| Table B-2. 2016 Regulatory Gaps Analysis Tables – Current Status Summary | | | | | | | | |
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| Faro Mine Remediation Project | | | | | | | | |
| Activity Code | Data or Information Gap | Rationale | | Importancea | Actions Required to Address Gap | Actions Completed to Address Gap | Changes in Scope | Remaining Gaps |
| ***R05.02.02 - Hydrogeology*** | | | | | | | | |
| R05.02.02a | Delineate the extent of surface water or groundwater interaction at each of the major groundwater seepage sites, including spatial and temporal variability. | This information is critical to improving the understanding of site conditions in the following areas:   * Quantify the magnitude of sulphate- and metals-loading from groundwater-seepage sites to target surface streams, such as North Fork/Rose Creek (NFRC), Vangorda Creek, and the Rose Creek Tailings Impoundment * Provide calibration targets for groundwater flow model(s) developed to support design efforts to ensure that the numerical tools adequately replicate the observed stream and aquifer interaction * Support the evaluation of changes in groundwater discharge to streams in winter and the potential effects on fish-rearing conditions * Provide flow data to evaluate the effect that groundwater interception may have on reducing stream flows under low-flow conditions * Provide vertical hydraulic gradient information in the vicinity of steam reaches where lining is being considered, a necessary consideration in development of the liner design | | 1 | Perform potentiomanometer investigations to collect in-stream data to map gaining and losing reaches of the major streams within the FMC (CVD completed 2013). Install pressure transducers in monitoring wells adjacent to target stream reaches (preferably monitoring well clusters). Drill additional wells if existing wells do not exist in critical locations.  Establish stream-stage monitoring stations on target stream reaches.  Complete survey of all culverts for accurate comparison of groundwater elevations and stream-stage conditions.  Additional wells needed in the Vangorda, Grum, Zone 2 Outwash, and S-wells areas. | Potentiomanometer investigations in NFRC completed in 2013 and 2014 (CH2M February 2014q), (CH2M March 2015u)  WL transducers installed in wells adjacent to NFRC at S-wells and Zone II Outwash (CH2M March 2015t), (CH2M March 2015u) and RCDC (2015 NFRC DBR GW appendix) (CH2M February 2014q)  Stream stage monitoring stations established in NFRC adjacent to S-wells and Zone II Outwash (CH2M March 2015t), (CH2M March 2015u), and in RCDC adjacent to Secondary Tailings Impoundment (2015 NFRC DBR GW appendix) | Vangorda and Grum mine areas removed from project scope in spring, 2014.  Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.  Design concept for NFRC refined in 2014 / 2015. Existing creek channel to become a seepage collection channel, negating requirement for design of interception systems at Zone II Outwash and S-Wells SIS. | Delineate the extent of surface water or groundwater interaction at Vangorda, Grum and Lower Guardhouse Creek, including spatial and temporal variability. |
| R05.02.02b | Delineate the properties of the aquifer system in the vicinity of the planned groundwater interception systems. | An accurate characterization of site aquifer property distribution is necessary to design a groundwater interception system. This data help determine the geometry of the following interception infrastructure concerns:   * Spacing of extraction wells * Need for and extent of permeable trenches * Need for and extent of associated low-permeability barrier systems * Interception flows delivered to a treatment plant | | 1 | Perform aquifer testing in each area where groundwater interception is planned (CVD completed 2013). More data collection will be required in areas, such as the Grum and Vangorda dumps, where little data currently exists. Less data will be required at the S-Wells and Zone II outwash areas.  Operational data will be used in areas where the groundwater extraction system currently operates (S-Wells and ETA) to estimate aquifer properties. | Specific capacity testing completed in new well installations at Zone II Outwash and S-wells in 2014 (CH2M March 2015t), (CH2M March 2015u)  Aquifer testing completed at the proposed NFRC seepage collection dam area downstream of S-wells and at the east limb of the Secondary tailings impoundment Dam. (2015 NFRC DBR GW `)  Aquifer testing and GW modelling completed downstream of the CVD at the proposed location of the CVD SIS. (CH2M HILL, 2014e, 2014i, 2015gg) | Same as above. | Delineate the properties of the aquifer system in the vicinity of the planned groundwater interception systems at Lower Guardhouse Creek, Vangorda WRD and Grum WRD. |
| R05.02.02c | Define bedrock topography and saturated alluvial thickness in areas where groundwater interception is planned. | A detailed depiction of the bedrock surface and the thickness of available saturated alluvium are both critical elements to the design of a high-efficiency groundwater interception system. The bedrock topography will define the target extraction well depths and permeable trench configuration, and will influence the design approach of any low-permeability hydraulic barriers that may be included in the design. The saturated thickness of the target aquifer may constrain the operational strategy of the interception system and place limitations on available extraction rates. | | 1 | Perform geophysical surveys in the vicinity of the interception system alignments (CVD completed in 2013). Drill soil borings to correlate geophysical data. | Geophysical surveys and coincident borings completed at the S-Wells (CH2M March 2015u), Zone II Outwash (CH2M March 2015t), proposed NFRC seepage collection pond area and east limb of the Secondary tailings impoundment Dam (2015 NFRC DBR GW appendix).  Field investigation conducted for CVD SIS included borings to bedrock and geophysical survey (CH2M HILLL, 2014q) | Same as above. | Define bedrock topography and saturated alluvial thickness in remaining areas where groundwater interception is planned. (requires further development of PP to define locations) |
| R05.02.02d | Delineate the 3D extent of the target areas for hydraulic capture at each planned groundwater interception area. | A refined delineation of the 3D extent of the site COCs that require hydraulic capture is needed to develop a highly effective groundwater interception system. | | 1 | Drill additional monitoring wells where data gaps exist in the monitoring network. The Vangorda/ Grum area will require a greater extent of investigation. The S-wells and Zone II outwash areas have a greater number of existing monitoring wells and will require fewer additional wells to complete delineation of the target zone. | Monitoring wells installed since 2012 include:   * 7 Wells at toe of CVD (CH2M February 2014q) * 1 Well in the Outer Haulroad West WRD between the Intermediate WRD and the S-Wells (CH2M October 2013b) * 1 Well in the Main WRD (CH2M October 2013b) * 1 Well in the Northeast WRD (2014 SW-015 Report) * 2 Wells in the Grum WRD (CH2M October 2013b) * 1 Well in the Vangorda WRD (CH2M October 2013b) * 15 Wells along RCDC downstream of fuse plug (CH2M February 2014q) * 3 Wells in the north portion of the Intermediate Tailings impoundment (CH2M February 2014q) * 3 Wells in the Original Tailings Impoundment at the mouth of the ETA canyon (CH2M March 2015b) * 4 Wells between the S-wells SIS and the NFRC (CH2M March 2015u) * 2 Wells downstream of the Rock Drain and upstream of the S-Wells (CH2M March 2015u) * 11 Wells downstream of the S-wells (2015 DBR GW appendix) * 6 Wells in the Zone II Outwash (CH2M March 2015t Report) * 2 Wells downstream of the Zone II Outwash (CH2M March 2015t) * 6 Wells below the Northeast WRD (2015 DBR GW appendix) * 6 Wells at the Secondary Tailings Impoundment Dam East Limb (2015 DBR GW appendix) | Vangorda and Grum mine areas removed from project scope in spring, 2014.  Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.  Design concept for NFRC refined in 2014 / 2015. Existing creek channel to become a seepage collection channel, negating requirement for design of interception systems at Zone II Outwash and S-Wells SIS. | Delineate the 3D extent of the target areas for hydraulic capture at Lower Guardhouse Creek, Vangorda WRD and Grum WRD |
| R05.02.02e | Delineate permafrost at the Faro Mine, Grum, and Vangorda areas. | The presence of massive or discontinuous permafrost in the groundwater system has a significant influence on groundwater flow directions and rates, and the surface water and groundwater interaction. The design of an effective SIS system requires knowledge of permafrost in the immediate area of the system. Permafrost may also alter contaminant migration pathways and require modification to groundwater monitoring network designs. | | 1 | Perform geophysical surveys in the vicinity of proposed SIS installations to assist in identifying permafrost in those areas. | Geophysical surveys performed at toe of CVD (CH2M February 2014q Report), ETA (105.2), Zone II (CH2M March 2015t), S-wells (CH2M March 2015u), | Same as above. | Delineate permafrost at Lower Guardhouse Creek, Grum WRD, Vangorda WRD |
| ***R05.03.02 - Hydrology*** | | | | | | | | |
