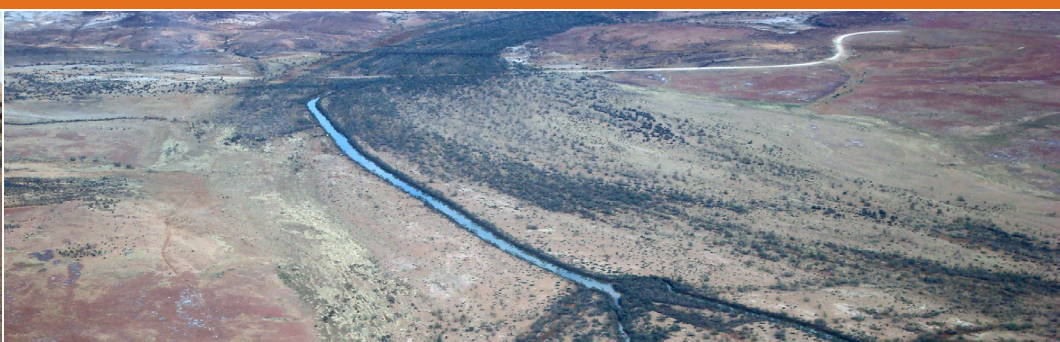




Government of South Australia
South Australian Arid Lands Natural
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May 2011

South Australian Arid Lands Natural Resources Management Board
**Cultural landscape assessment and analysis of the
Neales Catchment and Algebuckina Waterhole**

Gini Lee

CULTURAL LANDSCAPE ASSESSMENT AND ANALYSIS OF THE NEALES CATCHMENT AND ALGEBUCKINA WATERHOLE

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June 2011

Report to the South Australian Arid Lands Natural Resources Management Board

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This report may be cited as:

Lee, G. 2011. Cultural landscape assessment and analysis of the Neales Catchment and Algebuckina Waterhole. A report by the Queensland University of Technology to the South Australian Arid Lands Natural Resources Management Board. Port Augusta.

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ACKNOWLEDGEMENTS

The collection of information for the community engagement, landscape assessment and analysis of the Neales Catchment project would not have been possible without the assistance and support of the following people. I wish to acknowledge the important and always helpful guidance, fieldwork assistance and project management support of Henry Mancini, the SAAL NRM water project officer who understands the critical importance of community and landscape considerations in ecological research programs. To the people and communities of the Neales Catchment who provided shelter, good conversations and advice and assistance getting around, our sincere thanks. Thank you especially for your time to the Dunjiba and Arabunna people, the managers and staff of Allandale, The Peake, Nilpinna, Todmorden and Mount Barry Stations, the teachers and children of the Oodnadatta Aboriginal School, and to the Pink Roadhouse in Oodnadatta and the William Creek mob. A special acknowledgement for the hard work of my collaborators Dale McNeil, David Schmarr, Gresley Wakelin-King, Glen Scholz and Justin Costelloe and their ever willing advice and opinions about the landscape. Most importantly my gratitude and admiration to my research assistant and travelling partner Brooke Madill who has prepared the drawings and collections of images that so enrich this report.

EXECUTIVE SUMMARY

This report presents the findings of a regional-scale landscape and cultural assessment of the Neales River catchment, and is one component of the South Australian Arid Lands Natural Resources Management Board project *"Understanding and managing critical refugia in the arid lands of central northern Australia"* (the Critical Refugia project). Funding was granted through the Australian Government's Caring for Our Country 2009/10 Program. This work contributes to the SAAL Regional NRM Plan Resource Condition Target (RCT) 4: *"By 2020, at least 50% of documented natural ecosystems of particular cultural significance that are suffering from disturbance are in improved condition"*.

The cultural landscape assessment and analysis component of the Critical Refugia project assessed the physical and cultural characteristics of selected waterholes and other waterbodies in the Neales River Catchment. A detailed cultural landscape assessment into the physical features and human influences of the Neales Catchment uses a landscape design based methodology and cross-disciplinary approach. A landscape design approach identifies the environmental, economic, cultural and social values associated with landscape features (e.g. waterholes, rockholes and springs). It provides practical solutions, such as, identifying impacts from tourism pressure, and designing visitor management options through consultation with stakeholders and reference to scientific knowledge. It identifies the Aboriginal cultural importance of waterbodies and options for a combined management approach.

The detailed landscape attributes study of individual sites was informed by the communities and stakeholders who use and experience the various waterbodies: as a resource, as places of cultural and spiritual importance, and as places for recreation, meeting, education and research.

Four other scientific studies associated with the Critical Refugia project provide the biophysical context and inform the landscape assessment methodology to enable a whole of catchment perspective for this multidisciplinary project – geomorphology, hydrology, aquatic ecology, and vegetation and ecological diversity. The themes developed typify the ecosystem attributes of the area. This provides management approaches for the protection and conservation of critical waterholes and water systems.

The project captures feedback from face to face community consultation. It maps and documents the landscape character and values of the Neales River Catchment. The Critical Refugia Matrix is a key organisational tool for landscape assessment. It provides an understanding of the complex overlay of water–landscape relationships at the regional and local scale, and the mapping of associations between water and social and cultural systems. The matrix identifies key stakeholders and landscape conditions and their interconnectivity. The results of the matrix survey are collated into individual illustrated site reports. (see Section 6 Landscape Assessment).

The Neales Catchment is a cultural landscape in which rivers and waterholes are magnets for people and ecosystems. The landscape character of the Neales River Catchment has basic structural elements and a range of uses and attributes:

- The major Neales and Peake ephemeral river systems flow towards Lake Eyre through tablelands and gibber and gypsum plains.
- Historic road and exploration routes cross these plains by linking to the water systems: vegetated rivers, creeks, waterholes, springs, bores and dams.
- Pathways along rivers, creek lines and road crossings, uncovers rich evidence of human occupation – Arabunna and Dunjiba people’s campsites and meeting grounds, pastoral stock routes and watering points, historic mining sites, tourism campsites and fishing holes.
- Aquatic environments of the Neales Catchment are places of intense activity, where resources used for shelter, water and warmth leave a visible impact upon fragile riverine ecologies and historic sites.
- Roads and tracks, GPS and the internet has improved access to these remote areas.

Five key waterbodies with high landscape quality, indigenous and pastoral heritage, intensity of use from a number of stakeholders, and proximity to road access, have been identified as critical areas for management:

- The Algebuckina complex including West Algebuckina semi-permanent waterhole and historic site, and East Algebuckina permanent waterhole. This is the key critical refuge site for the entire catchment.
- Hookeys Waterhole and expanded number of semi-permanent waterholes to the north of the Oodnadatta–Coober Pedy creek crossing are central to the recreational and cultural life of the Oodnadatta community.

- The Old Peake Repeater Station historical site and springs, and the associated Freeling Springs area, demonstrate the cultural history of exploration, communication and pastoralism.
- Angle Pole is a semi-permanent waterhole and historic site for Aboriginal meeting grounds and is one of a series of waterholes critical to early stock routes along inland rivers.
- The Oodnadatta Track string of historical sites from William Creek to Afghan Waterhole, and the associated springs, waterholes and infrastructure, demonstrate the boom and bust nature of life in the arid lands and the essential requirement of proximity to water for settlements.

South Australia's Stony Plains area, which contains the Neales Catchment, and Oodnadatta Track, can be characterised by the following broad landscape attributes:

- Rising and falling terrain between gibber plains and sand dune country afford picturesque views over arid pastoral landscapes.
- Tree-lined creeks snake across bare gibber plains providing spatial variety and a green and cool contrast with red and rocky desert landscapes.
- The presence of water in ephemeral and permanent waterholes, specifically Algebuckina Waterhole, contributes to high landscape quality because of its rich ecological diversity and uniqueness in an arid landscape.
- Wide gravel and dirt roads provide access across the plains, interrupted at regular intervals by treed creek crossings.
- Remnant Ghan railway embankments and ruins punctuate the road journey and identify places where water sources once supported habitation.

Initial consultation with a range of stakeholders aimed to gain local understanding of the Neales Catchment landscape qualities and the cultural values that the waterholes and their environs hold. The stakeholders raised a number of points that can inform future management approaches:

Understand the dynamics of arid zone water regimes: The variable nature of rivers, creeks, waterholes and floodplains, and the current and emerging resource-driven practices that impact on them, affect their future sustainability in the face of climatic and economic change and will be influenced by identifying and valuing their landscape qualities.

Changing pastoral practices and communities: Contemporary pastoral practices have influenced the demise of old infrastructure which focused stock into fragile watercourses and intense use of limited water points.

Awareness of cultural values: Awareness of Aboriginal and European cultural values is critical to developing environmentally responsible management through understanding community aspirations.

Landscape assessment and ecological values: Aquatic environments require relevant information on landscape qualities to evaluate ecological health and cultural values.

Involvement of Aboriginal stakeholders in expanded programs: Meaningful engagement with the Arabunna and Dunjiba communities is an important objective. The introduction of participatory education programs around waterholes is a way to continue ongoing engagement.

Access to water: Identifying and mapping who accesses water and for what purpose, should be established to protect fragile waterholes and their riparian zones.

Impacts upon riparian zones adjacent to waterholes: Stakeholders report that stream bank modification by tourists causing destabilisation (e.g. step cutting, bank compaction, firewood gathering) is potentially worse than any stock damage.

Management of tourism drivers and impacts: Identify critical issues, and develop management programs for protection, rehabilitation and management of critical refugia sites and culturally important places currently visited by tourists.

Access and information: Signs and fences can prevent access to vantage points for the majority of visitors but are only marginally effective when visitors leave designated tracks.

Government programs and support: Research to identify a range of management approaches requires funding programs and management assistance that enables change across public and private landscapes and sites.

The waterholes and other waterbodies are the focus of ongoing human existence in the outback. The appeal of arid zone landscapes is increased by the visual presence of water

and/or the indication that water sources exist to sustain vegetation. Natural waterholes and springs are refuges for animals and humans in dry times, and are places for sustenance and recreation. Preferred landscapes exhibit high biodiversity, viewpoints overlooking visibly pristine landscapes and/or heritage sites that may be in ruins. Constructed dams, bores and tanks are indicators of pastoral and other activity and contribute to the cultural landscape, but there is a preference for 'natural' and preferably pristine waterholes. Conversely, there is also a preference for 'safe' places to camp and walk associated with waterholes where clear visibility of the surrounding area and ground conditions is possible. There is also a preference for occupation at the margins of waterholes, in creek beds and riparian edges.

The presence of fish and other wildlife at healthy waterholes contributes to the desert experience and promotes an important opportunity for recreation and social meetings for locals and visitors. The landscape quality of watercourses and waterbodies is reduced by visible signs of human-induced impacts such as vehicular tracks, multiple campfires, damaged trees, stock tracking, erosion gullies, compacted ground, litter and inappropriate signage and infrastructure. The impact of intense tourism visitation along the Oodnadatta Track at waterholes and creek crossings is a serious issue for the SAAL NRM Board, pastoralists and Arabunna and Dunjiba peoples as it is seen as negatively impacting the landscape quality of these culturally significant places. The lack of strategies for management of tourism sites and effective information systems and facilities along the Oodnadatta Track may result in greater impacts further along watercourse banks and associated floodplains.

Drawing upon this multidisciplinary research it is recommended that landscape management strategy plans for critical refugia waterholes and their environs be developed as a priority. Documentation of landscape character, ecological diversity and cultural values, and the evaluation of impacts inform projects for bank and vegetation rehabilitation and ongoing management strategies.

Focusing on Algebuckina Waterhole for landscape design-based management approaches it is necessary to establish the landscape aesthetic values, cultural heritage and ecological diversity of the waterhole complex. The Algebuckina waterhole case study identifies eight landscape zones for landscape rehabilitation, spatial planning and interpretation design strategies. Tourist camping, walking and driving areas are identified and management options provided to protect the ephemeral and permanent waterholes and their fragile riparian zones. Additionally, it is essential to develop strategies for infrastructure funding for landscape design projects at this intensively used waterhole, with a similar approach

recommended for Hookeys Waterhole.

Other suggested landscape driven projects for the Neales catchment include:

- Expand upon this review of sites along the Oodnadatta Track, with Algebuckina and Hookeys waterholes as foci, to develop an overall tourism infrastructure and landscape design program to manage impacts and potential benefits of tourism in relation to local resources.
- Develop a publicly accessible cultural landscapes annotated visual database for the Oodnadatta Track and Neales Catchment as a resource for the community and management of waterholes and other cultural sites (e.g. photo library, photostory, place stories options).
- Establish a mechanism for ongoing engagement with local communities and stakeholders, State Government agencies and researchers to enable ongoing development of a cultural landscapes database.
- Develop appropriate protocols for access to and research on Aboriginal cultural sites on public and privately held lands of the Neales River Catchment and the Oodnadatta Track in partnership with Arabunna and Dunjiba peoples.
- Expand upon local education programs and interpretation strategies on the ecological and landscape attributes of the waterholes of the central South Australian arid zone.

1 INTRODUCTION

1.1 Background and context

This community engagement, cultural landscape assessment and analysis project for the Neales River Catchment and Algebuckina Waterhole is a component of a larger scientific study into the systems and dynamics that affect the ongoing viability of ecological refugia in the arid lands of central South Australia. These ‘critical refugia’ are typically fresh or semi-saline waterholes located in large dry river systems, which may become the only refuge for isolated or relict populations in times of severe drought. Their healthy condition is essential to the continuing presence of animal and human populations and livelihoods.

If these waterholes become marginal, either through climatic change or due to unsustainable human use, then their ecological value as ‘safe houses’ becomes under threat. Most stakeholders in remote South Australia recognise the need for management programs driven by local knowledge and supported by state and national government policies and frameworks. The prediction of a drying climate has highlighted the urgent need for action towards sustainable management regimes to prepare for future conditions. Despite extensive rainfall over the past 18 months, records of historical boom and bust, and drought and flood regimes, testify that drought will return and management for extreme dry conditions will continue to be of critical importance.

The systems most at risk from a range of climatic and human induced effects on fragile ecosystems are the aquatic ecosystems and riparian zones associated with river catchments of arid South Australia. The waterholes and wetlands in the Neales River catchment are significant ecosystems that have been studied over a number of years from hydrological and aquatic perspectives. Ongoing research is needed to document seasonal factors and subsequent physical change and the contributing effects on the animals and plants that rely on the health and longevity of these systems to survive.

To gain an understanding of the impacts on critical refugia scientific data is used to assess the health of ecosystems within the natural landscape context, whereas the gathering of local knowledge from a cultural landscape perspective provides an assessment of the human factors, behaviours and aspirations for these ecosystems.

This provides the basis for the cultural landscape assessment and analysis approach for the Neales Catchment waterbodies that documents the dynamics of the riverine system

alongside human interaction with natural resources. On ground management regimes including designing for human activity, particularly in the form of increasing tourism requires this knowledge to plan for infrastructure and interpretation programs for waterholes, springs and heritage places in the catchment.

This project contributes to the SAAL Regional Natural Resources Management Plan 2010 through addressing RCT 4: “By 2010 at least 50% of documented natural ecosystems of particular cultural significance that are suffering from disturbance are in improved condition”.

The RCT specifically refers to the protection of cultural features of significance through a landscape assessment approach and recommends the development of a landscape assessment philosophy and methodology for the SAAL region.

1.2 Project description

This research project developed a methodology for documenting the landscapes of the Neales Catchment through fieldwork supported by community engagement. The two landscape based components for the Neales–Peake River system are:

- overall community engagement and landscape character assessment of selected types of waterbodies in the context of the ‘natural system’ of the Neales Catchment and the coexistent ‘cultural’ system of the Oodnadatta Track
- detailed case study component for the critical refugia of Algebuckina and Hookeys waterholes to demonstrate how a multi-disciplinary approach to understanding critical water ecosystems, including human use, can inform landscape based infrastructure, restoration and community engagement projects towards sustainable waterhole management.

The first component aims to assess the cultural, social and ecological landscape characteristics of the Neales Catchment in the scope of a multi-disciplinary approach to collecting baseline biophysical information. It then analyses and seeks to distribute findings to a wide community audience for further consultation towards developing workable management strategies. The multidisciplinary method identifies key processes that influence ecological function and community aspirations through gaining expert knowledge into the catchment’s hydrology and fish distributions, geomorphology, ecology and landscape character, historical records and community knowledge. Demonstrating the connectivity between natural and cultural systems that occurs at water bodies is a key aspect that frames the research method and proposals for developing various management approaches.

The outputs comprise landscape-based site analysis and visual datasheets proposing landscape character types informed by community consultation and site visits. This illustrated technical report records and nominates landscape values and design based concepts to suggest a range of management approaches for preserving existing landscape qualities and managing threats and impacts from external factors and from climatic change.

Detailed study into the historic Algebuckina Waterhole located at the intersection of the Neales River and the Oodnadatta Track, and the locally popular Hookeys Waterhole near Oodnadatta, is used as a pilot to integrate landscape design, cultural history and ecological knowledge into developing effective and locally driven management options for places where natural and cultural elements coincide. This report together with a series of map overlays and descriptions of character types and landscape values will inform the ongoing input of local and regional landholders, users, scientists and managers to develop cultural and ecological management protocols for the future management of Algebuckina and Hookeys waterholes. It is intended that the strategies for on-ground works will apply to the wider catchment.

1.3 Aims, objectives and organisational strategies

The key aims of the project are to:

- identify key cultural, social, economic and ecological features, identify key stakeholders and undertake surveys and questionnaires
- assess opportunities and threats to the study area
- provide recommendations and strategic design approaches for sustainable management of key waterhole sites.

Detailed objectives have been applied to the collection, collation and dissemination of the critical refugia project tailored to a landscape assessment approach to:

- aid in the protection, understanding of the diversity of systems, patterns of use, management and long term sustainability of the waterholes of the Neales Catchment and in particular Algebuckina Waterhole
- identify the range of practices that impact upon the sustainability of the waterholes and fill key knowledge gaps regarding their cultural, ecological and productive importance

- collate known information of the waterbodies of the Neales Catchment system through community engagement of various stakeholders and identify Aboriginal community members, landholders, NRM regional bodies and government agencies
- develop spatial data on the location, existing conditions over a one-year time scale and the cultural importance of selected waterholes and other water typologies using a range of cultural landscape assessment methodologies
- develop a cross-disciplinary working methodology of science and landscape design based methods through working with the range of environmental, community and recreational needs for the management and sustainable use of waterholes.

Focusing on Algebuckina and Hookeys waterholes as case studies through research, fieldwork and consultation with local communities, the project aims to develop concepts for coordinated landscape design and infrastructure projects as the basis for negotiated planning for future on-ground projects.

A number of external organisational frameworks and strategies underpin this landscape assessment and community engagement component of the project:

1.3.1 South Australian Arid Lands NRM Board Regional Plan goals and strategies

The SAAL NRM Board Regional Natural Resources Management Plan 2010 identifies a range of risks to natural terrestrial systems, natural aquatic ecosystems, surface water resources, cultural features, geological features, iconic landscapes and infrastructure of the major 'assets' of the region. The report nominates key issues such as excessive grazing, terrestrial pest plants and animals, soil erosion, disruption of natural river flows, decline in water quality, inappropriate vehicle access and poorly maintained infrastructure and importantly inadequate response to climate change events as the primary issues to be managed. (SA Arid Lands Natural Resources Management Board 2010, p90)

SAAL NRM conservation priorities for the Stony Plains include ecological responses to water flows in the landscape, conservation of important permanent and semi-permanent waterholes and threatened ecological communities on floodplains and swamps, habitat diversity of Great Artesian Basin (GAB) springs and conservation of the Denison and Davenport Ranges. (SA Arid Lands Natural Resources Management Board 2010, p79)

Resource condition targets (RCT) and management action targets (MAT) in the plan form a comprehensive framework for a cultural landscape assessment program for the Neales

Catchment. Specific areas for evaluation in relation to RCT's include: improving the condition of vegetation cover and aquatic ecosystems, reducing risks to ecological communities overall, reducing human-induced soil erosion, encouraging ecologically sustainable natural resource-based industries, and improving the quality of groundwater and surface water systems.

The MATs that describe the methods to attain these RCTs include: undertaking surveys and mapping places for environmental water requirements, registering regionally significant sites, engaging Aboriginal communities to participate in projects, improving adaption to climate change, reducing total grazing pressure, implementing protection, management and/or rehabilitation of priority aquatic systems, developing landscape assessment frameworks for the SAAL region, sustainably developing new waterpoints, developing best practice guidelines for tourism and accrediting environmentally aware tourism operators, and improving the knowledge base and information dissemination of water resources in the SAAL region.

The Biodiversity Strategy for the SA Arid Lands nominates five Priority Actions (PA) that set goals that include: Improving ecological knowledge, decision making and capacity (PA1), reducing the impact of climate change (PA2), invasive species (PA3), total grazing pressure (PA4), and land use pressure (PA5) on biodiversity.

MATs and Action targets also recommend biological surveys, vegetation mapping, environmental water requirements and engagement with landholders to fill gaps in the knowledge and to increase preparedness for drought and other climate based events. Of specific relevance to landscape assessment are targets to minimise effects of grazing pressure and support alternative strategies, conservation and protection regimes for water resources, best practice standards for nature based tourism, parameters for disturbance thresholds, guidelines for infrastructure development and strategies for monitoring. (The Biodiversity Strategy for the SA Arid Lands, Overall Strategy Volume 1, 2009)

1.3.2 SA Pastoral Board

The Pastoral Board has jurisdiction over South Australia's rangeland pastoral properties through its pastoral programs that provide technical advice, mapping, inventory and inspection services. It also facilitates public access via public access routes (PAR) which is crucial to the access and use of the Algebuckina Waterhole and the Old Peake Ruins. PAR's enable access via the public road system and are an ongoing source of management concern due to their remoteness and need for maintenance and appropriate signage.

1.3.3 South Australian Tourism Commission strategies

Cultural tourism in places of natural and cultural significance may provide benefits such as restoration of ecological and heritage sites, and conservation of historical fabric and access routes. Sustainable tourism seeks to limit degradation from overuse of sites and improve visitor use. Effective interpretation for cultural tourism can help visitors value landscapes.

The SA Tourism Commission *Principles of Sustainable Tourism leaflet 2003–2008* quotes a World Tourism Organisation statement: “Sustainable tourism is “tourism which meets the needs of present visitors and host regions while protecting and enhancing opportunity for the future”. www.tourism.sa.gov.au/tourism/plan/design_guidelines.pdf

Their key principles can be summarised as:

- development based upon the attributes and strengths of the destination
- achieving authenticity through sites which are genuinely relevant to history, industry, culture, lifestyle and natural resources of the district
- representing the past, present and future aspirations of the community in a living and dynamic way
- developing specialised products based upon the inherent attributes of the area
- understanding the motivation for travel to experience beyond their everyday
- adding value to existing attributes to help diversify the local economy
- respecting natural and cultural values
- achieving conservation outcomes – mutually beneficial alliance between tourism and conservation
- tourism development to interpret natural, social, historic and ecological features
- achieving excellence and innovation in design
- providing mutual benefits to visitors and hosts
- building local capacity and collaboration with the community.

In the cultural landscape, the combined knowledge of community and visitor held landscape values, combined with conservation principles for natural and historical features, support well designed infrastructure and interpretation materials implemented by the local community.

2 THE NEALES CATCHMENT AREA

2.1 Scope and inventory: catchment overview



Figure 2.1 Lake Eyre Basin: Neales Catchment indicated west of the Oodnadatta region and flowing towards Lake Eyre North to the East. Source: Australian Government DEWHA 2010

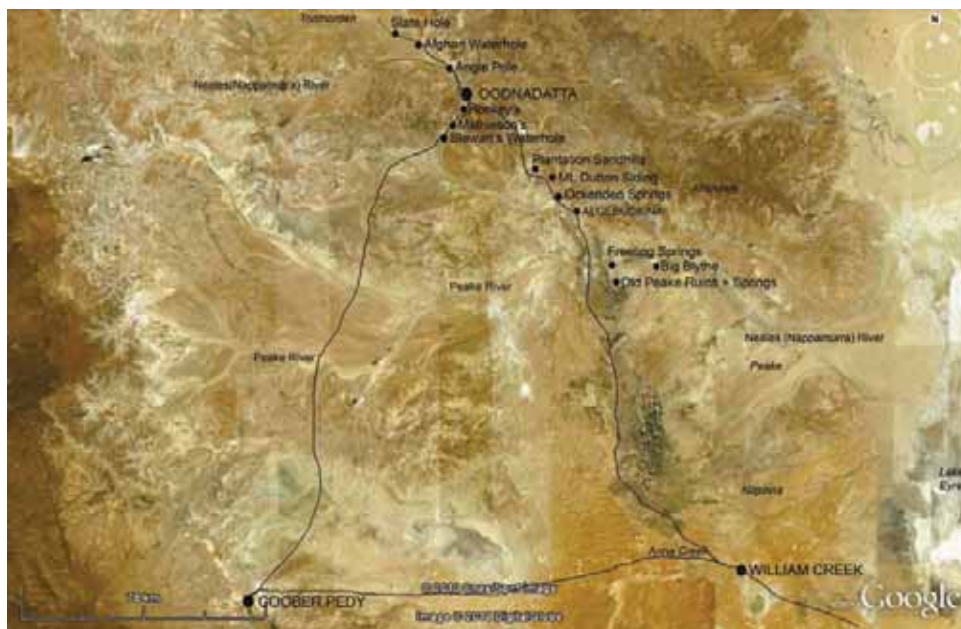


Figure 2.2 Extent of the Neales Catchment from the western sources in the Stony Plains draining east to Lake Eyre Source: Source www.earthgoogle.com retrieved 19/11/2010.

The Neales Catchment is located in the Stony Plains Bioregion and encompasses a major river system that drains from the west of the Central Tablelands to Lake Eyre. These landscapes are characterised by sparsely vegetated hills, longitudinal dunes, and gibber and silcrete plains crossed by dry tree-lined rivers and creeks interrupted by mesas and occasional taller hills – the Denison and Peake Ranges are a dominant feature. Climatic conditions range from hot summers to temperate–cold winters and from prolonged droughts to periods of intensive flooding over extended periods. Vegetation associations include open woodlands, chenopod shrublands and seasonal grasses.

The Neales River and Peake River, and their localised channels and waterholes, are the major focus of this landscape assessment study, which identifies and classifies the range of landscape character types in the area. The other major focus is the extent and type of human interaction with, and occupation of, the landscapes associated with the various waterbodies that connect with the rivers.

Predominantly designated as pastoral leasehold, the area is crossed by fence lines, tracks, communication lines and small settlements associated with early exploration and pastoral activities. More recently, large-scale mining and tourism activities have added to the economic life of the area. Aboriginal occupation over thousands of years pre-dated these modifications to the landscape; they introduced a range of fire and localised water resource management practices that have subtly modified the landscape and, over time, built up layers of knowledge of land systems. Movement through the landscape is directed by a range of roads and tracks, named in both Aboriginal and non-Aboriginal language, which provides rich interpretation of the relationship between the environment and its use over the years.

Limited water has concentrated use and occupation around waterholes and springs, and the later development of bores and dams for more reliable water supplies. Subsequent degradation around these waterholes from grazing, feral animals, and more recently tourism, has resulted in erosion, compaction, tracking, and loss of vegetation and native animals across the Neales Catchment.

The north–south Oodnadatta Track is a major influence on the occupation and use of the area as it follows the springs and waterholes that enabled exploration and the opening up of the centre through construction of the Ghan Railway. The interaction between water availability and human existence in the desert environment is the central story of the Neales

Catchment landscape and is made particularly evident at the creek and river crossings that intersect the track.

This assessment focuses on waterholes located close to the Oodnadatta Track from Slate Hole Dam on Todmorden Station to the north, to the Old Peake Repeater Station on The Peake. The track traces a range of landscape character types and settlement typologies. Waterholes and springs are the places most impacted by the overlay of various activities. Aboriginal cultural practices and recreation, pastoral uses, and tourism visitation and general recreational activities such as fishing, all coincide at the waterholes and springs. Some activities are locally focused (e.g. at Afghan, Angle Pole and Stewarts waterholes and Slate Hole Dam); whereas a wider range of locals and visitors use East and West Algebuckina, Old Peake and Freeling Springs and Hookeys Waterhole. The range of activities may not have changed but the impacts on these places intensify with use. The visible effects on their ecological health are mapped in this research.

2.2 Water typologies

Four types of waterbodies (defined below) are examined. GAB bores and dams are included as part of the typology to include the different landscape conditions resulting from construction of artificial water points.

Waterholes: Fresh, semi-saline or saline waterholes located in the deeper and wider sections of the multiple channel of ephemeral rivers and creeks. Surface fed either by local rainfall or through overland flows from associated hills and sloping plains, they are characterised by a range of bank and riparian conditions. Generally easily identified through aerial survey, they are often concealed from view by riverine vegetation and topography. Evidence of occupation is generally limited but may include pastoral and road/rail based infrastructure and buildings.

Great Artesian Basin (GAB) springs: Naturally occurring underground water of varied salinity, discharges through springs or seeps and is either contained in a shallow open pool, confined by an encircling mound or seeps into swales and small channels, identified by a concentration of brighter green vegetation and the presence of settlements or ruins.

GAB bores: Artesian water is extracted under pressure through drilled wells to underlying rock layers and tapped to provide some management of water delivery. Untapped bores are easily recognised as containing a 'tail' of *Phragmites* associated with water spilling over the

landscape and following natural or formed swales draining towards creek lines. Pastoral and/or mining infrastructure such as yards, machinery and tracks are associated with bores.

Dams: Constructed dams comprising a deeper usually circular or square formed waterhole surrounded by extensive walls that rise above the surrounding landscape. Dam walls are usually un-vegetated and may be formed by materials adjacent or distant to the site, which provide contrast to local soils. Outback dams either stand alone in the landscape in relation to drainage lines to capture rain and overland flows or are situated in river channels to capture river flow. Frequently associated with water management infrastructure, such as windmills and tracks, they are artificial incursions into the natural landscape character.

2.3 Relevant projects and research

There are a number of programs that have direct reference to community involvement and landscape and tourism management in the region.

Ecosystem Management Understanding (EMU): The EMU process develops the principle of effective pastoral management within ecological guidelines, driven by local knowledge and mapping this knowledge directly with landholders. EMU has been implemented on a number of pastoral properties in the Neales Catchment. A whole of paddock and/or property approach provides a broad approach to catchment management in relation to farming practices and proposals for on-ground works. The benefits are landholders have a key role in landscape management to achieve environmental gains and improved productivity.

Two tourist driven research reports are particularly pertinent:

Lake Eyre Basin Heritage Tourism Future Directions Summary Report: This 2003 report and its subsequent review in 2010 advocate a heritage tourism approach to the Oodnadatta Track. It does not specifically focus on the Neales Catchment but confirms that the track is a cultural route that follows traditional communication lines and traces settler and indigenous histories which include the ongoing need for access to water and sites that exist due to the presence of water.

There are 9 key outcomes addressed in the report:

- manage access onto pastoral leases
- develop protocols to manage the environmental impacts of tourism on water quality and water-dependent ecosystems
- preserve natural and cultural heritage values

- develop an outback 'sense of place' through appropriately designed infrastructure
- plan and coordinate effective priority projects
- maintain inventories of historic heritage assets
- develop Aboriginal tourism
- improve interpretation
- support people and products through on the ground officers and internet-based programs.

