Goldfields.com

Technical Report – National Instrument 43-101

Granny Smith Gold Mine

Western Australia

Effective Date: 31 December 2021

Prepared by Gold Fields Limited

Qualified Person	Company	Date of Signing
Dr Julian Verbeek, FAusIMM	Gold Fields	30 June 2022
Richard Butcher, FAusIMM (CP)	Gold Fields	30 June 2022

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1 Summary

This Technical Report was prepared for Gold Fields Limited (Gold Fields, the Company or the Issuer) in accordance with the requirements of National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101) of the Canadian Securities Administrators, in relation to the Granny Smith Gold Mine (Granny Smith), a production stage property located in Western Australia.

This Technical Report has been prepared for purposes of applicable Canadian securities laws (i) to support the scientific and technical information concerning the project which will be contained or in the management information circular of Yamana Gold Inc. (Yamana) for the special meeting of Yamana's shareholders to be held to approve the proposed acquisition by Gold Fields of all the issued and outstanding shares of Yamana pursuant to a plan of arrangement under the *Canada Business Corporations Act* (the Arrangement), and (ii) in connection with Gold Fields becoming a "reporting issuer" upon completion of that Arrangement for purposes of applicable securities laws in each of the provinces and territories of Canada.

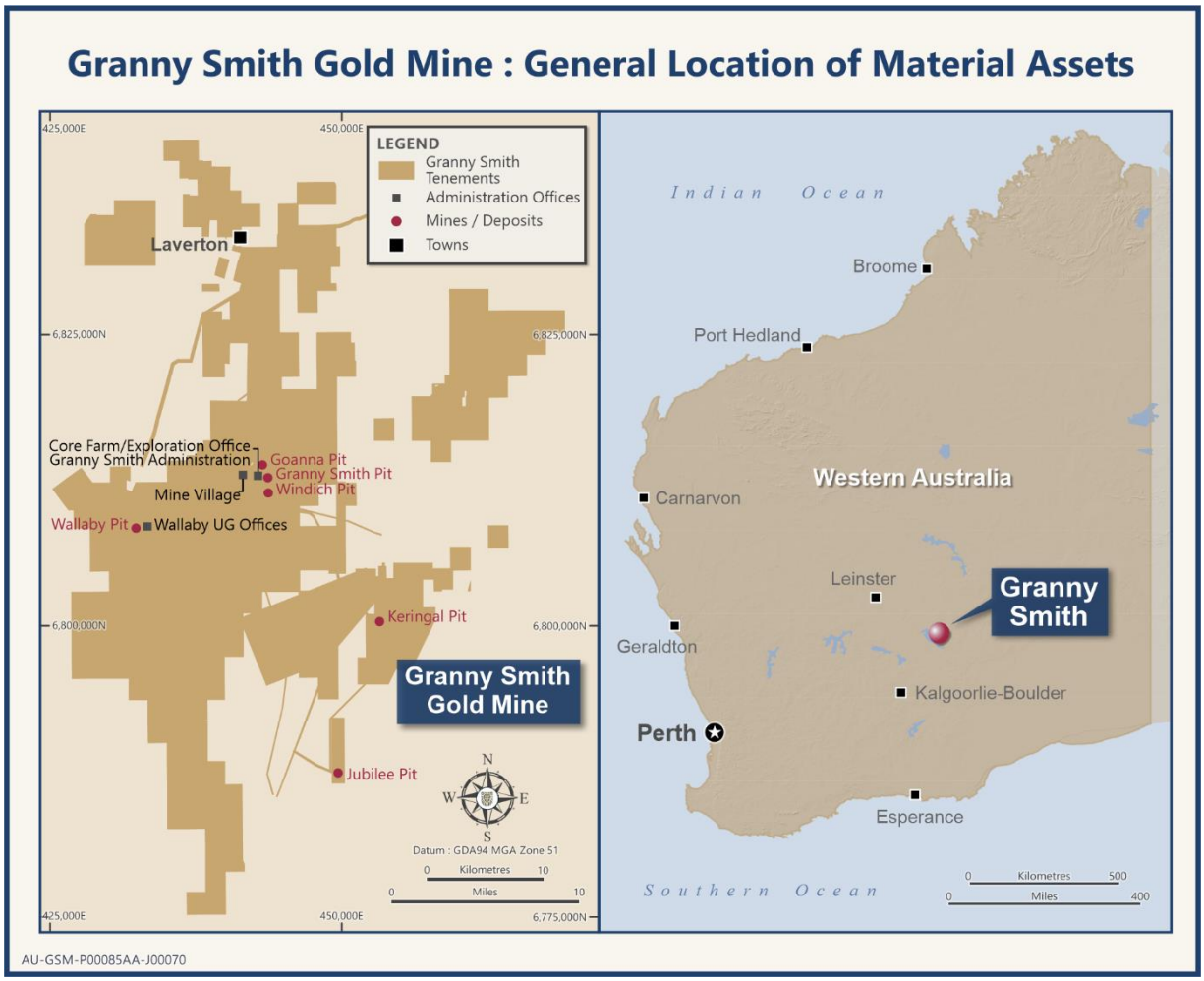
The effective date of this Technical Report is 31 December 2021. This Technical Report does not purport to reflect new information regarding the project arising after such date.

Unless otherwise specified, all units of currency are in United States Dollars (US$). All measurements are metric with the exception of troy ounces (oz).

1.1 Property description and ownership

Granny Smith is located approximately 740 kilometres (km) northeast of Perth, the capital of Western Australia (Figure 1.1).

Figure 1.1 Location of Granny Smith in Western Australia in Ghana



Source: Granny Smith CPR, 2021

Gold Fields through its wholly owned subsidiary GSM Mining Company Pty Ltd (GSM) controls mineral tenements covering a total area of 81,827 ha and a further 10,570 ha of miscellaneous and non-managed tenements.

The major components of the Granny Smith mining and processing operation are:

- The Wallaby underground mine.
- A 3.5 Mt/a carbon-in-pulp (CIP) processing facility.
- A tailings storage facility (TSF).
- A hybrid power station.
- Administration centres.
- Granny Smith aerodrome.
- An accommodation village.

Ore mined from Wallaby is trucked 13 km to the process plant to the northeast at Granny Smith.

1.2 Geology and mineralisation

Granny Smith is in the Kurnalpi Terrane of the Archean Yilgarn Craton. At a regional scale, the host greenstone belt is dominated by the Mt Margaret Dome in the northwest and the Kirgella Dome in the southeast. The zone between the two domes hosts a series of north to north-northeast striking sigmoidal shear zones of the Laverton Tectonic Zone.

The stratigraphy of the Laverton region is defined broadly by a mafic–ultramafic succession overlain by an intermediate volcanic succession, which in turn is overlain by siliciclastic basin successions (e.g. Granny Smith Basin and the Wallaby Conglomerate) and intruded by temporally and chemically distinct suites of felsic to mafic intrusive rocks.The Granny Smith gold deposits (including Windich, Granny and Goanna) occur along a north-trending structural corridor. The eastern contact zone of a granitoid intrusion within metasedimentary rocks is the locus of the Granny Smith corridor mineralisation.

The gold mineralisation is closely associated with a north-south striking reverse (thrust) fault zone that dips shallowly to the east and partly follows the contact between the granitoid and sedimentary rocks. Two stages of alteration are associated with the gold mineralisation: an earlier widespread and pervasive hematite and sericite-carbonate alteration overprinting sericite-carbonate alteration hosting ankerite-pyrite-quartz breccia veins which represent the main mineralising stage.

The Wallaby gold deposit is hosted within a thick mafic conglomerate unit that dips moderately to the southeast and is intruded by a suite of fractionated alkaline dykes. A 600 m × 800 m wide zone of actinolite-magnetite-calcite±epidote±pyrite alteration affects the intrusives and conglomerates and forms a relatively uniform and brittle pipe-shaped body dipping approximately 50 º to the south. In general, the gold lodes form a series of stacked zones. Four dominant gold-related domains are identified:

- Fracture mesh gold lodes developed at intersections of brittle structures (faults and veins).
- Horsetail domain gold lodes where the lode fault has diverged into multiple faults with extensive extension veins formed between the multiple faults.
- Ductile shear-controlled gold lodes resulting from the intersection between brittle structures and earlier ductile shears and cleavages associated with north oriented shearing.
- Early-stage hematite associated gold lodes.

Gold within the Wallaby deposit occurs along micro-fractures within pyrite or as grains within quartz veining. Coarse visible gold is also observed in narrow, moderate to steeply dipping quartz-carbonate veins.

Gold mineralisation at Hillside is associated with two separate stages of quartz veining, hosted by carbonate-muscovite-quartz-pyrite-(magnetite-biotite) altered basalt exhibiting a pervasive shear fabric. Pyrite and arsenopyrite are the two major sulphide phases present, with gold appearing to be associated intimately with arsenopyrite.

1.3 Exploration, development and operations

Granny Smith is an underground gold mining operation with all currently ore sourced from Zones 250/60, 70, 80, 90, 100, 110 and 120 at the Wallaby mine. Access to the Wallaby underground mine is via a portal established within the former Wallaby open pit. The mine operation is trackless, with truck haulage from underground via a decline and ramp to the surface. The main underground mining methods are inclined room and pillar and long-hole stoping.

The Wallaby underground mining equipment is predominantly an owner-operated fleet, with maintenance activities undertaken in-house. Some development, cable bolting and charging activities are completed by contractors. A contractor fleet of 190t capacity road trains transports the stockpiled surface ore to the Granny Smith process plant.

The recent production performance of Granny Smith is summarised in Table 15.1.

A feasibility study on Zone 135 at ~1,450 m below surface in parallel with initial development was completed and approved during 2021.

Exploration activities at Granny Smith during 2021 were focused on extensions to the Wallaby deposit and across the broader tenement package with the aim of discovering new gold deposits.

In-mine exploration and resource drilling at Wallaby focused on infill and extensions of Zone 135 and Zone 150. Infill of Zone 135 confirmed continuity of the main lode with all holes returning mineralised intercepts. Drilling identified an extension of the Zone 135 Vertical East lodes to the east and confirmed mineralisation of the Zone 135 Vertical West lodes. Zone 150 extensional drilling identified mineralisation at expected depths which returned assays of economic tenor.

The 2022 exploration program will continue to focus on Mineral Resource and Mineral Reserve growth at Wallaby through extensions both laterally and at depth with further drilling of the Zone 135 Horizontal and Vertical lodes to close-out open areas and define the full orebody footprint. 100 x 100 m conversion drilling in Zone 150 will continue to test geological and grade continuity in the southern half of the orebody while 50 x 50 m infill drilling will commence in the northern half. The aim is to complete 50 x 50 m drilling on >70 % of the Zone 150 Main lode for a pre-feasibility study in Q1 2023.

Follow-up bedrock testing of high-priority surface exploration targets will continue. The in-mine exploration program will be supported and extended by a surface drilling program around the Wallaby deposit. At Granny Smith, drilling will evaluate further east-dip shear repeats in the footwall.

1.4 Mineral Resource estimates

The Granny Smith Mineral Resources exclusive of Mineral Reserves as of 31 December 2021 are summarised by category in Table 1.1. The Mineral Resources are 100 % attributable to Gold Fields and are net of production depletion up to 31 December 2021. The point of reference for the Mineral Resources is in situ with dilution applied.

Table 1.1: Granny Smith - summary of gold Mineral Resources as at 31 December 2021 (fiscal year end) based on a gold price of $1,500/oz

.	Mineral Resources (exclusive of Mineral Reserves)			Cut-off Grades (g/t Au)	Metallurgical Recovery (%)
	Tonnes (kt)	Grades (g/t Au)	Gold (koz Au)		
.Underground Mineral Resources					
UG Measured Mineral Resources	4,050	5.3	693	2.30 - 2.90	92 %
UG Indicated Mineral Resources	20,743	5.0	3,367	1.89 - 3.08	92 %
UG Measured + Indicated Mineral Resources	24,792	5.1	4,059	1.89 - 3.08	92 %
UG Inferred Mineral Resources	10,663	5.1	1,735	1.89 - 3.08	92 %
.Open Pit Mineral Resources					
OP Measured Mineral Resources	-	-	-	-	
OP Indicated Mineral Resources	-	-	-	-	
OP Measured + Indicated Mineral Resources	-	-	-	-	
OP Inferred Mineral Resources	357	1.9	22	0.66	92 %
.Stockpile Mineral Resources					
SP Measured Mineral Resources	-	-	-	-	
SP Indicated Mineral Resources	-	-	-	-	
SP Measured + Indicated Mineral Resources	-	-	-	-	
SP Inferred Mineral Resources	-	-	-	-	
.Total Granny Smith Mineral Resources					
Total Measured Mineral Resources	4,050	5.3	693	2.30 - 2.90	92 %
Total Indicated Mineral Resources	20,743	5.0	3,367	1.89 - 3.08	92 %
Total Measured + Indicated Mineral Resources	24,792	5.1	4,059	1.89 - 3.08	92 %
Total Inferred Mineral Resources	11,020	5.0	1,757	0.66 - 3.08	92 %

Note:
a) Rounding of figures may result in minor computational discrepancies.
b) Mineral Resources are exclusive of Mineral Reserves.
c) Mineral Resources categories are assigned with consideration given to geological complexity, grade variance, drillhole intersection spacing and proximity of mining development.
d) Quoted as diluted in situ metric tonnes and grades. Metallurgical recovery factors have not been applied to the Mineral Resource estimates. The approximate metallurgical recovery factor is 92 %. The metallurgical recovery is the ratio, expressed as a percentage, of the mass of the specific mineral product recovered from ore treated at the process plant to its total specific mineral content before treatment. Granny Smith mining operations vary according to the mix of the source material.
e) The metal prices used for the 2021 Mineral Resources are based on a gold price of $1,500 per ounce or A$2,000 per ounce (at an exchange rate of A$1: $0.75). Open pit Mineral Resources at the Australian operations are based on revenue factor 1 pits and the underground Mineral Resources on appropriate mine design and extraction schedules. The gold price used for Mineral Resources approximates 15 % higher than the selected Mineral Reserve.
f) The cut-off grade may vary per shaft, open pit or underground mine, depending on the respective costs, depletion schedule, ore type, expected mining dilution and expected mining recovery. The average or range of cut-off grade values applied to the Mineral Resources are; Granny Smith 2.11 g/t to 3.08 g/t Au mill feed (underground) and 0.66 g/t Au (open pit).
g) The Mineral Resources are based on initial assessments at the resource gold price of $1,500/oz and consider estimates of all Granny Smith costs, the impact of modifying factors such as mining dilution and mining recovery, processing recovery and royalties. Mineral Resources are also tested through the application of Environmental, Social and Governance (ESG) criteria to demonstrate reasonable prospects for economic extraction.
h) The Mineral Resources are estimated at a point in time and can be affected by changes in the gold price, US Dollar currency exchange rates, permitting, legislation, costs and operating parameters.

Source: Granny Smith CPR, 2021

The Mineral Resources are based on initial assessments at the Mineral Resource gold price of $1,500/oz and consider estimates of all Granny Smith costs, the impact of Modifying Factors such as mining dilution and recovery, processing recovery and royalties to demonstrate reasonable prospects for economic extraction.

1.5 Mineral Reserve estimates

The Granny Smith Mineral Reserves as of 31 December 2021 are summarised by category in Table 1.2. The Mineral Reserves are 100 % attributable to Gold Fields and are net of production depletion up to 31 December 2021. The point of reference for the Mineral Reserves is ore delivered to the processing facility.

Table 1.2: Granny Smith - summary of gold Mineral Reserves at 31 December 2021 (fiscal year end) based on a gold price of $1,300/oz

.	Tonnes (kt)	Grades (g/t Au)	Gold (koz Au)	Cut-off Grades (g/t Au)	Metallurgical Recovery (%)
.Underground Mineral Reserves					
UG Proven Mineral Reserves	2,212	4.9	351	3.21	92 %
UG Probable Mineral Reserves	10,363	5.6	1,861	3.21	92 %
UG Total Mineral Reserves	12,575	5.5	2,211	3.21	92 %
.Stockpile Mineral Reserves					
SP Proven Mineral Reserves	26	5.6	5	1.03	83 %
SP Probable Mineral Reserves	-	-	-	1.03	83 %
SP Total Mineral Reserves	26	5.6	5	1.03	83 %
.Total Mineral Reserves					
Total Proven Mineral Reserves	2,239	4.9	355		
Total Probable Mineral Reserves	10,363	5.6	1,861		
Total Granny Smith Mineral Reserves 2021	12,601	5.5	2,216		
Total Granny Smith Mineral Reserves 2020	12,613	5.3	2,167		
Year on year difference (%)	-0.1%	2%	2%		

Note:
a) Rounding of figures may result in minor computational discrepancies.
b) Refer to Table 15.6 for year-on-year Mineral Reserve comparison.
c) Quoted as mill delivered metric tonnes and run-of-mine grades, inclusive of all mining dilutions and gold losses except mill recovery. Metallurgical recovery factors have not been applied to the reserve figures. The approximate metallurgical recovery factor is 92 % for underground feed. The metallurgical recovery is the ratio, expressed as a percentage, of the mass of the specific mineral product recovered from ore treated at the process plant to its total specific mineral content before treatment. The recoveries for Granny Smith vary according to the mix of the source material (e.g. oxide, transitional fresh and ore type blend) and method of treatment.
d) The metal prices used for the 2021 life of mine Mineral Reserves are based on a gold price of $1,300 per ounce or A$1,750 per ounce (at an exchange rate of A$1:$0.74). Open pit Mineral Reserves at Granny Smith are based on optimised pits and the underground operations on appropriate mine design and extraction schedules. The gold price used for Mineral Reserves is detailed in particularity in Item 19.
e) Dilution relates to planned and unplanned waste and/or low-grade material being mined and delivered to the process plant. Ranges are given for those operations that have multiple orebody styles and mining methodologies. The mine dilution factors is 11 % to 20 % (underground).
f) The mining recovery factor relates to the proportion or percentage of ore mined from the defined orebody at the gold price used for the declaration of Mineral Reserves. This percentage will vary from mining area to mining area and reflects planned and scheduled reserves against actual tonnes, grade and metal mined, with all modifying factors, mining constraints and pillar discounts applied. The mining recovery factors are 90 % to 92 % (underground).
g) The cut-off grade may vary per zone, open pit or underground mine, depending on the respective costs, depletion schedule, ore type, expected mining dilution and expected mining recovery. The average or range of cut-off grade values applied in the planning process for the Wallaby underground mine is between 2.63 g/t and 3.48 g/t Au mill feed.
h) A gold based Mine Call Factor (gold called for over gold accounted for) determined primarily on historic performance but also on realistic planned improvements where appropriate, is applied to the Mineral reserves. A Mine Call Factor of 100 % has been applied at Granny Smith.
i) The Mineral Reserves are estimated at a point in time and can be affected by changes in the gold price, US Dollar currency exchange rates, permitting, legislation, costs and operating parameters.
j) Granny Smith is 100 % attributable to Gold Fields and is entitled to mine all declared material located within the properties mineral leases and all necessary statutory mining authorisations and permits are in place or have reasonable expectation of being granted.

Source: Granny Smith CPR, 2021

The Granny Smith Mineral Reserves are the economically mineable part of the Measured and Indicated Mineral Resources based on life of mine schedules and pre-feasibility studies completed at the Mineral Reserve gold price of $1,300/oz to justify their economic viability at 31 December 2021. A pre-feasibility study has an estimated accuracy of ± 25 % with a contingency of no more than 15 %.

1.6 Capital and operating cost estimates

Capital costs for the Mineral Reserve are based on continued operation and includes underground mine development, ventilation, dewatering, power, escapeways, exploration, TSF construction and expansions. The forecast capital costs are summarised in Table 1.3.

Table 1.3: Capital costs ($ million)

	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Capital	$ million	95.4	74.9	51.9	24.8	25.4	25.7	20.5	18.7	23.3	4.0	3.3

Notes: a) The detailed capital cost schedule is presented in Table 21.1.
b) This capital summary estimate is for the Mineral Reserve life of mine schedule.
c) Closure costs are included in operating costs.

Source: Granny Smith CPR, 2021

Budgeted operating costs for the 31 December 2021 Mineral Reserve life of mine plan are summarised in Table 1.4.

Table 1.4: Operating costs ($ million)

	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Operating Cost	$ million	195.2	203.3	194.6	161.1	166.9	137.5	147.5	152.2	122.6	96.3	88.7

Notes: a) The detailed operating cost schedule is presented in Table 21.2.
b) This capital summary estimate is for the Mineral Reserve life of mine schedule.

Source: Granny Smith CPR, 2021

The operating costs covers mining, cartage, processing, onsite and offsite administration. The total excludes rehabilitation and closure costs of $65.5 million with 56.1 million being spent after 2033. The 2021 Mineral Reserve life of mine mining costs are based on the 2022 budget unit costs. In cases where there is an expected change in operating practice (mining at increased depth) in the mine that will have a material effect on costs these expected changes have been incorporated into the cost estimates.

1.7 Permitting

The key operating environmental permits for the operation are issued by Western Australian Department of Mines, Industry Regulation and Safety (DMIRS) and Department of Water and Environmental Regulation (DWER) and relate to:

- Mining Proposal which includes Land Clearing, Disturbance and Infrastructure.
- Environmental Licence.
- Native Vegetation Clearing.
- Mine dewatering (category 06).
- Water abstraction and groundwater operating strategies.
- Sewerage facility (category 54).
- Putrescible landfill site.
- Mine Closure Plan.

Gold Fields maintains a tenement management auditing system that flags lease renewals to meet the renewal process timeline and to keep the tenement ownership in good standing by meeting expenditure and other conditions.

Granny Smith has security of tenure for all current exploration and mining tenements that contribute to Mineral Resources and reserves. Granny Smith operates in compliance with relevant environmental legislation and remains compliant regarding key environmental risks, namely: tailings storage facilities, processing of ore, land disturbance, chemical blending and storage, electric power generation, sewage and landfill operations and mine dewatering. All other permitting and licensing requirements to start any future mining operation, including but not limited to, issues of Aboriginal cultural heritage, local disturbance, clearing, environmental, power and water extraction/disposal permitting, follow well established authorisation protocols with the relevant state authorities.

In 2019, a claim under the Native Title Act 1993 by the Nyalpa Pirniku People (WAD91/2019) was registered. This claim covers the entire Granny Smith mining operations. Granny Smith is currently engaged in early discussions with the Nyalpa Pirniku People under the 'right to negotiate' process with respect to certain ancillary tenure. This claim is still under determination as at December 2021. In May 2021 a Heritage Agreement was signed between Granny Smith and Nyalpa Pirniku.

Granny Smith consults with relevant Aboriginal stakeholder groups (including the Nyalpa Pirniku) to ensure that areas of Aboriginal cultural heritage are identified and recorded. Granny Smith also actively contributes to initiatives that assist the host community.

The overall closure liability for Granny Smith is currently estimated at $65.5 million.

1.8 Conclusions and recommendations

The Granny Smith Mineral Reserves currently support an 11-year life of mine plan that values the operation at $204.3 million at the reserve gold price of $1,300/oz. Granny Smith continues to discover and replace Mineral Reserves that contribute to growing the life of mine profile. Continued investment in exploration and infrastructure is justified by the positive economic analysis.

Ongoing exploration and geological interpretation suggest that the Granny Smith property has the potential to extend and replace existing Mineral Resources and Mineral Reserves. It is recommended that further exploration is carried out at the following areas which have a good probability of extending mine life:

- Wallaby Zone 135
- Wallaby Zone 150
- Granny Smith Complex.

Gold Fields' commitment to materiality, transparency and competency in its Mineral Resources and Mineral Reserves disclosure to regulators and in the public domain is of paramount importance to the Qualified Person and the Issuer's Executive Committee and Board of Directors continue to endorse the company's internal and external review and audit assurance protocols. This Technical Report should be read in totality to gain a full understanding of Granny Smith's Mineral Resource and Mineral Reserve estimation and reporting process, including data integrity, estimation methodologies, Modifying Factors, mining and processing capacity and capability, confidence in the estimates, economic analysis, risk and uncertainty and overall projected property value.

However, to ensure consolidated coverage of the company's primary internal controls in generating Mineral Resource and Mineral Reserve estimates a key point summary is provided in Item 24 for reference.

2 Introduction

2.1 Terms of reference and purpose of the Technical Report

This Technical Report was prepared for Gold Fields Limited (Gold Fields, the Company or the Issuer) in accordance with the requirements of National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101) of the Canadian Securities Administrators, in relation to the Granny Smith Gold Mine (Granny Smith), a production stage property located in Western Australia.

This Technical Report has been prepared for purposes of applicable Canadian securities laws in connection with the proposed acquisition by Gold Fields of all the issued and outstanding shares of Yamana Gold Inc. (Yamana), a company incorporated under the *Canada Business Corporations Act* (the CBCA) whose shares are listed on the Toronto Stock Exchange, the New York Stock Exchange and the London Stock Exchange, pursuant to a plan of arrangement under the CBCA (the Arrangement). The management information circular of Yamana (the Yamana Circular) for the special meeting of Yamana's shareholders to be held to approve the Arrangement will contain certain information regarding the project, including estimates of Mineral Reserves and Mineral Resources for the project effective as of December 31, 2021. In addition, upon completion of the Arrangement, Gold Fields will become a "reporting issuer" for purposes of applicable securities laws in each of the provinces and territories of Canada. Accordingly, this Technical Report has been prepared (i) to support the scientific and technical information concerning the project which will be contained in the Yamana Circular, and (ii) in connection with Gold Fields becoming a reporting issuer in such jurisdictions of Canada. It is understood that this Technical Report will be filed on the System for Electronic Document Analysis and Retrieval (SEDAR) maintained by the Canadian Securities Administrators.

The effective date of this Technical Report is 31 December 2021. This Technical Report does not purport to reflect new information regarding the project arising after such date.

In addition to this disclosure being in line with NI 43-101, the Mineral Resources and Mineral Reserves stated in this Technical Report have also been reported in accordance with the South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves (SAMREC Code 2016). SAMREC is aligned to the Committee for Mineral Reserves International Reporting Standards (CRIRSCO) Reporting Template November 2019.

2.2 Qualified Persons and details of inspection

The Qualified Persons responsible for the preparation of this Technical Report are listed in Table 2.1. All the Qualified Persons are eligible members in good standing of a recognised professional organisation (RPO) within the mining industry and have at least five years of relevant experience in the type of mineralisation and type of deposit under consideration and in the specific type of activity that the Qualified Person is undertaking on behalf of the Company at the time this Technical Report was prepared.

Qualified Person has the same meaning as Qualified Persons and vice versa within this report.

2.2.1 Certificates

Dr Julian Verbeek, FAusIMM

CERTIFICATE OF QUALIFIED PERSON

This Certificate of the Qualified Person has been prepared to meet the requirements of National Instrument 43-101 Standards of Disclosure for Minerals Projects Part 8.

a. Name, Address, Occupation

Dr Julian Verbeek FAusIMM, Geologist

Registered Office, Johannesburg: Gold Fields Limited, 150 Helen Road, Sandown, Sandton 2196.

Postnet Suite 252, Private Bag X30500, Houghton 2041

b. Title and Effective Date of Technical Report

Technical Report – National Instrument 43-101 Granny Smith Gold Mine - 2021

Effective Date: 31 December 2021

c. Qualifications

PhD Geology, University of Natal 1991.

FAusIMM

I am a geologist with 35 years relevant experience in Mineral Resource estimation in multiple commodities including gold, copper and silver in deposit styles of placer, lode gold, porphyry and epithermal. I am currently in full time employment with Gold Fields, in which I have had overseeing involvement in geology and resource estimation at the operating mines and development projects for the Issuer.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43-101 for the sections of the technical report that I take responsibility for.

d. Site Inspection

Has not attended site but has attended virtual reviews.

e. Responsibilities

I am responsible for Items 1-28 of this Technical Report.

f. Independence

I am a full time employee of Gold Fields Limited and hence not independent in accordance with the application of Section 1.5 of National Instrument 43-101.

g. Prior Involvement

I have been employed by Gold Fields since September 2021. I have not visited the GSM site but have participated extensively in virtual reviews and in person reviews at Gold Fields office in Perth.

h. Compliance with NI 43-101

I have read National Instrument 43-101 and Form 43-101F1 and the Technical Report has been prepared in compliance with the same.

i. Disclosure

As of the effective date of the Technical Report, to the best of my knowledge, information, and belief, the parts of the Technical Report that I am responsible for, contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

"Signed and sealed by Julian Verbeek"

"Julian Verbeek" Date: June 30, 2022

Dr. Julian Verbeek

Richard Butcher, CEng, Msc (Eng), FAusIMM (CP), MIMMM, MSAIMM

CERTIFICATE OF QUALIFIED PERSON

This Certificate of Qualified Person has been prepared to meet the requirements of National Instrument 43-101 Standards of Disclosure for Minerals Projects Part 8.

a. Name, Address, Occupation

Richard Butcher, CEng, FAusIMM (CP), MIMMM, MSAIMM

Registered Office, Johannesburg: Gold Fields Limited, 150 Helen Road, Sandown, Sandton 2196.

Postnet Suite 252, Private Bag X30500, Houghton 2041

b. Title and Effective Date of Technical Report

Technical Report – National Instrument 43-101 Granny Smith Gold Mine - 2021

Effective Date: 31 December 2021

c. Qualifications

Msc (mining engineering)

CEng, FAusIMM (CP), MIMMM, MSAIMM

I am a mining engineer with 41 years relevant experience in Mineral Reserve estimation, assessment, evaluation and economic extraction in gold, copper and silver. I have worked in Resources and Reserves at Barrick, MMG, **SRK, IGL** and Gold Fields for the last **25** years. I also worked at SRK and other Consultancies in estimating Resources and Reserves. I have held various corporate positions and I am currently the Chief Technical Officer for Gold Fields, in which I have had overseeing involvement in mining engineering and technical services matters at various operating mines and development projects for the Issuer.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43-101 for the sections of the technical report that I take responsibility for.

d. Site Inspection

Has attended site on the 25th May 2021.

e. Responsibilities

I am responsible for Items 1-5, 13 & 15-28 of this Technical Report.

f. Independence

I am not independent of Gold Fields Limited in accordance with the application of Section 1.5 of National Instrument 43-101.

g. Prior Involvement

During my 6-year tenure at Gold Fields I have been responsible for providing leading levels of technical standards, technical assurance, technical excellence, operational leadership, project delivery and asset optimisation, to the Issuer. I have had oversight of planning and execution of technical programs for Gold Fields to ensure that all Group technical disciplines are optimised, standardised and leveraged in a manner that delivered benefit across Gold Fields assets, operations and projects. I have had communications with and attended meetings with discipline heads at site and the corporate level.

h. Compliance with NI 43-101

I have read National Instrument 43-101 and Form 43-101F1 and the Technical Report has been prepared in compliance with the same.

i. Disclosure

As of the effective date of the Technical Report, to the best of my knowledge, information, and belief, the parts of the Technical Report that I am responsible for, contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

"Signed and sealed by Richard Butcher"

"Richard Butcher" Date: June 30, 2022

Richard Butcher

The Qualified Persons were appointed by Gold Fields. The RPO affiliation in good standing was also reviewed by Gold Fields.

Table 2.1: List of Qualified Persons

Incumbent	Employer	Position	Affiliation in good standing	Relevant experience (years)	Details of inspection	Responsibility for which Item
Dr Julian Verbeek	Gold Fields	VP Geology and Mineral Resources	FAusIMM - 207994	35	Has not attended site	This document has been prepared under the supervision of and reviewed by Julian Verbeek. Items 1-28
Richard Butcher	Gold Fields	Chief Technical Officer GFL Group Technical Services	FAusIMM CP - 211182	41	25 May 2021	Overview and review of document. Items 1-5, 12-13 & 15-28

1.

The Qualified Persons were not all able to attend site during 2021 for the Mineral Reserve and Mineral Resource reviews, however, the Mineral Reserve and Mineral Resource were reviewed according to the Item 24 descriptions. Members of the Qualified Persons team have attended site historically.

2.3 Report version update

This is the maiden Technical Report filed by Gold Fields on the Granny Smith property in Western Australia.

3 Reliance on other experts

The Qualified Person(s) has not identified any information provided by the Issuer for Granny Smith that requires noting under Item 27.

4 Property description and location

4.1 Area

Gold Fields through its wholly owned subsidiary GSM Mining Company Pty Ltd (GSM) controls mineral tenements covering a total area of 81,827 ha and a further 10,570 ha of miscellaneous and non-managed tenements.

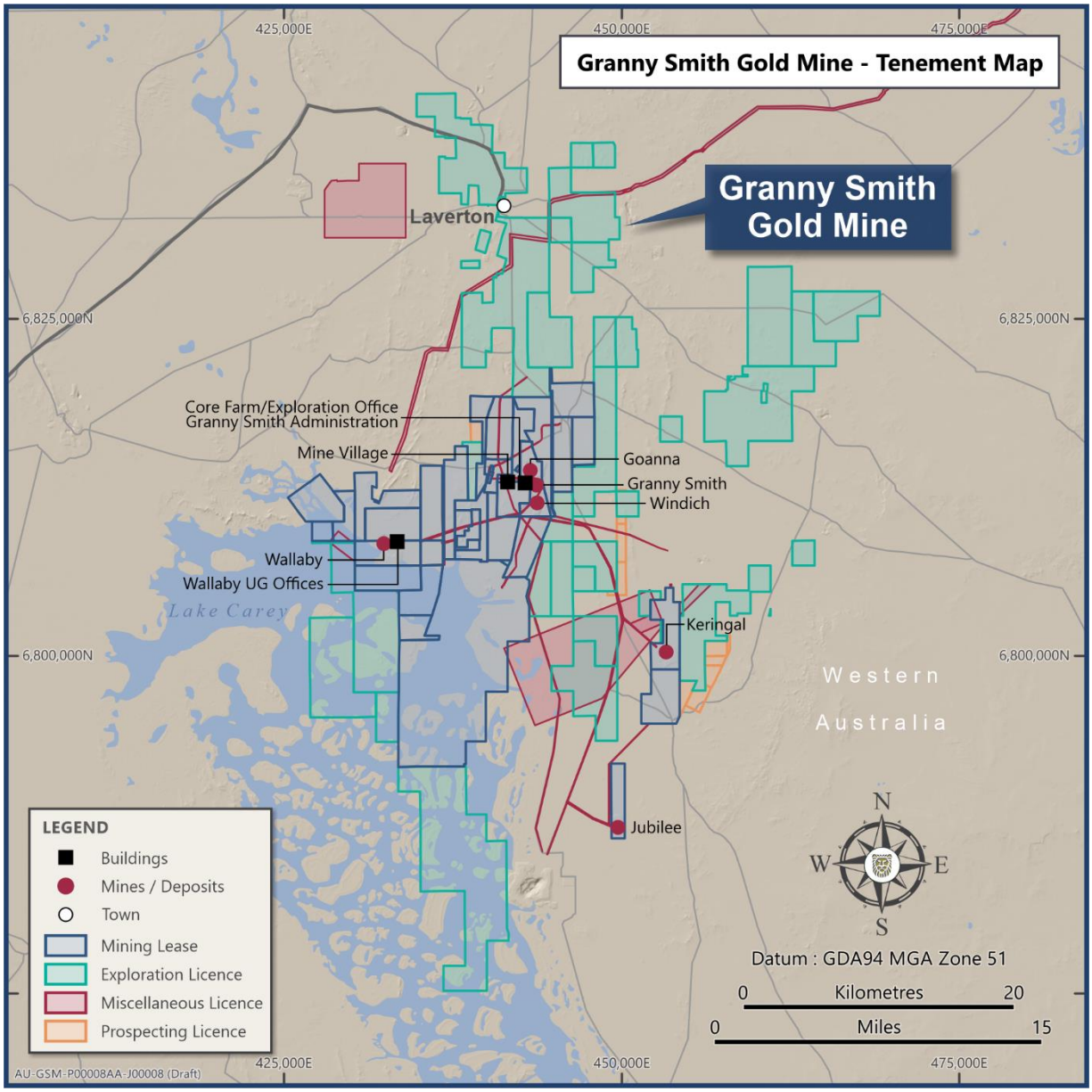
4.2 Location

Granny Smith is located 740 km northeast of Perth, the capital of Western Australia at latitude 28°51'09" S and longitude 122°18'35" E. The nearest population centre is the town of Laverton, 23 km to the north. The closet major population centre is the city of Kalgoorlie-Boulder 230 km to the south-southwest.

4.3 Type of mineral tenure

The Company has 100 % ownership of 35 granted Mining Leases, 27 granted Exploration Licences, 22 granted Miscellaneous Licences and 13 granted Prospecting Licences covering an area of 92,105 ha. A summary of the tenements is shown in Table 4.1 and illustrated in Figure 4.1.

Figure 4.1: Granny Smith tenement map



Source: Granny Smith CPR, 2021

All tenements are registered the name of Granny Smith which has security of tenure for all current exploration and mining leases that contribute to the Mineral Resources and reserves described in this report.

Granny Smith does not have freehold ownership of the mining areas.

