts in the water. We are looking into different technology alternatives to solve this issue.

Vegetation: Satellite pictures were taken of the Mine to check the total size of area impacted by the Mine in 2008. We found that the impact on vegetation was less than we thought it would be. All vegetation communities were impacted less than we expected, except for the esker. We thought only 0.5 hectares (ha) of the esker would be disturbed, but 1.6 ha of the esker was disturbed in the winter of 2001. No further disturbance on the esker is expected to happen. Dustfall exceeded the Alberta Ambient Air Quality Objective for commercial and industrial properties at one sampling location for four consecutive months. This is believed to be a result of dumping in close proximity and the switch from the North American Occupational Safety and Health (NAOSH) hygiene standard to an environmental standard for measurement. Overall, dust does not appear to be having an effect on vegetation at the Mine site.

Wildlife: In 2010, monitoring indicators for caribou, grizzly bear and wolverine all indicated low levels of activity, but this is likely related to the recent declines in the Bathurst caribou herd. We continued to monitor peregrine falcon nests in the area, the number of occupied nests was higher than 2009, but the total number of chicks observed was within the range observed during the baseline studies. Incidents in 2010 were mostly related to fox and wolverine at site, and some isolated incidents included caribou and songbirds. Wildlife mortalities have been very rare at Snap Lake, but in 2010, a fox, two swallows, a ptarmigan and three fledgling robins, were all found dead within the mine boundaries.

Compliance: There were twelve inspections conducted by Indian and Northern Affairs (INAC) in 2010. All issues brought up by the Inspector were addressed or are being addressed.

Mitigative Measures: The AEMP annual report demonstrates that the Snap Lake Mine's impact is similar to what was predicted in the Environmental Assessment. This demonstrates that the mitigative measures being used by De Beers are working effectively. Currently, the main area of investigation for new mitigative measures is in the area of TDS lake concentrations. This work is ongoing.

Adaptive Measures: Adaptive measures adopted in 2010 included the construction of the Main Settling Sump (MSS) in the underground, new cleaning methods for the water treatment plant filters, the commencement of the five year review of the AEMP and the grizzly bear hair snagging program.

4.1.2 Air Quality, Meteorological Monitoring and Emissions Reporting 2010 Annual Summary

Why do we conduct air quality and meteorological monitoring at Snap Lake?

The principal objective of the Air Quality, Meteorological Monitoring and Emissions Reporting Annual Summary is to comply with the Surveillance Network Program (SNP) described in Section D of the SNP, Appendix to Water License (MV2001L2-0002), Article VI Section 6.3 items d and e and Article VI Section 7.2 part a) of the Environmental Agreement, and related corporate commitments including the Snap Lake Environmental Management System.

This report provides the results of the air quality and meteorological monitoring programs that were active at Snap Lake during 2010. This document fulfills the annual reporting requirements outlined in the Air Quality and Emissions Management and Monitoring Plan (De Beers 2008). Changes to the original Plan (De Beers 2005) were made in 2007 and 2008 to align with design recommendations from Environment Canada and the Government of the Northwest Territories' (GNWT) Ministry of Environment and Natural Resources (GNWT and Environment Canada 2006).

What was monitored in 2010?

In 2010, the monitoring program included the following components:

- Meteorological monitoring – Hourly measurements of wind speed, wind direction, solar radiation, temperature, relative humidity, and rainfall were collected from instruments mounted on a 10 metre (m) tower and a 3 m tripod;
- Particulate monitoring – 24-hour average values of total suspended particulate (TSP), particulate matter nominally less than or equal to 2.5 (micrometres) µm aerodynamic diameter ($PM_{2.5}$) and particulate matter nominally less than or equal to 10 µm aerodynamic diameter (PM_{10}) sampled once every six days between January and December; and
- Passive gas monitoring – Passive gas sampling began in January and continued through December; monthly samples were collected for nitrogen dioxide (NO_2) and sulphur dioxide (SO_2).

What were the results of the 2010 meteorological and air quality monitoring program?

The results of the 2010 monitoring program included:

- Meteorological monitoring – Wind speed, wind direction were within the long-term ranges for the area. Precipitation at Snap Lake was lower than the 30 year Yellowknife climate normals

(1971 to 2000) from March to September and December, but was higher than Yellowknife normals during the month of November (Environment Canada 2011a). Annual average temperatures were within the range of those observed in the past five years with the exception of January to March 2010, where the temperature was higher than normal. The relative humidity observed the same pattern as those observed in the past five years, but were higher than normal for most of the year.

- Particulate monitoring – The maximum monitored TSP concentration was 324.6 micrograms per cubic metre (µg/m³), observed at Dichotomous Partisol 2, south of the ammonium nitrate fuel oil (ANFO) storage area. The average TSP concentration observed across all stations was 15.9 µg/m³. The Northwest Territories (NWT) 24-hour TSP standard of 120 µg/m^3 (GNWT 2011) was exceeded four times during 2010. Of the 117 samples collected, 108 values were above the sample detection limit. The maximum monitored PM_{10} concentration was 40.2 µg/m³, observed at Dichotomous Partisol 2, south of the ANFO storage area. The average PM_{10} concentration observed between both stations was 6.6 µg/m³. Of the 54 samples collected, 41 values were above the sample detection limit. The British Columbia 24-hour PM_{10} objective of 50 µg/m³ was used as there are no PM_{10} guidelines in the NWT. This guideline was not exceeded during the monitoring period. The maximum monitored $PM_{2.5}$ concentration was 26.3 µg/m³, observed at Dichotomous Partisol 2, south of the ANFO storage area. The average $PM_{2.5}$ concentration observed between both $PM_{2.5}$ stations was 3.0 µg/m³. Of the 53 samples collected, 41 values were above the sample detection limit. The 24-hour guideline concentration for the NWT is 30 µg/m³. This guideline was not exceeded during the monitoring period.
- Passive Monitoring – The highest monthly NO_2 concentration was 17.6 µg/m^3 during February 22, 2010 to March 15, 2010 at the Tank passive monitoring site located just west of the tank farm. This peak concentration falls well below the maximum desirable annual level of 60 µg/m^3 set forth in the National Air Quality Objectives (Environment Canada 1981). The highest SO_2 concentration monitored during 2010 was 0.6 µg/m^3 and was observed three times. Two occurrences were observed February 22, 2010 to March 15, 2010 at the Tank passive monitoring site and the Wetlands passive monitoring site, both located west of the tank farm. The third occurrence was observed November 12, 2010 to December 16, 2010 at the Tank passive monitoring site located just west of the tank farm. This peak concentration falls well below the maximum annual average objective of 30 µg/m^3 regulated by the GNWT (GNWT 2011). The comparison of monthly values to annual criteria is conservative as monthly criteria would be expected to be higher.
- Snap Lake Mine emissions – Fuel consumption was 23,241,986 litres of diesel with a sulphur content of 15 parts per million by weight. Waste oil consumption was 165,092 litres with an assumed sulphur content of 20,000 ppm by weight. Emission rates were generally lower in 2010 from 2009 estimates primarily due to lower power generation and less fleet use at the facility. SO_2 emissions increased due to the addition of waste oil, but emissions were still below the 2007 Air Modelling Update.

4.1.3 Hydrology Monitoring 2010 Annual Report

Why do we monitor water elevation and streamflow at Snap Lake?

Water elevation and streamflow are monitored near the Mine to meet three principal objectives:

- to confirm Environmental Assessment Report (EAR) predictions (De Beers 2002) related to changes in lake water levels and streamflows;
- to provide flow and water level information for fish habitat compensation monitoring, and to provide an annual water balance and lake level data for water quality monitoring; and,

1. to fulfill requirements of the Water License MV2001L2-0002 (MVLWB 2004) and the Environmental Agreement (De Beers 2004).

What did we monitor in 2010 at Snap Lake?

In 2010, water level data were collected at four stations in the Snap Lake drainage area and at one station at each of the following lakes; the 1999 Reference Lake, North Lake and Northeast Lake. Additional flow data was collected from their outflow channels and on smaller streams that flow into Snap Lake.

