

MIRA Indicator Definitions		
Indicator	Used for describing:	Description
CONDUCTIVITY	Environmental Condition of underlying watershed	<p>Conductivity of the HUC12 watershed(s) in which the mine is being proposed. Specific conductivity or Total Dissolved Solids (TDS - conductivity can be calculated from TDS) as measured at the proposed mining site. As such this relates to current environmental condition of the streams. The greater the value of CONDUCTIVITY-MD the worse the environmental condition.</p> <p>UNITS: us/cm METHOD: Average of all reading within all HUCs impacted by the mine</p>
IBI	Environmental Condition of underlying watershed	<p>State actual measurements for all the HUCs impacted by the mine</p> <p>UNITS: Index Range 0-100 METHOD: Average of all reading within all HUCs impacted by the mine</p>
HQHV	Environmental Condition of underlying watershed	<p>Is there at least one stream length classified as High Quality/High Value in any of the HUC12 watersheds that are affected by the proposed mine?</p> <p>UNITS: (Y/N) 0 = N & 1 = Y</p>
303D	Environmental Condition of underlying watershed	<p>Clean Water Act classified Section 303d impaired streams. The % streams in all of the HUC12s (where a proposed mine will be located) that are classified as 303d impaired.</p> <p>UNITS: (%) METHOD: Average of all reading within all HUCs impacted by the mine</p>
NPDES_OUTFALLS	Environmental Condition of underlying watershed	<p>NPDES Outfalls. The Total # of NPDES existing discharges in all HUC impacted by the proposed mine .</p> <p>IF the surface area of the proposed mine includes more than one HUC12 watershed, this value will be the sum of those affected HUC12 watersheds.</p>
CHG_FORPCT	Environmental Condition of underlying watershed	<p>Change in Forest Percent. The change in total forest % (from 1992 to 2001), in those HUC12 watersheds where the proposed mine will be locating.</p> <p>IF the surface area of the proposed mine includes more than one HUC12 watershed, this value will be the average % weighted by HUC area of those affected HUC12 watersheds.</p> <p>Positive numbers mean increased forest</p> <p>UNITS: (%)</p>

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INT250	Environmental Condition of underlying watershed	<p>Interior Core Forest > 250 acres. The % of the total area of Interior core forest (forest patches that are >= 250 acres) within the HUC12 watersheds where the proposed mine will be locating.</p> <p>IF the surface area of the proposed mine includes more than one HUC12 watershed, this value will be the average % weighted by HUC area of those affected HUC12 watersheds.</p> <p>UNITS: (%)</p>
FORPCT	Environmental Condition of underlying watershed	<p>Forest Percent. The % forest in the HUC12 watersheds where the proposed mine will be locating.</p> <p>IF the surface area of the proposed mine includes more than one HUC12 watershed, this value will be the average % weighted by HUC area of those affected HUC12 watersheds.</p> <p>UNITS: (%)</p>
WETPCT	Environmental Condition of underlying watershed	<p>Wetlands Percent. The % of wetlands, by area, in all the HUC12 watersheds that the proposed mine affects..</p> <p>IF the surface area of the proposed mine includes more than one HUC12 watershed, this value will be the average % weighted by HUC area of those affected HUC12 watersheds.</p> <p>UNITS: (%)</p>
DISTURBED_LANDS	Environmental Condition of underlying watershed	<p>Disturbed Lands. This indicator includes Urban + Barren. % over all HUCs that the proposed mine impacts.</p> <p>IF the surface area of the proposed mine includes more than one HUC12 watershed, this value will be the average % weighted by HUC area of those affected HUC12 watersheds.</p> <p>UNITS: (%)</p>
TE_SPECIES	Environmental Condition of underlying watershed	<p>Threatened and Endangered Species. Is there at least one threatened or endangered aquatic or terrestrial species or candidate species in any of the HUC8 watersheds that are affected by the proposed mine?</p> <p>If there is the presence of at least one T&E or candidate species, there is cause for concern.</p> <p>UNITS: Y/N per HUC8 0 =N & 1 = y</p>

