Executive summary

Parsons Brinckerhoff (PB) Australia was commissioned by SunWater Limited (SunWater) to prepare an Environmental Impact Statement (EIS) and accompanying draft Environmental Management Plan (EMP) for a proposed water transport system from Clair Weir on Burdekin River to Bowen. The Project is known as the Water for Bowen Project.

E.1 Project proponent

The Project proponent is SunWater Limited which is a Queensland government-owned corporation. SunWater is a leading water service provider that offers a range of services including infrastructure ownership, water delivery, operation and maintenance of infrastructure and engineering consultancy services throughout Queensland and Australia. SunWater supplies about 40% of the water used commercially in Queensland to approximately 6,000 customers including mining, industrial and manufacturing companies, irrigators, local water boards, power generators and local government.

SunWater maintains an effective consultation program in the region. SunWater has regularly engaged with various stakeholders, including the local community and regulating authorities on the benefits and issues relating to the Project and providing opportunities for stakeholder involvement and feedback throughout the Environmental Impact Statement process. SunWater will continue to consult with the relevant stakeholders throughout the life of the Project.

SunWater has an overarching Environmental Policy which stipulates their high level aims, vision and commitments to environmental management. As part of their policy, SunWater have adopted the AS/NZS ISO14001/2004 Environmental Management System which covers every aspect of SunWater's business.

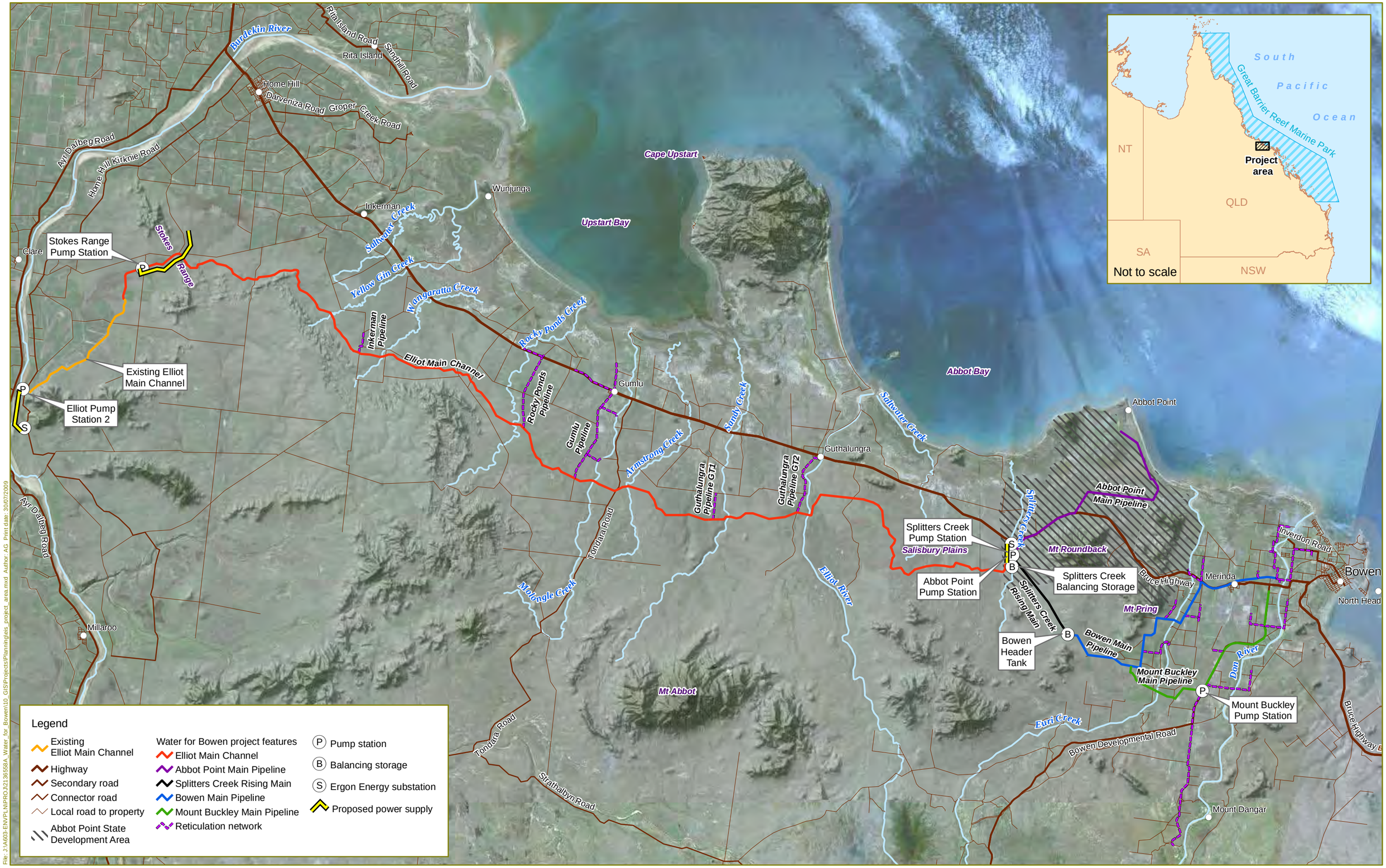
The contact details for the Water for Bowen Project are:

Project Manager, Water for Bowen Project
SunWater
Level 9, 179 Turbot Street
BRISBANE QLD 4000
PO Box 15536
CITY EAST QLD 4002
Phone +61 7 3120 0000
Fax +61 7 3120 0242
Email: water4bowen@sunwater.com.au
Website: www.sunwater.com.au

E.2 Project description and need

The Water for Bowen Project is a proposed water transport system that will provide up to 60,000 ML of water per annum from water allocations sourced from the Burdekin Falls Dam. The water will be transported from the Clair Weir on the Burdekin River as far south as Bowen. The Project is located near to the townships of Bowen within the Whitsunday Regional Council and Home Hill and Ayr within the Burdekin Shire Council.

The water transport infrastructure includes approximately 93 km of new open channel and approximately 63 km of main pipeline, including the Bowen Main Pipeline, the Mount Buckley Main Pipeline and the Abbot Point Main Pipeline. A network of smaller reticulation pipelines, five pump stations, two balancing storages and other associated ancillary infrastructure structures also support the Project. The water will be delivered via metered outlets to the property boundary of individual customers.



File: J:\A603-ENVPL\NPRO\J12136558A_Water_for_Bowen\10_GIS\Projects\Planning\eis_project_area.mxd Author: AG Print date: 30/07/2009

PARSONS BRINCKERHOFF

Source: Satellite image, watercourses - Geoscience Australia 2003, Roads - Queensland Transport 2003

Figure E.2-1
Project area

Water supplies in the region are currently heavily reliant on groundwater and the main aquifers are over allocated. In times of drought water use is restricted, water quality declines to unacceptable levels and seawater intrusion has occurred as a result of the lowered level of groundwater.

Local streams and rivers are highly ephemeral and cannot support substantial extraction.

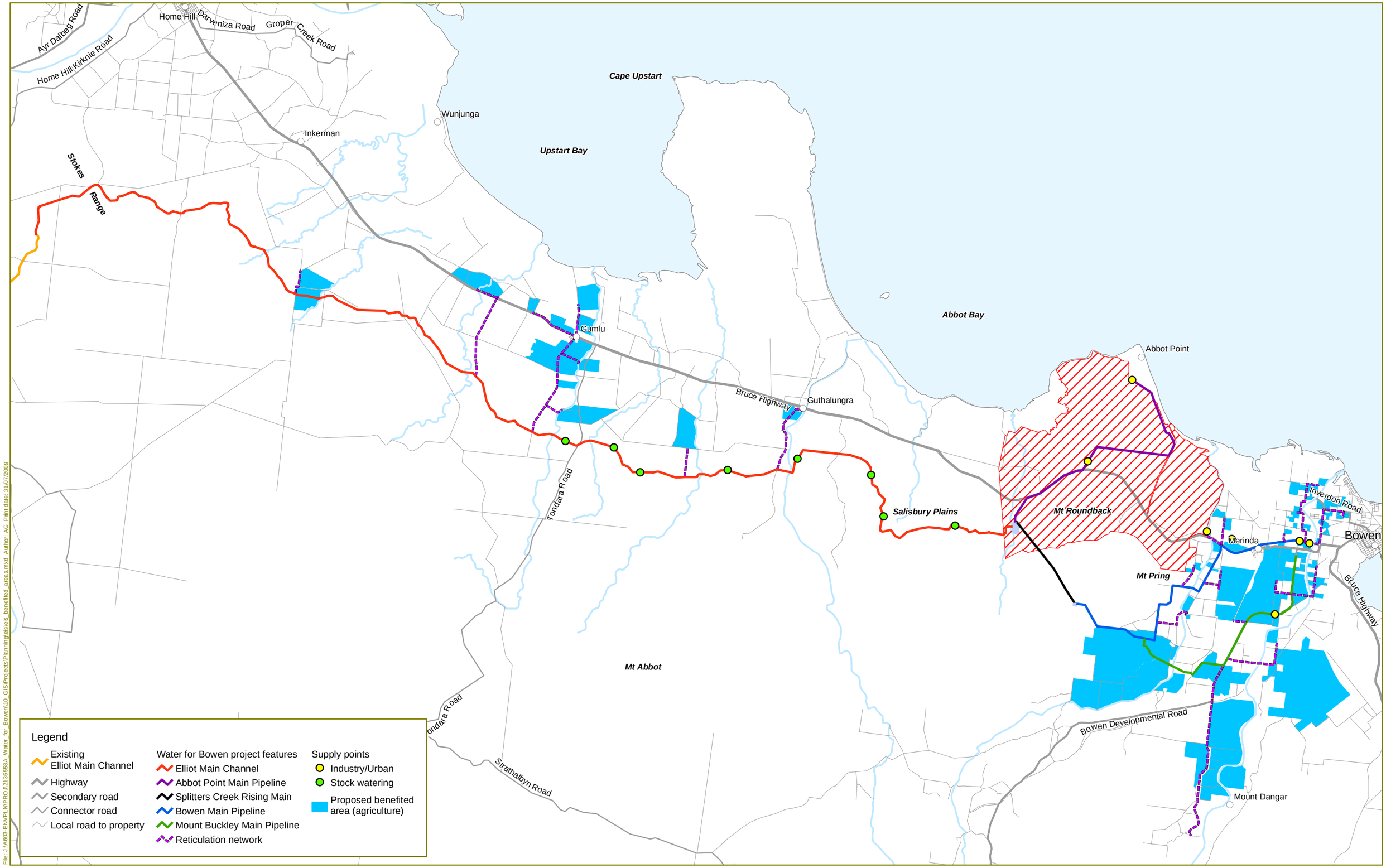
Agriculture, urban users and the proposed industrial area of Abbot Point require secure water supplies of reliable quality. The Project is identified as the preferred alternative to meet these requirements and to partly alleviate the problems with the current groundwater supply.