Table 4.1: List of Granny Smith mineral tenements

Number	Grant date	Expiry date	Area (BL= blocks) (HA = hectares)	Min. annual expenditure ($)	Annual rent ($)	Reporting group	Term granted
Exploration Licences							
E38/1935	29-May-08	28-May-22	17 BL	$51,852	$8,525	Wallaby - C168/2001	5 Years (Extended)
E38/2221	23-Mar-10	22-Mar-22	3 BL	$37,037	$1,504	Central Laverton - C086/2002	5 Years (Extended)
E38/2886	17-Jun-15	16-Jun-25	3 BL	$22,222	$1,504	Central Laverton - C086/2002	5 Years (Extended)
E38/2887	15-Apr-14	14-Apr-24	10 BL	$51,852	$5,015	Central Laverton - C086/2002	5 Years (Extended)
E38/2888	23-Jan-15	22-Jan-25	10 BL	$37,037		Central Laverton - C086/2002	5 Years (Extended)
E38/2924	16-Oct-15	15-Oct-25	7 BL	$37,037	$3,510	Central Laverton - C086/2002	5 Years (Extended)
E38/2925	23-Sep-14	22-Sep-24	2 BL	$37,037	$1,003	Central Laverton - C086/2002	5 Years (Extended)
E38/3005	09-Jul-15	08-Jul-25	3 BL	$22,222	$1,504	Central Laverton - C086/2002	5 Years (Extended)
E38/3025	17-Jun-15	16-Jun-25	11 BL	$37,037	$5,516	Wallaby - C168/2001	5 Years (Extended)
E38/3052	26-Apr-17	25-Apr-22	39 BL	$43,333	$10,342	Central Laverton - C086/2002	5 Years
E38/3095	28-Mar-17	27-Mar-22	13 BL	$22,222	$3,447	Prendergast Shear - C160/2017	5 Years
E38/3149	09-Feb-18	08-Feb-23	1 BL	$7,407	$301	Prendergast Shear - C160/2017	5 Years
E38/3162	03-Jul-17	02-Jul-22	5 BL	$14,815	$1,326	Central Laverton - C086/2002	5 Years
E38/3171	13-Sep-17	12-Sep-22	1 BL	$7,407	$301	Central Laverton - C086/2002	5 Years
E38/3172	16-Mar-17	15-Mar-22	1 BL	$7,407	$301	Central Laverton - C086/2002	5 Years
E38/3180	20-Mar-17	19-Mar-22	1 BL	$7,407	$301	Central Laverton - C086/2002	5 Years
E38/3181	20-Mar-17	19-Mar-22	1 BL	$7,407	$265	Central Laverton - C086/2002	5 Years
E38/3182	20-Mar-17	19-Mar-22	3 BL	$14,815	$796	Central Laverton - C086/2002	5 Years
E38/3204	10-Jul-17	09-Jul-22	14 BL	$22,222	$3,713	Prendergast Shear - C160/2017	5 Years
E38/3214	10-Oct-17	09-Oct-22	8 BL	$22,222	$2,121	Prendergast Shear - C160/2017	5 Years
E38/3215	10-Oct-17	09-Oct-22	4 BL	$14,815	$1,061	Prendergast Shear - C160/2017	5 Years
E38/3216	31-Jul-17	30-Jul-22	1 BL	$7,407	$301	Central Laverton - C086/2002	5 Years
E38/3239	01-Dec-17	30-Nov-22	7 BL	$22,222	$1,856	Prendergast Shear - C160/2017	5 Years
E38/3241	09-Feb-18	08-Feb-23	1 BL	$7,407	$301	Prendergast Shear - C160/2017	5 Years
E38/3242	09-Feb-18	08-Feb-23	1 BL	$7,407	$301	Prendergast Shear - C160/2017	5 Years
E38/3406	13-Feb-20	12-Feb-25	5 BL	$11,111	$541	Prendergast Shear - C160/2017	5 Years
E39/1260	29-May-08	28-May-22	29 BL	$64,444	$14,543	Wallaby - C168/2001	5 Years (Extended)
Miscellaneous Licences							
L38/106	26-Sep-06	25-Sep-27	200.00000 HA		$2,919		21 Years
L38/144	12-Aug-09	11-Aug-30	150.00000 HA		$2,189		21 Years
L38/148	23-Mar-09	22-Mar-30	1.00000 HA		$15		21 Years
L38/149	12-Aug-09	11-Aug-30	4.00000 HA		$58		21 Years
L38/223	17-Jun-13	16-Jun-34	6,058.00000 HA		$2,692		21 Years
L38/292	27-Sep-18	26-Sep-39	2,961.53070 HA		$1,316		21 Years
L38/326	24-Jan-19	23-Jan-40	14.50000 HA		$0		21 Years
L38/329	20-Sep-21	19-Sep-42	240.29052 HA		$3,517		21 Years
L38/330	01-Jul-21	30-Jun-42	154.47690 HA		$2,262		21 Years
L38/48	14-Oct-92	13-Oct-22	18.00000 HA		$263		5 Years (Renewed)
L38/50	11-Aug-93	10-Aug-23	74.30000 HA		$1,094		5 Years (Renewed)
L38/51	11-Aug-93	10-Aug-23	18.80000 HA		$277		5 Years (Renewed)
L38/58	18-Jan-95	17-Jan-25	28.00000 HA		$0		5 Years (Renewed)
L38/62	17-Feb-95	16-Feb-25	176.40000 HA		$2,583		5 Years (Renewed)
L38/69	17-Sep-98	16-Sep-23	22.90000 HA		$336		5 Years (Renewed)
L38/77	23-Jun-00	22-Jun-42	11.60000 HA		$175		21 Years (Renewed)
L38/80	07-Aug-00	06-Aug-42	21.10000 HA		$321		21 Years (Renewed)
L38/88	21-Nov-00	20-Nov-42	27.70000 HA		$409		21 Years (Renewed)
L38/95	12-Jul-02	11-Jul-23	3.23209 HA		$58		21 Years
L38/99	18-Dec-03	17-Dec-24	40.12065 HA		$598		21 Years
L39/109	15-Oct-99	14-Oct-41	14.70000 HA		$219		21 Years (Renewed)
L39/31	12-Apr-89	11-Apr-24	60.07000 HA		$890		5 Years (Renewed)

Number	Grant date	Expiry date	Area (BL= blocks) (HA = hectares)	Min. annual expenditure ($)	Annual rent ($)	Reporting group	Term granted
Mining Leases							
M38/1131	11-Aug-08	10-Aug-29	486.65000 HA	$36,074	$7,936	Central Laverton - C086/2002	21 Years
M38/1136	03-Nov-09	02-Nov-30	422.75000 HA	$31,333	$6,893	Wallaby - C168/2001	21 Years
M38/1137	03-Nov-09	02-Nov-30	781.90000 HA	$57,926	$12,744	Wallaby - C168/2001	21 Years
M38/1144	28-Apr-09	27-Apr-30	581.35000 HA	$43,111	$9,484	Central Laverton - C086/2002	21 Years
M38/1145	28-Apr-09	27-Apr-30	806.75000 HA	$59,778	$13,151	Central Laverton - C086/2002	21 Years
M38/1146	23-Jun-09	22-Jun-30	800.00000 HA	$59,259	$13,037	Central Laverton - C086/2002	21 Years
M38/1280	29-Nov-18	28-Nov-39	10,245.00000 HA	$758,889	$166,956	Wallaby - C168/2001	21 Years
M38/161	24-May-88	23-May-30	787.65000 HA	$58,370	$12,841	Central Laverton - C086/2002	21 Years (Renewed)
M38/162	24-May-88	23-May-30	576.85000 HA	$42,741	$9,403	Central Laverton - C086/2002	21 Years (Renewed)
M38/167	30-Aug-88	29-Aug-30	19.44000 HA	$7,407	$326	Central Laverton - C086/2002	21 Years (Renewed)
M38/18	16-Oct-84	15-Oct-26	8.73400 HA	$7,407	$147	Central Laverton - C086/2002	21 Years (Renewed)
M38/191	13-Oct-88	12-Oct-30	993.25000 HA	$73,630	$16,199	Central Laverton - C086/2002	21 Years (Renewed)
M38/205	03-Mar-89	02-Mar-31	553.30000 HA	$41,037	$9,028	Central Laverton - C086/2002	21 Years (Renewed)
M38/253	04-Dec-89	03-Dec-31	60.88000 HA	$7,407	$994	Central Laverton - C086/2002	21 Years (Renewed)
M38/287	11-Sep-90	10-Sep-32	316.85000 HA	$23,481	$5,166	Central Laverton - C086/2002	21 Years (Renewed)
M38/288	11-Sep-90	10-Sep-32	870.85000 HA	$64,519	$14,194	Central Laverton - C086/2002	21 Years (Renewed)
M38/361	07-Sep-93	06-Sep-35	994.00000 HA	$73,630	$16,199	Central Laverton - C086/2002	21 Years (Renewed)
M38/362	07-Sep-93	06-Sep-35	999.10000 HA	$74,074	$16,296	Central Laverton - C086/2002	21 Years (Renewed)
M38/380	04-Feb-94	03-Feb-36	9.71900 HA	$7,407	$163	Central Laverton - C086/2002	21 Years (Renewed)
M38/389	25-Oct-94	24-Oct-36	558.50000 HA	$41,407	$9,110	Central Laverton - C086/2002	21 Years (Renewed)
M38/397	20-Oct-98	19-Oct-40	975.85000 HA	$72,296	$15,905	Central Laverton - C086/2002	21 Years (Renewed)
M38/440	20-Oct-98	19-Oct-40	315.15000 HA	$23,407	$5,150	Central Laverton - C086/2002	21 Years (Renewed)
M38/483	25-Nov-98	24-Nov-40	552.80000 HA	$40,963	$9,012	Central Laverton - C086/2002	21 Years (Renewed)
M38/525	20-Oct-98	19-Oct-40	240.35000 HA	$17,852	$3,927	Central Laverton - C086/2002	21 Years (Renewed)
M38/532	10-Jan-08	09-Jan-29	786.30000 HA	$58,296	$12,825	Central Laverton - C086/2002	21 Years
M38/533	10-Jan-08	09-Jan-29	878.30000 HA	$65,111	$14,324	Central Laverton - C086/2002	21 Years
M38/560	18-Nov-08	17-Nov-29	928.70000 HA	$68,815	$15,139	Wallaby - C168/2001	21 Years
M38/593	18-Jan-08	17-Jan-29	455.90000 HA	$33,778	$0	Wallaby - C168/2001	21 Years
M38/690	02-Mar-00	01-Mar-42	901.10000 HA	$66,815	$14,699	Wallaby - C168/2001	21 Years (Renewed)
M38/691	02-Mar-00	01-Mar-42	300.50000 HA	$22,296	$4,905	Wallaby - C168/2001	21 Years (Renewed)
M38/692	02-Mar-00	01-Mar-42	901.60000 HA	$66,815	$14,699	Wallaby - C168/2001	21 Years (Renewed)
M38/725	13-Jan-03	12-Jan-24	985.15000 HA	$73,037	$16,068	Wallaby - C168/2001	21 Years
M38/726	18-Jan-08	17-Jan-29	981.05000 HA	$72,741	$0	Wallaby - C168/2001	21 Years
M38/744	18-Jan-08	17-Jan-29	220.20000 HA	$16,370	$0	Wallaby - C168/2001	21 Years
M38/849	10-Feb-09	09-Feb-30	894.90000 HA	$66,296	$14,585	Wallaby - C168/2001	21 Years
Prospecting Licences							
P38/4181	29-Mar-17	28-Mar-25	44.97000 HA	$1,481	$110	Central Laverton - C086/2002	4 Years (Extended)
P38/4182	04-Apr-16	03-Apr-24	196.00000 HA	$5,807	$479	Central Laverton - C086/2002	4 Years (Extended)
P38/4183	04-Apr-16	03-Apr-24	189.76000 HA	$5,630	$464	Central Laverton - C086/2002	4 Years (Extended)
P38/4190	02-Jun-16	01-Jun-24	132.20000 HA	$3,941	$325	Central Laverton - C086/2002	4 Years (Extended)
P38/4208	16-Apr-18	15-Apr-22	193.75000 HA	$5,748	$474	Prendergast Shear - C160/2017	4 Years
P38/4342	07-Dec-17	06-Dec-21	166.00000 HA	$4,919	$406	Prendergast Shear - C160/2017	4 Years
P38/4343	07-Jul-17	06-Jul-25	138.45250 HA	$4,119	$340	Prendergast Shear - C160/2017	4 Years (Extended)
P38/4344	07-Jul-17	06-Jul-25	27.89730 HA	$1,481	$68	Prendergast Shear - C160/2017	4 Years (Extended)
P38/4345	07-Jul-17	06-Jul-25	25.98410 HA	$1,481	$64	Prendergast Shear - C160/2017	4 Years (Extended)
P38/4407	14-Nov-17	13-Nov-21	40.43960 HA	$1,481	$100	Wallaby - C168/2001	4 Years
P38/4423	08-Feb-18	07-Feb-22	184.70150 HA	$5,481	$452	Prendergast Shear - C160/2017	4 Years
P38/4424	08-Feb-18	07-Feb-22	103.16850 HA	$3,081	$254	Prendergast Shear - C160/2017	4 Years
P38/4513	02-Jul-21	01-Jul-25	2.01076 HA	$1,481	$24	Wallaby - C168/2001; Wallaby - C168/2001	4 Years

Note: a) The Qualified Persons opinion is that licences and tenements can be renewed or extended as require.

Source: Granny Smith CPR, 2021

4.4 Ownership

The Company via its wholly owned subsidiary GSM (Australian Company Number 165 235 030) controls prospecting, exploration, mining, miscellaneous and non-managed tenements. The tenements are grouped into four major areas: Wallaby, Central Laverton, Barnicoat and Prendergast. Granny Smith has 100 % interest in all mineral rights on these leases, including 10,278 ha of miscellaneous licences for mine infrastructure such as pipelines and power lines. Granny Smith also has an interest in a further two tenements under the Merolia Joint Venture covering 291 ha. Granny Smith does not manage the joint venture tenements.

4.5 Mineral rights description

The operation of mining and associated activities at Granny Smith are governed by numerous Western Australian Government Acts.

The Western Australian Mining Act 1978 (WA) (the Mining Act (1978)) is the principal legislation governing exploration and mining on land in Western Australia. Licences and leases for, among other things, prospecting, exploration and mining must be obtained pursuant to the requirements of the Mining Act (1978) before the relevant activity can begin. Application fees and annual rental payments are payable in respect of each tenement. Where Native Title has not been extinguished, Native Title legislation may apply to the grant of tenure and some subsequent administrative processes. Heritage legislation may operate to preclude or regulate the disturbance of a particular area.

Prospecting licences are granted over a maximum area of 200 ha and have an initial period of four years and can be extended by one period of four years. Exploration Licences are granted for five years plus a possible extension of five years and further periods of two years thereafter with 40 % per cent of ground to be surrendered at the end of year six.

If the holder of a Prospecting or Exploration Licence establishes indications of an economic mineral deposit and expends a minimum level of investment, it may apply for a Mining Lease which gives the holder exclusive mining rights with respect to all minerals on the property. It is possible for one party to own the surface of the property and for another to own the mineral rights.

An application for a Mining Lease must be accompanied by one of the following:

- A Mining Proposal completed in accordance with the guidelines.
- A statement of mining operations and a mineralisation report prepared by a Qualified Person.
- A statement of mining operations and a resource report that complies with the JORC Code that has been made to the Australian Securities Exchange (ASX).

The maximum initial term of a Mining Lease is 21 years, and the holder has the right to renew the lease for a further period of 21 years. Subsequent renewals are subject to the minister's discretion and the lease can only be assigned with the consent of the relevant minister.

Prescribed minimum annual expenditure commitments and activity reporting requirements apply to holders of Exploration and Prospecting Licences and Mining Leases.

Miscellaneous Licences are granted for purposes such as a roads, infrastructure and pipelines.

Mining operations on tenements in Western Australia must be developed and operated in compliance with various Commonwealth and State legislative requirements.

The operation of Granny Smith is under the control of the following Western Australian Government legislation.

- Mining Act (1978)
- Environmental Protection Act (1986) and Environmental Protection Amendment Act (2004)
- Contaminated Sites Act (2003)

- Environmental Protection (Clearing of Native Vegetation) Regulations (2004)
- Rights in Water and Irrigation Act (1914)
- Conservation and Land Management Act (1984)
- Wildlife Conservation Act (1950)
- Country Areas Water Supply Act (1947)
- Aboriginal Heritage Act (1972)
- Heritage of Western Australia Act (1990)
- Environmental Protection Regulations (1987)
- Environmental Protection (Unauthorised Discharge) Regulations (2004)
- Mining Rehabilitation Fund Act (2012).

The operation of Granny Smith is also under the authority of the following Commonwealth of Australia Government legislation.

- Environmental Protection and Biodiversity Conservation Act (1999)
- National Greenhouse and Energy Reporting Act (2007).

The governing Western Australian agencies are the Department of Water and Environmental Regulation (DWER), the Department of Planning, Lands and Heritage (DPLH) and the DMIRS.

Mineral royalty rates are prescribed under the Mining Regulations 1981. For gold, an ad valorem royalty rate of 2.5 % is applied.

Granny Smith also holds regulatory licences and registrations that govern various aspects of environmental management as disclosed in Item 20.

4.6 Royalties, back-in rights, payments, or other agreements and encumbrances

GSM also has an interest in a further two mining tenements covering 291 ha under the Merolia Joint Venture with Focus Minerals. Under the Joint Venture, Granny Smith has a free-carried 5 % interest in the tenements until a decision to mine is made, at which point Granny Smith will be required to contribute to Joint Venture expenditure, or dilute out of the Joint venture completely.

Other regulatory requirements including those associated with the operation and management of mining, rehabilitation and exploration activities are managed under the Mining Act (1978) in the form of tenement conditions administered by the DMIRS.

Section 20 discloses the remediation and reclamation guarantees that are pertinent to Granny Smith.

GSM received no fines during 2021.

4.7 Environmental liabilities

Mineral rights and/or mining rights are subject to the necessary approvals and permits discussed in Item 20.

4.8 Permits

Mineral rights and/or mining rights are subject to the necessary approvals and permits discussed in Item 20.

4.9 Other significant factors and risks

There are no other significant factors and risks that may affect access, title, or the right or ability to perform work on the property.

If mine expansions are required into areas currently held under an Exploration Licence, conversion to a Mining Lease is required prior to the commencing mining. This may also trigger negotiations under the Native Title Act 1993 with the relevant Traditional Owners, which must be undertaken prior to the grant of tenure. Aboriginal cultural heritage consultation, surveys and approvals are required for most mining and exploration activities, which requires engagement with relevant Traditional Owners. In most cases, agreements exist to facilitate this process. The permitting and licensing requirements required to start a new mining operation (or expand or modify existing operations) may also include local disturbance, clearing, environmental, power, water extraction and waste disposal, which follow well established authorisation protocols with the relevant government authorities.

The Qualified Persons are not aware of any other current or pending legal matters that may have an influence on the rights to explore or mine for minerals at Granny Smith. The Qualified Person has relied on information provided by the Issuer in preparing its findings and conclusions regarding other significant factors and risks.

A review of recent Company public disclosure documents including the annual report (for the 12 months ended 31 December 2021) do not contain any statements by the directors on any legal proceedings or other material conditions (other than as set out above) that may impact on the Company's ability to continue mining or exploration activities at Granny Smith.

5 Accessibility, climate, local resources, infrastructure and physiography

5.1 Topography, elevation, and vegetation

The topography of Granny Smith is characterised by low relief containing only a few low ridges with elevations ranging from 400 m to 420 m above sea level. The most significant geomorphological feature of the area is the 750 km² Lake Carey salt lake. The area is sparsely vegetated by mainly acacia species with larger eucalyptus adjacent to creeks.

5.2 Access

Access to Granny Smith is via the unsealed Mt Weld Road from the town of Laverton (Figure 4.1). Laverton is 390 km by sealed road from the city of Kalgoorlie-Boulder. The Wallaby operations are 13 km by road to the southwest of the Granny Smith process plant.

5.3 Proximity to population centre and transport

The nearest population centre is the town of Laverton, 23 km to the north with a population of 1,217 as at 2017. The closet major population centre is the city of Kalgoorlie-Boulder (population of ~30,000) 230 km to the south-southwest. Laverton is 390 km and 950 km by sealed road from the cities of Kalgoorlie-Boulder and Perth respectively. Granny Smith is serviced by private charter flights from Perth to Laverton airport, four days a week.

5.4 Climate and length of operating season

The climate is classified as semi-arid with temperatures ranging from an average minimum of 15 °C in July to an average maximum of 36 °C in January. Temperature extremes range from below freezing on winter nights to above 45 °C on summer days.

Mean annual rainfall is 275 mm and although the mean monthly rainfall is relatively consistent, high rainfall events can occur during late summer and early autumn due to remnant cyclonic activity. However, these events are relatively rare and have little effect on mine operations.

The most reliable rains occur in winter from cold fronts arriving from the west, and cloud bands from the northwest. January and February are the wettest months with an average of above 40 mm. Evaporation rates are high and there are no naturally occurring perennial lakes, streams or rivers in the region.

No extreme climate conditions are experienced that materially affect operations.

5.5 Infrastructure

Granny Smith is currently an underground gold mining operation with associated infrastructure and facilities that operate year-round. In addition to the Wallaby underground mine accessed by decline, major infrastructure owned and operated by Granny Smith includes a 3.5 Mt per annum carbon-in-pulp (CIP) process plant, tailings storage facility (TSF), haul roads, administration centres and an accommodation village Figure 5.1).

Other significant facilities include:

- Reagent storage and mixing facilities.
- Process laboratory.
- Process maintenance and warehouse facilities.
- Power generation plant and substation.
- Fuel storage.
- Raw water tanks and reverse osmosis water treatment system.
- Process water storage pond.
- Airstrip.
- Borefields.
- Paste plant.

Additional administration offices (mine engineering, geology, mine safety and training), a mine equipment workshop, warehouse and core yard are located at the Wallaby mine.

The main gas fired power station is located approximately halfway between Granny Smith and Wallaby. A new hybrid power system, comprising more than 20,000 solar panels (7 MW capacity) supported by a 2 MW/1 MWh battery system was commissioned in 2020 to supplement the existing gas power station.

In 2021 Granny Smith signed a Water Agreement with Mt Weld Mining to continue freshwater supply until October 2023. Granny Smith owns and maintains the infrastructure (including powerlines, production bores, monitoring bores, pumps and pipelines) associated with the Mt Weld Bore field while suppling water to Mt Weld Mining and Granny Smith.

An additional freshwater source, North Keringal Borefield, is under construction with production bores, monitoring bores, roads and power lines scheduled for completion in Q1 2022. This water source will supply up to 1 Gl of freshwater per year. An additional Stage 2 North Keringal Borefield is currently in planning phase and is expected to be able to supply an additional 1 Gl per year for Granny Smith.

The 950 room accommodation village is located 1.5 km west of the process plant.

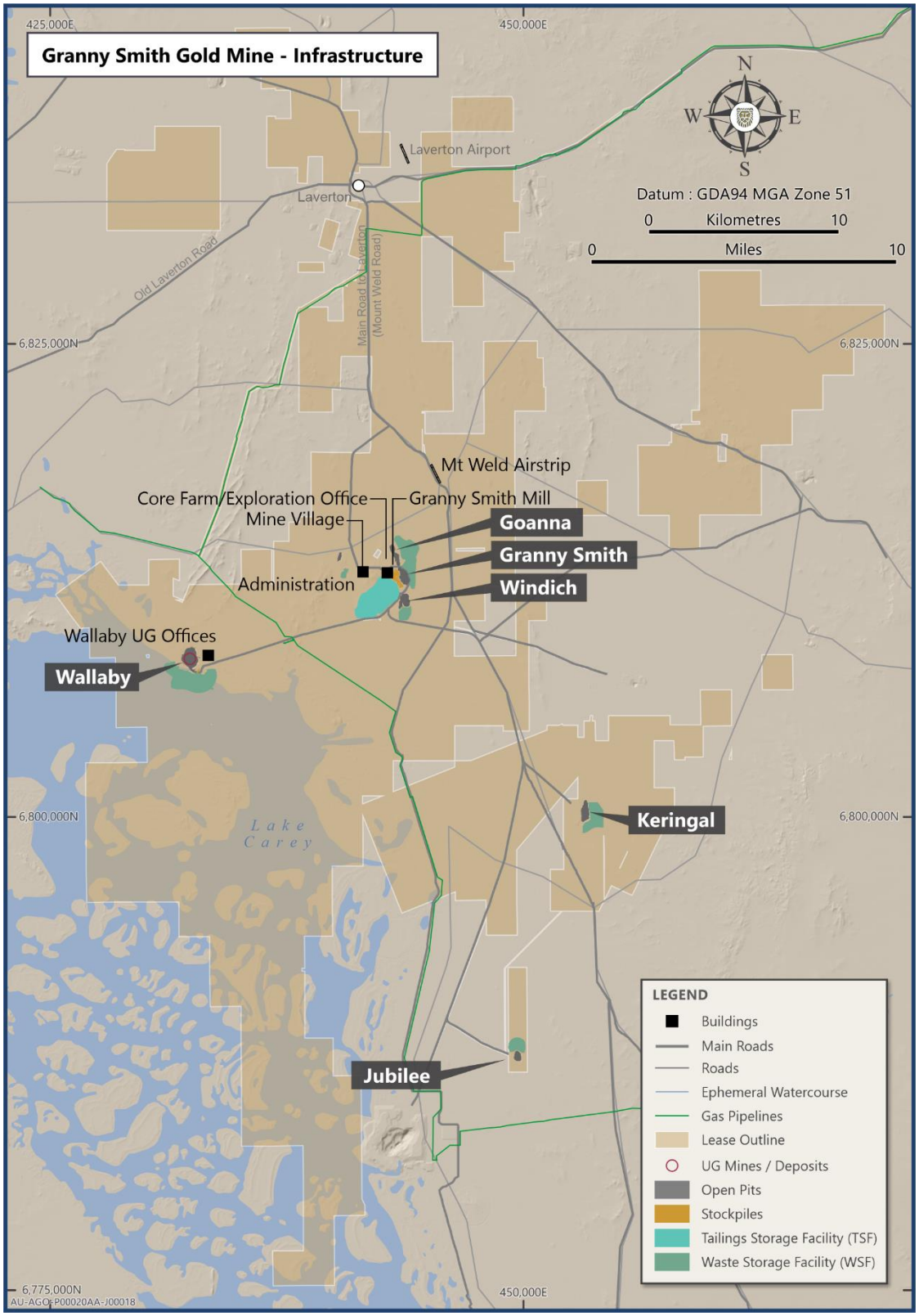
The majority of the Granny Smith workforce are fly-in fly-out (FIFO) from Perth with a small number of employees residing in Laverton and Kalgoorlie. Work rosters are predominantly based on eight days on, six days off cycles; however, some contractors operate on longer rosters such as two weeks on, one week off.

Supplies are delivered to site via road transport from either Kalgoorlie or Perth via Mt Weld Road.

Further details regarding the infrastructure are provided in Item 18.

The nearest population centre is the town of Laverton, 23 km to the north, with a population of 1,217 as at 2017. Facilities at Laverton include an airstrip, accommodation, police station, hospital, general store, supermarket, post office, service station, school, library, aquatic centre and hotel. The closest major population centre is the city of Kalgoorlie-Boulder.

Figure 5.1: Granny Smith operating sites and infrastructure



Source: Granny Smith CPR, 2021

6 History

Gold was first identified and pegged in the Granny Smith area by prospector Raymond Smith in 1979. Following a series of exploration joint ventures, significant bedrock gold mineralisation was identified by Canyon Resources Ltd in 1982. The tenements were subsequently acquired by Delta Gold NL in 1983. At around the same time, CSR Limited identified gold mineralisation on the adjoining tenements and a joint venture was formed with Delta Gold in 1984. Drilling programs completed between 1985 and 1988 outlined the Windich, Granny and Goanna gold deposits.

In 1988, CSR sold its interest to Placer Pacific Ltd (60 %) with the remaining 40 % held by Delta Gold.

In 1989, a feasibility study was completed, and production commenced at the Granny Smith pit and continued concurrently with the development of Goanna, Windich and other nearby satellite pits. The Wallaby deposit was discovered in 1998 following the acquisition of the adjoining ground from Newcrest Mining Ltd in 1992. First open pit ore was mined in 2001 and underground operations commenced in December 2005.

Barrick Gold acquired Placer Dome in 2006 and Gold Fields acquired 100 % of Granny Smith in Q4 2013 as part of its purchase of Barrick Gold's Yilgarn South operations. At Wallaby, underground exploration drilling in 2021 continued to expand the footprint of the Zone 135 lodes, the deepest planned mining area at ~1,450 m below surface. Exploration drilling is ongoing down to Zone 150, along with regional exploration programs evaluating other high-quality surface exploration targets.

The Qualified Person is of the opinion that the historic exploration results have been superseded and supplemented by more recent exploration undertaken by Gold Fields for areas of current interest and that any historic errors or deficiencies will have little influence on the current Mineral Resource models or the life of mine Mineral Reserves.

7 Geological setting and mineralisation

Granny Smith is in the Kurnalpi Terrane of the Archean Yilgarn Craton, a 2.7 Ga granite-greenstone terrane in southern Western Australia.

7.1 Regional geology

At a regional scale, the host greenstone belt is dominated by the Mt Margaret Dome in the northwest and the Kirgella Dome in the southeast (Figure 7.1). These domes are flanked to the east and west by north-northwest striking shear zones of the Laverton Tectonic Zone, with the central zone between the two domes being dominated by north to north-northeast striking sigmoidal shear zones. These distinctly different strikes to the shear zones developed early in the tectonic evolution and resulted in a favourable architecture for late-stage orogenic gold mineralisation.

7.2 Local geology

The stratigraphy of the Laverton region is defined broadly by a mafic–ultramafic succession overlain by an intermediate volcanic succession, which in turn, is overlain by siliciclastic basin successions (e.g. Granny Smith Basin and the Wallaby Conglomerate) and intruded by temporally and chemically distinct suites of felsic to mafic intrusive rocks (Figure 7.2). A significant unconformity occurs between the intermediate volcanic succession and the overlying siliciclastic basins.

The basin forming mechanisms are the source of much debate, varying from remnants of a region-wide basin, perched basins developed in a fold and thrust belt, to extensional basins. There are two distinctly different types of basin successions; one forming linear geometries such as the Mt Lucky Conglomerate, and a second type; the Wallaby Conglomerate, that wraps around the southern margin of the Mt Margaret Dome.

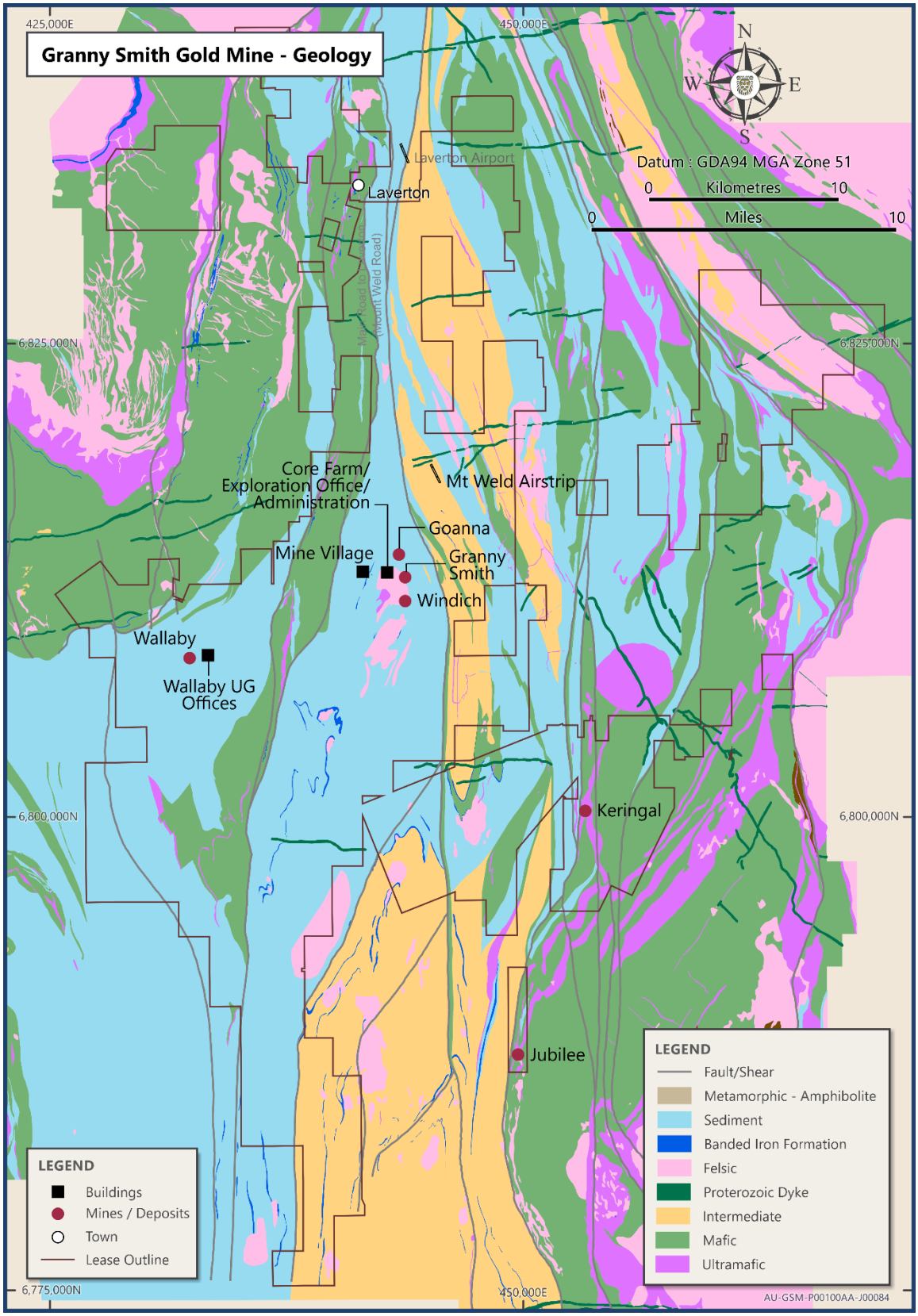
7.3 Mineralisation

7.3.1 Granny Smith corridor

The Granny Smith gold deposits (including the Windich, Granny and Goanna lodes) occur along a north-trending structural corridor (Figure 7.3). The eastern contact zone of a granitoid intrusion within the metasedimentary rocks is the locus of the Granny Smith corridor mineralisation. The metasedimentary rocks consist of quartz-rich greywacke, lithic wacke and minor shale, and sandstone interbeds, with a basal conglomerate of clasts of shale, quartz, quartzite, banded iron formation (BIF) and feldspar-phyric volcanic rocks.

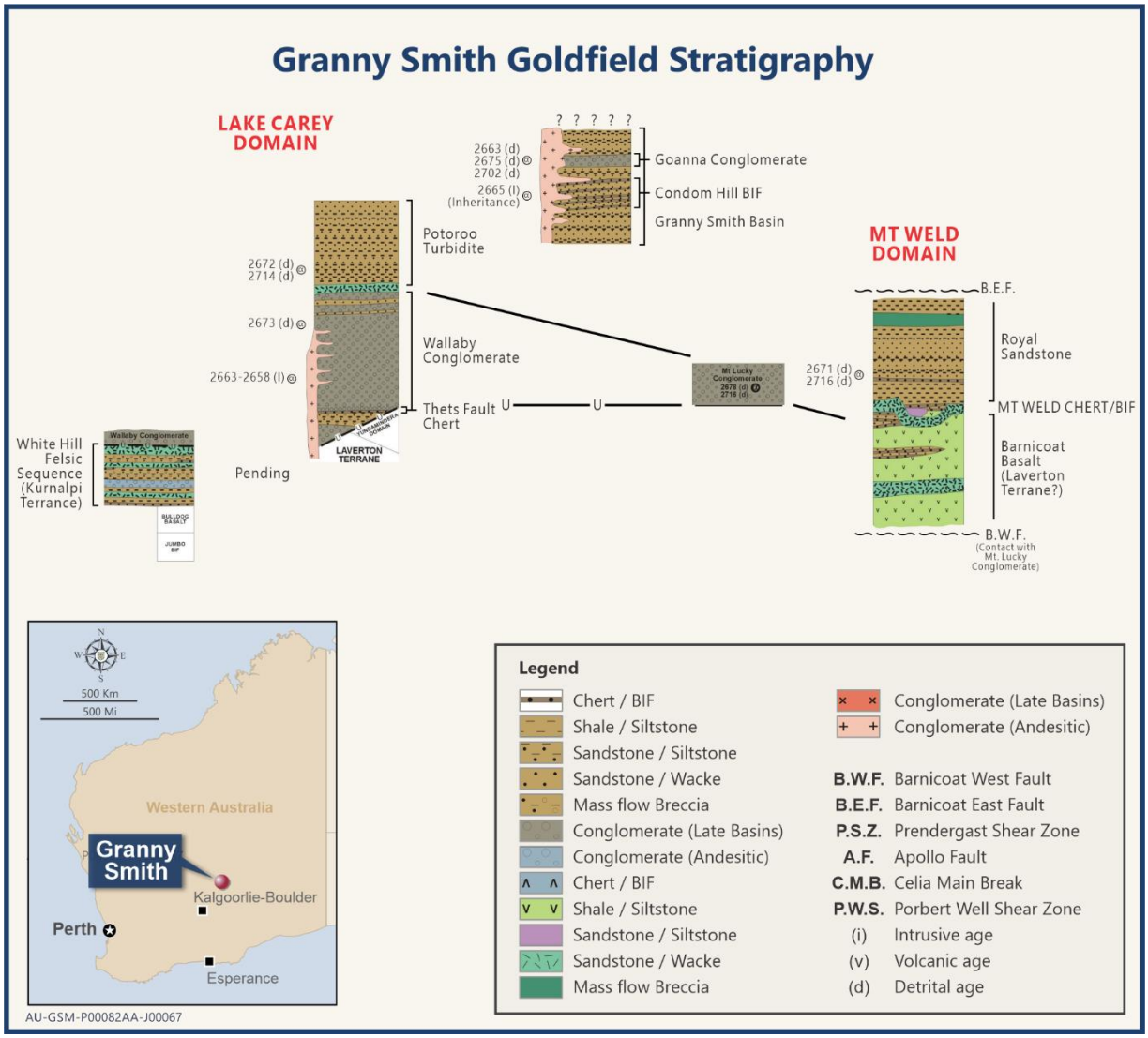
The Granny Smith granodiorite is a small (2 km × 5 km) elongate pluton which is porphyritic and has mafic-rich margins. Aplitic pegmatite dykes, which only cut the granitoid, represent the last magmatic phase. The present erosional level is close to the roof of the pluton, and in places has a thin cap of sedimentary rocks.

Figure 7.1: Granny Smith – regional geology



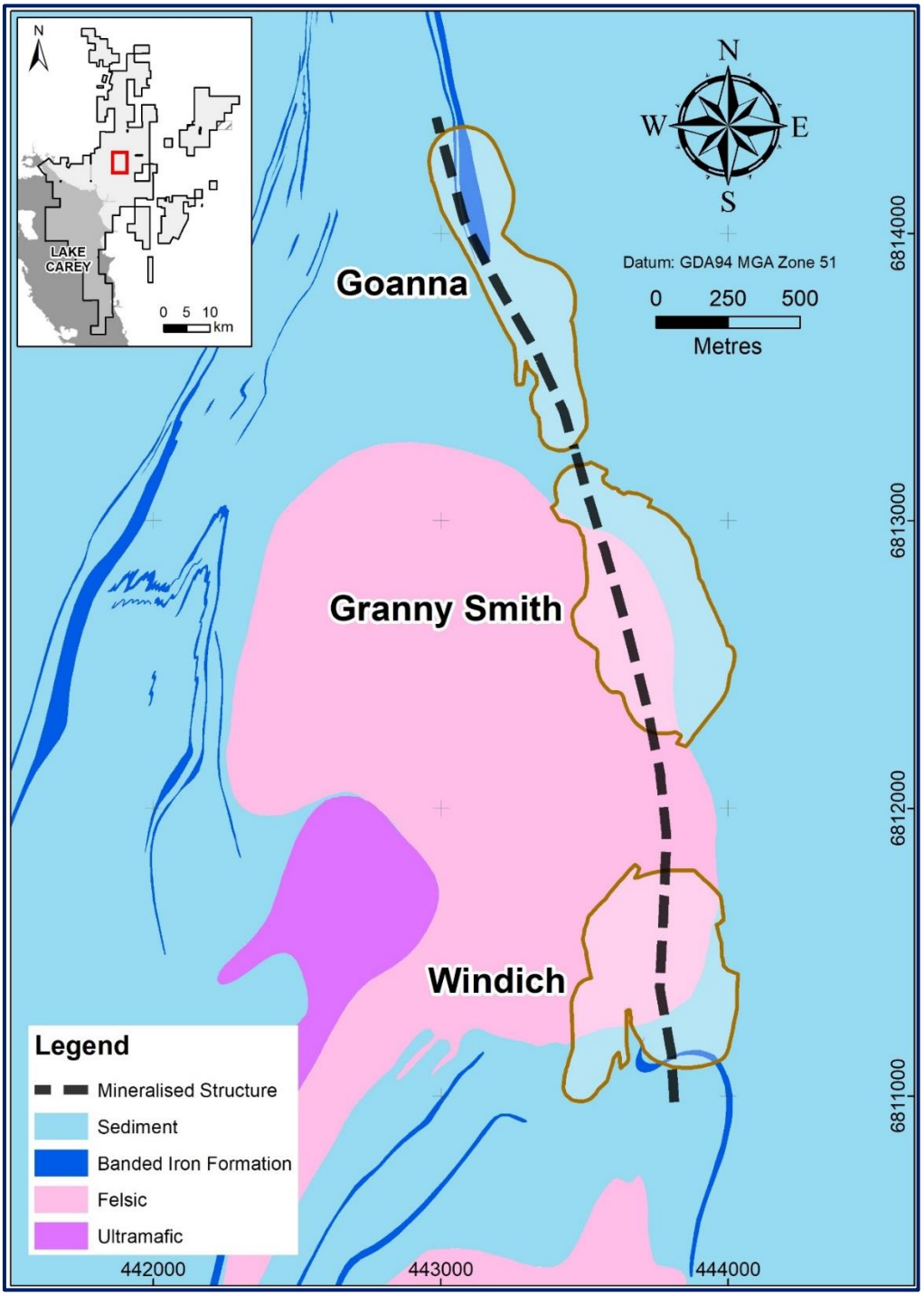
Source: Granny Smith CPR, 2021

Figure 7.2: Granny Smith – stratigraphic section



Source: Granny Smith CPR, 2021

Figure 7.3: Geology of the Granny Smith mineralised corridor



Source: Granny Smith CPR, 2021

The pluton is surrounded by a 200 m-300 m wide contact metamorphic aureole that is progressively zoned from the granitoid contact outwards through a several metres-wide hornfelsed margin, to an andalusite-bearing slate, and finally to a slate with mica spots. Intrusive breccias and miarolitic cavities suggest a high-level intrusion, where a volatile phase was exsolved from the magma during or after high-level emplacement. The granitoid and gold mineralisation are cut by carbonatite and lamprophyre dykes. Late-stage plagioclase porphyry dykes have also intruded into the sedimentary sequence.

Gold mineralisation within the Granny Smith corridor is closely associated with a north-south striking and shallow east-dipping reverse (thrust) fault zone that partly follows the contact between the granitoid and host sedimentary sequence. Some of the porphyry dykes in the sedimentary sequence and their contacts are also mineralised. Mineralisation occurs along a strike length of 3.7 km and has been observed up to 850 m down dip on the main east dipping lodes but remains open at depth. Conjugate west dipping lodes extend up to 350 m off the main trend at intermittent intervals and are more regular at the southern (Windich) end of the Granny Smith corridor.

The gold mineralisation follows the granitoid contact where it dips at low angles (<50°). Some of the highest grades are recorded from the sediments just above the intrusive contact where the contact is shallow dipping and irregular. However, where the dip of the contact is greater, mineralisation occurs either in the granitoid or roughly follows bedding in the sedimentary rock. Mineralisation within the granitoid, is confined to a sub-horizontal zone that can be up to 60 m thick.

Brittle and brittle-ductile deformation has occurred in the granitoid and sedimentary units respectively. Two stages of alteration associated with gold mineralisation are recognised in the Granny and Windich deposits. These include:

- Earlier hematite alteration and sericite-carbonate overprinting alteration. The widespread and pervasive hematite alteration is exhibited as a hematite dusting of the feldspars in the granitoid.
- Fracture controlled sericite-carbonate alteration in the alteration envelopes of a network of thin millimetre-scale ankerite-quartz breccia veins, which represents the main mineralisation stage.

Gold occurs in both the veins and alteration haloes. Gold grade is strongly correlated with the intensity of associated pyrite alteration, and typical high-grade ore is a thoroughly brecciated and bleached, ankerite-pyrite-silica±sericite altered rock. Pyrite is the main sulphide phase; however, there is minor pyrrhotite, chalcopyrite, galena, sphalerite and arsenopyrite. Gold, silver and lead tellurides occur mainly in rare late-stage quartz-ankerite veins.

At Windich, the gold mineralisation occurs in both the granitoid and sedimentary units. The controls on mineralisation are similar to those at the Granny deposit; however, the dip of the contact is generally steeper with a wider zone of low-grade mineralisation in the granitoid.

Goanna is the northernmost and smallest of the three deposits within the Granny Smith corridor. The deposit is entirely within the sedimentary units, with more banded iron formation and no conglomerate units. The gold mineralisation is hosted predominantly by coarser grained sedimentary units, with the mineralised (alteration) zone approximately 5 m thick but can be up to 15 m thick. The highest gold grades occur where the moderately east dipping, reverse fault intersects BIF in the hangingwall. The gold mineralisation is associated with intense pervasive alteration consisting of silica-pyrite ± Fe-carbonate-sericite-albite. Veining (quartz-carbonate) within the mineralised zones is generally absent.

7.3.2 Wallaby

The Wallaby gold deposit is hosted within a thick matrix-supported, mafic conglomerate unit (Wallaby conglomerate) that dips moderately to the southeast and is intruded by a suite of fractionated alkaline dykes on the south-eastern margin of the Mt Margaret Dome. Regional-scale structures near the deposit include:

- Dominant north-south trending, near vertical fault systems such as the Chatterbox Fault.
- East-northeast trending faults, dipping moderately to steeply to the south.

The Chatterbox Fault is hypothesized as one of the main structures that control the location of the Wallaby deposit. The east-northeast faults are interpreted as extensional faults developed during basin growth that were later inverted. One of the largest of these structures, Thet's Shear, is a 250 m wide zone of intense alteration and ductile deformation that underlies the Wallaby deposit

The alkaline dyke suite in the core of the Wallaby gold deposit displays increasing fractionation from an early-stage northeast trending mafic monzonite through to monzonite, followed by syenite, syenite porphyry, and late-stage carbonatite. The intrusives are concave in profile, stacked one above the other, plunge 50 º to the south and are inferred related to the intersection of north-south and northeast trending structures. Late-stage post-mineralisation lamprophyres occur as narrow east-northeast trending vertical dykes.

A 600 m × 800 m wide zone consisting of actinolite-magnetite-calcite ± epidote ± pyrite alteration affects the intrusives and conglomerates and forms a broadly pipe-shaped body dipping approximately 50 º to the south. Early magmatic intrusions such as mafic monzonite and monzonite are overprinted by the actinolite-magnetite-calcite alteration, while younger syenite and porphyritic syenite intrusions are unaltered. This suggests that some intrusions predate or are synchronous with the main alteration event.

The distal alteration assemblages comprise chlorite, calcite and magnetite, with the magnetite content decreasing with distance from the centre of the pipe.

The actinolite-magnetite-calcite alteration event is accompanied by the formation of generally <20 cm calc-silicate veins that comprise assemblages of mostly andradite garnet and clinopyroxene and abundant carbonate-rich veins up to 1 m thick, with variable amounts of biotite, magnetite and garnet.