What are the results of the 2010 Streamflow and Lake Elevation Monitoring Program?

The results indicate that 2010 had low water levels and streamflows compared to previous years. This trend was also observed at nearby Water Survey of Canada hydrometric stations and was indicative of a regional trend.

Snap Lake water levels continue to exhibit similar increases and decreases as other monitored lakes. The Environmental Assessment Report (EAR) predicted small increases in the mean water elevation of Snap Lake as a result of the mining operations (De Beers 2002). Predicted increases above baseline conditions ranged from 0.033 metres (m) to 0.053 m over the period of operations.

Annual changes in Snap Lake water levels remain similar to three other monitored lakes in the region. Changes in lake elevation from 2007 to 2009 were within a range of previously measured changes, and appear to be less than predicted in the EAR for the construction period and early years of operation. During 2010, the lake elevation dropped to its lowest level since 2004 due to very

low precipitation and high evaporation. The impact of mine activities on lake elevation remains small.

4.1.4 Vegetation Monitoring Program 2010 Annual Report

Why is vegetation monitored at Snap Lake?

A Vegetation Monitoring Program (VMP) is a requirement of the Mine's Environmental Agreement (De Beers 2004) and provides support for the closure and reclamation monitoring requirements as outlined in Part I of the Mine's Water License (MV2001L2-0002; MVLWB 2004). A VMP was prepared for the Mine in 2005 (De Beers 2005).

What was monitored at Snap Lake in 2010?

De Beers has implemented and maintains a VMP for the Mine, which includes annual/interval monitoring including Area of Impact, Ecological Land Classification (ELC) area, and reclamation monitoring programs. The VMP also includes triggered vegetation monitoring of detailed ELC and effects of dustfall on vegetation. In addition to complying with the requirements of the Environmental Agreement and the Water License, the VMP has been designed to verify the accuracy of the impact predictions made in the Environmental Assessment Report (EAR) (De Beers 2002a). It also provides information to the Snap Lake Environmental Management System (EMS) (De Beers 2002b) and supports De Beers commitment to mitigate impacts during Mine planning and operation (De Beers 2005).

Triggered programs are additional field programs that are initiated if established action levels are exceeded. Adaptive management and mitigation measures are implemented, where appropriate, only when the defined trigger is surpassed.

What were the results of the Monitoring Programs?

Area of Impact and ELC Monitoring were not required as part of the VMP in 2010 as there was minimal additional surface disturbance. QuickBird satellite images are scheduled to be captured every five years until closure. The next QuickBird image and associated assessment will be completed in 2013.

Area of Impact

The disturbance of the local study area (LSA) and esker complex, as of July 2008, is 155.4 hectares (ha), or 11 percent (%) of the LSA. This is below the predicted disturbance area; therefore, the Detailed ELC Monitoring Program is not triggered and modifications to the monitoring program are not needed at this time.

Ecological Land Classification Area Monitoring

None of the ELC units have received a greater proportionate disturbance than predicted in the EAR (De Beers 2002a) as of July 2008, with the exception of the esker complex. As reported in previous VMPs, the area of disturbance to the esker was expected to be 0.5 ha; however, the actual disturbance was 1.6 ha. Granular material was removed from this esker in the winter of 2000/2001. No further disturbance to this esker is anticipated and none was recorded as occurring up to 2008. Overall, the disturbance covers 11% of the LSA, which is below the predicted 15%. The Detailed ELC Monitoring Program is not triggered and modifications to the monitoring program are not needed at this time.

Reclamation Monitoring

Due to slow growth rates and colonization of vegetation in the Arctic, reclamation surveys are not required annually. Reclamation permanent sample plots (PSPs) were surveyed in 2008 and will be monitored every five years thereafter. The next survey will take place in 2013. Reclamation PSPs will be assessed for changes in vegetation community composition and changes in physical and chemical properties of soil over time.

What were the results of the Triggered Monitoring Programs?

Detailed Ecological Land Classification Monitoring Program

Treatment and control PSPs were surveyed from 2004 to 2006 to collect baseline data. Control plots are undisturbed, while treatment plots were disturbed, but are being allowed to revegetate naturally. This data will be compared to data collected during future annual/interval monitoring programs and, if required, Triggered Monitoring Programs. Surveys were conducted in 2008 and will be conducted every five years thereafter. The next survey will take place in 2013. No Triggered Monitoring Programs have been initiated thus far.

Dustfall Monitoring Data

Monthly dustfall samples were collected in the months of January to December, excluding May. The maximum deposition rate of 312 milligrams per square decimetre per 30 days (mg/dm²/30d) was recorded at DF012 in January 2010. The rest of the dustfall deposition rates were low in January and were within the Alberta Ambient Air Quality Objective (AAAQO) (AENV 2005). Four samples exceeded the 158 mg/dm²/30d guideline for commercial and industrial properties.

These results cannot be used solely to ascertain whether dustfall is affecting vegetation communities. The Alberta dustfall criteria were developed in 1975 to address aesthetic concerns associated with elevated dustfall levels (Fu 2006, pers. comm.). However, there are no scientifically defensible relationships between these dustfall criteria and discernible effects on vegetation communities. Vegetation is inspected visually to assess impacts of dustfall on vegetation. However, a structured and focused visual inspection of dustfall on vegetation was not conducted in 2010. A comprehensive study will be conducted again in 2013 or earlier if De Beers observes substantial dust accumulation and/or stressed vegetation in the interim.

4.1.5 Wildlife Effects Monitoring Program 2010 Annual Report

Why Do We Monitor Wildlife At Snap Lake?

In accordance with the Mine's Wildlife Effects Monitoring Program (WEMP) (De Beers 2004a), commitments made in the Environmental Assessment Report (De Beers 2002), and the Mine's Environmental Agreement (De Beers 2004b), a WEMP report is to be completed each year. Because of the large degree of natural variation inherent in ecosystems, it is often difficult to detect indirect effects with only one or two years of data. Therefore, a more comprehensive analysis and discussion of all data from the WEMP will be completed every five years; the next comprehensive report will include all data collected from 1999 to December 2012. For the intermediate years, the annual reports will present findings from that year, and summarize cumulative data collected up to that year. If critical issues become apparent in the shorter term, then a discussion of these issues will be presented in annual reports.

What Did We Monitor At Snap Lake In 2010?

Consistent with other mining developments in the Northwest Territories, wildlife studies in 2010 were focused on Valued Ecosystem Components (VECs). Criteria for choosing VECs were based on the ecological, social, cultural, and economic aspects of the ecosystem. The VECs used in the WEMP include:

- wildlife habitat;
- barren-ground caribou;
- grizzly bear and black bear;
- wolverine; and,

2. raptors.

The occupancy and productivity of wolf dens is recorded and provided to the Department of Environment and Natural Resources, but is not considered part of the WEMP.

Wildlife studies were completed in the wildlife study area, defined by a circle with a radius of 31 km, centred on the Mine site, and equivalent to 3,019 square kilometres (km^2). Baseline data, collected from 1999 to 2004, were used to provide estimates of the natural variation in species presence, abundance, distribution, and habitat use in the study area. Effects monitoring began in 2005 when construction started.

What Have Been The Effects Of The Snap Lake Mine?

So far, the effects of the Snap Lake Mine to wildlife have been within the range predicted in the Environmental Assessment Report (De Beers 2002). In 2010, the measures for caribou and bears indicated low levels of activity by these species. Further data collection and more comprehensive data analyses in the next comprehensive report will help to determine if these changes are related to the Mine, or natural factors. It is likely that some of these changes are influenced by the decline in the Bathurst caribou herd, and the bears, wolverine, and wolves that depend on caribou.

Wildlife habitat loss due to the expanding Mine footprint mine has occurred as expected, and the Mine is currently about 71 percent (%) of its total predicted size. Further habitat loss will occur as the waste rock storage at the North Pile expands but this expansion is not expected to increase the size of the footprint.

