

ASX Announcement

31 March 2016

## **ECONOMICALLY ROBUST ZINC AND PRECIOUS METALS PROJECT DEMONSTRATED AT HAYES CREEK**

---

- Scoping Study demonstrates the Hayes Creek project as financially robust producing zinc concentrate and gold-silver doré from both open pit and underground operations
- The Scoping Study has identified a base case pre-tax project Net Present Value of A\$109.4 million with an Internal Rate of Return of 58%, giving a payback period of less than 2 years<sup>1</sup>
- Initial capital expenditure of A\$54 million for processing plant and infrastructure, plus a further A\$10.9 million in year 2 of underground development capital
- Estimated average annual payable metal sales of 13,700 tonnes of zinc in concentrate, and 1,290,000 oz silver and 14,000 oz gold in doré from production of 400,000 tonnes of ore per year
- Indicative mine life of 7 years commencing in 2019 with total metal revenues of A\$631 million
- Annualised Life-of-Mine pre-tax net cash flows of A\$35 million (net of ongoing underground development capital) resulting in a total Life-of-Mine pre-tax net cash flow of A\$244 million
- Project revenues split between zinc (41%), silver (34%), and gold (25%), providing a natural hedge against fluctuations in individual commodity prices
- Opportunities for Project enhancement include; increasing the resource base through near mine and regional exploration, increasing metal recoveries through optimisation of the mineral processing route, and improving capital and operating cost efficiencies
- Pre-Feasibility studies underway, including commencement of long lead-time items such as environmental studies

---

<sup>1</sup> At published Consensus Forward Price Estimates compiled from a group of domestic and international mining analysts and financial institutions

### **Cautionary Statement**

The Scoping Study referred to in this report is based on low-level technical and economic assessments, and is insufficient to support estimation of Ore Reserves or to provide assurance of an economic development case at this stage, or to provide certainty that the conclusions of the Scoping Study will be realised.

The Scoping Study is preliminary in nature with conclusions drawn from Resources predominantly in the Inferred Resource (88%) category classification, according to JORC guidelines (2012).

There is a low level of geological confidence associated with Inferred Mineral resources and there is no certainty that further exploration will result in the determination of additional Indicated Mineral Resources or that the production targets will be realised. The production targets stated by PNX Metals Limited are based on information available and the Company's current expectations of future results of events, and should not be solely relied upon by investors when making investment decisions.

A number of factors could cause actual results, or expectations to differ materially from the results expressed or contained in this announcement, or in the Scoping Study itself. Further evaluation and appropriate studies are required to establish sufficient confidence that these results or expectations will be met.

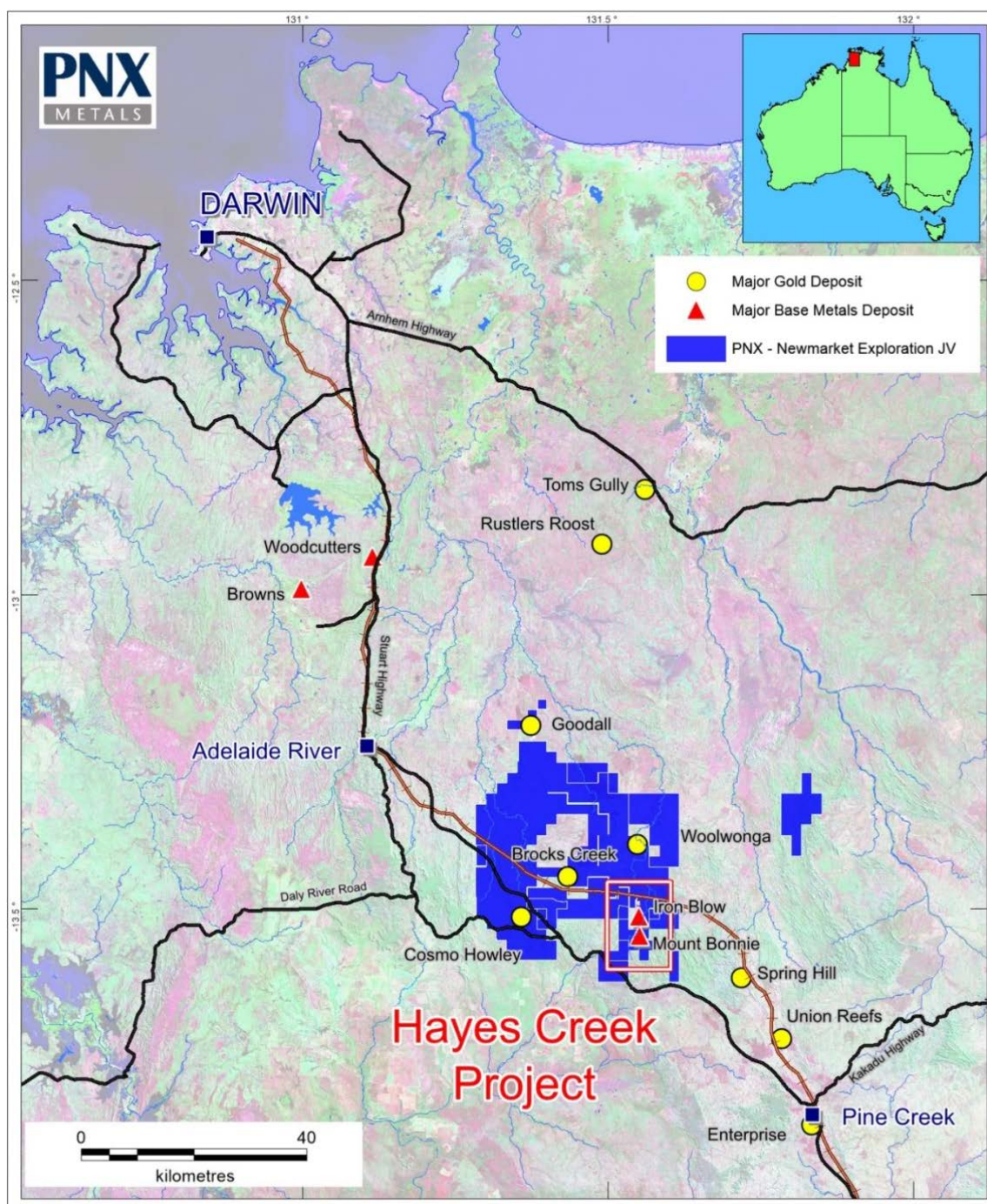
Further, PNX Metals cautions that there is no certainty that forecast financial information derived from production targets will be realised. All material assumptions underpinning the production targets and forecast financial information derived from the production targets are set out in this announcement.

The estimated mineral resources used to generate the Scoping Study production targets have been prepared by Competent Persons in accordance with the current JORC Code 2012, and current ASX listing rules.

**PNX Managing Director James Fox said** *"The Hayes Creek Scoping Study provides a robust economic base case that confirms the potential for the Project to become an economically viable operation. The level of capital investment that has been scoped provides for a modest mining and ore throughput rate and demonstrates a Project payback period of under two years. This is likely to be attractive to stakeholders and/or other financiers, as is the inherent commodity mix of zinc, gold and silver. The Project is located in a favourable mining jurisdiction in the Northern Territory where the development scenario considers and utilises existing infrastructure further enhancing project fundamentals and lowering development risks. The results from this Study will underpin the completion of a Pre-Feasibility Study, already underway, that aims to improve the certainty of the mining inventory and associated operating and development costs, and reduce the technical risk of the Project toward a development decision."*

## Overview

PNX Metals Limited (**ASX:PNX**) is pleased to announce the results of a Scoping Study completed for its wholly owned Hayes Creek zinc-gold-silver project ('Project')<sup>2</sup>, comprising the Iron Blow and Mt Bonnie deposits located in the Pine Creek region of the Northern Territory, approximately 170km south-east of Darwin (Figure 1).



**Figure 1: Location of the Hayes Creek Project**

<sup>2</sup> Refer PNX ASX release 18 August 2014 for full details of acquisition

The Hayes Creek Scoping Study set out to achieve an industry-accepted guideline cost estimate of up to  $\pm 35\%$  and has been prepared using 2012 JORC Code guidelines<sup>3</sup>. This level of confidence has been achieved through a series of technical studies completed by consultants, direct responses from industry suppliers and desktop reviews. The outcomes of the Study confirm the potential for the Project to be an economically viable operation (Table 1) that is robust across the commodity cycle.

The Mineral Resources<sup>4</sup> at Iron Blow and Mt Bonnie on which the Study is based have been previously announced by PNX (ASX releases 3 November 2014 & 1 February 2016). These resources form the basis for the mining planning and scheduling studies that generate a near-surface, high-grade mining inventory totalling:

- 2.81Mt at 5.02% zinc, 2.11g/t gold, 143g/t silver, 1.17% lead, and 0.3% copper from the two deposits.