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CRIT_HAB	Environmental Condition of underlying watershed	Critical Habitat. Is there at least one Critical Habitate area in any of the HUC8 watersheds that are affected by the proposed mine? UNITS: (Y/N per HUC8) 0 = N & 1= Y
RARE_STATE	Environmental Condition of underlying watershed	Rare, State-listed Species. The total number of rare state listed aquatic or terrestrial species in the HUC watersheds that are affected by the proposed mine? UNITS: Y/N per HUC8 0 =N & 1 = y
PEOPLE	Mine Impact	Population (U.S. Census). This indicator represents mining impacts on human health from all pathways. Higher numbers mean more vulnerability. UNITS: (# people/HUC12)
COAL_REFUSE_DISPOSAL_AREA	Mine Impact	Is the proposed mine planning to have a coal refuse disposal area? A coal refuse disposal area is often a slurry pond but could include other types. UNITS: (Y/N) 0 = N & 1= Y
SAD_AREA	Mine Impact	Surface Area Disturbance Area. Total Surface Area of Disturbance (NEW+ EXPANSION + REMINE) area disturbed, including roads, mineral extraction area, valley fills of the proposed activity.
SAD_TYPE	Mine Impact	Surface Area Disturbance Type. This is a flag which represents the possible types of SAD that can be included in total area found in the terminal indicator "SAD_AREA" The possible flags and their definations are as follows: 1.. EXPANSION or REMINING 2. NEW UNITS: (Flag: 1 or 2)
MINING_EFF	Mine Impact	Mining Efficiency = tons of coal mined per acre of mine area. The higher this number the more efficient the use of the land. UNITS: (TONS/ACRE)

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EXCESS_SPOIL_PCT	Mine Impact	Excess Spoil Percent. This is the ratio (expressed as a percentage) of the Excess Spoils to the Total Spoils. The higher the number, the worse environmentally (e.g., excess spoil disposal is often into valley fills resulting in stream impacts.) METRIC: (Excess Spoils/total spoils) UNITS: (%)
VF_EFF	Mine Impact	Valley Fill Efficiency = volume of excess spoils per linear ft of stream filled. The higher the number the lower the stream impact. UNITS: (cu.yd fill /linear ft. stream)
EXCESS_SPOIL_EFF	Mine Impact	Excess Spoil Efficiency = excess spoil per ton of coal. The lower this number the higher removal efficiency meaning likely to have less aquatic resource impacts per ton of coal extracted. UNITS: (cu.yd/Ton)
AOC_80_20_VARIANCE	Mine Impact	Approximate Original Contour or Equivalent (i.e., 80-20) Variance. Does the applicant have a variance so that the area will not be brought back to AOC of the pre-mined land? If no, the area will be brought back to AOC (or AOC plus). UNITS: (Y/N) 0 = N & 1 = Y
PERM_P	Mine Impact	Permanent Perennial Stream Impact. Length of perennial stream filled or mined through permanently. UNITS: linear ft.
TEMP_P	Mine Impact	Temporary Perennial Stream Impact. Length of Perennial stream filled or mined through temporarily. UNITS: linear ft.
PERM_I	Mine Impact	Permanent Intermittent Stream Impact. Length of intermittent stream filled or mined through permanently. UNITS: linear ft.
TEMP_I	Mine Impact	Temporary Intermittent Stream Impact. Length of intermittent streams filled or mined through temporarily. UNITS: linear ft.