The Project is strategically supported by the national Water Reform Framework and National Water Initiative and Queensland's Northern Economic Triangle Infrastructure Plan 2007–2012, Statewide Water Policy, the Program of Works, Statewide Water Grid, Regional Water Infrastructure Projects and the Coal Infrastructure Program of Actions.

The Project supports the proposed expansion of the Port of Abbot Point and the establishment of the Abbot Point State Development Area. These Projects are driven by the need to provide the infrastructure to support the export of thermal and coking coal from the northern Bowen Basin and the future development of industrial uses in the Abbot Point State Development Area. In addition, the Project supports the sustained development of local agriculture industries and urban settlements. Availability of water supply is an important component of development of the region.

Over half of the water transported is anticipated to be supplied to industrial and urban users in the Bowen and Abbot Point area while the remainder will go to agriculture.

The agricultural areas expected to receive water from the Project are referred to as 'benefited areas' (Figure E.2-2). It is anticipated the water will be used in part to replace the existing groundwater supply and in part to develop new irrigation areas. Some 2,887 ha of land development, primarily for irrigated horticulture in Bowen and Gumlu, is expected. This represents a 23% expansion in the area of irrigated agriculture in the region and a 0.8% change in overall catchment land use.



File: J:\A603-ENVPLNPRO\21236558A_Water_for_Bowen\10_GIS\Projects\Planningleis\eis_benefited_areas.mxd Author: AG Print date: 31/07/2009

PARSONS BRINCKERHOFF

Source: Watercourses - Geoscience Australia 2003, Roads - Queensland Transport 2003

0 4 8 12 16 20

Kilometres

Figure E.2-2
Benefited areas

Should the project not proceed, alternative water sources will require development prior to any proposed industrial or agricultural developments in the region proceeding, as the existing water supply system (primarily based on supply from underground sources) is at capacity.

The opportunity to supply water to high value industrial and urban clients allows agriculture to be supported whereas in its own right it would not justify the development of the Project. Failure to support agriculture to an extent, or the social infrastructure associated with urban development in Bowen, would not allow a sustainable balance to be achieved from economic, social, community and amenity perspectives.

E.2.1 Project alternatives

The key objective of the Project is to provide a long-term reliable water supply to urban, industrial and agricultural customers in the Bowen region.

Existing water supplies cannot support existing demand in a reliable and sustainable manner. A significant new and reliable water supply is needed to support the strategic growth of the region as planned within various State Government documents. These developments are of regional, State and National significance.

The alternatives options considered in this section were assessed firstly with respect to their ability to meet the demand identified above in terms of total supply capacity, location of demand and the reliability required of that demand source. As much of the demand is urban and industrial the supply requires high reliability. Any alternatives that met these criteria were then assessed on economic, social or environmental criteria with the aim being to identify any clearly unacceptable outcomes that would make the alternative not prudent or feasible. The following alternative options were not considered feasible:

- demand reduction and recycling – current water use in the region is estimated to be 50,000 ML/a, this is less than the identified new demand. It is therefore not possible for reduction of current demand or recycling to meet the identified new demand
- groundwater – all groundwater resources in the area are fully committed and water quality issues have been recognised. A moratorium has been placed on the allocation of additional groundwater licences. Groundwater is therefore not an option to satisfy all or even part of the identified demand
- surface water – as Burdekin Falls Dam and the Elliot Main Channel already exist, the Water for Bowen Project represents a relatively simple extension to this existing infrastructure. If that source of supply is not used, entirely new surface water storages would need to be developed. No single potential source could supply the necessary volume as a result of the small size of local systems; therefore more than one storage would be necessary. The cost becomes immediately prohibitive
- desalination issues include; geographical and location constraints, availability of skilled operators, and land and energy availability. The size of plant required would be approximately 30% larger than that recently constructed at Tugun on the Gold Coast at a cost of about $1.2b. On a simple capital cost comparative basis this would make the water several times more expensive than the Water for Bowen option and exceed the capacity of agricultural customers, and probably even industrial customers, to pay.

E.3 Project approvals

On 11 January 2006, the Project was declared a Controlled Action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and designated a Significant Project on 1 December 2006, under the Queensland *State Development and Public Works Organisation Act 1971* (SDPWO Act). The bilateral agreement between the Commonwealth and Queensland governments provides the overall Project approval and environmental impact assessment process for the Project under the SDPWO Act.

As the Project involves development requiring an application for a development approval under the Integrated Planning Act 1997, the Coordinator Generals report on the Project may, under section 39 of the SDPWO Act, state for the assessment manager one or more of the following:

- the conditions that must attach to the development approval
- that the development approval must be for part only of the development
- that the approval must be preliminary approval only.

Alternatively the report must state for the assessment manager that:

- there are no conditions or requirements for the Project
- the application for development approval be refused.

In addition, the Coordinator-General's report may, under section 52 or 54B of the SDPWO Act respectively, state recommendations relating to an approval required under another Act or impose conditions.

As the Project was determined to be a 'controlled action' under the EPBC Act, the report will also be provided to the Commonwealth Minister responsible for administering Part 9 of the EPBC Act. The Minister will provide his response to the proponent and to DIP.

A number of additional key approvals under state legislation and local laws will be required for the Project to proceed and will incorporate the conditions noted in the Coordinator Generals report and in the Commonwealth Ministers report as applicable. The relevant legislation, trigger mechanism and permit description are outlined in the EIS.

E.4 Impact assessment

E.4.1 Climate and meteorological conditions

The Project area is located in the Queensland tropical and subtropical climatic zones and experiences high frequency rain events with most of the annual rainfall in late summer (January to March) and February being the wettest month of the year in terms of amount of rainfall and number of rainy days. The Project area is prone to cyclones, with associated flooding, during summer and early autumn. Flooding at other times of the year has been recorded. Data recorded at three major rivers of the region show a highly seasonal flow regime driven by high flow events which are of short duration.

The Project area experiences warm summers, with average maximum temperatures in the low 30s between November and March. Winter temperatures are mild, with a daily temperature range from about 15°C to 25°C in July.

Evaporation rates are highest in November and December however are also high in winter. For the majority of the months of the year, evaporation rates are greater than rainfall, which would result in minimal stream flow and groundwater recharge for most of the year, with the exception of late summer. The region is commonly referred to as the 'dry tropics' because the short wet season is followed by an extended dry season and droughts are not uncommon.

At the time of writing, the Burdekin Shire and Whitsunday Regional Councils were not drought declared. However, the Whitsunday Regional Council was drought declared from 1 January 2003 until 14 March 2008 and the Burdekin Shire Council was drought declared from 27 October 2003 to 14 March 2008.

Bushfire risk analysis mapping prepared by the Department of Emergency Services Rural Fire Service indicates that the majority of the infrastructure corridor passes through low to medium bushfire risk areas.

Climatic factors that may impact the Project construction phase are well understood and managed through standard risk management procedures, including monitoring of short and long term weather predictions.

Risks during the operation phase, may also be magnified as a result of predicted climate change. The potential changes in key regional climatic and hazard variables that may impact the Project relate to rainfall, temperature, evapotranspiration, wind speed, fire and sea level rise. These factors will be included in an Operational Environmental Management Plan (OEMP) which will be implemented to address climate variability in the context of operational risk. The process is commenced in Chapter 17 of the EIS. Appropriate mitigation and management strategies will be incorporated into the OEMP to minimise impacts on the Project from current and predicted climate patterns.

E.4.2 Land

E.4.2.1 Land tenure and ownership

The tenure of land within the Project area consists primarily of freehold or leasehold agricultural land. Other land tenure in the Study Area includes National Park, Conservation Park, Reserve, State Lands and Water Resource. Additionally, special interest areas such as fauna sanctuary and habitat areas and the Great Barrier Reef Marine Park also occur within the Study area.

A total of 70 individual properties will be directly affected by the Project. Of these, 20 lots will be directly affected by the channel alignment, with a further 50 lots affected by the pipelines. SunWater intends to purchase or obtain permits to occupy a (generally) 50 m wide corridor to accommodate the channel. SunWater also intends to obtain a 20 m wide easement over all pipelines. In addition a small area of freehold land will be acquired to locate the Splitters Creek balancing storage, Bowen Header Tank and the five pump stations.

