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AUG 1 5 2018

DIVISION OF AIR QUALITY

August 15, 2018

Public Comment Division of Air Quality PO Box 144820 Salt Lake City, UT 84114-4820

Attn: Thomas Gunter

Re: <u>Kennecott Utah Copper Comments</u> <u>Proposed Rule Making: SIP Subsection IX. Part H: Emissions Limits</u> <u>and Operating Practices, R307-110-17</u>

Dear Mr. Gunter:

Kennecott Utah Copper LLC (KUC) submits the enclosed comments on the July 1, 2018 proposed rulemaking to amend State Implementation Plan (SIP) Subsection IX, Part H: Emissions Limits and Operating Practices, R307-110-17, Section IX, Control Measures for Area and Point Sources, Part H Emissions Limits, and supporting information Utah Division of Air Quality has provided on the website.

Should you have any questions, please contact me or Cassady Kristensen at 801-204-2129.

Respectfully submitted,

Steve Sehnoor

Manager - Environment, Land and Water

Enclosure

# AUG 1 5 2018

#### DIVISION OF AIR QUALITY COMMENTS ON THE PM2.5 RULEMAKING, PART H EMISSION LIMITATIONS

#### August 15, 2018

Kennecott Utah Copper LLC (Kennecott or KUC) provides these comments on the proposed rulemaking, State Implementation Plan (SIP) Subsection IX, Part H: Emission Limits and Operating Practices, R307-110-17, Section IX, Control Measures for Area and Point Sources, Part H Emission Limits, and the supporting information that the Utah Division of Air Quality (UDAQ) has provided on its website.<sup>1</sup>

#### **INTRODUCTION**

On May 10, 2017, the U.S. Environmental Protection Agency (EPA) published a final rule in the Federal Register in which it reclassified the Salt Lake City PM2.5 nonattainment area (SLC NAA) to "serious."<sup>2</sup> By doing so, EPA triggered the Clean Air Act's (CAA) provisions that require Utah to evaluate and implement best available control technology (BACT) for major stationary sources located in the SLC NAA.<sup>3</sup> UDAQ's BACT determinations for the SLC NAA are codified in Part H of the Utah SIP, which is the subject of the current rulemaking action. KUC has significant interests in the proposed rulemaking as the company owns and operates multiple facilities that are directly regulated in Part H of the Utah SIP; KUC's Bingham Canyon Mine, Utah Power Plant, Smelter, and Refinery are all sources subject to specific provisions contained in Section IX, Part H.

KUC has a long history of regulation under Part H of the Utah SIP. Indeed, UDAQ first regulated KUC's operations in Part H in 1991, when the agency adopted a PM10 SIP covering Salt Lake County. While a complete SIP submittal must include both control strategies and an attainment demonstration, UDAQ opted to bifurcate the development of the Part H emission limitations from the remainder of the Serious PM2.5 SIP.

#### **TOPIC 1: BACT ANALYSIS FOR UTAH POWER PLANT UNIT #4**

Utah Power Plant (UPP) Unit #4 is capable of producing power by either combusting natural gas or coal. Since 1991, UDAQ has leveraged this operational flexibility to require KUC

<sup>&</sup>lt;sup>1</sup> UDAQ published notice of the proposed revisions to Part H in the July 1, 2018 version of the Utah State Bulletin. 2018-13 Utah Bull. pp. 34-36 (July 1, 2018); *see also* Utah Air Quality Board, Final Agenda, Items VIII and IX (June 6, 2018); https://deq.utah.gov/legacy/pollutants/p/particulate-matter/pm25/serious-area-state-implementationplans/control-strategies.htm.

<sup>&</sup>lt;sup>2</sup> 80 Fed. Reg. 21711 (May 10, 2017).

<sup>&</sup>lt;sup>3</sup> CAA § 189(b)(1)(B); *see also* 40 CFR § 51.1010(a). Sections 51.1000 to 51.1015 are the federal regulations that EPA promulgated for the implementation of the PM2.5 National Ambient Air Quality Standards (NAAQS). In these comments, KUC refers to these regulations as the "PM2.5 Implementation Rule." EPA published the PM2.5 Implementation Rule on August 24, 2016. 81 Fed. Reg. 58010. Included in that publication was a preamble to the PM2.5 Implementation Rule, wherein EPA provided an extensive discussion of its interpretation of certain issues associated with the rule. For clarity, these comments refer to EPA's discussion as the "preamble to the PM2.5 Implementation Rule."

to produce fewer emissions during northern Utah's wintertime inversion season by prohibiting KUC from burning coal between November 1 and the end of February.<sup>4</sup> Given the seasonal restrictions on coal, coupled with the fact that the SLC NAA's PM exceedances primarily occur during this four-month period, UDAQ has previously (and consistently) determined that an evaluation of controls for UPP for the PM SIPs would be limited to operations that occur between November 1 and the end of February.<sup>5</sup> In other words, UDAQ has strictly applied a seasonally-based RACT/BACT determination for UPP based on natural gas-based combustion limits during the wintertime inversion season combined with a prohibition on combusting coal during the inversion season.

Now, however, for the first time in the nearly three decades of regulating the UPP via the PM10/2.5 SIP, UDAQ dramatically changed its interpretation, proposing to require controls on coal burning outside of the wintertime inversion season.<sup>6</sup> In particular, UDAQ concluded that, for "Coal [combustion] during the period March 1 to October 31," "BACT requires that KUC install Over-fired Air (OFA) and Selective Catalytic Reduction (SCR). This will reduce the NOx emissions from 384 ppm to 80 ppm."<sup>7</sup>

<sup>&</sup>lt;sup>4</sup> See SIP Section IX Part H.2.h.i.D & E (December 7, 2016) ("During the period from November 1, to the last day in February inclusive, only natural gas shall be used as fuel . . . ."); *id.* Part H.12.k.i.D & E (same); SIP Section IX Part H.2.b.Z.2 & 3 (July 26, 1993) ("During the period from November 1 to the last day in February, inclusive, the following conditions shall apply: A. The four boilers shall use only natural gas as a fuel . . . ."); SIP Section IX, Appendix A, Part 2.2.Z.2 (June 28, 1991) (same).

<sup>&</sup>lt;sup>5</sup> UDAQ's PM10 and PM2.5 SIP have consistently been focused on evaluating and reducing emissions during northern Utah's wintertime inversion season. Utah SIP, Section IX. Part A.21, PM2.5 SIP for the Salt Lake City, UT Nonattainment Area (December 4, 2014), p. 23 (identifying contributions to PM2.5 concentrations during the winter), pp. 30 (identifying how UDAQ selected "SIP episodes for modeling" and determining that all episodes selected would be from the wintertime inversion season), p. 57 (providing an inventory of "typical winter inversion weekday"), see also UDAQ Particulate Matter Overview. available at https://deq.utah.gov/legacy/pollutants/p/particulate-matter/index.htm ("Particulate Matter in Utah. Winter inversions are a common event in Utah, generally occurring between December and February. Prolonged inversions can lead to high levels of fine particulate pollution, or PM2.5."); Utah SIP, July 1993, Section IX. Part A.2 ("Table IX.A.1 below shows the number of exceedance measured in Utah and Salt Lake Counties since 1985. It also shows the months when the exceedance occurred. As can be seen, most of the exceedances occur during the winter months. During the winter, extremely strong temperature inversions develop which trap PM10 particles and all other pollutants in a layer near the ground.").

<sup>&</sup>lt;sup>6</sup> See SIP Section IX. Part H.12.k.i.C. UDAQ's proposed revisions appear to authorize KUC to combust coal in Unit #4 throughout the year by seemingly proposing to eliminate the restriction on combusting coal between November 1 and the end of February. However, KUC is still precluded by other SIP conditions from combusting coal during the wintertime inversion season. See PM10 SIP, Part H.2.h.i.D & E (December 7, 2016; current). Additionally, wintertime coal burning would result in significantly higher direct PM2.5 emissions. Compare SIP Section IX. Part H.12.k.i.A (limiting Unit #4 emissions when combusting natural gas to 0.03 gr/dscf of PM2.5 and 20 ppmdv of NOx) with Part H.12.k.i.B (limiting Unit #4 emissions when combusting coal to 0.29 gr/dscf of PM2.5 and 80 ppmdv of NOx). Given that this provision would arguably allow KUC to emit greater emissions during the wintertime inversion period, KUC assumes that it was an oversight on UDAQ's part to propose to eliminate Part H.12.k.i.C. KUC requests that UDAQ confirm that this was an oversight.

<sup>&</sup>lt;sup>7</sup> PM2.5 SIP Evaluation Report – Kennecott Utah Copper LLC – Power Plant, DAQ-2018-007701, p. 7 (July 1, 2018).

#### I. UPP Comment No. 1. UDAQ Misconstrued EPA's Explanation of BACT as Precluding Seasonally-Based Controls for UPP Unit #4

The only explanation offered by UDAQ for its shift away from a seasonal control strategy approach is premised on an isolated statement in the PM2.5 Implementation Rule preamble that BACT "is generally independent of attainment." UDAQ has indicated to KUC that it believes that EPA's "generally independent" statement requires BACT for coal firing outside of the wintertime inversion season. This rationale has been both articulated to KUC in conversations with UDAQ and alluded to in UDAQ's memorandum to the Board, which contains the following statement: "EPA's Fine Particulate Matter Implementation Rule explains that BACM/BACT is 'generally independent' of attainment, and is to be determined without regard to the specific attainment demonstration for the area. For this reason, the Division of Air Quality (DAQ) is presenting the Air Quality Board an opportunity to release the proposed revisions to Part H for public review and comment prior to the completion of the accompanying modeling and attainment demonstration."<sup>8</sup>

UDAQ has misconstrued EPA's discussion regarding the relationship of the attainment demonstration to BACM/BACT as precluding the common-sense, seasonal-control strategy that it has taken for almost 30 years. In fact, nothing in the PM2.5 Implementation Rule or its preamble precludes seasonal controls. To the contrary, designing a control strategy, including BACT controls, around the seasonal nature of the air quality circumstances that the SLC NAA area faces, is consistent with the CAA and its implementing regulations. Furthermore, addressing the seasonal nature of the problem is required pursuant to the Utah Air Conservation Act.

In the preamble, EPA explains the differences between the control requirements applicable in a Moderate nonattainment area (RACT/RACM) compared to those required for a Serious nonattainment area (BACT/BACM). In explaining the former, EPA states that, "the specific determination of RACM and RACT is to be made within the broader context of assessing control measures for all stationary, area and mobile sources of direct PM<sub>2.5</sub> and PM<sub>2.5</sub> precursors that would collectively contribute to meeting the Moderate area attainment date as expeditiously as practicable."<sup>9</sup> "Measures that are not necessary for attainment need not be considered as RACM/RACT."<sup>10</sup> Clearly then, in assessing RACM/RACT, consideration may be given to the air quality benefits that would result from control measures being evaluated.

Turning to controls for Serious NAAs, the agency states that, "EPA has decided to maintain the policy that BACM/BACT determinations are to be 'generally independent' of

<sup>10</sup> Id. at 58035/1.

<sup>&</sup>lt;sup>8</sup> Memorandum from Bill Reiss, through Bryce Bird, to the Air Quality Board, regarding, "PROPOSE FOR PUBLIC COMMENT: Amend SIP Subsection IX. Part H: Emission Limits and Operating Practices. Specifically Proposed for Amendment are Requirements in Subparts H. 1, 2, 11, and 12." (May 24, 2018). The term "BACM" refers to Best Available Control Measure. BACT is a sub-category of BACM. 40 CFR § 51.1000. These comments also refer to the terms "RACM" and "RACT," which means Reasonably Available Control Measures and Reasonably Available Control Technology.

<sup>&</sup>lt;sup>9</sup> 81 Fed. Reg. 58034/3.

attainment for purposes of implementing the PM2.5 NAAQS."<sup>11</sup> EPA explained that, "while RACM emphasizes the attainment needs of the area, BACM has a greater emphasis on identifying measures that are feasible to implement. Keeping in mind that the overall objective of the implementation of BACM and BACT and additional feasible measures is to bring a Serious  $PM_{2.5}$  nonattainment area into attainment as expeditiously as practicable, . . . the test for BACM puts a greater emphasis on the merits of the measure or technology alone, rather than on flexibility in considering other factors, in contrast to the approach for determining RACM and RACT."<sup>12</sup>

This qualified "general independence"<sup>13</sup> is simply a recognition that compared to a RACT determination, there will be a "greater emphasis" on whether a particular control measure is technically and economically feasible compared to whether it is necessary for attainment. Nowhere in its discussion, however, does EPA suggest that there is an absolute prohibition on considering the relevance of the controls toward bringing an area into attainment; after all, that's the ultimate objective of the SIP planning process.

In the proposed rulemaking, EPA outlined an option for states to identify *de minimis* categories of sources that could be exempted from BACM/BACT. In the final rule, EPA declined to adopt such an option but noted that even without the exemption, "the final rule will nevertheless provide *sufficient flexibility* in the Serious area control measure analysis and attainment demonstration process, due to the availability of provisions *enabling states to identify sources that should not be subject to control measures*, including the ability to develop precursor demonstrations to exclude certain precursors from control requirements, and to consider case-specific factors in determining technical and economic feasibility of potential control measures."<sup>14</sup>

So the statement that BACT "is generally independent of attainment" does not mean that no consideration be given to whether a control is appropriate or, more to the point, whether account may be given to seasonal prohibitions. The recognition that states have "flexibility" and can consider "case-specific factors" when making the BACT determinations is far from a prohibition on seasonal controls. The acknowledgment that states may conduct precursor demonstrations is perhaps the most obvious recognition that BACT is not an absolute requirement.<sup>15</sup>

While it is correct that, under EPA's interpretation of "general independence," UDAQ's determination of BACT for Unit #4 *during the wintertime inversion season* should place

<sup>14</sup> 81 Fed. Reg. 58082/3 (emphasis added).

<sup>&</sup>lt;sup>11</sup> *Id.* at 58081/2 (emphasis added).

<sup>&</sup>lt;sup>12</sup> Id. at 58081/1 (omitting quotation marks and references to the General Preamble).

<sup>&</sup>lt;sup>13</sup> EPA is careful through this discussion to always qualify the concept of independence by "generally."

<sup>&</sup>lt;sup>15</sup> See 40 CFR § 51.1010(a)(ii) ("The state is not required to identify and evaluate potential control measures to reduce emissions of a particular PM2.5 precursor from any existing sources if the state has submitted a comprehensive precursor demonstration approved by EPA ...."); see also id. § 51.1010(a)(ii) (providing a similar exception for a "major stationary source precursor demonstration). A precursor demonstration is a demonstration that one or more precursors does not "significantly contribute" to PM2.5 levels. See id. § 51.1006.

"greater emphasis" on whether a particular control measure is technically and economically feasible than on the resultant contribution to the attainment demonstration, there is no basis for looking to impose BACT level controls for an operating mode that is wholly prohibited during that period of time. This concept of general independence has no relevance to seasonal control measures.<sup>16</sup>

# II. UPP Comment No. 2. The CAA and Implementing Regulations Do Not Prohibit Seasonal Controls as Part of BACT

As discussed in the preceding section of these comment, EPA's interpretation of "general independence" has no bearing on the appropriateness of seasonal control measures as part of a BACT determination. The CAA and its implementing regulations do, however, specifically address what constitutes an impermissible intermittent control; the use of seasonal controls is not precluded by these provisions.

Section 123 of the CAA includes a prohibition on "any intermittent or supplemental control of air pollutants varying with atmospheric conditions."<sup>17</sup> EPA explains that intermittent control systems "vary a source's rate of emissions to take advantage of meteorologic conditions. When conditions favor rapid dispersion, the source emits pollutants at higher rates, and when conditions are adverse, emission rates are reduced."<sup>18</sup> In other words, prohibited intermittent controls are those that are engaged in response to specific atmospheric conditions.

Seasonal controls do not run afoul of section 123's prohibition (or that of EPA's implementing regulations codified in 40 CFR Part 51, subpart F) on intermittent controls systems: "Seasonal controls that are implemented at pre-determined periods of the year and that do not vary with atmospheric or meteorological conditions are not limited by section 123, even if they apply to stationary sources."<sup>19</sup> We assume UDAQ agrees since it has included such

<sup>&</sup>lt;sup>16</sup> Additionally, KUC questions whether UDAQ has provided KUC with an adequate explanation of the reasons why the agency believes EPA's "generally independent" statement equates to a prohibition on seasonal controls. The rulemaking record is particularly silent on this issue. A fundamental tenet of administrative law underlying rulemaking actions is that the agency must provide an adequate explanation of its reasons for the actions it is taking. This is particularly applicable where the agency has taken a contrary position in prior rulemakings. *See Perez v. Mortgage Bankers Ass'n*, 135 S.Ct. 1199, 1204 (2015) (distinguishing between legislative and interpretive rules).

<sup>&</sup>lt;sup>17</sup> CAA § 123(b).

<sup>&</sup>lt;sup>18</sup> 50 Fed. Reg. 27892, 27893/2 (July 8, 1985); see also 40 CFR § 51.100 (defining "dispersion technique" to include "[v]arying the rate of emission of a pollutant according to atmospheric conditions or ambient concentrations of that pollutant"); Kamp v. Hernandez, 752 F.2d 1444, 1452 (9<sup>th</sup> Cir. 1985) ("So long as the smelter's emissions are within the specified emission profile, the source will be in compliance with the implementation plan *regardless of the prevailing atmospheric conditions*." (emphasis added)); Bunker Hill Co. v. EPA, 572 F.2d 1286, 1291 n. 4 (9<sup>th</sup> Cir. 1977) ("Supplemental control systems involve staggering the hours of operation of the polluting facilities, with the facilities operating extensively when meteorological conditions are favorable to dispersion, and sometimes even temporarily closing when meteorological conditions are unfavorable." (emphasis added)).

<sup>&</sup>lt;sup>19</sup> EPA OAQPS guidance, INCORPORATING EMERGING AND VOLUNTARY MEASURES IN A STATE IMPLEMENTATION PLAN (SIP) (Sept. 2004) at 10. As part of the legislative history for the 1990 CAA amendments, Congress also acknowledged the distinction EPA had made between prohibited intermittent controls and lawful seasonal controls. Specifically, a committee report quoted the following from a letter submitted by EPA Congress, "A third type of noncontinuous control is the use of seasonal controls, such as the seasonal use of oxygenated fuels. Seasonal controls are implemented during a specific predetermined period of the year, and do not

seasonal controls in past SIPs.<sup>20</sup> Importantly, the section 123 prohibition – and the exception from this prohibition for seasonal controls – applies broadly to any control measure (RACT or BACT) established under a State implementation plan.<sup>21</sup>

UDAQ's longstanding prohibition on coal combustion at UPP between November 1 and the end of February is not based on varying atmospheric conditions. Regardless of the air quality concentrations, meteorology, or the presence or absence of any other condition, the condition historically imposed by UDAQ prohibits KUC from combusting coal during a specific fourmonth period. This is not an intermittent control prohibited by section 123 or EPA's implementing regulations.

# III. UPP Comment No. 3. UDAQ's Entire Attainment Demonstration is Predicated on a Seasonal Approach

UDAQ's decision to not recognize seasonal controls is at odds with its attainment demonstration. While UDAQ has not formally proposed its attainment demonstration, UDAQ has made clear that that demonstration will be based on a PM2.5 episode that occurred during the cold air pool event of January 1-10, 2011 and included multiple exceedance days.<sup>22</sup> This makes sense in view of the broad recognition that the PM2.5 nonattainment problem is aligned with the wintertime inversion season.<sup>23</sup> UDAQ's decision to ignore seasonality in the context of developing a control strategy for the UPP stands in stark contrast to its attainment demonstration focused on the wintertime inversion season.

The PM2.5 Implementation Rule supports a seasonal attainment strategy. For instance, the PM2.5 Implementation Rule allows states to develop emission inventories based on seasonal emissions as opposed to annual emissions.<sup>24</sup> EPA explains the rationale for allowing seasonal inventories thusly,

In the case of the 24-hour NAAQS . . . the form of the NAAQS is based upon monitored values on particular days with high levels of ambient PM2.5 and in some nonattainment areas those days may occur only during a distinct and

vary with specific atmospheric conditions. Thus, EPA also does not consider the use of these seasonal controls to be limited by section 123." Report of the Committee on Energy & Commerce U.S. House of Representatives on H.R. 3030, p. 269 (May 17, 1990). Congress was clearly aware of EPA's interpretation on the validity of seasonal controls under the CAA and could have, if it did not concur, direct that EPA's interpretation was contrary to the CAA or revise section 123 to exclude seasonal controls as part of the CAAA.

<sup>20</sup> See discussion in footnote 5 and related text.

<sup>21</sup> See 40 CFR 51.119.

<sup>22</sup> See also UDAQ PM2.5 Emission Inventory Preparation Plan, p. 8 (June 22, 2017) (identifying the 2011 events as one of three candidate episodes to base the attainment demonstration on).

<sup>23</sup> UDAQ SIP Inventories, p. 2 ("Seasonality: Utah's problem with PM2.5 is a wintertime problem. As such, some of the emissions have been adjusted to reflect conditions more typical to the winter season. Any comparison with other emission inventories presented on DAQ's website should take this into account."), *available at* https://deq.utah.gov/legacy/pollutants/p/particulate-matter/pm25/serious-area-state-implementation-plans/posted-inventories.htm.

<sup>24</sup> 40 CFR § 51.1008(a)(1)(iii) ("The emission values shall be either annual total emissions, *average-season-day emissions*, or both, as appropriate for the relevant PM2.5 NAAQS.").

definable season of the year. The EPA considers it appropriate to interpret the emissions inventory requirements of the CAA in light of the specific inventory needs that are relevant for the NAAQS in question. \* \* \*

[T]he 24-hour  $PM_{2.5}$  NAAQS are designed to protect against peak exposures. Thus, for the 24-hour  $PM_{2.5}$  NAAQS, there are circumstances in which the EPA believes that only seasonal emissions inventories may be useful for attainment planning purposes. This rule at 40 CFR 51.1008(a)(1)(iii) allows states to use seasonal inventories for attainment plan development for attaining the 24-hour  $PM_{2.5}$  standard in areas that are designated nonattainment for only the 24-hour standard. Use of a seasonal emissions inventory will also be appropriate only if the monitored violations of the 24-hour  $PM_{2.5}$  NAAQS in the area occur during an identifiable season.<sup>25</sup>

Given that the SLC NAA's PM2.5 exceedances are limited to a specific season and UDAQ's recognition of this fact in preparing an attainment demonstration and emissions inventory based on the seasonal nature of the area's PM2.5 problem, UDAQ's determination that it will impose controls and emission limitations for operations that only occur outside of that defined season is unreasonable and arbitrary. The arbitrariness of UDAQ's determination is further illuminated by the fact that UDAQ's determination is in conflict with the agency's longstanding policy and interpretation that UPP's operations will be subject to a seasonally-based evaluation of controls.

As a result, KUC requests that UDAQ delete the language proposed in Part H.12.k.i.B,<sup>26</sup> which would impose emission limitations for Unit #4's coal combustion between March 1 and October 31. UDAQ should also retain the language, "During the period from November 1 to February 28/29, when burning natural gas . . ." in Part H.12.k.i.A.<sup>27</sup>

#### IV. UPP Comment No. 4. There is no Legal Basis for Imposing Controls on a Mode of Operation that Will Not Occur During the Wintertime Inversion Season

As discussed above, seasonal controls are not prohibited under the CAA. Furthermore, in the case of UPP Unit #4, imposing controls on a mode of operation – coal firing – that is simply prohibited during the wintertime inversion season under the PM10 SIP, will have absolutely no relevance to the attainment strategy. Accordingly, there is no legal basis for imposing such controls.

In exercising its rulemaking authority, "[t]he board may establish emission control requirements by rule that *in its judgment may be necessary* to prevent, abate, or control air pollution that may be statewide or may vary from area to area, *taking into account varying local* 

<sup>&</sup>lt;sup>25</sup> 81 Fed. Reg. 58029-30.

<sup>&</sup>lt;sup>26</sup> In the proposed Part H.12.k.i, UDAQ included two subparagraph "B." When referencing Part H.12.k.i.B, these comments are referring to the provisions UDAQ proposed to add to Part H that set emission limitations for UPP "[w]hen burning coal" in Unit #4.

<sup>&</sup>lt;sup>27</sup> The PM10 SIP also contains a provision prohibiting KUC from combusting coal in Unit #4 between November 1 and the end of February. SIP Section IX Part H.2.h.i.D.

*conditions*.<sup>28</sup> The rulemaking record does not satisfy this requirement for two reasons. First, there has been no finding of "necessity." To the contrary, as these comments make clear, not only are controls on coal-firing not necessary, they have no bearing whatsoever on the attainment strategy.

Second, there has been no determination that the controls for UPP Unit #4 "tak[e] into account varying local conditions," namely, the seasonal inversion conditions. Taking into account the fact that the SLC NAA's nonattainment problem is confined to the wintertime inversion season leads to the conclusion that controls on a mode of operation that is prohibited during the season are not necessary.

Given that the revisions UDAQ proposed for Part H.12.k.i.B relate to Unit #4 combusting coal during the non-wintertime inversion season, KUC requests that UDAQ reject those proposed changes to the SIP and retain the SIP conditions as they currently exist.

#### V. UPP Comment No. 5. UDAQ's Proposed BACT Determination is Applied Arbitrarily as UDAQ Eliminated Seasonal Control for Unit #4 but Continued to Regulate Other SIP Sources via Seasonal Controls

Further undermining UDAQ's position that Unit #4's coal operations would be subject to BACT because UDAQ would no longer rely on seasonal controls is the fact that UDAQ has allowed other sources to continue to be regulated in this manner in the PM2.5 SIP. For instance, UDAQ regulates Unit #3 of PacifiCorp's Gadsby Power Plant with the following provision,

- iii. Steam Generating Unit #3
  - A. Emission of NOx shall be no greater than
    - I. 142 lb/hr on a three (3) hour block average basis, *applicable between November 1 and February 28/29*
    - II. 203 lb/hr on a three (3) hour block average basis, *applicable between March 1 and October 31*
- iv. Steam Generating Units #1-3
  - A. The owner/operator shall use only natural gas as a primary fuel and No. 2 fuel oil or better as a back-up fuel in the boilers. The No. 2 fuel oil may be used only during periods of natural gas curtailment and for maintenance firings. . . . <sup>29</sup>

Likewise, UDAQ regulates ATK Launch Systems with the following Condition,

<sup>&</sup>lt;sup>28</sup> Utah Code Ann. § 19-2-109(2)(a) (emphasis added).

<sup>&</sup>lt;sup>29</sup> Utah SIP, Subsection IX, Part H.12.n. (emphasis added).

- i. During the period November 1 to February 28/29 on days when the 24-hour average PM2.5 levels exceed 35  $\mu$ g/m3 at the nearest realtime monitoring station, the open burning of reactive wastes with properties identified in 40 CFR 261.23(a) (6) (7) (8) will be limited to 50 percent of the treatment facility's Department of Solid and Hazardous Waste permitted daily limit. During this period, on days when open burning occurs, records will be maintained identifying the quantity burned and the PM2.5 level at the nearest real-time monitoring station.
- ii. During the period November 1 to February 28/29, on days when the 24-hour average PM2.5 levels exceed 35  $\mu$ g/m3 at the nearest real-time monitoring station, the following shall not be tested:
  - A. Propellant, energetics, pyrotechnics, flares and other reactive compounds greater than 2,400 lbs. per day; or
  - B. Rocket motors less than 1,000,000 lbs. of propellant per motor subject to the following exception:
    - I. A single test of rocket motors less than 1,000,000 lbs. of propellant per motor is allowed on a day when the 24-hour average PM2.5 level exceeds 35  $\mu$ g/m3 at the nearest realtime monitoring station provided notice is given to the Director of the Utah Air Quality Division. No additional test of rocket motors less than 1,000,000 lbs. of propellant may be conducted during the inversion period until the 24hour average PM2.5 level has returned to a concentration below 35  $\mu$ g/m3 at the nearest real-time monitoring station.<sup>30</sup>

These provisions impose seasonal controls in a similar way to how UDAQ has previously regulated Unit #4. UDAQ imposed specific limitations and requirements that apply during a specific period of time (which is derived from the basis for the SLC NAA's PM2.5 nonattainment status). Like the Unit #4 prohibition on coal combustion, UDAQ imposed these provisions in an earlier version of the PM2.5 SIP. Yet, despite UDAQ's statements to KUC that UDAQ would no longer accept seasonal controls for the SLC NAA, UDAQ has, in fact, extended similar seasonal controls to other sources located in the SLC NAA.

It is a fundamental tenant of administrative law that it is arbitrary and capricious for an agency to apply one interpretation of the law to one party while applying a different, and contradictory, interpretation to another party. That is precisely what UDAQ has proposed to do here: UDAQ has proposed that ATK and PacifiCorp continue to be regulated through seasonal controls while eliminating similar seasonal controls for Unit #4.

<sup>&</sup>lt;sup>30</sup> Id. Part H.12.a. (emphasis added).

#### VI. Conclusion to KUC's UPP Comments

Given that neither the CAA nor the Act's implementing regulations preclude UDAQ from implementing seasonal control strategies in the PM2.5 SIP, UDAQ ought to limit its review of BACT to potential controls for operations that occur during the SLC NAA's inversion season. As such, KUC requests that UDAQ remove the revisions to Parts H.12.k.i.B & C that UDAQ proposed in the current rulemaking. Moreover, such a withdrawal of the proposed BACT determination is required because UDAQ has not shown – and cannot show – how regulation of Unit #4's operations outside of the period of November 1 through the end of February is "necessary" for attainment and UDAQ has not taken into account varying local conditions impacting PM2.5 concentrations, as required by the Utah Air Conservation Act. As UDAQ has done with other sources located in the SLC NAA, UDAQ should continue to apply its longstanding policy that the agency may evaluate controls on a seasonal basis for the PM2.5 NAAQS; UDAQ cannot treat Unit #4's emissions differently than these other sources.

In the event that UDAQ refuses to withdraw the revisions to Part H.12.k, KUC requests that the AQB decline to adopt the proposed revisions for the reasons stated previously.

### **TOPIC 2: BACT FOR THE BINGHAM CANYON MINE EMISSIONS CAP**

In Part H.12.j of the proposed SIP, UDAQ proposed the following conditions, which revise the provisions regulating emissions from the Bingham Canyon Mine (BCM),

i. Bingham Canyon Mine (BCM)

. . .

- A. Emissions at the Bingham Canyon Mine shall not exceed 6,205 tons of NOx, PM2.5, and SO2 combined per rolling 12-month period.
- B. Maximum total NO2 emissions from ore and waste haul trucks shall not exceed 16.9 tons per day (calendar month average).

KUC understands from communications with UDAQ staff that the agency attempted to validate the daily emission limitation for the haul trucks by comparing the proposed limit to actual emissions from the BCM between 2014 and 2016. However, KUC's operations in these years are not representative operations sufficient to form the foundation of this emission limitation. As KUC has apprised UDAQ previously, on April 10, 2013, the BCM experienced the Manefay landslide, which carried about 145 million tons of material to the bottom of the BCM and significantly restricted the BCM's operations for several years.

#### I. BCM Comment No. 1. The Emission Cap on KUC's Haul Trucks and Other Nonroad Engines is a Standard which the CAA Preempts UDAQ from Imposing on Nonroad Engines

The CAA delineates between the regulation of stationary sources in title I of the Act and mobile sources in title II of the Act. That distinction is important because, whereas Congress

gave states broad authority to regulate and control emissions from stationary sources under title I, it purposefully narrowed the authority of the states to regulate and control emissions from mobile sources in title II.