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PERM_E	Mine Impact	<p>Permanent Ephemeral Stream Impact. Length of ephemeral streams filled or mined through permanently.</p> <p>UNITS: linear ft.</p>
TEMP_E	Mine Impact	<p>Temporary Ephemeral Stream Impact. Length of ephemeral streams filled or mined through temporarily.</p> <p>UNITS: linear ft.</p>
VF_DRAIN	Mine Impact	<p>Valley Fill Drainage (applicable only to mountaintop mining) This indicator is a linear weighted sum of the number of valley fills that are proposed to be located in one of three drainage classes: i.e.,</p> <ol style="list-style-type: none"> 1) Drainage areas that are > 40 acres 2) Drainage areas that are >= 15 acres & <= 40 acres 3) Drainage areas that are < 15 acres <p>METRIC: $\sum(\text{from } i=1 \text{ to } i=3) [DA_{wt_i} \times VF_i]$ where: i=1 for drainage area > 40 acres i=2 for drainage area >= 15 acres & <= 40 acres i=3 for drainage area < 15 acres DA_{wt_i} is the weight (0-1) of the ith drainage area VF_i is the number of valley fills that are to be located in the ith drainage area</p> <p>Each of the valley fill drainage area classes above will be weighted based on the relative significance of these kinds of drainage areas.</p> <p>UNITS: (weighted Number)</p>

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PMI_LOW	Mine Impact	<p>Post Mine Impact Low This indicator is designed to consider the impact that the proposed mine will have on aquatic resources if both the present conductivity of the proposed surface area disturbance and the conductivity of its closest area of adjacent mining are < the tipping point for a stream's conductivity (i.e. in general, 500 us/cm).</p> <p>Post Mine Impact Medium This indicator is designed to consider the impact that the proposed mine will have on aquatic resources if the present conductivity of the proposed surface area disturbance is less than the tipping point for a stream's conductivity (i.e. in general, 500 us/cm) and the conductivity of the closest adjacent mining areas is >= the tipping point.</p> <p>Post Mine Impact High This indicator is designed to consider the impact that the proposed mine will have on aquatic resources if both the present conductivity of the proposed surface area disturbance and the conductivity of its closest area of adjacent mining are >= than the tipping point for a stream's conductivity (i.e. in general, 500 us/cm).</p>
PMI_MED	Mine Impact	<p>Each of the three PMI terminal indicators relate to the impact on aquatic resources that the proposed mine is expected to have, based on an estimate of the conductivity that will result from the mining operations. Although the metric for these three indicators is calculated in the same manner (based on a knowledge of the pre-mine conductivity and the conductivity of the closest adjacent) the value of the metrics will be indexed differently, since each indicator represents one of three possible cases that vary in the degree to which a proposed mine's impact will be significant. That is, the significance of the impact will depend on both the value of the metric and which of the following three cases apply. The three cases are as follows:</p> <ol style="list-style-type: none"> 1) PMI_LOW: pre-mine & adjacent mine conductivities are < tipping point. 2) PMI_MED: pre-mine conductivity < 500 us/cm & adjacent mine conductivity >= tipping point. 3) PMI_HIGH: pre-mine & adjacent mine conductivities >= tipping point. <p>The construction of these indicators is based on the concept of a tipping point above which a stream is expected to be impaired.</p>

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PMI_HIGH	Mine Impact	<p>The metric for PMI_LOW, PMI_MED & PMI_HIGH is calculated as follows:</p> $PMI_{...} = [(COND_Adj - CONDUCTIVITY)/(COND_Adj)] * [COND_Adj + CONDUCTIVITY] * [(COND_Adj)/CONDUCTIVITY]$ <p>The logic behind this metric is based on three principles: 1) the greater the expected percent increase in conductivity from pre to post mining conditions the greater the mine's impact (i.e. COND_Adj/CONDUCTIVITY0); 2) the greater the overall magnitude of both the pre and post mining conductivities the greater the mine's expected impact; and 3) the closer the pre and post mining conductivities are the less the concern (e.g. consider a pre and post mine conductivity that were equal, such a situation would cause no concern, however greater the difference the greater the concern).</p>
WETLAND_LOSS	Mine Impact	<p>Wetland Loss = acres of wetlands removed by the proposed mine.</p> <p>UNITS: acres</p>
ADD_ADD_MINES	Mine Impact	<p>This column contains the total number of mines, not evaluated individually by MIRA, that are in the regulatory pipeline and are proposed to be located (as defined by a single point --Lat/Long) within any HUC that the footprint of the mine being evaluated impacts.</p> <p>The manner in which this data is used in the analysis is as follows:</p> <p>The ADD_ADD_MINES Indicator is calculated by multiplying the # of ADD_ADD_MINES by the median of a subset of the values or the "Additional Proposed Mines" composite indicator. The subset is constructed of all proposed mines that have one and only one additional mine, from the proposed list of mines being evaluated, that impacts at least one of the same HUCs.</p>
ADD_SAD_AREA	Mine Impact	<p>Additional Mines Surface Area Disturbance Area.</p> <p>Total Surface Area of Disturbance (NEW+ EXPANSION + REMINE) area disturbed, including roads, mineral extraction area, valley fills of the additional proposed mines in all the affected watersheds.</p> <p>UNITS:(acres)</p>
ADD_PERM_P	Mine Impact	<p>Permanent Perennial Stream Impacts due to additional proposed mines in the same watershed(s) as the proposed mine.</p> <p>Total length of Permanent Perennial stream that includes footage from additional proposed mines in the affected watersheds.</p> <p>UNITS: linear ft.</p>

