

# CRC ORE Research Program PROJECT PIPELINE

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17 July 2019

| Development Projects (timeline is calendar year)   | Partners  | 2015 |    | 2016   |    |  |    | 2017                                    |    |   |  | 2018                             |                                  |  |    | 2019 |    |  |                                  | 2020 |   |    |    | 2021 |    |  |  |
|--|---|------|----|--|----|--|----|---|----|---|--|----------------------------------|----------------------------------|--|----|------|----|--|----------------------------------|------|---|----|----|------|----|--|--|
|  |   | Q3   | Q4 | Q1   | Q2 | Q3                                       | Q4 | Q1                                      | Q2 | Q3                                      | Q4   | Q1                               | Q2                               | Q3   | Q4 | Q1   | Q2 | Q3   | Q4                               | Q1   | Q2                                      | Q3 | Q4 | Q1   | Q2 |  |  |
| <b>PROGRAM 1: DEFINE</b>   |   |      |    |  |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P1-001</a> & <a href="#">P1-009</a> & <a href="#">P1-012</a> : Gamma Activation Analysis for geo-sensing | CSIRO   |      |    |  |    | Concept TRL2-TRL3 <a href="#">P1-001</a> |    |   |    | Design TRL4-TRL5 <a href="#">P1-009</a> |  |                                  |                                  | Prototype TRL 5 <a href="#">P1-012</a>           |    |      |    | P1-012 Prototype Demonstration Under Development |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P1-002</a> : PGNAA elemental logging for Instrumenting the Bench   | CSIRO   |      |    |  |    | Prototype TRL5 <a href="#">P1-002</a>    |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P1-003</a> : Magnetic resonance of covellite for geo-sensing   | CSIRO   |      |    |  |    | Prototype TRL4 <a href="#">P1-003</a>    |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P1-004</a> : GE View an online tool for assessing Grade Engineering® (GE) opportunities                  | MRIWA   |      |    | Enhance database TRL4 <a href="#">P1-004</a>                           |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P1-005</a> : Upconversion fluorescence of minerals for geo-sensing                                       | Uni of Adelaide   |      |    | Phase 1: Design TRL2-TRL4 Phase 2: Testing TRL5 <a href="#">P1-005</a> |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P1-006</a> : Geological controls on grade by size department   | UTAS  |      |    | Phase 1 Models TRL2-TRL4 Phase 2: Testing TRL5 <a href="#">P1-006</a>  |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P1-007</a> : Surface techniques for geo-sensing  | UTAS  |      |    | Review TRL4 <a href="#">P1-007</a>                                     |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P1-011</a> : Resource scale heterogeneity evaluation   | Uni of Adelaide   |      |    |  |    |  |    |   |    |   |  |                                  |                                  | TRL TBA <a href="#">P1-011</a>                   |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P5-013</a> : Magnetic Resonance Bench Analysis – Stage 1 Laboratory Feasibility                          | CSIRO   |      |    |  |    |  |    |   |    |   |  |                                  |                                  | TRL 4 <a href="#">P1-013</a>                     |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P5-014</a> : Real-Time Fluorine Mineral Identification using Novel Fluorescence Technology               | University of Adelaide  |      |    |  |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  | TRL3-TRL6 <a href="#">P1-016</a> |      |   |    |    |      |    |  |  |
| <b>PROGRAM 2: SEPARATE</b>   |   |      |    |  |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P2-001</a> : Sensors for rock mass characterisation  | Mining <sup>3</sup>   |      |    |  |    |  |    |   |    |   |  | TRL4-TRL5 <a href="#">P2-001</a> |                                  | Next phase dependent on outcomes of review       |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P2-002</a> : Blast design optimisation for GE  | Mining <sup>3</sup>   |      |    |  |    |  |    |   |    |   |  | TRL3-TRL5 <a href="#">P2-002</a> |                                  |  |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P2-003</a> : Orebody DNA (M3-003)  | Mining <sup>3</sup>   |      |    |  |    |  |    |   |    |   | Prototype TRL2-TRL5 <a href="#">P2-003</a> |                                  |                                  |  |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P2-004</a> & <a href="#">P2-006</a> : LIBS