South Hedland Integrated Sports Complex

Master Plan Report

Town of Port Hedland

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Housekeeping

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Introduction

Carabiner and our Consultant Team were commissioned by the Town of Port Hedland to prepare this Master Plan for the South Hedland Integrated Sports Complex.

Prior to our team commencing our work on the Master Plan, the Town of Port Hedland also commissioned 'ABV Leisure Consulting Services' to simultaneously conduct extensive community consultation with users and community stakeholders; in order to establish needs and make recommendations for the upgrade and redevelopment of three very important sport and recreation precincts within the Town of Port Hedland, which were:

- South Hedland Integrated Sports Complex
- JD Hardie Reserve Recreation Centre
- MacGregor Reserve Precinct.

The outcomes and recommendations resulting from this extensive stakeholder community consultation, were then detailed in ABV's Draft & Final reports 'Community Consultation and Needs Analysis – Town of Port Hedland', April & June 2019.

Following the issue of the Draft Report in April 2019, Carabiner commenced preparation of our Concept Design for the South Hedland Integrated Sports Complex Master Plan, based on its recommendations.

Then, at the Town of Port Hedland's request on 19th-20th June, Carabiner presented and workshopped our Proposed Concept Master Plan for the South Hedland Integrated Sports Complex to both:

- Town of Port Hedland, Elected Representatives & Key Staff
- Community Representatives and User/Stakeholder Groups

Following the feedback, enthusiastic acceptance and endorsement of the 'Proposed Concept Master Plan' at these presentation/workshops; Carabiner completed, finalised and is pleased to provide this South Hedland Integrated Sports Complex – Master Plan Report to the Town of Port Hedland.

The existing South Hedland Sports Precinct

The existing South Hedland Sports Precinct consists of the following major functional elements:

- Wanangkura Stadium, constructed in 2006
- Wangangkura Stadium Car Parking, accessed from Hamilton Road
- Four Outdoor Basketball Courts – unshaded
- Netball Pavilion (constructed 2017) + 6 No. Outdoor Netball Courts – unshaded
- Netball Centre Carparking (accessed separately from Hamilton Road)
- Kevin Scott Oval, with sports lighting
- Marie Marland Reserve - Multi-Use Playing Fields, with sports lighting
- Marie Marland Reserve - Baseball Diamond, with dated sports lighting & improvements
- New Recently Upgraded 'hi-tech' Children's Playground
- Finucane Island Sports Club – Transportable Building (redundant, with dis-used carpark)
- Miscellaneous Small Shed-like Buildings – used for storage

The most significant problems and deficiencies with the existing South Hedland Sports Precinct have been identified as follows:

- The single Indoor Multi-use Show Court, in Wanangkura Stadium, is over-used and insufficient to fulfil the established demand for indoor sports courts and other large floor space uses.
- The existing Football Club facilities inside the Wangangkura Stadium are poorly located and not fit for purpose. Note: These facilities have now been abandoned by the Football Club, who are temporarily utilising the old Finucane Island Sports Club building, as their club facility.
- The existing Gym, Weights, Pilates & Squash facilities inside the Wanangkura Stadium are insufficient in size and functionality to fulfil current and future needs.
- The required separation of gym member and public access to the Wangankura Stadium, is operationally difficult and restrictive, within the current stadium layout.
- The existing Wanangkura Stadium car park is prone to flooding (into the building itself) during the Wet Seasons.
- The existing Marie Marland Reserve is also subject to poor drainage and seasonal flooding
- The existing four outdoor Basketball courts are aged, inflexible and no longer fulfil current needs, standards and expectations
- The sports facilities within the existing South Hedland Sports Precinct are inflexible, distant from each other, fragmented, separated by open drainage swales and difficult to access from car parking areas.
- The existing sports fields on the Marie Marland Reserve are over-used and difficult to maintain to an acceptable standard
- The existing Baseball diamond (and its associated dugout facilities, lighting etc) is aged and in need of major upgrade to meet current standards. Also, there are currently no club facilities or amenities to support the current and future needs of the sport of Baseball.
- The popular, high-participation sports of Softball and Touch Football/Rugby are currently poorly accommodated for; lit sporting fields; and appropriately located club facilities/ amenities.
- The sport and recreation facilities at the existing South Hedland Sports Precinct do not currently support (or accommodate) very popular passive recreational activities such as walking, jogging, dog exercising, rollerblading/skating, BBQin /picnicking and children's play.
- The precinct generally lacks adequate shade for walking, spectating, playing, recreating and for community gatherings (formal & informal)

