DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
	Summary of Primary Concerns		
NPS-1	1. Reference areas do not represent true background conditions, but are located in areas contaminated with both fugitive dust and background mineralization. Reference areas are supposed to form the basis for comparison against more polluted areas. Findings of no significant differences between bioeffects in background versus polluted areas are therefore inappropriate. As used in the RA, this comparison has introduced bias.	High	Please review all background data provided by the NPS and determine if using lower background concentrations would affect the number of COPCs selected and conclusions about differences in site-versus-background risks. Summarize the findings of this analysis in the revised RA.
NPS-2	2. Lichens are inadequately studied in the RA but the small amount of data collected indicate a substantial lichen decline adjacent to the DMTS road. Impacts due to zinc and sulfur—elements widely implicated in lichen decline in the published literature—have not been addressed. Lichens and bryophytes were not identified by species so no information on species-level impacts or community change was provided. In spite of the wealth of publications on the toxicity of metals to lichens, the assessment of risk to lichens is based on only two publications.	High	Please review the existing literature on the toxicological effects of metals on lichen in the revised ERA. If the lichen work were repeated with a greater level of taxonomic resolution and other modifications suggested by the NPS (see NPS-16), would the overall findings be greatly changed? If so, to what extent? Provide answers to these questions in the revised ERA. Including more detailed lichen studies in future monitoring work at the site should be discussed.
NPS-3	3. The RA fails to incorporate the spatial data of Hasselbach et al. (2004) in designing the siting of reference areas in areas known to be free of fugitive dust, or in analyzing the data beyond 1000 m from the DMTS road. These data could have formed the basis for analysis of impacts to lichen communities.	High	See recommendation for comment NPS-1.
NPS-4	4. Muskox—a locally significant species with a small home range (unlike caribou)—were omitted from the RA. They consume large quantities of nonvascular plants, which uptake high concentrations of heavy metals relative to vascular plants.	High	Please discuss the fact that muskox are resident in the area. Please include a discussion of their habitat and feeding behavior. Please provide a rationale why the caribou is a more conservative receptor than the muskox. Please provide exposure parameters for review by Alaska DEC before completing the analysis.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
NPS-5	5. The RA uses a regulatory framework, rather than an ecological one. As a result, additive effects of metal toxicity, effects on areas beyond 1000 m, and effects to ecosystem members not represented by benchmark species (e.g., lichens, mosses) are under-addressed.	Medium	To the extent possible, the ERA should be revised to address additive impacts (especially for wildlife), effects beyond 1000 m from the haul road, and possible effects to non-benchmark species. Please clearly identify for the reader the elements of the existing work that do consider additive impacts (i.e. vegetation surveys, benthic surveys, sediment toxicity tests)
NPS-6	6. In spite of the serious ecological effects to vegetation on over 128 km^2 of tundra on NPS land, the RA concludes that no corrective action is necessary by Teck Cominco. NPS and USGS recently observed large problems with concentrate-contaminated vehicles and fugitive dust along the DMTS system. We believe these problems need to be addressed in a meaningful way.	High	Please revise the ERA so that adverse impacts to lichens and other receptor groups are not downplayed. The revised ERA should indicate that adverse effect thresholds have been exceeded for several receptor groups and that action is needed to further reduce fugitive dust emissions.
NPS-7	7. While chronic effects are well-addressed in the document, the acute toxicity that may occur during snowmelt, as 7-8 months of deposited metals are released in a few weeks, is not considered.	High	Please identify the lack of evaluation of acute effects in the uncertainty section of the ERA. Future monitoring work should include studies to evaluate possible acute impacts during snowmelt.
NPS-8	8. Vegetation sampling was inadequate due to lack of true background reference conditions, failure to cover a broad variety of landcover types, failure to assure an adequate number of sample units, failure to identify the majority of plant taxa to species and failure to use plant species (rather than derived or composite variables) as the main inputs to plant community analysis.	High	See recommendations for comments NPS-1 and NPS-2. How do the shortcomings mentioned in this comment affect the results and conclusions of the vegetation survey work? Describe the effects in the revised ERA. Include more detailed vegetation analysis of more landcover types in future monitoring studies.
NPS-9	9. The RA considers the toxicity of single elements well, but fails to base the RA in the biological reality that species face the additive effects from a suite of elements at the same time.	High	See recommendation for comment NPS-5.
NPS-10	10. The transects begin sampling at 10 m from the DMTS road. They thereby omit from study the areas with the greatest levels of contaminants present along the corridor in CAKR—the 1-10 m zone.	High	Please indicate in the revised ERA the magnitude of risk underestimation that may have resulted by excluding samples from the 1-10 m zone. See also comment USGS-31, which indicates the wildlife may be attracted to the area next the road due to early snowmelt.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
NPS-11	11. Even though the DMTS crosses 32 km of National Park Service lands designed to protect the ecosystem in perpetuity, Exponent has used industrial rather than residential screening levels in the RA.	Medium	Please clarify which screening values were used for the ecological risk assessment. Please indicate the extent to which risks may be underestimated based on using industrial versus residential screening values.
NPS-12	12. Effects do not need to apply to an entire population or species to be significant.	High	Unsupported claims regarding no impacts to wildlife populations should be omitted from the revised ERA. Please assure that the ERA does not downplay or dismiss possible adverse impacts to wildlife.
NPS-13	13. Bone and bone marrow is the locus of Pb accumulation in most fauna, but was not discussed in this risk assessment.	High	The revised assessment should include a discussion of the importance of bone as a site of lead accumulation and possible need for follow-up sampling to properly evaluate risks.
	Primary Areas of Concern (detailed description)		
NPS-14	**Location of Reference Sites**. We do not believe that the Reference Areas represent true background conditions, as is their purpose in this RA. In theory, Reference Areas should be designed to capture concentrations and bioeffects of unpolluted, unmodified natural areas. Comparing the highly polluted "Site" areas to a "somewhat polluted" reference site--rather than a clean reference site--may potentially have led to erroneous conclusions of reduced (or no) risk in the highly polluted areas for some ecological components. As currently designed, the two primary Reference Areas are located only approximately 2 miles south of the DMTS haul road or the Port Site. Both of these areas occur in areas of likely heavy metal deposition as per Hasselbach et al. (2004). Though the Terrestrial Reference Area lies outside the area mapped by Hasselbach et al. (2004), it is reasonable to predict that the isolines showing enrichment in mosses would continue similarly around the northeast part of the road and the mine. Indeed, heavy metal enrichment might even go farther from the center line of the road in this area as it is closer to the highly dust-enriched mine site. The main Terrestrial Reference Site is also likely to contain elevated concentrations of heavy metals because it is in close proximity (perhaps about 1 km based on Fig 1-4) to known metals deposits. Table 3-4 shows that the Reference Area concentration of Pb in soils ranged from 9-142 mg/kg with a mean of 38.5 (Table 1 below). Concentrations on the low end of this range are common in non-mineralized areas, while the high end of this range and the mean occurs only in mineralized sites. Table 1 shows much lower mean values and	High	See recommendation for comment NPS-1.

<table>
<tr><th>No.</th><th>Comment</th><th>Priority</th><th>Recommendation</th></tr>
<tr><td></td><td>
ranges for both Pb and Cd in the entire CAKR area (Hasselbach et al. 2004) and in the background levels for the Arctic Contaminant Research Program (Jesse Ford, pers. comm.). Tests for significant differences with these data should be done before the final draft is issued.

Table 1. Comparison of Pb and Cd concentrations (mg/kg) in soils from the Terrestrial Reference Area in the RA, Hasselbach et al. (2004) and ACRP Arctic Alaska background.

<table>
<tr><th>Study</th><th>Pb Range</th><th>Pb Mean</th><th>Cd Range</th><th>Cd Mean</th></tr>
<tr><td>Terrestrial Reference Area (Table 3-4 in RA)</td><td>9 - 142</td><td>38.5</td><td>0.2 - 3.6</td><td>1.1</td></tr>
<tr><td>Hasselbach et al. 2004</td><td>8 - 83</td><td>18</td><td>0.07 – 0.75</td><td>0.27</td></tr>
<tr><td>Ford ACRP</td><td>3 - 22</td><td>10.8</td><td>0.05 - 1.7</td><td>0.46</td></tr>
</table>

The Pb and Cd soils data from Hasselbach et al. 2004 should have been used to identify clean reference sites. Exponent had acquired all relevant NPS data during the study design phase of the RA. No data is presented comparing the concentrations in the moss Hylocomium splendens of Reference Areas relative to Hasselbach et al (2004). This would have been the primary means to test whether the Reference Area was enriched with metals from fugitive dust. Three samples of Hylocomium appear to have been taken from the Reference Area (Appendix C-22) but they are not summarized and do not represent an adequate sample for statistical inference. For Pb the mean of these 3 samples was approximately 7.7 mg/kg. None reached the levels documented by Ford (1995: 0.6 mg/kg Pb) or Hasselbach et al. (2004: 1.1-2.0 mg/kg) in clean areas. From Table 3-19 it appears that the concentrations of Pb in tundra soil in the Reference Site ranged from 3-23 mg/kg. It is not known what portion of the concentrations in tundra soil result from natural plant uptake and decomposition versus incorporation from airborne deposition, and we don't have analogous data from other studies. We can say, however, that these levels are higher than the levels in/on mosses in clean areas (<2 mg/kg, as per above.)

