



NOONAMAH RIDGE

INTRAPAC

Supplement to the post-SEIS response for Noonamah Ridge



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1 Introduction

On 15 February 2017, Intrapac submitted a *Post-SEIS Response for Noonamah Ridge* to the Northern Territory Environment Protection Authority (NT EPA). In response, on 9 March 2017, the NT EPA requested further information from Intrapac.

The main outstanding concern of the NT EPA relates to the protection of significant biodiversity values through the application of Conservation (CN) zones within the *NT Planning Scheme*. Other information was requested relating to water monitoring, groundwater resources and adjacent mining titles.

The purpose of this document is to respond to the NT EPA's request for further information. Section 0 addresses the application of CN zoning, with Sections 0 to 8 responding to the other identified issues.

This is the third document to provide supplementary information to the original EIS.

2 Project update

It is envisaged that Stage 1 of the development will include the installation of a water body. The water body will serve the dual purposes of:

- Stormwater management along the main watercourse to help with attenuation of peak flows, acting as a wet detention basin.
- An aesthetic focal point for the first Village. The social benefits of the lake are substantial – water is the number one recreational activity in Australia. This amenity will be the social hub of Noonamah Ridge.

The lake is still in the concept phase, requiring additionally modelling and survey work prior to Stage 1 to determine its commercial and environmental viability (as noted in the commitments table in Section 9.2). Currently, the size option being considered (as depicted in Figure 3) is a 6 ha waterbody with an approximate water volume of 105 ML (assuming 1:6 batters and 2 m depth).

The location of the lake is dictated by both the conservation-significant values and the topography of the north-west corner of the project area. The site has been historically cleared as part of a previous extractive lease. It has a clay foundation which will require very little additional work to ensure water does not seep into the surrounds. The shape of the lake has been nominated to work with the contours, allowing it to be cut into natural ground. This will result in a cut batter on the north-eastern side of the lake. The inlet and outlet locations for the lake (shown in Figure 3) have been defined by visual onsite assessment, avoiding localised ridges in the natural terrain, as well as mitigating the destruction of large vegetation as much as practicable.

The lake will be filled up every wet season with water diverted from the main creek line (which contains no water during the dry season). Modelling will be undertaken to ensure that there remains adequate water for environmental usage. Because of the high evaporation rates in the Top End, during the dry season the lake may need to be topped up using groundwater. Evaporation rates for Darwin vary throughout the year – looking at the worst-case month of September (evaporation of 250 mm and average rainfall of 31 mm), the groundwater extraction rate required would be 5.10 L/s. Total extraction volume over a 12-month period is estimated to be 83 ML. These calculations ignore the effects of losses through soil seepage, as well as the possibility of base flow entering the lake from irrigation of upslope land (both valid assumptions at this concept stage). More detailed investigations will be undertaken during the detailed design process.

3 Framework for achieving conservation goals

Intrapac is committed to the protection and enhancement of the natural environment as a key component of Noonamah Ridge. The purpose of this section is to present and justify a framework for achieving conservation goals for the Noonamah Ridge development.

3.1 Context

In the letter accompanying the NT EPA's request for further information that this report addresses, the suggestion was made that:

An appropriate response to the potential impacts to significant environmental values associated with threatened species habitat can be demonstrated by amending the NT Planning Scheme to put in place conservation (CN) zones at the time that the remainder of the site is zoned for specific use (SU), rather than a single zoning of SU across the entire site. If subsequent additional studies are able to demonstrate acceptable alternatives, conservation zoning may be amended or refined in the future.

Intrapac proposes to accommodate the above request through the provision of land zoned CN. The site will in effect therefore be a split zone – CN and SU. It is noted, however, that the introduction of zone CN on land with no detailed subdivision proposal is a different approach to that normally followed. Ordinarily, CN zoning is incorporated at the subdivision stage, because at that point, the necessary level of detail is present to justify the extent of land zoned CN, as well to provide for necessary road connections and infrastructure.

Based on past experiences, and on the wording of the CN zone within the *NT Planning Scheme*, Intrapac initially had reservations about the level of project risk that up-front CN zoning would create. Intrapac's main concern was that once land is zoned CN, it would be very difficult to undertake works within that land to provide for road connections, stormwater management and other essential infrastructure. Further to this, Intrapac was concerned that applying the CN zoning too broadly, before detailed subdivision design, would lead to inappropriate land use locations and outcomes; for example, resulting in unnecessary cut and fill and vegetation removal to deliver effective stormwater management.

Although not explicitly stated in the *NT Planning Scheme*, it is possible to undertake necessary works within land zoned CN, and that there are precedents for doing so – for instance, the recent subdivision of Lots 1607 and 1603 on Cyrus Rd in Berry Springs (which includes a road built through CN land). Land zoned CN is not an 'exclusion zone', so long as any development is 'sensitive to the natural features and habitats of the zone and be so sited and operated as to have minimal impact on the environment' – as per 5.22 of the *NT Planning Scheme*.

Intrapac is now content that the project risk associated with the introduction of land zoned CN at the re-zoning stage (i.e. preceding detailed subdivision design) is acceptable. Intrapac will therefore use the pending Planning Scheme Amendment to zone most of the conservation-significant biodiversity values within the project area (as elaborated under the heading *Phase 1* below) as zone CN. To this end, Intrapac will also include in the EIS the following new environmental commitment:

At the time of subdivision application for any stage of development that includes land zoned CN (Conservation), and where the subdivision proposal incorporates roads, infrastructure or other works within land zoned CN, the subdivision application will demonstrate to the Department of Environment and Natural Resource's satisfaction that the road or infrastructure works comply with the intent of the CN zoning. Reference shall be made in the subdivision application to the underlying environmental values that led to the designation of land zoned CN.

It is acknowledged that consent will be required under the Planning Act to undertake works within the CN zone and that works will need to be consistent with Clause 10.2 of the NT Planning Scheme.

Within each subdivision application that requires works to be undertaken in CN zoned land, there will be detail about the management and mitigation measures that will be followed to ensure that disturbance to that land is confined to essential works, and that appropriate remediation occurs.

3.2 Biodiversity values to be protected

As the result of comprehensive field surveys and habitat mapping, the significant biodiversity values within the Noonamah Ridge project area are mostly well known. There are four sensitive vegetation types present:

- A small patch of monsoon rainforest with potential heritage values (because of the presence of natural rock shelters) in the north-east
- Riparian vegetation (three vegetation types) along the main intermittent stream.
- Two seasonal swamps and a permanent soak.
- A patch of sandsheet and gravel heath in the north-west.

There are also populations of threatened species occurring within the project area:

- *Cleome insolata* (three patches within the gravel heath).
- Howard River Toadlet (two large sub-populations).
- Black-footed Tree-rat (within the riparian vegetation).
- *Typhonium praetermissum* (two broadly-dispersed sub-populations).

3.3 Staging

It is envisaged that the development will be completed over the course of 30 years – possibly longer – with approximately 150 – 200 lots/homes sold and constructed each year. This time frame is dependent on market drivers, as well as population and economic growth in the region. As depicted in Figure 1, development will commence in the north-west (south of the sandsheet and gravel heath), and progress southward and then eastward for the first 12 or so years. It may be more than twenty years before the development extends much beyond the Alverly Road corridor.

It is acknowledged that as the development progresses, it is likely that new residents will use the surrounding bushland for recreational purposes. If left unmanaged, there is the potential for increased human disturbance of significant biodiversity values. To counter this, Intrapac will use signage and other resources to identify significant conservation sites, inform the public of their value and dissuade recreational use of them.