The Algebuckina Bridge and Waterhole is regarded as a tourism hot spot.

Flinders Ranges and Outback SA Region Integrated Strategic Tourism Plan 2008–2014: The plan discusses key attributes and themes, and the need to conserve and protect arid rivers and associated waterholes as tourism assets. It advocates building infrastructure at popular destinations and developing environment management frameworks at areas of high conservation value such as on the Neales River. Appropriate activities are noted: walking, fishing (with proviso) and driving on 4WD tracks only; and the impacts described: erosion, trampling, littering, imported animals, disturbance of sediment and fish stocks. Camping in these areas is not covered in detail.

3 LANDSCAPE BASED METHODOLOGY FOR WATERHOLE ECOLOGY AND COMMUNITY

3.1 Cultural assessment, community engagement and landscape assessment from ecological perspectives

The general principles adopted for this landscape survey are drawn from a variety of methodological sources that embrace landscape ecology, landscape planning, landscape design and scenic assessment. They are underpinned by cultural mapping principles from other regions in Australia. The multidisciplinary nature of the project combines landscape assessment and design expertise in a collaborative process. A range of scientific perspectives is used to assess the ecologies and geomorphology of the rivers and waterholes and their cultural associations.

The Neales Catchment project investigates the expanded landscape in a range of scales and qualities evident in the Stony Plains and Lake Eyre region. The site specific, local, regional and nationally significant attributes of this arid landscape contribute to the nomination of seven themes (Section 3.4) critical to understanding the dynamics and future threats to, and potential for, the area and its waterholes.

The structured method of landscape assessment for Neales and Peake waterholes, springs, dams and bores, links **description** of landscape systems, **classification** of a range of types and attributes, **analysis** of scenic, ecological, cultural and spatial landscape qualities, and overall **evaluation** of the regional landscape at a local scale. Community interaction with, and attitudes to, these waterbodies is presented through observations of built forms and traces of occupation informed by conversations with a variety of stakeholders and visitors during fieldwork. Ideas for landscape-based projects to alleviate current impacts are drawn and written into findings.

In general, this methodology follows a hybrid of typical landscape assessment approaches in order to engage with scientific methods and findings.

Landscape measurement forms an inventory of the structural and visible elements in the landscape in scale, form, pattern and recognisable natural features and constructed infrastructure. Natural and cultural landscape systems are mapped as co-existing.

Landscape values are attributed through investigation and nomination of community value judgments for occupying landscapes. This study includes historical, recreational and

commercial use values alongside ecosystem value in the natural landscape drawn from scientific fieldwork and evaluation.

Landscape character evaluation is a generally numerical score of the relative scenic amenity of the area in terms of individual or societal preferences for landscape types, in complexity, simplicity, degree of intactness, viewpoint, accessibility and consistency with local landscape character types.

The working methodologies for the landscape assessment of the Neales Catchment:

- identify the geographical region and extent of the stakeholder community
- review all previously known information and research in order to confirm existing knowledge and identify gaps
- propose themes for consultation based upon a cross-disciplinary approach including ecological, hydrological, landscape, heritage, pastoral management and tourism interests
- negotiate themes and information requirements across researchers and project managers
- establish ethics protocols for the landscape research component
- engage stakeholders in the scope and proposed outcomes of the project and invite their contribution, establish availability and method of consultation and feedback
- negotiate and confirm the research program based upon cross-disciplinary and layered methodologies
- develop a critical refugia methodology matrix for the project based on the themes
- include science-based fieldwork methodologies, surveys and evaluations into landscape-based approaches to be workshopped with the research team
- develop a database of existing knowledge based upon stakeholder themes: pastoral, ecology, geomorphology, aquatic ecology, hydrology, tourism, heritage, mining, government and landscape
- establish a timeline for consultation with stakeholders based upon agreed questions and data collection, feedback and dissemination methods
- establish a timeline for fieldwork consultation with stakeholders based upon survey aims and objectives
- determine the availability of stakeholders and provide preliminary information and briefing
- undertake on-the-ground consultation using a range of survey questions and recording methods appropriate to each stakeholder
- undertake fieldwork to record and assess the landscape character of a range of agreed waterholes and other waterbodies in relation to team research and places of focused natural and human interaction
- develop a graphic dataset of the results of consultations and field work around a series of annotated maps to scale for future overlay purposes
- disseminate the results of fieldwork back to stakeholders, researchers and project managers to consult on possible management approaches and landscape design strategies.

3.2 Literature review for cultural landscape assessment and design

The annotated literature review for the project focused on gathering the range of recording, testing, assessing and implementation methods employed by geographers, landscape architects, planners, cultural studies and heritage researchers, and by the stakeholders who operate in these complex landscapes. The methods analysis is developed from a detailed matrix-based annotated bibliography of cross-disciplinary methodologies for the cultural and ecological landscape assessment of arid areas water resources, arranged under the themes of Design, Planning and Landscape Assessment, Ecological/Scientific, Consultation, Cultural/Historical and Heritage/Interpretation. The literature review also collated various local, regional and state government environmental and strategic reports to assess the available data, and pertinent ecological, heritage and tourism research and management projects completed for the waterhole and region.

The useful summary of landscape assessment and evaluation methodologies in *Ecological planning A historical and comparative synthesis* (Ndubisi 2002) documents a range of conceptual and practical methodologies for ecologically based landscape assessment projects. Expanding upon Ian McHarg's well-known landscape suitability framework that overlays mapped natural features to determine fitness of land for a particular use (McHarg 1992), a number of alternative approaches were reviewed such as:

- the applied landscape ecology approach which investigates landscape structure evolution in relation to natural and human influences
- the scenic landscape values and perception approach which evaluates aesthetic values based on values and preferences derived from landscape experience
- Cliff McLucas' deep mapping of layers of occupation to develop trace concepts approach
- cultural landscape heritage methods and guidelines to assess comparative significance.

Recording and mapping types and techniques, both formal and informal, are also collated to develop methods for how the region can be graphically represented for landscape character assessment and design approaches that can be easily interpreted by the range of stakeholders.

3.3 Critical Refugia Matrix and landscape assessment approach

Landscape survey fieldwork must be completed over an appropriate timescale, including return visits to disseminate information and to ground-truth the results of initial consultation. On-the-ground consultation maps local knowledge of the history, management systems, environmental, cultural, economic and management concerns of the variety of stakeholders.

In effect, the range of stakeholders is asked to inform the process of drawing, diagramming, marking up and photography of waterholes and other particular places of interest. These recordings spatially and visually support talking about local knowledge, management regimes and concerns as the basis for a visualised approach to information gathering. Such surveys are ideally undertaken alongside the researcher/consultant in order to record current conditions, but this is often logistically impossible in remote areas due to timelines and the need for favourable weather. Equally, a historical perspective that includes gaining access to each stakeholder's personal records of conditions and systems from the past is made possible through conversations around kitchen tables and over maps. The collection and collation of the information from consultation, literature review and fieldwork is a complex task, which requires both text and graphic information to be read simultaneously. The Landscape Assessment documentation methodology employs a matrix based approach where the layers of information and interaction can be added to the Critical Refugia Matrix. The matrix is composed of two sections and is used in the field to both document landscape characteristics at each site and to collate other verbal and literature based information.

The landscape matrix documents activities and interests at each waterhole or waterbody site and locates them within a grid reference system. The first matrix grouping is organised vertically by stakeholder group sections (Chapter 5). These are the active participants to be consulted on the active agents of the landscape, the biota and their elements. The horizontal organisation includes activities such as pastoralism, tourism, local amenity, aquatic ecology, hydrology, geomorphology and landscape, Aboriginal cultural, mining, heritage, government and other. Additional, existing interpretation, documentation, specific qualities, impacts and change over time and management regimes where they exist are also noted. This simple and repetitive organisation tool enables cross-referencing of activities and interest groups for each site in relation to landscape attributes to evaluate the range of stakeholders involved in future management approaches.

The detailed site analysis matrix is used to record the landscape elements of each site through notes, sketches and photographic imagery in the layers:

Form: Scale, Structure, Topography

Riparian zones: Types, Qualities, Materials

Views: Within, Over, Along

Water feature: Type, Quality, Permanent, Ephemeral

Vegetation: Type, Density, Associations

Occupation inventory: Buildings, Ground works, Infrastructure, Materials

Access: Roads, Tracks, Materials

Interpretation: Type, Materials

Chapter 6 documents the outcomes of the landscape character mapping and evaluation and includes content drawn from discussions with stakeholders. The combined use of the populated Critical Refugia Matrix together with the summary analysis of the landscape qualities, issues and ideas to support management approaches forms the basis of a package to be returned to stakeholders for ongoing planning and development of management regimes.

As all information collected and evaluated must be disseminated in an ethical and confidential manner, the direct results of interview and the populated Critical Refugia matrices do not form part of the published documentation of this technical report.

3.4 Multidisciplinary approach

This landscape character assessment methodology is informed by four scientific assessment studies for a whole of catchment perspective alongside the mapping of specific waterhole attributes:

- Geomorphologic assessment and analysis of the Neales catchment by Gresley Wakelin-King (Wakelin & Associates)
- Ecological condition assessment and evaluation of waterbodies in the Neales catchment by Glen Scholz (DWLBC)
- Assessment of fish habitat, refugia and connectivity in the Neales Catchment by Dale McNeil and David Schmarr (SARDI)
- Hydrological assessment and analysis of the Neales catchment by Justin Costelloe (University of Melbourne)

Project organisation focused on methods to coordinate a multidisciplinary perspective and overview of critical refugia waterholes and catchment systems. The sequence of activities was:

- fieldwork undertaken by all researchers where possible at the same time, in concurrent locations to enable different survey methods, community engagement, mapping and documentation practices to be shared on site
- team project meetings to discuss work in progress findings and coordinated dissemination of outcomes
- establishment of key themes based upon geomorphology, aquatic ecology, hydrology, ecology and landscape assessment from individual fieldwork

- development of a series of overarching conceptual themes applicable to each area to summarise the dynamic conditions impacting upon the Neales Catchment and the Stony Plains.

Themes allow the various researchers to investigate and interpret the range of attributes and conditions of their areas of interest. For landscape assessment they allow emphasis on human activities, processes and stories associated with places rather than just classifications by type or function of a place. For the group of disciplines, themes allow overlapping perspectives of ecological, landscape form and function and processes of change to be captured. Key project-specific themes include:

- assessing the way the river works: geomorphology
- effects of change on riparian vegetation: ecology
- flow events over time: hydrology
- refugia are fish recovery havens: aquatic ecology
- rivers and waterholes are magnets in the landscape: landscape character.

The landscape character assessment findings are summarised below. For detailed surveys of each place assessed see Chapter 6:

- The major Neales and Peake ephemeral river systems flow towards Lake Eyre through tablelands and gibber and gypsum plains.
- The historic road and exploration routes that cross these plains are linked to the water systems: vegetated rivers, creeks, waterholes, springs, bores and dams.
- Tracking pathways along rivers, creek lines and road crossings, shows rich evidence of human occupation: Arabunna and Dunjiba people's campsites and meeting grounds, pastoral stock routes and watering points, historic mining workings, tourism campsites and fishing holes.
- Roads and tracks, and global positioning systems (GPS) and internet based systems, open up the landscape to improved access to remote areas for all.
- The water places of the Neales Catchment are places of intense activity. The need for shelter, water and fire result in visible impacts on fragile riverine ecologies and historic sites.

The seven overarching themes have agreed working definitions and concepts:

Time: Water quality varies from season to season, dry to wet, and Algebuckina faces constant changing circumstances. In the past 10 years, the longest period that Algebuckina has gone without flow has been 14 months.

Landscape: Record Algebuckina's landscape aesthetic values, cultural heritage and ecological diversity – it is a magnet in the landscape. Make a design strategy for tourist camping, walking and driving areas to rehabilitate and protect the fragile riparian zone.

Salt: Manage salinity by enabling flows and minimising extractions to promote healthy vegetation and reduce destabilisation from impacts to creek and waterhole banks.

Refugia: Algebuckina is the most important place for fish in the western Lake Eyre Basin. Gain understanding of its independent core refuge status. Retain healthy riparian vegetation to provide good food sources for fish and animals alike.

Pathways: Greater access to Algebuckina by all through improved technologies: gain understanding of the critical overlap between the ecology, the culture of the waterhole and catchment, and the movements upstream and downstream, up and down roads and tracks, and across internet and GIS systems.

Vulnerability: Algebuckina Waterhole is vulnerable to being *loved to death*. Need to look after the fish, particularly big and old Yellow Belly, to sustain fish populations in good times and in drought. Current intense public use of water points and their local riparian zones demands strategies for managing tourism drivers and impacts.

Futures: Healthy fish indicate healthy waterhole ecosystems. Plan for education and interpretation programs for Algebuckina with the local community embracing heritage, ecology, Arabunna and Dunjiba cultural protocols, pastoralism, mining and tourism.

The **Landscape** theme summarises key underpinning concepts that include:

- investigating the broad catchment and its landscape features
- understanding the dynamics of waterhole existence and change over time
- locating the range of refugia and describing their typologies

- investigating other surface systems such as dams and groundwater systems to gain understating of both hydrological and cultural water formed landscape systems
- analysing rainfall events and waterhole landscape quality linked to flood and drought
- recording fish distribution from a scientific perspective, expanded through spatial landscape analysis of waterhole and waterbody habitat conditions
- describing the aesthetic qualities of waterholes linked to ecological processes and geomorphology
- documenting and discussing with communities and stakeholders their deeply held cultural associations with and resource use of the waterholes.

4 CULTURAL LANDSCAPES OF THE NEALES CATCHMENT

4.1 Definitions

The idea of the cultural landscape has developed since the late nineteenth century. In general a cultural landscape is defined as displaying modification of the natural or wilderness landscape due to human presence and activity.

The Cultural Landscape category of the World Heritage Convention describes 3 overview categories as guides for implementing cultural landscape assessment:

Category 1 is the clearly defined landscape intentionally designed and created. It includes landscape constructed for aesthetic reasons such as gardens and parklands.

Category 2 is the organically evolved landscape that reflects the process of development of its features and consists of two subsections: a relict landscape that retains material features but is now subject to no further change; and the continuing landscape that exists often in relation to traditional lifestyles, and displays evidence of evolution over time.

Category 3 is the associative cultural landscape that refers to cultural associations with natural elements characterised by ephemeral, narrative or material evidence (UNESCO WHC 2008).

For the Neales Catchment project it is useful to adopt a definition where extensive areas of natural and sparsely settled landscapes are common. Lennon and Mathews' working definition has been applied to a number of remote and rural landscapes across Australia, and is adopted here as appropriate to this study.

A cultural landscape is a physical area with natural features and elements modified by human activity resulting in patterns of evidence layered in the landscape, which give a place its particular character, reflecting human relationships with and attachment to that landscape (Lennon & Mathews 1996, p4)

However, the landscapes of the Stony Plains region of South Australia, containing the Neales Catchment, do not readily convey visible patterns of human evidence across wide stretches of landscape. Rather, the lines of exploration, communication and pathways made by Aboriginal, settler, pastoral and tourism movements across the landscape are made evident through the connections between water sources and their associated settlements or compounds. Where these systems coincide – usually at permanent or semi-permanent waterholes, mound springs, bores and more recently dams – is also where the refuges in the outback are found, and where both natural and human influenced systems become the critical drivers in the history and ongoing legacy of existence in the arid places of inland South Australia.

Three landscape categories follow from the above working definition:

- **Designed landscapes:** created according to a plan or strategy, often at a certain point in time, such as the Oodnadatta Town settlement or the Ghan Railway
- **Evolved landscapes:** developed more organically over time in the absence of a plan but as the result of opportunity afforded by exploration, pastoralism or the need for infrastructure such as Algebuckina Waterhole and Old Peake Station complex
- **Associative landscapes:** more intangible landscapes influenced by the meanings attributed to them through Aboriginal and local community cultural practices, such as waterholes and springs, geological formations, and river and creek lines, and their associations with Lake Eyre.

4.2 Cultural landscape identification and assessment

In order to identify, describe and then assess cultural landscapes a number of methodological approaches are customarily applied to cultural landscape mapping and description across Australia. From a national perspective the Burra Charter, the Australia ICOMOS Charter for Places of Cultural Significance, states that 'cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects' (ICOMOS 1999, p2). While this perspective is necessarily place specific, it is an important basis from which to expand the assessment methodology for the interconnected places and landscape features that form the cultural landscapes of the Neales Catchment. In particular, Article 13 recognises the co-existence of cultural values and confirms that these values should be respected and encouraged, especially in cases where they conflict (ICOMOS 1999, p5).

Understanding how to assess cultural significance through a system of values is also an essential aspect of cultural landscape assessment. Values attributed to the aesthetic, archaeological, architectural, historical, scientific and/or social significance of a place are described in terms of the physical, aesthetic, contextual setting and association with places over time (Heritage Victoria 2009). Although useful in providing the necessary categories to enable recording of landscape conditions and qualities, this perspective falls short of prescribing values for the fundamental connectivity between cultural and natural landscapes that are central to the Neales Catchment research. Landscape assessment requires gaining understanding of the broad context and influences on the place or locale and usually involves general building and settlement classifications such as: structures, complexes, sites, features and linear networks.

In the Neales Catchment environment, an expanded review is necessary to include documentation and analysis of natural features, in particular framed through the lens of water formed landscapes and places. The minimum elements to be described are: vistas, vantage points and landmarks, circulation networks, general patterns in the landscape, imprints of past uses, waterbodies, vegetation characteristics, clusters of structures and individual features, divisions within the landscape, building materials and construction techniques, extent of earthworks and current land use (Lennon 2009, pp12-13). The research includes information sourced from the field gained alongside stakeholder, community and project team knowledge to ensure that landscape and ecological systems perspectives influence landscape assessment.

Structural categories of waterholes, rivers and creeks and other water systems have been established as typically general concepts. They are based on structure and activities in the landscape, to help identify issues that ultimately inform potential landscape-driven conservation and infrastructure management projects.

- **Form:** includes location, scale and description of the local and contextual landscape structures that influence the specific waterhole and its environs; and describes the spatial and topographical structures that influence the landscape character.
- **Riparian zone:** describes the relationships between banks, waterbodies and vegetation, including schematic sectional relationships between natural systems and identification of cultural use where applicable.
- **Views:** demonstrates major views in and over the waterbodies, vantage points, and the spatial quality of view across a range of landscape types and features.
- **Water feature:** describes the scale, natural and/or cultural qualities and permanence, impermanence of the waterbody, where possible in various times of drought and/or flood; and includes notation on the presence of fish and other faunal species, and quality of the aquatic environment from a visual and landscape structure perspective.
- **Vegetation:** describes the vegetation type, assembly, relative density and distribution along and around the waterbody and its environs.
- **Occupation:** gives evidence of occupation, both permanent and ephemeral, including patterns of use, impact and visual, historical and cultural qualities with a specific focus on human/waterbody interaction
- **Access:** documents visible roads, pathways, tracks and desire paths for humans and animals
- **Interpretation:** gives evidence of physical interpretation and signage materials at the site; and discusses interpretation due to the presence of built structures and other human induced information
- **Other aspects:** discusses specific aspects of historical and cultural associations and impacts due to cultural and natural influences
- **Issues requiring management approaches:** summarises analysis of the qualities of each particular waterbody, its condition and potential use, current impacts and issues to enable a range of landscape driven management approaches.

Landscape character types for the Neales Catchment: below is an overview of the landscape character types based on data collected during field trips and collated into the

structural categories (Chapter 6). Previously recorded landscape systems sourced from various SAAL NRM and Lake Eyre Basin reports and the Atlas of South Australia are also valuable references in the development of character descriptions. These cultural landscape types and qualities also coincide with landscape descriptors used for ecological zones. The natural and cultural landscape character of central South Australia's Stony Plains and Central Tablelands ecological zones of the Lake Eyre Basin landscapes and the Oodnadatta Track that passes through them exhibit the following features:

- undulating terrain rising and falling between gibber plains, escarpments and sand dune country crossed by tree-lined creeks and associated floodplains; picturesque views over arid pastoral landscapes, unique geological forms and materials, low open mulga woodlands and wide horizons in all directions, with generally little evidence of human interaction beyond ruined settlements and dirt tracks
- tree-lined creeks, predominantly *Eucalyptus coolabah*, with often dense understorey *Acacia* species and lignum in riparian zones, snake across bare stone and grass plains providing spatial variety, and a green and cool contrast with red and rocky desert ground scapes; evidence of some transient Aboriginal and non-Aboriginal occupation at waterholes and springs, through detritus left on the ground, or tracks and clearings in riparian zones
- depending upon seasonal and climatic conditions, the presence of water in ephemeral and permanent waterholes (such as at Algebuckina) contributes to high landscape quality and is the focus for intensive tourist visitation due to their rarity in these arid landscapes; evidence of such occupation revealed through abandoned camp areas, signage, tracks and pathways made across the landscape, some historic constructions and litter
- wide gravel and dirt roads cross the diverse variety of ground conditions: gibber, desert pavements, claypans, salt lakes and dry stony creek beds, interrupted at regular intervals by tree-lined creek crossings, with associated historic Ghan bridge structures and occasional ephemeral waterholes and springs
- remnant Ghan railway embankments, fettler's cottage ruins and water tanks punctuate the Oodnadatta Track and identify places where water sources once supported inhabitation, exploration and pastoral activities, lately supplemented by tourism; in particular springs or creek crossings contribute to relic structures, signage and clearings made in the gibber or sandy ground

- lateral tracks are signposts along the road indicating access to pastoral properties and potential tourism destinations; interpretation signs, the most visible the Oodnadatta Roadhouse pink and white recycled drums, provide recognisable and continuous interpretation of the route and its cultural points and landscape features.

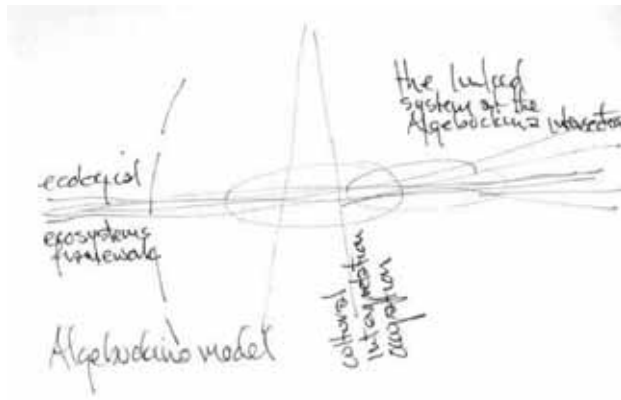


Figure 4.1 Schematic model of ecological/cultural overlay at Algebuckina Waterhole: A common feature of major creek crossings is forms of inhabitation and tracks running generally north–south and lines of natural systems generally from the west towards the east terminating at Lake Eyre.

Figure 4.1 illustrates a primary landscape character element for the Neales Catchment and the greater arid lands environs transected by the Oodnadatta Track. Where river and water systems are present and suitable river crossings can be constructed, a concentration of rich environmental conditions for both natural ecosystems and human occupation coincide. In these places, evidence of past and present occupation and biological systems intersect and provide points of intensity along these fluvial and communication tracks carved into desert landscapes over time. Specific areas for cultural landscape assessment based on this connectivity principle include the important local features and complexes of:

- the Algebuckina complex including West Algebuckina ephemeral waterhole and historic site and East Algebuckina permanent waterhole
- Hookeys Waterhole and the expanded semi-permanent waterholes complex adjacent to Oodnadatta, north of the Oodnadatta–Coober Pedy creek crossing
- Old Peake Station historical site and springs and associated Freeling Springs area
- Angle Pole semi-permanent waterhole and historic site
- the Oodnadatta Track string of historical sites based on servicing trade and communication routes from William Creek to Afghan Waterhole, their springs and waterholes and infrastructure.

4.3 Implications for management and policy

Defining cultural significance as a simple, graphically illustrated statement, enables guiding policy to be prepared that informs future management approaches based upon conservation principles that take into account contemporary systems and influences. A general approach to establishing cultural significance deals firstly with assessment in terms of collection of information and data, which is the focus of this technical landscape assessment report.

It is unlikely that a single statement of cultural significance for the Neales Catchment as a whole is feasible; a number of place-related nominations for critical sites such as Algebuckina Waterhole, Hookeys Waterhole and the Oodnadatta Track should be considered. This will require engagement with various stakeholders to ascertain, and would require further policy development across a number of stakeholder groups. In the context of this multidisciplinary research project, proposed outcomes include combined assessments of the scientific and landscape qualities and features of the range of waterholes in the system, which will contribute to documenting significant water systems in the Neales Catchment.

5 COMMUNITY ENGAGEMENT AND LANDSCAPE VALUES

5.1 Key stakeholders

A critical driver of the Neales Catchment project is to provide pathways for meaningful community engagement in developing management approaches for critical refugia waterholes and other waterbodies. Both the Regional Natural Resources Management Plan for the South Australian Arid Lands (2010) and the SAAL Biodiversity Strategy (2009) state the importance of including stakeholder and community knowledge and support in all programs. Local experience, gained over time, is an essential component of data collection, along with fieldwork research and report-back mechanisms for ground-truthing landscape assessment findings. Key stakeholder groups were first identified through their interactions with, and influence on, sites and catchments. Additionally, previous research by a range of government agencies was collated, and key people and communities identified. The current stakeholders and community interests in the Neales Catchment and Algebuckina Waterhole environment are identified through two descriptors: the broad stakeholder group and local communities who operate in the area on a day-to-day basis.

The broad stakeholder group covers regional, state and national and international perspectives and includes: Australian and South Australian government agencies, pastoralism, arts and culture and nature based tourism, mining industry, indigenous interests, scientific and academic research organisations, conservation organisations, heritage and interpretation interests, and educational organisations.

Local community groups with direct interest in the stewardship and ongoing management of the catchment and its waterbodies include: landholders and pastoral workers, Aboriginal traditional owners and communities, tourism operators and service providers along the Oodnadatta Track, tourists/campers from the region, researchers and state government project officers engaged in ongoing surveys and assessments, conservation groups, local schools and community groups.

The Critical Refugia Matrix for landscape-derived data recording was organised around stakeholder involvement with the range of waterholes and waterbodies in order to document the current range and type of interests held by each stakeholder and/or local group. As the engagement methodology was being developed, the research group noted that the natural landscape is also a stakeholder and this element was also included in the matrix. The intent of the matrix approach was to uncover the degree to which multiple interests are engaged in each studied waterhole/waterbody and the issues that arise from often competing rather than complementary interests.

5.2 Community engagement approaches and program

The range of stakeholder and community interests in Algebuckina Waterhole and its regional environment are both diverse and geographically dislocated. A number of consultations with various groups and individuals over the past years have been undertaken as a mixture of face-to-face interviews and questionnaires predominantly focused on gaining information on broad land management regimes and as background for scientific studies of waterhole conditions.

Just as important to effective community consultation as the gathering and recording of outcomes, is evaluation and feedback to the community of the consultation results. It is essential to integrate community engagement processes and feedback with fieldwork data and current knowledge. Research needs to be actively drawn out of reports and used in participative programs that provide mechanisms for feedback and negotiation in both the knowledge obtained and the uses to which such feedback is put. From the landscape perspective, community and stakeholder feedback is necessary to inform design,

infrastructure and interpretation projects for critical waterholes that are under pressure from human use and over use.

The approach to community engagement and information gathering for the Neales Catchment is intended to involve stakeholder communities in a cyclical and ongoing process which brings demonstrable outcomes. It is equally essential that the results of previous consultation are built upon rather than repeated and that the information gained from the community is linked into the database of information available for the catchment and particularly its critical waterholes, Algebuckina and Hookeys.

Applied research into the engagement practices and outcomes of consultation for housing provision in remote area Aboriginal communities of South Australia found that the consultation had often been regarded as unsatisfactory, and people thus became less inclined to share knowledge. It was reported time and again that very often people were over-consulted, outcomes were not reported back to communities or that demonstrable outcomes were not forthcoming to support change and improved conditions. These issues are further exacerbated by remote conditions, which include large distances to travel, difficulties with the availability of busy people with social and business obligations, and the need to find appropriate, transparent methods for feedback and communication that meet agreed privacy and ethical conditions (Lee and Morris 2005). Lee and Morris propose five principles for effective Aboriginal community engagement that are equally appropriate for the broader community:

Engagement: through initial contact followed usually through face-to-face meeting to gain negotiated and mutual understanding of the reasons for consultation and an appropriate method supported by agreed protocols.

It is preferable that engagement with communities is both verbal and web-based supported by on-the-ground interviews and meetings focused on uncovering site knowledge. An appropriate fieldwork schedule allows enough time to meet on site and walk, drive and/or fly the area to visually survey and map, and to confirm oral histories and management regimes uncovered through discussions.

Communication: appropriate communication tools based upon local conditions and a good working and geographical knowledge of the area need to be developed early in the process.

Different community groups require different methods of communication and it is essential that consultation and recording methods are known and agreed. In particular, for the various Aboriginal community stakeholders in the Neales Catchment and Algebuckina and Hookeys

waterholes, as many people as possible should be gathered together over time. Ideally, they should meet at the waterholes and their environs. A range of visual tools for recording spatial information of local conditions, including maps and computer-based technologies for visualising and transferring information, should be developed.

Reciprocation: reciprocal relationship building based on local and visitor/researcher knowledge and expertise where the research contributes to the community, can be seen as part of, or at least close to, the aspirations for the community – working together towards an agreed aim.

An important component of effective consultation is the visitor/researcher and the community developing structures and mechanisms for mutual support. In remote Aboriginal and non-indigenous communities, it is essential to engage beyond information gathering and to offer something back that is of immediate benefit to the community, such as negotiated tourism management plans or educational field days around water systems.

Feedback: extends information gathering to embrace ongoing community involvement in confirming the accuracy of information, including new material and leaving the way open for future engagement in useful programs and/or projects.

Protocols and mechanisms with a feedback loop for dissemination of information, aid in the ongoing success of projects founded upon local knowledge. Such mechanisms increasingly adopt the information and communication technologies available to remote area communities.

Continuity: development of effective and ongoing communication systems, including readily accessible databases and programs that include ongoing evaluation of the works associated with consultation, is desirable, supported by ongoing engagement of stakeholders.

Effective engagement programs link talking and information-gathering over time and as a result build new communities, often involving stakeholders with different aspirations and management regimes for the same country, in a mutually understood framework for action. The continuity of communication with diverse communities is essential to the ongoing sustainability of programs in complex environments.

5.3 Community engagement for the Neales Catchment: approaches and methods

Due to diverse geographical locations the range of appropriate information available is layered, complex and contained in a range of databases and reports. Therefore, a good deal of supporting information is available, although dispersed, to assist consultation with the broad stakeholder group through web-based and already identified information contained in scientific reports and transcripts. The approach to consulting with stakeholder and local community groups, can begin with engagement through at-distance telephone and internet based communication, supported where appropriate with meetings framed around a series of thematic concepts, supported by maps where necessary. Reporting protocols include submission of transcripts of interviews and regular updates through web-based technologies and follow-up meetings held where appropriate.

The aim in consulting with the broad stakeholder group is to uncover the various policy, research, environmental, economic and cultural program frameworks that impact upon the cultural and economic use and the environmental management of the catchment and its identified critical water areas.