The production model contemplates open-pit mining at Mt Bonnie commencing 2019 for an initial 1.8 years of production followed by a further 5.2 years of underground mining at Iron Blow for a total mine life of 7 years. Construction of a central stand-alone mineral processing facility is assumed to treat the ore from both deposits at a nominal 400,000tpa feed rate to produce an average of approximately 16,100 tonnes per annum zinc (13,700 tonnes per annum payable in concentrate), 14,000 oz gold, and 1,290,000 oz silver in doré per year.

Key aspects of the Scoping Study are provided below, with further detail presented in the Scoping Study Executive Summary that is included as Annexure 1 to this release.

**Table 1: Scoping Study – Project Returns, Physicals, and Key Inputs (in AUD\$)**

Hayes Creek project - Base case scenario 400,000tpa feed			
	Mt Bonnie	Iron Blow	Units/comments
<b>Mineral Resources</b>	1,285,000	2,600,000	Tonnes
<b>Mining Inventory</b>			
Open Pit	726,000	-	Tonnes
Underground	-	2,084,000	Tonnes
Zinc	140,979		Tonnes
Gold	192,105		Ounces
Silver	12,947,807		Ounces
Lead	32,846		Tonnes
Copper	8,019		Tonnes
<b>Strip Ratio</b>	8.1	-	waste:ore
<b>Mine Life</b>	1.8	5.2	Years
<b>Mineral Processing rate</b>	400,000		Tonnes per year
<b>Metals Paid</b>	Total	Average per year	
Zinc (in concentrate)	95,866	13,695	Tonnes
Gold (to dore)	98,262	14,037	Ounces
Silver (to dore)	9,031,095	1,290,156	Ounces
Lead	Nil		Tonnes
Copper	Nil		Tonnes

<sup>3</sup> Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (2012 JORC Code) guidelines.

<sup>4</sup> Refer Table 3 on Page 9 for details of the Resource Estimates

<b>Operating Costs</b>		
Open pit mining (Mt Bonnie)	\$28.25	per tonne of ore mined
Underground mining (Iron Blow)	\$84.78	
Tech services (Mining)	\$3.49	
Processing	\$38.61	
General & Administration	\$6.68	
<b>Offsite Charges</b>		
Transport	\$4.17	per tonne of ore mined
Treatment & Refining	\$20.89	
Royalties (NT Govt./Newmarket)	\$13.85	
<b>Capital Costs</b>		
Pre-Production CAPEX	\$54.0m	to first ore
Underground Development CAPEX	\$10.9m	to first UG ore
<b>Financials</b>		
Total Revenue (net of TC/RCs)	\$631m	Derived using consensus forecast metal prices and exchange rates
Life of mine pre-tax net cashflow	\$244m	
NPV pre-tax (10%)	\$109.4m	
IRR pre-tax (%)	58.0%	
Payback period	1.8 years	

**Mining Inventory** – The Scoping Study considered an estimated mining inventory for the Iron Blow and Mt Bonnie deposits of 2.8 million tonnes of ore containing 141,000 tonnes of zinc, 12.9 million ounces of silver, 192,000 ounces of gold, 32,800 tonnes of lead, and 8,000 tonnes of copper. This inventory is based on the total Mineral Resource estimated at Hayes Creek with approximately 88% in the Inferred category and 12% in the Indicated category. Approximately 0.7 million tonnes is assumed to be initially mined via open pit from Mt Bonnie over the first 1.8 years of the project. Underground mining at Iron Blow accounts for approximately 2.1 million tonnes and a further 5.2 years of production.

**Production** – Estimated average annual production of zinc in concentrate is approximately 16,100 tonnes (13,700 tonnes per annum payable in concentrate) with average annual silver and gold doré production of 1,290,000 ounces and 14,000 ounces respectively (both assumed to be paid at 100% in doré). Lead and copper are also recovered to concentrate but no revenues have been assumed due to mid-level concentrate grades. There is however an opportunity, with further test work, to refine this product stream to generate revenue from lead and copper. Total mill feed over the 7 year mine life has been modelled at approximately 2.8 million tonnes, with a steady state mill feed rate of approximately 400,000 tonnes per annum after an initial 6 month ramp up/commissioning period.

**Metal Recoveries** - A conservative approach has been taken to metal recoveries and payables with production figures based on expected metal recoveries of 80% zinc, 70% silver and 51% gold. The process design was based on analysis of recent PNX and historic test work on ore from the Iron Blow

and Mt Bonnie deposits. Targeted improvement in these recoveries will be investigated as part of the Pre-Feasibility Study.

**Infrastructure** - The project lies approximately 7km east of the Stuart Highway, 170km south east of Darwin. It is well serviced by existing roads, access to the Northern Territory electricity grid, Telstra 3G network, accommodation facilities and water supplies. The route to market would be through the Port of Darwin to international smelters, or via rail southwards to smelters on the Australian mainland. Gold and silver doré produced on site would be transported to an Australian refiner (assumed in the Study to be the Perth Mint) for further refining.

**Operating Costs (Estimated per tonne of ore)** – Contract mining costs for the Mt Bonnie open pit are \$28.25 tonne of ore delivered to the Run-of-Mine (ROM), with Iron Blow contract underground mining costs of \$84.78 tonne (inclusive of underground development costs after first ore). Mining Technical services costs are \$3.49 tonne. Processing costs are \$38.61 tonne, and general/administration costs are \$6.68 tonne. Offsite transport costs of concentrate and doré add a further \$4.17 tonne.

*By-product credits from gold and silver will exceed the direct cash cost of production for zinc resulting in an estimated C1 cash operating cost over life of mine of negative 98c/lb zinc (i.e. credit).*

**Capital Costs** – The upfront capital costs required for the processing plant and infrastructure to commence production of first concentrate from Mt Bonnie open pit ore is estimated at \$54 million. Development of the underground operation at Iron Blow will commence late in the first year of full production and is estimated to require \$10.9 million of capital to reach first ore with no additional processing capital requirements beyond normal sustaining capital.

**Cash Flow** – Life of mine revenue (net of Treatment and Refining charges of \$58.7 million, or \$20.89 tonne of ore) is estimated at \$631 million, split between zinc - \$259 million (41%), silver - \$214 million (34%), and gold - \$158 million (25%). Life of mine pre-tax net cashflows are estimated at \$244 million, averaging \$35 million per year. These figures are exclusive of initial capital expenditure.

**Price Assumptions** – Commodity forward prices and USD/AUD exchange rate forward estimates have been compiled from a group of domestic and international mining analysts and financial institutions. Over life of mine (2019-2026) these average US\$2,555 tonne of zinc, US\$19.0 oz silver, and US\$1,236 oz gold at an average exchange rate of \$US0.78.

**NPV** – The project pre-tax Net Present Value (NPV), at a nominal 10% discount rate, is \$109.4 million.

**IRR & Payback Period** – The Project Internal Rate of Return (IRR) is 58%, reflected in the 1.8 year period to payback upfront capital costs.

**Sensitivities** - The key financial projections of the project are most sensitive to movements in the AUD/USD foreign exchange rate, commodity prices, metal recoveries, and processing costs per tonne. Movement in the exchange rate has the greatest effect on the project as it impacts each revenue stream. A  $\pm 10\%$  movement in the exchange rate has an approximate  $\pm \$40$  million effect on Project NPV.

**NOTE** - Commodity forward price forecasts commencing in 2019 have been used in the Study. Using commodity prices current as of 29 March 2016, being zinc US\$1,774, silver US\$15.4, gold US\$1,242, and US\$0.76/AUD, the project returns a pre-tax NPV (at a nominal 10% discount rate) of \$32.7



million, and life of mine pre-tax net cashflow of \$127.3 million, demonstrating the Project's robustness across the commodity cycle.

**Future work** – A Pre-Feasibility Study (PFS) is underway to increase the confidence level of Resources in the mining inventory to at least Indicated status, undertake further detailed metallurgical test work and analysis of various options of revenue streams vs costs to allow more detailed process engineering, and commence Government and environmental approvals processes.