As a general matter, the CAA assigns stationary source regulation and SIP development responsibilities to the states through title I of the Act and assigns mobile source regulation to the EPA through title II of the Act. In so doing, *the CAA preempts various types of state regulation* of mobile sources as set forth in section 209(a) (preemption of state emission standards for new motor vehicles and engines), section 209(e) (preemption of state emission standards for new and in-use off-road vehicles and engines), and section 211(c)(4)(A) (preemption of state fuel requirements for motor vehicle emission control, i.e., other than California's motor vehicle fuel requirements for motor vehicle emission control, -see section 211(c)(4)(B)).<sup>31</sup>

UDAQ's direct regulation of the haul truck and other nonroad engine emissions – via the proposed 6,205 tpy of NOx, PM2.5, and SO2, and 16.9 tpd NOx limitations – is preempted by title II of the CAA.<sup>32</sup> To demonstrate how UDAQ has crossed into the area of vehicle regulation preempted by title II, KUC presents its comments through the lens of how KUC would comply with the emissions caps.

#### *A.* Option 1: Limit production at the BCM

The first option for compliance would be for KUC to limit the use of haul trucks and other nonroad engines by limiting production at the BCM. In other words, KUC could meet the 16.9 tpd and 6,205 tpy emission cap by curtailing operations; i.e., KUC could cut emissions by driving less and moving less material.

UDAQ has not indicated that the BACT determination for the BCM was designed to act as an operating limitation that curtails KUC's operations and we do not believe that UDAQ is intending to require KUC to limit production in order to comply with the SIP; to KUC's knowledge, UDAQ has never imposed mandatory production curtailments as a SIP control strategy.<sup>33</sup> If our understanding is incorrect – that is, if UDAQ is, in fact, intending to require KUC to meet the BCM emissions caps through production limitations – KUC requests that the UDAQ affirmatively acknowledge the same. Furthermore, if UDAQ's intention is to impose production limitations on KUC, KUC requests that UDAQ provide the legal basis for doing so.

<sup>&</sup>lt;sup>31</sup> 83 Fed. Reg. 8403, 8403/2-3 (February 27, 2018) (emphasis added); see also Engine Manufacturers Association v. EPA, 88 F.3d 1075, 1079 (D.C. Cir. 1996) (hereinafter "Engine Manufacturers No. 1").

<sup>&</sup>lt;sup>32</sup> While the 6,205 tpy emission limitation is not labeled as a limitation specific to nonroad engines, the limitation is effectively an emissions limitation on the fleet of haul trucks and other nonroad engines because nonroad engines are responsible for 98% of the BCM's NOx emissions.

<sup>&</sup>lt;sup>33</sup> Additionally, we note that such a "strategy" does not appear to be consistent with the State and the Governor's policy of fostering prudent economic development.

#### B. Option 2: Retrofitting or retiring haul trucks

The second option for compliance would be for KUC to upgrade the haul trucks to higher engine tiers. There are two potential methods of upgrading KUC's fleet: repowering existing engines to higher tiers; or retiring existing trucks and replacing them with new haul trucks that meet EPA's Tier 4 standards. Given UDAQ's discussion of the BCM in its PM2.5 SIP Evaluation Report for the BCM and Copperton Concentrator, this second option appears to be what UDAQ is anticipating KUC do to meet the NOx emission cap.<sup>34</sup>

But regulating the BCM's fleet by either requiring repowering or, alternatively, forced early retirement of existing vehicles and engines is preempted by the CAA. Under title II, EPA and California have exclusive authority to adopt and enforce emission standards relating to the control of emissions from nonroad vehicles.<sup>35</sup> In contrast, UDAQ is permitted to implement inuse rules for nonroad vehicles.<sup>36</sup> Thus, the distinction between "standards" (which are preempted) and in-use rules (which are not preempted) is critical to the issue of whether UDAQ can regulate KUC's fleet through an emissions cap.

In reviewing section 209(a)'s preemption against a set of regulations adopted by a California air control district, the U.S. Supreme Court described a "standard" under title II as follows,

The criteria referred to in § 209(a) relate to the *emission characteristics of a vehicle or engine*. To meet them the vehicle or engine *must not emit more than a certain amount of a given pollutant, must be equipped with a certain type of pollution-control device*, or must have some other design feature related to the control of emissions. This interpretation is consistent

<sup>36</sup> CAA § 209(d) ("Nothing in this part shall preclude or deny to any State . . . the right otherwise to control, regulate, or restrict the use, operation, or movement of registered or licensed motor vehicles."). For the same reasons as stated in footnote 35, section 209(d) also applies to nonroad vehicles and engines.

<sup>&</sup>lt;sup>34</sup> PM2.5 SIP Evaluation Report – Kennecott Utah Copper LLC – BCM and Copperton Concentrator, DAQ-2018-007709, pp. 11-14 (July 1, 2018) (hereinafter "UDAQ BCM SIP Evaluation Report"); *see id.*, p. 14 ("The UDAQ estimates that the Caterpillar Tier 1 trucks will have reached the end of their useful life by 2021 and the Komatsu Tier 1 trucks will have reached the end of their useful life by 2023. It is both technically and economically feasible that all Tier 1 haul trucks shall be replaced with the highest Tier trucks available when [retired] replaced.").

<sup>&</sup>lt;sup>35</sup> Clean Air Act section 209 establishes two routes that preempt states from imposing standards on nonroad vehicles and engines. First, and most obviously, is section 209(e). In section 209(e)(1), Congress imposed a blanket preemption on all states (including California) from adopting "any standards or other requirements related to the control of emissions" for a specific list of nonroad engines (the haul trucks are not covered by this exclusion). Then, in section 209(e)(2), Congress authorized California, with EPA approval, to adopt "standards and other requirements" for nonroad vehicles and engines and allowed other states to adopt standards that are identical to those adopted by California. *See also Pacific Merchant Shipping Association v. Goldstone*, 517 F.3d 1108, 1114 (9<sup>th</sup> Cir. 2008). As such, a state like Utah is preempted from enacting its own "standards relating to the control of emissions from nonroad engines." Second, section 209(a) has also been interpreted as preempting state regulation of nonroad vehicles and engines. Section 209(a) states that, "No state . . . shall adopt or attempt to adopt or attempt to enforce any standard related to the control of emissions from *new motor vehicles or new motor vehicles engines* subject to this part." While section 209(a) is written in terms of applying to new motor vehicles and new motor vehicle engines, the federal courts and EPA have interpreted this preemption as applying to nonroad engines and vehicles as well. 59 Fed. Reg. 36969, 36973/3 n.16 (July 20, 1994); *Engine Manufacturers No. 1*, 88 F.3d at 1094.

with the use of 'standard' throughout Title II of the CAA (which governs emissions from moving sources) to denote requirements such as numerical emission levels with which vehicles or engines must comply, *e.g.*, 42 U.S.C. § 7521(a)(3)(B)(ii), or emission-control technology with which they must be equipped, *e.g.*, § 7521(a)(6).<sup>37</sup>

What is critical in identifying a standard (which is preempted by section 209) is that a standard regulates or sets a certain amount of emissions from nonroad engines or vehicles.<sup>38</sup> Indeed, as the Ninth Circuit Court of Appeals has said, a standard is a provision that "regulates emissions" or a regulation that is characterized as a "general requirement *limiting* emissions."<sup>39</sup>

While EPA's regulations are typically viewed as regulating the manufacture and sale of vehicles and engines, the decision in *Engine Manufacturers No. 2* demonstrates that "standards" adopted by states that apply to purchasers and users of vehicles are also preempted by section 209. "The manufacturer's right to sell federally approved vehicles is meaningless in the absence of a purchaser's right to buy them. . . . A command, accompanied by sanctions, that certain purchasers may buy only vehicles with particular emission characteristics is as much an 'attempt to enforce' a 'standard' as a command, accompanied by sanctions, that a certain percentage of a manufacturer's sales volume must consist of such vehicles" <sup>40</sup> The Supreme Court's discussion of this issue is germane in that it clarifies that the CAA's preemption of "standards" extends to regulations that impact purchasers and users of vehicles, meaning that states cannot mandate a requirement to force the early retirement of otherwise legal engines and dictate the purchase of higher tier vehicles without coming into conflict with section 209.

In contrast, in-use regulations are those impacting the operation of a vehicle; "operational controls, such as idling limits directed toward the operator of the vehicle, are not preempted."<sup>41</sup> A federal district court recently described in-use regulations through the following,

Section 209(d) preserves States' inherent authority *to police conduct within their borders*, and also enables them to develop additional tools to meet the EPA-established NAAQS. *Inspection and maintenance programs are an example of "in use" regulations*. Under such programs, States may require vehicle testing after sale to the ultimate purchaser to identify vehicles emitting excessive pollutants.... Other "in use" controls

<sup>&</sup>lt;sup>37</sup> Engine Manufacturers Association v. South Coast Air Quality Management District, 541 U.S. 246, 254 (2004) (emphasis added) (hereinafter "Engine Manufacturers No. 2"); see also Pacific Merchant Shipping Association, 517 F.3d at 1114 (finding that certain California rules governing nonroad engines are preempted because the regulations imposed rules that were "susceptible to precise quantification" of emissions and that "this sort of regulation is a standard").

<sup>&</sup>lt;sup>38</sup> This limitation also applies to state regulations that target fleets. *See Engine Manufacturers No. 2*, 541 U.S. at 248, 258-59 (invalidating six "Fleet Rules" that "generally prohibit the purchase or lease by various public and private fleet operators").

<sup>&</sup>lt;sup>39</sup> Pacific Merchant Shipping Association, 517 F.3d at 1115 (emphasis added); Engine Manufacturers No. 1, 88 F.3d at 1093 (stating that "standard" under section 209 means "quantitative levels of emissions").

<sup>&</sup>lt;sup>40</sup> Engine Manufacturers No. 2, 541 U.S. at 255.

<sup>&</sup>lt;sup>41</sup> 77 Fed. Reg. 9239, 9245/1-2 (February 16, 2012).

include *transportation planning regulations, such as "carpool lanes, restrictions on car use in downtown areas, and programs to control the extended idling of vehicles." Anti-tampering and concealment laws can also be applied as "in use" regulations, prohibiting the disabling of emission-control systems and the use of devices that conceal on-road emissions.*<sup>42</sup>

The district court's use of the phrase "polic[ing] conduct" is particularly apt in describing the difference between preempted standards and lawful in-use regulations. In-use regulations are those that direct operators to do something in a particular manner. An in-use regulation dictates *how* an owner operates a vehicle and the state is policing conduct in such regulations. Whereas standards are limitations on the characteristics and amount of emissions that may be released from the tailpipes of an individual engine/vehicle or a fleet or vehicles.

In this instance, UDAQ proposed to cap the BCM's fleet of haul trucks and other nonroad engines at 16.9 tpd of NOx emissions and 6,205 tpy of NOx, PM2.5 and SO2. This proposed SIP condition does what the U.S. Supreme Court says section 209 prohibits as it effectively says KUC "must not emit more than a certain amount [16.9 tpd/ 6,205 tpy] of a given pollutant [NOx, PM2.5, SO2]" from the fleet of haul trucks and other nonroad engines.<sup>43</sup>

KUC operates an existing fleet of haul trucks with specific emission characteristics. To reduce those emissions in order to comply with the proposed emission cap, KUC can either retrofit the existing fleet or retire existing haul trucks (which have years of useful life remaining) and replace them with new trucks that meet higher emission standards.<sup>44</sup>

But, as discussed above, compelling retrofits and/or early retirements and dictating the composition of KUC's fleet is in conflict with title II of the CAA. As a general matter, title II applies to "new motor vehicles or new motor vehicle engines."<sup>45</sup> As such, the federal "standards" that result from title II apply to a particular vehicle/engine at the time it is manufactured and sold. Importantly, the application of the standard that applies at the time of manufacturing remains attached to the vehicle throughout its life. As such, when EPA promulgates additional standards, the federal agency has been clear that the revisions to the standard or to retire existing vehicles/engines before their useful life has expired:

Manufacturers must ensure that each new engine, vehicle, or equipment meets the latest emission standards. Once manufacturers sell you a certified product, no further effort is required to complete certification. If products were built before EPA emission standards started to apply, they are generally not affected by the standards or other regulatory

<sup>&</sup>lt;sup>42</sup> In re Volkswagen Clean Diesel Marketing, Sales Practices, and Products Liability Litigation, 264 F.Supp.3d 1040, 1050-51 (N.D. Cal. 2007) (emphasis added) (internal citations omitted).

<sup>&</sup>lt;sup>43</sup> Engine Manufacturers No. 2, 541 U.S. at 254.

<sup>&</sup>lt;sup>44</sup> The feasibility of retrofitting and purchasing new vehicles is discussed in KUC's next comment.

<sup>&</sup>lt;sup>45</sup> CAA § 202(a)(1); 40 CFR 1039.2.

requirements. See Table 1 for a listing of when EPA emission standards started to apply. *We never require owners to retire their old engines, vehicles, or equipment.*<sup>46</sup>

By imposing an emission limitation that requires retrofits and retirements, UDAQ is, in effect, compelling the application of EPA's tier 4 standards to require early retirement of vehicles and engines.

In addition to the impermissible emission cap, the proposal also includes another provision that affects BCM haul trucks.

When KUC replaces haul trucks, they shall be replaced with trucks that have the highest engine tier level available which meets mining needs. KUC shall maintain records of haul trucks purchased and replaced.<sup>47</sup>

By dictating the composition of KUC's haul truck fleet, this provision likewise runs afoul of title II's preemption provision as interpreted by the U.S. Supreme Court; however, KUC is committed to purchasing haul trucks with the highest engine tier available that meet KUC's mining needs *when* it replaces haul trucks that have reached the end of their useful lives.

Rather than being consistent with title II's preemption, UDAQ has proposed emission caps that are nothing more than a disguised standard regulating the emissions from the BCM's haul trucks and other nonroad engines. The CAA does not allow UDAQ to skirt section 209's limitations on state authority in this manner. Given that UDAQ's proposed daily and annual emission caps are standards, UDAQ must delete the provisions – i.e., that "Maximum total NOx emissions from ore and waste haul trucks shall not exceed 16.9 tons per day (calendar month average)" and "Emissions at the Bingham Canyon Mine shall not exceed 6,205 tons of NOx, PM2.5, and SO2 combined per rolling 12-month period" – from the final version of the rulemaking presented to the AQB for approval.<sup>48</sup>

<sup>&</sup>lt;sup>46</sup> EPA's Office of Transportation and Air Quality, *Frequently Asked Questions from Owners and Operators of Nonroad Engines, Vehicles, and Equipment Certified to EPA Standards,* EPA-420-F-12-053 (Aug. 2012) at 1. This is consistent with the U.S. Supreme Court's decision in *Engine Manufacturers No. 2*, which invalidated six fleet rules that targeted the purchase of vehicles and engines.

<sup>&</sup>lt;sup>47</sup> Proposed Section IX. Part H.12.j.i.E.

<sup>&</sup>lt;sup>48</sup> Given that UDAQ's proposed emission cap on the BCM's nonroad engines emissions and the preemption imposed in section 209, UDAQ must reconsider not only how it regulates these vehicles but how they are accounted for in the SIP. UDAQ accounts for the nonroad engine fleet emissions as part of the emissions inventory for point sources. (This is reflected in the emissions inventories UDAQ has made available to the public as part of the development of the PM2.5 SIP.) This is inappropriate; the emissions from the haul trucks (and other nonroad engines/vehicles) operated in the BCM are nonroad emissions that should be accounted for in the SIP like all other nonroad vehicles/engines, which are considered cumulatively as "mobile sources." *See* 40 CFR § 51.1000 (defining "mobile" and "point sources" by incorporating the definitions contained in 40 CFR § 51.50); § 51.1008(a)(2)(v) & (b)(2) (requiring separate inventories for point, nonpoint, and mobile sources); *see also* 40 CFR § 51.50 (defining mobile), identifiable sources of emissions"). UDAQ must include the emissions from the BCM's haul trucks and other nonroad engines in the emissions inventory's mobile emissions and remove those emissions from the point source category of the emissions inventory.

#### II. BCM Comment No. 2. Even Assuming UDAQ can Regulate KUC's Haul Truck Fleet in the Method Proposed in Part H.12.j.i.B, UDAQ has not Followed the BACT Process

KUC makes the following comments regarding UDAQ's BACT determination for the controls and emissions associated with the BCM's haul trucks and other nonroad engines. In making these comments, KUC does not concede the point (made in BCM Comment No. 1) that CAA section 209 preempts UDAQ's authority to regulate the haul truck and other nonroad engine emissions through an emissions cap.

UDAQ's stated purpose for the current rulemaking is to identify and implement BACT for large stationary point sources located in the SLC NAA.<sup>49</sup> In the preamble to the PM2.5 Implementation Rule, EPA outlines the process that states should follow when making such BACT determinations.<sup>50</sup> Among the considerations that EPA identifies is that the state should identify potential add-on controls for emission units, which are then evaluated for technological and economic feasibility. Indeed, UDAQ states that its review of BACT for the BCM will begin by identifying potential controls technologies and evaluating those controls for both technological and economic feasibility.<sup>51</sup>

But when it comes to mobile sources and potential add-on control technology, the CAA preempts UDAQ from even engaging in such a BACT review. As the Supreme Court stated in *Engine Manufacturers No. 2*, states are preempted from imposing standards, which includes "emission-control technology with which they must be equipped."<sup>52</sup>

UDAQ's BACT review for the haul trucks included the following,

#### **Description:**

UDAQ considers this a BACT/BACM requirement and provides the following analysis. Various emissions associated with the use of haul trucks and support equipment such as graders and dozers. Tailpipe emissions from the haul trucks and support equipment meet the current required EPA standards for Nonroad equipment for tier 1 and tier 2 engines, but they do not meet the higher EPA standards for Nonroad equipment that is currently available. Komatsu has had tier 4 engines

<sup>&</sup>lt;sup>49</sup> Memorandum from Bill Reiss, through Bryce Bird, to the Air Quality Board, regarding, "PROPOSE FOR PUBLIC COMMENT: Amend SIP Subsection IX. Part H: Emission Limits and Operating Practices (May 24, 2018) ("A Serious area nonattainment plan includes provisions for the implementation of best available control measures, including control technologies (BACM/BACT) and includes enforceable emission limitations as well as schedules and timetables for compliance. The emission limits and operating practices expressed in Part H. subparts 11 and 12 have been developed to meet this requirement with respect to the large stationary 'point' sources within the PM2.5 nonattainment area.").

<sup>&</sup>lt;sup>50</sup> 81 Fed. Reg. at 58084-85.

<sup>&</sup>lt;sup>51</sup> UDAQ BCM SIP Evaluation Report, pp. 3-4

<sup>&</sup>lt;sup>52</sup> 541 U.S. at 254.

available in their 360 and 400 ton haul trucks. Caterpillar has tier 4 available in their D9, D10 and D11 dozers.

#### **BACT/BACM Selection:**

The UDAQ recommends that as KUC replaces haul trucks they are replaced with trucks that have the highest engine Tier level available which meets the mining needs. KUC shall maintain records of haul trucks purchased and [retired] replaced.

#### **Implementation Schedule:**

The UDAQ estimates that the Caterpillar Tier 1 trucks will have reached the end of their useful life by 2021 and the Komatsu Tier 1 trucks will have reached the end of their useful life by 2023. It is both technically and economically feasible that all Tier 1 haul trucks shall be replaced with the highest Tier trucks available when [retired] replaced.<sup>53</sup>

Correctly, UDAQ did not identify any add-on controls that could be installed to reduce emissions from KUC's existing haul trucks. UDAQ's analysis, however, moves on to effectively set out a schedule for the retirement of KUC's fleet of haul trucks based on incomplete and incorrect information.<sup>54</sup> For example, the analysis is based upon outdated information that is no longer accurate.<sup>55</sup> Furthermore, and more significantly, UDAQ appears to have relied upon these outdated projections of when replacements will take place to calculate and establish emission caps. By establishing such emission caps based on a date certain (which is, again, inaccurate), UDAQ has impermissibly mandated that KUC replace otherwise legal engines before their useful life expires.

#### III. BCM Comment No. 3. Even Assuming UDAQ can Regulate KUC's Haul Truck Fleet in the Method Proposed in Parts H.12.j.i.A & H.12.j.i.B, UDAQ's is Limited to Evaluating Transportation Control Measures for Mobile Source Emissions

In the preamble to the PM2.5 Implementation Rule, EPA directs states to determine BACM for mobile source emissions.<sup>56</sup> Given the preemption that title II imposes on UDAQ, the question becomes what should UDAQ have evaluated as BACM for mobile sources in preparing

<sup>&</sup>lt;sup>53</sup> UDAQ BCM SIP Evaluation Report, pp. 11-12, 14.

<sup>&</sup>lt;sup>54</sup> As noted above, KUC is committed to replacing haul trucks with the highest engine tier available that meet KUC's mining needs *when* such replacements take place.

<sup>&</sup>lt;sup>55</sup> UDAQ based its understanding the existing fleet from information KUC submitted in 2008. In the intervening decade, significant events – e.g., the Manefay Landslide – and subsequent revisions to the mine plan have altered KUC's operations. As a result, the information submitted in 2008 does not provide an accurate picture of KUC's current operations or those that KUC anticipates in the future.

<sup>&</sup>lt;sup>56</sup> 81 Fed. Reg. at 58084/2-3.

the PM2.5 SIP. The preamble to the PM2.5 Implementation Rule provides direction on this very issue, as EPA states,

*Specific to potential control measures for mobile source emissions*, the EPA's past guidance has indicated that where mobile sources contribute significantly to PM2.5 violations, "the state must, at a minimum, address the *transportation control measures* listed in CAA section 108(f) to determine whether such measures are achievable in the area considering energy, environmental and economic impacts and other costs.<sup>57</sup>

In other words, the state should review potential transportation control measures when identifying potential controls for mobile sources as part of a BACT analysis. In making this statement, EPA understood that transportation control measures are not preempted by title II.<sup>58</sup>

Given this guidance, UDAQ should have limited its review of potential control strategies for KUC's haul trucks and other nonroad engines to potential transportation control measures.

#### IV. BCM Comment No. 4. Even Assuming UDAQ can Regulate KUC's Haul Truck Fleet in the Method Proposed in Parts H.12.j.i.A & H.12.j.i.B, it is NOT Feasible to Upgrade the Existing Haul Trucks and New Higher-Tiered Trucks Meeting KUC's Mining Needs are not Available

In providing the following comment, KUC does not concede that UDAQ has authority to engage in a review of whether it is technologically or economically feasible to retrofit or replace KUC's haul trucks with vehicles/engines meeting more stringent federal standards. As stated previously, the state is preempted from taking such measures by title II of the CAA. Nevertheless, KUC makes the following comment to show that, even if UDAQ had authority to impose an emissions cap that necessarily required retrofitting/retirement of existing haul trucks, neither option is feasible.

UDAQ's BACT evaluation does not adequately consider the technical feasibility of either retrofitting haul truck engines or retiring/replacing existing haul trucks with new haul trucks. Moreover, UDAQ's BACT evaluation does not consider at all the economics of retrofitting or replacing existing engines and vehicles (KUC understands this failure because it is extremely difficult to evaluate costs for unavailable equipment).

# 1. It is not technologically feasible to further retrofit the fleet of haul trucks to higher tier engines

KUC's haul truck fleet is comprised of two different vehicles, Komatsu 930s (320 ton payload) and Caterpillar 793Ds (240 ton payload). UDAQ must evaluate each type of vehicle for retrofits separately because their designs and ability to be retrofitted are different.

<sup>&</sup>lt;sup>57</sup> Id. at 58084/2, n. 166.

<sup>&</sup>lt;sup>58</sup> Such transportation control measures should apply broadly and not exclusively to the BCM. See CAA § 108(f)(1)(A) (identifying 16 transportation control measures, all of which apply broadly as opposed to applying only to specific sources).

• There is no support for a conclusion that Komatsu 930s can be re-powered to meet EPA's tier 4 standards

All of the Komatsu 930s operated by KUC meet EPA's tier 2 nonroad standards.<sup>59</sup> Thus the analysis becomes whether the haul trucks can be further retrofitted to meet EPA's tier 4 nonroad standards. In KUC's experience, such upgrades require significant and expensive modifications to the existing frame and other ancillary parts and equipment. Such modifications may also lead to structural changes – such as reducing the size of the fuel tank to accommodate additional equipment and controls to meet the higher tier standard – that would significantly reduce the vehicle's operational capabilities.

The BCM is a unique operating environment and KUC has implemented specific performance requirements for the haul trucks it operates in the BCM. The replacement engines must be able to enable the haul trucks to meet requirements governing payload, vehicle speed, fuel economy, and reliability before they can be deployed at the BCM. From our work with Komatsu, KUC understand that there currently is not a tier 4 engine available for sale that has passed the BCM's performance criteria. As pointed out above, UDAQ has previously regulated the BCM's haul truck fleet by recognizing that KUC must be able to evaluate the availability of haul trucks based on mining needs.

# • It is not feasible to repower the Caterpillar 793D to meet either EPA's tier 2 or tier 4 standards

KUC has a smaller fleet of Caterpillar 793D haul trucks. These haul trucks meet EPA's tier 1 standards. KUC has previously evaluated whether it is feasible to re-power these haul trucks to meet EPA's tier 2 standards. That analysis determined that it is not technically feasible to retrofit the Caterpillar 793Ds with a tier 2 engine. The frame modifications – particularly to make space available for an afterburner – were so significant that KUC determined that these haul trucks could not be upgraded with existing and available tier 2 engines.

As to the potential to retrofit the Caterpillar 793Ds with tier 4 engines, KUC understands from Caterpillar that such engines are not available at this time because tier 4 engines for large haul trucks have not yet met Caterpillar's certifications.

#### 2. New tier 4 haul trucks meeting the demands of the BCM are not available

In the agency's BACT determination, UDAQ states that Komatsu 360 and 400 ton haul trucks meeting EPA's tier 4 standards are currently available. KUC contacted Komatsu to determine if either of these models could meet the BCM's performance requirements. At this time Komatsu cannot commit that those trucks would meet the BCM's performance requirements and it is, therefore, incorrect for UDAQ's to take the position that these vehicles are currently available to KUC.

<sup>&</sup>lt;sup>59</sup> In the UDAQ BCM SIP Evaluation Report, UDAQ erroneously implies that KUC continues to operate Komatsu 930s that only meet EPA's tier 1 standards.

Ultimately, UDAQ's BACT determination – which led to a specific emission cap for KUC's haul trucks – is based on errant assumptions and speculation that retrofits and replacement vehicles are available to KUC. It is improper under the CAA to impose an emission limitation on such speculative information and UDAQ should, for these reasons, revise the proposed provisions by removing the haul truck emissions cap.

#### V. BCM Comment No. 5. Even Assuming UDAQ can Regulate KUC's Haul Truck Fleet in the Method Proposed in Part H.12.j.i.B, UDAQ Arbitrarily Based the Emission Limitation on Minimal Variability

KUC understands from discussions with UDAQ staff that the agency attempted to validate the daily emission cap by comparing the proposed limit against annual emissions reported by KUC between 2014 and 2016. Specifically, KUC understands that UDAQ tried to validate the daily limitation by reducing actual annual emissions to a daily figure by dividing the BCM's annual emissions by 365 and then adding 20% back to account for variability. As explained in greater detail below, the selection of the emission limitation was arbitrary for numerous reasons, including the fact that the Manefay landside significantly restricted the BCM's operations for the years UDAQ relied upon in its analysis.

#### • UDAQ did not follow the BACT process to select the emission limitation.

The CAA defines BACT as "an emission limitation based on the maximum degree of reduction of each pollutant . . . emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems, and techniques . . . for control of each such pollutant."<sup>60</sup> This definition has been interpreted as a review of controls that lead to an emission limitation that sources can achieve on a consistent basis. As explained in KUC's prior comments, the emission limitations selected are a product of UDAQ's misunderstanding of when certain vehicles would be replaced, the availability of vehicles that meet EPA's more-stringent standards, and a misunderstanding of the state's authority under title II of the CAA. UDAQ did not follow the BACT process for determining control measures for nonroad sources and attaching an arbitrary 20% variability factor does not cure the UDAQ's error.

• UDAQ selected base-years to validate the emission limitation that are not representative of KUC's long-term operations.

Even assuming that UDAQ could establish an emission limitation for the BCM's haul trucks in the method proposed in the rulemaking, UDAQ's derived limits are

<sup>&</sup>lt;sup>60</sup> CAA § 169(3); *see also* UAC R307-401-2 (defining BACT similarly). The definition of BACT used here is taken from the CAA's PSD provisions. Relying on this definition is appropriate given EPA's directive in the preamble to the PM2.5 Implementation rule. 81 Fed. Reg. 58081/1 ("Consistent with past policy, BACT determinations for PM2.5 NAAQS implementation are to follow the same process and criteria that are applied to the BACT determination process for the PSD program.").

arbitrary because UDAQ attempted to validate the limit by comparing it to actual emissions from years that are not representative of KUC's long-term operations.

On April 10, 2013, the BCM experienced the Manefay landslide, which carried about 145 million tons of material to the bottom of the BCM. The Manefay landslide damaged the BCM's main haul road and took a number of pieces of equipment – including numerous haul trucks – out of service. As a result, KUC's operations were significantly curtailed during the time period UDAQ used to validate the emission limitation. Given the significant impact on operations, it is arbitrary for UDAQ to use the emissions from these years as the basis to establish or verify a daily emission limitation for the BCM's fleet of haul trucks that would endure for the remainder of the Mine's operation.

• UDAQ has not explained the basis for limiting the BCM to 20% variability.

UDAQ has not stated in the record the basis for proposing a specific numeric emission limitation on the haul trucks' NOx emissions or the BCM overall emissions limitation. KUC explained UDAQ's basis as it understands it above and requests that UDAQ confirm the basis in response to this comment. Further, KUC requests an explanation of the legal basis for limiting the variability at the BCM to 20% variability.

KUC believes that such an explanation is necessary because, as the definition of BACT recognizes, the emission limitation must be "achievable." Accounting for potential variability is important as it allows KUC to achieve the emission standards on a continuous basis.

• UDAQ's arbitrary selection of a 20% variability figure is highlighted by the greater variability that UDAQ allows other sources.

In communications with UDAQ during the development of the proposed Part H limitations, UDAQ informed KUC that 20% was the maximum variability that UDAQ could provide to sources regulated by the PM2.5 SIP. KUC has reviewed the proposed emission limitations contained in the rulemaking and has identified a number of emission limitations that provide as much as 400% variability in emissions between daily emission limitations and annual limitations.<sup>61</sup> It is arbitrary for UDAQ to impose emission limitations based on minimal variability while also providing significant variability to other sources.

#### VI. Conclusion to KUC's Comments on the BCM

<sup>&</sup>lt;sup>61</sup> For instance, in Part H.12.o.iii, the SIP establishes an annual SO2 emissions cap of 300 tpy and a daily SO2 emissions limitation of 3.8 tpd for Tesoro Refining and Marketing Company, which amounts to 462% variability between the annual and daily limitations. Likewise, for in Part H.12.i.ii, the SIP establishes an annual NOx emissions cap of 347.1 tpy and a daily NOx emissions limitation of 2.09 tpd, which equates to 220% variability between the annual and daily limitations.

For the foregoing reasons, UDAQ has overstepped its authority to regulate the BCM's fleet of nonroad engines in the proposed revisions to Part H of the PM2.5 SIP. Title II of the CAA preempts UDAQ from imposing the emission limitations that UDAQ has proposed in the current rulemaking. Furthermore, even if UDAQ had the authority to regulate the nonroad engines in this manner, (i) its BACT determination did not follow the procedures for evaluating BACT, should have been limited to a review of potential transportation control measures, and failed to adequately determine if retrofits and replacements were either technologically or economically feasible, and (ii) UDAQ arbitrarily determined the emission limitations that it proposed for the BCM's haul truck fleet. KUC requests that UDAQ strike all provisions from Part H regulating the BCM's nonroad engines from the proposed revisions as well as the existing PM10 and PM2.5 SIPs.

This request does not mean that KUC's haul trucks will go unregulated. To the contrary, and consistent with the express division of responsibility dictated by title II of the CAA, KUC's haul trucks will remain appropriately regulated by EPA's title II regulations.