| R05.03.02a | Conduct cross-section field surveys. | The hydrologic and hydraulic models will require detailed cross-sectional information for all creeks and diversions so that the models can be accurately constructed. This is particularly important since the accuracy of the model is related to the accuracy of water-level predictions, peak flow rates, and erosion potentials, as well as water quality. | | 1 for engineering; 3 for regulatory YESAB requirements | Complete cross section field surveys of creek and ditch channels that were under water during LIDAR aerial mapping. | Cross section surveys have been completed in the following creeks and diversions since 2012:   * RCDC (CH2M March 2015n) * SFRC (CH2M March 2015i), (NFRC DBR Hydrology Appendix) * NFRC (CH2M March 2015i), (NFRC DBR Hydrology Appendix) * FCD (CH2M March 2015k), (2015 TA020 RGA) * Upper Guardhouse Creek (CH2M March 2015j), (2015 TA020 RGA) * NWID (CH2M March 2015j), (2015 TA020 RGA) * Vangorda Creek Diversion (CH2M March 2014d) | Vangorda and Grum mine areas removed from project scope in spring, 2014.  Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. | None (assumes no additional work will be required as result of PP development) |
| R05.03.02b | Assess creek and diversion (all waterways) bed material and bank material for stability. | The size of the material that comprises the creek or diversion bed and side slopes to the flood levels is integral to proper model calibration (roughness coefficients). The material that makes up the channel has a significant impact on the conveyance capacity and the flow velocities that contribute to erosion potential. | | 1 for engineering; 3 for regulatory YESAB requirements | Complete field surveys, included in the engineering data gaps. | Qualitative bed and bank material characterization completed in the following creeks and diversions:   * NFRC (NFRC DBR Hydrology Appendix) (CH2M March 2016b) * Faro Creek Diversion East Valley and Faro Creek Diversion West Valley Interceptor Ditch (CH2M March 2015j) * Lower Guardhouse Creek (CH2M March 2015k) * North Wall Interceptor Ditch and Upper Guardhouse Creek (CH2M March 2015j) | Same as above. | Bed and bank material characterization required for RCD, SFRC, VCD, Vangorda Creek, Run-off Interceptor Ditch to Dixon Creek |
| R05.03.02c | Assess soils types in creek and diversion areas. | This is required to better define infiltration components in the hydrology model. The interaction of surface water and groundwater is key to understanding channel base flows and water quality under low-flow conditions. | | 1 for engineering; 3 for regulatory YESAB requirements | Complete field surveys to determine surficial soils and local geology, included in the engineering data gaps. | Surficial materials characterized by borings, test pits, geophysical surveys and geological reconnaissance completed for engineering investigations. | Same as above. | None  (Note that NFRC DBR recommends additional field work downstream of Mine Access Road) |
| R05.03.02d | Monitor pre-closure water flow at specific hydrology points in each of the major drainage channels. | Required for the calibration of the hydrology model. Calibration of the model under rainfall conditions is key to the success of extrapolating the model to determine flows under large theoretical events conditions, such as the 500-year-return rainfall and the probable maximum precipitation event. The results are also key to establishing the rates of groundwater seepage or groundwater infiltration, since they indicate the availability of surface water under low-flow conditions to support habitats and vegetation. | | 1 (YESAB 4.1.10) | Develop a monitoring plan that includes monitoring locations, parameters, and frequency and protocols for sampling. | Additional continuous flow monitoring stations installed to supplement existing monitoring plan as detailed in:   * *2014 Hydrology Field Program Report* (CH2M, February 2015a) * *Surface Water Data Processing Report* (CH2M, March 2015ii) * *Summary of 2014 Field Investigation – Site-Wide Surface Water Monitoring* (CH2M, March 2015dd) * *North Fork Rose Creek Hydrology/Hydraulics Report (Appendix D of Design Basis Report;* CH2M, March 2016i) | Same as above. | Rating curves not yet established for new continuous flow monitoring stations. Updates to existing rating curves required to account for changes in channel morphology and to supplement range of recorded events (emphasis on capturing large runoff events such as freshet). |
| R05.03.02e | Develop information from downstream of the mine site to establish baseline conditions. This could include hydrology components of flows and water-surface elevations under various return periods, TSS primarily from a hydrology perspective, and socio-economic parameters from a water-use perspective. | Baseline required to determine impacts to Value Components (VC). The project will need to establish the temporal and spatial requirements of the hydrology VCs and potential effects of the project. | | 1 (YESAB 6.3.2 and 6.3.3 indicate the need for baseline information on effects integrated across VCs; because hydrology was not identified as a VC in the past, this effort may be significant) | Develop field studies and monitoring plan to augment existing data as part of the engineering analysis. Existing information needs to be entered into spatial and temporal context. | None | Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. | Develop field studies and monitoring plan to augment existing data as part of the engineering analysis. Existing information needs to be entered into spatial and temporal context. |
| R05.03.02f | Monitor the pre-closure downstream TSS outside of the area-wide site. Selected sites should be designated at key locations within the local site areas, as well, to gauge areas for TSS load. | Required to develop a database of baseline suspended solids loading downstream of the mine site and at selected key locations for Faro, Vangorda, and Rose Creek diversions. Other critical areas that have a high risk of slope failure should be monitored. This will allow for performance monitoring later in the maturation of the reclaimed areas and forms part of the AMP triggers. | | 1 (YESAB 4.1.10) | Develop a monitoring plan that includes monitoring locations, parameters, and frequency and protocols for sampling. | None | Same as above. | All work remains |
| R05.03.02g | Collect rainfall data for Faro and Vangorda sites during all phases of activity and post-closure. | Rainfall data will be required to support the hydrologic model calibration efforts and to correlate rainfall event IDF with concurrent monitored stream flows. Continuation during construction allows monitoring of TSS and flows to be correlated to rainfall events, and triggers to be set for managing water flow or runoff onsite during construction. After construction, the information will be used to continually improve the modelling calibration as part of the AMP. | | 1 (YESAB 4.15) | Develop a monitoring plan that includes a review of current monitoring sites and protocols and a description of future requirements. | Meteorological data from Faro station collected and processed as detailed in:   * *Surface Water Data Processing Report* (CH2M, March 2015ii) * *North Fork Rose Creek Hydrology/Hydraulics Report (Appendix D of Design Basis Report;* CH2M, March 2016i)   Meteorological data from Faro Airport compiled for comparison with FMC data | Same as above. | Ongoing operations and maintenance of meteorological stations to confirm conformance with manufacturer’s requirements. |
| ***R05.04.02 - Surface Water Quality and Aquatic Ecosystem*** | | | | | | | | |
| R05.04.02a (Task 1)  R05.04.02b (Task 2) | Define aquatic species-at-risk. | This is a requirement for the Project Proposal. Previous definitions exist for plants, birds, and wildlife, but are lacking for aquatic species (for example, aquatic plants, fish, invertebrates, and amphibians). | | 1 | Task 1: Review Yukon species-at-risk lists, and identify any species that could be present within the project area based on distribution and preferred habitat.  Task 2: If there are any species-at-risk at Faro, undertake a field survey; produce an Aquatic Species-at-Risk Report (primary deliverable); and summarize results for the baseline chapter of the Project Proposal (secondary deliverable). | None | Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. | All work remains |
| R05.04.02c | Update the benthic invertebrate baseline description and current impacts. | The Executive Committee Project Proposal (Hardrock Mining) requires an inventory of benthic invertebrates and baseline data for affected drainages, including, where applicable, sample site descriptions, species abundance, spatial distribution, taxonomy, and biomass. There are deficiencies associated with the AECOM baseline descriptions and Chapter 4 of the draft Project Proposal that summarize key baseline information. Also, there is additional information available now that should be incorporated. Mainly, existing data are old and will need to be updated to reflect current baseline conditions.  The benthic invertebrate impact assessment (CABIN approach) by DeGraff (2010) lacked supporting details, such as a statistical model or reference-area characteristics, and the production quality of Appendix 4 is almost illegible. Baseline data should be presented in quantitative format to allow for quantitative future comparisons to baseline conditions. | | 1 | Conduct benthic invertebrate community and biomass surveys. Implement recommendations by Minnow (2010a) and Laberge (2010), particularly with respect to inclusion of more reference areas and appropriate statistical analyses.  Sample up to six stations along the North Fork Rose Creek and Rose Creek diversion for baseline data to support monitoring associated with the fisheries compensation plan (community and biomass analysis) and risk assessment (tissue metals). | Benthic sampling program in 2014. Reported in: Minnow Environmental Inc. (Minnow). March 2015. *DRAFT Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014.* Report Prepared for: CH2M HILL. March.  Under separate contract with YG, Minnow prepared data interpretation; report not provided to CH2M HILL. | Same as above. | Updating of data if needed to address regulatory requirements for specific PP projects. |
