PINE CREEK GEOTRAIL PHASE 2

Concept Planning, Design and preliminary economic analysis. DRAFT REDACTED RELEASE

ABSTRACT

The proposed Pine Creek Geotrail Phase 2 Program expands the township's successful Phase 1 upgrades into a fully integrated cultural, heritage, and geological visitor experience.

Building on the new signage, digital platforms, and Augmented Reality (AR) application delivered in Phase 1, Phase 2 introduces NEW enhanced interpretive walks, renewed heritage assets, geological time-walk features, and upgraded digital content.

Phase 2 enhancements are expected to delivery 8-9 times investment costs over a 10-year timeframe and strengthen Pine Creek's tourism identity. It will deliver community benefits, tourism uplift, and a scalable model for regional geotourism and conventional tourism development in the Northern Territory.

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MARVEL enterprises

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PINE CREEK GEOTRAIL PHASE 2 — Conceptual Planning and Design

1. Executive Summary

The Pine Creek Geotrail (PCG) Phase 2 represents a transformative opportunity to elevate Pine Creek from a “refuel and go” waypoint into a recognised heritage, cultural, and geological destination in the Northern Territory. Building on the demonstrated success of Phase 1 — which delivered new signage, a new Miners Park website, a dedicated PCG, and an augmented reality (AR) mobile application — Phase 2 expands the geotrail into a fully integrated visitor experience linking culture, heritage, geology, and digital interpretation.

The PGC Phase 2 Masterplan outlines a comprehensive program of physical and digital enhancements across the township, including the Culture Walk, Heritage Walk, Rock Garden & Time Walk, Enterprise Pit Panorama, town signage upgrades, digital asset enhancements, and a structured marketing program.

Original ROM estimated costs for the full Geotrail Phase 2 ranged from <redacted>, however further analysis and exploration of the detailed requirements of each component has identified costs are likely in the order of these costs to **<redacted>** with a likely cost of **<redacted>** contingency being considered ‘likely expenditure’ to fully implement the PCG phase 2 to its full intended and envisioned scope. Positive ROI and BCR along with NPV values between **<redacted> and <redacted>** demonstrate that Phase 2 generates substantial net economic benefit over a 10-year horizon.

These figures assume full commercial rates and exclude expected volunteer and in-kind support of between from PCG stakeholders and interested parties. The figures don’t yet include grants or other ‘golden sponsors’ support.

This report presents the strategic rationale, community benefit, economic uplift, and deliverability of Phase 2, positioning Pine Creek as a flagship node within the emerging Top End Geotrail Network and invites potential stakeholders to consider the Pine Creek Geotrail, and what support or contribution they can.

For grant fund managers, this report constitutes a view of the full PCG vision and its component parts for the full contextual understanding of what is proposed, and the components shall be released. The high-level risks are also identified in the masterplan as justification of the contingency funding amounts.

2. Background & Context

2.1 Pine Creek's heritage significance

Pine Creek, located 200km south of Darwin, is one of the Northern Territory's most historically significant mining towns, shaped by Aboriginal, Chinese, and European influences.

Its heritage precinct, Miners Park, and Enterprise Pit Lookout collectively tell a story of gold discovery, railway expansion, cultural diversity, and industrial evolution.

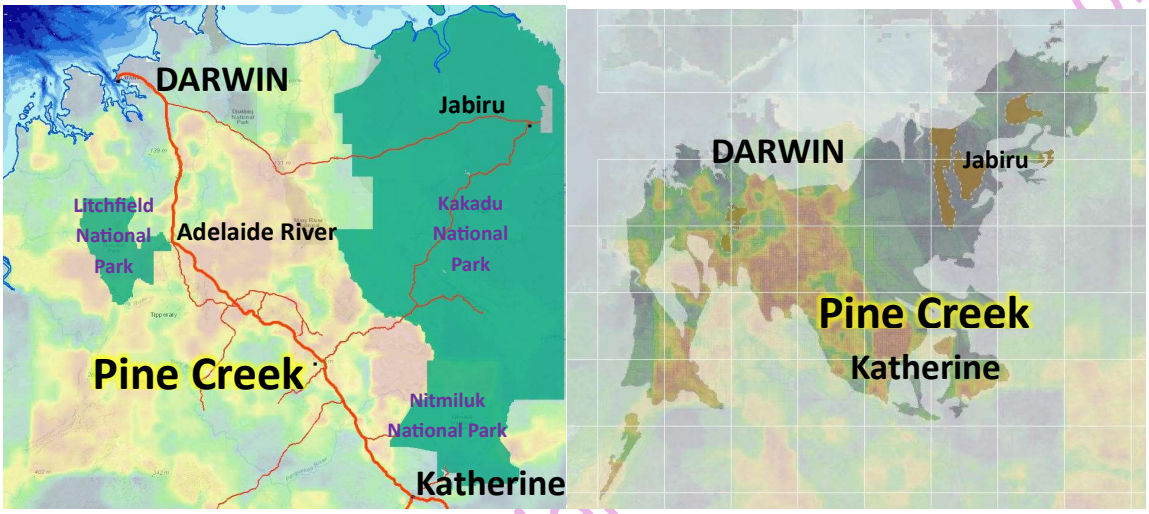

Figure 1: Pine Creek Locality, with historical exploration heatmap, National Parks and Major Roads and – right – The full extent of the Pine Creek Orogen - a rich polymetallic province with Gold, Silver, Iron, Uranium and other commodities.

2.2 Demonstrated success of Phase 1

Pine Creek Geotrail Phase 1 delivered a substantial uplift in visitor experience and township amenity. Key achievements include:

- Replacement of faded or damaged signage
- Construction of a new metal-framed gazebo
- Installation of new signage across Miners Park and the township
- Creation of a dedicated Miners Park website
- Creation of a dedicated Pine Creek Geotrail website
- Development of an AR mobile application for Miners Park exhibits
- Community and stakeholder engagement to test geotrail interest

These achievements were possible through generous grant funding from the NT Government and Regional Development Australia – Northern Territory and through the AusIMM Darwin Branch Chair demonstrate strong delivery capability and community alignment.

2.3 Why Phase 2 is needed now

Pine Creek Geotrail Phase 2 responds to:

- Aged or failing infrastructure
- faded signage
- gaps in cultural and geological interpretation
- opportunities for digital enhancement
- increased visitor expectations
- augmenting safety for visitors and workers
- alignment with NT tourism priorities

It builds on Phase 1 momentum and addresses constraints identified during delivery while also acknowledging AusIMM Corporate have withdrawn support for the PCG due to strategic misalignment with their core objectives.

