CAPITAL COST ESTIMATE

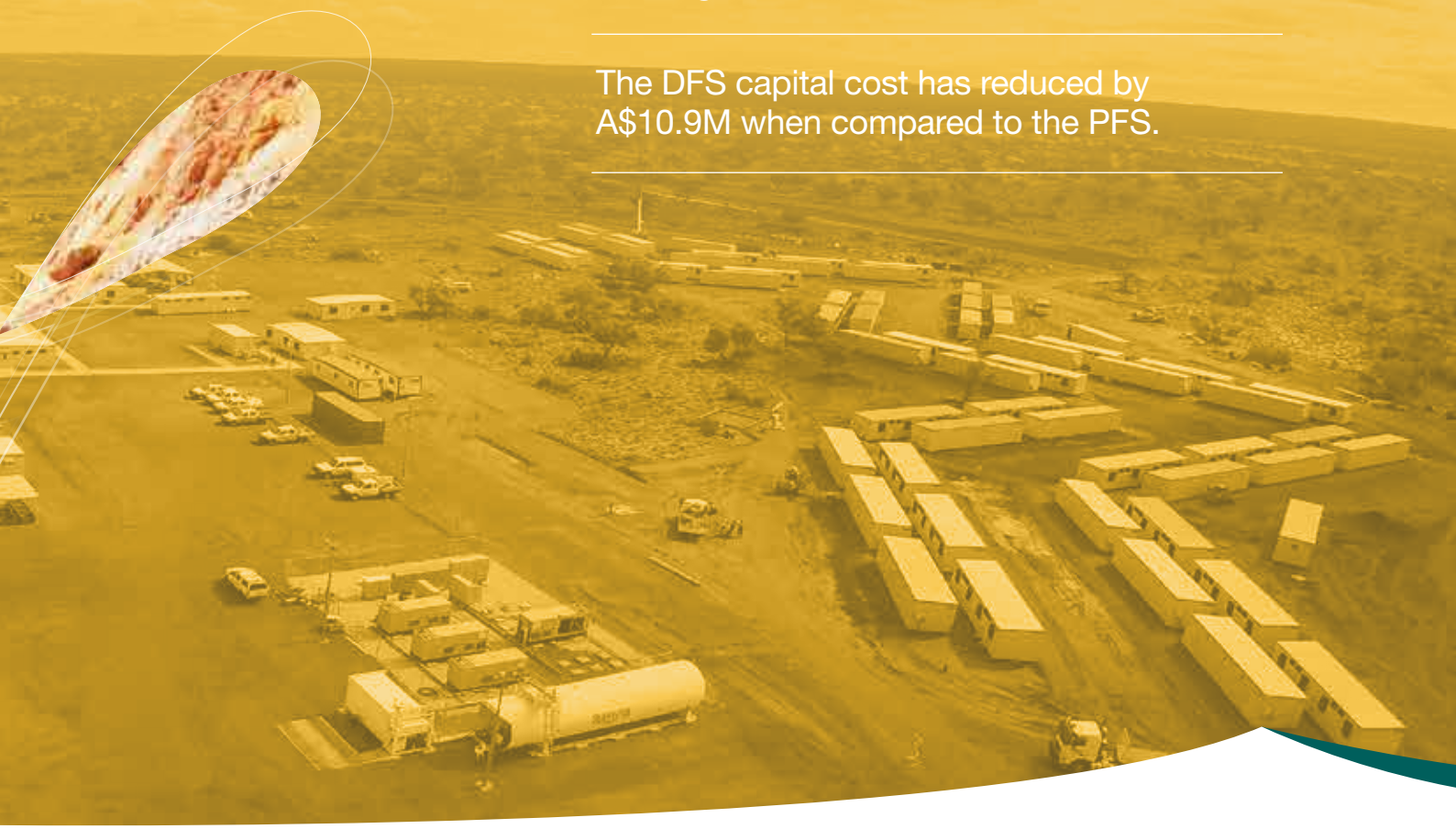
p76-p85

Photo courtesy of GRES

Highlights

Total capital cost is A$493M inclusive of growth allowance and contingency totalling A$41.7M.