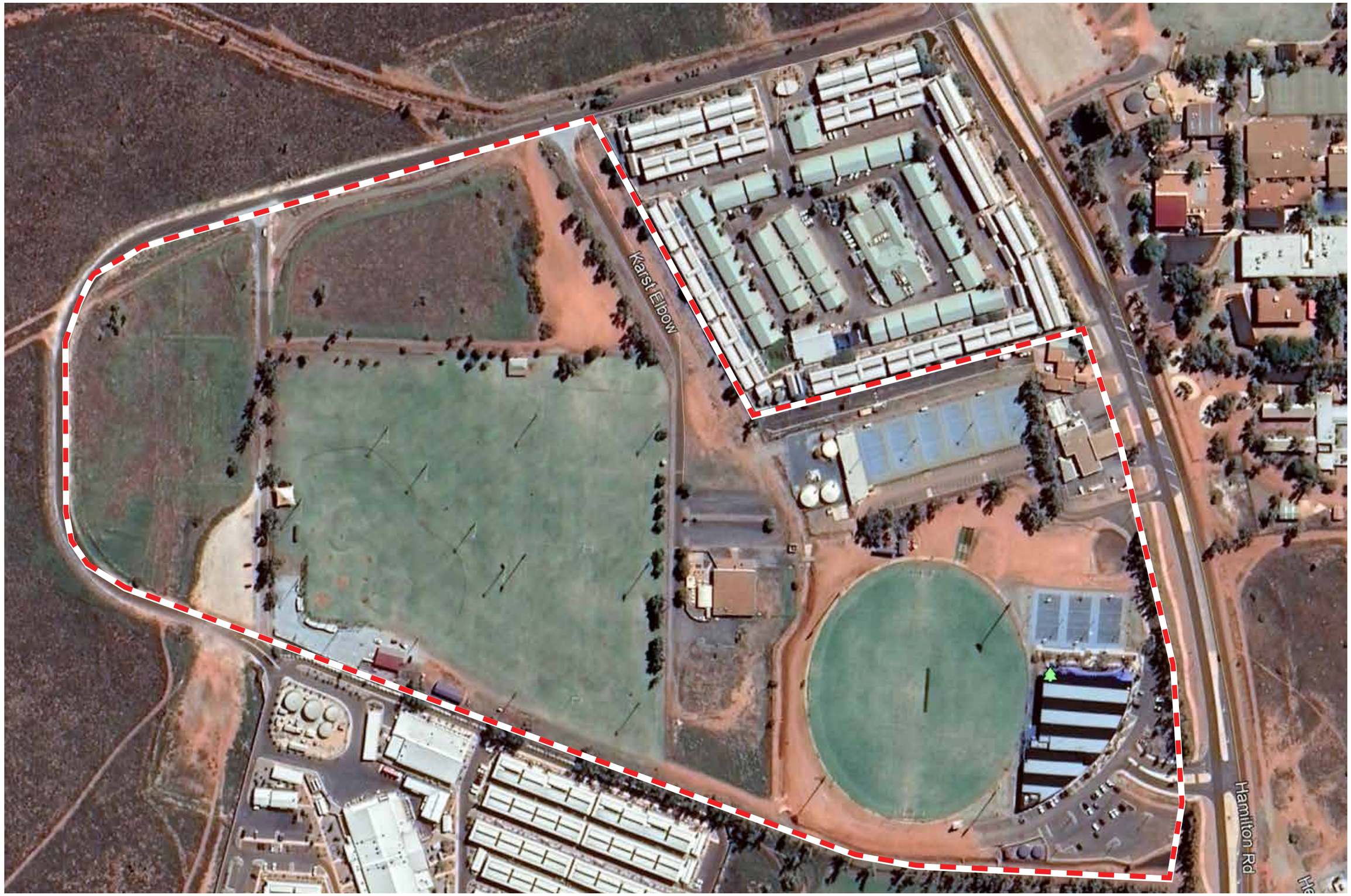
Community & Stakeholder Consultation

Following extensive community and stakeholder consultation; ABV's 'Community Consultation and Needs Analysis – Town of Port Hedland, April & June 2019' report provided the following requirements and recommendations for consideration in the design and preparation of Carabiner's Master Plan for the South Hedland Integrated Sports Complex:

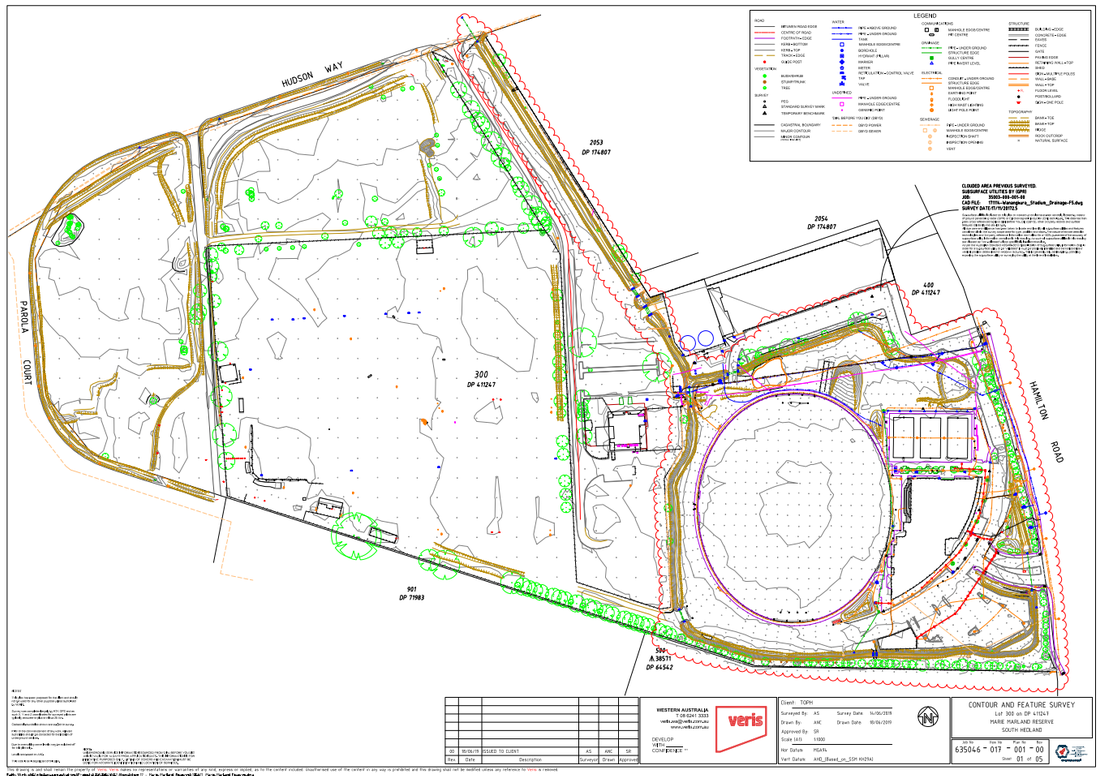
- The South Hedland Sports Complex be identified and classified as a 'Regional Level' Sporting Precinct in the Town of Port Hedland.
- Extension of the Wanangkura Stadium to include 2 - 3 additional indoor courts adjacent to the existing court and accessible from the existing indoor court.
- Provision of 1-2 outdoor multi-purpose sports courts with permanent shade structure and lighting, adjacent to and accessible via the indoor courts, to enable growth of sports. Ideally the outdoor court/s should be in proximity to the existing netball court facility to accommodate future growth.
- Development of a multi-use pavilion that includes club room facilities, change rooms, undercover spectator viewing, and community activity space located on the western side of the Kevin Scott Oval to service the Kevin Scott Oval & the eastern end of Marie Marland Oval.
- Development of the eastern end of Marie Marland oval to be accessible for future growth of football and cricket.
- Development of an additional active open space to the east of the existing permanent baseball diamond to provide rectangular space for touch rugby, rugby, future soccer and hockey, also providing flexibility for additional diamond sports fields.
- Retain permanent baseball field in current location and provide permanent dugouts, scorers box and undercover spectator seating.
- Development of club room facilities to the west of the existing baseball diamond to service new diamond sports and new active open space. Change rooms, kiosk facilities, small social space, storage and undercover spectator viewing to the permanent baseball diamond and new active open space location. These club room facilities will also service the extended active open space area recommended in this report that will provide additional space for rectangular sports and diamond sports.
- Modifications to the Wanangkura Stadium to increase the size of the gymnasium and fitness class space (noting the existing change room/club room facility will be surplus to need once the club room facility is developed). Modifications to consider improved facilities for squash courts, including spectator seating, referees area and club tea prep area.
- Formalisation of car parking and access roads – including ingress and egress points. To include the provision of an additional ingress and egress point for the Marie Marland facilities.
- Include pathways and landscaping to the site to improve access around and through the site, linking car parks to main buildings. Pathways to meet accessibility requirements and can include distance markers so can also be used as a fitness track.
- Include a playground in proximity to each of the new pavilions.
- Furthermore, as the suggested lifespan for an aquatic facility is 50 years and the SHAC will be coming to the end of the lifespan in the foreseeable future, it is recommended that the master plan include consideration to the future development of an aquatic centre within the South Hedland Sporting Precinct, ideally located to reduce management costs by joint reception and administration facilities.
- The area to the north of Marie Marland Oval to be developed into general recreational space, inclusive of a dog exercise area.