E.4.2.2 Land use

The total area of the regional catchment is 351,706 ha. The existing land use categories within the Project area together with the percentage of the regional catchment which they occupy include:

- grazing natural vegetation and forestry (80%)
- water, including marsh and wetland (8.4%)
- conservation and natural environments (7.1%)
- irrigated agriculture (3.6% or 12,515 ha)

- intensive uses (1.3%)
- dryland agriculture and plantation (0.02%).

There are eight mining tenures in the Project area, including mining and petroleum exploration tenures, mining leases and mineral development licences. There is no active commercial mineral extraction in the Project area. The Project will not lead to the sterilisation of the mining interests and the Project is considered to be consistent with State Planning Policy 2/07 Protection of Extractive Resources.

There will be no impacts on existing bridges, airports, oil, gas, water and sewer pipelines nor power lines or telecommunications in the Project area. Sections of new power line will be required to service the pump stations. Additionally, there are no identified long term impacts of the reticulation networks on other than reserve tenures held by local government (primarily road reserves) or the Department of Main Roads for State controlled roads (Bruce Highway, Bowen Development Road). A Traffic Management Plan will be developed, in consultation with the relevant district offices of the Department of Transport and Main Roads and relevant Local Government authorities.

The potential impacts of land use changes are related to both the Project footprint and the activities conducted on the benefited areas. Within the channel and above ground infrastructure footprints, the land use will change from the existing primary grazing use to water infrastructure. This loss will be mitigated through financial compensation for the land. The land use above the buried pipelines will remain. Easement conditions will not restrict existing activities such as grazing once construction has been completed and the land surface restored and rehabilitated.

The potential for land use change in the benefited areas relates to the identified water demands associated with the Project. Over 56% of the water supplied by the Project will be used for industrial and urban purposes. Changes in these land uses will be regulated and managed by the Bowen Shire Council planning scheme (now under the Whitsunday Regional Council) and the development Scheme for the Abbott Point State Development Area (i.e. all water used by industry/urban customers will be subject to the approvals required for the individual industry or urban land use under the relevant planning instrument).

Water supplied by the Project for agriculture will be used for both stock watering (approximately 5% of the agricultural water) and horticultural irrigation (95%). The small volume provided for stock watering is not expected to result in any significant land use changes.

In terms of expansion of irrigated agriculture, it should be noted that many irrigators will have access to both groundwater and surface water supplies. In years of good groundwater supply landholders may use their total water supply for irrigation, whereas in years of poor groundwater supply surface water allocations may used plus a proportion of normal groundwater supply. As such, the area irrigated will vary from year to year.

However, calculations undertaken for the purpose of this Environmental Impact Statement indicate that the likely new development of irrigated agriculture resulting from the Project will be 2,887 ha and the maximum possible new development will be 5,994 ha. Relative to the current level of irrigation, the maximum increase represents a 48% expansion, while the likely level of development represents a 23% expansion. The total percentage of land in the regional catchment that is currently irrigated is nearly 3.6%. Under the maximum level of expansion this would increase to nearly 5.3% and under the likely level it would be 4.4%. It is assumed this increase would be primarily at the expense of grazing land.

The *Water Act 2000* specifies that an approved Land and Water Management Plan is required before using water for irrigation purposes when a new or additional water allocation is obtained. Therefore, all agricultural customers who purchase water from the Project for irrigation will be required to develop and operate under a Land and Water Management Plan (LWMP). As the Project delivers water to the farm

gate, it is not directly responsible for development of the LWMPs but as part of the Project, SunWater has committed to developing a template for such a plan which may be used by local growers. SunWater views the development, implementation and auditing of such plans as an essential mitigation strategy to ensure their customers operate sustainable enterprises within the local planning environment and as such an approved LWMP will be a requirement of contracting for the water.

E.4.2.3 Topography and geomorphology

The water infrastructure corridor follows mainly flat to gently undulating land, comprising lower slopes and upper floodplain terrain throughout most of its length, traversing land with a gradient generally less than 2%. The main potential impact on the geomorphology of the area is the interruption and diversion of surface water sheetflow runoff as a result of the channel. However, any such impacts are expected to be negligible as current geomorphic processes in the Project area are dominated by streams. Further, the impact on the topography and geomorphology of existing waterways will be minimised through the use of siphons. Siphons convey water from the channel under the existing waterway via pipes to minimise impedance to natural flows. Concentration of the flow immediately at the discharge point of cross channel drainage culverts, which convey water from small catchments under the channel, will require implementation of erosion prevention measures.

The Stokes Range cutting will have a maximum depth of approximately 9 m and maximum width of approximately 80 m. The base of the cutting will be above the height of the surrounding lowland topography and the cutting is not expected to impact the drainage flow patterns from the range.

E.4.2.4 Geology and soils

The Project alignment and potential benefitted areas are underlain by a range of geological units and similarly, a range of landscape and soils units are also present within the Project area. The majority of the channel and pipeline alignment is located within an area identified as Good Quality Agricultural Land. State Planning Policy 1/92 makes allowances for developments on good quality agricultural land where the development provides an overriding public benefit and there are no other suitable sites for the purpose. The Project is assessed as in this category.

The channel alignment runs approximately along the 35 m AHD contour and therefore, no acid sulphate soils are anticipated to occur along the channel corridor. However, if acid sulphate soils are encountered, SunWater will manage these in accordance with the Management Principles outlined the Soil Management Guidelines (Natural Resources and Water, 2002).

The Project will not impact on any significant geological features in the area. The soils in the Project area have the potential to be impacted by a number of factors including (but not limited to) wind erosion, water erosion, compaction hazards and channel leakage. Prior to Project construction commencing, a Project Construction Environmental Management Plan will be developed and will include a detailed Erosion and Sediment Control Plan.

E.4.2.5 Land contamination

A site history investigation has been undertaken to determine any possible properties within the alignment that have the potential to contain contamination sources. Eight properties listed on the Environmental Management Register were identified. Further, a review of historical titles and aerial photography identified a further four lots which may support potentially contaminating activities (predominantly associated with livestock dips).

The lots identified are considered to require further investigation to determine the presence, type and extent of any contamination that may be present and the risk that it may pose. The potential type and

extent of contamination presents no unusual risks and will be managed in accordance with 'Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland'.

E.4.3 Visual amenity

Visual impacts associated with the water transport scheme will generally not be significant. This is due to the lack of visually sensitive locations throughout the water transport scheme. Existing vegetation and topography should provide natural screening of the channel and pipelines along the majority of the infrastructure route. In more densely populated areas such as the Don River Floodplain, the concentration of buildings within the area and the extent of the reticulation network may result in a number of residences and buildings being visually effected during construction, however, not in the longer term during operation. The Stokes Range Cut will temporarily create a medium visual effect for the property on the eastern side of the Range, however, factors including distance from the cut (over 2 km), natural vegetation screening, and the re-vegetation of the battered embankments should effectively reduce the visual impact in the long term.

E.4.4 Nature conservation

E.4.4.1 Terrestrial flora

Searches of relevant databases identified 1,313 unique vascular species of plant that were likely to be found in the study area. Seasonal field surveys identified 368 species of plant, including 83 species not reported in any of the database searches. Fifty-one (14%) of the recorded species are exotic. Fifteen rare or threatened species of plant listed under the *Nature Conservation Act 1992* (NC Act) and/or EPBC Act were identified as potentially occurring within the study area from the desk-based assessment. Only one of these species, *Eucalyptus raveretiana* (black iron-box), listed as vulnerable under both the NC Act and EPBC Act, was identified during field survey.

Photo E.4-1 Eucalyptus raveretiana

A further eight threatened plant species were identified as having a moderate or higher likelihood of

occurring within the study area. No suitable habitat for the remaining six threatened plant species was recorded as being present during the field surveys.

Despite extending over 100 km east to west, the study area incorporates relatively few Regional Ecosystems (REs), reflecting the region's dry climate and lack of diversity in landform and geology. Seventeen REs and four 'vegetation communities' were identified from ground survey within the study area. Two threatened REs were confirmed during field surveys — RE 11.3.33 and 11.3.34. RE 11.3.33 has a *Vegetation Management Act 1999* (VM Act) status of 'of concern' and a biodiversity status of 'endangered' whilst RE 11.3.34 has a VM Act status of 'of concern' and a biodiversity status of 'of concern – under review'. Three 'of concern' REs mapped by the Queensland Herbarium (RE 11.3.4, 11.3.13 and 11.12.10) were not encountered during surveys, but may have been present in areas not visited in field studies.

Weed invasion was observed as having a major impact on intact vegetation communities throughout the study area. Eleven species recorded in the study area are 'declared plants' listed under the *Land Protection (Pest and Stock Route Management) Act 2002*. Four of these species are also considered Weeds of National Significance (WONS). An additional seven species are considered significant environmental weeds under either the Burdekin Shire Pest Management Plan Priority for Management, or the Whitsunday Shire Pest Management Plan Priority for Control.

The Project corridors occupy 750.5 ha. Construction will result in the loss of 309.7 ha of mapped remnant vegetation, the remainder being non-remnant (26 ha) or cleared (415 ha). Within these areas, the infrastructure will impact directly on 27.1 ha of 'of concern' remnant vegetation and approximately 24 ha of remnant riparian vegetation. Additionally, approximately 3.3 ha of clearing will be required for construction of cross drainage culverts. Despite current potential minor future adjustments to the alignment, it is not possible to avoid clearance of remnant vegetation so offsets in accordance with the VM Act will be necessary.