The DFS capital cost has reduced by A$10.9M when compared to the PFS.



CAPITAL COST ESTIMATE

The overall project capital cost estimate was developed by GR Engineering Services (GRES) for the DFS and is based on an Engineering, Procurement, Construction and Management (EPCM) approach for the process plant and infrastructure.

The estimate includes all the necessary costs associated with engineering, drafting, procurement, construction, construction management, commissioning of the processing facility and associated infrastructure, mining infrastructure, first fills of plant reagents, consumables and spare parts.

The estimate is based upon preliminary engineering, material take-offs and budget price quotations for major equipment and bulk commodities.

Unit rates for installation were based on market enquiries specific to the MRP and benchmarked to those achieved recently on similar projects undertaken in the Australian minerals processing industry.

The estimate pricing was obtained predominantly during fourth quarter 2017 (4Q17) and is in Australian dollars (A$). Where pricing was received in foreign currency these have been converted to A$ at the foreign exchange rates provided by Vimy.

The overall capital estimate is considered to be a Class 2 estimate according to the American Association of Cost Engineering (AACE) International with an estimate accuracy of ±10 to 15%. The basis of estimate is summarised in Table 11.1.

An Engineering, Procurement, Construction (EPC) allowance has been provided by GRES to enable the estimate to be converted to a lump sum EPC contract.

Table 11.1: Engineering Development and Cost Estimation Methodology

Category	Level of Development	Cost Estimation Methodology
Mining	» Excavator, shovel and truck fleet sizes derived from mine schedule » Ancillary equipment fleet sizes derived from review of active open pit areas across mine schedule	» Mobile equipment budget pricing from multiple contractors
Mining Infrastructure	» Advanced pit dewatering requirements designed and estimated by industry specialist (Advisian) » Preliminary general arrangement and layout drawings » Preliminary design and material take-offs by experienced civil engineer	» Pit dewatering equipment budget pricing from multiple vendors » Multiple quotations for earthworks, concrete and structural scope items » Multiple vendor prices for equipment and buildings
Earthworks	» Detailed Light Detection and Ranging (LIDAR) survey » Soil and foundation geotechnical assessment » Preliminary 3D modelling to determine bill of quantities	» Budget pricing from multiple contractors
Concrete	» Preliminary general arrangement and layout drawings » Preliminary design and material take-offs by experienced civil engineer	» Sole source quotation for all-in unit rate to supply and install, including mobilisation and demob costs of the batching plant
Structural	» Preliminary general arrangement and layout drawings of major steel structures to determine bill of quantities	» Multiple quotations for all-in rates to supply, fabricate, paint and deliver
Equipment	» Equipment sizing based on project mass balance derived from process design criteria » Specifications and data sheets developed for all major equipment and packages	» Multiple vendor budget prices for major equipment (>$50k) » In-house database for minor equipment (<$50k)

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Category	Level of Development	Cost Estimation Methodology
Platework	» Fabricated platework component list (covering tanks, bins, chutes and launders) developed from project mass balance » Preliminary general arrangement and layout drawings to determine bill of quantities » Materials of construction determined from corrosion coupon testing	» Multiple quotations for supply, fabrication, surface preparation and painting » Leach and RIP tank datasheets issued for multiple quotations to supply, fabricate, transport to site and erect
Piping	» Preliminary line and valve lists developed from piping and instrumentation diagrams » Piping quantities and pipe supports calculated from layout drawings » Overland piping quantities calculated from layout drawings	» Supply rates from multiple piping suppliers for various specification pipes, valves and fittings
Electrical & Instrumentation	» Electrical, instrumentation and control quantities compiled from single line diagrams, instrument list, piping and instrumentation diagrams, layouts, equipment list and electrical load list » Switchroom requirements based on substation general arrangements	» Budget pricing for major electrical components including transformers, switchrooms, motor control centres, and variable speed drives » Budget pricing for supply and installation of overhead powerlines » In-house database used for electrical cabling, cable ladders, instrumentation and instrument control cabling
Buildings	» Floor plans developed for all buildings and workshops » Accommodation village building specification developed	» Multiple budget quotes including supply, installation and freight
Installation Labour	» Installation man-hours estimated for each equipment and fabrication item to be installed	» GRES construction labour rates used for civil, structural, mechanical and piping » GRES site installation rates used for electrical, instrumentation and control system
Project Indirect Costs	» EPCM estimate based on man-hours required for engineering and project delivery team » EPC allowance estimated by applying a margin to all costs identified as EPC associated costs	» GRES commercial rates used for EPCM disciplines required » Multiple quotations for flights, meals and accommodation services
Growth Allowance	» Growth allowance commensurate with level of engineering completed and estimating confidence for each item within capital estimate	» Overall growth allowance estimated for pre-production, process plant and infrastructure is 6.7% of direct capital cost
Contingency & Owner's Costs	» Owner's contingency is provision for unforeseen costs associated with project execution risk » Owner's costs include allowances for owner's project team, insurances, approvals, computing system, home office costs, systems development and training	» Owner's contingency estimated based on Monte Carlo analysis for all major components of the project » Owner's cost developed from quotations and first principles