NPS notes that the soils in CAKR are not heavily mineralized (Table 1 above), and are relatively free from natural heavy metal enrichment. In choosing the Reference Areas, we recognize that Exponent was trying to mimic conditions along the DMTS. By choosing a reference area with soil and dust-borne mineralization, however, the RA
</td><td></td><td></td></tr>
</table>

No.	Comment	Priority	Recommendation
	fails to adequately represent the clean natural below and above-ground conditions found on NPS lands. For NPS, this makes the comparison of polluted "Site" areas to theoretically (but not actually) clean "Reference Areas" all the more problematic. From the perspective of study design, we question the wisdom of using one single reference area to reflect the diversity of flora, fauna and wind/deposition patterns on the landscape. Clearly a landscape-level approach would have been far preferable as well as statistically more defensible.		
NPS-15	One additional point: reference stations for soil were sampled in material borrow sites for the road construction and maintenance. Surface portions of these exposed soils are undoubtedly enriched by fugitive dust and make poor reference locations.	High	In the revised RA, please describe sampling depths at the borrow sites and whether or not samples collected there are biased high. Describe the magnitude of the effect.
NPS-16	**Lichens**. NPS has strong concern about the finding that lichen cover along the DMTS haul road at distances even beyond 2000m is now only 20-50% of that in the Reference Areas (p. 6-33). From the perspective of park management, this suggests impacts on some unknown quantity of tundra greater than 128 km^2. Lacking a root system, nonvascular plants are highly adept at absorbing minerals from the atmosphere and water. As a result, nonvascular plants uptake far more heavy metals from airborne deposition than vascular plants in the same locale. Using the data in Appendices C and G-19, we calculated that the lichens analyzed for elemental composition contained 25 to 92 times the Pb and Cd concentrations of vascular plants in the same location. Because of their heightened uptake capacity for heavy metals, they are at increased risk for injury, mortality and physiological problems than vascular plants at the same levels of fugitive dust deposition. These plants represent a large portion of the vegetation in CAKR, and play important ecological roles including forage, N-fixation and shelter for invertebrates. Lichens are at the base of the winter food chain for caribou and muskox and adult caribou consume an average of 6 kg/day dw of these plants (Boertje 1984). The conclusion (p. 8-2) that the primary changes in vegetation community structure occurred within 100 m of the DMTS road and port appears curious in light of the findings above. Lichens are an integral part of the healthy tundra environment in Cape Krusenstern, and additional study is warranted to determine the extent of damage and appropriate corrective actions. The lichen component of the risk assessment included just two literature citations on metal toxicity to lichens and one additional study on road dust (Folkesson and Andersson 1988, Tyler 1989, Auerbach et al. 1997). Lichen are among the most sensitive members of their ecosystem and there is a rich literature on lichens as	High	See recommendation for comment NPS-2. Please ensure that the revised ERA makes adequate use of existing lichen literature and does not downplay adverse impacts to lichens.

No.	Comment	Priority	Recommendation
	indicators of air pollution. Hundreds of papers worldwide (chronicled in the series "Literature on air pollution and lichens" in the *Lichenologist*) and dozens of review papers and books (e.g., Nash & Wirth 1988; Richardson 1992; Seaward 1993; Smith et al. 1993; van Dobben 1993) published during the last century have documented the close relationship between lichen communities and air pollution, especially metals, SO_2, and acidifying or fertilizing nitrogen or sulfur-based pollutants. Smelters on the Kola Peninsula in Russia have been responsible for widespread lichen decline in adjacent Scandinavia from both metals and SO_2 (Tommervik et al. 1998). This decline was large and severe enough to be detected via remote sensing imagery. Much of the sensitivity of epiphytic lichens to air quality apparently results from their lack of a cuticle and their reliance on atmospheric sources of nutrition. The entire lichen section of the study should be reworked with the following guidelines: 1. Lichens and bryophytes need to be identified to species, as this is the only way to determine which species are being most impacted by pollution and which may be responding only to the physical/hydrological effects of the DMTS and normal road dust. The use of frequency of lichens lumped as a group provides no meaningful data on the lichen species impacted by pollution. A capable lichenologist and bryologist needs to be employed in this endeavor as in similar projects where nonvasculars represent the frontline of decline in the wake of pollution (e.g., Athabasca Oil Sands, numerous smelter studies, sulfur and nitrogen emissions studies such as the USDA/Forest Inventory and Analysis Program oversees.) In terms of diversity, it is estimated from adjacent areas that lichens represent approximately 45% of the flora in CAKR; mosses and vascular plants probably represent approximately 30% each (Thomson 1984, Hulten 1968, Steere 1978, Neitlich and Hasselbach 1998). It is therefore estimated that 75% of the flora is represented by nonvascular plants, giving these plants a high priority for conservation. 2. Zinc is highly toxic to lichens. The literature is replete with references to lichen declines related to zinc both on a microscale (e.g., dead lichens underneath galvanized fences and hardware) and macroscale (e.g., smelters; Nash 1972, Nash 1975, Nash 1988, Buck et al. 1999, Folkeson 1984, Pilegaard 1994). The data provided in Hasselbach et al. (2004) provides a landscape view of zinc deposition. The zinc model should be studied for correlation to ground-based effects on lichen cover.		

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
	3. Sulfur (presumably present as sulfide and sulfate) represents approximately 20% and 32% of the Pb and Zn concentrates, respectively (Table 3-1). This element is not at all treated in the RA, which is a significant omission. Sulfur oxides (SO_x) are among the greatest toxins to lichens and some bryophytes, as these organisms uptake the pollutants directly without benefit of cuticle guard cells (Nash and Wirth 1988, McCune 1988). Sulfur effects need to be carefully considered for lichens, bryophytes and vascular vegetation. We consider this RA to be incomplete without these data. We recognize that sulfide—the form that probably accounts for the bulk of the sulfur—is a different form of sulfur than the SO_2 and SO_4^{-2} that have accounted for the bulk of the research on S effects on lichens. However, the most likely oxidation path of sulfide is to sulfate, and the effects of sulfides are little studied. The timeline and proportion of the S likely to change to forms injurious to lichens are currently unknown. While more papers have addressed the effects of SO_x including dissolved forms of sulfate on lichens, there are a number of studies isolating the harmful effects of SO_4^{-2} as well (e.g., Showman 1992, Marti 1983, Newberry 1974). As there are currently a great deal of unknowns and high potential risk, this topic requires considerably more study. Page 6-20 of the RA discusses plant communities with both dead and unhealthy lichens close to the DMTS road. An extreme version of this condition is noted along TT7, near the mine's ambient air boundary. We do not yet know the condition of lichen communities in CAKR, but given the cursory attention paid to lichens in the RA, we argue that this entire topic needs thorough quantitative evaluation. In a follow up study and monitoring, lichens need to be specifically targeted as receptor organisms.		
NPS-17	**Failure to incorporate Hasselbach et al. 2004 landscape-level spatial data**. As DEC is aware, NPS released work in 2004 detailing spatial patterns of heavy metal deposition in Cape Krusenstern National Monument (CAKR) and adjacent areas. One major shortcoming of the risk assessment was the failure to use these data to choose reference sites that represented truly uncontaminated areas. NPS data could also easily have been incorporated into the risk assessment to look at spatial patterns beyond the 1000m transect endpoints. Lichens—for which evidence of reduced cover are said to extend beyond 2000m (p 6-29)—could have been studied directly for effects using the landscape-level deposition values generated, thus taking the work to a new level. Instead, Exponent primarily limited the work to 1000m from the DMTS haul road.	High	See recommendation for comment NPS-1. To the extent possible, use the work of Hasselbach et al. (2004) to better quantify the extent of adverse impacts to lichens in the revised ERA.
NPS-18	**Choice of Receptors**. We agree with the general conclusions that terrestrial taxa are at greatest risk, but argue that several key receptors were omitted from this study: 1. Muskoxen. Muskoxen from a small herd in the CAKR area are year-round residents of the DMTS corridor area. They are active grazers in the area as	High	Please discuss the fact that muskox are resident in the area. Please provide a rationale why the caribou is a more conservative receptor than the muskox. Please provide exposure parameters