Local stakeholders are identifiable with current management regimes and community activities and are able to identify immediate issues, define areas for study and confirm protocols for access and engagement. Additionally, transient populations such as tourists, service providers and transport operators are nonetheless identified as engaged with and are impacting upon the ongoing use and well-being of the waterholes and cultural places along the Oodnadatta Track, the Coober Pedy Road and its various access tracks.

Two monitoring field trips contributed to the landscape assessment and initial contact and engagement components of the project.

The November 2009 field trip sought to:

- identify the scope of the country and the people involved with Algebuckina Waterhole and the Neales Catchment through stakeholder engagement
- identify the range of practices that impact upon the sustainability of the waterholes and fill key knowledge gaps regarding their cultural, ecological and productive importance
- undertake a series of preliminary surveys of key waterholes and waterbodies together with the geomorphology, hydrology, aquatic ecology and vegetation ecology researchers, to confirm areas to study in detail.

The April–May 2010 field trip sought to:

- undertake on-the-ground detailed landscape assessment surveys of selected waterholes, GAB springs, bores and dams and their environs
- undertake cultural and heritage landscape surveys of the Oodnadatta Track for impacts upon water systems and waterbodies from human interaction
- confirm landscape assessment research methodologies for gaining ecological and hydrological data, monitor fish and identify pest species
- engage with Aboriginal community knowledge on key issues for access to and collaborative management of waterholes and springs and re-engage with other stakeholders where possible.

Generally both trips achieved their stated aims but with reduced access to places and people and desired community meetings at waterholes due to the impacts of the weather. The November program coincided with two weeks of heatwave conditions which truncated field work and group community meetings, but nonetheless enabled landscape assessment to confirm conditions in times of drought and extreme temperatures. The following April fieldtrip began in favourable and warm weather but was affected halfway through by extensive rains and flooding over the catchment causing difficulty of access along the tracks and into some of the waterholes. A further field trip and educational day at Hookeys Waterhole in November 2010 successfully engaged Aboriginal community members through an educational project (see below).

The initial mechanisms for feedback and ongoing consultation are maps and an illustrated executive summary publication which will confirm management approaches and key projects. They can facilitate communication with all stakeholders who desire to access and conserve water resources and important cultural places. Through them, a practical management strategy can be developed for Algebuckina Waterhole and other easily accessible waterholes in the Neales Catchment.

A range of information sheets and questions were used as prompts during face-to-face meetings on-site at pastoral properties, community businesses and when logistically possible at waterholes. Everyone who participated was very forthcoming with information and discussion on the various issues affecting them, either directly or in ways that were seen as trends for the future. Themes for conversation included the ecology and landscape of the waterholes and water systems, and the social, historical, environmental and economic

conditions that currently exist. A series of questions was given as a guide, and it was made clear that this information will contribute to the development of negotiated management approaches for the waterholes. The questions are included for information in the body of the report as they can be evaluated as contributing to the development of cultural and ecological themes alongside on the ground management issues.

- What is your interest in the area? Do you have current and past management strategies for the waterholes?
- Can you describe the extent and quality of Algebuckina waterhole and the Neales catchment waterholes and river systems? Can we update the existing maps to see where watering places are located and their names? Are there access tracks to these places?
- Can you describe how the water systems including waterholes and bores are used on your lands? And over time how has this use changed due to varying water quality and availability? Which ones persist during dry times?
- What is the history of use? Do you have any maps or photographs that record these histories?
- What are your memories of droughts, floods and other events and how have these events affected the waterholes? Do you recall the times when the river was connected to Lake Eyre?
- Are there places where waterholes have filled up with silt, or places where new waterholes appeared after floods?
- Where do you take people? Are there any places that you think are high quality places for visiting, camping, food, refuge?
- Where do you notice that tourists now go? Can you comment on the impact that occurs from visits? Are these impacts more obvious at particular times?
- What changes are you noticing? Are there vegetation changes over time in relation to the creeks and waterholes?
- What do you see are the competing interests?
- Do you have a sense of future scenarios? What would you like to see happen?

The cyclical nature of engagement makes this technical report the base information for returning to the stakeholders to confirm the cultural landscape assessments and findings around the individual waterbody case studies.

Two graphic projects associated with the project to date have been prepared to inform and engage the range of stakeholders and the general public in the project, the Neales Catchment environment, and its fish and waterholes:

Approaches posters: two posters that inform the community of the work in progress, fieldwork and development of themes through multidisciplinary collaboration.

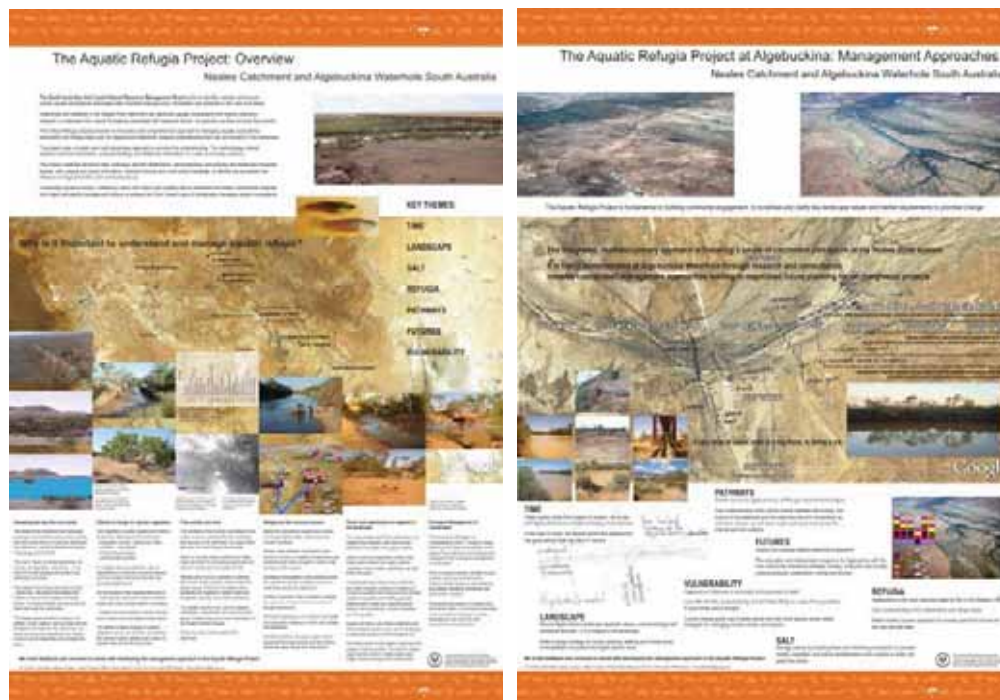


Figure 5.3.1 Community information and consultation posters

Fishing and Landscape Day posters: 10 small posters for children at the Oodnadatta Aboriginal School as support materials for working with them and their families to gain understanding about the fish and their habitats and maintain the ongoing quality of the landscape setting and ecology.

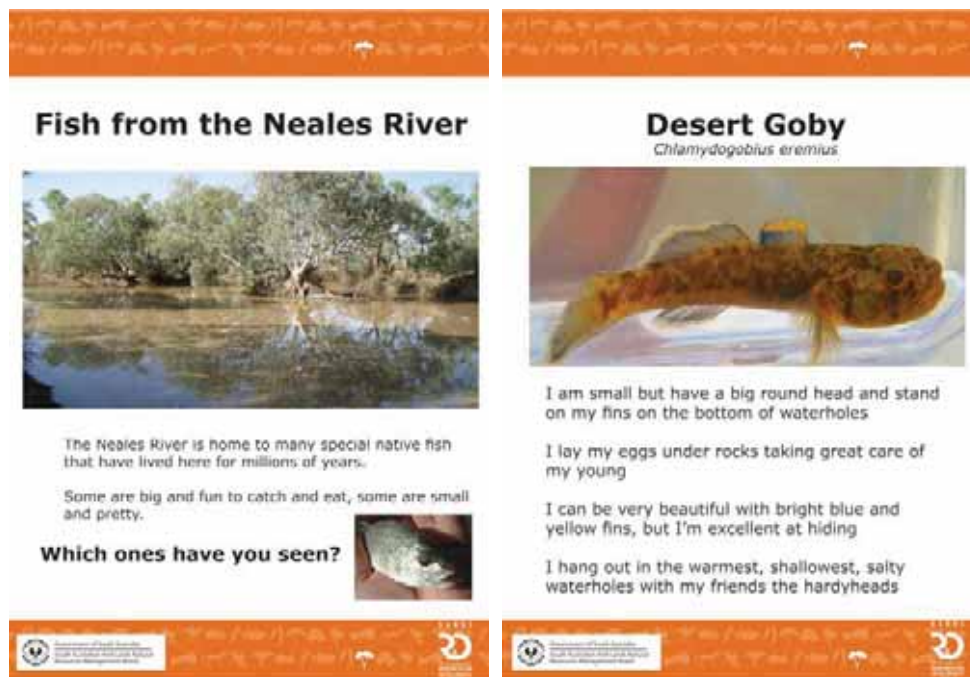


Figure 5.3.2 Hookeys Waterhole educational material for Oodnadatta Aboriginal School Fishing Day

5.4 Critical issues and findings

Stakeholders and local communities commonly raised issues on access to and management of waterholes and their associated natural and cultural systems:

Understand the dynamics of arid zone water regimes: It is critically important to research, document and gain understanding of the changing nature of rivers, creeks, waterholes and floodplains, and the current and emerging resources driven practices (such as increasing mining and tourism operations alongside new pastoral management programs) that impact upon waterbodies. Their future sustainability in the face of climatic and economic change will be influenced by methods that promote identifying and valuing their landscape qualities.

Changing pastoral practices and communities: Changes to grazing management programs, including planning for water points, alternative water delivery to stock and paddock and grazing regimes, have influenced the demise of old infrastructure which focused stock into fragile watercourses and intense use of limited water points. Increasing national and multinational management of pastoral properties is seen to result in changing (and less collaborative and supportive) community dynamics with a subsequent loss of long-term experience and local knowledge of water events and impacts to inform management approaches.

Awareness of cultural values: Both Aboriginal and European values must be documented and mapped to achieve greater awareness of the cultural, social and ecological values to support community desires for working with the landscape towards environmentally responsible management. Recent work on arid lands management regimes acknowledge these shared values with calls to establish protocols for researching traditional sites, gaining negotiated access to places, identifying designated places for specific uses and protecting critical areas from the impacts of excessive human and animal use.

Landscape assessment and ecological values: Knowledge of water systems requires relevant information on landscape qualities together with reliable methods for assigning attributes to evaluate ecological health and cultural values. Graphic and text based systems promote easy understanding by a range of users. A combination of visual assessment, landscape character assessment, historical accounts and scientific research provides the detail to enable the range of positive and negative attributes to be recorded and valued. For example, extant remnants of the abandoned Ghan Railway at Algebuckina – the bridge, old siding, stone fettler's cottage – when documented, evaluated and incorporated into assessment programs alongside ecological research, contribute to developing a whole of

waterhole understanding to inform future management and establish priorities for protection and ongoing resource use.

Involvement of Aboriginal stakeholders in expanded programs: A major issue has been meaningful engagement with the Arabunna and Dunjiba communities. A fish and environment day was held with Oodnadatta Aboriginal School students and community members at Hookeys Waterhole, in November 2010. Fish ecologists and the landscape architect prepared educational material for engaging local children and their families in the research, the management of fish resources and the landscape and vegetation of this well loved waterhole. General community feedback has been that the day was a success, the educational materials are very useful and should be widely circulated, and similar and extended programs at Algebuckina Waterhole could be a component of ongoing engagement in the waterholes project.

Access to water: Who documents and maps an issue, and why, to establish a framework for access protocols for the range of users, which protect fragile waterholes and their riparian zones? The visible short and long term impacts on water points due to public use and the persistence of feral animals, particularly rabbits, at East Algebuckina (erosion, gullying, tracking, compaction, fire, vegetation disturbance) negatively affects the quality and public perception of culturally important landscapes and places.

Impacts upon riparian zones adjacent to waterholes: Stakeholders report that stream bank modification by tourists potentially causes worse destabilisation than any stock damage (step cutting, bank compaction, firewood gathering). Management regimes for tourist resources including responsible and well-publicised guidelines for fire making and landscape design projects to reduce impacts along extensive riparian zones are recommended.

Management of tourism drivers and impacts: Develop programs for infrastructure, education, interpretation, and tourist access management that take account of the specific conditions encountered in arid zones. The programs should be based on detailed knowledge of tourist movements, vehicular and associated equipment, navigation systems and seasonal activities. Critical issues must be identified, and negotiated programs developed for protection, rehabilitation and management of critical refugia sites and culturally important places currently visited by tourists. Use internet based surveys, appropriate and current information and interpretation on organised and private tourism websites, and tap into the informal net-based positioning and reporting programs currently universally accessible to assist in managing access and behaviour.

Access and information: Signs and fences can prevent access to vantage points (fragile mesas, high hills, extant Ghan track embankments) for most visitors but are only marginally effective when the tourist explorers leave sanctioned tracks. It is reported that the few can cause great damage particularly when armed with GPS that enable people to explore widely without good understanding of local conditions and potentially impassable and dangerous landscape conditions.

Relationships to government organisations with regard to programs and support: Research into existing conditions to identify a range of management approaches requires funding regimes and management assistance that enable change implementation across public and private landscapes and sites. Workable policy and implementation programs tailored for local conditions are needed for coordination of stakeholder engagement, participation and funding requirements.

5.5 Engagement projects arising from consultation

Stakeholders also asked for assistance in managing a range of critical problems of public access and use on pastoral lands and inappropriate visitation to Arabunna cultural places. Several projects in landscape design and interpretation have the potential to be useful.

- Use the combined findings and knowledge as a point of discussion with local stakeholders to develop negotiated management approaches. Informed plans can respond to the variety of perspectives in working meetings held over prepared plans, visual material and on-site ground truthing.
- Review sites along the Oodnadatta Track with Algebuckina and Hookeys waterholes as a focus to develop a tourism infrastructure and spatial design plan, which would manage access and the impact of tourism on local resources.
- Identify critical areas for protection, renovation or as sites for intensive use (in effect sacrificial sites), and negotiate spatial landscape design areas and vehicular and walking tracks for tourist, pastoral and other access to Algebuckina Waterholes east and west.
- Develop a visual and information database of places and regions in the study area and confirm the management of such information for release in websites and publications.
- Develop an educational and interpretation strategy for the Neales Catchment's publicly accessible waterpoints in consultation with local and regional experts, both on and off the Oodnadatta Track.

- At a policy level, reconsider land tenure at critical and publicly accessible waterholes such as Algebuckina in relation to public–private leaseholds and ILUA negotiations.

6 LANDSCAPE ASSESSMENT

6.1 Overview and context

The key driver behind the Critical Refugia Project is water in the landscape and its presence, its absence and the activities focused around waterbodies in dry rivers. This detailed landscape analysis identifies sites of importance in the broader river catchment and works outwards along the roads and access tracks with the intent of gaining understanding of the impacts on local conditions in a regional perspective. Scientific approaches and design-based strategies are linked through systematic recording, coordinated mapping, and the development of common language and concepts. One of the project's critical aspects revolves around providing a visual language (through images, photographs and sketches) that allows information to be shared and coordinated through mapping and interpretation drawn from a landscape design approach.

6.1.1 Site mapping and analysis

Drawn from the literature review and landscape architecture practice, a range of routine site mapping procedures and GPS-based techniques are employed alongside alternative techniques undertaken by design, design research, landscape character and scenic assessment and interpretation methodologies. The Google Earth aerial visual mapping system has been adopted utilising the 2006 data capture, which was taken during a time of extreme drought. The Google base maps provide an easily recognisable visual perspective of the landscape, geographical coordinates and relative scale that are easily translated across research data and for the general public.

The Critical Refugia Matrix mapping technique includes on-site freehand sketch mapping of plan and section (not to scale) and site notes in the categories: form, bank margin zones, water feature/type, vegetation, occupation, access, interpretation, views, other (associated information) and issues with implications for future management approaches. All identified mapping of the various waterbodies at local, regional and national scales, has been collated to include aerial imagery and interpretation, major roads and access points, historic features and sites, popular tourism and ecological/hydrological processes analysis. Panoramic photographic imagery enables spatial characteristics and traces of use of natural systems around waterbodies to be evaluated. Immediate site conditions and details are also mapped

through photographs and collection of materials and vegetation that contribute to the place's character.

Additionally, informal mud maps, produced during consultations with both locals and researchers, indicate local knowledge of the systems and situations that impact upon river and waterhole conditions and management regimes. This informal diagramming is a valuable tool for use in consultation and information dissemination.

6.2 Water typologies: waterholes, springs, bores, dams

The research has been expanded from its focus on assessing the physical and cultural attributes of the Neales River creek and waterhole systems to develop a range of landscape typologies across the catchment including GAB fed springs, bores and surface water fed dams. This overview identifies the variety of ways that water is found or captured in the landscape and enables a comprehensive perspective on the relationships between water as a resource and as a cultural magnet in the landscape. Importantly, the expanded landscape assessment component now traces the trajectory of the more extensive geomorphology, hydrology and aquatic ecology field studies that range further along the creeks of the system. However, the final selection of waterbodies for landscape evaluation is framed through their association with human historical development and current interfaces. A total of five waterhole systems, three springs, one bore and one dam are assessed in detail.

Applied to the water typology assessment is Lennon's (1996) cultural landscape mapping overlay that relates landscape character to human occupation and intervention. The three general categories: designed, evolved and associative landscapes are attributed to each site. There are few waterbody originated designed landscapes in the Neales Catchment, with the predominant sites conveying the evolved landscape condition. Associative landscape types also abound in the small and/or more remote waterholes that exhibit high 'natural' landscape quality.

6.3 Oodnadatta Track: Landscape characteristics

Location: 135 24° E 27.30° S to 136° 20' E 28° 55'S



Fig. 6.3.1 The Oodnadatta Track exploration, rail and road corridors mapped in relation to historic water points. Source www.earthgoogle.com retrieved 19/11/2010.

General landscape character features

The following photographic survey is an account of a day's journey along the Oodnadatta Track. It conveys the diverse range of landscape and heritage experiences witnessed over the course of some 250 kilometres: starting from the remnant overland telegraph pole at Angle Pole (1) on Todmorden Station, passing through the bare red/yellow stony plains with Mount O'Halloran to the east (2–4), passing through the main street of Oodnadatta and stopping at the Pink Road house (5) for fuel, food and advice. Heading south after the Coober Pedy turn off to traverse the red gibber plains and acacia lined creeks of Allandale Station (6), crossing dry North Creek and the remnant Ghan bridge emerging out of the trees (7), passing over the sandhill country around Plantation Bore (8), a walk up the rise to overlook the vast floodplains of Hann and Ockenden Creeks to the east (9), continuing along the gently undulating dirt road that changes colour with changing soils, passing Mount Dutton (10) and the remnant Ghan rail embankment and disused springs which provided water for trains and people (11), to finally reach a crest (12) from where the panorama of the Neales or Nappamurra River spreads to the east and west, bisecting the road at the pinch causeway (13). This is the closest a road traveller can get to the immensity of the Neales and its floodplain, Algebuckina Bridge is to the west (14) contrasting with the densely vegetated riparian banks to the north. Leaving Algebuckina (15), the famous waterhole is

evident from the road in these drought times in the searing November heat. (A subsequent visit in April 2010 saw water flooding across the causeway following intensive rains and the waterhole to the east could then be glimpsed from the road.) The sandhill country emerges and across the rocky Peake River (16) the landscape opens up to the wide and treeless plains on the west side of the Davenport and Denison Ranges to the east. The ruined Warrina Siding (17) is so close to the track that the rusty fragments of machinery that kept the place going, give the site the air of an arranged museum rather than the simply abandoned appearance of the other ruined places. Warrina has an absence of vegetation and there is no presence of water in the stony countryside (18–19) with only the line of trees on Warrina Creek to the west breaking the horizon. The track evens out to flatter ground passing over variously clay and sandy soils, deeply rutted in parts, (21) – especially near creek crossings. The presence of water is apparent at the closed-off ruins of Edward Creek Siding (20) on the hillslopes above the alluvial plain of Edward Creek. Evidence of current pastoral activities emerges in the wide sandy creek, where the windmill bore and tanks attract cattle to drink and shade in the old coolibahs in the channel. Moving further south, the plains redden and are more stony (22) interspersed with parallel deep red sandy dunes covered with grasses (23), saltbush and mulga. Approaching William Creek the plains become even more treeless, the soil is yellow and the hamlet of William Creek (24) is a refuge from the constant horizon and endless plains.

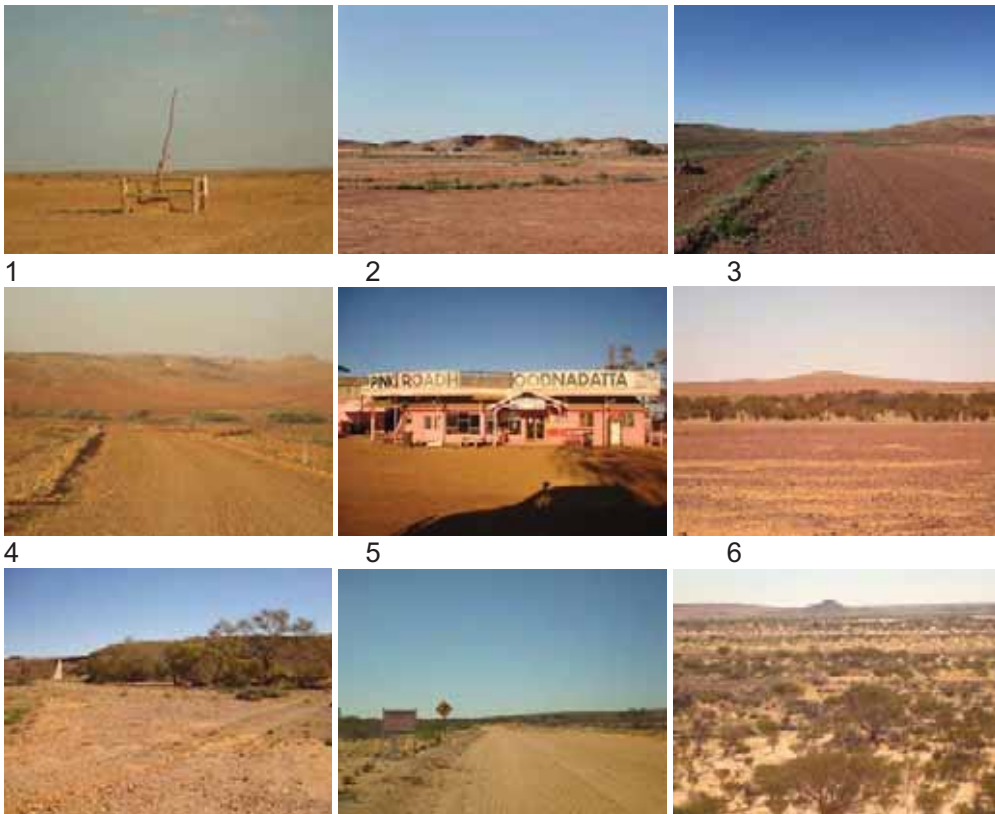




Fig. 6.3.2 Driving south on the Oodnadatta Track from north of Oodnadatta to William Creek indicating landscape character types, typical ruined settlements and river and creek crossings. Images: G Lee 2009, 2010, B Madill 2010

Issues requiring management approaches

The Oodnadatta Track combines diverse central Australian landscapes with rich explorer and settler histories that are left to the management of pastoralists and various government bodies responsible for infrastructure and pastoral regimes. Aboriginal cultural sites and associations abound but lack visibility and interpretation, as does much of the track. The Pink Roadhouse signs provide useful information in a larrikin manner but many question the appropriateness of their 'fit' in the landscape. The Oodnadatta Track Heritage Survey deals with architectural and infrastructure heritage sites but fails to survey intersections between the natural and cultural landscape qualities. They are left to land management systems to address. A management plan for the upkeep, tourism facilities planning, and interpretation of the track and its natural and cultural features needs to be developed in collaboration with local Aboriginal communities, pastoralists, tourism operators and the progress associations of Oodnadatta and William Creek.

6.4 Afghan Waterhole: Landscape characteristics

Location: 135°20' E, 27°27' S



Figure 6.4.1. Afghan Waterhole on the north branch of the Neales (Nappamurra) River north of Oodnadatta.

Source: www.earthgoogle.com retrieved 19/11/2010



Fig. 6.4.2 Afghan Waterhole with landscape characteristics sketch overlay.

Source www.earthgoogle.com retrieved 19/11/2010.

Form

This shallow tree lined semi-permanent to ephemeral waterhole lies in the channelled north branch of the Neales River passing through Todmorden Station, approximately 2 kilometres from the Oodnadatta Track. The treeless eastern silt plains fall gently into the long and relatively narrow waterhole whose sloping banks extend seamlessly from the surrounding riparian plains. Extensive channels in the alluvial plains to the west are bounded by open woodland.



Figure. 6.4.3 Afghan Waterhole treeless stony plains to the east and gently sloping easily accessible treed riparian edge. Image: B Madill April 2010



Figure 6.4.4. Afghan Waterhole 270degree panorama up stream and across shallow banks, treed creek line, open woodland with alluvial plains to the west. Image: G Lee April 2010



Figure 6.4.5 Afghan Waterhole open banks with low shrubs and trees with exposed root systems, samphire species. Note: fish monitoring nets in foreground. Image: G Lee April 2010

Riparian zone

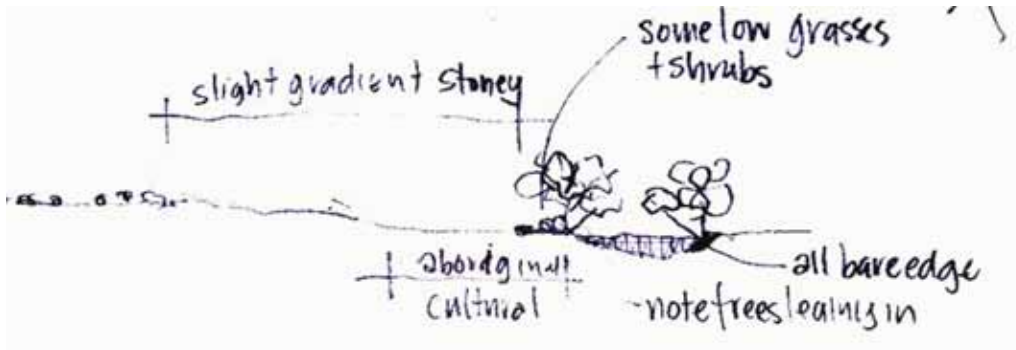


Figure 6.4.6 Sketch and photograph of typical section from east to west Image: G Lee April 2010

The riparian zone exhibits grey clay soils and furrowed banks which support acacia species and coolibah merging into samphire and other salt zone shrubs. Easy access along the eastern banks is indicated by the presence of cattle tracks. These clay margins give way to stony plains on the east and alluvial soils to the west.



Figure 6.4.7 Gently sloping sparsely vegetated banks allow access for cattle. Tracking, compaction, erosion and impact upon riparian zone integrity is evident. Images: G Lee + B Madill April 2010

Views

There are clear internal views along and across the waterhole except where vegetation is denser on the western bank to the north and to both banks in the southern area. From the eastern plains, views indicate the creek line as densely vegetated by mature coolibahs, typical of the creek lines that bisect the Stony Plains. The waterhole is not visible from the approach road.



Figure 6.4.8 View along waterhole from plains, accessible long views along length of waterhole and across banks to the west. Image: G Lee April 2010

Water feature

Afghan Waterhole presents as the most ephemeral waterhole in the Neales group surveyed on Todmorden, due to its lack of defined banks and generally shallow and turbid appearance. The shaded water under mature trees provides for a sense of refuge from the surrounding plains

Vegetation

This Neales River channel is lined with mature coolibah and some gidgee with grasses and salt tolerant shrubs and samphire species to the adjacent riparian zones.



Figure 6.4.9 Samphire sp. Afghan Plain, mature gidgee on bank, salty understorey at riparian edge. Image: G Lee + B Madill April 2010

Occupation

An associative landscape that exhibits evidence of recent and past Aboriginal occupation through the collection of remnants of stone chips on the eastern banks. The name Afghan

suggests early occupation by Afghan traders and explorers but this has not been corroborated. In the 19th century the waterhole was used as one of a string of water points along the Neales to bring cattle to the railhead at Oodnadatta and also for watering in times of drought. It is likely that the impact of cattle movement and watering over time has contributed to the eroded condition of the banks.



Figure 6.4.10 Mussels on banks, stone tool making chips on stony plain adjacent bank.
Image: B Madill April 2010

Access

Afghan Waterhole is reached from an unmarked pastoral road off the Oodnadatta Track and is privately accessed with permission only. It appears to be only occasionally visited, generally by property managers and workers. During rain the clay plains become impassable especially with access over swales and small tributary channels.



Figure 6.4.11 Unsigned single track access off Oodnadatta Track across saltbush and samphire to gibber plain, stony plain provides good access along the eastern edge for cattle and people. Fish monitoring nets in foreground. Image: B Madill April 2010.

Interpretation

No existing place name or interpretive signage on the track; however Afghan Waterhole is located on topographic maps and via GPS.

Issues requiring management approaches

Private waterhole use and access requires stock management to protect riparian banks and vegetation; and limiting occasional tourist visitation who may access the waterhole through GPS or other mapping means. As Afghan is an Aboriginal cultural site the protection of cultural artefacts in their current location is desirable.

6.5 Algebuckina Overview: Landscape characteristics

Location: 135°48' E, 27°55' S



Figure 6.5.1 Algebuckina area in the Neales River. Source: www.earthgoogle.com Retrieved 19/11/2010.



Figure 6.5.2. Algebuckina area with landscape characteristics overlay. Source: www.earthgoogle.com Retrieved 19/11/2010.

Form

The Algebuckina complex is an extensive semi-permanent and permanent linear waterhole at the intersection of the Neales River and the Oodnadatta Track some 60 km south of Oodnadatta. Algebuckina comprises two waterhole areas: West Algebuckina, a semi-permanent waterhole, historic bridge, and abandoned settlement and mining site; and East Algebuckina, nominated as the major critical refugia waterhole of the western Lake Eyre region. Algebuckina is located on both Allandale and Peake stations. It extends up to 6 km east and west of the road causeway located at the pinch or narrowest point on the Neales, depending on water flows.