ESTIMATE STRUCTURE

The capital estimate was prepared using a project Work Breakdown Structure (WBS) which delineates the various areas of the project. Individual estimates were prepared for each area covering all engineering disciplines.

The capital estimate has been structured into the following major categories:

- Direct costs;
- Indirect costs;
- Growth allowance; and
- Owner's costs.

DIRECT COSTS

Direct costs are project expenditures that cover the supply of equipment and materials, freight to site and construction labour. These are the costs to build the project and exclude indirect and other costs as described below.

INDIRECT COSTS

Indirect costs are project expenditures that cover miscellaneous construction costs such as EPCM services, mobilisation/demobilisation, construction facilities, temporary construction accommodation, flights, meals, as well as plant first fills, critical equipment spares and plant commissioning costs.

GROWTH ALLOWANCE

A growth allowance has been included in the estimate which is commensurate with the level of design and estimating confidence. The allowance is based on the project scope and does not include changes to the process flowsheet, process plant design or major equipment selections. Growth allowance is reserved for errors and omissions based upon data assumed and equipment detailed as the basis for this study.

Growth allowances made in the estimate vary for each discipline item according to the level of accuracy associated with equipment/materials pricing, estimates of material quantities, estimates of equipment and labour requirements and site costs.

OWNER'S COSTS

Owner's costs have been included in the capital estimate for the following:

- Owner's project management team;
- Pre-mobilisation construction costs;
- Insurances;
- Approvals;
- Computing systems (business services systems);
- Recruitment costs for operational team;
- Salaries for operational team during commissioning and handover period; and
- Office costs.

Owner's contingencies and/or risk amounts have also been included in the estimate. Owner's contingency is an allowance to cover costs associated with unexpected items during construction that are not covered by the EPCM contract. These may include such items as scope changes, changes to equipment or material specification changes, rain delays, etc.

The amount has been determined based on a risk workshop conducted by Vimy and GRES. Risk weightings were assigned to the best, most likely and worst-case ranges to the various elements of the estimate. The cost variables were then modelled using a Monte Carlo statistical simulation process. The difference between the P95 scenario and the base case was adopted for the owner's contingency.

COST ESTIMATE SUMMARY

The estimated total capital cost for the MRP is A$492.98M, including a growth allowance and owner's contingency totalling A$41.7M (or approximately 8.5% of total project costs), and capitalised pre-production mining costs of A$36.3M. Capital breakdown by Work Breakdown Structure (WBS) is presented in Table 11.2 and Figure 11.1, with costs expressed in Australian dollars.