| R05.04.02d | Prepare periphyton baseline description and current impacts. | The Executive Committee Project Proposal (Hardrock Mining) requires an inventory of periphyton baseline data for affected drainages, including, where applicable, sample site descriptions, species abundance, spatial distribution, taxonomy, biomass, and chlorophyll contents. However, no data or discussions were included in the AECOM baseline or in the draft Project Proposal. Biomass and chlorophyll-a estimates are also important for fisheries compensation planning and follow-up monitoring. A periphyton community survey was done by DeGraff (2010) but lacked interpretation and supporting details (e.g., explanation of statistical model and reference-area locations and characteristics), and the production quality of Appendix 4 is almost illegible. Most existing data are old and will need to be updated to reflect current baseline conditions. | | 1 | Collect samples for the periphyton community at same locations as for benthic invertebrates (30 areas) to allow for assessment of current effects through statistical reference-exposure comparisons. Collect periphyton samples from six near-field areas for analysis of tissue concentrations, biomass, and chlorophyll-a. | Periphyton sampling program in 2014. Reported in: Minnow Environmental Inc. (Minnow). March 2015. *DRAFT Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014.* Report Prepared for: CH2M HILL. March.  Under separate contract with YG, Minnow prepared data interpretation; report not provided to CH2M HILL. | Same as above. | Updating of data if needed to address regulatory requirements for specific PP projects. |
| R05.04.02e | Update fisheries baseline description, and fill information gaps. | Fish are an important VC. Good baseline information is required to complete a defensible impact assessment and provide a basis for quantitative future comparisons. Past studies largely focussed on fisheries in the immediate mine area only, were not quantitative (densities), are missing information on seasonal utilization patterns, and lack regional context. Little fisheries data exists for Rose and Anvil Creeks downstream of X14. | | 1 | Conduct field survey work to develop density estimates and fill in gaps respecting seasonal utilization patterns and aquatic habitat characteristics in ponds and pools used by fish. Some aspects addressed by 2012-2013 fish telemetry programs. | Fisheries sampling program in 2014. Reported in: Minnow Environmental Inc. (Minnow). March 2015. *DRAFT Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014.* Report Prepared for: CH2M HILL. March.  Fish habitat investigation completed by EDI in 2014, in association with the fish telemetry program. Environmental Dynamics Inc. (EDI). March 2015a. *Arctic Grayling Telemetry & Fish Habitat Investigations, Faro Mine, 2012-2014.* (Final). Prepared for CH2M HILL Canada Limited (CH2M HILL). March 25.  Under separate contract with YG, Minnow prepared data interpretation; report not provided to CH2M HILL. | Same as above. | Updating of data if needed to address regulatory requirements for specific PP projects. |
| ***R05.06.02 - Fish Habitat Compensation*** | | | | | | | | |
| R05.04.02a | Fill in gaps for detailed fish habitat mapping (e.g., spawning, rearing, and over-wintering areas) and characterization (e.g., substrate composition) information on the creeks, focussing on Arctic grayling and Chinook salmon (likely VCs or indicator species for the EA). | There are types of fish habitat present that are not fully documented or quantified. For example, information is missing about fish overwintering in areas where surface water quality is currently impacted and where winter water quality is worse than at other times of the year. With the fish habitat compensation measures to be implemented, need to study if fish could be impacted if we create areas where opportunity for fish exposure is higher than it is currently. | | 1 | Conduct fish habitat field surveys. Some aspects addressed by 2012-2013 fish telemetry programs. | Habitat surveys were conducted during the fish telemetry study (EDI March 2015) at locations where:   * Spring spawning was suspected based on the presence of spawning-stage fish or disturbed substrate; and, * Summer feeding was suspected based on the presence of radio tagged adult grayling. | Vangorda and Grum mine areas removed from project scope in spring, 2014.  Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. | Habitat surveys in areas that may be affected by any off-site proposed habitat compensation programs. |
| R05.04.02b | Fill in gaps for quantitative information about the determination of seasonal and local fish population densities, habitat use, and migration relative to regional population characteristics and habitat availability and accessibility. | The use of fish habitat is not fully documented or quantified in creeks that may be affected by the FMRP. Further characterization is needed to understand baseline conditions and support development of fish habitat compensation plans. Information regarding nearby unaffected areas is also required to provide context about compensation needs and how compensation efforts are likely to perform. | | 1 | Use radio-telemetry to track seasonal movements, home range, and habitat preferences of grayling over 1-2 years. (in process 2013) | Radio tags deployed in 35 and 37 arctic grayling in the Rose Creek Watershed in 2012 and 2013 respectively.  Tags were tracked in Spring, Summer and Winter  Fish habitat investigation completed by EDI in 2014, in association with the fish telemetry program. Environmental Dynamics Inc. (EDI). March 2015a. *Arctic Grayling Telemetry & Fish Habitat Investigations, Faro Mine, 2012-2014.* (Final). Prepared for CH2M HILL Canada Limited (CH2M HILL). March 25. | Same as above. | Information about fish use in areas that may be affected by any off-site proposed habitat compensation programs. |
| R05.04.02c | Fill in gaps for information on seasonal surface-water levels, flow patterns and needs, DO and temperature profiling, and groundwater inflow locations and flow measurement in the local study area. | This engineering data is needed for replacement stream design. | | 1 | Undertake field surveys and continue for one full field season. | Continuous surface water levels and temperatures monitored at select stream stages in FCD, Rose Creek, RCDC, NFRC, SFRC, Vangorda Creek  Fish habitat investigation completed by EDI in 2014, in association with the fish telemetry program. Environmental Dynamics Inc. (EDI). March 2015a. *Arctic Grayling Telemetry & Fish Habitat Investigations, Faro Mine, 2012-2014.* (Final). Prepared for CH2M HILL Canada Limited (CH2M HILL). March 25.  Potentiomanometer investigations in NFRC completed in 2013 and 2014 (CH2M February 2014q), (CH2M March 2015u)  WL transducers installed in wells adjacent to NFRC at S-wells and Zone II Outwash (CH2M March 2015t), (CH2M March 2015u) and RCDC (2015 NFRC DBR GW appendix) (CH2M February 2014q) | Same as above. | Collect and compile data at all stations. |
| ***R05.10.02 - Human Health and Ecological Risk Assessment*** | | | | | | | | |
| R05.10.02a | Collect recent surface water quality data, including data from new stations, to better characterize baseline conditions and for future monitoring purposes. | The baseline should reflect current conditions. The AECOM baseline was 2005 to 2007. Updated data is available for Faro and Vangorda Areas. The Minnow (2010) aquatic monitoring plan indicated more and newer reference locations are needed for water assessment, at least in the short-term. | | 1 | Collect surface water quality information at new stations; consider future monitoring requirements for establishing new stations. | Benthic sampling program in 2014. Reported in: Minnow Environmental Inc. (Minnow). March 2015. *DRAFT Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014.* Report Prepared for: CH2M HILL. March.  Under separate contract with YG, Minnow prepared data interpretation; report not provided to CH2M HILL. | Vangorda and Grum mine areas removed from project scope in spring, 2014.  Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. | Review of Minnow reports required to determine if data gaps adequately addressed. |
| R05.10.02b | Complete limited surface water chronic toxicity testing. | Chronic testing more accurately reflects the potential effects expected. Testing has not been completed on a salmonid species to better assess the effects on Chinook salmon and grayling, which will likely be identified as VCs for the EA. | | 2 | Collect onsite water quality samples from areas of current and future impact, and conduct testing. | Benthic sampling program in 2014. Reported in: Minnow Environmental Inc. (Minnow). March 2015. *DRAFT Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014.* Report Prepared for: CH  Under separate contract with YG, Minnow prepared data interpretation; report not provided to CH2M HILL.2M HILL. March. | Same as above. | Further additional chronic toxicity testing required for salmonids due to performance of control samples during laboratory testing  Review of Minnow reports required to determine if data gaps adequately addressed. |
