

**FORM 51-102F3**  
**MATERIAL CHANGE REPORT**

**Item 1            Name and Address of Company**

Ivanhoe Mines Ltd. (“**Ivanhoe Mines**”, “**Ivanhoe**” or the “**Company**”)  
Suite 654, 999 Canada Place  
Vancouver, British Columbia  
Canada, V6C 3E1

**Item 2            Date of Material Change**

December 13, 2017

**Item 3            News Release**

A news release with respect to the material change referred to in this report was disseminated through the facilities of recognized newswire services on December 13, 2017 and subsequently filed under the Company's profile on the System for Electronic Document Analysis and Retrieval (“**SEDAR**”). The statements in such news release under the heading “Forward-Looking Statements” are incorporated in this material change report.

**Item 4            Summary of Material Change**

On December 13, 2017, the Company announced the positive findings of an independent, pre-feasibility study (“**PFS**”) for the planned redevelopment of the company's historic, high-grade, Kipushi zinc-copper-silver-germanium mine.

The study anticipates annual production of an average of 381,000 tonnes of zinc concentrate over an 11-year initial mine life at a total cash cost of approximately US\$0.48 per pound of zinc.

The PFS focuses on the initial mining of Kipushi's Big Zinc Zone, which has an estimated 10.2 million tonnes of Measured and Indicated Mineral Resources grading 34.9% zinc. The planned return to production would establish Kipushi as the world's highest-grade major zinc mine. Its exceptional zinc grade is more than twice as high as the Measured and Indicated Mineral Resources of the world's next-highest-grade zinc project, according to Wood Mackenzie, a leading, international industry research and consulting group (see Figure 2).

**Item 5            Full Description of Material Change**

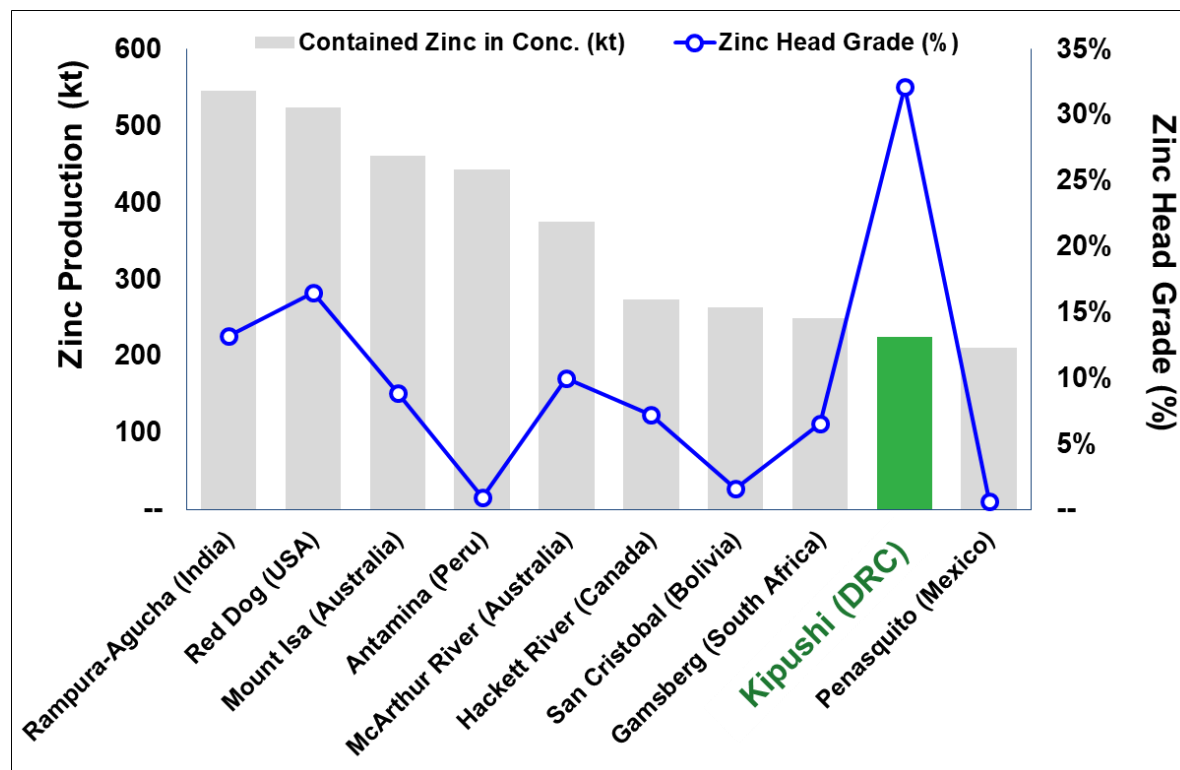
On December 13, 2017, the Company announced the positive findings of an independent PFS for the planned redevelopment of the company's historic, high-grade, Kipushi zinc-copper-silver-germanium mine.

The study anticipates annual production of an average of 381,000 tonnes of zinc concentrate over an 11-year initial mine life at a total cash cost of approximately US\$0.48 per pound of zinc.

The PFS focuses on the initial mining of Kipushi's Big Zinc Zone, which has an estimated 10.2 million tonnes of Measured and Indicated Mineral Resources grading 34.9% zinc. The planned return to production would establish Kipushi as the world's highest-grade major zinc mine. Its exceptional zinc grade is more than twice as high as the Measured and Indicated Mineral Resources of the world's next-highest-grade zinc project, according to Wood Mackenzie, a leading, international industry research and consulting group (see Figure 2).

Independent research by Wood Mackenzie concludes that the Kipushi Project could rank among the world's largest zinc mines.

**Figure 1: World's 10 largest zinc mines, showing estimated annual zinc production and zinc head grades (ranked by forecasted production by 2020).**



Source: Wood Mackenzie

Note: Independent research by Wood Mackenzie concludes that at the forecast production and head grade, the Kipushi Project, once in production, will rank among the world's largest zinc mines. Wood Mackenzie compared the Kipushi Project's life-of-mine average annual zinc production and zinc head grade of 225,000 tonnes and 32%, respectively, against production and zinc head grade forecasts for 2020.

Given the significant, very-high-grade zinc resource at Kipushi, which is rich in potential by-product credits including copper, silver and germanium and the ongoing exploration campaign at Kipushi, Ivanhoe and the Gécamines technical team are continuing to investigate additional downstream processing options.

A definitive feasibility study, to further refine and optimize the project's economics, is underway and is expected to be completed in the second half of 2018.

The Kipushi Project is operated by Kipushi Corporation ("**KICO**"), a joint venture between Ivanhoe Mines (68%) and Gécamines (32%), the DRC's state-owned mining company.

Highlights of the PFS, based on a long-term zinc price of US\$1.10/lb, include:

- After-tax net present value ("**NPV**") at an 8% real discount rate of US\$683 million.
- After-tax real internal rate of return ("**IRR**") of 35.3%.
- After-tax project payback period of 2.2 years.

- Pre-production capital costs, including contingency, estimated at US\$337 million.
- Existing surface and underground infrastructure allows for significantly lower capital costs than comparable greenfield development projects.
- Life-of-mine average planned zinc concentrate production of 381,000 dry tonnes per annum, with a concentrate grade of 59% zinc, is expected to rank Kipushi, once in production, among the world's largest zinc mines (Figure 1).
- Life-of-mine average cash cost of US\$0.48/lb of zinc is expected to rank Kipushi, once in production, in the bottom quartile of the cash cost curve for zinc producers globally (Figure 11).

The PFS was prepared by OreWin Pty. Ltd., MSA Group (Pty.) Ltd., SRK Consulting, Murray & Roberts, Golder Associates and MDM Engineering, a subsidiary of Amec Foster Wheeler. The PFS was prepared in compliance with Canadian National Instrument 43-101 – Standards of Disclosure for Mineral Projects (“NI 43-101”).

### Details of Mineral Resource Estimates

The Mineral Resource used in the PFS has an effective date of January 23, 2016, and was estimated using The Canadian Institute of Mining, Metallurgy and Petroleum (“CIM”) Best Practice Guidelines and is reported in accordance with the 2014 CIM Definition Standards established by the Canadian Institute of Mining, Metallurgy and Petroleum. The Mineral Resource is classified into the Measured, Indicated and Inferred categories as shown in Table 1 for the predominantly zinc-rich bodies and in Table 2 for the predominantly copper-rich bodies.

The Mineral Resource estimate was based on the results of 84 holes drilled at Kipushi by Ivanhoe Mines and an additional 107 historical holes drilled by Gécamines. Ivanhoe completed its drilling program for the Mineral Resource estimate in October 2015. Mineral Resource estimates were completed below the 1,150-metre-level on the Big Zinc Zone, Southern Zinc Zone, Fault Zone and Série Récurrente Zone. The Mineral Resources were categorized either as zinc-rich resources or copper-rich resources, depending on the most abundant metal. The Big Zinc and Southern Zinc zones have been tabulated using zinc cut-offs and are shown in Table 1; the Fault Zone, the Fault Zone Splay and Série Récurrente Zone have been tabulated using copper cut-offs and are shown in Table 2. For the zinc-rich zones, the Mineral Resource is reported at a base-case cut-off grade of 7.0% zinc and the copper-rich zones at a base-case cut-off grade of 1.5% copper.