#### **Competent Person's Statement**

*The information in this report that relates to Exploration Results is based on information compiled by Mr Andrew Bennett, a Competent Person who is a Member of the Australasian Institute of Mining and Metallurgy (AusIMM). Mr Bennett has sufficient experience relevant to the style of mineralisation and the type of deposits under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves". Mr Bennett is a full time employee of PNX Metals Ltd and consents to the inclusion in this report of the matters based on his information in the form and context in which it appears.*

**James Fox**  
**Managing Director & CEO**  
Telephone: +61 (0) 8 8364 3188  
Email: [info@pnxmetals.com.au](mailto:info@pnxmetals.com.au)  
Website: [www.pnxmetals.com.au](http://www.pnxmetals.com.au)

**Peter Taylor**  
**Investor Relations**  
Telephone: +61 (0) 412 036 231  
Email: [peter@nwrcommunications.com.au](mailto:peter@nwrcommunications.com.au)

## **ANNEXURE 1 – SCOPING STUDY EXECUTIVE SUMMARY**

The following provides a high-level summary of the Scoping Study including:

1. Scoping Study Parameters
2. Mineral Resources
3. Mining
  - a. Mt Bonnie
  - b. Iron Blow
4. Processing Recoveries and Payables
5. Commercial and Smelter Discussions
6. Infrastructure and Access to Markets
7. Capital Costs
8. Operating Costs
9. Marketing
10. Financial Assessment and Economic Sensitivity
11. Approvals and Project Risks
12. Project Planning and Future Work
13. Resource Growth Potential

---

### **1. Scoping Study Parameters**

The Scoping Study has followed industry accepted guidelines, particularly those provided by AusIMM<sup>5</sup> to develop an accuracy level within a range of up to  $\pm 35\%$ .

A variety of sources consistent with a Scoping Study level of accuracy have been utilised by PNX including Technical Specialists to provide cost estimates. These sources comprise;

- Benchmarking against similar sized operations in Australia and overseas,
- Cost comparisons with operations within the region,
- Expertise and experience of Technical Specialists from previous projects/operations.

Within the Scoping Study scenario and parameters, PNX believes it has used consistent and reasonable information in establishing the potential financial outcome of the Project.

The following Technical Specialists have provided technical input, and assisted in preparing the Scoping Study.

---

<sup>5</sup> AusIMM 2012. *Cost Estimation Handbook*. 2<sup>nd</sup> Edition Monograph 27. The Australian Institute of Mining and Metallurgy



**Table 2:** Technical Specialists utilised in preparing technical reports referenced in the Scoping Study

Area	Scope	Company	Authorised person
Processing	Designing metallurgical testwork program. Defining recovery of metal from ore, including process flow diagram, Capex and Opex	BHM Process Consultants Pty Ltd	Damien Bryant, Steve Hoban Principal Metallurgists
Processing and metallurgical work review	Review processing and metallurgical test results and studies, verifying assumptions and outcomes are acceptable for study	Mworx Pty Ltd	David Readett Principal Consultant
Resource Statement Iron Blow	Define resource model for Iron Blow deposit	AMC Consultants Pty Ltd	Andrew Proudman Principal Geologist
Resource Statement Mt Bonnie	Define resource model for Mt Bonnie deposit	CSA Global Pty Ltd	Aaron Meakin Principal Resource Geologist
Mining Study - Iron Blow Underground option	Develop mining plan, production schedule, Capex and Opex	Rombus Mining Pty Ltd	Roddy Ormonde Principal Mining Engineer
Mining Study - Iron Blow open cut option	Develop mining plan, production schedule, Capex and Opex	CSA Global Pty Ltd	Paul O'Callaghan Principal Mining Engineer
Mining Study - Mt Bonnie open cut	Develop mining plan, production schedule Capex and Opex	CSA Global Pty Ltd	Paul O'Callaghan Principal Mining Engineer
Northern Territory Mining Approvals	Provide summary of NT approvals process and strategy to obtain Authorisation	ERIAS Group Pty Ltd	David Browne Principal Consultant

## 2. Mineral Resources

A summary of the Mineral Resource estimates used in the study is presented in Table 3. Tonnage in the lower confidence Inferred category accounts for approximately 88% of the total Mineral Resources for both the Iron Blow and Mt Bonnie deposits, with all of the Indicated Resources at Mt Bonnie. No allowance for future exploration success has been assumed in this Study; however, there are opportunities for additional near-surface mineralisation at the Hayes Creek project and within the surrounding Burnside exploration project. During the PFS, additional drilling will be completed to increase the level of geological confidence in the resource estimates included in the mining schedule to at least the Indicated category.

The total contained metal for the Indicated and Inferred Mineral Resources at the Hayes Creek project is 178,500 tonnes of zinc, 256,600 ounces of gold, 16.3 million ounces of silver, 40,600 tonnes of lead, and 11,500t of copper (Table 4).

**Table 3: Hayes Creek Project Mineral Resources**

Deposit	Domain	Cut-off	Category	Ktonnes	Zn %	Pb %	Cu %	Ag g/t	Au g/t	ZnEq* %	AuEq* g/t
Iron Blow	> -90m RL	0.7 g/t AuEq	Inferred	2,200	4.9	1.0	0.3	140	2.4	11.8	6.7
	< -90m RL	3.0 g/t AuEq	Inferred	400	4.1	0.4	0.4	71	2.7	10.0	5.6
Mt Bonnie	>1% Zn		Indicated	456	5.63	1.26	0.32	151	1.15	9.14	5.46
	>1% Zn		Inferred	644	4.38	1.52	0.25	131	1.47	8.16	4.87
	>0.5g/t Au		Inferred	78	0.16	1.87	0.26	121	1.88	5.36	3.20
	>50g/t Ag		Inferred	107	0.26	0.06	0.04	70	0.04	1.60	0.96
<b>TOTAL</b>			<b>Indicated &amp; Inferred</b>	<b>3,885</b>	<b>4.59</b>	<b>1.05</b>	<b>0.30</b>	<b>130</b>	<b>2.05</b>	<b>10.29</b>	<b>5.91</b>

**Table 4: Hayes Creek Project Total Contained Metal Estimate Based on Total Mineral Resources**

Contained Metal	Zn (t)	Au (oz)	Ag (oz)	Pb (t)	Cu (t)	ZnEq (t)	AuEq (oz)
Iron Blow	124,200	204,482	10,815,677	23,600	8,200	304,504	550,450
Mt Bonnie	54,283	52,149	5,470,469	17,057	3,315	102,803	197,382
<b>Total</b>	<b>178,483</b>	<b>256,631</b>	<b>16,286,146</b>	<b>40,657</b>	<b>11,515</b>	<b>407,307</b>	<b>747,832</b>

**Notes relating to Tables 3 and 4**

Due to effects of rounding, totals may not represent the sum of all components.

**Mt Bonnie** - zinc domains are reported above a cut-off grade of 1% zinc, gold domains are reported above a cut-off grade of 0.5 g/t gold and silver domains are reported above a cut-off grade of 50 g/t silver.

**Iron Blow** - a variable gold-equivalent cut-off grade was used corresponding to an RL at which mineralisation could be extracted with open cut versus underground methods.

In order to assess the potential value of the total suite of minerals of economic interest in the mineral inventory, formulae were developed to calculate metal equivalency for the gold and zinc (see below). Metal price assumptions were updated during the Mt Bonnie estimation to reflect average consensus forecasts for the period 2017 through 2021, (consensus forward price forecasts compiled from a group of domestic and international mining analysts and financial institutions).

Metallurgical recovery information for Iron Blow was assigned prior to any diagnostic testwork by PNX and was based on what was considered reasonable in similar operations. Metallurgical recovery information for Mt Bonnie was sourced from test work completed on diamond drill core from the Iron Blow deposit, and historical test work on the Mt Bonnie deposit. Mt Bonnie and Iron Blow have similar mineralogical characteristics and are a similar style of deposit, hence the assumption that metallurgical characteristics are similar between the two deposits is considered reasonable by the Competent Persons.

Price Assumptions:						Recovery Assumptions				
Deposit	Zn Price	Pb Price	Cu Price	Ag Price	Au Price	Zn	Pb	Cu	Ag	Au
	\$USD/t	\$USD/t	\$USD/t	\$USD/troy oz	\$USD/troy oz	%	%	%	%	%
Iron Blow	2350	2250	7000	20	1300	70	70	70	90	90
Mt Bonnie	2400	2000	6200	18	1250	80	60	60	75	55

The formulae below was applied to the estimated constituents to derive the metal equivalent values:

Gold Equivalent (field = "AuEq") (g/t) = (Au grade (g/t) \* (Au price per ounce/31.10348) \* Au recovery) + (Ag grade (g/t) \* (Ag price per ounce/31.10348) \* Ag recovery) + (Cu grade (%) \* (Cu price per tonne/100) \* Cu recovery) + (Pb grade (%) \* (Pb price per tonne/100) \* Pb recovery) + (Zn grade (%) \* (Zn price per tonne/100) \* Zn recovery) / (Au price per ounce/31.10348)

Zinc Equivalent (field = "ZnEq") (%) = (Au grade (g/t) \* (Au price per ounce/31.10348) \* Au recovery) + (Ag grade (g/t) \* (Ag price per ounce/31.10348) \* Ag recovery) + (Cu grade (%) \* (Cu price per tonne/100) \* Cu recovery) + (Pb grade (%) \* (Pb price per tonne/100) \* Pb recovery) + (Zn grade (%) \* (Zn price per tonne/100) \* Zn recovery) / (Zn price per tonne/100)

### 3. Mining

Mine designs and production schedules were generated separately for the Iron Blow and Mt Bonnie deposits. The Mt Bonnie deposit was modelled using an open cut mining method for a period of 1.8 years, followed by mining for a further 5.2 years at Iron Blow using an underground sub-level open stoping method.