analysis for Geo-sensing                                      | NRC   |      |    |  |    |  |    |   |    |   |  |                                  |                                  | Tools TRL2-TRL5 <a href="#">P2-004</a>           |    |      |    | Prototype TRL6 <a href="#">P2-006</a>            |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P2-005</a> : Simulation of GE mining processes   | UQ, Mining <sup>3</sup>   |      |    |  |    |  |    |   |    |   |  |                                  |                                  | Simulation TRL2-TRL5 <a href="#">P2-005</a>      |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P2-007</a> : Custom Blast Design Value Proposition   | Mining <sup>3</sup>   |      |    |  |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      | TRL-6 <a href="#">P2-007</a>            |    |    |      |    |  |  |
| <a href="#">P2-008</a> : Heterogeneity Index for ORE Mixing  | Mining <sup>3</sup>   |      |    |  |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      | TRL-5 <a href="#">P2-008</a>            |    |    |      |    |  |  |
| <a href="#">P2-009</a> : Elastic Limit Blast Design to Maximise the Grade Engineering Response                       | Mining <sup>3</sup>   |      |    |  |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      | TRL-3 <a href="#">P2-009</a>            |    |    |      |    |  |  |
| <b>PROGRAM 3: EXTRACT</b>  |   |      |    |  |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P3-001</a> : IES Baseline Project  | CRC ORE   |      |    |  |    |  |    |   |    |   |  |                                  |                                  | IES Development TRL4-TRL6 <a href="#">P3-001</a> |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P3-006</a> : AMIRA P9Q   | UQ, Amira and others  |      |    |  |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      | Models TRL5-TRL8 <a href="#">P3-006</a> |    |    |      |    |  |  |
| <a href="#">P3-005</a> : AMIRA P420F   | Curtin  |      |    | Models – TRL5 <a href="#">P3-005</a>                                   |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P3-008</a> : Comminution optimisation for GE (Selective Breakage)  | JKMRC, Gekko  |      |    |  |    | TRL4-TRL6 <a href="#">P3-008</a>         |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P3-007</a> : Validation of mass balance and model calibration in IES (P9Q AR)                            | UQ  |      |    |  |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      | TRL5 <a href="#">P3-007</a>             |    |    |      |    |  |  |
| <a href="#">P3-009</a> : Additional Research P9Q – IES Development Project   | AMIRA, JKMRC, UFRJ, UCT, Hacettepe, Chalmers, Anglo American, AngloGold Ashanti, Barrick, BGRIMM, JKTech, Magotteaux, Metso, Newmont, South32, Vale Technology, Weir Minerals |      |    |  |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      | TRL7 <a href="#">P3-009</a>             |    |    |      |    |  |  |
| <a href="#">P3-010</a> : Beneficiation of Hard Rock Lithium Ores   | Curtin  |      |    |  |    |  |    |   |    |   |  |                                  |                                  | TRL3 <a href="#">P3-010</a>                      |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P3-012</a> : IES Foundation Project  | AMIRA, Hatch, Sedgman, BHP, Anglo American, Teck  |      |    |  |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      | TRL 7-9 <a href="#">P3-012</a>          |    |    |      |    |  |  |
| <b>PROGRAM 4: CONTROL</b>  |   |      |    |  |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P4-001</a> & <a href="#">P4-003</a> : Data driven models   | QUT   |      |    |  |    | Plan TRL2 <a href="#">P4-001</a>         |    | Models TRL2-TRL5 <a href="#">P4-003</a> |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P4-004</a> : Implementation Accelerator  | Clareo  |      |    |  |    |  |    |   |    |   |  |                                  | TRL4-TRL7 <a href="#">P4-004</a> |  |    |      |    |  |                                  |      |   |    |    |      |    |  |  |
| <a href="#">P4-007</a> : Optimised Production Scheduling for Grade Engineering                                       | Curtin  |      |    |  |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      | TRL3-TRL5 <a href="#">P4-007</a>        |    |    |      |    |  |  |
| <a href="#">P4-008</a> : Business and eco-system management tools to overcome barriers to change                     | QUT   |      |    |  |    |  |    |   |    |   |  |                                  |                                  |  |    |      |    |  |                                  |      | TRL N/A <a href="#">P4-008</a>          |    |    |      |    |  |  |