

Environmental Report - Cumulative Impacts

Background

Since the 2007 submission of the North Trend Expansion Area (NTEA) application to amend the Crow Butte Source Materials License, Cameco Resources has submitted two additional applications for expansion. The Three Crow Expansion Area (TCEA) and the Marsland Expansion Area (MEA) license amendment applications were submitted in 2010 and 2012, respectively. Each application addresses the cumulative environmental impacts relevant at the time of submission. Regardless, evolving business decisions have altered the planned sequence of activities.

As stated in each of the applications, Cameco Resources will utilize the additional mineral resource available at the expansion areas to replace the declining resource at the Crow Butte Operation. The applications also emphasize that the expansion areas will be sequenced (brought on line) in a manner that continues production at current levels.

Much of the information is available in the existing administrative record, but it is neither cohesive nor readily identifiable. This submission is intended to update the schedule, highlight relevant information and assess the cumulative impacts of the proposed approach.

Schedule

As noted in the MEA application (ML#1210A513), Cameco Resources is focused on first obtaining a license amendment for the MEA. If licenses and permits are granted, construction of the MEA will begin in 2014, with production starting in 2015 and extending until approximately 2029.

Similarly, as noted in the TCEA application (ML#102220278) if licenses and permits are granted, construction of the TCEA will begin in 2015, with production starting in 2016 and extending until 2030.

Cameco plans to utilize the NTEA to complement the MEA and TCEA operations when their production begins to decline. To accomplish this, the NTEA will be constructed in 2023, with production starting in 2024 and extending until 2032.

Attached Information

Cameco has attached a table from each application that compares the predicted environmental impacts of each satellite area:

- Table 2-2: Comparison of Predicted Environmental Impacts, Environmental Report, North Trend Expansion Area, pages 2-12 and 2-13;
- Table 2.6-1 Comparison of Predicted Environmental Impacts, Environmental Report, Three Crow Expansion Area, pages 2-9, 2-10 and 2-11; and

- Table 2.6-1 Comparison of Predicted Environmental Impacts, Environmental Report, Marsland Expansion Area, pages 2-11 and 2-12.

Cumulative Impact Assessment

Cameco has taken the information in the applications, especially the tables in the Attachment, and compiled two tables. Table 1 reiterates the individual impacts described in each application with relevant factual notations and then describes the cumulative impacts of the combined project activities.

Table 2 compiles the unavoidable cumulative environmental impacts of the combined project activities and notes any associated mitigation measures.

Table 1 Cumulative Additional Impacts of North Trend, Three Crow and Marsland Expansion Areas (September 14, 2012)

| Impact of Operation | Individual Impacts | Cumulative Impacts |
|----------------------------|--|--|
| Land Surface Impacts | Minimal temporary impacts in wellfield areas, significant surface and subsurface disturbance confined to a portion of the 12 to 30 acre satellite facility footprint. | The existing Crow Butte Operation will transition to satellite areas to allow continued production at current levels. Late in the project life (e.g. 2025 to 2040) approximately 58 acres of significant disturbance will exist beneath the footprint of the three satellite facilities. |
| Land Use Impacts | Loss of crop and cattle production on 1,320 acres of the NTEA, on 671 acres of the TCEA and on 562 acres of the MEA. | Crop production and cattle production would be reduced by a total of 2553 acres late in the project (e.g. 2025 to 2040). This represents less than a 0.4% reduction of the total for Dawes County. |
| Transportation Impacts | For each satellite area minimal impact on current traffic levels. Estimated additional heavy truck traffic of 500 trips per year; additional 6-8 vehicle trips per day. | The existing Crow Butte Operation will transition to satellite areas to allow continued production at current levels. Late in the project life (e.g. 2025 to 2040) when all three satellite facilities and existing operation will have varying levels of activity, at maximum the heavy truck traffic and additional vehicle traffic will double to 1000 trips per year and 12-16 trips per day, respectively. |
| Geology and Soil Impacts | None. | None. |
| Surface Water Impacts | None. | None. |
| Groundwater Impacts | Consumption of Chadron groundwater for control of mining solutions and restoration (estimated at 50 gpm average). | The existing Crow Butte Operation will transition to satellite areas to allow continued production at current levels. Late in the project life (e.g. 2025 to 2040) when all three satellite facilities and existing operation will have varying levels of activity, additional widely separated consumption of Chadron groundwater will occur. |
| Ecological Impacts | No substantive impairment of ecological stability or diminishing of biological diversity. | The NTEA and TCEA are predominantly used as cropland. The MEA is primarily open rangeland and is some distance away. As such no increased impairment of ecological stability or biological diversity is anticipated on a cumulative basis. |
| Air Quality Impacts | Additional dust emissions of 14.5 tons per year total for the NTEA, 16.9 tons per year total for the TCEA and 23.7 tons per year total for the MEA due to vehicle traffic on gravel roads. | The existing Crow Butte Operation will transition to satellite areas to allow continued production at current levels. Late in the project life (e.g. 2025 to 2040) when all three satellite facilities and existing operation will have varying levels of activity, the maximum cumulative dust emissions will be dispersed and less than 55.1 tons per year. The cumulative dust emissions will not jeopardize NAAQS attainment status in the region. |