Table 11.2: MRP Capital Cost Estimate Summary

WBS	Cost Area	A$M
1000	**Mining**	**144.09**
1010	Mining Pre-Strip	36.34
1020	Advanced Pit Dewatering	9.40
1050	Heavy Vehicle Washdown	0.78
1060	Fuel Storage & Dispensing	0.81
1090	Explosive Compound	0.22
1110	Mine Buildings & Earthworks	6.64
1120	Mining Fleet	89.89
2000	**Process Plant**	**127.58**
2100	Ore Beneficiation	23.03
2200	SAG Mill & Leach	16.82
2300	Uranium Recovery	22.95
2400	Uranium Precipitation	8.80
2600	Tailings	3.97
2700	Water Management	3.20
2800	Services & Utilities	2.41
2900	Reagents	5.88
2910	Sulphuric Acid Plant	22.12
2950	Piping & Cable Racks	18.37
3000	**Plant Infrastructure**	**34.14**
3010	Site Preparation & Improvements	2.56
3020	Electrical Substations	7.32
3030	Plant Buildings	9.48
3060	Waste Water Treatment Plant	0.54
3070	Mobile Equipment	5.50
3080	Bulk Fuel Storage Facility	1.62
3130	High Voltage Switch Yard	0.30
3140	Control System	1.19
3150	Communications	5.06
3190	Turnkey Plants	0.57
4000	**Area Infrastructure**	**40.13**
4010	Permanent Accommodation	18.67
4020	Water Supply & Distribution	9.25
4030	Electrical Power Distribution	4.02
4040	Air Strip & Terminal	5.56
4050	Area Roads	1.99
4060	Stormwater Protection	0.26
4070	Area Communications	0.38

WBS	Cost Area	A$M
5000	**Regional Infrastructure**	**9.51**
5010	Regional Roads	8.19
5060	Regional Communications	1.32
Project Directs Sub-Total		**355.46**
6000	**Miscellaneous**	**25.39**
6010	First Fills & Consumables	7.04
6030	Critical Spares	1.48
6040	Mobilisation & Demob	13.71
6050	Vendor Representatives	0.46
6060	Commissioning Assistance	2.70
7000	**Indirect Costs**	**53.54**
7010	Construction Facilities & Services	11.57
7020	Construction Camp	2.38
7030	EPCM	39.59
Project Indirects Sub-Total		**78.92**
Total Bare Cost		**434.38**
8000	**Growth Allowance**	**23.90**
8010	Design Growth	23.90
9000	**Owner's Costs**	**34.70**
9110	Owner's Team	16.93
9120	Owner's Contingency	17.77
Grand Total		**492.98**