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
	evidenced from a high density of pellets on Turtleback Mountain (Mile 7 of DMTS) in 2005. They may be particularly susceptible to heavy metal bioaccumulation because a large fraction of their diet comes from nonvascular plants. One study of muskoxen diet on the Seward Peninsula found that greater than 40% of these animals' diet came from mosses, with some additional portion coming from lichens (Ihl and Klein 2001). Muskoxen are a species of high concern for NPS and area residents. 2. Montane-Nesting Shorebirds. This group of birds nests on sparsely vegetated hilltops in the Northwest Arctic, then flies to wintering grounds in various Pacific Islands. One species, the globally rare Bristle-Thighed Curlew, occurs in the study area and is a species of high concern for the Audubon Society (Audubon 2005, Brown et al. 2001). Although these birds also spend a great deal of time elsewhere during the year, they forage intensively in contaminated areas near the DMTS during the summer months. Many birds in this group are known to forage right along the DMTS corridor (Bob Gill, pers. comm.).		for review by Alaska DEC before completing the analysis. E & E believes that the selected avian receptors (snipe and Lapland longspur) are adequate surrogates for the Montane-Nesting shorebirds?
NPS-19	**Action Levels and Legal Context**. NPS does not agree with the conclusion that future actions to clean up heavy metal contamination are unnecessary and we look forward to a dialog on actions to reduce future contamination in the DMTS area. Reclamation is a requirement before Teck-Cominco and NANA vacate the easement in Cape Krusenstern National Monument. Exhibit B of the January 31, 1985 Land Exchange Agreement (*Terms and Conditions Governing Legislative Land Consolidation and Exchange Between NANA Regional Corporation, Inc., and the United States of America*, which was ratified in Public Law 99-96 that amended the Alaska Native Claims Settlement Act) includes section B. 4. Abandonment. This section specifies that NANA (or its operator Teck Cominco) must furnish a reclamation plan to NPS prior to abandoning the road. The plan would: – Prevent future interference with drainage – Mitigate soil erosion – Protect water quality, fish and wildlife and habitat, threatened and endangered species and cultural and paleontological resources – Examine costs or road surface scarification, methods and benefits of recontouring material sites and road prism, removal of culverts for fish streams and alternative revegetation techniques. NANA is required to conduct reclamation research during the life of the project. Furthermore and related to the fugitive dust issue, the Agreement states NANA and its assigns are required to implement dust control measures as required by ADEC and after consultation with NPS. While TC has been beginning work on a closure plan,	High	The revised ERA should indicate that adverse effect thresholds have been exceeded for several receptor groups and that actions are needed to further reduce fugitive dust emissions. The other corrective actions mentioned in this comment also should be considered for inclusion in the risk management plan.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
	NPS believes that since impacts have already been registered, corrective actions should not wait until the abandonment of the DMTS, at which point the contaminant levels and bioavailability could be significantly worse than at present.		
NPS-20	**Action Levels And Fugitive Dust Control Measures**. As addressed in Section 2.2.4, Teck Cominco has made operational improvements that have reduced dust emissions in several areas. Still, there are significant problem areas with respect to fugitive dust, as observed on a recent visit on June 15-16, 2005. The primary issues remaining are: 1. *Truck Contamination*. While the truck washing station at the mine site is a modest start, we observed that trucks were still covered with dark grime (presumably a mixture of mud and concentrate) and $CaCl_2$ mud. The washing station did little to remove contaminants from the undercarriage. Moreover the washing station only operates during the short summer season. We observed concentrate on the fenders as well. The dust containment system at the unloading facility at the port site was very dusty and the air was filled with fine particulates in that facility despite air suction filters, stilling curtains, and vibrators to knock concentrate into hoppers. Presumably, suspended dust was redeposited on the trucks that then distributed the dust out on the tundra on the northbound trip. Overall, while the new trucks with hydraulic lids over the concentrate-bearing trailers certainly represent an upgrade, truck contamination has not been adequately addressed. 2. *Mine Site*. A great deal of fugitive dust comes from all aspects of work at the mine site. The transects closest to the mine clearly showed this pattern, as did field observation of dead lichens and stressed vegetation. While some attempts were made to control dust (e.g., traffic separation, water trucks around the buildings) there was a large amount of dust coming both from the open pit itself and the facilities. We did not observe any dust palliatives at the open pit, which contains highly enriched ores. 3. *Port Site*. There are currently no facilities to decontaminate trucks at the port site. There were numerous holes in the CSB that are continuing to exchange air (and presumably dust) with the outside, though the doors were closed. 4. *DMTS Dust Control*. On our recent visit (June 15-16, 2005), we observed that $CaCl_2$ was applied very thickly to some portions of the haul road, but that the palliative was thin or absent over other portions of the road. Where a thick coating of the palliative was applied, a reduced dust trail from vehicles was observed. In other areas, the dust trails (as videoed by us on the DMTS near the airport) were quite large. Dust on roadside vegetation was still so thick that we were able to collect samples readily just by shaking leaves and twigs into sample bags adjacent to Turtleback Mountain (MP 7) in CAKR. We appreciate the steps that have been taken thus far, and would like to see a great deal more attention placed on efforts to bring this problem under control.	High	See recommendation for comment NPS-19.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
	5. *Winter Dust Control*. We appreciate the challenges of controlling dust during the long winter, but it is extremely important due to the fact that dust is likely to travel much farther over the smooth, windpacked snow and frequently windy conditions. To date, even in light of the heightened awareness of the fugitive dust issues, voluntary cleanup does not appear to have remedied the situation. We would like to see some concrete measures stipulated in the Risk Management Plan. We do not agree with Exponent's conclusion that future actions are unnecessary. NANA and its assigns must return the DMTS to the NPS at the end of the easement period in an acceptable condition that meet ADEC and EPA standards for management of a public park unit. We are concerned that if heavy metals are allowed to accumulate and change over time to more bioavailable forms, we may face a difficult situation in the future. We think all reasonable and feasible measures to limit metals pollution in the now industrial--but eventually to become public--area should be undertaken sooner, not later.		
NPS-21	**Design Of Vegetation Sampling** (Section 6.2.1.1). The primary question posed is in this section is "How does distance from the DMTS haul road and/or port influence the composition of vegetation communities?" Exponent writes in Section 6.2.1.2 (Statistical Methods) that the "individual species data are highly variable; thus, average cover for vegetative types, or functional groups, was used in the analysis." Analytically, the analysis of plant communities should be done using a primary species x plots matrix, rather than using such derived variables as evenness or diversity or functional groups as primary variables. The vegetation should be readdressed using these guidelines: 1. Address the primary question directly with community data, not derived or composite variables. Analyze the microplot data via ordination using NMS (nonmetric multidimensional scaling) and using distance to road as a secondary (or explanatory) variable. Then present the Pearson correlation coefficients with the primary and secondary matrix. Additionally, group the microplots by distance from road and conduct MRPP (multi-response permutation procedures) to see if there are community differences with distance from road. 2. Address the primary question additionally by controlling for vegetation. Much greater statistical power on the primary question of road/dust effects can be achieved by placing transects in homogeneous landcover types. This entire section should be redone using GIS-based dominant NPS landcover classes as stratifying variables and increasing the sample size to obtain sampling adequacy within each landcover class of interest. That is, these transects should be located only *within* homogeneous landcover blocks; they should not run across two or more landcover	High	To the extent possible with existing information, please revise the analysis of the vegetation survey data to address the shortcomings described in this comment. Does changing the data analysis methods based on this comment affect the overall conclusions of the vegetation survey? Describe differences in conclusions in the revised ERA. Please include more detailed vegetation survey work of more landcover types in future monitoring studies to address these NPS concerns.

No.	Comment	Priority	Recommendation
	types. This would allow Exponent to pick up on changes within landcover types such as species shifts, elimination of species sensitive to heavy metals or sulfur, etc. This would be particularly germane to lichens, as they may or may not occur in dwarf shrub tundra depending on a variety of physical factors and pollution. 3. As noted above, lichens need to be identified to genus and mosses need to be identified at least to groups (e.g., Sphagnum, feather mosses, acrocarpus mosses). These determinations can be made easily in the field with a normal hand lens. It would be far easier to suggest causation for the observed decrease in lichen cover close to the road if the lichens and mosses were identified to genera/groups. For instance, lichens are naturally far less common in the wet habitats that promote Sphagnum growth. If Sphagnum predominated the microplots close to the road (rather than feather mosses which are generally more upland), then causation is more likely to be physical or pH-related. If as noted (p. 6-20) other mosses or no mosses dominated, and the habitat is one that typically supports high lichen cover (e.g. mesic to dry well-drained open low shrub tundra) then a poverty of lichens is more likely to indicate chemical effects. 4. Conduct the study using a much larger number of plots that cover the entire spectrum of landcover types and cover each landcover class adequately. As it stands, we are not convinced that the vegetation survey is based on a high enough number of replicates. Assess the adequacy of sampling by using species-area curves, and convey the sampling adequacy to the readers.		
NPS-22	**Acute vs. Chronic Effects.** The RA never mentions the possible acute effects that may occur during melt-off. Fugitive dust is deposited on the snowpack for 7-8 months per year. It is then released in a matter of days or a few weeks. For sensitive organisms such as nonvascular plants, this may constitute an acutely toxic window that may create greater physiological harm than low level steady deposition.	High	See recommendation for comment NPS-7.
NPS-23	**Single Elements versus Additive Effects**. One of the large uncertainties in the RA is the question of multiple toxic stressors may contribute to injury or mortality beyond that caused by any single element. The heavy metals in fugitive dust occur jointly, not in isolation. There is little discussion of how the concert of metals may amplify the effects caused by any single metal.	Medium	See recommendation for comment NPS-5. Please add more discussion of additive effects to the uncertainty section of the revised ERA.
NPS-24	**Transect Design.** Given that the greatest loads of contaminants are found immediately adjacent to the haul road (1-3 m; Hasselbach et al. 2004), we find it inappropriate for the RA's transects begin at the 10m mark (unless perhaps a pre-existing reclamation plan had already specified removal of all surface materials up to the 10 m mark). While the zone immediately adjacent to the road may not account for a great amount of land, it crosses a broad area and represents the most	High	See recommendation for comment NPS-10. Include more sampling on NPS lands in future monitoring work.