#### **TOPIC 3: CONSISTENCY WITH THE PM10 SIP**

# I. PM10 SIP Comment. UDAQ Should Revise the PM10 SIP so that Parts H.2 and H.12 are Consistent

While the current rulemaking is intended to implement control strategies for point sources under the PM2.5 SIP, UDAQ proposed a number of revisions to the PM10 SIP as well.<sup>62</sup> It appears that UDAQ opened up the PM10 SIP as part of the current rulemaking to make the existing PM10 SIP consistent with the PM2.5 SIP.<sup>63</sup>

KUC supports UDAQ's attempt to make the PM10 and PM2.5 SIP consistent. Each of these SIPs is independently enforceable, meaning that sources subject to both SIPs are required to comply with the requirements of both. By normalizing the two documents, UDAQ eases the burden on both regulators and the source to determine compliance. Additionally, establishing consistency between the SIPs streamlines the title V permitting process.

Kennecott therefore requests that UDAQ revise the conditions applicable to KUC in Part H.2 of the PM10 SIP to be consistent with the proposed revisions to the conditions applicable to KUC in Part H.12 of the PM2.5 SIP.

<sup>&</sup>lt;sup>62</sup> Specifically, UDAQ proposed to amend various provisions in Parts H.1 and H.2 of the SIP. Both of these sections compile controls, emission limitations, and operating practices under the PM10 SIP. *See* SIP Part IX. H.1 (titled "General Requirements: Control Measures for Area and Point Sources, Emission Limits and Operating Practices, PM10 Requirements"); SIP Part IX. H.2 (titled "Source Specific Emission Limitations in Salt Lake County PM10 Nonattainment/Maintenance Area").

<sup>&</sup>lt;sup>63</sup> Memorandum from Bill Reiss, through Bryce Bird, to the Air Quality Board, regarding, "PROPOSE FOR PUBLIC COMMENT: Amend SIP Subsection IX. Part H: Emission Limits and Operating Practices, p. 1 (May 24, 2018) (stating that Parts H.1 and H.2 were opened to "add clarification and consistency throughout Part H").

### TOPIC 4: SPECIFIC COMMENTS ON OTHER PART H.12 CONDITIONS AND SIP EVALUATION REPORTS

# **TOPIC 4: Specific Comments on Other Part H.12 Conditions and SIP Evaluation Reports**

The following are additional comments on specific revisions that UDAQ has proposed to Part H that apply directly to KUC's operations. As part of the proposed revisions to Part H, UDAQ prepared three SIP Evaluation Reports for KUC's facilities. KUC has reviewed each of these reports – i.e., the reports for the "BCM and Copperton Concentrator," "Molybdenum Autoclave Process, Refinery, and Smelter," and "Power Plant" – and identified numerous inaccuracies and errors in UDAQ's analysis. To clarify KUC's comments, KUC has prepared a redline version of the proposed revisions to Part H.12 and the three SIP Evaluation Reports applicable to KUC's facilities and attached the same as Appendix 1 to these comments.

Please contact KUC should you or your staff need further clarification on the revisions that KUC believes are necessary to the proposed Part H.12 and the SIP Evaluation Reports.

# Bingham Canyon Mine and Copperton Concentrator

#### Comment 1:

A review of the BACT analysis for the in-pit crusher at the Bingham Canyon Mine is presented in DAQ-2018-007709. Emissions from the crusher are currently controlled with a high efficiency baghouse. Based on manufacturer information, the baghouse is designed to achieve a control efficiency of 99.9 percent. This removal efficiency is consistent with the BACT rate (correctly) established by UDAQ for baghouses in DAQ-2018-007161, Appendix A: BACT for Various Emissions Units at Stationary Sources. The in-pit crusher at the BCM is within the scope of emissions units addressed by DAQ-2018-007161.<sup>1</sup>

Furthermore, while KUC does not agree with the need for a separate BACT review for the in-pit crusher, KUC submitted iterations of detailed BACT analyses for the in-pit crusher in 2017 and 2018 and incorporates those submissions by this reference. The BACT emission rate included in DAQ-2018-007709 for the in-pit crusher is arbitrary and should be based on the BACT analysis. BACT for the in-pit crusher is a high efficiency baghouse with a control efficiency of 99.9 percent.

Section 2.1.1, Section 3.0, and Subparagraph D in Section 6.0 of DAQ-2018-007709 should be deleted as the BACT review for baghouses in DAQ-2018-007161 Section 3 is applicable. Section 5.0 of DAQ-2018-007709 should also be modified to indicate proper operations are

<sup>&</sup>lt;sup>1</sup> In explaining "DAQ-2018-007161, Appendix A: BACT for Various Emissions Units at Stationary Sources," UDAQ notes that, "As part of this review, the DAQ found that several sources had similar smaller emission units. DAQ has consolidated the review of these smaller emission units into this document." At 2. A number of emission units operated by KUC are within the scope of the BACT reviews set forth in DAQ-2018-007161.

already in place. Please see the SIP Evaluation Report markups provided in Appendix 1 of these comments.

Additionally, KUC is requesting a modification to the Part H limitation for the in-pit crusher. Condition j.i.D in Part H.12 should be deleted.

#### Comment 2:

A review of the BACT analysis for haul roads at the BCM is presented in DAQ-2018-007709. Fugitive emissions from haul roads are currently controlled by application of water, dust suppressant and road base material. These controls are consistent with the BACT evaluation in DAQ-2018-007161, Appendix A: BACT for Various Emissions Units at Stationary Sources.

Section 2.1.5 of DAQ-2018-007709 should be deleted as the BACT review for haul roads in DAQ-2018-007161 Section 12G is applicable. Please see the SIP Evaluation Report markups provided in Appendix 1 of these comments.

#### Comment 3:

Pages 11 and 12 of DAQE-2018-007709 provides a BACT review for the ore and waste haul trucks and other nonroad support equipment operated at the BCM. Condition j.i.A and Condition j.iB in Part H.12 includes emissions limitations for nonroad engines at the Bingham Canyon Mine.

UDAQ has stated that the modifications to Part H limits are considered BACT determinations. BACT is an evaluation of technically and economically feasible potential emission controls. Even if a BACT evaluation were appropriate for engines regulated by Title II, no technically and economically feasible add-on emission control technologies have been identified for nonroad engines.

For the reasons explained in Topic 2 of KUC's comment letter, all discussion regarding emissions from haul trucks should be eliminated from the SIP Evaluation Report. However, even assuming that UDAQ can regulate KUC's haul truck fleet in the method proposed in Part H.12, UDAQ has not followed the BACT process.

Section 2.1.5, Section 3.0, references to nonroad engines in Section 5.0 and Subparagraphs A, B and E in Section 6.0 of DAQ-2018-007709 should all be deleted. Conditions j.i.A, j.i.B, j.i.D and j.i.E of Part H.12 should also be deleted. Please see the SIP Evaluation Report markups provided in Appendix 1 of these comments and further review of this issue in Topic 2 of KUC comments.

#### Comment 4:

A review of the BACT analysis for the Tioga heaters at the Copperton Concentrator is presented in DAQ-2018-007709. The heaters are rated at less than 5 MMBTU/hr each. Specifically, the

facility includes seven (7) 4.2 MMBtu/hr natural gas fired heaters and one (1) 2.4 MMBtu/hr natural gas fired heater.

KUC submitted iterations of detailed BACT analyses for the Tioga heaters in 2017 and 2018. The iterations reflect the variations in emissions reported in the Annual Emissions Inventories. Emissions for these heaters are calculated based on their natural gas consumption. KUC continuously refines its calculation methodology to accurately estimate emissions from the heaters. The 2017 actual emissions for the Tioga heaters are 0.63 tons per year of NOx. In previous years, KUC has employed a conservative method to attribute natural gas consumption to the heaters which has resulted in a conservative estimate of emissions. In 2017, however, KUC updated the estimation methodology (instead of using the conservative estimated consumption rates that KUC used previously).

As established in DAQ-2018-007161, Appendix A: BACT for Various Emissions Units at Stationary Sources, KUC already implements the BACT requirements for the heaters. Section 2.2.1, Section 3.0, and Subparagraph 3 in Section 6.0 of DAQ-2018-007709 should be deleted as the BACT review for space heaters in DAQ-2018-007161 Section 5D is applicable. Section 5.0 of DAQ-2018-007709 should also be modified to indicate proper operations are already in place. Please see the SIP Evaluation Report markups provided in Appendix 1 of these comments.

KUC is therefore requesting a modification to the Part H limitation for the Tioga heaters. Condition j.ii.B of Part H.12 should be deleted.

#### Comment 5:

A review of the BACT analysis for the Roadbase Crushing and Screening Plant at the BCM is presented in DAQ-2018-007709. Emissions from roadbase crushing and screening are controlled by water sprays. The controls are consistent with the BACT evaluation in DAQ-2018-007161, Appendix A: BACT for Various Emissions Units at Stationary Sources.

Section 2.1.8 of DAQ-2018-007709 should be deleted as the BACT reviews for crushers, screens and transfers in DAQ-2018-007161 Sections 12A, 12B and 12I are applicable. Please see the SIP Evaluation Report markups provided in Appendix 1 of these comments.

#### Comment 6:

A review of the BACT analysis for the Feed and Product Dryer Oil Heaters at the Copperton Concentrator is presented in DAQ-2018-007709. The controls for these heaters are consistent with the BACT evaluation in DAQ-2018-007161, Appendix A: BACT for Various Emissions Units at Stationary Sources.

Section 2.1.13 and Subparagraph A in Section 6.0 of DAQ-2018-007709 should be deleted as the BACT reviews in DAQ-2018-007161 Sections 5A are applicable. Please see the SIP Evaluation Report markups provided in Appendix 1 of these comments.

KUC is therefore requesting a modification to the Part H limitations. Condition j.ii.A of Part H.12 should be deleted.

# Smelter, Refinery, MAP

#### Comment 7:

Markups to the SIP Evaluation Report DAQ-2018-007702, included as Appendix 1 of these comments, include corrections to the description of the sources at the Smelter, Refinery and MAP facilities. Facility descriptions in Sections 1.2, 2.3, 2.3.2, 2.3.5, 3.0, 5.2 and 6.0 have been modified to correct inaccuracies.

#### Comment 8:

The SIP Evaluation Report DAQ-2018-007702 does not clearly state actual emissions used in the BACT analysis. For example, UDAQ has identified 2014 actual emissions as calendar year 2016 emissions. Additionally, the PTE emissions summaries for PM2.5 do not include the condensable portion of emissions but actual emissions represent total PM2.5 emissions do include the condensable fraction and are therefore inconsistent. Emissions summaries in Sections 1.3, 1.4, 2.1, 2.1.1 and 2.1.3 should be modified to correctly summarize facility emissions. Please see the SIP Evaluation Report markups provided in Appendix 1 of these comments.

#### Comment 9:

The SIP Evaluation Report for the Combined Heat and Power Unit at the Refinery and the Holman Boiler and Foster Wheeler Boiler at the Smelter presented in DAQ-2018-007702 should be revised. In May 2018, KUC submitted revised economic feasibility analysis for the BACT determinations for these emission sources. The information presented in Sections 2.1.2, 2.3.2 and 2.3.9 of DAQ-2018-007702 is not accurate and should be revised with updated cost information.

#### Comment 10:

The addition of SCR for  $NO_X$  control was found to be economically infeasible for the Holman and Foster Wheeler boilers at the Smelter and Combined Heat and Power Unit at the Refinery. Section 3.0 of DAQ-2018-007702 incorrectly references SCRs and ammonia slip. All references to SCR in Section 3.0 should be deleted.

Hydrometallurgical Silver Production is a source of ammonia; however the relevant BACT information was omitted from Section 3.0. BACT discussion regarding ammonia emissions from the Hydrometallurgical Silver Production scrubber has been added to Section 3.0. Please see the SIP Evaluation Report markups provided in Appendix 1 of these comments.

#### Comment 11:

DAQ-2018-007161, Appendix A: BACT for Various Emissions Units at Stationary Sources includes emissions units/processes operating at the Smelter. The following sources at the Smelter are covered by the Appendix A BACT review and meet the specified BACT requirements in each section:

- Miscellaneous Storage Piles/Loadout, Section 12J
- Ground Matte Silo, Section 3
- Mold Coatings Storage Silo, Section 3
- Lime Storage Silo, Section 11
- Limestone Storage Silo, Section 11
- Smelter Laboratory, Section 3 and 10
- Propane Communications Generator, Section 8E
- Cold Solvent Degreaser, Section 4
- Gasoline Fueling Stations, Section 13B
- Diesel Emergency Generator for Pyrometallurgical, Section 8C
- Space Heaters, Section, Section 5D

Since the above mentioned BACT reviews from DAQ-2018-007161 are applicable, <sup>2</sup> and KUC has implemented BACT controls for each source, the following sections should be deleted from DAQ-2018-007702: 2.3.10, 2.3.13, 2.3.14, 2.3.15, 2.3.16, 2.3.17, and 2.3.18. Please see the SIP Evaluation Report markups provided in Appendix 1 of these comments.

#### Comment 12:

The BACT analysis presented in Section 2.3.2 for installation of Ultra Low NOx Burners on the Holman Boiler indicates that the upgrade is not cost effective. Accordingly, Sections 4.1 and 5.2 of DAQ-2018-007702 should be deleted and Section 6.0 n.i.A.II Holman Boiler NOx limit should remain 14 lb/hr (calendar day average) as the change in emissions limitation was not established as part of the BACT process. Condition 1.i.A.II of SIP Part H.12, NOx limit should also be revised back to 14 lb/hr (calendar day average). Please see the SIP Evaluation Report markups provided in Appendix 1 of these comments.

#### Comment 13:

DAQE-2018-007702 includes discussions of the MAP facility in Sections 1.2 and 1.4. All discussions related to MAP should be deleted. Please see the SIP Evaluation Report markups provided in Appendix 1 of these comments.

## Utah Power Plant, Tailings and Laboratory

#### Comment 14:

Markups to the SIP Evaluation Report DAQ-2018-007701, included as Appendix 1 of these comments, include corrections to the description of the sources at UPP and the Tailings impoundment. Facility descriptions in Section 1.2 and 2.1.1 have been modified to correct inaccuracies.

<sup>2</sup> Reference footnote 1, above.

#### Comment 15:

The SIP Evaluation Report DAQ-2018-007701 does not clearly state actual emissions used in the BACT analysis. For example, UDAQ has identified 2014 actual emissions as calendar year 2016 emissions. Additionally, the PTE emissions summaries for PM2.5 do not include the condensable portion of emissions but actual emissions represent total PM2.5 emissions do include the condensable fraction and are therefore inconsistent. Emissions summaries in Sections 1.3, 1.4, and 2.1.1 should be modified to correctly summarize UPP emissions. Please see the SIP Evaluation Report markups provided in Appendix 1 of these comments.

#### Comment 16:

Previous SIP determinations for UPP Unit 4 operating on natural gas during the winter months from November 1<sup>st</sup> to March 1<sup>st</sup> required the installation of LNB, OFA and SCR for NOx controls. Since the top control technology is already required no further analysis is necessary. Section 2.1.1 of DAQ-2018-007701 should be modified to accurately indicate the top controls for NOx are already required. Please see the SIP Evaluation Report markups provided in Appendix 1 of these comments.

#### Comment 17:

Per discussion in Topic 1 of these comments, Unit 4 operates with seasonal variability. Unit 4 shall be operated on natural gas during the winter months between the months of November 1 and February 28/29. Section 2.1, Section 3.1, Section 4.1 and Section 5.0 of DAQ-2018-2007701 should be modified to accurately describe the seasonal natural gas operation and controls review of Unit 4. Please see the SIP Evaluation Report markups provided in Appendix 1 of these comments.

#### Comment 18:

SCRs are operated per manufactures' recommendations and no control technologies exist to minimize ammonia slip. Control Options, Technological Feasibility, Economic Feasibility and BACT Selection paragraphs in Section 2.3 of DAQ-2018-007701 should be modified to indicate control technologies for minimizing emissions from ammonia slip include proper design of the equipment and operating the SCR per manufacturers' recommendations. There is no additional identified control technologies for minimizing emissions from ammonia slip to those listed above. Please see the SIP Evaluation Report markups provided in Appendix 1 of these comments.

# Bingham Canyon Mine, Copperton Concentrator, Smelter, Refinery, MAP, Utah Power Plant, Tailings and Laboratory

#### Comment 19:

KUC identified inaccurate information in various locations in the SIP Evaluation Reports (DAQ-2018-007709, DAQ-2018-007702 and DAQ-2018-007701) related to our operations. In addition

to those specified in the previous comments, further markups on the reports are provided in Appendix 1 of these comments.

# **APPENDIX 1: SIP EVALUATION REPORT MARKUPS**

# PM2.5 SIP Evaluation Report – Kennecott Utah Copper LLC-Power Plant

### UTAH PM2.5 SIP SERIOUS SIP

### Salt Lake City Nonattainment Area

# Utah Division of Air Quality

Major New Source Review Section

July 1, 2018

## <u>PM<sub>2.5</sub> SIP Evaluation Report – Kennecott Utah Copper LLC-BCM and</u> <u>Copperton Concentrator</u>

# UTAH PM2.5 SERIOUS SIP

### Salt Lake City Nonattainment Area

**Utah Division of Air Quality** 

**Major New Source Review Section** 

July 1, 2018

#### PM<sub>2.5</sub> SERIOUS SIP EVALUATION REPORT KENNECOTT UTAH COPPER LLC-BCM & COPPERTON CONCENTRATOR

#### **1.0** Introduction

The following is an updated version of the original RACT evaluation that was completed on October 1, 2013 as a part of the Technical Support Documentation for Section IX, Parts H.11, 12 and 13 of the Utah SIP; to address the Salt Lake City PM<sub>2.5</sub> and Provo, Utah PM<sub>2.5</sub> Nonattainment Areas.

#### **1.1 Facility Identification**

Name: Kennecott Utah Copper LLC (KUC) Address: 8362 West 10200 South Bingham Canyon, UT 84006 Owner/Operator: Rio Tinto/KUC UTM coordinates:

402,500 m Easting, 4,486,500, m Northing, UTM Zone 12 (Bingham Canyon Mine) 406,850 m Easting, 4,493,100, m Northing, UTM Zone 12 (Copperton Concentrator)

#### 1.2 Facility Process Summary

Kennecott Utah Copper LLC (KUC) owns and operates the Bingham Canyon Mine and the Copperton Concentrator. The Bingham Canyon Mine (BCM) is an open pit mining operation located in the southwest corner of Salt Lake County, Utah. Ore from the mine is conveyed to the Copperton Concentrator located approximately five miles north of the open pit in Copperton, Utah where it is ground and treated to produce copper concentrate solution.

The ore and waste rock at the BCM are transferred from the mining areas to other areas of the mine through a series of transfers using haul trucks and conveyor belts. Ore is transferred to the in-pit crusher with haul trucks from the shovel face and waste rock is hauled to dumping areas with haul trucks. After the ore is crushed it is transferred to the Copperton Concentrator by conveyor belts. Once the ore is processed at the concentrator, it is transferred to the smelter.

The Bingham Canyon Mine operates under Approval Order (AO) DAQE-AN105710042-18 issued January 10, 2018. Under the 1990 Clean Air Act the BCM and the Copperton Concentrator constitute an area source and are not a major Title V source. The Copperton Concentrator operates under the AO DAQE-AN105710035-13 issued on June 25, 2013. The BCM is subject to 40 CFR 60 Subpart A- General Provisions, 40 CFR 60 Subpart LL - Standards of Performance for Metallic Mineral Processing Plants and 40 CFR Subpart OOO - Standards of Performance for Nonmetallic Mineral Processing Plants. The emergency generators are subject to 40 CFR 60 subpart IIII, 40 CFR 60 subpart JJJJ and 40 CFR 63 subpart ZZZZ. The Copperton Concentrator is subject to 40 CFR 60 Subpart A- General Provisions, 40 CFR 60 Subpart LL - Standards of Performance for Metallic Mineral Processing Plants.

#### 1.3 Facility 2016 Baseline Emissions

Site-wide 2016 Actual Emissions (tons/yr) for BCM and Copperton Concentrator

PM <sub>2.5</sub>	NO <sub>x</sub>	$SO_2$	VOC	NH <sub>3</sub>
247.58	3,899.26	2.66	193.98	1.79

#### 1.4 Facility Criteria Air Pollutant Emissions Sources

Emission Unit	Potential to Emit					
	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	VOC	NH <sub>3</sub>	
BCM				A		
Point Sources	3.04	4 <u>.175.28</u>	0. <del>0002<u>43</u></del>	0. <del>20</del> <u>33</u>		
Other Fugitive					F:	
Sources	36.69			11.30	1.65	
Haulroad		0				
Fugitives Inside				1		
Pit	60.18		_			
Haulroad						
Fugitives						
Outside Pit	48.05					
Mobile Sources	220.79	5,829	6.56	302.43		
Copperton						
Concentrator	13.86	10.66	0.10	4.04	0. <del>10</del> <u>27</u>	

#### <u>BCM</u>

The following emission units are not source specific. A separate BACT analysis has been conducted on these common emission units. The technical support for these sources is in the  $PM_{2.5}$  Serious SIP – BACT for Small Source document ("PM2.5 Serious SIP – BACT for Small Sources.," 2017).

Disturbed Areas Gasoline Fueling Cold Solvent Degreasing Washers Conveyor Transfer Points <u>Baghouse Dust Collectors (In-Pit Crusher, C6/C7, C7/C8, Sample Preparation)</u> Lime Bins <u>Sample Preparation Baghouse</u> <u>Roadbase Crushing and Screening</u> Propane Communications Generators Storage Piles <u>Haul Roads</u>
# Diesel-Fired Emergency Generators (size) Screens Drilling Blasting

## Copperton Concentrator

The following emission units are not source specific. A separate BACT analysis has been conducted on these common emission units. The technical support for these sources is in the  $PM_{2.5}$  Serious SIP – BACT for Small Source document ("PM2.5 Serious SIP – BACT for Small Sources.," 2017).

Lime and Molybdenite Storage Bins Closed-circuit fluid cooling towers Product Molybdenum Dryers (feed dryer heater, product dryer heater) Molybdenite Bag Loading Vacuum Cleaning System with Baghouse Ore Sorting Plant with Ore Sorting Baghouse and Sample Preparation Baghouse Metallurgical Laboratory with Two Baghouses Cone crusher and size screen for feed preparation Conveyor belts **Degreasing Parts Washers Gasoline Fueling Stations** Two Lime Bins Three Storage tanks One Liquid Propane-fired Emergency Generator Tioga Heaters - Natural gas-fired equipment including water heaters or comfort heaters (that are each individually rated at less than 5 MMBTU/hr)

# 2.0 BACT Selection Methodology

The general procedure for identifying and selecting BACT is through use of a process commonly referred to as the "top-down" BACT analysis. The top-down process consists of five steps which consecutively identify control measures, and gradually eliminate less effective or infeasible options until only the best option remains. This process is performed for each emission unit and each pollutant of concern. The five steps are as follows:

- 1. Identify All Existing and Potential Emission Control Technologies: UDAQ evaluated various resources to identify the various controls and emission rates. These include, but are not limited to: federal regulations, Utah regulations, regulations of other states, the RBLC, recently issued permits, and emission unit vendors.
- 2. Eliminate Technically Infeasible Options: Any control options determined to be technically infeasible are eliminated in this step. This includes eliminating those options with physical or technological problems that cannot be overcome, as well as

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eliminating those options that cannot be installed in the projected attainment timeframe.

- 3. Evaluate Control Effectiveness of Remaining Control Technologies: The remaining control options are ranked in the third step of the BACT analysis. Combinations of various controls are also included.
- 4. Evaluate Most Effective Controls and Document Results: The fourth step of the BACT analysis evaluates the economic feasibility of the highest ranked options. This evaluation includes energy, environmental, and economic impacts of the control option.
- 5. Selection of BACT: The fifth step in the BACT analysis selects the "best" option. This step also includes the necessary justification to support the UDAQ's decision.

Should a particular step reduce the available options to zero (0), no additional analysis is required. Similarly, if the most effective control option is already installed, no further analysis is needed.

The final BACT evaluations for the Kennecott BCM and Copperton Concentrator sites were performed using data that Kennecott submitted,(CH2M, 2017), (CH2M, 2018) comments received from Techlaw on the Kennecott RACT submittal, comments received from EPA, comments received from the public, AOs, Title V permit, and research of available data bases including but not limited to RBLC, CARB, sources in nonattainment areas and air regulatory agencies that regulate sources in their jurisdiction.

# 2.1 Emission Unit (EU) and Existing Controls

## **Bingham Canyon Mine (BCM)**

2.1.1 In-pit Crusher

# **Description:**

The crusher is used to crush rock containing copper ore mined at the BCM. Particulate emissions that result from the in-pit crusher are currently controlled with a baghouse.

## **Emissions Summary:**

The PM<sub>2.5</sub> potential to emit (PTE) emissions for the crusher are 2.28 tons per year.

# Pollutant [PM2.5]

The existing baghouse for the crusher is permitted at a grain loading of 0.016 grains per dry standard cubic feet (gr/dsef). KUC investigated the options of either upgrading the filter system in the baghouse or replacing the baghouse.

# **Control Options:**

Baghouse (fabric filter) Enclosures with water sprays

# **Technological Feasibility:**

The search of databases identified specific emissions control information for copper ore crushers. Databases identified baghouses (fabric filter) and enclosures with water sprays as possible control technologies for limiting emissions from crushers. The databases did not provide needed information on copper ore crushing but they did contain information on rock crushers and the material crushed by the In-pit crusher contains less than 1% copper. Therefore, a comparison of rock crushers and ore crushers using a baghouse grain loading will be used.

Fabric filtration is the predominant control option for abatement of particulate emissions (PM, PM<sub>10</sub>, PM<sub>2.5</sub>) from any crushing application. Other particulate control options are not considered as effective as a baghouse that can control in excess of 99% of emissions.

The existing baghouse for the crusher is permitted at 1.77 lb/hr with a grain loading of 0.016 grains per dry standard cubic feet (gr/dscf). Based on the review of databases, KUC found small baghouses with the grain loading of 0.002 gr/dscf to 0.003 gr/dscf. Using the most stringent emissions rates, KUC requested vendor (CH2M, 2017) information on baghouse upgrades to meet the 0.002 gr/dscf grain loading. Based on the grain loading of the upgraded baghouse, PM<sub>2.5</sub> emissions from the crusher would be reduced from 2.28 tpy after the primary control to 0.28 tpy. This is a 2.0 tpy reduction in PM<sub>2.5</sub> emissions.

KUC is required to stack test the existing baghouse every three years (Condition II.B.1.a,b of Approval Order DAQE-AN105710042-18). The stack test results are as follows:

 Year stack test
 Results

 was performedlb/hr
 Grain/dscf

 2015
 0.02
 0.0001

 2012
 0.03
 0.0002

 2009
 0.05
 0.001

 2006
 0.11
 0.001

 2003
 0.04
 0.001

 2000
 0.164
 0.0031

UDAQ research revealed Arizona DEQ requires the Rosemont Copper Company to replace the primary crusher control equipment with a baghouse. The cartridge filter baghouse controls the primary crusher emissions by 99.99% (Balaji Vaidyanathan, 2013).

All identified control technologies are technically feasible.

**Economic Feasibility:** 

Based on the data provided by the vendors, the total installed costs for the upgraded baghouse would be about \$608,000, this is \$30,400 per year over a 20-year period. Based on the costs for the baghouse replacement and a 2.0 tpy reduction in PM<sub>2.5</sub>, the cost per ton of PM<sub>2.5</sub> removed would be \$15,200 per ton. Therefore, replacing the crusher baghouse is economically feasible at this time.

# **BACT Selection:**

The replacement of the baghouse with an emission limit of 0.002 gr/dsef and 0.18 lb/hr was considered by the UDAQ as a BACT selection.

In response to the proposed BACT selection, KUC proposed a limit of 0.30 lb/hr (Cassady Kristensen, 2018). After further evaluation this initial proposal was then revised to a proposed limit of 0.78 lb/hr\* (Steve Schnoor, 2018).

\*Note: This change was made due to the rates of crushed ore loaded onto the conveyor belt which creates an up-flow air stream which increases the loading on the bags with heavy particles and impacts its overall performance. Airborne coarse dust from the operations as well as from the surrounding area also impact the performance of the baghouse and overall outlet grain loading. KUC was also unable to secure a vendor guarantee for the initial proposed PM<sub>2.5</sub> emission limitation.

## **Implementation Schedule:**

KUC can currently meet the proposed 0.78 lb/hr of PM<sub>2.5</sub> limitation.

# Startup/Shutdown Considerations

The In-pit crusher is designed to operate on a continuous basis. The operations are in shutdown or startup modes during scheduled maintenance, and site-wide shutdowns.

# 2.1.31 Waste Rock Offloading from Trucks

### **Description:**

The act of mining involves the excavation of rock containing valuable minerals. This rock is known as ore. To access and excavate ore, sources must move and store or dispose of rock that does not contain economic mineral values. This rock is known as waste rock. (US Epa, 1995)Waste rock consists of monnon-mineralized rock removed from above or within the ore body during extraction activities. Waste rock includes granular, broken rock and soils ranging in size from fine sand to large boulders, with the fines content largely dependent on the nature of the formation and methods employed during mining.

Waste rock is produced at mines as a byproduct of excavating an identified economic mineral deposit. Mines design their open pit and underground operations to provide the most cost effective means for recovering the ore. Since removed waste rock is transported to location for disposal, mines attempt to limit the amount of waste rock removed as economically as possible. Haul trucks dump waste rock or overburden at the BCM waste rock disposal areas 24 hours per day.

Large-scale open pit mines move hundreds of thousands of tons of material daily, from the loading sources to the destination zones, whether these are massive mine dumps or, to a lesser extent, to the crushers or grinding mills. The stripping ratio is the amount of overburden and waste rock that must be removed for each unit of crude ore mined and varies within the mine site and the ore being mined. Depending on the nature and depth to the ore deposit, mine waste rock may constitute the largest volume waste stream generated by a mining project and can be thousands of tons per day. The quantity of waste rock generated relative to ore extracted from a mine is typically larger for surface mines than underground mine, reflecting the greater costs of underground mining operation. The ratio of waste rock to ore (i.e., the stripping ratio) at surface mines are as high as 10:1 for some areas.

#### **Emissions Summary:**

The PM<sub>2.5</sub> fugitive dust emissions for the dump trucks are  $\frac{8.717.67}{1000}$  tons per year.

Pollutant [PM<sub>2.5</sub>]

### **Control Options:**

Available Control Technology

Water application Enclosures Minimizing the drop distance during dumping-

## **Technological Feasibility:**

The drop location is not static, and as such an enclosure would not be technically feasible.

Water application is similarly not technically feasible because excessive water application would create geotechnical instability on the waste rock dumps. Additionally, an installation or setup of a water irrigation system for water application is not technically feasible because of the drop location is not static. The strength of the waste rock pile may be assessed by density, particle size distribution, and water pressures within the waste pile.(Jorge Puell Ortiz, 2017) Water pressures decrease the stability of both the waste and foundation materials. With respect to shear strength, the most favorable pile materials are hard, durable rock with little or no fines and minimal water

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# **Economic Feasibility:**

<u>All control options</u><u>Water application and enclosures</u> were found to be technically infeasible and as such an economic feasibility analysis was not performed.

## **BACT Selection:**

Minimizing drop distances while the waste rock is being dumped is an effective method for reducing the emissions and has been selected as BACT.

## **Implementation Schedule:**

Controls are already being implemented.

# Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

# 2.1.42 Graders, Bulldozers and Front-end Loaders

### **Description:**

The graders primarily operate on the haul roads, maintaining surfaces of the roads. Particulate matter is controlled by the application of water and chemical dust suppressants to the roads.