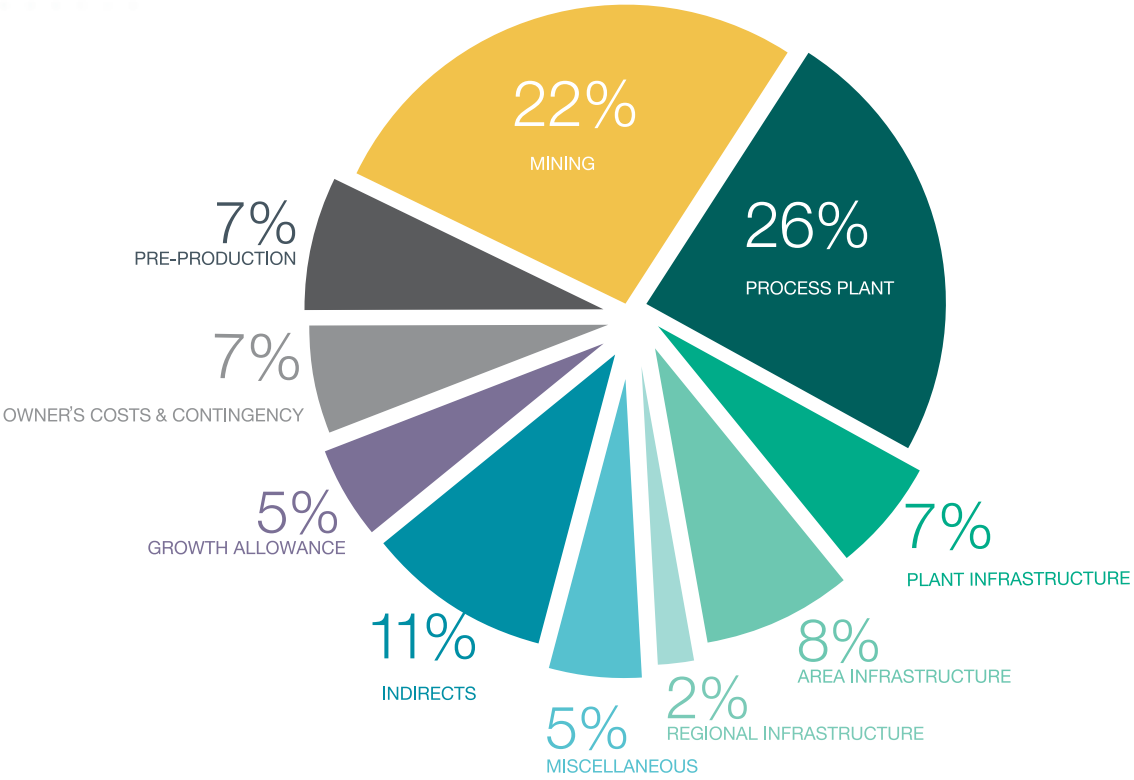

Figure 11.1: MRP Capital Cost Breakdown – by Work Breakdown Structure

MINING

PRE-PRODUCTION CAPITAL

Costs associated with the pre-production mining prior to Year 1, Month 1 were developed by Mining Plus and are summarised in Table 11.3. These operating costs include a full complement of management and supervision to support the mining operation as soon as it commences. The costs also include the maintenance personnel which are mobilised in line with the delivery of the mining fleet.

Table 11.3: Pre-production Capital Estimate

Capital Expenditure Area	Year -1 (A$M)	Year 0 (A$M)	Total (A$M)
Labour	3.7	15.1	18.8
Fuel	0.6	9.2	9.8
Other (variable)	0.6	5.4	6.0
Other (fixed)	0.1	0.8	0.9
Pit dewatering	-	0.8	0.8
Total	**5.0**	**31.3**	**36.3**

MINING EQUIPMENT

Mining equipment is procured from Year -1 through to Year 2, with the cost of this equipment estimated by Mining Plus based on multiple budget quotations. The mining capital cost estimate includes the following equipment items:

- Mobile mining fleet;
- Mobile ancillary fleet;
- Mobile maintenance equipment;
- Light vehicles;
- Pit dewatering;
- Workshop tooling;
- Equipment spares;
- Surveying equipment;
- Grade control equipment;
- Mobile lighting equipment; and
- Specialist software.

Vimy is assessing commercial proposals to finance the mining fleet through the equipment suppliers.

MINING INFRASTRUCTURE

The capital cost of the following mining infrastructure has been estimated by GRES based on in-house experience and quotations:

- Mining operational and administration buildings;
- Mining compound including earthworks, civils, fencing, bunding, parking bays, jack pads and laydown areas;
- Mining workshop and stores;
- Mining heavy vehicle and light vehicle re-fuelling facility; and
- Heavy vehicle and light vehicle washdown bays.

PROCESS PLANT

ORE BENEFICIATION PLANT

The beneficiation plant has been designed and costed by GRES based on findings of the pilot plant testwork and multiple budget quotations from OEMs, with the plant consisting of the following major unit operations:

- ROM ore pad and retaining wall;
- Parallel mineral sizer trains;
- Parallel logwasher trains;
- Fines separation cyclone cluster;
- Rougher Up-Current Classifier (UCC);
- Cleaner UCC;
- Fines thickener;
- Barren sand dewatering module;
- Various ore, concentrate and barren sand conveyors; and
- Beneficiated concentrate stockpile.

The beneficiation plant will be constructed and commissioned in two stages, with Stage 1 consisting of the installation of the ROM ore pad and retaining wall, one of the two mineral sizers, ore transfer conveyors, and the concentrate stockpile. This will enable the processing of high-grade ore during the first two years of operation, with the remainder of the ore beneficiation plant equipment installed during the first half of Year 2, in preparation for high-grade ore ceasing in Year 2, Month 8.