Overall slope angles for all pit walls of 45° were utilised for the mine design at Mt Bonnie. The Mining Inventory (Table 5) reflects adjustments for ore losses (10%) and diluted grade (5%).

A mining production target of 400,000 tonnes per annum was scheduled to match the processing plant design feed requirements. Further optimisation of feed tonnage will be completed as part of the PFS.

**Table 5: Hayes Creek Project Mining Inventory**

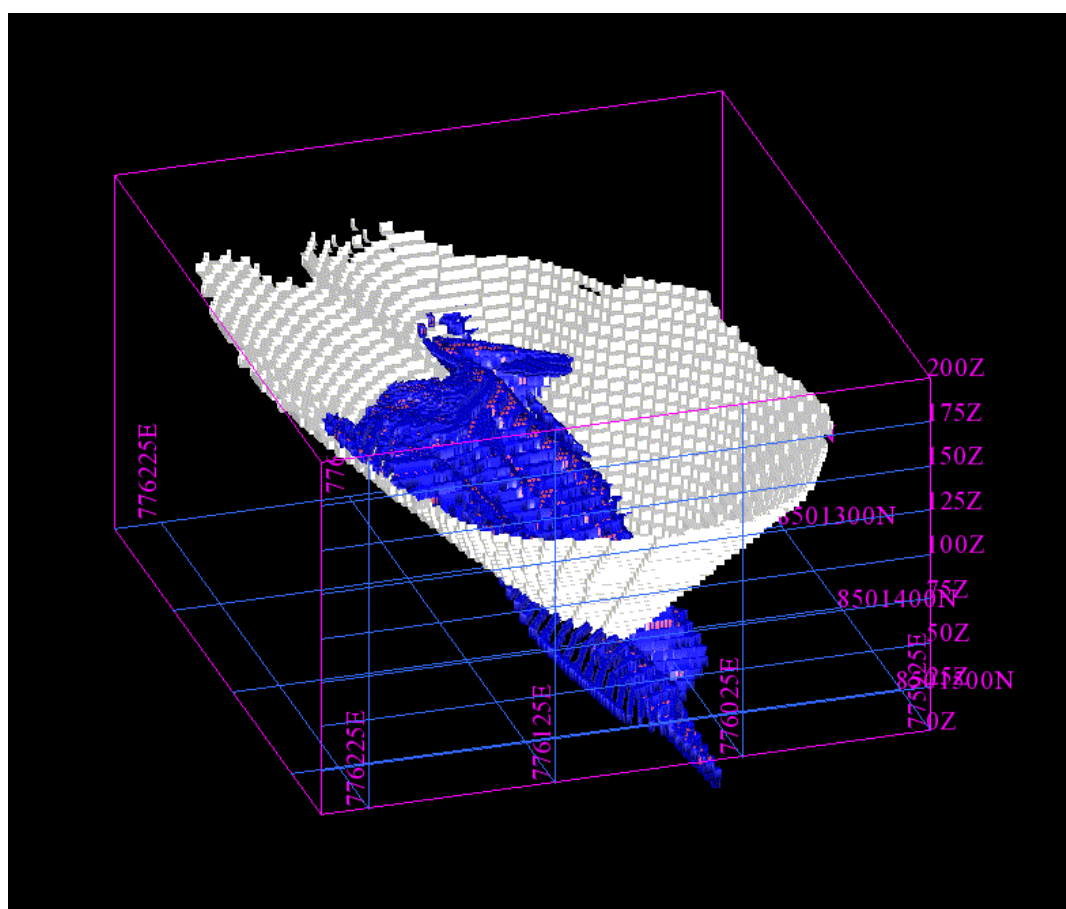
		Units	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
<b>Mining Inventory</b>											
Mt Bonnie (Open Pit)	t		725,919	237,018	351,542	137,359	-	-	-	-	-
Iron Blow (Underground)	t		2,084,083	-	48,332	262,641	400,000	400,000	397,455	400,000	175,655
<b>Average Mined Grades</b>											
Zinc	%		5.02%	3.80%	5.99%	5.45%	3.97%	6.12%	4.84%	4.73%	4.40%
Gold	g/t		2.11	2.60	1.42	1.94	2.29	3.33	2.19	1.52	1.66
Silver	g/t		143	205	151	179	114	184	141	81	85
<b>Metals Processed</b>											
Zinc	t		140,979	9,001	23,950	21,810	15,863	24,489	19,230	18,905	7,731
Gold	oz		192,105	19,791	18,311	24,901	29,387	42,871	27,982	19,485	9,376
Silver	Moz		12,948	1,561	1,937	2,300	1,466	2,361	1,804	1,040	480
<b>Metals Paid</b>											
Zinc	t		95,866	6,121	16,286	14,831	10,787	16,653	13,076	12,855	5,257
Gold	oz		98,262	10,123	9,366	12,737	15,032	21,929	14,313	9,967	4,796
Silver	Moz		9,031	1,089	1,351	1,604	1,022	1,646	1,258	725	335

### **a. Mt Bonnie**

The Mt Bonnie open cut mining assessment uses a conventional truck and shovel operating method with modelling conducted in Whittle pit optimisation software by CSA Global Pty Ltd.

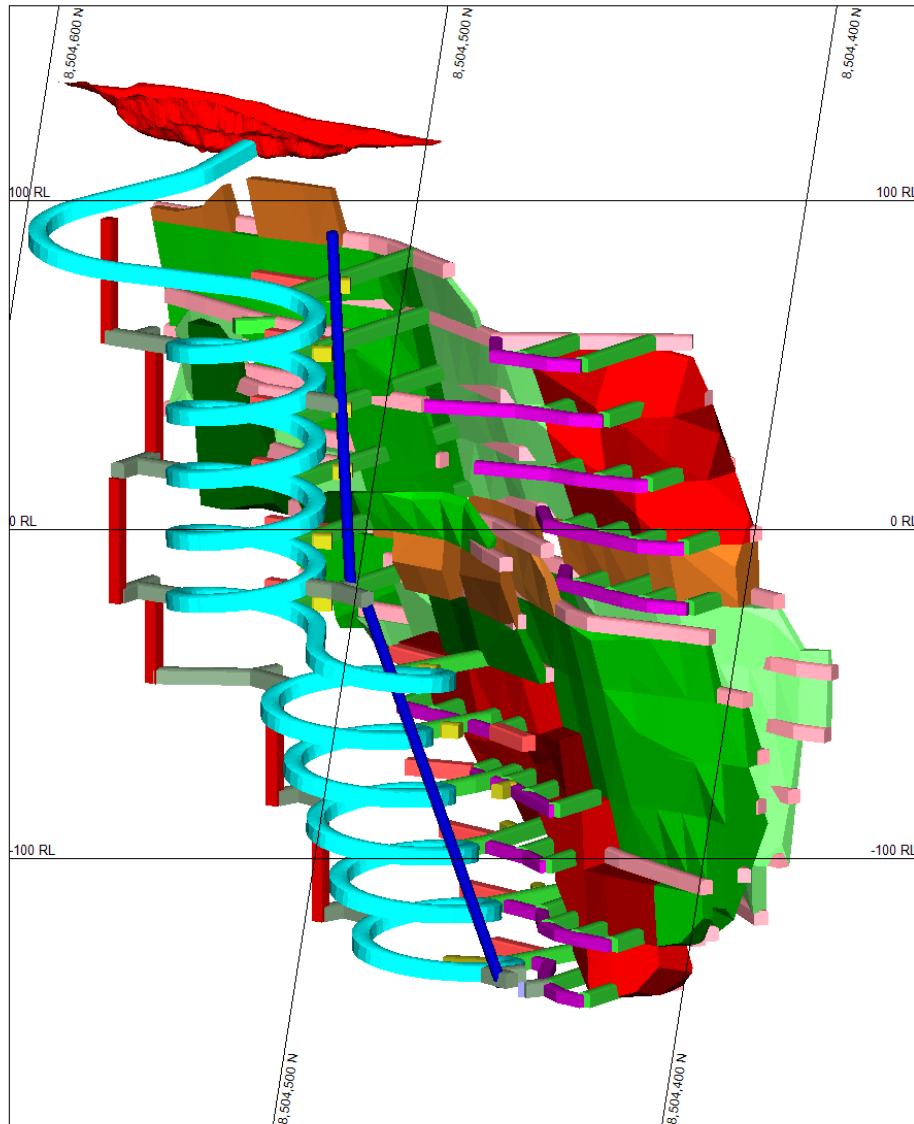
Mining assessments demonstrate that the Mt Bonnie mineral deposit can be viably mined using open cut methods with a mine life of approximately 1.8 years using an average strip ratio of 8.1:1 (Table 6 and Figure 2). The mining inventory established that approximately 40,400 tonnes of zinc, 4.04 million ounces of silver and 42,000 ounces of gold are available for processing at grades of 5.56% zinc, 173g/t silver, and 1.78g/t gold. Potential for additional ore sources (currently non-JORC) will be assessed as part of the PFS, these include historic waste dumps, and potential for near-surface mineralisation to the south of the existing historic open pit.