No.	Comment	Priority	Recommendation
	toxic area in CAKR. The omission of this zone misleadingly reduces the highest concentrations of heavy metals found in the study. An additional point: only a relatively small amount of the sampling occurred on NPS lands. As land managers affected by fugitive dust, we would appreciate the knowledge of how specifically the dust is affecting biota in our jurisdiction.		
NPS-25	**Use of Industrial Rather than Residential Screening Levels**. The RA assumes use of non-residential (industrial) screening levels for Pb along the entire DMTS road corridor and sample areas. (Industrial screening levels for Pb in soil are 1,000 mg/kg dw and residential screening levels are 400 mg/kg dw.) The document should clearly specify what clean-up levels it is using or rejecting and whether EPA or ADEC clean-up levels are being used. Even so, the RA reports 168 out of 479 sample sites found Pb exceeded industrial screening levels. All of these except one, however, were within the port ambient air boundary. If the screening level were the residential level, it's likely that most or all sample sites would exceed this screening level. The rationale for using the industrial level is that no one lives along this road corridor and a safety factor of 0.1 is used to protect people from exposure to Pb. Given NPS's mandate to preserve the flora and fauna in perpetuity, we consider the industrial screening levels inappropriate for areas within CAKR's boundaries.	High	See recommendation for comment NPS-11.
NPS-26	**Bone and Bone Marrow**. The methodology used to document heavy metal contamination of arctic wildlife fails to focus attention on bone and bone marrow, where lead is most likely to be accumulate, causing physiological impacts and potentially passing into the human and wildlife food chains. Bone and marrow contaminant concentrations should be reported for representative wildlife species, including shrews, voles, ptarmigan, musk oxen, and caribou collected from within areas where actual data and modeling indicated high heavy metal deposition.	High	See recommendation for comment NPS-13.
NPS-27	**Emphasis on Population-Level Effects**. The RA minimizes effects on herbivorous and insectivorous small mammals voles and shrews), and caribou, by suggesting that "localized effects on individuals' growth, survival and reproductive performance are unlikely to translate into population-level effects because of the small proportion of the total numbers affected". Lethal or sublethal effects to any subset of the wildlife population should not be lightly dismissed, especially when dealing heavy metals expected to persist in the environment for many years.	High	See recommendation for comment NPS-12.
	Responses to Specific Points		
NPS-28	**P. xxii-xxiii, Terrestrial Habitats.** For nonvascular plants, the negative effects of road dust may be compounded considerably by metals because, as noted, these plants get all of their nutrients from the atmosphere. Data is needed specifically on the effects of Cd,	Medium	See recommendations for comments NPS-2, 7, and 16.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
	Zn, S compounds, and Pb on lichens and mosses as well as the additive effects of these compounds—including normal road dust. It is also necessary to differentiate between chronic effects of steady deposition versus the acute effects that may be experienced during melt-off, as 7-8 months of metals are released within a short time.		
NPS-29	**Pages xxii and xxiii, Terrestrial Habitats, Lichen Cover, Bullet 2.** The reference areas should have sufficient variability to define unaffected lichen cover and be far enough away from road fugitive dust impacts to measure background conditions. This is not the case. Effects to tundra lichens beyond 100 m from the physical and hydrological effects of the road are unlikely as is normal road dust (see below).	High	The revised ERA should describe how deficiencies in the study design (specifically those mentioned in this comment) affect the overall conclusions of the work. Causes of lichen decline along the road should be reevaluated.
NPS-30	**Page xxiii, Terrestrial Habitats, Port Facility Areas, Paragraph 2.** If the field research does not document physical impacts on the ground from construction or report the damage to the tundra area during construction, then the conjecture should be left out. The summary should focus on the findings of the research. Future investigations on tundra hydrology may be included in another study.	High	Please remove the conjecture in this section of the report.
NPS-31	**Page xxiii, Terrestrial Habitats, Small Mammals Bullet.** Voles and shrews within 100 m of the road show adverse effects, but the document concludes that no population level effects are likely. We disagree with this suggestion. Wouldn't small mammal populations along the road corridor and near the mine and port facility be adversely affected? The definition of "population level" used here needs to be clarified.	High	See recommendation for comment NPS-12.
NPS-32	**Page xxiii, Terrestrial Habitats, Birds Bullet.** Similar comment as above on population level effects. The RA states that "site-wide" effects on ptarmigan populations is very unlikely. What is the definition of site-wide? From the NPS standpoint the site of concern is the road corridor and the affected area in Cape Krusenstern National Monument as far as enrichment of heavy metals are detected. NPS Comment 34. TC to respond. E&E also commented on this issue. See our Comments Eco-9 and 11. I am looking for TC to back off on their claim that no population level effects for Ptarmigan are likely at the site based on their findings. **Page xxiii, Terrestrial Habitats, Caribou Bullet .** Some idea of the size of the over-wintering herd would be helpful here.	High	See recommendation for comment NPS-12.
NPS-33	**Page xxii, Terrestrial Habitats, Terrestrial Wildlife Bullet.** Again the area of concern should be carefully articulated. We are not concerned with animal populations in the entirety of Northwestern Alaska, and this study did not measure those effects that widely. We are primarily concerned with effects to terrestrial wildlife in the study area along the DMTS. The results should focus on this; they should not seek to minimize the impacts by expanding the area or the size of the	High	See recommendation for comment NPS-12.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
	population under consideration. The authors need to carefully define the study area and areas of concern and stick with them. They may vary by resource, but should not extend to the entire northwestern part of Alaska.		
NPS-34	**P. 1-2, paragraph 4. Dust control.** As noted above, efforts to reduce fugitive dust have not generally been adequate with respect to truck decontamination, dust at the mine site, dust along the DMTS road, and truck contamination at the unloading facility at the port site. We suggest that other methods be employed to prevent deposition of ore concentration on outer truck surfaces, and to more thoroughly removed dust prior to leaving enclosed areas (e.g., compressed air/vacuum).	High	See recommendations for comments NPS-19 and 20.
NPS-35	**P. 1-2, paragraph 2**. As noted, there is no mention of Hasselbach et al. (2004) or use of these extensive data in the RA. While Exponent cites some data from Hasselbach (2003), pers. comm., they clearly know about this document and they cite other documents published in 2004. In order to be more complete, RA should cite this work, use its data, and address the implications it raises.	High	Please cite Hasselbach et al. (2004) in the revised ERA, use its data, and address the implications it raises. See also recommendation for comment NPS-1.
NPS-36	**Fig 2-2 and Table 6-1, p. 2-23.**. It is unclear why inhalation is considered a secondary source of exposure for small mammals, foxes, etc. We observed a red fox napping immediately adjacent to the haul road (approximately 5 meters away). It has been already stated that particles > 1 (i.e., 98% of the roadside dust) is incorporated into the GI tract after inhalation. Are these additional sources accounted for as a subset of ingestion—and if so, does inhalation only refer to particles <1	Medium	In the revised ERA, please provide example calculations to demonstrate the relative importance of the inhalation pathway.
NPS-37	**Fig 2-2**. Uptake via surface deposition is not listed as a direct effect for mammals or birds. Any mammals (like muskoxen) eating forage laden with a layer of road dust (e.g., dusty willow leaves) would be eating fugitive dust directly.	Medium	In the revised ERA, please clearly indicate whether or not external dust contamination was included in the analysis of wildlife foods.
NPS-38	**Table 2-3 Relative importance of potential human exposure pathways.** No data are given for Pb. Either this data should be included or a footnote is needed to explain why it is not included.	Low	Please add a footnote to the table.
NPS-39	**Page 2-3, Paragraphs 2 and 3, Spill Data.** The incomplete reporting and recording of Pb and Zn concentrate spills before 1995 is disturbing. We wonder about the potentially large size of these spills as operating procedures and equipment were not as sophisticated as they have become in recent years. We recommend the contractor consult with the National Response Center records to determine spill records before 1995. These may predate the ADEC records if Cominco reported those as required by law.	High	Please summarize all available information on pre-1995 spills in the revised RA.
NPA-40	**Road Dust** itself is not listed in the RA as a possible concern (e.g., PM 10, PM 2.5).	Medium	Please summarize available information on PM 10 and 2.5 in the revised RA. Based on this information, determine if dust itself should be considered a stressor. If so, revise the RA accordingly.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
NPS-41	**Section 2.2.4. Fugitive Dust Control Measures**. NPS appreciates that some efforts have been made to control fugitive dust. As noted above in "Action Levels and Fugitive Dust Control Measures", the dust is still a problem.	High	See recommendations for comments NPS-19 and 20.
NPS-42	**Section 2.2.** Most of the sources here are identified as potential, rather than actual. For instance Section 2.2.3.: "Dust can be generated from drilling, blasting, …" rather than dust "is" generated. We have observed dust emanating from all of these sources during visits over the past 6 years.	Medium	In the revised RA, please describe these activities as actual sources of dust.
NPS-43	**Page 2-25. Measurement endpoints**. The preliminary measurement endpoints used to evaluate the attainment of assessment endpoints of structure and function of plant communities are the range of concentrations of CoPCs in soil. For nonvascular plants which lack roots, airborne deposition, rather than soil should have been used. Moreover, uptake rates from airborne dust for nonvasculars are not known, and vary by species. We do know, however, that vascular plants uptake approximately 1-4% of the heavy metals uptaken by nonvascular plants. This entire area needs thorough research, and possibly some original lab work to choose appropriate nonvascular species, to document their uptake rates, and to determine physiological effects.	Medium	If warranted, modify the list of assessment and measurement endpoints. In future monitoring work, consider including studies to evaluate metals uptake by nonvascular species.
NPS-44	**Page 2-4, Section 2.2.1, Road:** This section and section 2.2.4 don't mention when new haul trucks with hydraulic lids replaced the older smaller trucks.	Low	Please provide this information in the revised RA.
NPS-45	**Page 2-9. 2.3.1.1 Land Ownership and Management, Paragraph 1, Last Sentence.** This section should indicate Public Law 99-96, which was passed in 1985, enacted the 100-year easement.	Low	Please make this point clear in the revised RA.
NPS-46	**Page 2-11, 2.3.2 Potential Receptors:** There are a few small fly-in lodges along the Wulik River and tributaries to it that lie within the zone with heavy metals enrichment according to Hasselbach et al. (2004). Lodge operators working there during the summer fishing and fall hunting seasons may be at risk of exposure to CoPCs because they work in the field annually. These operators should be advised of the fugitive dust report and the RA.	Low	Please indicate the number and locations of these lodges in the revised RA. Are risks to receptors at the lodges covered by the evaluation of risks to subsistence receptors? If so, state this in the revised RA. If not, conduct the necessary analysis to define risks for this newly identified group.
NPS-47	**Page 2-14, Section 2.3.3 Potential Exposure Pathways:** We think a representative marine mammal such as ugruk (bearded seal) or beluga whale should be added to the list of subsistence foods important in the area. Even though marine sediment levels of CoPCs are low, Pb half life in bones of mammals is up to 20 years. Therefore longer-lived marine mammals could accumulate heavy metals over a few years.	Medium	See recommendation for comment NPS-13.
NPS-48	**Page 2-14, Section 2.3.3.1 Worker and Subsistence Use in the Terrestrial Environment, Paragraph 2.** Were the "reference conditions" cited in Exponent (2002) in Reference Areas? If so,	Medium	Please provide the information needed to answer this question in the revised RA. If the subject reference data are biased high due to