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Indicator	Used for describing:	Description
ADD_TEMP_P	Mine Impact	Temporary Perennial Stream Impacts due to additional proposed mines in the same watershed(s) as the proposed mine. Total length of Temporary Perennial stream that includes footage from additional proposed mines in the affected watersheds. UNITS: linear ft.
ADD_PERM_I	Mine Impact	Permanent Intermittent Stream Impacts due to additional proposed mines in the same watershed(s) as the proposed mine. Total length of Permanent Intermittent stream that includes footage from additional proposed mines in the affected watersheds. UNITS: linear ft.
ADD_TEMP_I	Mine Impact	Temporary Intermittent Stream Impacts due to additional proposed mines in the same watershed(s) as the proposed mine. Total length of Temporary Intermittent stream that includes footage from additional proposed mines in the affected watersheds. UNITS: linear ft.
ADD_PERM_E	Mine Impact	Permanent Ephemeral Stream Impacts due to additional proposed mines in the same watershed(s) as the proposed mine. Total length of Permanent Ephemeral stream that includes footage from additional proposed mines in the affected watersheds. UNITS: linear ft.
ADD_TEMP_E	Mine Impact	Temporary Ephemeral Stream Impacts due to additional proposed mines in the same watershed(s) as the proposed mine. Total length of Temporary Ephemeral stream that includes footage from additional proposed mines in the affected watersheds. UNITS: linear ft.

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ADD_VF_DRAIN	Mine Impact	<p>Valley Fill Drainage (applicable only to mountaintop mining) from additional proposed mines. This indicator is a linear weighted sum of the number of valley fills that are proposed to be located in one of three drainage classes from additional proposed mines in the same watersheds. These drainage classes are::</p> <ol style="list-style-type: none"> 1) Drainage areas, from the downstream sediment pond, that are > 40 acres 2) Drainage areas, from the downstream sediment pond, that are >= 15 acres & <= 40 acres 3) Drainage areas, from the downstream sediment pond, that are < 15 acres <p>METRIC: $\sum(\text{from } i=1 \text{ to } i=3) [DA_{wt_i} \times VF_i]$ where: i=1 for drainage area > 40 acres i=2 for drainage area >= 15 acres & <= 40 acres i=3 for drainage area < 15 acres DA_{wt}_i is the weight (0-1) of the ith drainage area VF_i is the number of valley fills that are to be located in the ith drainage area</p> <p>Each of the valley fill drainage area classes above will be weighted based on the relative significance of these kinds of drainage areas.</p>
ADD_WETLAND_LOSS	Mine Impact	<p>ADD Wetland Loss = acres of wetlands removed by additional proposed mines in the same watershed(s) as the proposed mine.</p> <p>UNITS: acres</p>
STRM_RATIO	Mine Impact	<p>Stream Mitigation Ratio.</p> <p>This indicator represents the % of impacted streams that the proposed mine intends to mitigate. The indicator is constructed as the ratio of the Total length of mitigated streams to the total length of mine impacted streams.</p> <p>UNITS: Non-dimensional (0 - 1)</p> <p>NOTE: If the Total length of streams impacted = 0.00 then this indicator is set equal to 8.00</p>
WETL_RATIO	Mine Impact	<p>Wetlands Mitigation Ratio.</p> <p>This indicator represents the % of the impacted wetlands that the proposed mine intends to mitigate. The indicator is constructed as the ratio of the Total area of mitigated wetlands to the total area of mine impacted wetlands.</p> <p>UNITS: Non-dimensional (0 - 1)</p> <p>NOTE: If the Total area of mine impacted wetlands = 0.00 then this indicator is set equal to 8.00</p>