Table 1 Cumulative Additional Impacts of North Trend, Three Crow and Marsland Expansion Areas (September 14, 2012)

| | | |
|--------------------------------|--|---|
| Noise Impacts | Barely perceptible increase over background noise levels in the area. | On a cumulative basis the sources of noise will be widely dispersed and barely perceptible over the background noise, especially the heavy train traffic in the vicinity of the sites. |
| Historic and Cultural Impacts | None. | None. |
| Visual /Scenic Impacts | Moderate impact; noticeable minor industrial component in sensitive viewing areas. | On a cumulative basis the visual/scenic impacts will not increase as the sites are dispersed and the rolling terrain restricts or prevents simultaneous line of site viewing of multiple facilities. |
| Socioeconomic Impacts | Extension of the current annual direct economic impact of \$10.4M plus the addition of \$5.3M to \$6.1M annual direct economic impact to the local area. | The existing Crow Butte Operation will transition to satellite areas to allow continued production at current levels. Late in the project life (e.g. 2025 to 2040) when all three satellite facilities and existing operation will have varying levels of activity, employment will increase somewhat above the estimates provided for each individual satellite facility. The cumulative level of employment will be satisfied locally with only nominal impact on local services. |
| Nonradiological Health Impacts | None. | None. |
| Radiological Health Impacts | The Total Effective Dose Equivalent (TEDE) for the highest exposure near the NTEA is 31.7 mrem per year. The TEDE for the highest exposure near the TCEA is 32.3. The TEDE for the highest exposure near MEA is 79.5. All of these exposures are less than the annual dose limit of 100mrem/year found at 10 CFR §20.1301. | For residents in the vicinity of the current Crow Butte Operation, the NTEA and the TCEA, the cumulative TEDE for all simultaneous operations was presented in Table 4.12-1 of the TCEA application. Table 4.12-1 demonstrates that the annual dose limit of 100mrem/year found at 10 CFR §20.1301 will be attained. Marsland is sufficiently distant that it will contribute only 0.5mrem/year in the vicinity of Crawford. |
| Waste Management Impacts | Generation of additional liquid and solid waste for proper disposal | On a cumulative basis, the local and remote waste disposal capacity will remain adequate. |
| Mineral Resource Impacts | Recover and use of a vital domestic energy resource. | None. |

Table 2 Unavoidable Cumulative Environmental Impacts (September 14, 2012)