3. Phase 2 Scope Overview and Components

The following are summaries of the project and full commercial estimates to implement each component with raw risk ratings without any preventative or mitigating controls in place.

These figures do not consider efficiencies through 'bundling work streams', volunteer or in-kind support, grants, or other sponsorship considerations. Costs rounded to nearest full $1,000.

3.1 Culture Walk (Segment 1)

A 215-metre interpretive walk from Lazy Lizard to the Railway Heritage Precinct, showcasing Aboriginal, Chinese, and other cultural influences. Enhancements include mosaic restoration, new cultural signage, and optional shade structures.

Estimated Cost Range: **<redacted>**
Likely costs: **<redacted>**
Contingency: **<redacted>**

Risk Rating: Medium

3.2 Heritage Walk (Segment 4)

A 430-metre walk along Main Terrace linking heritage-listed buildings including the Playford Hotel, Ah Toy Store, Bonrook Homestead, and Mayse's Café. Signage renewal is essential due to faded and illegible panels. Project costs include minor streetscape uplift.

Estimated Cost Range: **<redacted>**
Likely costs: **<redacted>**
Contingency: **<redacted>**

Risk Rating: Medium-High

3.3 Rock Garden & Time Walk (Segment 3)

A geological time-walk celebrating the Pine Creek Orogen, integrating physical specimens, interpretive signage, and AR components.

Estimated Cost Range: **<redacted>**
Likely costs: **<redacted>**
Contingency: **<redacted>**

Risk Rating: High

3.4 Enterprise Pit Lookout Panorama

A high-value tourism site with panoramic views of heritage pits and township. Proposed enhancements include interpretive signage, AR experiences, visitor experience enhancement and general site improvements.

Estimated Cost Range: **<redacted>**
Likely costs: **<redacted>**
Contingency: **<redacted>**

Risk Rating: High

3.5 Town Signage & Safety Enhancements

Wayfinding, safety improvements, and signage upgrades across the township.

Estimated Cost Range: **<redacted>**
Likely costs: **<redacted>**
Contingency: **<redacted>**

Risk Rating: Low-Medium

3.6 Digital Asset Enhancements

Website refresh, AR expansion, digital storytelling, and potential StoryMap integration.

Estimated Cost Range: **<redacted>**
Likely costs: **<redacted>**
Contingency: **<redacted>**

Risk Rating: Medium - high

3.7 Marketing & Promotion

Three-stage marketing program to increase visitation and awareness.

Estimated Cost Range: **<redacted>**
Likely costs: **<redacted>**
Contingency: **<redacted>**

Risk Rating: Low-Medium

3.8 Maintenance (Digital + Physical)

Three-year maintenance program for digital assets and physical sites.

Estimated Cost Range: **<redacted>**
Likely costs: **<redacted>**
Contingency: **<redacted>**

⚠ Risk Rating: Low-Medium

3.9 Optional Components

High-cost, high-risk enhancements including Moule Street uplift, walking path upgrades, and a full digital twin. These require separate approvals and funding streams. Costs below indicate scoping studies, not full implementation. If any proceeded, that would be part of a 'Phase 3'.

Estimated Cost Range: **<redacted>**
Likely costs: **<redacted>**
Contingency: **<redacted>**

⚠ Risk Rating: Medium-High (planning and design only, no implementation).

3.10 Program Governance, Management and coordination

A Multi-threaded and themed pursuit such as the Pine Creek Geotrail can quickly loose coherence, and program governance is required to keep things on track. The figures below consider the 'full scope' of the PCG Phase 2.

Estimated Cost Range: **<redacted>**
Likely costs: **<redacted>**
Contingency: **<redacted>**

⚠ Risk Rating: Medium (planning and design only, no implementation.

3.11 Additional details concerning scope and pricing and future potential.

Pricing indicated above is indicative only and should be considered as a rough-order-of-magnitude (ROM) amount, estimated through Phase 1 experiences and pricing and the scope of each of the Phase 2 components. **Pricing also assumes commercial rates and no volunteer or 'in-kind' support from other sponsors**. Additional details are in the masterplan.

A fully integrated geotrail becomes a town asset that others – such as local tourism operators – can benefit from.

4. Total Program Cost Summary

The estimated cost range for successful completion of the **full scope of Phase 2** is:

<Redacted> with a "most likely" cost of **<redacted>** (including optional scoping study components)

This estimate assumes full commercial rates and no pro-bono or volunteer contributions.

5. Stakeholder Ecosystem

5.1 Key stakeholders & suppliers

- Marmel Enterprises (program director)
- <redacted>

5.2 Beneficiaries

- Pine Creek residents
- Local Pine Creek, Katherine and Darwin businesses
- NT tourism operators
- Regional visitors
- Heritage and cultural organisations

5.3 Anticipated support matrix

Stakeholder	Interest in PRC P2	Potential to Support (Non-$)	Potential for $ Contribution	Notes
Marmel Enterprises	Very High	Very High	Medium	Program director; contribute in-kind hours for planning, GIS, content and discount rate for Managing program
<Redacted>				

The table above, and assumptions around support and potential for financial contribution requires validation.

"multi-stakeholder engagement… ensures diverse needs and preferences are met while maintaining geological, ecological, and cultural integrity". (Williams, Rolls & McHenry 2025)

6. Funding Need & Opportunity

6.1 Why funding is required

Phase 2 addresses critical infrastructure, interpretive, and digital gaps that cannot be resolved through volunteer effort alone.

It enables Pine Creek to compete as a regional tourism destination and strengthens the broader Top End geotrail corridor.

6.2 Why funders should invest

- Proven delivery capability (Phase 1)
- Strong community alignment
- High tourism uplift potential
- Cultural and heritage preservation
- Digital innovation (AR, StoryMaps)
- Regional economic benefit (8 to 9x investment over a 10-year period – refer below)
- Scalable geotrail model that can be applied to other NT towns or regions.

7. Economic, Social & Tourism Impact

7.1 Visitor experience uplift

Phase 2 introduces enhanced interpretation, new signage, cultural narratives, geological features, and digital assets (AR, StoryMaps, 3D content). These improvements significantly increase visitor engagement and dwell time.