**Table 1: Kipushi zinc-rich Mineral Resource at 7% zinc cut-off grade, 23 January 2016**

| Zone          | Category                        | Tonnes (millions) | Zn %         | Cu %        | Pb %        | Ag g/t    | Co ppm    | Ge g/t    |
|---------------|---------------------------------|-------------------|--------------|-------------|-------------|-----------|-----------|-----------|
| Big Zinc      | Measured                        | 3.59              | 38.39        | 0.67        | 0.36        | 18        | 17        | 54        |
|               | Indicated                       | 6.60              | 32.99        | 0.63        | 1.29        | 20        | 14        | 50        |
|               | Inferred                        | 0.98              | 36.96        | 0.79        | 0.14        | 7         | 16        | 62        |
| Southern Zinc | Indicated                       | 0.00              | –            | –           | –           | –         | –         | –         |
|               | Inferred                        | 0.89              | 18.70        | 1.61        | 1.70        | 13        | 15        | 43        |
| Total         | <b>Measured</b>                 | <b>3.59</b>       | <b>38.39</b> | <b>0.67</b> | <b>0.36</b> | <b>18</b> | <b>17</b> | <b>54</b> |
|               | <b>Indicated</b>                | <b>6.60</b>       | <b>32.99</b> | <b>0.63</b> | <b>1.29</b> | <b>20</b> | <b>14</b> | <b>50</b> |
|               | <b>Measured &amp; Indicated</b> | <b>10.18</b>      | <b>34.89</b> | <b>0.65</b> | <b>0.96</b> | <b>19</b> | <b>15</b> | <b>51</b> |
|               | <b>Inferred</b>                 | <b>1.87</b>       | <b>28.24</b> | <b>1.18</b> | <b>0.88</b> | <b>10</b> | <b>15</b> | <b>53</b> |

| Contained metal quantities |                                 |                   |                  |                  |                  |                 |                  |                 |
|----------------------------|---------------------------------|-------------------|------------------|------------------|------------------|-----------------|------------------|-----------------|
| Zone                       | Category                        | Tonnes (millions) | Zn (million lbs) | Cu (million lbs) | Pb (million lbs) | Ag (million oz) | Co (million lbs) | Ge (million oz) |
| Big Zinc                   | Measured                        | 3.59              | 3,035.8          | 53.1             | 28.7             | 2.08            | 0.13             | 6.18            |
|                            | Indicated                       | 6.60              | 4,797.4          | 91.9             | 187.7            | 4.15            | 0.20             | 10.54           |
|                            | Inferred                        | 0.98              | 797.2            | 17.1             | 3.0              | 0.23            | 0.03             | 1.96            |
| Southern Zinc              | Indicated                       | 0.00              | 0.0              | 0.0              | 0.0              | 0.00            | 0.00             | 0.00            |
|                            | Inferred                        | 0.89              | 368.6            | 31.8             | 33.5             | 0.38            | 0.03             | 1.23            |
| Total                      | <b>Measured</b>                 | <b>3.59</b>       | <b>3,035.8</b>   | <b>53.1</b>      | <b>28.7</b>      | <b>2.08</b>     | <b>0.13</b>      | <b>6.18</b>     |
|                            | <b>Indicated</b>                | <b>6.60</b>       | <b>4,797.4</b>   | <b>91.9</b>      | <b>187.7</b>     | <b>4.15</b>     | <b>0.20</b>      | <b>10.54</b>    |
|                            | <b>Measured &amp; Indicated</b> | <b>10.18</b>      | <b>7,833.3</b>   | <b>144.9</b>     | <b>216.4</b>     | <b>6.22</b>     | <b>0.33</b>      | <b>16.71</b>    |
|                            | <b>Inferred</b>                 | <b>1.87</b>       | <b>1,168.7</b>   | <b>49.6</b>      | <b>36.8</b>      | <b>0.61</b>     | <b>0.06</b>      | <b>3.21</b>     |

Notes:

1. All tabulated data has been rounded and as a result minor computational errors may occur.
2. Mineral Resources that are not Mineral Reserves have no demonstrated economic viability.
3. The Mineral Resource is reported as the total in-situ Mineral Resource and on a 100% project basis.
4. Metal quantities are reported in multiples of Troy Ounces or Avoirdupois Pounds.
5. The cut-off grade calculation was based on the following assumptions: zinc price of US\$1.02 /lb, mining cost of US\$50 /tonne, processing cost of US\$10 /tonne, G&A and holding cost of US\$10 /tonne, transport of 55% Zn concentrate at US\$375 /tonne, 90% zinc recovery and 85% payable zinc.