Incidents are any wildlife interaction that requires a response by Mine personnel, and may range from simple deterrent actions to the injury or death of an animal. De Beers environmental staff report all wildlife incidents, and follow written procedures. A total of 11 wildlife incidents were recorded at the Mine in 2010. These incidents were mostly related to fox and wolverine at site. Wildlife mortalities have been very rare at the Mine. In 2010, a red fox, a ptarmigan, and two songbirds were all found dead within the Mine footprint. Worker education and good waste management are considered essential in limiting wildlife incidents.

Caribou pass through the Snap Lake wildlife study area, particularly during their spring and fall migrations. They are monitored through the movements of satellite-collared caribou, observations by employees at the Mine, and with aerial surveys by helicopter. The number of caribou observed has been very different from year to year since monitoring began in 1999. Aerial surveys during the northern migration are no longer required and were not completed in 2010. In 2010, no caribou were observed during post-calving migration aerial surveys.

Because searches for fresh bear sign during past bear monitoring programs limited and variable results, a new study design was tried in 2010. The new design includes the use of 40 hair snagging stations that were inspected for the presence of grizzly and black bear hair. In 2010, hair snagging results indicated that grizzly bears continue to be present in the study area, although at low levels.

Wolverine are monitored by recording observations of tracks in the snow along the same 50 transects each year. Each transect is 4 km long and checked by two observers on two snowmobiles. Surveys for wolverine snow-tracks were not

completed in 2010. In 2009 the snow-track survey indicated that wolverine continue to be present in the study area, although the number of transects with wolverine tracks was lower in 2009 than in any previous year.

Fifteen raptor nests have been recorded in the study area. Each nest is checked twice every year to determine nest occupancy and success. Raptors observed at these nests have included peregrine falcon, gyrfalcon, rough-legged hawk, American kestrel, and bald eagle. In 2010, six nests were occupied by peregrine falcon and one by an unidentified falcon species. One peregrine falcon nest hatched young. The number of occupied nests was greater in 2010 than in 2009. However, nest success was 14% in 2010 and lower than in 2009.

What are the results collected during baseline and construction (1999-2007) at Snap Lake?

Vegetation Loss

Based on the July 2008 satellite image and the June 2007 esker quarry survey, the estimated area directly impacted by Mine in the LSA or core Mine site is 155.4 ha, or approximately 71 percent (%) of the expected disturbed area. A further 60.9 ha of disturbance is expected before the Mine footprint reaches maximum extent, much of which will be associated with the development of the North Pile waste rock storage area. With the exception of esker habitat, Mine-related disturbance to vegetation types is below the predicted maximum. Currently, the largest amount of disturbance, by area, has been to heath tundra/boulder, which is the dominant land cover type in the LSA. Esker habitat has been disturbed by 1.1 ha more than anticipated. The disturbance was associated with the granular material borrow site at the esker south of the Mine, where a total of 2.5 ha were disturbed (boulder, heath tundra/boulder and water were also disturbed at this site). Granular material was removed from this esker along the esker access road during the winter of 2000. No further disturbance to this esker is anticipated.

Caribou

The Mine is located within the migratory range of the Bathurst and Ahiak caribou herds. The Bathurst herd's calving grounds are near Bathurst Inlet, Nunavut, and the Ahiak calve further east near the Queen Maud Gulf. Each forms a discrete herd during calving and rut, but may overlap during the migratory and winter periods. Caribou are of great cultural and economic importance to aboriginal groups in the area, and are an important source of food for residents of Nunavut and the NWT. Caribou are also an important prey species for other wildlife such as bears, wolverine, and wolves. The Bathurst and Ahiak herds may be exposed to mining activities at Snap Lake during their northern migration to the calving grounds, and during the subsequent post-calving migration and rut.

Because Snap Lake is near the treeline, caribou may also be present in the study area during the winter.

Caribou monitoring at Snap Lake consists of aerial surveys conducted during the northern migration, and post-calving migration. Surveys are flown along seven transect lines, spaced 8 km apart, running in a north-south direction. Usually, two to six surveys are completed during each migration period, until the caribou leave the study area. During these surveys, wildlife biologists and community members record information on the number, location, behaviour, group composition (males, females, and calves), and habitat type of caribou. Caribou tracks and trails in the snow are also documented.

During the northern migration, observed caribou numbers ranged from 1 to over 3,800 during baseline (1999 to 2004), between 40 and approximately 300 during construction (2005 to 2007) and 76 during operation (2008). During the post-calving period, estimated caribou numbers ranged between approximately 300 to 6,900 during baseline, between 1 and approximately 6,500 during construction and none in the first year of operation in 2008. This indicates a relatively high level of variation in caribou numbers across years, with no consistent trends over time.

Since 1999, the number of caribou observed per area surveyed (mean density) ranged from close to zero to 1 during the northern migration, and 3.62 caribou per km^2 during the post-calving migration. In 2008, 76 caribou were recorded in 6 groups during the northern migration, while none were recorded during the post-calving migration.

Bears

Both grizzly bears and black bears can occur within the study area. Bear signs are monitored to determine if the Mine influences the activity and distribution of bears in the study area. Occurrences of bear signs, which include tracks, scat, digs, beds, hair, dens, and prey remains, are recorded by observers in plots placed throughout the study area.

From 2001 to 2008, a total of 432 plot surveys for bear sign were conducted, including 229 sedge wetland plots, and 203 riparian plots. A total of 116 fresh bear signs were detected in 66 of the 229 sedge wetland plots, and 113 fresh signs were detected in 68 of 203 riparian plots. In both habitats, the number of sign per plot was highest in 2001, mostly due to the high number of tracks detected. Scats and digs were the next most frequently observed sign type. The number of signs per plot varied annually between habitat types ranging from 0.2 to 2.0.

Wolverine

Snow-track surveys were used to study the presence and relative activity of wolverine in the study area from 1999 to 2008. A new snow-track method using multiple 4 km transects in habitats preferred by wolverine was implemented in 2003. This method was adopted to resolve some of the limitations of the previous method, and to determine if wolverine are attracted to or avoid the Mine. This report presents data gathered from 2003 to 2008.

From 2003 to 2008, the number of transects surveyed per year ranged from 12 to 50, accounting for between 48 and 200 km of survey distance. Overall, the results indicate a fairly even distribution of tracks throughout the study area from 2003 to 2008, although transects closer to the south and east of the Mine appear to have a higher frequency of detections. No wolverine were observed on a transect and no wolverine dens were found in 2008.

Mean track densities ranged from 0.21 in 2003 and 2004 to 0.01 in 2008. Overall, the mean TDI decreased with each year, although the associated variances indicate that the track densities may not statistically differ between every year. In addition, snow tracking conditions in 2008 were poor relative to previous years as indicated by the average number of days since threshold wind speed or snowfall.The proportion of transects with wolverine tracks ranged from 24% in 2008 to 67% in 2003.

A single wolverine was harvested by a hunter while staying at the Mackay Lake Lodge (Mandeville, F. 2009 pers. comm.). No information on specific date, harvest location, sex, age, or condition of the wolverine was available. Mackay lake lodge is located 30 km north-northeast of the Mine site.

Raptors

Surveys of raptor nest sites were conducted from 1999 to 2007 to determine if the Mine influences the distribution, occupancy rate, nest success, and productivity of raptors within the study area. Fourteen nest sites have been identified within the study area, and range from 8 km to 29 km from the Mine footprint.

Fifteen raptor nest sites have been identified within the study area since 1999, although not all of these sites have been occupied every year. In 2008, there was a new potential nesting site observed during the spring bear survey. A peregrine was observed flying in the area of Portage Bay. No nesting platform

was observed, although occupancy was inferred from the visible white wash on the cliff face. The distance from these nest sites to the Mine footprint ranges from 8 km (Reference Lake) to 30 km (Munn C and Portage Bay). In 2008, peregrine falcons, gyrfalcons and ravens each occupied 6, 1, and 3 nests, respectively. No rough-legged hawk or bald eagle nests were found in 2008.