This Master Plan and Report for has been designed and prepared in fulfilment of these recommendations and aspirations.

Existing Precinct (Aerial Photo)



(Source: 2019 Google Earth)



SIte Survey Plan (Existing)

Proposed Layout

The Master Plan

Overarching Aspirations & Concepts

The over-arching aspirations and concepts inherent in the design and development of this Master Plan for the South Hedland Integrated Sports Complex are as follows:

- To plan and design for the future development and improvement of the SHISC in an ‘organic’ fashion which recognises, respects and retains the important and valued existing characteristics and features of the precinct.
- To recognise and respect the importance and iconic architectural significance of the existing Wanangkura Stadium (and its location), within the greater Town of Port Hedland context.
- To fully exploit the synergies, advantages, benefits and flexibilities of co-locating a wide variety of sport and recreation activities within a single, integrated complex
- To facilitate the resolution of the identified functional shortcomings and frustrations with the amenity and capacity of the existing Wanangkura Stadium - within the context of the proposed Master Plan
- To facilitate the resolution of the existing broad-acre technical and engineering faults within the precinct (such as localised flooding & inadequate services infrastructure etc) – within the context of the proposed Master Plan
- To consider the need for the continuous use of the precinct (and its interim stage functionality) during the likely stages of re-development, within the design of the overall Master Plan.
- To investigate and report on the technical and engineering consequences and feasibility of executing this Master Plan in full and/or in stages.
- To prioritise flexibility in the accommodation of the stated needs of the various sporting clubs and community organisations within the Master Plan
- To conceive, create and utilise;
  - new passive recreational facilities/amenities and initiatives;
  - new pedestrian infrastructure;
  - and new vehicular infrastructure

  to truly integrate and synergise the South Hedland Integrated Sports Complex.

Illustrative Masterplan

EXISTING TREES

EXISTING TREES
WITHIN PROPOSED BASINS TO BE ASSESSED DURING DESIGN DEVELOPMENT

NEW TREES

NEW TREES
TREES SPECIES TO BE LOCATED WITHIN SWALES AND BASINS

OVERALL GRASS AREAS

OVERALL GARDEN BEDS
PROPOSED NATIVE VEGETATION AREAS

DRAINAGE BASINS AND SWALES
WITH BASIN VEGETATION MIX

OVERALL FOOTPATHS (3.5m WIDE)
WASHED AGGREGATE (TRAFFICABLE) ACCESSIBLE TO EMERGENCY VEHICLE ONLY

FEATURE FOOTPATHS
PAVING (TRAFFICABLE WITHIN SPORTS ZONE)