3.4 Objectives

The objective of the conservation framework is to conserve and manage the existing significant biodiversity values within the Noonamah Ridge project area in perpetuity, acknowledging that over the long timescale of the development those values may be altered because of natural processes beyond the influence of the proponent and/or changes in legislated statuses.

3.5 General principles

The following general principles governed the development of the conservation framework:

- Management of CN zoned land – and responsibility for that management – will be made on a site-by-site basis, depending primarily on the biodiversity values present, and in negotiation with all stakeholders.
- Infrastructure and roads can be permitted to cross CN zoned land.
- All CN zoned land will have large private lots (between 4,000 and 20,000 m²) abutting, or included as part of, them as an additional buffer between the natural and developed environments. This has been added to the commitments made in the EIS.
- Land clearing on individual lots will be in accordance with the *NT Planning Scheme*, which contains standard land-clearing requirements for lots 2 ha and larger. For lots smaller than 2 ha, a new clause will be incorporated into the *NT Planning Scheme* (through the Planning Scheme Amendment), requiring land-holders to obtain a permit to clear more than 1,000 m² of native vegetation (exclusive of the assigned building envelope).

3.6 Delivery

The proposed conservation framework is structured using sequential phases to ensure that biodiversity conservation priorities are addressed at the appropriate stage of development. The approach proposed by Intrapac is to establish up-front CN zones for the most significant biodiversity values within the project area. Then, as the project approaches other significant biodiversity values, the pertinent sub-division application will identify where CN zones will be applied during lot normalisation.

Discussed in more depth in the following sub-sections, a summary of the framework is:

- Phase 1 will commence with the Planning Scheme Amendment application, during which an initial sub-set of the significant biodiversity values will be zoned CN.
- Phase 2 involves the Howard River Toadlet sub-population dispersal surveys and the investigation into the sub-surface hydrology to their habitats – the results of which will inform the final extent of CN land around the two significant sub-populations of that species.
- Phase 3 will occur whenever a stage encounters an occurrence of *Typhonium praetermissum* (which has not already been incorporated within CN land), at which time a decision will be made in conjunction with DENR as to whether to undertake conservation *in situ* or follow a different course of action.

3.6.1 Phase 1

Intrapac will use the Planning Scheme Amendment application to protect an initial sub-set of the significant biodiversity values within the project area under a CN zone. These are predominantly in the north-west of the project area, which is also where Intrapac wishes to commence development.

In Phase 1 the following significant biodiversity values will be buffered within a CN zone:

- The sandsheet and gravel heath – which includes all the onsite *Cleome insolata* records and the calling habitat of the north-western Howard River Toadlet sub-population
- The calling habitat of the central Howard River Toadlet sub-population
- Intermittent streams and riparian vegetation
- The monsoon rainforest
- Large patches of *Typhonium praetermissum*
- The Restricted Works Area in the south-west.

This rezoning is depicted in Figure 2 and Figure 3.

Sandsheet and gravel sheet heath

The sandsheet and gravel sheet heath in the north-west of the project area will be contained within a CN zone that is buffered by 200 m (slightly less, in the south of that habitat, because of the natural limit presented by the creek line) – as shown in Figure 3. In the early stages of the development, investigations into the extent of toadlet habitat (see Section 3.6.2) and the sub-surface hydrology to the heath habitats (see Section 5) will be undertaken. These investigations will inform the final extent of the CN zone around the heath habitats. The results may show that the habitat supporting threatened species extends beyond the mapped heath habitats, in which case the CN zone may have to be extended accordingly. Alternatively, it may be concluded that a 200 m buffer is excessive in certain directions, in which case the CN zone may be reduced accordingly.

Central toadlet population

A 200 m buffer ‘no-go’ area will be installed around the mapped calling habitat of the central Howard River Toadlet population – as shown in Figure 3. The ‘no-go’ area will not extent westwards beyond the natural limit presented by the creek line. No works will be allowed to be undertaken in that area until investigations into the extent of that sub-population’s habitat and the sub-surface hydrology that supports it (akin to those in Section 3.6.2) are complete, and Intrapac have used the results to buffer within a CN zone the habitat supporting the central Howard River Toadlet population. Intrapac commit that the ‘no-go’ area and its effect will be enshrined within the SU zone text and the Area Plan.

Intermittent streams

As a general rule, *NT Land Clearing Guidelines* recommend that riparian vegetation should not be cleared, and Intrapac agrees with that conclusion. Indeed, most of the riparian vegetation that is present within the project area is within the 1-in-100-year flood zone, or is on heavily-constrained land, and hence is not suitable for development. It also has aesthetic value for the project.

All riparian vegetation and second order streams (as mapped by EcOz during habitat ground-truthing for the EIS) will be buffered within a CN zone. The buffer is 50 m from the extent of riparian vegetation, if present. If no riparian habitat is mapped, the buffer is 50 m from the centre of the drainage line. In some instances, it may be appropriate to incorporate riparian vegetation buffers into private property, where a portion of the site is zoned CN (as is currently the case across the rural area) and the balance zoned for an appropriate residential zone. This is in accordance with existing subdivision practices in the rural area.

Typhonium praetermissum

Habitat loss due to land clearing is considered to be the key threatening process for *Typhonium praetermissum* (Westaway and Cowie 2012a¹). The CN zones for the *Typhonium* patches depicted in Figure 2 will be a buffer of 100 m from each recorded plant.

GIS mapping calculates that 120 *Typhonium praetermissum* records will be buffered within a CN zone. This is greater than the retention of 116 individuals suggested by DENR in the advice provided on 19 June 2017. The area of habitat that will be conserved within CN zone is 72 ha (i.e. land units 2a1 and 3c).

Cleome insolata

Habitat loss due to land clearing is considered to be the key threatening process for *Cleome insolata* (Westaway and Cowie 2012b¹). The *Cleome insolata* patches that occur within the project area are buffered within the sandsheet and gravel sheet heath CN zone discussed above.

It is noted that if a lake (as discussed in Section 2) goes ahead, there is the potential for it to impact upon one sub-population of *Cleome insolata*. The lake is at a concept stage only – various studies have to be undertaken to identify its commercial and environmental viability – and it may not go ahead. As currently envisaged, the lake is, at its closest, more than 50 m from the nearest *Cleome* plant recorded. The area immediately to the east of the *Cleome* patch has historically been used for gravel extraction and contains dirt tracks regularly used by recreational vehicles. Although more detailed contour surveying is required, because of adjacent historic gravel extraction, the *Cleome* patch is at a higher elevation to the land to the east, reducing the likelihood of the patch's reliance on surface (and possibly sub-surface) flows from the east. It is more likely that the patch receives its water from incident rainfall and flows from the north.

Other values

The monsoon rainforest in the north-east of the project area will be buffered by 100 m. The Restricted Works Area in the south-eastern corner of the project site will be zoned CN.

3.6.2 Phase 2

Phase 2 establishes CN zones to protect the two largest sub-populations of Howard River Toadlet within the project area. The species is most readily identified in the Wet season from the calls it makes within suitable inundated areas. What is known about similar species' ecology is that at the end of the wet season they move from their breeding grounds into surrounding habitat and burrow underground during the dry season to 'hibernate'. What is not known is what constitutes the Howard River Toadlet's preferred Dry season habitat, and therefore the extent of post-breeding dispersal.