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
	these are likely to have somewhat elevated metals concentrations compared to true background conditions. See critique in "Location of Reference Areas" above.		fugitive dust contamination, please indicate the magnitude of the effect and whether or not it affects the conclusions of the analysis.
NPS-49	**Page 3-1. Sulfate and Sulfur**. SO_4^{-2} and S are not included in the list of CoPC's in spite of potentially serious harm to the ecosystem. $SO_4^{-2}$and SO_2 have been implicated in large-scale and localized lichen declines in Europe, Asia and North America. AMAP cites the western Brooks Range as acutely vulnerable to the effects of acidification and S deposition (AMAP 1998 fig 9-25). Given that the concentrates are between 20-32% S (presumably present as sulfide and sulfate), it is likely that damage would occur to nonvascular plants as sulfides become oxidized to sulfates.	Medium	Please add sulfur as a COPC for lichens. Based on available literature and existing site data, provide a discussion in the revised ERA on the possible relationship between sulfur deposition and lichen decline at the site.
NPS-50	**Table 3-2, Page 3-2, 3-3.** We are puzzled that data by Hasselbach et al. (2004) is not included in the RA. There were many opportunities to assess biota and choose sites relative to deposition beyond the 1000 m transect ends that were missed by not using this data set. It is stated that data gathered in 2001-2003 is not used as it does not represent the most recent deposition levels and predates some of the control measures. This dust, however, is still present in the environment, and will become increasingly bioavailable through weathering.	High	See recommendations for comments NPS-1 and 35.
NPS-51	**Page 3-3, Data Usability, Paving and Removal.** Though areas with new pavement and recently removed soils would no longer represent exposure to humans and wildlife, these areas once represented great exposures. The document should specify when and where the pavement and removal activities took place.	Low	Please provide this information in the revised RA.
NPS-52	**Table 3-4. Reference Areas Enriched.** The mean concentration of Pb in soil in the Terrestrial Reference Area was 38.5 mg/kg. In Hasselbach et al. (2004) the median and mean concentrations of Pb in soil were 15 and 18 mg/kg. The range of Pb values in soil in Hasselbach et al. (2004) were 8-84 mg/kg. In the Terrestrial Reference Area the range of Pb values in soil was 9-142 mg/kg. It is highly probable that the Terrestrial Reference Area was located in a zone of enriched mineralization, a suggestion supported by its proximity to a known mineral deposit in Fig 1-4. Surprisingly, no data is presented except in Appendix C-22 (unsummarized) on contaminant concentrations in Hylocomium splendens in the Reference Area. Only 3 samples are shown. For Pb the mean was approximately 7.7 mg/kg. Comparing Reference Area concentrations in moss with Hasselbach et al. (2004) would have been the primary means to test whether the Reference Area was enriched with metals from fugitive dust. Little inference can be drawn from the 3 values in the appendix other than to say that none reached the background levels documented by Ford (1995: 0.6 mg/kg Pb) or Hasselbach et al. (2004: 1.1-2.0 mg/kg)	High	See recommendations for comments NPS-1 and 35.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
	Table 3-5 additionally supports the idea that the Reference Area is enriched with metals from fugitive dust in that the mean tundra soil concentration of Pb is 9 mg/kg with a maximum of 23 mg/kg. Presumably, enrichment in this soil layer would derive not directly from subsurface soil interchange but from fugitive dust and to a lesser extent plant uptake remains. For *Hylocomium splendens*, a large portion of CAKR south of the Tahinichok Mountains falls in the range of 0.5 -2 mg/kg Hasselbach et al. (2004), which begins to converge with Ford's (1995) median arctic Alaska baseline of 0.6 mg/kg.		
NPS-53	**Page 3-8, 3.2.8 Comparison of Site Data with Reference Data.** Because the reference site area is likely enriched with DMTS fugitive dust and natural mineralization, the statistical comparisons of site data with the reference site are likely in error if the data is supposed to be compared to background levels.	High	See recommendations for comments NPS-1 and 35.
NPS-54	**Page 3-10, 3.3.1.1 Comparison of Site Soil Data with Reference Data.** Material sites used for road repair have most definitely been affected by fugitive dust in recent years because they are close to the road and within the zone of enrichment. The reference soil samples would only be valid for subsurface analysis where the samplers took care to avoid mixing with surface layers. Though we agree with the results of constituents that are likely elevated in Table 3-4, the comparisons would be even more evident with cleaner reference sites.	Medium	See recommendation for comment NPS-15.
NPS-55	**Page 3-20, 3-21. Benchmarks**. Tundra soil data were compared to ORNL toxicological benchmarks for effects on vascular plants. We need a detailed study of toxicological thresholds for nonvascular plants. Currently, as noted above, only 2 references are used for this.	Medium	In the revised ERA, please indicate that literature benchmarks for nonvascular species are highly limited. Consider conducting studies to identify threshold concentrations for nonvascular species as part of future monitoring studies at the site.
NPS-56	**Page 3-13, Section 3.3.1.2, Last Paragraph. Human Health Screening Levels.** We note that Pb exceeded EPA non residential screening levels (1000 mg/kg) in 168 out of 479 samples and all but one of these sites occurred in road and facility areas within ambient air boundaries of the port. We would like to know how many Pb samples exceed the EPA residential screening level (400 mg/kg). The selection of health CoPCs for other metals assumed the residential exposure level. Since Pb is a major heavy metal of concern in the region, we wonder why it is treated differently.	Medium	Please clarify this section so that readers will not be confused regarding the screening value actually used for lead in soil. Please indicate where in the report the number of exceedances of the residential screening value (400 mg/kg) is found.
NPS-57	**Page 3-17, 3.3.3.1.2 Marine Environment, Last Paragraph.** As noted for the terrestrial reference area, the marine reference area falls within a zone that is subject to fugitive dust enrichment according to extrapolation from Hasselbach et al. (2004). Our observations during and after loading of ore concentrate during 2004 indicated a layer of ore concentrate blanketing the barge deck beyond areas partially enclosed by tarpaulins. Despite ongoing deck cleanup efforts, we must assume that the	High	In this section, please provide additional discussion regarding the importance of lead in the marine environment near the loading terminal and how it was evaluated in the baseline ERA. Refer to the 2004 sediment data as necessary to address the stated concerns.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
	area of deposition extended beyond the deck surface into the surrounding waters and that additional material had been lost during transport. The statistical results comparing the site samples with the reference sites are likely to be inaccurate. Some CoPCs may have been inappropriately excluded from consideration and the comparisons between site areas and truly clean areas may be weak. Furthermore, we would like to see the variability in Pb concentration values reported. If the high Pb values would require analysis when compared to the reference site, then we think Pb should be included to err on the side of conservatism and because the reference site is likely also contaminated.		
NPS-58	**Page 3-19, 3.3.3.3.1 Lagoon Environment.** Again, the reference sites are in close proximity to the DMTS and are within the zone of likely enrichment, especially since they are near the port facility. Given this, it is impossible to know if the site concentrations of CoPC's exceeded true background levels.	High	In the revised RA, please indicate the degree of possible contamination of the subject reference areas and to what degree site-to-background comparisons may be affected by it.
NPS-59	**Page 4-3, 4.2.1 Terrestrial Assessment, First Full Paragraph.** We note the pH values change with distance from the DMTS road becoming more alkaline closer to the road with natural acidic conditions father out. This phenomenon needs explanation in the document.	Medium	Please provide additional explanation of this observed effect in the revised assessment.
NPS-60	**Figure 4-11. High Contaminant Values Reported from CAKR**. Transect TT2 is in CAKR. It appears that tundra soils bear approximately 800+ mg/kg Pb close to the DMTS road. Lichens appear to have approximately 200 mg/kg Pb. These values corroborate data in Hasselbach et al. (2004), though that study is far more detailed. In terms of benchmark-based risk assessment, some taxa may tolerate these levels, but it is unclear whether this would be true for sensitive nonvascular plant taxa. Regardless, NPS believes these high values are incompatible with the NPS mandate to protect this park unit unimpaired. The highest Pb concentration reported in lichens from the Pacific Northwest's USDA/Forest Service Lichen-Air Program was 127 mg/kg in a highly polluted section of the Columbia River Gorge (Geiser and Neitlich 2005). This area has lost all sensitive lichen taxa due to NO_x and metals pollution from Portland, OR.	High	See recommendations for comments NPS-2 and 16. Please include more detailed lichen studies within CAKR in future monitoring work at the site.
NPS-61	**Pages 5-2 and 5-3, 5.2.1.1 Exposure Point Concentrations for Environmental Media.** We note the report defines subsistence use areas for Kivalina and Noatak from Dames and Moore (1983), but with changes in technology and access (more reliable ATVs and snowmobiles), subsistence users travel farther and faster than they did in 1983 and subsistence use areas have likely changed in the last two decades. More recent use data would lead to more accurate area calculations and potential exposures.	Medium	In the revised RA, please discuss the extent to which subsistence use over a larger area would change the risk estimates for subsistence users. If warranted, consider collecting updated subsistence use data as part of future monitoring work at the site.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
NPS-62	**Page 5-3, 5.2.1.2.1 Data Used to Calculate Fish EPCs.** ADF&G collected Dolly Varden from the Wulik River from 1991 to 2003, but these fish are distant from the DMTS and would likely have low Pb concentrations. Fish should be collected and tested from closer to the DMTS (New Heart Creek, Aufeis Creek, Straight Creek, Omikviorok River, Tutak Creek, and Ikalukrok Creek).	High	In the revised RA, please describe the extent to which the existing fish data represent the worst-case situation along the haul road. If they do not, fish should be sampled from more contaminated streams in future monitoring work at the site.
NPS-63	**Page 5-3, 5.2.1.2.2 Data Used to Calculate Caribou EPCs.** Caribou analysis should also include bone and bone marrow testing because Native people cook, boil and eat all parts of caribou including bone. Pb accumulates in bone and the Pb half-life in bone is up to 20 years in people and large mammals but only a few months in muscle, liver and kidneys (AMAP 1998, pages 393, 397, and 784).	High	See recommendation for comment NPS-13.
NPS-64	**Page 5-4, 5.2.1.2.3 Data Used to Calculate Ptarmigan EPCs.** Why weren't reference area ptarmigan tested to determine "background" or comparative CoPC levels and EPCs? We would like to know the lower levels of exposure farther away from the DMTS. Also, ptarmigan should be collected farther away from the DMTS to determine true background exposures to CoPCs in the region.	High	Please refer to Table G-28 (Analytical results for PHASE2 ptarmigan tissue [reference]) in this section. In future monitoring work, consider collecting additional ptarmigan samples further from the site.
NPS-65	**Page 5-6, 5.2.1.2.7 Estimation of edible tissue weighted-average concentrations for caribou and ptarmigan.** Muscle weights for ptarmigan should also include the legs and back muscles, which would further increase the percent of muscle in ptarmigan EPC calculations. These parts and the heart are routinely eaten.	Low	Please verify if leg and back muscle also is eaten. If so, they should be included in the analysis.
NPS-66	**Page 5-6, 5.2.2.1 Lead Exposure.** We note Pb exposure is estimated using blood Pb levels, but Pb resides only a short time in blood and its half life is up to 20 years in bone of humans and wildlife (AMAP 1998, pages 393, 397, and 784). To be complete the RA needs to analyze Pb levels in bone of wildlife.	High	See recommendation for comment NPS-13.
NPS-67	**Page 5-7, 5.2.2.1 Lead Exposure.** This section indicates assumptions used in the model were EPA default assumptions except soil concentrations. The document should briefly describe the EPA assumptions and whether they are appropriate for Northwestern Alaska and how they are changed for some factors in this analysis. Secondly, we wonder about the accuracy of the fractional intake of soil for employees working at the port site and mine of 0.09.	Medium	In the revised RA, please provide a discussion of the EPA assumptions and whether they are appropriate for NW Alaska. Please describe the rationale for the FI of 0.09. If it cannot be defended, the parameter should be changed in consultation with Alaska DEC.
NPS-68	**Page 5-7, 5.2.2.1.1 Soil Lead.** We note this section reports the mean soil Pb concentration in the port area is 1,225 mg/kg. This exceeds both the EPA and ADEC industrial clean-up levels. We think the RA should recommend these more highly contaminated areas are cleaned up immediately or capped (paved over) to reduce the potential tracking and transport of this contamination to adjacent areas.	High	See recommendation for comments NPS-19 and 20.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
NPS-69	**Page 5-18 and 5-19, 5.2.3.1.1 Baseline Blood Lead Level.** We agree that the 1991 blood Pb levels are not representative of current conditions, nor would they have detected much Pb from the DMTS because the mine had only been operating for a few years by then and at lower production rates than at present. The 2004 blood level sampling at Kivalina and Noatak by ADPH was very limited and not comparable to the 1991 blood sampling to make any conclusions. We think ADPH failed to make a sufficient effort to sample a greater percentage of residents in these villages (only 10 people sampled in Kivalina and 48 people in Noatak and no children at either location).	Medium	Please add to the uncertainties the limitations of the ADPH study and discuss any other provisions that are available to assess blood lead levels.
NPS-70	**Page 5-19, 5.2.3.1.2 Soil and Dust Ingestion Rate.** We think Exponent erred in not using the ADEC requested soil ingestion rate of 100 mg/day in the RA. Rather they decreased the soil ingestion rate to 50 mg/day while at work. If a worker is at the mine or port facility or driving a truck along the DMTS, their exposure to and ingestion rate of fugitive dust would likely be greater than the standard 50 mg/day and potentially higher than 100mg/day. Assuming the lower default ingestion rate for areas along the DMTS--where known soils levels for Pb are elevated far above ambient arctic conditions—should require substantial justification.	Medium	Please use 100 mg/day as the soil ingestion rate for workers.
NPS-71	**Page 5-20, 5.2.3.1.4 Gastrointestinal Absorption Fraction of Lead from Soil.** This section states the absolute bioavailability of Pb in Red Dog ore for adults ranges from 2.7 percent to 5.4 percent, with an average of 3.9 percent. If the Risk Assessment purports to err on the side of overestimating exposures, then the absolute exposure of 5.4 % should be used in the fractional intake calculations, not the lower average value. The RA should evaluate the potential exposures of the most at-risk persons, not the average person.	Medium	In the revised RA, please present risk estimates for lead based also on the maximum bioavailability.
NPS-72	**Page 5-32, 5.4.2.1 Risk estimates for Lead.** Again, we think the default Pb bioavailability of 12 percent and 3.9 percent may be low due to averaging.	Medium	See recommendation for comment NPS-71.
NPS-73	**Page 5-33, 5.4.3.1.1 Soil Ingestion Rate.** The ALM is designed to use averages, but averages leave out considerations of people most at risk to high levels of Pb exposures. Moreover, the EPA guidance for 50 mg/day incidental ingestion rate is probably reasonable for much of the US, but the DMTS is unusual with greatly elevated levels of Pb and other heavy metals in the soil and surface vegetation. For this reason we think the ADEC recommendation of 100 mg/day of soil ingestion rate for workers and subsistence users in the area is more reasonable. The ADEC recommended cleanup level of 50 mg/day ingestion rate would be the difference they want to see between the likely existing condition and the minimum level industry should clean up to.	Medium	See recommendation for comment NPS-70.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
NPS-74	**Page 5-34, 5.4.3.1.2 Soil Lead EPC.** Again, we feel the assumptions regarding Pb bioavailability need to be evaluated carefully.	Medium	See recommendations for comments NPS-70 and 71.
NPS-75	**Page 5-36, 5.4.3.3 Discussion of ADPH Blood Lead Surveys, Paragraphs 1 and 2.** Though ADPH succeeded in sampling a low percentage of the total populations of Kivalina and Noatak villages for blood Pb levels in 2004, we would like to know the ranges of blood Pb levels recorded in addition to the geometric means for each village.	Medium	Please provide the requested information in the revised RA.
NPS-76	**Page 5-36 and 5-37, 5.4.3.3 Discussion of ADPH Blood Lead Surveys, Paragraphs 3.** We do not think the child-bearing female population between ages 18 and 45 are necessarily the best to evaluate as a target population because women loose blood Pb burdens through menstruation and child birth. Older men who have and continue to hunt are likely to be more at risk of high blood Pb and bone Pb concentrations.	Medium	Please provide further support of your use of child-bearing females in the revised RA.
NPS-77	**Page 5-36 and 5-37, 5.4.3.3 Discussion of ADPH Blood Lead Surveys, Bullets 1 & 3.** We maintain that the RA did not always use conservative assumptions to ensure sensitive individuals are protected. See comments above. The data sets between 1991 and 2004 from Kivalina and Noatak are not comparable data sets in terms of percent of population sampled. The 2004 data set is inadequate. It is encouraging, however, to read that 32 of 33 individuals show lowered blood Pb level between the two sample years, however, those who volunteered may not be representative of the whole population. Blood tests are also not sensitive indicators of total tissue lead loads. Another question would be to test how blood Pb levels changed for those who were measured in 1991 and have since worked at the mine and also participate in subsistence activities.	Medium	See recommendations for comments NPS-70 and 71. Please consider including blood lead monitoring of residents in Kivalina and Noatak in future monitoring work at the site.
NPS-78	**Page 5-41, 5.4.3.7.3 Ptarmigan.** Paragraph 3 of this section contradicts the finding that Pb is elevated in ptarmigan tissues along the DMTS. Better wording could be something like: "Lead concentrations appear to be elevated in ptarmigan tissues, but levels of other CoPCs are low. Results from the RA indicate human health risks would not be greatly influenced from consumption of small amounts of ptarmigan."	Medium	Please revise the wording as indicated in the comment.
NPS-79	**Page 5-41, 5.4.3.7.3 Ptarmigan, Last Paragraph.** This sentence appears to be a conclusion for the entire subsistence food investigation rather than simply for ptarmigan. Nevertheless, we believe a more qualified conclusion would be advisable.	High	Please omit the subject sentence from the revised RA.
NPS-80	**Table 6-9, Figures 6-5, 6-6. PCA Results**. Distance to DMTS road is highly correlated with Factor 2 (r^2=-0.48), as are a suite of heavy metals ($0.4<r^2<0.8$). PCA is not a preferred method of ordination as it is known to distort plant community data. NMS (nonmetric multidimensional scaling) has become the modern standard, and may lead to very different values. If lichen cover increases with distance to DMTS road, we wonder why this isn't showing up on Factor 2. Possibly the lichen signal is swamped	High	Please reanalyze the existing plant survey data based on the recommendations in this comment. Please include more detailed vegetation survey work in future monitoring studies at the site. See also recommendations for comments NPS-16 and 21.