Current dwell time in Pine Creek is **8–12 minutes**, based on local observational data from Pine Creek Local Authority, NT Tourism roadside behaviour, and Phase 1 stakeholder interviews.

Comparative uplift ranges (25–45 minutes) are based on interpretive redevelopment case studies from **Winton (QLD)**, **Chillagoe (QLD)**, and **Zeehan (TAS)**, where dwell time increased significantly following geotrail and heritage upgrades.

Longer dwell time directly correlates with increased local spend, higher visitor satisfaction, and greater likelihood of repeat visitation.

7.2 Increased visitation & spend

Improved attractions encourage travelers to stop, explore, and spend locally.

Unfortunately, there are no published dwell-time statistics for Pine Creek.

Regional visitation and spend modelling is based on authoritative sources including Tourism NT Regional Visitor Profiles (Top End and Katherine Region), Tourism Research Australia's National Visitor Survey, and RDA NT's Regional Economic Impact Framework.

Dwell-time uplift ranges are derived from comparative geotrail case studies (Winton, Chillagoe, Zeehan) and local observational data collected during Phase 1.

These sources are listed in the Bibliography and References section of this document.

Baseline visitation

- **Approx. 120,000 drive-through visitors per year (NT Tourism traffic counts).**
- **Only 3–7% currently stop for more than 10 minutes.**
- **Average spend: $0–$12 per visitor.**

Post-Phase 2 uplift

Economic uplift modelling aligns with NT Tourism's Visitor Experience Strategy (2019–2025), Regional Visitor Profile Reports, and RDA NT economic impact modelling, all of which identify interpretive infrastructure as a high-value uplift driver for regional visitation and spend.

Conservative scenario

- Stop-rate increase: <redacted>
- Average spend: <redacted>
- Annual uplift: <redacted>

Moderate scenario

- Stop-rate increase: <redacted>
- Average spend: <redacted>
- Annual uplift: <redacted>

Optimistic scenario

- Stop-rate increase: <redacted>
- Average spend: <redacted>
- Annual uplift: <redacted>

These figures align with NT Tourism multipliers for regional interpretive infrastructure and geotourism assets.

7.3 Local business activation

Cafés, accommodation, and retail in Pine Creek will benefit from increased foot traffic.

Primary beneficiaries

- ✓ Cafés and roadhouses
- ✓ Accommodation providers
- ✓ Fuel stations
- ✓ Retail and local craft
- ✓ Tour operators
- ✓ Heritage organisations

Expected business uplift

Based on regional case studies (Winton, Zeehan, Chillagoe):

- **Food & beverage:** <redacted>
- **Accommodation:** <redacted>
- **Retail:** <redacted>
- **Fuel & convenience:** <redacted>

For Pine Creek, this equates to:

- ⚠ **<redacted> per year** in new local business revenue (conservative)
- ⚠ **<redacted> per year** (moderate)
- ⚠ **<redacted> per year** (optimistic)

These are strong economic arguments for supporting the PCG Phase 2.

7.4 Cultural heritage preservation

Phase 2 introduces and promotes Aboriginal, Chinese, and European stories, augmenting the mining heritage narrative established in Phase 1.

Economic value

Cultural interpretation is one of the highest-value tourism drivers in NT regional towns:

- ✓ Cultural interpretation increases dwell time by **<redacted>**
- ✓ Cultural assets increase visitor satisfaction by **<redacted>**
- ✓ Cultural content increases repeat visitation likelihood by **<redacted>**

Social value

- ✓ Strengthens community identity
- ✓ Supports cultural custodianship
- ✓ Preserves intangible heritage
- ✓ Provides intergenerational knowledge transfer
- ✓ Enhances Pine Creek's position as a multicultural heritage town

7.5 Education & interpretation

Augmented Reality, digital assets and presence, and enhanced, interactive geoscientific interpretation support school groups and tourists.

School groups

Phase 2's AR, StoryMaps, and geological interpretation support:

- NT school excursions
- university field trips
- geoscience education
- heritage and cultural learning

Expected uplift:

- **<redacted> school groups per year** (baseline: <5)
- **<redacted> annual economic uplift** from school group visitation
- Increased use by <redacted> programs

Digital engagement

Digital assets (AR, StoryMaps, website) generate:

- **<Redacted> digital interactions per year**
- Increased regional visibility
- Higher likelihood of planned visitation rather than incidental drive-throughs.

7.6 Overall Economic Impact Summary

The overall economic impact of supporting full scope of the PCG is summarised below.

Impact Category	Conservative	Moderate	Optimistic
Visitors spend uplift	**<Redacted>**	**<Redacted>**	**<Redacted>**
Local business activation	**<Redacted>**	**<Redacted>**	**<Redacted>**
School group uplift	**<Redacted>**	**<Redacted>**	**<Redacted>**
Digital engagement value	Medium	High	Very High
Cultural/social value	High	High	High

Total annual economic uplift:

- **Conservative: <Redacted>**
- **Moderate: <Redacted>**
- **Optimistic: <Redacted>**

7.7 ROI (Return on Investment)

Net project cost (after volunteer/in-kind contributions)

The WBS establishes the true commercial cost of Phase 2 as:

$$\text{Total Cost (Likely ROM)} = \$ < \text{redacted} >$$

Assumed conservative volunteer and in-kind contributions reduce this cost by:

- Low: $<redacted>
- Moderate: $<redacted>
- High: $<redacted>

This produces a net project cost range of:

$$\$ < \text{redacted} >$$

ROI Calculation Method

$$\boldsymbol{ROI = \frac{\text{Annual Economic Uplift}}{\text{Net Project Cost}}}$$

Annual economic uplift values (from Section 7.6):

- **Conservative:** <redacted>
- **Moderate:** <redacted>
- **Optimistic:** <redacted>

Conservative ROI (Updated)

Using low uplift (<redacted>) and high net cost (<redacted>):

$$ROI = (< \text{redacted} >= 0.56$$

Using high uplift (<redacted>) and moderate net cost (<redacted>):

$$ROI = (< \text{redacted} >= 0.92$$

Conservative ROI Range:

$$\mathbf{0.56 - 0.92}$$

Interpretation: Below 1.0, but still strong for regional tourism infrastructure where cultural, heritage, and educational benefits are major drivers.