**Table 2: Kipushi copper-rich Mineral Resource at 1.5% copper cut-off grade, 23 January 2016**

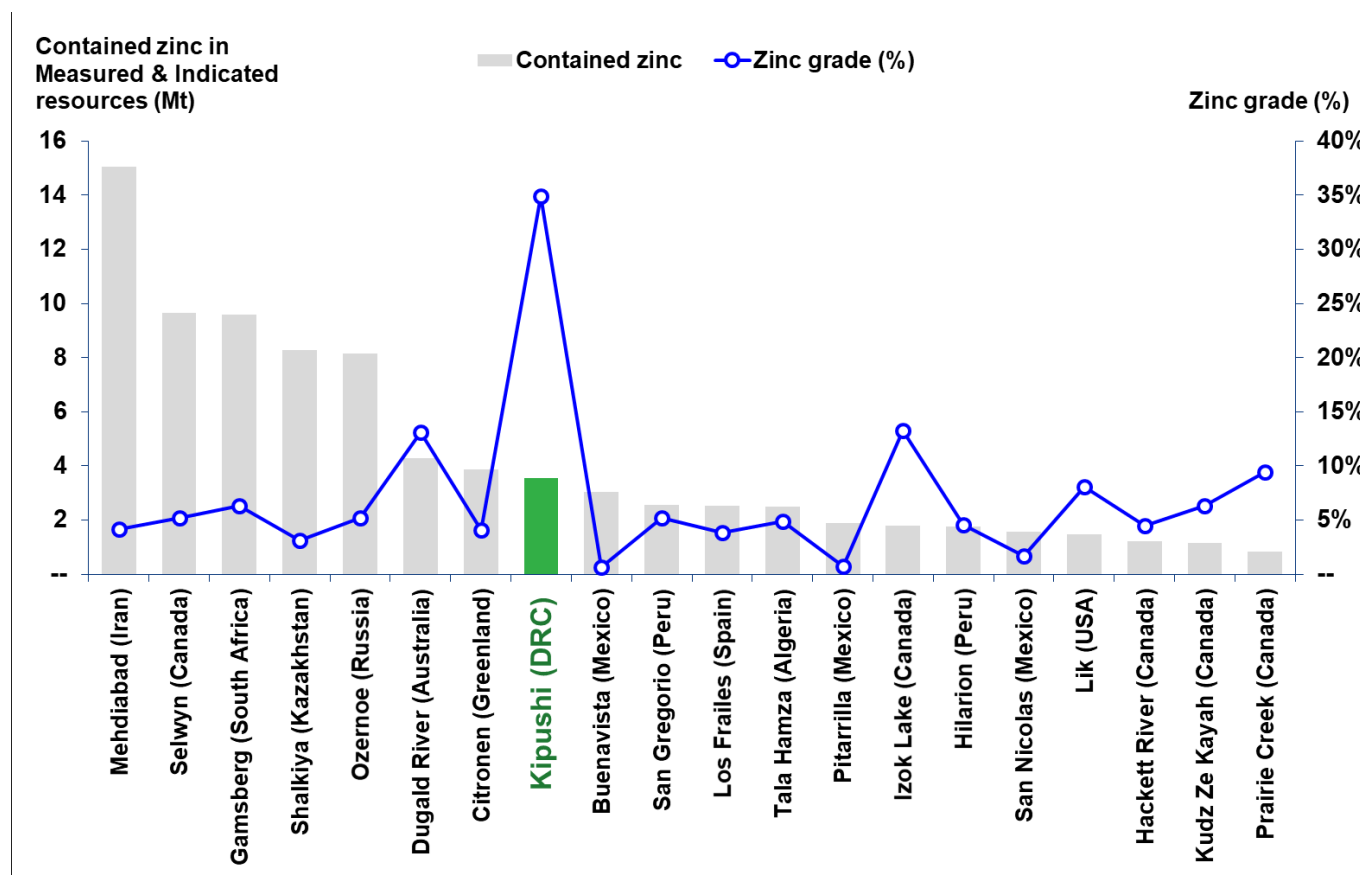
| <b>Zone</b>                       | <b>Category</b>                          | <b>Tonnes<br/>(millions)</b> | <b>Cu<br/>%</b>              | <b>Zn<br/>%</b>              | <b>Pb<br/>%</b>              | <b>Ag<br/>g/t</b>           | <b>Co<br/>ppm</b>            | <b>Ge<br/>g/t</b>           |
|-----------------------------------|--|------------------------------|------------------------------|------------------------------|------------------------------|-----------------------------|------------------------------|-----------------------------|
| Fault Zone                        | Measured                                 | 0.14                         | 2.78                         | 1.25                         | 0.05                         | 19                          | 107                          | 20                          |
|                                   | Indicated                                | 1.01                         | 4.17                         | 2.64                         | 0.09                         | 23                          | 216                          | 20                          |
|                                   | Inferred                                 | 0.94                         | 2.94                         | 5.81                         | 0.18                         | 22                          | 112                          | 26                          |
| Série<br>Récurrenté               | Indicated                                | 0.48                         | 4.01                         | 3.82                         | 0.02                         | 21                          | 56                           | 6                           |
|                                   | Inferred                                 | 0.34                         | 2.57                         | 1.02                         | 0.06                         | 8                           | 29                           | 1                           |
| Fault Zone<br>Splay               | Inferred                                 | 0.35                         | 4.99                         | 15.81                        | 0.005                        | 20                          | 127                          | 81                          |
| <b>Total</b>                      | <b>Measured</b>                          | <b>0.14</b>                  | <b>2.78</b>                  | <b>1.25</b>                  | <b>0.05</b>                  | <b>19</b>                   | <b>107</b>                   | <b>20</b>                   |
|                                   | <b>Indicated</b>                         | <b>1.49</b>                  | <b>4.12</b>                  | <b>3.02</b>                  | <b>0.07</b>                  | <b>22</b>                   | <b>165</b>                   | <b>15</b>                   |
|                                   | <b>Measured &amp;<br/>Indicated</b>      | <b>1.63</b>                  | <b>4.01</b>                  | <b>2.87</b>                  | <b>0.06</b>                  | <b>22</b>                   | <b>160</b>                   | <b>16</b>                   |
|                                   | <b>Inferred</b>                          | <b>1.64</b>                  | <b>3.30</b>                  | <b>6.97</b>                  | <b>0.12</b>                  | <b>19</b>                   | <b>98</b>                    | <b>33</b>                   |
| <b>Contained metal quantities</b> |  |                              |                              |                              |                              |                             |                              |                             |
| <b>Zone</b>                       | <b>Category</b>                          | <b>Tonnes<br/>(millions)</b> | <b>Cu lbs<br/>(millions)</b> | <b>Zn lbs<br/>(millions)</b> | <b>Pb lbs<br/>(millions)</b> | <b>Ag oz<br/>(millions)</b> | <b>Co lbs<br/>(millions)</b> | <b>Ge oz<br/>(millions)</b> |
| Fault Zone                        | Measured                                 | 0.14                         | 8.5                          | 3.8                          | 0.2                          | 0.09                        | 0.03                         | 0.09                        |
|                                   | Indicated                                | 1.01                         | 93.2                         | 59.1                         | 1.9                          | 0.75                        | 0.48                         | 0.64                        |
|                                   | Inferred                                 | 0.94                         | 61.1                         | 120.9                        | 3.8                          | 0.68                        | 0.23                         | 0.79                        |
| Série<br>Récurrenté               | Indicated                                | 0.48                         | 42.4                         | 40.5                         | 0.2                          | 0.32                        | 0.06                         | 0.09                        |
|                                   | Inferred                                 | 0.34                         | 19.4                         | 7.7                          | 0.4                          | 0.09                        | 0.02                         | 0.01                        |
| Fault Zone<br>Splay               | Inferred                                 | 0.35                         | 38.9                         | 123.3                        | 0.0                          | 0.23                        | 0.10                         | 0.92                        |
| <b>Total</b>                      | <b>Measure<br/>d</b>                     | <b>0.14</b>                  | <b>8.5</b>                   | <b>3.8</b>                   | <b>0.2</b>                   | <b>0.09</b>                 | <b>0.03</b>                  | <b>0.09</b>                 |
|                                   | <b>Indicated</b>                         | <b>1.49</b>                  | <b>135.7</b>                 | <b>99.6</b>                  | <b>2.1</b>                   | <b>1.08</b>                 | <b>0.54</b>                  | <b>0.73</b>                 |
|                                   | <b>Measure<br/>d &amp;<br/>Indicated</b> | <b>1.63</b>                  | <b>144.1</b>                 | <b>103.4</b>                 | <b>2.3</b>                   | <b>1.16</b>                 | <b>0.58</b>                  | <b>0.82</b>                 |
|                                   | <b>Inferred</b>                          | <b>1.64</b>                  | <b>119.4</b>                 | <b>251.8</b>                 | <b>4.3</b>                   | <b>1.00</b>                 | <b>0.35</b>                  | <b>1.73</b>                 |

Notes:

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2. Mineral Resources that are not Mineral Reserves have no demonstrated economic viability.
3. The Mineral Resource is reported as the total in-situ Mineral Resource and on a 100% project basis.
4. Metal quantities are reported in multiples of Troy Ounces or Avoirdupois Pounds.
5. The cut-off grade calculation was based on the following assumptions: copper price of US\$2.97 /lb, mining cost of US\$50/tonne, processing cost of US\$10/tonne, G&A and holding cost of US\$10/tonne, 90% copper recovery and 96% payable copper.

Exploration drilling conducted by Ivanhoe Mines in 2015 successfully confirmed that both the Big Zinc Zone and Fault Zone remain open at depth and to the south. Additional high-grade copper-zinc-germanium mineralization also was discovered in the Fault Zone and in the Fault Zone Splay in the immediate footwall of the Fault Zone.

Figure 2: World's top 20 zinc projects, by contained zinc.



Source: Wood Mackenzie.

Note: All tonnes and zinc grades of the above-mentioned projects (except for Kipushi) are based on public disclosure and have been compiled by Wood Mackenzie.

### Initial Mineral Reserve estimate for the Kipushi 2017 PFS

The Kipushi 2017 PFS Mineral Reserve has been estimated by Qualified Person Bernie Peters, Technical Director – Mining, OreWin Pty. Ltd., using the 2014 CIM Definition Standards. The Mineral Reserve is based on the January 2016 Mineral Resource. The effective date of the Mineral Reserve statement is December 5, 2017.

**Table 3. Kipushi 2017 PFS Mineral Reserve Statement**

| <b>Category</b>              | <b>Tonnage<br/>(Mt)</b> | <b>Zinc<br/>(%)</b> | <b>Zinc<br/>(Contained kt)</b> |
|------------------------------|-------------------------|---------------------|--------------------------------|
| Proven Mineral Reserve       | 3.10                    | 35.41               | 1,098                          |
| Probable Mineral Reserve     | 5.48                    | 30.29               | 1,660                          |
| <b>Total Mineral Reserve</b> | <b>8.58</b>             | <b>32.14</b>        | <b>2,758</b>                   |

Notes:

1. Effective date of the Mineral Reserves is 12 December 2017.
2. Net Smelter Return ("**NSR**") is used to define the Mineral Reserve cut-offs, therefore cut-off is denominated in US\$/t. By definition the cut-off is the point at which the costs are equal to the NSR. An elevated cut-off grade of US\$135/t NSR (14.03% Zn) was used to define the mining shapes. The marginal cut-off grade has been calculated to be US\$51/t NSR (3.43% Zn).
3. Mineral Reserves are based on a zinc price of US\$1.01/lb Zn and a treatment charge of US\$200/t concentrate.
4. Economic analysis to demonstrate the Kipushi 2017 PFS Mineral Reserve used a zinc price of US\$1.10/lb Zn and a treatment charge of US\$170/t concentrate.
5. Only Measured Mineral Resources were used to report Proven Mineral Reserves and only Indicated Mineral Resources were used to report Probable Mineral Reserves.
6. Mineral Reserves reported above were not additive to the Mineral Resources and are quoted on a 100% project basis.
7. Totals may not match due to rounding.