HYDROMETALLURGICAL PROCESS PLANT

The hydrometallurgical process plant has been designed and costed by GRES based on the process design criteria confirmed through continuous piloting. The estimate is supported by multiple budget quotations from OEMs. The process plant consists of the following major unit operations:

- SAG milling;
- Leach feed thickener;
- 6-stage uranium leach circuit;
- 8-stage RIP circuit;
- Resin elution;
- Resin elution reagents make-up;
- UF/NF plant;
- 4-stage Uranyl peroxide precipitation circuit; and
- Uranyl peroxide thickening, washing, drying and packaging.

The design implications of the characteristics of the acidic saline leach and RIP circuit slurries have been carefully considered by GRES. Non-metallic materials for construction have been selected where possible, such as fibre reinforced plastic, high density polyethylene, PVC, butyl rubber and epoxy coatings. Where the use of non-metallics is not practical, conservative metallic materials such as titanium and Hastelloy C276 have been selected predominantly in the leach, RIP and UF/NF areas of the plant, while super duplex stainless steels (SAF2507 and SAF2205) have been used in other areas. Corrosion testing has been conducted to support material selection for the project.

REAGENTS

The reagents area of the process plant has been designed and costed by GRES based on in-house experience and budget quotations from OEMs, with the plant consisting of the following major unit operations:

- Sulphuric acid vendor package plant and acid storage;
- Ferric sulphate generation and storage;
- Sodium chloride dissolution and storage;
- Caustic unloading and storage;
- Hydrogen peroxide unloading and storage; and
- Flocculant mixing and storage.

The reagents area of the process plant consists mainly of tanks and pumps, with the exception of the sulphuric acid plant. The capital estimate has allowed for the installation of a turn-key 250tpd (85,000tpa) sulphuric acid plant supplied by industry-experts Outotec GmbH & Co. (Germany). The acid plant consists of a skid-mounted, fully pre-commissioned plant which will be supplied, installed and commissioned by and under the supervision of Outotec. The acid plant generates 12t/h of steam through its heat recovery system, which will be used to heat the leach circuit. Sulphuric acid may also be imported via truck if required.

UTILITIES AND SERVICES

The utilities and services area of the process plant has been designed and costed by GRES based on in-house experience and multiple budget quotations from OEMs, with the plant consisting of the following major areas:

- Water supply – raw water, pit water, demineralised water, potable water, process water, fire water, gland water, and safety shower systems;
- Air supply – plant air and instrument air; and
- Steam supply – boiler to provide low pressure steam.

PLANT INFRASTRUCTURE

Process plant infrastructure has been designed and costed by GRES based on in-house experience and multiple budget quotations from OEMs, with the plant consisting of the following major assets:

- Power plant generator haul;
- Bulk fuel storage and distribution;
- Sewage disposal and treatment;
- Plant buildings, including administration, training, gatehouse/first aid, operations, change-rooms, crib rooms, plant control room, workshops, warehouse, etc;
- Process plant control system;
- High voltage switch yards, substations buildings, and power distribution;
- Mobile plant equipment; and
- Site communication systems, including communication towers, microwave data links, private LTE system, local area network/wide area network (LAN/WAN) data infrastructure, IT equipment and telephone system.

The cost for the supply and installation of all of the above assets, with exception of the power plant, has been included in the capital cost estimate. The power plant will be installed under a build, own and operate (BOO) contract.

AREA AND REGIONAL INFRASTRUCTURE

All area and regional infrastructure has been estimated by GRES including the accommodation village, aerodrome, airstrip, Kakarook North borefield, raw water distribution system, high voltage electrical distribution system, main access and regional roads, and communications system.

PREVIOUS CAPITAL COMPARISON

A comparison of the change in the capital cost estimate developed for the DFS, at A$492.98M, to that released to the ASX in November 2015 for the PFS, at A$503.9M, is presented in Figure 11.2.