Ore will be transported by road train to the Run of Mine (ROM) pad located at the proposed Brocks Creek processing facility, approximately 17.6 km from the mine.



Australian industry standard mechanised loading and trucking techniques have been assumed to remove the ore from underground, with the ore then transported via road trains to the ROM pad at the Brocks Creek processing facility located approximately 21km from the mine.

The mining assessment demonstrates that the Iron Blow mineral deposit can be viably mined using sub-level open stoping methods with a mine life of approximately 5.2 years at the mill feed rate of 400,000 tonnes per year. A 2.7 g/t gold equivalent cut-off grade was used to calculate the mining inventory, this is consistent with similar underground mining operations in the Pine Creek region and elsewhere. The mining inventory established approximately 100,600 tonnes of zinc, 8.9 million ounces of silver and 150,000 ounces of gold are available for processing (Table 6).



**Figure 3:** Isometric view of the Iron Blow underground mine design looking south west. Blue – Fresh air intake/egress, Red – Exhaust air, Green stopes – Longitudinal Retreat stopes, Red stopes – transverse stopes, Brown – Blind uphole/crown stopes, Light Blue - decline.

**Table 6: Mt Bonnie and Iron Blow Mining Assessment Results**

Scenario	Unit	Mt Bonnie (O/P)	Iron Blow (U/G)
<b>Total Mined – Ore+Waste</b>	Mt	6.6	2.18
<b>Total Mined – Waste</b>	Mt	5.9	0.1
<b>Strip Ratio (S/R)</b>	Waste:Ore	8:1	-
<b>Total Ore – Process feed</b>	Mt	0.73	2.08
<b>Process Feed Grade - Zn</b>	%	5.56	4.83
<b>Process Feed Grade - Pb</b>	%	1.88	0.92
<b>Process Feed Grade - Cu</b>	%	0.36	0.26
<b>Process Feed Grade - Ag</b>	g/t	173	133
<b>Process Feed Grade - Au</b>	g/t	1.78	2.22
<b>Mining Inventory - Zn</b>	t	40,351	100,637
<b>Mining Inventory - Pb</b>	t	13,668	19,185
<b>Mining Inventory - Cu</b>	t	2,629	5,399
<b>Mining Inventory - Ag</b>	Koz	4.04	8.9
<b>Mining Inventory - Au</b>	Koz	42	150
<b>Life of Mine</b>	Years	1.8	5.2

#### 4. Processing Recoveries and Payables

A practical and cost-effective process to economically recover the key payable metals at the Hayes Creek project was developed in conjunction with BHM Process Consultants Pty Ltd using conventional technology. The process design was based on analysis of recent PNX and historic test work on ore from the Iron Blow and Mt Bonnie deposits (PNX ASX release 19 January 2016).

The process plant design (Figure 4) includes a two stage crushing circuit, followed by a single-stage closed circuit (ball mill) targeting a flotation feed size  $P_{80}$  of 75 $\mu$ m to the lead/copper rougher feed conditioning cell.

The lead/copper rougher/scavenger flotation circuit will produce a lead/copper concentrate which is subsequently re-ground via closed circuit fine grinding to achieve a particle size  $P_{80}$  28 $\mu$ m.

The finely ground concentrate is then cleaned in a separate lead/copper cleaner flotation bank. The lead/copper cleaner flotation tails are returned to the head of the rougher bank, whilst the lead/copper (and high precious metals) cleaner concentrate is sent to the pre-oxidation circuit followed by the Intensive Cyanide Leach (ICL) stage to leach the precious metals into solution.

Gold is recovered from solution and electrowon, followed by smelting to produce a doré bar, whilst the high grade silver ICL tail is retained for further processing.

Provision for a Merrill Crowe circuit to replace the pre-oxidation and ICL stage is also included in the CAPEX and OPEX costs to maximise silver recovery.

The lead/copper rougher/scavenger circuit tail is then fed to the zinc rougher/scavenger circuit to recover the zinc. The concentrate is finely re-ground in closed-circuit to achieve a particle size  $P_{80}$  35 $\mu$ m. This concentrate is then cleaned in a separate zinc cleaner flotation bank where the

zinc cleaner concentrate is sent to a thickener/ filter press to reduce moisture for final concentrate transport, whilst the zinc cleaner flotation tail is recirculated to the head of the zinc rougher bank for further treatment.

The tails streams are thickened to recover process water, with the underflow being discharged to tails, for in-pit tails deposition. It has been assumed that existing historical open pits at the Brocks Creek processing area may be used for in-pit tails deposition, a capital cost of \$1 million has been included for this purpose. The historical open pits are located on granted Mineral Leases and currently owed by Newmarket Gold NT Holdings Pty Ltd ('Newmarket'). Use of these pits will rely on a number of factors, including but not limited to:

- Suitability for in pit tails deposition
- Negotiating purchase or lease from Newmarket of Brocks Creek Minerals Leases
- Approval from Northern Territory Department of Mines and Energy and Environmental Protection Authority

A concentrate grade of at least 52% zinc is targeted based on PNX recent flotation test-work and industry modelling of deposits with similar mineralogy. The next stage of metallurgical test work and analysis will include:

- Improving the understanding of elemental and mineral distribution, association and liberation
- increasing recoveries of all payable metals to final products
- decreasing any potential penalty and/or deleterious elements
- investigating the installation of a Merrill Crowe circuit on site to recover gold and silver doré (a key assumption of the Scoping Study)
- potential for establishing a revenue stream from the lead and copper in concentrate post extraction of the silver and gold to doré

In addition, historical test-work on Mt Bonnie sulphide ore suggests an overall gold recovery of 92.5% can be achieved in the sulphide zones.

PNX is investigating a number of options including, but not limited to toll treatment options, overseas design and sourcing of equipment, and utilisation of used equipment to potentially reduce upfront capital costs and reduce risk associated with long-lead items. It should also be noted that timelines and costs for major equipment, design and engineering services in the current economic environment are more favourable than they were several years ago.