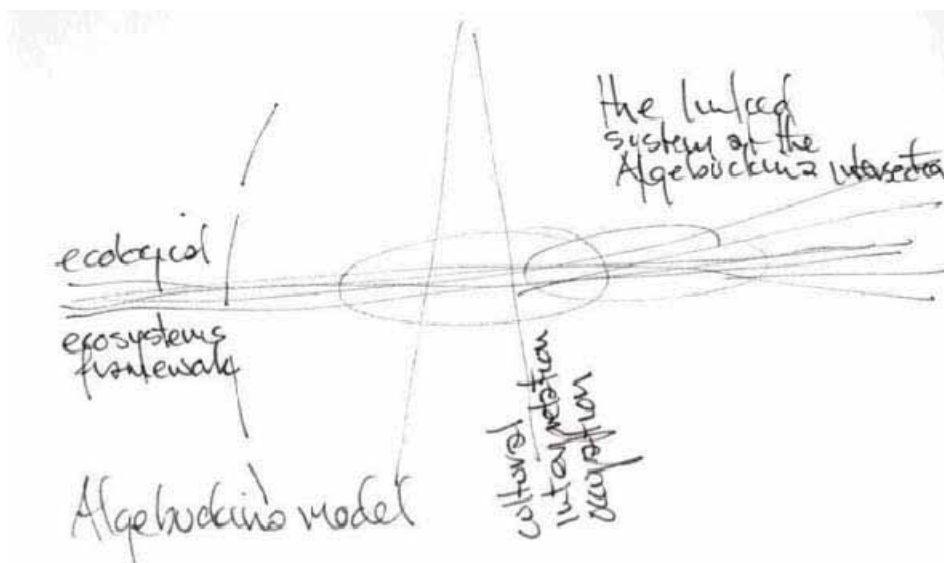


Fig 6.5.3 Schematic model of ecological/cultural overlay at Algebuckina Waterhole

From an aerial perspective, the geomorphology of Algebuckina is clearly visible: it passes through two stony hills with escarpments to the north, cut through with local creeks that deliver localised flows from rain events into the western waterhole. A number of channels form the Neales to the west. They are characterised by woodland vegetation over an extensive valley interspersed with a rocky substrate adjacent the Algebuckina Bridge. The now disused railway bridge and the Oodnadatta Track Causeway were constructed and aligned with the narrowest zone of the river. An extensive broad floodplain in gently rising hillslopes to the east spreads out towards Lake Eyre. It contains the long and deep Algebuckina Waterhole characterised by steep banks, branching channels at its eastern termination and hummocky floodplains.



Figure 6.5.4 Aerial view of West Algebuckina looking east. Image: G Lee July 2009



Figure 6.5.5 Aerial view of East Algebuckina looking west. Image: G Lee July 2009

Views

Algebuckina has excellent approach views from both south and north particularly from the northern elevated road plateau escarpment and surrounding hills to the south and the Oodnadatta Track, where the bridge slowly emerges in the landscape as the road drops into the river valley. The natural characteristics of the vast Neales River are an example of a major arid lands landscape and afford the highest quality visual experience from a range of viewpoints. The cultural landscape is also spectacularly framed by the extensive Algebuckina Bridge and associated Ghan infrastructure. When water is present in West

Algebuckina the landscape is further enhanced by the association of water in the normally dry environment, focusing the view on the river channels and their margins.



Figure 6.5.6 West Algebuckina southern hills looking west, from northern bank looking south towards the bridge and East Algebuckina. Image: G Lee April 2010

Water feature

West and East Algebuckina exhibit a range of different qualities depending upon the season. East Algebuckina is a contained and closed linear waterhole that must be accessed from narrow clearings in the banks or from the causeway when the water level is sufficiently high. West Algebuckina is a series of dispersed channels, concentrated around rocky outcrops, swampy zones and irregular riparian edges. To the east, the permanent deep waterhole breaks into a series of smaller channels with lateral feeders that eventually extend parallel to the floodplain flow regime. The southern edge is typified by hummocky plains and its northern edge is deeply channelled near the causeway becoming flat with channelled and hummock formations further east. To the west of the causeway the semi-permanent waterhole leads into a multi-channelled stream complex with irregular bed forms, and rock and vegetation assemblages at Algebuckina Bridge.



Figure 6.5.7 West Algebuckina from south bank adjacent bridge, East Algebuckina from north bank adjacent causeway. Images: G Lee April 2010



Figure 6.5.8 Causeway looking west after rain, causeway looking east during dry times. Images: G Lee April 2010, November 2009

Occupation

An evolved landscape, the Algebuckina complex is an integral part of indigenous, settler and pastoral culture in the SA Arid Lands. Algebuckina means 'pea' in the Arabunna language and is said to be the place of frog dreaming. It has had continuous use for thousands of years and is on national Aboriginal trade routes. In more recent history explorers, cameleers, miners and stockmen used the same route supported by the permanent waters of East Algebuckina. Today it is well used by tourists on the Old Ghan Heritage Trail and Oodnadatta Track. A number of ruins associated with Ghan operations and mining provide heritage interest and navigation around the area, with the principal focus of these to the west. Algebuckina Bridge and fettler's cottage are recognised on heritage registers. To the east, the aquatic and vegetative ecologies of the extensive and generally intact Algebuckina Waterhole are a magnet for locals and outsider tourists as a place of natural beauty where camping away from the crowd is possible. The boundary between Allandale and Peake stations limits the extent of visitation along the waterhole margins, with predominant campsites on the eastern margins of the Allandale fenced zone. Figures 6.5.10 and 6.5.11 indicate zones of activity and impact in relation to landscape form.



Figure 6.5.9 Algebuckina Bridge looking south, typical view looking southwest with fettler's cottage in foreground and the bridge beyond. Image: G Lee November 2009, April 2010

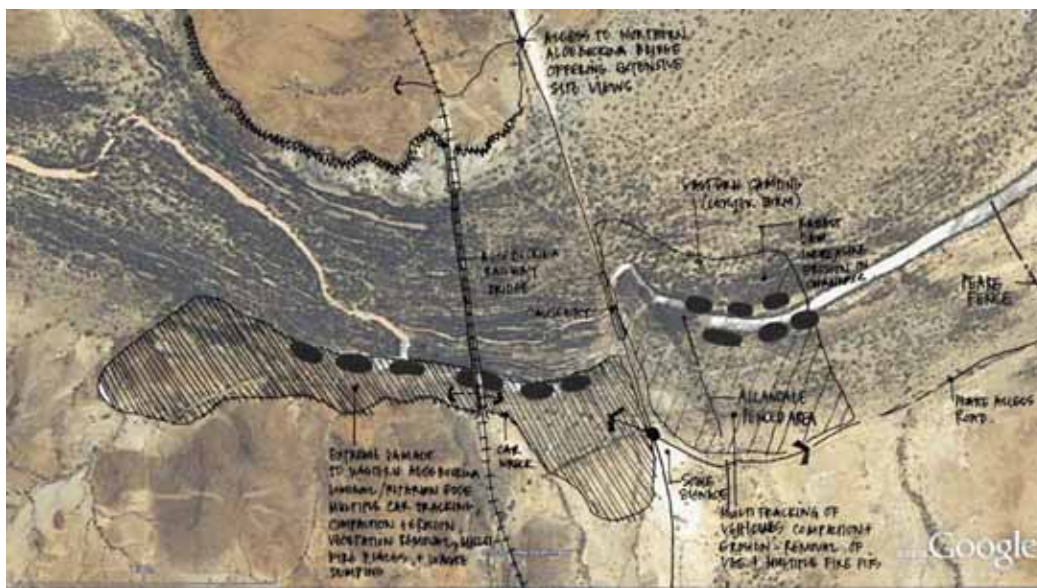


Figure 6.5.10 Algebuckina on the Neales River: general landscape form in relation to infrastructure lines. Source: www.earthgoogle.com Retrieved 19/11/2010

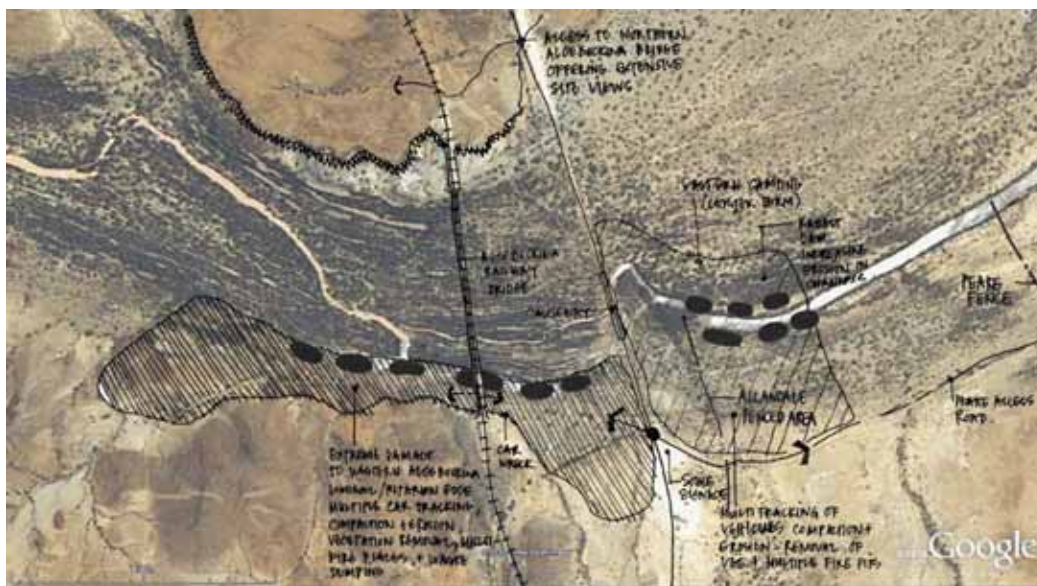


Figure 6.5.11 General tourism use and impact areas. Source: www.earthgoogle.com Retrieved 19/11/2010.

Access

The eastern waterhole is open to visitors on the Allandale lease and easily accessed via a well-marked pastoral access road. The western area is accessible directly from the Oodnadatta Track, as are the fettler's cottages, Algebuckina Bridge and heritage mining area further west. The Algebuckina causeway is an important stopping point for tourists and is the direct interaction point for initial visitation to the area.



Figure 6.5.11 Algeuckina causeway and entry to Algeuckina Waterhole. Image: G Lee April 2010 November 2009

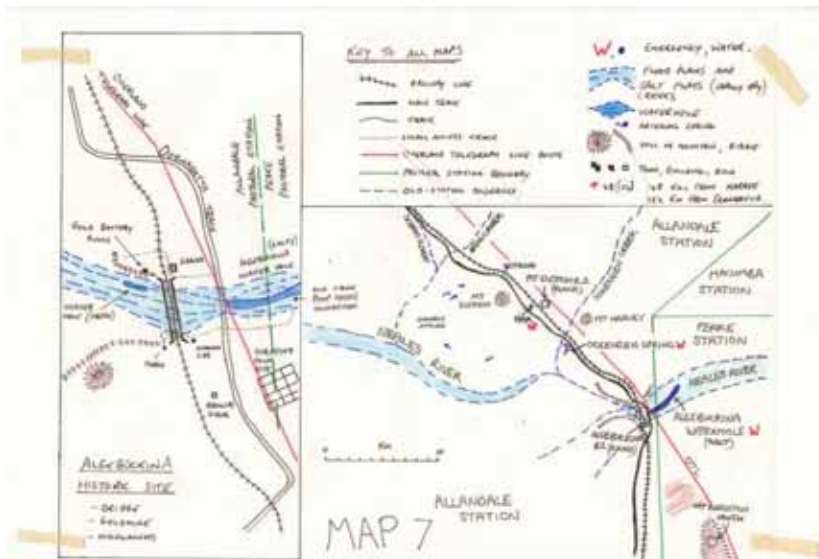
Interpretation

Interpretive signage is limited to directional SA Government signage, and Pastoral Board and Oodnadatta Roadhouse information signage. This unstructured signage system provides less synthesis of site features, access control, and care for country in the mind of the visitor.



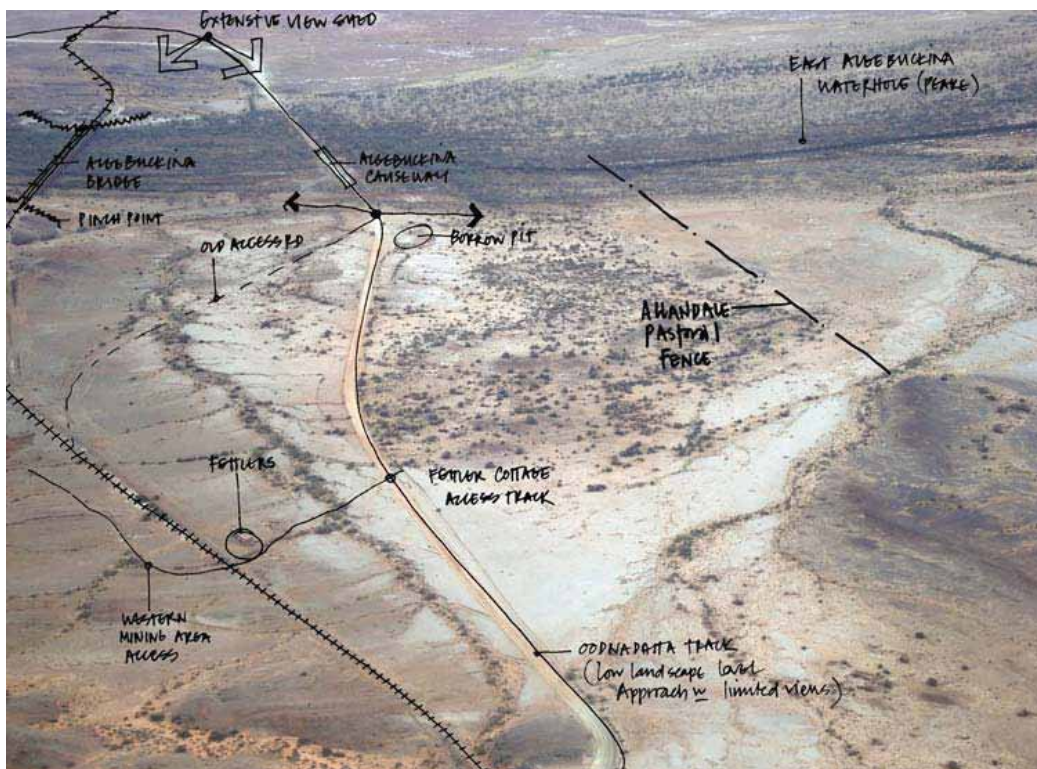
Figure 6.5.12 Various interpretive signs at Algeuckina including Transport SA, Pastoral Board and Pink Roadhouse. Images: G Lee + B Madill 2009-2010

A number of experienced tourism operators are aware of the rich history of the area and have produced maps and educational material. The Oodnadatta Heritage Survey notes Algeuckina Bridge and its legacy, and the String of Springs brochure enables a natural and cultural overview of Algeuckina in relation to GAB springs landscapes. The increasing appearance of blogs and internet sites posted by tourists provides a number of private research documents and illustrated accounts of travellers' tales and experiences.



Issues requiring management approaches

Figure 6.5.14 provides an overview of the key structural aspects and important sites of the Algebuckina area. The need for a total tourism management and infrastructure plan for the immediate environs has been discussed by many locals consulted during the project.



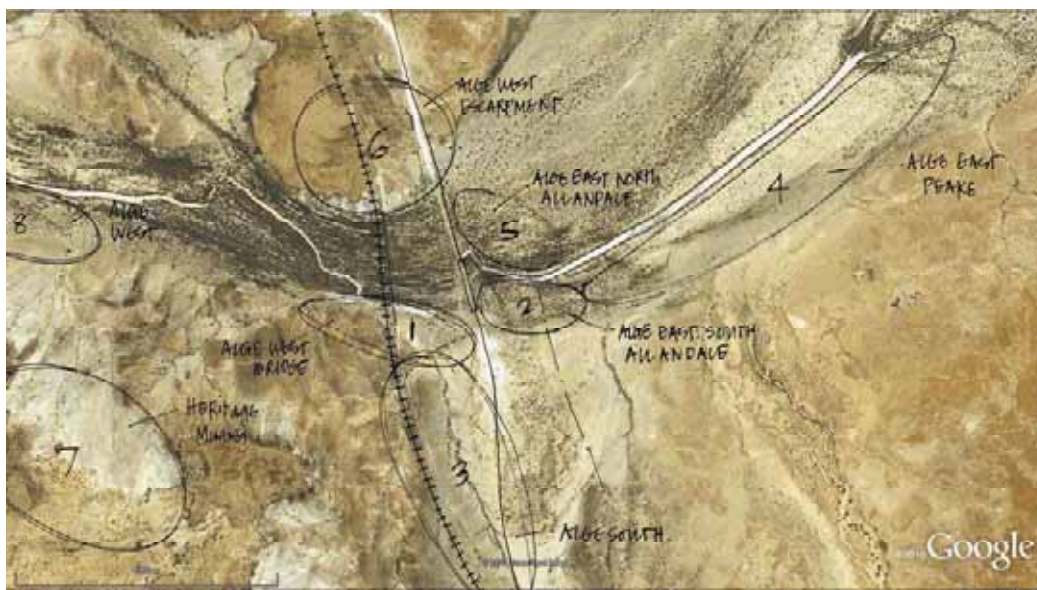


Fig 6.5.15 Algebuckina overview landscape character zones designated in relation to landscape attributes, activity type and intensity of use.

These landscape character zones are suggested to aid in preparing management approaches to the Algebuckina complex:

Area 1 West Algebuckina Bridge:

Cultural tourism, Neales River interpretation and waterhole ecology, Aboriginal culture, walking trails and camping infrastructure, rehabilitation

Area 2 East Algebuckina Waterhole South Allandale:

Historical, ecological and tourism interface, Aboriginal culture, interpreting natural, especially fish ecologies, limited camping, rehabilitation

Area 3 Algebuckina South and Ghan Railway:

Explorer and settler histories, walking trails and camping infrastructure

Area 4 East Algebuckina Peake:

Pastoral, rehabilitation and aquatic ecology research area, limited public access

Area 5 East Algebuckina Waterhole North Allandale:

Aboriginal culture, interpreting natural, especially aquatic ecologies, no camping, walking trails rehabilitation

Area 6 West Algebuckina Escarpment:

Viewing and interpretation point of natural and heritage features, no camping, walking trails and car access limited to east of Ghan line.

Area 7 West Algebuckina Heritage Mine:

Walking and organised driving trails, limit access to waterhole

Area 8 West Algebuckina Waterhole:

Pastoral, tourism management

6.6 East Algebuckina Waterhole: Landscape characteristics

Location: 135°50' E, 27°55' S

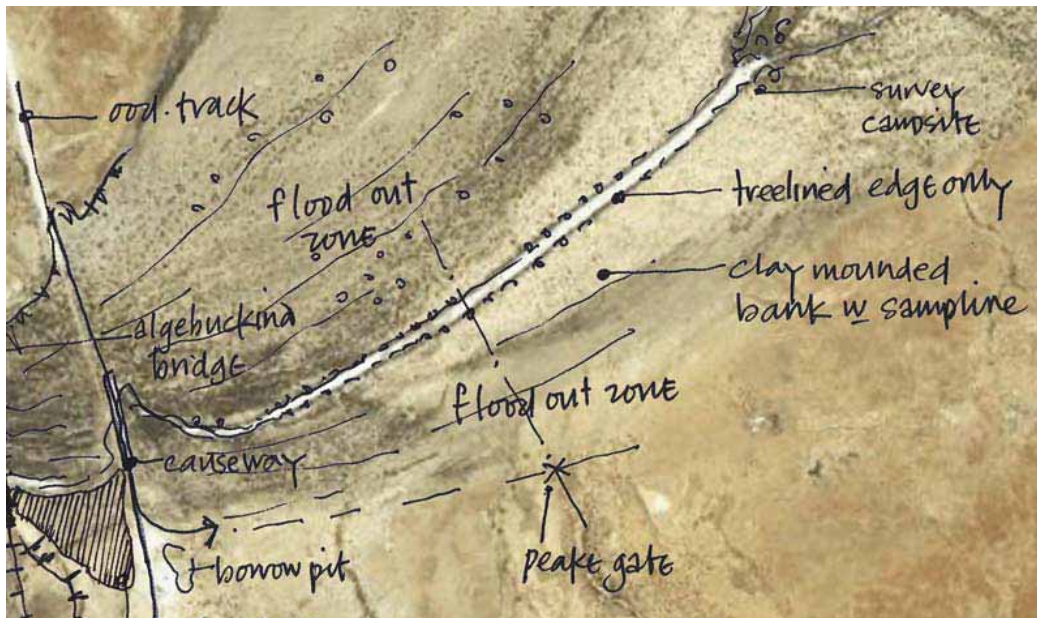


Figure 6.6.1. East Algebuckina Waterhole with landscape characteristics sketch overlay. Source www.earthgoogle.com retrieved 19/11/2010

Form

East Algebuckina is a large permanent linear waterhole in the Neales River alluvial plain located downstream of the Oodnadatta Track causeway. It is located on both Allandale and Peake stations and extends several kilometres east of the causeway, depending on water flow, where it breaks into a series of smaller channels with lateral feed that eventually extend parallel to the floodplain flow regime. The waterhole visually emerges from a rocky pavement at the causeway, loops and narrows northwards before curving back to head northeast towards Lake Eyre. It ranges in width at its extremities but retains a typical width of around 30 metres and runs parallel to the line of flow of the greater river. The southern alluvial zone is typified by hummock formation and the northern valley is deeply channelled near the causeway, flattening out with some hummock formation further east.



Figure 6.6.2. East Algebuckina Waterhole at eastern most extent, lateral channel to north. Image: G Lee April 2010.



Figure 6.6.3 East Algebuckina east of the Algebuckina causeway from north bank. Image: B Madill April 2010

Riparian zone

The riparian zone is typically steep banked silty clay soil with coolibah lined banks and a medium to high density lignum understorey. This is broken only where erosion gullies have impacted on bank integrity in many places on both north and south banks. Areas of dry swamp extending to silty clay hummock country support young coolibahs, stringy acacia species and samphire and nitre assemblages on the low gradient ground sloping away from the waterhole edge to the eastern hillslopes. Similar vegetation on the northern banks is denser due to the expanded alluvial valley.

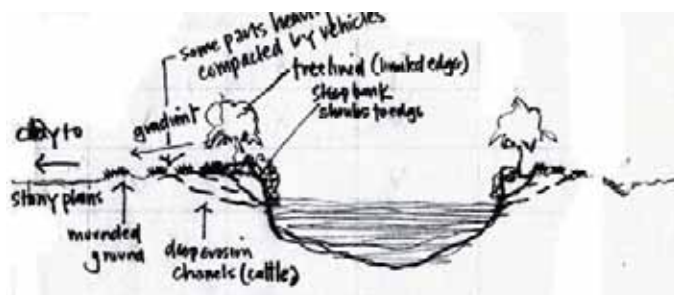


Figure 6.6.4 Section showing arrangement of East Algebuckina banks and waterhole

Views

Contained in the channel zone and framed by coolibah and lignum, the waterhole is viewed along its length only by air or from larger clearings along the banks. There are a number of particularly good vantage points for long views along its length, some accessible by visitors. It has excellent across bank and distance views, except where dense vegetation, particularly to the eastern channels, interrupts visual access. Views across the flat plains to the south exhibit pastoral landscape character interspersed by occasional trees and low shrubs.



Figure 6.6.5 East Algebuckina Waterhole and riparian zone showing steep well vegetated banks to extensive waterhole with hummocky shrubby plains to the south. Images: G Lee + B Madill April 2010

Water feature

East Algebuckina is a large permanent linear waterhole of significant depth with exposed banks in drought to seamless vegetation and water in the wet. Contained by dense vegetation along its banks, its scale provides an uninterrupted view of an extensive waterbody in the arid country. Starting at the rocky Oodnadatta Track causeway, it appears as a contained pool from the road, with no evidence that it extends some kilometres east before a dog-leg into lateral channels to merge into the Neales floodout zone.



Figure 6.6.6 East Algebuckina Waterhole and causeway wet and dry conditions. Images: B Madill April 2010 G Lee November 2009

Vegetation

East Algebuckina is dominated by coolibah lined with a well-defined lignum understorey interspersed with small acacia and santalum in the riparian zone. The southern edge vegetation structure is principally nitre bush hummocks opening to sparsely grassed and chenopod stony plains. To the north its assemblage includes those same species in an open woodland assembly opening to stony plains and sparsely grassed hill country beyond the alluvial zone. These systems are not visible to the north from the waterhole.



Figure. 6.6.7 Collected vegetation samples, East lateral channel showing dense lignum to bank. Image: G Lee April 2010

Occupation

The largely pastoral and Aboriginal cultural activities at the waterhole, supplemented by more recent tourism in the eastern areas are obvious in the traces of cattle tracks and droppings, rabbit warrens, vehicular tracks, abandoned campsites, rubbish and tree cutting. The ruins of the pump house and knowledge of the gazetted but unbuilt 19th century town site to the east, link the importance of the waterhole to ideas for continuing inhabitation to support the Ghan, north–south movement along the track and pastoral regimes. East Algebuckina is of great interest to the scientific and pastoral community as a water and ecological resource. However, its remoteness and natural qualities appeal to a specific type of adventurer tourist and many day-trippers pass it by.



Figure. 6.7.8 Ghan associated pumphouse, the fish laboratory, two camping sites in clearing around coolibah, and clearings cut from low points in banks. Images: G Lee November 2009 April 2010

Access

The waterhole is easily accessed via Allandale and a well-marked pastoral access road directly off the Oodnadatta Track. Peake Station limits access to tourists and at present the pastoral access gate is locked. This effectively blocks vehicle access to half of the southern edge of the waterhole. Allandale Station has attempted to control cattle access and visitor camping, fencing off part of their property for use by tourists to the exclusion of other areas. A number of tracks criss-cross the alluvial plains adjacent to the waterhole despite the

visible primary tracks along fence lines. Campsites are strung along the accessible length of the waterhole to enable individual and private camping to the detriment of the banks and adjacent silty floodplains and their vegetation. Erosion gullies are evident in the tracked areas from stock and heavy off road vehicles.



Figure 6.6.8 Vehicular tracks to access bank campsites and intensive group camping at waterhole.
Image: G Lee November 2009, April 2010

Interpretation

Directional and information signs are installed at the road junction but there are no tourist facilities or indications of where to camp or how to use the waterhole and its surrounds for best practice, long-term care. Signage is NRM, South Australian Government Heritage and Pink Roadhouse approach. Within the site, directions to the waterhole and away from private pastoral land helps orientation but this focuses more intense visitation to areas that may otherwise be overlooked.



Figure 6.6.9 East Algeuckina Waterhole interpretation and identification with directions at the Allandale/Peake intersection. Images: G. Lee 2009

Other aspects

Information on the importance of Algeuckina as an educational, meeting and fishing site for Aboriginal people remains undeveloped. Negotiated management between pastoralists and local communities for improved tourist outcomes has great potential. Algeuckina Waterhole's relationship to the broader Neales Catchment and Lake Eyre Basin system is of high interest to conservation groups, scientists, land managers and the general travelling

public. Documentation and presentation of these qualities framed by cultural and natural landscape conservation principles in relation to connectivity and resources use is essential.

Issues requiring management approaches

Long term impact to the site by overuse, including damage by vehicles and inappropriate camping locations and practices, has led to soil compaction, vegetative decline and riparian zone integrity problems. The soil is heavily compacted, with obvious impact to vegetation not only from stripping for use in campfires but also from degraded soil conditions in riparian zones. Cattle have also impacted on the southern riparian zone particularly by advancing bank erosion and degradation. The northern banks are impacted extensively by rabbit occupation and warren construction. In the Allandale zone particularly, the soil is heavily compacted with multiple vehicle tracks, campsites and campfires strung along the bank where the lignum has been cleared. Stripping vegetation for use in personal fires shows in the obvious patchy degraded conditions of riparian zones. On the Peake side, the cattle tracks and rabbit warrens have extensively altered the bank in both southern and northern riparian zones resulting in areas of gullying and bank erosion.

In 'good years' there are high visitation rates and intensive use by groups with sophisticated camping and vehicular equipment. Management consideration needs to be given to interpretation and access control. Interpretive signage should include information on care for the waterhole and its surrounding environments. Control of bank erosion and access, and camping access and practices, will also be critical to the health of the waterhole.

The annotated aerial views along the waterhole in Figures 6.6.10 and 11 summarise the key issues described above and present the visual evidence to inform future management approaches.