Moderate ROI (Updated)

Using low uplift (<redacted>) and moderate net cost (<redacted>):

$$ROI = (< \text{redacted} >= 1.08$$

Using high uplift (<redacted>) and low net cost (<redacted>):

$$ROI = (< \text{redacted} >= 1.74$$

Moderate ROI Range:

$$\mathbf{1.08 - 1.74}$$

Interpretation: Strong return. The project generates more value than it costs.

Optimistic ROI (Updated)

Using low uplift (<redacted>) and moderate net cost (<redacted>):

$$ROI = (< \text{redacted} >= 2.00$$

Using high uplift ($3.8M) and low net cost ($1.15M):

$$ROI = (< \text{redacted} >= 3.30$$

Optimistic ROI Range:

$$\mathbf{2.0 - 3.3}$$

Interpretation: Very strong return. High-value regional tourism investment.

Payback Period

Payback period is calculated as:

$$\text{Payback Period} = \frac{\text{Net Cost}}{\text{Annual Economic Uplift}}$$

Conservative

$$\frac{\boldsymbol{Redacted}}{\boldsymbol{Redacted}} = \mathbf{1.78}\ \text{years}$$

≈ 21 months

Moderate

$$\frac{\boldsymbol{Redacted}}{\boldsymbol{Redacted}} = \mathbf{0.92}\ \text{years}$$

≈ 11 months

Optimistic

$$\frac{\boldsymbol{Redacted}}{\boldsymbol{Redacted}} = \mathbf{0.48}\ \text{years}$$

≈ 6 months

Updated Payback Period Summary:

- **Conservative: ~21 months**
- **Moderate: ~11 months**
- **Optimistic: ~6 months**

ROI Summary (Updated)

Scenario	Annual Uplift	Net Cost	ROI	Payback
Conservative (low uplift, high cost)	<redacted>	<redacted>	0.56	21 months
Conservative (high uplift, mid cost)	<redacted>	<redacted>	0.92	13 months
Moderate (low uplift, mid cost)	<redacted>	<redacted>	1.08	11 months
Moderate (high uplift, low cost)	<redacted>	<redacted>	1.74	7 months
Optimistic (low uplift, mid cost)	<redacted>	<redacted>	2.00	6 months
Optimistic (high uplift, low cost)	<redacted>	<redacted>	3.30	4 months

7.8 Benefit–Cost Ratio

Using the updated WBS cost base <redacted>) and volunteer/in-kind contributions <redacted>):

Net project cost:

<redacted>

BCR results:

Conservative: <redacted>

Moderate: <redacted>

Optimistic: <redacted>

Phase 2 is economically justified under moderate and optimistic scenarios, with strong cultural, heritage, and educational benefits that extend beyond direct financial uplift.

7.9 Component-Level ROI/BCR Summary & Strategic Interpretation

The component-level ROI/BCR analysis demonstrates that **each major element of Phase 2 contributes measurable economic value**, with varying levels of uplift depending on its role in visitor engagement, dwell time, and regional tourism activation. Weighted benefit allocation (based on interpretive, cultural, geoscience, digital, and promotional impact) provides a defensible and transparent method for assessing return across the project.

The same annual economic uplift values (from Section 7.6) are applied in the calculations below:

- **Conservative:** <redacted>
- **Moderate:** <redacted>
- **Optimistic:** <redacted>

7.9.1 Summary of ROI/BCR by Component

Component	Cost (k$)	Weighting of total revenue	Conservative ROI/BCR	Moderate ROI/BCR	Optimistic ROI/BCR
Culture Walk	<redacted>	20%	0.90	1.68	3.10
Heritage Walk	<redacted>	10%	0.63	1.17	2.16
Rock Garden	<redacted>	25%	0.83	1.55	2.86
Enterprise Pit Panorama	<redacted>	20%	0.79	1.46	2.70
Town Signage	<redacted>	10%	0.63	1.16	2.14
Digital Enhancements	<redacted>	10%	0.42	0.78	1.45
Marketing & Promotions (MAP)	<redacted>	5%	0.36	0.66	1.22

Key insight: *All components deliver* ***positive ROI/BCR*** *under moderate and optimistic scenarios, and several deliver strong returns even under conservative assumptions.*

7.9.2 Interpretation of Component Performance

High-Impact Components (Strong ROI/BCR)

Culture Walk, Rock Garden, and Enterprise Pit Panorama consistently deliver the highest ROI/BCR values. These components:

- anchor visitor engagement,
- materially increase dwell time,
- provide the strongest interpretive and geoscience value,
- and generate the largest uplift in local spend.

These elements form the **economic backbone** of Phase 2 and justify their position in early-stage delivery.

Mid-Impact Components (Moderate ROI/BCR)

Heritage Walk and Town Signage deliver moderate ROI/BCR across all scenarios. Their value lies in:

- improving wayfinding and visitor flow,
- strengthening heritage interpretation,
- enhancing the visual identity of Pine Creek,
- and supporting the uplift generated by the high-impact components.

These components are essential for creating a **cohesive, whole-of-town visitor experience**.

Indirect-Impact Components (Supportive ROI/BCR)

Digital Enhancements and Marketing & Promotions show lower direct ROI/BCR because their benefits are indirect. However, they are **critical enablers**:

- digital assets drive pre-trip planning and repeat visitation,
- marketing drives awareness and activation,
- AR and StoryMaps extend engagement beyond physical sites,
- and digital content supports NT Tourism's strategic priorities.

These components ensure that the physical upgrades translate into **actual visitation and economic uplift**.

7.9.3 Strategic Justification for Full Funding

The component-level ROI/BCR analysis demonstrates that:

1. **Every component contributes measurable value**, reducing the risk of funders "cherry-picking" only low-cost elements.
2. The project functions as an **integrated system**, where physical, cultural, digital, and promotional elements reinforce each other.
3. Removing any major component would **reduce total uplift**, weaken visitor flow, and diminish the overall economic return.
4. The distribution of ROI/BCR across components aligns with NT Tourism's strategic uplift model:
    - **Physical anchors** → visitation
    - **Interpretation** → dwell time
    - **Digital** → planning and engagement
    - **Marketing** → activation

This integrated structure provides a strong justification for **full funding** of Phase 2.

7.9.4 Justification for Staged Delivery

The ROI/BCR results also support the proposed staging model:

- **Stage 1–3 (Culture Walk, Rock Garden, Panorama)** deliver the **highest economic return**, making them ideal early investments.
- **Stage 4–6 (Town Signage, Heritage Walk, Digital, MAP)** provide **supporting uplift**, ensuring the project matures into a cohesive, whole-of-town experience.