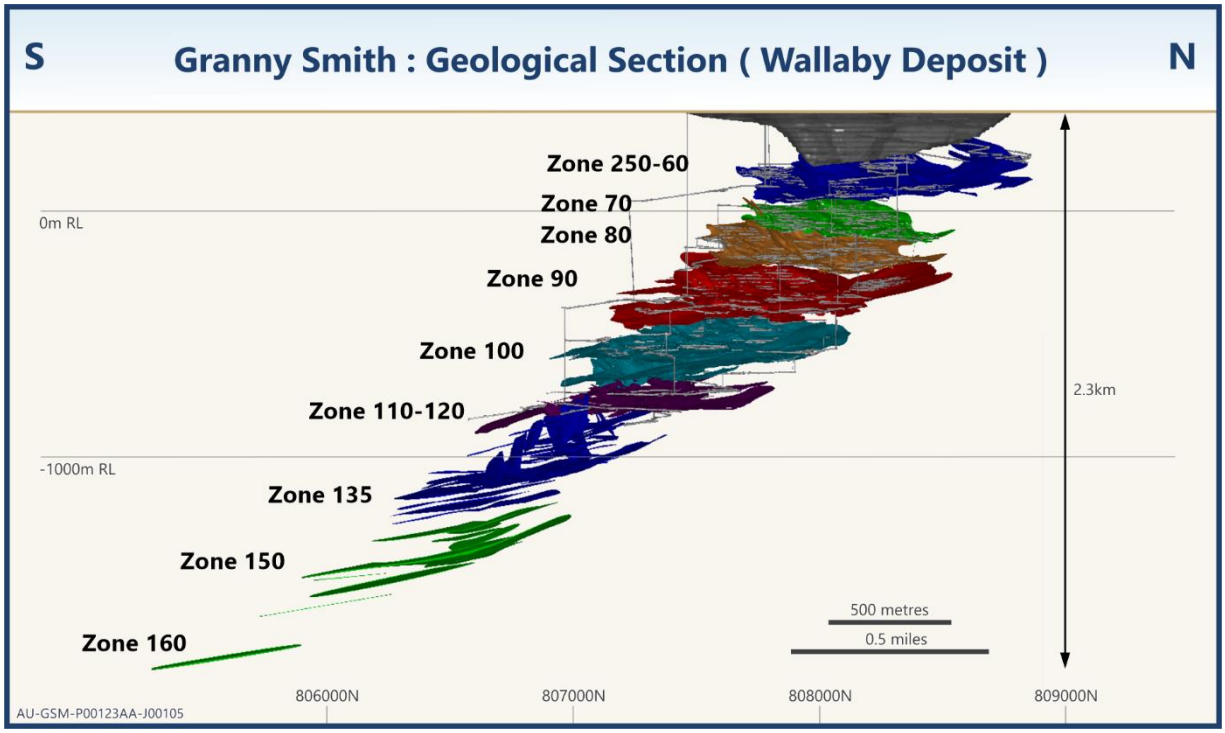
Four dominant gold-related structural domains are identified in the Wallaby deposit:

- Fracture mesh lodes developed at the intersections of brittle structures (faults and veins), dip and strike changes along structures, and gold mineralisation linked to the development of laminated and quartz breccia veins. These develop due to the intersection of primary fault structures or between closely spaced primary fault structures via linking extension veins (tension gashes). The primary fault structures (or backbone structures) are identified by the existence of parallel laminated quartz veins (1-5 cm wide) and strong dolomite alteration adjacent to these faults.
- Horsetail domain lodes developed where the lode fault diverges into multiple faults with extensive extension veins formed between the faults. The mineralisation-related alteration is restricted to discrete zones around the faults, with the bulk of the wallrock containing barren actinolite-magnetite alteration. The horsetail domain is viewed as a small fractal version of the main fracture mesh lodes.
- Ductile shear-controlled gold lodes resulting from the intersection between brittle structures and earlier ductile shears and cleavages associated with north oriented shearing. The lodes are marked by a series of discrete anastomosing brittle faults that have minimal parallel veining with extensive mineralisation between these structures. The mineralisation is variably developed with gradational alteration contacts following the ductile shears away from the lodes.
- Hematite associated gold lodes distinguished by an assemblage of quartz, iron-rich dolomite, hematite and gold. These lodes are overprinted by later gold lodes (fracture mesh and ductile shear) associated with sinistral movement.

The gold lodes form a series of stacked zones with two distinct geometries; 5 to 20 m thick sub-horizontal to gently northeast dipping lodes measuring approximately 800 m along strike and 1.1 km down dip and narrower, moderately northeast-dipping lodes. The major flat lying lodes typically have vertical separation of 150-250 m and offset to the south with depth, following the hanging-wall of Thet's shear zone (Figure 7.4). Existing models suggest that the low angle lodes formed within a north-west/south-east phase of compression. A series of east-west striking vertical lodes is present as linking structures between the main horizontal lodes.

The main gold mineralising event is associated with dolomite-albite alteration which bleaches the conglomerate to a distinctive fawn/green colour. Sulphidation appears to be the main gold deposition mechanism. Lower grade areas are associated with carbonate-biotite and early-stage hematite alteration.

Figure 7.4: Wallaby lodes and intrusive system (west view)



Source: Granny Smith CPR, 2021

Gold occurs along micro-fractures within pyrite and generally ranges from 1 -20µm in size. It also occurs as larger (up to several millimetres) grains within quartz veining, either in strongly dolomite-albite altered rocks or in small veins within a few metres of an ore zone. Coarse visible gold is also observed in narrow (<5 mm) moderate to steeply dipping quartz-carbonate veins.

7.3.3 Hillside

The geology of the Hillside gold deposit, 6 km south-west of Granny Smith, comprises three zones separated by two interpreted north-northeast trending first order faults of the Laverton Tectonic Zone (Figure 7.1):

- Western zone - mafic volcanic rocks, BIF, argillite and arenite with irregularly developed polymictic conglomerate.
- Central zone – basalt, ultramafic flows, argillites, BIF and minor dolerite.
- Eastern zone - shale and turbiditic sequence intruded by dolerite.

The area has undergone metamorphism to greenschist facies.

Gold mineralisation at Hillside is hosted by a carbonate-muscovite-quartz-pyrite-(magnetite-biotite) altered basalt exhibiting a pervasive shear fabric. There is frequent segregation into carbonate-quartz-rich and muscovite-rich domains, leading to a banded appearance. Mineralisation occurs along a strike length of 480 m and extends 200 m down dip.

Three generations of quartz veining are recognised:

- Thin ptygmatic and isoclinally folded veins and foliation-parallel veins, interpreted to be pre to syn-shearing. These are not mineralised.
- Sub-horizontal, gently west-dipping extensional quartz-carbonate veins with strongly developed carbonate-muscovite-quartz-pyrite-arsenopyrite selvedges. These veins crosscut the shear fabric and are the main host for the gold mineralisation.
- Steeply west to southwest-dipping quartz veins, that also crosscut the shear fabric, and have somewhat weaker alteration selvedges. These veins can also host gold mineralisation.

Pyrite and arsenopyrite are the two major sulphide phases present. Gold appears to be associated intimately with arsenopyrite.

8 Deposit types

Archaean orogenic lode mineralisation is the primary source of gold at Granny Smith.

The Wallaby lodes are flat-lying alteration zones hosted in magnetite amphibole altered conglomerates. Mineralised zones show moderate to long-range geological continuity and short-range grade continuity.

Other deposits and targets comprise of vein stock works and shears.

9 Exploration

Exploration activities at Granny Smith during 2021 were focused extensions to the Wallaby deposit to increase Mineral Resources and Mineral Reserves, and across the broader tenement package with the aim of discovering new gold deposits. Given Granny Smith is a well-established production stage property with a significant Mineral Resource and Mineral Reserve base, it is not disclosing any exploration targets.

During 2021, $12.7 m (A$17 m) was spent on near-mine exploration at Granny Smith. The mine's Mineral Reserves increased by 2 % to 2.2 Moz and Mineral Resources increased by 2 % to 8.1 Moz. Drilling activity was focussed on infill and extensions to Zones 135 and 150 at Wallaby.

10 Drilling

10.1 Type and extent

During 2021, 72,947 m of drilling was completed, with most activity focused on extending known mineralisation at Wallaby. Drilling activities were undertaken elsewhere on the property on early stage projects with potential to provide new mining fronts in the future. Granny Smith is a production stage property and the results from this work are not considered material for the purpose of this report.

The Qualified Person's opinion is that a register of individual drill results would be too voluminous, potentially misleading and not relevant to the current reporting of Mineral Resources and Mineral Reserves.

In-mine exploration and resource diamond drilling at Wallaby included extensional drilling targeting Zone 135 and Zone 150 (Figure 7.4).

A summary of the exploration drilling physicals for 2021 is shown in Table 10.1.

Table 10.1: Summary of Granny Smith drilling – 2021

Type	For the year ending 31 December 2021		
	Metres	**A$m**	**US$m**
Air core (AC)	0	$0	$0
Reverse circulation (RC)	2,850	$0.2	$0.1
Diamond core drilling (DD)	70,098	$9.6	$7.2
Total	**72,947**	**$9.8**	**$7.3**

Note:
a) Drilling costs only. No additional costs such as assaying or administration quoted on this table
b) Infill exploration is reported separately from exploration.
c) Average exchange rate A$1:US$0.7511.
d) All procedures and parameters applied to the surveys and investigations are appropriate for the style of mineralisation being prospected.
e) The exploration programs have confirmed continuity of geology and controls on gold mineralisation in key areas.
f) There were no material variations encountered during the 2021 exploration programs.
g) Based on the 2021 exploration and results a 2022 exploration budget has been approved to retain traction on the programs and to progress leading projects.

Source: Granny Smith CPR, 2021

All surface exploration drilling services are provided by Ausdrill Pty Ltd. Diamond drilling is conducted via KWL 1600 diamond drill rigs usually using HQ hole diameters through the weathered zone and changing to NQ2 size once competent ground is reached.

All underground exploration drilling services are provided by Barminco Pty Ltd (Barminco). Diamond drilling is conducted using a variety of diamond drill rigs including:

- Epiroc Diamec U8
- Epiroc Diamec MCR
- Epiroc Diamec Smart 6M
- Newland Erebus
- Boart Longyear LM90.

All underground diamond drill rigs usually use HQ and NQ2 hole diameters.

10.2 Procedures

10.2.1 Survey

Underground drill collar positions are surveyed by the mine surveyors using a Leica Total Station. A TN-14 Gyro tool is used by the drillers to align the rig to the correct azimuth and dip while using foresight and backsight markups as a reference for rig positioning.

Surface drill collar positions are set out using a Garmin handheld GPS and picked up by the mine surveyors using differential GPS. Wallaby, Granny Smith /Hillside have different local grids. The Wallaby grid is oriented +00° 20' 08" from true north and the Granny Smith /Hillside grid is oriented +00° 16' 40" from true north. Regional scale (outside of the mine areas) maps and sections are produced using MGA94 Zone 51 coordinates.

All drillholes are picked up in local grid and converted to MGA94-51 grid using acQuire® software. Both sets of coordinates are stored.

All recent DD holes were surveyed downhole using a single shot camera and non-magnetic, multi-shot gyro. Downhole surveys are routinely undertaken by the drilling contractor and validated by a geologist.

RC drillhole samples are collected every metre via a cyclone with the whole sample presented to a splitter attached to the cyclone from which a 3 kg – 5 kg sample is produced. Most samples are dry on collection. Where wet samples are encountered, this information is recorded and preserved in the database against that interval.

AC drillhole samples are collected in a bucket/bag via a cyclone with 2 m composites weighing 2 kg – 3 kg produced. In paleochannels, 1 m composites are collected.

Both the RC and AC samples are taken by the rig offsider whilst drilling and collected by the field technicians.

Diamond core sampling is completed on whole (grade control) or half core. Diamond core samples are taken according to a cut sheet compiled by the geologist. Sample intervals range from 0.3 m – 1.0 m around mineralised structures and areas of altered intrusive material. Sampling is continued for 6 m and 2 m outside major and minor mineralised structures respectively. Where the core is not required to be cut, whole core samples are taken (underground mine definition and grade control drilling).

When core is to be half core sampled it is orientated by assembling it along a steel orientation bar. Successful orientation marks are indicated on the core by a red line at the start of the drill run marked by the drill crew. Once the core is assembled, orientation marks are inspected and checked for accuracy. Orientation lines are marked on the bottom of the hole. The core is cut using a core saw along the orientation line, with the resulting half core closest to the operator being sampled and the remainder of the core being retained.

Core recoveries are measured by geological staff as a percentage between core runs. In general, core recoveries are very high and there are no issues with samples not being representative.

Grade control channel samples are also collected from underground faces using a jumbo drill depending on the geology and alteration present. The samples are retrieved with a sample catcher basket attached to the boom. Five to seven channel samples are usually taken from each face.

Samples for analysis are assigned a unique sample number for internal and database tracking and laboratory processing and are bagged in pre-numbered calico bags and submitted with a sample submission form.

Drill rig supervision is performed by a suitable GSM representative.

There are no drilling, sampling, or recovery factors that could materially affect the accuracy and reliability of drilling results.

The Qualified Person's opinion of the 2021 exploration and resource extension drilling is:

a) All drilling and exploration field activities are supervised to ensure health and safety and maintain appropriate technical standards.

b) The drillhole surveys are adequate by type and length for the intended purpose.

c) Utilising orientated core significantly enhances recorded information to assist with 3D modelling.

d) The drillhole database and subsequent modelling aligns to core recovery losses and should not cause material errors.

e) Post QAQC screening and validation exploration results are incorporated into the estimation of Mineral Resources; the categorisation of Mineral Resources is described in Item 14.

f) Validated exploration results are used in the 31 December 2021 Mineral Resource estimation.

Individual exploration drillhole information is not viewed as significant or material to the Mineral Resource and Mineral Reserve reporting at Granny Smith and consequently exploration data is not presented.

10.2.2 Sampling

The following is noted:

- Diamond drilling: where samples are required, core is cut into half core (exploration samples mostly). Where the core is not required to be cut, whole core samples are taken (underground definition and grade control).

- RC drilling: the sample is collected and passed through a cyclone; the whole sample is presented to the splitter attached to the cyclone and sample collected. Most samples are dry on collection, where wet samples are collected this information is recorded and preserved in the database against that interval as this may impact sample recovery.

- AC drilling: the sample is collected straight into a bucket / bag through a cyclone; 1/2 m composites are sampled. In paleochannel 1 m composites are collected and whole sample is collected and sent to the lab. The lab homogenises and split by the fractional scooping method the sample to 3 kg and analyses for gold. A field duplicate is collected for these samples by splitting a coarse reject at the lab. AC drilling is not used in Mineral Resource estimates at Granny Smith.

10.2.3 Core orientation

A Reflex ACT II RD or ACT III orientation tool is used to orient the drill core. An orientation is attempted every run.

At the core farm, the oriented core is prepared by assembling it along a steel orientation bar. Successful orientation marks are indicated on the core by a red line at the start of the drill run marked by the drill crew. Once the core is assembled, orientation marks are inspected and checked for accuracy. Orientation lines are marked on the bottom of the hole, allowing the orientation accuracy information to be seen on core photographs. At least two continuous good orientation marks are required before information recorded from the orientation line can be gauged as accurate, with three continuous orientation marks indicating a high level of accuracy.

10.2.4 Logging

Data collected includes detailed logging of all drillhole chips and core to extract maximum data and value from the available information. The logging may be as broad spaced as 1 m composite chips for AC and RC drilling to centimetre scale for structures and alteration in diamond core. In most cases routine data collected includes lithology, structure, stratigraphy, mineralisation, alteration, geophysical (magnetic properties) and geochemical properties (multi-element assays) and physical measurements (rock hardness, geotechnical rock quality designation (RQD), density, acid rock drainage).

Core recoveries and density measurements are also taken. Core recoveries are measured by geological staff as a percentage between core runs. In general, core recoveries are very high and there are no issues with samples not being representative.

AC and RC sample recovery are usually of no concern. In case of poor sample recovery, the driller will document this on the drill pods and the geologist will also take note during the logging process.

Standard logging conventions (lithology, alteration, structures and quartz veins) are used to capture the information. Most of the observations are captured electronically using acQuire® logging software on laptops, while the remainder is recorded on paper. Numerous validation steps are built into the acQuire® logging software and all codes are selected from drop down lists.

Diamond core is delivered by the drilling contractor to the Wallaby and Exploration core farm facilities where it is logged and processed for sampling. AC and RC logging is usually conducted in the field directly from drill spoils or at the office from representative sub-samples collected by field technicians into chip trays.

All data is uploaded into the mine acQuire® database via a wireless network.

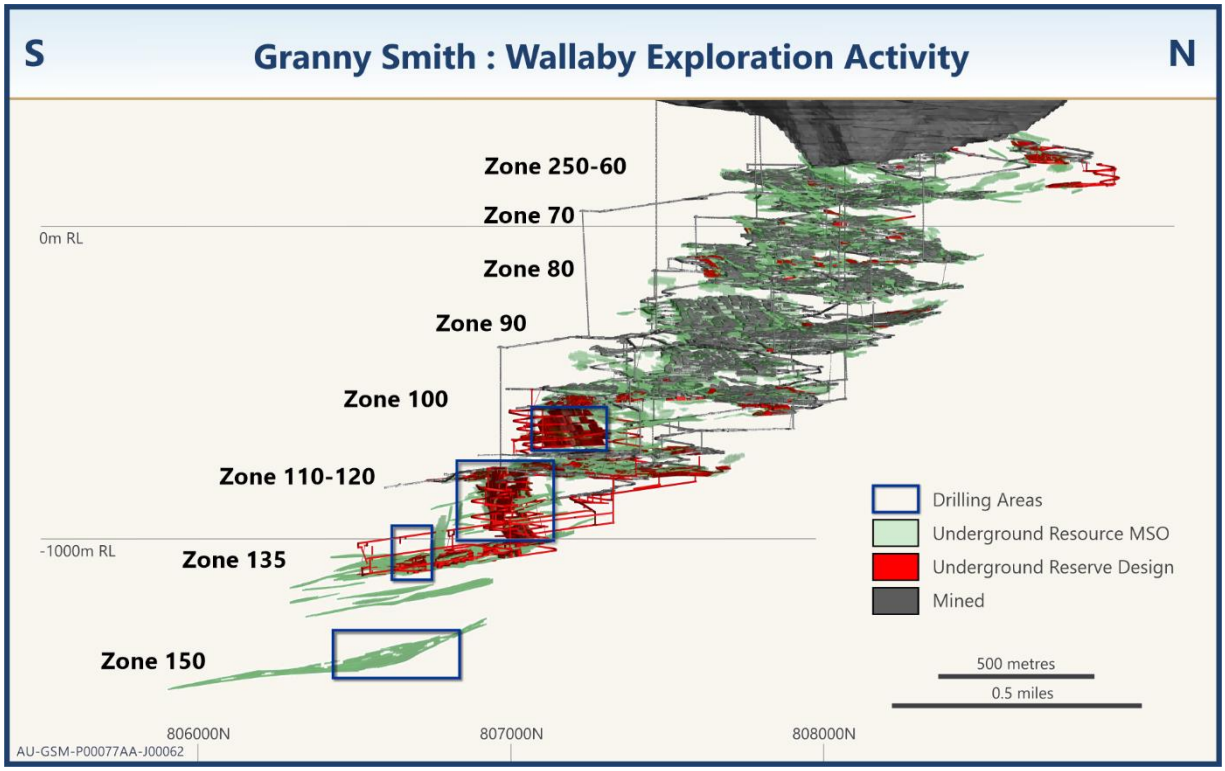
In some cases, additional work is completed off site by technical experts including petrographic analyses, mineralogy, and geochronology as part of ongoing research and development cooperative ventures. This data is included in standard reports and in the database for future use.

10.3 Results

In-mine exploration and resource drilling at Wallaby focused on infill and extensions of Zone 135 and Zone 150. Infill of Zone 135 confirmed continuity of the main lode Mineral Resource with all holes returning mineralised intercepts. Drilling identified an extension of the Zone 135 Vertical East lodes to the east and confirmed mineralisation and extensions of the Zone 135 Vertical South lodes. Zone 150 extensional drilling identified mineralisation at expected depths which returned assays of economic tenor within the 2021 Mineral Resource.

The 2022 exploration program will continue to focus on Mineral Resource and Mineral Reserve growth at Wallaby through extensions both laterally and at depth with further drilling of the Zone 135 Lateral and Vertical lodes to close-out open areas and define the full orebody footprint. 100 x 100 m conversion drilling in Zone 150 will continue to test geological and grade continuity in the southern half while 50 x 50 m infill drilling will commence in the northern half. The aim is to complete 50 x 50 m drilling on >70 % of the Zone 150 Main lode for a pre-feasibility study starting in Q1 2023. (Figure 10.1).

Figure 10.1: Schematic long-section through Wallaby



Source: Granny Smith CPR, 2021

The Qualified Person's opinion of the 2021 exploration and resource extension drilling is that all exploration activities, including drilling, database management, validation and QAQC, prior to incorporating relevant data into the resource modelling and estimation process, is viewed as sufficient, appropriate, technically assured and suitable to support Mineral Resource estimates.

11 Sample preparation, analyses, and security

11.1 Sample preparation

All resource development and exploration samples for preparation and analysis are dispatched to Australian Laboratory Services (ALS) in Kalgoorlie or Perth by truck. Underground grade control and face samples are dispatched to the Granny Smith site laboratory facility on a daily basis. In summary:

- All samples are sorted on arrival at the laboratory and checked against the accompanying documentation, weighed and the sample numbers entered into the Laboratory Information Management System (LIMS). Granny Smith is notified of any discrepancies prior to sample preparation commencing.
- Bar-coded sample labels and work sheets are used to control the workflow through the sample preparation and analytical phases. Samples are dealt with sequentially as per the instructions from Granny Smith. The samples within their calico bags are placed in a drying oven and dried at 105 ºC in a modern forced air oven.
- Where required (drill core), the dry samples are jaw crushed to -15 mm and then to 90 % passing 3 mm. If over 3 kg, the sample is split using a stainless steel riffle splitter or a rotary splitter as per the instructions. A 3 kg split is taken and pulverised to 90 % passing 75 µm in a LM5 pulveriser.
- A 250-300 g scoop of the pulverised sample is placed in a labelled paper sample bag for analysis and the remainder of the pulp placed in the original calico sample bag and returned to Granny Smith for cataloguing and storage.

ALS is an independent testing, inspection, certification and verification company headquartered in Brisbane, Australia, with the laboratories which are used by Granny Smith located in Kalgoorlie and Malaga, Perth (Table 11.1).

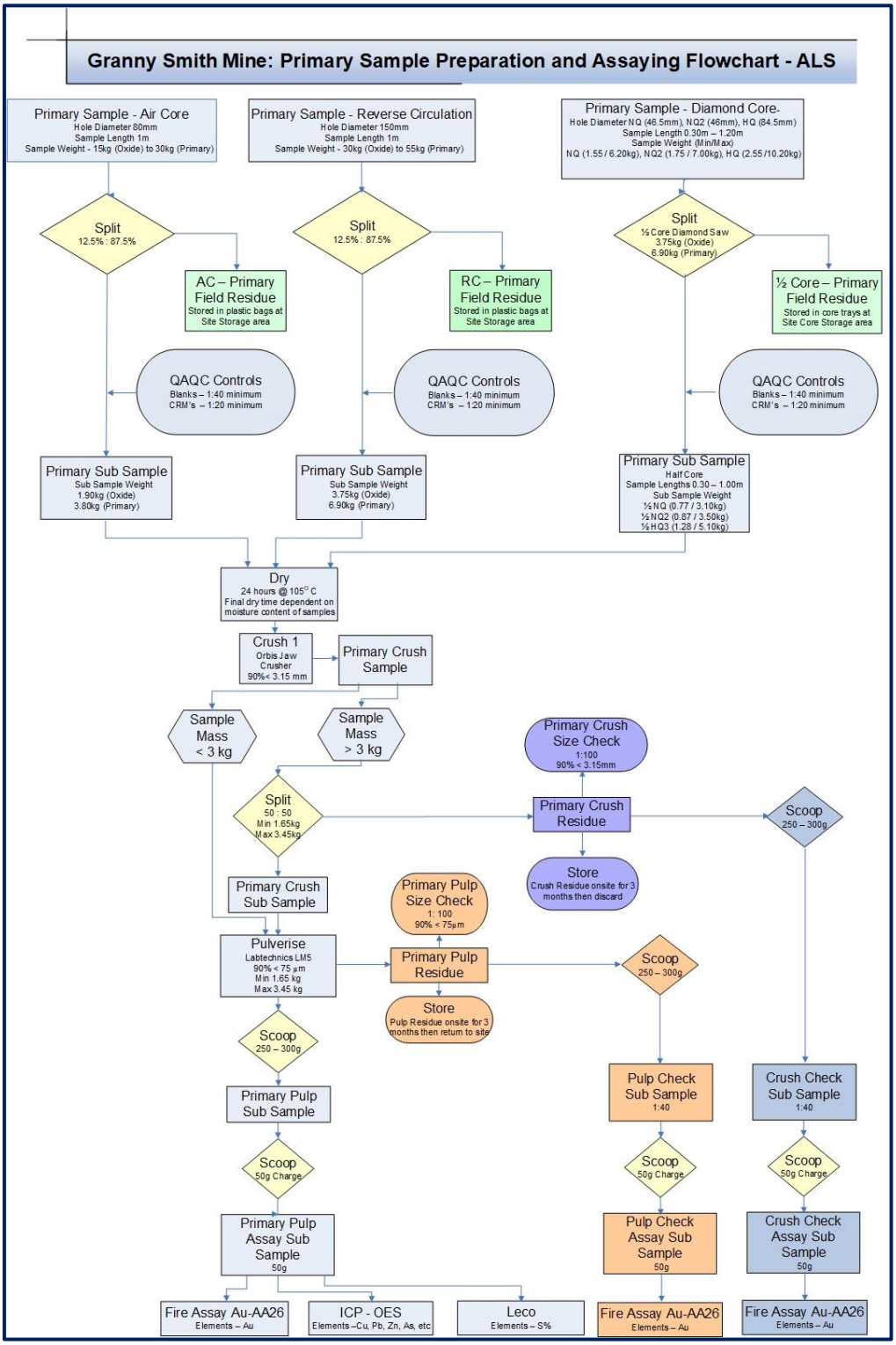
Table 11.1: Analytical laboratory accreditation

Laboratory	Certificate number Accreditation number	Independent testing inspection
ALS Kalgoorlie	QEC27912, C-90494 (ISO 9001:2015)	SAI Global ISO 9001:2015
ALS Perth	825, 23001 (ISO/IEC 17025)	Accredited NATA (National Association of Testing Authorities, Australia) ISO/IEC 17025

Source: Granny Smith CPR, 2021

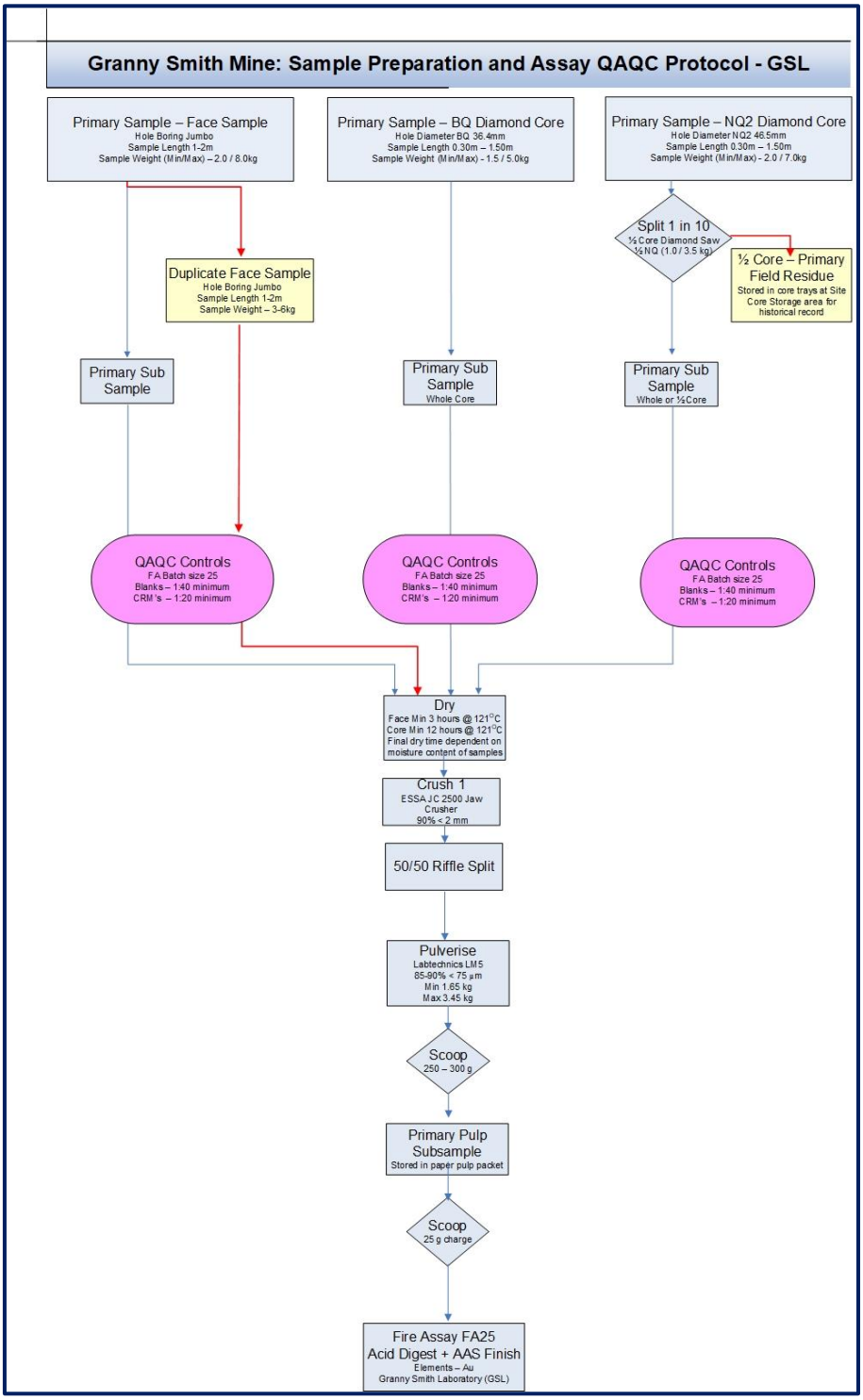
A summary of the ALS sample preparation process is provided in Figure 11.1. A summary of the sample preparation process for grade control and face samples at the Granny Smith site laboratory is provided in Figure 11.2.

Figure 11.1: Sample preparation and analytical flow sheet for ALS Laboratory



Source: Granny Smith CPR, 2021

Figure 11.2: Sample preparation and analytical flow sheet for Granny Smith Laboratory



Source: Granny Smith CPR, 2021

The Qualified Person has reviewed the sample preparation and security procedures. The sample preparation is found to be adequate with effective supervision and in line with industry leading standards. No material bias is indicated that could potentially impact the sampling preparation and analysis.

11.2 Security

Although security is not strongly enforced, Granny Smith is a remote site and the number of outside visitors is small. The deposits are known to contain visible gold and this renders drill core susceptible to theft; however, the risk of sample tampering is considered low.

Sample collection and storage is undertaken by dedicated Gold Fields personnel who utilise an embedded risk and control matrix (RACM).

All recent exploration diamond drill core is retained in the core farm at Granny Smith Exploration office for current and future reference. Pulps returned from the analytical laboratory are stored in labelled individual paper envelopes within labelled cardboard boxes. Recent (post 2014) RC chips are stored in labelled sealed compartment trays. Appropriate procedures and systems are in place to document, store and access retained material.

Sampling data is captured via computer applications and written directly to the database. Controls on the database restrict the input and storage of data to acceptable values. Further database controls prohibit the use of unauthorised and duplicate sample identifiers and similar problematic data.

11.3 Sample analysis

At the two ALS laboratories Granny Smith typically assays for gold using the 50 g fire assay method (FA50) with an atomic absorption spectrometry (AAS) finish to a 0.01 g/t Au detection limit. Samples above 60 g/t Au are re-assayed using a gravimetric finish to improve assay accuracy.

At Granny Smith site laboratory Granny Smith assays for gold using the 25 g fire assay method (FA25) with an AAS finish to a 0.01 g/t Au detection limit.

All laboratories processing Granny Smith samples are required to have separate preparation and analysis circuits for grade control and exploration samples (i.e., those with potential low-level gold) so as to minimise cross contamination. The sample analysis flowsheets for the ALS laboratories and the Granny Smith site laboratory are shown in Figure 11.1 and Figure 11.2 respectively.

The Qualified Person has reviewed the certificates and is of the opinion that the analytical laboratories are certificated and have effective process and protocol in place to ensure quality control and assurance and minimise any material errors.

11.4 Quality control and quality assurance (QAQC)

QAQC is an integral aspect of the entire sampling and assaying procedure. It allows measurement of the reliability of the collected data as well as accuracy and precision ensuring that best practice is followed throughout the drilling, sampling, preparation and analytical processes.

To monitor QAQC, Granny Smith has implemented a comprehensive "Best Practice" quality control system, comprising of written procedures and monitoring by the mine and exploration geology groups and resource geology group together with internal and external audits.

On receipt, each laboratory batch is analysed to determine accuracy, precision and repeatability of each assay. All assay results are received directly from the laboratory in a digital format and automatically loaded into the database using scheduled automated database tasks. On loading, the assay results are subjected to an automated assay pass/fail process where the QAQC samples are evaluated and either passed or failed.

Assays results outside a standard set of control guidelines are flagged automatically and a warning notification is sent to the responsible geologist. If a batch fails, it is quarantined in the database until the geologist concerned has examined the data and determined the course of action required in conjunction with the QAQC requirements. Results are collated and reported monthly. Data analysed includes standard and blank performance, and monthly summaries are presented to the geology staff within the monthly report.

QC samples are submitted within assay batches allowing the monitoring of drilling, sampling, laboratory sample preparation techniques as well as analytical accuracy and precision. All QC data is stored in the database. All original data is preserved in the database as originally loaded and follow-up actions such as re-assays are recorded in the pass/fail extension.

QC sample types are summarised in Table 11.2.

Table 11.2: Quality control type summary

Sample description	QC stage	Comments
Field duplicate	Monitors sample source and sampling procedure	Duplicate sample taken identically as the original sample (1/2 core; RC: duplicate split taken in field)
Laboratory duplicate	Preparation	Repeats taken by ALS to monitor the laboratory process
Crush duplicate	Preparation after jaw crush, but before pulverised	Implemented October 2013 to ensure that whole diamond core samples can get a representative duplicate
Standard/blank	Analytical	Certified sample of known concentration: pulps (standards), coarse crushed matrix-matched basalt (blank)
Pulp duplicate	Analytical	Repeated re-assay on the analytical pulp as requested by the QAQC geologist from a QC failure or as a lab check
Pulp umpire	Analytical (at the end of a program)	Random subset of pulps sent to an umpire laboratory to ensure analytical accuracy and precision

Source: Granny Smith CPR, 2021

The following procedures are stipulated by Granny Smith:

- Sample pulverisers are cleaned mechanically and/or with a vacuum.
- Bowls must be clean before inserting a new sample in the bowl.
- Quartz, feldspar or blue metal washes are utilised to ensure no carry-over contamination between individual jobs and after every rack.
- Washes are required between samples when any amount of the previous sample adheres to the bowl or puck.
- Samples of wash materials are retained for analysis as noted on the sample submission sheet.
- Crushing equipment is cleaned with barren material before and after each sample batch.
- Bowls are vacuumed between each sample.
- Wet screening of sample pulps on a 1:40 basis to ensure >90 % passes 75 µm with the results reported each batch.
- Screening of crushed material on a 1:40 basis to ensure that >90 % passes a 3 mm with the results reported each batch.

The target grind size is 90 % passing 75 µm for samples pulverised for six minutes with 1 in 50 samples sized. If the required grind size is not achieved, grind compliance is considered to have failed. Protocols for failed grind sizes include investigations for the cause, notifying the laboratory of the problem and re-milling and re-assaying of the mineralised intersection.

Granny Smith also monitors and measures laboratory QAQC compliance and performance at regular intervals and against each batch submitted to the laboratory. This entails the measurement of contamination in preparation, and the quality of crushing, milling, fire assay and analysis of solutions. All monitoring is completed by batch after the assay results are reported and each batch must pass Gold Fields' QAQC criteria before being accepted. Granny Smith reports on QAQC compliance monthly.

Accuracy is monitored by using different certified standards corresponding with expected grades of the batch. Commercial certified reference materials (CRM) or standards are used and inserted at a minimum rate of 1 in 20. If the standard returns a value outside 3 times the certified standard deviation for that standard, then the standard will fail the QAQC protocols. Field duplicates are used for reverse circulation drilling.

Contamination is monitored by using coarse blank material (20 mm rainbow quartz) sourced from Teak Industrial Supplies are inserted at a minimum rate of 1 in 40 before and/or after medium to high-grade intersections based on alteration intensity. Quartz flushes are also requested for samples within zones of strong alteration or visible gold.

If a blank contains more than 20 ppb Au, the blank is considered to have failed. If the failure is caused by an analytical or process problem, the laboratory is notified, and a re-assay is carried out. If the blank pulp returns anomalous gold and if the failure is caused by contamination, the laboratory is notified and dependent upon the cause and the extent of the effect, the samples are re-split, re-submitted and re-assayed.

Precision is monitored using crush duplicates, pulp duplicates and laboratory duplicates. A minimum of 5 % precision duplicates are inserted.

If the duplicates fail MAPD (Mean Average Percentage Difference – from GFA-RSG-PR005 "QAQC Procedure Gold Fields Australia") tolerances, then the duplicate is considered to have failed. The protocol for failed duplicates is to investigate for possible reasonable causes such as a nugget effect, sampling error, poor recovery or wet sampling. Granny Smith will then determine the course of action.

The following sample fire assay analytical procedures are required by Granny Smith:

- Minimising samples lost during flux mixing to an agreed level.
- Pot racks to be kept clean to make easily visible lead lost after pouring.
- Fires spotted on regular basis and all furnace control sheets to be made available for view upon Granny Smith's request.
- Re-assay of any samples with loss of sample in mixing, boil over in the furnace, lost lead in pouring, lost lead in slag, lead in pot racks or signs of unfused sample.

Batches not in accordance with the laboratory QAQC requirements must be re-assayed and each occurrence reported to Granny Smith within the normal reporting parameters for each batch and in the monthly QAQC report.

Umpire assays on pulps are completed at Genalysis Perth following the same assaying protocols as ALS. Samples are selected at random using an automated script within acQuire® to approximate equal proportions of samples are submitted (0.3-1.0 g/t Au, 1.0-3.0 g/t Au, 3.0-10.0 g/t Au and >10.0 g/t Au). A standard is inserted at a rate of 2.5 % for this QAQC protocol.

Granny Smith representatives also conduct regular laboratory audits in keeping with industry best practice (Table 11.3 and Table 11.4). During 2020, monthly laboratory inspections and in-depth quarterly audits were carried out at ALS Perth, ALS Kalgoorlie and the Granny Smith site laboratory. Any issues are dealt with when identified.

Table 11.3: Recent reviews of Australian Laboratory Services (ALS) Kalgoorlie laboratory

Date	Auditor	Conclusions
24/02/2021	L. Smuts	Large sample volumes, GFA volumes honoured as per contract, LM5 lid replacement program completed. ME/ASD sample TAT in Kal, Au priority to ensure ME/ASD within 21 days. New acting lab manager Brenen Christie under Greg Brosnan supervision. Face sample TAT priority remain important to GFA, also sample volumes to honour GFA contract volumes.
09/06/2021	L. Smuts	James Egan, Claudia, Jesse Osborne, Thomas, Darren Murray and Andrew, Lab process review and training completed for sites. CRM performance, increased failures due to an operator not following procedure. TAT starting to blow out, Kal ALS struggle with sample throughput due to staff shortages.
06/09/2021	L. Smuts	TAT blow outs for GFA due to staff shortages, weekly meetings implemented, Perth ALS loadshedding assisting TAT backlogs. Pb button slag separation observed, Boilovers, LM2 lid seals issue,
23/11/2021	L. Smuts	Orbis internal cleaning improvements being reviewed, all Q3 audit issues was resolved except for ongoing testwork being completed in Perth ALS reviewing PB slag separation if it contain gold, as well as the wet lab temperature effects on gold results.

Source: Granny Smith CPR, 2021

Table 11.4: Recent reviews of Australian Laboratory Services (ALS) Perth laboratory

Date	Auditor	Conclusions
09/02/2021	L. Smuts / Samuel George / Kab Karuna / Kyle Wohlers	Commissioning new Robotic cell, New Orbis fine crushers being tested. Low sample volumes. Big focus on staff training, maintenance, fixings, housekeeping undertaken.
21/05/2021	Gail Clark	COVID measures, AGM DD samples all in Perth, limited to 2,500 full core and 1,500 half core only, rest to go to Kal ALS, Gruyere GC RC program, QAQC data review, ALS Round robin with GFA CRMs compared, reflect differences to Geostats Round Robins.
05/09/2021	L Smuts	Gold Field's flush insertion methods reviewed, Gold Field's insert on paperwork rather than lab. Orbis internal cleaning mechanism implemented as a test environment, automated internal air jets cleaning rather than manual operator based.
03/12/2021	L Smuts	Lab capacity expansion ongoing, LM5 mill cleaning prctices improvements, sample TAT backlog resolution plan reviewed and sample priority weekly meeting implemented. Ongoing testwork related to PB slag seperation if it contain gold, as well as the wet lab temperature effects on gold results.

Source: Granny Smith CPR, 2021

The QP considers that no systematic long term sample biases have been identified from the QAQC program. The QA program for the drilling carried out at Granny Smith demonstrates sufficient accuracy and precision for use in the estimation of the Mineral Resources.

12 Data verification

The execution of the mine and regional exploration programs were completed to industry best practice and are aligned with numerous standards and procedures developed by Granny Smith and Gold Fields over many years. The process consists of procedures, audits and sign-off documents for all key elements that input into the generation of a Mineral Resource model to ensure full compliance. The key components of the geological data acquisition framework include:

- Validity – Controls to ensure the validity of key activities.
- Accuracy – Controls to establish the accuracy of data inputs and outputs.
- Completeness – Controls to ensure the completeness of the process followed.
- Timing – Preventative and detective controls to identify potential risk and deviation of quality.
- Segregation of duties/sign-off – Key members of the senior team are responsible for different aspects of the process.

The Qualified Person's opinion on the adequacy of the data for the purposes used in the Technical Report.