| R05.10.02c | Update old baseline sediment quality data. | The sediment data is old (from 2004 to 2006) and is not available for all required watercourses. Actual measured sediment concentrations are preferable to those that were calculated through the development of site-specific water-to-sediment distribution coefficients. | | 2 | Collect onsite sediment samples and conduct laboratory analysis. | Benthic sampling program in 2014. Reported in: Minnow Environmental Inc. (Minnow). March 2015. *DRAFT Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014.* Report Prepared for: CH2M HILL. March. | Same as above. | Review of Minnow reports required to determine if data gaps adequately addressed. |
| R05.10.02d | Complete limited sediment chronic toxicity testing to directly assess effects on benthic invertebrates, which will be exposed to COCs in sediment. | Chronic testing more accurately reflects potential effects expected and has not yet been conducted. | | 2 | Collect onsite sediment samples from areas of current and future impact, and conduct laboratory testing. | Benthic sampling program in 2014. Reported in: Minnow Environmental Inc. (Minnow). March 2015. *DRAFT Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014.* Report Prepared for: CH2M HILL. March.  Under separate contract with YG, Minnow prepared data interpretation; report not provided to CH2M HILL.2M HILL. March. | Same as above. | Review of Minnow reports required to determine if data gaps adequately addressed. |
| R05.10.02e | Fill in gaps for tissue chemical analysis data that does not exist or is not present for some aquatic biota. | Tissue data provides a more accurate assessment of risks than modelling. | | 2 | Collect fish, benthic invertebrate, and aquatic vegetation samples for tissue analysis. | Benthic sampling program in 2014. Reported in: Minnow Environmental Inc. (Minnow). March 2015. *DRAFT Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014.* Report Prepared for: CH2M HILL. March.  Fish habitat investigation completed by EDI in 2014, in association with the fish telemetry program. Environmental Dynamics Inc. (EDI). March 2015a. *Arctic Grayling Telemetry & Fish Habitat Investigations, Faro Mine, 2012-2014.* (Final). Prepared for CH2M HILL Canada Limited (CH2M HILL). March 25.  Under separate contract with YG, Minnow prepared data interpretation; report not provided to CH2M HILL.2M HILL. March. | Same as above | Review of Minnow reports required to determine if data gaps adequately addressed. |
| R05.10.02f | Update baseline soil quality description, as all of the data is old and no information is present in some areas. This information is needed to assess risks to human and ecological receptors. | Existing data insufficient, analyses are Not completed in all areas of the site or on the full suite of expected COCs. | | 1 | Collect soil samples and conduct laboratory testing. | Site-wide soil characterization survey completed (CH2M February 2015c) | Vangorda and Grum mine areas removed from project scope in spring, 2014.  Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. | Report evaluation required in conjunction with development of PP to determine if all areas planned for disturbance have been evaluated |
| R05.10.02g | Complete soil toxicity studies on soil organisms and vegetation. This information is needed to directly assess effects to these receptors that will likely be identified as VCs for the EA. | Direct impacts of soil COCs on soil organisms (for example, insects, such as spiders, beetles, ants, and grasshoppers) and plants are not known. This testing is likely needed for the unreclaimed areas of the site to ensure there are no expected long-term effects to terrestrial flora and fauna. | | 2 | Collect soil samples from the site, and conduct toxicity testing to assess current risks, which will involve acute testing on two species. | Soil toxicity testing completed with site wide soil characterization survey (CH2M February 2015c) | Same as above. | Report evaluation required in conjunction with development of PP to determine if all areas planned for disturbance have been evaluated |
| R05.10.02h | Complete soil-chemical bioavailability analyses. This information will assist in the determination of the bioavailable fraction of each chemical in soil and the potential for uptake or exposure to human and ecological receptors. | The percent of potentially available fraction of a chemical is not known and may be important to determine if biological tissue data is limited. | | 2 | Perform leachate analyses of select soil samples. | DI leach and sequential extractions completed on soil samples collected for engineering investigations and borrow material characterization. | Same as above. | Need to compile and evaluate data collected |
| R05.10.02i | Complete soil organism and plant tissue analysis in unsampled areas and in areas where updated soil-chemistry data will be collected. This information is needed to directly assess effects to these receptors and to assist in the determination of dietary exposure to top predators, all of which will likely be identified as VCs for the effects assessment. | This information is needed to assess direct effects on those ecological receptors and for the assessment of effects on wildlife through the food chain. | | 1 | Collect soil organism and plant samples collocated with soil samples and conduct testing. | Collected plant tissue samples collocated with soil samples during site wide soil characterization survey (CH2M February 2015c) | Same as above | Report evaluation required in conjunction with development of PP to determine if all areas planned for disturbance have been evaluated |
| R05.10.02j | Collect data on tissue-chemical concentrations in small mammals. | This information is required to address risks directly to these receptors, which will be identified as VCs in the effects assessment, as well as to higher trophic animals. | | 2 | Conduct a field survey to collect red-backed voles or similar small mammals throughout the site. Can be completed while other wildlife programs are being undertaken.  Discussions with FPET in January 2012 identified concerns about community sensitivities for this proposed program, however during the July 2013 gaps workshop contaminant data was considered to be important to the overall risk assessment process. Community sensitivities should not be great enough so as to limit the collection of data that will be needed for the YESAA Project Proposal. | Wildlife baseline study conducted in 2014 included small-mammal tissue sampling (CH2M March 2015aa) | Same as above. | Report evaluation required in conjunction with development of PP to determine if all areas planned for disturbance have been evaluated |
| R05.10.02l | Collect information related to dust to assess effects to human and ecological receptors. This data will be critical to the assessment of risks during the construction period with the movement of wasterock. | There is a major exposure pathway during construction. | | 1 | Undertake data collection, modelling, and monitoring. | None | Same as above. | All work remains |
| ***R05.07.02 - Terrain, Geology, Geological Hazards, and Seismicity*** | | | | | | | | |
| R05.07.02c | Compile bedrock geology for the site. Yukon geological survey bedrock mapping coverage of the study area exists at a 1:25,000 scale, comprising 17 map sheets and associated reports. Summarize data into one overall baseline document. | The lithology and structure is required for overall site characterization, geohazards, geochemistry, hydrogeology, and quarry locations. | | 1 | Create a desktop summary of site geology and structure, and rock descriptions. Conduct confirmatory field surveys as needed, including collecting representative rock samples of key units for mineralogy/petrology to confirm composition. Complete a tie-in program with engineering. Engineering properties will not be determined under this task item.  Data available from the Yukon Geological Survey (i.e. Lee Pigage) will be reviewed prior to conducting supplemental sampling, if required. | NFRC Realigned Channel Project DBR (2016b) and Tectonic Setting Evaluation (2103d) both evaluated bedrock geology and compiled mapping. Geohazards evaluation completed for NFRC.  See CDRM report Section 2.8 for a listing of compiled mapping. . | Vangorda and Grum mine areas removed from project scope in spring, 2014.  Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. | None |
| R05.07.02d | Compile Quaternary geology for the study area. YGS has 1:25,000 surficial geology maps covering the southern portion of study area. Summarize data into one overall baseline document. | Identify major Quaternary geology units, terrain, soils, and location of bedrock exposures. This provides understanding of geological history to support aerial photography interpretation and forms the base of geohazards mapping and permafrost assessment. Surficial geology and Quaternary aerial photography interpretation will supplement and extend this data across the study area. This is required for overall site characterization, geochemistry, hydrogeology, and borrow areas. | | 1 | Create a desktop summary of Quaternary and surficial geology units. Describe Quaternary geological history and major units. Transfer mapping data onto a new project DEM GIS database. Conduct limited field program, as needed, to groundtruth data. | Not completed | Same as above. | All work remains |
| R05.07.02e | Interpret aerial photographs of geohazards and mapping, and assess the study area. | Within the study area, identify areas of instability, erosion, mass wasting, permafrost degradation, debris flows, and avalanches that may affect closure design or impact the environment. | | 1 | Carry out geohazard assessment, and compile data onto a site DEM topographic GIS database. Carry out field surveys as needed to groundtruth hazards and assess recent activity. | Geohazard surveys completed in Faro Creek, NFRC and Rose Creek Watersheds (CH2M March 2015jj) | Same as above. | None for Faro Mine Area or RCTA |