No.	Comment	Priority	Recommendation
	out in the ordination by the major community differences related to physiography—or perhaps it owes to the fact that the ordination results are based only on vascular plants. To get a better sense of the problem for nonvascular plants, they need to be identified to species and included as part of the plot x species matrix that gets ordinated. They may also be ordinated by themselves, or in concert with bryophytes in a reduced matrix, for additional explanatory power. Equally, subsets of the main matrix may be ordinated by themselves (e.g., landcover classes known to be high in lichen cover, classes with greatest representation close to the DMTS road). NMS should be used for all ordinations. Heavy metal values from Hasselbach et al. (2004) should be used as environmental variables along with sulfur. The PCA results presented here are additionally misleading because only composite values (diversity, evenness, etc) are used in the primary ordination—rather than actual plant community data—and lichen cover is used as an explanatory variable rather than a member of the community. Moreover, all possible environmental variables need to be overlaid into the ordination as explanatory variables so that the axes may be interpretable. Axes need to then be rotated to achieve interpretability with the major explanatory variable of interest. The ordination approach presented in the RA would not survive most standard peer review in vegetation or ecological journals.		
NPS-81	**Appendix C-21. Some Very High Metals Levels In Nonvascular Plants**. Pb concentrations in Hylocomium are presented for PO-05m (1670 mg/kg) and TT1-0100 (Phase1RA). There is no mention of TT1 in the Risk Assessment. Where is this? Additionally, 1500 ppm of Pb is reported for the lichen Cladina sp. Values of this magnitude are typically accompanied with injury and/or mortality from multiple stressors.	High	Please include the data referred to in this comment in the baseline ERA. Please ensure that the revised ERA does not downplay adverse impacts to lichens.
NPS-82	**Page 6-6; Section 6.1.6. Muskox**. As noted above, we are disappointed that muskox were not chosen as a receptor. They consume large quantities of moss and lichens, which absorb 25 to 100 times the amount of metals as vascular plants. They also have a much smaller home range and their pellets are found in abundance along the DMTS.	High	See recommendation for comment NPS-4.
NPS-83	**Table 6-3. Lichen distribution related to distance from DMTS road**. Lichen cover again emerges as significantly different ($p<0.05$) between the site and reference area and especially different (0.03) at the 10m distance. Again, sulfur forms should be added to this table. Table 6-4 amplifies the high correlation between distance to the DMTS road and lichen frequency and lichen cover ($r^2=0.77$).	Medium	See recommendations for comments NPS-2 and 16.
NPS-84	**Page 6-12, 6.2.1.1 Plant Survey Methods, Paragraph 2.** The vegetation communities along transect TT2 near the port's ambient boundary and TT7 downwind of the mine's ambient air/solid waste permit boundary, were assessed qualitatively without formal plant community characterization. We wonder why these	High	In future monitoring work at the site, please include more detailed evaluation of the vegetation along these two transects. See NPS recommendations in comment NPS-21.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
	sites were excluded. As highly polluted sites, these sites would have been most informative.		
NPS-85	**Page 6-13, Plant Survey Methods, Last Paragraph.** To what extent would the date of sampling affect frequency and cover calculations? A brief discussion on this point would be helpful.	Medium	Please include a brief discussion of this issue in the revised ERA.
NPS-86	**Page 6-20. Schematic layout for vegetation sampling: implications for contaminant loads**. In this analysis, graminoid communities are not different in the site versus reference area. Yet it is obvious from having conducted studies in the area that grasses flourish unnaturally immediately along the road corridor (1-3 m from the road). The cause of the grass bloom is probably the nutrient enrichment from road dust. This zone was omitted from the study. The omission of this 1-10 m zone also diminishes the potential contaminant loads found in the study tremendously.	High	To the extent possible with existing information, please describe impacts to vegetation in the 1-10 m zone in the revised ERA. In future monitoring work, please include vegetation survey work in the 1-10 m zone.
NPS-87	**Page 6-28. Zinc in Lichens.** Numerous studies have shown lichen declines related to zinc toxicity. Hasselbach et al. (2004) documented zinc levels of up to 2500 mg/kg. Other studies have shown lichen decline for zinc levels of only 200-600 mg/kg. It would be worthwhile sampling lichens at each of Hasselbach et al. (2004)'s sample points stratified by cover type to assess the effects of zinc on lichen communities here.	High	Please consider conducting the sampling work mentioned in this comment as part of future monitoring work at the site. See also recommendation for comment NPS-2.
NPS-88	**Page 6-29**. **Lichen cover**. Lichen cover along the DMTS at 10, 100, and 1000 m was significantly lower than in Reference Area. Qualitative assessment showed that lichens were still lower than at the Reference Area at 2000 m. For most other taxa in the RA, the most significant effects apparently extended out to 100 m.	Medium	Please clearly indicate in the executive summary of the revised RA that effects on lichens have been observed up to 2 km from the haul road. In future monitoring work in the CAKR, please determine the full extent of impacts to lichens.
NPS-89	**Page 6-31. Excellent comment**. "Lichens may be eliminated entirely in areas of high dust and are the most affected growth form in the tundra…" Also, excellent observation that Sphagnum is harmed by Ca inputs—though this is not assessed quantitatively because mosses were not ID'ed to groups. It would be fruitful to compare Sphagnum levels in Reference Areas versus Site.	Medium	Please design future vegetation surveys so that relationships between Ca and Sphagnum at the site can be better understood. See NPS recommendations in comment NPS-21.
NPS-90	**Page 6-32. Zinc**. Zn concentrations were reportedly high enough to cause mortality and/or reduction in cover up to 1000m from the DMTS road in feather mosses. That represents 64 km^2 in CAKR. It is also stated that zinc effects could extend up to 100m for lichens. This requires a great deal more study since lichens weren't identified to species and the sensitivities were based on only one study. Some species are much more tolerant than others to metal toxicity. The lichen literature is rich in studies on metals. Again, we also need to consider the acute effects that could occur during melt-off.	High	Please design future vegetation surveys so that relationships between metals and nonvascular species at the site can be better understood. See NPS recommendations in comment NPS-21.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
NPS-91	**Page 6-33. Need for Long Term Monitoring Due to Large Affected Area.** Lichen cover is reported to be still 2 to 4.5 times lower than reference covers at 2000 m from the DMTS road. By extrapolation, this suggests that at least 128 km^2 of land is suffering reduced lichen cover. Given the scale of this observation, it appears we need considerably more study and mitigation. Long-term vegetation monitoring should be one component of these efforts, as it is easier to detect change over time than to control for differences at least in part caused by within and between plant community variability.	High	See recommendations for comments NPS-88, 89, and 90.
NPS-92	**Page 6-36. Cadmium and Lichens**. The one study cited shows that Cd is more toxic to lichens than Zn. If this bears out in the literature, then why is Zn being used for assessment of toxicity? In addition, since a zone up to 2000 m is strongly affected, additive effects from multiple stressors (Cd, Zn, S, SO_4) is probably the most likely scenario. As the RA has a regulatory approach, which appears to regulate each element separately, multiple causation is little considered.	Medium	Please add discussion of multiple causation to explain lichen impacts. Consider the chemicals named in this comment.
NPS-93	**Page 6-36, Section 6.2.4 Soil Fauna.** The RA fails to evaluate effects to tundra soil fauna communities because ecological screening benchmarks are typically lower than for plants. We wonder to what extent the ORNL values reflect values in arctic Alaska. Some additional justification for omitting this receptor would be valuable.	Medium	Provide additional justification as requested in this comment.
NPS-94	**Page 6-51, 6-52. Lichens at Lagoon South.** NPS landcover maps show such tundra types as Sedge-Dryas Tundra, Crowberry Tundra, Partially Vegetated, Low Shrub Birch-Ericaceous Scrub around the Port Lagoon South. All of these cover types are favorable to high lichen diversity, far more so than the graminoid and tussock tundra communities sampled. Mosses and lichens were not collected at the lagoon. The conclusion that "coastal lagoon vegetation does not appear to be adversely affected" may be unwarranted given the high diversity of habitat types there and the presence of several habitat types known for high lichen diversity.	High	Please describe this shortcoming of the plant survey work in the revised ERA. See recommendations for comments NPS-88, 89, and 90.
NPS-95	**Sampling Transects on NPS Lands**. The only transect on NPS land is TT2. In future studies we would like to request that more attention be given to NPS lands affected by mining operations and transport.	Medium	Please include more transects on NPS lands in future vegetation monitoring studies at the site.
NPS-96	**Page 6-75, 6.5.4.1.1 Willow Ptarmigan.** If Pb continues to be distributed into the area along the DMTS over the next couple of decades and with the LOAELs close to 1.0 for ptarmigan, would not ptarmigan experience adverse affects such that precautionary tactics should be taken to minimize future release of fugitive dust? This is one example of why we disagree with Exponent that Teck-Cominco need not pursue any mitigation measures other than their "voluntary" clean-up efforts.	High	See recommendations for comments NPS-12 and 19.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
NPS-97	**Page 6-76, 6.5.4.1.2 Tundra Vole.** If the terrestrial reference area were less enriched, would the LOAELs for Pb and other CoPCs change for tundra voles, showing a greater potential effect over background conditions?	Medium	Please provide an answer to this question in the revised ERA. See also recommendation for comment NPS-1.
NPS-98	**Page 6-76. NPS Risk Tolerance**. The RA states that risk to tundra voles doesn't translate into an "unacceptable ecological risk to the site's vole population as a whole…" From NPS's perspective, the population as a whole does not need to be threatened before we become concerned about the level of impacts. The AIDEA easement through CAKR ranges from about 140 m to 3 km from the DMTS haul road, therefore the effects described for vegetation are already having impacts on CAKR lands both inside and outside the easement boundaries.	High	See recommendation for comment NPS-12.
NPS-99	**Page 6-77, 6.5.4.1.3 Caribou.** Though we agree the entire population of the WACH is unlikely to be affected by CoPCs from the Red Dog mine because they migrate so far and so fast, we are more concerned with sub-populations that remain near the DMTS facilities. We understand that as many as 200 caribou stay near the mine during some winters, consuming fugitive dust-contaminated lichens all winter. Again, the RA emphasis on the huge range and population of the WACH minimizes appropriate concern about smaller populations of caribou or other wildlife that use habitat with heavy metals enrichment along the DMTS. Though this approach put things in a regional context for caribou, the data about heavy metals enrichment along the DMTS do not support Exponent's suggestion that further actions are not required to change the trend of increasing metals enrichment along the DMTS.	High	See recommendations for comments NPS-12, 19, and 20.
NPS-100	**Page 6-82, 6.6.2 Uncertainties Related to Terrestrial Assessment.** As noted above, an additional uncertainty for plant assessment would be the number of plots sampled to achieve statistical validity in describing vegetation variation.	Medium	Please expand the uncertainty discussion as requested in this comment.
NPS-101	**Page 6-83, Section 6.6.2.1. Monitoring.** Monitoring for vegetation on all of the major landcover types—with special emphasis on those high in nonvascular plant cover and diversity—should be a high priority for upcoming work.	Medium	Please consider this suggestion when designing the risk management plan at the site.
NPS-102	**Page 6-84. Selection of Reference Areas**. Two major questions remain about the choice of Reference Areas: 1) Why were there only two Reference Areas? 2) Why weren't they located in a zone clearly outside the influence of fugitive dust (Hasselbach et al. 2004) or mineralization (Fig 1-4, Table 3-4).	High	See recommendation for comment NPS-1.
NPS-103	**Page 6-85. Vegetation Cover Estimation**. Ecologists often estimate cover for each species separately, even if in the understory, such that the total cover on a plot can be >100%. This more closely approximates the biomass on the plot than 100%-based dominant canopy cover estimates.	Medium	In the revised ERA, please discuss the impact of this alternative approach for estimating biomass on the results and conclusions of the vegetation survey.
NPS-104	**Page 6-86, second paragraph. Mosses and Lichens Evaluated at Group Levels**. In the RA, mosses and lichens were treated as one group each rather than being treated at	High	Please follow these suggestions when designing future vegetation monitoring studies at the site.