BUILDINGS

OUTDOOR FITNESS STATIONS
OUTDOOR EXERCISE CIRCUIT INCLUDING SHADE STRUCTURES

A EXISTING BASEBALL FIELD TO BE RETAINED & UPGRADED
B NEW BASEBALL FIELD
C NEW SOFTBALL FIELD
D POTENTIAL SECOND SOFTBALL FIELD
E POTENTIAL RECTANGULAR PLAYING FIELDS
F NEW MULTI-PURPOSE OVAL
G EXISTING OVAL TO BE RETAINED
H NEW CRICKETS PRACTICE NETS
I NEW OUTDOOR COVERED SPACE WITH BASKETBALL COURT AND SPECTATOR SEATING
J NEW INDOOR BASKETBALL COURTS
K EXISTING NETBALL COURTS TO REMAIN

1 WANANGKURA STADIUM (WITH INTERNAL MODIFICATIONS)
2 NEW BUILDING EXTENSION
3 NEW MULTI-USE PAVILIONS
4 NEW MAIN ENTRANCE LOBBY (AS PART OF THE NEW BUILDING EXTENSION)
5 GRASS MOUND WITH SHADE STRUCTURES
6 EXISTING PLAYGROUNDS TO BE RETAINED
7 EXISTING FOOTPATH AROUND EXISTING OVAL TO BE RETAINED
8 NEW ADVENTURE PLAYGROUND
9 NEW DOG PARK
10 FAMILY AREA / BBQ PARK
11 RETAINING WALLS
12 GRASS MOUND / STEPS (LOOKOUT) - SHADED
13 NEW PLAYGROUND - SHADED

Components – Detailed Description

The following describes in detail the individual elements comprising this South Hedland Integrated Sports Complex Master Plan:

Wanangkura Stadium - New Northern Extension & Internal Modifications to Existing

(Ref: I, J, K,1,2,4)*

The proposed major extension to the existing Wanangkura Stadium includes a new Main Entry & Lobby, three new indoor Basketball (& multi-sport) Courts, new Court Store/Amenities and (most significantly) a new large multi-purpose Outdoor Covered Area. The new Outdoor Covered Area will accommodate an additional outdoor Basketball (& multi-sport) court and retractable spectator seating. This major extension to the Wanangkura Stadium will be designed to complement but not copy the architecture and aesthetics of the iconic, existing Wanangkura Stadium.

The new Main Entry & Lobby will provide a large multi-purpose linking space that will allow flexible public access to both the new and existing Basketball courts; and allow them to be accessed and used in a simultaneous, efficient and co-ordinated manner.

The three new state-of-art Basketball indoor courts will greatly reduce pressure on the existing single (currently very over-used) multi-purpose show court; and hence allow that space to accommodate other required functions, other than the just the formalised court sports.

In addition to accommodating a new outdoor sports court, the new Outdoor Covered Area, will provide a much-needed, large, shaded, multi-purpose Community Space for the use of all residents of greater Port Hedland. The new Outdoor Covered Area is located directly adjacent to the new Family Area/BBQ Park; mutually increasing the functionality and amenity of both these facilities.

The internal modifications to the existing Wanangkura Stadium will include the following:

- The conversion and re-fitting of the existing redundant Football Club facilities and amenities to increase the size and capacity of the Gym, Pilates, Weights and other exercise facilities.
- The conversion of the existing Main Entry & Lobby space to provide ‘member only’ access and additional member facilities for the Gym and associated exercise areas.
- The conversion of the existing Weights Room back to its original function as a third Squash court, plus additional facilities and amenities to encourage and support the increased Squash capacity.

(*Please also refer to the below plan references, in cross-referencing these detailed individual element descriptions to the Master Plan drawing itself)

Wanangkura Stadium (including new extension)

Existing Wanangkura Stadium building

Alterations to existing stadium building

Existing Kevin Scott Oval to be Retained

(Ref: G)

The existing floodlit Kevin Scott Oval is the premium Australian Football & Cricket facility in Port Hedland and will be maintained in its current form. The new master planned sporting fields will reduce the existing usage pressure on the Kevin Scott Oval, assisting the TofPH, in maintaining its quality as a premium multi-use regional sporting field.

New Large Multi-Use Pavilion Building

(Ref: 3)

The new large Multi-Use Pavilion building will be located between the existing Kevin Scott Oval and the new master planned Multi-Purpose sports oval. Its location between the two ovals will allow it to equally view (and service) both ovals; in addition to efficiently and flexibly accommodating their associated sports clubs.

Refer also to the above Accommodation Schedule for a summary of the indoor and outdoor functions and spaces provided in this building.