| R05.07.02f | Identify permafrost characterization and distribution within the study area. This applies to locations with planned construction only (SIS, toes of slopes, channels, etc.) | The site is located in the discontinuous permafrost zone, so it is necessary to identify areas containing permafrost that may be affected by reclamation and closure activities. | | 1 | Conduct aerial photography interpretation to note permafrost and periglacial terrain features. Supplement photos with data collected from Quaternary, geohazards, and surficial geology mapping. Carry out separate aerial photography interpretation of vegetation cover characteristics. Derive detailed slope aspect, elevation, and angle data from the site DEM topographic database. Compile local weather station data, preferably from various elevations and other attributes, as input to a permafrost model. Collect regional climate, global warming, and permafrost degradation information. Compile ground temperature data from existing thermistors, and relate to air temperature data. These activities will be undertaken as needed in relation to areas of planned construction. | Completed permafrost delineation in NFRC valley, including thermistor installation and monitoring (CH2M HILL, 2016b)  Completing permafrost delineation in Faro Valley, including thermistor installation and monitoring (2016 FCD drilling) | Same as above. | Requires query of EQuiS database for site-wide evaluation and comparison with results of site specific explorations. Also, compare with probabilistic mapping presented in NFRC DBR.  Vegetation analyses.  Compilation of permafrost data. |
| R05.07.02g | Update seismology study. | Completed in 2012. | | 1 | None. Completed in 2012. |  |  |  |
| ***R05.08.02 - Vegetation and Reclamation*** | | | | | | | | |
| R05.08.02a | Fill gaps in baseline documentation (Section 4.1.3 YESAB Proponent's Guide) on soil and vegetation classification for disturbed areas. | Existing vegetation in the project footprint needs to be considered for the ETA, NFRC, the Grum/Vangorda Creek Valley, and onsite regrowth areas to assess additional disturbance for revegetation planning. The rationale of using existing condition as baseline needs to be supported, but is not currently in enough detail, so status needs to be checked in disturbed areas. A bioavailable metals assessment needs to be part of screening to check if micronutrient levels are high enough for toxicity or for adverse food-chain impacts (Pb, As, Zn, and B will likely be the main focus). | | 1 | Conduct field studies to document vegetation in:   * North Fork Rose Creek Valley * ETA adjacent areas * Grum Creek/Vangorda Valley * Regrowth areas on the mine(s) footprint | Vegetation characterization survey completed (CH2M March 2015z) | Vangorda and Grum mine areas removed from project scope in spring, 2014.  Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. | Report adequacy needs to be reviewed in conjunction with PP preparation. |
| R05.08.02b | Update vegetation survey at Survey Intensity Level SIL 3 for the LSA in 2007. This data will be 7 years old by the Project Proposal submission. | Determine if YESAB feels the data needs to be recollected for current conditions. Recommend that vegetation is unlikely to have changed much over this period in the LSA, with the exception of areas proximal to mine disturbance. | | 3 | Recollect SIL 3 vegetation data in the entire LSA. | Vegetation baseline characterization survey completed at SIL 3 level (CH2M March 2015z) | Same as above. | Report adequacy needs to be reviewed in conjunction with PP preparation. |
| R05.08.02c | Access the raw field data to determine if soil surveys were collected during the vegetation survey work within the LSA. | Ecological land classification requires a survey of both vegetation and soil to confirm mapping and classification activities. This activity needs to be weighed against a verification of mapping required by YESAB in LSA areas outside the disturbance footprint. This is less important than reporting of soil conditions in disturbed or mine-proximal areas, but the requirement needs to be discussed with YG/YESAB. | | 2 | Collect SIL 3 soils-mapping data within the LSA. | SIL 3 baseline soil characterization survey completed (CH2M February 2015c) | Same as above. | Report adequacy needs to be reviewed in conjunction with PP preparation. |
| R05.08.02d | Fill in information gaps for riparian revegetation details missing from the vegetation section after baseline data. There is almost no data on wetlands or riparian areas at all within the EA or in the closure design it is based on. Even if we do not want wetlands, we will need to plan to ensure that they cannot form (wildlife proximity issue) (Source: Chapter 8 of the draft Project Proposal). | Wet landscape planning has to be included in the revegetation plan to ensure that seepage and ponding areas are included or deliberately excluded. Mapping existing wetland areas within the LSA is a necessary part of the EA, as they are currently treated as a vegetation community, but no wetlands-specific vegetation or soils data has been collected. This is needed to set baseline conditions and as a planning tool for the reclamation surface. | | 1 | Collect wetlands soil and vegetation baseline data within the LSA. Create a map interpretation for RSA. | Wetlands soils and vegetation investigated in site wide soil and vegetation characterization surveys (CH2M February 2015c), (CH2M March 2015z) | Same as above. | Report adequacy needs to be reviewed in conjunction with PP preparation. |
| R05.08.02e | Determine contaminant characterization, load in wetland, riparian vegetation, and food chains. | Determine if the existing wetlands need to be cleaned up (for example, excavated or capped) and re-established, if selected sites can offer transplant options, and which plants are suitable for wildlife habitat wetlands and treatment wetlands. Determine whether and in what form contaminants are sequestered in organics, and if any existing organic soils be used in part for reclamation, what the nutrient status of established wetlands is, and if there is a correlation with the vegetation community. Bioavailable metals assessment needs to check if micronutrient levels are high enough for toxicity or for adverse food-chain impacts (Pb, As, Zn, and B are likely the main focus). | | 1 | Conduct a basic risk assessment in wetland/riparian communities, food-chain sampling (vegetation tissue and soil-fauna samples), and wetland soil toxicity sampling. Compare with other RSA wetlands/riparian areas. | Vegetation tissue and soil-fauna samples collected and soils baseline and rare plants surveys completed (CH2M February 2015c), (CH2M March 2015z) | Same as above | Report adequacy needs to be reviewed in conjunction with PP preparation. |
| R05.08.02f | Characterize potential borrow and quarry areas in undisturbed locations for:   * Vegetation and soils baseline * Rare plants * Actual borrow volumes (and plant and soil salvage volumes) (Source: Chapter 4 of the draft Project Proposal). | Materials and quarry rock should be covered, as riprap and armouring appear to be minimal, and additional borrowing for hard rock and till is potentially required. There is some reference to additional borrow sites for peat and construction materials, but they do not appear to have been included in baseline work or characterized for closure planning. The location of borrow and quarry sites needs to be verified, and baseline soils and vegetation information collected for areas not yet covered in the LSA. | | 1 | Conduct a field program to characterize:   * Vegetation and soils baseline * Rare plants * Actual borrow volumes (and plant and soil salvage volumes) | Vegetation and soils baseline and rare plants surveys completed (CH2M February 2015c), (CH2M March 2015z)  Results of field explorations of borrow areas provided in Borrow Report (CH2M HILL, 2014hh | Vangorda and Grum mine areas removed from project scope in spring, 2014.  Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. | Reports adequacy needs to be reviewed in conjunction with PP preparation. |
| R05.08.02g | Document wildlife use or avoidance of wetland and riparian zones (e.g., moose, sheep, grizzly bear, muskrat, and waterfowl [lesser sand hill crane, trumpeter swan, et al.]). | To identify the appropriate juxtapositions of wetlands according to migration paths and other habitats. This does not appear to have been specifically addressed to date, but this information is important for wetlands planning in the closure landscape. | | 2 | Conduct seasonal surveys documenting specific wildlife use of wetland and riparian zones. | Limited studies completed by ELR/ Terrestrial Wildlife Baseline Report (Appendix 6G to IWPP CH2M,2014);  CH2M HILL (2015ll). Wildlife Baseline Studies  ELR (2013) Waterfowl Studies;  ELR (2012) Winter Tracks Study | Same as above. | Additional studies required |
| R05.08.02h | Identify permafrost locations not identified in the EA or closure plan (Source: Section 4.1.3 YESAB Proponent's Guide). | Permafrost locations are not noted in the EA or closure plan, either as baseline or as closure features. Not clear how this information is to be handled within the reclamation planning. | | 1 | Map current and potential permafrost areas, and groundtruth permafrost areas onsite. Predictive mapping and groundtruthing carried out in the terrain and geology section. Scope is limited to areas of proposed construction activities. | Completed permafrost delineation in NFRC valley, including thermistor installation and monitoring (2015 DBR)  Completing permafrost delineation in Faro Valley, including thermistor installation and monitoring (2016 FCD drilling) | Same as above. | Compilation of data entered into EQuIS and comparison with field investigation reports required. |