Approximately 225 ha of land designated as having state biodiversity protection significance will be cleared for construction of the channel and pipeline alignments (based on mapping by the Environmental Protection Agency 2008). Another 49 ha of land with regional biodiversity significance and 28 ha with local biodiversity significance will be cleared.

The vegetation to be cleared provides habitat (either known or predicted) for a range of rare and threatened species of plant. An assessment of the significance of the likely impacts on these species (pre-mitigation) indicated that the impacts were likely to be moderate for three species, minor for five and negligible for one species.

The extent of change related to groundwater levels associated with channel seepage has been estimated as minor and is unlikely to lead to a change in the surrounding vegetation.

Overflow points and cross channel drainage culverts will concentrate waters to an extent and lead potentially to focussed germination areas. If ponding results, the species complement may be markedly different to that in the surrounding landscape and could potentially include invasive species. In areas of cross drainage culverts the impact is likely to be largely restricted to species which are already present in the upstream catchment while overflows will be carrying water from the Burdekin River.

The EIS recommended a large range of mitigation measures related to the identified impacts and these have been incorporated within the EMP. Mitigation measures included the mandatory compliance with the requirement for offsets under the VM Act. As part of these offsets, SunWater has committed to investigate opportunities to achieve maximum value from the offsets through geographic location, strategic infilling or creation buffers. The intention is that the offsets not be limited to those potential areas immediately adjacent to the infrastructure footprint but they be more strategic in nature, taking in to account secondary and potential cumulative impacts such as in more coastal areas. The offset code allows and fosters such

measures. It is not anticipated that any further offset in accordance with the Draft State or Commonwealth policy required.

The mitigation measures were assessed as successfully reducing the level of impact to minor or negligible levels.

E.4.4.2 Terrestrial fauna

Eleven broad terrestrial fauna habitats occur in the study area, which correspond with the REs identified. Database searches identified 411 species of terrestrial vertebrate fauna within the study area and surrounds. Seasonal field surveys identified 314 species of terrestrial vertebrate fauna including 206 birds, 53 mammals, 41 reptiles and 14 frogs. Twenty of these species were exotic, including two reptiles, one amphibian, 10 mammals and seven birds. Eucalyptus/Corymbia woodland and riparian woodland habitats recorded the highest species richness in the study area, with 208 and 181 species respectively.

Forty-eight threatened species listed under the NC Act (45 species) and/or EPBC Act (14 species) were identified as having potential to occur within the study area and surrounds as a result of desk-top assessment. Twenty-six of these were considered with moderate or higher likelihood of occurrence within the study area. During field surveys, 11 of these were recorded, including the endangered Black-throated Finch. The Critically Endangered Bare-rump Sheath-tail Bat was recorded based on possible call identification from an Anabat recorder. In addition, 13 regionally significant species were recorded.

Ten species of bird recorded during the field survey are currently recognised under the migratory provision of the EPBC Act. A further six species have a moderate or greater potential to occur in the Project area based on the EPBC Act Protected Matters Search Tool.

Five species recorded in the study area are ‘declared animals’ listed under the Land Protection (Pest and Stock Route Management) Act 2002. All of these are Class 2 pests: dingo/wild dog (Canis lupus dingo), feral cat (Felis catus), feral pig (Sus scrofa), rabbit (Oryctolagus cuniculus) and fox (Vulpes vulpes). These species are also listed as pest animals under the Burdekin Shire Pest Management Plan Priority for Management.

Fauna habitats directly affected by the proposed infrastructure include Eucalypt/Corymbia Woodland (209 ha), Riparian Woodland (40 ha), Allocasuarina Woodland (27 ha), Acacia Woodland (20 ha) and Grevillia-Eremophila Shrubland (7 ha). Each of these habitats provides resources related to refuge, foraging and breeding. Either none or negligible amounts of Beach Scrub, Estuarine, Vine Thicket and Native Grasslands will be removed to accommodate the Project. Potential impacts associated with removal of habitat are considered likely to be relatively benign for two reasons:

- much of the habitat identified for removal is linear in nature suggesting the proposal is unlikely to remove a significant component of an individual species home range nor the resources it depends on

- a considerable proportion of the route traverses a fragmented or open degraded landscape suggesting those species recorded during the survey exhibit some form of tolerance to impacts arising from habitat removal and associated impacts therein.

With regard to operation of the Project, the most significant impact is considered to be habitat fragmentation. Fragmentation is to a large extent unavoidable when linear corridors are placed across a landscape. As the pipelines will be buried, they will have far less impact than the channel, which will be wider, contain water and be fenced. The cleared pipeline corridor can cause fragmentation but the distance between fragments will be smaller (a smaller easement) and the intervening habitat will be grass. Fauna crossing of the open channel is achieved via the 24 siphons because the riparian zone is

maintained in these locations. It is also fostered by the approximate four channel crossings that also facilitate stock and farm machinery crossing.

Additionally, the Project will influence fire regimes by placing a new and substantial firebreak (the channel and pipeline corridors) across vegetation communities. The spread of weeds into new environments may also alter fire regimes.

The mitigation measures proposed in the EIS and EMP can significantly avoid or reduce the predicted levels of impact.

E.4.4.3 Freshwater environments

Sixteen endemic aquatic plants were recorded during field surveys. They comprised seven emergent, seven submerged and two floating forms. Six exotic species were recorded including one weed of national significance; Salvinia molesta. Five of the observed weed species were only observed in the Saltwater Creek catchment.

No aquatic floral species observed has special conservation status; however, one rare species as listed under the NC Act; Aponogeton queenslandicus is considered to have the potential to occur in the study area.

A total of 8,077 individual aquatic invertebrates from 57 nominal taxa were collected over the course of the surveys. The majority of taxa recorded were insects. No freshwater aquatic invertebrates species of any elevated conservation status are known to occur, or likely to occur in vicinity of the study area.

A total of 33 fish species were recorded from the 17 sites surveyed across eight catchments in the study area. The maximum species diversity recorded at a site from an individual survey effort was 19 species at Saltwater Creek, while localised extinctions of fish communities were observed at several sites following drying out of waterholes. No freshwater fish species of conservation significance were identified from the study area, with most species recorded listed as ‘Non-Threatened’ with widespread distributions across eastern Australia. No freshwater fish species occurring in the area are of notable commercial or recreational fishing importance. However, several marine-estuarine species of importance to recreational, commercial and indigenous fisheries utilize freshwater habitats in the study area to varying degrees.

Construction phase impacts on the freshwater environment relate to direct disturbance of watercourses and their riparian zones, runoff from construction areas and potential accidental spillages of contaminants into watercourses. Construction of the channel and pipe system will generally not directly disturb any recognised wetlands of conservation significance (apart from a small area of the Abbott Point wetlands), but will cross numerous watercourses of various sizes, though no refuge pools were identified within the footprint of works. Each watercourse crossed by the infrastructure will be disturbed through removal of the riparian zone and disturbance to the bed and banks. As a large number of minor and more significant watercourses will be disturbed, the unmitigated potential impact is regarded as moderate. Proposed mitigation measures can reduce this impact to minor levels.

During the operations phase the potential impacts relating to changes in groundwater levels or channel overflows link to impacts on the sustainability of remnant pools. The latter were assessed as unlikely or in a positive direction (because the systems are currently drier than they naturally would be) so impacts on freshwater ecology were negligible or minor.

E.4.5 Water resources

E.4.5.1 Surface water

There are 22 named watercourses in the Project area, all are relatively short and in most cases discharge through significant freshwater or intertidal wetlands with shallow gradients. Major waterways include the Burdekin River, Elliot River, Euri Creek and Don River.

Other than the Burdekin, all the watercourses are highly intermittent or ephemeral and for most of the year standing water is represented by a few permanent and semi-permanent waterholes. The major watercourses may sustain flow for several months after rainfall ceases but most typically stop flowing and retract into a few, mostly small waterholes within a few days to a few weeks. Peak flows occur between December and March, with February and January producing the highest average flows. Most water used in the study area is extracted from groundwater. Supplemented surface water supplies relate solely to the part of the Bowen urban supply sourced from Peter Faust Dam in the Proserpine catchment (outside the study area) or to areas serviced by the existing Elliot Main Channel to the north of the study area. Water may also be extracted from rivers and creeks during flood seasons and stored in offline reservoirs.

The surface water resources of the Project area are not governed by a water resource plan. However, the water that will be transported by the Project will come from SunWater's allocation in the Burdekin Haughton Water Supply Scheme, governed by the Water Resource (Burdekin Basin) Plan (2007) and is managed under an Interim Resource Operations Licence (IROL).