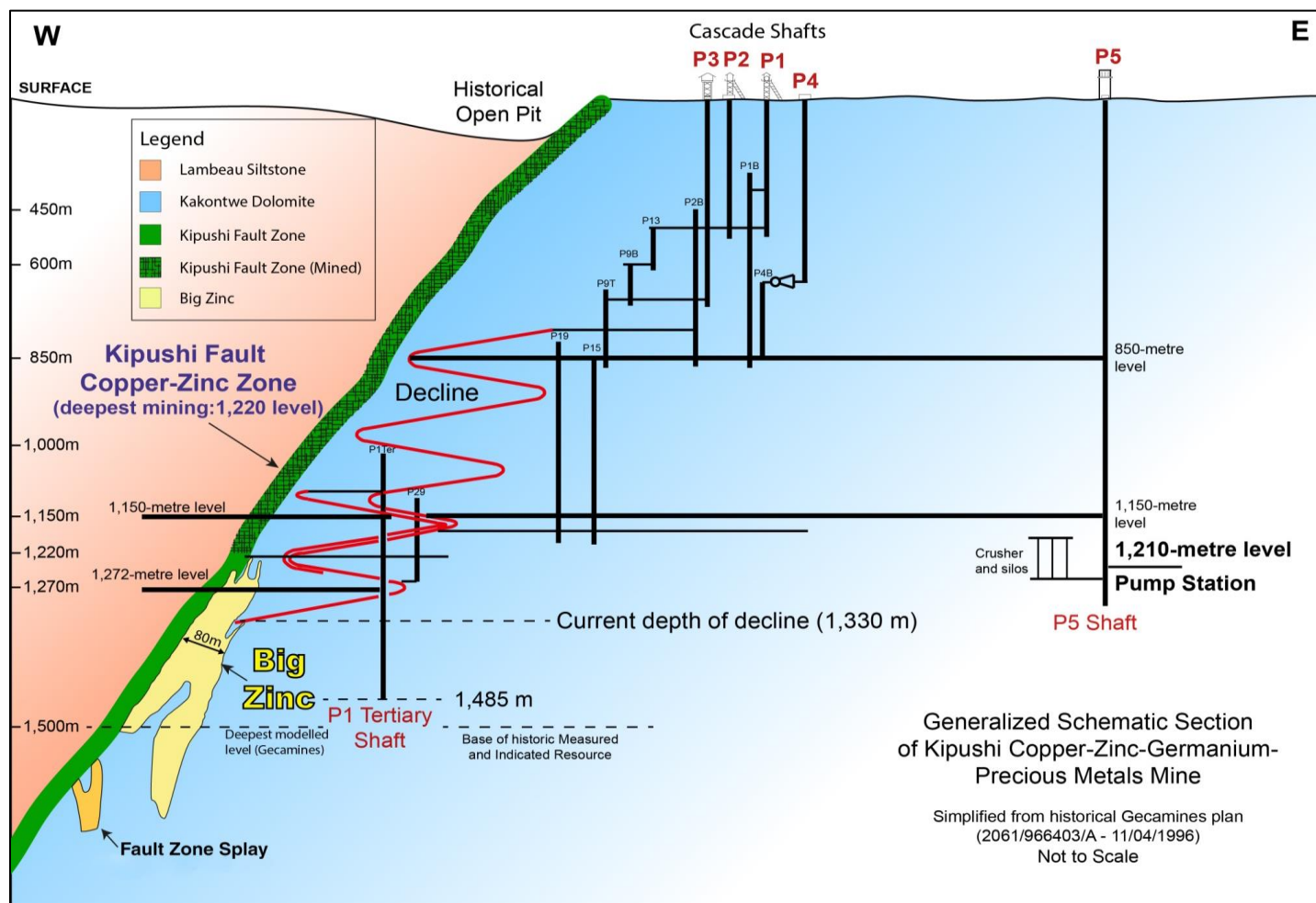
**Upgrading of existing underground infrastructure nearing completion**

KICO has completed the refurbishment of a significant amount of underground infrastructure at the Kipushi Project, including a series of vertical mine shafts, with associated head frames, to various depths, as well as underground mine excavations. A series of crosscuts and ventilation infrastructure still are in working condition. The underground infrastructure also includes a series of pumps to manage the influx of water into the mine. A schematic layout of the existing development is shown in Figure 3.

The main production shaft for the Kipushi Mine, Shaft 5 (labelled as P5 in Figure 3), is eight metres in diameter and 1,240 metres deep, and has been upgraded and re-commissioned. The main personnel and material winder has been upgraded and modernized to meet global industry standards and safety criteria. The Shaft 5 rock-hoisting winder, which had an annual hoisting capacity of 1.8 million tonnes, is being upgraded and is expected to be fully operational early next year.

Underground upgrading work is continuing on the crusher and the rock load-out facilities at the bottom of Shaft 5 and the main haulage way on the 1,150-metre level, between the Big Zinc access decline and Shaft 5. This work is expected to be completed before the end of the first quarter of 2018.

**Figure 3: Schematic section of Kipushi Mine**



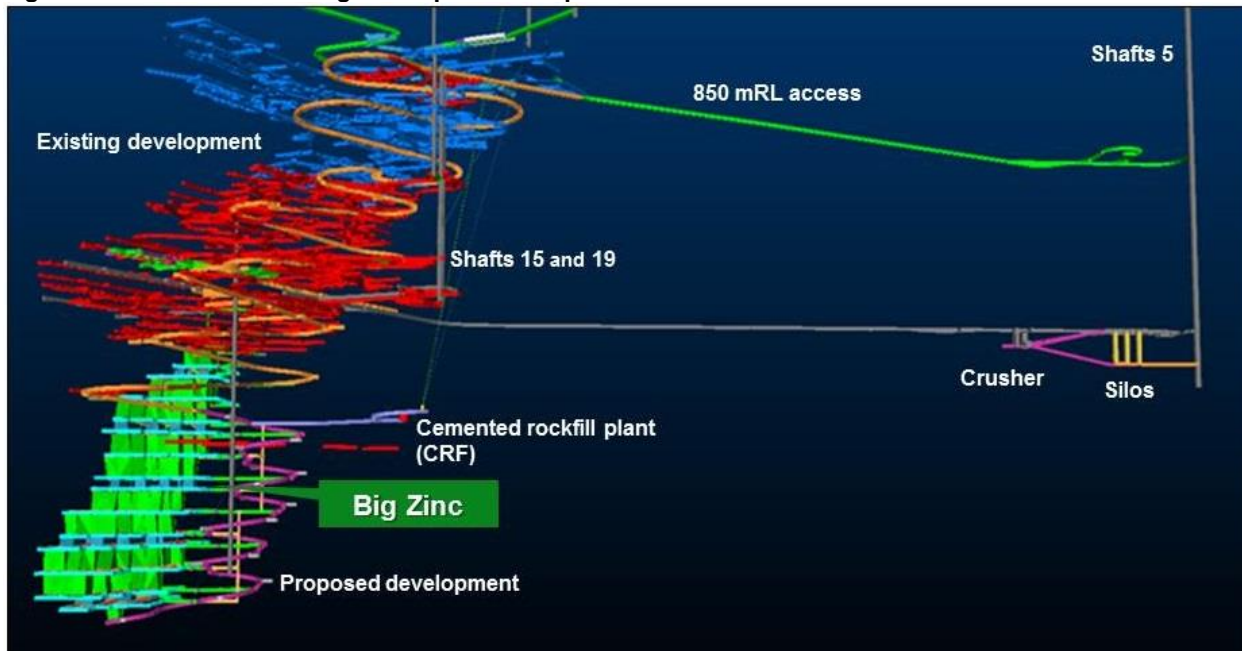
### MOU signed with leading mining contractor Byrnecut

Earlier this month, KICO signed a memorandum of understanding (“**MOU**”) with Byrnecut Offshore Proprietary Limited (“**Byrnecut**”), of Perth, Australia. The MOU relates to the potential engagement of Byrnecut to provide underground mining services at Kipushi, including cost estimation, contractor management, operational readiness and operational services.

The planned primary mining method for the Big Zinc Deposit in the PFS is sublevel long-hole, open stoping, with cemented backfill. The crown pillars are expected to be mined once adjacent stopes are backfilled using a pillar-retreat mining method. The Big Zinc Deposit is expected to be accessed via the existing decline and without any significant new development. The main levels are planned to be at 60-metre vertical intervals, with sublevels at 30-metre intervals.



Figure 4: Planned and existing development at Kipushi



### Optimized zinc processing methodology for the PFS

Based on additional metallurgical test work and trade-off studies, Ivanhoe revised the planned process-plant design for the PFS. The optimized plant utilizes dense media separation (“**DMS**”), followed by milling and a flotation recovery plant. DMS is a simple density-concentration technique that preliminary test work has shown yields positive results for the Kipushi material, which has a sufficient density differential between the waste rock (predominantly dolomite) and mineralization (sphalerite). The addition of milling and a flotation recovery plant resulted in an overall recovery of 89.6%, producing a consistent high-grade concentrate of 58.9% contained zinc. The improved concentrate grade results in lower transportation costs as compared to the Kipushi 2016 PEA.

### Infrastructure

The Kipushi Project includes surface mining and processing infrastructure, concentrator, offices, workshops and a connection to the national power grid. Electricity is supplied by the DRC’s state power company, Société Nationale d’Electricité (“**SNEL**”), from two transmission lines from Lubumbashi. Pylons are in place for a third line.

The surface infrastructure is owned by Gécamines. KICO has entered into an agreement to use the surface rights on the Kipushi Project to the extent required for its operations.

An abundant supply of process water from the underground dewatering operations is expected to provide adequate water for processing and mining operations.

The overall proposed site layout is shown in Figure 5.

Figure 5: Kipushi Project's proposed site layout



### Concentrate exports via newly rebuilt spur line to DRC national railway

On October 30, 2017, Ivanhoe Mines and the DRC's state-owned railway company, Société Nationale des Chemins de Fer du Congo ("**SNCC**"), signed a MOU to rebuild 34 kilometres of track to connect the Kipushi Mine with the DRC national railway at Munama, south of the mining capital of Lubumbashi.

Under the terms of the MOU, Ivanhoe has appointed R&H Rail (Pty) Ltd. to conduct a front-end engineering design study to assess the scope and cost of rebuilding the spur line from the Kipushi Mine to the main Lubumbashi-Sakania railway at Munama. The study has begun and construction on the Kipushi-Munama spur line could start in late 2018. Ivanhoe will finance the estimated US\$32 million (plus contingency) capital cost for the rebuilding, which is included within the overall Kipushi 2017 PFS capital cost.