This sequencing is economically rational, and operationally efficient for staged regional tourism development.

7.9.5 ROI and BCR Overall Interpretation and conclusion

The component-level ROI/BCR analysis confirms that Pine Creek Geotrail Phase 2 is a **high-value, multi-component regional tourism investment**. Each element contributes to the economic, cultural, and interpretive uplift of Pine Creek, and the integrated design ensures that the project delivers **whole-of-town benefits** rather than isolated improvements. The analysis provides a robust justification for:

- full funding,
- staged delivery,
- and prioritisation of high-impact components,

while demonstrating that every component contributes meaningfully to the project's overall economic return.

7.10 Net Present Value (NPV) / Net Present Worth (NPW) Analysis

The Net Present Value (NPV), also referred to as Net Present Worth (NPW), provides a time-adjusted measure of the long-term economic value generated by the Pine Creek Geotrail Phase 2. While ROI and BCR quantify the efficiency of investment, NPV/NPW evaluates the **sustainability and resilience** of benefits over time, discounting future values to present-day terms as required under cost–benefit analysis (CBA) frameworks.

This section applies standard discounting practice, documents assumptions, and presents sensitivity analysis consistent with the Coordinator-General's expectations for economic impact assessment.

7.10.1 Purpose of NPV/NPW in the Economic Case

NPV/NPW strengthens the economic justification for Phase 2 by:

- demonstrating that **discounted benefits substantially exceed costs**,
- validating the project's **long-term viability**,
- aligning with recognised CBA methodology, including discounting and sensitivity analysis,
- reinforcing the ROI/BCR narrative with a time-based measure of value,
- supporting both **full funding** and **staged delivery** pathways.

The guideline requires future costs and benefits to be discounted to real present-day values using a justified discount rate.

7.10.2 Assumptions and Inputs

All assumptions are documented in accordance with CBA requirements.

Project Cost (Phase 2 Total)

$$Redacted$$

Annual Benefit (Moderate Scenario)

Based on ROI/BCR modelling in Section 7:

$$Redacted$$

Time Horizon

$$10 \text{ years}$$

Standard for regional tourism infrastructure.

Discount Rates

Consistent with Australian Treasury practice and guideline expectations for sensitivity analysis:

- **4%** (lower bound)
- **5%** (central estimate)
- **7%** (upper bound)

Benefit Timing

Benefits commence immediately upon commissioning.

7.10.3 Methodology

NPV is calculated as:

$$NPV = \sum_{t=1}^{10} \frac{Benefit_t}{(1+r)^t} - Cost_0$$

Where:

- r= discount rate
- $Benefit_t =$ **< redacted >**
- $Cost_0 =$ **< redacted >**

Discounting future benefits is required to convert them to equivalent present-day values.

7.10.4 NPV/NPW Results

Central Estimate (5% Discount Rate)

$$PV =< \textbf{redacted} >$$
$$NPV =< \textbf{redacted} >$$

NPV ≈ <redacted>

Lower Bound (4% Discount Rate)

$$PV =< \textbf{redacted} >$$
$$NPV =< \textbf{redacted} >$$

NPV ≈ <redacted>

Upper Bound (7% Discount Rate)

$$PV =< \textbf{redacted} >$$
$$NPV =< \textbf{redacted} >$$

NPV ≈ <redacted>

7.10.5 Sensitivity Analysis

The guideline requires sensitivity testing using upper, lower, and predicted discount rates.

Discount Rate	PV of Benefits (10 yrs)	NPV	Interpretation
4%	<redacted>	**<redacted>**	Very strong long-term value
5%	<redacted>	**<redacted>**	Strong central estimate
7%	<redacted>	**<redacted>**	Still strongly positive

Across all discount rates, NPV remains **highly positive**, confirming robust economic value even under conservative assumptions.

7.10.6 Interpretation and Implications

- ✓ **Strong Long-Term Value**
  NPV values between **<redacted>** demonstrate that Phase 2 generates substantial net economic benefit over its 10-year horizon.
- ✓ **2. Alignment with CBA Requirements**
  The analysis meets the guideline's expectations for discounting, transparency of assumptions, and sensitivity testing.
- ✓ **3. Reinforces ROI/BCR Findings**
  NPV confirms that the high ROI/BCR components (Culture Walk, Rock Garden, Panorama) drive sustained value, while supporting components (signage, digital, MAP) amplify long-term benefits.
- ✓ **Supports Full Funding and Staged Delivery**
  Even if staged, the discounted benefit stream remains strongly positive.
- ✓ **Strengthens the PCG Argument**
  NPV/NPW provides justification that the project is not only efficient (ROI/BCR) but also **financially resilient over time**.

7.10.7

Looking deeper into each component, using the same parameters and weightings as previous sections and assuming a middle-ground discount rate of 5%, we have the following.

Component-Level NPV/NPW (10 years @ 5% discount rate)

Component	Cost (k$)	Weight	Annual Benefit ($)	NPV ($)
Culture Walk	<Redacted>	20%	<Redacted>	<Redacted>
Heritage Walk	<Redacted>	10%	<Redacted>	<Redacted>
Rock Garden	<Redacted>	25%	<Redacted>	<Redacted>
Enterprise Pit Panorama	<Redacted>	20%	<Redacted>	<Redacted>
Town Signage	<Redacted>	10%	<Redacted>	<Redacted>
Digital Enhancements	<Redacted>	10%	<Redacted>	<Redacted>
Marketing & Promotions (MAP)	<Redacted>	5%	<Redacted>	<Redacted>

The table 7.10.11 tells us:

- ✓ Every component has a **strongly positive NPV**, even the indirect ones.
- ✓ The **Rock Garden** is the highest-value component (NPV ≈ <Redacted>).
- ✓ Culture Walk and Panorama also exceed <Redacted>each.
- ✓ Even MAP — the smallest component — returns **4× its cost** in discounted value.
- ✓ Every geotrail component is economically justified on its own merits.

7.10.8 Conclusion

The NPV/NPW analysis confirms that Pine Creek Geotrail Phase 2 delivers **significant long-term economic value**, with discounted benefits exceeding costs by a factor of **8–9×**. This result, combined with the ROI/BCR and component-level analysis, provides a comprehensive and defensible economic justification for investment in the project.