From the outset, Intrapac have been committed to undertaking further ecological investigations into the species' dispersal, in order to inform the extent of conservation land required around the breeding habitat in order to maintain the sub-populations. Discussions regarding methodology, costs, timing and logistics for such investigations have already commenced with the Flora and Fauna Division of DENR. The investigation will occur within one of first two Wet seasons after the Planning Scheme Amendment has been approved. Likewise, there will be investigation into sub-surface hydrology to the two main sub-populations' habitats (described in Section 5).

Once the results of the investigations are clear, Intrapac will use them to inform the areas of CN zoned land required to support the three sub-populations. This may require changing the extent of the CN land applied

¹ Westaway J. & Cowie I. (2012a). *Threatened Species of the Northern Territory: Typhonium praetermissum*, Northern Territory Department of Land Resource Management, online: http://www.lrm.nt.gov.au/_data/assets/pdf_file/0018/143163/Typhonium_praetermissum_VU_FINAL.pdf [Accessed 1 June 2017].

Westaway J. & Cowie I. (2012b). *Threatened Species of the Northern Territory: Cleome insolata*, Northern Territory Department of Land Resource Management, online: https://nt.gov.au/_data/assets/pdf_file/0017/208502/typhonium-praetermissum.pdf [Accessed 1 June 2017].

during Phase 1 on the sandsheet and gravel heath, and will require zoning some extent of the 'no go' area for the central toadlet population into CN (and possibly removing the remaining extent of 'no go' area).

3.6.3 Phase 3

Phase 3 will occur whenever a subdivision application includes one or more occurrences of *Typhonium praetermissum* (which have not already been incorporated within CN land). For each occurrence, a decision will be made in conjunction with DIPL and DENR as to which of the following courses of action to follow:

- Conservation within a public CN reserve.
- Conservation within a CN reserve on private land², where a portion of the site is zoned CN and the balance zoned for an appropriate residential zone.
- Not preserving those individuals.

This approach has been added to the commitments made in the EIS.

3.7 Management

Concurrently with being zoned CN, interim management plans will be developed for these areas to address any immediate threatening processes. Fencing, gates and/or bollards will be installed to prevent access to especially sensitive areas (such as the toadlet calling habitat). More detailed, long-term management plans will then be developed for each area in consultation with DENR. As part of these management plans, monitoring programs will be designed to ensure habitat integrity is not declining (i.e. because of weeds, inappropriate fire regimes, human disturbance or changes to hydrology) and also to periodically take stock of the threatened species present. Formal monitoring plan will be developed by ecologists for the following species:

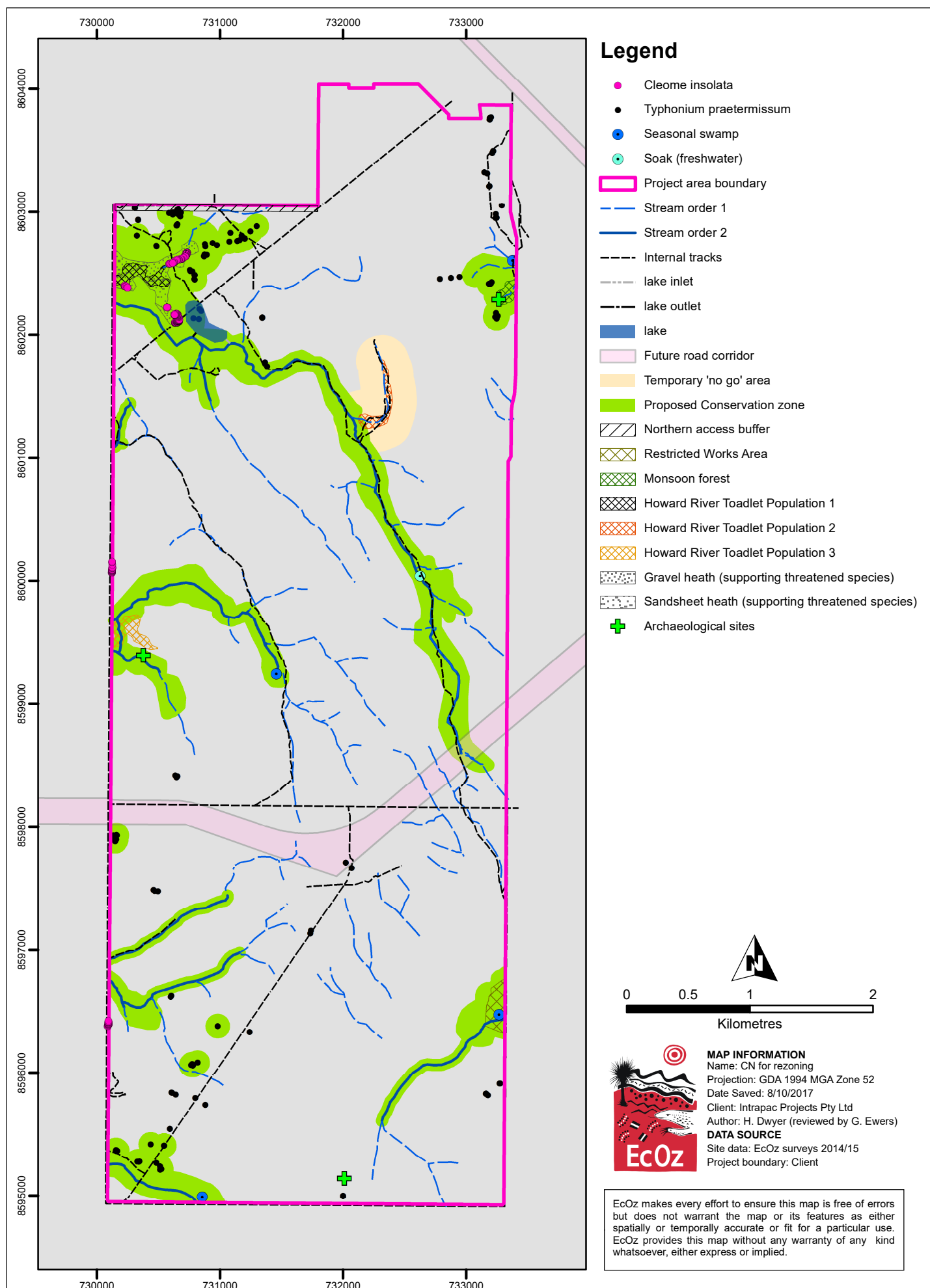
- *Cleome insolata* (abundance and distribution)
- *Typhonium praetermissum* (abundance and distribution)
- Howard River Toadlet (presence and inferred abundance based on calling)
- Black-footed Tree-rat (presence)

Whilst Intrapac acknowledges some level of responsibility for the ongoing facilitation and funding of management of these CN zones, significant biodiversity values are 'commons' in which many stakeholders have interests and, therefore, responsibilities. As such, Intrapac believes that management and responsibility needs to be negotiated between all stakeholders – i.e. Intrapac, landowners, Litchfield Council and DENR. The environmental commitments within the EIS reflect this intention.

Management of riparian vegetation will largely involve protection from fire and weed infestation. Responsibility for CN zoned riparian vegetation will depend on whether it is on public or private land. If on public land, management would likely fall within the ambit of the Northern Territory Government or Litchfield Council. If on private land, Intrapac would facilitate the creation of a community group comprising owners with the common thread of having contiguous CN land within their boundary. With support from Intrapac, each group would implement a management plan prepared by Intrapac in consultation with DENR.

Management of *Typhonium praetermissum* will revolve around protection from inappropriate fire regimes, weed infestation and direct disturbance. As for riparian vegetation, management and responsibility for CN zoned land supporting *Typhonium praetermissum* will depend on whether it is on public or private land.