The proposed export route is to utilize the SNCC network from Kipushi to Ndola, connecting to the North-South Rail Corridor from Ndola to Durban. The North-South Rail Corridor to Durban via Zimbabwe is fully operational and has significant excess capacity.

### Key projections from the Kipushi 2017 PFS

Future proposed mine production has been scheduled to maximize the mine output and meet the annual nominal capacity of 800,000 tonnes of the DMS and mill-flotation plant. The mining production forecasts are shown in Table 4. Mine, process and concentrate production are shown in figures 6 to 8.

**Table 4: Mining production statistics**

| Description                         | Unit     | Total LOM | 5-Year Average | LOM Average |
|-------------------------------------|----------|-----------|----------------|-------------|
| <b>Zinc feed – tonnes processed</b> |          |           |                |             |
| Quantity Zinc Tonnes Treated        | kt       | 8,581     | 777            | 780         |
| Zinc Feed Grade                     | %        | 32.14     | 30.20          | 32.14       |
| Zinc Recovery                       | %        | 89.61     | 88.76          | 89.61       |
| Zinc Concentrate Produced           | kt (dry) | 4,196     | 354            | 381         |
| Zinc Concentrate Grade              | %        | 58.91     | 58.51          | 58.91       |
| Contained Zinc in Concentrate       | kt       | 2,472     | 207            | 225         |

Figure 6: Estimated tonnes mined and zinc feed grade

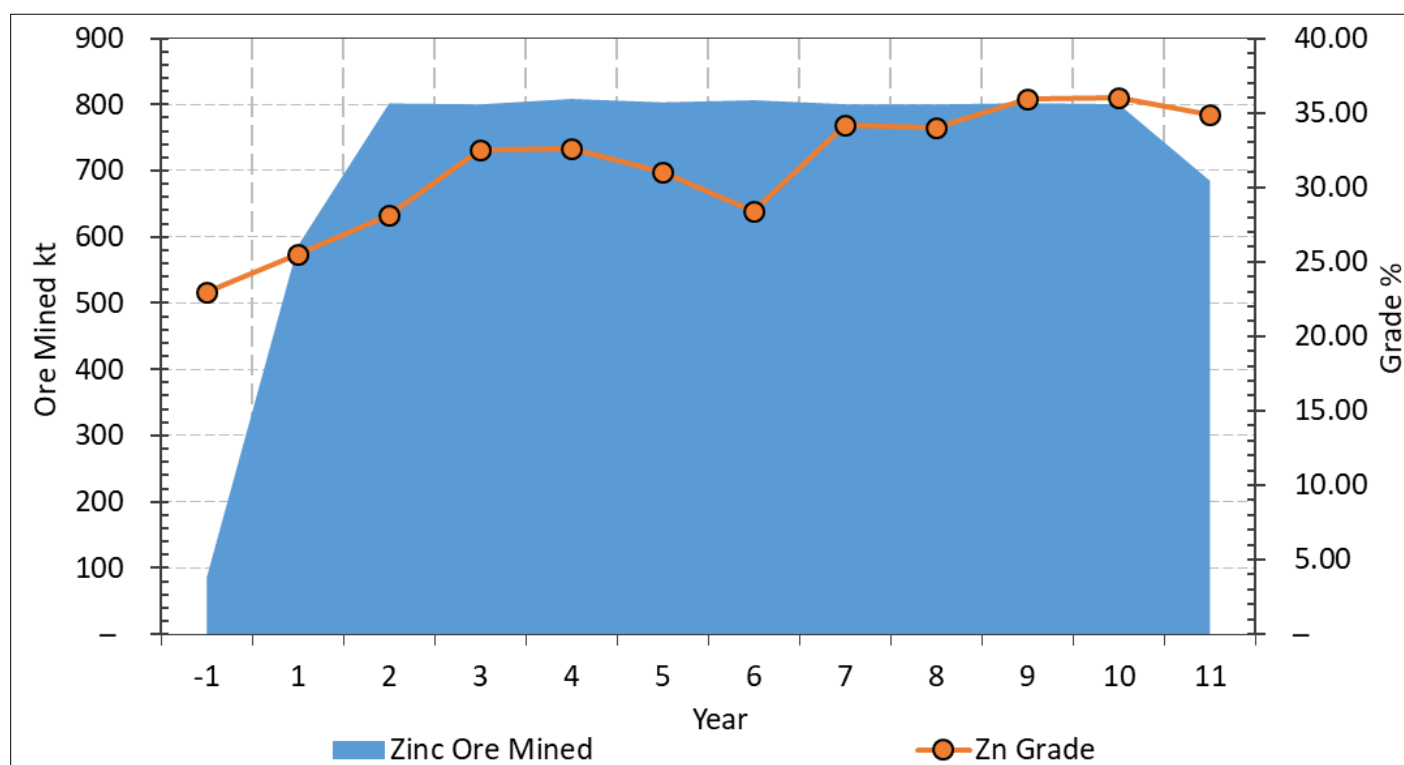
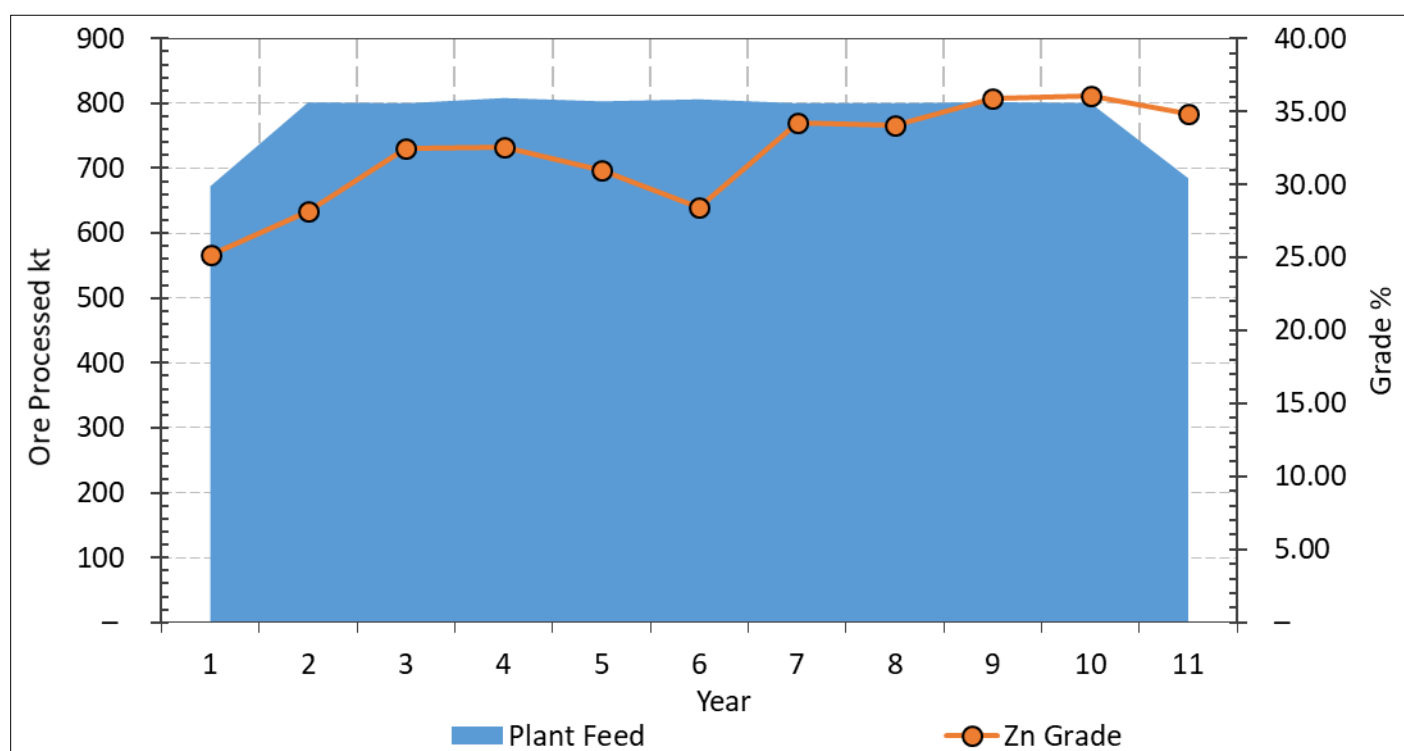
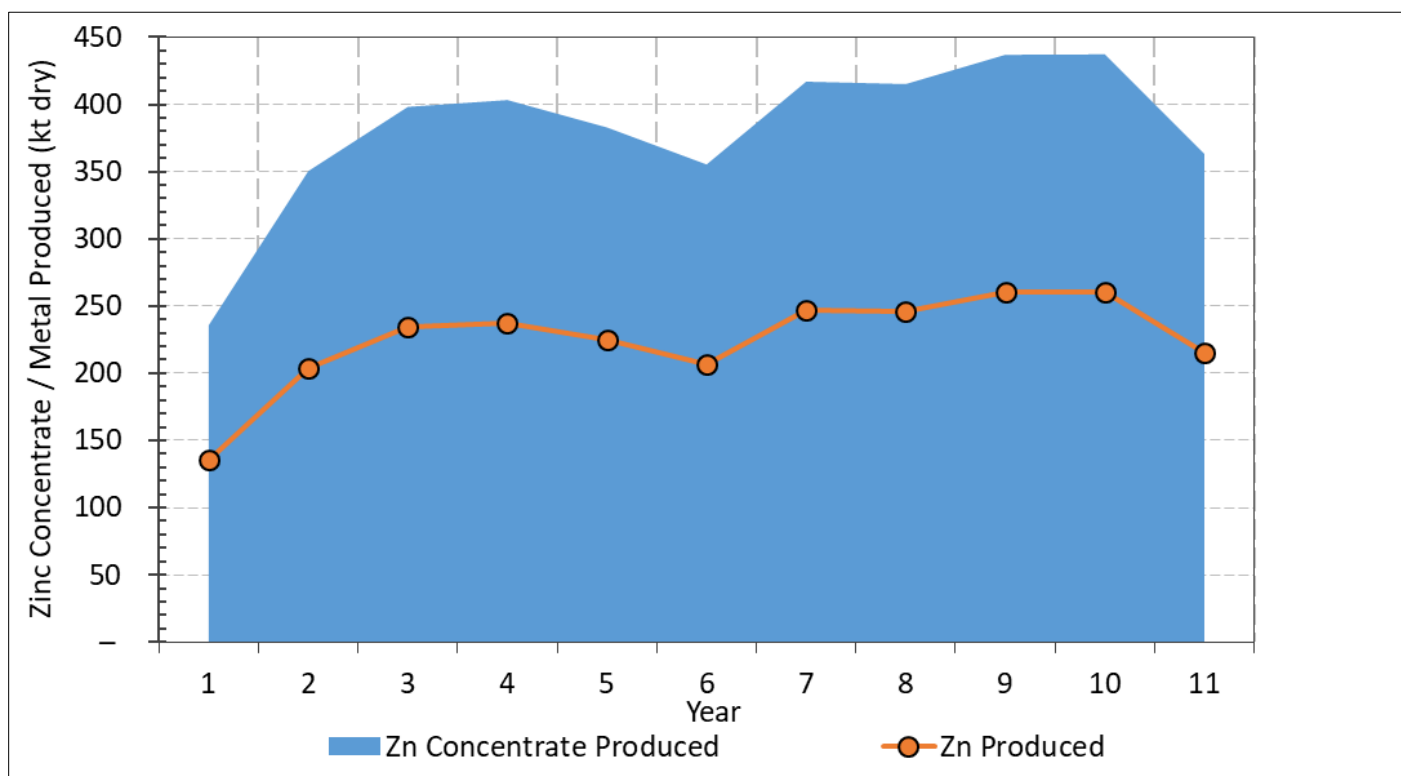