| Impact | Estimated Cumulative Impact | Mitigation Measures |
|---|---|---|
| <i>Use of Natural Resources</i> | | |
| Temporary Land Surface Impacts (acres) | Significant land surface impacts to approximately 58 acres for the satellite plants; minimal disturbance to remaining wellfield acreage impacted for the duration of the project. | Sediment and topsoil management during construction and operation; Surface reclamation following operational activities to return surface to pre-operational condition. |
| Temporary Land Use Impacts | Restriction of agricultural use of proposed sites; restricted access for the duration of the project. | Surface reclamation following operational activities to return surface to pre-operational use. |
| Lost cattle production (\$/yr.) | Up to \$42,222 | Compensation to landowners through surface leases and/or mineral royalties. |
| Lost crop production (\$/yr) | Up to \$51,200 | Compensation to landowners through surface leases and/or mineral royalties. |
| Groundwater consumption in Basal Chadron Formation (net gpm) | 50 | None |
| Groundwater quality impacts | Temporary impacts to groundwater quality in the basal sandstone of the Chadron Formation mining zone. | Proven groundwater restoration following mining to return Chadron groundwater quality to baseline or pre-operational water uses. |
| Visual and scenic impacts | Noticeable minor industrial component in existing agricultural/rural landscape; VRM Class III objectives met. | Use of harmonizing colors; use of existing vegetation and topography; avoidance of straight line site roads to follow topography; removal of construction debris. |
| <i>Emissions</i> | | |
| Dust emissions (tons/yr.) | 55.1 | Dust control measures implemented where appropriate. |
| <i>Radiological Impacts</i> | | |
| Additional maximum predicted dose (mrem/yr.) | 32.3 (TCLA nearby resident) 20.9 (MEA nearby resident) | None |
| Highest dose rate at cities and towns within an 80 km radius of the combined Crow Butte NLEA and TCLA at Crawford, NE (mrem/yr) | 2.6 | None |
| Highest dose rate at cities and towns within an 80 km radius of the MEA at Marsland and Hemmingford, NE (mrem/yr) | 0.9 | None |

Table 2 Unavoidable Cumulative Environmental Impacts (September 14, 2012)

| Impact | Estimated Cumulative Impact | Mitigation Measures |
|---|------------------------------------|----------------------------|
| <i>Socioeconomic Impacts</i> | | |
| Employment | | |
| Maximum additional full time employment | 15 to 18 | None |
| Additional contractor employment | 6 to 10 | None |
| Part time and contractor employment (during satellite construction) | 15 to 22 | None |
| Additional CBR payroll (\$/yr.) | \$600,000 to \$720,000 | None |
| Taxes Paid (\$/yr.) | \$1,000,000 to \$1,200,000 | None |
| Local purchases | \$3,650,000 to \$4,350,000 | None |
| <i>Waste Management Impacts</i> | | |
| Wastewater (gpm) | 150 | None |
| Solid waste produced (yd ³ /yr.) | 2100 | None |
| 11(e)2 byproduct waste produced (yd ³ /yr.) | 180 | None |

Attachments

CROW BUTTE RESOURCES, INC.

**Environmental Report
North Trend Expansion Area**



Table 2-2: Comparison of Predicted Environmental Impacts

| Impacts of Operation | No-Action Alternative | Preferred Alternative | Process Alternatives | |
|--------------------------------|--|--|--------------------------------|--|
| | | | Alternate Lixiviant Chemistry | Alternate Waste Management |
| Air Quality Impacts | None | Additional 14.5 tons per year total dust emissions due to vehicle traffic on gravel roads. | Same as Preferred Alternative. | Same as Preferred Alternative. |
| Noise Impacts | None | Barely perceptible increase over background noise levels in the area. | Same as Preferred Alternative. | Same as Preferred Alternative. |
| Historic and Cultural Impacts | None | None | None | None |
| Visual/Scenic Impacts | None | Moderate impact; noticeable minor industrial component in sensitive viewing areas. | Same as Preferred Alternative. | Same as Preferred Alternative plus possible long term visual and scenic impacts from on-site disposal cell for 11(e)2 byproduct material |
| Socioeconomic Impacts | Eventual loss over the next 5 to 10 years of positive economic impact of \$8.95M to the local area as reserves deplete in the current licensed operation | Extension of the current annual direct economic impact of \$8.95M plus the addition of between \$5.05M and \$6.03M annual direct economic impact to local area | Same as Preferred Alternative. | Same as Preferred Alternative. |
| Nonradiological Health Impacts | None | None | None | None |
| Radiological Health Impacts | None | 12 % increase in estimated maximum dose from additional radon gas released at North Trend. | Same as Preferred Alternative. | Same as Preferred Alternative. |

CROW BUTTE RESOURCES, INC.



