ESA Effect Analysis Discussion Support table – WCI Indicators, Assessment Methods and Criteria, and Available Data and Modeling, and Cause/Stressor

Notes below in blue were taken during the Effects Analysis discussion on June 6 2019 at the ESA IC Fish Meeting.

Text in green were added per action item agreed to at June 6 2019 at the ESA IC Fish Meeting that PL would complete the final rows of the table and send out for review

Pathway and WCI Indicators	Assessment Methods and Criteria	Available Data and Modeling [Modeled, Measured, Estimated]	Cause/Stressor
Water Quality			
Temperature	• Regulatory water temperature criteria • Biological water temperature criteria for ESA species • Literature on avoided and inhabited stream temperatures • Literature on short-term temperature tolerances and use of thermal refugia Downstream extent Temporal changes relative to life stages present Check if temp data available for downstream – how compare to downstream most temps and does the mass balance works Climate change (USFS as part of baseline; NOAA considers in baseline and future potential projects)	• Baseline water temperatures for 2012-2019 at xx locations • SPNLT simulated stream temperatures by SFA Reaches for Base Case for wet, average, and dry years [summer average, summer max, fall average, fall max]	• Vegetation Clearing • Increased Road Size and Location/Density • Reduced Groundwater Contribution • Increase Solar Warning due to Channel Alteration • Stormwater Warming • Flow alteration and diversions
Sediment	• Qualitative estimates of additional contribution of fine sediments with design measures and BMPs in place • PIBO Methods for substrate/sediment measurements • Substrate Watershed Condition Indicators for Cobble Embeddedness in Granitic and Non-Granitic Watersheds of the South Fork Salmon River Subbasin Loss of sediment trap function of YPP _ See Occurrence and Transport of Selected Constituents in Streams near the Stibnite Mining Area, Central Idaho, 2012–14 (USGS 2015) Restoration of Blowout Creek USGS analysis	• Stream habitat survey data collected 2012-2019 including the sediment parameters: cobble embeddedness, free matrix, McNeil core and suspended sediment sampling, and spawning sediment depth fines • Sediment loading reduction estimates for Blowout Creek restoration (?) • Road density estimates Road usage levels • Qualitative estimates of additional contribution of fine sediments with design measures and BMPs in place	• Increased Road Density • Runoff from Cleared Areas • Reduced Sediment from Restored Channels Long term from
Chemical Contaminants and Nutrients	• Comparison of Site Wide Water Chemistry (SWWC) modeling results to Idaho WQ standards • Comparison to additional water quality evaluation criteria recommended by NOAA Fisheries	• Surface Water Quality Baseline Study (Dec 2016), sampling results for xx sites • Metal concentrations for sediment, macroinvertebrates, and fish (WH 2017)	• Mine Water/Stormwater • NPDES Discharge • Air Emissions • Spills •

	• See table of Constituents and Criteria – Discuss in a future meeting • Mixing zones, zone of passage	• Occurrence and Transport of Selected Constituents in Streams near the Stibnite Mining Area, Central Idaho, 2012–14 (USGS 2015) • Dust abatement compounds • Occurrence and Transport of Selected Constituents in Streams near the Stibnite Mining Area, Central Idaho, 2012–14 (USGS 2015) • Stibnite Gold Project Baseline Geochemical Characterization Report • Springs and Seeps Report (?) • Site Wide Water Chemistry (SWWC) modeling results • Occurrence and Transport of Selected Constituents in Streams near the Stibnite Mining Area, Central Idaho, 2012–14	
Habitat Access			
Physical Barriers	• Semi-quantitative comparison of changes in known artificial and natural fish passage barriers • Changes in summer flows by SFA reach and effect on passage needs by ESA species • Depth requirements for passage at critical passage areas (riffle crests, etc.) • Changes in stream temperature that may cause passage impediment or barrier •	• TM Evaluation of Upper EFSFSR Fish Passage Barriers • Source documents summarized in TM • Description of proposed changes to existing fish passage barriers for each alternative • Salmonid Zone of Passage Considerations (NOAA 2015) • See TM Stream Functional Assessment Scoring Concerns Addressed (Rio ASE 2019) • Literature on fish barriers and passage and benefits and risks of removal • SPLNT Results • Action Item to discuss as future discussion item •	• Stream Diversion • Barrier Removal • Road Crossings/Culverts • Changes in Water Quality • Flow Alteration • Barriers caused by facilities
Pathway and WCI Indicators	**Assessment Methods and Criteria**	**Available Data and Modeling**	**Cause/Stressor**
Habitat Elements			
Substrate Embeddedness (see also Sediment)	• Qualitative estimate of change in substrate embeddedness or % fines • Change in sediment loading from Blowout Creek restoration • Qualitative estimates of additional contribution of fine sediments with design measures and BMPs in place • Project specific scale, any way to quantify existing and created spawning habitat — relates	• Stream habitat survey data collected 2012-2019 including the sediment parameters: cobble embeddedness, free matrix, McNeil core and suspended sediment sampling, and spawning sediment depth fines	• Increased Road Density • Land Clearing and Construction • Stream Diversion • Reduced Sediment from Restored Channels (e.g., Blowout Creek) • Stream Enhancement/Restoration