Figure 7: Estimated tonnes processed and zinc feed grade





**Figure 8: Concentrate and metal production**



### Economic analysis

The estimates of cash flows have been prepared on a real basis as at January 1, 2018, and a mid-year discounting is used to calculate the NPV.

The projected financial results for undiscounted and discounted cash flows, at a range of discount rates, IRR and payback are shown in Table 5. The key economic assumptions for the discounted cash flow analyses are shown in Table 6. The results of NPV sensitivity analysis to a range of zinc prices and zinc treatment charges are shown in Table 7. A comparison of the Kipushi 2017 PFS key results to the Kipushi 2016 PEA is shown in Table 8. A chart of the cumulative cash flow is shown in Figure 9.

**Table 5: Financial results**

| Description                    | Discount Rate | Before Taxation | After Taxation |
|--------------------------------|---------------|-----------------|----------------|
| Net Present Value (US\$M)      | Undiscounted  | 1,944           | 1,435          |
|                                | 5.0%          | 1,239           | 900            |
|                                | <b>8.0%</b>   | <b>953</b>      | <b>683</b>     |
|                                | 10.0%         | 743             | 517            |
|                                | 12.0%         | 628             | 431            |
| Internal Rate of Return        | –             | 41.7%           | 35.3%          |
| Project Payback Period (Years) | –             | 1.9             | 2.2            |

**Table 6: Kipushi 2017 PFS zinc price and treatment charge**

| Parameter             | Unit               | Economic Analysis Assumption |
|-----------------------|--------------------|------------------------------|
| Zinc Price            | US\$/lb            | 1.10                         |
| Zinc Treatment Charge | US\$/t concentrate | 170                          |

**Table 7: After-tax NPV<sub>8%</sub> and IRR sensitivity to zinc prices and treatment charges**

| Zinc Treatment Charge (US\$/t) | Zinc Price (US\$/lb) |              |                            |                |                |                |                |                |
|--------------------------------|----------------------|--------------|----------------------------|----------------|----------------|----------------|----------------|----------------|
|                                | 0.90                 | 1.00         | 1.10                       | 1.20           | 1.40           | 1.50           | 1.70           | 2.00           |
| <b>50</b>                      | 524<br>29.8%         | 698<br>35.8% | 870<br>41.3%               | 1,043<br>46.5% | 1,385<br>56.0% | 1,557<br>60.5% | 1,899<br>69.0% | 2,412<br>80.5% |
| <b>100</b>                     | 444<br>26.9%         | 619<br>33.2% | 792<br>38.8%               | 965<br>44.2%   | 1,308<br>53.9% | 1,479<br>58.4% | 1,822<br>67.2% | 2,334<br>78.8% |
| <b>150</b>                     | 364<br>23.8%         | 540<br>30.4% | 714<br>36.3%               | 886<br>41.8%   | 1,230<br>51.7% | 1,401<br>56.4% | 1,744<br>65.2% | 2,257<br>77.1% |
| <b>170</b>                     | 331<br>22.5%         | 508<br>29.2% | <b>683</b><br><b>35.3%</b> | 855<br>40.8%   | 1,199<br>50.9% | 1,370<br>55.5% | 1,713<br>64.4% | 2,226<br>76.4% |
| <b>200</b>                     | 282<br>20.5%         | 461<br>27.4% | 635<br>33.7%               | 808<br>39.3%   | 1,152<br>49.6% | 1,324<br>54.3% | 1,666<br>63.2% | 2,179<br>75.4% |
| <b>250</b>                     | 200<br>17.0%         | 380<br>24.4% | 556<br>30.9%               | 730<br>36.8%   | 1,074<br>47.3% | 1,246<br>52.1% | 1,589<br>61.2% | 2,102<br>73.6% |

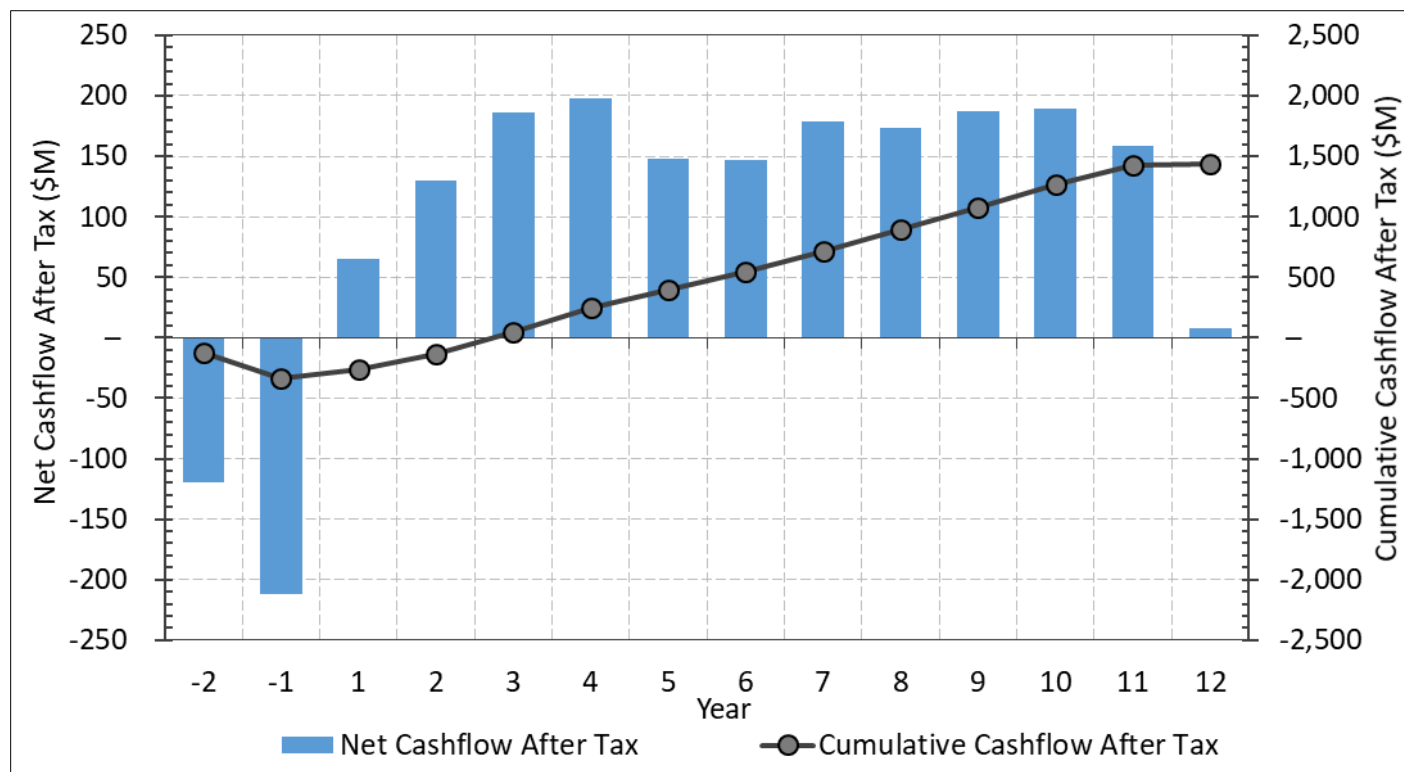
**Table 8: Comparison of results from Kipushi 2017 PFS to Kipushi 2016 PEA**