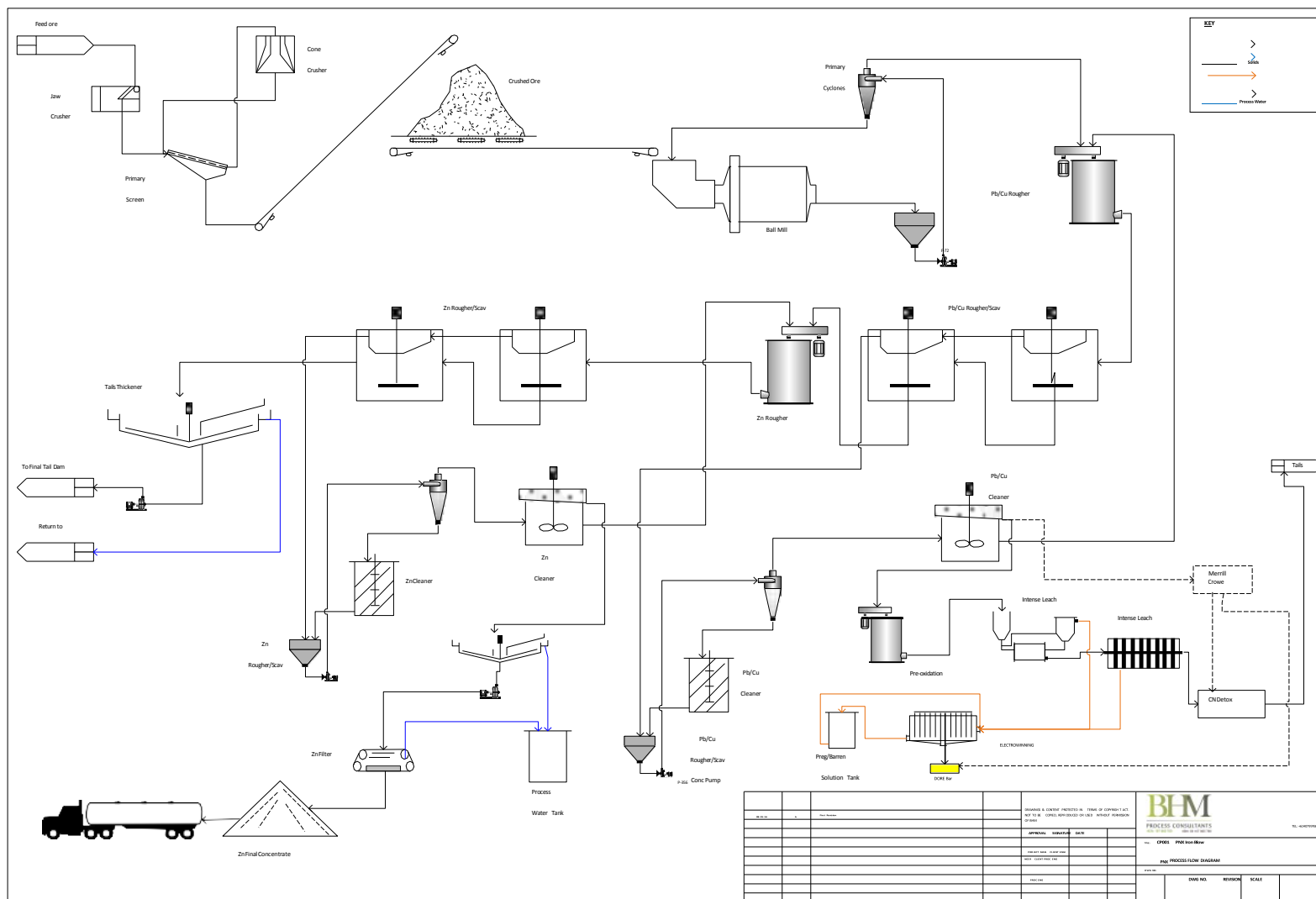


Figure 4: Process Flow Diagram

## 5. Commercial and Smelter Discussions

Preliminary discussions with international and domestic smelters indicate that the zinc concentrate generated from recent flotation test work by PNX would be a commercially viable product for use as smelter feed. Impurities and deleterious elements are either within specifications, or are expected to be reduced to within specifications with further locked-cycle flotation test work.

The Base Case financial scenario does not include any revenue from the lead/copper concentrate, although the potential to generate a payable product for lead, or copper, or both, will be investigated as part of the PFS.

Gold and silver are expected to be recovered from the lead/copper concentrate and a doré produced on site before being further refined offsite.

Indicative payable percentages from smelters and recoveries used in the Base Case scenario are shown in Table 7.

**Table 7:** Recoveries and Smelter Payable percentages used in the financial model

<b>Metal</b>	<b>Recovery</b>	<b>Payable</b>	<b>Recovery x Payable</b>
<b>Zinc</b>	80%	85%	68%
<b>Gold</b>	51%	100%	51%
<b>Silver</b>	70%	100%	70%
<b>Copper</b>	60%	0%	0%
<b>Lead</b>	60%	0%	0%

## 6. Infrastructure and Access to Markets

The Hayes Creek project is located approximately 7km east of the Stuart highway and approximately 170km south east of Darwin. The route to market would either be through the Port of Darwin to international smelters, or via rail southwards from Darwin to smelters on the Australian mainland. The concentrates would be containerised on site and trucked to Darwin.

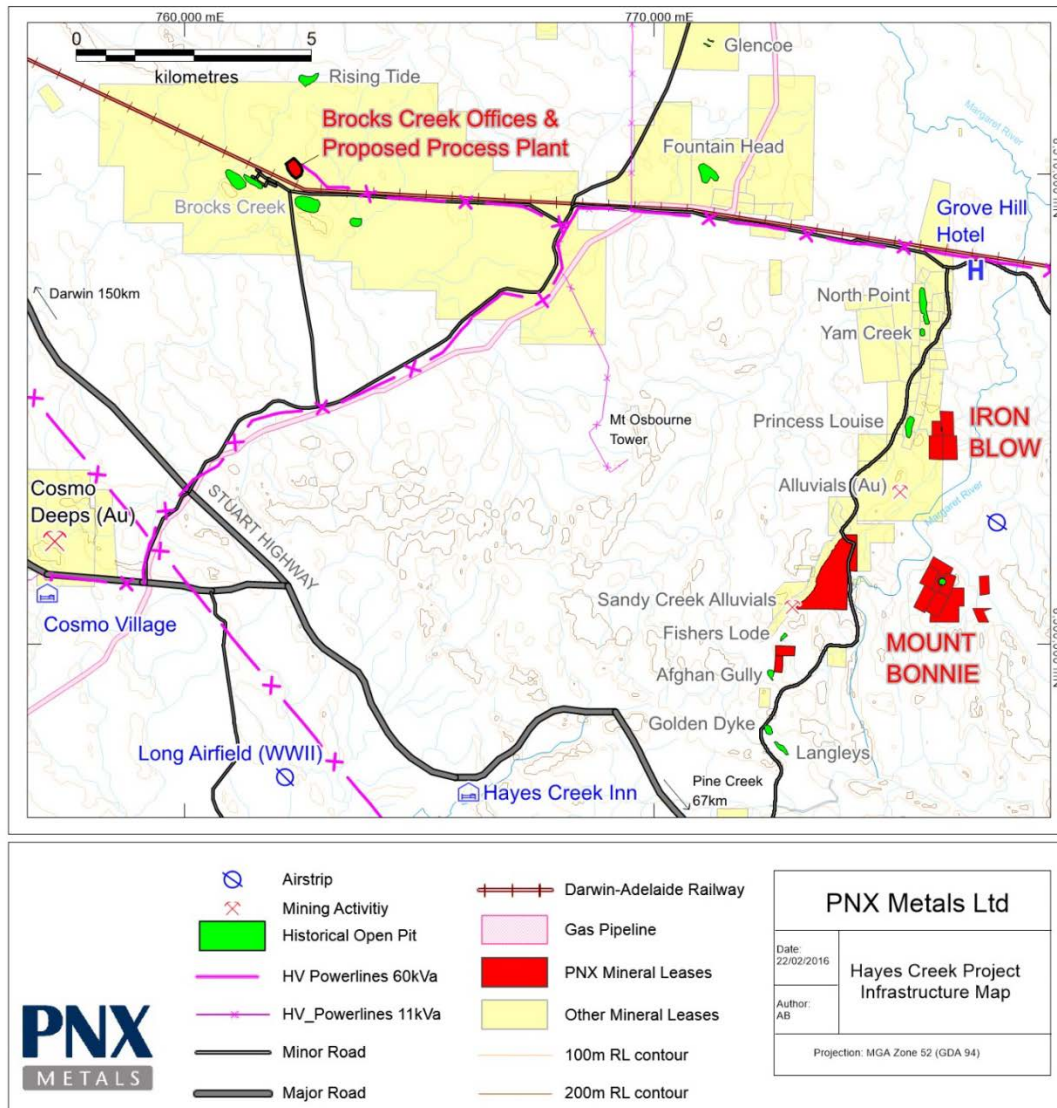
Gold and silver doré produced on site would be transported to an Australian gold refiner (assumed to be the Perth Mint) for further refining.

The processing facility is planned to be located at the site of the former Brocks Creek mine and processing facility that was decommissioned and removed in 2001 (currently owned by Newmarket). The Brocks Creek site has access to the Northern Territory electricity grid via a 66kV line and water may be sourced from nearby historical abandoned open pits which may also be considered for in-pit tails deposition. PNX currently leases office and core shed facilities at Brocks Creek from Newmarket via a standard commercial arrangement. Significant existing infrastructure exists and is illustrated in Figure 5.

The area is covered by the Telstra 3G mobile phone network and is well serviced by existing roads. These may require minor upgrading and maintenance to permit all weather operation.

The trucking distance from mine to mill would be approximately 17km (Iron Blow) and 21km (Mt Bonnie).

Operating personnel may be accommodated at either a recommissioned camp at Pine Creek or a purpose built facility near to the processing infrastructure at Brocks Creek. Personnel would operate on drive in, drive out roster from Darwin and the surrounding areas.



**Figure 5: Hayes Creek infrastructure**

## 7. Capital Costs

The initial capital expenditure estimate to develop the Hayes Creek project is \$54 million with first production derived from ore mined from the Mt Bonnie open pit. The capital estimate includes;

- Processing plant (including all electrical & instrumentation, on-stream-analyser, control room, office/workshop facilities, transport of equipment)
- Infrastructure (including road upgrades, power, tailings storage etc.)
- Critical path spares and first fill (reagents, mill balls)
- Water supply including ground water monitoring network
- Management internal and Engineering Procurement Construction & Management (EPCM)
- Statutory payments to land holders and Government agencies
- 25% contingency on all of the above costs

To develop the Iron Blow underground operation additional capital of \$10.9 million is required of which \$1.9 million is to establish the surface infrastructure and portal with the remainder to develop the decline to access first ore (to occur in year two of the project) with full mill feed production rate from Iron Blow being achieved during year three of the project.