The Qualified Person is of the opinion that the data verification process and protocols are adequate to minimise any material errors, are in line with industry leading standards and underpin technical assurance.

12.1 Data management

Sample data is electronically captured in the field via acQuire® software. The acQuire® relational database system is used to store all drilling physicals, survey data, assay data and QAQC checks. All geological data is entered into acQuire® data logger software through the use of laptops. The acQuire® database import forms have built-in validation checks. Further cross validation of the data is undertaken following export from acQuire® and import into Datamine®.

The acQuire® database contains a register of the sample numbers for primary samples, blanks, and standards. All assay results for the primary samples, standards, and blanks are returned to site via email in a SIF file format and automatically imported into the database.

Confirmation is required that all data imported into the acQuire® database was validated by the geologists. Confirmation is also required that validation of all data had occurred prior to it being imported into the final acQuire® tables. Only results accepted automatically or by the geologist are used in Mineral Resource estimation. Any primary results that failed the QAQC standards are rejected, re-assayed and re-imported for the geologists to approve.

Once collected and entered into the drillhole database, data elements are validated by the relevant data owner. Sample data is also externally audited by independent audit firms. Drill core is photographed which is digitally stored prior to sampling.

Daily server backups of the acQuire® database are completed.

Prior to Gold Fields purchase of Granny Smith in 2013, all geological and drilling data was acquired by Placer Pacific and Barrick Gold. Limited data is used from non-Granny Smith sources. Where this data is used it is acknowledged and identified in the appropriate reports. Standard practice is to convert such data to Granny Smith standards and import it into the database upon validation and checks.

The Qualified Person's opinion of the data management is:

a) The data management process and protocols are adequate to minimise any material errors.

b) Regular validation of the database and data management process is aligned with standard industry practices, verified through an embedded risk and control matrix (RACM).

12.2 Drilling and sampling

In general, data collected includes detailed logging of all borehole chips and core on a detailed basis to extract maximum data and value from available information. The logging may be as broad spaced as composite one metre chips for RC percussion drilling to centimetre scale of small detail structure and alteration in diamond core. In most cases routine data collected includes lithology, structure, stratigraphy, mineralisation, alteration, geophysical (magnetic properties) and geochemical properties (multi-element assays) and physical measurements (rock hardness, geotechnical RQDs, density, acid rock drainage (ARD). Core recovery is measured for diamond core, while sample weights are measured for percussion methods to estimate sample recovery. Historical diamond drill half-core and percussion sample chip tray are stored to allow review of historical drillholes. Within the Wallaby deposit, twinning historical drillholes can be used during infill phases where spatial confidence of the historical drillholes is low.

The Qualified Person is of the opinion that the drilling and sampling protocols described in this report are adequate to minimise material errors and provide the necessary technical assurance.

12.3 Survey

All recent drillholes have been surveyed down the hole by single shot downhole camera and non-magnetic, multi-shot gyro survey at the completion of each hole. Downhole surveys are routinely undertaken by the drilling contractor and verified within the Imdex Hub by a geologist before importing the data into the acQuire® database.

The Qualified Person is of the opinion that the survey protocols are adequate to minimise material errors.

12.4 Sample analysis

Gold Fields monitors and measures the Laboratory QAQC compliance and performance at regular intervals and against each batch submitted to the laboratory. This entails the measurement of contamination in preparation, quality of crushing and milling, fire assay circuit and analysis of solutions. All monitoring is completed batch-by-batch after the assays are reported and each batch must pass Gold Fields' QAQC criteria before being accepted by Gold Fields. Gold Fields reports on the QAQC compliance on a monthly basis.

Accuracy is monitored by using different certified standards corresponding with expected grades of the batch. Commercial certified standards are used, inserted at a minimum rate of 1 in 20.

Contamination is monitored by using coarse blank material. Blank material is sourced from Rowe Scientific Pty Ltd and consists of 20 mm coarse feldspar. Blanks inserted at a minimum rate of one in 40 before and/or after medium to high-grade ore intersections based on alteration intensity. Quartz flushes are also requested for samples within zones of strong alteration or visible gold.

Precision is monitored using crush duplicates, pulp duplicates and laboratory duplicates. A minimum total of 5 % precision duplicates are undertaken.

Compliance criteria - Standards

If the standard returns a value outside three times the certified standard deviation for that standard, then the standard will fail Gold Fields QAQC protocols.

Compliance criteria - Blanks

If a blank contains more than 20 ppb for the AA25 method (0.2 g/t) for Au, the blank is considered to have failed. Consideration can be given if the blank assay value is within 1 % of the proceeding sample's assay value. Gold Fields protocol for failed blanks is as per the following:

- If the grade of the blank is higher than 20 ppb Au and should the failure be caused by an analytical or process problem, the laboratory will be notified and required to re-assay; or
- If the blank pulp returns with anomalous Au results and if the failure is caused by contamination, the laboratory will be notified and dependent upon the cause and the extent of the effect, the samples may be re-split, re-submitted and re-assayed.

Compliance criteria – Duplicate

If duplicates fail MAPD tolerances, then the duplicate is considered to have failed.

Gold Fields protocol for failed duplicates is to investigate for possible reasonable causes such as:

- True in situ nugget effect
- Sampling error
- Poor recovery or wet sampling.

Gold Fields will then determine its own course of action.

Compliance criteria - Grind sizes

Target compliance is 90 % of sized samples passing 75 µm. If the required grind sizes are not achieved, grind compliances are considered to have failed. It should be noted that the samples are to be pulverised for six minutes with one in 20 samples being sized. If the grind size fails, then the standard operating procedure (SOP) will need to be revised after consultation with Gold Fields. Gold Fields protocol for failed grind sizes is as follows:

- Investigate for reasonable cause
- Notify laboratory of the problem
- If failed grind sizes coincide with a mineralised section and assay results shows variability caused by heterogeneity of pulps then the laboratory shall re-mill and re-assay the mineralised intersection.

Fire Assay - Process

- Samples lost during flux mixing shall be minimised to an agreed level.
- Pot racks are to be kept clean to make easily visible lead lost after pouring.
- Fires shall be spotted on regular basis and all furnace control sheets will be available to view upon Gold Field's request.
- Any samples with loss of sample in mixing, boil over in furnace, lost lead in pouring, lost lead in slag, lead in pot racks or signs of unfused sample shall be re-assayed.

The Qualified Person is of the opinion that the sample analysis protocols are adequate to minimise material errors.

12.5 Metallurgical tests

Metallurgical testing of all new projects is completed as part of routine exploration operations. Selected core and chip samples are provided by the relevant geologists for separate analysis. Samples are aimed at providing a broad and representative set of samples to reflect differing domains and geology to determine future metallurgical impacts and options.

12.6 Quality control and quality assurance (QAQC) process

Sample registers are used to record sample recovery, as well as sample type. The data, once loaded into the database along with their assay results, can then be manipulated to make comparisons between the data e.g., quantile-quantile (QQ) plots and comparisons of bias between drilling techniques, these can then be recorded in resource reports.

Geologists define sampling intervals within drillholes in accordance to sampling protocols set out by Granny Smith.

RC and AC samples are taken whilst drilling by the rig off-sider then collected by field technicians. Diamond core samples are typically marked out by the geologist, cut by automated cutting saws if needed, and then sampled by field staff at the core farm. Lengths of these samples on average can vary between 0.3 m and 1.2 m. Whilst sampling the diamond core preservation of the bottom of hole orientation mark must be ensured.

QAQC is an integral aspect of the entire sampling and assaying procedure. It allows measurement of the reliability of the collected data as well as accuracy and precision ensuring that best practice is followed throughout the drilling, sampling, preparation and analytical processes.

To monitor QAQC, Gold Fields has implemented a comprehensive “Best Practice” QC system at Granny Smith, comprising of written procedures and monitoring by the mine and exploration geology groups and resource geology group together with internal and external audits.

On receipt, each Laboratory batch is analysed to determine accuracy, precision and repeatability of each assay. All assay results are received directly from the Laboratory in a digital format then automatically loaded into the database using scheduled automated database tasks. On loading, the assay results are subjected to an automated assay pass/fail process where the QAQC samples are evaluated and either passed or failed.

Assays results outside a standard set of control guidelines are flagged automatically and warning notification is sent to the responsible geologist. If a batch fails it is quarantined in the database until the geologist concerned has examined the data and determined any course of action that may be required in conjunction with the QAQC requirements. Results are collated and reported monthly. Data analysed includes standard and blank performance, and monthly summaries are presented to the geology staff within the monthly report.

Quality control samples are submitted within batches allowing monitoring of the drilling, sampling, laboratory sample preparation techniques as well as analytical accuracy and precision. All QC data is stored in the database.

All original data is preserved in the database as originally loaded and follow-up actions such as re-assays are recorded in the pass/fail extension.

No systematic long term sample biases have been identified from the QAQC program. The quality assurance program for the drilling carried out at Granny Smith demonstrates sufficient accuracy and precision for use in estimating of the Mineral resource.

Table 12.1: Quality control type summary

Sample description	Quality control stage	Comments
Original		Original sample
Field Duplicate	Monitors sample source and sampling procedure	Duplicate sample taken identically as the original sample (1/2 core; RC: duplicate split taken in field)
Lab Duplicate	Preparation	Repeats taken by ALS to monitor the laboratory process
Crush Duplicate	Preparation after jaw crush, but before pulverised	Implemented October 2013 to ensure that whole diamond core samples can get a representative duplicate
Standard/Blank	Analytical	Certified sample of known concentration: pulps (standards), coarse crushed matrix-matched basalt (blank)
Pulp Duplicate	Analytical	Repeated re-assay on the analytical pulp as requested by the QAQC geologist from a QC failure or as a lab check
Pulp Umpire	Analytical (at the end of a program)	Random subset of pulps sent to an umpire laboratory to ensure analytical accuracy and precision

Source: Granny Smith CPR, 2021

12.6.1 Umpire sampling

Umpire assays on pulps are completed by Intertek Genalysis (Perth), following the same assaying protocols as ALS. Samples are selected at random using an automated script within acQuire® to approximate equal proportions of samples are <1 g/t, 1-7 g/t, and >7 g/t submitted. A standard is inserted at a rate of 2.5 % for this QAQC protocol.

12.7 Geological modelling

All data acquired is based on current detailed knowledge and intellectual models derived over many years of exploration and mining at Granny Smith. Corporate consultants and industry experts routinely visit site to review the best practices and guide, align the current staff with new innovative methods, ideas and concepts to facilitate continued excellence in exploration, mining and resource estimation. In addition, internal and external training of new and existing staff to appropriate methods, techniques together with management oversight ensures on-going best practices.

The geological interpretation has potential to materially impact on the estimated quantity and quality of the Mineral Resource and Mineral Reserve. Incorrect assumptions regarding volume and geological and/or grade continuity has the potential to overestimate contained metal. However, support from expert geologists, site and corporate peer reviews, external reviews, and the Model Handover Report (MHR) and Model Sign-Off Form processes ensure that the geological interpretation is one that most geologists would independently arrive at.

A series of standard model validations are carried out during and after completion of the grade estimation including:

- Visual validation checks.
- Wireframe vs. block model volume checks.
- Comparison of different estimation methods (SK vs OK).
- Comparison of composite vs block model statistics.
- Comparison of composite vs block model swath plots.
- Global change of support.
- Analyses of quality of estimates (including slope of regression and kriging efficiency).

Granny Smith has an extensive and proactive grade control and reconciliation process to review operational planning against actual performance. This encompasses model performance, dilution, mining mix and grade distributions and are comprehensively tracked and managed through the site database. Periodic reports and reviews are completed as part of monthly and quarterly reviews, as well as tracking of the mine call factor and ore sources. Current 2021 reconciliation results indicate no adverse impacts or risks associated with the resource models.

The Qualified Person's opinion of the geological modelling is:

a) The geological modelling protocols are adequate to minimise material errors.

b) The controls have been reviewed and the adequacy is reasonable and that material bias or errors are unexpected.

c) The systems to reduce human and procedural errors, checks and balances are adequate and minimise material errors.

d) The protocols are adequate as reviewed and that the Mineral Resource models are based on sound data and are reasonable.

13 Mineral processing and metallurgical testing

13.1 Testing and procedures

13.1.1 Metallurgical sampling and testing

Metallurgical testing of all new projects is completed as part of routine exploration operations. Selected drill core and chip samples are provided by the relevant geologists upon definition of discrete geological domains for separate analysis. Samples are composited from drill intersections to obtain a representative sample mass to reflect differing domains to determine future metallurgical impacts and options. The samples are dispatched to a third-party laboratory for metallurgical testing.

Many factors which can significantly impact on processing capability include the physical properties of the orebody (ore hardness, abrasiveness and breakage characteristics), liberation properties (grind/recovery sensitivity, gold-mineral associations, gravity recoverable gold content), metallurgical properties (oxidant sensitivity, leach rate profile, leach accelerant amenability) and the presence of other minerals or species that can contribute to additional reagent consumption or become a contaminating presence in the tailings stream. It is the aim of the metallurgical testing program to identify these factors and attempt to quantify their effects.

Testwork on the physical and liberation properties of deposits are conducted on the samples to develop orebody domain definition. This testwork is utilised to review whether existing Granny Smith processing capabilities are suited to process the required ore from these deposits. This is backed up by ongoing review and reconciliation work by the on-site process team who actively track and monitor metallurgical efficiency as part of standard operating practices.

All Mineral Resources and Mineral Reserves are analysed in regard to existing plant capacity, infrastructure, processes and personnel. Existing metallurgical infrastructure is planned to process all current and future Mineral Resources and Mineral Reserves mined within the property.

Granny Smith follows a standard testwork protocol designed to reflect the unit operations present in the current plant infrastructure. This analysis includes:

- Comprehensive assessment of process mineralogy including head assays, elemental sweep and X-ray diffraction (XRD) analysis.
- Examination for deleterious material including acid mine drainage analysis.
- Comminution characteristics including crusher indices, abrasion indices, and grinding indices for semi-autogenous grinding (SAG) and ball milling.
- Extraction sensitivities in time profiled laboratory gravity and leach testwork programs to determine overall recovery.
- Subsequent diagnostic analysis of tailings residue if warranted.
- Impacts on expected reagent consumption, specifically cyanide and lime.

Metallurgical testwork programs are ongoing at Granny Smith, based upon the progressive drilling and definition of new or existing mining area extensions that are associated with the exploration program. Metallurgical testwork programs that were completed during 2020 as drilling and ore definition of deposits advanced and progressive studies were completed included:

- Wallaby Zone 120 - 135 Vertical & Horizontal
- Wallaby Zone 250 - 60 Joey.

The characteristics of the ore sources are typically sufficiently different such that where appropriate, a fixed or grade recovery per ore source is assigned. For ore sources that are currently or have been historically treated then an overall grade recovery relationship based on known process plant performance is assigned.

The Granny Smith process plant currently sources feed from the Wallaby underground mining operation. Daily composite samples of process plant feed and tailings streams are taken to assist in gold accounting on site. These are collected using a combination of automatic sampling stations as well as manual cuts using properly designed samplers. Analysis of the composites includes gold contained in solids, solution and carbon. The analysis of samples used for accounting purposes is conducted by the Granny Smith site laboratory.

The laboratory facilities include sample preparation, fire assay and a wet analysis area. Solid sample composites are analysed using fire assay with an AAS finish. Carbon sample composites are assayed using high temperature ashing, acid digest and an AAS finish. Solution sample composites are assayed using DIBK extraction and an AAS finish. All laboratory assaying procedures are aligned with standard industry practices.

On a weekly and monthly basis, gold in circuit surveys are conducted to reconcile gold recovery and feed grades against assayed estimates. Bullion samples are taken when required by vacuum sampling from each gold pour. These samples are used as an estimate prior to receiving official outturn assays provided by the Perth Mint.

13.2 Recovery estimates and relevant results

13.2.1 Sample head analysis

Table 13.1 shows a summary of the average sample head analyses grouped by Wallaby zone. The samples are reasonably and consistently enriched in sulphide sulphur, carbonates, calcium (Ca) and magnesium (Mg). The samples beneficially contain relatively low concentrations of organic carbon, copper (Cu), lead (Pb), arsenic (As), mercury (Hg), tellurium (Te) and antimony (Sb). There appears to be no significant variation in multi-element species concentrations between the different geological zones.

Table 13.1: Summary of Wallaby zone average sample head analysis

Analyte	Units	Zone 80 (Avg)	Zone 90 (Avg)	Zone 100 (Avg)	Zone 110 (Avg)	Zone 120 (Avg)	Zone 135 Vertical (Avg)	Zone 135 Horizontal (Avg)
Ag	ppm	0.60	0.50	0.53	0.53	0.54	0.49	0.97
Al	%	6.53	5.99	6.60	6.60	6.03	6.26	5.76
As	ppm	116	38	29	29	28	20	22
Ba	ppm	248	443	1279	1279	930	1055	822
Be	ppm	2.10	1.60	<20	<20	<20	5.00	9.53
Bi	ppm	3.00	2.00	<25	<25	<25	10.00	14.53
C total	%	3.45	2.84	2.55	2.55	2.69	2.91	2.78
C organic	%			0.05	0.05	0.06	0.03	0.03
C carbonate	%			8.39	8.39	12.64	14.44	8.01
Ca	%	7.22	5.95	5.91	5.91	6.21	6.56	6.32
Cd	ppm			20	20	20	5	10
Co	ppm	34	30	32	32	34	27	34
Cr	ppm	164	134	164	164	150	118	100
Cu	ppm	93	87	87	87	87	73	86
Fe	%	6.24	5.71	6.77	6.77	5.98	5.45	6.30
Hg	ppm	0.30	2.10	0.43	0.43	0.33	0.35	0.32
K	%	1.71	1.95	2.46	2.46	2.13	2.58	1.76
Li	ppm	78	85	25	25	27	17	23
Mg	%	2.24	1.98	1.88	1.88	2.12	1.79	2.03
Mn	ppm	1,737	1,442	1,299	1,299	1,339	1,353	1,394
Mo	ppm	10	12	24	24	28	85	18
Na	%	2.99	2.74	3.13	3.13	2.70	2.74	2.67
Ni	ppm	105	86	81	81	94	71	90
P	ppm	527	699	643	643	927	822	612
Pb	ppm	52	36	36	36	24	50	46
S total	%	3.44	3.16	2.01	2.01	2.18	2.41	2.67
S sulphide	%	2.27	2.87	2.22	2.22	2.48	2.23	2.45
Sb	ppm	28.0	28.0	5.9	5.9	5.0	6.2	7.1
SiO_2	%	46	52	47	47	44	47	47
Sr	ppm	1,501	1,379	1,412	1,412	1,151	1,976	1,102
Te	ppm			1.1	1.1	1.9	1.8	1.8
Ti	ppm	3,400	2,900	3,457	3,457	3,806	3,564	3,793
V	ppm	198	192	148	148	167	142	154
Y	ppm			85	85	37	100	100
Zn	ppm	125	106	110	110	94	84	75

Source: Granny Smith CPR, 2021

13.2.2 Metallurgical recovery

A summary of the number and results of laboratory recovery tests carried out on samples taken from key selected mining areas is shown in Table 13.2. The average grades, tails and recoveries for each mining zone data is also shown for reference.

Table 13.2: Summary of metallurgical samples/tests quantities and summary of average recovery results

Wallaby zone	No. samples	Zone structure direction	Calculated head grade Au (g/t)	Gravity recovery (%Au)	Final tails grade Au (g/t)	Overall recovery (%Au)
Joey Z250-60	6	Horizontal	7.62	34.75	0.47	93.9
Zone 80	3	Horizontal	6.28	NA	0.86	86.4
Zone 90	15	Horizontal	10.03	NA	1.30	87.0
Zone 100	35	Horizontal	6.50	NA	0.71	89.0
Zone 105	3	Vertical	6.31	46.39	0.37	94.1
Zone 110	5	Horizontal	4.46	32.23	0.50	88.9
Zone 120	11	Horizontal	7.37	36.01	0.61	91.8
Zone 125	3	Vertical	7.53	42.84	0.61	91.9
Zone 135	20	Horizontal	7.62	30.09	0.66	91.4
Zone 135	9	Vertical	9.75	27.53	0.84	91.4

Source: Granny Smith CPR, 2021

The laboratory testwork methodology carried out on the samples from Zones 80, 90 and 100 excluded a gravity recovery stage, since the plant was not equipped with a gravity circuit at the time that the testwork was carried out.

Table 13.3 summarises metallurgical recoveries for the key ore sources in the Granny Smith Mineral Reserve. For the development of the Mineral Reserve process recovery estimation models for the plant, two separate approaches have been adopted, and described as follows:

- Grade/recovery estimation model fitted to the 2020 monthly actual plant performance results – a single recovery estimation model is adopted for the surface stockpiles and Wallaby Zones 60, 70, 80, 90, 100, 110 and 120 ore sources, due to the availability of actual processing experience and history treating these blended ore sources.
- Grade/recovery estimation model fitted to testwork results – adopted for Wallaby Zone 250/Joey and Zone 135 (vertical and horizontal), because these ore sources have not yet been processed through the plant, and therefore the metallurgical testwork results are the only available information concerning recovery of these two mining areas.

Table 13.3: Summary metallurgical recoveries estimate by ore source (geological zone)

Mining area		Note	Tonnes (kt)	Grade (g/t Au)	Recovery (%)	Recovery estimation model
Underground	Wallaby Zone 250/Joey	1	479	4.7	93.8	100 x (Grade – $\frac{(0.0589 \times Grade + 0.0164)}{Grade}$)
	Wallaby Zones 60, 70, 80 & 90	2	459	4.61	92.1	100 x (0.8322 + 0.058 x LN(Grade))
	Wallaby Zone 100	2	1,904	5.15	92.7	100 x (0.8322 + 0.058 x LN(Grade))
	Wallaby Zone 110	2	910	5.19	92.8	100 x (0.8322 + 0.058 x LN(Grade))
	Wallaby Zone 120	2	4,078	5.42	93.0	100 x (0.8322 + 0.058 x LN(Grade))
	Wallaby Zone 135	1	4,752	5.52	91.1	100 x (1 – $\frac{(0.10561 \times Grade^{0.89756})}{Grade}$)
	Surface stockpiles	2	31	4.76	92.3	100 x (0.8322 + 0.058 x LN(Grade))

Note: a) Recovery estimation model developed using testwork results.
b) Recovery estimation model developed using 2020 monthly plant results treating blended ore.

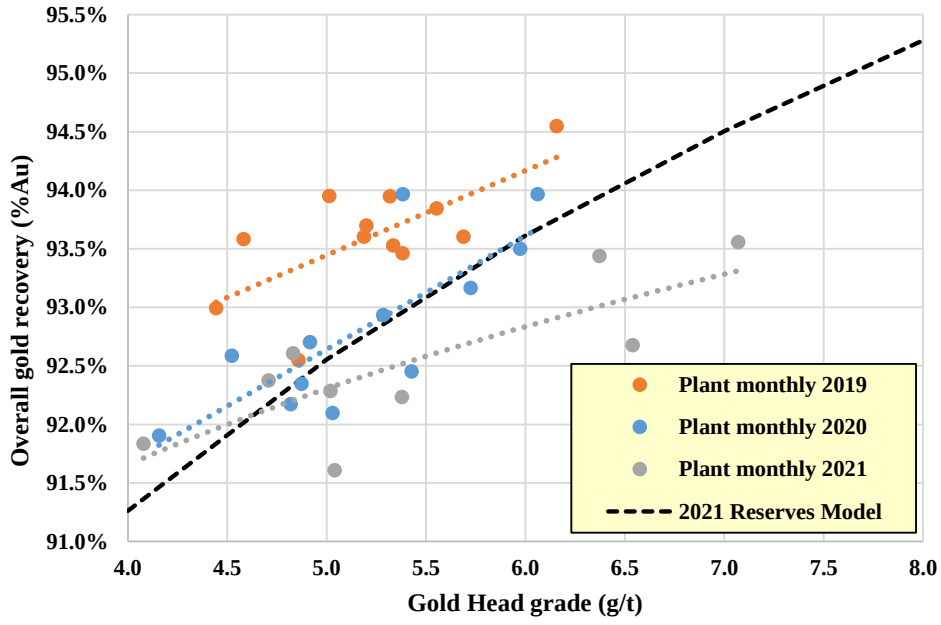
Source: Granny Smith CPR, 2021

Due to the added complexity of the Granny Smith treatment plant with the inclusion of a CIP tailings retreatment circuit (spirals and concentrate regrinding), and the significantly larger volumes treated (compared to metallurgical core sample volumes) there is more confidence in using the actual plant results for recovery performance estimation, as compared to the laboratory test results.

A chart comparing the monthly plant feed grade and recovery results, with the plant recovery estimation model (used for Zones 60 through to 120) is shown in Figure 13.1. There is a reasonable degree of variability in the plant results, however the recovery estimation model matches the 2020 plant results reasonably well, since this was the dataset used to develop the model early in 2021. The plant recovery results achieved in 2021 are slightly lower than the recovery estimation model.

The recent performance of the Granny Smith process plant is provided in Figure 13.1 for comparison.

Figure 13.1: Granny Smith plant monthly feed grades and recoveries compared to the recovery estimation model used for Z60 to Z120



Source: Granny Smith CPR, 2021

13.2.3 Ore hardness

The metallurgical testing program at Granny Smith includes ore hardness testing, typically being the crushing work index, abrasion index (Ai), Bond ball work index (BMI) and SAG milling parameters by Steve Morrell Consulting (SMC). To estimate mill throughput expectations for future ores from the hardness test results, the Morrell Total Power method is used, which provides an estimate of overall grinding circuit power requirement in kWhr/t using the SMC parameters (SAG mill, Mia and Ball mill, Mib) which are calculated from the BMI test and the SMC drop weight index test results.

The grouped ore hardness indices and total milling power draw requirement estimates are shown in Table 13.4, for a final grind size of approximately 100 μm, listed in order of increasing estimate of power draw.

Table 13.4: Summary of hardness indices and power requirements estimates for Wallaby underground mine

Wallaby ore source, by zone	Rock specific gravity (t/m^3)	SAG index, Mia (kWhr/t)	Ball index, Mib (kWhr/t)	Estimated mill power required motor (kWhr/t)
Joey	2.87	23.0	18.1	16.5
Zone 80	2.84	23.0	17.9	16.4
Zone 90	2.82	21.1	16.9	15.3
Zone 100	2.84	24.7	20.0	18.0
Zone 110	2.83	22.3	18.1	16.2
Zone 120	2.83	22.5	18.9	16.7
Zone 135 Vertical	2.79	20.1	15.1	14.1
Zone 135 Horizontal	2.84	19.9	15.1	13.9

Source: Granny Smith CPR, 2021

From an operational perspective, the treatment capacity of the installed process plant far exceeds the ore mining rate from the Wallaby underground mine. The plant is operated on a calendar monthly campaign basis, running for about two weeks, and then going on stand-by (shut-down) for about two weeks, timing varying based up on the availability and volume of the Wallaby mined ore stockpile.

13.3 Process plant sampling

Daily composite samples of process plant feed and tailings streams are taken to assist in gold accounting on site. These are collected using a combination of automatic sampling stations as well as manual cuts using properly designed samplers. Analysis of the composites includes gold contained in solids, solution, and carbon. The analysis of samples used for accounting purposes is conducted by the Granny Smith site laboratory.

The laboratory facilities include sample preparation, fire assay and a wet analysis area. Solid sample composites are analysed using fire assay with an AAS finish. Carbon sample composites are assayed using high temperature ashing, acid digest and an AAS finish. Solution sample composites are assayed using DIBK extraction and an AAS finish. All laboratory assaying procedures are aligned with standard industry practices.

Bullion samples are taken when required by vacuum sampling from each gold pour. These samples are used as an estimate prior to receiving official outturn assays provided by the Perth Mint.

In accordance with Gold Fields Plant Metal Accounting Standard, a gold in circuit inventory is undertaken monthly to reconcile (by mass balance) the back-calculated gold grade of the mill feed with the mill feed grade estimates obtained using daily plant samples and assays. The monthly variance between the assayed grade and the back-calculated grade is monitored, and an investigation is initiated if this variance exceeds the minimum allowable levels outlined in the Gold Fields Plant Metal Accounting Standard.

13.4 Processing factors and deleterious elements

The testwork procedures includes analysis for elements that could be deleterious to plant recovery (e.g., arsenic, tellurium, antimony, organic carbon). However, to date no specific deleterious mineral species have been identified that significantly impacts the process plant.

The Granny Smith ore sources are notably enriched in sulphide sulphur; and there is a positive relationship between the Wallaby metallurgical sample's leach tailings grade and sulphur head grade. However, due to the limited availability of sulphur grade data in the mine's geological assay database, it is not possible to estimate sulphur grade distribution within the Granny Smith mineralisation areas.

13.5 Metallurgical risks

In the opinion of the Qualified Person, the combination of a well-established process plant with a known operating history of treating ores mined from the associated mining leases, together with the ongoing and active metallurgical testwork program assessing core samples selected from future local mineralisation areas, provides a reasonable platform for estimating the associated metallurgical and processing Modifying Factors underpinning the 2021 Mineral Reserves.

However, the reader should be aware that uncertainties remain, and some key potential areas of risk and uncertainty are discussed in Item 13.5.1 to Item 13.5.3.

13.5.1 Sample representativity

Metallurgical sample selection is an important aspect of the process of developing resources into reserves. The results of the testwork undertaken on those samples are often used directly as input into plant performance estimates that are then used for the life of mine and Mineral Reserve's financial evaluations. It is important that the metallurgical samples are representatively selected, for example, to cover a suitable range of gold head grades, to consider the different geological lithologies and domains expected to be encountered, and to appropriately incorporate internal and external material dilution expected during the mining process. Individually testing different head grades ranges and geological domains improves the ability to see the metallurgical response variability of the orebody, which improves the ability to make better judgements and estimates about how the material could perform in the process plant.

As new potentially economic mineralised areas are identified at the mine, the site's exploration geologists and metallurgists will select a few, to several, core composite samples of each new mineralisation area, and submit to a commercial metallurgical laboratory for the undertaking of a defined testwork program including, head assays, recovery, and physical properties analyses.

Whilst effort and care are taken with the sample selection process, there are practical constraints to samples numbers due to core availability and testwork cost, and therefore it is not possible for the Qualified Person to guarantee that the proposed Mineral Reserves have been fully representatively sampled, and therefore some inherent uncertainty will remain.

13.5.2 Laboratory test methods and scale-up

The laboratory test results require scale-up to estimate performance through the industrial processing facility.

The metallurgical testing regime adopted has been specifically tailored to provide results that reasonably and practically represent the actual installed processing facility. This regime has been developed from experience gained over many years of undertaking such work, culminating in eventual mining, and processing of ores that have been historically metallurgically tested.

Gravity and leach recoveries achieved in the laboratory are assumed to be achievable within the plant. Overall laboratory recovery results are typically model-fitted to a bounded sample head grade relationship, and this resulting model is assumed to be reasonably achievable at plant scale.

Hardness properties are applied to the Morrell Total Power method to estimate grinding mill throughputs.

However there remains potential risk associated with the delivery of these metallurgical testing results associated with the differences between laboratory methods and full-scale processes, and miscellaneous and unidentified errors associated with undertaking the testing.

The selected laboratory (ALS Metallurgy, Balcatta, Western Australia) that is undertaking the metallurgical testwork is highly regarded within the local gold mining industry, and has an established history of performing well, with both Gold Fields and the Qualified Person.

No pilot-plant testing is carried out prior to reserve declaration and subsequent mining, and the metallurgical properties are based on bench scale test results only. The sample requirements and cost for pilot testing are considered as being prohibitive. However, with a history of successful operation, and in being consistent with practices adopted for other similar operations, it is the opinion of the Qualified Person that pilot plant testing is not required for the estimation of plant Modifying Factors for the 2021 Mineral Reserves.

Despite reasonable efforts and care in the application of scale-up factors and modelling methods, there remains some inherent uncertainty in actual performance of the industrial facility predicted from a small volume of small-scale laboratory tests. One of the key challenges in confirming scale-up is the practice of ore blending of the plant feed (to optimise overall performance of the plant) which can limit regular direct comparison of plant performance and laboratory test results over the longer term.

13.5.3 Deleterious elements

The routine metallurgical testwork program includes detailed head analysis (multi-element ICP-MS scan) to check for quantities of potential deleterious elements to the plant, such as mercury, arsenic, organic carbon, antimony, tellurium, base metals, etc. Whilst this assessment is carried out on the limited number of metallurgical composite samples, it is not typically undertaken on individual exploration or mine geological samples.

The multi-elemental assay results obtained from the metallurgical samples are used as a guide to identify if there are any deleterious elements at concentrations that would be of reasonable concern that could materially impact plant performance. If such a species is identified then the option to submit a larger number of individual exploration samples for detailed analysis, to better quantify and locate the deleterious species, is readily available.

However, it needs to be recognised that the relatively low number of metallurgical samples initially checked for deleterious elements means that some inherent risk remains of unexpectedly encountering such a species during subsequent mining and processing operations, despite such elements not being identified during metallurgical testing.

13.6 End-2021 Mineral Reserves recovery estimation model

The recovery estimation model used to predict recoveries for ores mined from Zone 60 through to Zone 120, reasonably matches the plant results achieved during 2020, since the recovery model was developed early in 2021 using the 2020 plant results. However, the actual plant performance achieved during 2021 (i.e., after the development of the recovery model) are slightly lower by approximately 0.5 % recovery at a head grade of approximately 5.5 g/t.

Due to the study timing associated with the various tasks to develop annual reserves, it is required to update the recovery estimation models early in the calendar year, to provide time for the calculation of cut-off grades and updates to be made to the mine design accordingly.

14 Mineral Resource estimates

The December 2021 Granny Smith Mineral Resource estimate is comprised of three areas: Wallaby, Granny Smith and Hillside. The Mineral Resources undergo an initial assessment through the application of a range of assumed technical and economic factors to ensure reasonable prospects for economic extraction. All Mineral Resource grades and tonnages are diluted and reported in situ. The in situ cut-off grade has Modifying Factors applied.

Software used for the data analysis and grade modelling includes:

- Leapfrog® 2021.1.2
- Datamine® Studio RM v1.3.35.0
- Snowden Supervisor® v8.14.0
- Geovariance Isatis® v18.04.

14.1 Mineral Resource estimation criteria

14.1.1 Geological model and interpretation

The Wallaby Mineral Resource comprises eight models covering the extent of the underground mine and future Mineral Reserves. The Granny Smith Mineral Resource model is a single model that contains the underground Mineral Resource areas. The Hillside Mineral Resource model is a single model covering the open pit Mineral Resource

The geological interpretations are based on conceptual models which reflect the current understandings of the controls on mineralisation as discussed in Item 7.3. The conceptual models consider lithology, structural controls, alteration and mineralisation. The understanding of these controls are updated and reviewed as additional information is collected for each deposit.

Geological interpretation and modelling are an iterative process that evolves as new data and ideas become available. Generally, only one interpretation and model is submitted for evaluation; however, the interpretation(s) is one that most geologists would independently determine and report. This has been confirmed by ongoing peer, corporate, and external audits and reviews, which have in all cases supported existing methodologies and processes while suggesting a number of minor enhancements.

Domain wireframes are created using Leapfrog® software where drillhole interval selections are used to generate wireframes using Leapfrog®' vein modelling or interpolant 3D wireframe modelling functions. Wireframes (depending on the deposit) are created for geological/grade domains, base of oxidation, top of fresh rock, and topography/pits. All models are constrained by geological boundaries and when relevant, by previous open-pit surfaces or underground development wireframes. Internal sub-domains are defined where geological understanding is sufficient. Domaining to define geological zones takes account gold grade and alteration.

Cross-cutting dykes and intrusives are accounted for if of sufficient size during the geological interpretation stage.

14.1.2 Block modelling

The resource models are 3D block models constrained within 3D domain wireframes. Grade estimates are carried out into block sizes optimised with respect to the nominal drill spacing (parent cells). The parent cells are sub-celled to accurately represent the volume within the domain. The block sizes used for each resource model are listed in Table 14.1. Mining depletion is flagged in the resource model and excluded from Mineral Resource reporting.

Table 14.1: Summary of December 2021 Mineral Resource estimation parameters

Model	Maximum Search	Min. Max Samples	Parent cell size (X, Y, Z)	Sub-cell maximum size (X, Y, Z)	Estimator	Estimate sample type	Composite length	Top cuts	Date
Granny Smith	136 m × 105 m × 29 m	6, 30	6 m × 6 m × 6 m	6 m × 6 m × 6 m	Simulation	DD, RC/DD & RC	1 m	5 g/t-50 g/t	July 2020
Hillside	181 m × 66 m × 20 m	6, 48	10 m × 10 m × 5 m	1.25 m × 1.25 m × 0.25 m	SK & OK	DD, RC/DD & RC	1 m	1.5 g/t-16 g/t	September 2017
Wallaby Zone 250/60	135 m × 81 m × 33 m	8, 32	5 m × 5 m × 2 m	2.5 m × 2.5 m ×1 m	SK & OK	DD, RC/DD & face (grade control areas)	1 m	2 g/t-100 g/t	May 2021
Wallaby Zone 70	114 m × 88 m × 40 m	8, 32	5 m × 5 m × 2 m	2.5 m × 2.5 m × 1 m	SK & OK	DD, RC/DD & face (in grade control areas)	1 m	2 g/t-70 g/t	March 2021
Wallaby Zone 80	60 m × 54 m × 22 m	12, 46	5 m × 5 m × 2 m	2.5 m × 2.5 m × 1 m	SK & OK	DD & face (in grade control areas)	1 m	2 g/t-110 g/t	June 2021
Wallaby Zone 90	123 m × 120 m × 22 m	8, 40	5 m × 5 m × 2 m	2.5 m × 2.5 m × 1 m	SK & OK	DD & face (in grade control areas)	1 m	3 g/t-125 g/t	May 2020
Wallaby Zone 100	149 m × 94 m x 31 m	10, 44	5 m × 5 m × 2 m	2.5 m × 2.5 m × 1 m	SK & OK	DD & face (in grade control areas)	1 m	2 g/t-130 g/t	October 2021
Wallaby Zone 110-120	97 m × 87 m × 42 m	8, 38	Variable: 10 m × 10 m × 2 m & 5 m × 5 m × 2 m	2.5 m × 2.5 m × 1 m	SK & OK	DD & face (in 5 m × 5 m × 2 m grade control areas)	1 m	2 g/t-70 g/t	November 2021
Wallaby Zone 135	214 m x 173 m	4, 12 (Seam composite)	10 m × 10 m × seam	1.25 m ×1.25 m × seam	2D GM SK & OK	DD	Seam width single composite	6 gm-250 gm	December 2021
Wallaby Zone 150	164 m x 46 m x 20 m	8, 30	5 m × 5 m × 5 m	1.25 m × 1.25 m × 2 m	Localised Conditional Simulation	DD	1 m	100 g/t	December 2021

Note: Wallaby Zone 150 is localised to SMUs (5m x 5m x5m) from big parent volumes

Source: Granny Smith CPR, 202:

14.1.3 Bulk density

Density testing is undertaken on-site by core yard technicians using Archimedes principle (water immersion method). Densities are calculated using the below formula.

$$Density = mass\ (dry)/(mass\ (dry) - mass(\ in\ water))$$

A tabulation of the densities applied is provided in Table 14.2, Table 14.3 and Table 14.4

Table 14.2:Granny Smith density values

Block model domain	Density (t/m³)
Air	0
Fill/dumps	1.8
Complete oxidation	2.2
Partial oxidation	2.47
Granodiorite Partial oxidation & fresh	2.67
Felsic porphyry Partial oxidation & fresh	2.67
Banded iron formation Partial oxidation & fresh	2.74
Meta-sediment Partial Oxidation & fresh	2.74

Source: Granny Smith CPR, 2021

Table 14.3: Wallaby density values

Block model domain	Conglomerate ore (t/m³)	Intrusive ore (t/m³)	Conglomerate waste (t/m³)	Intrusive waste (t/m³)
Zone 250-60 oxide	All lithology types 1.90			
Zone 250-60 transitional	All lithology types 2.51			
Zone 250-60 fresh	2.73	2.65	2.77	2.62
Zone 70	2.77	2.66	2.77	2.66
Zone 80 – Zone 90	2.81	2.72	2.87	2.75
Zone 100	2.84	2.72	2.87	2.78
Zone 110 – 120	2.81	2.71	2.84	2.72
Zone 135	2.82	2.71	2.83	2.72
Zone 150	2.82	2.71	2.83	2.72

Source: Granny Smith CPR, 2021

Table 14.4: Hillside density values

Block model domain	Density (t/m³)
Air	0
Cover/transported	1.78
Complete oxidation	2.35
Partial oxidation	2.63
Fresh	2.76

Source: Granny Smith CPR, 2021

The Qualified Person's opinion of the density work is that the bulk density testing is adequate for the intended purpose and the tonnage estimation based on the bulk densities appear to have little bias. Bulk densities are consistent with lithology and ore types estimated over a ±25 year mining history.

14.1.4 Compositing and domaining

DD and RC drillhole data are exported from the Granny Smith acQuire® databases in comma separated text file format (.csv) using queries to restrict the data to the relevant model area. Face sampling data are also used for the Wallaby underground models where grade control had been completed but restricted by polygon to areas immediately surrounding the drives (Table 14.1). Cross validation checks, duplicate checks and overlap checks on the data are undertaken following import into Datamine®.

Drillholes are composited at 1 m intervals within the interpreted mineralised zones for all models except the Wallaby Zone 135 model where the drillholes are composited across the full width of the lodes. The 1 m length chosen for compositing matches closely the average sample length. Composites are split at mineralisation domain and lithology boundaries.

14.1.5 Top cuts

The objective of cutting of high gold assay values is to reduce the influence of high-grade outlier values on the grade estimate. Top cut analyses are conducted on all model domains resulting in updated top-cuts. Top cut statistics for each deposit and each domain/zone are determined using the following methods:

- Histogram plots.
- Cumulative log probability plots.
- Mean and variance plots.
- Spatial distribution review.

14.1.6 Variography

The correlation between sample grades can be seen to increase with decreasing distance between samples and can vary with direction, sample size and the degree of grade continuity. The variogram function attempts to quantify this correlation in 2D or 3D space and determine the search parameters in the grade estimation process.

Where appropriate (i.e. for 3D cases), down-the-hole and spherical directional continuity variograms are completed using Snowden Supervisor® software and used in combination with manually created search ellipses in Datamine®. Corresponding 2D accumulation and true width variograms also modelled for 2D estimation.