Legend

Key waterway
Other watercourse
Sub catchment (2007 alignment)
Wetland area

Water for Bowen project features
Elliot Main Channel
Abbot Point Main Pipeline
Splitters Creek Rising Main
Bowen Main Pipeline
Mount Buckley Main Pipeline
Reticulation network

Home Hill
BURDEKIN RIVER
Wunjunga
Inkerman
Gumlu
Abbot Point
Guthalungra
Merinda
Bowen
Mount Dangar
SIX MILE CREEK
FOUR MILE CREEK
TWO MILE CREEK
YELLOW GIN CREEK
WANGARATTA CREEK
ROCKY PONDS CREEK
IRM CREEK
MOLONGLE CREEK
ARMSTRONG CREEK
SANDY CREEK
BIG JACK CREEK
SALTWATER CREEK
KANGAROO CREEK
PLAIN CREEK
ELLIOT RIVER
SPLITTERS CREEK
GREENTOP CREEK
SANDY CREEK
SHEEP STATION CREEK
EURI CREEK
DON RIVER

0 5 10 15 20
Kilometers

Surface watercourses intersected by the Project

Source: Watercourses - Geoscience Australia 2003, wetlands - QLUMP DNRW 1999, cadastre DNRW 2008

PARSONS BRINCKERHOFF

File: J:\A603-ENVPLN\PROJ\121365584_Water_for_Bowen\10_GIS\Projects\Water\eis\lt_watercourses.mxd Author: Ek Print Date: 28/07/2009

Construction water will be drawn from the Elliot Main Channel, existing groundwater bores under permit, or from farm dams (with agreement). Water for dust suppression, haul roads and rehabilitation is also proposed to be sourced from sedimentation ponds (which will be constructed to hold site runoff) or borrow pits. Potable water during construction will be drawn from existing supplies in Bowen or Home Hill or will consist of treated rainwater collected at the construction camp.

Unlike many other water supply Projects, particularly those related to irrigation, this Project does not use existing watercourses for transport of the water supply or as part of the irrigation drainage system. This significantly reduces the potential for impact. No stream diversions are planned and works within watercourses will be undertaken during the dry season. A coffer dam is proposed to allow the new pump station at Clare Weir to be constructed.

Similarly the Project is not actually using the water resources of the study area as the delivered product. As such its only potential impacts on existing surface waters relate to physical impacts on catchments as a result of the imposition of the infrastructure or potential 'leakage' of the transported water from the system or from end uses.

During construction of the Project, the primary potential impacts on surface water resources relate to erosion and contamination of watercourses due to construction activities within the watercourses and nearby floodplains. Construction impacts can be successfully mitigated by elements of an Erosion and Sediment Control Plan. The Project Description also notes that drainage of structures such as roads and channel crossings will be in accordance with Main Roads or local government standards as appropriate.

These potential operational impacts have largely been taken into account in the Project design such that the diverted catchments are small and quickly re-enter the natural watercourses downstream of the open channel. Similarly the flood immunity of the channel batters is 1 in 100 years; the cross drainage culverts will drain a 1 in 100 year event in less than 24 hours and siphon design is based on achieving no significant restriction of the watercourse.

Seepage from the open channel is expected to be less than 2 mm per day and this is very unlikely to affect surface water resources in the area as it is expected to largely evapotranspire before reaching a watercourse.

The Water for Bowen Project has the potential to generate some unnatural discharges to the adjacent watercourses; the two possible means are:

1. Operational overflows

2. Channel draining.

The hydrological impact of an overflow will depend on the size of the overflow, the size of any detention basin in the drainage path, the receiving environment (floodplain or watercourse) and antecedent condition in terms of rainfall and flow. The maximum likely volume of an overflow is 100 ML discharged over 12 hours. During the more typical drier times when the full capacity of the detention pits was available as storage and the floodplain had its full water holding capacity available, little if any discharged water is likely to reach a watercourse.

The increased farming area represents approximately 0.8% of the total catchment so will not lead to any significant hydrological change. It is unlikely that runoff would actually increase at all given the likelihood of increased infiltration once the soils are tilled and particularly while they are fallow.

The current efficient irrigation techniques (mainly drip) do not lead to any tailwater discharge but maintain the soil water profile near the root zone of the crop and this is expected to continue, if not improve in efficiency over time. As such, tailwater runoff will not alter local or regional hydrology.

The potential for infiltration to lead to groundwater changes is addressed in Section 8.2 and the modelling undertaken suggests that the likelihood of groundwater infiltration leading to a change in surface water hydrology is very low.

The watercourses in the region will retain their largely natural seasonal drying characteristics so it is unlikely that the level of anticipated expansion would lead to a noticeable change in surface water hydrology.

It is unlikely that any change in flows reaching the marine environment will occur. If it did, it would be in the wet season as a result of the increased rainfall accession to groundwater.

The water which is provided to urban areas will enter the existing water treatment and distribution network, be used in the urban area of Bowen, and will be treated and discharged through the current system. This will not result in any change to regional hydrology or that of the Don River. Similarly, the industrial supply to the Abbot Point State Development Area will be delivered to individual users once established.

E.4.5.2 Hydrogeology

The Bowen Groundwater Management Area (BGMA) has a long history of data collection, management and review (summarised in WRC 1988 and Jensen 2005), including the establishment (Welsh 2002), review and updating (URS 2005) of groundwater models specific to the area. The URS report was prepared by Dr Tim Ezzy, Dr Robin Connolly and Dr Ian Swane and was peer reviewed by John Hillier as well as by the department which commissioned it (then DNRM). It also built on an earlier model developed by the Bureau of Rural Sciences Canberra (Welsh 2002) so it is assessed as a credible and useful tool. As such, these information sources and models are used as the primary data source for this assessment.

The recent modelling and reviews are the result of increasing pressures on the groundwater resource as the recent drought has increased demand but yield and water quality have been compromised. Water quality issues relate to:

- salt water intrusion
- upward leakage of poor water quality groundwater from the fractured granitic basement
- irrigation salinity caused by continued re-use of groundwater without sufficient recharge/flushing, particularly during low recharge years.

The possible use of imported surface water to compensate for the poorly performing groundwater was seen as a potential solution to these issues and was modelled by URS. The Water for Bowen Project is suggested by SunWater as that solution.

The modelled groundwater water balance suggested irrigation is a small proportion of the inflow, which is dominated by rainfall. Evapotranspiration is the major loss component, being particularly significant in dry years.

Seepage averaged 10% of rainfall (plus irrigation) but varied between 0 and 28% depending on soil type and vegetation cover. URS also noted that ‘irrigation is applied during the dry season and is applied efficiently using trickle methods, so should have little impact on seepage to groundwater’.

In the model, irrigation tended to increase seepage and URS noted ‘this was mainly because of seepage of rainfall in excess of soil water holding capacity during the summer fallow under the irrigated agriculture

land use'. Hence, it is not irrigation itself that leads to increased seepage or accession to groundwater but rainfall on the fallow ground that has been cleared for irrigation.

The largest groundwater outflow was identified as seepage to the river (average 76.2 GL per annum). Bore extraction represented 13.6 GL on average. Seaward discharge is a small component of outflow, averaging 1.7 GL per annum.

Clearly, as 13.6 GL is extracted for irrigation on average and none re-enters groundwater storage during the dry season but 4.4 GL re-enters from summer rainfall, extraction exceeds accession so the groundwater levels show a net seasonal decrease as a result of irrigation. This loss is compensated for in the long term by rainfall recharge but in a sequence of dry years with low recharge, it can lead to the saltwater intrusion and irrigation induced salinity issues noted earlier.

During times of lowered water tables and increased groundwater extraction, the poorer water quality of the weathered granite is accessed and applied to crops. Salts can be left in the soil profile when insufficient flushing (by rainfall) occurs.

In response to the *Water Act 2000* and the Water Regulation 2002, BGMA water sharing rules were developed (latest version DERM 11 May 2009). This plan describes the area and defines nominal entitlements, announced entitlements, the requirement for metering and water charges, amongst other things. As an example of the relatively stringent management of this area, no carry over, forward draw or seasonal assignment of entitlements is allowed.

The Bowen Water Management Policy was revised in August 2007. The policy addressed both sub-artesian water and surface water within the BGMA. The policy was a clear response to the ongoing issues of over extraction of groundwater, particularly during low recharge periods, to poor water quality and the risk of seawater intrusion, and to the potential threats to the relationship between groundwater and surface water.

The Project proposes to use groundwater as one option for construction water supplies. The volume likely to be obtained from groundwater over the 21 month construction period represents approximately 3% of the annual yield from just the BGMA. The likelihood for impact on the groundwater regime at this level of usage is considered very low.

The primary hydrogeology risk associated with the Project is the potential for elevated groundwater levels from channel seepage and overflows or as a result of increased irrigation. Channel seepage and overflows do not apply to the piped sections of the water distribution infrastructure.

A major reason the Project is being undertaken is to relieve stress on the groundwater system from current levels of usage and to provide for future growth in the region through provision of an alternative water source. Source substitution has benefits of reducing the threat and reality of seawater intrusion, re-establishing the relationship between groundwater and surface watercourse baseflow, minimising the economic impact of water restrictions and flushing accumulated salts in surface soils. These positive impacts need to be assessed against the potential for negative impacts. It also means that an outcome that might often be construed as negative, viz an increased water table level, would in this case be positive, unless it resulted in the achieving of a level above the pre-European natural level.

Given the elevation of the channel and the depth to groundwater generally encountered at this elevation, the slow seepage rate, the high evapotranspiration rates in the region and the intact nature of the woodlands across much of the channel alignment, it is unlikely that any significant change in groundwater levels would occur.

Modelling by URS (2005) included a Water for Bowen scenario. The report showed that the large majority of additional groundwater recharge occurred in the wet season of dry years and was largely a result of

rainfall on fallow fields rather than from irrigation itself. Seepage from irrigation accounted for just 2.4% of inflows overall in the existing scenario, with rainfall accounting for 97%. In the Water for Bowen scenario modelled, some 10.7 GL was estimated to return to groundwater but some 13.6 GL was extracted.