| R05.08.02i | Study dust issue in the Vangorda/Grum Area and as a result of the Grum Sulphide cell sedimentation pond blow-out for baseline (Source: Chapter 4 of the draft Project Proposal). | There may be areas in addition to those in the baseline studies that merit a check on dust or sediment impact on previously undisturbed areas. These should be coordinated with baseline surveys for existing vegetation areas, but also identified as specific responses to dust and sediment issues, as well as for assessment of mitigation and closure landscape design. | | 1 | Discuss with YG and the field program to assess impact of dust and sediment in the areas below the Grum Sulphide Cell and towards Moose Pond. | None | Same as above. | All work remains |
| R05.08.02j | Conduct more extensive rare plant surveys, especially if further borrow areas are required. The impact on undisturbed ETA-adjacent areas and creek channel realignments will also require this (Source: Chapter 4 of the draft Project Proposal). | Currently there is a lack of rare plant information with little data. Only the toe of four waste-rock areas has been surveyed. Any further disturbance in the LSA needs to be surveyed, and there should be a discussion with YG about rare plant surveys in the LSA. | | 1 for disturbed LSA areas 3 for the entire LSA | Conduct field program to characterize rare plants in undisturbed areas likely to be impacted by construction and reclamation activities, and potentially within the LSA. | Rare plants survey completed as part of site wide baseline vegetation survey (CH2M March 2015z) | Same as above | None  (Need to confirm/ review report in conjunction with PP development) |
| ***R05.09.02 - Wildlife*** | | | | | | | | |
| R05.09.02a | Review baseline study plan with YG wildlife managers. | Prior to beginning a baseline study program for 2014, prepare a summary of the intended study program to present to YG's wildlife managers. This would provide an opportunity for YG to comment on the program, and also would provide an opportunity to identify potential comments and synergies to improve the program. | | 1 | Organize a presentation with details of the program, and present this to YG wildlife managers (and potentially YESAB). | None | Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. | All work remains |
| R05.09.02b | **Furbearers** Collect data to determine the distribution and abundance of furbearer species within the LSA. | Furbearers were selected as a VC in the existing EA and appear to have high local value. Data on species occurrences, distribution (according to vegetation type), and relative abundance of furbearer species was collected during the winter of 2012. This data is currently believed to be sufficient, however it will need to be considered in the future to determine whether it is still relevant based on the project timing (i.e. age of data. *S. 4.1.9 Describe abundance and distribution of major wildlife species.* | | 3 | Potentially conduct a follow-up field study to collect further information on furbearer abundance and distribution. The required field study would be a winter track count that uses track transects arranged by site vegetation type to determine presence and relative abundance. | Initial study complete – ELR November 2012. | Same as above. | Additional study based on review of initial study. May require update depending on when PP prepared. |
| R05.09.02c | **Thinhorn Sheep** Collect data describing the usage, timing, and location of Thinhorn sheep migration corridors through the Vangorda/Grum Area and potentially the site access road. | Results from YG wildlife key area datasets and other data have established that migration corridors exist through the Vangorda/Grum and access road areas. Corridors are used through the spring and fall, and migration could be impacted by activities onsite, traffic, and habitat changes. Information regarding the use of these corridors is outdated (from 1980); therefore, impacts cannot be accurately assessed. This data will also be used to feed into adaptive management plans for sheep.  *S. 4.1.9 Describe any transportation corridors and critical, key or sensitive habitats.(YESAB Proponent’s Guide)* | | 1 | Discussions with FPET and government wildlife experts in January 2012 concluded that earlier studies combined with ongoing site observations are sufficient to characterize migration corridors through the site and that efforts should focus on maintaining these corridors while protecting sheep from adverse effects.  Conducting limited further studies on site is still recommended to better refine both the location / routing of migration corridors, as well as the characteristics of movements (timing on a seasonal basis, frequency, and characteristics of individuals (e.g. rams, ewes, nursery groups). | None | Same as above. | Conducting limited further studies on site is recommended to better refine both the location / routing of migration corridors, as well as the characteristics of movements (timing on a seasonal basis, frequency, and characteristics of individuals (e.g. rams, ewes, nursery groups). |
| R05.09.02d | **Water Birds and Waterfowl** Collect data regarding waterfowl use of pits and ponds in the Faro Mine Complex area, and also data regarding the risks of use of these habitats (the current quality of habitat is water, sediment, and biota). | Waterfowl and water birds are potential seasonal or temporary users of the Faro Mine site on an annual basis. Waterfowl might also use pits and ponds, and as the ponds slowly recolonize with plants and invertebrates over time, the chance of exposure, contamination, or mortality may increase. We have only anecdotal data regarding water bird use at the mine pits and ponds, and there appears to be no data about existing pit and pond sediment quality and biota. *S. 6.2.1.3 (YESAB Proponent’s Guide)* | | 1 | Address data gap with a field survey of waterfowl and water bird use of pits and ponds in the mine area during staging and breeding seasons. Partially addressed by work conducted in fall 2013. | Partial completion in fall 2013. No further work completed. (ELR 2013)  Wildlife Baseline Study 2014 Summary report (CH2M,2015ll). | Same as above. | Completion of field work required; additional surveys; different times of year |
| 2 | Investigate habitat, and conduct a desktop study to determine and document conditions in which we can determine the likelihood of feeding or ingestion by waterfowl/water birds. This habitat investigation would investigate the current habitat conditions, including depth, presence of vegetation, sediment metal levels, and existence of any potential feeding sources, such as benthic invertebrates. Partially addressed by work conducted in fall 2013. | Partial completion in fall 2013. No further work completed. (ELR 2013)  Wildlife Baseline Study 2014 Summary report (CH2M,2015ll). | Same as above. |  |
| R05.09.02e | **Grizzly Bear** Collect data regarding the potential for Grizzly Bear denning in the LSA and vicinity. | As a species-at-risk at the site, grizzly bears have potential to use the site in a variety of ways, including for denning (overwintering) at the site. The existing EA in the draft Project Proposal states that this is low potential; however, based on the existing information, we feel this should be revisited. As earthworks are anticipated to occur year-round at the site through the decommissioning period, there is potential for abandonment of den sites, mortality, or other effects. Information regarding the potential suitability of the LSA area for grizzly bear habitat will help to focus the effects assessment, and determine whether further studies (e.g., denning) may be required prior to or during the closure process.  *S. 4.1.9 (YESAB Proponent’s Guide)* | | 1 | Conduct habitat suitability modelling to provide a concept of the likelihood of grizzly bear habitat, including denning habitat. This modelling would use existing datasets (e.g., elevation, vegetation, substrate, slope, and aspect) to determine whether suitable habitats exist, and whether further study is warranted. | Desktop study initiated (CH2M, 2015ll) | Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. | Additional field work required |
| R05.09.02f | **Small Mammal Sampling for Contaminant Data** Collect small mammals, and perform laboratory analysis to provide recent contaminants data. | Up-to-date information regarding contaminants data in small mammals is required for local mine areas to feed into the risk assessment process and to determine potential effects on small mammal populations. | | 2 | Collect a limited number of small mammals, and send to the laboratory for analysis; required to fill this data gap. Collections would be performed during the summer and fall of 2012 in conjunction with other wildlife field programs.  Discussions with FPET in January 2012 identified concerns about community sensitivities for this proposed program, however during the July 2012 gaps workshop contaminant data was considered to be important to the overall risk assessment process. Community sensitivities should not be great enough to limit data collection for information that needs to be included in the YESAA Project Proposal. | Wildlife baseline study conducted in 2014 included small-mammal tissue sampling (CH2M March 2015aa) | Same as above. | Depending on when PP developed, additional sampling and testing may be required. |