The dozers and front-end loaders operate within the pit. They are utilized for maintaining the haul roads, performing cleanup operations, and in dumping operations at the waste rock disposal areas.

#### **Emissions Summary:**

The PM<sub>2.5</sub> PTE fugitive dust emissions in tons per year for for the graders, bulldozers and front end loaders combined inside and outside the pit are as follows: are 0.8329.02 tons per year.

 $\begin{array}{c} ----- PM_{2.5} \\ \hline \\ \text{Inside the pit} \\ \hline \\ \text{Outside the pit} \\ \hline \\ 4.95 \\ \hline \end{array}$ 

# Control Options:

Application of water Application of chemical dust suppressants

# **Technological Feasibility:**

All identified control technologies are technically feasible.

# **Economic Feasibility:**

All of the controls are economically feasible.

# **BACT Selection:**

The application of water within the pit influence boundary and water and chemical dust suppressants outside the pit influence boundary constitute BACT.

### **Implementation Schedule:**

Controls are already being implemented.

## Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

#### 2.1.5 Unpaved Haul Roads

## **Description:**

Emissions resulting from the movement of ore and waste around the mine represent a significant portion of overall emissions at the Bingham Canyon Mine. The emissions related to material movement include fugitive dust generated from the truck travel on the haul roads and the tailpipe emissions from the haul trucks. Also on an annual basis, material movement represents 85% or greater of overall particulate emissions at the Bingham Canyon Mine.

Haul roads are used by the haul trucks to transfer ore and waste rock from the mining face to the waste rock piles and in-pit ore crusher. Dust from the haul roads is controlled by water trucks applying water and chemical dust suppressants on the roads and maintaining a good road base of coarse gravel. KUC is currently allowed a maximum total mileage of 30,000 miles per calendar day for the haul trucks to haul ore and waste rock.

The daily mileage limitation effectively limits road dust emissions, tailpipe emissions from the haul trucks and overall activity of sources at the mine. Ore processing at the Copperton Concentrator, which results in minimal emissions, is also limited through the Bingham Canyon Mine mileage activity limitations.

KUC currently uses conveyors to transport the majority of the crushed ore from the mine to the Copperton Concentrator. The use of conveyors mitigates both fugitive dust and tailpipe emissions to the atmosphere, by removing the need to use haul trucks. The use of conveyors has also allowed KUC to comply with the daily mileage limit, and still transport the ore to the Copperton Concentrator.

KUC uses a real time tracking system for both tracking haul trucks as well as for recording miles travelled. These records are used to comply with the miles per day limitation. The system may be a Global Positioning System or a system with similar tracking capabilities necessary to comply with this condition.

The minimum design payload per ore and waste haul truck will be increased from a minimum of 240 tons per truck to a minimum average of 300 tons. This will allow the use of the smaller trucks in special areas as needed.

#### **Emissions Summary:**

The PM<sub>2.5</sub> fugitive dust emissions for the mobile equipment and haul roads are 108.23 tons per year.

### Pollutant [PM2.5]

PM<sub>2.5</sub> emissions are generated from vehicular traffic on unpaved roadways and paved roadways.

#### **Control Options:**

Application of water Application of chemical dust suppressants Paving the unpaved roads Limiting mileage Routine maintenance (including the use of road base material) of haul roads

#### **Technological Feasibility:**

Watering the unpaved haul road reduces fugitive PM<sub>2.5</sub> emissions by binding the soil particles together, reducing free particles available to be picked up by wind or vehicles. Additional watering and application of chemical dust suppressants on certain locations of unpaved haul roads also occurs when heavy traffic is expected along the road. Water is applied on a scheduled basis and supplemented as needed based on road conditions.

Application of chemical dust suppressants is not technically feasible for some haul road locations because of the adverse effect the chemical can have on the coefficient of friction of the road surface. Given that the grade of the haul roads exceeds 10 percent in some locations, creating a slippery skin on the road inhibits the ability of mobile equipment to brake and steer safely while traveling on the steep grade.

Paving the haul roads is not technically feasible at the mine due to the rapid deterioration that would occur from the weight of the haul trucks. Additionally the frequently changing road locations make paving technically infeasible. Paving the roads is not technically feasible and will not be evaluated further.

# Limiting haul road mileage

Dust is also reduced through performing regular and routine maintenance of the haul roads (through use of road base material) and limiting unnecessary traffic on roads.

#### **Economic Feasibility:**

The use of water application inside the pit influence boundary, chemical dust suppressants and water application outside of the pit influence boundary, limiting haul road mileage, and routine maintenance of haul roads are economically feasible.

## **BACT Selection:**

The use of road base material and the application of water within the pit influence boundary and water, and chemical dust suppressants outside the pit influence boundary on unpaved roads constitute BACT.

In recent years, KUC has purchased newer haul trucks with higher capacity where possible, which has led to a decrease in the round trips and vehicle miles traveled, thereby additionally reducing fugitive dust emissions.

# **Implementation Schedule:**

KUC is currently limited to mileage requirements in AO DAQE-AN105710042-18.

#### Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

#### 2.1.6 Tailpipe Emissions from Mobile Sources

#### **Description:**

UDAQ considers this a BACT/BACM requirement and provides the following analysis. Various emissions are associated with the use of haul trucks and support equipment such as graders and dozers. Tailpipe emissions from the haul trucks and support equipment meet the current required EPA standards for Nonroad equipment for tier 1 and tier 2 engines, but they do not meet the higher EPA standards for Nonroad equipment that is currently available. Komatsu has had tier 4 engines available in their 360 and 400 ton haul trucks. Caterpillar has tier 4 available in their D9, D10 and D11 dozers.

# **BACT/BACM Selection:**

The UDAQ recommends that as KUC replaces haul trucks they are replaced with trucks that have the highest engine Tier level available which meets the mining needs. KUC shall maintain records of haul trucks purchased and [retired] replaced... Proper operation and maintenance of all equipment and the use of ultra-low sulfur fuel that is rated at a maximum of 15 ppm sulfur is considered BACT.

The UDAQ recommends for the dozers that the tier 0, tier 1 and tier 2 dozers shall be replaced with the highest Tier level equipment which meets the mining needs. KUC should also maintain records of dozers purchased and [retired] replaced.

# May 24, 2018 Air Quality Board Packet

On May 24, 2018, the revised Part H limits were submitted to the Utah Air Quality Board

j. Kennecott Utah Copper (KUC): Mine

i. Bingham Canyon Mine (BCM)

A. [Maximum total mileage per calendar day for ore and waste haul trucks] No later than January 1, 2019, combined site wide emissions of NO<sub>x</sub>, PM<sub>2.5</sub>, and SO<sub>2</sub> shall not exceed[30,000 miles] 5,585 tons per year and 15.3 tons per day.

Haul truck emissions shall be calculated daily using the miles driven per haul truck. KUC shall keep records of daily total mileage for all periods when the mine is in operation. KUC shall track haul truck miles with a Global Positioning System or equivalent. The system shall use real time tracking to determine daily mileage.

All other emission sources shall use their respective means of emission calculation through AP-42 emission factors or associated stack testing.

On May 18, 2018 (Cassady Kristensen, 2018), KUC submitted the following changes to the Part H limits:

j. Kennecott Utah Copper (KUC): Mine

i. Bingham Canyon Mine (BCM)

A. Maximum total NOx emissions from ore and waste haul trucks shall not exceed 4,624 tons per year and 12.67 16.2 tons per day (calendar month average).

After January 1, 2024, maximum total NOx emissions from ore and waste haul trucks shall not exceed 15.3 tons per day (calendar month average).

Emissions shall be calculated for the calendar month using hours of operation for haul trucks. NOx emissions from the haul trucks shall be estimated using the hours of operation for each ore and waste haul truck and an emission factor based on its EPA certified tier rating. Emission factors will be obtained from the most current version of EPA approved NONROAD model, manufacturer data and/or related guidance.

On May 30, 2018 (Steve Schnoor, 2018), KUC submitted the following changes to the Part H limits:

- j. Kennecott Utah Copper (KUC): Mine
  - i. Bingham Canyon Mine (BCM)
    - A. Maximum total mileage per calendar day for ore and waste haul trucks] Emissions at the Bingham Canyon Mine shall not exceed 6,205 tons of of NO<sub>x</sub>, PM<sub>2.5</sub>, and SO<sub>2</sub> combined per rolling 12-month period. No later than January 1, 2019, combined site-wide emissions of of NO<sub>x</sub>, PM<sub>2.5</sub>, and SO<sub>2</sub> shall not exceed[30,000 miles] 5,585 tons per year and 15.3 tons per day.
    - B. Maximum total NO<sub>x</sub> emissions from ore and waste haul trucks shall not exceed 16.9 tons per day (calendar month average).
       Haul truck emissions shall be calculated daily using the miles driven per haul truck. KUC shall keep records of daily total mileage for all periods when the mine is in operation. KUC shall track haul truck miles with a Global Positioning System or equivalent. The system shall use real time tracking to determine daily mileage.

All other emission sources shall use their respective means of emission calculation through AP-42 emission factors or associated stack testing.

- BC. To minimize fugitive dust on roads at the mine, the owner/operator shall perform the following measures:
  - I. Apply water to all active haul roads as weather and operational conditions warrant except during precipitation or freezing weather conditions, and shall apply a chemical dust suppressant to active haul roads located outside of the pit influence boundary no less than twice

#### per year.

- II. Chemical dust suppressant shall be applied as weather and operational conditions warrant except during precipitation or freezing weather conditions on unpaved access roads that receive haul truck traffic and light vehicle traffic.
- III. Records of water and/or chemical dust control treatment shall be kept for all periods when the BCM is in operation.
- IV. KUC is subject to the requirements in the most recent federally approved Fugitive Emissions and Fugitive Dust rules.

#### **DE.** Implementation Schedule

- When KUC replaces [shall purchase new] haul trucks, they shall be replaced with trucks that have the highest engine Tier level available which meet mining needs. KUC shall maintain records of haul trucks purchased and [retired]replaced.
- E. Minimum design payload per ore and waste haul truck shall not be less than 240 tons. The minimum design payload for all trucks combined shall be an average of 300 tons.

These changes were accepted and an addendum was made to the proposed PM<sub>2.5</sub> Serious SIP Part H limitations for KUC. The addendum took into consideration the 2013 Manefay slide and the revised mine plan KUC implemented to ensure safe operations. The day to day variability was included to account for the NOx emissions from the Haul and Ore trucks.

#### **Implementation Schedule:**

The UDAQ estimates that the Caterpillar Tier 1 trucks will have reached the end of their useful life by 2021 and the Komatsu Tier 1 trucks will have reached the end of their useful life by 2023. It is both technically and economically feasible that all Tier 1 haul trucks shall be replaced with the highest Tier trucks available when [retired] replaced.

#### Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

# 2.1.7-3\_Ore Handling

#### **Description:**

The mined ore is transported around the mine through the use of conveyors and trucked

to the stock piles as needed. The sources include Truck Loading and Offloading, Ore Main In-pit Crusher, Ore Stockpile, End Dump Trucks, Main In-Pit Enclosed Transfer Points, Conveyor-stacker Transfer Point, Coarse Ore Stacker and Reclaim Tunnels. The most favorable material characteristics for ore handling are hard, durable rock with little or no fines present.(US EpaEPA, 1995)

# Pollutant [PM<sub>2.5</sub>]

## **Emissions Summary:**

The PM<sub>2.5</sub> fugitive dust emissions for the ore handling operations are  $\frac{5.280.721}{5.280.721}$  tons per year.

## **Control Options:**

Material characteristics such as large size with minimal quantities of fine material Enclosures Inherent moisture content

### **Technological Feasibility:**

The drop locations are not static, as such an enclosure is not technically feasible for ore stockpiles, truck loading and offloading, but is technically feasible for ore main In-pit crusher, end dump trucks, Main In-Pit enclosed transfer points, conveyor-stacker transfer point, coarse ore stacker and reclaim tunnels.

The inherent water contained in the ore is technically feasible but the use of water application is not technically feasible because excessive water application may result in geotechnical issues on the waste rock dumps.

#### **Economic Feasibility:**

The use of water application inside the pit influence boundary, chemical dust suppressants and water application outside of the pit influence boundary, limiting haul road mileage, and routine maintenance of haul roads are economically feasible.

#### **Economic Feasibility:**

All of the controls that have not been identified as being technically infeasible are economically feasible.

#### **BACT Selection:**

Material characteristics such as large ore size and presence of very small quantities of fine material, inherent moisture content and enclosures also represent BACT for the ore handling emission sources.

# **Implementation Schedule:**

Controls are already being implemented.

## Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

# 2.1.8 Road Base Crushing and Screening Plant

### **Description:**

The mine has two semiportable plants that crush and screen rock for use for base material on the unpaved haul roads. Particulate emissions from the crushing, screening, and transfer operations are effectively controlled with water sprays and belt enclosures.

## Pollutant [PM25]

The PM<sub>2.5</sub> fugitive dust emissions for the road base crushing and screening plant are 0.24 022 tons per year.

# **Control Options:**

Baghouses Enclosures Water Sprays

# **Technological Feasibility:**

The road base crushing system is moved through the mine to facilitate the production of road base material to meet demands. As a result, permanent installation of a baghouse to control emissions from the plant is not technically feasible. Water Sprays and temporary enclosures are considered feasible for the plant.

# **Economic Feasibility:**

Remaining control technologies are economically feasible. Therefore, an economic feasibility was not performed.

#### **BACT Selection:**

Water sprays and enclosures are identified as BACT for the road base crushing and screening plant.

# **Implementation Schedule:**

Proper operations are already in place.

# Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

# 2.1.9 54 Solvent Extraction and Electrowinning Process

# **Description:**

Tanks, mixers and settlers are used in the solvent extraction and electrowinning process. Covers are currently used to minimize emissions from these sources.

# Pollutant [PM2.5, NOx, SO2, and VOC]

It should be noted that potential emissions of  $PM_{2.5}$  and precursors for solvent extraction and electrowinning are minimal. In 2014, the VOC emissions were 0.48 tons per year and all of the other emissions were less than 0.01 tons per year.

## **Control Options:**

Covers on process equipment

## **Technological Feasibility:**

Covers are the only control technology and are currently implemented at <u>KUC;KUC;</u> therefore no technological feasibility analysis was performed.

## **Economic Feasibility:**

Covers are the only control technology and are currently implemented at <u>KUC,KUC</u>; therefore, an economic feasibility analysis was not performed.

# **BACT Selection:**

KUC currently utilizes covers to minimize emissions associated with the solvent extraction and electrowinning operations. This is considered BACT.

## **Implementation Schedule:**

Proper operations are already in place.

## Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

# **Copperton Concentrator**

## 2.2.1 Tioga Heaters

## **Description:**

Natural gas fired heaters are used throughout the Copperton Concentrator. The heaters are rated at less than 5 MMBTU/hr each. Specifically, the facility includes seven (7) 4.2 MMBtu/hr natural gas fired heaters and one (1) 2.4 MMBtu/hr natural gas fired heaters.

### Pollutant [PM2.5, NOx, SO2, and VOC]

The PTE emissions, in tons per year, from the Tioga heaters are as follows:

	DM	NO	50.	VOC
	P 1V12.5	INO <sub>X</sub>	205	100
II.	0.1	62	0.1	0.1
Heaters	0.1	0.2	0.1	0.1

The actual NO<sub>\*</sub> emissions from the Tioga heaters are as follows:

2014 3.24 tpy 2016 2.87 tpy

# **Control Options:**

Low NO<sub>\*</sub> burners Good combustion practices

# **Technological Feasibility:**

All identified controls are considered technically feasible.

# **Economic Feasibility:**

Based on the data provided by the vendors, the total installed cost of the eight new heaters is estimated to be \$940,000 (CH2M, 2017). This is \$62,667 per year when amortized over a 15 year period. The costs assume the installation costs to be 35 percent of the equipment costs. Theses heaters will be equipped with the latest burner technology. Assuming the new heaters will minimize NO<sub>x</sub> emissions by 90% from current levels, the new heaters will reduce the annual emissions from the Tioga heaters from 6.2 tpy (based on PTE emissions for the heaters) to 0.68 tpy. This is a 5.52 tons per year reduction in NO<sub>x</sub>-emissions.

Based on the annualized costs for the new heaters over a 15 year period of \$62,667, and a 5.52 tpy reduction in NO<sub>x</sub>, the cost of additional control per ton of NO<sub>x</sub> removed is \$11,353 for the Tioga heaters. Based on this cost, it is cost effective to replace the

existing Tioga heaters with new heaters.

On May 18, 2018 (Jenny Esker, 2018), KUC submitted the following modifications to the emission calculations and for the revised cost of replacing the Tioga heaters:

The annualized cost for the heaters was modified to \$116,169 a year based on an amortization rate of 10%.

The emissions were recalculated so that the  $NO_x$  actual emission rate went from 2.87 tpy in 2016 to 0.56 tpy. This made the replacement of the heaters not economically feasible at \$207,602.

# **BACT Selection:**

BACT for the Tioga heaters is use of pipeline quality natural gas and good combustion practices as control technology for reducing  $NO_{x}$  emissions from the Tioga heaters.

The May 24, 2018 <u>Air Quality Board Packet included a natural gas consumption limit for</u> the Tioga heaters in order to limit their NO<sub>x</sub> emissions.

On May 24, 2018, the revised Part H limits were submitted to the Utah Air Quality Board

j. Kennecott Utah Copper (KUC): Mine

ii. Copperton Concentrator (CC)

B. The eight (8) Tioga heaters shall not consume more than 70 MMCF of natural gas per rolling 12 month period.

On May 30, 2018 (Steve Schnoor, 2018), KUC submitted the following changes to the Part H limits:

j. Kennecott Utah Copper (KUC): Mine

ii. Copperton Concentrator (CC)

- [The remaining heaters shall not operate more than 300 hours per rolling 12-month period unless upgraded so the NOx emission rate is no greater than 30 ppm.]
- B. The eight (8) Tioga heaters shall not consume more than 70 MMCF of natural gas per rolling 12 month period.

The UDAQ ensures that the BACT emission level of 0.56 tpy is being met by effectively limiting the use of natural gas consumption to 120 MMCF of natural gas per year.

This is required through SIP Part H Condition Section IX, Part H.j.ii.B which reads as

# follows:

B. The eight (8) Tioga heaters shall not consume more than 120 MMCF of natural gas per year.

#### **Implementation Schedule:**

Proper operations are already in place.

## Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

# Pollutant [(PM2.5, SO2, and VOC)]

### **Control Options:**

A review of the similar sources identify the use of pipeline quality natural gas and good combustion practices as control technologies for minimizing PM<sub>2.5</sub>, SO<sub>2</sub> and VOC emissions from heaters.

### **Technological Feasibility:**

All identified control technologies are technically feasible.

# **Economic Feasibility:**

All control technologies are economically feasible. Therefore, an economic feasibility was not performed.

#### **BACT Selection:**

The technology identified for controlling PM<sub>2.5</sub>, SO<sub>2</sub> and VOC emissions from heaters is the use of pipeline quality natural gas and good combustion practices is BACT.

### **Implementation Schedule:**

Proper operations are already in place.

# Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

## 2.1.12 Pebble Crushing System

# **Description:**

The pebble crushing system includes a crusher and ore handling conveyors and transfer points. The system is placed inside a building to minimize particulate emissions to the atmosphere.

#### Pollutant [(PM<sub>2.5</sub>)]

Potential emissions of  $PM_{2.5}$  are 0.10 tons per year.

### **Control Options:**

Baghouses Wet scrubbers Water sprays Enclosures

#### **Technological Feasibility:**

Because the emissions will be vented inside the building, wet scrubbers and fabric filters are not technically feasible. Water sprays are not feasible as the water makes the material too wet to crush.

#### **BACT Selection:**

Enclosures, or placing the source inside the building, is effective in minimizing emissions from the crusher operations and identified as BACT for the pebble crushing system.

#### **Implementation Schedule:**

Proper operations are already in place.

#### Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

### 2.1.13 Feed and Product Dryer Oil Heaters

#### **Description:**

Natural gas-fired heaters provide heat to the feed and product dryers that are used in molybdenum process at the Copperton Concentrator. The heaters are rated at 5.7 MMBTU/hr and 2.2 MMBTU/hr each. The heaters are regularly inspected for optimum combustion performance. Potential control technologies in other nonattainment areas were reviewed for this analysis.

	DM	NO	SO.	VOC
	1 1v12.5	TYO <sub>X</sub>	002	100
Heaters	0.008	0.11	0.0006	0.006
Treaters	0.000	0.11	0.0000	0.000

# Pollutant [(NOx)]

## **Control Options:**

A review of the similar sources indicate that Low  $NO_*$  burners and good combustion practices as control technologies for minimizing  $NO_*$  emissions from heaters less than 10 MMBtu/hr.

## **Technological Feasibility:**

All identified control technologies are technically feasible.

#### **Economic Feasibility:**

All control technologies are economically feasible. Therefore, an economic feasibility was not performed.

#### **BACT Selection:**

The technology identified for controlling NO<sub>\*</sub> emissions from heaters is Low NO<sub>\*</sub> burners, use of pipeline quality natural gas and good combustion practices is BACT.

#### **Implementation Schedule:**

Proper operations are already in place.

#### Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

# Pollutant [(PM2.5, SO2, and VOC)]

### **Control Options:**

A review of the similar sources identify the use of pipeline quality natural gas and good combustion practices as control technologies for minimizing PM<sub>2.5</sub>, SO<sub>2</sub> and VOC emissions from heaters.

**Technological Feasibility:** 

All identified control technologies are technically feasible.

### **Economic Feasibility:**

All control technologies are economically feasible. Therefore, an economic feasibility was not performed.

## **BACT Selection:**

The technology identified for controlling PM<sub>2.5</sub>, SO<sub>2</sub> and VOC emissions from heaters is the use of pipeline quality natural gas and good combustion practices is BACT.

### **Implementation Schedule:**

Proper operations are already in place.

# Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

# 2.2 Consideration of Ammonia

The only- source of ammonia emissions at the BCM is the blasting operations performed to allow access to new ore bodies. The ammonia emissions were estimated in 2014 to be 1.65 tons per year.

There are several sources of ammonia emissions at the Copperton Concentrator. All ammonia emissions at the Copperton Concentrator are associated with- the combustion of natural gas.

The unreacted ammonia can be treated as a  $PM_{2.5}$  precursor. Although currently not being considered as a precursor pollutant in Utah's  $PM_{2.5}$  Serious SIP, the source's BACT analysis did include an analysis of BACT for ammonia emissions, which is being included here for completeness

#### **Control Options:**

BCM

The only control option for blasting is minimizing the blast area and maintaining control of the blast area.

## Copperton Concentrator

Good combustion practices are the only control technology for minimizing NH<sub>3</sub> emissions from heaters less than 10 MMBtu/hr.

#### **Technological Feasibility:**

All identified control technologies are technically feasible.

## **Economic Feasibility:**

All control technologies are economically feasible.

## **BACT Selection:**

BCM

The technology identified for controlling  $NH_3$  emissions from blasting is minimizing three blast area and maintaining control of the blast area is considered BACT.

Copperton Concentrator

The technology identified for controlling NH<sub>3</sub> emissions from heaters is the use of pipeline quality natural gas and good combustion practices.

### **Implementation Schedule:**

Proper operations are already in place.

## Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

## 3.0 Conclusion- Emissions Reduction through BACT implementation

#### BCM

The In-pit crusher baghouse will be required to meet a PM2.5-emission limit of 0.78 lb/hr.

The emissions at the Bingham Canyon Mine shall not exceed 6,205 tons of  $NO_x$ ,  $PM_{2.5}$  and  $SO_2$  combined per rolling 12-month period.

Maximum total NO<sub>x</sub> emissions from ore and waste haul trucks shall not exceed 16.9 tons per day (calendar month average).

 It is estimated that all of the the tier 1 trucks will have reached the end of their useful life by 2023. It is both technically and economically feasible that as Tier 1 haul trucks are replaced, they shall be replaced with the highest engine Tier level available.
 KUC shall replace the tier 0, tier 1 and tier 2 Caterpillar D10 and D11 dozers with the hightest Tier level equipment available when they have reached the end of their useful life.

# **Copperton Concentrator**

The eight (8) Tioga heaters shall not consume more than 120 MMCF of natural gas per year.

# 5.0 Implementation Schedule and Testing Requirements

# Proper operations are already in place.BCM

The in-pit crusher baghouse shall meet the 0.78 lb/hr limitation as of the date of this document.

When KUC replaces haul trucks, they shall be replaced with trucks that have the highest engine Tier level available which meet mining needs. KUC shall maintain records of haul trucks purchased and replaced.

**Copperton Concentrator** 

KUC shall begin tracking the fuel usage of the eight (8) Tioga heaters as of the date of this document.

## 6.0 New PM2.5 SIP – KUC BCM Specific Requirements

The KUC BCM specific conditions in Section IX.H.12.j address those limitations and requirements that apply only to the KUC BCM and Copperton Concentrator in particular.

IX.H.12.j.i This condition lists the specific requirements applicable to the KUC BCM.

Subparagraph A: Emissions at the Bingham Canyon Mine shall not exceed 6,205 tons of NO<sub>x</sub>, PM<sub>2.5</sub>, and SO<sub>2</sub> combined per rolling 12-month period[

Subparagraph B: Maximum total NO2 emissions from ore and waste haul trucks shall not exceed 16.9 tons per day (calendar month average).

Subparagraph CA: To minimize fugitive dust on roads at the mine, the owner/operator shall perform the following measures:

- I. Apply water to all active haul roads as weather and operational conditions warrant except during precipitation or freezing weather conditions, and shall apply a chemical dust suppressant to active haul roads located outside of the pit influence boundary no less than twice per year.
- II. Chemical dust suppressant shall be applied as weather and operational conditions warrant except during precipitation or freezing weather conditions on unpaved access roads that receive haul truck traffic and light vehicle traffic.
- III. Records of water and/or chemical dust control treatment shall be kept for all periods when the BCM is in operation.
- IV. KUC is subject to the requirements in the most recent federally approved Fugitive Emissions and Fugitive Dust rules.

Subparagraph D: The In-pit crusher baghouse shall not exceed a PM<sub>2.5</sub>-emission limit of 0.78 lb/hr. PM<sub>2.5</sub> monitoring shall be performed by stack testing every three years.

Subparagraph E: Implementation Schedule

- When KUC replaces haul trucks, they shall be replaced with trucks that have the highest engine Tier level available which meet mining needs. KUC shall maintain records of haul trucks purchased and replaced.
- IX.H.12.j.ii This condition lists the specific requirements applicable to the KUC Copperton Concentrator.

Subparagraph A: Control emissions from the Product Molybdenite Dryers with a scrubber during operation of the dryers.

During operation of the dryers, the static pressure differential between the inlet and outlet of the scrubber shall be within the manufacturer's recommended range and shall be recorded weekly.

The manometer or the differential pressure gauge shall be calibrated according to the manufacturer's instructions at least once per year.

Subparagraph B: <u>The eight (8) Tioga heaters shall not consume more</u> than 120 MMCF of natural gas per year.

# 6.1 Monitoring, Recordkeeping and Reporting

Monitoring for IX.H.12.j.i is specifically outlined in IX.H.12.b.i.A; while IX.H.12.b.ii.A is addressed in IX.H.12.b.ii.B. Recordkeeping is subject to the requirements of IX.H.11.c and IX.H.11.f.

# 4.0 References

Balaji Vaidyanathan. (2013, January 31). ADEQ FACT SHEET Proposed Air Quality Permit

#55223 for Rosemont Copper Company.

Kennecott Utah Copper. Cassady Kristensen. (2018, May 18). PM2.5 SIP Limits Mine

KUC\_Comments.docx.

CH2M. (2017, July). PM2.5 State Implementation Plan: Best Available Control Technology

Determinations.

CH2M. (2018, February). PM2.5 State Implementation Plan: Best Available Control Technology Determinations.

Kennecott Utah Copper. Jenny Esker. (2018, May 18). Kennecott-TiogaHeaters-CostAnalysis.

Jorge Puell Ortiz. (2017). Methodology for a dump design optimization in large-scale open pit mines. Retrieved from

https://www.tandfonline.com/doi/full/10.1080/23311916.2017.1387955

Kennecott Utah Copper. (2013, September 12). 260 MM Emissions Workbook.

PM2.5 Serious SIP – BACT for Small Sources. (2017, August 11). Utah DAQ Minor Source NSR.

Kennecott Utah Copper. Steve Schnoor. (2018, May 30). Kennecott Part H Limitations PM2.5 Serious SIP Comment.docx.

US Epa. (1995, July). The Design and Operation of Waste Rock Piles.

Utah Division of Air Quality. (2016, December 7). SIP Section IX. Part H: Emission Limits and

Operating Practices.

# <u>PM<sub>2.5</sub> SIP Evaluation Report – Kennecott Utah Copper LLC- Molybdenum</u> <u>Autoclave Process, Refinery and Smelter</u>

UTAH PM2.5 SIP SERIOUS SIP

Salt Lake City Nonattainment Area

Utah Division of Air Quality

**Major New Source Review Section** 

July 1, 2018

#### PM2.5 SERIOUS SIP EVALUATION REPORT KENNECOTT UTAH COPPER LLC- MAP, REFINERY AND SMELTER

#### 1.0 Introduction

The following is an updated version of the original RACT evaluation that was completed on October 1, 2013 as a part of the Technical Support Documentation for Section IX, Parts H.11, 12 and 13 of the Utah SIP; to address the Salt Lake City  $PM_{2.5}$  and Provo, Utah  $PM_{2.5}$  Nonattainment Areas.

#### 1.1 Facility Identification

Name: Kennecott Utah Copper LLC (KUC)
Address: 8362 West 10200 South Bingham Canyon, UT 84006
Owner/Operator: Rio Tinto/KUC
UTM coordinates:
401,173 m Easting, 4,508,975 m Northing, UTM Zone 12 (MAP)
401,532 m Easting, 4,508,441 m Northing, UTM Zone 12 (Refinery)

398,821 m Easting, 4,508,539 m Northing, UTM Zone 12 (Smelter)

#### 1.2 Facility Process Summary

The KUC Molybdenum Autoclave Processing (MAP) Plant, Refinery and Smelter Facilities are located in Salt Lake County, Utah. A Best Available Control Technology (BACT) analysis of sources at the KUC site that emit fine particulate matter (PM2.5) and PM2.5 precursors was prepared by KUC as input to the State of Utah's State Implementation Plan (SIP). This report is a review of that BACT analysis.

The KUC Facility is categorized under Standard Classification Code (SIC) 3331 (Primary Copper) and North American Industry Classification System (NAICS) code 3314411 (Primary Smelting and Refining of Copper). Based on actual air emissions, the KUC Facility is a major source of particulate matter (PM), sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), and carbon monoxide (CO). The KUC Facility is classified as an area source for hazardous air pollutants. Operation of the KUC Facilities is conducted according to air emissions limits and other requirements specified in a Title V Operating Permit for the KUC Refinery (Refinery) and KUC Smelter (Smelter), and an Approval Order (AO) for the KUC MAP (MAP) plant that were issued by the State of Utah Department of Environmental Quality (DEQ).

KUC constructed permitted the MAP plant that was schedule to begin operation in 2014 but <u>KUC has permanently ceased construction on this project. No evaluation of the</u> facility and the permitted equipment is required. do to market conditions has not begun operation. In the copper ore, molybdenum exists as molybdenum disulfide (MoS2). The Copperton Concentrator produces bulk concentrate which consists of copper,

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molybdenum, gold, and silver among other metals. The molybdenum concentrate is separated from the bulk concentrate using differential flotation. The MAP plant will process bulk molybdenum disulfide concentrate into molybdenum trioxide and ammonia perrhenate. The MAP plant is a hydrometallurgical process that consists of a series of operations beginning with oxidation in an autoclave, and a pressurized steam-heated vessel used to dry and oxidize the concentrate. A series of process steps then follows including solution purification and crystallization, and finally product drying, calcining, and packaging.