No.	Comment	Priority	Recommendation
	the species level. As noted, tolerances to metals toxicity varies widely among nonvascular taxa. Follow up study should focus on species, and should use nonmineralized, clean reference areas.		
NPS-105	**Page 6-86, Section 6.6.2.2. Uncertainty in Comparisons to Phytotoxicity Thresholds.** A recent literature search on the lichen literature search engine (http://www.nhm.uio.no/botanisk/lav/RLL/RLL.HTM) generated a list of 44 publications just for zinc and 269 publications for heavy metals. The RA bases its evaluation of phytotoxicity on 2 studies. One of these is a field study of a coniferous woodland community near a brass foundry, which is not strikingly similar to tundra communities exposed to Zn, Cd and S. Since mosses and lichens were not identified to species an evaluation of species sensitivity and adverse impacts could not be assessed with this project. Because there is evidence that mosses and lichens are adversely affected at considerable distances from the DMTS corridor, we believe it is incorrect to assume no further actions should be taken by the industry to reduce fugitive dust emissions along the DMTS. We agree with the author's statement on page 6-87, section 6.6.2.3 that further study is needed to elucidate the role of CoPCs from the DMTS relative to other road effects (e.g., hydrological effects, road dust, dust palliatives).	High	See recommendations for comments NPS 2, 6, and 19.
NPS-106	**Page 6-87, First Paragraph. Retention of Dust on Samples**. It is stated that plant samples weren't washed before analysis. We are a bit unclear on exact sample handling however. Were the specimens analyzed together with the dust remaining in the bottom of the sample bags—so that the full amount of dust originally on the leaves was included? Were the plants shaken in the field to remove dust prior to bagging? Some discussion would be helpful.	Low	Please provide the requested information in the revised ERA.
NPS-107	**Page 6-89, 6.6.3.1.1 Body Masses and Intake Rate Parameters.** Because the models use average size individuals in a receptor wildlife population, they tend to underestimate exposures to smaller members of a population and overestimate exposure to larger members. If effect levels are reached, we think smaller members of a population are likely to be selected against, thereby potentially affecting the genetic make-up of a population.	Medium	In the revised ERA, please indicate how large an effect body mass and intake rate have on the wildlife risk estimates. Use example calculations as appropriate.
NPS-108	**Page 6-92, 6.6.3.3 Representativeness of Sampling Locations.** This section states that tissue data from wildlife receptors were adequate to detect spatial patterns relative to the DMTS, including a return to background levels of risk. We maintain all reference sampling locations are enriched with heavy metals above background from the DMTS. This study cannot properly determine return to background levels because no samples were obtained from areas unaffected by DMTS fugitive dust.	High	See recommendation for comment NPS-1.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
NPS-109	**Page 6-96, 6.6.3.5, Uncertainty in TRV Extrapolation.** We are concerned that the hazard quotients for birds exceed 1.0 for mercury and zinc at all stations, *including the reference area*. This is understandable for mercury because this heavy metal is very volatile and is transported to and concentrated in arctic regions from global emissions. Zn is more likely derived from fugitive dust emissions from the DMTS *including to reference sites* and is less likely derived from deeply buried and bio-*unavailable* bedrock.	High	Based on information provided by the NPS, please determine the potential bias in the background risk estimates for mercury and zinc based on the NPS claim that the reference areas do not represent true background. Summarize the findings in the revised ERA. See also recommendations for comment NPS-1.
NPS-110	**Page 6-98, Last Paragraph. Ecological Significance**. It is argued in the RA that there is a marked decline in lichens that's related to distance from the DMTS road and that the effect continues beyond 2000 m. Exponent writes in assessing overall significance that "the adverse effects are most pronounced in the first 100 m and are not expected to occur at any substantial distance from the road, port or mine…" NPS considers lichens to be highly significant members of their ecosystem in terms of both forage and diversity. This statement understates the importance of nonvascular plants in the arctic ecosystem.	High	See recommendation for comment NPS-6.
NPS-111	**Page 6-98, Last Paragraph. Metals vs. Normal Road Dust.** Exponent writes that "the contribution of metals in producing some of these effects, particularly on plant communities near the DMTS road, is unclear." Auerbach (1997) concludes that distance to the Dalton Highway in arctic Alaska is correlated at only r^2=0.28 and r^2=0.08 with lichen biomass at two different study areas with vegetation similar to that near the DMTS road. Table 6-4 shows a correlation of 0.77 between distance to DMTS road and lichen cover.	High	In the revised ERA, alternative explanations for lichen decline should be rigorously evaluated. The discussion should address the specific points made in this comment.
NPS-112	**Page 7-1, Section 7.2 Ecological Risk Based Action Levels**. It is again stated that effects to terrestrial vegetation may simply be a function of normal road dust. In light, both of the preceding comment on road dust and the known toxicity of Zn, Cd and S to lichens, this statement appears to demonstrate a strong bias. Clearly this entire topic warrants considerably more study in addition to a suite of effective contaminant control measures. The statement suggesting no action levels are required because the role of metals cannot be quantified is inadequate because it cannot be demonstrated CoPC metals were not responsible for ecological changes and stress. These questions cannot be answered with the level of study conducted to date and we disagree with the summary judgment. It would be more accurate to state more study is required before a judgment can be made whether to assign action levels to further control fugitive dust along the DMTS to prevent or reduce adverse effects to tundra vegetation. We also believe it's also overly simplistic to state that since no action is warranted because no one CoPC is responsible. First, with regard to lichens, we have no proof	High	See recommendations for comments NPS-6, 19, and 111. Adverse impacts, whether due to normal road dust or metals, should still be identified as adverse impacts in the revised ERA.