From 2000 to 2010, occupancy at raptor nest sites (not including ravens, eagles, and kestrels) varied from 50% in 2003 to 92% in 2005 (Table 6-2). Chicks were produced in every year and productivity ranged from 0.25 to 2.33 chicks per occupied site. Nest success ranged from 25% in 2001 and 2005 to 83% in 2000 and 2003. In 2010, one peregrine falcon nests were successful in producing 4 fledglings.

Wildlife Incidents

Incidents are defined as any wildlife interaction that requires a response by Mine personnel, and may include simple deterrent actions, or the injury or death of an animal. De Beers environmental staff report all wildlife incidents, and follow the procedures outlined in the Snap Lake Wildlife Management Plan (De Beers 2007).

In 2010, there were 11 wildlife incidents associated with the Mine. There were five incidents with red fox, one with cross fox, two with wolverines, two with songbirds, and one with ptarmigan. Mortalities included in these incidents were a red fox, two songbirds, and one ptarmigan.

Staff reported a dead red fox on January 6, 2010. Environment staff collected the carcass and forwarded it to ENR. Staff reported two dead swallows in the environment shop on June 14. Three pre-fledged robins were found dead in a nest at the North Pile on August 3 and a ptarmigan was found dead on site November 11. After collecting the bird carcasses and notifying ENR of the mortalities, Environment staff incinerated the carcasses.

4.1.6 2010 Type A Water License Annual Report

The 2010 Water License Annual Report addresses the annual reporting requirements under Water License MV2001L2-002 issued by the MVLWB in May 2004. The 2010 Water License Annual Report was submitted on March 31, 2011.

The 2010 Water License Annual Report consists of a main document addressing the following:

- monthly and annual quantities of freshwater removed from Snap Lake;
- monthly and annual quantities of discharge from the Water Treatment Plant;
- monthly and annual quantities of treated sewage effluent discharged from the sewage treatment plant;
- monthly and annual quantities of water pumped to the North Pile;
- monthly and annual quantities of mine water pumped from the mine to the Water Treatment Plant;
- monthly and annual quantities of water pumped into and out of the Water Management Pond;
- monthly and annual estimates of seepage and evaporation losses from the water control and collection system;
- monthly and annual estimates and measurements of precipitation and runoff;
- monthly elevations of water in Snap Lake during ice-free conditions;
- monthly elevations of water in the Water Management Pond;
- annual quantities of processed kimberlite (PK);
- annual quantities of PK placed as underground backfill;
- annual quantities and locations of Mine rock placed in the North Pile;
- summary of construction activities;
- an updated mine plan showing all underground excavation and backfilling locations;
- summary of all work carried out under the OSWRPKMP;
- summary of modifications or maintenance work on water control and collection system;
- summary and explanation of changes to Water and Sewage Treatment Plants;
- summary of the SNP and a summary of activities at each station;
- report on studies requested by the MVLWB;
- approved revisions to Spill Contingency Plan;
- spills and unauthorized discharges;
- spill training and communications exercises;
- annual hydrogeological modelling; and,

- changes or updates to the AMP.

The appendices of the 2010 Water License Annual Report are as follows:

- 2010 Dam Inspection Report (Section 4.1.8);
- Detailed Tabular Summaries of the 2010 Water Quality Data for the SNP Stations;
- 2010 Fish Tasting Event Summary; and,
- 2010 Annual Report for the Aquatic Effects Monitoring Program (AEMP) (Section 4.1.9).

4.1.7 2010 Acid Rock Drainage and Geochemistry Monitoring Report

The Mine is owned and operated by De Beers. Monitoring of acid/alkaline rock drainage (A/ARD) at the Mine is required in support of Type A Water License (MV2001L2-0002). Ongoing aspects of ARD monitoring program include: monitoring of site runoff/seepage; conducting an annual site inspection by a qualified hydrogeochemist to review material placement and identify signs of incipient acid generation (if any); and preparing an annual report describing the environmental conditions on site with emphasis on the presence of acid/alkaline drainage. This report summarizes the results of ARD and geochemical monitoring conducted during 2010, comprising the sixth year of reporting.

This report fulfills the annual reporting requirement as required under the Type A Water License Part B, Section 5k):

"The Licensee shall file an Annual Report with the Board no later than March 31 of the year following the calendar year reported which shall contain the following information … 5k) updated results of ARD and related geochemical test work."

This report also fulfills the reporting requirement under the Type A Water License Part B, Section 5j) pertaining to the reporting for seepage surveys:

"…j) summary of all work carried out under the Ore Storage, Waste Rock and Processed Kimberlite Management Plan including the results of seepage surveys of the kimberlite ore storage stockpiles, North Pile, and Water Management Pond."

Under the Type A Water License, an ARD and Geochemical Characterization Plan for the Mine was submitted to the MVLWB as part of the OSWRPKMP in October 2005. The OSWRPKMP was revised and resubmitted to the board in February 2010. It was approved in March 2010. Data in this report have been presented and reported in accordance with the ARD Plan.

Primary study areas for the 2010 ARD and Geochemistry Monitoring Report are as follows:

- the underground mine and surface facilities, including the North Pile; the WMP, and associated areas;
- the explosive storage facility;
- the kimberlite ore stockpile; and
- site infrastructure (i.e., roads, rock pads, and any areas where rock has been disturbed or deposited).

Significant conclusions and recommendations resulting from the 2008 ARD and geochemistry monitoring program include the following:

Conclusions

- Of the 91 samples of rock collected during 2010, only four samples contained greater than 0.17 percent (%) sulphide sulphur, including two samples of metavolcanic rock and two samples of kimberlite (Tables 4- 4a and 4-4b).
- New construction, such as rock placement, that took place during the 2010 monitoring period included ongoing construction of the East Cell perimeter access road and sumps, construction of a walking path near the diffuser road, and addition of a 0.5 metre (m) thick layer of granite to the outside face of Dam 1 at the WMP. Granitic rock samples collected from areas of new construction contained less than 0.17% sulphide sulphur.
- Granite rock collected from existing site infrastructure contained less than 0.17% sulphide sulphur.
- The perimeter embankments of the North Pile continued to be raised with PK coarse and grits. Samples of PK coarse and grits collected from the North Pile contained less than 0.17% sulphide sulphur.
- Metavolcanic rock at the FAR was iron-stained, and had visible signs of sulphide oxidation. Metavolcanic rock samples collected from the FAR contained greater than 0.17% sulphide sulphur. Ongoing monitoring of metavolcanic rock exposed at the FAR is recommended, as is monitoring of downstream water quality.

- With the exception of rock observed at the FAR, no visible signs of sulphide oxidation or incipient ARD were observed in rock exposed in rock pads, roads, building foundations, and laydowns during the September 2010 site inspection (Golder 2010).

- A layer of PK coarse and grits formed on the route used to transport PK by truck between the processing plant and the North Pile (De Beers 2009). De Beers has made efforts to minimize the spillage from haul trucks on the road since 2009, and has made efforts to remove the PK from the haul road.

- The results of geochemical characterization of mine rock samples collected by De Beers and samples collected from site infrastructure during the September 2010 site visit were consistent with the observed ARD results and trends in mine rock/construction rock geochemistry in the EAR and previous annual reporting periods. The geochemical evaluation of the main rock types at the Mine, i.e., granite, metavolcanic, and kimberlite, has not changed as a result of the visual surveys or geochemical analysis of mine rock and confirmation geochemistry samples conducted in 2010.

Recommendations

Recommendations for ongoing adaptive management at the Mine have been developed based on the results of ongoing ARD monitoring and water quality/mass loading trends, including:

- The clean granite stockpiles located near the Apron Quarry should continue to be available as a source of non-acid generating (Non-AG) construction material for operators and mine managers.

- Localized zones of metavolcanic rock have been identified in roads near the WMP, the diffuser outflow, the fresh water intake, and the FAR during site inspections conducted during 2010 and previous monitoring years. Ongoing monitoring of locations with metavolcanic rock is recommended. An ongoing record of visible signs of sulphide oxidation and/or incipient acid generation should be kept. If the results of downstream water quality monitoring from these locations show an influence attributable to acid generation, remedial measures would need to be investigated.