KUC operates a copper smelter and refinery in Salt Lake County, Utah. The Smelter and Refinery were modernized with a new Refinery facility completed in 1995 and Smelter facility completed during 1995 and again modified in 1997. The Smelter employs flash smelting technology with flash converting technology to produce copper anodes and high concentration sulfur dioxide gases. The gases are treated by electrostatic precipitators (ESP), baghouses, scrubbers, and a high-efficiency double contact acid plant. The Refinery uses an electrolytic refining process to convert the Smelter produced anode copper to cathode copper and also recovers precious metals from the electrolytic refining slimes in a precious metals circuit.

The copper ore concentrates received at the Smelter is are first dewatered, and then dried to reduce the moisture content. The dried concentrate then is blended with fluxes and secondary copper-bearing materials. This mixture is fed to a flash smelting furnace where the ore is melted and reacts to produce copper matte, a molten solution of copper sulfide mixed with iron sulfide. The Outokumpu flash smelting process used at the Smelter is a closed process that captures the  $SO_2$  rich off-gases from the furnace for the production of sulphuric acid. The copper matte from the smelting furnace next is converted to blister copper (approximately 98% pure copper) by oxidization to remove remaining sulfur as SO<sub>2</sub> gas and the iron as a ferrous oxide slag. The Smelter uses a continuous copper converting process in which solid matte granules are fed to a flash smelting furnace-like vessel. The molten slag from converting is cooled, processed in slag concentrators to remove residual copper, and ultimately disposed in on-site waste piles. The SO<sub>2</sub> gases from smelting and converting are vented to a sulfuric acid plant. Molten blister copper is transferred from the converting vessel to an anode furnace for fire-refining to further remove residual impurities and oxygen. The blister copper is reduced in the anode furnace to remove oxygen by injecting natural gas producing a high purity copper. The molten copper from the anode furnace is poured in molds to cast solid copper ingots called anodes.

The anode copper produced at the Smelter is moved to the copper Refinery co-located near the Smelter where it is further purified using an electrolytic process to obtain the high-purity cathode copper sold. The Refinery uses the Kidd Process technology. For this process, the copper anodes from the Smelter are submerged in tanks containing an electrolyte solution in batch operations. An electric current is applied to the tank for a 10-day period during which copper ions migrate from the anode to form a cathode of 99.99% pure copper. Precious metals (gold, silver) are recovered from the electrolytic refining slimes removed from the tanks in a series of hydrometallurgical operations.

The Smelter, Refinery, and MAP together have over 70 individual sources. The Smelter recently had UDAQ permitting actions. A modified approval order (AO) was issued for the Smelter on June 10, 2014. AO DAQE-AN0103460054-14 allows the Smelter toto incorporate operate a crushing and screening plant. and significant No other modifications were made to the Smelter AO in the last 5 years.

The EPA performed extensive technology reviews of Smelter emissions in support of the 2002 primary copper smelting major source maximum achievable control technology (MACT) standard (40 Code of Federal Regulations [CFR] 63 Subpart (Environmental Protection Agency, 2002) and the 2007 primary copper smelting area source MACT standard (40 CFR 63 Subpart EEEEEE)(Environmental Protection & Agency, 2007). Specific discussion of the unique aspects of pollution controls at the Smelter are included in the Federal Register notices associated with the draft((Environmental Protection Agency, 2006) and final promulgation of both rules. Both standards establish a separate category for only the Smelter due to its unique design and emission performance not achievable by conventional technology. The primary copper smelting area source MACT standard specifically identifies the Smelter main stack emission performance as MACT for copper smelters (existing sources, not using batch copper converters). Smelter process and emission controlling technologies that contributed to EPA's designation of the modernized Smelter as a separate MACT category for HAP emissions, including offgases from furnaces, also contribute to the control of fine particulate and precursor emissions. No new major developments in technologies or costs have occurred after promulgation of the MACT standards.

AO DAQE-AN01013460045-10 for the Refinery was issued in 2010 to add the combined heat and power (CHP) unit. The CHP unit utilizes  $SoLoNO_x^{TM}$  burners minimizing  $NO_x$  emissions from the unit. The Smelter and Refinery facilities operate under a single Title V Operating Permit # 3500030003.

The MAP facility will process molybdenum disulfide into molybdenum trioxide and ammonia. The MAP facility was originally permitted in 2008 and was modified in March 2013 (AO DAQE-AN0103460052-13) to reflect the updated design of the plant. The permitting actions require thorough control technology analysis and the plant will implement BACT to minimize emissions from the facility.

#### 1.3 Facility 2016 Baseline Emissions

Site-wide 2016 &-2014 Actual Emissions (tons/yr) for Refinery and Smelter.

	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	VOC	$\mathrm{NH}_3$
2014	420.01	159.96	704. <del>35<u>24</u></del>	10.38	5.62
2016	205.45	140.33	735.29	9.74	8.63

1.4 Facility Criteria Air Pollutant Emissions Sources

Emission Unit		Potential to Emit (TPY)					
	PM <sub>2.5</sub> *	NOx	SO <sub>2</sub>	VOC	$\mathrm{NH}_3$		
MAP	9.99	35.57	2.43	6.71	0.00		
Refinery	25.64	38.57	4.44	8.42	0.61		
Smelter	426.35	185.29	1,085.72	13.50			

\*The PM2.5 Potential to Emit totals do not include condensable particulate emissions. unlike the baseline emissions presented in Section 1.3 that do include condensable particulate emissions.

The following emission units are not source specific. A separate BACT analysis has been conducted on these common emission units. The technical support for these sources is in the  $PM_{2.5}$  Serious SIP – BACT for Small Source document ("PM2.5 Serious SIP – BACT for Small Sources.," 2017).

## MAP

Ceoling Tower IT Building Backup Generator Emergency Fire Water Pump Startup Boiler Briquette Dryers Additional Boiler Testing Laboratory

#### Refinery

Space Heaters Gasoline Fueling Cooling Tower #1 Cooling Tower #2 Degreasing Paint Primer Diesel Generators Refinery LPG Emergency Communication generator

<u>Smelter</u> <u>Space Heaters</u> <del>10</del>-Cold solvent degreaser part washer Carpenter Sho<u>p Cyclone</u>

Cyclone-

Lab Baghouse (BH) Fueling Feed Strg Xfer Belt BH Feed Strg Bldg BH Feed Xfer Belt BH Wet Feed BH Dry Feed BH Hydromet Limestone Silo BH Ground Matte Silo BH Hydromet Lime Silo BH Power House Cooling Tower Granulator Cooling Tower Acid Plant Cooling Tower Loading to Storage Pile on Patio Emergency backup power generator Emergency backup power generator Diesel generator Misc. Storage Piles & Loadout Vacuum Cleaning System Mold Coating Silo BH **Recycle and Crushing Building** Anode Area Lime Silo Secondary Gas System Lime Silo Diesel Compressor Smelter LPG Emergency Communication generator Diesel Emergency Generator for Pyrometallurgical

#### 2.0 BACT Selection Methodology

The general procedure for identifying and selecting BACT is through use of a process commonly referred to as the "top-down" BACT analysis. The top-down process consists of five steps which consecutively identify control measures, and gradually eliminate less effective or infeasible options until only the best option remains. This process is performed for each emission unit and each pollutant of concern. The five steps are as follows:

- 1. Identify All Existing and Potential Emission Control Technologies: UDAQ evaluated various resources to identify the various controls and emission rates. These include, but are not limited to: federal regulations, Utah regulations, regulations of other states, the RBLC, recently issued permits, and emission unit vendors.
- 2. Eliminate Technically Infeasible Options: Any control options determined to be technically infeasible are eliminated in this step. This includes eliminating those options with physical or technological problems that cannot be overcome, as well as eliminating those options that cannot be installed in the projected attainment timeframe.
- 3. Evaluate Control Effectiveness of Remaining Control Technologies: The remaining

control options are ranked in the third step of the BACT analysis. Combinations of various controls are also included.

- 4. Evaluate Most Effective Controls and Document Results: The fourth step of the BACT analysis evaluates the economic feasibility of the highest ranked options. This evaluation includes energy, environmental, and economic impacts of the control option.
- 5. Selection of BACT: The fifth step in the BACT analysis selects the "best" option. This step also includes the necessary justification to support the UDAQ's decision.

Should a particular step reduce the available options to zero (0), no additional analysis is required. Similarly, if the most effective control option is already installed, no further analysis is needed.

The final BACT evaluations for the Kennecott MAP, Refinery and Smelter sites were performed using data that Kennecott submitted(CH2M, 2017), (CH2M, 2018), comments received from Techlaw on the Kennecott RACT submittal, comments received from EPA, comments received from the public, AOs, and the Title V permit.

#### 2.1 Emission Unit (EU) and Existing Controls

#### Refinery

- 2.1.1 Boilers
- 2.1.2 CHP Unit
- 2.1.3 Hydrometallurgical Precious Metals Processing
- 2.1.4 Tankhouse Sources

#### **Description:**

The copper refining and precious metal recovery used at the Refinery are hydrometallurgical processes. Because these processes do not require the materials to be molten and instead are handled in a wet or moist form, most of these individual sources on an annual basis emitted less than the 2 tons of a single. The major sources of  $PM_{2.5}$  and  $PM_{2.5}$  precursors at the Refinery are the Refinery boilers, and the combined heat and power (CHP) unit (a stationary combustion turbine with a heat recovery steam generator equipped with a natural gas-fired duct burner).

Emission Unit	Potential to Emit (TPY)				
	PM <sub>2.5</sub> *	NOx	SO <sub>2</sub>	VOC	NH3
Si di	(filterable only	)			
Boilers	0.761.2	12.908.31	<u>0.060.1</u>	<del>0.55<u>0.88</u></del>	
CHP Unit	11.8 <u>8.68</u>	<del>24.9</del> 29.79	1.2	6. <u>37</u>	0.32
Cooling Towers	5.50				
Propane Communications					

Generator		0.28		0.04	
Degreasers				0.06	
Fueling Stations				0.24	
Emergency Generator	0.013	0.181	0.012	0.015	
Soda Ash Storage Silo	0.05				
Precious Metal Packaging					
Area	2.00				
Hydrometallurgical Precious					
Metals Processing	2.70		3.10		<del>0.61</del>
Hydrometallurgical Silver					
Production					0.61
Tankhouse Sources	1.92				

\*The PM2.5 Potential to Emit totals do not include condensable particulate emissions. unlike the baseline actual emissions presented in Section 1.3 (and restated below) that do include condensable particulate emissions.

The emissions for the Refinery are combined with the Smelter. The 2014 <u>& 2016</u>Actual Emissions (tpy) for the Refinery and Smelter as listed in the emissions inventory are as follows:

	PM <sub>2.5_</sub>	NOx	SO <sub>2</sub>	VOC	NH3
2014	(filterable) 420.01	- <u>condensable)</u> 704. <del>35<u>24</u></del>	159.96	10.37	5. <del>62</del> 63
2016	205.45	140.33	735.29	9.74	8.63

#### 2.1.1 Boilers

#### **Description:**

The two boilers are each rated at 82 MMBtu/hr when burning natural gas and 79 MMBtu/hr when burning fuel oil and are permitted to operate on natural gas to meet the steam demand at the Refinery. During natural gas curtailment, the boilers are permitted to operate on oil. Emissions of NO<sub>x</sub> are limited with flue gas recirculation (FGR) and low NO<sub>x</sub> burners (LNB) with good combustion practices. Emissions of PM<sub>2.5</sub>, SO<sub>2</sub>, and VOCs are limited with good combustion practices, good design, opacity limits, sulfur content limit, and proper operation of the boilers.

#### **Emissions Summary:**

The potential to emit emissions (tons/yr) for both boilers are as follows:

PM <sub>2.5</sub>	$SO_2$	NOx	VOC	$NH_3$
0.76		12.90	0.55	0.32
1.22	0.1	8.31	0.88	

#### Pollutant [(NO<sub>x</sub>]

#### **Control Options:**

Selective Catalytic Reduction (SCR) FGR LNB with good combustion practices Ultra-low-NOx burners (ULNB) with good combustion practices

#### **Technological Feasibility:**

All control technologies are technically feasible. The Refinery boilers are equipped with FGR and LNB to reduce  $NO_x$  emissions. The addition of the SCR will reduce the emissions by 90%. This will be from 12.9 tpy (based on based on 2016 actual emissions for both boilers or 6.45 tpy per boiler) to 1.29 tpy. This is 11.61 tpy reduction in  $NO_x$ .

The SCR will reduce the emissions by 90% and replacing the boiler with one that has ULNB will reduce the emissions from 50 ppm to 9 ppm. The SCR is a 90% reduction whereas the ULNB would only be an 82% reduction.

#### **Economic Feasibility:**

From the Alternative Control Techniques Document –  $NO_x$  Emissions from Industrial/Commercial/Institutional Boilers, 1994 Alternative Controls Techniques (ACT) document, Table 6-7 presents controlled  $NO_x$  emission rates for various control technologies (U.S. Environmental Protection Agency, 1994). For the 50 MMBtu/hr natural gas packaged water tube boiler, the controlled  $NO_x$  emission rate utilizing SCR technology is 0.02 lb/MMBtu (the 100 MMBtu/hr boiler controlled  $NO_x$  emission rate with SCR is listed at 0.03 lb/MMBtu). From Table 6-5 of the ACT document, the total annualized cost for the 50 MMBtu/hr gas boiler (closest entry to 82 MMBtu/hr Refinery boiler) is \$1,500 to \$1,900 per MMBtu/hr. To estimate the impact of escalating capital cost from 1992 to 2017 dollars, cost indices from CPI Inflation Calculator (http://www.bls.gov/data/inflation\_calculator.htm) can be used. The escalation multiplier is determined to be 1.74. The estimated cost for the Refinery boilers is \$428,040 for both boilers, this is \$214,020 per boiler.

Based on the costs for the SCRs of \$428,040, and 11.61 tpy reduction in NO<sub>x</sub>, the cost of additional control per ton of NO<sub>x</sub> removed is 36,868 for the Refinery boilers. Based on this cost, it is not cost effective to install an SCR on both boilers.

Replacing the burners with ULNBs will result in an 82% reduction. This would decrease the emissions from 6.45 tpy to 1.16 tpy (5.29 tpy reduction). In a comparable boiler

upgrade that resulted in ULNBs being installed that were rated at 9 ppm  $NO_x$  the cost was \$900,000. This included upgrading the boiler and the building to include the additional equipment required for ULNBs. The estimated cost for the ULNB is \$900,000, and over a 15 year amortization period at 5% interest, the annual payment is \$86,708 per year per boiler for the ULNB.

Based on the annualized costs for the ULNB over a 20 year period of \$109,941 (Cleaver Brooks, 2017), and 3.29 tpy reduction in NO<sub>x</sub>, the cost of additional control per ton of NO<sub>x</sub> removed is \$33,379 per boiler. If one of the boilers is replaced and the other is on standby, then the cost is \$26,594 per ton of NO<sub>x</sub> removed for one boiler and \$43,638 per ton of NO<sub>x</sub> removed for the other boiler. Based on this cost, it is cost effective to install ULNBs on the one of the boilers.

#### **BACT Selection:**

FGR, good combustion practices, good design, and proper operation and an ULNB on each boiler constitute BACT for this source.

#### **Implementation Schedule:**

The next shutdown at Kennecott is scheduled for 2020. Installation of an ULNB on one of the boilers can be completed by December 2020 (Steve SchnoorKennecott Utah Copper, 2018).

#### Pollutant [PM2.5, SO2 and VOC]

#### **Control Options:**

Use of pipeline quality natural gas Good combustion practices

#### **Good Combustion Practices**

Several operations are listed in the U.S. EPA's RBLC database where good combustion practices are the accepted technology for minimizing particulate emissions. Particulate emissions are reduced by good combustion practices by keeping the burners maintained properly so that they continue to operate according to their design.

#### Use of Natural Gas as Fuel

Particulate emissions from combustion of natural gas are typically very low and generally lower than from combustion of other fuels such as diesel. KUC currently employs natural gas as fuel for control of particulate emissions from combustion sources at the facility and fuel oil as a backup.

#### **Technological Feasibility:**

All control technologies are technically feasible.

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# **Economic Feasibility:**

All control technologies are economically feasible. Therefore, an economic feasibility was not performed.

## **BACT Selection:**

Use of pipeline quality natural gas, good combustion practices, and good design and proper operation constitute is BACT for the boilers.

## **Implementation Schedule:**

Proper operations are already in place.

# Startup/Shutdown Considerations

The Refinery Boilers are designed to be operated 24 hours per day, seven days per week to meet steam demands of the facility. The boiler load is adjusted based on the facility steam demand and the CHP Unit operations. The Boilers may undergo a shutdown for maintenance activities, planned facility shutdowns, or if affected due to a natural gas curtailment. These operating practices limit the emissions for startup/shutdown procedures.

FGR, LNBs, SCRs and good combustion practices will control emissions during startup/shutdown. Good combustion practices and proper operation of the boiler include good engineering design, adherence to operation and maintenance procedures, inspections, use of clean burning fuel, and burner optimization. analysis.

# 2.1.2 CHP

The CHP unit will generate power and steam to support Refinery operations. The CHP unit uses a low  $NO_x$  duct burner and the turbine has SoLoNOx burners. Emissions of  $PM_{2.5}$ , SO<sub>2</sub>, and VOC are limited with good design and proper operation.

# **Emissions Summary:**

The potential to emit emissions (tons/yr) for the CHP unit are as follows:

PM <sub>2.5</sub>	$SO_2$	NOx	VOC
8.68	1.24	29.79	6.74

# Pollutant [NO<sub>x</sub>]

## **Control Options:**

SCR LNB with good combustion practices

The CHP unit is equipped with LNB on the duct burnher and SoLoNO<sub>x</sub> technology burners on turbine to reduce NO<sub>x</sub> emissions.

# **Technological Feasibility:**

All control technologies are technically feasible. The addition of the SCR will reduce actual annual emissions from the CHP unit by 90% (CH2M, 2017). This would reduce the  $NO_x$  emissions from 29.79 tpy (based on Revised NOI Spread sheet submitted November 9, 2009 NOI) to 2.98 tpy.

## **Economic Feasibility:**

The addition of the SCR will reduce actual annual emissions from the CHP unit by 90%. This will reduce the NO<sub>x</sub> emissions from 12.24 tpy (used the lesser increase as shown in the 2010 AO) to 1.50 tpy. Solar Turbines, Inc. developed an estimation spreadsheet for the Taurus 70 combustion turbine and duct burner arrangement, which utilized vendor quotations for the installation of an SCR system. From the Solar calculations, the capital and operating costs were estimated to be \$932,100 per year.

Based on the annual \$932,100 cost for the SCR and a 13.49 tpy reduction in  $NO_x$ , which makes the cost of additional control per ton of  $NO_x$  removed to be \$69,096 per ton of  $NO_x$  removed for the CHP. Based on this cost, it is not cost effective to install an SCR on the CHP.

# **BACT Selection:**

FGR, LNB with good combustion practices, good design, and proper operation constitute BACT for this source.

## **Implementation Schedule:**

Proper operations are already in place.

## Pollutant [PM2.5, SO2 and VOC]

## **Control Options:**

Use of pipeline quality natural gas Good combustion practices

**Good Combustion Practices** 

Several operations are listed in the U.S. EPA's RBLC database where good combustion practices are the accepted technology for minimizing particulate emissions. Particulate emissions are reduced by good combustion practices by keeping the burners maintained properly so that they continue to operate according to their design.

# Use of Natural Gas as Only Fuel

Particulate emissions from combustion of natural gas are typically very low and generally lower than from combustion of other fuels such as diesel. KUC currently employs natural gas as fuel for control of particulate emissions from combustion sources at the facility.

## **Technological Feasibility:**

All control technologies are technically feasible.

## **Economic Feasibility:**

All technically feasible options are already implemented, no additional technologies were identified. Therefore, an economic feasibility was not performed.

#### **BACT Selection:**

Use of pipeline quality natural gas, good combustion practices, and good design and proper operation constitute is BACT for the boilers.

## **Implementation Schedule:**

Proper operations are already in place.

## Startup/Shutdown Considerations

The Refinery CHP is designed to be operated 24 hours per day, seven days per week to The Refinery CHP unit is designed to be operated 24 hours per day, seven days per week. CHP may be shutdown for scheduled maintenance activities, planned facility shutdowns, or if affected due to a natural gas curtailment.

Low  $NO_x$  burners, SoLo $NO_x$ , and good combustion practices will control emissions during startup/shutdown. Good combustion practice and proper operation of the unit include good engineering design, adherence to operation and maintenance procedures, inspections, use of clean burning fuel, and burner optimization. Standard operating procedures will be developed for the CHP unit to ensure operation in accordance with the above practices. These practices are already in place and effective in minimizing emissions during periods of startup and shutdown.

# 2.1.3 Hydrometallurgical Precious Metals Processing

The Refinery has a precious metals processing and recovery area. Particulate matter, ammonia and  $SO_2$  from the process are vented to a scrubber.

## **Emissions Summary:**

# Pollutant [PM2.5, SO2 and NH3]

## **Control Options:**

Although RBLC and CARB did not provide controls for the specific operation, possible particulate control technologies include baghouses and wet scrubbers.

#### **Technological Feasibility:**

The fabric filter (baghouse) is more effective at capturing fine particulate. However, due to high temperature of the exhaust steam and its pH level, baghouses are not technically feasible. Wet scrubbers are therefore the only technically feasible control of particulate emissions and  $SO_2$ .

## **Economic Feasibility:**

All technically feasible options are already implemented. Therefore, an economic feasibility was not performed.

## **BACT Selection:**

Scrubbers are the most effective control technology for controlling particulate emissions and constitute BACT.

It should be noted that the  $\frac{2016}{2014}$  actual PM<sub>2.5</sub> and precursor emissions from the processes were 0.5856 tpy. The use of scrubbers to control particulate emissions, ammonia and SO<sub>2</sub> also represents the most stringent measure for the precious metals processing area.

## **Implementation Schedule:**

Proper operations are already in place.

## Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

# 2.1.4 Tankhouse Sources

The Refinery Tankhouse and MPC buildings include liberator, cathode wash and anode scrub wash processes that result in sulfuric acid mist emissions. Potential sulfuric acid mist from the processes are vented to a mist eliminator. Potential control technologies in other nonattainment areas in states such as California and Alaska were reviewed for this analysis.

# **Emissions Summary:**

## Pollutant [PM2.5]

## **Control Options:**

Baghouses Scrubbers Mist eliminators

Although review of other nonattainment areas, RBLC and CARB did not provide controls for the specific operation, and possible sulfuric acid control technologies.

## **Technological Feasibility:**

The presence of acid in the exhaust stream cannot be effectively captured by a baghouse. Therefore, Baghouses are not technically feasible for these sources. The presence of electrolytes in the exhaust stream cannot be effectively captured with a wet scrubber. Therefore, wet scrubbers are not technically feasible for these sources. Mist eliminators are technically feasible and effective in minimizing sulfuric acid mist emissions.

Watering: Watering increases the moisture content of the surface, which conglomerates particles and reduces their likelihood to become airborne. The control efficiency for watering depends on how fast the area dries after water is added. Frequent watering is necessary to maintain its effectiveness.

## **Economic Feasibility:**

No additional technologies were identified as technologically feasible. Therefore, an economic feasibility was not performed.

## **BACT Selection:**

Mist eliminators are the most effective control technology for controlling sulfuric acid mist emissions and constitute BACT.

It should be noted that the 2016-2014 actual sulfuric acid mist as PM2.5 emissions from the Tankhouse sources were 0.005 tpy. The use of mist eliminators to control sulfuric

acid mist emissions also represents the most stringent measure for the Tankhouse sources.

## Implementation Schedule:

Proper operations are already in place.

## Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

# 2.3 EU and Existing Controls

## **Smelter**

- 2.3.1 Main Stack
- 2.3.2 Powerhouse Holman Boiler
- 2.3.3 Soda Matte and Slag Granulators
- 2.3.4 Feed Process (Wet and Dry)
- 2.3.5 Feed Storage Building
- 2.3.6 Anode Area Fugitives
- 2.3.7 Smelter Fugitives
- 2.3.8 Acid Plant Fugitives
- 2.3.9 Powerhouse Foster Wheeler Boiler
- 2.3.10 Miscellaneous Storage Piles/Loadout
- 3.2.11 Hydrometallurgical Precious Metals Processing
- 2.3.11 Slag Concentrator
- 2.3.12 Smelter Cooling Towers
- 2.3.13 Ground Matte Silo
- 2.3.14 Molding Coatings Storage Silo
- 2.3.15 Lime Storage Silos
- 2.3.16 Limestone Storage Silo
- 2.3.17 Recycle and Crushing Building
- 2.3.18 Smelter Laboratory
- 2.3.19 Propane Communications Generator
- 2.3.20 Cold Solvent Degreaser
- 2.3.21 Gasoline Fueling Stations
- 2.3.22 Diesel Emergency Generator for Pyrometallurgical
- 2.3.23 Hot Water Boiler

# **Description:**

The Smelter is the only primary copper smelter in the United States that uses flash smelting with continuous flash copper converting technology.

The EPA performed extensive technology reviews of Smelter emissions in support of the

Comment [A1]: Refinery reference

2002 primary copper smelting major source MACT standard (40 CFR 63 Subpart QQQ) and the 2007 primary copper smelting area source MACT standard (40 CFR 63 Subpart EEEEEE). Specific discussion of the unique aspects of pollution controls at the Smelter are included in the Federal Register notices associated with the draft and final promulgation of both rules (e.g., the design of the Smelter is based on the furnace technology). Both standards go so far as to establish a separate category for the Smelter due to its unique design and emission performance not achievable by conventional technology. Typical smelting operations require batch processing which intermittently produces high concentrations of SO<sub>2</sub> and particulate in a manner that can reduce the efficiency of the acid plant as a control device. By employing the flash smelting and flash converting technologies, KUC can eliminate many of the problems inherent with batch type smelter operations. These technologies include continuous flow of off-gases to the acid plant during the flash converting process as well as reduced total volume of offgases. Additionally, the furnaces are stationary which improves the ability to capture the off-gases as well as the ability to capture any fugitive emissions with the secondary capture system, which cleans the gases with baghouses and scrubbers before venting to the main stack. As a result, both MACT standards go so far as to establish a separate category for the Smelter due to its unique design and emission performance not achievable by conventional technology.

The primary copper smelting area source MACT standard specifically identifies the Smelter main stack emission performance as MACT for copper smelters (existing sources not using batch copper converters). The Smelter employs several technologies to minimize the smelting emissions that report to the main stack.

The concentrate dryer burns natural gas to heat/dry concentrate for use in the flash smelting furnace. Operation with LNB along with lower dryer temperatures minimizes the formation of  $NO_x$  while also preventing the formation of  $SO_2$ . KUC operates both a baghouse and a scrubber as controls for the concentrate dryer.

The secondary gas system collects fugitive emissions in the hot metals building (typically associated with the furnaces) and vents them through a baghouse and a sodium based scrubber before they are vented to the main stack.

The matte grinding circuit crushes and dries granulated matte for use in the flash converting furnace. The particulate from the ground matte is collected in a baghouse and pneumatically conveyed to the flash converting furnace feed bin. NO<sub>x</sub> emissions from natural gas combustion are minimized with LNB and low temperature firing and PM<sub>2.5</sub> emissions are controlled with the production baghouse.

In the anodes area, blister copper from the flash converting furnace is refined in two available refining furnaces to remove the final traces of sulfur. Copper production can be supplemented with copper scrap, which can be added to the refining furnaces for re-melt. The anodes refining furnaces are natural gas fired with oxy-fuel burners. Off-gas is vented (in series) to a quench tower, lime injection, baghouse, and scrubber and vented to the main stack. NO<sub>x</sub> reduction activities also include maintaining furnaces to prevent

## ingress of air.

The shaft furnace and holding furnace are used to re-melt anode scrap and other copper scrap to incorporate into copper production. LNBs are used to reduce  $NO_x$  from the natural gas combustion and a baghouse is operated to control  $PM_{2.5}$  emissions. The shaft furnace is in the anodes area, but vents separately to the main stack.

Emission Unit	n Unit Potential to Emit (TPY)			
	PM <sub>2.5</sub> .*	NOx	SO <sub>2</sub>	VOC
Main Stack	372.30	153.30	924.18	2.80
Powerhouse Holman Boiler	2.09	24.09	0.25	0.59
Matte and Slag Granulators	13.4		7.88	
Feed Storage Building	62.61			
Anode Area Fugitives		2.31		
Smelter fugitives			157	
Acid Plant fugitives	0.47		0.16	
Powerhouse Foster				
Wheeler Boiler	2.01	23.17	0.24	0.56
Miscellaneous Storage Piles/Loadout	2.15			
Slag Concentrator	3.00			
Smelter Cooling Towers	0.03			
Ground Matte Silo	1.20			
Molding Coating Storage Silo	1.20			
Lime Storage Silos	2.40			
Limestone Storage Silos	1.20			
Recycle and Crushing Building	0.11			
Smelter laboratory	1.80			
Cold Solvent Degreasers				1.00
Fueling stations				1.17
Diesel Emergency Generators	0.03	3.93	0.06	0.11
Hot Water BoilerSpace Heaters	<del>372.30</del>	1.4	<del>924.18</del>	2.80
* PM2.5 Potential to Emit totals do not include particulate condensable emissions.				

2.3.1 Main Stack

## **Description:**

Emissions from multiple processes and equipment are routed through the main stack. The emissions from these sources are monitored at the main stack.  $PM_{2.5}$  is tested every year, and  $NO_x$  and  $SO_2$  are monitored with continuous Emission Monitors (CEM). Processes routed to the stack include the matte granulators, acid plant, anode building, power house, furnaces, dryers and grinding circuits. Many of these sources of emissions have their own primary control devices (baghouse, scrubbers, etc.). Some are then routed to the secondary gas system and then through the main stack. The processes that vent to the main stack at the Smelter include the following:

Equipment	Pollutants	Primary emissions control
Concentrate Dryer Powerhouse	PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>x</sub> ,	LNB, baghouse, scrubber
Superheater	PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>x</sub> , VOC	ULNB, FGR, fuel throughput limits, Good operational practices
Powerhouse FW Aux Boiler	PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>x</sub> , VOC	LNB, FGR, fuel throughput limits,
Matte Grinding	PM <sub>2.5</sub> , SO <sub>2</sub>	Baghouse
Anode Refining Furnaces	PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>x</sub> , VOC	Oxy-fuel burners, Baghouse, scrubbers
Anode Shaft Furnace	PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>x</sub> , VOC	Baghouse
Anode Holding Furnace	PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>x</sub> , VOC	Baghouse
Vacuum Cleaning System	PM <sub>2.5</sub>	Baghouse
North and South Matte Granulator	PM <sub>2.5</sub> , SO <sub>2</sub>	Scrubber, SGS baghouse, SGS Scrubbers
Acid Plant	SO <sub>2</sub>	Mist eliminators

Pollutant [PM2.5, NOx, SO2, and VOC]

# **Control Options:**

The primary copper smelting area source MACT standard specifically identifies the Smelter main stack emission performance as MACT for copper smelters (existing sources not using batch copper converters). Smelter process and emission controlling technologies that contributed to EPA's designation of the modernized Smelter as a separate MACT category for HAP emissions, including off-gases from furnaces, also contribute to the control of fine particulate and precursor emissions. No new major developments in technologies or costs have occurred after promulgation of the MACT standards.

Baghouses used to control particulate emissions from the concentrate dryer, matte grinding, anode furnaces and granulators are maintained regulatory and the bags are replaced as recommended by the vendors. The exhaust from these processes is at high temperature and low pH due to the acidic nature of the materials. Over the years, KUC has experimented with different types of bags, such as pleated bags, that are more effective in removing particulate. However, these bags could not provide optimum performance due to high temperature and low pH. Therefore, upgrading to different types of bags is not technically feasible for these processes.