The above results indicate that the current Water for Bowen scenario will have little discernible impact on groundwater levels and it will be least during the dry season, leading to the conclusion that changes to dry season flows would likely be insignificant if any change were to occur at all. As noted above, the increase was occurring in the wet season of dry years and results mainly from increased seepage from rainfall on fallow ground. It would also lead to no discernible effect in wet years because irrigation is reduced in any case and the net change is negligible.

The additional application does not entirely compensate for the existing extraction and it does so during the wet season, whereas extraction is during the dry season.

A major driver for the Project was the current over-use of groundwater for irrigation purposes and the associated risks related to saltwater intrusion (some actual impact has been observed), irrigation induced salinity and altered interactions between groundwater and surface water. It is concluded that the Water for Bowen Project is very likely to contribute to overcoming these problems and to do so with little risk to other factors.

SunWater has committed to prepare a template for local Land and Water Management Plans and to assist their potential customers in producing plans that are appropriate and will be approved by DERM. Landowners, particularly outside the BGMA, will need to provide data on various aspects of their local environment and water use in order to be able to produce an adequate plan. In general, the continued use of best irrigation practices along with the implementation of the required LWMPs will satisfactorily mitigate the potential impacts associated with the provision of additional fresh surface water for irrigation.

SunWater will commit to actively participate in relevant local planning bodies (NQ Dry Tropics and Water Advisory boards for example) and to provide all relevant data from its Project related to surface water use (as it will all be metered) and water quality of delivered water.

E.4.6 Water quality

The EIS utilised existing agency and university based water quality data plus a seasonal field monitoring program to understand local water quality.

Water quality dynamics vary between sites and change from year to year. Conditions naturally deteriorate somewhat during periods of low flow and stagnation, and very poor water quality conditions can develop even at undisturbed sites, especially if the waterholes begin to approach dryness.

Field results confirmed expectations that the water contained in stagnant and/or intermittently flowing waterholes has significantly different quality characteristics to the water in perennial streams. However, that does not necessarily mean that the water quality is actually poorer from an ecological perspective.

Euri Creek and Don River, the two streams that drain more intensively cultivated catchment areas, generally reported higher nitrate concentrations than other streams in the study area. However, the highest nitrate level was recorded in the grazing areas upstream of the cultivated lands on Don River, and all of the elevated values were observed during periods of baseflow and could therefore simply be a consequence of natural groundwater inflows.

Based on available knowledge of the geology of the study area and existing land uses there is no reason to expect any anomalous accumulations of metals in local stream water, and the field data broadly confirmed this. Results were generally low with only one exceedence of the ANZECC 2000 value for the

protection of freshwater ecosystems (i.e. an elevated manganese value was reported at site EL3, a shallow tidally-influenced pool). The values recorded for metals in sediment are all well within normal expectations for the region.

Water samples were scanned for a fairly extensive suite of 122 pesticides and pesticide residues including most popular herbicides. Five of these were detected in at least some of the water samples collected after pre-flush rains in January 2007. Low but detectable concentrations of diuron, atrazine and one of its degradation products (desethylatrazine) were recorded downstream of canefarms in Saltwater Creek (Inkerrman), while traces of diuron and hexazinone were detected downstream of the horticultural areas on Euri Creek and Don River. Further pesticide detections were recorded downstream of the horticultural areas on Sandy Gully and Euri Creeks during storm event monitoring in 2008. No pesticide residues were detected in benthic sediment samples collected in January 2007 or in November 2008.

Adverse effects from pesticides are unlikely at the low concentration levels indicated from sampling.

The water for this Project will originate mainly from Burdekin Falls Dam and will be pumped from Clare Weir on the Burdekin River. This water is basically of good quality but during the dry season it differs from most natural streams in the study area in one major respect — it is often (during most years) turbid enough to limit the growth rates of submerged plants and algae.

During the construction phase potential impacts relate primarily to erosion and sedimentation or to spillage and can be satisfactorily managed through standard EMP procedures.

Water for urban purposes will be delivered to Bowen where it will enter the current treatment and distribution system. The quality of water to be delivered will be within the treatment capabilities of the current system.

Water delivered to Abbot Point for industrial users will be treated as necessary for the particular standards required for each use. The approvals processes related to the SDA and to each individual user are separate to the Project but will include assessment of any proposed water treatment and disposal systems.

The primary risks of impact to water quality from the provision of irrigation water to the Water for Bowen area relate to changes in the nutrient, sediment and pesticide loads in runoff from new irrigation areas. To aid the assessment of changes to nutrient and sediment loading a detailed model of the catchment was developed using the eWater Cooperative Research Centre's WaterCAST modelling framework.

Due to the seasonality of rainfall and irrigation practices in the Project area, changes in pollutant loads would only be expected to occur during high runoff discharges i.e. predominantly summer months. During the drier months flows are minimal therefore changes in pollutant loads would be expected to be negligible.

The most likely increase in catchment loads resulting from a predicted intensification and expansion of irrigated agriculture is approximately 1.1% overall with increases in total suspended solids, total nitrogen and total phosphorous over all catchments of 1.2%, 1.5% and 0.6% respectively. These figures may represent an over-estimate because local growers are likely to be more efficient than those from which the input data was obtained.

E.4.7 Coastal environment

The coastal environment in proximity to the Project supports a range of estuarine and marine habitats that include tidal wetlands, estuaries, mangroves, mudflats, seagrass beds and coral reefs. These provide high feeding, spawning and nursery ground values for a variety of commercially, recreationally and

culturally significant plants and animals including coastal marine wildlife such as dugongs, coastal dolphins and marine turtles. Water and sediment quality and a range of habitats were specifically sampled as part of the EIS.

No Ramsar listed wetlands are recorded within the Project area or coastal environments adjacent to the Project area. However, four Nationally Significant Wetlands occur within coastal environments adjacent to the Project area. The coastal zone in proximity to the Project area also supports numerous fauna and flora species, habitats and ecological communities which are protected under state and national legislation. The field sampling program confirmed that the local habitats are in good, and often near natural condition, despite the identification of some minor water and sediment quality exceedences. The closest Great Barrier Reef Marine Park coral reefs to the Project area are Old and Stanley Reefs, which are located approximately 40 km to the north east from Cape Upstart.

No activities will take place in or near the coastal zone so there is no potential for direct impact. The channel construction areas are generally 5–10 km from the nearest coastal areas.

However, indirect impacts to the coastal environment associated with intensified or expanded irrigated agriculture resulting from the increased availability of water supply may occur. Impacts on the habitats of the coastal environment as a result of changes in groundwater levels or surface water hydrology are assessed as negligible based on the results presented above.

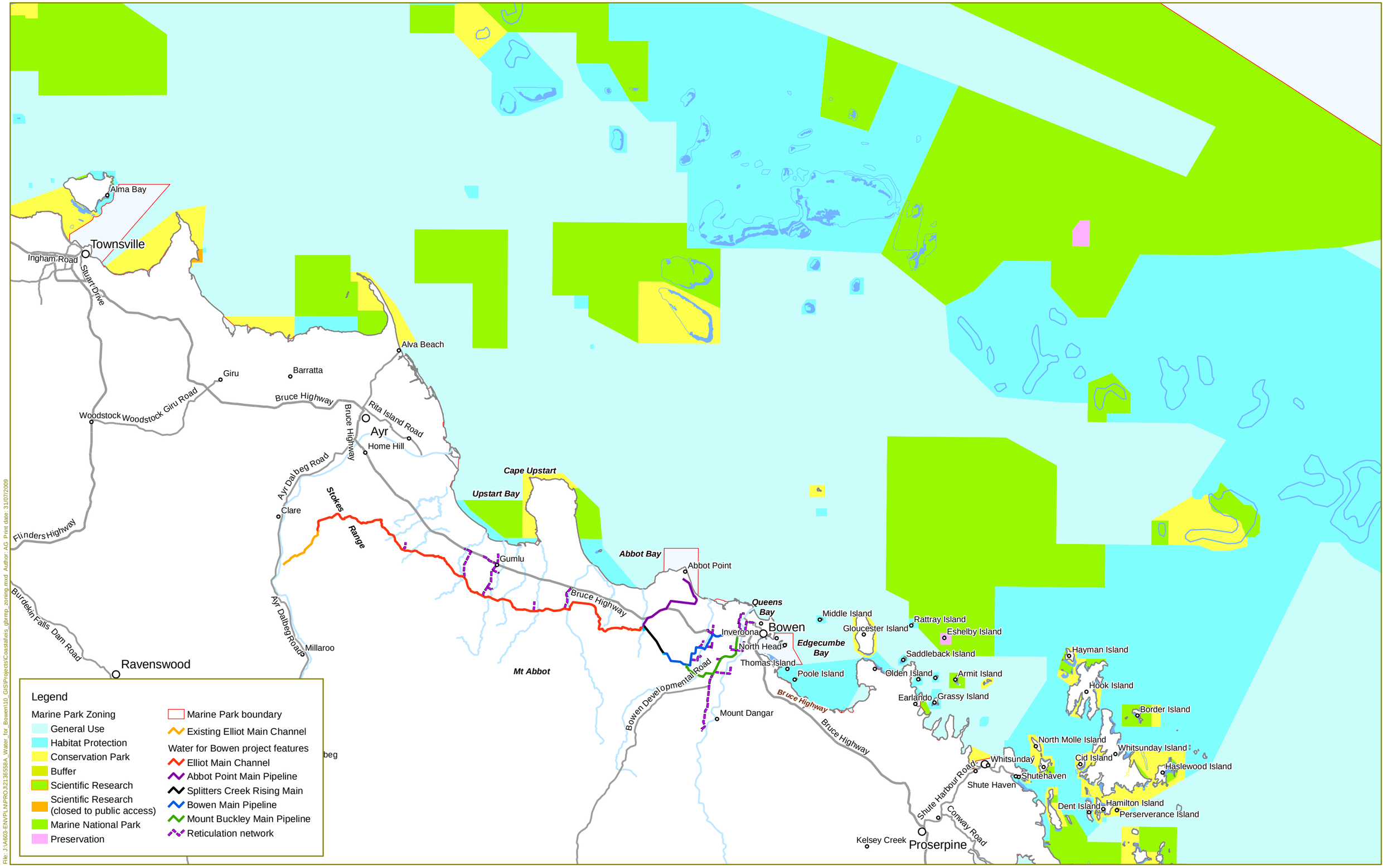
Also as noted above the potential increase in pollutant load is low and likely to be immeasurable amongst normal wet season discharges. The majority of the change would be seen in Queens Bay, near Bowen, with minor change in Upstart Bay and little or no change in Abbot Bay and Edgecumbe Bay. The primary ecological assets are in or near Upstart Bay and Abbot Bay.