² Note: CN zoning does not allow for single or multiple dwellings. The zoning table associated with the CN description (5.22 of the Planning Scheme) does allow for 'home occupation'. This is described in 7.10.7 of the *NT Planning Scheme*, and is essentially a professional working from home. It is an unusual exception given that single dwellings within CN are prohibited (as shown in the CN zoning table mentioned above).



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Figure 2. Map showing extent of land to be zoned CN in Phase 1 (whole site)

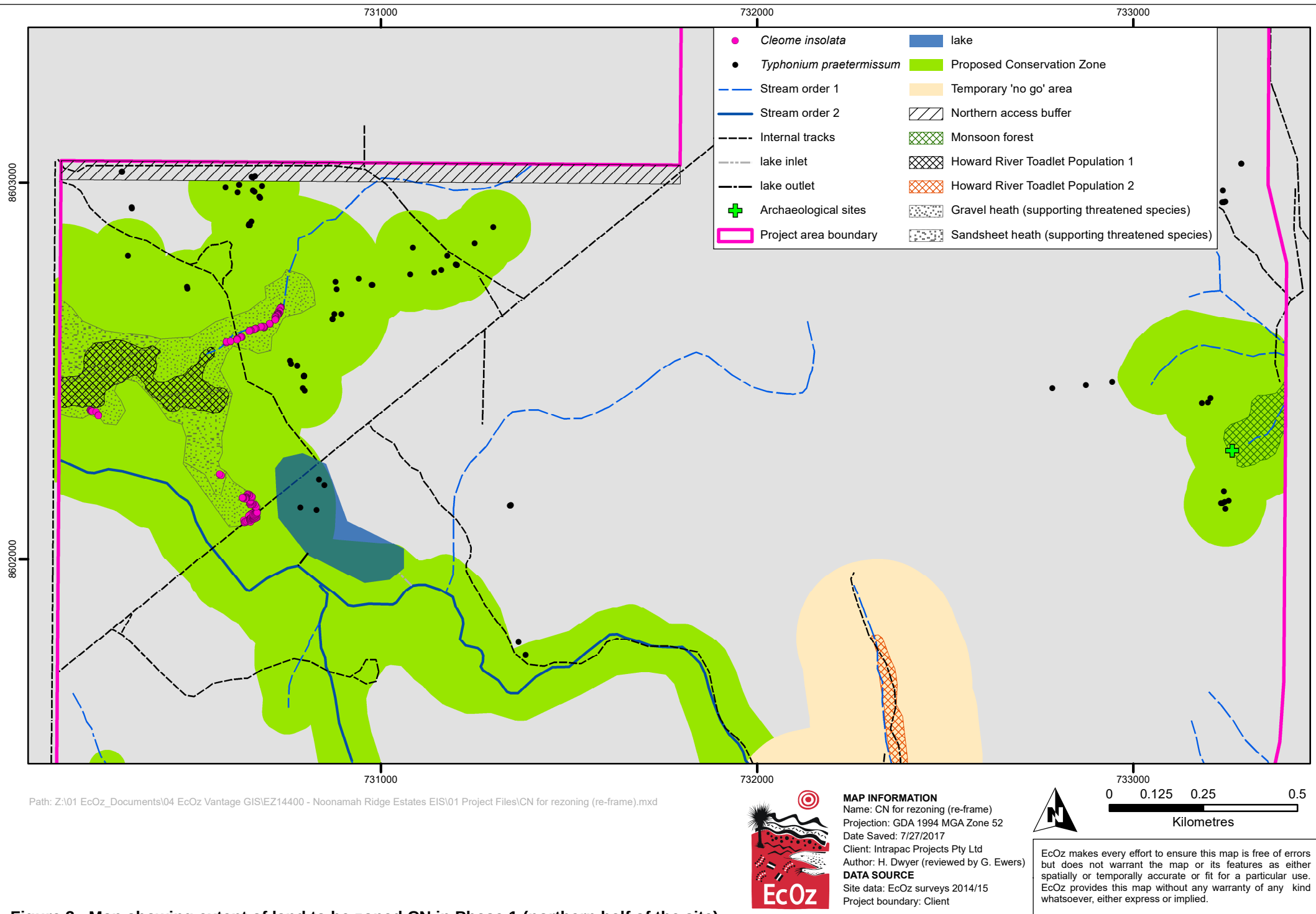


Figure 3. Map showing extent of land to be zoned CN in Phase 1 (northern half of the site)



4 *Typhonium praetermissum*

Information request

The NT EPA and the Department of Environment and Natural Resources have previously written to Intrapac Projects Pty Ltd (Intrapac) to request that it provide a revised conceptual Masterplan to incorporate all occurrences of *Typhonium praetermissum* into a buffered Zone CN network that informs the Planning Scheme Amendment for the site.

In its Post SEIS Response, Intrapac proposed an alternative strategy involving the translocation of *T. praetermissum* plants from existing occurrences intended for clearing into one of two designated Typhonium reserves. The reserves would then be Zoned CN under the NT Planning Scheme.

The translocation of a species is normally only considered as a 'last resort' and is only acceptable where all other efforts to avoid/mitigate impacts have been considered and found unsuitable. The translocation of *T. praetermissum* is considered to be high risk with previous translocations having varied levels of success even under optimal conditions (under captive conditions). Furthermore, no specific information has been provided with respect to how *T. praetermissum* will be translocated, the location of the Typhonium reserves, ongoing management of the reserves, or if the translocated plants will be monitored to determine success of the program.

In the absence of specific information on the secure, in situ 'reserves' that are to be zoned CN, the NT EPA is unable to consider the merits of a translocation strategy.

It is recommended that all important populations of the species are incorporated into a buffered Zone CN network.

This request for information is addressed in Section 3.6 under the discussion of Phase 1 and Phase 3 of the conservation framework.

5 Hydrology for sandsheet & gravel heath

Information request

There are still concerns about the knowledge of and the ability for the Proponent to maintain the existing hydrological regime for threatened species that are dependent on sandsheet heath habitat (i.e. *Uperoleia daviesae*, *Cleome insolata*). Comments were previously provided by the DENR which identified the significant residual uncertainty surrounding the hydrology of sandsheet heath habitats.

Further information was sought by the NT EPA to address and better assess the risks associated with developing within the catchments of these areas.

No further site-based hydrological monitoring has been provided with the Post SEIS response to elucidate the current hydrological regime and to explicitly address the issues related to baseline water supply to sandsheet heath habitats and to calibrating the hydrological model. The information that is required needs to be adequate to design an adequate monitoring and assessment framework to ensure that sufficient water is supplied to the sandsheet heath to maintain essential ecological processes for threatened species as the surrounding land is developed.

A targeted monitoring and assessment program needs to be developed to ensure the commitments given in the Post SEIS Response are understood and can be implemented.

In the addition to the monitoring and assessment program, the NT EPA requires that the three populations of *U. daviesae* are provided with an appropriate buffer from the calling boundaries (inferred and confirmed). Furthermore the buffers will need to be clearly identified as conservation areas and rezoned to CN as part of the current Planning Scheme Amendment.

It is considered likely that the sandsheet and gravel sheet heath habitats in the north-west corner of the project area are primarily reliant on incident rainfall, surface flows down a drainage line originating in the north-east, and lateral sub-surface throughflows/inflows from within the surrounding catchment (which predominantly extends to the north-east). Intrapac acknowledges that further information is required about the proportion, extent and depth of the lateral sub-surface component of this hydrological regime.