Again, KUC maintains and replaces bags in these baghouses as recommended by vendors to maintain performance, pressure differential and particulate removal efficiency. The Smelter continues to be the cleanest Smelter operations in the United States. KUC reviewed emission reductions alternatives for anode furnaces venting through the main stack. The operations at the Smelter are continuously optimized to ensure high efficiency operation of the facility, including periodic upgrades of the burners to maintain optimum operations. KUC performed a pre-feasibility level study to evaluate NO<sub>x</sub> emissions reductions options for the anodes furnaces at the Smelter. The study evaluated emission reduction strategies such as SCR, SNCR, oxidation systems and wet scrubbers.

# **Technological Feasibility:**

All identified control technologies are technically feasible.

## **Economic Feasibility:**

While all the identified technologies were determined to be feasible, each had significant energy and economic impacts. Based on the pre-feasibility study, the costs per ton of  $NO_x$  removed from these technologies ranges from \$55,000 to \$590,000 (CH2M, 2017). These costs are based on the pre-feasibility study and actual implantation costs are expected to be higher as major process and structural modifications would need to be made to implement these alternatives.

Therefore,  $NO_x$  emissions reduction technologies such as SCR, SNCR and wet scrubber are not cost effective for BACT for the anode furnaces venting to the main stack.

## **BACT Selection:**

Because no new major developments in technologies have occurred after the promulgation of the MACT standards, the control technologies currently in place constitute BACT.

Complying with applicable requirements of the 2007 primary copper smelting area source MACT standard (40 CFR 63 Subpart EEEEEE) represent the most stringent measure for the main stack.

## **Implementation Schedule:**

Proper operations are already in place.

#### Startup/Shutdown Considerations

The Smelter and associated equipment is designed to operate on a continuous basis. The operations are run in shutdown or startup modes during scheduled maintenance, plant shutdowns and during periods of natural gas curtailments

The emissions for the Smelter main stack and, acid plant, and Holman boiler are limited during startup/shutdown by hourly limits for  $NO_x$  and/or  $SO_2$ . The emissions from the main stack and acid plant are monitored by CEMs, and the Holman boiler emissions are monitored by alternative monitoring.

Specific procedures for startup and shutdown have been developed for the Smelter. These procedures are developed based on design of its operations and best management practices.

## 2.3.2 Powerhouse Holman Boiler

The boiler is rated at 187 MMBTU and is used to provide process steam at the Smelter. Emissions of  $NO_x$  are limited with FGR, LNB, opacity limits, an alternative monitoring plan which requires continuous monitoring of operational parameters (fuel use, stack oxygen, steam output), and operational controls with good combustion practices. Emissions of PM<sub>2.5</sub>, SO<sub>2</sub>, and VOC are limited with use of pipeline quality natural gas, good combustion practices, gas consumption limit, good design, opacity limits, and proper operation of the boiler. Potential control technologies in other nonattainment areas in states such as California and Alaska were reviewed for this analysis.

#### Pollutant [NOx]

## **Control Options:**

SCR FGR LNB with good combustion practices Ultra-low-NOx burners (ULNB) with good combustion practices

#### **Technological Feasibility:**

All control technologies are technically feasible.

The SCR will reduce the emissions by 90% and replacing the boiler with one that has ULNB will reduce the emissions from 50 ppm to 9 ppm. The SCR will result in a greater reduction in  $NO_x$  than will the ULNB.

## **Economic Feasibility:**

The Holman boiler is equipped with FGR and LNB to reduce  $NO_x$  emissions. The addition of the SCR would reduce the emissions by 90% from the boiler from 9.9 tpy (based on 2016 actual emissions) to 1.0 tpy.

From the Alternative Control Techniques (ACT) Document — NO<sub>x</sub> Emissions from Industrial/Commercial/Institutional Boilers, 1994 ACT document, Table 6-7 presents controlled NO<sub>x</sub> emission rates for various control technologies. For the 100 MMBtu/hr natural gas packaged water tube boiler, the controlled NO<sub>x</sub> emission rate utilizing SCR technology is 0.03 lb/MMBtu. From Table 6-5 of the ACT document, the total annualized cost for the 100 MMBtu/hr gas boiler is \$1,500 to \$1,900 per MMBtu/hr. To estimate the impact of escalating capital cost from 1992 to 2017 dollars, cost indices from Consumer Price Index (CPI) Inflation Calculator (http://www.bls.gov/data/inflation\_calculator.htm) can be used. The escalation multiplier is determined to be 1.74; therefore, for the Holman boiler, the estimated cost is \$487,287. The annual estimated cost for the SCR.

Based on the annualized costs for the SCR over a 15 year period of \$487,287, and an 8.9 tpy reduction in NO<sub>x</sub>, the cost of additional control per ton of NO<sub>x</sub> removed is \$54,751 for the Holman boiler. Based on this cost, it is not cost effective to install an SCR on the Holman boiler.

Replacing the burners with ULNBs will result in a  $\frac{8278}{0}$  reduction. This would decrease the emissions from 9.9 tpy to  $\frac{1.782.2}{1.782.2}$  tpy. The cost analysis to upgrade the Holman Boiler with ULNB was In a comparable boiler upgrade that resulted in ULNBs being installed that were rated at 9 ppm NO<sub>x</sub> the cost was  $\frac{900,0003,069,851}{0}$ . This included upgrading the boiler, structures and auxiliary equipment and the building to include the additional equipment required for ULNBs. The estimated cost for the ULNB is  $\frac{900,000}{0}$ , and  $\frac{0}{0}$  ver a  $\frac{1520}{0}$  year amortization period with  $\frac{510}{0}$  interest, the rate is  $\frac{86,708360,584}{0}$  per year for the ULNB.

Based on the annualized costs for the ULNB over a 1520 year period of 86,708360.584, and a 8.127.7 tpy reduction in NOx, the cost of additional control per ton of NO<sub>x</sub> removed is 10,67846.808 for the Holman boiler. <u>Based on this cost, it is not</u> economically feasible to install ULNBs on the Holman boiler.<del>Based on this cost, it is cost</del> effective to install ULNBs on the Holman boiler.

On May 15, 2018, KUC submitted additional information (Process Combustion Systems, 2018) with revised costs analysis for the Holman boiler. The total capital cost is now \$3,069,851 with an annualized cost of \$360,584. This new cost analysis and with a NO<sub>x</sub> reduction of 7.70 tons per year results in a cost per ton of NO<sub>x</sub> removed at \$46,804 per ton. This makes it not economically feasible to upgrade the boiler.

## **BACT Selection:**

Using the current FGR, with good combustion practices, limited gas consumption, good design, and proper operation constitute BACT for this source.

KUC continuously monitors operational parameters to predict  $NO_x$  emissions and ensure proper boiler operation. The parameters monitored are fuel use (to predict  $NO_x$  emissions lb/hr), stack oxygen (to monitor proper boiler operation and compliance with  $NO_x$ lb/MMBtu emission limit), and steam output (used to estimate heat input if fuel use is unavailable). The ranges for these parameters were developed during a 30-day monitoring campaign where data from a certified NO<sub>x</sub> analyzer were used to develop predictive equations with the operation parameters. The current monitoring plan meets the requirements of 40 CFR 60 NSPS Subpart Db and was approved by the DAQ in correspondence dated December 4, 1998.on ####.

## **Implementation Schedule:**

Proper operations are already in place.

Pollutant [PM2.5, SO2, and VOC]

## **Control Options:**

Use of pipeline quality natural gas and good combustion practices

## **Technological Feasibility:**

All control technologies are technically feasible.

## **Economic Feasibility:**

All technically feasible options are already implemented, no additional technologies were identified. Therefore, an economic feasibility was not performed.

## **BACT Selection:**

Use of pipeline quality natural gas, good combustion practices, opacity limits, good design, and proper operation of the boiler constitute BACT for this emission source.

## **Implementation Schedule:**

Proper operations are already in place.

## Startup/Shutdown Considerations

The Smelter and associated equipment is designed to operate on a continuous basis. The operations are run in shutdown or startup modes during scheduled maintenance, plant shutdowns and during periods of natural gas curtailments

The emissions for the Smelter main stack, acid plant, and Holman Boiler are \_limited during startup/shutdown by hourly limits for  $NO_x$  and/or  $SO_2$ . The <u>NOx</u> emissions from the main stack and acid plant are monitored by CEMs, and the Holman Boiler emissions are required to be monitored under 40 CFR 60 NSPS Subpart Db which allows for the use of CEMS or monitored by approved alternative monitoring.

Specific procedures for startup and shutdown have been developed for the Smelter. These procedures are developed based on design of its operations and best management practices.

## 2.3.3 Matte and Slag Granulators

Matte and slag granulators are each equipped with a three-stage impingement plate scrubber. The Smelter operates two matte granulators and one slag granulator. The molten matte is granulated with water in two separate granulation tanks (two matte granulators), each equipped with a scrubber. The convertor slag is granulated in a separate granulator (one slag granulator), also equipped with a scrubber. The matte granulators are vented through the main stack. The slag granulator is vented to the atmosphere through a separate stack. PM<sub>2.5</sub> and SO<sub>2</sub> emissions are controlled by a neutral pH three stage impingement plate scrubber. Potential control technologies in other nonattainment areas in states such as California and Alaska were reviewed for this analysis.

## Pollutant [PM2.5, and SO2]

#### **Control Options:**

Although review of other nonattainment areas, RBLC and CARB did not provide controls for these specific operations, other possible particulate control technologies include baghouses, cyclones, ESP, and scrubbers.

#### **Technological Feasibility:**

While baghouses are most effective in controlling particulate emissions, this technology is not feasible for the granulators. The exhaust from the granulators has very high moisture content, which is not suitable for baghouses. Moisture condensation can cause accumulation of mud on the bags and baghouse walls. This results in blinded bags and clogged dust removal equipment. A dryer would have to be installed to remove the moisture from the exhaust before a baghouse could be used. This would increase PM,  $SO_2$  and  $NO_x$  emissions. For these same reasons an ESP is also technologically infeasible. As discussed in the Western Regional Air Partnership (WRAP) Fugitive Dust Handbook, cyclones are mainly used to control large particles. Therefore, scrubbers are the only technically feasible option.

## **Economic Feasibility:**

The only technically feasible options is already implemented, no additional technologies were identified. Therefore, an economic feasibility was not performed.

## **BACT Selection:**

Scrubbers constitute BACT for the granulators. The use of scrubbers also represents the

most stringent measure for both the matte and slag granulators.

## **Implementation Schedule:**

Proper operations are already in place.

# Startup/Shutdown Considerations

The Smelter and associated equipment is designed to operate on a continuous basis. The operations are run in shutdown or startup modes during scheduled maintenance, plant shutdowns and during periods of natural gas curtailments

The emissions for the Smelter main stack are limited during startup/shutdown by hourly limits for  $NO_x$  and/or  $SO_2$ . The emissions from the main stack are monitored by CEMs.

Specific procedures for startup and shutdown have been developed for the Smelter. These procedures are developed based on design of its operations and best management practices.

## 2.3.4 Feed Process (Wet and Dry)

Silica flux, concentrate, and converter slag are transferred directly to feed bins then conveyed to the dryer. Particulate emissions from the loading of the flux and concentrate, and from transfer points of the conveyor are vented to a baghouse. Potential control technologies in other nonattainment areas in states such as California and Alaska were reviewed for this analysis.

## Pollutant [PM2.5]

## **Control Options:**

Although review of other nonattainment areas, RBLC and CARB did not provide controls for these specific operations, other possible particulate control technologies include baghouses, cyclones, ESP, and scrubbers.

## **Technological Feasibility:**

All control technologies are technically feasible. The fabric filter (baghouse) is more effective at capturing fine particulate than an ESP, because ESPs tend to collect larger particles selectively. Cyclones are only effective in capturing larger particulate. Wet scrubbers, although effective at capturing fine particulate, produce a wet sludge requiring disposal. Also, wet scrubbers have higher operating costs and lower removal efficiencies than fabric filters. Based on their control effectiveness, the fabric filter ranks at the top, followed by an ESP and then by wet scrubbers.

## **Economic Feasibility:**

All of the available control technologies are economically feasible. The most effective control technology, a baghouse, is already in place. Therefore, an economic feasibility was not performed.

## **BACT Selection:**

Baghouses are the most effective control technology for controlling particulate emissions and constitute BACT. The use of a baghouse to control particulate emissions also represents the most stringent measure for both the wet and dry feed process.

## **Implementation Schedule:**

Proper operations are already in place.

#### Startup/Shutdown Considerations

The Smelter and associated equipment is designed to operate on a continuous basis. The operations are run in shutdown or startup modes during scheduled maintenance, plant shutdowns and during periods of natural gas curtailments

## 2.3.5 Feed Storage Building

Wet copper concentrate feed is stored in the enclosed wet feed storage building. Particulate matter from loading materials into the feed storage building, from reclaiming materials, and from conveyor/transfer point SME 002-A, are vented to a baghouse. Potential control technologies in other nonattainment areas in states such as California and Alaska were reviewed for this analysis.

## Pollutant [PM2.5]

## **Control Options:**

Although RBLC and CARB did not provide controls for these specific operations, other possible particulate control technologies include baghouses, cyclones, ESP, and scrubbers.

## **Technological Feasibility:**

All control technologies are technically feasible. The fabric filter (baghouse) is more effective at capturing fine particulate than an ESP because ESPs tend to collect larger particles. Cyclones are only effective in capturing larger particulate. Wet scrubbers, although effective at capturing fine particulate, produce a wet sludge requiring disposal. Also, wet scrubbers have higher operating costs and lower removal efficiencies than fabric filters. Based on their control effectiveness, the fabric filter ranks at the top, followed by an ESP, and then by wet scrubbers

## **Economic Feasibility:**

All of the available control technologies are economically feasible. The most effective control technology, a baghouse, is already in place. Therefore, an economic feasibility was not performed.

# **BACT Selection:**

The use of enclosures and baghouse to control particulate emissions also represents the most stringent measure for the feed storage building.

## **Implementation Schedule:**

Proper operations are already in place.

## Startup/Shutdown Considerations

The Smelter and associated equipment is designed to operate on a continuous basis. The operations are run in shutdown or startup modes during scheduled maintenance, plant shutdowns and during periods of natural gas curtailments

#### 2.3.6 Anode Area Fugitives

Emissions from the anode building process are controlled with a baghouse, quench tower, and scrubber. However, some emissions can escape as fugitives. Potential control technologies in other nonattainment areas in states such as California and Alaska were reviewed for this analysis.

#### Pollutant [PM2.5]

## **Control Options:**

The review of other nonattainment areas, RBLC and CARB do not identify any specific control technologies for process fugitives. The MACT, however, does address such emissions.

40 CFR 63.11147(a)(3) states, "You must operate one or more capture systems that collect the gases and fumes released from each vessel used to refine blister copper, remelt anode copper, or re-melt anode scrap and convey each collected gas stream to a control device. One control device may be used for multiple collected gas streams." KUC certified compliance with 63.11147(a)(3), as required by 63.11150(b)(4), in a letter dated and received by UDAQ on January 30, 2007.

40 CFR 63.11150(b)(4) states "Your notification of compliance status must include this certification of compliance, signed by a responsible official, for the work practice

standard in § 63.11147(a)(3): "This facility complies with the requirement to capture gases from operations in the anode refining department and convey them to a PM control device in accordance with § 63.11147(a)(3)."

# **Technological Feasibility:**

Current anode process units and the collection hoods on anode building processes have been designed to collect fugitives.

## **Economic Feasibility:**

All of the available control technologies are economically feasible. The most effective control technology, a baghouse, quench tower, and scrubber, are already in place. Therefore, an economic feasibility was not performed.

## **BACT Selection:**

In addition to opacity limits and required maintenance, collection hoods have been engineered/designed to reduce fugitives and the current design of anode process units and the collection hoods on anode building processes practices constitute BACT. The current design of anode process units and the collection hoods on anode building processes were engineered/designed to reduce fugitives and these represent the most stringent measure.

## **Implementation Schedule:**

Proper operations are already in place.

#### Startup/Shutdown Considerations

The Smelter and associated equipment is designed to operate on a continuous basis. The operations are run in shutdown or startup modes during scheduled maintenance, plant shutdowns and during periods of natural gas curtailments

## 2.3.7 Smelter Fugitives

Emissions from Smelter processes are controlled with appropriate control technologies including closed processes, launder hoods and others outlined below. However, some emissions can escape as fugitives. Potential control technologies in other nonattainment areas in states such as California and Alaska were reviewed for this analysis.

## Pollutant [PM2.5]

## **Control Options:**

The EPA performed extensive technology reviews of Smelter emissions in support of the

2002 primary copper smelting major source MACT standard (40 CFR 63 Subpart QQQ) and the 2007 primary copper smelting area source MACT standard (40 CFR 63 Subpart EEEEEE). Specific discussion of the unique aspects of pollution controls at the Smelter are included in the Federal Register notices associated with the draft and final promulgation of both rules. Regarding the design and fugitive emission controls of the Smelter, the EPA provided the following discussion when promulgating the final copper smelting MACT standard (FR Vol. 67, No. 113, Page 40488):

Due to its unique design and operations, most of the process fugitive emission sources associated with smelters using batch converting are eliminated at the Smelter. There are no transfers of molten material in open ladles between the smelting, converting, and anode refining departments at the Smelter. In addition, there are no fugitive emissions associated with the repeated rolling-out of converters for charging, skimming, and pouring. Also, only one continuous flash converter is needed at the Smelter compared with the need for three or more batch copper converters at the other smelters.

Both standards go so far as to establish a separate category for only the Smelter due to its unique design and emission performance not achievable by conventional technology. Smelter process and emission controlling technologies that contributed to the EPA's designation of the modernized Smelter as a separate MACT category for HAP emissions, including off-gases from furnaces, also contribute to the control of fine particulate and precursor emissions. No new major developments in technologies or costs have occurred after the promulgation of the MACT standards.

Specific notes regarding control techniques listed in Table 5 of Attachment 5 of the EPA comments are listed below:

a. Smelter hot metals operations are serviced by an extensive local ventilation (secondary gas) system. This system collects gasses and routes them through baghouses and scrubbers before venting them to the main stack where they are continuously monitored for multiple pollutants.

b. Smelter hot metals operations are completely enclosed in a building.

c. KUC processes only grade 1 scrap in its melting furnaces.

d. A leak detection/prevention/repair program is not applicable to Smelter furnaces and hot metals process units because they are enclosed and operate at negative pressure due to their inherent design.

e. Because KUC furnaces are enclosed and do not require open air transfer of molten metal, they are not dependent on hooding systems for process gas collection.f. It is not necessary to add curtains to improve hood performance at the Smelter as

the process does not rely on hoods to capture process gasses.

g. The KUC process does not require the open-air transfer of molten metal from smelting to converting vessels so it is not necessary to collect these emissions.

h. The EPA noted in the primary copper smelting MACT standard, KUC was the first smelter in the United States to capture and control emissions from anode refining furnaces.

## **Technological Feasibility:**

Not applicable due to the design of the smelting, converting, and anode refining at the Smelter.

# **Economic Feasibility:**

Not applicable.

# **BACT Selection:**

Best operational practices may include, (1) placement or adjustment of negative pressure ductwork and collection hoses, (2) welding of process gas leaks, or (3) containment of process gas leaks. These practices and current design of processes were engineered/designed to reduce fugitives and therefore constitute BACT. The best operational practices currently implemented and the current designs of the processes also represent the most stringent measure for the acid plant fugitives.

## **Implementation Schedule:**

Proper operations are already in place.

## Startup/Shutdown Considerations:

The Smelter and associated equipment is designed to operate on a continuous basis. The operations are run in shutdown or startup modes during scheduled maintenance, plant shutdowns and during periods of natural gas curtailments

## 2.3.8 Acid Plant Fugitives

The double contact acid plant removes  $SO_2$  from the off-gases of the flash furnaces. The sulfuric acid produced by the plant is sold. Among other technologies, the system is equipped with tubular candle fiber mist eliminators and the tail gas is discharged to the main stack. However, some emissions can escape as fugitives, which are controlled using best operational practices to minimize emissions. Best operational practices to minimize the emissions include opacity limits, weekly visual opacity surveys and the requirement of prompt repair or correction and control to minimize emissions. Potential control technologies in other nonattainment areas in states such as California and Alaska were reviewed for this analysis.

# Pollutant [SO2]

## **Control Options:**

Review of other nonattainment areas, the RBLC and CARB do not identify any specific control technologies for such fugitives.

## **Technological Feasibility:**

No controls identified to conduct a feasibility study.

# **Economic Feasibility:**

No controls identified, therefore, an economic feasibility was not performed.

## **BACT Selection:**

Best operational practices may include, (1) placement or adjustment of negative pressure ductwork and collection hoses, (2) welding of process gas leaks, or (3) containment of process gas leaks. These practices and current design of processes were engineered/designed to reduce fugitives and therefore constitute BACT.

The best operational practices currently implemented and the current designs of the processes also represent the most stringent measure for the acid plant fugitives.

#### **Implementation Schedule:**

Proper operations are already in place.

## Startup/Shutdown Considerations

The Smelter and associated equipment is designed to operate on a continuous basis. The operations are run in shutdown or startup modes during scheduled maintenance, plant shutdowns and during periods of natural gas curtailments

# 2.3.9 Powerhouse Foster Wheeler Boiler

This boiler is used to produce superheated steam to start the Smelter, drive acid plant compressors, and standby power. Emissions of  $NO_x$  are limited with FGR, LNB with good combustion practice, continuous monitoring of  $NO_x$  at the Smelter main stack, and limitations on fuel throughput. Emissions of  $PM_{2.5}$ ,  $SO_2$ , and VOCs are limited with use of pipeline quality natural gas; good combustion practices; good design and proper operation of the boiler; and continuous monitoring of opacity, particulate, and  $SO_2$  at the Smelter main stack. Potential control technologies in other nonattainment areas in states such as California and Alaska were reviewed for this analysis.

# Pollutant [NO<sub>x</sub>]

## **Control Options:**

SCR FGR ULNB with good combustion practices LNB with good combustion practices

## **Technological Feasibility:**

All control technologies are technically feasible.

The SCR will reduce the emissions by 90% and replacing the boiler with one that has ULNB will reduce the emissions from 50 ppm to 9 ppm. The SCR will result in a greater reduction in  $NO_x$  than will the Ultra LNB.

## **Economic Feasibility:**

The Foster Wheeler boiler is equipped with FGR and LNB to reduce  $NO_x$  emissions. Emissions from this boiler are vented through the main stack and it is difficult to differentiate the boiler  $NO_x$  emissions from the main stack emissions. Based on the understanding of operations at the Smelter, the addition of the SCR might reduce the annual emissions by 90% for the boiler from 5.3 tpy (based on 2016 actual emissions and engineering estimates) to 0.53 tpy.

From the Alternative Control Techniques Document –  $NO_x$  Emissions from Industrial/Commercial/Institutional Boiler, 1994 ACT document, Table 6-7 presents controlled NOx emission rates for various control technologies. For the 100 MMBtu/hr natural gas packaged water tube boiler, the controlled NOx emission rate utilizing SCR technology is 0.03 lb/MMBtu. From Table 6-5, the total annualized cost for the 100 MMBtu/hr gas boiler is \$1,500 to \$1,900 per MMBtu/hr. To estimate the impact of escalating capital cost from 1992 to 2017 dollars, cost indices from CPI Inflation Calculator (http://www.bls.gov/data/inflation\_calculator.htm) can be used. The escalation multiplier is determined to be 1.74; therefore, for the powerhouse boiler the estimated cost is \$261,000.

Based on the annualized costs for the SCR of \$261,400, and a 4.77 tpy reduction in  $NO_x$ , the cost of additional control per ton of  $NO_x$  removed is \$54,800 for the Foster Wheeler boiler. Based on this cost, it is not cost effective to install an SCR on the Foster Wheeler boiler.

Replacing the burners with ULNBs will result in an 8278% reduction. This would decrease the emissions from 5.3 tpy to 0.951.19 tpy. In a comparable boiler upgrade that resulted in ULNBs being installed that were rated at 9 ppm NO<sub>\*</sub> the cost was \$900,000. The cost to upgrade the boiler to ULNBs at 9ppm NOx was \$1.705.473 (Process Combustion Systems, 2015) This included upgrading the boiler, structures, and and the building to include the additional auxilliary equipment required for ULNBs. The estimated cost for the ULNB is \$900,000, and oOver a 15-20 year amortization period, this is \$86,708.200.324 per year for the SCRUNLB.

Based on the annualized costs for the ULNB over a 15-20 year period of \$86,708200,324,

and a 4.354.11 tpy reduction in NOx, the cost of additional control per ton of NOx removed is \$19,99248,770 for the Foster Wheeler boiler. Based on this cost, it is <u>not cost</u> <u>effective\_conomically feasible</u> to install ULNBs on the Foster Wheeler boiler.

On May 15, 2018, KUC submitted additional information (Process Combustion Systems, 2018) with revised costs analysis for the Holman boiler. The total capital cost is now \$3,069,851 with an annualized cost of \$360,584. This new cost analysis and with a NO<sub>x</sub> reduction of 7.70 tons per year results in a cost per ton of NO<sub>x</sub> removed at \$46,804 per ton. This makes it not economically feasible to upgrade the boiler.

# **BACT Selection:**

Using the current FGR, with good combustion practices, limited gas consumption, good design, and proper operation constitute BACT for this source.

## **Implementation Schedule:**

Proper operations are already in place.

# Pollutant [PM2.5, SO2, and VOC]

#### **Control Options:**

Use of pipeline quality natural gas and good combustion practices

#### **Technological Feasibility:**

All control technologies are technically feasible.

## **Economic Feasibility:**

All control technologies are economically feasible. Therefore, an economic feasibility was not performed.

## **BACT Selection:**

Use of pipeline quality natural gas, good combustion practices, opacity limits, good design, and proper operation of the boiler constitute BACT for this emission source.

# **Implementation Schedule:**

Proper operations are already in place.

## Startup/Shutdown Considerations

The Smelter and associated equipment is designed to operate on a continuous basis. The

operations are run in shutdown or startup modes during scheduled maintenance, plant shutdowns and during periods of natural gas curtailments

The emissions for the Smelter main stack are limited during startup/shutdown by hourly limits for  $NO_x$  and/or  $SO_2$ . The emissions from the main stack are monitored by CEMs.

Specific procedures for startup and shutdown have been developed for the Smelter. These procedures are developed based on design of its operations and best management practices.

#### 2.3.10 Miscellaneous Storage Piles/Loadout

Concentrate, granulated matte, slag, and other materials are stored in storage piles on pads. Water sprays or chemicals are applied as necessary to minimize fugitive emissions. Potential control technologies in other nonattainment areas in states such as California and Alaska were reviewed for this analysis.

#### **Control Options:**

See control options for minor sources

#### 2.3.11 Slag Concentrator

Emissions associated with the crushing, grinding, and slag processing at the Smelter are minimized with the water sprays and enclosures. Potential control technologies in other nonattainment areas in states such as California and Alaska were reviewed for this analysis.

## Pollutant [PM2.5]

## **Control Options:**

Baghouses Cyclones Scrubbers Water sprays Enclosures.

# **Technological Feasibility:**

Baghouses are not feasible for the slag processing equipment. The slag stock piles are sprayed with water frequently to minimize emissions. The material as a result has very high moisture content, which is not suitable for baghouses. Moisture droplets and condensation can cause accumulation of mud on the bags, baghouse walls, and ductwork. This results in blinded bags and clogged dust removal equipment. Further, when ambient temperatures are below freezing, the mud will freeze on the baghouse bags and plug them.

Wet scrubbers are not expected to be effective in minimizing emissions from crushing and grinding operations. Operation of the scrubbers is compromised due to below freezing ambient temperatures and very cold water streams in the scrubber. The duct work of the scrubbers will freeze during subfreezing ambient temperature conditions. As discussed in the WRAP Fugitive Dust Handbook (Countess Environmental, 2006), cyclones are mainly used to control large particles.

## **Economic Feasibility:**

The remaining technologies of water sprays and enclosures are economically feasible.

#### **BACT Selection:**

Water sprays and enclosures are used to minimize particulate emissions from the slag concentrator, which were demonstrated to be very effective. The use of water sprays and enclosures to minimize particulate emissions represent the most stringent measure from the slag concentrator.

## **Implementation Schedule:**

Proper operations are already in place.

## Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

## 2.3.12 Smelter Cooling Towers

Three noncontact water cooling towers are used for various Smelter processes. The towers are equipped with drift eliminators with drift a loss rated at 0.001 percent.

## **Control Options:**

## PM2 5 Emissions

 $PM_{2.5}$  emissions are generated as water evaporates from a cooling tower and small droplets of water become entrained in the air stream and are carried out as drift droplets. The drift droplets will often contain impurities from the water flowing through the system, so they are considered a type of emission (USEPA, 2015). These impurities are often from water treatment additives, such as anti-fouling or anti-corrosion additives, or from direct contact between the cooling water and the process fluid (Brady et al., 1998).

# **RBLC** and Technical Documents

The following control technologies were identified as available options for PM2.5

emissions from cooling towers:

- · Use of dry cooling (no water circulation) heat exchanger units
- High efficiency drift eliminators
- · Limitations on TDS in the circulating water

## Dry Cooling Towers

Dry cooling towers use fans to move dry ambient air through the towers and cool the process stream. Because these towers do not rely on the evaporation of water for heat transfer, they do not generate drift emissions (Baker et al., 2001).

## **Drift Eliminators**

High efficiency drift eliminators remove droplets before the air is discharged to the atmosphere. Drift eliminators are rated by the percentage of emissions from the cooling tower water circulation rate. The drift rates in the RBLC database range between 0.0005% and 0.02%; the majority of drift rates reported are under 0.001%.

## Limitations on TDS in Circulating Water

Dissolved solids in the circulating water increase in concentrations as the circulating water evaporates (USEPA, 2015). TDS can also occur as a result of the addition of anticorrosion or anti-biocide additives. A filtration system can be used to reduce TDS concentrations in circulating water (Reisman & Frisbie, 2002). Monitoring the TDS content in circulation water is an effective approach to ensure that excess emissions are not generated as a result of high TDS levels in circulation water. The TDS concentration limitations in the RBLC database range between 1,000 mg/L and 6,009 mg/L.

#### **VOC Emissions**

VOC emissions are caused when a VOC-containing process stream contaminates circulation water due to a leak in the system or if the circulation water is treated with VOC-containing material (TCEQ, 2003). VOC emissions from cooling towers are more likely to occur in petroleum refineries or chemical manufacturing

## **RBLC** and Technical Documents

Identifying leaks by routinely monitoring VOC concentrations in circulation water was the only control technology identified as an available option for VOC control from cooling towers.

Elevated VOC concentrations can be an indication of leaks in the system. By routinely monitoring VOC concentrations in circulation water, leaks can be identified and repaired. The El Paso Method is commonly used to monitor VOC concentrations in circulation water (TCEQ, 2003). TCEQ established a VOC concentration of 0.08 ppmw for identifying a leak in the system. The RBLC database identified a VOC limit of 0.05 ppm.

## **BACT Selection:**

Evaluation of Findings & Control Selection:

The cooling towers operating at major sources in the  $PM_{2.5}$  nonattainment area are equipped with drift eliminators with loss rates ranging from 0.2% to 0.0005%. Routine monitoring of TDS concentrations in circulating water is a common operating practice for these cooling towers.

DAQ has determined that BACT for PM2.5 emissions from cooling towers is drift eliminators combined with TDS limitations. A specific drift eliminator efficiency and TDS limitation is not specified in this BACT analysis as these limitations are dependent on the specific cooling tower design and the industrial process.

DAQ has determined that BACT for VOC emissions from cooling towers is implementation of a leak detection program, in accordance to an applicable Subpart and/or with the El Paso Method. This is only applicable to process streams that may contain VOC or if the circulated water is treated with VOC-containing materials.