## 8. Operating Costs (estimated per tonne of ore mined)

The Mt Bonnie average life of mine contract mining cost is \$28.25 tonne including transport costs from mine to ROM.

The Iron Blow average life of mine underground mining cost of \$84.78 tonne includes ongoing underground development costs after first ore, but not the initial \$10.9 million of capital noted above in Section 7.

In addition to the above, technical services costs for mining are \$3.49 tonne over the life of mine.

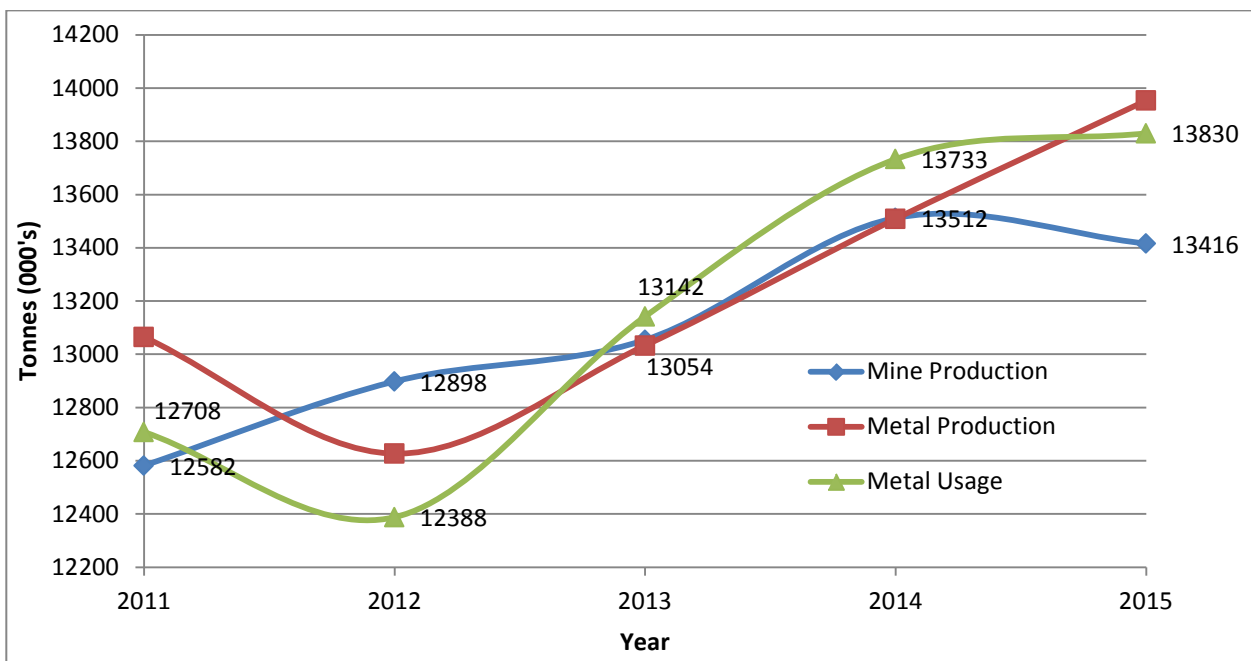
Underground mining development and production cost estimates for Iron Blow have been provided by a contractor currently operating in, and familiar with, the region.

Processing costs are \$38.61 tonne, this is inclusive of labour, consumables, reagents, power, maintenance and equipment hire, plus an additional \$6.68 tonne for general and administration charges.

Estimated Treatment Charges have been applied to the zinc concentrate and refining charges to the gold/silver doré, these total \$20.89 tonne. Shipping/transport costs of product from mine gate has been estimated at \$4.17 tonne.

## 9. Marketing

International Lead and Zinc Study Group (ILZSG) state that total consumption of zinc (metal usage) in 2015 was 13.83Mt, a 0.71% increase on 2014 consumption. Figure 6 presents world zinc usage, mine production and metal production (including recycled product) for 2011 to 2015 from the ILZSG.



**Figure 6:** World Zinc Demand and Supply (sourced from International Lead and Zinc Study Group [ilzsg.org](http://ilzsg.org))

The global supply of zinc concentrate is contracting with mining and processing having ceased at MMG's Century zinc mine in January 2016 removing approximately 450ktpa<sup>6</sup> from the market. Vedanta's

<sup>6</sup> MMG Ltd <http://www.mmg.com/en/Our-Operations/Mining-operations/Century.aspx>. Accessed 9 March 2016.

Lisheen zinc mine in Ireland has also wound down production with its final shipment of concentrate in January 2016<sup>7</sup> removing an additional 150ktpa from the market.

This equates to approximately 4% of the zinc concentrate supply no longer being available to meet a growing global demand for zinc metal from 2015/2016 onwards. Consensus forecast for zinc prices are consequently higher than the current spot prices.

PNX have utilised a number of industry sources to compile the prices forecast in Table 8 which have been used in the Scoping Study to generate the financial model. Spot prices are also shown (from 30 March 2016) as is the difference in the average price over the period of operations versus current spot prices.

**Table 8: Commodity Price Forecast (All prices in USD)**

Metal (\$)	2019	2020	2021	2022	2023	2024	2025	2026
Zinc (lb)	1.10	1.12	1.19	1.19	1.19	1.19	1.19	1.08
Zinc (t)	2,435	2,467	2,634	2,634	2,634	2,634	2,634	2,371
Gold (oz)	1,234	1,246	1,256	1,256	1,256	1,256	1,256	1,130
Silver (oz)	18.3	18.8	19.4	19.4	19.4	19.4	19.4	17.5
AUD	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78

Metal (\$)	Average prices 2019-2026	Spot Prices 29/03/16	Difference between average 2019-2026 and Spot prices	
			\$	%
Zinc (lb)	1.16	0.80	0.36	44%
Zinc (t)	2,555	1,774	781	
Gold (oz)	1,236	1,242	(6)	(0%)
Silver (oz)	19.0	15.4	3.6	23%
AUD	0.78	0.76	0.02	3%

<sup>7</sup> Online news article <http://www.irishtimes.com/business/energy-and-resources/lisheen-mine-in-tipperary-makes-final-shipment-1.2509609>. Accessed on 7 March 2016.

## 10. Financial Assessment and Economic Sensitivity

The key project returns are shown below in Table 9, while the key financial inputs and costs used in the base case analysis are presented in Table 10.

**Table 9: Results of the Base Case Financial Analysis**

Project Returns	AUD
Total Metal Revenue	\$631M
Total Zinc (& as a % of Total)	\$259M, 41%
Total Silver (& as a % of Total)	\$214M, 34%
Total Gold (& as a % of Total)	\$158M, 25%
Total Pre-tax net Cash flow	\$244M
Annual Average Cash flow	\$35M
Net Present Value, 10%	\$109.4M
IRR	58%
Payback Period	1.8 years

The Project is expected to generate an average Life-of-Mine pre-tax net cashflow of approximately \$35 million per year over its 7 year mine life, resulting in a total of \$244 million of pre-tax net cashflow (exclusive of initial capital expenditure).

Net revenues and pre-tax net cashflows peak in the fourth full year of production at \$122 million and \$60 million respectively, and decline to \$29 million and \$5 million respectively in the seventh and final year.

Metal revenue from the 400,000 tonnes per annum, open pit and underground mining operation, is split between zinc (41%), silver (34%), and gold (25%). Annual average production volumes are estimated at 16,100 tonnes of zinc (13,700 tonnes payable at 85%), 12.9 million ounces of silver, and 14,000 ounces of gold.

From an investment analysis standpoint, the initial investment of \$54 million in development capital yields a pre-tax Net Present Value, at a nominal 10% discount rate, of approximately \$109.4 million. The pay-back period on this investment is under 2 years, reflected in the Internal Rate of Return of least 58%.