Although conceptually simple, little is known about inflow hydrology in the greater Darwin region. Cognisant of this, the Land Assessment Branch of DENR (then NRETAS) have undertaken two preliminary investigations of throughflows along sloped transects in Howard Springs and at the proposed Weddell site. The Howard Springs investigation involved automated monitoring of wells. More than five years later, the resultant data is yet to be analysed.

The objectives of the Weddell investigation were to:

- Collect qualitative information to help understand and explain the function of sub-surface water movement within the landscape
- Trial and develop a practical methodology for measuring and describing the function of lateral subsurface water movement at a landscape scale
- Verify (or contest) the rationale and observations made during the dry season to define areas that feature high water tables during the wet season.

To this end, multiple 'wells' were installed by hand auguring through the soil profile to the substrate and then a simplified piezometer inserted in each. These were manually read twice a week. From each well, a graph showing depth to saturation within the soil profile was derived – an example is presented in Figure 4. Wells could be compared with each other and with rainfall records.

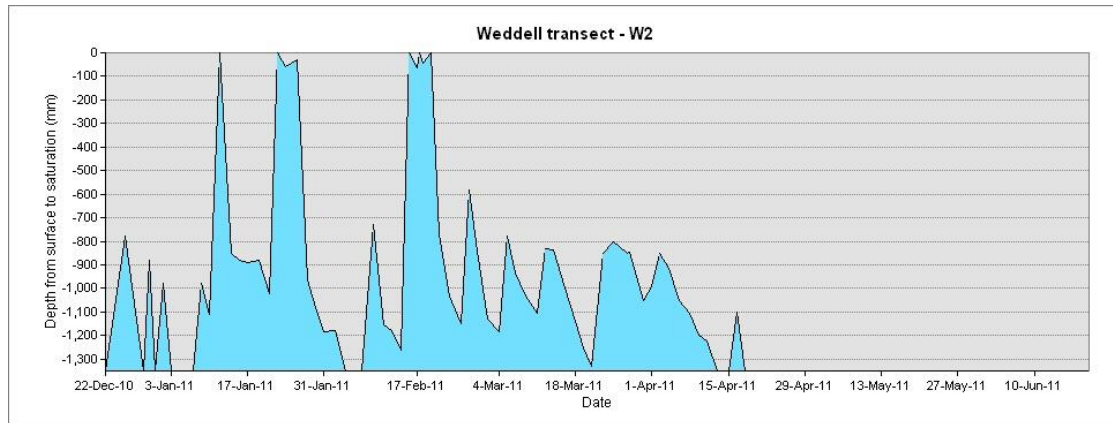


Figure 4. Sample graph of the results for a monitored well from the Weddell throughflow hydrology investigation undertaken in 2011 by the Land Assessment Branch of DENR

The Weddell and (presumably) the Howard Springs investigations provide a starting-point for garnering a baseline, pre-disturbance model of the hydrologic inflows that support the north-west sandsheet heath within Noonamah Ridge. Clearly greater complexity than a single transect will be required, and the methods used by the Land Assessment Branch would need to be honed and supplemented to collect all the requisite information. Integrating the data from piezometers with land unit information – particularly vegetation and soil profiles – should assist with developing an understanding of the area.

There is time to obtain such an understanding. For at least the first 12 years of the Noonamah Ridge project, the development will not be proximate to the inflow catchment of the north-west sandsheet heath. Within the first 24 months of the Planning Scheme Amendment being approved, Intrapac will engage a hydrologist/hydrogeologist to develop and undertake an inflow hydrology study for the north-west sandsheet heath. Using the data from the study, a model will be created that will inform how and where the catchment can be developed, and how the impact of that development on inflow hydrology can be monitored. That this will be undertaken has been added to the commitments table of the EIS.

A similar study will be undertaken for the other main toadlet sub-population prior to any conversion of the 'no go' zone described in Section 3.6.1 into CN zoned land.

The final aspect of this information request relates to appropriate buffers of Howard River Toadlet calling habitat. This issue is addressed in Section 3.6 under the discussion of Phase 2 of the Conservation Framework.

6 Surface water quality and flows

Information request

The Proponent has committed to designing stormwater infrastructure and managing the site to ensure there are 'no significant changes to pre-development surface water quantity, quality and flows (as compared to baseline data)'.

There are still concerns relating to the management of surface water flows and water quality from the site and the ability to meet the above commitment. It is requested that you provide further information in the form of a framework which sets out how this commitment will be achieved.

In particular, it is requested that you provide the following:

- The timeframes for the collection of baseline water quality data. Noting that baseline water quality needs to be collected over a timeframe of at least 24 continuous months (pre-development) for it to be sufficient to calculate water quality trigger values.
- Further details around the monitoring regime, including the sampling intensity. Noting that the sampling intensity should require monthly sampling and include the first flush event of each year.
- Specific detail around the procedures and protocols that will be implemented in the event that a trigger value has been exceeded.
- The agency/person(s) that will be responsible for any corrective actions if the trigger values are exceeded or there is an incident.
- Timeframes for undertaking further modelling to accurately identify the baseline hydrology both on, and in adjacent areas affected by runoff from the site.
- Prospective timeframes for finalising the hydro-geological modelling/stormwater modelling.

6.1 Quality

To inform the EIS, some baseline surface water quality data were collected and analysed. It is acknowledged that further baseline data are required. The development will be staged over more than 30 years, involving different sub-catchments within the project area at different times. Therefore, in the 24-months leading up to a sub-catchment being included within a sub-division application, baseline data for that sub-catchment will be collected monthly, as well as the 'first flush'. This has been added to the commitments made in the EIS.

The initial stages are within the mid-north-west of the project area, and so the first round of baseline water quality data will be collected from monitoring sites (NRSW02 and NRSW03) on the two relevant watercourses – see Figure 5. Those two sites are immediately upstream of the culverts through which water from those watercourses leaves the project area. This is also immediately upstream from where water runoff from Redcliffe Road enters the watercourses. This ensures that only water originating from the project area will be analysed.

In Section 6.6.4, a Water Monitoring Plan was presented; the surface water component is summarised in Table 1. Stormwater monitoring plan. Water quality data will be compared to the *Darwin Harbour Water Quality Objectives* (WQO's) for freshwater rivers and streams. Parameters that are not provided in the WQO's will be compared to the default ANZECC guidelines for 95 % species protection (slightly-to-moderately disturbed ecosystems) of aquatic ecosystems. Site-specific trigger values will be developed based on baseline data, in accordance with the framework provided in the ANZECC guidelines. This process is described in the *Surface Water Quality Monitoring Report* in Appendix F of the EIS.

Table 1. Stormwater monitoring plan

Monitoring sites	Frequency	Measurements/Analytes
Stream monitoring sites: NRSW02 – NRSW07 (see Figure 5) Sediment retention basins and lake(s): Specific locations to be determined prior to commencement of construction	Construction: <u>Downstream:</u> Monthly NRSW02–NRSW04 (whichever are downstream of active construction) and NRSW06 <u>Upstream (Control):</u> Monthly NRSW05 and NRSW07 Occupancy: Annually at all sites during the late wet season recession flow period	Field measurements: Stream flows (i.e. readings from gauge boards installed at each monitoring site, relating to stream flows). Records should reflect whether flowing or standing water is sampled. Temperature, pH, oxidation-reduction potential (ORP), electrical conductivity (EC), total dissolved solids (TDS), dissolved oxygen (DO) and turbidity. Laboratory analyses: • Total suspended solids (TSS) • Major anions (Cl, SO₄, CO₃/HCO₃, and NO₃) and cations (Ca, Mg, Na and K) • Dissolved metals (Al, As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Zn and Fe) • Ammonia and nutrients (NO₂, NO₃, TKN, Total N and Total P) • E. coli and Enterococci

6.2 Quantity

Subject to securing the Planning Scheme Amendment, monitoring stations will be installed to facilitate baseline data capture over the 2017-2018 wet season. Baseline pre-development stormwater quantity and flowrate data will be established from rainfall and streamflow data captured across each of the sub-catchments on the development site.