Two x New Small Multi-Use Pavilion Buildings

(Ref: 3)

The two new small Multi-Use Pavilion buildings will be located adjacent to the existing and new Baseball, Softball & Rectangular sports fields. Each of these buildings will be located very near to their associated sporting fields (on both sides); allowing them to equally and efficiently view (and service) each of these sporting fields and their associated sporting clubs.

Refer also to the above Accommodation Schedule for a summary of the indoor and outdoor functions and spaces provided in both these buildings.

Shaded Grass Mound Spectator Area

(Ref: 5)

The proposed shaded, Grass Mound, located north of the existing Kevin Scott Oval, represents an upgrade to this existing (and popular) banked viewing area. It is proposed to increase the size of the grassed mound, by adding shading and slightly more formalised landscaped seating – thus improving the functionality and amenity of this already established outdoor spectator requirement. Refer also to the Landscape Architecture section of this report for more design detail, regarding the Shaded Grass Mound spectator area.

New Family Area/BBQ Park

(Ref: 10)

The area located between the proposed Outdoor Covered Area extension of the existing Wanangkura Stadium and the existing Netball Centre parking will be developed into a landscaped Family Area & BBQ Park. This family-focused, outdoor community area will augment and synergise the sport-related, social functions of the SHISC, in addition to introducing additional activated, (non-sport related) passive recreational activities into the complex. Refer also to the Landscape Architecture section of this report for more design detail, regarding the Family Area/ BBQ Park.

Existing Upgraded Playground to be Retained

(Ref: 6)

This ‘state of the art’, recently upgraded hi-tech, Children’s Playground is (of course) to be retained. It’s use, integration and activation will be increased by both the proposed new adjacent family related facilities and the recommended relocation of the existing Cricket Practice Nets, away from this area.

New Small Playground

(Ref: 13)

This proposed new shaded, Children’s Playground will be located very close to the two new small Multi-Use Pavilions. The new playground is intended for the younger children, of the Baseball, Softball and rectangular sport participants. It will allow these younger children to amuse themselves (under close supervision) while their parents participate in their chosen sport nearby. Note: The need for a safe, shaded playground for young children, located very closely to the Softball facilities, was a very strongly stated requirement in the Community Consultation phase of the master planning process.

New Adventure Playground

(Ref 8)

The proposed new Adventure Playground is a major and significant ‘aspirational’ component of the SHISC Master Plan. It is conceived as an iconic, ‘destination facility’ in its own right. The new Adventure Playground should and will be a major drawcard, to the SHISC, for both primary school aged children (and their families) and teenagers. The placement of this significant new, destination facility within the SHISC will provide synergy with the surrounding activity from the formalised sports in the Complex. In addition, the surrounding activation from the sporting activities, will be a deterrent to the possible incursion of ‘unsociable behaviour’ (from both adults and teenagers) into the new Adventure Playground – particularly at night. Refer also to the Landscape Architecture section of this report for more detail, regarding the conceptual design of the new Adventure Playground.

New Dog Park

(Ref: 9)

A new fenced, custom-landscaped dog exercise park will be located north of the new Multi-Sport Oval. The inclusion of a fenced, purpose - designed dog exercise park into the SHISC Master Plan was a very clear need (and requirement) that emerged for the Community Consultation sate of this master plan project.

The proposed Dog Park is located adjacent to the new vehicular entry and car parking off Hudson Way at the northern edge of the SHISC. Dog owners will be able to arrive at the SHISC, with their pet, by car and exercise their dogs in a purpose-designed environment without impacting negatively on the adjacent sports fields. Refer also to the Landscape Architecture section of this report for more conceptual design detail, regarding the proposed Dog Exercise Park.

New Multi-Purpose Football/Cricket & Rectangular Sport Oval

(Ref: F)

A new flood-lit, multi-purpose oval will be located to the west of the existing Kevin Scott Oval. The new oval will be constructed to the same high standards as the existing Kevin Scott Oval and will accommodate Australian Football, Cricket and the rectangular sports, when required.

The new multi-sport oval will relieve the over-use pressure and scheduling conflicts (between the different sports and sports clubs), that currently exists with the existing Kevin Scott Oval. Importantly, users of the new multi-sport oval will have equal (and simultaneous) access to the new Large Multi-Use Pavilion facility, located between the new and existing ovals.