- The geochemical testing included acid base accounting (ABA) and net acid generation (NAG) test results for samples of metavolcanic rock collected from the FAR during 2010, and samples of metavolcanic rock collected from the bulk sample mine rock pad (BSMRP) during previous monitoring periods (e.g., De Beers 2010a). The results indicate that some of the rock at these locations has a potential for acid generation. Ongoing monitoring is required to assess the in situ acid generation potential of this material.

- Removal of in situ rock at the FAR rock pad may not be practical, as this rock consists of material that was blasted from an in situ outcrop. Some of the metavolcanic rock in the FAR rock pad has the potential to generate acidity, according to the results of ABA and NAG testing. This location should be monitored to assess the potential for acid generation in ambient site conditions. Remedial action may be necessary at this location if acidity develops in runoff from the area.

- Metavolcanic rock should not be used in the outer perimeter berms of the North Pile, or within 50 m of the toe of the North Pile perimeter embankments unless it is first demonstrated to be non-AG.

The following recommendations are related to ongoing water quality monitoring at the Mine:

- Water quality samples should continue to be collected from select SNP monitoring stations and bogs downstream of site infrastructure to evaluate changes in water quality over time resulting from runoff and/or seepage from key site facilities.
- Runoff from non-point source discharges that do not report to the WMP should continue to be monitored. If runoff located downstream of these locations reports elevated concentrations of acidity or dissolved metals, then remedial measures such as removal of the source material to an oxygen-limiting environment, e.g., relocation to the North Pile where it will be covered, may be required.
- Ongoing monitoring of bogs downstream of the former AN storage pad, currently referred to as SNP 02-09, is recommended confirm decreasing concentrations of these parameters relative to those observed before this facility was relocated.
- Ongoing monitoring of the piezometers in the north perimeter embankment of the Starter Cell is recommended to verify the performance of the Starter Cell to and evaluate the composition of potential seepage from the North Pile.
- Piezometers at WMP Dam 1 and WMP Dam 2 should be routinely checked, and sampled, if possible, to assist in evaluation of seepage from the WMP.

The following recommendations relate to the ongoing geochemical characterization program at the Mine, including site water quality predictions:

- It is considered that the overall geochemical evaluation program as completed is reasonable and appropriate for the site. The scope of the geochemical evaluation program should continue to be evaluated as mine activities progress.
- Site water trends should continue to be monitored and loading rates should be evaluated routinely as additional operational monitoring information is updated.

4.1.8 2010 Dam Inspection Report

The geotechnical dam inspection and preparation of this summary report are required in partial satisfaction of De Beers' Water License obligations. The 2008 Dam Inspect Report was submitted separate from the Water License Annual Report. The purpose of the inspection is to visually assess the performance of

the structures from a geotechnical and hydrotechnical perspective and to bring deficiencies and points of concern to De Beers' attention.

Mr. Holger Hartmaier of BGC Engineering conducted the inspection on July 8, 2008. Both dams were in satisfactory condition; no settlement or deformations were noted in the visual observation. Some minor disturbance of the upstream erosion protection was noted on Dam 1. The majority of Dam 2 is covered with PK grits and kimberlite stockpiles on the upstream side of access road construction materials on the downstream side preventing direct observation of the dam. Recommendations made during this inspection were that the small depression on the upstream slope near the midpoint of Dam 1 should be re-graded. Overall both dams are in satisfactory condition.

4.1.9 Aquatic Effects Monitoring Program 2010 Annual Report

The AEMP is a requirement of Part G of the Water License for the Mine. Components of the AEMP must also comply with Part F of the Water License and Section 5 of the Fisheries Authorization for the Mine. The MVLWB approved the AEMP in July 2005. An annual report, summarizing the yearly AEMP activities, must be submitted to the MVLWB by March 31 of the following year. This document represents the seventh annual AEMP report for the Mine and presents the results of the 2010 program.

The core of the AEMP is monitoring of water quality, plankton, sediment quality, benthic invertebrate community, fish tasting, and fish health. All monitoring components, with the exception of fish health, are undertaken annually. Fish health monitoring occurs on a five-year cycle. The fish tasting program was conducted by De Beers in 2010, and is reported in Appendix E of the AEMP.

The primary study area for monitoring in 2010 was Snap Lake. The MVLWB approved Northeast Lake as the reference lake for the AEMP in April 2006; accordingly, monitoring in Northeast Lake has been integrated into the Snap Lake AEMP. Water quality monitoring in Northeast Lake began in 2006 and results are presented in Section 2 of this report. Sediment quality and benthic invertebrate community monitoring were also conducted Northeast Lake in 2010.

As required under Part G, Item 7 of the Water License, De Beers has reviewed the site activities from 2004 to 2008. Minor spills and leaks that occurred on site during this period were contained and mitigated, which prevented an influence on the results of the AEMP.

Water Quality

The 2010 water quality results were compared to regulatory guidelines, EAR benchmarks, and Water License limits to assess whether there was a potential for effects to aquatic life in Snap Lake in 2010. Based on the laboratory results from Snap Lake in 2010, there does not appear to be potential for aquatic or human health effects from water quality in Snap Lake. Concentrations for most parameters were below aquatic life and drinking water guidelines, and acute toxicity was not observed in samples collected in 2010.

In 2010 water quality measurements for individual parameters in Snap Lake were generally below water quality guidelines and EAR benchmarks, with the exception of a number of fluoride results, and four manganese results. Whole-lake average and maximum concentration of total dissolved solids (TDS) in Snap Lake was below the License limit of 350 milligrams per litre (mg/L) in 2010. The 2010 total phosphorus loading to Snap Lake from the sewage treatment system and water treatment plants was also below the Water License limit of 256 kilograms (kg).

The 2010 Snap Lake results for TDS, major ions, nutrients and metals indicate that water quality was within maximum whole-lake average EAR predictions. However, as in 2009, whole-lake average concentration and cumulative load of TDS from 2005 to 2010 were higher than predicted.

The concentrations and levels of water quality parameters in treated effluent discharges and site runoff to Snap Lake in 2010 were below EAR predictions, with the exception of flow-weighted average concentrations of sulphate and thallium in the water treatment plant effluent. The higher than predicted concentrations of these parameters in treated effluent did not result in concentrations above guidelines or EAR benchmarks in Snap Lake, and are unlikely to cause whole-lake effects in Snap Lake because of the small volumes that enter the lake over a relatively short time period each year.

The EAR predicted increases in concentrations of major ions, nutrients and metals over time in Snap Lake due the discharge of treated effluent (De Beers 2002). In 2010, the parameters that appeared to be increasing in at least one area of Snap Lake were TDS, total alkalinity, total hardness, reactive silica, bicarbonate, calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, all monitored nitrogen parameters, barium, boron, lithium, molybdenum, manganese, nickel, rubidium, strontium, titanium, and uranium. Concentrations of the these parameters have not and are not expected to increase above water quality guidelines, EAR benchmarks, or EAR predictions in the near future, with the exception of fluoride and possibly manganese.

Future increases in fluoride are not likely to be a concern in Snap Lake as these increases will be accompanied by increases in calcium and hardness which are expected to reduce the potential for toxic effects from fluoride. Future increases in manganese may exceed the aesthetic drinking water guideline. Although this guideline is not related to human health, implications of exceeding it in the future should be evaluated. The manganese guideline is aesthetic, which means that elevated concentrations might affect the taste, smell, or colour of the water. Manganese at this recommended limit is not considered to represent a threat to health, and drinking water with much higher concentrations has been safely consumed (Health Canada 1987). Generally, only exposure to extremely high levels at concentrations much higher than measured in Snap Lake has resulted in adverse health effects. A maximum acceptable concentration has not been set for manganese.

As in 2009, vertical patterns in field conductivity indicate that the plume may no longer be sinking to the bottom of Snap Lake due to a lower density difference between the plume and lake water. Open-water profiles of conductivity indicate that the plume continues to be more evenly mixed throughout the water column during open-water conditions.