No.	Comment	Priority	Recommendation
	that this is true, and we have strong suspicion about Zn, Cd and S. Second, the concept of additive stressors needs to enter this equation somehow. If the multiple effects of two CoPC's cause injury or mortality to an organism—but neither can produce as strong of an effect alone—it makes little sense to claim that no action is required because these elements are below certain effects thresholds. Lastly, the RA bases the inappropriateness of action levels because of a limited spatial scale. As noted, the minimum size of the affected area of nonvascular vegetation is 128 km^2. At what point does a "limited scale" become a sizeable area? In addition, does an entire population need to be threatened before action is warranted, or would action be warranted if demonstrable effects to small mammals on 6 km^2 are shown?		
NPS-113	**Page 7-2, 7.2 Ecological Risk Based Action Levels.** Similarly, the conclusion that no action levels should be required to reduce exposures and potential impacts to small mammals and birds along the DMTS is in error because the reference sites are within the zone of fugitive dust deposition and calculations of hazard quotients at study sites relative to reference sites are not as far apart as they should be. In our opinion the conclusions are invalidated by used of impacted reference sites that are assumed to be reasonable indicators of uncontaminated, natural background levels.	High	See recommendations for comments NPS-1, 12, and 19.
NPS-114	**Page 8-2 and 8-3. Conclusion—Plant Community Structure**. We are unclear as to what it is concluded that there are changes in vegetation community structure within 100 m of the road and port when elsewhere in the RA it clearly states that effects to lichens extend beyond 2000 m of the DMTS road.	High	See recommendation for comment NPS-6.
NPS-115	**Page 8-3, 8.2.1 Ecological Risk Assessment for Terrestrial Habitats, Bullet 3.** The authors should research CSB1 construction history before suggesting or dismissing vegetative impacts downwind from the structure as being caused by the construction and its subsequent effects (to hydrology or other factors.) This situation begs more study; it does not reject possible effects from CoPCs.	High	Please remove the conjecture in this section of the report.
NPS-116	**Page 8-3, 8.2.1 Ecological Risk Assessment for Terrestrial Habitats, Bullet 4.** The last statement in this section indicates population level effects to small mammals are unlikely because of the limited spatial scale of effects and the uncertainties associated with TRVs, but the discussion on TRVs indicates these values could be low or high and are based on different species in different habitats.	High	See recommendation for comment NPS-12.
NPS-117	**Page 8-4**. **Conclusion—Plant Communities at Port Lagoon**. As noted earlier, an inadequate number of plant community types were sampled in this effort. Specifically omitted were those types hosting high diversity of lichen taxa. This conclusion would probably not withstand the scrutiny of detailed study.	High	Please describe this shortcoming of the plant survey work in the revised ERA. Discuss the effect it has on the conclusions drawn for vegetation impacts at the lagoons. See recommendations for comments NPS-88, 89, and 90.

DEC's comments/recommendations on: National Park Service (NPS) Comments (dated 11 July 2005) on the DMTS Fugitive Dust Risk Assessment Prepared by Exponent for Teck Cominco Alaska Incorporated (dated April 2005).

No.	Comment	Priority	Recommendation
NPS-118	**Effects of Road Dust vs. Concentrate**. The RA suggests that the effects of road bed material dust on vegetation cannot be distinguished from the effects of ore concentrate dust. We acknowledge that these substances are mixed by wind and traffic and that the relative importance of inert physical properties vs. toxicity is not readily discernable by monitoring. However, their combined impacts can be measured and remain important. We also believe that experimentation could distinguish between road and ore concentrate effects.	Medium	See recommendations for comments NPS-6, 19, and 111. Adverse impacts, whether due to normal road dust or metals, should still be identified as adverse impacts in the revised ERA.

Key:
ADEC = Alaska Department of Environmental Conservation
ADPH = Alaska Department of Public Health
ANOVA = Analysis of Variance
CAKR = Cape Krusenstren National Monument
COPC = Chemical of Potential Concern
CSB = Concentrate Storage Building
DEC = Department of Environmental Conservation (Alaska)
DMTS = DeLong Mountain Regional Transportation System
EPC = Exposure Point Concentration
E&E = Ecology and Environment, Inc. (E&E)
ERA = Ecological Risk Assessment
LOAEL = Lowest Observed Adverse Effect Level
NA = Not Applicable
NANA = Northwest Arctic Native Association
NMS = Nonmetric Multidimensional Scaling
NPS = National Park Service
PCA = Principal Component Analysis
RA = Risk Assessment
TC = Teck Cominco
TRV = Toxicity Reference Value
USGS = United States Geological Survey

Notes:
1. Where needed, yellow highlighting is used to identify critical comments lying within larger blocks of text.
2. NPS comments were prepared by the National Park Service-Western Arctic National Parklands in collaboration with National Park Service Alaska Regional Office. Collaborating Staff: Peter Neitlich, Bud Rice, Linda Hasselbach, and Robert Winfree.
3. See original NPS comment letter for complete citations of cited literature.