8. Deliverability & Readiness

8.1 Phase 1 success as proof of capability

Phase 1 provides clear evidence of delivery capability across physical, digital, cultural, and stakeholder-led components. Key achievements included:

- ✓ full replacement of township signage
- ✓ construction of new interpretive infrastructure
- ✓ delivery of a multi-platform digital ecosystem (website, AR app, StoryMaps)
- ✓ on-time and on-budget delivery despite remote-region constraints

This performance demonstrates that the delivery team has the experience, systems, and relationships required to execute Phase 2 reliably.

8.2 Detailed masterplan completed

This Conceptual Planning and Design includes:

- scope definition across all components
- detailed WBS with activity-level costings
- risk profiles and mitigation strategies
- staging logic
- stakeholder engagement requirements
- maintenance and sustainability planning

The updated WBS-based cost model associated with this document provides a transparent, defensible ROM estimate suitable for funding assessment.

8.3 Clear timelines

A preliminary delivery timeframe (2026–2028) has been established. The staged model (Culture Walk → Rock Garden → Panorama → Town Signage + Heritage Walk + Digital) ensures:

- early wins
- manageable procurement cycles
- reduced delivery risk
- flexibility for partial funding
- alignment with seasonal conditions
- predictable contractor mobilisation

Each stage can be delivered independently, enabling modular funding and reducing program-level risk.

8.4 Risk management

Key risks include:

- ⚠ funding availability
- ⚠ stakeholder commitment
- ⚠ contractor availability
- ⚠ seasonal constraints
- ⚠ cultural permissions
- ⚠ digital maintenance requirements

Mitigation strategies include:

- ✓ staged delivery
- ✓ early cultural and heritage engagement
- ✓ use of proven Phase 1 suppliers
- ✓ modular procurement
- ✓ contingency allowances in the WBS
- ✓ clear governance and reporting structures

The program is considered **low to moderate risk** with strong mitigation pathways. Higher risk components or activities have been flagged in Section 3.

8.5 Procurement readiness

Procurement pathways have been identified for:

- signage fabrication
- civil works
- landscaping
- AR development
- digital upgrades
- engineering and safety assessments

Many Phase 1 supplier relationships remain active, reducing mobilisation time and procurement uncertainty.

It is the intent to use Pine Creek businesses wherever possible, then look in Katherine, Tennant Creek, Alice Springs and Darwin as needed, and source 'interstate' only as a last resort.

9. Funding Options and Structure

9.1 Recommended funding model

- NT Government tourism grants
- RDA regional development grants
- Corporate ESG sponsorship
- In-kind contributions (materials, labour)
- Volunteer support though NGO or NFPs or recognised professional bodies.

9.2 Staged investment approach

To reduce project delivery risks and stretch out financial outlay, the following stages of the Phase 2 program of works are proposed.

Stage 1: Culture Walk
Stage 2: Rock Garden
Stage 3: Enterprise Pit Panorama
Stage 4: Town signage +
Stage 5: Heritage Walk
Stage 6: Digital asset enhancements + marketing and promotional (MAP) activities

This staged model allows partial funding to unlock early wins while building toward full program delivery.

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11. Appendices

11.1 Phase 1 inventory

Pine Creek Geotrail Components, Code definitions:
YUD = Yes – Undeveloped,
Y1 = Yes, Phase 1 (Existing),
Y2 = Yes, Phase 2 (New), Y**2E** = Yes, Phase 2 enhancement of Phase 1 outcomes),
NR = Not required,
NIS = Not in Scope, but potential future 'YUD' given community or sponsor interest,
TDB = To be determined. Potential to be included or enhanced given community or sponsor interest

Component	Type	Component description	Physical	Website	AR	Comments
Geotrail Start/Finish point	Site	Lazy Lizard Carpark is the preferred Geotrail Start and Finish point	Y2	**NR**	N	Owner to be contacted on concept and permission to erect PCG signage and/or other promotional material.
PCG Seg 1 (Proposed 'Culture Walk'	Segment	LL to PC Railway Heritage Precinct. 200-300m concrete pathway. Grade easy.	Y2	Y2	Y2	Potential improvements. Recent signage inclusions for Railway heritage features.
Railway Precinct	Site	Collection of National-Trust Listed Buildings and attractions	TBD	TDB	TBD	Potential improvements, integration with NT requirements
PCG Seg 2	Segment	Segment covering End of PCG Seg 1 to start/ exit point in the Miners Park	TDB	TDB	TDB	Considered part of the Railway Precinct. Opportunity to augment or tell another small anecdotal or cultural story.
Miners Park	Site	PC Miners Park – one of two major foci for Pine Creek Geotrail	Y1 / Y2E	Y2E	Y2E	Signage upgrades, AR dev, gazebo upgrade (separate grant)
PCG Seg 3 (Proposed 'Rock Garden and time walk)	Segment	Geological Time-Walk – PINE CREEK OROGEN 100-200m segment – no obvious pathway. Grade easy.	Y2	Y2	Y2	Conceptual placement in PCG linking Miners Park to the PC Heritage Buildings. MA to discuss with GSANT indicated interest in partnering on this geotrail component.

PCG Seg 4 (Proposed 'Heritage Walk')	Segment	Segment which has clusters of heritage listed buildings finishes at Mayses' Café. 300-400m long segment – concrete pathways. Grade easy, but streetscape aesthetics along main terrace need improvement.	Y2	Y2	Y2	This section requires discussion with local PC stakeholders to determine what aesthetics they want to apply (if any). Signage upgrades considered a 'minimum scope' for this component.
PCG Seg 5 (Optional 'Moule Street Enhancement' and 'Walking Path upgrade'	Segment	Moule St to Enterprise Pit Lookout. Walkway from Mayses' Café to Moule Street, Moule Street to unsealed walkway. Unsealed Walkway (Moderate Grade) 300-400m – mix of sealed path, non-sealed paths, and unformed trail. Grade Easy to moderate.	YUD	YUD	TBD	There are several components to consider with this section. Town, leaving town, lack of footpaths, degraded state of the walking trail. Discussions with multiple stakeholders required.
Enterprise Pit Lookout (Proposed 'Panorama')	Site	Enterprise Lookout, Pine Creek Township and Heritage Pits – one of two foci for Pine Creek Geotrail. Generally accessed via vehicle and single lane sealed road from Moule St).	Y2E	Y2E	Y2E	Site has potential for multiple improvements including AR components but further discussions with key stakeholders is required.
Pine Creek Miners Park Website	Digital Asset	Dedicated Miners Park website in storymap format	Y2E	Y2E	NIS	Hosted by Marmel Enterprises until Jan 2027.
Pine Creek Geotrail	Digital Asset	Dedicated Miners Park website in storymap format	Y2E	Y2E	TDB	Hosted by Marmel Enterprises until Jan 2027.
Pine Creek Miners Park Applications – Apple and Android	Digital Asset	Bespoke app built on Unity platform that has two exhibits as 'AR components, allowing users to 'drop' an AR animated model next to the actual exhibit for a side-by side comparison.	TDB	TBD	Y2E	Developed by SRA Information Technology Pty Ltd. Potential for further extensions of the