	to stream design and factors determine embeddedness – available and would it become embedded • The PBF for CS is spawning substrate – so add separate item in BA effects analysis?		
Large Woody Debris	• Change in abundance of large woody debris due to stream loss, enhancement, and restoration	• Number of large woody debris pieces per mile (MWH 2017) • See SFA Report, Rationale, and User's Manual (Rio ASE 2019a, 2019b, 2019c) • See TM Stream Functional Assessment Scoring Concerns Addressed (Rio ASE 2019) • Frequency and recruitment potential long-term	• Land Clearing and Construction • Stream Diversion • Stream Enhancement/Restoration • Reclamation
Pool Frequency and Quality	• Change in abundance of large woody debris due to stream loss, enhancement, and restoration • Change in species-specific functional unit WCIs for mine site area • See SFA Report, Rationale, and User's Manual (Rio ASE 2019a, 2019b, 2019c)	• Reach-averaged, low-flow pool wetted width to wetted depth ratio; • Depth of individual pools (MWH 2017) • See SFA Report, Rationale, and User's Manual (Rio ASE 2019a, 2019b, 2019c) • SFA Pool Frequency and Quality Analysis (Rio ASE 2019)	• Land Clearing and Construction • Stream Diversion • Stream Enhancement/Restoration • Changes in Flow or Sediment Regime • Stream Enhancement/Restoration
Large Pools	• See TM Stream Functional Assessment Scoring Concerns Addressed (Rio ASE 2019)	• Depth of individual pools (MWH 2017) • See SFA Report, Rationale, and User's Manual (Rio ASE 2019a, 2019b, 2019c) • SFA Pool Frequency and Quality Analysis (Rio ASE 2019)	• Land Clearing and Construction • Stream Diversion • Stream Enhancement/Restoration • Changes in Flow or Sediment Regime • Stream Enhancement/Restoration
Off-Channel Habitat	• Changes in backwaters with cover, low-energy off channel areas (ponds, oxbows, side channels) • See TM Stream Functional Assessment Scoring Concerns Addressed (Rio ASE 2019)	• Aerial photography, field surveys, PiBO surveys	• Land Clearing and Construction • Stream Diversion • Stream Enhancement/Restoration • Changes in Flow or Sediment Regime • Stream Enhancement/Restoration
Refugia	• Bull trout - Habitats capable of supporting strong and significant local populations are protected and are well distributed and connected for all life stages and forms of the species. • Chinook/steelhead - Habitat refugia exist and are adequately buffered (e.g., by intact RCAs); existing refugia are enough in size, number, and connectivity to maintain viable populations. • Not necessarily covered	• Previous biological assessments for EFSFSR Section 7 Watershed • Pools, large wood, temperature, etc. that contribute to refugia • Not sure if the temp WCI covers it • Thermal plumes from CW habitats/streams • USFS breaking down by stream – possible presentation on this topic and how it would be done in the NEPA analysis; will use SFA	