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Sum of Fills	Mine Impact	Sum of Stream Fills or Mined through: Total linear ft of all types of streams filled or mined through by the proposed mine (temporary and permanent impacts). UNITS: linear ft.
Excess Spoil	Mine Impact	Excess Spoils. UNITS: 10^6 cu yd. per valley fill
COND_Adj	Mine Impact	The specific conductivity or Total Dissolved Solids (TDS - conductivity can be calculated from TDS) as measured at the the existing mines within the watershed where the proposed mine is planning to locate. This is used in conjunction with the terminal PMI indicator to estimate post-mine aquatic impacts. See the 3 PMI terminal indicators. The data can be found in either the the Cumulative Hydrologic Impact Analysis or the EID (Environmental Information Document). UNITS: us/cm
COND_Pre	Mine Impact	Where baseline data was available from the application materials, it was used. Where baseline data was not available from the application materials the mean of the available data points for the streams closest to the proposed mine were used. Where no baseline measurements were available, the minimum value for the HUC was used. Where no HUC conductivity was available, the median of the minimum HUC12 conductivities was used.
Coal Extraction	Mine Impact	Coal extraction expected from each mine proposed UNITS: (million tons)
# of VF w/ Drain Area > 40 (VF)	Mine Impact	Number of VF in the mining proposal with a drainage area (measured from the downstream sediment pond if available, otherwise from the toe of the fill) greater than 40 acres
# of VF w/ Drain Area 15-40 (VF)	Mine Impact	Number of VF in the mining proposal with a drainage area (measured from the downstream sediment pond if available, otherwise from the toe of the fill) greater than or equal to 15 acres but smaller than or equal to 40 acres
# of VF w/ Drain Area < 15 (VF)	Mine Impact	Number of VF in the mining proposal with a drainage area (measured from the downstream sediment pond if available, otherwise from the toe of the fill) less than 15 acres
Addl # of VF w/ Drain Area > 40 (VF)	Mine Impact	Number of VF in the additional mining proposal(s) that are within the same watershed as the mining proposal with a drainage area (measured from the downstream sediment pond if available, otherwise from the toe of the fill) greater than 40 acres

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Addl # of VF w/ Drain Area 15-40 (VF)	Mine Impact	Number of VF in the additional mining proposal(s) that are within the same watershed as the mining proposal with a drainage area (measured from the downstream sediment pond if available, otherwise from the toe of the fill) greater than or equal to 15 acres but smaller than or equal to 40 acres
Addl # of VF w/ Drain Area < 40 (VF)	Mine Impact	Number of VF in the additional mining proposal(s) that are within the same watershed as the mining proposal with a drainage area (measured from the downstream sediment pond if available, otherwise from the toe of the fill) less than 15 acres
Stream mitigation (linear feet)	Mine Impact	Stream Mitigation proposed UNITS: linear ft.
Wetland mitigation (acreage)	Mine Impact	Wetland Mitigation proposed UNITS: acres.
Total Spoil (cu. yds.)	Mine Impact	Total Spoil UNITS: 10 ⁶ cu.yrds.
New Mine (Y/N)	Mine Impact	New Mine or not UNITS: (Y/N) 0 = N & 1 = Y