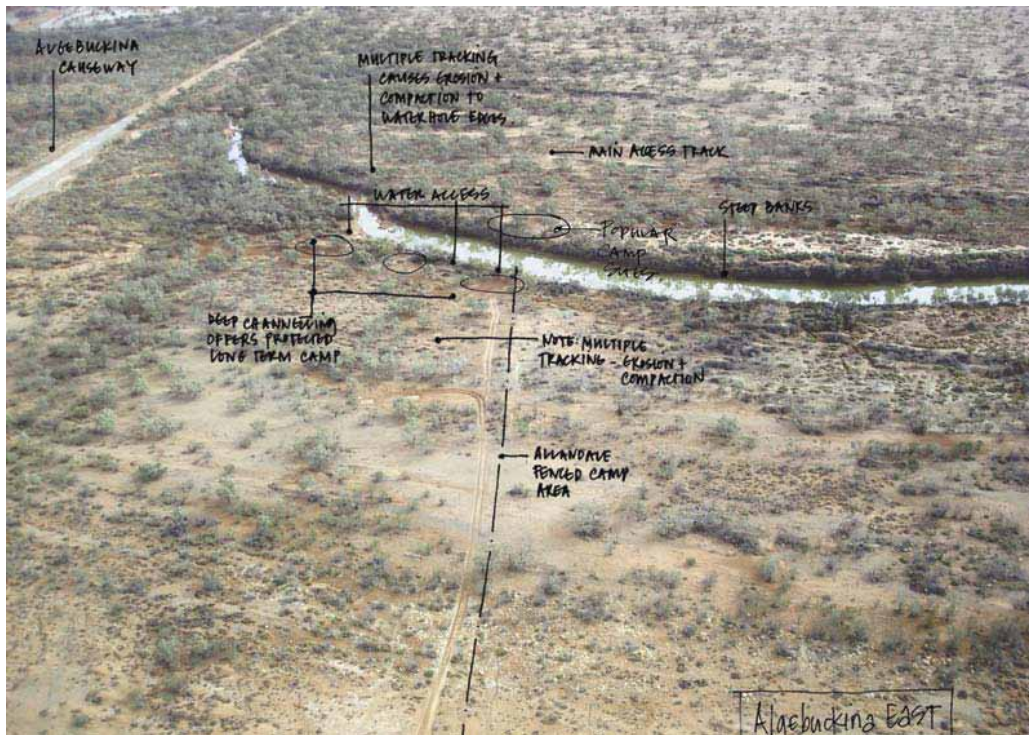


Figure 6.6.10 East Algebuckina impact issues in area close to causeway. Image: G Lee July 2009



Figure 6.6.11 East Algebuckina on Allandale Station vehicular impact to riparian edge. Image: G Lee July 2009

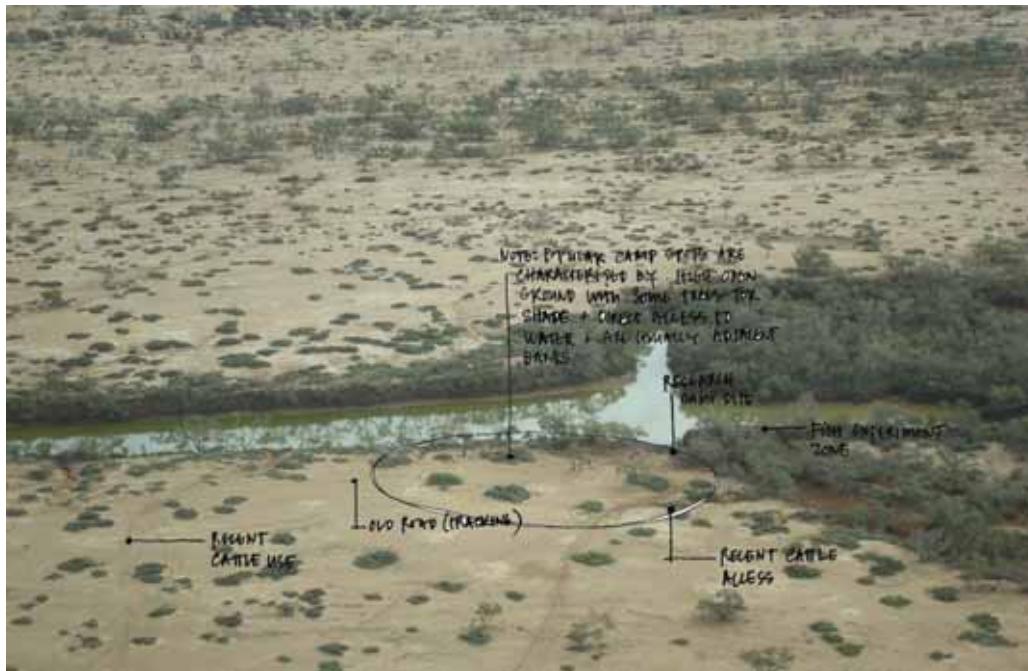


Figure 6.6.12 East Algebuckina on Peake Station impact to banks to the east. Image: G Lee July 2009



Figure 6.6.13 East Algebuckina Waterhole rabbit and stock initiated impacts resulting in gullying at the riparian edge and compaction on the floodplain. Image: G Lee and B Madill April 2010

6.7 West Algebuckina Waterhole: Landscape characteristics

Location: 135°48 E, 27°55' S

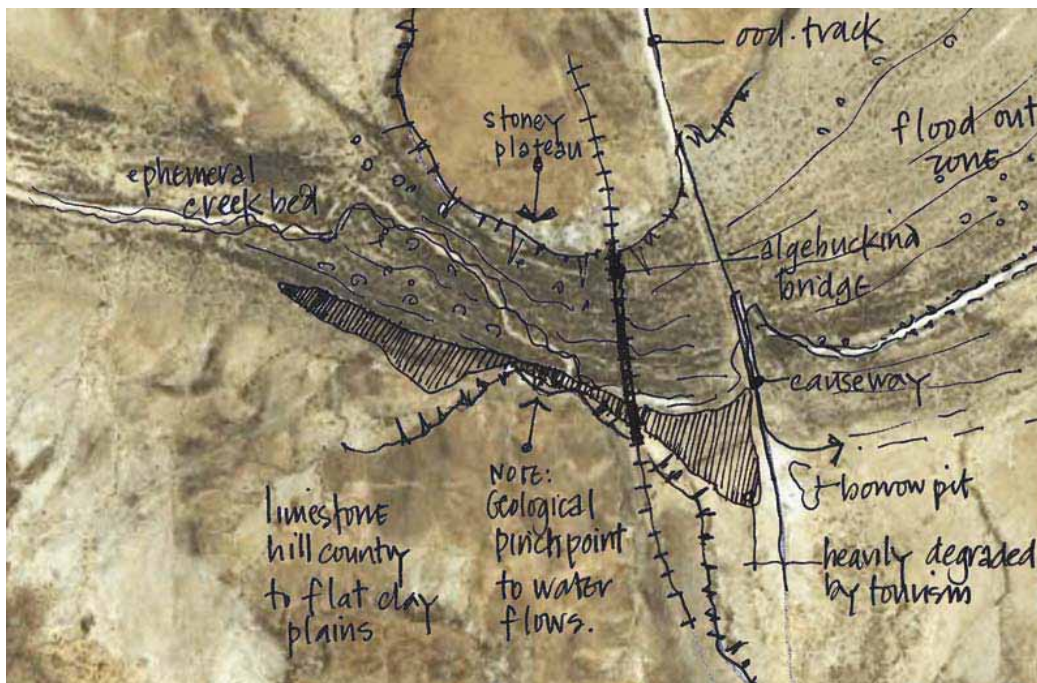


Figure 6.7.1 West Algebuckina with landscape characteristics overlay. Source: www.earthgoogle.com Retrieved 19/11/2010.

Form

West Algebuckina Waterhole lies wholly within Allandale Station and is a large semi-permanent linear waterhole to the west becoming more irregular as it passes through the pinch zone of the western rocky rises and creek cut hillslopes of the Neales River. It is contained in a multiple channelled creek complex and valley which flows from the west to the Oodnadatta Track causeway depending on climatic conditions, and passing under the Algebuckina Railway Bridge. It is as wide as East Algebuckina Waterhole, before it is squeezed by the geological formation of the area it passes through. It then forms a densely vegetated multiple channelled creek complex breaking into many small channels and swales as it approaches the Oodnadatta Track causeway. Overall it is an area of striking spatial form; its deep channel in the surrounding plains landscape is atypical in the greater landscape of the arid lands.



Figure 6.7.2 West Algebuckina Waterhole including Algebuckina Bridge looking northeast, stream complex as seen from plateau to south, sparse stony hills in foreground. Image: B Madill April 2010



Figure 6.7.3 West Algebuckina heritage mining area and limestone hills. Image: B Madill April 2010



Figure 6.7.4 West Algebuckina heritage mining area looking west toward semi-permanent waterhole and alluvial plain at the western margins. Image: B Madill April 2010



Figure 6.7.5 West Algebuckina limestone country looking east to Algebuckina Bridge and Oodnadatta Track. Image: B Madill 2010

Riparian zone

The western clay/silt riparian zone extends out over grassed hills to limestone/clay country with sparse vegetation. Here the zone is typified by red clay vertically incised banks to 3 metres leading on to a gentle gradient towards steep stony ground and the plateaus. Further toward the bridge the bank zone height diminishes as shallow rock outcrops and silty clay banks expand the waterhole into a broad undifferentiated zone. Vegetation remains dense on the northern banks; however, to the south, trees, shrubs and forbs diminish as the stony plains extend into the river margins.



Figure 6.7.6 West Algebuckina linear waterhole area, steep banks with dense edge vegetation, poor tree condition to banks. Image: B Madill April 2010



Figure 6.7.7 Under Algebuckina Bridge at West Algebuckina. Image: G Lee April 2010



Figure 6.7.8 West Algebuckina main channel east of Algebuckina Bridge. Image: G Lee April 2010



Figure 6.7.9 West Algebuckina Waterhole opening to stony stream base with sparse riparian vegetation. Image: G Lee November 2009



Figure 6.7.10 West Algebuckina looking toward waterhole, note stony banks with compaction of riparian edge through visitation. Image: G Lee April 2010

Views

Views are extensive both along the channelled creek system and across the waterhole. The waterhole section has a dense riparian edge in places where cross-bank views are reduced. Elevated views of the Algebuckina complex are seen from the old Ghan Railway infrastructure or the plateaus to either side. Expansive views from the higher ground exhibit all the values of areas of high landscape quality including complexity, variation, orientation points and panoramas over the stony plains and river landscapes below. Localised views across and to the west of the waterhole and surrounds are enclosed by dense and healthy vegetation and framed by industrial heritage of high quality. Key views over the natural landscape are devoid of infrastructure or signage which contributes to the perspective of the elemental natural arid landscape and its refuge site.



Figure 6.7.11 West Algebuckina south view over bridge toward west waterhole, West Algebuckina north view and East Algebuckina. Image: G Lee April 2010

Water feature

West Algebuckina Waterhole is located in a large ephemeral creek system. It forms a channelled impermanent waterhole 3 km west of Algebuckina Bridge and then forms into a singular channel semi-permanent linear waterhole to the west. Its variable water condition provides for a diverse experience along the river bed where topography, rich ecologies and water pools provide a high landscape quality environment.



Figure 6.7.12 Overview of West Algebuckina. Image: B Madill April 2010

Vegetation

Its asymmetrical riparian edges display a number of vegetation assemblies. The western reaches mimic the coolibah and lignum bank and silty nitre bush hummocks of East Algebuckina. The rocky pinch zone of the causeway forms a flat floodable plain with a gentle gradient to the southern plateau with steep slopes to the sparse and stony northern escarpments. Vegetation associations respond to channel structure, soil type and water regime typified by reeds, grasses and small trees, acacia species and coolibah, in multiple channels. Eremophila and acacia scrub populates the rising hill slopes beyond.

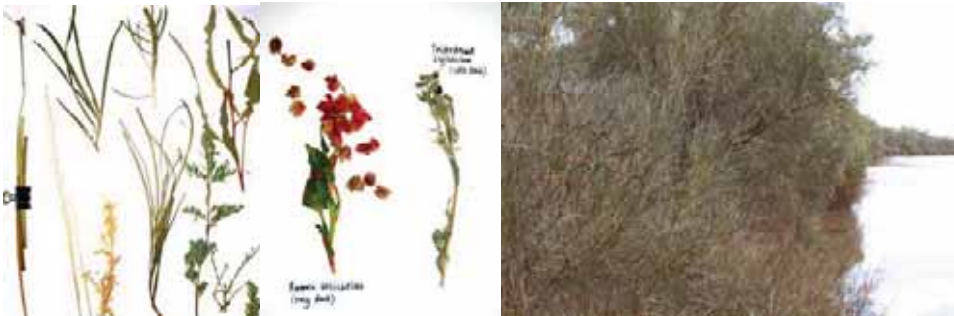


Figure 6.7.13 Vegetation of West Algebuckina at waterhole and dense riparian edge. Image: G Lee + B Madill April 2010.

Occupation

The principal cultural landscape character of this evolved landscape is of heritage value in association with natural systems. This area is the main magnet for tourists along the track and especially for day-trippers. Extensive built and material cultures of the explorers and settlers from the 19th and into the 20th century are present in the ruins and extant infrastructure. Aboriginal heritage is not obvious here although there are many stories surrounding the origins of the three 'frog' rocks and stories of the central importance of

Algebuckina to Aboriginal life in the area. Numerous instances of settlement and infrastructure heritage sites are popular with visitors including Algebuckina Bridge, fettlers' cottages and old mining sites in the limestone hills to the west.



Figure 6.7.14 West Algebuckina heritage sites located adjacent to the Oodnadatta Track and hinterland; Algebuckina Bridge, car ruin, Ghan fettlers' cottages, mining site and ruined mining machinery
Image: B Madill April 2010

Access

The waterhole is easily accessed directly from the Algebuckina causeway and for a number of kilometres south and west of the causeway. Large areas are thus extensively damaged by vehicle use, inappropriate camping locations and practices such as driving over the Ghan embankment to reach the highest viewing point to the west of the bridge. The soil is heavily compacted at the riparian edge, with obvious damage to vegetation not only from stripping for use in campfires but also from degraded soil conditions around bank edges and floodplain. Further unlimited access to the limestone mining hills has led to multiple tracking of vehicles over fragile desert ecosystems.

Interpretation

A range of uncoordinated signs, badged SA Government and Pastoral Board, or Ghan historical interpretation and Pink Roadhouse information signs, provide directions and information; however, there are neither tourist facilities nor control of access at the site. Internet blog and tourism sites provide extensive anecdotal information on tourist experiences, both good and bad. What is clear is the absence of information on the natural systems and their interaction with the cultural landscape.



Figure 6.7.15 The variety of information at West Algebuckina. G Lee + B Madill April 2010.

Other issues

Extensive visitation from tourists, a lack of facilities, difficult management issues for pastoralists and other organisations charged with heritage protection, and the intersection between pastoral and tourism activities, suggest challenges for effective and sustainable management of this increasingly popular place. The annotated overlay in Figure 6.7.16 marks the areas of use, important cultural sites and landscape zones, and the extent of impacts across both West and East Algebuckina. Although they exhibit different characteristics, the two waterholes should not be regarded as two separate areas requiring separate management regimes. Rather the tourist areas of Algebuckina, well planned and serviced together, will work to improve and conserve current conditions, which have come about through a combination of natural and human influences.

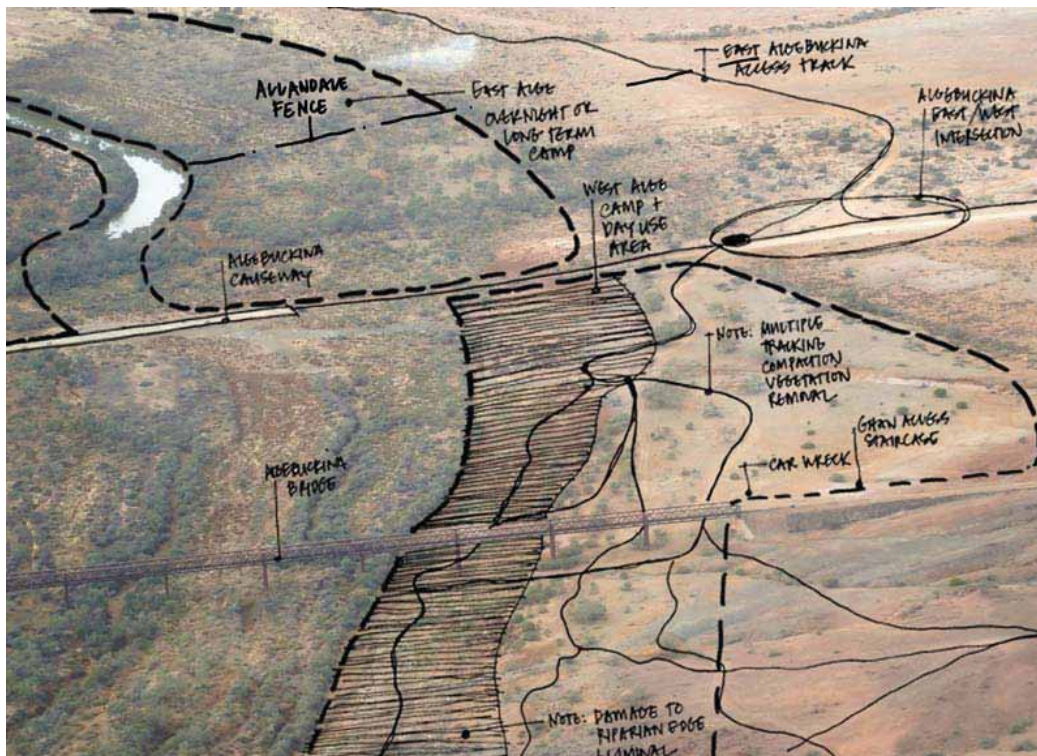


Figure 6.7.16 West Algebuckina camping and sightseeing areas and impacts. Image: G Lee 2009

Issues requiring management approaches

Uncontrolled visitor and vehicle access and use of waterhole and stream riparian zones has led to extreme compaction and erosion of the edge. Camping in and beside the creek bed zone, creating multiple fireplaces, stripping of local vegetation and waste deposition has exacerbated these issues. Lack of appropriate signage that educates visitors is also a problem. Access to fragile edge systems and desert pavements to the west requires management.



Figure 6.7.17 West Algebuckina compaction, erosion and fire issues. Image: B Madill April 2010

6.8 Angle Pole Waterhole: Landscape characteristics

Location: 135°20' E, 27°30' S



Figure 6.8.1 Angle Pole in the Neales River Catchment north of Oodnadatta

Source: www.earthgoogle.com retrieved 19/11/2010.



Figure 6.8.2 Angle Pole waterhole with sketch overlay landscape characteristics.

Source: www.earthgoogle.com retrieved 19/11/2010

Form

Situated in a contained landscape in the northern branch of the Neales River downstream from Afghan Waterhole on Todmorden Station, Angle Pole is a medium depth semi-permanent to shallow linear channel waterhole situated in the alluvial plain and not on the hillslope margins as are other waterholes. Angle Pole emerges out of open woodlands and multiple channel river plains and is associated with local depressions and dry swamps. Its banks are generally shallow and a number of clearings allow for access over easy gradients. On the eastern margin an extensive clearing along the stony and silty banks terminates at a branching channel to the north.



Figure 6.8.3 Angle Pole looking north along the riparian edge and access track; the waterhole is to the left with dry swamp and treed channel to the right. Image: B Madill 2010

Riparian zone

Differing bank gradients along its length provide for a range of vegetation assemblies and densities (Figure 6.8.4 Sections A and B). Soils are red clay with stony areas and erosion is limited to occasional areas on the bank margins east and west. The understorey is generally limited until the upper multiple channel reaches which have predominantly mature coolibah and some gidgee plantings along the riparian ridge and into the water edge.

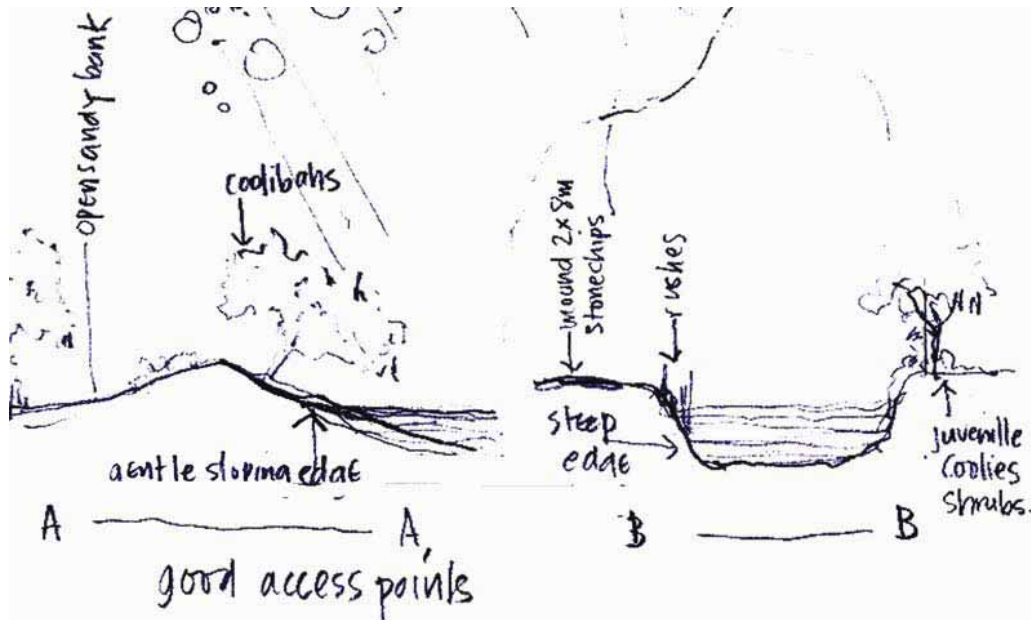


Figure. 6.8.4 Angle Pole Waterhole section looking north, section looking south

Views

Angle Pole is a contained waterhole, not visible from roads or tracks, but is easily identifiable from aerial photographs due to its scale and length. A number of highly picturesque views over shaded and extensive stands of water make this a waterhole of high visual quality, improved by the relative degree of its natural and untouched attributes. Views are both contained by mature vegetation and framed by overhanging branches.



Figure 6.8.5 Excellent long and cross views of waterhole both at southern and northern ends. Image: G Lee April 2010

Water feature

The extent to which Angle Pole Waterhole is a refuge in the larger Neales system and is contained in the alluvial valley, influences its high landscape quality. The water appears to be of good quality, the banks are open and relatively intact and the scale is substantive in the context of northern river reaches. The terminating margins of the waterhole are complex and provide added complexity to the waterhole.



Figure 6.8.6 Angle Pole Waterhole in the late afternoon reveals a shady and sheltered refuge. Image: G Lee April 2010

Vegetation

A mature coolibah lined waterhole, more densely vegetated on the western edge due to the steeper bank and reduced access. Coolibah, acacia and myoporum species are present along riparian margins, where zebra finches were observed nesting. In the swampy margins and channel tributaries, grasses, samphire and saltbush species populate the silty and clay grounds in a diverse assembly of groundcover types.



Figure 6.8.7 Vegetation samples, samphire plains vegetation, southern waterhole edge vegetation, access track vegetation assembly. Images: G Lee + B Madill April 2010

Occupation

An associative landscape, Angle Pole derives its name from the junction of the overland telegraph line on the Oodnadatta Track a few kilometres to the east. Stone chips are evidence of Aboriginal occupation, with evidence of recent stock and local use of the area present on the riparian banks and ridge. Angle Pole has been used as a watering point and camp on overland stock musters heading for Oodnadatta. It is a place popular for local fishing and visiting due to its refuge landscape qualities and relative proximity to town.



Figure 6.8.8 Evidence of long-term occupation at waterhole including stone tool making site, contemporary material collections. Image: B Madill April 2010

Access

An unmarked pastoral access track from the Oodnadatta Track, Angle Pole is nonetheless signalled by the historical pole adjacent to the turn off. The single lane access track moves over a range of landscape types including flat clay plains with low shrubs, tending to spindly trees nearing the river valley and forking into two as it passes into open low woodland in the alluvial valley. The track becomes impassable after rain.



Figure 6.8.9 Access track off Oodnadatta Track – unmarked access tracks across mulga plains and along the swamp adjacent the waterhole. Images: G Lee + B Madill April 2010

Interpretation

Angle Pole is located on topographic maps and in GPS systems but is otherwise unmarked.

Issues requiring management approaches

This popular private waterhole may become well known to tourists due to its high landscape quality, extent of naturalness and relative ease of access. Management requirements are: stock management to protect riparian banks and vegetation; and limiting access to tourists who may access the waterhole through GPS or other mapping means. Angle Pole is an Aboriginal cultural site and the protection of cultural artefacts is desirable.

6.9 Big Blyth Bore: Landscape characteristics

Location: 136°03' E, 28°04' S



Figure 6.9.1 Big Blyth Bore drain between Blyth and Peake creeks. Source: www.earthgoogle.com Retrieved 19/11/2010.

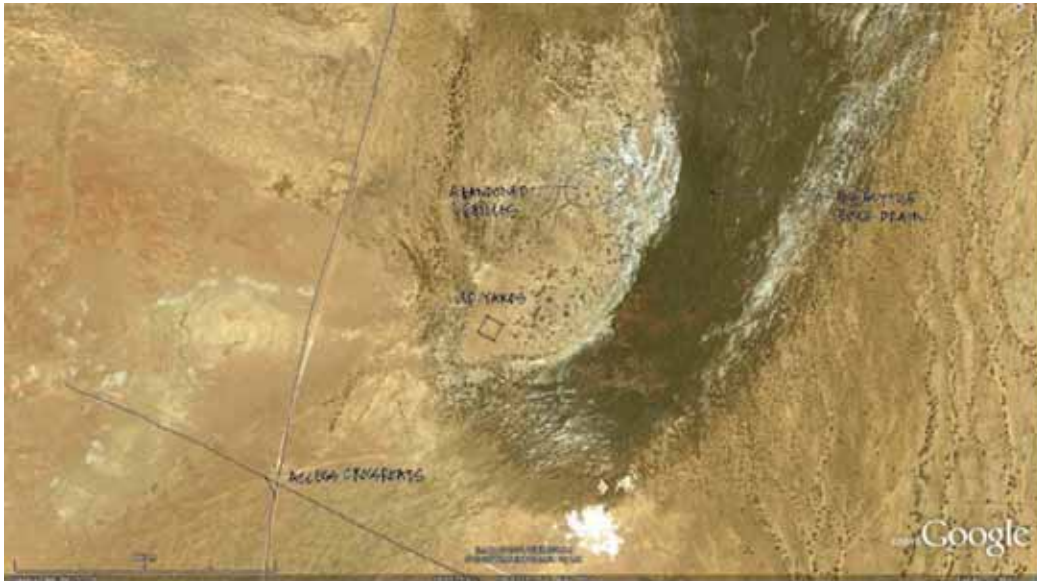


Fig. 6.9.2 Big Blyth Bore drain landscape characteristics sketch overlay.
Source: www.earthgoogle.com Retrieved 19/11/2010.

Form

Big Blyth Bore appears out of the heavy clay plains at the confluence of Peake and Blyth creeks on Peake Station. The submerged and uncapped bore drain outlet has provided sufficient GAB water over the years to form an extensive 3 metre plus high bore tail and associated wetland that drains away to the north towards Peake Creek. The soils are heavy and saline around the swampy margins of the drain. The approach is through a large copse of acacia to enter the drain area from the otherwise treeless saltbush dotted plains.



Fig. 6.9.3 Big Blyth Bore drain panorama. Image: B Madill April 2010



Fig. 6.9.4 Big Blyth Bore drain approach road. Image: B Madill April 2010



Fig. 6.9.5 Big Blyth Bore drain immediate area. Image: G Lee April 2010

Views

From the plains, Big Blyth is visible as a long intense green line emerging out of the red/grey saltbush covered plains and is a striking visual feature of the landscape. Views into the bore depend on breaks in the dense vegetation and it generally feels impassable. From the air, the bore is an intrusion into the natural landscape but due to its past use and history is a cultural landscape feature.



Fig. 6.9.6 Big Blyth Bore drain extent of tail. Image: G Lee April 2010



Figure 6.9.7 Immediate views into the surrounding bore margins clearly indicate water conditions. Images: B Madill 2010 + G Lee 2010

Water feature

As a water feature Big Blyth does not exhibit any of the inviting and nurturing features that water in arid landscapes affords. The untapped bore is edged with black salt encrusted soil and dank pools of algae-covered salty water. As a cultural feature it can be regarded as an important example of pastoral practices.

Vegetation

The plains vegetation of bluebush, saltbush and grassy plains is overtaken by saline samphire and rush species closer to the bore. A dense stand of mulga *Acacia aneura* stands to the west. The main bore is encircled by phragmites and typha and samphire species emerging out of stagnant water on the margins.



Figure 6.9.8 Vegetation species samples, bore vegetation and surrounding plains bluebush and mulga. Image: G Lee April 2010.

Occupation

A designed landscape that has become an evolved landscape over time due to the presence of the bore drain tail and the associated wetlands it has produced. The original pastoral pursuits are evident in the farm tracks, handmade stock yards and the artificial water incursion in the landscape. As a site for scientific exploration into hydrology and ecology of these artificial wetlands, Big Blyth has been subject to study over the years. Efforts to cap the bore have seen a range of heavy machinery appear on site over the years as the area takes on the appearance of a small industrial site. Big Blyth is an important remnant cultural site of pastoral occupation and activity, and the bore drain and tail has developed a new and extensive artificial wetland landscape.



Figure 6.9.9 Hydrological research, SA Government abandoned equipment from attempted bore head closure, stock yards adjacent to bore drain. Image: G Lee + B Madill April 2010

Access

Unmarked access through farm paddocks on a dirt track is by permission from Peake Station only. The road crosses grassed stony plains with areas of heavy clay and a number of difficult small creek crossings. The single access track to Big Blyth starts at Old Peake Track and passes the track into North Freeling springs.



Figure 6.9.10 Farm track access looking towards Big Blyth to the northwest. Image: B Madill 2010

Interpretation

No sign marks the track but it is noted on topographic maps and GPS systems.

Issues requiring management approaches

Plans for capping Big Blyth have been resumed after a number of failed attempts through the GABSI (Great Artesian Basin Sustainability Initiative) Phase 3 program. Given the success of this project, the management of Big Blyth as both an ecological and a cultural landscape has the potential to be very important. From an ecological perspective, research into the plant, faunal and aquatic communities should assess which ecosystems are now supported by this large artificial system. From the perspective of the cultural landscape Big Blyth is both an extensive bore drain and symbolic of pastoral activities over time. Recording and interpretation would ensure that its history is set down and made available to interested parties who may not have the opportunity to experience bore-fed wetland landscapes in the future.

6.10 Hookeys Waterhole and the Oodnadatta group: Landscape characteristics

Location: 135°27' E, 27°36' S



Figure 6.10.1 Hookeys Waterhole in the Neales River south of Oodnadatta.

Source www.earthgoogle.com retrieved 19/11/2010.

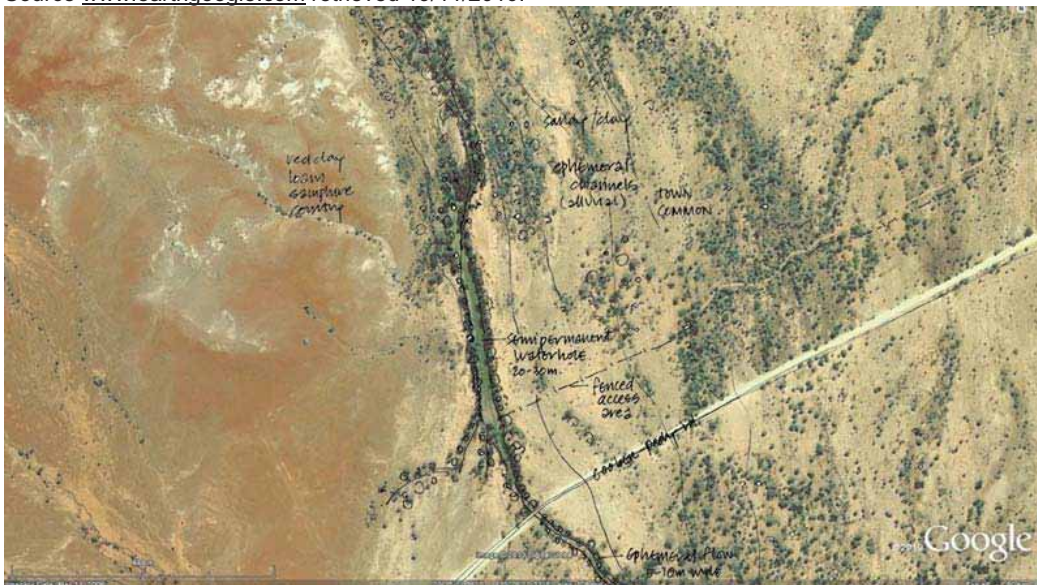


Fig. 6.10.2 Hookeys Waterhole, Oodnadatta: landscape characteristics sketch overlay.

Image www.earthgoogle.com retrieved 19/11/2010



Figure 6.10.3 Hookeys cultural overlay map showing string of local in-channel waterholes. Image: www.earthgoogle.com Retrieved 19/11/2010 with overlay map prepared by Adam Plate of Pink Roadhouse Oodnadatta

Form

Hookeys Waterhole, or as it is more commonly known, Hookeys Hole, is a semi-permanent linear waterhole that extends some 500 m north and south of the Oodnadatta–Coober Pedy Road in the Neales River multiple channel system. It is located between Allandale Station and the Oodnadatta town common. The road crosses the waterhole at the margins of the deeper hole to the north and forms two distinct zones. To the north, Hookeys is 20 to 30 metres wide with multiple lateral channels at a variety of scales, together with vegetated stream silt islands. Downstream, Hookeys breaks into a series of small ephemeral channels that eventually meander into the centre of the river. Its margins are composed of silty alluvial in a valley adjacent the characteristic stony hillslopes of the Oodnadatta area. To the north, numerous semi-permanent and ephemeral waterholes are contained in the channel system, notably Shepherds Waterhole, which demonstrates similar attributes to Hookeys Waterhole. Hookeys is an incised waterhole with vegetated vertical banks of a few metres to areas of sloping banks in the northern zone to the east adjacent the town common.



Figure 6.10.4 Hookeys Hole northern reaches adjacent to the town common high cut banks with good vegetation cover. Image: G Lee November 2009



Figure 6.10.5 Hookeys Hole from Coober Pedy Rd: western side looking northeast across the waterhole shallow slope to extensive banks. Image: G Lee November 2009



Figure 6.10.6 Hookeys Hole from Coober Pedy Rd crossing looking south following summer rains. Note the rock fishtraps in the riffle zone adjacent to the road. Image: B Madill April 2010

Riparian zone

The riparian zone is typified by red clay loam soils. The western banks feature vertical cut formation, retaining dense scrub understorey that open out to stony plains. The banks are typically gently sloping and open onto a silty alluvial plain. At the road junction both sides of the northern waterhole are low gradient banks.