SunWater has committed to assist new or expanding irrigation ventures with development of LWMP's. This will reduce the predicted increases by incorporating measures such as ensuring adequate protection of riparian zones and inclusion of vegetated filter strips in the drainage network on farm.

As part of development of offsets related to the VM Act, SunWater has committed to investigate opportunities to achieve maximum value from the offsets through geographic location, strategic infilling or creation of buffers. The intention is that the offsets not be limited to those potential areas immediately adjacent to the infrastructure footprint but they be more strategic in nature, taking account of secondary and potential cumulative impacts. The offset code allows and fosters such measures.

SunWater has also committed to become actively involved in regional NRM programs as they relate to its operations, including secondary activities of water users. This will ensure a process of continuous improvement and joint recognition of goals ranging from local to Commonwealth level.

Given the small level of change predicted in discharge to coastal and marine environments, the likelihood that current and future improvements in land management will completely negate those increases and the current very healthy state of the local environment despite the current level of land use change, the level of potential impact on coastal and marine environments is assessed as minor or negligible.



File: J:\A603-ENVPLNPRO\21365598A_Water_for_Bowen\10_GIS\Projects\Coastallies_gbrmp_zoning.mxd Author: AG Print date: 31/07/2009

PARSONS BRINCKERHOFF

Source: Great Barrier Reef Marine Park Zoning - GBRMPA 2005,
Watercourses - Geoscience Australia 2003, Roads - Queensland Transport 2003

Figure E.4-3
Great Barrier Reef Marine Park Zoning Plan

E.4.8 Air environment

A review of existing land uses in the Project area has indicated that the existing air quality is likely to be characteristic of a rural environment. A low number of industrial land uses are present within the regional airshed. These sources are likely to contribute to low background levels of particulate matter and volatile organic compounds however, based on the low number of industrial sources in the Bowen and Burdekin region, the ambient air quality in the regional airshed is not expected to be significantly adversely affected by these sources.

The main potential for air quality impacts associated with this Project is likely to occur during the construction phase as a result of the generation of dust. Impacts from the construction phase are not expected to have cumulative effects on the existing local ambient air quality of the nearest potentially affected receptors nor degrade the existing environment. Sensitive receptors are generally not located in close proximity to the works.

The modelling results predicted compliance with 24 hour PM10 and daily dust deposition goals at all of the sensitive receptor locations included in the air quality assessment.

The inherent 'construction on the move' nature of the channel and pipeline will mean that receivers along the route will have a reduced impact as the time each receiver is exposed to dust is only a small proportion of the total construction period.

Appropriate air quality management strategies and practices will be incorporated into an EMP and a Road Use Management Plan to reduce any potential impacts on local air sheds. Further to this, measures used to minimise dust will be developed in consultation with the relevant approval bodies prior to the commencement of construction.

There is a small likelihood that blasting may be required during the construction phase. With respect to blast impacts on the air shed, the quantity of particulate matter injected into the atmosphere is a function of blast patterns, horizontal area, and quantity of charge. Impacts are also dependent on meteorological conditions and other construction practices. To minimise potential impacts, mitigation measures have been prescribed in this Environmental Impact Assessment and would be further expanded in the EMP.

No adverse air quality impacts are expected during the operational phase of the Project and as such, mitigation measures are not considered necessary.

E.4.9 Waste

Construction, operation and maintenance of the Project will involve waste generating activities and subsequent waste products/streams. Examples of wastes produced during the construction phase include (but are not limited to) vegetative waste from land clearing activities, office and camp waste associated with accommodation and site offices, and spoil (soils, rocks etc) from earthworks activities. Wastes generated during operation and maintenance are expected to include waters associated with channel and pipeline testing and waste resulting from aquatic pest (weed) treatment etc. With regard to waste generation and management, SunWater is committed to employing sustainable waste management practices, which are based upon the waste management hierarchy.

A detailed Waste Management Plan is to be developed prior to commencement of Project construction. Additionally, general management measures are described in the EMP. The detailed Waste Management Plan will include all actions needed to effectively implement the waste management hierarchy, in addition

to a waste monitoring program for implementation during the Project construction and operational phases. Accordingly, potential for significant environmental impact associated with waste handling, management and disposal is considered to be low.

E.4.10 Noise and vibration

The majority of the proposed Project alignment is located within a rural environment, with grazing or cropping the main land uses. Accordingly, in most cases, residential receptors are widely dispersed however, the number of sensitive receptors in proximity to the pipeline reticulation components increases near Bowen. As part of an initial noise assessment, ambient noise levels were measured at five locations in proximity to the Project alignment over a seven day period. The measurement results indicate that ambient noise levels are reasonably low with the major sources of noise comprising insects, bird, wind and occasional farming activity.

During construction, earthmoving machinery and associated equipment including haul trucks will cause elevated noise levels. Noise emissions from vehicular movements during construction are anticipated to be moderate as the number of vehicle movements per day is expected to increase for short periods. The construction of the channel and pipelines will progressively move along the alignment and it is unlikely that longer term construction periods will occur in any specific locality along the alignment.

Potential construction noise impacts were predicted for six construction situations including clearing, excavation and construction. The noise emissions likely to be associated with these activities were predicted to comply with the short term compliance criterion of 65 dB(A) LAeq(15 minute) at a distance of 300 m from the activity. There are 126 potential sensitive receptors (i.e. potential residential dwellings) estimated to be located within this distance from the alignment. As above, levels in excess of this criterion would be likely to occur for short periods only, particularly in main and reticulation pipeline areas where laying is expected to proceed at approximately 600 m per day. Channel construction will progress less rapidly and therefore, noise impacts in these areas may occur for longer periods.

Once the Project is constructed and in full operation, with appropriate noise management strategies incorporated, it is anticipated that the noise emissions of the Project will not significantly alter the existing environment or have a significant impact on nearby sensitive receivers. With regard to the Project operation phase, there are methods for minimising noise emissions from the pump stations. The primary strategies to manage potential noise impacts include enclosing, screening or silencing of plant.

E.4.11 Transport and access arrangements

The road network within the study area comprises state controlled roads, local authority controlled roads and private landholder access tracks. The study area also includes new haul roads that will provide lateral access along channel/pipeline routes. All of the roads in the Project area, with the exception of the Bruce Highway, carry daily traffic volumes of less than 2,000 vehicles per day. The impact of this Project on other transport networks such as air and sea is likely to be negligible and there will be minimal impact to the operation of the North Coast Rail Line.

There are a number of road intersections which will be affected by vehicles associated with construction of the Project. The majority of these intersections provide a connection between the local road network and the Bruce Highway. Where new haul roads are to be constructed, a connection to a number of the local authority/private ownership roads will be required. These intersections will need to be designed in accordance with Department of Main Roads and local authority standards to allow for the specified truck movements and to restrict unauthorised access to the construction haul roads and the Project site.

No road closures or realignments are proposed as part of the Project development and operation. All construction and operation activities will utilise the existing road network in its current form or the designated maintenance track which will be contained within the channel or main pipeline easements. A series of connecting haul roads are to be constructed along the channel to provide lateral access across the site. These roads will not be open or accessible to the public and will be signed accordingly to restrict unauthorised access. Maintenance access to the reticulation pipeline network will primarily be from the existing road network.

Should any changes or upgrades to the road network be identified in the later planning and design stages, these will be designed and constructed in line with the requirements set out in the DMR Road Planning Design Manual, Austroads guidelines, and the Whitsunday Regional Council and Burdekin Shire Council planning requirements as appropriate and the applicable agency will be consulted. The need for additional maintenance works on the road network will be identified as part of the detailed pavement investigation, where a maintenance strategy and program will be formed and agreed with the road asset owner.

In summary, construction phase impacts on the transport network are assessed as minor with appropriate management procedures in place and the operational phase impacts are negligible.

E.4.12 Cultural heritage

E.4.12.1 Aboriginal cultural heritage

In August 2007, in accordance with the provisions of Part 7 of the ACHA, SunWater publicly notified its intentions to establish a Cultural Heritage Management Plan for the Project area. Representatives of the Juru People responded to this notification and were subsequently endorsed as the relevant Aboriginal party for development of the Cultural Heritage Management Plan (CHMP). In formulating the CHMP, a number of cultural heritage surveys have been carried out by the Juru People and Northern Archaeology Consultancies Pty Ltd between October 2007 and July 2008. All Project areas were surveyed during this time including:

- the main open channel alignment, including possible route variations
- all proposed main pipelines and reticulation
- other work and access areas.