Recommendations for the water quality component of the 2011 AEMP are:

- Complete a quality assurance study to investigate the accuracy and precision of analyzing individual components of total phosphorus by the analytical laboratories currently used in the AEMP program;
- review the application of the fluoride guideline because there are known ameliorating factors that would likely apply in Snap Lake, which could potentially allow development of a site-specific fluoride guideline for Snap Lake;
- evaluate the implications of concentrations of total manganese increasing above the aesthetic drinking water guideline in Snap Lake;
- consider the findings from the TDS re-evaluation that is currently underway and make necessary adjustments to loadings and predictions for TDS and other treated effluent-related parameters.
- evaluate the potential changes to sediment quality and risk to aquatic life from uncontrolled runoff, and consider options, if needed, for mitigation.

A recommendation for the five-year AEMP update is to:

- shift the focus of the monitoring and data analyses from spatial, seasonal and temporal trends in Snap Lake to a comparison of temporal trends in Snap Lake and Northeast Lake and spatial trends downstream of Snap Lake.

Phytoplankton and Zooplankton

Significant spatial and temporal variation in total phytoplankton biomass and community composition occur naturally in lakes, and have been observed in Snap Lake between 2004 and 2009. Trend analysis indicated that there has been a shift in phytoplankton community composition, based on biomass over these last 6 years. While a critical effect size for phytoplankton cannot be established, phytoplankton remains a useful tool for monitoring longer-term changes due to nutrient enrichment in Snap Lake.

Chlorophyll *a* results to date suggest that the trophic status of Snap Lake has not changed; however, this variable may not be an accurate surrogate of the Snap Lake phytoplankton community. At this time, continued monitoring of chlorophyll *a* concentrations is required by the Water License MV2001L2-0002 (Water License) Part G, Condition 2d. Currently, chlorophyll *a* is not recommended as a surrogate measure of the Snap Lake phytoplankton community, due to the poor correlation between chlorophyll *a* and total phytoplankton biomass. Calanoid copepods remain the dominant zooplankton group within Snap Lake, with seasonal changes occurring in the biomass of the cyclopoid copepods and rotifers. Cladocerans, commonly referred to water fleas, continue to account for a relatively small proportion of the zooplankton community. A shift in biomass-based community composition has been documented in Snap Lake between 2004 and 2009, but no change in zooplankton biomass was detected over time.

Although chlorophyll *a* and total phosphorus (TP) concentrations suggest that Snap Lake remains within the range of oligotrophic lakes, concentrations of total nitrogen (TN) were within the range of eutrophic lakes. Although the lake remains severely P-limited, results suggest that the lake is becoming nitrogen enriched with continued discharges of treated effluent. Multivariate analysis and evaluation of trends suggest that the plankton community is experiencing mine-related effects consistent with nutrient enrichment consistent with EAR predictions.

Based on the results to date, continuation of the monitoring program is recommended, with adjustments to enhance consistency among AEMP components.

Specific recommendations for the plankton component of the 2011 AEMP are:

- evaluate the reasons for discrepancies observed between TP results obtained from the University of Alberta (plankton program) and ALS Laboratories (water quality program);
- continue picoplankton monitoring in both lakes to accumulate more data to allow a detailed evaluation of the usefulness of this component; and,
- re-evaluate of the usefulness of microcystin sampling.

A recommendation for the five-year AEMP update is to:

- increase the sampling frequency in Northeast Lake by including a summer program, to fully match timing of sampling in Snap Lake and Northeast lake.

Sediment Quality

Evaluation of spatial and temporal trends in sediment quality did not provide clear evidence of an effect on Snap Lake sediments in areas exposed to treated effluent. Concentrations of available phosphate continued to be elevated in the diffuser area following the large increase that occurred in 2008; concentrations decreased with increasing distance from the diffuser but were still higher than in 2007. Available phosphate concentrations should continue to be monitored for further spatial and temporal changes.

Overall, evaluation of spatial and temporal patterns in sediment quality did not provide clear evidence of an effect on Snap Lake sediments in areas exposed to treated effluent from the Mine. Ongoing sediment quality monitoring under the AEMP is expected to provide a more reliable indication of any potential effects on sediment quality in Snap Lake as the number of years of available data increases. If potential effects to sediment quality have occurred to date, they have been subtle and not clearly different than natural variability. Inclusion of Northeast Lake as a reference lake should still allow future comparisons of temporal trends between the two lakes, thereby controlling for long-term regional trends.

Recommendations for the five-year AEMP update are to:

- Reduce the number of northwest arm monitoring stations; and,
- Add at least one new sampling station downstream of Snap Lake.

Benthic Invertebrate Community

Benthic invertebrate monitoring has proven to be an effective monitoring tool to evaluate the potential biological effects of the Mine to Snap Lake. Differences between Northeast Lake, and the near-field and mid-field exposure areas in Snap Lake were minor and not indicative of an adverse effect on the benthic community. Among-area statistical comparisons between Northeast Lake and exposure areas in Snap Lake in fall 2010 did not provide evidence of an adverse effect on the benthic community of Snap Lake. However, visual evaluation of the differences in abundances of dominant taxa suggests emergence of a Mine-related enrichment effect. Higher total density and densities of dominant taxa Pisidiidae, *Micropsectra*, *Valvata* and *Procladius,* in the near-field and mid-field areas suggest that nutrient enrichment is occurring in these areas. Higher densities of molluscs are also consistent with increased TDS concentration, which provides a greater amount of major ions used for shell development by these organisms.

The overall magnitude of the effect on the benthic invertebrate community can be classified as low, because no statistically significant differences were detected in total invertebrate density and richness in the 2010 fall data and the taxonomic composition of the community has not changed appreciably compared to baseline conditions. An effect of low magnitude is consistent with EAR predictions.

A recommendation for the benthic invertebrate component of the 2011 AEMP is:

- A pilot study consisting of sorting of benthic invertebrates from both the 250-µm and 500-µm sample fractions from a subset of AEMP stations is recommended. This study would evaluate whether potential loss of midges resulting from the current use of a 500-µm screen reduces the sensitivity of the program to detect Mine-related effects.

A recommendation for the five-year AEMP update is to:

- Combine the near-field and mid-field areas for future analyses of effects, because these areas are similarly exposed to treated mine effluent, as indicated by similar conductivity profiles in these areas both under-ice and during the open-water season.

4.1.10 Dissolved Oxygen 2010 Annual Monitoring Report

Why Do We Monitor Dissolved Oxygen in Snap Lake?

Dissolved oxygen (DO) concentrations in water are often used to gauge the overall health of the aquatic environment. DO refers to the amount of oxygen that is present in a given quantity of water. Fish and other aquatic biota living in Snap Lake use the oxygen that is dissolved in the water, much like people use the oxygen in the air they breathe. As part of the environmental assessment, De Beers predicted that the discharge of treated effluent to Snap Lake could result in a small decrease in the amount of DO in lake water, but that concentrations would remain at a level that is healthy for aquatic life in Snap Lake.

DO in Snap Lake is monitored to ensure that concentrations remain at a level that is healthy for aquatic organisms. DO is measured more often during the ice-covered period because concentrations tend to be lower under-ice than during the open-water season where the water surface is directly exposed to air and wind actively promotes re-aeration of the lake water. Potential Mine effects to Snap Lake from the discharge of treated effluent may be more easily discernable during ice-covered conditions, when wind-induced re-aeration is absent.

DO monitoring is required under the authority of the Water License, Environmental Agreement, Fisheries Authorization (FA), and Environmental Agreement.

What Did We Do in 2008 - 2009?

Between 199 and 2010, profiles of DO were measured throughout the water column at a number of monitoring stations in Snap Lake and Northeast Lake. The stations included several relatively deep locations in Snap Lake because DO concentrations tend to be lower in deeper waters.

DO was measured in July and August during the open-water period, and in February, March, late April/early May and June during ice-covered conditions. DO concentrations were compared with the minimum concentration required for fish and aquatic biota to remain healthy. Also, the changes in concentration of DO during the period of ice cover in 2010 were compared with the changes observed in previous years, and with the changes predicted in the EAR for Snap Lake Mine (Mine).