Existing Baseball Diamond – Upgraded

(Ref: A)

The existing Baseball diamond located on the existing Marie Marland Reserve will be retained in its current location. The existing aged dugout facilities, lighting and the Baseball field itself will be upgraded and/or replaced, as required, to meet contemporary standards for community and regional Baseball competitions.

The first of the two new Small Multi-Use Pavilions will be located immediately adjacent to the upgraded Baseball diamond, providing the Baseball club with the required support amenities to facilitate the growth of their club and their sport.

New Baseball Diamond – Permanent

(Ref: B)

In addition to the full upgrade of the existing Baseball diamond, the Master Plan includes the provision for an additional new permanent, floodlit, Baseball diamond. The future new Baseball diamond will be located immediately west of the first of the two new Small Multi-Use Pavilions, in the same convenient proximity, to these support amenities, as the original upgraded Baseball field.

New Softball Field – Permanent

(Ref: C)

A new permanent, floodlit Softball field will be constructed immediately west of the second (northernmost) of the new Small Multi-Use Pavilions. The establishment of this new permanent Softball facility (independent of the permanent Baseball fields) and adjacent to the new amenities Pavilion will encourage growth and increased participation in the already popular sport of Softball in Port Hedland.

New Flexible Softball/Rectangular Sports Fields – Overlaid

(Ref: D, E)

In addition to the upgraded and new Baseball and Softball field the Master Plan includes for the provision of additional flexible, floodlit, multi-purpose sporting fields - to be located immediately east of the northernmost of the new Small Multi-Use Pavilions. It is planned that these new flexible, floodlit sporting fields will appropriately accommodate: an additional Softball field, multiple Touch Rugby/Football fields or even an additional full-size Rugby or Soccer pitch, if required.

These additional flexible sporting fields and their associated sporting clubs will, of course, be equally supported by the amenities and facilities provided in the new northernmost of the Small Multi-Use Pavilions.

New Shared-Use Running Track

A significant feature of the SHISC Master Plan is the proposed Shared-Use Running Track that both circumnavigates and connects all the elements of the western component of the SHISC.

The Shared-Use Running Track will provide the SHISC with a structured facility for walking running, jogging, roller-skating and roller-blading. It is proposed that the track will be wide, have safety lighting & line-marking and be constructed with an appropriate 'jogger-friendly', shock-absorbing resilient finish. The Shared-Use Running Track will feature accurate distance markers (for timing and training) and approximately eight drinking water, shade and exercise 'oases' along its route.

In addition to providing a user-friendly, structured exercise and training facility, the Shared-Use running track will also provide a much-needed pedestrianised link to integrate and synergise the many and varied sport and recreation activities provided within the re-invigorated South Hedland Integrated Sport and Recreation Complex.

New Cricket Practice Nets

(Ref: H)

The existing Cricket Practice nets will be removed from the Kevin Scott Oval perimeter and re-constructed on the western flank of the of the new Large Multi-Purpose Oval.

This modification will permit better integration between the existing Playground (Ref: 6) and the proposed new Grass Spectator Mound and Family/BBQ Park. In addition, it will assist to avoid the current conflicts between Cricket training and Football training, caused by the current practice nets location.

New & Modified Vehicular Circulation & Car Parking

Adequate car parking and efficient vehicular circulation, access and egress will be critical to the success and functionality of the proposed SHISC Master Plan.

The concept behind the parking and vehicular circulation strategy proposed in the Master plan is that, in addition to meeting its basic logistical requirements, the parking and vehicular circulation will also serve to connect, integrate and energise the various elements the SHISC. It will achieve this in the following ways:

- Providing more (and closer) direct vehicular access to the various facilities, avoiding the current major issue of navigating long, unappealing walking routes (in the hot Port Hedland sun) from your car to your sporting or recreational destination.
- Providing formalised, sealed, drained and well-lit (safe) car parking in locations where the need for parking, and vehicular access & egress has already been established by the existing ad-hoc parking and vehicular 'goat-tracks'
- Providing additional vehicular Entry and Exit crossover points to the new integrated SHISC to prevent vehicular congestion when all the facilities are been utilised at the same time.
- Recognising the established tradition in country and regional Australian Football of watching Football from your car, by partially surrounding the new and existing Australian Football ovals with 'centre-circle facing' car parking bays.