As a result of the surveys, approximately 50 areas and/or objects of Aboriginal cultural heritage value or potential value were observed within or adjacent to the Project alignment. The findings of the surveys have been compiled into a report however; the Juru People have requested that the content of the report remain confidential. Whilst some of the identified areas/objects of Aboriginal cultural heritage value or potential value are of low or moderate scientific value, the Juru surveyors have identified all such sites to be of high Aboriginal cultural heritage significance.

In accordance with the requirements of the *Aboriginal Cultural Heritage Act 2003*, SunWater and the Juru People have negotiated a CHMP setting out management arrangements for the Project, based on the outcomes of the survey and recommendations contained in the survey report. As required by the *Aboriginal Cultural Heritage Act 2003*, the CHMP will be negotiated and provided to the Department of Environment and Resource Management for approval prior to grant of Project construction approvals.

E.4.12.2 Non-indigenous cultural heritage

A non-Indigenous cultural heritage assessment has been undertaken for the Project area and involved a desktop review of relevant background literature and Commonwealth, State and Local government databases to determine the presence of known historical and heritage sites within the Project area. Although there are numerous heritage places recorded within the (former) Bowen and Burdekin Shires, none were identified as being within the vicinity of the Project. Accordingly, no previously recorded sites will be directly or indirectly impacted by the Project.

However, as a result of the surveys undertaken by the Juru People and Northern Archaeology Consultancies Pty Ltd, two non-indigenous historical sites were identified within the Project area, those being the remains of an old telegraph line and a bottle dump from an old logger's camp. While the two sites identified represent aspects of the historic development of the area, they were determined as having historical significance only at the local level. They do not contain any unique, rare, uncommon or well-preserved historical items that would support their inclusion on the Queensland Heritage Register.

E.4.13 Native title

There are currently three registered native title claims in proximity to the Project area. One is made by the Birri People (QC98/12) generally covering the Bogie River valley to the west of the Project, another made by the Gia People (QC99/24) for the area south and south west of the town of Bowen, and another made by the Birri Gubba (Cape Upstart) (QC97/19) for Cape Upstart and Camp Island, Abbot Bay. Neither of these native title claim areas is directly affected by the Project therefore, the potential impacts and mitigation measures associated with native title are considered negligible.

E.4.14 Social and economic environment

A social and economic impact assessment of the Project area and surrounding area has been undertaken. The objective of the assessment is to anticipate and predict social and economic impacts from the Project so findings and recommendations can become part of the Project's planning and decision-making process.

The study area has historically been used primarily for agricultural and pastoral activities, including a range of livestock grazing and irrigated horticulture activities. The drier upland areas are generally used for livestock grazing. The large grazing properties tend to be inland of the Bruce Highway and North Coast railway through which the proposed channel alignment will traverse. Irrigation has developed on much smaller blocks nearer the coast and highway, particularly concentrated around Bowen, Gumlu and Guthalungra but with smaller pockets in other areas. The proposed pipeline and associated reticulation will service these existing irrigation areas.

The economy of the Project area is diverse, with a range of key industry sectors providing employment and economic benefits including agriculture, commercial fishing, mining, tourism and aquaculture. Agricultural production from the study area makes a significant contribution to the regional and state economies. The total gross value of agricultural production for Bowen and Burdekin for the 2005–06 financial year was $270m and $314m respectively. Beef production also plays an integral part of the Bowen and Burdekin economies.

Coal mining is an important industry in Bowen Local Government Area (LGA), and is home to the Bowen Central and Collinsville coal mines. Approximately 12 million tonnes per annum of coal is exported through the Port of Abbot Point. Increased coal through-put at the Port of Abbot Point is expected with the completion of major upgrade works. The Bowen Coke Works produces up to 45,000 tonnes of coke which is transported by rail to the Xstrata Copper mine at Mount Isa.

The potential impacts of the Project on the social and economic environment include both positive and negative impacts which differ between construction and operation phases. Project beneficiaries include the water supply customers, who will benefit from improved water availability and security for irrigation and industrial use, and the flow-on benefits accruing from growth in these industries. The negative impacts relate mainly to directly affected landowners who will lose access to or some potential utilisation of land within the water infrastructure corridor.

In accordance with the requirements of the Local Industry Policy 'A Fair Go for Industry' (2007), SunWater will prepare a local industry participation plan for the Project, which will in turn be implemented by the construction contractor.

Considering the relatively low levels of local participation in construction industry, it is assumed that 10 to 20% of employment opportunities associated with construction could be sourced from the study area. Prior to the commencement of construction, SunWater will establish a registry of local individuals and businesses who are interested to supply services to the Project. Specialist and professional services are likely to be sourced from the larger urban centres of Townsville and Mackay. Local recruitment is not likely to result in any adverse impacts to the labour market due to the relative proximity of the Project to the urban centres of Bowen and Ayr.

SunWater will also provide employment opportunities for members of local indigenous communities, as identified in the State Suburbs of Bowen and Gumlu, in accordance with the State Government Indigenous Employment Policy for Queensland Government Building and Civil Construction Projects (2004).

An improvement in the security of water supply would have the following effects on existing business and industry:

- enhanced viability by reducing operational risks associated with water supply and quality constraints
- enhanced productivity and service provision
- enhanced economic sustainability by improving short and long-term investment security.

The Project has the potential to induce further investment, demand for goods and services, and diversification of business type and composition. Such growth would be accompanied by a steady increase in population, skills development and community infrastructure.

The Project has a high level of significance in the local and regional economic context. There are significant advantages at the regional level if the Project was to go ahead with the provision of a reliable water supply to the development of Abbot Point State Development Area.

Project construction is estimated to cost around $400m over a 21 month construction period. The direct, indirect and induced economic impacts arising from the construction period were assessed as per the Input-Output (I-O) approach. The total contribution to Gross Regional Product is expected to range from $64m to $80m per annum over the two year construction period (or 882 to 1,176 FTE jobs annually).

E.4.15 Hazard and risk

Hazards present during construction and operational phases may be associated with use of hazardous materials, construction and maintenance activities, natural events (e.g. storms, flooding), wildlife, disease vectors, traffic and actions by members of the public. An assessment of risks arising from these hazards has been undertaken in order to identify those that require special management and mitigation measures.

Risks were analysed in regard to the three Project phases covering construction, operation and eventual decommissioning.

The risk of a number of hazards occurring throughout the Project was calculated as being high and therefore, mitigation measures have been outlined for these hazards. After implementation of appropriate hazard mitigation, residual risk was generally reduced to medium; therefore, the Project will not present a significant adverse risk to the Project employees, the general public or the natural environment.

An Emergency Management Plan will be developed for Project construction in consultation with relevant stakeholders, in particular with each of the agencies of the Department of Emergency Services likely to be involved in any emergency: the Queensland Police Service, the Queensland Ambulance Service, the Queensland Fire and Rescue Service and the Rural Fire Service. The Whitsunday Regional Council and Burdekin Shire Council will also be consulted.

A separate Emergency Management Plan will be prepared covering the operation of the Project. This will be developed in a similar manner to the construction Emergency Management Plan once design is complete and operating procedures have been prepared for the Project. The operating Emergency

Management Plan will be revised regularly throughout the life of the Project and if necessary in response to any emergency situation where deficiencies are noted.

E.4.16 Health and safety

The existing environment in the vicinity of the Project area is characterised by a mixture of rural activities, with a number of small communities and scattered rural residences as well as the residential and light industrial areas of Bowen. The Project will aim to ensure that there is no deterioration in the general level of health as a direct result of Project activities or as a result of any consequent extra demand that it might impose on existing health services in the region. The local population will be given priority with regard to employment on the Project, so that any increase in the local population during construction will be limited.

The risks to the construction workforce for the Project are not expected to differ significantly from other construction work. The Project workforce will potentially be exposed to typical construction site health and safety risks including exposure to noise, dust, heat, and physical injury. All contractors to the Project will be required to comply with, or demonstrate that they operate systems similar to, SunWater's Workplace Health and Safety Management System, as well as complying with the requirements of the legislation, regulations and relevant codes of practice.

The main potential health and safety issues during operation will include exposure to hazardous materials, in particular the herbicide acrolein (toxicity); drowning accidents and increase in mosquito breeding areas and the risk of vector-borne diseases as a result of more extensive irrigation.

SunWater is committed to ensuring the health and safety of the construction workforce, its operations and maintenance staff and the community in which it operates. The Project will therefore comply with strict standards of performance, including all legislation, with the objective of completing the Project without any serious injury to the workforce and with no health effects impacting the surrounding community.

E.5 Conclusion

The EIS was commissioned to identify and review the environmental impacts resulting from construction and operation of the Water for Bowen Project. Potential for both direct and indirect (e.g. change in land use expected from reliable supply of water) impacts have been considered. While the Project may result

in localised impacts on some of the aspects investigated, the overall need for the Project has been demonstrated.

Where potential environmental, social and economic impacts have been identified, mitigation measures have been developed. These measures are outlined in the draft Environmental Management Plan. Final Construction and Operational Environmental Management Plans will be prepared in accordance with the Environmental Impact Statement, draft Environmental Management Plan and any conditions of approval prior to construction and operation respectively.

Adoption and implementation of these plans will ensure that environmental, social and economic impacts are minimised. As such, no significant residual environmental, social or economic impacts have been predicted that would prevent the Project from being approved by the relevant Minister under the *State Development and Public Works Organisation Act 1971* or the EPBC Act.