Hydrological modelling will be undertaken for each of the sub-catchments using run-off routing software to compare pre-development and post-development peak flow rates, allowing for the design of detention systems to attenuate any increase in peak flow rate resulting from the development. This will ensure that the pre-development flows are not exceeded at the points of discharge from the development site.

Monitoring data will be used to calibrate the hydrological modelling parameters, including rainfall conditions and catchment response, to provide a robust assessment of the pre-development peak flow rates leaving the site. The post-development catchment response will be based on best industry practice guidelines.

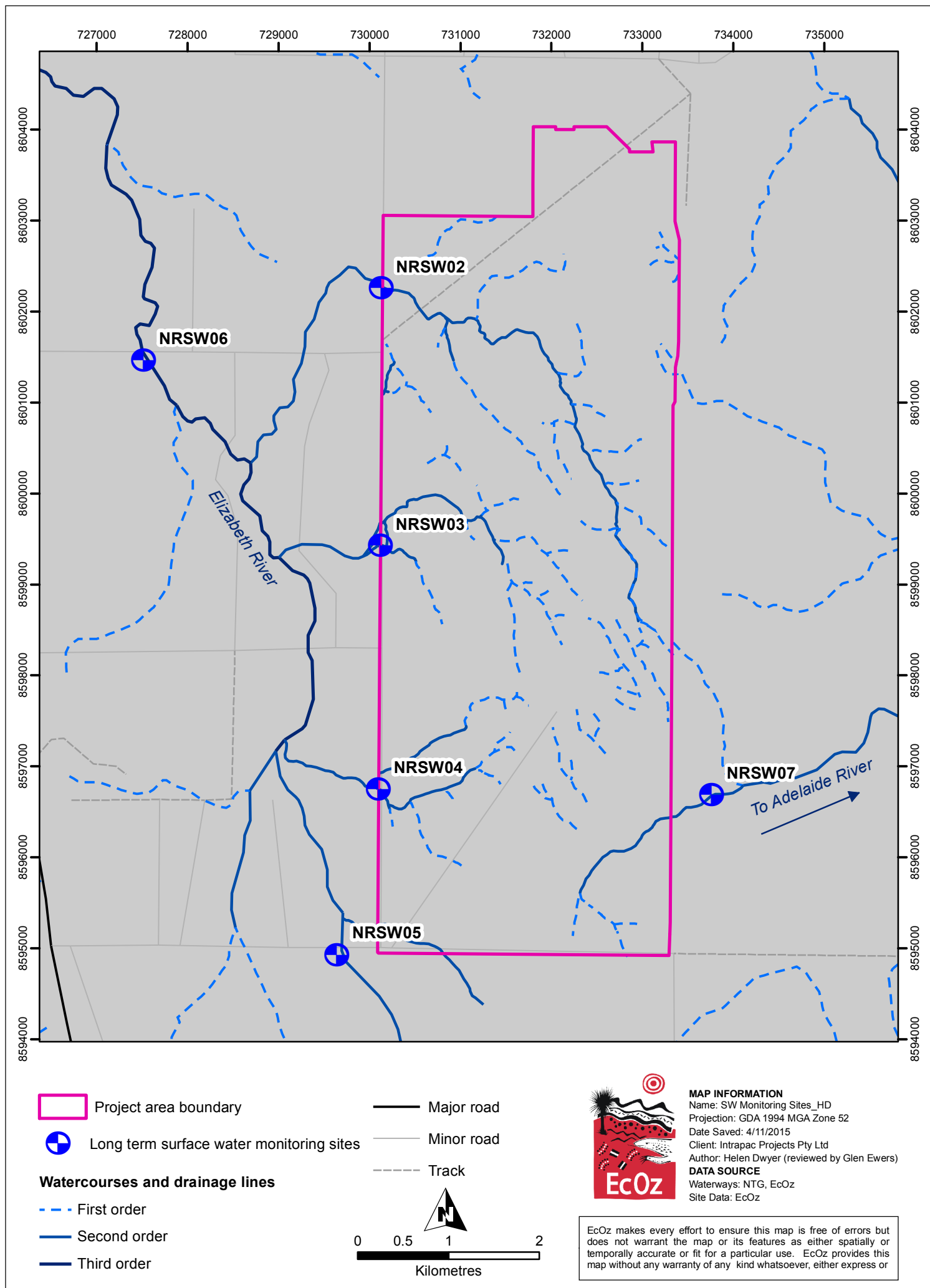
Monitoring stations will be maintained until at least one wet season has passed following complete development of a single sub-catchment. Three 'real' storm events (max, min, median) will be modelled using the calibrated pre-development catchment model to ascertain 'trigger values' for peak flow rates leaving the site (i.e. calculated pre-development flow rates for each given storm event). These will then be compared against recorded post-development flow rates. If the post-development flow rates exceed the trigger values, corrective action will be undertaken to provide additional on-site attenuation.

The data captured during the developed stage will be used to calibrate the post-development catchment response. This will ensure the corrective action undertaken appropriately deals with any deficiencies which may be experienced during large (rare) storm events which are unlikely to be captured during field monitoring. This will also allow for continual improvement of the hydrologic model for future works stages, to mitigate the risk of trigger values being exceeded across the development.

6.3 Management

The construction of each stage of the development phase will have a Construction Environmental Management Plan (CEMP) as the over-arching management document. The development and implementation of the CEMP will be the responsibility of the construction contractor. It will include an Erosion and Sediment Control Plan and a Water Management Plan. More detail will be provided with each CEMP, but essentially any significant change in surface water quality from baseline data (as determined by the site-specific trigger values discussed above) will be investigated by the construction contractor. If necessary, incidents will be reported by the construction contractor to the relevant authorities.

During occupancy, Intrapac will be responsible for water quality monitoring (as per the Water Monitoring Plan), and for investigating any exceedances of trigger values. If necessary, incidents will be reported by Intrapac to the relevant authorities. Maintenance of stormwater infrastructure will be the responsibility of Litchfield Council.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\IEZ14400 - Noonamah Ridge Estates EIS\01 Project Files\EMPI\Long term SW monitoring locations.mxd

Figure 5. Map of surface water monitoring sites

7 Water supply

Information request

The Post-SEIS Response has not quantified the long term sustainability of all the aquifer systems proposed as the sources of water to all stages of the development.

The Proponents must demonstrate that an appropriate plan is in place to undertake all required studies at appropriate stages of development, consistent with the *NT Water Allocation Planning Framework*.

The *NT Water Allocation Planning Framework* requires that for Top End aquifers:

At least 80 per cent of annual recharge is allocated as water for environmental and other public benefit water provision, and extraction for consumptive uses will not exceed the threshold level equivalent to 20 per cent of annual recharge.