**Environmental Report
North Trend Expansion Area**

Table 2-2: Comparison of Predicted Environmental Impacts

| Impacts of Operation | No-Action Alternative | Preferred Alternative | Process Alternatives | |
|-----------------------------------|---|--|---|--|
| | | | Alternate Lixiviant Chemistry | Alternate Waste Management |
| Waste Management Impacts | None | Generation of additional liquid and solid waste for proper disposal. | Same as Preferred Alternative. Mobilization of additional hazardous elements in lixiviant requiring disposal. | Same as Preferred Alternative. Potential additional long term impact from on-site disposal of 11(e)2 byproduct material. |
| Mineral Resource Recovery Impacts | Loss of a valuable domestic energy resource. CBR estimated reserves are under development but the current estimated recoverable resource is \$2.0 million pounds with a current spot market value of \$160 million. | Recovery and use of a domestic energy resource. | Same as Preferred Alternative. | Same as Preferred Alternative. |



Table 2.6-1 Comparison of Predicted Environmental Impacts

| Impacts of Operation | No-Action Alternative | Preferred Alternative | Process Alternatives | |
|--------------------------|-----------------------|--|---|--|
| | | | Alternate Lixiviant Chemistry | Alternate Waste Management |
| Land Surface Impacts | None | Minimal temporary impacts in wellfield areas, significant surface and subsurface disturbance confined to a portion of the 14 acre satellite facility site. | Same as Preferred Alternative. | Same as Preferred Alternative. Potential additional impacts from land application of treated waste water. |
| Land Use Impacts | None | Loss of crop and cattle production in 671 acre area for duration of project. | Same as Preferred Alternative. | Same as Preferred Alternative plus a potential long term land use impact from on-site disposal of 11(e)2 byproduct material. |
| Transportation Impacts | None | Minimal impact on current traffic levels. Estimated additional heavy truck traffic of 500 trips per year; additional 6 - 8 VTPD light duty trucks. | Same as Preferred Alternative. | Same as Preferred Alternative. |
| Geology and Soil Impacts | None | None | None | None |
| Surface Water Impacts | None | None | None | None |
| Groundwater Impacts | None | Consumption of Chadron groundwater for control of mining solutions and restoration (estimated at 50 gpm average) | Same as Preferred Alternative. Increased difficulty with groundwater restoration and stabilization. | Same as Preferred Alternative. |
| Ecological Impacts | None | No substantive impairment of ecological stability or diminishing of biological diversity. | Same as Preferred Alternative. | Same as Preferred Alternative. |



Table 2.6-1 Comparison of Predicted Environmental Impacts

| Impacts of Operation | No-Action Alternative | Preferred Alternative | Process Alternatives | |
|--------------------------------|--|--|--------------------------------|---|
| | | | Alternate Lixiviant Chemistry | Alternate Waste Management |
| Air Quality Impacts | None | Additional 16.9 tons per year total dust emissions due to vehicle traffic on gravel roads. | Same as Preferred Alternative. | Same as Preferred Alternative. |
| Noise Impacts | None | Barely perceptible increase over background noise levels in the area. | Same as Preferred Alternative. | Same as Preferred Alternative. |
| Historic and Cultural Impacts | None | None | None | None |
| Visual/Scenic Impacts | None | Moderate impact; noticeable minor industrial component in sensitive viewing areas. | Same as Preferred Alternative. | Same as Preferred Alternative plus possible long term visual and scenic impacts from on-site disposal cell for U(e)2 byproduct material |
| Socioeconomic Impacts | Eventual loss over the next 5 to 10 years of positive economic impact of \$13.9M to the local area as reserves deplete in the current licensed operation | Extension of the current annual direct economic impact of \$13.9M plus the addition of between \$5.3M and \$6.3M annual direct economic impact to local area | Same as Preferred Alternative. | Same as Preferred Alternative. |
| Nonradiological Health Impacts | None | None | None | None |
| Radiological Health Impacts | None | 22% increase in estimated maximum dose from additional radon gas released at Three Crow. | Same as Preferred Alternative. | Same as Preferred Alternative. |



Table 2.6-1 Comparison of Predicted Environmental Impacts

| Impacts of Operation | No-Action Alternative | Preferred Alternative | Process Alternatives | |
|-----------------------------------|---|--|---|--|
| | | | Alternate Lixiviant Chemistry | Alternate Waste Management |
| Waste Management Impacts | None | Generation of additional liquid and solid waste for proper disposal. | Same as Preferred Alternative. Mobilization of additional hazardous elements in lixiviant requiring disposal. | Same as Preferred Alternative. Potential additional long term impact from on-site disposal of 11(e)2 byproduct material. |
| Mineral Resource Recovery Impacts | Loss of a valuable domestic energy resource. CBR estimated reserves are under development but the current estimated recoverable resource is 5.0 million pounds with a current spot market value of \$225 million. | Recovery and use of a domestic energy resource. | Same as Preferred Alternative. | Same as Preferred Alternative. |