What Did We Learn?

DO monitoring during the open-water season of 2010 and ice-covered period of 2010 confirmed that the concentrations of DO in Snap Lake were at levels

considered healthy for fish and other aquatic organisms. Overall, DO concentrations in Snap Lake during the open-water and ice-covered seasons have not decreased since the beginning of minewater discharge.

We will continue to monitor DO while the Mine is operating to confirm that levels remain within the healthy range for the fish and other aquatic biota living in Snap Lake.

4.1.11 Total Dissolved Solids Monitoring Near Fish Habitat Compensation Areas in Snap Lake

Why Do We Monitor Total Dissolved Solids?

Total dissolved solids are defined as the measure of the total amount of dissolved matter in water, such as calcium, magnesium, carbonates, bicarbonates, metallic compounds, etc. The amount of solids dissolved in natural water varies with water type. The salt water in oceans, for instance, has a much higher concentration of TDS than freshwater in Arctic lakes, such as Snap Lake. High concentrations of TDS can be harmful to fish and other aquatic organisms if they are not adapted to these levels.

An increase in the concentration of TDS in Snap Lake water was predicted in the Mine environmental assessment (De Beers 2002a). Most of the water discharged from the Water Treatment Plant into Snap Lake is sourced from groundwater, which has higher concentrations of TDS than the water in the lake. The environmental assessment predicted that over the life of the Mine, the average concentration of TDS in Snap Lake would remain below 350 mg/L. The concentration of TDS in Snap Lake is monitored on an on-going basis to confirm that it remains below the 350 mg/L maximum that was predicted in the environmental assessment.

What Did We Do in 2010?

Water samples and water column profile measurements were collected during open-water and ice-covered conditions near the three habitat compensation structures. Water samples and profile measurements were collected in July, August and September, during open-water conditions of 2010 from AEMP and SNP stations.

What Did We Learn?

Monitoring during the open-water period of 2010, confirmed that the concentrations of TDS near the three fish habitat compensation structures, and throughout Snap Lake, were below 350 mg/L. To confirm that the concentration

remains below the predicted maximum and within a healthy range for aquatic life in Snap Lake, monitoring of TDS in Snap Lake will continue over the life of the Mine.

4.1.12 Benthic Invertebrate Community

The objectives of the 2010 Snap Lake benthic invertebrate program were to determine if the benthic invertebrate community was affected by changes in water and sediment quality in Snap Lake, and to compare observed changes to EAR predictions.

Benthic invertebrate samples were collected at 13 stations in Snap Lake and 5 stations in Northeast Lake during late winter (March and April) 2008, when ice cover was still present on both lakes. Samples were analyzed for taxonomic composition and biomass. Benthic community variables were compared among sampling areas within Snap Lake and between the two lakes, and over time in the near-field and mid-field areas.

Differences between Northeast Lake, and the near-field and far-field exposure areas in Snap Lake in terms of taxa present were minor and not indicative of an adverse effect on the benthic community. Statistical tests comparing benthic community variables among sampling areas detected a significant difference only in diversity, evenness and density of the midge *Microtendipes*, which was absent from the Northeast Lake. Magnitudes of differences between the Northeast Lake and exposure area means in Snap Lake were below the magnitude of variation observed among reference stations in previous years, with the exception of density variables.

Results of among-year comparisons of benthic community summary variables were inconsistent between the near-field and mid-field areas. No significant differences were detected in total density, richness and evenness in the near-field area. However, among-year comparisons found significant declines in diversity (2007) and increases in dominance (2007) in the near-field area compared to 2004 (baseline). In the mid-field area, density and richness were significantly higher in 2008, evenness was significantly lower in both 2007 and 2008 and dominance was significantly higher in 2007 compared to 2006 (the year prior to effluent reaching the mid-field area).

Although among-area comparisons between Northeast Lake and exposure areas in Snap Lake provided no clear evidence of effects on the benthic community of Snap Lake, trends in benthic community characteristics over time indicate that the community is changing over time. The type of change observed in 2007 was

consistent with potential nutrient enrichment originating from effluent discharge, although increases in TDS and major ions also may have contributed to these changes. The declining trend in diversity and evenness reversed in the near-field area in 2008, but not in the mid-field area. As a result, the link to nutrient enrichment is not as clear based on the 2008 results, and the observed patterns in the near-field and mid-field areas may also reflect natural year-to-year variation.

The overall magnitude of the effect on the benthic invertebrate community can be characterized as low, because no statistically significant differences were detected in total invertebrate density and richness in 2008; as well, no significant difference was detected among years in total density and richness in the near-field area, which receives the greatest exposure to the treated Mine effluent; and taxonomic composition of the Snap Lake benthic community has not changed appreciably compared to baseline conditions. An effect of low magnitude is consistent with EAR predictions.

The 2007 and 2008 conductivity data indicate that effluent has reached two of the three stations in the northwest arm, and is expected to reach the entire northwest arm in the future. Therefore, Northeast Lake will be used as a reference area in future AEMP surveys. Although the benthic invertebrate community of Northeast Lake is similar to that of Snap Lake, some natural differences exist between these lakes (e.g., higher relative abundance of Sphaeriidae in Northeast Lake). Therefore, although within-year spatial comparisons are still recommended for future AEMP cycles, testing for Mine-related effects will be more appropriately based on temporal trends than spatial variation. The benthic Invertebrate Program Interim Update has been terminated. Benthos is now reported as a part of the annual AEMP report.

4.2 NON-ANNUAL REGULATORY REPORTING REQUIREMENTS

4.2.1 Water Intake and Minewater Outlet Embankments Post Construction Habitat Compensation Monitoring Report

In 2005, De Beers Canada Inc. (De Beers) began construction of the water intake and minewater outlet at the Snap Lake Mine (Mine). Although these structures were designed to minimize the change or loss of existing fish habitat, some fish habitat along the shore of Snap Lake was lost during installation of the pipes for the water intake and minewater outlet. To make up for the loss, new fish habitat was constructed by placing clean, large rocks (cobble and boulders) on top of the water intake and minewater outlet pipes. The large rock placed on

the water intake and minewater outlet pipes increased the amount of shoreline area available for fish at two locations in the lake.

De Beers conducted pre-construction (2005) and post-construction (2007 and 2008) fish and fish habitat monitoring at the intake and outlet locations. A variety of fish species were observed using the new habitat after construction was complete. More fish were seen after construction of the new shoreline habitat than before construction began. Monitoring of the new habitat will continue for one more year (2009) to ensure fish keep using these new areas.

4.2.2 Stream 27 Habitat Compensation Monitoring Report

One small stream (Stream 29) near Snap Lake will lose feeding habitat for Arctic grayling due to the construction of a rock berm as part of the De Beers Canada Inc. (De Beers) Snap Lake Mine. To make up for the loss of this habitat, habitat improvements were designed and implemented on another nearby stream, (Stream 27). The use of habitat in S27 by fish was limited by stream flow, low water levels in early summer, and the presence of natural barriers to fish passage. Habitat improvements to increase the potential of the stream to provide spawning and rearing habitat for fish species from Snap Lake were installed on S27 in fall 2007. A natural barrier (alder rootwad) was removed to increase stream flows and fish passage, and a rock weir was constructed at the head of the stream to moderate water levels during the spring freshet.

Use of the stream by fish was monitored before and after removal of the rootwad barrier. After the blockage was removed and the weir constructed, Arctic grayling were observed spawning in S27 in both 2007 and 2008. Arctic grayling eggs hatched in the stream, and juvenile fish were observed throughout the stream in spring and summer. The compensation work conducted at S27 is considered to be successful, as fish are not trapped in stream at low flows, and are able to spawn and rear in areas upstream from the old barrier. De Beers will continue to monitor the habitat in the stream and to stabilize the rock weir and rock wall as required. As of 2010, the stream 27 compensation is closed.