| Item                                  | Unit               | 2016 PEA <sup>(1)</sup> | 2017 PFS <sup>(2)</sup> |
|---------------------------------------|--------------------|-------------------------|-------------------------|
| <b>LOM Average Zinc Ore Processed</b> |                    |                         |                         |
| Zinc Ore Mined                        | kt                 | 939                     | 780                     |
| Zn Ore Head Grade                     | %                  | 32.15                   | 32.14                   |
| Zinc Concentrate Recovery             | %                  | 92.94                   | 89.61                   |
| Zinc Concentrate Produced             | kt (dry)           | 530                     | 381                     |
| Zinc Concentrate Grade                | %                  | 53.00                   | 58.91                   |
| <b>LOM Average Metal Produced</b>     |                    |                         |                         |
| Zinc Produced                         | Mlb                | 619                     | 495                     |
| Zinc Produced                         | kt                 | 281                     | 225                     |
| <b>Key Financial Results</b>          |                    |                         |                         |
| Pre-Production Capital                | US\$M              | 409                     | 337                     |
| Mine Site Cash Cost                   | US\$/lb Payable Zn | 0.12                    | 0.14                    |
| Realization                           | US\$/lb Payable Zn | 0.44                    | 0.35                    |
| Total Cash Costs After Credits        | US\$/lb Payable Zn | 0.54                    | 0.48                    |
| Site Operating Costs                  | US\$/t milled      | 74.77                   | 87.77                   |
| After Tax NPV <sub>8%</sub>           | US\$M              | 533                     | 683                     |
| After Tax IRR                         | %                  | 30.9                    | 35.3                    |
| Project Payback Period                | Years              | 2.18                    | 2.24                    |

1. Based on long-term zinc price of US\$1.01/lb and zinc treatment charge of US\$190/t concentrate.

2. Based on long-term zinc price of US\$1.10/lb and zinc treatment charge of US\$170/t concentrate.

**Figure 9: Cumulative cash flow**



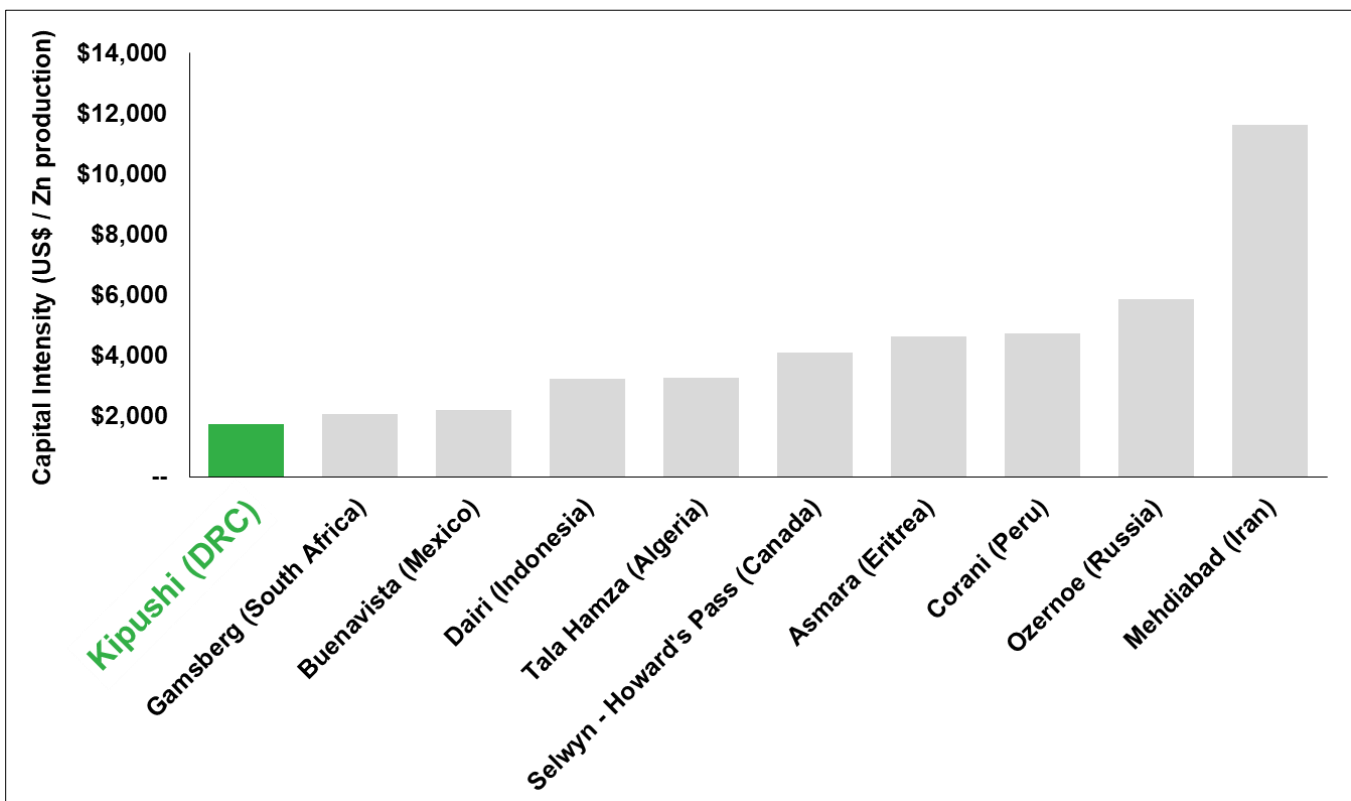
The total capital cost estimates for Kipushi are shown in Table 9. Kipushi's estimated low capital intensity relative to comparable "probable" and "base case" zinc projects identified by Wood Mackenzie is highlighted in Figure 10.

**Table 9: Estimated capital costs**

| <b>Description</b>                     | <b>Pre-Production<br/>(US\$M)</b> | <b>Sustaining<br/>(US\$M)</b> | <b>Total<br/>(US\$M)</b> |
|--|-----------------------------------|-------------------------------|--------------------------|
| <b>Mining:</b>                         |                                   |                               |                          |
| UG Mine Refurbishment                  | 17                                | –                             | 17                       |
| Underground Mining                     | 57                                | 128                           | 185                      |
| Capitalized Operating Costs            | 37                                | –                             | 37                       |
| <b>Subtotal</b>                        | <b>112</b>                        | <b>128</b>                    | <b>239</b>               |
| <b>Process &amp; Infrastructure:</b>   |                                   |                               |                          |
| Process & Infrastructure               | 78                                | 7                             | 84                       |
| Railway                                | 32                                | –                             | 32                       |
| Capitalized Operating Costs            | 7                                 | –                             | 7                        |
| <b>Subtotal</b>                        | <b>116</b>                        | <b>7</b>                      | <b>123</b>               |
| <b>Closure:</b>                        |                                   |                               |                          |
| Closure                                | –                                 | 20                            | 20                       |
| <b>Subtotal</b>                        | <b>–</b>                          | <b>20</b>                     | <b>20</b>                |
| <b>Indirects:</b>                      |                                   |                               |                          |
| EPCM                                   | 12                                | –                             | 12                       |
| Capitalized G&A                        | 11                                | –                             | 11                       |
| <b>Subtotal</b>                        | <b>22</b>                         | <b>–</b>                      | <b>22</b>                |
| <b>Others:</b>                         |                                   |                               |                          |
| Owners Cost                            | 49                                | 24                            | 73                       |
| <b>Capital Cost Before Contingency</b> | <b>300</b>                        | <b>178</b>                    | <b>478</b>               |
| Contingency                            | 37                                | –                             | 37                       |
| <b>Capital Cost After Contingency</b>  | <b>337</b>                        | <b>178</b>                    | <b>515</b>               |



Figure 10: Capital intensity for zinc projects



Source: Wood Mackenzie, December 2017.

Note: All comparable “probable” and “base case” projects as identified by Wood Mackenzie. Source: Wood Mackenzie (based on public disclosure and information gathered in the process of routine research. The Kipushi 2017 PFS has not been reviewed by Wood Mackenzie).