# 2.3.13 Ground Matte Silo, Molding Coatings Storage Silo, Lime and Limestone Storage Silos,

Ground matte material is stored in silos. Particulate matter from loading materials into the silos is vented to a baghouse. The 2016 actual PM<sub>2.5</sub> emissions from the silo baghouse were 0.04 tpy.

#### **Control Options:**

The EPA and the State of Utah have regulations and requirements that apply to this process.

40 CFR 63 Subpart AAAAA applies to lime manufacturing plants that are major sources due to major HAP emissions. This subpart defines processed stone handling (PSH) to include bulk loading or unloading systems. Table 1 of this subpart applies to PSH operations and limits subject sources to the following (e-CFR, 2004):

Fugitive Emissions 10%

Stack emissions from all PSH 7%

PM emissions must not exceed 0.05 g/dscm

40 CFR 60 Subpart OOO applies to nonmetallic mineral processing plants' enclosed truck or railcar loading stations. This subpart applies to this activity and limits PM emissions to 0.022 gr/dsef for any emission unit constructed between 8/31/1983 and 4/21/2008. Sources constructed or modified on or after 4/22/2008 must meet a limit of 0.014 gr/dsef. (e-CFR, 2009).

Utah rule R307-309 for Nonattainment and Maintenance Areas for PM10 and PM2.5: Fugitive Emissions and Fugitive Dust applies to this process. Specifically, R307-309-5: General Requirements for Fugitive Dust limits on-site fugitive dust opacity to 20% and 10% at the property boundary. Additionally, R307-309-6: Fugitive Dust Control Plan requires that sources create and follow a plan to reduce and mitigate fugitive dust

## emissions.

Other states have varying requirements for this process. New Jersey's State BART analysis from 2011 lists possible PM controls for this process as: particle enclosure and a fabric filter (pg.407); or ducting to a control system that has a bin vent filter with a 100% eapture rate and a 0.02 gr/dsef filtration rate for PM10 (pg. 467) (State of New Jersey Department of Environmental Protection, 2011). Missouri requires that all loadout operations be controlled by a baghouse ("DNR MACC-Permit to Construct: Mississippi Lime Company," 2015). The Nelson Lime Plant in Arizona was permitted with a baghouse controlling lime loadout into railcars and a subsequent emission limit of 0.01 gr/dsef ("Nelson Lime Plant – Permit #42782")

To meet these requirements possible controls include; using enclosed trucks during transport, utilizing a venting system controlled with vent, fabric filtered vents, or a baghouse ("Lime Handling Systems," 1984).

## **BACT Selection:**

Both bin vents and baghouses are feasible options for lime silo controls. A baghouse can control multiple silos at once. The use of a baghouse may be more applicable depending on the operator's needs. Bin vents are an acceptable control for lime silos and operates independently on each silo. This control limits emissions during material transfers and movements. As the system is enclosed and the only venting point is through the silo vent, this control is considered BACT for this process.

## 2.3.14 Recycle and Crushing Building, and Smelter Laboratory

The matte and slag material is recycled and crushed in a building. Particulate matter from these small-scale operations are minimized as they occur inside the building and are controlled with a baghouse. The 2016 actual  $PM_{2.5}$  emissions from the Recycle and Crushing Building baghouse were 0.03 tpy.

#### **Control Options:**

Baghouses are considered a control for multiple source categories. There are no federal or state requirements that regulate baghouse selection or filter type. Typically, baghouse filters are rated with a control efficiency of 99%. Therefore, one percent of a source's emissions are vented into ambient air.

Potential controls for the emitted particulates include using a more efficient filter in the baghouse. While fabric filters are typically rated at 99% efficiency, newer filters are available with a rating at 99.9% ("San Joaquin SIP," 2015, "PTFE Membrane Baghouse Filters," 2017).

#### **BACT Selection:**

In some cases, using a more efficient filter is a cost effective, technically feasible control option that reduces particulate emissions. The higher efficiency filter bags require no additional operational or maintenance changes. The increased efficiency bags will reduce emissions and are considered BACT for this operation.

However, there are other operations where a higher efficiency bag is not technically feasible and/or cost effective.

Each site must evaluate the feasibility based on operation type and design.

In all operations, to ensure control efficiencies, operators must follow manufacturer recommended operation and maintenance. This includes monitoring and maintaining the pressure drop across filter bags, cleaning the filters, and replacing the filters as needed. This is considered standard practice for baghouse operations. (State of New Jersey Department of Environmental Protection, 2011).

In 40 CRF 63 Subpart X, §63.548, best practices include the development of a source baghouse leak procedure. The procedure includes daily pressure gauge inspections, weekly visual inspections of the dust collection hoppers, and quarterly inspections of the physical integrity of the bags and fans ("40 CFR 63.548"). This procedure could be implemented to all source categories using baghouses for controls.

#### 2.3.15 Propane Communications Generator

The Smelter operates a propane fired communication generator. This generator is used to support communication systems during emergencies or loss of power at the Smelter. Emissions are controlled with good combustion practices while operating the generator.

## **Control Options:**

The following sources were reviewed to identify available control technologies: • EPA's RBLC

\* EPA's Air Pollution Technology Fact Sheets

\* EPA's Control Techniques Guidelines and Alternative Control Techniques Documents

- Various state regulations
- -40 CFR 60 Subpart JJJJ and 40 CFR 63 Subpart ZZZZ
- Various state specific example permits

\* A thorough literature search using the Google search engine

After a review of the above sources, the DAQ determined that many state and federal regulations provide specific exemptions for the control and applicability of various regulations and control devices to emergency engines. The following control options were found for controlling emissions from stationary natural gas-fired engines:

#### Control Options for NOX:

\* Non-Selective Catalytic Reduction (for rich-burn engines with carburetors) (CleanAIR

#### Systems, 2009)

- Exhaust Gas Recirculation (CS, 2009)
- Lean NOX Catalyst (for lean-burn engines) (CS, 2009)
- Selective Catalytic Reduction (for lean-burn engines) (CS, 2009)
- Turbocharging and aftercooling (US EPA, 1993)
- Engine Ignition Timing Retardation (US EPA, 1993)
- Modifying air-to-fuel ratio (US EPA, 1993)

**Control Options for VOC:** 

- Non-Selective Catalytic Reduction (for rich-burn engines) (CS, 2009)
- Oxidation Catalyst (for lean-burn engines) (CS, 2009)

Additional control options for all pollutants include replacement of older engines with new engines, and adherence to emission limitations contained in 40 CFR 60 Subpart JJJJ. 40 CFR 63 Subpart ZZZZ contains no additional requirements for emergency engines beyond operational and maintenance practices. For older engines that do not comply with an emission limitation in 40 CFR 60 Subpart JJJJ, emissions could be controlled by one of the above methods.

## **BACT Selection:**

Control Options for NO<sub>x</sub>: The retrofit of an existing portable propane fired emergency engine to become a low emissions combustion unit could potentially be cost effective and feasible for this source category, depending on a site by site analysis. This is assuming an old engine that is not currently subject to 40 CFR 60 Subpart JJJJ. This control selection is not applicable to newer engines. Therefore, the DAQ recommends as BACT a site by site analysis to determine as necessary if older engines need to be retrofitted to become low emissions combustion units.

Control Options for VOC: The DAQ did not find any VOC controls that were cost effective for controlling VOC emissions. Therefore, the DAQ recommends proper maintenance and operation of the emergency stationary diesel engine as BACT for control of VOC emissions.

#### 2.3.16 Cold Solvent Degreaser

Cold solvents are used to degrease and clean equipment parts. The degreaser lids are kept closed when the unit is not in use to minimize solvent loss and emissions. Potential control technologies in other nonattainment areas in states such as California and Alaska were reviewed for this analysis. The 2014 actual VOC emissions from the degreasers at the Smelter were 0.002 tpy.

Solvent degreasers are used to remove various contaminants from pieces of equipment. Solvent degreasing is the physical process of using an organic or inorganic solvent to remove tars, greases, fats, oils, waxes, or soil from metal, plastic, printed circuit boards, or other surfaces. This cleaning is typically done prior to such processes as painting, plating, heat treating, and machining, or as part of maintenance operations. The solvent containers can be horizontal or vertical. The solvent may be agitated. Agitation increases the cleaning efficiency of the solvent. Agitation can be used with pumping, compressed air, vertical motion, or ultrasonics.

# **Control Options:**

- Carbon adsorption
- Refrigerated primary condensers
- Increased freeboard ratio
- Combination of covers
- Water covers
- Internal Draining Rack
- -----Spray hose/spray nozzle
- Reduced room drafts
- Selected operation and maintenance practices

## **BACT Selection:**

Compliance with the requirements of R307-335 is considered BACT for solvent degreasers.

#### 2.3.17 Diesel Emergency Generator for Pyrometallurgical Process

The Smelter operates one 998 HP diesel-fired emergency generator to support the pyrometallurgical process during emergencies. The emergency generator is equipped with turbo charger and after cooling and complies with applicable New Source Performance Standards to minimize emissions. Potential control technologies in other nonattainment areas in states such as California and Alaska were reviewed for this analysis. The 2014 actual PM<sub>2.5</sub> and precursor emissions from the generator were 0.78 tpy

# Control Options:

Control Options for PM2.5:

- Catalyzed Diesel Particulate Filter (CleanAIR Systems, 2009)
- Diesel Oxidation Catalyst (CS, 2009)
- Diesel Particulate Filter (CS, 2009)

# Control Options for NO<sub>\*</sub>:

- Exhaust Gas Recirculation (CS, 2009)
- -----Selective Catalytic Reduction (CS, 2009)
- Turbocharging and aftercooling (US EPA, 1993)
- Engine Ignition Timing Retardation (US EPA, 1993)
- Modifying air-to-fuel ratio (US EPA, 1993)

Control Options for SO<sub>2</sub>: Ultra-Low Sulfur Diesel Fuel (Bradley Nelson, 2010)

Control Options for VOC:

- Catalyzed Diesel Particulate Filter (CS, 2009)

Diesel Oxidation Catalyst (CS, 2009)

**BACT Selection:** 

**Evaluation of Findings & Control Selection:** 

Control Options for  $PM_{2.5}$ : The DAQ did not find any  $PM_{2.5}$  controls that were cost effective for controlling  $PM_{2.5}$ -emissions. Therefore, BACT for direct  $PM_{2.5}$ -emissions is proper maintenance and operation of the emergency stationary diesel engine.

Control Options for NO<sub>x</sub>: The installation of a new emergency stationary diesel engine subject to the newest requirements for stationary emergency engines as specified in 40 CFR 60 Subpart IIII could potentially be cost effective and feasible for this source eategory, depending on a site-by-site analysis. This is assuming an old engine that is not currently subject to 40 CFR 60 Subpart IIII. This control selection is not applicable to newer engines. In the absence of replacing an old engine with a new engine, the installation of exhaust gas recirculation technology on older engines could be cost effective and feasible, again depending on a site-by-site basis of actual cost to retrofit the stationary emergency diesel engine on site. This control selection is assuming an old engine that is not currently subject to 40 CFR 60 Subpart III.

Control Options for  $SO_2$ : The DAQ recommends the use of ultra-low sulfur diesel fuel as BACT for  $SO_2$  control.

Control Options for VOC: The DAQ did not find any VOC controls that were cost effective for controlling VOC emissions. Depending on the age of the engine and site-specific information, a diesel oxidation catalyst could be cost effective for controlling VOC emissions. However, the DAQ does not recommend a diesel oxidation catalyst as BACT for this source category due to the fact this control option is probably not cost effective. Therefore, the DAQ recommends proper maintenance and operation of the emergency stationary diesel engine as BACT for control of VOC emissions. A site-specific cost/ton removed could be derived for making a determination on the requirement of installing a diesel oxidation catalyst.

#### 2.3.18 Hot Water Boiler

Natural gas-fired water boilers are used for water heating throughout the Smelter. The water boilers use low NOx burners (LNB) and regular inspections are done to the units to ensure optimum combustion performance. The water heaters are rated at less than 10 MMBTU/hr. Potential control technologies in other nonattainment areas in states such as California and Alaska were reviewed for this analysis. The 2016 actual PM2.5 and

precursor emissions from the comfort heating units generator were 0.611.1 tpy.

## **Control Options:**

The following control technologies were identified as available options for PM2.5 emissions from boilers with input ratings less than or equal to 10 MMBtu/hr.

- Good combustion practices
- Use of gaseous fuels
- Baghouses
- Cyclone
- Electrostatic Precipitators

The following control technologies were identified as available options for NO<sub>\*</sub> emissions from boilers with input ratings less than or equal to 10 MMBtu/hr.

- Good combustion practices
- Pre-combustion modifications (oven fire air, low excess air, air staging, etc)
- Combustion controls
- FGR
- Low NOX burners
- Ultra-low NOX burners
- ----SCR
- SNCR

The following control technologies were identified as available options for SO<sub>2</sub> emissions from boilers with input ratings less than or equal to 10 MMBtu/hr.

- Good combustion practices
- Use of low sulfur fuels
- Wet Scrubbers

The following control technologies were identified as available options for VOC emissions from boilers with input ratings less than or equal to 10 MMBtu/hr.

- Good combustion practices
- Carbon Adsorption
- Thermal Oxidizers
- Catalytic Oxidizers

## **BACT Selection:**

The economic feasibility analysis demonstrates that retrofit options and boiler replacements are generally not cost effective options for boilers under 5 MMBtu/hr. Retrofitting or replacing boilers between 5 and 10 MMBtu/hr could both be cost effective

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options depending on the boiler size, age, and hours of operation.

The estimated costs for low NO<sub>x</sub> burner retrofits start at \$8,454 per ton of NO<sub>x</sub> removed and boiler replacements start at \$13,542. Retrofitting or replacing existing low-NO<sub>x</sub> boilers with ultra-low NO<sub>x</sub> boilers also proved to be cost prohibitive. Retrofits costs start at \$24,735 per ton of NO<sub>x</sub> removed and replacement costs start at \$46,173 ("PM2.5 Serious SIP BACT for Small Sources.," 2017).

DAQ recommends the use of natural gas as primary fuel and good combustion practices as BACT for the existing boilers operating at major sources within the nonattainment area. Diesel or fuel oil may only be used as backup fuel or in areas where natural gas is not available. The sulfur content of any diesel or fuel oil burned shall not exceed 15 ppm by weight.

An evaluation to determine whether retrofitting or replacing boilers between 5 and 10 MMBtu/hr with low  $NO_*$  or ultra-low NOx burners is economically feasible should be conducted on a case-by-case basis.

## 3.0 Consideration of Ammonia

The only sources of ammonia emissions at the Refinery and the Smelter is from the SCRs that will be installed on the CHP, the combustion of natural gas and the Hydrometallurgical Silver Production and at the Refinery.

The unreacted ammonia can be treated as a  $PM_{2.5}$  precursor. Although ammonia was previously not considered as a precursor pollutant in Utah's  $PM_{2.5}$  Serious SIP, and the source's BACT analysis did not include an analysis of BACT for ammonia emissions, an analysis is being included here for completeness.

There are only sources of ammonia emissions at the Refinery and Smelter that could be controlled is the ammonia from the Hydrometallurgical Silver Production process. - The SCR units used to control emissions of NO<sub>x</sub> from the CHP combustion turbine. The eatalyst serves to lower the reaction temperature required and helps speed the process. Ideally, a stoichiometric amount of ammonia would be added just enough to fully reduce the amount of NO<sub>x</sub> present in the exhaust stream. However, some amount of ammonia will always pass through the process unreacted; and since the process possesses some degree of variability, a small amount of additional ammonia is added to account for minor fluctuations. The ammonia which passes through the process unreacted and exits in the exhaust stream is termed "slip" (sometimes "ammonia slip"). The amount varies from facility to facility, but ranges from almost zero to as high as 30 ppm in poorly controlled systems. Also, as catalyst systems degrade over time, the degree of ammonia slip will gradually increase as increasing amounts of ammonia are added to maintain NO<sub>x</sub> reduction performance. The unreacted ammonia can be treated as a PM<sub>2.5</sub> precursor.

## **Control Options:**

There is only one control technique considered available for ammonia emissions. Monitoring of ammonia slip emissions and setting a "not to exceed" emission rate limitation. This allows for setting up a feedback process where the source can adjust ammonia injection rates based on both parameters: NO<sub>x</sub> emission reduction levels and ammonia slip levels. Should catalyst activity, over time, degrade to the point where both parameters cannot be met, then the SCR catalyst should be replaced.

Although RBLC and CARB did not provide controls for the specific operation, possible ammonia control technologies include wet scrubbers.

## **Technological Feasibility:**

This represents a work practice standard, and is inherently technically feasible.

A review of recently issued permits for SCR units at large combustion turbine installations reveals NH<sub>2</sub> emission limits ranging between 2.0 ppm and 5.0 ppm.

The source has not provided a cost effectiveness breakdown for upgrading the ammonia injection systems at the Refinery and Smelter so that a limitation could be established. This is not an easy task, as it is not as simple as merely upgrading the injection system. An entire SCR upgrade might be required to guarantee that the SCR unit itself was still operating with required removal efficiency at the tighter ammonia injection levels. Increased monitoring would also be required.

Wet scrubbers are the only technically feasible control of ammonia.

## **Economic Feasibility:**

All control technologies are economically feasible. Therefore, an economic feasibility was not performed.

# **BACT Selection:**

# Scrubbers are the most effective control technology for controlling ammonia and constitute BACT.

Given the difficulty in redesigning a new SCR system for control of a pollutant not currently listed as a precursor pollutant, and the expected high cost for this process, no change in ammonia slip requirements is recommended at this time. Retention of the existing ammonia slip design parameter of 10 ppm as a limitation is recommended as BACT. Existing work-practice standards should suffice to minimize emissions.

## **Implementation Schedule:**

Proper operations are already in place.

A proper design of the SCRs when they are installed to limit the ammonia slip.

# Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

## 4.0 Conclusion- Emissions Reduction through BACT implementation

## 4.1 Reduction in emissions at the Refinery

One of the boilers at the Refinery will be upgraded with ULNB. Currently the annual emission rate is 12.9 tpy and will be reduced by 11.61 tpy to 1.29 tpy. The installation of the ULNBs will be by December 2020.

PM<sub>2.5</sub>, SO<sub>2</sub> and VOCs are estimated to remain the same.

#### 4.1 Reduction in emissions at the Smelter

Reduction in NO<sub>x</sub> limit on Holman boiler from 14.0 to 9.0 lbs per hour.

## 5.0 Implementation Schedule and Testing Requirements

## 5.1 Refinery

Installation of ULNBs on one the boilers by December 2020.

## 5.2 Smelter

Installation of ULNBs on the boilers by December 2019.

Currently the limit for the Holman boiler is 14.0 lbs/hr (calendar-day average). This will be reduced to 9.0 lbs/hr (calendar-day average).

Currently there are no testing limits on the Foster Wheeler boiler. The boiler is rated at 100 MMBTU/hr and using the same emission factor as the Holman boiler which is 0.05 lb NOx/MMBTU, the emission rate is 5.0 lb/hr.

## 6.0 New PM2.5 SIP – KUC Smelter and Refinery Specific Requirements

The Smelter and Refinery specific conditions in Section IX.H.12 address those

**Comment [A2]:** Emissions from the Foster-Wheeler boiler are monitored through the main stac CEMS and stack testing requirements.
limitations and requirements that apply only to the Smelter and Refinery in particular.

n. Kennecott Utah Copper: Smelter and Refinery.

i. SMELTER:

- A. Emissions to the atmosphere from the indicated emission points shall not exceed the following rates and concentrations:
  - I. Main Stack (Stack No. 11)
    - 1. PM2.5
      - a. 85 lbs/hr (filterable)
      - b. 434 lbs/hr (filterable + condensable)
    - 2. SO2
      - a. 552 lbs/hr (3 hr. rolling average)
      - b. 422 lbs/hr (daily average)
    - 3. NOx 154 lbs/hr (daily average)
  - II. Holman Boiler
    - 1.  $NO_x$

a. 9.014 lbs/hr, (calendar-day average)

B. Stack testing to show compliance with the emissions limitations of Condition (A) above shall be performed as specified below:

EMISSION POINT	POLLUTANT	TEST FREQUENCY
I. Main Stack (Stack No. 11)	PM2.5 SO2 NOx	Every Year CEM CEM
II. Holman Boiler	NOx	Every three years and <u>CEMS or</u>

The Holman boiler shall use an EPA approved test method every three years and in between years use an <u>approved CEMS or alternate monitoring</u> method according to applicable NSPS standards.

alternate method

standards

according to applicable NSPS

- C. During startup/shutdown operations, NO<sub>x</sub> and SO<sub>2</sub> emissions are monitored by CEMS or alternate methods in accordance with applicable NSPS standards.
- D. KUC must operate and maintain the air pollution control equipment and monitoring equipment in a manner consistent with good air pollution control practices for minimizing emissions at all times including during startup, shutdown, and malfunction.

#### ii. REFINERY:

A. Emissions to the atmosphere from the indicated emission point shall not exceed the following rate:

EMISSION POINT	POLLUTANT	MAXIMUM EMISSION RATE
The sum of two (Tankhouse) Boilers	NO <sub>X</sub>	9.5 lbs/hr (Before December 2020)
(Upgraded Tankhouse Boiler)	NOx	1.5 lbs/hr (After December 2020)
Combined Heat Plant	NOx	5.96 lbs/hr

B. Stack testing to show compliance with the above emission limitations shall be performed as follows:

EMISSION POINT	POLLUTANT	TESTING FREQUENCY
Tankhouse Boilers	NOx	every three years*
Combined Heat Plant	NOx	every year

\*Stack testing shall be performed on boilers that have operated more than 300 hours during a three year period.

- C. One 82 MMBTU/hr Tankhouse boiler shall be upgraded to meet a NO<sub>x</sub> rating of 9 ppm no later than December 31, 2020. The remaining Tankhouse boiler shall not consume more than 100,000 MCF of natural gas per rolling 12- month period unless upgraded so the NO<sub>x</sub> emission rate is no greater than 30 ppm
- D. KUC must operate and maintain the stationary combustion turbine, air pollution control equipment, and monitoring equipment in a manner consistent with good air pollution control practices for minimizing emissions at all times including during startup, shutdown, and malfunction. Records shall be kept on site which indicate the date, and time of startups and shutdowns.

#### 5.1 Monitoring, Recordkeeping and Reporting

Monitoring for IX.H.22.k.i.A is specifically outlined in IX.H.22.k.i.B; while IX.H.22.k.i.C is addressed in IX.H.22.k.i.D. Recordkeeping is subject to the requirements of IX.H.21.c and IX.H.21.f.

#### 6.0 References

CH2M. (2017, July). PM2.5 State Implementation Plan: Best Available Control Technology

Determinations.

CH2M. (2018, February). PM2.5 State Implementation Plan: Best Available Control Technology Determinations.

Cleaver Brooks. (2017, July 27). Kennecott Refinery Boiler Replacement.

Countess Environmental. (2006, September 7). WRAP Fugitive Dust Handbook.

Environmental Protection Agency. (2002, June 12). Federal Register June 12, 2002.

ENVIRONMENTAL PROTECTION, & AGENCY. (2006, October 6). Federal Register Friday

October 6, 2006.

Environmental Protection, & Agency. (2007, July 3). Federal Register Tuesday July 3 2007.

PM2.5 Serious SIP – BACT for Small Sources. (2017, August 11). Utah DAQ Minor Source NSR.

Process Combustion Systems. (2018, May 15). Kennecott Smelter Boilers.

Steve Schnoor.Kennecott Utah Copper. (2018, May 30). Kennecott Part H Limitations PM2.5

Serious SIP\_Comment.docx.

U.S. Environmental Protection Agency. (1994, March 1). Alternative Control Techniques (ACT)

Document - NOx Emissions from Industrial/Commercial/Institutional Boilers.

# PM<sub>2.5</sub> SIP EVALUATION REPORT KENNECOTT UTAH COPPER LLC- POWER PLANT, TAILINGS AND LABORATORY

## 1.0 Introduction-Purpose

The following is an updated version of the original RACT evaluation that was completed on October 1, 2013 as a part of the Technical Support Documentation for Section IX, Parts H.11, 12 and 13 of the Utah SIP; to address the Salt Lake City PM<sub>2.5</sub> and Provo, Utah PM<sub>2.5</sub> Nonattainment Areas.

### 1.1 Facility Identification

Name: Kennecott Utah Copper LLC (KUC) Address: 8362 West 10200 South Bingham Canyon, UT 84006 Owner/Operator: Rio Tinto/KUC UTM coordinates:

> 405,200 m Easting, 4,507,400, m Northing, UTM Zone 12 (Power Plant) 405,250 m Easting, 4,510,400, m Northing, UTM Zone 12 (Tailings) 403,800 m Easting, 4,507,700, m Northing, UTM Zone 12 (Laboratory)

### 1.2 Facility Process Summary

Kennecott Utah Copper LLC (KUC) owns and operates the Utah Power Plant (UPP)-<u>and</u> the Tailings Impoundment in Salt Lake County, Utah. Based on actual air emissions, the facilities are major source for PM10, NOx, and SO2. which had four boilers to generate power. The initial plant was constructed in 1943, and has been operated with the current output capacity and configuration since 1959. The plant did operate on both coal and natural gas. In 2011 KUC received an Approval Order (AO) to install a combined-cycle, natural gas fired combustion turbine (CT) to replace three coal-fired boilers (Units 1, 2 and 3). Units 1, 2 and 3 were removed from service in October 2016. The Power Plant and Tailings Impoundment constitute a major source of PM<sub>10</sub>, NO<sub>x</sub>, and SO<sub>2</sub>. 40 CFR 64 applies to the boiler.

The UPP was originally designed and operated with four dual-fired (coal and natural gas) boilers (Units 1, 2, 3, and 4). In 2011, KUC received an Approval Order (AO) to install a combined-cycle natural gas-fired combustion turbine (CT) to replace Units 1, 2, and 3. In September 2016, KUC entered into power purchase agreement with Rocky Mountain Power, whereby Units 1, 2 and 3 at UPP ceased operation in October of 2016. KUC will continuecontinues to operate Unit 4 in compliance with the applicable requirements. Upon completion of the construction of Unit 5, KUC will operate the unit in compliance with the applicable requirements.

The Tailings Impoundment stores tailings generated from the concentrating process. The

tailings received from the Copperton Concentrator are routed through cyclones to separate out the coarse and fine tailings. The fine tailings (or cyclone overflow) are deposited in the interior of the tailings facility which is kept saturated by spigotting once every four days and does not result in any emissions. The coarse tailings (or cyclone underflow) are used to build the embankment which generates less dust due to its larger particle size. This current practice of building the embankments out of the coarse underflow fraction is less dust generating than the use of whole tailings that was used to build the south embankment. The emissions are predominately fugitive.

The power plantUPP operates under Approval Order (AO) DAQE-AN105720031-15 issued November 10, 2015. Under the 1990 Clean Air Act the power plantUPP, Tailings Impoundment and laboratory constitute a major Title V source and operate under Title V Operating Permit #3500346002 issued August 26, 2009. The Tailings Impoundment operates under the AO DAQE-AN0572018-06 issued on April 6, 2006. The AO DAQE-AN105720028-13, dated November 26, 2013, for the Bonneville Borrow Plant (BBP) was revoked under DAQE-GN105720030-15, dated May 7, 2015. Therefore, a description of the BBP has been removed from this report.

The UPP is subject to 40 CFR 60 Subpart A- General Provisions, <u>40 CFR 60 Subpart Y</u> <u>Standards of Performance for Coal Preparation and Processing Plants</u>, 40 CFR 60 -Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines, 40 CFR 60 Subpart JJJJ - Standards of Performance for Stationary Spark Ignition Internal Combustion Engines, 40 CFR 60 Subpart KKKK - Standards of Performance for Stationary Combustion Turbines, 40 CFR 63 Subpart YYYY - National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines, 40 CFR 63 Subpart ZZZZ - National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines, 40 CFR 63 Subpart CCCCCC -National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Dispensing Facilities and 40 CFR 63 Subpart JJJJJJ - National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources.

## 1.3 Facility 2014 & 2016 Baseline Emissions

Site-wide 2014 & 2016 Actual Emissions (tons/yr) for power plant, tailings impoundment, and laboratory.

	$PM_{2.5}$	NO <sub>x</sub>	$SO_2$	VOC	NH <sub>3</sub>
2014	71.78	1,322.52	1,500.34	8.21	0.24
2016	117.86	1172.29	2151.94	8.42	0.64

### 1.4 Facility Criteria Air Pollutant Emissions Sources

Emission Unit	Potential to Emit				
	PM <sub>2.5</sub> *	NO <sub>x</sub>	$SO_2$	VOC	NH3

Power Plant	<del>248.00<u>165</u> 0.24</del>	<del>1,641.27<u>1,6</u></del>	<u>535</u>	2,577.06	4 <u>1.0340</u>
Tailings Impoundment	5.44	0. <del>26</del> 28	**	<del>0.0</del> 4 <u>4.00</u>	0.00
Laboratory	0. <del>12</del> 06	0. <del>68<u>54</u></del>	0. <del>13<u>01</u></del>	0. <u>1210</u>	0.01

\*PM2.5 Potential to Emit totals do not include the particulate condensable fraction in comparison with actual totals where the condensable fraction has been included. \*\*SO<sub>2</sub> emissions are less than 0.01 TPY.

The following emission units are not source specific. A separate BACT analysis has been conducted on these common emission units. The technical support for these sources is in the PM2.5 Serious SIP – BACT for Small Source document ("PM2.5 Serious SIP – BACT for Small Sources.," 2017).

### Power Plant

### Unit 4 Boiler

Unit 5 Combustion Turbine and Duct Burner Cold Solvent Parts Washers Petroleum Storage Tanks Diesel Engine Natural Gas Generator Wet Cooling Towers Gasoline Tanks Paved and Unpaved Service Roads

#### **Tailings Impoundment**

Unpaved Service Roads LP Fired Emergency Generator

### Laboratory

Process Laboratory Dust Collector Environmental Laboratory Dust Collector Muffle Furnace Filter Flux Mixers Filter Ore Compactor Filter Hot Water 7.133 MMBTU/hr natural gas fired boiler

## 2.0 BACT Selection Methodology

The general procedure for identifying and selecting BACT is through use of a process commonly referred to as the "top-down" BACT analysis. The top-down process consists

of five steps which consecutively identify control measures, and gradually eliminate less effective or infeasible options until only the best option remains. This process is performed for each emission unit and each pollutant of concern. The five steps are as follows:

- 1. Identify All Existing and Potential Emission Control Technologies: UDAQ evaluated various resources to identify the various controls and emission rates. These include, but are not limited to: federal regulations, Utah regulations, regulations of other states, the RBLC, recently issued permits, and emission unit vendors.
- 2. Eliminate Technically Infeasible Options: Any control options determined to be technically infeasible are eliminated in this step. This includes eliminating those options with physical or technological problems that cannot be overcome, as well as eliminating those options that cannot be installed in the projected attainment timeframe.
- 3. Evaluate Control Effectiveness of Remaining Control Technologies: The remaining control options are ranked in the third step of the BACT analysis. Combinations of various controls are also included.
- 4. Evaluate Most Effective Controls and Document Results: The fourth step of the BACT analysis evaluates the economic feasibility of the highest ranked options. This evaluation includes energy, environmental, and economic impacts of the control option.
- 5. Selection of BACT: The fifth step in the BACT analysis selects the "best" option. This step also includes the necessary justification to support the UDAQ's decision.

Should a particular step reduce the available options to zero (0), no additional analysis is required. Similarly, if the most effective control option is already installed, no further analysis is needed.

The final BACT evaluations for the Kennecott Laboratory, Power Plant and Tailings Impoundment sites were performed using data that Kennecott submitted (CH2MHill, 2013), (CH2M, 2017b),(CH2M, 2018), EPA documents (Environmental Protection Agency, 2000), comments received from Techlaw on the Kennecott RACT submittal, comments received from EPA, comments received from the public, AOs, and the Title V permit.