Dynamic anisotropy is a process used whereby the search ellipse is “moulded” to follow undulations within the mineralised domain wireframes. It is a method used to solve the problem of incorrect cross correlation of data points when using a single (variogram or ellipse) defined search ellipse across an undulating domain. This process is effective for the Wallaby deposit due to the undulating nature of the mineralised zones. For the Wallaby Zone 135 model, a 2D flattening approach is used in preference to dynamic anisotropy as a continuous improvement initiative to further reduce the effects of highly undulating domains.

The Qualified Person’s opinion is that the variography is practical reflection of the spatial continuity of the respective mineralisation grades and their application to the geostatistical analysis is adequate to minimise uncertainty and to derive appropriate resource block models for use by the planning engineers to complete mine design and production scheduling.

14.1.7 Grade estimation

For Granny Smith, conditional simulation (CS) is the main estimation technique used. For Hillside, ordinary kriging (OK) and simple kriging (SK) are the main estimation techniques used. For Wallaby Zones (except Zone 150), OK is the main 3D estimation technique, with SK used in areas of sparse drilling for more efficient estimates. As a result, the OK estimated grade is used in areas of Indicated Mineral Resource or better classification in all Wallaby models, while the SK estimated grade is used in areas of Inferred Mineral Resource classification. For Wallaby Zone 150 CS is the main estimation technique used. The grade estimation parameters by resource model are presented in Table 14.1

Different domains utilise a combination of hard, soft and semi-soft grade boundaries during estimation. If domains have distinctly different gold distribution characteristics, the estimation reflects this by having hard boundaries between domains. If domains shared similar gold distribution characteristics, they are estimated using a soft grade boundary, which assists to increase the number of samples available for estimation and better reflects the mineralisation. If following boundary analysis, domains have similar gold distribution characteristics near the boundary but different gold characteristics further from the domain boundary, a semi-soft grade boundary is used in the estimation.

Grades are estimated into models with optimised parent block sizes determined through the completion of kriging neighbourhood analysis (KNA) to optimise block size kriging efficiency and regression slope values. Parent blocks are sub-celled to increase volumetric accuracy of the domain wireframe. Sub-blocks are set to retain the same grade as the parent block.

A multiple pass approach is used for estimation within the mineralised domains. Directional ranges determined from variogram analysis are used to constrain search distances used in estimation as tabulated in Table 14.1. The ranges are also used as an aid in resource classification. The first pass uses the optimised search parameters for the domain based on variogram modelling and KNA. Search distances are based on maximum continuity from the variogram. With each subsequent estimation pass, the number of samples is reduced and the search volume (distance) increased. This approach is used to enable most blocks to receive a grade estimate within the domains, with the search pass coded into the model.

14.1.8 Selective mining units (SMUs)

The Granny Smith SMU size (i.e. the smallest volume of material on which ore and waste classification is determined) in underground operations varies from long-hole stoping (4 mH x 20 mL x 25 mW), bulk stoping (50 mH x 20 mL x 25 mW) and development (5 mH x 5 mL x 5 mW).

Resource parent block sizes are broadly aligned to the smallest SMU in length and width, while providing greater model selectivity in height. KNA is used to ensure optimal block sizes are chosen for estimation purposes. Mineral Resources are constrained within optimised stope solids varying between the minimum and maximum SMUs.

14.1.9 Model validation

All data acquired is based on current and historical detailed knowledge and models derived over many years of exploration and mining at Granny Smith. Corporate consultants and industry experts routinely visit site to review the best practices and guide, align the current staff with new innovative methods, ideas and concepts to facilitate continued excellence in exploration, mining and resource estimation. In addition, internal and external training of new and existing staff to appropriate methods, techniques together with management oversight ensures on-going best practices.

The geological interpretation has potential to materially impact on the estimated quantity and quality of the Mineral Resource and Mineral Reserve. Incorrect assumptions regarding volume and geological and/or grade continuity has the potential to overestimate contained metal. However, support from expert geologists, site and corporate peer reviews, external reviews, and the MHR and Model Sign-Off Form processes ensure that the geological interpretation is one that most geologists would independently arrive at.

A series of standard model validations are carried out during and after completion of the grade estimation including:

- Visual validation checks.
- Wireframe vs. block model volume checks.
- Comparison of different estimation methods (SK vs OK).
- Comparison of composite vs block model statistics.
- Comparison of composite vs block model swath plots.
- Global change of support.
- Analyses of quality of estimates (including slope of regression and kriging efficiency).

Granny Smith has an extensive and proactive grade control and reconciliation process to review operational planning against actual performance. This encompasses model performance, dilution, mining mix and grade distributions and are comprehensively tracked and managed through the site database. Periodic reports and reviews are completed as part of monthly and quarterly reviews, as well as tracking of the mine call factor and ore sources. Current 2021 reconciliation results indicate no adverse impacts or risks associated with the resource models.

14.1.10 Cut-off grades

Cut-off grades are influenced by the operating strategy, design and scheduling, and are therefore calculated annually.

Open pit

The cut-off grades used for the open pit Mineral Resources at Hillside are summarised in Table 14.5.

Table 14.5: Open pit resource cut-off grades

Open pits	Resource cut-off grade (g/t Au) Run-of-mine	Resource mining recovery (%)	Resource mining dilution (%)
Hillside	0.66	100	0

Source: Granny Smith CPR, 2021

The open pit Mineral Resources are constrained to an optimal shell defined by a Mineral Resource gold price of $1,500/oz and relevant unit costs and Modifying Factors. Optimisation of the resource pit shell is carried out using Geovia Whittle® software. The cut-off grade is calculated for the material within the pit shell using the following formula:

$$\frac{\text{[Ore Premium Mining Costs (\$/t) + Process Costs (\$/t) + Site G\&A Costs (\$/t)]}}{\text{[Price x (100 \% - Ad valorem Royalty Rate) – All product related costs] x PRF x MCF x 0.03215075}}$$

Where:

- Ore Premium Mining Costs cover adjustments in ore haulage distances and differences in ore and waste drill and blast costs. All other mining costs are accounted for during the pit shell generation phase.
- Process Costs including sustaining capital.
- Site G&A Costs including off-site general and administration (G&A) costs directly related to site (e.g. accounting or payroll services).
- Price is the gold price per ounce ($1,500/oz).
- The ad valorem Royalty Rate is 2.5 %.
- All product related costs include management fees, refining costs and contributions to the Gold Fields Foundation per ounce.
- PRF is the plant recovery factor or metallurgical recovery as a percentage estimated at a grade close to the cut-off grade.
- MCF is the mine call factor or the percentage of actual mill produced metal against the claim of metal produced.
- 0.03215075 is the ratio of troy ounces per gram.

All material within the pit shell above the calculated cut-off grade is judged to have reasonable prospects for economic extraction.

Underground

The cut-off grades for the underground Mineral Resources at Granny Smith and Wallaby are summarised in Table 14.6.

The underground Mineral Resource estimates are evaluated using the same formula and gold price of $1,500/oz.

$$\frac{\text{[Mining Costs (\$/t) + Process Costs (\$/t) + Site G\&A Costs (\$/t)]}}{\text{[Price x (100 \% - Ad valorem Royalty Rate) – All product related costs] x PRF x MCF x 0.03215075}}$$

Where:

- Mining Costs take account the mining method and area being mined inclusive of secondary development and sustaining capital.

The cut-off grade is applied to the deposit model as part of the assessment in relation to minimum mining width and reasonable prospects of extraction.

Table 14.6: Underground resource cut-off grades

Area	Resource cut-off grade (g/t Au) Run-of-mine	Minimum mining width (m)	Resource mining recovery (%)	Resource mining dilution (%)	Resource cut-off grade (g/t Au) MSO[1]
Granny Smith underground					
Granny Smith	1.89	4 mH x 5 mL x 5 mW	90	120	2.27
Wallaby underground					
Z60_Joey	2.30	4 mH x 5 mL x 5 mW	90	116	2.67
Zone 70/80	2.50	4 mH x 5 mL x 5 mW	90	116	2.90
Zone 90	2.53	4 mH x 5 mL x 5 mW	90	116	2.93
Zone 100 Main	2.67	4 mH x 5 mL x 5 mW	90	116	3.10
Zone 100 Vertical	2.82	4 mH x 5 mL x 5 mW	92	120	3.39
Zone 110	2.90	4 mH x 5 mL x 5 mW	92	116	3.37
Zone 120	2.83	4 mH x 5 mL x 5 mW	92	116	3.29
Zone 135 Main	2.91	4 mH x 5 mL x 5 mW	92	116	3.38
Zone 135 Vertical	3.08	4 mH x 5 mL x 5 mW	92	116	3.57

Note: [1] MSO is the mine shape optimiser block for selecting Mineral Resource mining shapes.

Source: Granny Smith CPR, 2021

Minimum mining width and reasonable extraction are assessed using a mineable shape optimiser (MSO) routine available in Datamine® Studio RM software. This routine generates a series of shapes related to a nominated SMU and a minimum width to maintain an average grade within the shape above the nominated cut-off grade. The SMU and minimum mining width are specified in line with current mining practices at Granny Smith.

MSO shapes are removed where they are judged too isolated and unlikely to be eventually economically extracted. This leaves a contiguous set of shapes. Small amounts of material below cut-off within the boundaries of the contiguous set of shapes are evaluated to determine if they would be extracted as part of a mining sequence.

When close to existing mining areas, a further assessment is made to ensure that material is potentially extractable. Remnant mining areas are coded using a stand-off distance to existing stopes. Mineralisation inside the stand-off zones is not reported as a Mineral Resource except where an engineering assessment has resulted in the design and potential extraction of planned stopes.

All material within the retained MSO shapes above the calculated cut-off grade is judged to have reasonable prospects for economic extraction and may include some material below the cut-off grade that is extracted as part of the sequence to mine the higher grade (above cut-off) material.

Gold Fields conducts an annual review of metal prices for Mineral Resource and Mineral Reserve reporting to monitor any significant changes that would warrant re-calibrating the price deck for strategic and business planning purposes. This review takes into account prevailing economic, commodity price and exchange rate trends, together with market consensus forecasts and Gold Fields' strategy and expectations for the mine operations.

The Mineral Resource gold price of $1,500/oz is based on consideration of the following elements and rationale:

- The 2020/21 gold price volatility, driven mainly by the COVID-19 pandemic and uncertainty related to federal reserve rate cuts, quantitative easing, global geopolitical tensions and fears of global recession, has added some complexity to the 2021 metal price analysis. However, as the pandemic peaks and moves into a 'controlled and diminishing' phase, gold prices could pull back and this has been factored into the analysis.
- The long-term Canadian Imperial Bank of Commerce (CIBC) market consensus forecast of $1,585/oz, and the January 2021 KPMG International Limited (KPMG) gold price survey, which involved 25 gold mining companies, indicating a long-term gold price of $1,496/oz, with a low long-term price of $1,350/oz and a high long-term price of $1,600/oz.
- A$ exchange rate of $0.74 which is within 2 % of the CIBC long-term foreign exchange forecast.
- Ensuring Mineral Resources volatility is lessened year-on-year with protection against possible downside scenarios if the gold price falls up to ~25 % in a specific year.
- Ensuring sufficient margin at prices incrementally lower than current spot price ranges and mitigating the risk of inflation.
- The Mineral Resource gold price premium to the Mineral Reserve price is circa 15 % and the differential is in general alignment to Gold Fields' peer group and industry standard practice.
- The Mineral Resource price premium provides information on each operation's potential at higher gold prices and indicates possible future site infrastructure and mining footprint requirements.

The Qualified Person has relied on information provided by the Issuer in preparing its findings and conclusions regarding commodity price and foreign currency exchange rate assumptions.

The Qualified Person has concluded that reasonable prospects for economic extraction have been demonstrated through the application of an appropriate level of consideration of the potential viability of the Mineral Resources. These considerations include a reasoned assessment of the geological, engineering (including mining and processing parameters), metallurgical, legal, infrastructural, environmental, marketing, socio-political and economic assumptions which, in the opinion of the Qualified Person, are likely to influence the prospect of economic extraction.

Although all permitting may not be finalised for some Mineral Resources, there is no reason to expect that these permits will not be granted based on existing processes and protocols.

14.1.11 Reasonable prospects of economic extraction

The Qualified Person has concluded that reasonable prospects for economic extraction has been demonstrated through the application of an appropriate level of consideration of the potential viability of Mineral Resources. These considerations include a reasoned assessment of the geological, engineering (including mining and processing parameters), metallurgical, legal, infrastructural, environmental, marketing, socio-political and economic assumptions which, in the opinion of the Qualified Person, are likely to influence the prospect of economic extraction.

Although all permitting may not be finalised for some Mineral Resources, there is no reason to expect that these permits will not be granted based on existing processes and protocols.

No mineralisation that does not have demonstrated reasonable prospects for economic extraction has been included in the Mineral Resource. Wherever the mineral resources are stated as being exclusive of mineral reserves: mineral resources that are not mineral reserves do not have demonstrated economic viability.

14.1.12 Classification criteria

Granny Smith's in situ Mineral Resources are classified as either Measured, Indicated or Inferred in accordance with the definitions of the SAMREC (2016) Code and CIM Definition Standards for Mineral Resources & Mineral Reserves (2014).

Increasing levels of geo-scientific knowledge and confidence are generally based on geological understanding, grade variance, drillhole/sample spacing, mining development (amount of exposed and mapped mineralisation) and mining history. The quality of the estimate is also taken into account and is based on the values and spatial distribution of kriging efficiency and slope of regression calculated during kriging.

In general, the following criteria are used as a guide to the Mineral Resource classification.

Measured Mineral Resources:

- High quality data.
- Nominal drill spacing less than 25 m × 25 m.
- Ore development drives with face sampling at <15 m intervals along the lode and grade control drillholes where lode contacts are not visible in the face.
- Geology, lithological controls, structure and mineralisation well understood. Geological evidence is sufficient to confirm geological and grade continuity between sample points.
- Updated geology interpretation wireframes include face and drive mapping.

Indicated Mineral Resources:

- Good data quality.
- Data density with nominal drill spacing between 25 m × 25 m and 50 m x 50 m.
- Geology, structure and mineralisation reasonably well understood. Geological evidence is sufficient to assume geological and grade continuity between sample points supported by the appropriate the drill spacing density.

Inferred Mineral Resources:

- Regions of the model that due to data quality issues would otherwise be considered as measured or indicated
- Data density with nominal drill grid spacing between 50 m × 50 m and 100 m x 100 m.
- Geology, structure and mineralisation not well understood. Geological evidence is sufficient to imply but not verify geological and grade continuity supported by the appropriate the drill spacing density.

Material that does not fit either of the three Mineral Resource categories is not reported.

GSM calculates and reports stockpiles when mining occurs and are supported by adequate sampling, surveys and end of month reconciliation and are thus classified as Measured Mineral Resources.

The Qualified Person is of the opinion that:

a) Inferred Mineral Resource has an even chance of converting to Indicated Mineral Resource with continued exploration, additional empirical data and evolving geoscientific modelling.

b) The Mineral Resource demonstrates reasonable prospects for economic extraction over the indicated study time frame.

c) The Mineral Resource gold price of $1,500/oz is at a 15 % premium to the Mineral Reserve price with the differential being in general alignment with Gold Fields standard practice for setting the Mineral Resource price. The 15 % premium is to provide information on Granny Smith Mineral Resource potential at higher gold prices and to indicate possible future site infrastructure, permitting, licencing, SLO, mining footprint and infrastructure requirements.

d) The Qualified Person's opinion is that, whilst effort and care are taken with the resource estimation and classification processes, increase in geological knowledge and available data will reduce the level of uncertainty, and therefore some inherent uncertainty will remain.

14.2 Mineral Resources as of 31 December 2021

The Granny Smith Mineral Resources exclusive of Mineral Reserves as of 31 December 2021 are summarised in Table 14.7. The Mineral Resources are 100 % attributable to Gold Fields and are net of production depletion up to 31 December 2021. The point of reference for the Mineral Resources is in situ with dilution applied to the MSO.

Table 14.7: Granny Smith - summary of gold Mineral Resources at the end of the fiscal year ended 31 December 2021 based on a gold price of $1,500/oz

.	Mineral Resources (exclusive of Mineral reserves)			Cut-off Grades (g/t Au)	Metallurgical Recovery (%)
	Tonnes (kt)	Grade (g/t Au)	Gold (koz Au)		
.Underground Mineral Resources					
UG Measured Mineral Resources	4,050	5.3	693	2.30 - 2.90	92 %
UG Indicated Mineral Resources	20,743	5.0	3,367	1.89 - 3.08	92 %
UG Measured + Indicated Mineral Resources	24,792	5.1	4,059	1.89 - 3.08	92 %
UG Inferred Mineral Resources	10,663	5.1	1,735	1.89 - 3.08	92 %
.Open Pit Mineral Resources					
OP Measured Mineral Resources	-	-	-	-	
OP Indicated Mineral Resources	-	-	-	-	
OP Measured + Indicated Mineral Resources	-	-	-	-	
OP Inferred Mineral Resources	357	1.9	22	0.66	92 %
.Stockpile Mineral Resources					
SP Measured Mineral Resources	-	-	-	-	
SP Indicated Mineral Resources	-	-	-	-	
SP Measured + Indicated Mineral Resources	-	-	-	-	
SP Inferred Mineral Resources	-	-	-	-	
.Total Granny Smith Mineral Resources					
Total Measured Mineral Resources	4,050	5.3	693	2.30 - 2.90	92 %
Total Indicated Mineral Resources	20,743	5.0	3,367	1.89 - 3.08	92 %
Total Measured + Indicated Mineral Resources	24,792	5.1	4,059	1.89 - 3.08	92 %
Total Inferred Mineral Resources	11,020	5.0	1,757	0.66 - 3.08	92 %

Note:
a) Rounding of figures may result in minor computational discrepancies.
b) Mineral Resources are exclusive of Mineral Reserves.
c) Mineral Resources categories are assigned with consideration given to geological complexity, grade variance, drillhole intersection spacing and proximity of mining development.
d) Quoted as diluted in situ metric tonnes and grades. Metallurgical recovery factors have not been applied to the Mineral Resource estimates. The approximate metallurgical recovery factor is 92 %. The metallurgical recovery is the ratio, expressed as a percentage, of the mass of the specific mineral product recovered from ore treated at the process plant to its total specific mineral content before treatment. Granny Smith mining operations vary according to the mix of the source material.
e) The metal prices used for the 2021 Mineral Resources are based on a gold price of $1,500 per ounce or A$2,000 per ounce (at an exchange rate of A$1: $0.75). Open pit Mineral Resources at the Australian operations are based on revenue factor 1 pits and the underground Mineral Resources on appropriate mine design and extraction schedules. The gold price used for Mineral Resources approximates 15 % higher than the selected Mineral Reserve.
f) The cut-off grade may vary per shaft, open pit or underground mine, depending on the respective costs, depletion schedule, ore type, expected mining dilution and expected mining recovery. The average or range of cut-off grade values applied to the Mineral Resources are; Granny Smith 2.11 g/t to 3.08 g/t Au mill feed (underground) and 0.66 g/t Au (open pit).
g) The Mineral Resources are based on initial assessments at the resource gold price of $1,500/oz and consider estimates of all Granny Smith costs, the impact of modifying factors such as mining dilution and mining recovery, processing recovery and royalties. Mineral Resources are also tested through the application of Environmental, Social and Governance (ESG) criteria to demonstrate reasonable prospects for economic extraction.
h) The Mineral Resources are estimated at a point in time and can be affected by changes in the gold price, US Dollar currency exchange rates, permitting, legislation, costs and operating parameters.

Source: Granny Smith CPR, 2021

The Mineral Resources are based on initial assessments at the Mineral Resource gold price of $1,500/oz and consider estimates of all Granny Smith costs, the impact of Modifying Factors such as mining dilution and recovery, processing recovery and royalties to demonstrate reasonable prospects for economic extraction.

14.3 Audits and reviews

All Granny Smith resource models compiled by site personnel are reviewed by Gold Fields regional technical staff and Corporate Technical Services (CTS) prior to release for mining and Mineral Reserve assessment.

The Mineral Resource estimate was also subjected to internal review and scrutiny by the relevant Qualified Persons and regional technical and financial disciplines, and peer reviewed for technical assurance and compliance in reporting by Gold Fields' CTS, Sustainable Development and Head Office Finance teams.

The Mineral Resource estimate is underpinned by appropriate Mineral Resource management processes and protocols verified through an embedded risk and control matrix (RACM)..

Gold Fields uses K2Fly RCubed® propriety software in combination with SharePoint to ensure accuracy, governance and auditability in the reporting of Mineral Resources and Mineral Reserves.

An external audit by Snowden of the Wallaby Zone 110-120 and Wallaby Zone 135 resource models was completed in December 2020, with no material issues identified.

14.4 Comparison with 31 December 2020 Mineral Resource

No Exclusive Mineral Resources were disclosed in 2020. For Inclusive Mineral Resources please refer to the Gold Fields Supplement to the Integrated Annual Report. Reporting of Exclusive Mineral Resources in this document is chosen to align with Gold Fields SK-1300 reports. Exclusive Mineral Resources have not been disclosed on any stock exchange previously; however, in the Qualified Persons opinion the 2021 to 2020 resource comparison changes are not material.

15 Mineral Reserve estimates

15.1 Mineral Reserve estimation criteria

Granny Smith's Mineral Reserves are that portion of the Mineral Resources which, as technical and economic studies have demonstrated, can justify extraction as at 31st December 2021.

The Mineral Reserves are based on appropriately detailed and engineered life of mine plans and are supported by relevant studies completed to a pre-feasibility study level. The life of mine plans schedule the Mineral Resources with appropriate Modifying Factors applied to estimate Mineral Reserves.

The process of Mineral Reserve definition for Granny Smith follows the mine planning process. Cut-off grades are applied to define potentially economic mining panels before technical analysis is completed and constraints are applied. Infrastructure requirements are then defined, and mine designs are undertaken before an economic analysis is completed. A project must return a sufficient margin above the cut-off to cover the required capital development costs and provide a return on investment.

All ore at Granny Smith is currently sourced from underground with the mining predominantly carried out by Granny Smith as an owner miner. Underground optimisation relies on the creation and evaluation of mining increments. Mining methods are largely determined by the geometry of the mineralised zones and the evaluation may involve the review of more than one method. Discrete zones within the defined areas of interest are further evaluated to ensure they satisfy overall economic criteria including any additional capital requirements. Infrastructure, waste disposal and ore stockpile management requirements are incorporated into the planning process.

All mine design and scheduling are completed by experienced engineers using appropriate mine planning software and incorporates relevant Modifying Factors, cut-off grades and the results from other techno-economic investigations.

Mining rates, fleet productivities, operational and plant capacities and constraints are accounted for in the plan and are typically based on historical performance trends. All geotechnical protocols and constraints are accounted for in the plan, including the provision for suitable mining geometries, mining losses, mining recovery and dilution. Provision is also made for sufficient waste rock and tailings storage with plans in place to meet life of mine requirements.

Mineral Reserves are derived from life of mine plans for currently producing operations and ore stockpiles. For all other projects, Mineral Reserves are derived from a minimum pre-feasibility level study with individual cost input parameters used to define the cut-off grades. A pre-feasibility study has an estimated accuracy of ± 25 % with a contingency of no more than 15 %.

The generation of a life of mine plan requires substantial technical input and detailed analysis and is critically dependent upon assumptions of the long-term commodity prices and sustained operating expenditure and the respective impact on cut-off grades, potential expansion and/or reduction in the Mineral Resource and the return on capital expenditure.

The basis of forward projections of operating costs for mature mining operations consider recent historical and forecast performance, including modifications for inflation. Capital costs are based on detailed requirements for the next two years and have in general an order of accuracy of ±10 %. Capital estimates beyond next two years, are based on pre-feasibility or better estimates for infrastructure and development requirements for individual projects.

The point of reference for the Mineral Reserves is ore delivered to the processing facility, also known as run-of-mine or run-of-mine ore.

The Qualified Person's opinion of the 2021 Mineral Reserve estimates is:

a) The Modifying Factors are based on recent mining and processing extraction history and performance and are reasonable and appropriate to derive the reserves from the resources and minimise any estimation errors. The Modifying Factors are aligned with leading industry technical practice, for example, blended process recovery is used in the Mineral Reserve estimate.

b) Granny Smith has grown its Mineral Reserves over the past three reporting cycles net of depletion. Infrastructure, environmental, permitting, closure, utilities and baseline studies are all aligned to support continued Mineral Reserves growth. Granny Smith's proactive study pipeline retains a focus on progressing all key work integral to supporting ongoing life of mine extensions so as to avoid any potential production delays. For example, a study has been completed to extend tailings disposal capacity.

c) The Indicated and Measured Mineral Resource is sufficient in geoscientific confidence to complete final life of mine designs. However, it is usual to complete a final phase of infill drilling to determine a high confidence 'mine defined' Mineral Resource with detailed geoscientific information prior to final stope design, pillar layouts and detailed production scheduling.

d) The reported Mineral Reserve is a 'point in time' or snapshot of the life of mine plan as at 31 December 2021. It is supported by a technically valid and economically viable mine design and schedule combining open pits and three underground mines. The techno-economic work does not exceed the estimated accuracy of ±25 % and or require more than 15 % contingency for both operating and capital costs.

e) Environmental compliance and permitting requirements have been assessed in detail with supporting baseline studies and relevant preliminary internal impact assessments completed. Detailed tailings disposal, waste disposal, reclamation, and mine closure plans are incorporated into the life of mine plan.

The life of mine plan, in its entirety, is completed to a minimum pre-feasibility level of study, although certain components of the plan have been completed to a feasibility level of study.

15.1.1 Recent mine performance

The recent performance Granny Smith is summarised in Table 15.1. There has been no open pit mining at Granny Smith since 2006.

15.1.2 Key assumptions and parameters

The assumptions and parameters considered in the Mineral Reserve estimate are summarised in Table 15.2. The Mineral Resources for Granny Smith underground and Hillside open pit were not converted to a Mineral Reserve.

Mining costs are underground mining costs, including ore handling costs. Mining costs are based on the 2022 budget unit costs, applied to the planned physicals.

Processing costs include tailings and waste disposal costs, as well as the cost of maintaining key on-mine infrastructure.

Table 15.1: Recent operating statistics

		Units	2021	2020	2019
Underground mining	Total mined	kt	2,622	2,336	2,342
	- Waste mined	kt	965	637	631
	- Ore mined	kt	1,657	1,700	1,712
	Mined grade	g/t Au	5.68	5.32	5.29
Processing	Tonnes treated	kt	1,662	1,719	1,753
	Head grade	g/t Au	5.66	5.27	5.2
	Yield	g/t Au	5.23	4.88	4.88
	Recovery	%	92.9	93.0	93.6
	Gold produced	koz	279	270	275
Financials	Exchange rate	$:A$	0.75	0.69	0.7
	Operating cost	$/oz	674	642	575
	Cost of sales before amortisation and depreciation	$/oz	693	620	572
	Total cash cost	$/oz	666	628	564
	Capital expenditure	$ m	100	66	72
	All in sustaining cost (AISC)	$/oz	1033	1010	922
	Total employees costed (TEC)	No.	717	592	541

Note: a) The operating statistics are based on annual fiscal year measurements

Source: Granny Smith CPR, 2021

Table 15.2: Summary of material Modifying Factors

		Units	2021	2020	2019
Mineral Resource	Mineral Resource gold price	$/oz	1,500	1,500	1,400
		$:A$	0.75	0.75	0.76
		A$/oz	2,000	2,000	1,850
	Cut-off for open pit	g/t Au	0.66	0.58 - 0.62	0.59 - 0.63
	Cut-off for underground - Wallaby	g/t Au	2.30 – 3.08	2.20 - 2.80	2.14 - 2.87
	Cut-off for underground - Granny Smith	g/t Au	2.11	2.11	2.08
Mineral Reserve	Mineral Reserve gold price	$/oz	1,300	1,300	1,200
		$:A$	0.74	0.74	0.75
		A$/oz	1,750	1,750	1,600
	Cut-off for mill feed - underground	g/t Au	2.63 – 3.48	2.49 - 3.17	2.46 - 3.29
	Mining recovery factor - underground	%	90 – 92	90 - 92	90 - 92
	Mining recovery factor open pit	%	n/a	n/a	n/a
	Mine call factor	%	100	100	100
	Dilution underground	%	11 – 20	12 - 20	12 - 16
	Plant recovery (average)	%	92.0	92.3	92.8
	Processing capacity	Mt/a	3.5	3.5	3.5

Note: a) The 2021 fiscal Modifying Factors are valid as at 31 December 2021 and are considered when estimate the Mineral Reserves and Mineral Resources.
b) The metal prices selected remained the same for the past two Mineral Reserve and Mineral Resource estimates.
c) The Qualified Person is of the opinion that the Modifying Factors are adequate for Mineral Reserve reporting and that the Modifying Factors are reported in ranges and vary based on open pit and underground extraction and estimated unit costs for depth and distance hauled.
d) The Qualified Person is of the opinion that the Modifying Factors estimated minimise estimation errors.

Source: Granny Smith CPR, 2021

G&A costs are largely based on the required and necessary technical and administrative support services required to sustain current and future mining production. In most instances these are assigned with fixed and variable cost components per tonne of ore within both the Mineral Reserve estimation and corresponding financial models. Corporate costs are assigned as variable with ounces sold in the financial model.

Operating expenditures comprise:

- Cash Cost Components: include direct mining costs, direct processing costs, direct G&A costs, consulting fees, management fees, transportation and realisation charges.
- Total Cash Costs: include additional components such as royalties (excluding taxes where appropriate).
- Total Working Costs: include terminal separation liabilities, reclamation and mine closure costs (the net difference between the total environmental liability and the current trust fund provision) but exclude the salvage value on closure and non-cash items such as depreciation and amortisation.
- Total Costs: total working costs plus net movement in working capital plus capital expenditure.
- Major Capital Projects: In addition to long-term capital projects, the life of mine capital expenditure programs generally include detail based on approved expenditure programs.

Details of the forecast operating and capital expenditures are provided in Item 21.

As disclosed in Item 14.1.10, Gold Fields conducts an annual review of metal prices for Mineral Resource and Mineral Reserve reporting to monitor any significant changes that would warrant re-calibrating the price deck for strategic and business planning purposes. This review considers prevailing economic, commodity price and exchange rate trends, together with market consensus forecasts and Gold Fields' strategy and expectations for the mine operations.

The Mineral Reserve gold price of $1,300/oz is detailed in particularity in Item 19 marketing.

The Qualified Person is of the opinion that the gold price applied to the estimation of the Mineral Reserves is reasonable and suitable for life of mine planning and is an appropriate reflection of recent historical trends and importantly provides a metal price that mitigates the risk of short to medium term price fluctuations with the potential to impact on the execution of the life of mine reserve plans. The gold price used provides a reasonable long-term delta to current spot prices and incorporates into the life of mine plan appropriate contingency to offset possible short term lower price cycles.

For the operating mines, 6 to 18 month trailing average actual costs form the basis of the unit rates applied to the Mineral Reserve financial model, with consideration for expected variations in operating and capital costs. This timeframe is selected based on alignment with recent business planning data. For new mines, costs are based on estimates from a range of recent sources and are deemed appropriate and representative by the Qualified Person.

The Mineral Reserve estimates may be materially affected based on changes to the cost and price assumptions, in addition to changes in the Modifying Factors. The Mineral Reserve is assessed at multiple scales, including individual stope or pit, level, orebody, mine, and operation. As such, the Qualified Person is of the opinion that the Mineral Reserve plan should be viewed as a consolidated entity, as removal of key components of the Mineral Reserve may have a material and disproportionate impact on the overall value and viability of the plan.

In addition to changes to Modifying Factors, additional data acquired into the future may materially impact the Mineral Reserve estimate. Examples include, but are not limited to, acquisition of additional drilling data, changes to interpretation of the data, mining studies, internal and external approvals and operating strategies.

15.1.3 Cut-off grades

Cut-off grades are influenced by the operating strategy, design and scheduling, and are therefore calculated annually.

The cut-off grades used for the underground Mineral Reserves are calculated using the same methodology described in Item 14.1.10 at the Mineral Reserve gold price of $1,300/oz. The cut-off grades by deposit are summarised in Table 15.3.

Table 15.3: Underground Mineral Reserve cut-off grades

	Mineral Reserve cut-off grade (g/t Au) Run-of-mine	Expected process recovery (%)	Minimum mining width (m)
Z60_Joey	2.63	93.5	3 m
Zone 70/80	2.84	89.3	3 m
Zone 90	2.87	89.3	3 m
Zone 100 Main	3.03	89.6	3 m
Zone 100 Vertical	3.20	90.0	3 m
Zone 110	3.29	90.1	3 m
Zone 120	3.25	90.1	3 m
Zone 135 Main	3.32	90.7	3 m
Zone 135 Vertical	3.48	90.7	3 m
Total Wallaby Underground	3.21	90.0	3 m
Granny Smith Underground	2.14	88.3	3 m

Note: a) The underground cut-offs are estimated based on the Mineral Reserve price, Modifying Factors and are not expected to change materially over the life of mine.
b) The estimated cut-off grades are adjusted for increased unit costs associated with depth and support type costs.
c) The Qualified Person is of the opinion that the estimated life of mine schedule contains sufficient diligence to minimise errors.

Source: Granny Smith CPR, 2021

15.1.4 Mine design

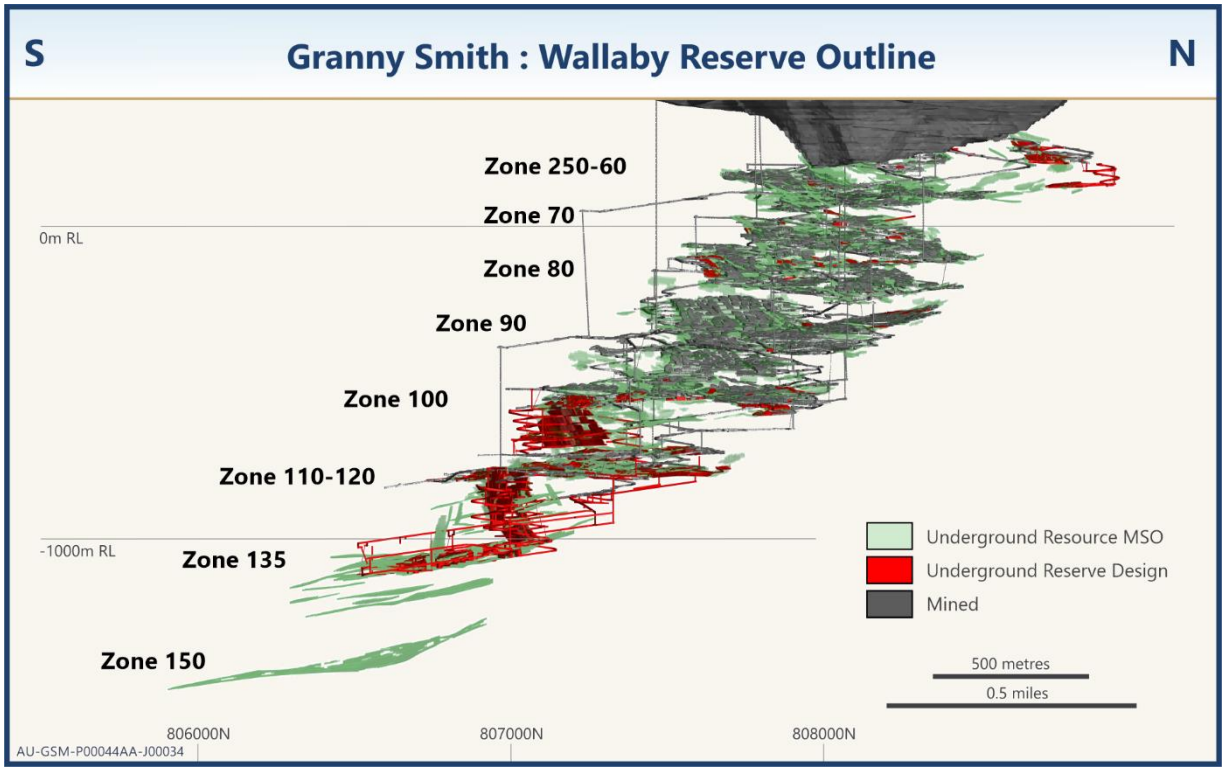
The main objective of the mine design and planning strategy at the Wallaby underground mine is to maximise value from the Mineral Resource while achieving a target free cashflow margin from the operation. The Wallaby underground mine is currently designed to exploit the stacked mineralised lodes from Zones 60/250, 70, 80, 90, 100, 110-120 and 135 to a depth of ~1.5 km below surface (Figure 15.1). Each zone has undergone a minimum pre-feasibility study assessment followed by staged development access and eventual mining. This approach provides a much higher level of confidence in mining prior to approval and allows for a safe and efficient mining strategy to be developed prior to mining.

During 2021, mining was concentrated in Zones 250/60, 80, 90, 100, 110-120,135. An expanded pre-feasibility study was completed for Zone 135 in 2019 with a feasibility study completed in 2021.

Access to the Wallaby underground mine is via a ramp decline from a portal established within the completed Wallaby open pit. The current portal and Wallaby pit surface ramp are assumed to be accessible for the remainder of the mine life. The mine operation is trackless, with truck haulage from underground via the ramp to surface.

Generally, exploitation of the Wallaby ore lodes progress top-down, although simultaneous exploitation of vertically adjacent lodes is required to achieve the targeted 1.70 Mt/a production rate. Likewise, from each lode, more than one stoping panel is extracted so barrier/regional pillars are used to separate mining panels according to geotechnical directions. As mining progresses to increasing depth, infrastructure and services are extended to support ongoing development and production activities.

Figure 15.1: Wallaby mining areas (west view)



Source: Granny Smith CPR, 2021

The Mineral Reserve estimate includes external dilution and mining recovery factors based on the selected mining method and historical reconciliations. A planned internal dilution of 0.2 m in height and width is applied to development for all mining methods with 100 % mining recovery. The following standard development dimensions are used:

- Decline and truck accesses - 5.5 mW × 5.7 mH
- Ore drives (existing stoping methods) - 4.6 mW × 4. mH

The mine planning process is to identify and optimise all feasibly mineable material that is identified in the Mineral resource models through creating and evaluating of mining access and stoping in the reserve plan. Mining methods are largely determined by the geometry of the mineralised zones. Individual zones are evaluated to optimise overall schedule economics. The infrastructure required to access the mineralisation is then designed before evaluation of the mine. Discrete zones within the defined areas of interest are further evaluated to ensure they satisfy overall economic criteria including any additional capital requirements.

The geotechnical and hydrogeological parameter is discussed in Item 16.

At present there are limited material technical risks such as staffing, logistics, equipment, ventilation or seismic impacts that are expected to prevent the mine from achieving the life of mine plan; however, the following risks may constrain the mine plan at various points.

Ventilation

Fresh air is brought into the mine via the decline and fresh air raise system and exhausted via five exhaust raises with primary ventilation fans situated at the bottom of each rise. A review of the long-term primary ventilation system was undertaken in 2019 when the Zone 135 Stage 2 study was completed. From the study, several ventilation upgrades ensued including a new ventilation exhaust raise (VR8), and the replacement of the existing primary fans with four new fans. The current ventilation upgrades are sufficient for the current life of mine.

Refrigeration and cooling

A 4.1 MW surface bulk air cooler was commissioned in 2017 above the VR7 intake air rise, which cools 300 m³/s of ambient air during summer and currently services the southern production areas of the mine. The bulk air cooler will be upgraded to 8.2 MW at the beginning of summer 2022/2023. An additional 4.1 MW bulk air cooler of the same design has been constructed on top of the VR6 intake rise, which services the northern production areas and cools 270 m³/s of air. Once the refrigeration system has been upgraded this will be sufficient for the current life of mine.

15.1.5 Mine planning and schedule

The Company's annual mine planning process is anchored by a corporate planning calendar that sets out the sequence of events to be followed that ensures a strong linkage between the strategic planning phase and the life of mine plan itself that defines the Mineral Reserves. During the first half of the year the preferred strategic plan is confirmed and approved by the Company's Executive Committee. This provides guidance for required investment and business and operational planning to position the mine to deliver on the strategic intent for the property. The detailed two-year operational plan and budget is informed by financial parameters determined by the Executive Committee and is the anchor to the longer-term planning and equates to the first two years of the life of mine plan.

The overall planning process schedules key work to be completed and stage gated before subsequent work can be continued and includes the metal prices, geology and estimation models, resource models, mine design, depletion schedules, environmental and social aspects, capital and operating costs and finally the cashflow model and financial evaluation. Capital planning is formalised pursuant to Gold Fields' capital investment and approvals process.

Projects are categorised and reviewed in terms of total expenditure, return on investment, net present value (NPV) and impact on All-in Costs (AIC) per ounce and all projects involving amounts exceeding $40 million are submitted to the Board for approval. Material changes to the plans are referred back to the Executive Committee and the Board. Post-investment reviews are conducted to assess the effectiveness of the capital approvals process and to leverage continuous improvement opportunities going forward.

The Mineral Reserve estimates are based on an appropriately detailed and engineered life of mine plan that is supported by relevant studies completed to a minimum pre-feasibility study level of work. All design and scheduling is completed by experienced engineers using appropriate mine planning software and incorporates all relevant Modifying Factors, the use of cut-off grades and the results from other techno-economic investigations. Mining rates, fleet productivities and all key operational and plant capacities and constraints are accounted for in the plan and are typically based on historical performance trends. All geotechnical protocols and constraints are accounted for in the plan, including the provision for suitable mining geometries and ground support, mining losses in pillars, mining recovery and dilution. The provision of sufficient waste storage and tailings capacity is engineered into the plans to meet the life of mine requirements.

Mine planning is driven primarily by personnel at the mine who are best positioned to determine the technical and commercial objectives for the site based on the parameters, objectives and guidelines issued by the corporate office. The site-based planning is supported by regional technical services functions, as well as from CTS and the corporate finance and sustainable development teams which provide overall oversight and assurance.

The scheduled target rates adopted for life of mine planning are based upon historical operational mining rates and are matched appropriately for future zones.

The life of mine plan is made up of the following underground mining areas:

- Wallaby Zone 250/Joey
- Wallaby Zone 60
- Wallaby Zone 70
- Wallaby Zone 80
- Wallaby Zone 90
- Wallaby Zone 100
- Wallaby Zone 110
- Wallaby Zone 120
- Wallaby Zone 135.

There are currently no other projects included in the life of mine plan.

Underground mining equipment is scheduled on the available time the equipment can be used. This availability is based on calendar hours and allows for scheduled repairs and maintenance of the equipment. The current equipment actual and planned availabilities and utilisation for 2021 are shown in Table 15.4.