Groundwater recharge mechanisms for the project area are likely to be a combination of direct and diffuse inputs. The recharge volume cannot be determined without in-depth field studies, but an approximate estimate of 200 mm/annum is commonly-used for this region. This figure is based on previous studies in the region and appears to work well in regional groundwater flow models.

Sustainable use (i.e. extraction for consumptive uses) is therefore considered the extraction of not more than the 20 % of estimated annual recharge, which equates to 40 mm/annum. The volume of groundwater that can be sustainably extracted from the aquifers in the project area can therefore be calculated by multiplying this amount by the land area of the development (40 mm multiplied by 28,000,000 m²), which equates to 1,120 ML a year. Based on the standard water consumption figure per lot of 1.4 ML/annum, a sustainable extraction of local aquifers could support up to 808 lots. This is more than sufficient to supply Stage 1 (approximately 400 lots). Indeed, the pending water extraction licence for Noonamah Ridge is for 571 ML/annum, which equates to 10 % of the estimated annual recharge.

Preliminary onsite bore test results are favourable regarding recharge, potability and flow rates. Nevertheless, Intrapac is fully aware that further investigations are required to determine whether there is sufficient groundwater available to supply the needs of the Noonamah Ridge development. The framework for these further investigations was presented in Section 3.4.2 of the Post-SEIS response. The investigations will be led by a hydrogeologist with extensive Top End experience.

It is likely that there will be insufficient onsite groundwater available to service the entire development, hence the proposal to investigate the Koolpinyah aquifer to the east (discussed in Section 3.4.3 of the Post-SEIS response). The risk that there is unsustainable extraction of groundwater is considered very low given that the borefield will be monitored. Intrapac accepts that there remains a risk that they will not be able to access sufficient groundwater to provide for the entire development. Intrapac considers that project risk to be low, but accepts it as their risk. It is acknowledged that the completion of the EIS process does not pre-empt or guarantee the successful acquisition of a water extraction licence, or of Intrapac's application to the Utilities Commission for a license to become a water utility retailer.

8 Mining titles

Information request

Previous comments have identified the potential for land use conflicts between existing mining operations adjacent to the site and the future use of the site for residential development.

Intrapac's response in the Post SEIS Response states that consultation has occurred with the Ostojoic Group which currently operates extractive titles immediately east of Noonamah Ridge. As requested previously, the NT EPA and the Department of Primary Industry and Resources requires written evidence that the consultation has occurred and outlining what has been agreed between Intrapac Projects Pty Ltd and the Ostojoic Group.

A copy of an email received from the General Manager of Ostojoic Group discussing the company's plans for its operations to the east of Noonamah Ridge is replicated below.

The first 10+ years of the Noonamah Ridge development will be on the western side of the project site, which is at least 3 km away from Ostojoic's activities and also is largely buffered from noise by the ridge lines that transect the development area.

From: Simon Ostojoic [mailto:Simon.Ostojoic@ostojoic.com.au]
Sent: Wednesday, 3 May 2017 7:09 AM
To: Paul Nicholls <pnicholls@intrapac.com.au>
Subject: RE: Noonamah ridge

Hi Paul,

As discussed previously, our intention is to continue mining for a period of 5-10 years at our Humpty Doo/Noonamah leases extracting raw materials for the construction industry. During this period we may be operating heavy machinery between the hours of 7am-5pm, Mon-Fri.

If you require any further information please do not hesitate to contact me.

Kind Regards,

Simon Ostojoic
General Manager


OSTOJOIC
Ostojoic Group Pty Ltd

9 Commitments (revised)

This is the third document to provide supplementary information to the original EIS. Throughout the assessment process – including in this document – Intrapac has made undertakings additional to those presented in the commitments section of the original draft EIS. The purpose of this section is to reconcile all of those commitments.

9.1 Context

The extant Planning Scheme Amendment application proposes the rezoning of the site to Specific Use zone, incorporation of a concept master plan, and incorporation of an Area Plan and Principles to guide development. Intrapac proposes to revise this Planning Scheme Amendment application to allow for the environmental commitments arising from the EIS to be incorporated in the *NT Planning Scheme* as a reference document. Also incorporated will be relevant recommendations made by the NT EPA in their *EIS Assessment Report*, and any federal conditions that may results from the federal Department of Energy and the Environment's review of the Preliminary Information that will be submitted by Intrapac in due course. Such a reference document will embed the outcomes of the EIS into the statutory planning framework, and thereby require each subdivision application to address the environmental commitments directly.

This approach differs to that presented in the original EIS which involved incorporating the text from the environmental commitments into the Specific Use text within the *NT Planning Scheme*. During assessment of the Planning Scheme Amendment application, the Department of Infrastructure, Planning and Logistics raised concerns about the complexity of the proposed Specific Use zone text. Specifically, it was considered too complex for the day-to-day administration of the zone by Development Assessment Services, and for the completion of the relevant technical assessments. Incorporating a reference document achieves the same outcome in a more straightforward manner, and ensures that the intent of the environmental commitments is articulated clearly.

9.2 Commitments table

In preparation for being included as a reference document within the *NT Planning Scheme*, the commitments presented in Chapter 9 of the EIS have been revised. Table 2 represents the most up-to-date list of commitments made by Intrapac, and supercedes any previous commitments tables. Only commitments which are otherwise not accounted for within the planning process are included; those commitments that are expected to be standard conditions associated with the subdivision approvals for this project have been removed.

Table 2. Commitments arising from the EIS

Social
A community development worker will be employed, charged with introducing new residents to their neighbours and organising social events to encourage interactions and social cohesion from the early stages of moving into the new area.
A 'social infrastructure needs' assessment will accompany each subdivision application. This assessment will consider the broader community needs, as well as the cumulative impact of nearby development.
A stakeholder engagement strategy will be established for the development application and subsequent construction stage.
The effectiveness of the stakeholder engagement strategy will be monitored and assessed at each subdivision stage
An ongoing social mitigation and monitoring plan will be put in place at development application stage.
Planning
The development will constitute a high quality, master-planned, rural character estate with a range of lot

sizes and an emphasis on rural living options.
The minimum lot size for SD properties will be 800 m ² and a maximum of 4,200 residential lots will be developed.
Each subdivision shall be designed in accordance with CPTED principles. This will be specifically addressed in each subdivision application's statement of effect.
A relevant controlling clause will be introduced into the <i>NT Planning Scheme</i> to ensure that, once developed, no further subdivision of individual properties will be permitted.
Lot sizes along Redcliffe Road and to the northern boundary will be complementary to existing lots/homes, creating an interface with existing adjacent landholdings.
Setbacks will be provided to the development's boundaries in accordance with the requirements of the <i>NT Planning Scheme</i> and will be endorsed through the application of building envelopes.
High-level architectural design guidelines will be developed and incorporated into each sale agreement. A covenant will be placed on the title of each property requiring an assessment of building plans against the guidelines, and approval before construction can commence.
The proportion of public green space within the project area will be no less than 15 %.
There will be a rural village within Stage 1 of the development that will reserve land for commercial purposes, a community garden, a public school and sports-fields, a volunteer fire brigade, aged care and a community centre.
The Land Suitability Assessment will be used to guide subdivision design and lot sizing for each stage.
Construction
Contractors will be required to develop, and submit for approval prior to construction commencing, a Construction Environmental Management Plan (CEMP) addressing all potential environmental impacts from the construction phase of the development. The CEMP will incorporate all construction-related management actions from the EMP.
Transport
The <i>Strategic Traffic Model</i> (currently being developed by the Department of Transport) will be used to validate the findings of the <i>Traffic Impact Assessment</i> , as well as to identify other junctions that require assessment.
Road and transport authorities will be collaborated with as the project proceeds to ensure that: • Staged upgrades and new road developments minimise congestion and ensure accessibility is maintained to the project area and surrounding regions, including access for emergency services. • Staged upgrades to junctions address potential road safety issues at key intersections. • Interim park-and-ride facilities within the site become a bus interchange servicing local and regional areas. • Bus services ensure that final development design allows for 90 % of the dwellings to be within 600 m of a bus stop.
The feasibility of extending bus routes, increasing service frequency and increasing operating hours will be investigated in conjunction with NT Government and private bus operators.
A Traffic Management Plan will be devised for the construction of each stage of the subdivision in consultation with, and submitted for approval to, the relevant authorities.
A pre-development survey of existing road conditions will be undertaken to enable monitoring of construction-related damage to roads.
Electricity and lighting
The use of solar technology to service schools, dwellings, commercial buildings and recreational areas will be investigated.
Sourcing energy from the sewerage system will be investigated.
No overhead streetlights will be used.
Low/ground level street lighting will only be provided in the rural activity centres and on roads where the