		• Analysis usually done at the 5th HUC; USFS may do at stream/reach level in NEPA analysis • Some WCIs not applicable are applicable at reach levels	
Pathway and WCI Indicators	**Assessment Methods and Criteria**	**Available Data and Modeling**	**Cause/Stressor**
Channel Conditions and Dynamics			
Wetted Width/Max W/D Ratio	• Change in reach wetted width to wetted depth ratio • Little change in non-altered reaches, and design will be used for any altered reaches; criteria from SFA • How depth changes with flow	• Baseline scoring was based on field-collected data: • SFA Report (HDR 2016), Appendix C, Table 10 • Great Ecology field data (Great Ecology 2018)	• Land Clearing and Construction • Stream Diversion • Stream Enhancement/Restoration • Changes in Flow or Sediment Regime • Stream Enhancement/Restoration
Streambank Conditions	• Change in stream reach stability and streambank conditions • More information on getting rid of uncovered but stable included in BA (covered stable, uncovered stable) • Confined/entrenched versus low gradient floodplain connected	• Channel Morphology and Condition (PIBO) Surveys • Rapid Stream Reach Inventory and channel stability evaluation • Predicted change post enhancement/restoration	• Land Clearing and Construction • Stream Diversion • Stream Enhancement/Restoration • Changes in Flow or Sediment Regime • Stream Enhancement/Restoration
Floodplain Connectivity	• Change in flood-prone width • Change in floodplains and wetlands that are hydrologically linked to the main channel when overbank flows occur. maintaining maintain wetland/floodplain functions and riparian vegetation succession. • WCI uses entrenchment ratio	• Mapped RCAs • GIS coverage of mapped floodplains and features	• Floodplain Encroachment and Loss • Altered High Flow Hydrology • Stream Diversion • Land Clearing and Construction • Stream Enhancement/Restoration
Flow/Hydrology			
Changes in Peak Flows/Base Flows	• Changes in flow regime due to mining activities, primarily groundwater drawdown • Change in peak and seasonal high flows • Change in summer/fall base flows • Pit filling/peak flow shaving effects – at meadow creek…does it include Blowout Creek? • What was basis for 5 cfs? What is point of diversion. • How affect WCI/channel forming flows for the period	USGS streamflow records at X sites within upper EFSFSR Response to RFAI-88a -	• Stream Diversion • Water Use • Groundwater Lowering • Clearing and Vegetation Removal • Discharges

Drainage Network Increase	• Change in the density of the stream network; loss or gain in intermittent, ephemeral, and perennial • Total length of natural channels minus length of diversions (See SFA scoring)		• Floodplain Encroachment and Loss • Stream Diversion • Land Clearing and Filling • Stream Enhancement/Restoration
Pathway and WCI Indicators	**Assessment Methods and Criteria**	**Available Data and Modeling**	**Cause/Stressor**
Watershed Conditions	Note: Paul to complete these last four rows before sending out to the group for further review.		
Road Density and Location	• Change in road density and location • Evaluated within specified Hydrologic Unit Code (HUC)-6 sub-watersheds • Length of road (miles) per area considered (square mile) and road density within RCAs	• Boise and Payette National Forest roads and manually digitized existing roads from satellite images. • Interim condition road layers incorporate baseline road layers and proposed roads for mine operations. • Restored condition road layers incorporate existing roads that are proposed to remain following mine closure and proposed post-closure roads.	• Increased Road Size and Location/Density
Disturbance History	• Change in percent of sub-watershed • Disturbance History is based on the equivalent clear-cut area (ECA) resulting from direct human disturbance (mine disturbance, roads, and power line corridor clearing) and is characterized as a percentage of the subwatershed area.	• To assess the baseline disturbance history, existing road GIS layers and the historical disturbance (from prior mining activity) was used. • Interim during mining and restored disturbance area will come from mine plan and sequence as well as reclamation and restoration plans.	• Increased Road Density • Land Clearing and Construction • Stream Diversion • Reclamation • Stream Enhancement/Restoration
Riparian Conservation Areas (RCA)	• Change in Riparian Conservation Area (RCA) element describes the overall conditions of RCAs based on the amount of disturbance within their boundaries • Evaluated within specified Hydrologic Unit Code (HUC)-6 sub-watersheds	• External datasets came from the USGS National Hydrography Dataset (NHD; USGS 2009, USGS 2014), and the Boise and Payette National Forest Roads datasets (Boise National Forest 2014, PNF 2011). • Baseline and predicted interim disturbance and post-mining boundaries used the maximum disturbance layer proposed for the SGP and existing roads. •	• Vegetation Clearing • Increased Road Size and Location/Density
Disturbance Regime	• Change in disturbance resulting from land management activities – streamflow regime, ecological processes within historical ranges • Evaluated within specified Hydrologic Unit Code (HUC)-6 sub-watersheds • Amount of effect that land management activities have or may have on the overall watershed function and resiliency.	• Qualitative summary based on available data outlined above	• All mining activities that affect hydrologic and ecological function and resiliency

Persistence and Genetic Integrity	• Change in connectivity of multiple local populations of fish species as related to benefits of access to habitats and refugia, risk of extinction, probability of hybridization or displacement, etc.	• TM Evaluation of Upper EFSFSR Fish Passage Barriers and source documents summarized in TM • Description of proposed changes to existing fish passage barriers for each alternative relative to population connectivity, access to habitats • Literature on fish barriers and passage and benefits and risks of removal	• Stream Diversion • Barrier Removal • Road Crossings/Culverts • Changes in Water Quality • Flow Alteration • Barriers caused by facilities