Table 15.4: Equipment availabilities and utilisation

Equipment	2021 availability		2021 utilisation of availability
	Actual %	Planned %	Actual %
Truck	84	85	68
Loader	79	80	75
Development Drill	83	83	78
Production Drill	86	85	79

Note: a) The estimated Mineral Reserve life of mine mining equipment fleet is expected to vary based on the open pit underground mining ratios.
b) The heavy mobile mining fleet is renovated based on manufacturers specification or on regular maintenance records.
c) The Qualified Person is of the opinion that Granny Smith fleet and the fleet of the contractor support the life of mine Mineral Reserve.

Source: Granny Smith CPR, 2021

Underground mine schedules are based on 3D block Mineral Resource models (inventory models), with allowances made for minimum mining widths, dilution and ore loss appropriate to the mining method being considered and geotechnical considerations. Historical performance measures are considered in determination of these Modifying Factors.

Infrastructure, waste disposal and ore stockpile management requirements are incorporated into the scheduling process.

A mining schedule is generated, and a time-based economic evaluation is undertaken to ensure the mines remain economic until completion of mining, at which point rehabilitation commences. Provided that individual mining areas cover the direct mining costs (capital and operating), variable processing, TSF, rehabilitation and on-site administration costs, contribute to overhead fixed costs, and do not increase the overall life of the operation (i.e. mine constrained), the material can be included in the reserve assessment.

Refer to Item 22.1 for details on the life of mine mining schedule.

The Qualified Person is of the opinion that the mine plan and schedule incorporate appropriate assessment of all relevant technical, environmental, social and financial aspects to ensure the Mineral Reserve complies with the NI 43-101 instructions and requirements. After reasonable assessment there is no unresolved material matter that could have a significant impact on the mines ability to execute the life of mine plan. The mine plan and schedule incorporate consideration of the following key criteria:

- Production depletion up to 31 December 2021.
- Application of cut-off grades to determine mineable ore.
- Application of appropriate Modifying Factors to convert Mineral Resource to Mineral Reserve.
- Allocation of suitable mining equipment and costs.
- Incorporation of realistic mining rates and efficiencies.
- Practical and realistic mine design and mining methods.
- Integrated production scheduling taking account of capacities, constraints and bottlenecks.
- Use of appropriate paste filling rates for stope voids.
- Integrated project management and execution.
- Security of water and energy for the life of mine.
- Provision for mine rehabilitation and mine closure costs.
- Consideration of all environmental, social and legal aspects to enable life of mine plan execution.
- Appropriate life of mine tail end management.
- Security of current and future land tenure and relevant leasing agreements, permits and licences.
- Life of mine cashflow model and economic viability.

15.1.6 Processing schedule

The processing schedule is derived from the Mineral Reserve schedule. The individual ore type recovery formulas as detailed in Item 13.2 are used in the mine schedule to aggregate into an overall process recovery.

Refer to Item 22.1 for details on the life of mine processing schedule.

15.1.7 Classification criteria

Granny Smith's Mineral Reserves are classified as either Proven or Probable as defined in the SAMREC (2016) Code and CIM Definition Standards for Mineral Resources & Mineral Reserves (2014).

A Proven Mineral Reserve is assigned if it is flagged as a Measured Mineral Resource, the Mineral Reserve block is covered by sufficient infill drillholes and/or exposed by development face mapping. A Probable Mineral Reserve is assigned if it is flagged as an indicated Mineral Resource, is only covered by exploration drillholes, and has no development face mapping.

The Mineral Reserves are quoted in terms of run-of-mine grades and tonnages delivered to the processing facility and are therefore fully diluted.

15.1.8 Economic assessment

The basis for establishing economic viability is discussed in Item 22.

15.2 Mineral Reserves as at 31 December 2021

The Granny Smith Mineral Reserves as of 31 December 2021 are summarised in Table 15.5. The Mineral Reserves are 100 % attributable to Gold Fields and are net of production depletion up to 31 December 2021. The point of reference for the Mineral Reserves is ore delivered to the processing facility.

The Granny Smith Mineral Reserves are the economically mineable part of the Measured and Indicated Mineral Resources based on life of mine schedules and pre-feasibility studies completed at the Mineral Reserve gold price of $1,300/oz to justify their economic viability at 31 December 2021 (refer to Item 22 for details on the supporting economic analysis).

Table 15.5: Granny Smith - summary of gold Mineral Reserves at the end of the fiscal year ended 31 December 2021 based on a gold price of $1,300/oz

.	Tonnes (kt)	Grades (g/t Au)	Gold (koz Au)	Cut-off Grades (g/t Au)	Metallurgical Recovery (%)
.Underground Mineral Reserves					
UG Proven Mineral Reserves	2,212	4.9	351	3.21	92 %
UG Probable Mineral Reserves	10,363	5.6	1,861	3.21	92 %
UG Total Mineral Reserves	12,575	5.5	2,211	3.21	92 %
.Stockpile Mineral Reserves					
SP Proven Mineral Reserves	26	5.6	5	1.03	83 %
SP Probable Mineral Reserves	-	-	-	1.03	83 %
SP Total Mineral Reserves	26	5.6	5	1.03	83 %
.Total Mineral Reserves					
Total Proven Mineral Reserves	2,239	4.9	355		
Total Probable Mineral Reserves	10,363	5.6	1,861		
Total Granny Smith Mineral Reserves 2021	12,601	5.5	2,216		
Total Granny Smith Mineral Reserves 2020	12,613	5.3	2,167		
Year on year difference (%)	-0.1%	2%	2%		

Note:
a) Rounding of figures may result in minor computational discrepancies.
b) Refer to Table 15.6 for year-on-year Mineral Reserve comparison.
c) Quoted as mill delivered metric tonnes and run-of-mine grades, inclusive of all mining dilutions and gold losses except mill recovery. Metallurgical recovery factors have not been applied to the reserve figures. The approximate metallurgical recovery factor is 92 % for underground feed. The metallurgical recovery is the ratio, expressed as a percentage, of the mass of the specific mineral product recovered from ore treated at the process plant to its total specific mineral content before treatment. The recoveries for Granny Smith vary according to the mix of the source material (e.g. oxide, transitional fresh and ore type blend) and method of treatment.
d) The metal prices used for the 2021 life of mine Mineral Reserves are based on a gold price of $1,300 per ounce or A$1,750 per ounce (at an exchange rate of A$1:$0.74). Open pit Mineral Reserves at Granny Smith are based on optimised pits and the underground operations on appropriate mine design and extraction schedules. The gold price used for Mineral Reserves is detailed in particularity in Item 19.
e) Dilution relates to planned and unplanned waste and/or low-grade material being mined and delivered to the process plant. Ranges are given for those operations that have multiple orebody styles and mining methodologies. The mine dilution factors is 11 % to 20 % (underground).
f) The mining recovery factor relates to the proportion or percentage of ore mined from the defined orebody at the gold price used for the declaration of Mineral Reserves. This percentage will vary from mining area to mining area and reflects planned and scheduled reserves against actual tonnes, grade and metal mined, with all modifying factors, mining constraints and pillar discounts applied. The mining recovery factors are 90 % to 92 % (underground).
g) The cut-off grade may vary per zone, open pit or underground mine, depending on the respective costs, depletion schedule, ore type, expected mining dilution and expected mining recovery. The average or range of cut-off grade values applied in the planning process for the Wallaby underground mine is between 2.63 g/t and 3.48 g/t Au mill feed.
h) A gold based Mine Call Factor (gold called for over gold accounted for) determined primarily on historic performance but also on realistic planned improvements where appropriate, is applied to the Mineral reserves. A Mine Call Factor of 100 % has been applied at Granny Smith.
i) The Mineral Reserves are estimated at a point in time and can be affected by changes in the gold price, US Dollar currency exchange rates, permitting, legislation, costs and operating parameters.
j) Granny Smith is 100 % attributable to Gold Fields and is entitled to mine all declared material located within the properties mineral leases and all necessary statutory mining authorisations and permits are in place or have reasonable expectation of being granted.

Source: Granny Smith CPR, 2021

15.3 Audits and reviews

Audits and reviews completed at Granny Smith during 2020 included:

- Site based internal peer reviews, validation and reconciliation of geology models, wireframes, estimates process and outputs with senior Mineral Resource management staff and department heads.
- Ongoing routine integrated routine drilling, sampling, geology audits, reviews and coaching of geological staff by senior geologists and MRM department heads to ensure due process and verified through an embedded risk and control matrix (RACM).in line with site and Gold Fields' documented processes, procedures and methodologies.
- Perth corporate technical audits and review of geology, estimation and mine planning models.
- Gold Fields Group Mineral Resource management technical team reviews and site visits for validation and compliance evaluation of resources and reserves process, detail and output.
- OHSAS compliance for certification.
- ISO 14001 surveillance audit by recognised external auditors.
- ISO 45001 certification audit.
- ISO 27001 certification audit.
- Global Reporting Initiative third party (ERM).
- Annual external financial audits (KPMG up to 2018, PWC from 2019).
- Ongoing routine internal audits (Gold Fields Johannesburg Internal Audit).
- Internal legal compliance and ethics policy review.
- Internal risk and control matrix (RACM) compliance (Perth and Gold Fields corporate auditors).
- External audit by Snowden, certificate of compliance issued with no material or adverse findings.

No adverse findings were recorded from any of the audits. Ongoing compliance with minor improvement, adjustments and best practice continue to be implemented. Records of audits are filed electronically on site in relevant departments and folders with major audit signoffs reported in the Gold Fields annual report.

The Mineral Resource estimate is underpinned by appropriate Mineral Resource management processes and protocols and verified through an embedded risk and control matrix (RACM). Technical and operating procedures developed for Granny Smith are verified through an embedded risk and control matrix (RACM).as adopted by Gold Fields' Mineral Resource management for Mineral Resource and Mineral Reserve estimation, reporting and auditing.

Gold Fields uses K2Fly RCubed® propriety software in combination with SharePoint to ensure accuracy, governance and auditability in the reporting of Mineral Resources and Mineral Reserves.

15.4 Comparison with 31 December 2020 Mineral Reserve

The net difference in Mineral Reserves between 31 December 2020 and 31 December 2021 is +49 koz Au or +2.3 % (Table 15.6).

Table 15.6: Net difference in Mineral Reserves between 31 December 2020 and 31 December 2021

Proven and Probable Reserve	Unit	Change %	Gold on the RoM
As at 31 December 2020	koz	-	2,167
Depletion 2021	koz	-13.9 %	-302
Gold price	koz	-	-
Cost	koz	-0.5 %	-10
Incremental	koz	1.7 %	37
Conversion	koz	13.2 %	285
Inclusion / exclusion	koz	1.8 %	39
As at 31 December 2021	koz	2.3 %	2,216

Note: a) Data from Mineral Reserve 2020 and Mineral Reserve 2021 has shown that after taking into account 2021 depletion, an additional 49 koz of gold has been added to the Granny Smith Mineral Reserve, representing a 2.3 % increase from 2020.

Source: Granny Smith CPR, 2021

A series of overlapping internal processes exist at Gold Fields to review and validate the Modifying Factors, input assumptions, cut-off grades, designs, schedules, economic evaluation, and other technical assessments. These reviews include site, regional and group technical assessments, internal audits, and trained Qualified Person authorisations. Multiple external audits of the Gold Fields Mineral Reserves declarations and processes for Granny Smith have been completed within the past five years.

These processes are designed to reduce the likelihood of a significant or material error in the Mineral Reserves estimation process and associated Mineral Reserves declaration, although potential for error exists. The Qualified Person for Mineral Reserves is not aware of any material error or omission that at the time of writing would be deemed likely to have a significant impact on the operation's ability to deliver the Mineral Reserve mine plan.

16 Mining methods

16.1 Mining methods

Due to the variable sub-horizontal nature of the orebody, the mining methods at Wallaby underground mine involves a variation of a long-hole room and pillar methodology with no backfill in upper levels (above Z100 level) and hybrid of long-hole room and pillar with and without paste fill below Z100 level. The main mining method at Wallaby underground mine is inclined room and pillar (IRP). Other methods utilised are transverse long-hole stoping (TLHS) and sub-level long-hole stoping (SLHS). Bulk long-hole stoping is also used, but to a lesser extent. The current Mineral Reserve outline is shown in Figure 16.1.

16.1.1 Inclined room and pillar (IRP)

IRP is used in areas of moderate ore dip (10 °-45 °) and moderate ore width (4 m-6 m). Multiple ore drives are developed on a fixed gradient to traverse the ore lenses following the ore contour on that elevation. Stoping is carried out on retreat from the ore extremity back to a central main lode access. Up-hole retreat stoping is employed with blast holes drilled at 76 mm diameter.

To initiate the starting void for the stopes, long-hole rises are employed typically up to a depth of 15 m. Where the stope geometry is too complex or the rise requirement exceeds 15 m, slot drives are employed to create the initial void. In the upper levels, stopes are limited to 30 m along strike with a 5 m pillar left between stopes and do not require backfill. In the lower levels, stopes are limited to 20 m along strike with a 7 m pillar left between stopes. Stopes in the lower levels require backfill.

The general sequence of mining in a cluster of stopes is top-down with the top stope leading the retreat by a 45 ° angle of retreat. This allows for multiple fronts of mining and will also progressively shift the stress concentration in a controlled manner. The use of IRP mining at Wallaby underground mine has shown:

- It is relatively inefficient in terms of production (due to the small stope size of 3,000 t - 4,000 t) and therefore produces 12,000 t - 15,000 t per month from individual areas.
- It requires considerable technical and operational effort to design, manage and control the stopes.
- Considerable ore loss can occur with ore left in the footwall area due to geometrical limitations.
- Maintaining geological control of the ore development lateral direction is more challenging in the flatter ore lodes.

The room and pillar mining method with isolated rib and barrier pillars is currently transitioning to a continuous stope-paste fill mining sequence for the Zone 110 and Zone 120 lodes. The first paste fill stope was poured in July 2019 on the Zone 100 level. Structural influences on stability are also becoming more commonplace resulting in a focus on structural mapping and characterisation in all active development to define the continuity of major structures (with a focus on lamprophyre intrusions) and their potential influence on stability of mining areas going forward.

16.1.2 Transverse long-hole stoping (TLHS)

TLHS is usually used in near horizontal zones with thicknesses up 20 m. In these extensive areas, the ore lode is divided into zones or mining panels approximately 150 m wide and 150 m long. Each panel is separated by regional barrier pillars to be mined at later stages of mining by retreat and are approximately 30 m wide. Each panel is in turn divided into several transverse mining stoping areas.

Ore development for each TLHS area is achieved by following the ore lode gradient with a set horizontal orientation. The ore drive is positioned approximately 2 m below the ore lode footwall, largely in a prevalent low-grade gold alteration area.

Each TLHS area is mined by up-hole retreat stopes using a long-hole raised slot mined back to a central access. TLHS stoping panels are limited to 15 m in width and 20 m in length with rib pillars surrounding all sides. Rib pillars dimensions are calculated for each zone based on geotechnical parameters. A wider pillar between ore drives is left under a minimum 5 m vertical pillar to reduce pillar slenderness. The use of TLHS mining at Wallaby underground mine has shown:

- Improved stoping efficiency with stope sizes up to 30,000 t.
- Production rates over 18,000 t/month from individual stoping areas.
- Improvements in production drilling efficiency.

16.1.3 Sub-level long-hole stoping (SLHS) with paste fill

This mining method is applied to areas where the orebody has a sub-vertical orientation (55 ° - 75 °). Typical stope dimensions have a strike length of 20 m – 25 m and width of 3 m -7 m. Each stoping block is backfilled with paste after extraction. The lead stope on each level creates the starting void by employing long-hole rises and boxhole rises. Subsequent stoping panels are opened by firing against the backfilled mass of the preceding panel.

The mining sequence for the vertical lode will follow a continuous top-down echelon end-on retreating between levels to the access. There are no pillars currently planned for the vertical lodes other than uneconomical waste pillars.

Gold Fields has a long history of successfully employing this mining technique at Granny Smith and St Ives; however, SLHS with paste fill has not yet been used at Wallaby underground mine due to the flat nature of the orebodies mined to date. This method is planned for future mining areas.

16.1.4 Bulk long-hole stoping

This mining method is applied to areas where two or three lodes are combined, and the total ore thickness is greater than 20 m. The lodes are divided into zones or mining panels approximately 100 m wide and 100 m long. Each panel is separated by regional pillars to be mined at later stages of mining by retreat and are approximately 20 m wide. Areas are mined by up-hole retreat stopes using a long-hole raised slot mined back to a central access. The use of bulk mining at Wallaby underground mine has shown:

- Improved stoping efficiency with stope sizes up to 80,000 t.
- Production rates over 22,000 t per month from individual stoping areas.
- Improvements in production drilling efficiency.

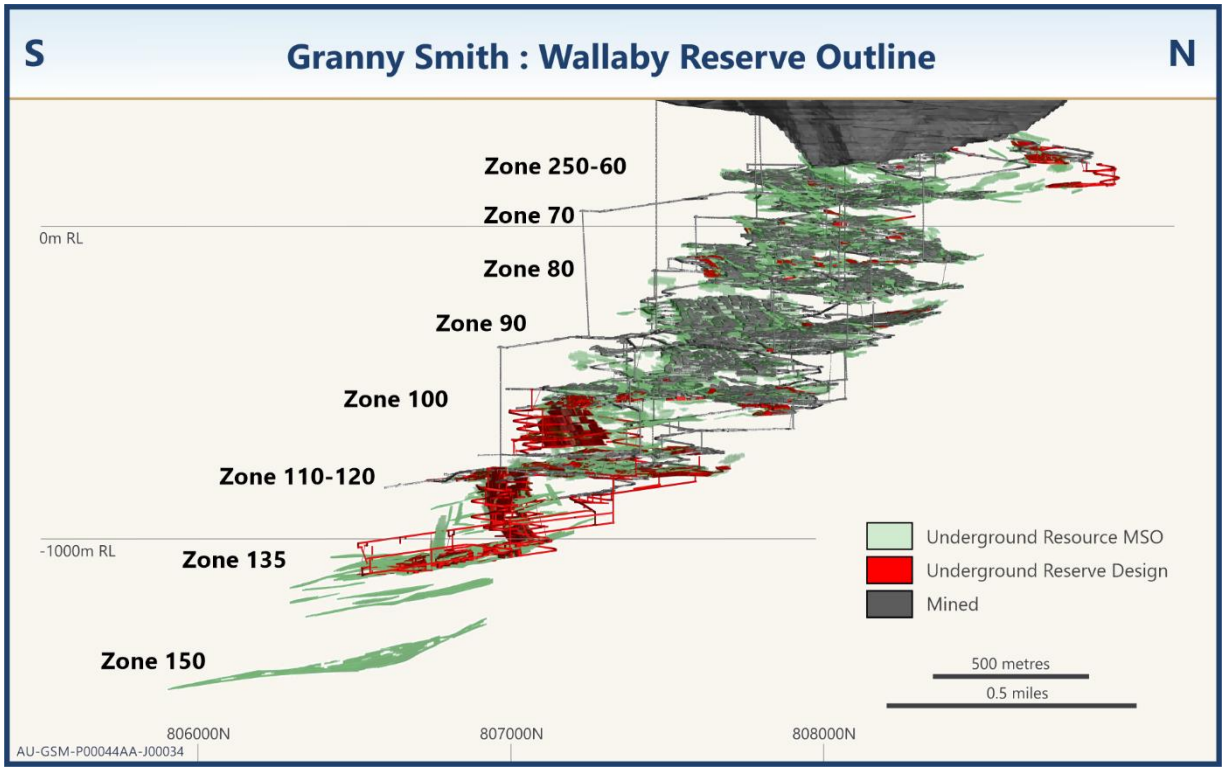
The Wallaby underground mine utilises different dilution and recovery factors for the varying mining methods and zones. The dilution and recovery factors are listed in Table 16.1.

Table 16.1: Mining dilution and recovery factors for each mining method

Stope type		Hole diameter (mm)	Dilution (%)	Mining recovery (%)	Dilution grade (g/t)	Mining zone
IRP Stopes – No Fill	4-10 m Height	76 mm	16 %	90 %	2.0 g/t	60 to 100
	>10 m Height	76 mm	12 %	90 %	2.0 g/t	60 to 100
Inclined Stopes – Paste Fill	4-10 m Height	76 mm	16 % - 20 %	92 %	0.5 g/t	110 to 135
LH Stopes – Paste Fill	10-23 m Height	89 mm	12 % - 18 %	92 %	0.5 g/t	110 to 135
	>23 m Height	89 mm	11 % - 16 %	92 %	0.5 g/t	110 to 135

Source: Granny Smith CPR, 2021

Figure 16.1: End of Mineral Reserve outline



Source: Granny Smith CPR, 2021

16.2 Geotechnical parameters

The geotechnical models comprise the rock mass properties, geological structures as well geological model. The geotechnical models have been developed at Wallaby and is used to help to assess development and stope design as well as completing reconciliations, model calibration and ground support performance. Smaller models are also used to assess rock mass conditions in new mining levels and zones.

There are a few models that have been created and used at Wallaby underground mine. These include:

- Lithology Model and Major Structural Model.
- Fracture Frequency and/or RQD and/or Q' Block Model.
- The Void Model.

Lithology and Major Structural Model

All of the recognised ore surfaces, major structures (Wedge, East Shears and Lamprophyres) and major intrusives have been created as 3D triangulation models. The geology department routinely updates these structural models for features intersected during development (i.e. localised faulting, lithology).

This model is used to identify and delineate boundaries of geotechnical domains in three-dimensional space. Mapping and structural data can be used in conjunction with the above model to determine the rock mass quality within the mine and identify areas of poor ground as well as characterise the geotechnical domains. The model is also used for ground support design in different domain with increasing depth.

Fracture Frequency and/or RQD and/or Q' Block Model

Detailed rock mass characteristics for each individual stope are obtained by conducting geotechnical mapping of ore drives (post ground support installation) and geotechnical core logging of oriented drillholes, this information is used for the determination of the geotechnical characteristics of each domain. This process helps to identify areas of reduced rock mass quality which may affect the stability of the stopes.

The Void Model

The Void Model for the Wallaby Underground mineis available in Datamine® and Deswik® Wireframe format. This file is created and updated using all void surveys which are processed using Deswik® mining software. The survey department is responsible for maintaining the void model for the mine, which include lateral development, vertical development and stope voids.

Numerical Analysis

Numerical modelling to assess mining induced stress changes and impacts has been conducted both internally using Map3D Fault-Slip and externally using Abaqus®.

The determination of the global rock mass response to the stress redistribution has been conducted using non-linear-modelling methods in Abaqus® by an external consultant. The aim of these non-linear models was to identify global instabilities, obtain the most economic, geotechnically sound extraction sequence and finally to define rules regarding pillar size, geometry and location.

The geotechnical design involves the sizing of various excavation geometries, location of the infrastructures, location, and sizing of pillars (i.e. barrier, regional and panel pillars), the timing of paste fill for each block as well as the extraction sequence.

Ongoing calibration of these models is used to model and maintain the overall global stability of the mine, and assess new mining areas during front end studies (i.e. feasibility studies).

Detailed numerical models are also completed on more specific and targeted areas when design criteria are being challenged or for variations on the normal mining method.

The risk associated with seismicity at depth are managed through the following strategies:

- Mine planning and design guidelines which ensure appropriate mine designs are generated. Geotechnical considerations form a key component of these designs and guide the design based on important constraints identified during feasibility and progressive mining of the orebody. The guidelines have been written to address various geotechnical issues during the mine planning and design process.
- Sizing the mining zones into blocks of various geometries depending on depth starting Z100 level. Each block is separated by barrier pillars and or regional pillars. Z100 -Z120 the block sizes are 150 mW x 150 mL. Each block is divided into panel and pillars of which the sizing of the panel pillar depends on the global non-linear modelling results.
- Global and local mining sequence whereby blocks are sequenced based on the spatial locations as well as the influence of various geological structures that are prone to seismicity. The mining sequence plays a dominant role to ensure the hazards associated with high stress and seismicity are managed.
- Paste filling which was introduced in the lower levels to maintain long-term regional stability and also to limit the exposure of large spans in the stoping area.
- Modelling of major and minor geological structures which are used in the non-linear numerical model as well for planning and design of the stopes.

- The developed Ground Support Standard for each mining profile has specific requirements (e.g. bolting and meshing) that are determined by development dimensions, the expected ground conditions, and the excavation life and serviceability as well as the stress conditions.
- Seismic exclusion after each stope firing which is assigned based on the historical seismic activities, specific geotechnical domains and the presence of major geological structures.

The Qualified Person's opinion is that all appropriate geotechnical parameters have been suitably considered and risk assessed to support the mining method selection and extraction sequencing and this information is embedded in Granny Smith's Ground Control Management Plan which is routinely updated as new empirical information becomes available. The mine plan is geotechnically robust from a local and regional stability perspective.

16.3 Hydrological parameters

The Wallaby deposit occurs below 20 m-110 m of transported aeolian, fluvial, and lacustrine cover that forms part of an extensive regional aquifer system. This aquifer system has known transmissive links between the paleo-drainage system and the underlying Wallaby deposit (e.g. fractured mineralised zones) resulting in a high groundwater yield in the open pit and upper level of the underground mine.

Based on historical abstraction data, sump pumping of up to 40 ℓ/s is required to maintain dry mining conditions. However, this does not include any additional surface inflows due to storm or cyclone events. Due to these two factors, successful and efficient dewatering is critical to the function of the underground operations.

The main Wallaby underground pump station is in Zone 60, and a new pump station was commissioned in Zone 80, with an overall capacity of 45 ℓ/s. Water from deeper within Wallaby is supplied to the Zone 80 station via a series of pumps at various levels down the decline. Water is transferred to surface via a vertical drillhole into the Wallaby open pit sump and finally to Lake Carey.

Hypersaline water pumped directly from Wallaby underground onto Lake Carey is governed by a series of regulatory requirements (refer to Item 20.3).

The majority of the excavations underground are dry except where water-bearing structures are exposed and thus corrosion is not considered a major issue with fully encapsulated reinforcement for all capital infrastructure. Discrete seepage zones have been encountered as geological features are traversed, many of which remain damp (<1 ℓ/sec) for the duration of mining. Only minor rehabilitation due to corrosion and water related issues has been required to date in Z60-Z70 level.

Fibrecrete applied to seepage zones will have provision for drainage via Split-Sets to prevent build-up of water pressure behind the Fibrecrete seal, or the installation of weep holes.

All capital infrastructures in the upper level have ground support standard that involves fibrecrete and resin bolts. The resin bolts are fully encapsulated as such less prone to corrosion. Temporary excavations such as oredrive generally have ground supports that involves mesh and split-sets. These excavations have life expectations less than two years which is within acceptable limits in for the type of water salinity experienced at Wallaby.

Historically the Zone 70 E was a mining area where water issues were identified. The extent of flow is very slow to slow and only observed in split sets due to drainage from a larger volume of rockmass.

The Qualified Person's opinion is that all appropriate hydrogeological parameters have been suitably considered and risk assessed to support the mining method selection and extraction sequencing and this information is embedded in Granny Smith's Ground Control Management Plan which is routinely updated as new empirical information becomes available.

16.4 Mining fleet and machinery requirements

Wallaby underground mining equipment is predominantly an owner-operated fleet, with maintenance activities undertaken in-house. The Wallaby underground mine utilises contractors for development, cable bolting and charging activities. The underground owner mining fleet is listed in Table 16.2.

Table 16.2: Underground mining fleet

Equipment class	Number of units
Development drill	5
Production drill	4
Cable bolt drill	1
Bogger	9
Haul truck	12
Charge wagon	3
IT	8
Grader	2
Water truck	1
Fibrecrete spray rig	2
Agitator truck	2

Source: Granny Smith CPR, 2021

Loading is carried out using load-haul-dump (LHD) units, as either manned units for loading trucks or tele-remote units for stope bogging. Haulage to surface is completed using 65 t haulage trucks. Waste material is backfilled in the Wallaby open pit and ore is stockpiled on surface. A contractor fleet using 190 t capacity road trains carries out haulage from the surface ore stockpile to the run-of-mine pad near the Granny Smith process plant, a distance of 13 km.

The Qualified Person considered the following factors when selecting the underground mining method for the Waroonga, New Holland and Redeemer areas:

- The geotechnical and rock behaviour models.
- The hydrological surveys.
- The Modifying Factors including underground cut-off grades.
- The mining fleet configuration and equipment specifications.
- Practical mining rates, stope size dimensions, mining dilution and mining recovery.
- Infrastructure and operating capacities and constraints.
- Capital and operating costs and economic viability.

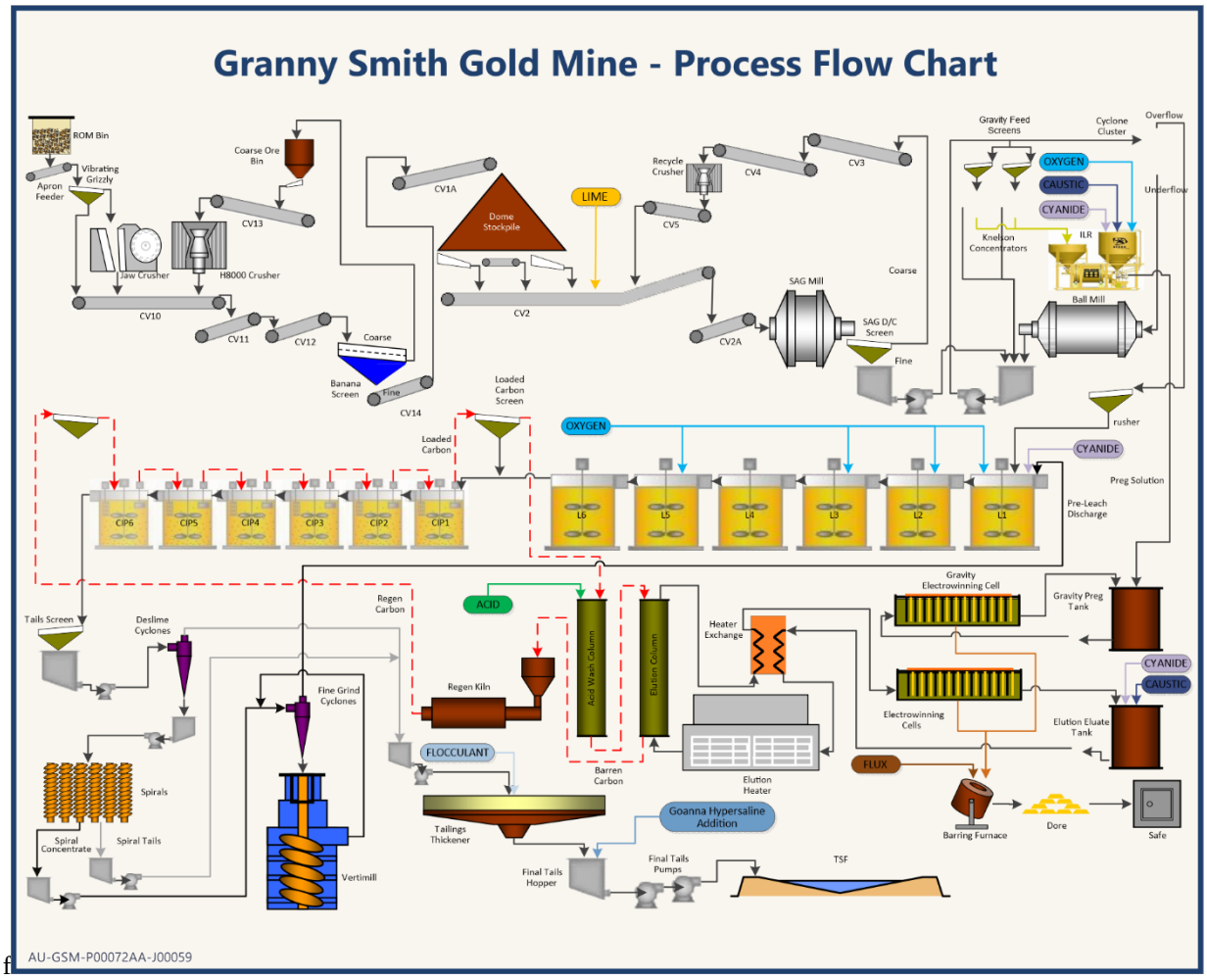
17 Recovery methods

17.1 Flow sheet and design

The Granny Smith process plant was originally commissioned in 1990 to treat oxide gold ores mined from the Goanna, Granny and Windich pits and was periodically upgraded to optimise recovery of the sulphide ore from Wallaby underground. The plant currently only treats Wallaby ore in campaign mode.

The crushing plant consists of two independent circuits – one for soft ore and one for hard/fresh ore. This is followed by a standard SAG and ball mill (SABC) grinding circuit, a gravity circuit, a leach/CIP train, a pressure Zadra elution circuit, a tailings recovery circuit and thickener. A schematic process flow sheet for the process plant is shown in Figure 17.1.

Figure 17.1: Schematic flow diagram of Granny Smith process plant



Source: Granny Smith CPR, 2021

The crushed product is fed from the stockpile and ground to P_{80} 110 µm – 120 µm using a 3.9 MW variable speed 28'×12' SAG mill, a 185 kW pebble crusher and a 4.0 MW ball mill in closed circuit. In 2015, a gravity circuit was retrofitted and comprises two 40" QS40 Knelson gravity concentrators in conjunction with an Intensive Leach Reactor 3000BA (ILR) for intensive cyanidation of the gravity concentrate.

The leach circuit comprises six 2,000 m³ leach tanks with oxygen injection and six1,000 m³ CIP tanks. CIP tailings gravitate to two 1,800 mm × 4,900 mm vibrating safety screens before being pumped to the tailings retreatment circuit. The total circuit residence time at high throughputs is approximately 72 hours.

The tailings retreatment circuit was originally installed in 1996 to recover sulphide locked gold that was not recovered in the leaching and CIP circuit. The CIP tailings stream is first de-slimed to remove light particles before gravity separation through spirals to recover the heavy fraction of the de-slimed stream. The gravity concentrate is further liberated by ultra-fine grinding before being returned to the head of the leaching circuit. The tailings retreatment circuit was upgraded in 2015 and included a complete replacement of all six spiral banks and an increase in the capacity of the spiral feed and tails pumps. The tailings retreatment circuit contributes approximately 2.5 % to the overall gold recovered.

The refinery uses the pressure Zadra method to strip gold from carbon and an ILR for gravity concentrate. Gold is recovered in the electrowinning cells before being smelted. Carbon is regenerated in a kiln before being returned to the CIP tanks. Gold produced from the gravity circuit averages approximately 34 % of total gold produced with the leach circuit, including tailings recovery, producing the remainder.

The gold sludge is washed and filtered from both the gravity and CIP electrowinning circuits. The sludge is further refined through smelting and crude doré is poured with the purity varying depending on the source. Gravity doré bars are approximately 90 % to 95 % gold whereas CIP doré bars are dependent on ore feed characteristics and can vary between 65 % and 80 % gold. The doré is dispatched to the Perth Mint refinery for further processing into gold bullion.

Gold shipments occur on a regular basis to minimise gold stocks held on site. All gold shipments are conducted by a registered security company in a completely secure environment. All gold movements on-site are monitored and recorded by CCTV.

Standard practice at the process plant is to ensure that all spillages are captured within bunds and are then hosed into sumps for pumping back into the process. There are four main areas for gold to collect outside the electrowinning/smelting and tailings streams: the gold room sump, strip solution tank, ILR sump pump and mill liners. The gold room sump and ILR sump pump are cleaned out monthly whilst mill liners are pressure cleaned back into the circuit when removed from service following a reline. The strip solution tank is usually cleaned on quarterly basis. Estimation of the exact amount of gold recovered during clean-up is difficult as the material is directly returned to the circuit without measurement unless it is collected and smelted separately. No gold is assumed to be locked up in the circuit or has been included in any metallurgical reconciliation.

17.2 Recent process plant performance

The recent performance of the Granny Smith process plant is provided in Table 15.1.

17.3 Processing risks

17.3.1 Major equipment failure

Industrial mineral process plants consist of a series of dedicated unit processes, e.g. crushing, grinding, leaching, CIP, and carbon elution. There is inherent risk associated with catastrophic failure of one (or more) of the key equipment items associated with these unit processes, whereby such failure could lead to a significant period of plant downtime until repairs are completed, resulting in the inability of the processing plan or forecast to be achieved and/or higher operational costs incurred than anticipated.

Catastrophic failures could be associated with the structural, mechanical, or electrical components of the key processing equipment items. Key equipment items could include the crushers, grinding mills, or leach/CIP tanks.

Risk minimisation activities to reduce the likelihood of such occurrences adopted by Granny Smith includes:

- Current plant steel and concrete monitoring and refurbishment program.
- Dedicated on-site maintenance department which undertakes condition monitoring activities, preventative maintenance, and repairs.
- Critical spares (e.g., spare mill motors and gearboxes).
- Contingency operational plans (e.g., contract/mobile crushing plant, leach/CIP tank by-passing).
- Fire suppression systems.
- Insurances.

Decisions associated with asset management, critical spares, insurances, etc. are outside the responsibility and accountability of the Qualified Person, and some inherent risk and uncertainty associated with catastrophic failure of processing equipment remains.

17.3.2 Plant operational management

The processing facilities are managed and operated by dedicated teams of personnel, who are required to make many operational and maintenance decisions every day.

For example, a decision to process ores at a higher throughput could result in a coarser grind size from the grinding circuit, resulting in a lowering of the plant recoveries. Similarly, the choice to operate the leaching circuit at lower free cyanide or dissolved oxygen concentrations to reduce consumables usage rates, could result in lower plant recoveries being achieved than anticipated.

Plant management and the associated decisions made by plant operating personnel, are outside the responsibility and accountability of the Qualified Person, and such decisions and actions taken by plant management can influence the achieved performance of the plant (e.g., throughput, costs, availability and recoveries).

17.3.3 Operating costs, plant consumables and reagents

The operating cost of the process plant represents a significant cost element to the overall financial evaluation of the life of mine plan. The processing facilities use relatively large quantities of power, reagents and consumables, including fuels, cyanide, grinding steel media, lime, caustic, etc.

The estimation of future processing costs is required as input into the cut-off-grade calculations and economic assessments of the Mineral Reserves and Mineral Resources. To estimate the processing costs, require assumptions to be made concerning consumables consumption rates, unit prices and inflation rates.

Metallurgical testing undertaken on Mineral Reserves and recent plant performance provide reasonable guidance of potential reagent consumption rates and mill throughput expectations, and this information is considered and reviewed by the plant metallurgist and the Qualified Person.

Granny Smith, like many other operating gold process plants that have a reasonable operating history, do not allow for a discreet operating cost contingency in their future operating cost forecast. The absence of contingency is considered by the Qualified Person as being a common and reasonable approach to operational process plant cost forecasting.

Consumables, commodity pricing and inflation are subject to external influences that are outside the control or predictive capability of the Qualified Person.

Further to this, operational decisions made by plant management, or unexpected variances in the nature of the ores being processed could unexpectedly impact reagent and consumables usage rates. Such variances are outside the control or predictive expectations of the Qualified Person.

17.4 Process plant requirements

The Granny Smith plant has been upgraded several times over its current lifetime including the addition of a gravity circuit (Knelson concentrators and ILR), and the upgrade of the existing spiral sulphide recovery circuit.

Plant management has an on-going program of structural steel and concrete refurbishment in progress. Leach and CIP tanks have a conditioning monitoring and refurbishment program required for compliance with the International Cyanide Management Code (ICMC).

The capacity of the existing process plant at Granny Smith significantly exceeds that which is required for the Mineral Reserve.

The key process plant requirements estimated for the Mineral Reserve life of mine plan are summarised in Table 17.1. These consumables quantities have been estimated using guidance from the 2022 Budget life of mine, prorated based on plant feed mass. The number of plant employees required is in the range of 50 to 60 for the period 2022 through to 2025 where mill feed rates exceed 1.5 Mt/a.

Table 17.1: Granny Smith process plant – key requirements

	Unit	2022	2023	2024	2025	2026	2027	2028	2029
Ore processed	kt	1,639	1,724	1,570	1,190	1,232	921	1,039	1,101
Plant power draw	MWhr	58	61	56	46	47	39	42	44
Grinding media	t	1,139	1,198	1,091	827	856	640	722	766
Lime	t	2,213	2,328	2,119	1,606	1,664	1,243	1,403	1,487
Sodium cyanide	t	485	510	464	352	365	272	307	326
Caustic	t	401	421	384	291	301	225	254	269
Activated carbon	t	33	34	31	24	25	18	21	22
Hydrochloric acid	t	93	98	89	68	70	52	59	62

Source: Granny Smith CPR, 2021

18 Project infrastructure

Details on each major item of non-process infrastructure is discussed in Item 18. The site infrastructure layout is shown in Figure 4.1. The administration offices (including process engineering, environmental, safety, tailings facility construction management) and the process plant complex are located in the Granny Smith area. Other significant facilities in this area include:

- Reagent storage and mixing facilities.
- Process laboratory.
- Process maintenance and warehouse facilities.
- Main diesel fired power generation plant and substation.
- Fuel storage.
- Raw water tanks and reverse osmosis water treatment system.
- Process water storage pond.
- Accommodation camp.

The mine administration offices (including the mine engineering, geology, mine safety, and training) are located at Wallaby. Other significant facilities in this area include:

- Mine equipment workshop.
- Mine warehouse.
- Core processing facilities.
- Paste plant.

18.1 Tailings storage facilities (TSF)

Process plant tailings are thickened to a target slurry density of 65 % solids weight/weight in the tailings thickener. The final tailings slurry is pumped to the existing TSF complex via two-stage pumps. When required, hypersaline water from the Goanna pit is injected into the tailings slurry at the tailings pump box to maintain the total dissolved salts (TDS) above 50,000 ppm, which is deemed acceptable for cyanide code compliance as an alternative to cyanide destruction.

The TSF comprises three upstream raised adjacent cells; Cell 1, 2 and 3. Cells 1 and 2 have a paddock geometry and have been used since early 1989 (Figure 18.1). Cell 3 is a hillside storage facility commissioned in 2002.

Soil and Rock Engineering Pty Ltd completed the original design of Cell 1 and Cell 2 for Placer Dome in 1989 to a maximum embankment height of RL 437 m. In 1999, Knight Piésold (KP) submitted a report for a Works Approval application to increase the permitted height of Cell 1 to RL 448 m and Cell 2 to RL 448.5 m. Cell 3 was designed by KP and commissioned in 2002.

The pond location is controlled by carefully depositing tailings from numerous deposition locations around the perimeter. Water is decanted through concrete ring gravity decant towers. In 2012 Granny Smith conducted a seepage collection trench and associated pumping facility downstream of the Cell 3 southern embankment. Its purpose was to reduce seepage and associated elevated groundwater levels in the area.