## 2.1 Emission Unit (EU) and Existing Controls

### **Power Plant**

Historically, KUC has operated three coal fired boilers rated at 100 megawatts (MW)

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combined, referred to as Units 1-3, at the UPP. The units operated on coal during the spring, summer and fall months, but were limited to burning natural gas during the winter months between November 1 and March 1. KUC was required by the PM2.5 moderate SIP (dated December 7, 2016) to not operate Units #1, #2 and #3 after January 1, 2018. In October 2016, KUC permanently ceased operation of Units 1-3 (CH2M, 2017a). Therefore, a BACT analysis for Units 1-3 is not included in this document.

# 2.1.1 Unit 4 Boiler

### **Description:**

Unit 4 is a tangentially fired boiler capable of burning both coal and natural gas, rated at 838 million British Thermal Units per hour (MMBTU/hr) (coal), or 872 MMBTU/hr (natural gas), equipped with an electrostatic precipitator. The uncontrolled NO<sub>x</sub> emission limit as listed in the 2015 Approval Order is 306 lbs per hour when operated on natural gas. This results in a NO<sub>x</sub> emission rate of 319.5 tons per year when operated for 2,088 hours during the period of November 1<sup>st</sup> to February 28<sup>th</sup> the following year or 1,340.3 tons per year when operated 8,760 hours per year.

Since the ambient 24-hour concentrations of PM<sub>2.5</sub> exceed the NAAQS during the winter months, the BACT analysis is limited to controls for the combustion of natural gas, which are the only controls that may affect the attainment of the PM<sub>2.5</sub> NAAQS in the Salt Lake City nonattainment area.

### **Emissions Summary:**

The PTE\* (tons/yr) for Unit 4 is as follows:

	DM	NO	SO	VOC
	1 112.5	TVO <sub>*</sub>	-00 <u>4</u>	100
Coal Fired	18674 85	5 13/1 108	5 782 562	2503.06
Coul-Frica	10074.05	5,1541,100	5.102,502	2575.70
Natural Gas Fired	356.25	605/1/1	0 780 8	137 35
Hatural Oas-Thea	550.25	0)5441	0.700.0	451.55

\*This is based on the fuel limits listed in Condition II.B.3.b of the 2015 Approval Order.

The 2016 <u>& 2014</u> actual emissions (tons/yr) for Unit 4 isare as follows:

2014	$PM_{2.5}$	$NO_x$	$SO_2$	VOC
Coal-Fired	38.16	648.82	914.64	4.61
Natural Gas-Fired	0.06	1.25	0.01	0.05
2016	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	VOC
Coal-Fired	-68	539.54	1330.01	4.38
Natural Gas-Fired	0.96	17.55	0.09	0.81

# **Control Options:**

[Pollutant  $(NO_x)$ ]

Good combustion practices Low NO<sub>x</sub> burners (LNB) LNB with over-fire air (OFA) Ultra-Low NO<sub>x</sub> Burners (ULNB) Selective Catalytic Reduction (SCR) Selective Non-Catalytic Reduction (SNCR)

#### **Technological Feasibility:**

All control technologies are technically feasible.

<u>Previous SIP determination for UPP Unit 4 required the installation of LNB with OFA</u> and SCR with 90% NO<sub>X</sub> control when operating on natural gas during the winter months between November 1 and March 1. Because the top technology is already identified in previous SIPs, additional analysis is not necessary.

An SCR has an efficiency rating of 90% NO<sub>\*</sub> removal while and SNCR is only 50% efficient. The SCR is the more efficient control unit.

A RACT analysis was performed in 2013 (CH2MHill, 2013) using 2,880 hours of operation which Unit 4 is allowed to operate during the winter months. The RACT analysis stated that the Unit 4 baseline emission rate is 0.150 lb/MMBtu. The November 10, 2015 Approval Order, DAQE-AN105720031-15, has a NO<sub>x</sub> emission limit of 306 lbs per hr when burning natural gas. This results in a NO<sub>x</sub> PTE of 319.46 tons per yr. The 2013 RACT analysis evaluated the installation of an LNB and OFA system and an SCR system on Unit 4. The LNB and OFA system result in an emission rate of 0.08 lb/MMBtu. This reduced the emissions from 319.46 tons per year to 170.38 tons per year. This would be a reduction in the hourly emission rate from 306 lbs per hr to 163.2 lbs per hr. If an SCR was added with a 90% reduction to the LNB and OFA system, the emission rate would be reduced from 163.2 lbs per hr to 16.32 lbs/hr.

Currently the 2015 Approval Order allows a NO<sub>\*</sub> emission rate of 306 lbs per hour and 336 ppm. If the emissions are reduced from 306 lbs per hour to 16.32 lbs per hour then the ppm limit should also be reduced from 336 ppm to 179 ppm with LNB and OFA. Then with a 90% efficient SCR the emission rate should be 17.9 ppm.

Previous SIP determination for UPP Unit 4 required the installation of LNB with OFA and SCR with 90% NO<sub>x</sub> control when operating on natural gas during the winter months between November 1 and March 1. Because the top technology is already identified in previous SIPs, additional analysis is not necessary.

#### **Economic Feasibility:**

This step is not applicable as the most efficiency technology is identified as BACT for the operation of Unit 4 during the winter months between the months of November 1 and February 28/29.

In the November 10, 2015 Approval Order Unit #4 has an allowed NO<sub>x</sub> emission rate of 377 lb per hr when burning coal and 306 lb/hr when burning natural gas. When 306 lb per hr and 2,088 hrs per yr is used the allowed emission rate is 319.46 tons per year. If LNB and OFA are installed then the emission rate is170.38 tons per year with a 149.08 tons/yr reduction in NO<sub>x</sub>. This is assuming the reduction from 0.15 lb/MMBTU to 0.08 lb/MMBTU as stated in the 2013 RACT submittal. When this is combined with the annual cost of \$578,000 per year this results in a cost of \$3,877/ton of NO<sub>x</sub> removed. If and annual emission rate of 8,760 hours is used then the cost is reduced to \$924 per ton of NO<sub>x</sub> removed.

If an SCR is installed the emission rate is reduced from 319.46 tons per year to 31.95 tons per year. This is a 287.52 tons per year reduction in NO<sub>x</sub> assuming the reduction from 0.15 lb/MMBTU to 0.015 lb/MMBTU as stated in the 2013 RACT submittal. This at an annual cost of \$1,323,000 per year which results in a cost of \$4,601 per ton of NO<sub>x</sub> removed. If and annual emission rate of \$,760 hours is used then the cost is reduced to \$1,097 per ton of NO<sub>x</sub> removed.

If an SCR is installed with ULNB and OFA the emission rate is reduced from 319.46 tons per year to 17.04 tons per year. This is a 302.43 tons per year reduction in NO<sub>\*</sub> assuming the reduction from 0.15 lb/MMBTU to 0.08 lb/MMBTU then a 90% reduction with the SCR as stated in the 2013 RACT submittal. This at an annual cost of \$1,901,000 per year which results in a cost of \$6,286 per ton of NO<sub>\*</sub> removed. If and annual emission rate of \$,760 hours is used then the cost is reduced to \$1,498 per ton of NO<sub>\*</sub> removed.

## **BACT Selection:**

LNB with OFA that have a 50% control efficiency and when coupled with the<u>and</u> SCR will reduce emissions of NOX from 306 lb/hr336 ppmv to 60 ppmv with 9082% control efficiency, this results in a reduction of NO<sub>x</sub> emissions 1,269 tons per year when operated 8,760 hrs per year. The ULNB and OFA with SCR constitute BACT for controlling NO<sub>x</sub> emissions for Unit 4 while operating on natural gas between the months of November 1 and February 28/29.

KUC submitted a BACT analysis (Steve Schnoor, 2018), (Black and Veatch, 2018) to operate Unit #4 on Coal during the period March 1 to October 31. The BACT requires that KUC install Over-fired Air (OFA) and Selective Catalytic Reduction (SCR). This will reduce the NO<sub>\*</sub> emissions from 384 ppm to 80 ppm.

### **Implementation Schedule:**

January 1, 2019.

[Pollutant PM25, NO2-SO2 and VOC]

## **Control Options:**

Good combustion practices Use of pipeline quality natural gas

### **Technological Feasibility:**

All control technologies are technically feasible. Unit 4 has an Electrostatic Precipitator to control  $PM_{2.5}$  and  $SO_2$ -emissions.

### **Economic Feasibility:**

Not applicable because all control technologies identified have been selected.

#### **BACT Selection:**

KUC will install OFA and Selective SCR on Unit 4. Use of pipeline quality natural gas, good combustion practices, good design and proper operation constitute BACT for Unit 4.

### **Implementation Schedule:**

January 1, 2019.

#### Startup/Shutdown Considerations

Occasionally a unit will need to be taken offline to make repairs. These are generally planned outages that are scheduled during Low Load hours if possible. The unit will be ramped down slowly in a controlled fashion to minimize impacts to equipment and the environment.

Unscheduled outages can be triggered by events outside of the operators control. These generally cause the Burner Management System to initiate an instantaneous safety shut down. These trips will cause the automatic power down of the Electrostatic Precipitators to prevent a possible secondary raw fuel ignition. Once the root cause of the trip has been determined and mitigated the unit is put back online based on manufacturer's recommended procedures based on the conditions existing at the time the unit is restarted.

Unit 4 has not been historically operated during the winter months. This unit was designed to be a baseload unit. It was not designed for frequent start-up and shut down and is usually left online during Low Load Hours of short duration (overnight), thus reducing frequency of startups and shutdowns. Emissions of  $NO_x$  will be limited with add-on controls and operational controls with good combustion practices after January 1, 2019. These controls are currently not in place and procedures will be developed using information from emission control manufacturers. KUC will operate Unit 4 per

manufacturer's recommendations to limit emissions of  $NO_x$  during periods of startup and shutdown.

Low  $NO_x$  burners generally achieve  $NO_x$  emissions reduction through staged combustion and controlling amount of oxygen in the primary combustion zone. KUC will achieve startup and shutdown  $NO_x$  emissions reduction through the utilization of the existing LNB and OFA system, and with SCR system, adherence to good combustion practices, and burning of pipeline-quality natural gas.

#### 2.1.2 Unit 5 Combustion Turbine and Duct Burner

## **Description:**

Unit 5 is a combined-cycle combustion turbine and HRSG with a nominal generating capacity of approximately 275 megawatts (MW). Dry low nitrogen oxide (DLN) combustors and the selective catalytic reduction (SCR) system will control nitrogen oxide (NOx) emissions. The catalytic oxidation (CatOx) system will control emissions of carbon monoxide (CO) and volatile organic compounds (VOCs).

## **Emissions Summary:**

The PTE (tons/yr) for Unit 5 as permitted in AO DAQE-AN105720031-15, dated November 10, 2015, is listed below:

PM2.5	SO2	NOx	VOC
<del>64.98</del> 72.2	12.4213.8	<del>65.3</del> 4 <u>72.6</u>	<del>22.50</del> 25.0

#### **Control Options:**

[Pollutant  $(NO_x)$ ]

Water injection Steam injection Selective Catalytic Reduction (SCR) Selective Non-Catalytic Reduction (SNCR) Low NOx burners (LNB) with good combustion practices

#### **Technological Feasibility:**

An SCR has an efficiency rating of 90%  $NO_x$  removal while and SNCR is only 50% efficient. The SCR is the more efficient control unit.

Unit 5 uses a new natural gas-fired stationary combustion turbine equipped with the current dry low-NO<sub>x</sub> combustor designs. It is technically infeasible to use water or steam injection on the dry low-NO<sub>x</sub> combustors on this Unit 5. There were no additional control options identified for Unit 5.

## **Economic Feasibility:**

SCR and catalytic oxidation has already been selected as BACT, therefore an economic feasibility analysis has not been conducted.

## **BACT Selection:**

SCR and catalytic oxidation constitutes BACT for controlling  $NO_x$  emissions from the combustion turbine and duct burner.

#### **Implementation Schedule:**

January 1, 2019.

#### **Control Options:**

[Pollutant (PM2.5, NO2-SO2 and VOC]

Good combustion practices Use of pipeline quality natural gas Catalytic Oxidation for VOC control

### **Technological Feasibility:**

All control technologies are technically feasible.

## **Economic Feasibility:**

Not applicable because all control technologies identified have been selected.

#### **BACT Selection:**

Use of pipeline quality natural gas <u>and</u>, good combustion practices <u>constitute BACT for</u> <u>Unit 4 for PM2.5 and SO2.</u>, <u>eC</u>atalytic oxidation, good design and proper operation constitute BACT for <u>VOC for</u> Unit 5.

#### **Implementation Schedule:**

January 1, 2019.

#### Startup/Shutdown Considerations

Occasionally a unit will need to be taken offline to make repairs. These are generally planned outages that are scheduled during Low Load hours if possible. The unit will be ramped down slowly in a controlled fashion to minimize impacts to equipment and the

#### environment.

Unscheduled outages can be triggered by events outside of the operator's control. These generally cause the Burner Management System to initiate an instantaneous safety shut down. Once the root cause of the trip has been determined and mitigated the unit is put back online based on manufacturer's recommended procedures based on the conditions existing at the time the unit is re-started.

KUC will achieve startup and shutdown  $NO_x$  emissions reduction through the utilization of the proper operation of the SCR and catalytic oxidation, adherence to good combustion practices, and burning of pipeline-quality natural gas.

# 2.2 Emission Unit (EU) and Existing Controls

## **Tailings Impoundment**

#### **Description:**

Tailings are sent to the tailings site via a slurry pipeline. At the facility, tailings are separated by size in a cyclone with the larger particles used to build the embankments and the smaller particles discharged in slurry form in the impoundment. Emissions from the tailings site are mainly from wind erosion of dry tailings on the embankment. The facility has a current dust control plan approved by the UDAQ Director for control of fugitive particulate matter. The dust control plan requires frequent monitoring of the impoundment for wind erosion potential, applying chemical dust suppressants in the late spring, applying water via water trucks and the dust suppression sprinkler system as needed to maintain adequate moisture content.

In 2013, KUC conducted a study to identify and evaluate the range of dust control practices that have been attempted and successfully applied for mine tailings impoundments. This study also reviewed published literature and available air quality compliance documentation to extend the breadth of the evaluation.

The tailings site can be categorized into four operational areas: impoundment, active embankment, inactive embankment, and reclaimed areas.

#### 2.2.1 Tailings Impoundment

#### [Pollutant PM<sub>2.5</sub>]

#### **Control Options:**

Watering Polymer application Revegetation Enclosures Watering: Watering increases the moisture content of the surface, which conglomerates particles and reduces their likelihood to become airborne. The control efficiency for watering depends on how fast the area dries after water is added. Frequent watering is necessary to maintain its effectiveness.

Polymer Application: As opposed to watering, chemical dust suppressants have much less frequent reapplication requirements. Polymers suppress emissions by changing the physical characteristics of the surface material. The polymers form a hardened surface that binds the particles together, thereby reducing their likelihood to become airborne.

Revegetation: Revegetation assists in minimizing emissions. The vegetation holds the soil surface together and therefore makes it less prone to wind erosion.

Enclosures: Enclosures reduce the wind shear at the surface and thereby reducing wind erosion and emissions.

#### **Technological Feasibility:**

Because of the size of the tailing site, enclosures are technically infeasible. It is not technically feasible to apply polymers to areas that are actively being sprayed with water. The water deceases the polymers and washes it away. All remaining controls are technically feasible.

#### **Economic Feasibility:**

All remaining control technologies are economically feasible. Therefore, an economic feasibility was not performed.

## **BACT Selection:**

The impoundment area is saturated with water and does not result in windblown dust emissions unless the wind exceeds 25 mph. Visual inspections are routinely performed to ensure the impoundment is saturated with water and in the unlikely event an area appears to be drying out, the area would be re-saturated. The current practices of reducing particulate emissions by following the approved dust control plan is most effective in reducing emissions. Additionally, the impoundment area is saturated with water and does not result in windblown dust emissions. The current practices of dust management at the tailings site also represent the most stringent measure.

### **Implementation Schedule:**

Proper operations are already in place.

#### Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

#### 2.2.2 Tailings Active (Flat) Embankments

## [Pollutant PM<sub>2.5</sub>]

#### **Control Options:**

Watering Polymer application Revegetation Enclosures

#### **Technological Feasibility:**

Because of the size of the tailing site, enclosures are technically infeasible. It is not technically feasible to apply polymers to areas that are actively being sprayed with water. The water decreases the polymers and washes it away. All remaining controls are technically feasible.

#### **Economic Feasibility:**

All remaining control technologies are economically feasible. Therefore, an economic feasibility was not performed.

#### **BACT Selection:**

The tailings are actively deposited in the embankment areas. In an active embankment cell, the tailings are deposited every fourth day. The tailings are extremely wet when deposited. Areas can remain moist for several days. Application of water for dust control in active areas is not feasible as it tends to channelize directly to the drain point instead of spreading across the surface. The flat embankment areas will therefore have a potential for wind erosion on days 2, 3, and 4. Emissions are estimated based on days with potential for wind erosion. The current practices of reducing particulate emissions by dust management isare most effective in reducing emissions and identified as BACT. The current practices of dust management at the tailings site also represent the most stringent measure.

#### **Implementation Schedule:**

Proper operations are already in place.

#### Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

# 2.2.3 Tailings Inactive and Sloped Embankments

## [Pollutant PM<sub>2.5</sub>]

### **Control Options:**

Watering Polymer application Revegetation Enclosures

### **Technological Feasibility:**

Because of the size of the tailing site, enclosures are technically infeasible. It is not technically feasible to apply polymers to areas that are actively being sprayed with water. The water decreases the polymers and washes it away. All remaining controls are technically feasible.

### **Economic Feasibility:**

All remaining control technologies are economically feasible. Therefore, an economic feasibility was not performed.

### **BACT Selection:**

In the inactive embankment areas, where tailings deposition has been completed for the year, KUC installs sprinklers for watering. Over the past few years, KUC converted this to an automated sprinkler system that wets the surface at regular intervals. This upgrade allows the surface to maintain its moisture.

The embankment slopes are sprayed with polymers to minimize windblown dust. Polymer is reapplied as necessary to maintain its effectiveness to minimize emissions.

The current practices of reducing particulate emissions by dust management is are most effective in reducing emissions and identified as BACT. The current practices of dust management at the tailings site also represent the most stringent measure.

#### **Implementation Schedule:**

Proper operations are already in place.

### Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

## 2.2.4 Tailings Reclaimed Areas

#### [Pollutant PM<sub>2.5</sub>]

## **Control Options:**

Watering Polymer application Revegetation Enclosures

### **Technological Feasibility:**

Because of the size of the tailing site, enclosures are technically infeasible. It is not technically feasible to apply polymers to areas that are actively being sprayed with water. The water decreases the polymers and washes it away. All remaining controls are technically feasible.

### **Economic Feasibility:**

All remaining control technologies are economically feasible. Therefore, an economic feasibility was not performed.

#### **BACT Selection:**

Once released for reclamation, KUC implements a revegetation plan to reclaim the areas. Polymers are applied to areas still waiting to be reclaimed. The current practices of reducing particulate emissions by dust management is are most effective in reducing emissions and identified as BACT. The current practices of dust management at the tailings site also represent the most stringent measure.

#### **Implementation Schedule:**

Proper operations are already in place.

#### Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

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### 2.2.5 Biosolids Application

Biosolids are primarily organic materials produced during wastewater treatment which may be put to beneficial use (Environmental Protection Agency, 2000). An example of such use is the addition of biosolids to soil to supply nutrients and replenish soil organic matter. This is known as land application. Biosolids can be used on agricultural land, forests, rangelands, or on disturbed land in need of reclamation.

Odors from biosolids applications are the primary negative impact to the air. Most odors associated with land application are a greater nuisance than threat to human health or the environment. Odor controls focus on reducing the odor potential of the biosolids or incorporating them into the soil. Stabilization processes such as digestion can decrease the potential for odor generation. Biosolids that have been disinfected through the addition of lime may emit ammonia odors but they are generally localized and dissipate rapidly. Biosolids stabilization reduces odors and usually results in an operation that is less offensive than manure application.

The Environmental Protection Agency's 40 CFR Part 503, Standards for the Use and Disposal of Sewage Sludge (the Part 503 Rule), requires that wastewater solids be processed before they are land applied. This processing is referred to as "stabilization" and helps minimize odor generation, destroys pathogens (disease causing organisms), and reduces vector attraction potential.

### [Pollutant PM<sub>2.5</sub> and NH<sub>3</sub>]

Salt Lake County and Salt Lake City operate small landfill type operations that produce organic material which are used by the Tailings Facility to enhance the reclamation of closed tailings areas. The application of biosolids does not result in any emissions of  $PM_{2.5}$ ,  $SO_2$ ,  $NO_x$  or VOC. Very small quantities of ammonia emissions are estimated from these operations resulting from the natural process of decomposition. The 2016 actual emissions from the source were 0.021 tpy of ammonia.

### **Control Options:**

**Biosolids** stabilization

#### **Technological Feasibility:**

All controls are technically feasible.

### **Economic Feasibility:**

All control technologies are economically feasible.

### **BACT Selection:**

That the wastewater solids be processed before they are land applied. This control is already being applied.

#### **Implementation Schedule:**

Proper operations are already in place.

### Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

### 2.3 Consideration of Ammonia

The only sources of ammonia emissions at the Power plant is from the SCRs that will be installed on Units 4 and 5, combustion of natural gas, diesel and coal, and rubber cement emissions from Salt Lake City Biosolids. The ammonia emissions from rubber cement in 2016 was 0.02 tpy. There are several sources of ammonia emissions from combustion with the largest being 0.04 tpy from the combustion of coal at Unit #4. All other sources of ammonia from natural gas combustion were smaller. The SCRs have not been installed, so there are no actual emissions to discuss. The potential emissions

The only source of ammonia at the laboratory in 2016 was from the natural gas-fired boiler and they were 0.01 tpy.

The unreacted ammonia can be treated as a  $PM_{2.5}$  precursor. Although ammonia was previously not considered as a precursor pollutant in Utah's  $PM_{2.5}$  Serious SIP, and the source's BACT analysis did not include an analysis of BACT for ammonia emissions, an analysis is being included here for completeness.

There are only two sources of ammonia emissions at the UPP. The SCR units used to control emissions of  $NO_x$  from the Unit 4 boiler and the Unit 5 combustion turbine. The catalyst serves to lower the reaction temperature required and helps speed the process. Ideally, a stoichiometric amount of ammonia would be added – just enough to fully reduce the amount of  $NO_x$  present in the exhaust stream. However, some amount of ammonia will always pass through the process unreacted; and since the process possesses some degree of variability, a small amount of additional ammonia is added to account for minor fluctuations. The ammonia which passes through the process unreacted and exits in the exhaust stream is termed "slip" (sometimes "ammonia slip"). The amount varies from facility to facility, but ranges from almost zero to as high as 30 ppm in poorly controlled systems. Also, as catalyst systems degrade over time, the degree of ammonia slip will gradually increase as increasing amounts of ammonia are added to maintain  $NO_x$  reduction performance. The unreacted ammonia can be treated as a  $PM_{2.5}$  precursor.

# **Control Options:**

There is only one control technique considered available for ammonia emissions. Monitoring of ammonia slip emissions and setting a "not to exceed" emission rate limitation. This allows for setting up a feedback process where the source can adjust ammonia injection rates based on both parameters: NO<sub>x</sub> emission reduction levels and ammonia slip levels. Should catalyst activity, over time, degrade to the point where both parameters cannot be met, then the SCR catalyst should be replaced.

There are no control technologies identified for controlling ammonia emissions.

## **Technological Feasibility:**

There are no control technologies identified for controlling ammonia emissions. This represents a work practice standard, and is inherently technically feasible.

A review of recently issued permits for SCR units at large combustion turbine installations reveals NH<sub>3</sub> emission limits ranging between 2.0 ppm and 5.0 ppm.

The source has not provided a cost effectiveness breakdown for the SCR ammonia systems at the UPP so that a limitation could be established.

### **Economic Feasibility:**

There are no control technologies identified for controlling ammonia emissions. All control technologies are economically feasible. Therefore, an economic feasibility was not performed.

#### **BACT Selection:**

There are no control technologies identified for controlling ammonia emissions. Given the difficulty in designing a new SCR system for control of a pollutant not currently listed as a precursor pollutant, and the expected high cost for this process, no change in ammonia slip requirements is recommended at this time.

#### **Implementation Schedule:**

A proper design of the SCRs when they are installed to limit the ammonia slip.

#### Startup/Shutdown Considerations

There are no startup/shutdown operations to be considered for these sources.

3.0 Conclusion- Emissions Reduction through BACT implementation

3.1 Reduction in emissions from the upgrade of Unit 4

The boiler operated as Unit 4 will be upgraded with LNB with OFA and SCR for winter time operation between the months of November 1 and February 28/29. The upgraded Unit 4 will begin operation in 2019.

Unit 4 reduction in NO<sub>x</sub> emissions will result from the installation of LNB with OFA and SCR. With the installation of these controls the NOx limit will be reduced from 336 ppmdv to 20 ppmdv which will result in the emissions being reduced by 302 tons when operated from November 1<sup>st</sup> to February 28<sup>th</sup> each year or 1,269 tons when operated 8,760 hours per year.

PM<sub>2.5</sub>, SO<sub>2</sub> and VOCs are estimated to remain the same.

#### 3.2 Tailings Impoundment

Controls have not been included in Part H of the  $PM_{2.5}$  SIP. The Tailings Impoundment is in constant change. A SIP requirement does not allow for change.

The 1994  $PM_{10}$  SIP was descriptive and did not allow for change. The 1994 system has been removed and a new better discharge system has been implemented at the Tailings Impoundment site. Some of the 1994 requirements were as follows:

Peripheral discharge system containing four segments with 7,500 gallons per minute of tailings flow.

A complete sequence through a given segment shall be considered to contain ten successive areas. The cycle time shall be four days.

Now KUC is required revegetate the exterior of the dike so that no more than 5% of the area can be subject to wind erosion.

Now they are also required to do the following: When it is determined by Kennecott or the Director, that additional tailings dust control beyond the above should be considered or tailings Impoundment operational problems are occurring, Kennecott shall meet with the Director, or Director's staff, to discuss proposed fugitive dust controls and implementation schedule within five working days after verbal notification by either party.

The above condition allows for Director discretion which could not be implemented into the PM2.5 SIP.

Based on the above examples and that a SIP does not allow for change or improvement, conditions requiring fugitive dust control have not been included in the PM2.5 SIP. The Tailings Impoundment is subject to the requirements of the most recent federally approved Fugitive Emissions and Fugitive Dust rules.

# 4.0 Implementation Schedule and Testing Requirements

## 4.1 **Power Plant**

Units 1, 2 and 3 were taken off line before January 1, 2018.

<u>To operate during the winter months from November 1 to February 28/29.</u> Unit 4 will be required to be upgraded by January 1, 2019, before it can be operated. In order to operate Unit 4, KUC will be required to meet the emission limits set <u>for winter time operation</u> for the upgraded Unit 4 by January 1, 2019.

## 4.2 Tailings

There are no additional controls scheduled for the Tailings site.

## 4.3 Bonneville Borrow Plant

The Approval Order the BBP has been rescinded. Therefore, the implementation schedule has been removed from this report.

### 5.0 New PM<sub>2.5</sub> SIP – KUC Power Plant Specific Requirements

The KUC Power Plant specific conditions in Section IX.H.13 address those limitations and requirements that apply only to the LSPP Power Plant in particular.

IX.H.22.k.i This condition lists the specific requirements applicable to the KUC UPP.

Subparagraph A: <u>During the period of November 1 to February 28/29</u>, <u>When when</u> burning natural gas, Unit #4 shall not exceed the following emission rates to the atmosphere:

POLLUTANT grains/dscfppmdv lbs/hr lbs/event 68°F. 29.92 in Hg 3% O<sub>2</sub>

- I. PM<sub>2.5</sub>:
- Filterable0.004Filterable + condensable0.03

II. NO<sub>x</sub>: <u>336</u> NOx (after January 1, 2019) 2060 17.0 Startup / Shutdown 395

IVIII.—\_\_\_Startup / Shutdown Limitations:

- 1. The total number of startups and shutdowns together shall not exceed 690 per calendar year.
- 21. The NO<sub>x</sub> emissions shall not exceed <u>395 lb280 lbs per mmBtu</u> from each startup/shutdown event, which shall be determined using manufacturer data.
- 32. Definitions:
  - (i) Startup cycle duration ends when the unit achieves half of the design electrical generation capacity.
  - (ii) Shutdown duration cycle begins with the initiation of boiler shutdown and ends when fuel flow to the boiler is discontinued.
- Subparagraph B: Upon commencement of operation of Unit #4, stack testing to demonstrate compliance with each emission limitation in IX.H.12.k.i.A and IX.H.12.k.i.B shall be performed as follows:

\* Initial compliance testing for the Unit 4 boiler is required. Initial testing shall be performed when burning natural gas and also when burning coal as fuel. The initial test shall be performed within 60 days after achieving the maximum heat input capacity production rate at which the affected facility will be operated and in no case later than 180 days after the initial startup of a new emission source.

The limited use of natural gas during maintenance firings and break-in firings does not constitute operation and does not require stack testing.

Pollutant	Test Frequency		
I.	PM <sub>2.5</sub>	every year	
П.	NO <sub>v</sub>	everv vear	

Subparagraph C: Unit #5 (combined cycle, natural gas-fired combustion turbine) shall not exceed the following emission rates to the atmosphere:

POLLUTANT	lb/hr	lb/event	ppmdv (15% O <sub>2</sub> dry)
I. PM <sub>2.5</sub> with duct firing: Filterable + condensable	18.8		
II. VOC:		<b>J</b>	2.0*
III. NO <sub>x</sub> : Startup / Shutdown		395	2.0*

\* Except during startup and shutdown.

IV. Startup / Shutdown Limitations:

- 1. The total number of startups and shutdowns together shall not exceed 690 per calendar year.
- 2. The NO<sub>x</sub> emissions shall not exceed 395 lbs from each startup/shutdown event, which shall be determined using manufacturer data.
- 3. Definitions:
  - (i) Startup cycle duration ends when the unit achieves half of the design electrical generation capacity.
  - (ii) Shutdown duration cycle begins with the initiation of turbine shutdown sequence and ends when fuel flow to the gas turbine is discontinued.

Subparagraph D: Upon commencement of operation of Unit #5\*, stack testing to demonstrate compliance with the emission limitations in IX.H.12.m.i.C shall be performed as follows for the following air contaminants

\* Initial compliance testing for the natural gas turbine and duct burner is required. The initial test shall be performed within 60 days after achieving the maximum heat input capacity production rate at which the affected facility will be operated and in no case later than 180 days after the initial startup of a new emission source.

The limited use of natural gas during maintenance firings and break-in firings does not constitute operation and does not require stack testing.

Pollutant	Test Frequency
I. PM <sub>2.5</sub>	every year
II. NO <sub>x</sub>	every year
III. VOC	every year

### 6.0 References

Black and Veatch. (2018, May 24). NOX AND PARTICULATE MATTER AIR QUALITY

CONTROL SYSTEM OPTIONS Utah Power Plant Unit 4.

CH2M. (2017a, April 27). Kennecott Utah Copper LLC PM2.5 SIP Best Available Control

Analysis.

- CH2M. (2017b, July). PM2.5 State Implementation Plan: Best Available Control Technology Determinations.
- CH2M. (2018, February). PM2.5 State Implementation Plan: Best Available Control Technology Determinations.
- CH2MHill. (2013, March). Kennecott Utah Copper LLC PM2.5 Reasonable Control Technology Determinations.
- Environmental Protection Agency. (2000, September). Biosolids Technology Fact Sheet Land Application of Biosolids.
- PM2.5 Serious SIP BACT for Small Sources. (2017, August 11). Utah DAQ Minor Source NSR.
- Steve Schnoor. <u>Kennecott Utah Copper (</u>2018, May 23). Best Available Control Technology (BACT) for the Utah Power Plant.