| R05.09.02g | **Wetland and Riparian Wildlife Use** Document wildlife use or avoidance of wetland and riparian zones (moose, sheep, grizzly bear, muskrat, waterfowl, and migratory birds). | To identify appropriate juxtapositions of wetlands regarding wildlife migration paths and other habitats. This does not appear to have been specifically addressed to date, but is information desirable for wetlands planning in the closure landscape. | | 2 | Conduct seasonal surveys documenting specific wildlife use of wetland and riparian zones. Recommend a combination of camera, observational, plot, and transect surveys in riparian areas to record occurrence of wildlife signs (e.g., trails and pellet groups). These would be tied to ELC groupings to allow data to be fed into wildlife modelling for effects and closure works. Winter wildlife riparian habitat has already been captured during 2012 furbearer surveys. | The wildlife baseline study conducted in 2014 included cameras in riparian areas (CH2M March 2015aa) | Same as above. | Data needs to be evaluated to determine if additional field work required. |
| R05.09.02h | **Moose Late Winter Survey** Collect information to add on to fall moose data, but for the critical late winter period, where disturbance effects can be greater for moose. | Generally, surveys of moose are conducted at times and locations that give information relevant to the project and potential impacts. The late-winter period is critical to moose because of low energy reserves and limiting habitat, making them susceptible to disturbance or predation. Recent information (2011) for early winter moose distribution has been collected, however no information on late-winter distribution in the project area exists | | 3 | As a first step in addressing this gap, conditions at the FMC will be compared and evaluated for habitat suitability for late winter use by moose (through comparison with regional conditions in known areas of late winter use). Should areas of the site offer suitable habitat conditions, then completion of an aerial survey in March of moose distribution in the study area may be undertaken to fill this gap. This survey would be conducted in the area local to the mine to determine abundance and distribution in relation to project areas, snow load, and habitat areas. The need for late winter field data will be assessed based on the results of habitat modelling. | None | Same as above. | All work remains |
| ***R05.11.02 - Air Quality, Climate, and Noise*** | | | | | | | | |
| R05.11.02a | Define air-quality baseline conditions. Previous monitoring results attempted to characterize TSP, PM10, and metals, but have not been optimal or successful in defining air-quality baseline conditions. Lack of quality data affects the characterization of background ambient concentrations in the vicinity of the mine, as well in the Town of Faro. | Several air quality monitoring studies had a number of shortcomings, such as low retrieval rate (Senes, 2008), laboratory errors (Senes, 2009), wet conditions leading to low and non-representative baseline concentrations (RWDI, 2006; and Senes, 2008), and poor siting of stations. YESAB’s response to Eagle Gold includes the statement: “Please make sure to include among others information regarding CAC emission inventories and PM monitoring.” YESAB Proponent's Guide, Sections 4.1.6, specifically asks for available background information on existing ambient conditions. However, current data is more indicative of pristine conditions, without the effects of care-and-maintenance activities. | | 1 | An emissions inventory and air dispersion modelling, in conjunction with the available monitoring data, is recommended to characterize the current conditions because of the cost of the air quality monitoring program and possible difficulties in obtaining reliable data from a single monitoring season.  Specifically, the current monitoring data, which is more indicative of pristine background conditions, can be added to concentrations predicted from air-dispersion modelling for typical care-and-maintenance activities to characterize current ambient conditions for a number of contaminants. Because of the vast area of the mining site and the multiple emission sites, a significant number of monitoring stations would be required to properly characterize the PM and metal emissions from the site. Also, additional factors, such as heavy precipitation over the course of the summer, could affect the quality of the data and proper characterization of ambient conditions. This option would be more cost-effective than performing another air monitoring program for particulates, metals, and possibly CACs.  Since the baseline for this particular project includes some care-and-maintenance activities, an emissions inventory that accounts for these activities, in addition to the estimates of pristine conditions through the previous monitoring programs, should provide a good estimate of current baseline conditions. | Baseline ambient air quality study completed in 2014 (CH2M November 2014i). Air quality modelling study completed in 2014 (CH2M November 2014m) | Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. | None |
| ***R05.12.02 - Socio-economic*** | | | | | | | | |
| ***The socio-economic gaps have not been updated since the 2012 Gaps Report because CH2M HILL did not re-engaged a socio-economic team until late July 2013 to address needs for the Interim Works Project Proposal. That team has not yet addressed gaps for the FMRP.*** | | | | | | | | |
| R05.12.02a | Collect labour-force information for both Aboriginal and non-Aboriginal population (by industry, occupation, experience, training, wages/earning, participation rates, and employment rates) (LSA and RSA). | Provides information on labour pool and an inventory of statistics to determine impact and possible mitigation methods for anticipated labour-force changes, demands, and wage inflation. Essential for data analysis. | | 1 | Research secondary sources for data and project-relevant statistics, and conduct primary research to complete missing data. | Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff | Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. | Research required specific to work that will be defined in PP. |
| R05.12.02b | Study fishing activity (Aboriginal and non-Aboriginal), including subsistence, commercial (including tourism), recreational, and traditional. | To determine the impact of the Faro project on possible socio-economic fishing and related activities in the LSA. It is an important indicator of community economic use of the land base. | | 1 | Conduct a primarily desktop analysis using secondary sources, and share data with other Faro project technical teams (i.e., the fisheries or aquatics technical focus teams). Augment data with primary research where needed. | None | Same as above. | Same as above. |
| R05.12.02c | Collect information on gathering activities (including hunting) for Aboriginal and non-Aboriginal communities, including activities, intensity, and harvest statistics, with a focus on LSA. | To determine impacts of project on existing gathering activities (hunting and land use). It is an important indicator of community economic use of the land base. | | 2 | Research primary data sources and existing traditional knowledge reports for hunting information. Cross-reference with other Faro technical teams. Augment data with primary research where needed. | None | Same as above. | Same as above. |
| R05.12.02d | Collect trapping-specific data, including LSA trap activities, registered interests, trapline locations, and economic data (Aboriginal and non-Aboriginal). | To determine baseline conditions for trapping activities in the Faro project area, evaluate potential impacts from the project, and permit the development of possible mitigation methods for adverse project impacts. | | 2 | Contact Yukon Environment for trapping statistics and registered trapline information. Additional communications with primary sources may be required to complete data collection and confirmation. | None | Same as above. | Same as above. |
| R05.12.02e | Research education statistics for LSA and RSA, including highest level of education, elementary and high school enrolment, school attendance, relevant skills programs, and training facilities/training capacity (Aboriginal and non-Aboriginal). | To assess the possibility of locally sourcing talent for the project and to determine ability for project to use local facilities for training and education purposes. Also permits analysis of LSA capacity to absorb possible population growth, and affects the funding needs of communities. | | 2 | Collect statistics from secondary research sources, augmented where necessary from primary sources. | None | Same as above. | Same as above. |
| R05.12.02f | Research occupational breakdown of LSA and RSA labour force, with particular focus on needed project-specific talent. | To assess, evaluate, and maximize deployment of the Yukon labour force on the Faro project. | | 1 | Research secondary labour-force statistics, and confirm with primary sources as needed. | Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff | Same as above. | Same as above. |
| R05.12.02g | Assess opportunities for local employment and training | To determine the ability of local residents to capture employment and possible service contract opportunities. This is of prime importance to project stakeholders and a probable key VSEC. | | 1 | Collect statistics from secondary research sources, augmented where necessary from primary sources. | Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff | Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. | Research required specific to work that will be defined in PP. |