Figure 18.1: TSF overview

Source: Granny Smith CPR, 2021

The TSF cells are appropriately managed. The current Engineer of Record (EoR) is Golder Associates (Golder).

Cell 2 is at full capacity, with the tailings within Cell 2 currently being remined. Cell 1 is the only operational cell with Cell 3 undergoing an embankment raise. In addition, there are numerous standpipe piezometers installed on the embankments of the decommissioned facilities, which are monitored to supplement other monitoring activities such as interferometric synthetic-aperture radar (InSAR) satellite audits, groundwater quality, vibrating wire piezometer data and seepage drain outflow measurements.

Tailings are deposited around the perimeter wall of the TSF, which is mechanically raised to create further depositional area and maintain the minimum freeboard requirement. This method of raising involves borrowing coarse tailings from the beach for use in successive lifts. The supernatant pond in Cell 1 drains to a gravity decant system, and the Cell 3 facility comprises a gravity decant system and a series of underdrains.

All three TSF cells have a consequence classification rating of High B in accordance with the Australian National Committee on Large Dams Incorporated (ANCOLD) 2019 guidelines.

The current elevations of the cells are:

- Cell 1was raised to the final permitted crest elevation of RL 448 m in late 2016.
- Cell 2 was raised to its final permitted crest elevation of RL 448.5 m in 2012. Therefore, Cell 2 is filled to its capacity.
- Cell 3 was raised to an elevation of RL 432.2 m in November 2018 (final permitted elevation of RL437 m).

As of the end-Q3 2021:

- Tailing is now being deposited in Cell 1
- Cell 2 is being used for the re-mining of tailings for underground backfill.
- Cell 3 at the end of Q3 2021 was offline, and construction has commenced on a top hat (or centerline) raise.

The cumulative quantity of tailings deposited on the TSF complex until the end of December 2020 is ~90.3 Mt. Approximately 1.23 Mt of tailings were deposited on Cells 1 and 3 until the end of Q3 2021. Thus, the total cumulative quantity of tailings stored is ~91.53 Mt. The current life of mine tailings storage requirements is approximately 17.5 Mt. The tailings deposition strategy for the period between the end of 2021 and 2030 will be to manage tailings deposition between Cell 1, Cell 3 and the proposed new Cell 4. The current deposition schedule is summarised as follows:

- Cell1, deposition from October 2021 to May 2022 at a rate of 150 kt per month.
- Cell 3, deposition from June 2022 to February 2023 at 150 kt per month.
- Cell 4, construction from March 2022 to February 2023.
- Deposition split between Cell3 and Cell 4 from March 2023 to life of mine.

In 2019 a zone of soft and contractive tailings was identified in the bases of TSF Cell 1 and 2 that resulted in tailings deposition being suspended to those cells until the embankment stability could be re-assessed. Geotechnical investigations in 2020 confirmed that a rock buttress had to be installed at selected (southern) embankment locations on TSF Cells 1 and 2 to ensure that the post-seismic factors of safety met the minimum ANCOLD (2019) requirements. The rock buttress detailed design for Cell 1 was completed, and the buttress construction was completed in August 2021 (Figure 18.2).

The buttress design for Cell 2 has commenced, and construction is due to start in Q1 2022.

The Granny Smith TSFs must comply with the Global Industry Standard on Tailings Management (GISTM) in August 2025. A gap analysis has been completed, and the GISTM compliance program is underway in collaboration with the EoR.

18.2 Waste rock dumps

At Granny Smith, waste rock is hauled from the underground mine and placed in the Wallaby open pit. It is expected that in 2025, the Wallaby open pit waste dump will be exhausted and all waste rock will be hauled to the designated surface waste rock dump.

Process plant tailings waste and waste rock are two of the most significant by-products produced by mines. By responsibly managing these waste streams, we can minimise their impact on the environment and our host communities.

Figure 18.2: Cell 1 buttress

Source: Granny Smith CPR, 2021

The following are the geotechnical design parameters for the in-pit waste dump geometry:

- Maximum bench height – 20 m.
- Maximum bench slope – 37 º.
- Minimum berm width – 10 m.
- Maximum haul road slope – 1:9.
- Haul road width – 20 m (15 m usable width + 5 m windrow).

The waste disposal design consists of four phases (Phase 1 to Phase 4) in four lifts of 20 m each with a total of 60 m height waste dump with an intermediate 5 m berms.

18.3 Water

The Granny Smith fresh water supply is derived from the following sources:

- Mt Weld borefield
- Windich open pit void.

The Mt Weld borefield is classed as fresh groundwater, while the water from the former Windich open pit is sourced from groundwater recharge, rainfall and the diversion of Windich Creek. Both water sources are used as raw water or processed by reverse osmosis (RO) to produce potable water. Water used at the process plant is obtained from the Windich pit. Mt Weld bore water is sourced through existing regional groundwater supply agreements with Lynas Rare Earths (expires November 2023).

Water exploration at the North Keringal area located within Granny Smith's tenements has identified a potential replacement supply of 1 Gℓ – 2 Gℓ per annum supply. North Keringal Borefield, is under construction with production bores, monitoring bores, roads and power lines scheduled for completion in Q1 2022. This water source will supply up to 1 Gℓ of freshwater per year. An additional Stage 2 North Keringal Borefield is currently in the planning phase and is expected to be able to supply an additional 1 Gℓ per year for Granny Smith.

18.4 Power

Granny Smith's power requirements are currently sourced from a gas-fired power station commissioned during 2016 and a hybrid power system, comprising more than 20,000 solar panels (7 MW capacity) supported by a 2 MWh/1 MWh battery system commissioned in 2020. The 24.3 MW power station is located approximately halfway between the process plant and Wallaby mine operation. Power is transmitted via a 33 kV overhead power line, with 11 kV feeding to underground via the portal and intake airway.

18.5 Accommodation

The 950 room accommodation village is located 1.5 km west of the Granny Smith process plant and is managed by Sodexo. The village include a dry and wet mess as well as recreational facilities.

18.6 Site access

Mine site access is dual lane elevated truck compacted roadways. These roads have been constructed from mining waste material and connect the surface infrastructure, specifically the operating mines, infrastructure and residential camp.

18.7 Other infrastructure

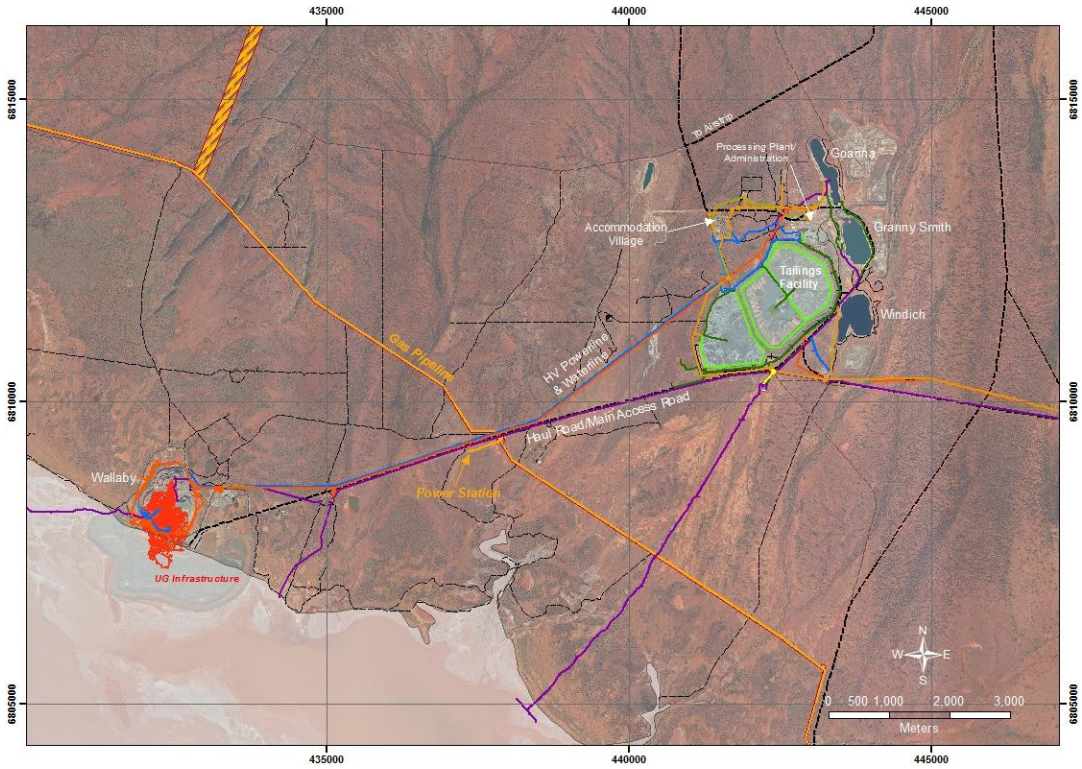
Other infrastructure on site includes.

- Paste plant.
- Core yard/ office.
- Contractors yard.
- Dams and turkey nests.
- Fuel storage facilities.
- Workshops and laydown areas.
- Landfill site.
- Administration and training facilities.
- Airstrip.

- A solar farm.
- Wastewater treatment plant.
- Vehicle wash down bays.
- Bioremediation pad.
- Communication towers.
- Pipeline corridors.

A plan view of primary infrastructure is shown in Figure 18.3.

Figure 18.3: Plan of Wallaby and Granny Smith infrastructure



Source: Granny Smith CPR, 2021

The Qualified Person is of the opinion that the infrastructure for the Granny Smith mining operation is fit for the life of mine Mineral Reserve estimation and that the Mineral Reserve quantities are tested against dump and disposal capacities. The tailings disposal has had a study completed to facilitate the in-pit deficit.

19 Market studies and contracts

19.1 Preliminary market study

The majority of gold production is used for jewellery and for investment purposes, in the latter case because the market views it as a store of value against inflation. In addition, certain physical properties of gold, including its malleability, ductility, electric conductivity, resistance to corrosion and reflectivity, make it the metal of choice in a number of industrial and electronic applications.

Supply of gold consists of new production from mining, the recycling of gold scrap and releases from existing stocks of bullion. Mine production represents the most important source of supply, typically comprising 75 per cent. each year. Annual demand requires more gold than is newly mined and the shortfall is made up from recycling. Management believes that long-term gold supply dynamics and global economy trends will support the gold price at levels above or aligned to $1,300 per ounce in the long-term.

The market for gold is relatively liquid compared to other commodity markets, with London being the world's largest gold trading market. Gold is also actively traded via futures and forward contracts. The price of gold has historically been significantly affected by macroeconomic factors, such as inflation, exchange rates, reserves policy and by global political and economic events, rather than simple supply/demand dynamics. Gold is often purchased as a store of value in periods of price inflation and weakening currency. The price of gold has historically been less volatile than that of most other commodities.

19.2 Metal prices

A review of metal prices for planning purposes is undertaken annually to monitor any significant changes in price trends or exchange rates that would warrant re-calibrating the price deck before the Strategic Planning process transitions into the Business Planning cycle.

This review of the metal price deck has taken account of the prevailing economic, commodity price and exchange rate (Fx) trends, together with market consensus forecasts, in addition to consideration of the Gold Fields' strategy and expectations for the operations.

The Company's strategy is to (1) mitigate annual volatility by holding planning metal prices as long as warranted to support stability in mine planning, notably regarding the underground MSO and open pit shell selections; (2) maintain appropriate margins on spot and long-term price forecasts to support the Group's Balanced Score Card (BSC) metrics; (3) protect against accelerating mining sector inflation and, (4) to confirm a separate gold price to be used specifically for the Operational Plan (budget) revenue streams and cashflows in Q3 each year.

The outcome of the pricing analysis was to use a gold price of $1,300/oz for Mineral Reserves and $1,500/oz for gold Mineral Resources for the December 2021 disclosure of estimates. The relevant copper and silver prices in US Dollars are shown in the summary table below. Note the A$/oz and ZAR/kg gold prices applied to the estimates in Australia and South Africa are included for transparency.

Table 19.1: Mineral Reserve and Mineral Resource metal prices

Units		December 2021 Metal price Deck	
Metal	**Unit**	**Mineral Reserve 31 Dec 2021**	**Mineral Resource 31 Dec 2021**
Gold	$/oz	**1,300**	**1,500**
	A$/oz	1,750	2,000

Source: Granny Smith CPR 2021

The above price deck comparison to market long-term forecasts assessed at the time of analysis is consistent with the Issuer's approach to retaining good discipline in support of the Company strategy; this approach ensures Gold Fields' Mineral Resources and Mineral Reserves are not too volatile year-on-year and that the company is protected against possible downside scenarios if the gold price falls up to ~25 % in any specific year. Ensuring a sufficient buffer to maintain our margins at prices that could be incrementally lower than the spot price ranges seen in 2021 is also important. Equally, with annual mining sector inflation estimated at $30-40/oz, we need to ensure we mitigate this escalation risk in the life of mine plans and Mineral Reserve estimates.

Sensitivity analysis on gold price for project financial evaluation is done to provide flexibility/range analysis for all regional studies and site growth opportunities and investment purposes.

The Mineral Resource gold price premium to the Mineral Reserve price is circa 15 % and the differential is in general alignment to our peer group and industry standard practice. The Mineral Resource price premium is to provide information on each operation's potential at higher gold prices and to indicate possible future site infrastructure and mining footprint requirements.

19.2.1 Metal price history

Gold prices London Metals Exchange afternoon close:

- Gold spot 30 December 2021 - $1,805.85/oz - A$2,484.32/oz
- Fx 30 December 2021 A$1:$0.727
- Gold spot 24 month average - $1,784.45/oz (for the period ending 31 December 2021)
- Gold spot 36 month average - $1,653.71/oz (for the period ending 31 December 2021)
- Gold spot 60 month average - $1,497.48/oz (for the period ending 31 December 2021)

19.3 Contractual agreements

All gold produced at Granny Smith is refined by the Perth Mint in Western Australia. The Perth Mint applies competitive charges for the collection, transport and refining services. The Perth Mint takes responsibility for the unrefined gold at collection from the operation where it engages a sub-contractor, Brinks Australia (Brinks). Brinks delivers the unrefined gold to the Perth Mint where it is refined, and the refined ounces of gold and silver are credited to the relevant metal accounts held by the operating company with the Perth Mint. The contractual arrangement with the Perth Mint continues until terminated by either party upon 90 days' written notice.

Gold Fields' treasury department in the corporate office in Johannesburg, South Africa sells all the refined gold produced by the operating company. On collection of the unrefined gold from a mine site, the relevant operating company will notify Gold Fields' treasury department of the estimated refined gold content, expressed in troy ounces, available for sale. After such confirmation, the treasury department sells the refined gold to authorised counterparties at a price benchmarked against the London Bullion Market Association PM gold auction price. All silver is sold to the Perth Mint at the London Bullion Market Association silver price on the last business day of each month.

Gold Fields may periodically use commodity or derivative instruments to protect against low gold prices with respect to its production. Variations in gold price, currency fluctuations and world economics can potentially impact on the revenue received. No derivative instruments are in place at the date of this report.

Significant service contracts and/or leases that are in place to enable execution of the life of mine plan include:

- Perth Mint – Refining
- Barminco – Mining and drilling
- MLG – Ore Haulage
- Coastal Midwest Transport – Freight haulage
- RUC Cementation – Raise boring
- APA Operations – Gas transportation
- EDL – Power supply
- Alliance Airlines – Flights
- Action Industrial Catering – Camp services
- ALS Global – Assay services.

The Qualified Person has relied on information provided by the Company in preparing its findings and conclusions regarding market studies related to gold sales from Granny Smith. Refining services are based on well-established long-term agreements and expediting gold sales over the life of the asset does not represent any significant uncertainty. Service contracts, lease agreements and goods contracts e.g., diesel, cyanide and cement, necessary to develop the property as planned, are in place and have the capability to support the full projected cashflow period.

20 Environmental studies, permitting and and social or community impact

Climate change is an integral part of the Mineral Reserve generation process and incorporating relevant costs associated with climate change, primarily decarbonisation, mitigation and adaptation to the changing climate, is a key theme for the Company. Integration of these key elements into the Mineral Reserve process is being carried out progressively and simultaneously across all of Gold Fields' sites.

20.1 Environmental studies

Environmental, ecological and social impacts are managed in accordance with existing regulatory instruments and GSM's internal ISO 14001 management system.

Gold Fields has developed a Group Environmental Policy Statement, which describes the key principles of how the sites and employees perform their work and how the Company supports its employees in minimising the operations impact, continual improvement and compliance with laws and other obligations.

Granny Smith operates in compliance with relevant legislation (including DWER Environmental Licence L8435 and Mining Act approvals) and remains compliant regarding key environmental risks, namely tailings storage facilities, processing of ore, land disturbance, chemical blending and storage, electric power generation, sewage and landfill operations and mine dewatering. These and other potential environmental impacts are assessed during the approvals process and are regularly reviewed as part of the site Aspects and Impacts Register and ISO 14001-certified Environmental Management System.

There are no environmental sensitive area receptors at risk near Granny Smith. Threatened and priority ecological communities, flora and fauna areas are mapped and assessed during the internal surface disturbance approval process and external regulator environmental clearing/disturbance approvals.

20.2 Waste disposal, monitoring and water management

Monitoring programs and reporting that are in place include:

- Quarterly and annual groundwater and surface water monitoring.
- Annual groundwater abstraction and aquifer reviews.
- Annual groundwater discharge reporting.
- TSF audit reviews.
- TSF groundwater seepage management.
- Annual vegetation impact monitoring.
- Annual Lake Carey fringing vegetation in the vicinity of Wallaby mine monitoring.
- Annual biological assessment of Lake Carey within the Wallaby area.

20.2.1 Tailings storage facilities (TSF)

Freeboard

Each tailings cell is at full capacity when the tailings operating freeboard reduces to 300 mm. The operating freeboard is the vertical distance between the upstream embankment crest and the head of the tailings beach. The DWER licence conditions restrict the maximum supernatant pond area to 15 % of a Cell's top surface area. The available freeboard (as of September 2021) for each TSF is adequate and in compliance with the DMIRS criteria. The EoR has estimated that the available storm storage capacity for each Cell exceeds the run-off volume for the Probable Maximum Precipitation (PMP) event superimposed on the operating pond.

Stability

Laboratory testing of samples recovered during the field investigations is substantially completed, and the results of the studies have been used to interpret and fully characterise the TSF foundation and tailings materials properties.

Zones of low strength and loose contractive materials were identified within the tailing's deposits, particularly at their base on the cells' downstream (southeast) side.

Limit equilibrium stability assessment identified the need for buttressing along the southeast side of Cell 1 to facilitate an increase in the factor of safety against potential failure associated with strain softening and/or static or dynamic liquefaction of the tailings.

No signs of instability have been evident on Cell 1 and Cell 2; nevertheless, factors of safety were substantially below the minimum required for post-seismic loading, adopting the measured post-peak/residual shear strength properties.

On advice from the EoR, a downstream buttress was designed for Cell 1 to improve geotechnical stability and satisfy the required factor of safety conditions.

Golder completed the static and dynamic numerical modelling for Cell 1, which refined the preliminary limit equilibrium stability assessment and allowed the optimisation of the buttress geometry from the maximum elevation of the crest being RL 433 m (preliminary design) to RL 429 m in the southern corner of Cell 1 and RL 426 m along the remaining extension of Cell 1. The next step will be to undertake similar static and dynamic numerical modelling for Cell 2.

Based on the Cell 1 analysis outcomes and the Cell 1 buttress completion, approval to recommence tailings deposition into Cell 1 was received from DMIRS.

Groundwater monitoring

Groundwater levels in the shallow unconfined aquifer and deeper saline aquifer beneath the TSF area are measured in a network of monitoring bores around the TSF perimeter.

Pre-mining water levels in the shallow aquifer were approximately 10 m below ground level. However, the development of groundwater mounding occurred beneath the TSF in the early 1990s, and a series of measures to manage seepage from the TSF have been implemented over the operating life of the mine, including:

- Installation and operation of a thickener to increase the tailings solids concentration.
- Construction of Cell 3 and alternation of deposition between cells to increase drying periods.
- Installation and upgrades to a shallow seepage collection system (trenches and sumps).
- Installation of seepage recovery bores between Cell 3 and Childe Harold Creek.

Some of the bores have been destroyed or decommissioned during ongoing construction activities. Quarterly water level readings are taken in 29 selected bores in accordance with the DWER operating Licence. An additional 11 bores are monitored annually. During the recent Cell 1 buttress construction, the bores (7 No) at locations MB 13, 14, 15 and 28 were decommissioned and grouted. MB 13 is one of the bores that was monitored quarterly and was the only one located next to Cell 1. This bore will require replacement.

Water levels in the bores remained relatively stable during Q3 2021, generally at depths between 1 m and 8 m. MB 57 is located on the hillside on the northwest flank of Cell 3 at a higher elevation than the other bores water depth is approximately 11 m. The drop in water level at MB 50 since June 2018 is due to its proximity to seepage recovery bore PB3A, which draws water down to approximately 22 m.

Tailings discharge weak acid dissociable (WAD) cyanide levels

Due to the potential use of hypersaline process water at Granny Smith, site-specific International Cyanide Management Code (ICMC) WAD cyanide levels are set for tailings discharge. The maximum WAD cyanide discharge concentration limit to the TSF is 83.3 mg/ℓ with an 80th percentile concentration of 71.7 mg/ℓ. These limits apply under hypersaline conditions (tailings discharge greater than 50,000 mg/ℓ total dissolved solids (TDS)). Where conditions are not hypersaline, discharge concentrations of WAD cyanide are limited to 50 mg/ℓ. The operating strategy at Granny Smith is to maintain the WAD level below 50 mg/ℓ to avoid the addition of hypersaline water due to operational concerns. These guidelines were recently re-approved by the International Cyanide Management Institute (ICMI) for recertification purposes. The WAD level in tails discharge did not exceed these limits during Quarter 3 of 2021.

Embankment movement

Granny Smith has 12 existing survey pins installed in the Cell 1/3 dividing embankment to check for embankment movement. In addition, survey pins were installed in the Cell 1 eastern embankment in Q1, 2019. The survey pins indicated minimal movement and monitored displacements were confirmed by the EoR to be negligible.

The quarterly InSAR scans detected no embankment settlement or movement.

Instrumentation

The ML suite database from Canary is online and receiving and recording the readings from the piezometers currently connected to the telemetry system on the TSFs. Golder is reviewing the instrumentation readings weekly. No abnormal or concerning conditions were identified since the commissioning of the online cloud-based dashboard system in late 2020.

Audits and Inspections

Golder conducts quarterly TSF inspections and interrogates monitoring data weekly. The next third-party audit is due in Q2 2022.

SRK Consulting has been appointed as the senior independent reviewer to conduct technical reviews on key studies and assessments.

The TSFs at Granny Smith are well managed from a facility safety and governance perspective.

a) The Qualified Person has the opinion that the procedures and monitoring, water management practices are adequate for the life of mine Mineral Reserve estimate.

20.2.2 Waste rock dumps

Waste rock management is conducted in accordance with the Wallaby Project Waste Dump Management Plan (Ministerial Statement 551), Mining Act tenement conditions (including Wallaby Deeps Mining proposal REGID 36911) and DWER Environmental Licence (L8435). The two approved locations are the in-pit Wallaby dump and the surface waste rock landform on the western side of the pit. Current estimates show that Wallaby in-pit dumping will reach its limit in 2025. From this time onwards, all waste from Wallaby will be dumped on the surface waste dump.

Parameters for utilising the surface waste rock landform are detailed in the Wallaby Project Waste Dump Management Plan (Ministerial Statement 551). Although capacity remains to dump more waste rock at the surface facility, final mine closure and rehabilitation costs could be reduced by maximising the amount of material dumped into the Wallaby open pit.

As part of the environmental due diligence for the TSF Cell 1 buttress construction, a review of the Wallaby rock characteristics was undertaken. The findings were:

- Recently mined waste rock material collected from the base of the pit consisted of fresh conglomerate.
- If the Wallaby waste rock was to be utilised as construction material, this material has minimal impact to the environment in respect to acid mine drainage.
- Geological core logging of waste material below the Zone 120 level is consistent with historic sampling and acid mine drainage classification. Geological logging records show an absent to trace occurrence of sulphides (typically pyrite) with neutralising carbonate frequently present in veining and alteration.
- As the underground mine gets deeper, ongoing assessment of waste rock characterisation is recommended to further supplement both the EGi, 2000 report and the Zone 110-120 feasibility study report.

GSM conducts annual waste rock dump monitoring and Rehabilitation Performance Monitoring Protocol (RPMP). The RPMP leverages technological advancements in data capture and processing in the science of remote sensing to assess rehabilitation performance at a landscape scale, as well as field-based monitoring and observations designed to collect detail on fine-scale features that are immeasurable by remote sensing. This information is used to develop any further rehabilitation requirements which is integrated in the Closure Cost Estimate and GSM closure related rehabilitation planning.

The Qualified Person is of the opinion that the waste rock dumps at Granny Smith are adequate for this life of mine Mineral Reserve plan. Regular waste rock inspections are performed to assess safety.

20.2.3 Water management

The Wallaby borefield has been operating since late-April 2001 due to the presence of aquifers formed by the paleochannel and local permeable fractured rocks. The mine is dewatered using ex-pit production bores (the Wallaby borefield) and sumps from both in-pit and underground.

There are two active discharge outfalls on Lake Carey located on either side of the Wallaby mine, referred to as the western discharge outfall (DWER water emission 1 or W1) and the southern discharge outfall (DWER water emission 2 or W2). Groundwater is pumped to either a transfer pond to allow sediment retention and then to the southern discharge outfall, or directly from the production bores (clear water) to the western discharge outfall. There is also an eastern discharge outfall to the Granny Smith open pit, which while constructed and commissioned, remains inactive with environmental application approvals currently pending and under assessment by DWER.

All water abstraction and discharge are fully permitted and compliant with the legal obligations and limits.

One of the most important components of the Granny Smith operation is the management and continuous monitoring of hypersaline water. In 2000, a Lake Carey Catchment Management Group (LCCMG) was formed. The LCCMG acts as a coordinating body to oversee and fund environmental monitoring and research and is a critical factor in maintaining compliance approvals associated with the management of hypersaline discharge from the Wallaby underground mine onto the salt lake.

Following a major flood event in 2012, consultancies involved in past research were commissioned to produce a document that summarised the findings of past studies into a single, scientifically robust document. The final report was submitted to the DWER in 2014. The LCCMG actively manages the cumulative impact to the lake and continues to build knowledge and safeguard environmental dewatering/discharge approvals.

Major flood events contribute to the dilution and dispersal of salts and metals that are usually associated with discharge in dry conditions providing temporary mitigation. However, it is unknown if the continued addition of salts to the lake over time will eventually result in a shift towards a less abundant and diverse, more salt-tolerant biological assemblage. To promote the recovery of lake ecology adjacent to the discharge points, alternative discharge points will be considered for short periods (2 - 4 weeks) during significant flood events (e.g. former Keringal and Granny Smith open pits).

In 2019, an application for a Works Approval/licence amendment was submitted to DWER regarding the dewatering of Goanna and Granny Smith open pit complex (~20 Gℓ) and the discharge to Lake Carey. The regulator requested further information regarding ecotoxicity of the discharge and GSM has since requested two extensions up to December 2021 to respond. This application was subsequently withdrawn by GSM. In 2022, an application is planned to be finalised, with further studies (environmental and technical) scheduled including:

- Closing the knowledge gaps identified during the current studies.
- Further alignment to the weights of evidence approach to better understand the stressors on the ephemeral and hypersaline Lake Carey receptors.
- Determine and refine the best environmental management options (water treatment).

The former Windich, Jubilee and Phoenix open pits are inundated with natural groundwater inflows, direct rainfall and diverted stream flow. In addition, the Keringal pit provides potential future storage capacity and was instrumental in providing a disposal location for ongoing Wallaby discharge since dewatering began. Although the Keringal pit is currently inundated with hypersaline groundwater and utilised for emergency discharge from the Wallaby underground mine, opportunities may allow use for usable water storage in the future.

In 2020, GSM updated the site water balance and reviewed the Regional Water Management Plan. This included a review of the life of mine water consumption requirements, optimised water use, underground water cycle, harvesting of water and water infrastructure. In 2021 GSM established a Site Water Working Group and continues to review water demand, supply and opportunities for water reduction and reuse.

As per GSM's EPA Licence (L8435) and three Groundwater Licences, an array of water monitoring and analysis is undertaken on a monthly, quarterly and annual basis.

The Qualified Person is of the opinion that the water balance and procedures are adequate and support the life of mine Mineral Reserve estimate.

20.3 Permitting

Mining operations on tenements in Western Australia must be developed and operated in compliance with the following Commonwealth and State environmental legislative requirements.

20.3.1 Commonwealth

The Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 is administered by the Department of the Environment, Water, Heritage and the Arts. Commonwealth approval is required for matters of national significance, as defined in the EPBC Act. Matters of national significance include the presence of migratory birds, federally listed rare flora or fauna, Commonwealth land, nuclear actions and marine areas. A new mine located on or with impact to Lake Carey may require Commonwealth approvals under the EPBC Act.

Currently, the Clean Energy Regulator oversees the administration of the Large-scale Renewable Energy Target and the Small-scale Renewable Energy Scheme to encourage additional generation of electricity from renewable energy sources. The Renewable Energy Target legislation provides an incentive for investment in renewable energy power stations and smaller systems while ensuring the energy sources used are ecologically sustainable. The Clean Energy Regulator Act, 2011 regulates and convenes the Clean Energy Regulator.

The Carbon Farming Initiative is a voluntary carbon offsets scheme. It is an integral component of the Emissions Reduction Fund and allows land managers to earn carbon credits by changing land use or management practices to store carbon or reduce greenhouse gas emissions under the Carbon Credits (Carbon Farming Initiative) Act 2011.

The National Greenhouse and Energy Reporting Act 2007 sets out the reporting framework for calculating carbon emissions from industry. National Greenhouse and Energy Reporting will form the basis for calculating permits under any proposed Carbon Pollution Reduction Scheme to be introduced into Australia in the future.

20.3.2 State

The Mining Act (1978) is administered by the DMIRS. Before commencement of any mining operation, a proponent is required to submit a Mining Proposal to the DMIRS. The Mining Proposal describes the project, surrounding environment, potential environmental impacts and proposed prevention and mitigation measures. Commitments made within the Mining Proposal are binding on any future operations within the tenements unless a request for an amendment to the relevant Government authorities is accepted.

The DMIRS advised in late 2019 that enforcement of the Statutory Guidelines for Mining Proposals and the Statutory Guidelines for Mine Closure Plans would be met in February 2020. The submission of Mining Proposals is being conducted in accordance with the new guidelines.

The Environmental Protection Act 1986 (EP Act) is administered by the DWER and Office of the Environmental Protection Authority (OEPA). There are two key components to the EP Act that affect Granny Smith's operations. Under Part IV of the EP Act, projects referred to the OEPA which are considered likely to have a significant environmental impact may be subject to assessment in accordance with Environmental Impact Assessment, Part IV Division 1. The environmental impact assessment (EIA) of development proposals is undertaken in accordance with Part IV Division 1 of the EP Act and the Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2016.

The DWER regulates industrial emissions and discharges to the environment through a Works Approval and licensing process under Part V of the EP Act. Industrial premises with potential to cause emissions and discharges to air, land or water are known as "prescribed premises" and trigger regulation under the EP Act. Prescribed premises categories are outlined in Schedule 1 of the Environmental Protection Regulations 1987.

The EP Act requires a Works Approval to be obtained before constructing a prescribed industrial premise and makes it an offence to cause an emission or discharge unless a licence or registration is held for the premises. On completion of construction of such infrastructure, completion certificates are required to be submitted to DWER to confirm the infrastructure was constructed in accordance with approved design criteria.

In addition, the Contaminated Sites Act 2003 (administered by DWER) has environmental investigation and reporting requirements required by mining operations under this legislation.

The Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (administered by DMIRS and DWER) was gazetted in 2004 as part of amendments to the Environmental Protection Amendment Act (2003). It requires all individuals, corporate bodies and private companies to gain formal approval for vegetation clearing in Western Australia prior to any ground disturbing activities commencing. All disturbances relating to mining, processing and related infrastructure require approval under both this framework (including clearing permit exemptions) as well as under the Mining Act.

The Rights in Water and Irrigation Act 1914 as administered by DWER are responsible for issuing groundwater licences (GWL) and licences to construct or alter wells (CAW).

There is no legal obligation in Western Australia to have unconditional performance bonds in place for mine closure liabilities. Such liabilities for continuing operations are now self-funding. In addition, companies are required to pay a levy to the state based on the total mine closure liability. This levy is 1 % of the total liability per mine, paid annually. This levy goes into a state administered fund known as the Mine Rehabilitation Fund. Capital and interest from the fund will be used to rehabilitate legacy sites or sites that have prematurely closed or been abandoned.

20.3.3 Granny Smith permitting

Granny Smith is entitled to mine within its tenement holding in accordance with all necessary statutory authorisations and permits.

The Wallaby open mine was approved in August 2000 under Part IV of the EP Act in accordance with Ministerial Statement (Reference #551). In August 2017, the OEPA conducted an audit on the Ministerial Statement which recommended "no action taken" as Granny Smith had demonstrated compliance to the conditions of Ministerial Statement 551. Separate to the existing Part IV approval (Ministerial Statement 551), additional small surface projects such as paste fill, the batch plant and causeways required additional approvals and operational commitments through State environmental regulators (DWER and DMIRS).

Currently, Granny Smith operates the Wallaby underground mine in accordance with the Wallaby Deeps Mining Proposal (REGID 36911, 2012) that describes the project as 'all future mineable reserve – lateral and deeper', within the Wallaby mine.

Approvals for abstraction and discharge to Lake Carey from the Wallaby mine was obtained in two parts:

- Abstraction: GWL 100054(7) for 13 Gℓ per annum.
- Discharge to Lake Carey: Environmental Licence L8435/2010/3 for 10.2 Gℓ per annum.

Current water abstraction levels are around 7 Gℓ per annum (total) based on the lower annual production rate which is comparable to the annual production rates for the remainder of the mine life. DWER Licence L8435/2010/3 was last amended on 7 March 2019 to include:

- The addition of discharge to land monitoring for the Wallaby Anti-Pollution (WAP) pond.
- Production capacity increase for category 52.
- Changes to the wastewater treatment plant (WWTP) monitoring requirements.
- Two additional landfill locations.
- Amendment to the landfill cover requirement.
- Addition of Special Waste Type 1 (asbestos) to category 64.
- Water transfer pond containment upgrade.
- Addition of mining tenement M38/361 to the Premises Boundary.

DWER Licence L8435/2010/3 was amended on the 12 April 2021 with only administrative corrections.

Granny Smith also holds groundwater abstraction licences GWL65744 Granny Smith and GWL59529 Mt Weld which allows the annual abstraction of 15 Gℓ and 1.2 Gℓ of water.

Groundwater monitoring is conducted regularly as part of the groundwater well licences operating strategy, licence conditions, tenement conditions and Mining Proposal commitments. These programs monitor groundwater levels and water quality at the borefields, mines and around the TSFs.

A summary of major current Granny Smith permits is provided in Table 20.1.

Table 20.1: List of Granny Smith permits

Number	Purpose	Registered holder	Status	Grant date	Expiry date	Fines
L8435	GSM EPA 1986 Licence	GSM Mining Company Pty Limited	Active	07/10/2013	06/10/2034	0
MS 551	Wallaby Ministerial Statement	Placer (Granny Smith) Pty Limited	Active	9/08/2000	-	0
GWL65744	Groundwater Licence	GSM Mining Company Pty Limited	Active	2/02/2014	27/02/2024	0
GWL59529	Groundwater Licence	GSM Mining Company Pty Limited	Active	2/10/2017	3/10/2027	0
GWL100054	Groundwater Licence	GSM Mining Company Pty Limited	Active	7/11/2016	27/02/2024	0

Source: Granny Smith CPR, 2021

20.4 Social and community

The Indigenous Peoples Strategy provides the framework for a consistent approach to engagement with Aboriginal peoples to improve relationships and mitigate risks to the business.

Through the implementation of a its Reflect Reconciliation Action Plan (RAP), Gold Fields' sites are developing appropriate strategies to improve and increase Aboriginal employment outcomes within its workplaces and increase supplier diversity.

In 2019, a claim under the Native Title Act 1993 (Cth) by the Nyalpa Pirniku People (WAD91/2019) was registered. This claim covers the entire Granny Smith mining operations. The registered claim is still under consideration by the Federal Court. In May 2021, GSM signed a Heritage Agreement with Nyalpa Pirniku, which covers cultural heritage management processes for exploration and prospecting tenure.

GSM consults with relevant Aboriginal stakeholder groups (including the Nyalpa Pirniku People) to ensure that areas of Aboriginal cultural heritage are identified and recorded. The sites identified during cultural heritage surveys are either archaeological (e.g. flake scatter artefacts) or ethnographic (e.g. an area linked to a story line). Such sites are recorded and managed in accordance with the Aboriginal Heritage Act (1972) (WA) under site and regional procedures and standards.

Stakeholder engagement is guided by an internal plan and Gold Fields' Stakeholder Relationship and Engagement Policy.

Granny Smith supports community development initiatives which add value to the host community. GSM pursues host community procurement and employment.

20.5 Mine closure

Granny Smith has an up-to-date mine closure plan, approved by DMIRS in 2021. The plan has been developed in accordance with legal requirements and Gold Fields guidance, which aligns with the International Council of Mining and Minerals (ICMM) guidance. The Mine Closure Plan determines the mine closure requirements and calculates the financial or closure cost liability associated with closure. The Mine Closure Plan identifies the baseline description, the closure vision or objectives, risks and opportunities, and closure activities, which include stakeholder engagement, decontamination, dismantling, re-profiling and revegetation of land or landforms, maintenance and monitoring, including post closure water monitoring (after rehabilitation is completed).

The operation has a Progressive Rehabilitation Plan (PRP), developed in accordance with the approved Mine Closure Plan and Group guidance. The operation sets annual targets for the implementation of the PRP and tracks their performance against these targets. These include the recent TSF Cell 1 buttress constructed for long term stability and safety purposes, rehabilitation of the Windich North and Windich South waste rock landforms, and technical studies such as waste rock landform erosion modelling for closure purposes. Monitoring of closure objectives is undertaken utilising an in-house Closure Monitoring Protocol. Monitoring data and results are reported annually as part of Granny Smith's Annual Environmental Report. Existing cash resources are utilised to fund the progressive rehabilitation activities. Granny Smith, as a tenement holder, is required to report disturbance data, and to contribute annually to the Mining Rehabilitation Fund (MRF) in accordance with the requirements of the Mining Act.

Granny Smith have developed their closure cost estimate using the Standardised Reclamation Cost Estimator (SRCE) model. Closure costs are reviewed every year to reflect actual and proposed disturbances and changes in closure requirements. The estimated closure cost for life of mine is calculated, as of 31 December 2021, as $66 m (excluding taxes). Financial provision for rehabilitation, closure and post closure obligations are met through existing cash reserves. The SRCE closure cost estimate, developed for asset retirement obligation purposes, is updated and reviewed, externally, every two years by an independent consultant, and reviewed annually as part of the Group financial assurance.

The Qualified person is of the opinion that:

a) All licences are in good standing and that any current or future licensing can and will be obtained for the Mineral Reserve or the Mineral Resource.

b) Granny Smith has a good standing with licensing authorities, community groups and that licensing is not expected to be material to reserves or resources.

c) Granny Smith is conducting progressive rehabilitation, as part of good practice and to reduce their closure liability.

d) Closure estimates and duration are reasonable and practical.

21 Capital and operating costs

21.1 Capital costs

Capital costs for Granny Smith include equipment replacement, underground mine development costs, infrastructure upgrades, process plant integrity and other minor expenditures to maintain operations. Major budgeted capital cost items include underground development, ventilation, dewatering, power, escapeways, exploration, TSF construction and expansions.

The forecast capital costs for the Mineral Reserve life of mine plan are summarised in Table 21.1.

Table 21.1: Capital costs ($ million)

Capital cost item	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Mining MP&Dev	$ million	48.7	31.7	24.2	8.8	15.9	15.9	12.9	10.8	18.9	3.2	2.7
Mining capital works	$ million	23.0	30.6	14.7	11.2	4.2	8.0	3.1	3.6	0.2	0.1	0.0
Processing (including TSFs)	$ million	12.9	9.2	6.0	2.7	3.3	0.1	3.4	3.5	3.4	0.0	0.0
G&A capital	$ million	2.4	2.9	6.4	1.5	1.5	1.0	0.5	0.3	0.2	0.1	0.0
Exploration	$ million	8.4	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Capital	**$ million**	**95.4**	**74.9**	**51.9**	**24.8**	**25.4**	**25.7**	**20.5**	**18.7**	**23.3**	**4.0**	**3.3**

Notes:
a) The capital costs are based on the 31 December 2021 life of mine schedule for Proven and Probable Mineral Reserves.
b) No Inferred Mineral Resource is included in the life of mine processing schedule or techno-economic evaluation.
c) Exploration costs are limited to year one in the life of mine cashflow model. Gold Fields is expecting to spend between $80 million and $100 million per annum on Mineral Reserve generation exploration to replace depletion with approximately a quarter share going to Granny Smith.
d) Closure cost is 'Day of Assessment' as at 31 December 2021 with subsequent life of mine disturbance rehabilitation added.
e) Tailing storage facilities are costed according to the life of mine requirements. The current in-pit tailings storage facility is expected to have reached capacity before the reserve life of mine is consumed. The cost of the replacement facility is included in the life of mine financial model.

Source: Granny Smith CPR, 2021

21.2 Operating costs

The 2021 Mineral Reserve life of mine operating costs are based on the 2022 budget unit costs. In cases where there is an expected change in operating practice in the mine that will have a material effect on costs, these expected changes have been incorporated into the cost estimates.

Budgeted operating costs for the 31 December 2021 Mineral Reserve life of mine plan are summarised in Table 21.2.

Table 21.2: Operating costs ($ million)

Operating cost item	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Mining	$ million	113.5	124.7	117.8	98.3	104.4	87.2	92.6	96.5	76.6	57.8	51.9
Processing	$ million	34.6	33.6	32.6	26.5	26.8	21.3	25.1	25.7	21.4	18.9	18.6
G&A operating costs	$ million	41.5	39.4	38.9	32.3	31.5	26.0	26.3	26.4	21.4	17.3	16.3
Other operating costs	$ million	5.5	5.6	5.2	4.0	4.1	3.1	3.5	3.7	3.2	2.2	1.9
Operating costs	**$ million**	**195.2**	**203.3**	**194.6**	**161.1**	**166.9**	**137.5**	**147.5**	**152.2**	**122.6**	**96.3**	**88.7**

Notes:
1. The operating costs are based on the 31 December 2021 life of mine schedule for Proven and Probable Mineral Reserves. The Mineral Resource and exploration required to replace depleted Mineral Reserves is not included in this techno-economic assessment.
2. No Inferred Mineral Resource is included in the life of mine processing schedule or techno-economic evaluation.
3. Costs are first principles based on the Mineral Reserve life of mine schedule.
4. This operating cost summary estimate is for the Mineral Reserve life of mine schedule.
5. The operating costs also include rehabilitation and closure costs of $56.1 million.