**Table 10: Summary of Key Inputs and Cost Estimates for the Base Case Analysis**

Key Inputs and Costs	Average Life of Mine
<i>US Dollars</i>	
Zinc price per tonne	2,555
Au price per ounce	1,236
Ag price per ounce	19.0
AUD exchange rate	\$0.78
<i>AUS Dollars</i>	
Initial Capex to first production at Mt Bonnie	\$54.0m

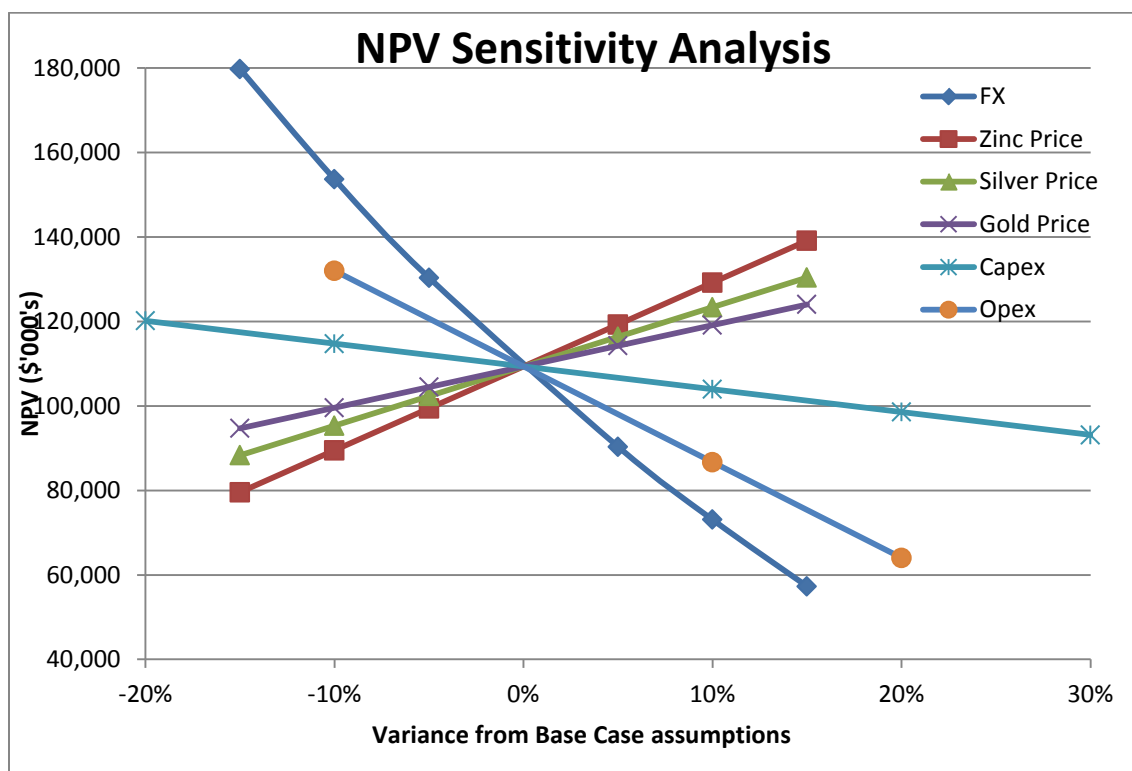
Iron Blow Capex and development costs to first ore	\$10.9m
Mt Bonnie (Open Pit) Mining – cost/tonne ore mined	\$28.25
Iron Blow (Underground) Mining – cost/tonne ore	\$84.78
Processing cost/tonne ore processed	\$38.61
Other operating costs (Tech Services, G&A)	\$10.17
Offsite charges (Transport, Treatment/Refining)	\$25.06
Royalties (NT Government/Newmarket)	\$13.85

Production volumes assume respective recoveries of zinc, gold, and silver of 80%, 51%, and 70%, and respective payable metal percentages of 85%, 100%, and 100% (as discussed previously in Sections 5). Selling prices are based on consensus forward estimates (see Section 9).

Royalties assumed are a 2% Net Smelter Returns Royalty over the gold and silver payable to Newmarket, plus a royalty payable to the Northern Territory government on extraction of all project minerals, which is calculated under the statutory rules and is equivalent to an approximate 5% NSR royalty.

The key financial projections of the project are most sensitive to movements in the AUD/USD foreign exchange rate, commodity prices, metal recoveries, and processing costs per tonne (Figure 7). Foreign exchange rates have the greatest effect on the project as they impact all sales revenues. A  $\pm 10\%$  movement in the foreign exchange rate has an approximate  $\pm \$40$  million effect on Project NPV.

**NOTE** - Commodity forward price forecasts commencing in 2019 have been used in the Study. Using commodity prices current as of 29 March 2016, being zinc US\$1,774, silver US\$15.4, gold US\$1,242, and US\$0.76/AUD, the project returns a pre-tax NPV (at a nominal 10% discount rate) of \$32.7 million, and life of mine pre-tax net cashflow of \$127.3 million, demonstrating the Project's robustness across the commodity cycle.



**Figure 7: NPV Sensitivity Analysis**



## **11. Approvals and Project Risks**

The Iron Blow and Mt Bonnie mineral deposits are located on granted mineral leases, where Native Title has been extinguished and the natural environment is disturbed from previous mining activities. PNX will however require approval to transport ore from mine to mill. The sovereign risk is considered low and likelihood of the Project gaining authorisation to mine is considered high.

A framework has been developed as part of a risk based assessment that identifies risks to be managed and mitigated during the development, construction and operational stages of the Project. Early stage work in particular will involve stakeholder engagement on all levels from local communities to government officials and Ministers, as well as environmental assessment, monitoring and closure plans. The approvals strategy presents concepts aimed at ensuring that the Project is not unduly delayed by using sound engagement practices and scientific based solutions to any potential issues. Should an Environmental Impact Statement be required, (the likelihood of this is considered high), the estimated timeframe from commencement of approvals work, to Authorisation to mine, is estimated at 23 months, followed by a construction period of approximately 9 months, with first product scheduled for early 2019. Preparation of a comprehensive Notice of Intent has commenced.

Once Authorisation is gained the Project can immediately move into execution and construction. Where possible and practical, the project team will also investigate ways of conducting early works that are permitted prior to gaining Authorisation aiming to minimise time to production.

During the anticipated time to gain Authorisation, the Project is planned to be advanced on all possible avenues, including geology, mining, processing, infrastructure, financing and engineering so that when Authorisation is granted the project can commence without delay.

## **12. Project Planning and Future Work**

It is envisaged the next stages of work will provide the relevant inputs to the Pre-Feasibility Study, and focus on the following areas for improvement and optimisation:

1. Metallurgical recovery:
  - increasing recoveries of all payable metals to final products
  - decreasing any potential penalty and/or deleterious elements
  - investigating the benefits of installing a Merrill Crowe circuit on site to recover gold and silver doré (a key assumption of the Scoping Study)
  - investigating the potential for establishing a revenue stream from the lead and/or copper in concentrate post extraction of the silver and gold to doré
2. Infill geological data to increase confidence in the Mineral Resources to define a majority of mineral resources in the mining plans in the 'Indicated' category for both deposits
3. Exploration drilling to test for extensions to mineralisation beyond the limit of current Mineral Resource boundaries
4. Exploration beyond the immediate Hayes Creek project, specifically in the surrounding Burnside exploration project area where significant potential exists for discovery and delineation of additional mineable mineralisation (see Figure 8)
5. Investigate the economic merit of processing historic oxide stockpiles that already exist on the Iron Blow and Mt Bonnie Mineral Leases
6. Commence the Approvals strategy and stakeholder engagement to reduce the risk of delay to the start of the project
7. Optimise the engineering of the processing plant and mine infrastructure, including reviewing tailings treatment facility location (and type), and location of waste dumps, to meet required Capital and Operating Cost estimate confidence levels

### 13. Resource Growth Potential

Both the Iron Blow and Mt Bonnie deposits hold the potential to contain additional mineralisation external to the mineral resources already defined. At Iron Blow this includes a near-surface extension to the western lode where there is limited drilling, and the prospect of additional high grade gold mineralisation at depth as seen in drill hole IBDH007.

Drilling in 2015 at Mt Bonnie (see PNX ASX release 18 June 2015) highlighted the potential for high grade shoot(s) of mineralisation to extend underneath the current limit of drilling, and discovered a southerly extension to mineralisation in 2 drill holes (MBDH034 and MBDH036) which has not been defined or closed-off.

Potential to define additional mineral resources also exists in the surrounding regional exploration tenure at Burnside, Moline and Chessman (Figure 8), where PNX is earning up to a 90% interest in two stages over 19 Exploration Licenses and 4 Mineral Leases (see PNX ASX release 18 August 14 for further details of agreement) covering approximately 1,700km<sup>2</sup> from Newmarket Gold NT Holdings Pty Ltd, a subsidiary of Newmarket Gold Inc.<sup>8</sup> (TSX: NMI).

By the end of the December 2015 quarter, total expenditure for the purpose of the first stage of the farm-in was approximately \$1.3 million. A further \$0.7 million is required to be spent by December 2016 to achieve the 51% stage one earn-in.



**Figure 8:** Hayes Creek Project and the Burnside, Moline and Chessman Exploration Projects

<sup>8</sup> See PNX ASX release 18/08/14 for further details of agreement  
Hayes Creek Project Scoping Study Executive Summary