The scarce vegetation and trees with deeply undercut root systems of old coolibahs characterise the popularity of this area of the waterhole.

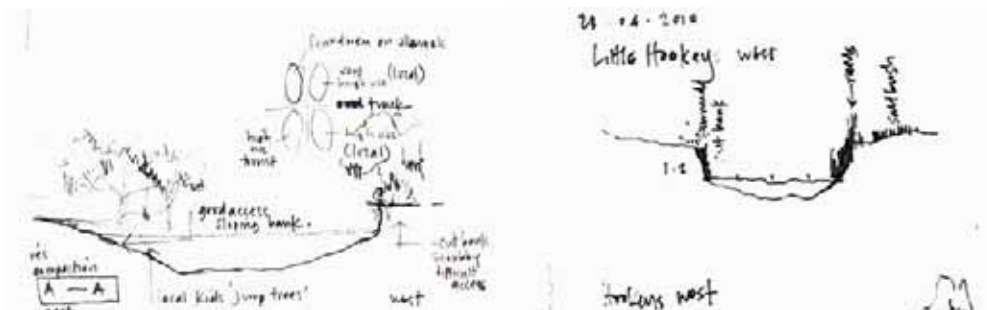


Figure 6.10.9 Section of primary northern waterhole adjacent to Cooper Pedy Rd, section of the banks in adjacent tributary feeder channel.

Views

There are clear views in, along and across the waterhole closest to the road where it forms a wide pool, narrowing further up and downstream where vegetation becomes increasingly dense. Hookeys is easily viewed from the road, looking north, and at various clearings along the eastern bank. The western bank is generally visually impassable beyond the main pool.



Figure 6.10.7 Hookeys Hole adjacent to Coober Pedy Rd looking west across the major pool and swimming hole. Image: B Madill April 2010



Figure 6.10.8 Hookeys Hole views across waterhole from the west towards the swimming hole and along the length further upstream adjacent town common. Images: G Lee November 2009

Water feature

'It is semi-permanent to the northern end, the southern end only filling after rains' (Oodnadatta, pers com). Hookeys Hole exhibits a range of character types from open shaded and reflective pools, dry stony channels and linear densely vegetated enclosed channels. It is of high landscape quality due to its complex features, accessibility along its eastern bank, and on its more isolated reaches, and its relatively intact condition. The stony channel base to the south fills with water after rain providing attractive ephemeral streams interspersed with vegetation, shrubs and grasses.



Figure 6.10.9. Hookey Hole at Coober Pedy Rd looking south in dry season and after rain at fish trap area.
Image: G Lee November 2009, April 2010

Vegetation

Vegetative assemblage density varies along the waterhole. Its riparian edge contains predominantly coolibah *Eucalyptus coolabah*, some river red gum *Eucalyptus camaldulensis* indicating less saline conditions over time, and acacia species on steeper banks; it supports associated grass and saltbush understorey. The western silt plain supports a range of eremophila, myoporium, lignum and other species. Where the banks are gently sloping and only a few coolibahs remain, the understorey plants have been removed. Remnant bamboo on the west bank may indicate the site of the historic Chinese market garden.



Figure 6.10.10 Vegetation samples, riparian vegetation on northern reaches of waterhole to the east, remnant bamboo possibly near old market garden. Image: G Lee April 2010 November 2009

Occupation

An evolved landscape Hookeys Hole has been occupied over long periods by Aboriginal people, towns people and settlers from the 19th century, as recorded in local accounts and collections of published images. Over time Hookeys provided water for the temporary camps of early settlers, Aboriginal meeting grounds and a thriving market garden. As the major waterhole in a group of waterholes that supported the original settlement of Oodnadatta, Hookeys Hole is a favourite local destination, although less used by tourists passing through. Some visitors camp on the western bank. Hookeys is a popular meeting, swimming and fishing place for local Arabunna and Dunjiba women and children. Activities include meetings near the road under a large coolibah, swimming at the pool closest the road and

fishing along the eastern banks well into the town common zone. The major hole has been fenced off from cattle for rehabilitation and the town common is managed by the Dunjiba community. Efforts to provide shade and a meeting place next to the road on the eastern bank have resulted in a shade shelter frame, fencing and rubbish containment in a single 44 gallon drum waste bin. There is clear evidence of camping and associated fireplace making.



Figure 6.10.11 Ned Chong's market garden at Hookeys Hole 1910, the sand island at the northern margin of the big pool, still prominent in 2010. Image: H Simpson 1905, Found objects Hookeys East, Children's swimming jump rope on coolibah. Images: B Madill April 2010



Figure 6.10.12 Hookeys Hole south-eastern meeting area, shade structure and alluvial plain following rains, test site fenced area to Coober Pedy Rd, town common beyond. Image: B Madill April 2010



Figure 6.10.13 Hookeys Hole shade structure woodpile, shade tree, swim tree. Image: G Lee April 2010

Access

The waterhole is accessed directly from the Oodnadatta–Coober Pedy Road up until the eastern town common which is restricted Aboriginal land, under the *Aboriginal Heritage Act 1988*. Permission is required from the Aboriginal Lands Trust or the Dunjiba Community Council. The western bank and plains on Allandale Station are partially fenced as an NRM project to examine the effects of cattle and tourist visitation on waterhole banks and floodplains. Access for vehicles to this area is directly adjacent the waterhole bank and riparian edge causing undercutting of root zone and the beginning of erosion gullies.



Figure 6.10.14 Hookeys Hole Coober Pedy Road crossing Neales Creek, access into western area localised after fencing Image: G Lee 2009

Interpretation

There is no existing place name or interpretive signage to Hookeys from the road access points. A directional map can be obtained from the Oodnadatta Roadhouse and Hookeys Hole appears on topographic and GPS data maps. However, at the fenced town common area where access is permitted only by request there is clear signage, fence and locked gate. Further into the waterholes complex, a number of Pink Roadhouse signs provide direction and some interpretation.



Figure 6.10.15 Shepherds Pink Roadhouse access signage, regulation signs for access to the town common, corner marker at Hookeys Hole, NRM fence. Image: G Lee 2009

Other aspects

Hookeys Waterhole has an important social function for the Oodnadatta township, offering respite from the heat, swimming, camping and fishing close to town. It enables women and children to fish and commune in a preferred environment appropriately distant from town. A review of the condition of the large waterhole pool with fish ecologist Dale McNeil has produced the spatial fish map (Figure 6.10.16) that clearly identifies the relationships between major structural components and the ecological condition of the waterhole, its landscape character and use, value and extent.

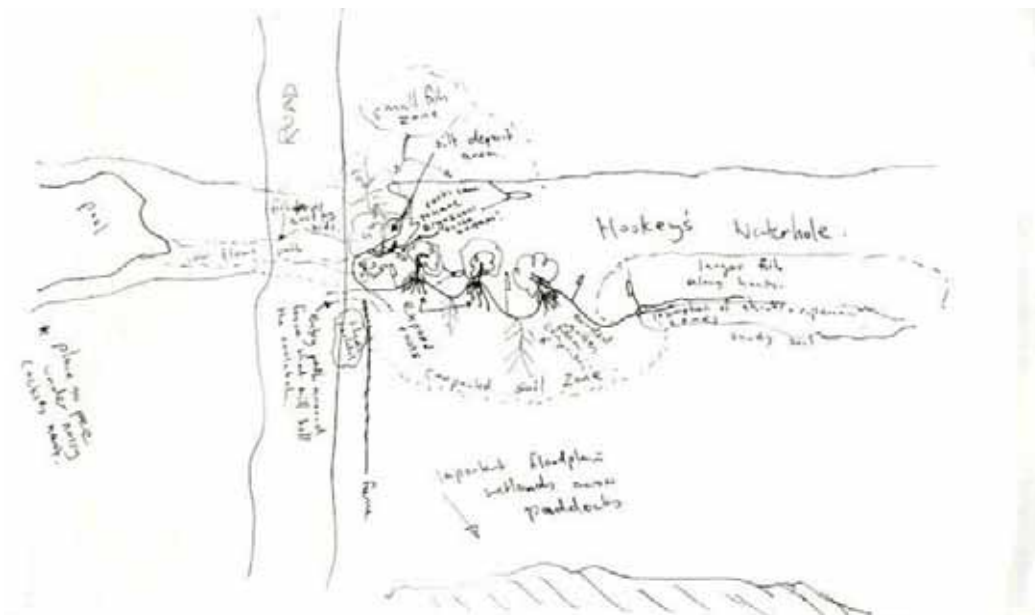


Figure 6.10.16 Spatial map of fish sites and waterhole qualities at Hookeys Waterhole. Dale McNeil developed over conversations with Gini Lee

Issues requiring management approaches

To the east where the gently sloping banks allow easy access, compaction is an issue, particularly from vehicle movement and overuse. There is evidence of fireplaces and camping spaces, as well as rubbish deposits on both eastern and western banks of the upstream reaches around the major pool. The linear nature of the waterhole means that

visitors and locals spread along the banks increasing impacts over a larger area. Around the swimming hole mature coolibahs are used as swimming infrastructure and their root systems are exposed through scouring of the bank margins. Vegetation growth and coverage is adversely affected by uncontrolled vehicle access and by overuse. Large areas of the riparian zone are heavily compacted and where access is possible by vehicles to the banks of the waterhole are heavily eroded.

To address these issues, management consideration needs to be given to interpretation and access control. Revegetation of some areas including riparian zones, and to the banks at the causeway where the coolabahs are severely affected is also required. Control of bank erosion and access to riparian edges will also be critical to the health of the waterhole, through planning for camping access and recreation activities.

In consultation with the local community, a landscape management plan based upon landscape character and use zones should be developed to include a range of measures to improve vegetation and riparian bank conditions in the heavily used areas and to provide appropriate infrastructure for camping, meeting and cultural events.

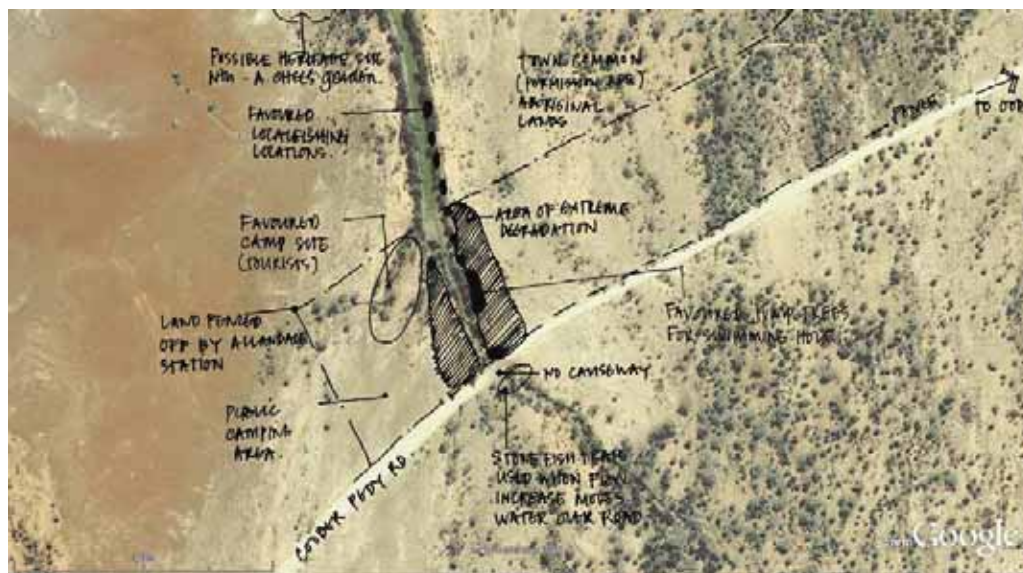


Figure 6.10.17 Hookeys Hole conditions overlay indicating area where management approaches are required to rehabilitate riparian zones and vegetation. Source: www.earthgoogle.com Retrieved 21/11/2010



Figure 6.10.16 Bank compaction and erosion, vehicle compaction and erosion, vehicle damage in multiple tracking. Image: G Lee 2009, 2010, 2009



Figure 6.10.18 Vehicle track erosion town side, camping western edge, multiple fireplaces on town common. Image: G Lee 2010, 2009, 2010

6.11 The (Old) Peake Station and Freeling Springs, North Freeling Springs: Landscape character

Location: Old Peake 135°52' E, 28°05' S Freeling Springs 135°55' E, 28°04' S



Figure 6.11.1 Old Peake ruins and Freeling Springs and North Freeling Springs associated with the Peake River.
Source www.earthgoogle.com retrieved 19/11/2010



Figure 6.11.2 Old Peake ruins and Freeling Springs complex. Source www.earthgoogle.com retrieved 19/11/2010

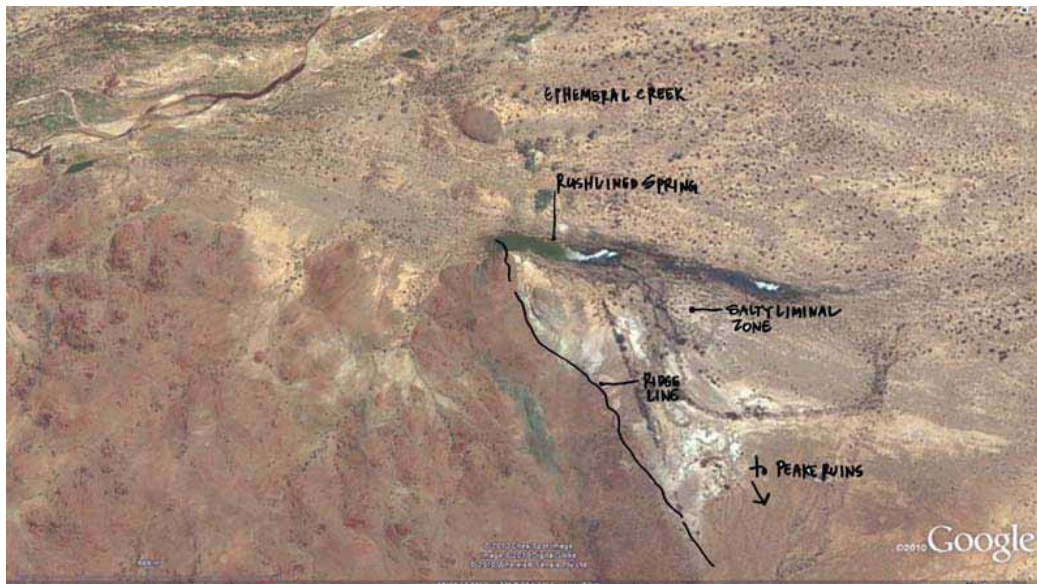


Figure 6.11.3 North Freeling Springs complex. Source www.earthgoogle.com retrieved 19/11/2010

Form

Located on Peake Station at the base of the Peake and Denison ranges, the (Old) Peake ruins and *Yardiya* Freeling Springs complex extend along the lower ridge of stony hills to the west. More than 20 km from the Oodnadatta Track just south of the Peake River crossing, the ruins complex nestles into the hill on a natural rock platform. The stone buildings rise out of a stony saddle between two ridges and are oriented to the east over the floodplains of the Peake River, which is crossed by numerous small creeks and swales. Rising bare hills to the southeast complete the sense of spatial enclosure of the greater landscape.

North Freeling Springs are a few kilometres to the north of Old Peake and form a densely vegetated linear formation at the base of a long rise of low hills at the margins of the Peake floodplain.



Figure. 6.11.4 Old Peake ruins and Freeling Springs complex from southeast. Image: G Lee April 2010



Figure 6.11.5 Ruins in the distance on the far right approaching from Big Blyth Bore access road. Image: B Madill April 2010



Figure 6.11.6 Old Peake ruins emerge out of the forms of the surrounding landscape. Image: B Madill April 2010.

Riparian zone: to creeks, drains and springs

The small creeks are either swales that slope towards the east discharging overflow from springs or are ephemeral channels that focus the runoff from the nearby ranges. Their riparian zones vary widely as grassy and low shrubs and acacia margins to rock holes and shallow pools or as dense linear plantings in swales and on margins becoming sparser with distance from the spring, where medium shrubs and occasional small trees occur.



Figure 6.11.7 Spring zone and drainage swale south of Peake Ruins, contained spring to the north adjacent road. Image: G Lee April 2010, November 2009

The North Freeling Springs riparian edge is distinctive in its relationship between salty, sticky clay banks, still water and extensive phragmites to more than 2 m height along the length of the spring. Further northwest, the spring assembly changes to lower reeds and the complex assembly of eucalypt and acacia shrubs emerges on the shallow banks.



Figure 6.11.8 North Freeling extensive spring and phragmites margins. Image: G Lee November 2009

Views

Views into the Old Peake complex from the surrounding hills are one of the most picturesque experiences of the Stony Plains and Oodnadatta Track landscapes. The cultural landscape qualities of both Aboriginal and settler/explorer origin coincide in the complex of ruins and springs and their interdependency. The approach to the ruins is indirect and becomes an exploration of the unfolding complex, the topography of the surrounding ranges and the signature palms as an identifiable cultural planting. The main complex is shielded from the carpark and interpretation area by these palms and associated scrubby native plants. Extensive 360 degree views over the Peake River valley beyond to the north and east from Peake Hill behind the complex, reveal an undulating stony landscape well vegetated by acacia species dotted along creeklines and across the lower plains.



Figure 6.11.9 Views on approach at distance, mine site, mine site creek to ruins in dry season. Images: G Lee November 2009, B Madiill April 2010



Figure 6.11.10 Views beyond ruins across vegetated plain, stony plain and Peake River beyond. Image: G Lee November 2009

Water feature

The *Yardiya* Freeling GAB springs are permanent features of the lower margins of the ridge of rocky hills that are part of the Peake and Denison ranges. These springs have provided for Arabunna, European explorer and settler existence over many years. They are a refuge from drought and a source of water for settlement. They are a subtle presence emerging as small pools seeping out of the rock and running into swales or contained pools of greater depth and are evidenced by the appearance of dense vegetation in this dry and rocky environment.



Figure 6.11.11 Springs at Old Peake 2009 and 2010. Image: G Lee 2009, B Madill 2010

The extensive spring complex at North Freeling exhibits a very different feature to the usually contained GAB springs. These large shallow pools have the appearance of waterholes and make an extremely picturesque setting in the dry landscape despite their inhospitable brackish qualities and salty clay margins.



Figure 6.11.12 Springs at Old Peake 2009 and 2010. Image: G Lee 2009, B Madill 2010

Vegetation

A range of vegetation types populate the Old Peake complex, from densely vegetated and diverse acacia species, low chenopod shrubs and grasses in association with seeping springs and swales near the ruins, to bare stony hillslopes dotted with *Eremophila* species. Larger acacias and eucalypts line the ephemeral creeks, which are in large part fed by runoff from the ranges to the west. Date palms, *Phoenix dactylifera* that have become overgrown over time, are evidence of original cultural plantings associated with development of the Old Peake Station settlement.



Figure 6.11.13 Dense and uncultivated palms, native and introduced shrubs to banks separating ruins complex and carpark, grasses and sparse shrubs to stony hills, acacia species and low scrub to springs and swales and gutters. Images: G Lee 2009 B Madill 2010 G Lee 2009

Occupation

Aboriginal occupation includes the naming of the springs *Yardiya* and the associated two snakes story suggests occupation of the place over thousands of years. Ephemeral evidence of such occupation is found in stone and bone fragments in association with the springs. This State Heritage listed site is an evolved landscape that provides very clear narratives of the history of the settler landscape since the 1850s, its economic situation over time, and past and recent development. The Old Peake complex includes relatively well-preserved ruins including police station, houses, gaol, store, tavern, well, retaining walls, mineshafts and copper processing over a broad area influenced by the prevailing

topography and proximity to water. The range of skills in both building and pastoral endeavours is evident in the scale and quality of the buildings and their continuing presence in the landscape. The past use of the springs is evident in the small and now rusting structures found near the larger springs associated with the eating house. Springs have evidence of gambusia and desert goby.



Figure 6.11.14 View of Old Peake Ruins from the mine site in hills behind. Image: B Madill April 2010



Figure 6.11.15 Remnants of occupation: copper ore, glass shards, handmade bricks, smelting refuse, building methods, steel and cast containers. Image: B Madill 2010

Access

Clear directions from the Oodnadatta track direct visitors into the Old Peake complex via an extremely rough rocky road with challenging creek crossings over more than 20 km. Access to the springs is readily available from the entry track while access to the ruins and carpark has been constructed in typical post and beam and timber bollard style in association with fencing to separate tourist areas from pastoral activities. The North Freeling Springs area is on pastoral land and requires permission for access through a hard to find gate and track. Access from the Oodnadatta Track can become impassable with dangerous conditions arising from flash flooding in creek crossings during rain events.



Figure 6.11.16 Old Peake approach road close to the ruins finally skirts the stony hills to the west and the eastern alluvial plains. Image: G Lee November 2009



Figure 6.11.17 The Old Peake track traverses the spring complex to end in a bare and shadeless carpark, rain events may make the long access track impassable. Image: G Lee November 2009, B Madill April 2010

Interpretation

Extensive directional and interpretation signage has been installed by a range of providers with little coordination. They do not help visitors understand the fragility of the springs and road conditions are not made obvious.



Figure 6.11.18 Entry directional, site information, Pastoral Board, Old Peake historic interpretation and orientation signage DENR, individual site signage, location signage mine site, base mine information Image: G Lee November 2009, B Madill April 2010

Other aspects

The important connectivity between water systems such as GAB springs in the ongoing cultural landscape of the Neales Catchment is demonstrated at Old Peake. This area of high Aboriginal and settler landscape quality demonstrates a number of management mechanisms to support and direct tourism at a very remote site. It is clear that unrestrained access to heritage places causes damage to both the waterbodies and the heritage fabric. Many examples and lessons are visible in this high quality environment, which requires further management at the site and local level to improve the quality of the landscape and the experience.

The responsibility for safe and effective cultural landscape management of springs and the surrounding site resides with a number of organisations as well as with pastoralists.

Issues requiring management approaches

Coordination between interpretive regimes is needed for a consistent approach; overall landscape quality is being eroded through lack of consistency and appropriate infrastructure. The visit to Old Peake begins on leaving the Oodnadatta Track, and information on the quality of the track, and the need to bring all facilities and supplies, is necessary. The fragile spring sites are open to access by all, are often difficult to notice and could be subject to trampling and compaction. More extensive information on natural systems and ecological interpretation would benefit the heritage interpretation.

6.12 Slate Hole dam: Landscape characteristics

Location: 135°19' E, 27°25' S



Fig.6.12.1 Slate Hole in the Neales River Catchment north of Oodnadatta. Source www.earthgoogle.com retrieved 19/11/2010

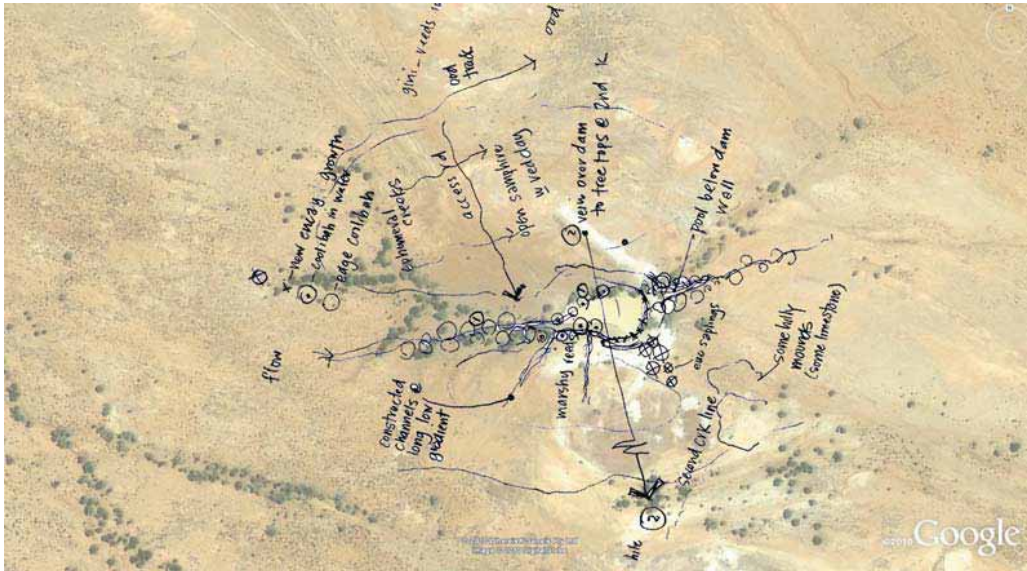


Figure 6.12.2. Slate Hole showing creek system to south of the dam location. Source: www.earthgoogle.com retrieved 19/11/2010

Form

The north branch of the Neales River is a broad and shallow series of channels and alluvial plains characteristic of the upper reaches of the river. Approached from the flat plains to the east, the sparsely tree-lined tributary is interrupted by a new construction, a wide arc of limestone quarried from the area forming a 3–4 m high bank to the south. The banks splay out widely to form an extensive berm to the east from the dam proper. Further west vegetated channels indicate the extent of the flat alluvial valley. The dam is a spatial interruption in the low and sloping form of the plains and rivers landscape.



Figure 6.12.3 Slate Hole looking north from dam berm wall. Image: B Madill April 2010



Figure 6.12.4 Slate Hole looking northeast from dam section to adjacent flat stony plains. Image: B Madill April 2010



Figure 6.12.5 Slate Hole looking northwest from dam wall across alluvial plain. Image: B Madill April 2010



Figure 6.12.6 Slate Hole looking northwest from raised dam wall and associated mounding over flat alluvial plain. Image: G Lee April 2010

Riparian zone

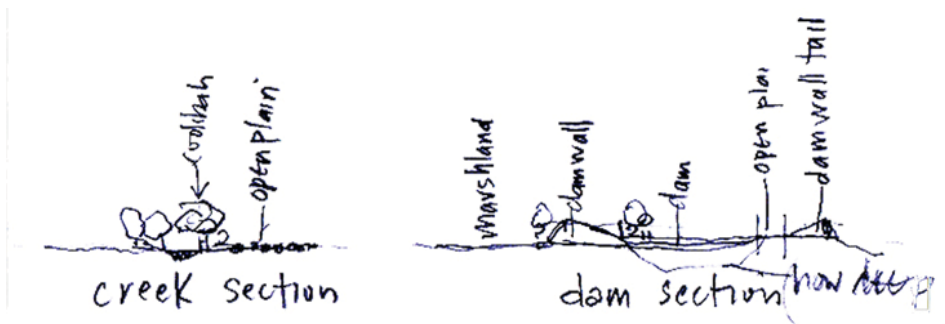


Figure 6.12.7 Sectional comparison of river zone and constructed and expanded dam zone



Figure 6.12.8 Dry shallow channel in river zone with acacia stands and chenopod shrubland. Image: G Lee April 2010



Figure 6.12.9 Dam limestone wall construction generally devoid of mature vegetation, a flat riparian treed zone with low samphire shrubland and grass understorey. Image: B Madill April 2010

Views

The appearance of stands of water associated with damming the channel enable views of mature coolibah emerging out of the water and on the shallow banks. This provides a cool and shady enclosed view that focuses on the patterns and detail of the waterbody. There is a seamless view across the ground plane which is atypical of most waterbodies in the arid zone. The distant view across flat and swampy plains is of dense vegetation along the major river channels further west. From the east, the white dam wall is an obvious new element in the landscape.



Figure 6.12.10 At the outer margins of the dam mature coolibahs emerge out of the shallow channel. Contained views across the alluvial valley to creek lines. Images: G Lee April 2010

Water feature

The constructed waterbody, Slate Hole dam, is large and turbid due to damming the usually dry riverbed. The area is marked as a waterhole on topographic maps and the dam has increased the capacity of the area to support stock. It is a striking structure with its white limestone dam walls and possesses a degree of human influenced landscape quality as a large and well-sited dam, and evidence of new pastoral practices. While it is hot and exposed it is a prominent feature in the plains landscape.



Figure 6.12.11 Slate Hole looking north from dam wall. Image: B Madill April 2010

Vegetation

As a relatively new installation, the dam walls are generally devoid of bank vegetation apart from a line of new eucalypt and samphire growth at the water margins. Remnant coolibahs persist at the original riparian margins and there is a lack of low or medium understorey vegetation along the river. To the west are marshy reed lands with stands of acacia in pockets along the small channels. To the east, dry marsh with samphire and saltbush species expands into grassed stony plains.



Figure 6.12.12 Grassy and chenopod floodplains, watercourse lined with acacia, new growth at dam edge.
Image: B Madill, G Lee April 2010

Occupation

Slate Hole is a large farm dam and a designed landscape recently formed to utilise both overland and intermittent river flows. It functions purely for pastoral use but will become increasingly popular for local fishing if it thrives as a place for native fish.

Access

This unmarked track over gently undulating plains is accessed across a number of ephemeral minor creeks and swales, which are impassable after heavy rain. This track is only minimally maintained as necessary for pastoral activities.



Figure 6.12.13 Access road to Slate Hole dam off Oodnadatta Track. G Lee April 2010

Interpretation

No signage on track denotes the waterhole's presence; however, it is noted on topographic maps and will be visible in satellite mapping systems as a large waterbody.

Issues requiring management approaches

This large river-fed dam with the intention of permanency, has the potential to become a popular fishing and visitation place for locals, as its health and landscape character increases with new vegetation and tree growth to enhance an already accessible, shady and picturesque waterbody.

6.13 Stewarts Waterhole: Landscape characteristics

Location: 135°24' E, 27°43' S



Figure 6.13.1 Stewarts Waterhole in the Neales River Catchment south of Oodnadatta. Source www.earthgoogle.com retrieved 19/11/2010

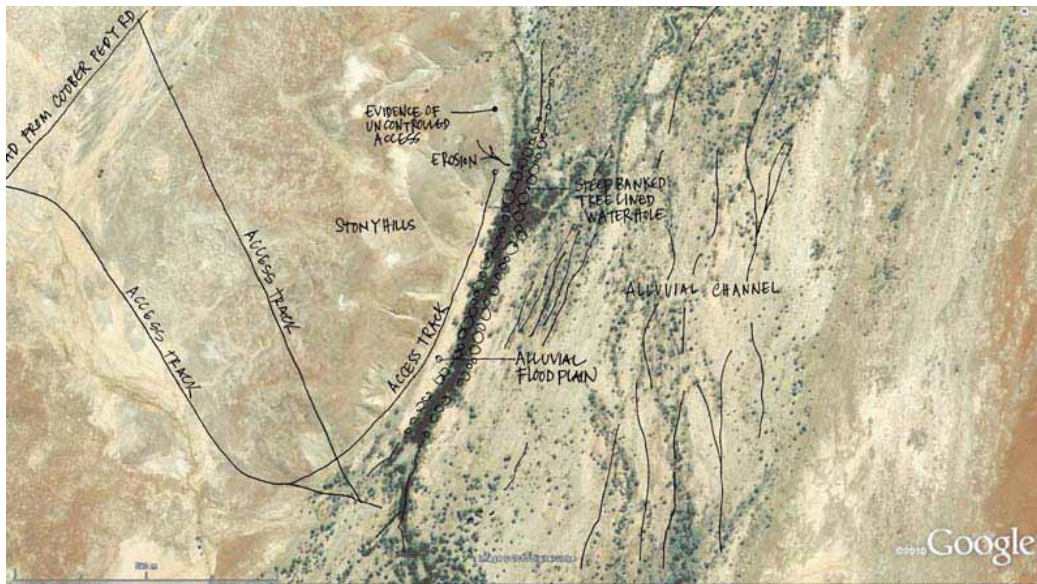


Figure 6.13.2 Stewarts Waterhole with landscape characteristics sketch overlay.
Source www.earthgoogle.com retrieved 19/11/2010

Form

Stewarts Waterhole is one of a localised string of semi-permanent deeper waterholes, including Mathiesons and Cramps Camp, on Allandale Station on the Neales River, some 20 km west of Oodnadatta just southeast of the Coober Pedy–Oodnadatta Road. It is contained in the characteristic red gibber plain landscape that is traversed by the densely tree-lined river flowing north–south at this point and draining towards Lake Eyre. A number of sparsely treed minor creeks flow into the Neales and feed into the waterhole, which is located on the western edge of the alluvial valley that extends to the east. Stewarts Hill rises 176m to the east while sloping hills frame the river line and its waterhole to the west.