Table 2.6-1 Comparison of Predicted Environmental Impacts

| Impacts of Operation | No-Action Alternative | Preferred Alternative | Process Alternatives | |
|-------------------------------|-----------------------|--|---|--|
| | | | Alternate Lixiviant Chemistry | Alternate Waste Management |
| Land Surface Impacts | None | Minimal temporary impacts in wellfield areas, significant surface and subsurface disturbance confined to a portion of the ~12 acre satellite facility site. | Same as Preferred Alternative. | Same as Preferred Alternative. Potential additional impacts from land application of treated waste water. |
| Land Use Impacts | None | Loss of crop and cattle production in 562 acre area for duration of project. | Same as Preferred Alternative. | Same as Preferred Alternative plus a potential long term land use impact from on-site disposal of 11(e)2 byproduct material. |
| Transportation Impacts | None | Minimal impact on current traffic levels. Estimated additional heavy truck traffic of 500 trips per year; additional 6 – 8 VTPD light duty trucks. | Same as Preferred Alternative. | Same as Preferred Alternative. |
| Geology and Soil Impacts | None | None | None | None |
| Surface Water Impacts | None | None | None | None |
| Groundwater Impacts | None | Consumption of Chadron groundwater for control of mining solutions and restoration (estimated at 50 gpm average) | Same as Preferred Alternative. Increased difficulty with groundwater restoration and stabilization. | Same as Preferred Alternative. |
| Ecological Impacts | None | No substantive impairment of ecological stability or diminishing of biological diversity. Additional 23.7 tons per year total dust emissions due to vehicle traffic on gravel roads. | Same as Preferred Alternative. | Same as Preferred Alternative. |
| Air Quality Impacts | None | Barely perceptible increase over background noise levels in the area. | Same as Preferred Alternative. | Same as Preferred Alternative. |
| Noise Impacts | None | None | None | None |
| Historic and Cultural Impacts | None | None | None | None |

Note: From Marland Expansion Area Application

Table 2.6-1 Comparison of Predicted Environmental Impacts

| Impacts of Operation | No-Action Alternative | Preferred Alternative | Process Alternatives | |
|-----------------------------------|--|--|---|---|
| | | | Alternate Lixiviant Chemistry | Alternate Waste Management |
| Visual/Scenic Impacts | None | Moderate impact; noticeable minor industrial component in sensitive viewing areas. | Same as Preferred Alternative. | Same as Preferred Alternative plus possible long term visual and scenic impacts from on-site disposal cell for 11(e)2 byproduct material. |
| Socioeconomic Impacts | Eventual loss over the next 5 to 10 years of positive economic impact of \$10.4M to the local area as reserves deplete in the current licensed operation | Extension of the current annual direct economic impact of \$10.4M plus the addition of between \$5.3M and \$6.1M annual direct economic impact to local area | Same as Preferred Alternative. | Same as Preferred Alternative. |
| Nonradiological Health Impacts | None | None | None | None |
| Radiological Health Impacts | None | The estimated additional maximum dose rate within 80 km of MLA was 1.6 person-rem/yr and 0 person-rem/yr beyond 80 km | Same as Preferred Alternative. | Same as Preferred Alternative. |
| Waste Management Impacts | None | Generation of additional liquid and solid waste for proper disposal. | Same as Preferred Alternative. Mobilization of additional hazardous elements in lixiviant requiring disposal. | Same as Preferred Alternative. Potential additional long term impact from on-site disposal of 11(e)2 byproduct material. |
| Mineral Resource Recovery Impacts | Loss of a valuable domestic energy resource. CBR estimated reserves are under development but the current estimated recoverable resource is 9.5 million pounds with a current spot market value (8/2011) of \$475 million. | Recovery and use of a domestic energy resource. | Same as Preferred Alternative. | Same as Preferred Alternative. |