Kipushi’s estimated revenues and operating costs are presented in Table 10, along with the projected net sales revenue value attributable to each key period of operation. Kipushi’s estimated cash costs are presented in Table 11. Based on data from Wood Mackenzie, life-of-mine average cash cost of US\$0.48/lb of zinc is expected to rank Kipushi, once in production, in the bottom quartile of the 2020 cash cost curve for zinc producers globally (see Figure 11).

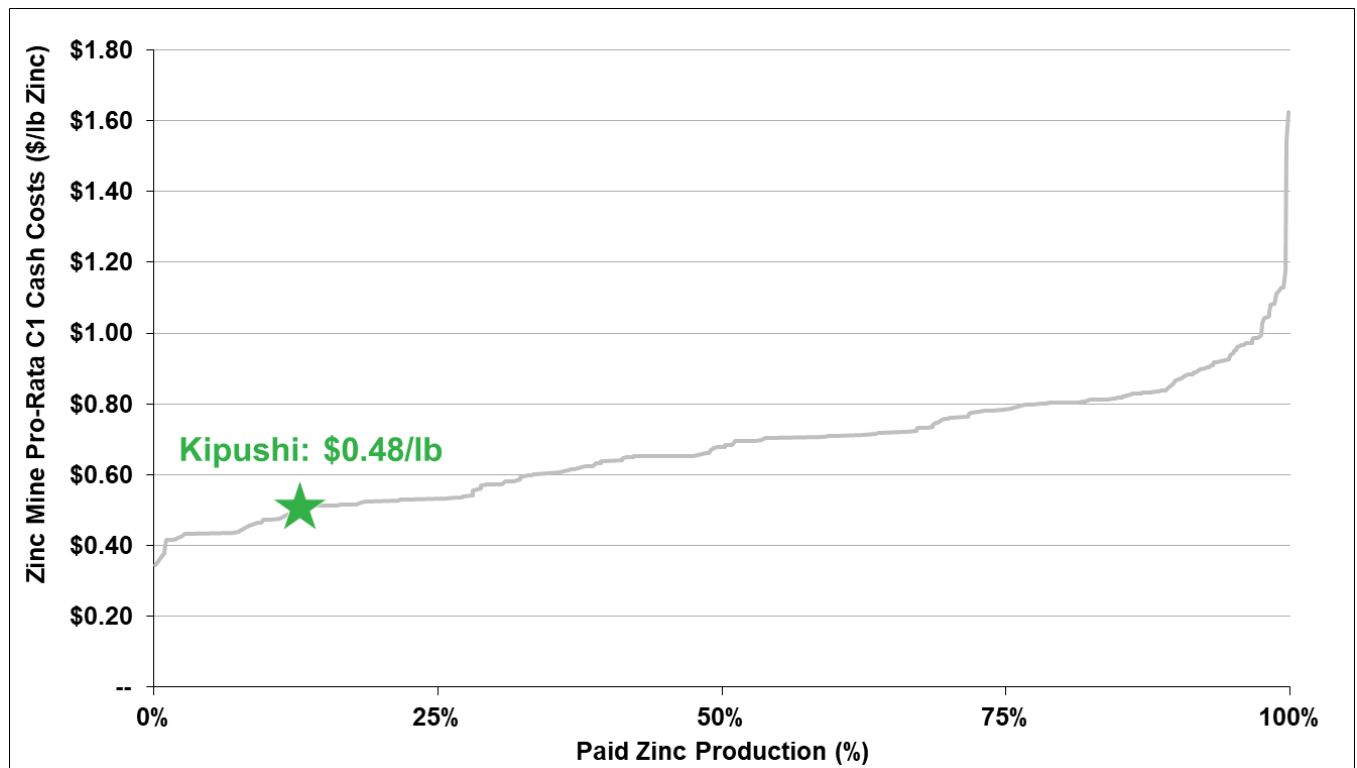
Table 10: Estimated operating costs and revenues

| Description                  | Total<br>(US\$M) | 5-Year Average  | LOM Average |
|------------------------------|------------------|-----------------|-------------|
|                              |                  | (US\$/t Milled) |             |
| Revenue:                     |                  |                 |             |
| Gross Sales Revenue          | 5,095            | 550             | 594         |
| Less: Realization Costs      |                  |                 |             |
| Transport Costs              | 972              | 103             | 113         |
| Treatment & Refining Charges | 713              | 77              | 83          |
| Royalties                    | 197              | 21              | 23          |
| Total Realization Costs      | 1,883            | 202             | 219         |
| Net Sales Revenue            | 3,212            | 348             | 374         |
| Less: Site Operating Costs   |                  |                 |             |
| Mining                       | 415              | 52              | 48          |
| Processing & TSF             | 194              | 23              | 23          |
| General & Administration     | 144              | 17              | 17          |
| Total                        | 753              | 93              | 88          |
| Operating Margin             | 2,459            | 255             | 287         |
| Operating Margin (%)         | 48.3             | 46.4            | 48.3        |

Table 11: Estimated cash costs

| Description             | 5-Year Average       | LOM Average |
|-------------------------|----------------------|-------------|
|                         | (US\$/lb Payable Zn) |             |
| Mine Site Cash Cost     | 0.16                 | 0.14        |
| Realization             | 0.34                 | 0.35        |
| <b>Total Cash Costs</b> | <b>0.50</b>          | <b>0.48</b> |

Figure 11: 2020 pro-rata C1 cash costs



Source: Wood Mackenzie, December 2017 (based on public disclosure and information gathered in the process of routine research. The Kipushi 2017 PFS has not been reviewed by Wood Mackenzie).

Note: Represents C1 cash costs which reflect the direct cash costs of producing paid metal incorporating mining, processing and offsite realization costs, having made appropriate allowance for the co-product revenue streams.

### Qualified Persons, Quality Control and Assurance

The following companies have undertaken work in preparation of the Kipushi 2017 PFS:

1. OreWin – Overall report preparation, mining, Mineral Reserve estimation and economic analysis.
2. MSA Group – Resource and geology.
3. SRK Consulting – Mine geotechnical recommendations.
4. MDM Engineering – Plant and surface infrastructure.
5. Murray & Roberts – Underground mining infrastructure.
6. Golder Associates – Environmental and hydrogeology.
7. Grindrod Rail Consultancy Services – Railway and logistics.

The independent Qualified Persons responsible for preparing the Kipushi 2017 PFS, on which the technical report will be based, are Bernard Peters (OreWin); William Joughin (SRK Consulting); John Edwards (MDM Engineering); and Michael Robertson and Jeremy Witley (MSA Group). Each Qualified Person has reviewed and approved the information in this material change report relevant to the portion of the Kipushi 2017 PFS for which they are responsible.

Other scientific and technical information in this material change report has been reviewed and approved by Stephen Torr, P.Geo., Ivanhoe Mines' Vice President, Project Geology and Evaluation, a Qualified Person under the terms of NI 43-101. Mr. Torr is not independent of Ivanhoe Mines. Mr. Torr has verified the technical data disclosed in this material change report not related to the current Mineral Resource and Mineral Reserve estimates disclosed herein.

Ivanhoe Mines maintains a comprehensive chain of custody and QA-QC program on assays from its Kipushi Project. Half-sawn core was processed either at its preparation laboratory in Kamoa, DRC, or its exploration preparation laboratory in Kolwezi, DRC. Prepared samples then were shipped to Bureau Veritas Minerals ("BVM") Laboratories in Australia for external assay. Industry-standard certified reference materials and blanks were inserted into the sample stream prior to dispatch to BVM. Ivanhoe Mines' QA-QC program has been set up in consultation with MSA Group (Pty.) Ltd., of Johannesburg.

Ivanhoe has previously filed an independent NI 43-101 Technical Report for the Kipushi Project, titled "Kipushi Zn-Cu Project, Kipushi 2016 Preliminary Economic Assessment," dated May 2016, which is available under the company's SEDAR profile at [www.sedar.com](http://www.sedar.com) and on the company's website at [www.ivanhoemines.com](http://www.ivanhoemines.com). The technical report includes relevant information regarding the effective dates and the assumptions, parameters and methods of the 2016 mineral resource estimates on the Kipushi Project cited in this material change report, as well as information regarding data verification, exploration procedures, sample preparation, analysis and security.

Ivanhoe Mines will be filing a new NI 43-101 Technical Report for the Kipushi 2017 PFS disclosed herein within 45 days of the issuance of the news release dated December 13, 2017.

Wood Mackenzie provided data based on public disclosure of comparable projects for the compilation of certain figures used in this material change report; however, Wood Mackenzie did not review the Kipushi 2017 PFS.

**Item 6                      Reliance on subsection 7.1(2) of National Instrument 51-102**

Not applicable.

**Item 7                      Omitted Information**

No confidential information has been omitted from this material change report.

**Item 8                      Executive Officer**

For further information, please contact Mary Vincelli, Vice President, Compliance and Corporate Secretary of the Company, at +1 604 331 9882.

**Item 9                      Date of Report**

December 22, 2017