Figure 6.13.3 Stewarts Waterhole as seen from stony plains to the west. Image: B Madill April 2010



Figure 6.13.4 Stewarts Waterhole silt plain opening to stony hills. Images: B Madill, G Lee April 2010

Riparian zone

The generally gently sloping silt plain to the north terminates in a narrow tree and shrub bank zone above steep densely vegetated banks. Relative bank to water height when visited was 1.5 to 2 metres. There are narrow clearings in the shrub layer and a deep eroded gully to the northern zone of the area surveyed.

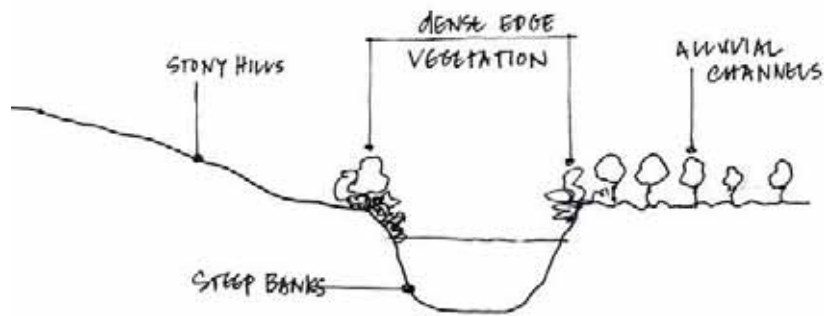


Figure 6.13.5 Stewart's Waterhole section indicating topography and vegetation



Figure 6.13.6 Stewart's Waterhole dense vegetation to riparian edge. Image: G Lee April 2010

Views

Stewart's is not visible from the surrounding plains to the north and west due to the densely vegetated riparian zone. Contained and framed internal views along and across the waterhole are available from small breaks in the vegetation along the banks. The pool extends beyond the visible limits of immediate viewing points contributing to the sense of its extensive scale.



Figure 6.13.7 Stewarts Waterhole framed long and cross-bank views. Image: B Madill, G Lee April 2010.

Water feature

The shaded and reflective pool has high water landscape quality as it is enclosed by dense vegetation with a great deal of variety in plant species. The apparent presence of fish and birdlife, together with its relatively untouched appearance contribute to its overall character as a refuge in the stony plains.



Figure 6.13.8 Stewarts Waterhole reflective pool. Image: G Lee April 2010.

Vegetation

Coolibah *Eucalyptus coolabah*, acacia and a diverse range of understorey species, with intact root zones convey the general appearance of a healthy waterhole unaffected by stock or extensive human visitation apart from the presence of small areas of nitre bush. The stony plains to the west are sparsely vegetated with bluebush and saltbush with grassed swales and occasional small eucalypts in erosion gullies.



Figure 6.13.9 Stewarts Waterhole densely vegetated riparian zones. Images: B Madill, G Lee April 2010

Occupation

An associative landscape, Stewarts is a locally used waterhole for pastoral and recreational activities such as fishing. Cattle watering was not obvious at the waterhole area visited. There appears to be little evidence of recent Aboriginal use, although the group of waterholes are well-known as rich pastoral and scientific resources. There was no evidence of tourism visitation and camping beyond fieldwork surveys.



Figure 6.13.10 Stewarts Waterhole northern vehicle park, local camping area. Image: G Lee April 2010

Access

Access from the main road is along an unmarked single lane track passing over grasslands and desert pavement. Its distance from the main road and the lack of visibility of the waterhole in the expanse of river corridor reduces tourism visitation. This track is only minimally maintained as necessary for pastoral activities.



Figure 6.13.11 Stewarts Waterhole access track along northern hillslope. Image: G Lee, B Madill April 2010

Interpretation

There is no interpretation on site but evidence of increasing knowledge beyond local communication of the waterhole and its fishing opportunities is appearing through internet-based mapping systems, and posted travellers stories.

Other aspects

Access into the waterhole is naturally terminated by a steep erosion gully, which is increasingly difficult to traverse, and vegetated hillslopes to the north. This forms a natural potential camping area adjacent to the waterhole although the lack of shade tree cover could reduce its appeal as an informal tourist site. Its sense of remoteness and the quality of the waterhole experience makes it a highly desirable place for explorer tourists.

Issues requiring management approaches

The naturally occurring erosion gullies are deeply cutting into the waterhole in places that coincide with the most easily accessible areas for access to water from the track, which traverses the silt zone and stony plains from the west. Vehicular management and erosion control should be considered.





Figure 6.13.12 Stewarts Waterhole vehicle tracking and riparian zone parking area, erosion gullies. Images: G Lee April 2010

7 ALGEBUCKINA WATERHOLE CASE STUDY: MANAGEMENT AND COMMUNITY ENGAGEMENT BY DESIGN

7.1 A Design Approach to coordinated community engagement and management for Algebuckina Waterhole

Proposals for landscape design-derived projects based upon broad scale strategies for the future sustainable management of Algebuckina Waterhole are developed from the recorded visual compendium of current conditions reproduced in Sections 6.5 to 6.7. Annotated concept diagrams for the Algebuckina area as a whole, together with two detailed areas along the western side of the Oodnadatta Track provide suggestions for small-scale infrastructure, vegetation and interpretation planning for each discrete area. As the area has not been drawn to accurate scale due to the scope of this research project, Google Maps, 1:250,000 topographic maps and aerial photography are used to develop relative scale overlay plans. In the further implementation stages of projects, surveyed to-scale measurements will be necessary for selected areas. These graphic sketch maps and supporting material are useful communication and data collection tools for ongoing planning and implementation of proposed projects. They are drawn as sketch proposals to allow for community input through one on one or group meetings to provide feedback and local knowledge towards a consolidated plan. The well-practiced design charette method for engagement is suggested, where invited participants, work collaboratively over maps and plans and 3D visualisations, to arrive at agreed plans for development. This mirrors the EMU process but from a landscape infrastructure and ecological design perspective.

For Algebuckina Waterhole stakeholder engagement arising from the technical report and project overview may utilise the following materials:

- Packages for each assessed landscape area provided to pastoralists and other stakeholders for updating as a dataset for the 2009/2010 season
- Algebuckina Waterhole complex project reports and drawings including landscape assessment, designated management zones and descriptions alongside sketch design management overlays to be brought to the range of stakeholders for comment, updating and ground-truthing on site.
- A particular focus on tourism management forms the basis of this landscape design strategy however an overlay of Aboriginal cultural values and pastoral management regimes is necessary to test these assumptions and proposals.

- Drawing upon conversations with Arabunna representatives their preferred method of engagement is to gather and sit down at the waterholes with drawings and proposals that have been prepared for discussion and further iteration. The intent is to update the drawings on site to lead to negotiated proposals for projects that support the rehabilitation, conservation and ongoing management of the waterhole zones.

This approach to a Landscape Design program as strategic mapping process accompanied by design sketch details for specific areas are the basis for visualising an entire landscape strategy and priorities for Algebuckina. This method is intended to be transferable to other waterholes and other landscape features in the Arid Lands where people and natural systems coincide.

7.2 Landscape Character Zones for Algebuckina Waterhole

To aid in the preparation of management approaches to the Algebuckina complex, the following eight Landscape Character Zones nominated in Section 6.5 are developed through their key characteristics assessed according to topography, vegetation, built infrastructure and past and present use:

Area 1 West Algebuckina Bridge:

Cultural tourism, Neales River interpretation and waterhole ecology, Aboriginal culture, walking trails and camping infrastructure, rehabilitation

Area 2 East Algebuckina Waterhole South Allandale:

Historical, ecological and tourism interface, Aboriginal culture, interpreting natural, especially fish ecologies, limited camping, rehabilitation

Area 3 Algebuckina South and Ghan Railway:

Explorer and settler histories, walking trails and camping infrastructure

Area 4 East Algebuckina Peake:

Pastoral, rehabilitation and aquatic ecology research area, limited public access

Area 5 East Algebuckina Waterhole North Allandale:

Aboriginal culture, interpreting natural, especially aquatic ecologies, no camping, walking trails rehabilitation

Area 6 West Algebuckina Escarpment:

Viewing and interpretation point of natural and heritage features, no camping, walking trails and car access limited to east of Ghan line.

Area 7 West Algebuckina Heritage Mine:

Walking and organised driving trails, limit access to waterhole

Area 8 West Algebuckina Waterhole:

Pastoral, tourism management

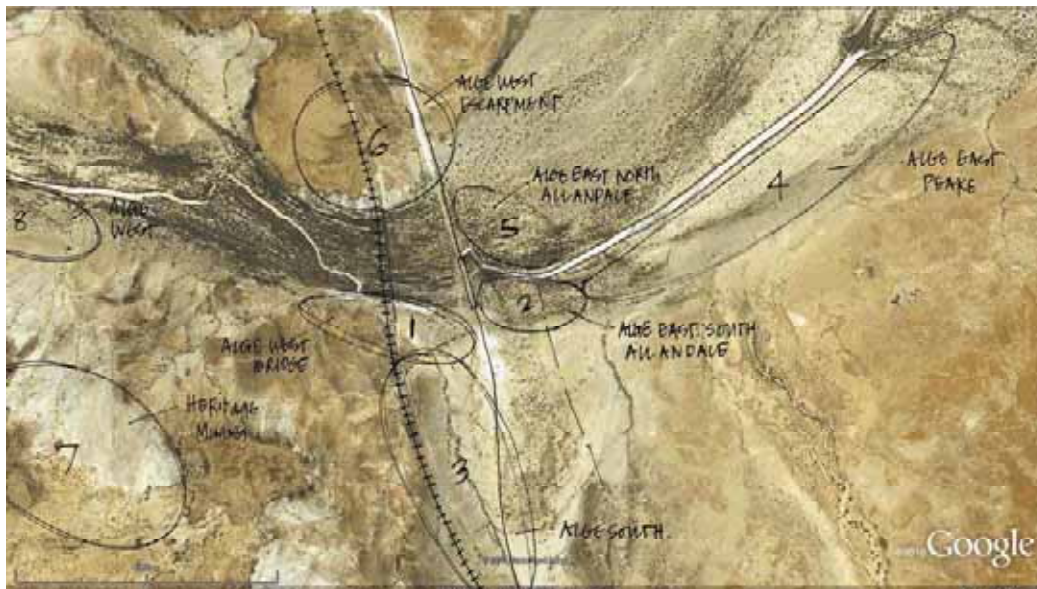


Fig 7.2.1 Algebuckina overview landscape character zones designated in relation to landscape attributes, heritage attributes, activity type and use

7.3 Algebuckina Waterhole Landscape Structure Systems

These sketch overlays indicate the key structural and spatial systems that comprise the Algebuckina Waterhole complex at the time of this report. They are drawn from observation, evaluation from aerial surveys and maps and on the ground records and form the framework upon which to develop the area designation and landscape strategies.

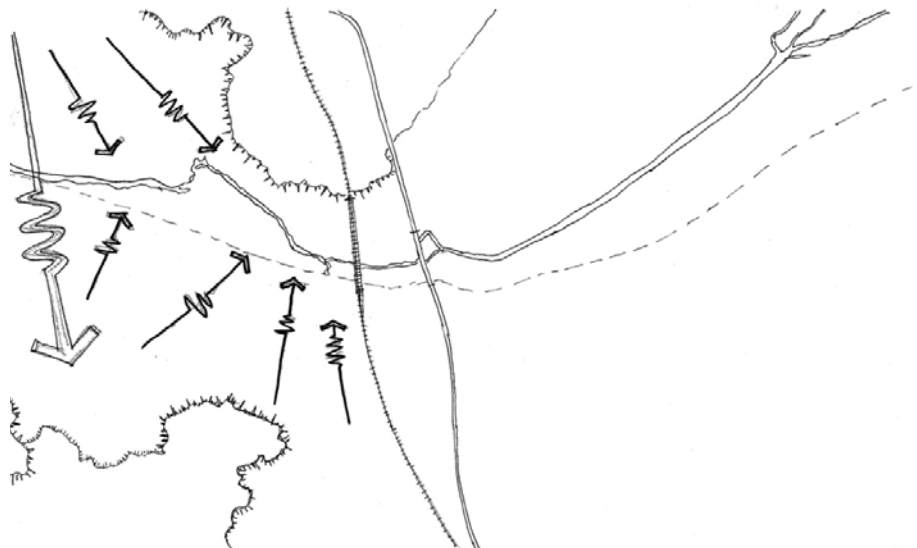


Figure 7.3.1 Topography: and flow gathered from the surrounding hills to feed the heavily vegetated Algebuckina pinch and the two Algebuckina Waterholes West and East and provide access for fauna and humans alike.
Source: Ian Fargher.



Figure 7.3.2 Vegetation: density in relation to Neales River channels, waterhole characteristics and minor creeks and gully lines indicate where establishment and maintenance of new tree cover may be afforded.



Figure 7.3.3 Boundaries: include fenced boundaries to define property, reduce and manage tourism access and provide for stock management. The Ghan Railway and Oodnadatta Track and Causeway are also spatial boundaries that enforce north south-flow and impede east-west flow. Riverbanks and channels in association with surrounding hills provide natural boundaries or impede movement of public and stock movement.

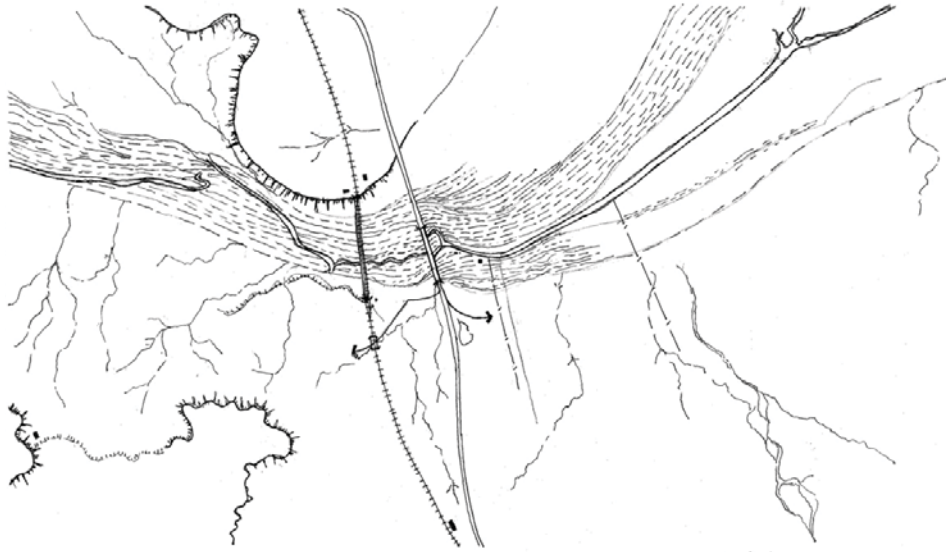


Figure 7.3.4 Infrastructure: heritage and current built infrastructure provides for both access (Oodnadatta Track) and as magnet for tourism (Ghan Railway and Algebuckina Bridge) unique in the Neales Catchment. Unofficial tracks and farm roads, PAR's and private criss-cross the area according to desire lines and relative ease of access. Car parks and camping areas are designated yet unplanned and are located according to proximity to water, shelter and access to tracks.

7.4 Analysis of Tourist Visitation

Observation of tourist movement and indications of impact on rivers banks, tracks and campsites reveals the most visited places for both day-trippers and overnights or more long-term campers. It appears that most visits do not extend beyond a few days and permanent sites are not established. However, increasing scale of sites due to increasing vehicular configurations of 4WD, trailers and caravans is indicated by the scale and compaction at preferred sites.

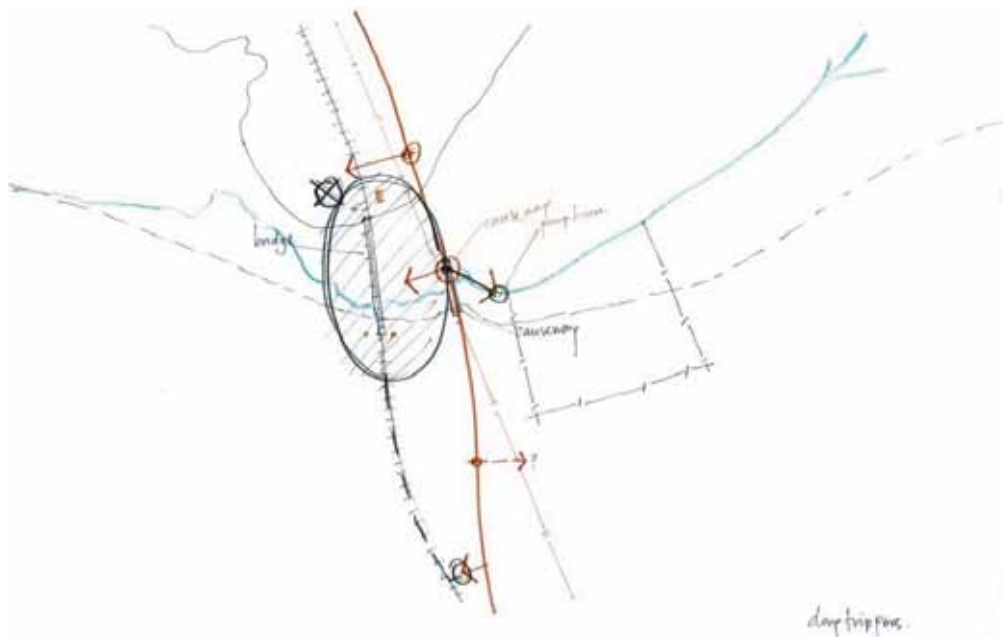


Figure 7.4.1 Day Trippers: access the areas west of the Oodnadatta Track, in particular the Algebuckina Bridge environs and the escarpment. The waterhole environs are more often walked rather than driven to. Some exploration of the Fettle's Cottage is evident.

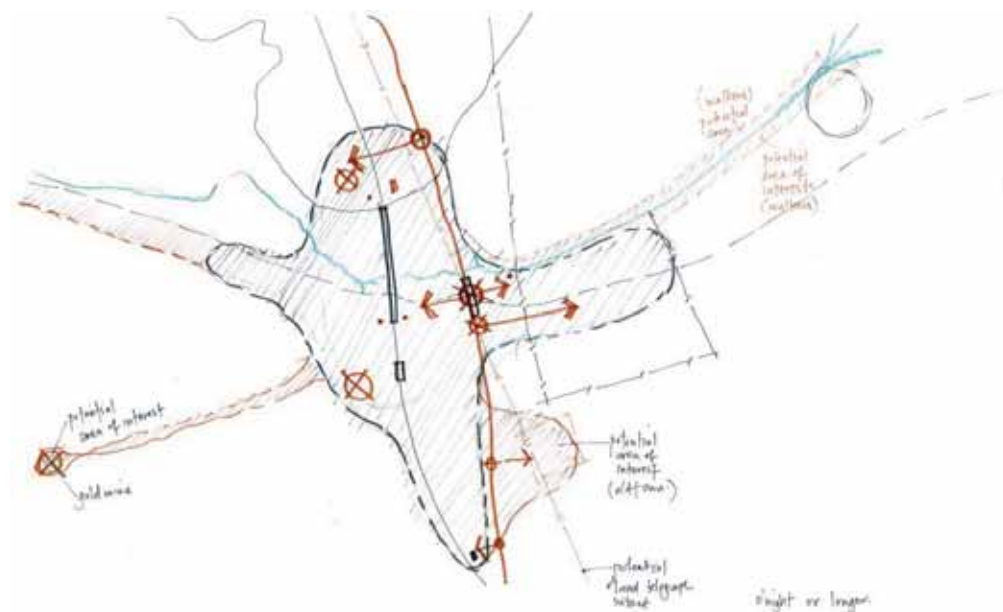


Figure 7.4.2 Over-nighters: access all areas, in particular the East Algebuckina Allandale area and both north and south sides of the Waterhole, seeking water and shelter. This wider zone suggests that further camping areas with limited facilities may assist in refocusing camping areas away from sensitive riparian banks if designated areas and infrastructure are designed with long term management strategies in place.

7.5 Mapping towards Design Strategies: multidisciplinary and multi-community approaches

In order to develop informed strategies for the ongoing use and management of the Algebuckina complex, a number of map overlays are drawn based upon project expertise in geomorphology, aquatic ecology and landscape architecture together with observations drawn from local land managers.

They are drawn below to relative scale to indicate landscape driven opportunities, areas of impact, proposed scope of rehabilitation sites and management of tourist and stock movements, and the development of appropriate sites for camping and infrastructure. Note: map orientation is towards the North.

These maps are then overlaid to form one consolidated overlay from which to derive landscape design strategies which include base spatial planning and detail design elements for ground works and re-levelling, buffer zones, planting, shelter and infrastructure, and interpretation regimes, which will include internet based networks.

The resulting overlay and visualisations form the basis for ongoing discussion towards a result informed by both specialist knowledge born from close observation, measuring over time and research and local knowledge towards workable management solutions.

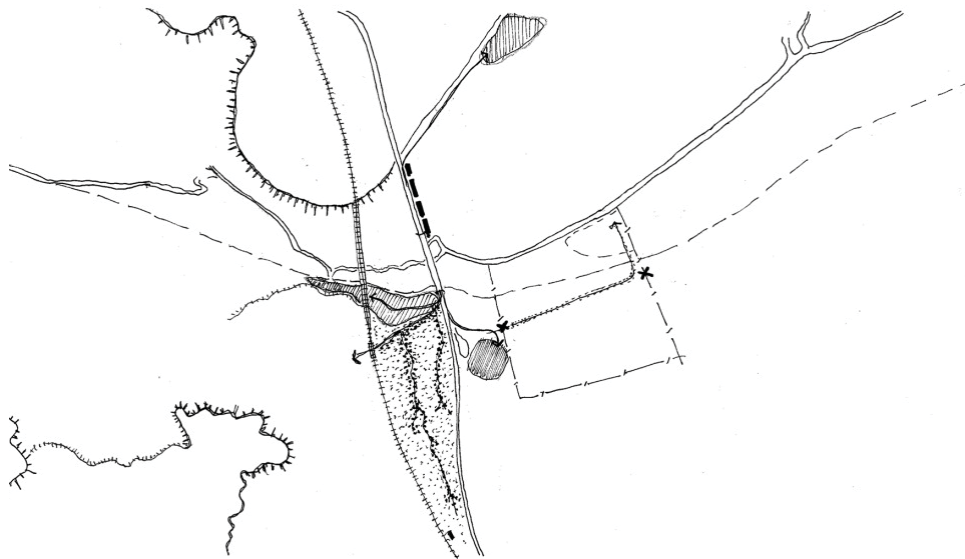


Figure 7.5.1 Geomorphology: refocus the use areas away from waterhole and riverbanks and floodplains to utilise the area between the disused railway bank and the road for camping and revegetation regimes. Rationalise and reinforce single road access across floodplains to reduce compaction caused by many tracks.

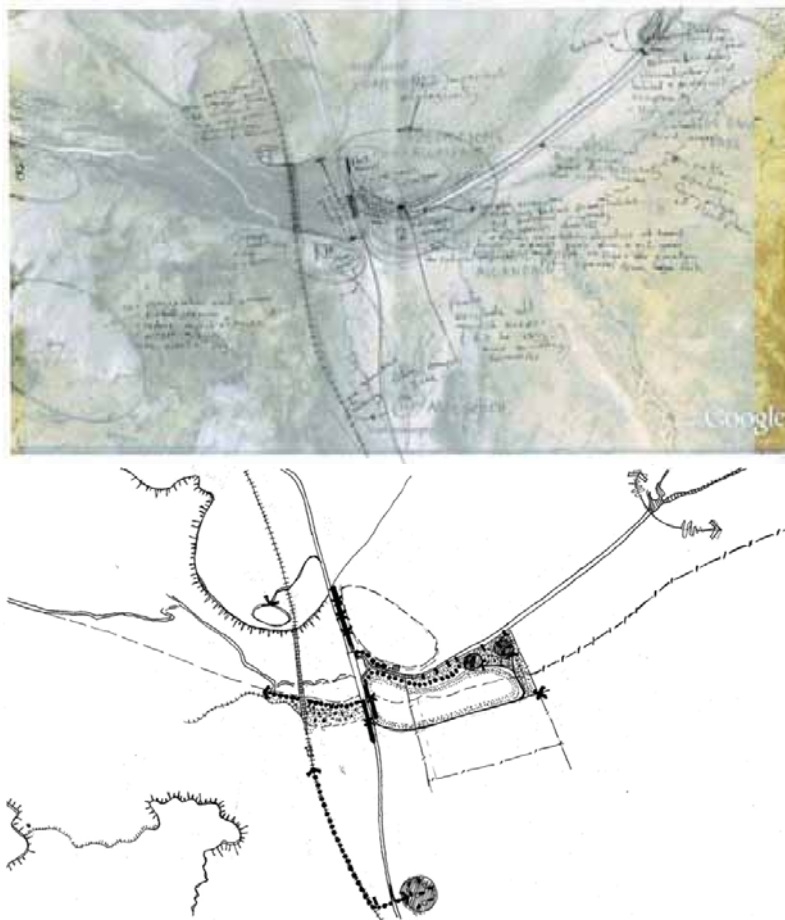


Figure 7.5.2 Aquatic ecology: the original overlay and the consolidated map drawn from both fish ecology and landscape architecture perspectives combined to include: nomination of important ecological zones and fish habitat, recommendations for locating fencing and camp areas to define public and stock access in relation to the best outcome for the waterholes, designating scale and shelter areas for camping and suggesting vegetation buffers

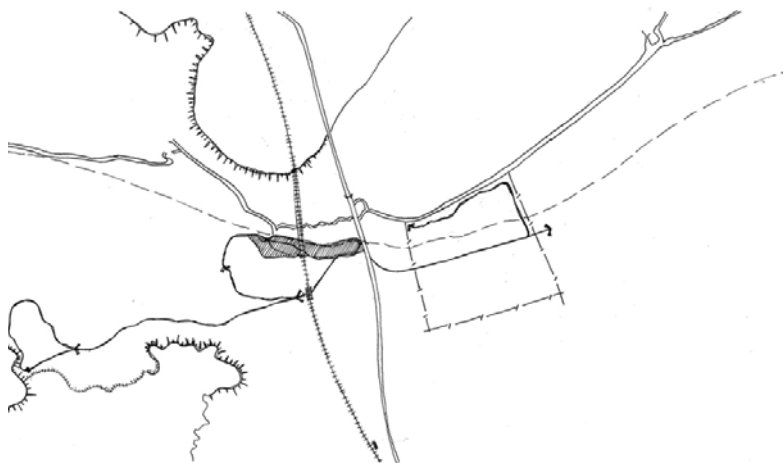


Figure 7.5.3 Pastoral Manager map indicating main road and track access along the Neales River and the waterholes including designating the area of greatest impact around and under the bridge. Note the fenced area set aside for camping on Allandale. Source: Rodney Fullerton, Allandale

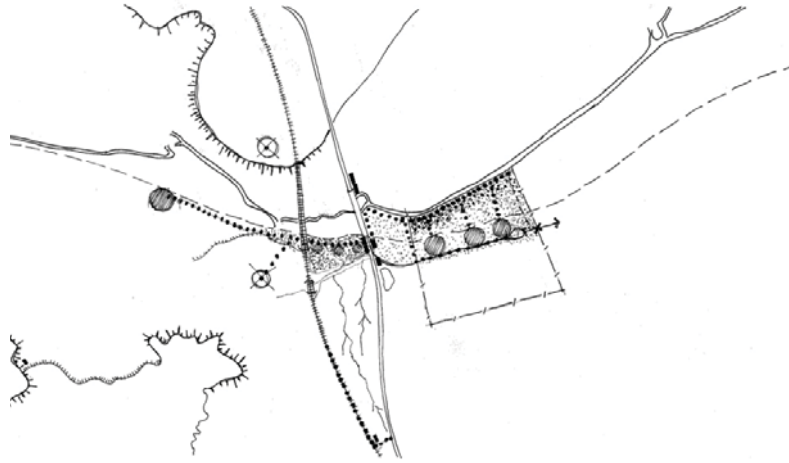


Figure 7.5.4 Landscape characteristics map including nomination of dispersed areas for designated camping away from the river banks and sensitive margins, development of walking tracks to the waterhole and designed roads and campsites for a variety of scales. Revegetation and designated parking and camping areas away from banks and waterhole flats alongside the development of walking tracks

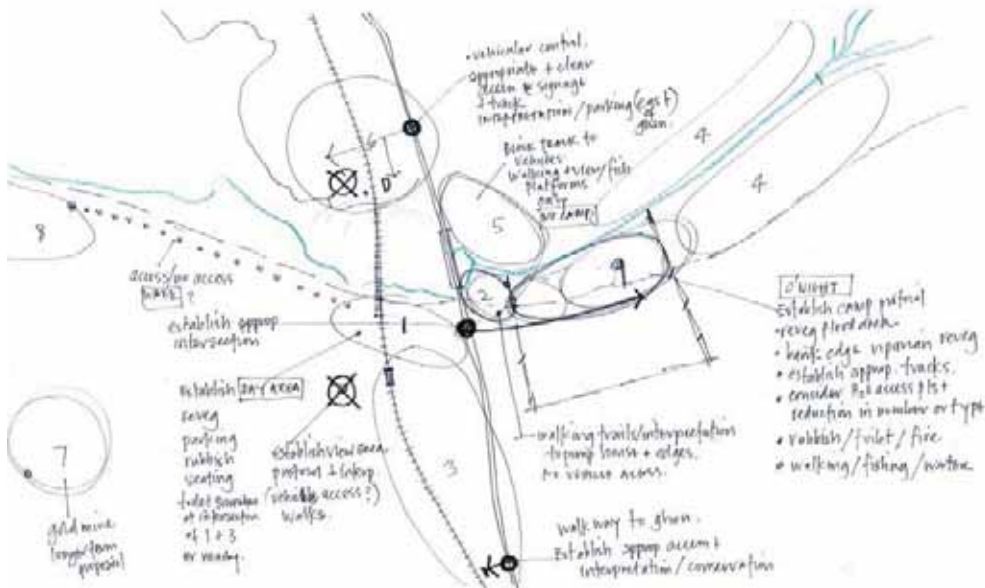


Fig 7.5.5 Algeuckina overview landscape character zones sketch map designated in relation to landscape attributes, activity type and intensity of use overlain with key recommendations for each area the most visited and impacted zones.