The DFS capital cost has reduced marginally from the PFS cost estimate, with the following cost centres being responsible for the overall 3% reduction in cost:

- The cost of the process plant has increased marginally by A$1M with the base metals plant being replaced with a turnkey sulphuric acid plant;
- The cost of plant and regional infrastructure has increased by A$1M, due to an increase in costs associated with the communications system and electrical substations, following refinement of the requirements for this part of the infrastructure scope, which has been partially off-set by a reduction in the cost of the accommodation village;
- The cost of indirects has increased by A$11M, primarily due to increases in construction mobilisation-demobilisation costs, construction facilities and EPCM hours for the project;
- The cost of mining and pre-strip has decreased by A$15M, due to the change from Princess to Ambassador North pit as the initial tailings storage facility;
- The growth allowance has decreased by A$9M, commensurate with the higher level of project definition developed as part of the DFS; and
- The owner's costs have decreased by A$13M, primarily due to lower owner's contingency with a greater level of definition of project scope and review of the project risk register.

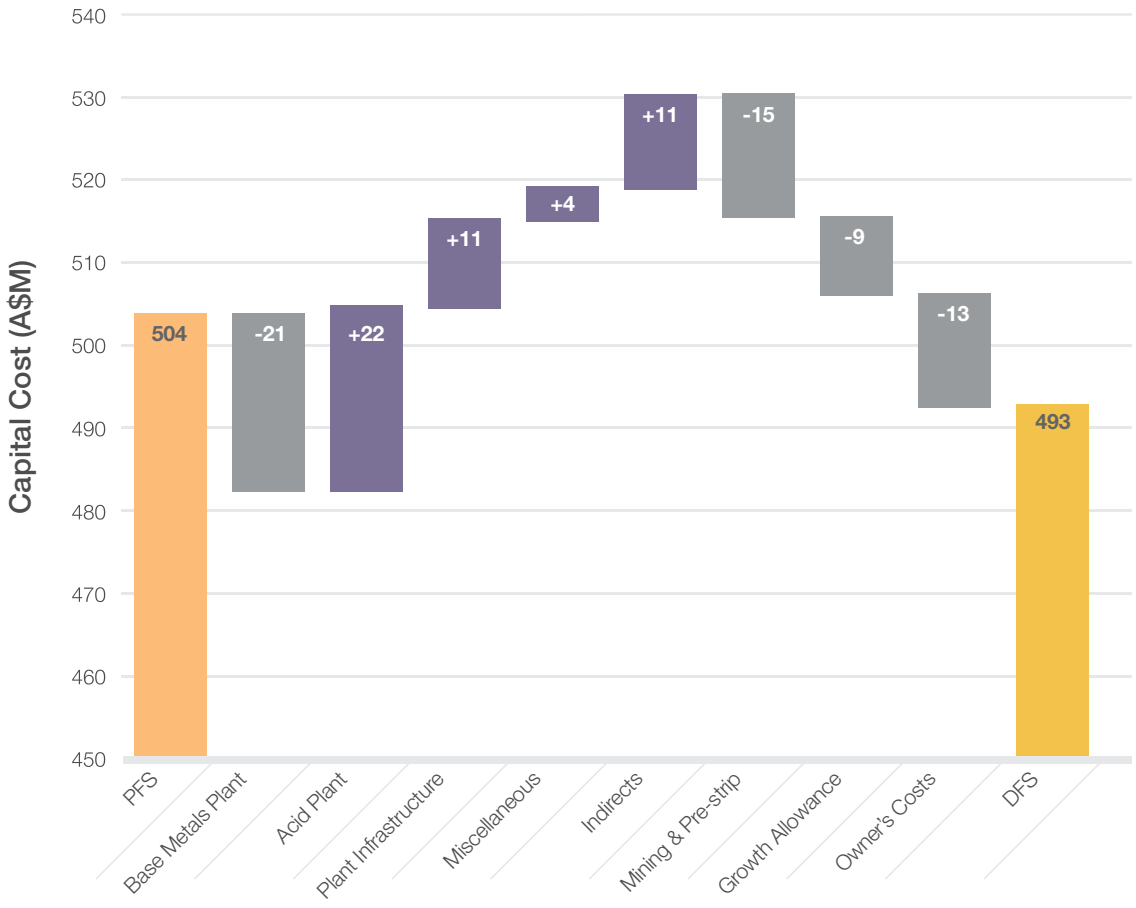

Figure 11.2: Comparison of DFS vs PFS Capital Cost Estimate