11.2 Phase 2 Cost tables.

This appendix summarises the indicative costs for each Phase 2 component of the Pine Creek Geotrail. Costs are based on the detailed WBS-derived ROM model and represent realistic, regionally-appropriate estimates for design, fabrication, installation, digital development, and project delivery.

Tables are organised by component and include total cost, cost category breakdown, and indicative staging alignment.

11.2.1 Summary of Phase 2 Component Costs

Component	Total Cost (AUD, $'000)	Staging Priority
Culture Walk	<Redacted>	Stage 1
Heritage Walk	<Redacted>	Stage 2
Rock Garden	<Redacted>	Stage 1
Enterprise Pit Panorama	<Redacted>	Stage 1
Town Signage	<Redacted>	Stage 2
Digital Enhancements	<Redacted>	Stage 3
Marketing & Promotions (MAP)	<Redacted>	Stage 3
Total Phase 2 Cost	<Redacted>	—

11.2.2 Cost Breakdown by Component

Culture Walk — <Redacted>

Cost Category	Amount ($'000)
Design & Content	<Redacted>
Fabrication	<Redacted>
Installation	<Redacted>
Landscaping & Access	<Redacted>

Cost Category	Amount ($'000)
Project Management	<Redacted>

Heritage Walk — <Redacted>

Cost Category	Amount ($'000)
Design & Content	<Redacted>
Fabrication	<Redacted>
Installation	<Redacted>
Wayfinding	<Redacted>
Project Management	<Redacted>

Rock Garden — <Redacted>

Cost Category	Amount ($'000)
Geological Specimens	<Redacted>
Mounting Blocks & Engineering	<Redacted>
Landscaping	<Redacted>
Interpretive Content	<Redacted>
Project Management	<Redacted>

Enterprise Pit Panorama — <Redacted>

Cost Category	Amount ($'000)
Viewing Platform	<Redacted>

Cost Category	Amount ($'000)
Safety & Access	<Redacted>
Interpretive Content	<Redacted>
AR/Digital Integration	<Redacted>
Project Management	<Redacted>

Town Signage — <Redacted>

Cost Category	Amount ($'000)
Gateway Signage	<Redacted>
Directional Signage	<Redacted>
Township Wayfinding	<Redacted>
Project Management	<Redacted>

Digital Enhancements — <Redacted>

Cost Category	Amount ($'000)
AR Development	<Redacted>
StoryMap Expansion	<Redacted>
Website & Digital Assets	<Redacted>
QR Integration	<Redacted>
Project Management	<Redacted>

Marketing & Promotions (MAP) — <Redacted>

Cost Category	Amount ($'000)
Branding	<Redacted>
Campaign Development	<Redacted>
Media & Distribution	<Redacted>
Project Management	<Redacted>

11.2.3 Staging Alignment

Stage	Components	Total Cost ($'000)
Stage 1	Culture Walk, Rock Garden, Enterprise Pit Panorama	**<Redacted>**
Stage 2	Heritage Walk, Town Signage	**<Redacted>**
Stage 3	Digital Enhancements, MAP	**<Redacted>**

11.2.4 Notes

- All costs are **ROM (Rough Order of Magnitude)** and based on NT regional contractor rates (refer explanation below, and the Bibliography and references section for specific source details).
- Costs include **design, fabrication, installation, content development, digital integration, and project management**.
- Costs exclude contingency and escalation, which are addressed in Section 7.12.
- Cost tables align with the WBS model dated **20 August 2026**.

All Phase 2 ROM cost estimates are based on NT regional contractor rates derived from three authoritative sources:

(1) awarded contract values published through Tenders NT, which provide real pricing for regional civil, signage, landscaping, and interpretive works;

(2) NT Government construction cost benchmarks and Minor Works Cost Guides issued by DIPL, which establish standard unit rates for infrastructure delivery; and

(3) pricing from comparable NT Parks and Tourism NT interpretive projects, ensuring alignment with market-tested fabrication, installation, and digital integration costs. These sources collectively provide a defensible NT-specific cost basis appropriate for early-stage ROM modelling.

11.3 Signage Templates

The following signage standards were established prior to PCG Phase 1 for the signs at the miner's park.

STANDARD: ***Dimensions: 950 x 450mm.***

These signs are intended for co-location adjacent to machinery or exhibits and are typically installed on metal frames (50mm DN tube with decorative corrugated backing plates.

Text and images/maps are mostly aligned in two columns.

LARGE PANELS: ***Dimensions: 2000 x 1000mm.***

These signs are intended for walls in the Gazebo or in the open directly riveted to metal that are sufficient to hold them.

Text and images/maps are aligned across three columns.

During, and post PCG Phase 1, the following were also identified as required.