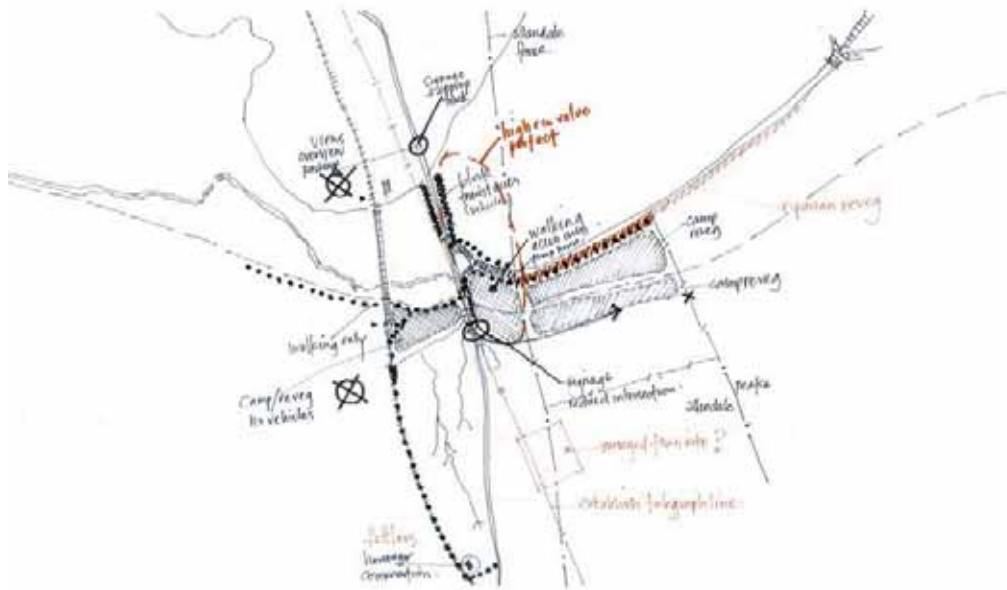


Figure 7.5.6 Consolidated Strategies for the Algebuckina Waterhole complex.

To encourage a capacity based approach that indicates when the Waterhole area is totally occupied and provide other facilities adjacent new infrastructure.

Area 1: West Algebuckina Bridge

- Day Area to include revegetation, parking and seating areas, toilet and water facilities located away from the waterholes to allow for flood damage mitigation, ease of maintenance, less visual impact on the historic and natural qualities of the place and reduce impact on the waterhole margins.
- Viewing area on the southern hills to be walked to rather than driven to.
- Designate appropriate limits to vehicular traffic and parking away from the bridge and provide walking and resting places under the shade of the Bridge

Area 2 (includes subset Area 9): East Algebuckina South Allandale

- Provide walking tracks and deter vehicular access and camping in high ecological zones closest to the Track and Causeway
- Overnight Area to include a range of campsites and regulated access tracks away from riparian bank zone in the already designated Allandale zone.
- Provide walking tracks and confirm access points to the waterhole of sufficient width and structure to prevent gullying and erosion.
- Develop a regime for rubbish management and fire to reduce impact on local vegetation install berms and rock-reinforced revegetation buffers for public vehicle management in designated camping areas.

Area 3: Algebuckina South and Ghan Railway

- Consider new facilities area for camping, toilets and shade a shelter in association with Fettle's Cottage ruins.
- Develop a vegetation plan for vegetation the gullies and associated areas to provide shade and shelter in line with the historic cultural landscape.

Area 5: East Algebuckina Waterhole North Allandale

- Designate a no camping area, close access road to the general public and provide only walking tracks and viewing points in this ecological zone.

Area 6: West Alge buckina Escarpment

- Manage traffic to provide car access and parking adjacent to viewing point and walking path systems elsewhere. Ideally confirm traffic to the east of the Ghan Railway line.
- Provide interpretive information at viewing point.

7.6 Landscape Concept Design for community development of the Alge buckina Waterhole

7.6.1 AREA 1: WEST ALGEBUCKINA BRIDGE

Characteristics: Cultural tourism, Neales River interpretation and waterhole ecology, Aboriginal culture, walking trails and camping infrastructure, rehabilitation.



Fig 7.6.1.1 West Alge buckina Bridge landscape character zones location and evidence of attributes, activity type, pattern and intensity of use Image: G Lee April 2010

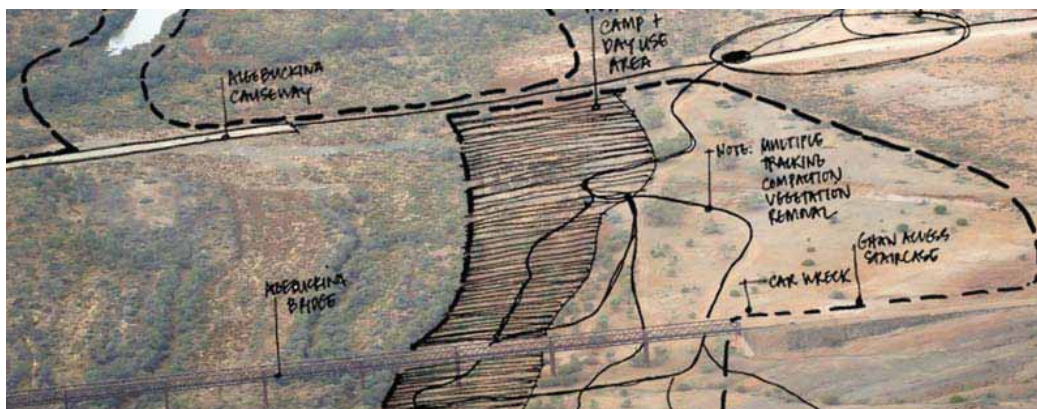


Figure 7.6.1.2 West Alge buckina Bridge landscape use areas, existing infrastructure and condition

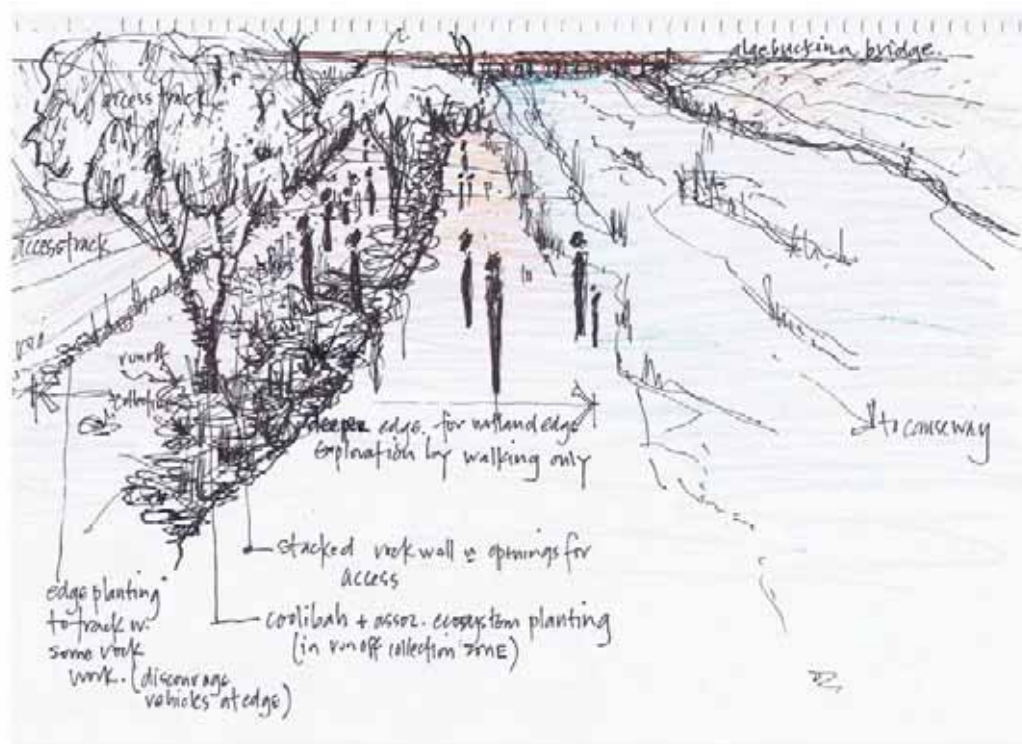


Figure 7.6.1.3 West Algebuckina Waterhole opening to stony stream base with sparse riparian vegetation.
Drawn: B Madill

See Strategies above to consolidate a Day Visit area for Area 1. Above is a sketch indicating the location of a proposed soil and rock berm on the rear edge of the existing upper bank to reinforce the impacted tree line and edge of waterhole and wetland. Utilising road making technology and local materials to provide for water retention and management of runoff this idea builds upon the water management programs currently underway in the APY Lands of northern South Australia.

The vegetated and rock reinforced berm is a buffer to prevent car access, reinforces the original bank line, over time can revegetate to provide shade and shelter and a natural parking and camping ground away from the channels and waterholes. Provide a walking path along the bank towards the bridge to focus upon the arid lands wetlands and waterholes when water is present.



Figure 7.6.1.4 The upper bank area where the soil and rock berm and consolidation of existing planting is proposed. Image: G. Lee November 2009

7.6.2 AREA 3: ALGEBUCKINA SOUTH AND GHAN RAILWAY

Characteristics: Rail and transportation, heritage explorer and settler histories, walking trails and camping infrastructure

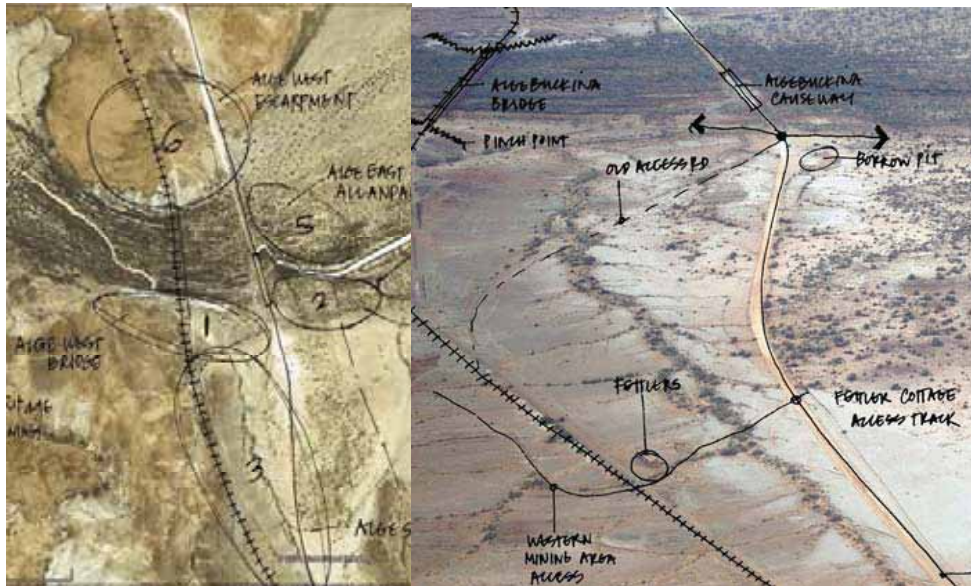


Figure 7.6.2.1 Alge Buckina South and Ghan Railway landscape character zones location and evidence of attributes, activity type, pattern and intensity of use



Figure 7.6.2.2 Alge Buckina South and Ghan Railway evidence of attributes, activity type, pattern and intensity of use and access from the Oodnadatta Track Images: G. Lee November 2009

See Strategies above to consolidate a day visitation area for Area 3. Below is a sketch indicating the location of a new area to support larger scale tourist vehicles including trailers and caravans and bus campers. Located some distance from the Waterhole it provides for a heritage tourist experience to balance the nature-based waterhole experience.

The Fettlers Cottage ruins may be reinforced as ruins and reinvigorated and the historic explorer story reinforced in this area. Management regimes including provision of water and

toilet maintenance to be developed in consultation with local Aboriginal groups, landholders and tourism operators.

A new facilities area either to the south or the north of the Fettle's Cottage Ruins for camping, toilets, shade and shelter draws from the Coward Springs model and a similar architectural and materials reference for Algebuckina can be made. This allows some consistency of message along the route.

Utilising drylands water management technologies alongside naturally occurring systems, develop a vegetation plan for vegetating the nearby gullies and associated areas to provide shade and shelter in line with the historic cultural landscape.

Develop walking tracks along the rail line and through the plains to the Bridge and Waterhole zone to encourage knowledge of the local ecology, flora and fauna.

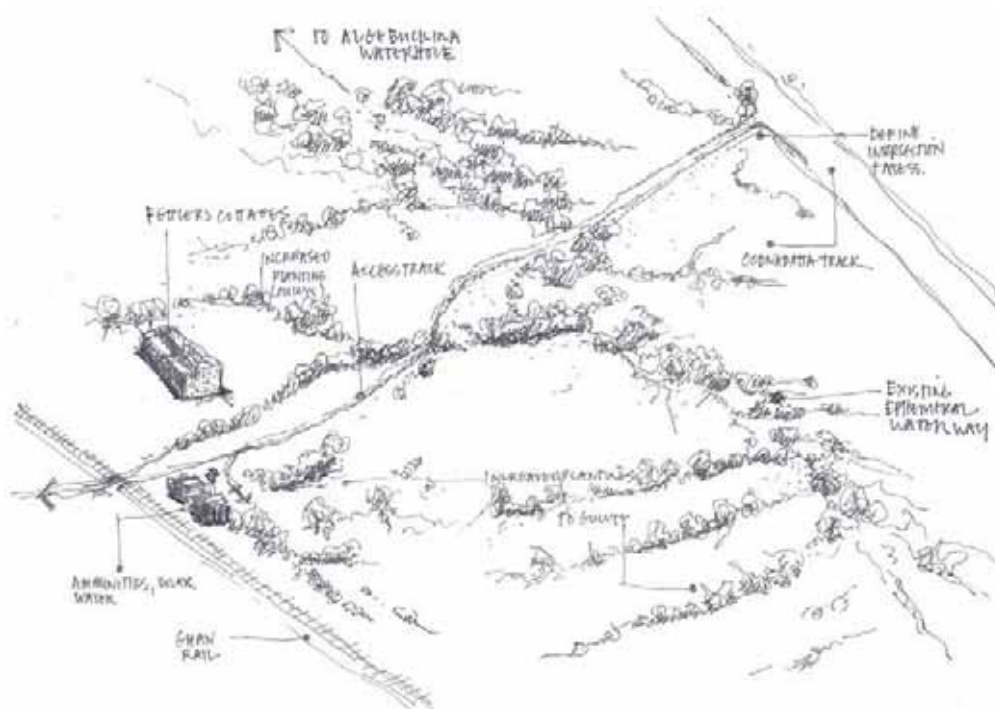


Figure 7.6.2.3 Sketch overview of a possible plan for camping, ablution facilities and increased interpretation and access to the Fettle's Cottage Ruins, adjacent the Ghan tracks.



Figure 7.6.2.4 Coward Springs ablution facilities and planting at the springs. Image: B Madill April 2010

8 KEY FINDINGS

The community engagement, landscape assessment and analysis component of the Critical Refugia project has researched the on-the-ground characteristics of selected waterholes and other waterbodies in the Neales Catchment. The detailed landscape attributes study of individual sites is informed by face-to-face feedback from the various communities and stakeholders who use and experience the various waterbodies: as a resource, as places of cultural and spiritual importance, as research areas, and as places for recreation, meeting and education.

The intent of the study is to contribute to a draft management strategy for critical refugia in the Neales Catchment, in particular Algebuckina and Hookeys waterholes. These findings are thus framed to propose management strategies for priority on-the-ground projects to spatially manage key areas from a landscape design perspective. The multidisciplinary nature of the research assists in developing a balanced perspective on relevant and achievable management approaches informed by geomorphology, ecological, aquatic, hydrological and landscape quality conditions alongside indigenous, pastoral, tourism and other community and commercial interests.

The Neales Catchment is a complex cultural landscape exhibiting rich historical and geological data alongside an arid lands ecological record that is nationally, if not globally, unique in its diversity and relevance to contemporary society and environment.

The following key aspects contribute to the findings of this cultural landscape assessment and design research:

8.1 Waterbody typologies and landscape assessment

Two major networks are examined in the Neales Catchment. Firstly, the system of rivers, creeks, floodplains and waterholes which generally moves across the stony plains from the west via the Neales and Peake rivers draining to Lake Eyre in the east. Secondly, the human movement system links current and ruined historical settlements along the Oodnadatta Track in a north–south direction. Where these two systems intersect at the important waterholes and generally dry creek crossings, the focus of most human interface and activity occurs. A secondary water system of springs and bores drawn from sub-artesian systems complements the focus on areas of historic human use and occupation, which, in some cases, continues.

The landscape assessment project primarily focused on the waterholes and springs, and on one dam and bore, to develop a working typology of the landscape description, quality, use and interpretation of each type in relation to the greater scientific surveys undertaken for this project. The aim has been to describe waterholes as cultural landscape concepts including landscape quality and diversity, and identify their assets and the relationships between waterholes and human access and activity over the catchments. Issues influencing management approaches are nominated at the end of each detailed survey.

Five key waterbodies are identified as critical areas for the development of management approaches due to their high landscape quality, indigenous and pastoral heritage, intensity of use from a number of stakeholders and proximity to road access:

- The Algebuckina complex including West Algebuckina ephemeral waterhole and historic site and East Algebuckina permanent waterhole
- Hookeys Waterhole and the expanded semi-permanent waterholes complex adjacent Oodnadatta to the north of the Oodnadatta–Coober Pedy creek crossing
- Old Peake Station historical site and springs and the associated Freeling Springs area
- Angle Pole semi-permanent waterhole and historic site
- The Oodnadatta Track string of historical sites from William Creek to Afghan Waterhole, their springs and waterholes and infrastructure.

8.2 Co-existence, connectivity and change in critical refugia waterholes

Waterholes and other waterbodies are magnets in the landscape for all communities, whether they are ecological, faunal or human. When such waterholes are further nominated as critical refugia it is important to establish what this term conveys to the humans who currently, and in the future will, effect the most localised change before major climatic and/or geological change impacts.

A working definition of critical refugia in this context is suggested:

Critical refugia waterholes are essential waterbodies that provide remnant ecological habitat for relict species due to capacity to endure climatic or other changes that have impacted alternative habitats. The ongoing existence of such critical refugia is tenuous and potentially terminal as their distribution in arid areas is typically limited.

Managing for critical refugia to endure requires a flexible approach that acknowledges the co-existence of multiple users, both human and ecologically based, and that climatic, ecological, economic and cultural conditions will change.

8.3 Landscape values and implications for management:

Neales Catchment waterholes and environs in creek systems demonstrate a number of similar features, which are synonymous with the natural and cultural landscape character of central South Australia's stony plains area and the Oodnadatta Track:

- Rising and falling terrain between gibber plains and sand dune country to afford picturesque views over arid pastoral landscapes, areas of geological interest and wide horizons in all directions.
- Tree-lined creeks, predominantly coolibah with often dense understorey acacia species and lignum in riparian zones, snake across bare gibber plains providing spatial variety and a green and cool contrast with red and rocky desert ground scapes.
- Depending upon seasonal and climatic conditions, the presence of water in ephemeral and especially permanent waterholes such as Algebuckina contribute to high landscape quality and are the focus for intensive tourist visitation due to their rarity in arid landscapes.
- Wide gravel and dirt roads provide access across the plains, interrupted at regular intervals by treed creek crossings, with associated cast iron/steel historic Ghan bridge structures and occasional ephemeral waterholes.
- Remnant Ghan railway embankments, fettler's cottage ruins and water tanks punctuate the road journey and identify places where water sources once supported inhabitation.
- Lateral tracks, sometimes signed, indicate access to pastoral properties and potential tourism destinations. Interpretation signs from the Pink Road House, Oodnadatta provide recognisable and continuous interpretation of the route and its cultural points and landscape features.

Stakeholder feedback identifying the landscape qualities and cultural values of the waterholes and their environs, and the resulting impacts, includes the following key, sometimes contradictory, aspects:

- The waterholes and other waterbodies are the focus of ongoing human existence in the outback. The appeal of arid zone landscapes is increased by the visual presence of water and/or the indication that water sources exist to sustain vegetation.
- Landscapes that exhibit permanent and natural waterholes and springs are refuges for animals and humans in dry times, and are places for sustenance and recreation.
- Preferred landscapes exhibit high biodiversity, viewpoints overlooking visibly pristine landscapes, heritage complexes that may be in ruins but are not subject to vandalism and littering.
- Constructed dams, bores and tanks are indicators of pastoral and other activity and contribute to the cultural landscape, but there is a preference for 'natural' and preferably pristine waterholes.
- Conversely, there is also a preference for 'safe' places to camp and walk associated with waterholes where clear visibility of the surrounding area and ground conditions is possible.
- The presence of fish and other wildlife at healthy waterholes contributes to the desert experience and promotes an important opportunity for recreation and social meetings for locals.

- The landscape quality of watercourses and waterbodies is reduced by visible signs of human-induced impacts such as vehicular tracks, multiple campfires, damaged trees, stock tracking, erosion gullies, compacted ground, litter and inappropriate signage and infrastructure.
- The impact of tourism visitation along the Oodnadatta Track at waterholes and creek crossings is a serious issue for pastoralists and Arabunna and Dunjiba peoples as it is seen as negatively impacting the landscape quality of these culturally significant places.
- The lack of strategies for management of tourism sites and effective information systems and facilities along the Oodnadatta Track is seen to result in greater impacts further along watercourse banks and associated floodplains.

Landscape management programs, projects and timelines for critical refugia waterholes must include ongoing broad local, regional and national stakeholder engagement and knowledge in any program design and implementation.

8.4 Neales Catchment cultural landscape and its user groups

Identified human user groups include pastoralists, indigenous communities, tourists, mining operations, local commercial operators, government agencies and researchers. In general the two types of spatial activities that occur in the Neales Catchment can be summarised as:

- **Dispersed use:** where travel across the landscape in relation to pastoral activities, Aboriginal cultural activities (e.g. hunting), exploration and other scientific research results in a pattern of movement along natural creek and gully lines associated with high vantage points and constructed road and rail lines
- **Localised use:** where occupation for intensive use activities, such as extraction, camping, watering and settlements, is associated with visible, intense impact at a localised site, most usually at a place where water is available through surface storage (waterholes) or ground water discharge (springs, bores).

Key issues related to user group activities:

- Visitation of waterbodies, particularly through intense and group based tourism activities impact locally upon water points through more intensive public use of private, pastoral water points and Aboriginal cultural sites, resulting in compaction, erosion, damage to banks and riparian vegetation, traces of fire and refuse.
- An increasingly frequent situation is dispersed use in the form of exploration through internet search engines, public and private websites and information, and GPS is leading to greater localised use. Potential visitation sites are pinpointed from a distance and often acted upon with insufficient knowledge of the reality of on-ground conditions.
- Understanding how water is accessed, by whom and for what purpose, is an essential component in the process of gaining knowledge of existing use and availability of water in the landscape as an economic and as a cultural resource, leading towards negotiated and sustainable management systems for the Neales Catchment.
- Protocols for accessing and researching Aboriginal traditional sites are necessary alongside ongoing monitoring of the ecological and cultural health of the natural waterbodies, waterholes and springs. It is equally necessary to record and monitor constructed water points such as dams and bores in a coordinated collaboration between government agencies, land managers, traditional owners and researchers.

- In the absence of effective control mechanisms (e.g. identification and design of designated places for specific uses, provision of appropriate infrastructure and information systems, and ongoing assisted local management regimes) there is dispersal of tourism sites further along creek banks.
- Capturing local and long-term knowledge is necessary for the development of sustainable management approaches for the region through effective and accessible databases and ongoing community engagement regimes.
- Emerging practices such as mining exploration and alterations to existing pastoral management is resulting in changing community knowledge and dynamics.
- The altered cultural landscape of the Neales Catchment is seen to require government planning and funding assistance in partnership with local communities and operators to record and understand historical and current water regimes to ensure planning for future sustainability in the event of both cultural and climate change.

8.5 Information, education and interpretation

Equally important for the community of users of the Neales Catchment and Algebuckina Waterhole, and for the researchers engaged with this survey, is the issue of information collection, management and dissemination. Community feedback during fieldwork reiterated a number of issues regarding education and interpretation of waterholes and access to arid landscapes and historic sites.

Directional and access information

- The minimum necessary physical directional and access signs are currently installed along major roads and river crossings. They are subject to damage and disappearance in some cases from adverse weather conditions and human intervention. Sufficient information on distances to water points and other facilities is lacking in public access areas but is now available through car mounted GPS systems.
- Public Access Roads are clearly marked, particularly at Algebuckina East, but may increase unwarranted visitation and damage to waterholes by drawing attention to the area.
- Increased access to information websites where waterbodies can be located with GPS technologies, require management strategies for: managing access that can interact with stock and private infrastructure, and indigenous cultural sensitivities to remote sites; and potentially limit the availability of such places on pastoral and Aboriginal lands.
- Management approaches to access to waterholes and cultural sites must include a coordinated effort to provide accurate positioning information, and include guidance for the appropriate use of waterhole landscapes and environs.

Educational programs

- Community participation in the development and delivery of educational programs for groups such as schools, tourist groups, individual tourists and other commercial concerns can operate at a number of levels: for community building and children's education when the knowledge of on-the-ground research can be disseminated locally; and for the education of the broader visiting public and new operators of pastoral and mining programs.

- Illustrated print materials alongside web-based materials ensure that information is both accessible and portable for a range of users from many cultures and ages.

Interpretation

- There is general support for the need for better interpretation of the range of sites of interest along the Oodnadatta Track particularly at Algebuckina Bridge and Waterhole and along the disused Ghan Railway sites and creek crossings and settlements.
- Indigenous knowledge and interpretation of culturally important sites is not widely available either on signage, websites or through personal communication by tourist guides or publications.
- Various respondents commented on the Pink Road House signs, which act as distance and location markers along the track and provide general historical and contextual information on sites in a humorous way. Tourists are generally supportive of their message and humour; many locals suggest that they provide too much information and directions to places they consider should not be open to public visitation.
- Appropriate information on important ecological and landscape systems operating around popular waterholes, and their relative fragility to human generated impacts, will assist with management of key sites and tourist preparation for visiting remote outback sites.
- There is a lack of coordination between various government agencies: NRM, Transport SA and Heritage for example along public routes as to the range of signs and the messages they intend to convey.

Internet and global positioning information systems

- The collection and collation of various landscape and ecologically based data through digital information systems is transforming the depth of knowledge and understanding of the Neales Catchment. Environmental systems and flows are modelled and transmitted as useful data instantaneously, opening up communication systems and providing necessary databases that support management approaches to waterholes, their communities and the regional landscape.
- It is important to note that areas were identified through topographical, historical and pastoral maps and on-the-ground surveys and visitation supplemented by aerial surveys and personal communication. Through these methods it was possible to limit knowledge of and access to places.
- Increasingly, free to all website postings, social networking internet sites, Google Earth and GPS daily expand the amount of information available.
- While generally well meaning, much of the information demonstrates a lack of knowledge and often poor practices for managing camping sites and the degree of access possible to remote waterholes and other cultural sites. The local community is increasingly having to manage unprepared visitation informed through GPS readings and travellers' tales.

Landscape management and spatial design approaches

- Interpretation programs are only partially developed through the use of visual and text based materials when the range of users travel across and work in remote landscapes.
- Building upon on-the-ground experience, management approaches to ecologically and culturally sensitive landscapes subject to public visitation require landscape design strategies to direct visitors across landscapes and heritage areas in a coordinated way.

Issues such as protection and improved visitation experiences require appropriately scaled and managed pathways, barriers and infrastructure to aid visitor movement and accommodation.

8.6 Themes for understanding and management of critical refugia

One outcome of the multidisciplinary team approach is the development of a number of overarching themes to assist in describing the specific attributes of the Neales Catchment, its riverine and landscape systems and its critical refugia waterholes.

The seven themes are: **Time, Landscape, Salt, Refugia, Pathways, Vulnerability and Futures**. The definitions of these themes and how they can be applied is described elsewhere in this report. However, the **Landscape** theme is elaborated on below.

Key concepts that underpin the Landscape theme include:

- investigation of the broad catchment and its landscape features
- the dynamics of waterhole existence and change over time
- location of the range of refugia and describing their typologies
- investigation of other surface systems such as dams and groundwater systems such as springs and bores to gain understating of both hydrological and cultural water formed landscape systems
- analysis of rainfall events and waterhole landscape quality linked to flood and drought
- recording of fish distribution from a scientific perspective, expanded through spatial landscape analysis of waterhole and waterbody habitat conditions
- description of the aesthetic qualities of waterholes linked to ecological processes and geomorphology
- documentation and discussion with communities and stakeholders on their deeply held cultural associations with, and resource use of, the waterholes.

In particular the landscape assessment and design-based management approaches seek to:

- recognise that the Algebuckina Waterhole complex is a magnet in the landscape in order to inform the record of Algebuckina's landscape aesthetic values, cultural heritage and ecological diversity
- propose design strategies for tourist camping, walking and driving areas to rehabilitate and protect the ephemeral and permanent waterholes and their fragile riparian zones.

8.7 Proposals for community and landscape generated projects

This Neales Catchment landscape character assessment project demonstrates the important spatial, ecological and cultural qualities experienced in the range of waterbodies evaluated. Evaluation of the dynamic climatic, human and geomorphologic factors point to key management issues at waterholes where stakeholder use and ecological imperative co-exist. A number of community-driven strategies and projects, devised in partnership with

government, can work to alleviate current functional, visible impacts on critical refugia waterholes.

Suggested landscape driven projects:

- Drawing upon this multidisciplinary research, develop individual landscape management strategy plans for critical refugia waterholes and their environs including evaluation of impacts over time, leading to programs for bank and vegetation rehabilitation and ongoing maintenance regimes.
- Develop landscape planning and infrastructure design feasibility studies to provide strategies for limiting the extent of campsites and access to publicly accessible waterholes, and providing walking tracks to displaced car access and parking areas, and limited ablution facilities.
- Develop strategies for infrastructure funding for landscape design projects at the intensively used waterholes on private lands, East and West Algebuckina Waterhole, Hookeys Waterhole, and various ruined settlements along the road.
- Expand upon this review of sites along the Oodnadatta Track to develop an overall tourism infrastructure and landscape design program for managing the impacts and potential benefits of tourism in relation to local resources.
- Develop a publicly accessible cultural landscapes annotated visual database for the Oodnadatta Track and Neales Catchment as a resource for ongoing management regimes for waterholes and other cultural sites.
- Establish a mechanism for ongoing engagement with local communities and stakeholders, appropriate State Government and other agencies, and experienced researchers to enable ongoing maintenance of the cultural landscapes database.
- Develop appropriate protocols for access to and research on Aboriginal cultural sites on public and privately held lands of the Neales Catchment and the Oodnadatta Track in partnership with Arabunna and Dunjiba peoples.
- Expand upon local education programs and interpretation systems for activities in and publications on the ecological and landscape attributes of the waterholes of the central South Australian arid zone.

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