5 SUMMARY OF COMPLIANCE

In addition to the submissions discussed in previous sections, Table 5-1 provides a summary of the Indian and Northern Affairs Canada (INAC) site inspections in 2010. The areas of the Mine that were inspected during each inspection are listed, followed by recommendations, comments and requests made by the Inspector. Observations by the Inspector concerning items that were recommendations or required action on previous inspection reports are also included. The table also provides a summary of the De Beers Canada Inc. (De Beers) response to the Inspector requests. The complete INAC Inspection reports can be found on the MVLWB public registry.

Table 5-1 Summary of Compliance, 2010

Inspection Date	Inspection Report
January 18th, 2010	The following areas were inspected:
	Ensure that bulk nitrate material temporarily stored on the historic AN storage pad are used up as soon as possible. The storage structure used since 2006 to store bulk explosives appears to be unable to ensure containment of AN and associated runoff.
February 10th, 2010	The following areas were inspected:
	Storage structures continue to be ranked as "unsatisfactory" until SNP data collected adjacent to the new storage building confirms nitrate containment
March 17th, 2010	The following areas were inspected:
	Storage structures continue to be ranked as "unsatisfactory" until SNP data collected adjacent to the new storage building confirms nitrate containment
April 7th, 2010	The following areas were inspected:
	Storage structures continue to be ranked as "unsatisfactory" until SNP data collected adjacent to the new storage building confirms nitrate containment The Annual Mine reclamation Status Report recently tabled with the MVLWB failed to meet compliance conditions detailed in the 2006 Mine Closure and Restoration Plan. Need to address soil stock piling issues, and gaps in restoration research.
May 5th, 2010	The following areas were inspected: •
	Storage structures continue to be ranked as "unsatisfactory" until SNP data collected adjacent to the new storage building confirms nitrate containment The Annual Mine reclamation Status Report recently tabled with the MVLWB failed to meet compliance conditions detailed in the 2006 Mine Closure and Restoration Plan. Need to address soil stock piling issues, and gaps in restoration research.
June 2nd, 2010	The following areas were inspected: •

Table 5-1 Summary of Compliance, 2010 (continued)

Inspection Date	Inspection Report
	1. Storage structures continue to be ranked as "unsatisfactory" until SNP data collected adjacent to the new storage building confirms nitrate containment 2. Clarification is needed on the status of reclamation related research. The 2009 Reclamation Status Report fails to address reclamation research reporting requirements. 3. Shortcomings identified in the INAC letter of July 12th, 2010 and in October and April must be addressed in the forth coming ICRP 4. Environmental Risks, concerns and issues associated with Spill 10-154 must be addressed.
July 28th, 2010	The following areas were inspected: •
	Shortcomings identified in the INAC letter of July 12th, 2010 and in October and April must be addressed in the forth coming ICRP De Beers must identify the reasons why the diffuser is not functioning as per design Environmental Risks, concerns and issues associated with Spill 10-154 must be addressed.
August 18th, 2010	The following areas were inspected: •
	Shortcomings identified in the INAC letter of July 12th, 2010 and in October and April must be addressed in the forth coming ICRP De Beers must identify the reasons why the diffuser is not functioning as per design
October 20th, 2010	The following areas were inspected: •
	Shortcomings identified in the INAC letter of July 12th, 2010 and in October and April must be addressed in the forth coming ICRP De Beers must identify the reasons why the diffuser is not functioning as per design

Table 5-1 Summary of Compliance, 2010 (continued)

Inspection Date	Inspection Report
November 18th, 2010	The following areas were inspected: •
	1. Shortcomings identified in the INAC letter of July 12th, 2010 and in October and April must be addressed in the forth coming ICRP 2. De Beers must identify the reasons why the diffuser is not functioning as per design 3. De Beers must determine the concentration and extent of the bulk nitrate contamination 4. De Beers must determine the future contamination potential of the AN storage pad 5. Measures must be implemented to minimize the head pressure at the AN sump 6. De Beers must contact the inspector should water exceed 40 mg/L of ammonia
December 15th, 2010	The following areas were inspected: •

Table 5-1 Summary of Compliance, 2010 (continued)

Inspection Date	Inspection Report
	1. Shortcomings identified in the INAC letter of July 12th, 2010 and in October and April must be addressed in the forth coming ICRP 2. De Beers must provide the Inspector and the MVLWB with a detailed project description for the diffuser 3. De Beers must determine the concentration and extent of the bulk nitrate contamination 4. De Beers must determine the future contamination potential of the AN storage pad- CLEAN UP MUST BE COMPLETED BY AUGUST 31ST 2010 5. Measures must be implemented to minimize the head pressure at the AN sump 6. De Beers must contact the inspector should water exceed 40 mg/L of ammonia 7. Plastic, wrap/bottles found in burn pit

6 SUMMARY OF ACTIVITIES AT SNAP LAKE

6.1 2010 CONSTRUCTION ACTIVITIES

Construction milestones achieved during 2010 included:

Construction of the permanent accommodation complex:

- installation of the required piling foundation;
- final placement and commissioning of camp modules; and
- installation of a utilidor to connect the camp to the mine dry complex.

Construction of Cement Mixer:

- Installation of the cement mixer for the use of underground backfill.

Construction of the East Cell

- Permanent sumps three, four and five were completed
- Ditching between sumps was completed
- Necessary piping and pumping to transport water was installed
- Grout Curtain on the north access road was installed
- Installation of thermistors and piezometers was completed
- Removal of organics within the East Cell footprint began

6.2 2011 CONSTRUCTION AND OPERATIONAL ACTIVITIES

Operation activities planned for 2011 include:

- East Cell development (North Pile)

7 SUMMARY OF MITIGATIVE MEASURES

The AEMP annual report demonstrates that the Snap Lake Mine's impact is similar to what was predicted in the Environmental Assessment. This demonstrates that the mitigative measures being used by De Beers are working effectively. Currently, the main area of investigation for new mitigative measures is in the area of TDS lake concentrations. This work is ongoing.

8 SUMMARY OF ADAPTIVE MEASURES

A summary of adaptive measures undertaken in 2010 are:

Main Settling Sump (MSS)
The MSS was designed and constructed underground in 2009 - 2010. It is a four cell sump that manages all the mine water flows so that there is an increase in the settling of solids prior to pumping to the WTP. The MSS has not only improved the TSS in the mine water but also has increased the life of underground pumps. Further mitigation measures include foam booms to help absorb hydrocarbons contained in the sump.

Backwashing WTP
It was determined by the WTP operators that simple backwashing of the filters in the WTP was not sufficiently efficient. As such they researched and tested a cleaning chemical. This chemical when used in conjunction with backwashing has improved the effectiveness of the filters.

AEMP
The five year review of the AEMP began. This review will include a revision of the monitoring response requirements of each of the AEMP's components. This work is ongoing.

Wildlife Monitoring
De Beers began a trial program design, which represents changes in the bear monitoring program. The use of baited scratching posts commenced in 2010 and will continue in 2011 to determine their effectiveness.

9 SUMMARY OF PUBLIC CONCERNS

De Beers hosted a number of Aboriginal Communities to site visits at Snap Lake Mine in 2010. The following concerns were discussed on site.

- Caribou: It is important for De Beers to ensure its activities on the land do not contribute to the caribou decline.
- North Pile: How does the pile operated? What is the size of the pile? What are the impacts on water and wildlife?
- Water Management and Water Treatment: How is water treated? How is water managed? How much water can Snap Lake treat and how much is being treated now?
- Fuel storage: How is fuel stored to protect the environment? How does Snap Lake reduce fuel use?

10 SUMMARY OF NEW TECHNOLOGIES INVESTIGATED

Summary of new technologies implemented in 2010 are:

- Low flow toilets and sinks in the new accommodation complex to reduce water consumption.
- Chemical cleanser for filter backwash in the WTP
- Installation of the grout curtain to act as a secondary barrier for seepage from the East Cell to Snap Lake.
- Bear scratching posts rather than track surveys.
- A traditional knowledge Caribou Camp was completed in 2010 to attempt to monitor wildlife through the use of TK.

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