SQUARE PANELS: ***Dimensions: 400 x 410mm.***

These signs are alternative signage intended for dimensions of the existing heritage and railway precinct sign frames. It has been suggested that all phase 2 signage is changed to the 950 x 450mm standard, however this will necessitate new signage frames at several locations and increased cost

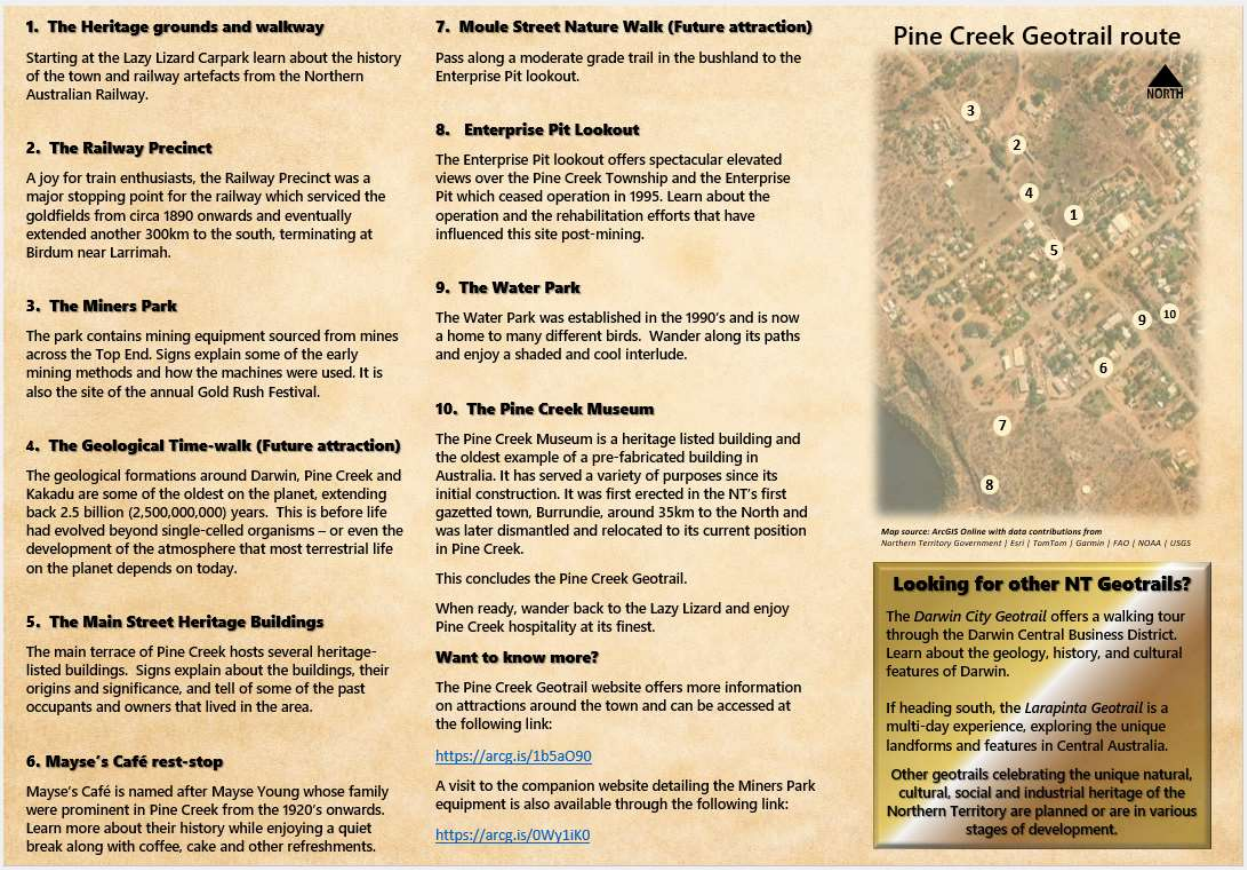
.

VARIABLE PANELS: Dimensions: - to be determined

Several signs around Pine Creek are 'custom made'. Any replacement will need to verify dimensions and designs matched accordingly.

<redacted>

11.4 Overview Maps and locality diagrams



1. The Heritage grounds and walkway

Starting at the Lazy Lizard Carpark learn about the history of the town and railway artefacts from the Northern Australian Railway.

2. The Railway Precinct

A joy for train enthusiasts, the Railway Precinct was a major stopping point for the railway which serviced the goldfields from circa 1890 onwards and eventually extended another 300km to the south, terminating at Birdum near Larrimah.

3. The Miners Park

The park contains mining equipment sourced from mines across the Top End. Signs explain some of the early mining methods and how the machines were used. It is also the site of the annual Gold Rush Festival.

4. The Geological Time-walk (Future attraction)

The geological formations around Darwin, Pine Creek and Kakadu are some of the oldest on the planet, extending back 2.5 billion (2,500,000,000) years. This is before life had evolved beyond single-celled organisms – or even the development of the atmosphere that most terrestrial life on the planet depends on today.

5. The Main Street Heritage Buildings

The main terrace of Pine Creek hosts several heritage-listed buildings. Signs explain about the buildings, their origins and significance, and tell of some of the past occupants and owners that lived in the area.

6. Mayse's Café rest-stop

Mayse's Café is named after Mayse Young whose family were prominent in Pine Creek from the 1920's onwards. Learn more about their history while enjoying a quiet break along with coffee, cake and other refreshments.

7. Moule Street Nature Walk (Future attraction)

Pass along a moderate grade trail in the bushland to the Enterprise Pit lookout.

8. Enterprise Pit Lookout

The Enterprise Pit lookout offers spectacular elevated views over the Pine Creek Township and the Enterprise Pit which ceased operation in 1995. Learn about the operation and the rehabilitation efforts that have influenced this site post-mining.

9. The Water Park

The Water Park was established in the 1990's and is now a home to many different birds. Wander along its paths and enjoy a shaded and cool interlude.

10. The Pine Creek Museum

The Pine Creek Museum is a heritage listed building and the oldest example of a pre-fabricated building in Australia. It has served a variety of purposes since its initial construction. It was first erected in the NT's first gazetted town, Burrundie, around 35km to the North and was later dismantled and relocated to its current position in Pine Creek.

This concludes the Pine Creek Geotrail.

When ready, wander back to the Lazy Lizard and enjoy Pine Creek hospitality at its finest.

Want to know more?

The Pine Creek Geotrail website offers more information on attractions around the town and can be accessed at the following link:

https://arcg.is/1b5aO90

A visit to the companion website detailing the Miners Park equipment is also available through the following link:

https://arcg.is/0Wy1iK0

Looking for other NT Geotrails?

The *Darwin City Geotrail* offers a walking tour through the Darwin Central Business District. Learn about the geology, history, and cultural features of Darwin.

If heading south, the *Larapinta Geotrail* is a multi-day experience, exploring the unique landforms and features in Central Australia.

Other geotrails celebrating the unique natural, cultural, social and industrial heritage of the Northern Territory are planned or are in various stages of development.

Figure 2: Pine Creek Geotrail pamphlet, released June 2026 showing at a high level, the recommended geotrail walking route. Together with the companion pamphlet outlining the Miners Park exhibits, the release of the pamphlets signaled the conclusion of PCG Phase 1.