Source: Granny Smith CPR, 2021

Budgeted closure costs post the 31 December 2021 Mineral Reserve life of mine plan are summarised in Table 21.3.

Table 21.3: Post life of mine costs

Sources	Units	2028	2029	2030	2031	2032	2033 Onwards
Post Mineral Reserve life of mine closure	$ million	0.1	18.6	26.6	6.2	1.3	3.3
Property holding costs[1]	$ million	2.7					

Notes: [1] Costs included in closure costs

Source: Granny Smith CPR, 2021

The Qualified Person's opinion on capital and operating costs is summarised below:

a) The financial schedule is connected to the life of mine plan to ensure the provision of capital is linked to when the major budgeted items require to be funded.

b) The capital, operating and closure cost estimation levels of accuracy meet the minimum pre-feasibility study requirements at an estimated accuracy of ±25 % and require no more than 15 % contingency. The specific engineering estimation methods have an accuracy equal to or better than this range.

c) Granny Smith has improved capital estimation and capital delivery through the application of Group Capital Standards and capital projects review by a select team with improved implementation planning. Gold Fields also perform post investment reviews across all major capital studies and share key learnings.

d) Gold Fields' two-year business planning cycle captures operating and capital costs along with key physicals and revenue. The business plans are internally reviewed, presented to the Executive Committee for approval, prior to sanctioning by the Gold Fields board of directors. The business plans are aligned with the Issuer's strategic direction and equate to the first two years of the life of mine plan.

e) Capital expenditure, once sanctioned, must follow the Company's capital reporting standard. Monthly and quarterly reviews are held to assess capital programs, operating unit costs, mine physicals, plan execution and revenue streams.

f) Operating unit costs are based on recent valid historical performance and where necessary take account of future changing circumstances that are anticipated to impact future operating costs.

22 Economic analysis

22.1 Key inputs and assumptions

Under the 31 December 2021 Mineral Reserve life of mine plan, the Granny Smith processing facility is not at full capacity for the full life of the operation. A portion of incrementally costed material is included, which supplements the fully costed feed but does not extend the life of the operation. The mining of the incremental material covers the full unit cost of mining, the variable unit costs of processing, rehabilitation and closure, and positively contributes to fixed overheads and off-site costs. Detailed assessments were undertaken, with iterative reviews prior to inclusion of this material in the 11 year life of mine plan.

The Mineral Reserve life of mine physical inputs are summarised in Table 22.1.

Table 22.1: Life of mine physicals

Sources		Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Underground	Life of mine processed	koz	286.3	277.2	294.6	234.0	237.8	186.0	178.1	176.3	144.5	104.4	96.8
	Plant recovery	%	92.8	92.7	92.6	92.3	92.1	91.9	91.5	91.0	90.8	90.8	91.5
	Metal Sold	koz	267.8	259.2	272.8	216.0	218.9	170.9	163.0	160.5	131.2	94.8	88.5
Stockpiles	Life of mine processed	koz											
	Plant recovery	%											
	Sold	koz											
Total Sold		koz	267.8	259.2	272.8	216.0	218.9	170.9	163.0	160.5	131.2	94.8	88.5
Costs, Revenue and Cashflow	Revenue	$ million	348.1	336.9	354.7	280.8	284.6	222.1	211.9	208.6	170.6	123.3	115.1
	Operating Costs	$ million	195.2	203.3	194.6	161.1	166.9	137.5	147.5	152.2	122.6	96.3	88.7
	Capital Costs	$ million	95.4	74.9	51.9	24.8	25.4	25.7	20.5	18.7	23.3	4.0	3.3
	Other	$ million	16.0	27.2	26.1	29.0	18.5	18.9	13.9	14.6	17.0	18.0	32.0
	Royalties*	$ million	10.4	11.1	11.7	9.3	9.4	7.3	7.0	6.9	5.6	4.1	3.8
	Government levies	$ million	-	-	-	-	-	-	-	-	-	-	-
	Interest (if applicable)	$ million	-	-	-	-	-	-	-	-	-	-	-
	Total Costs (Excl Tax)	$ million	317.0	316.6	284.3	224.1	220.2	189.3	188.9	192.4	168.5	122.3	127.8
	Taxes	$ million	7.5	6.1	19.8	13.9	13.9	6.4	2.9	0.5	0.0	0.0	0.0
	Cashflow	$ million	23.6	14.3	50.5	42.7	50.4	26.4	20.0	15.7	2.0	1.0	-12.7
	Discounted cashflow at 3.8 % (NPV)	$ million	23.6	13.7	46.9	38.2	43.4	21.9	16.0	12.1	1.5	0.7	-8.8

Notes: a) The capital costs are based on the 31 December 2021 life of mine schedule for Proven and Probable Mineral Reserves only. The Mineral Resource and exploration required to replace depletion is not included in this techno-economic assessment.

b) No Inferred Mineral Resource is included in the life of mine processing schedule or techno-economic evaluation.

Source: Granny Smith CPR, 2021

The assumptions on which the economic analysis is based include:

- All assumptions are on 31 December 2021 money terms consistent with the evaluation date.
- Royalties on revenue is consistent with relevant legislation (2.5 % ad valorem).
- Gold Fields operations are considered as a unit for taxation purposes and assessed losses and capital expenditure can be offset against corporate taxes.
- The real base-case discount rate of 3.8 % is determined by Gold Fields Corporate Finance annually.
- A 30 % corporate tax rate.
- A closure liability of $65.5 million.
- Discounted cashflow (DCF) applied to post-tax, pre-finance cashflows and reported in financial years ending 31 December.

The life of mine operating and capital cost inputs, including rehabilitation, leasing and closure costs, and revenue assumptions for the economic analysis are summarised in Table 22.2.

Table 22.2: Life of mine cost and revenue assumptions – Breakdown of ESG

Operating cost item	Units	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Progressive Closure	$ million	10.7	8.3	5.2	5.3	5.6	5.1	5.1	5.3	5.0	4.9	4.9

Source: Granny Smith CPR, 2021

22.2 Economic analysis

The NPV for Granny Smith based on the DCF forecast at a 3.8 % discount rate using the scheduled Mineral Reserves in the life of mine plan is $204.3 million.

22.3 Sensitivity analysis

Sensitivity analyses were performed to ascertain the impact on NPV to changes in operating costs, capital costs, grade and gold price as summarised in Table 22.3 to Table 22.6.

Table 22.3: NPV sensitivity to changes in gold price

Gold price	-15 %	-10 %	-5 %	0 %	+5 %	+10 %	+15 %	+25 %	+31 %
Gold price ($/oz)	1,105	1,170	1,235	1,300	1,365	1,430	1,495	1,625	1,700
NPV ($ million)	-66.4	32.2	119.8	204.3	286.7	368.8	449.4	819.0	940.9

Source: Granny Smith CPR, 2021

Table 22.4: NPV sensitivity to changes in grade

Grade	-15 %	-10 %	-5 %	0 %	+5 %	+10 %	+15 %
NPV ($ million)	-65.6	32.6	120.0	204.3	286.5	368.4	448.8

Source: Granny Smith CPR, 2021

Table 22.5: NPV sensitivity to changes in capital costs

Capital	-15 %	-10 %	-5 %	0 %	+5 %	+10 %	+15 %
NPV ($ million)	242.3	229.7	217.0	204.3	191.7	178.7	165.8

Source: Granny Smith CPR, 2021

Table 22.6: NPV sensitivity to changes in operating costs

Operating cost	-15 %	-10 %	-5 %	0 %	+5 %	+10 %	+15 %
NPV ($ million)	369.3	314.6	259.5	204.3	148.0	90.3	31.9

Source: Granny Smith CPR, 2021

Table 22.7: NPV sensitivity to changes in discount rate

Discount rate	2 %	3 %	3.8 %	5 %
NPV ($ million)	214.4	208.7	204.3	198.0

Source: Granny Smith CPR, 2021

The Qualified Person is of the opinion that the techno-economic model is based on the Mineral Reserve physicals. The recent historic assumptions are used to test the Mineral Reserve economic assumptions. The material assumptions have been found to be valid and used in the techno-economic studies.

The discounted cashflow has economic viability and a NPV of $204.3 million at a real discount rate of 3.8 %. The IRR has not been presented for this techno-economic study.

The techno-economic study for the Mineral Reserves excludes all Inferred Mineral Resource material.

23 Adjacent properties

The Qualified Person is unable to verify the information listed for the properties adjacent to Granny Smith and that the information is not necessarily indicative of the mineralisation on the property that is the subject of this Technical Report. Granny Smith is essentially stand alone and has no or little reliance of neighbouring properties and the proximity of workings are not expected to interact in any way with Granny Smith and the lease and permit areas are not overlapping.

There are many companies and individuals that control tenements adjacent to Granny Smith. Material adjacent properties include:

- AngloGold Ashanti Ltd - operator of the Sunrise Dam Gold Mine to the south of Granny Smith.
- Dacian Gold Ltd (ASX: DCN)– operator of the Mt Morgans Gold Mine to the west of Granny Smith.
- Focus Minerals Ltd (ASX: FML) at its Laverton Gold Project to the north of Granny Smith.
- Lynas Rare Earths (ASX: LYC) at its Mt Weld Rare Earth Mine to the southeast of Granny Smith.

24 Other relevant data and information

Gold Fields' commitment to materiality, transparency and competency in its Mineral Resources and Mineral Reserves disclosure to regulators and in the public domain is of paramount importance to the Qualified Person and the Issuer's Executive Committee and Board of Directors continue to endorse the Company's internal and external review and audit assurance protocols. This Technical Report should be read in totality to gain a full understanding of Granny Smith's Mineral Resource and Mineral Reserve estimation and reporting process, including data integrity, estimation methodologies, Modifying Factors, mining and processing capacity and capability, confidence in the estimates, economic analysis, risk and uncertainty and overall projected property value.

However, to ensure consolidated coverage of the Company's primary internal controls in generating Mineral Resource and Mineral Reserve estimates the following key point summary is provided:

a) A comprehensive quality assurance and quality control (QAQC) protocol is embedded at Granny Smith and all Gold Fields operations. It draws on industry leading practice for data acquisition and utilises national standards authority accredited laboratories which are regularly reviewed. Analytical QAQC is maintained and monitored through the submission of sample blanks, certified reference material and duplicates and umpire laboratory checks.

b) Corporate Technical Services (CTS), based in Perth, comprises subject matter experts across the disciplines of geology, resource estimation, geotechnical, mining, engineering, modernisation, capital projects, processing, metallurgy, tailings management and Mineral Resource and Mineral Reserve reporting governance. The CTS team budget for regular site visits to all operating mines when emphasis is placed on-site inspection and direct engagement with the technical staff to drive protocols and standards and enable on-site training and upskilling. CTS provides technical oversight and guidance to the operating Regions and mines and ensures an additional level of assurance to the Mineral Resource and Mineral Reserve estimates to supplement the mine sites and Regional technical teams.

c) Independent audit review of fixed infrastructure is conducted annually with the appointed insurance auditor focussed on plant, machinery and mine infrastructure risks. An effective structural and corrosion maintenance program with benchmark inspections is in place supported by equipment condition monitoring major critical component spares. Focus areas include the primary jaw crusher, ball mill shell or motor failure, structural failure of plant or conveyor, process tank failure and large transformer failure. Critical spares are well resourced and there are no large items not supported by on-site spares holdings.

d) Mobile equipment is largely owned and well maintained by the mining contractor, Barminco, with development and haulage units at New Holland owned by Granny Smith. There is some spare capacity in most of the fleets or within Barminco, or hire units are readily available in the region.

e) Processing controls include the preparation of quarterly plant metal accounting reconciliation reports by the mine sites which are reviewed by the Regional Metallurgical Manager and VP Metallurgy in the CTS team. Any monthly reconciliation variance outside the limits provided within the Gold Fields Plant Metal Accounting Standard is flagged for follow up assessment and remediation if warranted.

f) Granny Smith has a tailings management plan that promotes risk minimisation to operators and stakeholders over the lifecycle of each TSF. Granny Smith's TSFs are operated in accordance with the company TSF Management Guidelines which are aligned with the International Council on Metals & Mining's (ICMM) Position Statement on preventing catastrophic failure of TSFs (December 2016). Active TSFs are subject to an independent, external audit every three years, as well as regular inspections and formal facility safety reviews by formally appointed Engineers of Record (EoR). Further improvements in tailings management are expected through achievement of compliance with the new independently developed Global Industry Standard for Tailings Management (GISTM) issued in 2020.

g) The integration of Environmental, Social and Governance (ESG) themes into the estimation process continues as an important consideration for Modifying Factors, reasonable prospects for economic extraction assessments and to underpin the integrity of the Mineral Resources and Mineral Reserves. The Company's ESG Charter, issues and

priorities are fully considered in the life of mine plan with particular emphasis on tailings management, integrated mine closure planning, security of energy and water and the social and regulatory licence to operate.

h) Gold Fields also follows an embedded process of third-party reviews to provide expert independent assurance regarding Mineral Resource and Mineral Reserve estimates and compliance with relevant reporting rules and codes. In line with Gold Fields' policy, every material property is reviewed by an independent third-party on average no less than once every three years, or when triggered by a material year-on-year change. Certificates of compliance are received from the companies that conduct the external audits which are also configured to drive continuous improvement in the estimation process.

i) Importantly, Gold Fields endorses a well embedded risk and control matrix (RACM) configured to provide an annual assessment of the effectiveness of the Issuer's internal controls concerning the life of mine planning process and Mineral Resource and Mineral Reserve estimation and reporting.

j) The internal controls include coverage of the following (inter alia):

   i Reasonableness of parameters and assumptions used in the Mineral Resource and Mineral Reserve estimation process

   ii Reasonableness of the interpretations applied to the geological model and estimation techniques

   iii Integrity in the mine design and scheduling, including reasonableness of the mine planning assumptions, Modifying Factors, cut-off grades, mining and processing methods and supporting key technical inputs such as year-on-year reconciliation, geotechnical, mining equipment, infrastructure, water, energy and economic analysis

   iv Provision of the necessary skills, experience and expertise at the mine sites and the Regions to undertake and complete the work with the required level of technical ability and competency, including professional registration as a Qualified Person

   v Alignment with the NI 43-101 for the reporting of Mineral Resources and Mineral Reserves

   vi Review of the disclosure of the Issuer's Mineral Resources and Mineral Reserves process.

k) Because of its inherent limitations, internal controls may not prevent or detect all errors or misstatements. Also, projections of any valuation of effectiveness to future periods are subject to risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with policies and procedures may deteriorate.

RCubed® is a proprietary cloud-based reporting system adopted by Gold Fields in 2021 to enhance the level governance and data security concerning Mineral Resource and Mineral Reserve reporting across all company properties. It ensures transparency and auditability for all data verification checks, information stage gating, the approvals process and confirmation of Qualified Person credentials. The RCubed® reporting system is being incorporated into the risk and control matrix RACM matrix to support the December 2021 Mineral Resource and Mineral Reserve reporting.

25 Interpretation and conclusions

25.1 Conclusions

The views expressed in this Technical Report are based on the fundamental assumption that the required management resources and management skills are in place to achieve the Mineral Reserve life of mine plan projections for Granny Smith. The Granny Smith Mineral Reserves currently support a 11 year LoM plan that values the operation at $204.3 million at the Mineral Reserve gold price of $1,300/oz.

Climate change is an integral part of the Mineral Reserve generation process and incorporating relevant costs associated with climate change, primarily decarbonisation, mitigation and adaptation to the changing climate, is a key theme for the Company. Integration of these key elements into the Mineral Reserve process is being carried out progressively and simultaneously across all of Gold Fields' sites. Granny Smith mine has one of the world's largest renewable energy microgrids with 20,000 solar panels and a 2 MW battery system.

GSM continues to discover and replace Mineral Reserves that contribute to growing the life of mine profile. Continued investment in exploration and infrastructure is justified by the positive economic analysis.

The Mineral Reserve estimates contained in this report should not be interpreted as assurances of the economic life or the future profitability of Granny Smith. Mineral Reserves are only estimates based on the factors and assumptions described herein, thus future Mineral Reserve estimates may need to be revised. For example, if production costs increase or product prices decrease, a portion of the current Mineral Resources, from which the Mineral Reserves are derived, may become uneconomic and would therefore result in a lower estimate of Mineral Reserves. The life of mine plan includes forward-looking technical and economic parameters and involve a number of risks and uncertainties that could cause actual results to differ materially.

The life of mine plan for Granny Smith has been reviewed in detail by the Qualified Person for appropriateness, reasonableness and viability, including the existence of and justification for departure from historical performance. The Qualified Person considers that the Technical Economic Parameters and Financial Models are based on sound reasoning, engineering judgement and technically achievable mine plan, within the context of the risk associated with the gold mining industry.

The business of gold mining by its nature involves significant risks and hazards, including environmental hazards and industrial accidents. In particular, hazards associated with Gold Fields' underground mining operations include:

- Rock bursts.
- Seismic events.
- Underground fires and explosions.
- Cave-ins or gravity falls of ground.
- Discharges of gases and toxic substances.
- Flooding.
- Accidents related to the presence of mobile machinery.
- Ground and surface water pollution.
- Ground subsidence.
- Other accidents and conditions resulting from drilling, blasting and removing and processing material from an underground mine.

Hazards associated with Gold Fields' surface operations may include:

- Accidents associated with operating a rock dump and production stockpile, and rock transportation equipment.

- Production disruptions due to weather.
- Tailings facility collapses.
- Ground and surface water pollution.

Gold Fields may also be subject to actions by labour groups or other interested parties who object to perceived conditions at the mines or to the perceived environmental impact of the mines. These actions may delay or halt production or may create negative publicity related to Gold Fields. If Gold Fields experiences losses of senior management or is unable to hire and retain sufficient technically skilled employees, its business may be materially and adversely affected. Gold Fields may also suffer adverse consequences from:

- Its reliance on outside contractors.
- Changes in environmental and health and safety laws and regulations.
- Native Title claims and Aboriginal heritage sites.

Gold Fields is at risk of experiencing any of these hazards. The occurrence of any of these hazards could delay or halt production, increase production costs and result in a liability for Gold Fields.

25.2 Risks

The major risks and mitigation actions at Granny Smith are based on a formal risk review and assessment using risk ranking software are summarised in Table 25.1. Senior management review and update the risk register on routine basis which is reported on a quarterly basis.

Table 25.1: Risks and mitigating actions

Risk description		Risk mitigating action
Revenue	Gold Fields' revenues are primarily derived from the sale of gold that it produces. Gold Fields will generally hedge a percentage of annual production based on market research and guidance from Gold Fields.	Industry data about Gold Fields' markets obtained from industry surveys, industry publications, market research and other publicly available third-party information. In many cases, statements in this report regarding the gold mining industry and price have been made based on internal surveys, industry forecasts, market research, as well as Gold Fields' own experiences. Risk mitigation includes price sensitivity analyses at a range of gold prices.
Exploration	Exploration activities are focused on replacing production depletion and on growth in Mineral Reserves to maintain operational flexibility and sustainability. Exploration for gold and other metals associated with gold are speculative in nature involves many risks and is frequently unsuccessful.	The Company focuses on the extension of existing orebodies and the discovery and delineation of new ore bodies both at existing sites and at undeveloped sites. Best practices exploration techniques, technical peer reviews and technical specialists are employed to assist in conceptual targeting, execution and interpretation of the exploration programs. Geological, geochemical, geophysical, geostatistical and geo-metallurgical techniques are constantly refined to improve effectiveness and the economic viability of prospecting and mining activities. Once a potential orebody has been discovered, exploration is extended and intensified in conjunction with comprehensive infill drilling to enable clearer definition of the orebody and its technical and economic probability. Mineral Reserves published do not require any additional discovery.
Geology & estimation	The primary assumptions of continuity of the geologically homogenous zones are driven by the geological model, which is updated when new information arises. Any changes to the model are subject to peer and internal technical corporate review and external independent consultant review when deemed necessary.	At the Australian operations, the estimation of Mineral Reserves for both underground and open pit operations is based on exploration and sampling information gathered through appropriate techniques, primarily from DD, RC and AC drilling techniques. Gold Fields and the sites have well documented processes, procedures and systems to ensure appropriate drilling, logging, sampling interpretation, geology orebody and lithological modelling, and estimation are appropriately completed. Overall staff focus is on geology recruitment with required expertise and skills training coupled with field and peer reviews by both site and corporate staff are integrated into routine exploration and mining geology. Internal and external corporate audits, procedures and systems all enhance and support ongoing periodic review. All models are documented with peer reviews and model on model reconciliations to explore and understand the impacts of additional information, data and interpretation / methodology to support delivery of the most appropriate and best informed outcomes. Applications of alternative estimation methods to evaluate deposits are also routinely compiled to ensure the most relevant and appropriate estimation for mine planning is delivered. This may include considering OK, SK, and simulation. Conditional estimation techniques to validate and inform options and decisions are also considered.

Risk description		Risk mitigating action
		The locations of sample points are spaced close enough to deduce or confirm geological and grade continuity. Generally, drilling is undertaken on grids, which range between 10 m by 10 m up to 50 m by 50 m, although this may vary depending on the continuity of the orebody. Due to the variety and diversity of mineralisation at the Australian operations, sample spacing may also vary depending on each particular ore type.
Mine planning & scheduling	Changes in assumptions underlying Gold Fields' Mineral Reserve estimates risk.	Modifying Factors used to calculate the cut-off grades include adjustments to mill delivered amounts due to dilution and ore loss incurred in the course of mining, expected return on investment, and sustaining capital. These may change but typically are reviewed and managed through detailed reconciliation processes to minimise variations and impacts. Modifying Factors applied in estimating reserves are primarily based on historical empirical information, but commonly incorporate adjustments for planned operational improvements. Mineral Reserves also take into account operating cost levels as well as necessary capital and sustaining capital provisions required at each operation and are supported by life of mine plans. Detail planning protocols and review processes by qualified and experienced technical staff both on site and regional levels are held to ensure consistency and applicability of due process.
Mining execution	The ability to achieve anticipated efficiencies and production plans due to nature of risk and impacts associated with normal mining routine activities. These could include geotechnical, equipment and maintenance, explosives, staffing, power and water supply.	Benchmarking and technical reviews of all mine plans to validate and test assumptions are normal Mineral Resource and Mineral Reserve processes. Assumptions applied in estimating mine planning for Mineral Reserves are primarily based on historical empirical information, but commonly incorporate adjustments for planned operational performance. Equipment planned schedule and maintenance programs and condition monitoring processes are in place to ensure production capability.
Geotechnical		Geotechnical evaluation and monitoring, seismic systems and slope wall rock monitoring are all normal processes to mitigate risk. Underground geotechnical risk includes the impact of seismicity on operations, which may result in unplanned delays, closure, or falls of ground. Worse than predicted overbreak or poor mining recovery, due to geotechnical failures in stoping may also result in lower than predicted gold production. Ground control management plans are used to manage the geotechnical risk at Granny Smith.
Social licence to operate	Many mining companies face increasing pressure over their "social licence to operate" which can be understood as the acceptance of the activities of these companies by local stakeholders. While formal permission to operate is ultimately granted by host governments, many mining activities require social permission from host communities and influential stakeholders to carry out operations effectively and profitably. This aspect could impact future Mineral Reserves & Mineral Resources, mining activity and delivery.	To maintain its social licence to operate, Gold Fields may need to design or redesign parts of its mining operations to minimise their impact on such communities and the environment, either by changing mining plans to avoid such impact, by modifying operations, changing planned capital expenditures or by relocating the affected people to an agreed location. Responsive measures may require Gold Fields to take costly time-consuming remedial measures, including the full restoration of livelihoods of those impacted.
Staffing & technical capability	Gold Fields' ability to operate or expand effectively depends largely on the experience, skills and performance of its senior management team and technically skilled employees.	Gold Fields operates in a good labour market and stable political jurisdiction which adapts recruitment, staff development / retention policies to meet labour and staffing demand to support and deliver on operations.
Environmental and industrial accidents	Gold mining by its nature involves significant risks and hazards, including environmental hazards and industrial and mining accidents. These may include, for example, seismic events, fires, cave-ins and blockages, flooding, discharges of gases and toxic substances, contamination of water, air or soil resources, radioactivity and other accidents or conditions resulting from mining activities including, among other things, blasting and the transport, storage and handling of hazardous materials.	Gold Fields has appropriate staffing structures and processes and programs which manage, monitor and report on key environmental, health and safety compliance. Gold Fields also subscribes to a number of international regulatory frameworks (e.g. ISO 14001, ISO 18001, Cyanide Code) which include process and external audits review monitoring for compliance.

Source: Granny Smith CPR, 2021

The Qualified Person is of the opinion that the risks identified have reasonable risk mitigations and that action plans current and future will not materially affect the life of mine Mineral Reserve estimation.

26 Recommendations

Ongoing exploration and geological interpretation indicates that the Granny Smith property has the potential to extend and replace existing Mineral Resources and Mineral Reserves. The Qualified Person recommends that further exploration is carried out at the following areas which have a good probability of extending mine life:

- Wallaby Zone 135.
- Wallaby Zone 150.
- Granny Smith Complex.

The Granny Smith Mineral Resource and Mineral Reserve effective 31 December 2021 are reasonable estimates. The Qualified Person is of the opinion that there are no additional phases of work required to enhance this disclosure.

27 References

The primary reference documents that have written consent to be used by the appointed Gold Fields Lead Qualified Persons for this Technical Report are:

The Granny Smith Competent Person Report 31 December 2021 for Mineral Resources and Mineral Reserves. This report has written consent from Dom Grimbeek who is the Gold Fields appointed Lead Competent Person or Qualified Person for Granny Smith Gold Mine. Dom Grimbeek has accepted responsibility for the Competent Person Report 31 December 2021 for Mineral Resources and Mineral Reserves as a whole.

The Granny Smith Competent Person Report 31 December 2021 for Mineral Resources and Mineral Reserves is referred to in this document as “Granny Smith CPR 2021”.

28 Glossary of technical terms and abbreviations

$	United States dollars unless otherwise stated
°C	Degrees Celsius
µm	micron or micrometre
2D, 3D	two-dimensional, three-dimensional
%	percent
AAS	Atomic absorption spectroscopy analytical technique
AC	Air core drilling technique
Ag	Silver
Ai	Abrasion index laboratory test
All-in costs or **AIC**	A non-IFRS measure which means all-in sustaining costs plus additional costs relating to growth, including non-sustaining capital expenditure and exploration, evaluation and feasibility costs not associated with current operations.
All-in sustaining costs or **AISC**	A non-IFRS measure which means operating costs excluding amortisation and depreciation, plus all costs not included therein relating to sustaining current production including sustaining capital expenditure.
ANCOLD	Australian National Committee on Large Dams
As	Arsenic
ASL	Above sea level
Au	Gold
bcm	bank cubic metres
Brownfield	Exploration conducted in areas where mineral deposits have already previously been discovered and is also termed near mine or extensional exploration.
BWi	Bond ball mill work index laboratory test
Capex	Capital expenditure
CCD	Counter-current decantation
Cu	Copper
Cut-off grade	The lowest grade of mineralised rock which determines whether it is economic to recover its precious or base metal content by further concentration.
CIL, CIP	Carbon-in-leach, carbon-in-pulp
CIM	The Canadian Institute of Mining, Metallurgy and Petroleum
CN	Cyanide
CPR	Competent Person's Report
CRM	Certified reference material
CTS	Gold Fields Corporate Technical Services team
CO, CO_2	Carbon monoxide, carbon dioxide
dB	Decibel(s)
DCF	Discounted cash flow
De-stress	By mining a two-metre slice through the orebody package an optimal position is achieved to ensure a destressed window of 50 to 60 m above or below the associates stope to provide the necessary safe geotechnical stress conditions for extraction.
DD	Diamond core drilling technique
Dilution	Low or zero grade (waste) material that is mined during the course of mining operations and forms part of the reserve.

Dissolution	The process whereby a metal is dissolved and becomes amenable to separation from the gangue material.
dmt	Dry metric tonne(s)
doré	Unrefined gold and silver bullion bars which will be further refined to almost pure metal.
DTM	Digital terrain model
EIA	Environmental impact assessment
Electrowinning	The process of removing mineral from solution by the action of electric currents, known as electrolysis.
EM	Electromagnetic geophysical technique
EMP	Environmental Management Plan
EMS	Environmental Management System
EoR	Engineer of Record
EPA	Environmental Protection Agency
ESG	Environmental, social and governance
ESIA	Environmental and social impact assessment
FA	Fire assay analytical technique
FCF	Free cash flow
Fe	Iron
Feasibility Study or **FS**	A Feasibility Study is a comprehensive technical and economic study of the selected development option for a mineral project that includes appropriately detailed assessments of applicable modifying factors together with any other relevant operational factors and detailed financial analysis that are necessary to demonstrate, at the time of reporting, that extraction is reasonably justified (economically mineable). The results of the study may reasonably serve as the basis for a final decision by a proponent or financial institution to proceed with, or finance, the development of the project. The confidence level of the study will be higher than that of a Pre-feasibility Study.
FIFO	Fly-in/fly-out
Footwall	The bottom side of a geological structure or mineral deposit
FOS	Factor of safety
Fx	Foreign exchange rate
g, µg, mg, kg, g/t	Gram(s), microgram(s), milligram(s), kilogram(s), grams per tonne
Ga	Giga annum or billion years
G&A	General and administration
Gangue	Commercially valueless or waste material remaining after ore extraction from rock.
GC	Grade control
GPS, DGPS	Global positioning system, Differential global positioning system
Grinding	Reducing rock to the consistency of fine sand by crushing and abrading in a rotating steel grinding mill.
ha	Hectare(s)
Hangingwall	The top side of a geological structure or mineral deposit
HME	Heavy mining equipment
HSE, HSEC	Health, safety and environment, Health, safety, environment and community
Hypogene	Ore or mineral deposits formed by ascending fluids occurring deep below the earth's surface, which tend to form deposits of primary minerals, as opposed to supergene processes that occur at or near the surface and tend to form secondary minerals.
ICMC	International Cyanide Management Code
ICP	Inductively coupled plasma analytical technique
ILR	InLine Leach Reactor

Indicated Mineral Resource	An Indicated Mineral Resource is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of modifying factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. Geological evidence is derived from adequately detailed and reliable exploration, sampling and testing and is sufficient to assume geological and grade or quality continuity between points of observation. An Indicated Mineral Resource has a lower level of confidence than that applying to a Measured Mineral Resource and may only be converted to a Probable Mineral Reserve.
Inferred Mineral Resource	An Inferred Mineral Resource is that part of a Mineral Resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity. An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to a Mineral Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.
Initial assessment	A preliminary technical and economic study of the economic potential of all or parts of mineralisation to support the disclosure of Mineral Resources. The initial assessment must be prepared by a Qualified Person and must include appropriate assessments of reasonably assumed technical and economic factors, together with any other relevant operational factors, that are necessary to demonstrate at the time of reporting that there are reasonable prospects for economic extraction. An initial assessment is required for disclosure of Mineral Resources but cannot be used as the basis for disclosure of Mineral Reserves.
In situ	Within unbroken rock or still in the ground.
IP	Induced polarisation geophysical technique
ISO	International Organization for Standardization.
km, km^2	kilometres, square kilometres
Kriging	A geostatistical estimation technique used in the evaluation of Mineral Reserves.
L, kL, L/s	litre(s), kilolitres, litres per second
lb	Pound(s)
Leaching	Dissolution of gold from the crushed and milled material, including reclaimed slime, for adsorption and concentration onto the activated carbon.
Level	The horizontal tunnels of an underground mine used to access the workings or orebody.
Life of mine or **LoM**	The expected remaining years of production, based on production schedules and Proven and Probable Mineral Reserves.
Life of mine plan or **LoM plan**	A design and financial/economic study of an existing operation in which appropriate assessments have been made of existing geological, mining, metallurgical, economic, marketing, legal, environmental, social, governmental, engineering, operational and all other modifying factors, which are considered in sufficient detail to demonstrate that continued extraction is reasonably justified. This is completed to a minimum pre-feasibility level of study.
LHD	Load haul dump
LHOS	Long-hole open stoping
LIMS	Laboratory information management system
London afternoon fixing price	The afternoon fixing by the new electronic London Bullion Market Association, or LBMA price-discovery process. The price continues to be set twice daily, at 10:30 and 15:00 London time.
m, mm, cm, m^2, m^3	metre(s), millimetre(s), centimetre(s), square metre(s), cubic metre(s)
M	Million(s)
Ma	Mega annum or million years
MCP	Mine Closure Plan
Measured Mineral Resource	A Measured Mineral Resource is that part of a Mineral Resource for which quantity, grade or quality, densities, shape, and physical characteristics are estimated with confidence sufficient to allow the application of modifying factors to support detailed mine planning and final evaluation of the economic viability of the deposit. Geological evidence is derived from detailed and reliable exploration, sampling and testing and is sufficient to confirm geological and grade or quality continuity between points of observation. A Measured Mineral Resource has a higher level of confidence than that applying to either an Indicated Mineral Resource or an Inferred Mineral Resource. It may be converted to a Proven Mineral Reserve or to a Probable Mineral Reserve.

Metallurgical recovery factor	The proportion of metal in the ore delivered to the mill that is recovered by the metallurgical process or processes.
Metallurgy	The science of extracting metals from ores and preparing them for sale.
Mill delivered tonnes	A quantity, expressed in tonnes, of ore delivered to the metallurgical plant.
Mine call factor or **MCF**	The ratio, expressed as a percentage, of the specific product accounted for at the mill (including residue), compared to the corresponding specific product 'called for' based on an operation's measuring and valuation methods.
Mineralisation	The presence of a target mineral in a mass of host rock. A concentration (or occurrence) of material of possible economic interest, in or on the earth's crust, for which quantity and quality cannot be estimated with sufficient confidence to be defined as a Mineral Resource. Mineralisation is not classified as a Mineral Resource or Mineral Reserve and can only be reported under exploration results. The data and information relating to it must be sufficient to allow a considered and balanced judgement of its significance and the process or processes by which a mineral or minerals are introduced into rock, resulting in a potentially valuable deposit. Mineralisation generally incorporates various terms, including fissure filling, impregnation and replacement, among others.
Mineral Reserve	The economically mineable part of a Measured and/or Indicated Mineral Resource converted into Proven and Probable Mineral Reserves. It includes diluting minerals and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Pre-feasibility or Feasibility level as appropriate that include application of modifying factors. Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified. The reference point at which Mineral Reserves are defined, usually the point where the ore is delivered to the processing plant, must be stated. It is important that, in all situations where the reference point is different, such as for a saleable product, a clarifying statement is included to clarify what is being reported.
Mineral Resource	A concentration or occurrence of solid material of economic interest in or on the earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling. Gold Fields reports **Inclusive Mineral Resource** (IMR) which is the entire Mineral Resource from which the Mineral Reserve has been generated and **Exclusive Mineral Resource** (EMR) which is the Mineral Resource remaining after the Mineral Reserve has been generated. It should not be expected that IMR-Mineral Reserve is numerically equal to EMR as Mineral Reserve has had modifying factors applier and Mineral Resources have not. While some of the EMR may be converted to Mineral Reserves through additional drilling or other means, there it should not be expected that all of the EMR can be converted to Mineral Reserves.
Modifying factors	Modifying factors are considerations used to convert Mineral Resources to Mineral Reserves. These include, but are not restricted to, mining, processing, metallurgical, infrastructure, economic, marketing, legal, environmental, social and governmental factors.
MSO	Mineable shape optimiser
NaCN	Sodium cyanide
Net smelter return or **NSR**	The volume of refined mineral sold during the relevant period multiplied by the average spot mineral price and the average exchange rate for the period, less refining, transport and insurance costs.
NI 43-101	National Instrument 43-101 Standards of Disclosure for Mineral Projects published by the Canadian Securities Administrators.
NO_2	Nitrogen dioxide
NPV	Net present value
NSR	Net smelter return
OHS	Occupational health and safety
Open pit or **OP**	Mining where the ore is extracted from a surface mining operation or "pit". The geometry of the pit may vary with the characteristics of the orebody.
Opex	Operating expenditure
Ore	A mixture of material containing minerals from which at least one of the minerals can be mined and processed profitably.
Orebody	A well-defined mass of material of sufficient mineral content to make extraction economically viable.
Ore grade	The average amount of mineral contained in a tonne of mineral-bearing ore expressed in grams per tonne (g/t), or percent (%) per tonne.

Ounce or **oz, koz, Moz, oz/a**	One troy ounce which equals 31.1035 grams, kilo-ounces (or thousand ounces), million ounces, ounces per annum.
Overburden	The soil and rock that must be removed in order to expose an ore body.
P_x	Percentage (x) of material passing a specified size.
Pa, kPa, MPa	pascal(s), kilopascals, megapascals. A unit measurement of stress or pressure within the earth's crust used to profile tectonic stress, which can impact ground stability and ground support requirements in underground mining.
Paste fill or **back fill**	A technique whereby cemented paste fill is placed in mined-out voids to improve and maintain ground stability, minimise waste dilution and maximise extraction of the ore.
pH	Scale used to specify the acidity or basicity of an aqueous solution.
ppb, ppm	Parts per billion, parts per million
Pre-feasibility Study or **PFS**	A comprehensive study of a range of options for the technical and economic viability of a mineral project that has advanced to a stage where a preferred mining method, in the case of underground mining, or the pit configuration, in the case of an open pit, is established and an effective method of mineral processing is determined. It includes a financial analysis based on reasonable assumptions on the modifying factors and the evaluation of any other relevant factors which are sufficient for a Qualified Person, acting reasonably, to determine if all or part of the Mineral Resource may be converted to a Mineral Reserve at the time of reporting. A Pre-feasibility Study is at a lower confidence level than a Feasibility Study.
Probable Mineral Reserve	The economically mineable part of an Indicated, and in some circumstances, a Measured Mineral Resource. The confidence in the modifying factors applying to a Probable Mineral Reserve is lower than that applying to a Proven Mineral Reserve.
Prospecting or exploration right	Permission to explore an area for minerals.
Proven Mineral Reserve	The economically mineable part of a Measured Mineral Resource. A Proven Mineral Resource implies a high degree of confidence in the modifying factors.
PV	Photovoltaic
QAQC	Quality assurance quality control
RC	Reverse circulation drilling technique
Refining	The final stage of metal production in which final impurities are removed from the molten metal by introducing air and fluxes. The impurities are removed as gases or slag.
Rehabilitation	The process of restoring mined land to a condition approximating its original state.
RF	Revenue factor(s)
RL	Reduced level
RO	Reverse osmosis
RQD	Rock quality designation
Run of mine or **RoM**	When used with regard to grade, is a term to describe the average grade of the ore mined.
SAMREC Code 2016	The South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves, 2016 Edition
Seismicity	A sudden movement within a given volume of rock that radiates detectable seismic waves. The amplitude and frequency of seismic waves radiated from such a source depend, in general, on the strength and state of stress of the rock, the size of the source of seismic radiation, and the magnitude and the rate at which the rock moves during the fracturing process.
Semi-autogenous grinding or **SAG mill**	A piece of machinery used to crush and grind ore which uses a mixture of steel balls and the ore itself to achieve comminution. The mill is shaped like a cylinder causing the grinding media and the ore itself to impact upon the ore.
Shotcrete	A sprayed concrete or specialist cement type product applied through a hose or similar device and pneumatically projected at high velocity on the surface of excavations, as a geotechnical ground support technique to reinforce the stability of underground faces.
Slimes	The finer fraction or tailings discharged from a processing plant after the valuable minerals have been recovered. Also see 'Tailings'
Slurry	A fluid comprising fine solids suspended in a solution (generally water containing additives).

Smelting	Thermal processing whereby a mineral is liberated from molten beneficiated ore or concentrate, with impurities separating as lighter slag.
SMU	Selective mining unit
SO_2	Sulfur dioxide
SOX	Sarbanes-Oxley Act of 2002
Spot price	The current price of a metal for immediate delivery.
Stockpile or **SP**	A store of unprocessed ore, which is material resulting from mining or processing operations.
Stope	The underground excavation within the orebody where the main mineral production takes place.
Stratigraphic	The study of rock layers (strata) and layering (stratification) and is primarily used in the study of sedimentary and layered volcanic rocks. Stratigraphic modelling is often important in profiling the regional and local geology that has played a controlling role in mineralisation and orebody generation.
Stripping	The process of removing overburden (waste material) to expose the ore for mining.
Sulphide	A mineral characterised by the linkages of sulphur with a metal or semi-metal, such as pyrite (iron sulphide). Also a zone in which sulphide minerals occur.
Supergene	Ores or ore minerals formed where descending surface water oxidises the primary (hypogene) mineralised rock and redistributes the ore minerals, often concentrating them in zones. Supergene enrichment occurs at the base of the oxidised portion of the ore deposit.
Tailings	Finely ground rock from which the bulk of valuable minerals have been extracted by metallurgical processes. Also see 'Slimes'.
Tailings storage facility or **TSF**	A dam used to store by-products or tailing from mining operations after separating the ore from the gangue.
TCRC	Treatment charges and refining charges
TDS	Total dissolved solids
Tonne or **t, kt, Mt, t/a, Mt/a**	One tonne is equal to 1,000 kilograms (also known as a "metric" tonne), kilo-tonnes (or thousand tonnes), million tonnes, tonnes per annum, million tonnes per annum.
Tonnage	The quantity of material where the tonne is an appropriate unit of measure. Typically used to measure reserves of mineral-bearing material, or quantities of ore and waste material mined, transported or milled.
Underground or **UG**	Mining where the ore is extracted from an underground mining operation.
V, kV, kVA	Volt(s), kilovolt, kilovolt-ampere
W, kW, kWh, MW	Watt, kilowatt, kilowatt-hour, megawatt
WAD CN	Weak acid dissociable cyanide
Waste	Rock mined with an insufficient mineral content to justify processing.
Waste storage facility or WSF	A rock dump used to store accumulations of waste or low-grade material derived in the course of mining.
wmt	Wet metric tonne(s)
wt%	weight percent
XRD	X-ray diffraction analytical technique
XRF	X-ray fluorescence analytical technique
Yield	The actual grade of ore realised after the mining and metallurgical treatment process.