average lot size is 2000 m ² or smaller.
Water supply
Prior to Stage 1 being developed, a thorough groundwater investigation – involving the drilling of additional bores and led by a hydrogeologist with extensive Top End experience – will be undertaken to inform sustainable yields of groundwater extraction.
Groundwater extraction will be gauged and limited to 20 % of the available resource (based on annual rainfall, advice from DENR and the results of pump testing).
The viability of the Koolpinyah Aquifer will be investigated as an ongoing water supply for Noonamah Ridge.
In order to ensure that groundwater extraction is within sustainable limits, the number of lots with individual bores will be minimised and means to regulate the amount of water extracted from individual bores will be investigated.
The active recharge of groundwater using excess stormwater will be investigated.
There will be no significant changes to pre-development groundwater quality (as compared to baseline data).
Groundwater quality and quantity monitoring will be undertaken in accordance with the Water Management Plan.
Stormwater
There will be no significant changes to pre-development surface water quality and flows (as compared to baseline data). To this end: • In the 24-months leading up to a sub-catchment being included within a sub-division application, baseline water quality for that sub-catchment will be collected monthly, as well as the 'first flush'. • Water quantity data will be collected by automated monitoring stations installed over the 2017-2018 wet season. • Hydrogeological modelling will then be undertaken to inform design of the stormwater management system for that sub-catchment.
Prior to Stage 1, the water requirements of the lake will be modelled and the results used to ensure the design and operation of the lake has minimum environmental impact.
All stormwater infrastructure will be designed and engineered to the 1 % AEP (1 in 100 year event).
Wastewater
Wastewater treatment and land application systems (both individual lots and community-scale systems) will be sited and designed according to relevant standards and guidelines. The systems will accommodate relevant setbacks, buffers and design principles to minimise potential pollution events and impacts on groundwater and surface water resources.
An Irrigation Management Plan will be developed and implemented for each community-scale wastewater treatment plant and associated land application areas.
For every wastewater treatment plant, an Emergency Management Contingency Plan will be developed during future design phases once the plant's specifics are known.
Conservation-significant values
The conservation of significant biodiversity values within the Noonamah Ridge project area will be in accordance with the <i>Framework for Achieving Conservation Goals</i> *
* This will be attached as an Addendum to this table when it becomes a reference document.
Within the first 24 months of the Planning Scheme Amendment being approved, Intrapac will engage a hydrologist / hydrogeologist to develop an inflow hydrology study for the north-west sandsheet heath. Using the data from that study, a model will be created that will inform how and where the catchment can be developed, and how the impact of that development on inflow hydrology can be monitored.
To inform the extent of CN zoned land around the central Howard River Toadlet sub-population, Intrapac

will engage a hydrologist / hydrogeologist to develop an inflow hydrology study to identify and characterise the catchment for that sub-population's habitat.
At the time of subdivision application for any stage of development that includes land zoned CN (Conservation), and where the subdivision proposal incorporates roads, infrastructure or other works within land zoned CN, the subdivision application will demonstrate to the Department of Environment and Natural Resource's satisfaction that the road or infrastructure works comply with the intent of the CN zoning. Reference shall be made in the subdivision application to the underlying environmental values that led to the designation of land zoned CN. It is acknowledged that consent will be required under the <i>Planning Act</i> to undertake works within the CN zone and that works will need to be consistent with Clause 10.2 of the <i>NT Planning Scheme</i> .
All CN zoned land will have large private lots (between 4,000 and 20,000 m ²) abutting, or included as part of, them as an additional buffer between the natural and developed environments.
Landowners will be encouraged – through the combined use of building envelopes and land-clearing permit requirements – to retain as much natural vegetation as possible on their lots.
The CEMP for each stage will contain a Vegetation Clearing Management Procedure (including a Wildlife Rescue Procedure) and a site-specific Weed Management Plan.
Cultural heritage
All artefacts of low and medium cultural heritage significance will be collected, labelled, grouped and buried in a 'keeping place' in consultation with the responsible authorities.
Sites of high cultural heritage significance will be buffered within conservation reserves.
Maintenance and management of cultural heritage reserves will be undertaken to retain the fabric and condition of objects and sites.
Listing the aircraft wreck on the NT Heritage Register will be investigated.
The Restricted Works Area in the south-east of the project area will be zoned Conservation (as per the <i>Framework for Achieving Conservation Goals</i>) prior to any works taking place on the development.
Bushfire
Development design will include allocation of emergency evacuation routes.
Lot layout will avoid creating unmanaged interfaces between rural and high density areas that may become a fire hazard.
Agreements will be entered into for any land not designated for housing or commercial purposes (e.g. parks, drainage buffers and heritage zones) to allocate fire management responsibilities.
A Permit to Burn will be obtained for any controlled burning.
Signage will be installed within all bushland green spaces to inform residents about fire impacts on threatened species.
Biting insect
Drainage will be rectified – to the satisfaction of the responsible authority – in all onsite mosquito-breeding areas within 1.6 km of the village centres.
Clauses will be placed in contracts of sale – and included as covenants on titles – to inform residents of potential mosquito nuisances.
Dwellings located within an identified buffer from a potential mosquito breeding area will be subject to architectural guidelines requiring the installation of appropriate mosquito screening on all external doors and windows, as well as recommendations to screen outdoor entertainment areas.
Stormwater drainage and lakes will be planned, installed and maintained – with reference to the Department of Health's <i>Guidelines for Preventing Biting Insect Problems for Urban Residential Developments or Subdivisions in the Top End of the NT</i> – to avoid creating mosquito-breeding habitat.
The CEMP for each stage will include drainage work, housekeeping, inductions and management actions to



minimise construction workers exposure to mosquito-borne diseases.
The community-scale treated effluent irrigation areas will be planned, installed and maintained to avoid creating mosquito-breeding habitat.
Noise and air quality
The CEMP for each stage will outline specific management actions to minimise noise impacts from construction activities.
The CEMP for each stage will outline specific management actions to minimise air impacts from construction activities.
Other
A Domestic Waste Management Plan will be prepared for the development and will include timeframes for Litchfield Council to undertake waste removal and relevant stakeholders.
Intrapac will work with the responsible authorities to ensure that the collection and removal of household waste can be accommodated.
A public building within Village One will be constructed to the required standards to constitute a cyclone shelter.
An extension of the 'emergency response area' for the NT Fire and Rescue Service will be sought to include within in it the project area.



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