| R05.12.02h | Assess municipal infrastructure, such as sewage, parks, power, and telecommunications and services, such as social services and childcare in the LSA communities. | To determine impact of increased population and activity on LSA communities. Important to determine community impact of project. | | 2 | Collect statistics from secondary research sources, augmented where necessary from primary sources. | None | Same as above. | Same as above. |
| R05.12.02i | Research traffic volumes in LSA and RSA, including highways, roads, airports, transportation infrastructure, accident statistics, transportation modes, and commuting patterns as relevant to project. | To determine impact of increased population and activity on Yukon communities and transport infrastructure. Essential for community impact analysis. | | 1 | Collect statistics from secondary research sources, augmented where necessary from primary sources. | None | Same as above. | Same as above. |
| R05.12.02j | Research income and earnings in the LSA and RSA (Aboriginal and non-Aboriginal), as well as Yukon economic indicators. | Essential to evaluate and determine economic impacts on communities. | | 1 | Collect statistics from secondary research sources, augmented where necessary from primary sources. | Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff | Same as above. | Same as above. |
| R05.12.02k | Conduct a scan of locally owned businesses in the LSA, both Aboriginal and non-Aboriginal. | To understand the local capacity to maximize economic benefits to nearby goods and services suppliers. | | 1 | Research primary sources because of the small size and geographic distribution of population and businesses. | None | Same as above. | Same as above. |
| R05.12.02l | Assess taxation revenue impacts for local, territorial, and federal governments. | To provide baseline and analysis information on government revenues. | | 2 | Collect statistics from secondary research sources, augmented where necessary from primary sources. | None | Same as above. | Same as above. |
| R05.12.02m | Research population and personal income fluctuations in LSA communities using historical information. | Establish implications for diversification within the project timeline. | | 1 | Collect statistics from secondary research sources, augmented where necessary from primary sources. | Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff | Same as above. | Same as above. |
| R05.12.02n | Collect data on the ability of LSA and RSA business capacity to service the project. | Ensure that Yukon businesses maximize economic benefits from the project. | | 1 | Collect statistics from secondary research sources, augmented where necessary from primary sources. | None | Same as above. | Same as above. |
| R05.12.02o | Research the number of business licenses in LSA, and the number of businesses and employees in LSA and RSA. | To determine the ability of Yukon businesses to capture current and ongoing benefits from the project. | | 1 | Research using mostly secondary research sources because of distributed communities. | Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff | Same as above. | Same as above. |
| R05.12.02p | Collect population counts (LSA and RSA), both Aboriginal and non-Aboriginal. | To determine impact of project activities on local communities. | | 2 | Research using mostly secondary research sources because of distributed communities. | None | Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. | Research required specific to work that will be defined in PP. |
| R05.12.02q | Collect information regarding community events, including descriptions and numbers. | To determine impact of project activities on local communities. | | 2 | Research using mostly secondary research sources because of distributed communities. | None | Same as above. | Same as above. |
| R05.12.02r | Study area mobility status (LSA and RSA, both Aboriginal and non-Aboriginal, where appropriate), including mobility status, age and sex, family size, and marital status. | To build baseline information and allow for project impact analysis. | | 1 | Collect statistics from secondary research sources, augmented where necessary from primary sources. | Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff | Same as above. | Same as above. |
| R05.12.02s | Establish the number of dwelling units; housing prices; land lots for development; number of leasing properties, rental vacancies, or transactions; occupied private-dwelling characteristics; housing sales forecasts; and property values. | To build baseline information and allow for project impact analysis. | | 1 | Research using mostly primary research sources due to distributed communities. Augment data with primary research where needed. | None | Same as above. | Same as above. |
| R05.12.02t | Establish community crime rates in LSA, and identify the type of crime and frequency. | To determine impact of project activities and increased population on local communities. | | 2 | Collect statistics from secondary research sources, augmented where necessary from primary sources. | Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff | Same as above. | Same as above. |
| R05.12.02u | Research leisure and recreational activities, including description, type, and nature of use of existing recreation facilities in the LSA, including Aboriginal and non-Aboriginal population centres. | To determine impact of project activities and increased population on local communities. | | 2 | Research using mostly primary research sources because of distributed communities and small sample set. | None | Same as above. | Same as above. |
| R05.12.02v | Update information on Aboriginal governments (RRDC, LFN, and SFN) and applicable municipal and territorial governments, and identify other relevant major projects in LSA and RSA. | To determine the impact of project activities on local government capacity and services. | | 2 | Interview primary sources (governments, First Nations, and community groups). | None | Same as above. | Same as above. |
| R05.12.02w | Research domestic violence occurrences. | To analyze the effects of domestic violence on an increased population in smaller communities. | | 2 | Interview primary sources (governments, First Nations, community leaders, and community support organizations). | None | Same as above. | Same as above. |
| R05.12.02x | Describe health and social services. | Assess the ability of local communities to provide services to additional community members. | | 1 | Research using mostly primary research sources because of distributed communities. | None | Same as above. | Same as above. |
| R05.12.02y | Research health characteristics, hospitalization rates, medical facilities, medical staff, alcohol and drug use, domestic abuse and violence, and community health characteristics, both Aboriginal and non-Aboriginal (LSA and RSA). | Assess the ability of local communities to absorb additional community members. | | 1 | Collect statistics from secondary research sources, augmented where necessary from primary sources. | None | Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. | Research required specific to work that will be defined in PP. |
| R05.12.02z | Research the number of mining-related accidents each year. | Assess the ability of local communities to provide services to additional community members. | | 2 | Collect statistics from secondary research sources, augmented where necessary from primary sources. | Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff | Same as above. | Same as above. |
| R05.12.02aa | Study the quality of life of the Aboriginal population, including measures of health, community life, political stability, climate and geography, job security, and gender equality (RRDC, LFN, and SFN). | Assess the impact of the project on local First Nations well-being and community fabric. | | 1 | Research using mostly primary research sources because of distributed communities. Augment data with primary research where needed | None | Same as above. | Same as above. |
| R05.12.02bb | Seek out community input on VSEC priorities. | To ensure that communities support the selected VSECs. | | 1 | Conduct community meetings, discussions, and outreach. | None | Same as above. | Same as above. |
| R05.12.02cc | Identify other capacity constraints that may impact community engagement capacity, consultation, and engagement approach (e.g., C&C staffing and labour shortages). | Essential for correct interpretation of data. | | 1 | Assess other major projects in the LSA and the RSA (understand capacity issues, and competition for goods, services, and human resources) as they relate to community capacity and impacts discussions with First Nations and local communities. Comprises primary and secondary research. | None | Same as above. | Same as above. |
| a Importance: 1=Critical – must do; 2=Ideal; 3=Minor – nice to have but not necessary | | | | | |  |  |  |
| Notes:  3D = three-dimensional  AMP = adaptive management plan  As = arsenic  B = barium  CAC = criteria of concern  CO = carbon monoxide  COC = contaminant of concern  DEM = digital elevation map  DO = dissolved oxygen  EA = environmental assessment  EDI = EDI Consultants  GIS = geographic information system  IDF = intensity, duration, and frequency  km2 = square kilometre  LFN = Liard First Nation  LIDAR =light detection and ranging | | | LSA = local study area  NFRC = North Fork Rose Creek  ºC = degrees Celsius  Pb = lead  PM10 = particulate matter less than 10 micrometres in aerodynamic diameter  PMF = probable maximum flood  RRDC = Ross River Dene Council  SFN = Selkirk First Nation  SIL = survey intensity level  SIS = seepage interception system  TSS = total suspended solids  YESAB = Yukon Environmental and Socio-economic Assessment Board  YG = Yukon Government  YGS = Yukon Geological Survey  yr = year  Zn = zinc | | |  |  |  |