Refer also to the Traffic Engineering section of this report for more design detail regarding the Car Parking & Vehicular Circulation features and assumptions of this Master Plan.

General Arrangement

As per the Architectural Brief, in the ABV - Community Consultation and Needs Analysis – Town of Port Hedland, June 2019 - the sport, recreational and landscape features of this South Hedland Integrated Sporting Complex - Master Plan have been arranged such that:

- Pedestrian routes provide ease of movement for pedestrians and equitable access to all facilities (and associated car park areas).
- The number and design of car parking bays have been designed in accordance with our stated usage assumptions and in accordance with statutory regulations (including appropriate spaces for people with disabilities). In addition, car parking has been located and designed with appropriate safety lighting and secure access and egress controls.
- The soft landscaping elements of the Master Plan, recognise and reflect the Town of Port Hedland's water efficiency policies and preferred methodologies.
- All existing and proposed active oval and sports field developments in the Master Plan, have been designed to meet the requirements of the Department of Local Government, Sports and Cultural Industries (Previously Department of Sport & Recreation) Sports Dimensions Guide for Playing Areas, June 2016.

Schedule of Accommodation

1. Wanangkura Stadium – New Northern Extension

ROOM	AREA (Nominally)	FUNCTION	OCCUPANCY and FUNCTIONAL RELATIONSHIP	DETAIL
New Entry Hall & Lobby	650 m² - as shown on Master Plan	Includes Reception, Seating, Kiosk and Circulation Space	Provides access to both new and existing indoor sports courts	
Indoor Courts x 3	2350 m²	Provide 3 No. indoor sport courts plus space for community pursuits, dances and events.	Space to be designed to cater for 3 indoor courts side by side designed to meet requirements of DSR Sports Dimensions Guide 6th Edition June 2016 for Basketball courts. To be designed adjacent to and accessible from the existing indoor show court.	External door to open to outdoor multi-purpose court and community space Escape doors as necessary. Accessible for all ages.
Ancillary Areas	800 m² - as shown on Master Plan	Spectator Seating, Change Rooms, Public Toilet Amenities, First Aid, Admin. & Meeting Areas, Large Sports Storage Areas and Plant Space.	Accessible from courts	Note: The overall required size and functionality of these ancillary areas, is still subject to more detailed needs analysis and briefing.
Covered Outdoor Community Space, inc. 1 x Outdoor Court	1850 m²	Large covered area for outdoor sporting and community pursuits; including one outdoor sports court and associated retractable spectator seating.	Designed to cater for one undercover multi-sport outdoor court, designed to meet requirements of 'DSR Sports Dimensions Guide 6th Edition - June 2016' for Basketball courts. To be adjacent to and accessible from the new indoor courts.	Undercover of permanent roof structure. Structure to be designed in accordance with Cyclone Region Category D.

2. New Large Multi-Use Pavilion Building

ROOM	AREA (Nominally)	FUNCTION	OCCUPANCY and FUNCTIONAL RELATIONSHIP	DETAIL
Club Social Room	120 m²	The provision of social/community rooms facilitate opportunities for social interaction, community building, social capital and club sustainability.	Flexibility of the space is desirable to enable it to cater for a variety of community uses (meetings and function). Viewing access to oval spaces.	Doors to external undercover areas
User Group Store	75 m²	For equipment store of main users of complex.	In proximity to main building.	External access with roller door or double doors. Accessible by service road preferable.
Social Room Toilets	30 m²	Specific toilets for social rooms	Adjacent to Social Room	Must include universal access amenity. Must meet Health Dept Regulations
Kitchen and Servery	30 m²	To provide kitchen to service the main social space and other events being conducted on oval space.	Adjacent to social room but directly opening onto main oval and/or external entertainment area. Service access	Commercial grade stainless steel benches. Kiosk servery to be separated from main kitchen area and have space for large drinks fridge. Option for servery to be located to service both ovals. Alternatively, two servery locations off kitchen, to enable use on both sides.
Meeting Room	50 m²	Provide multipurpose/meeting space in a committee room setting with cupboard space and tea/coffee and light refreshments preparation area. Space for fridge.	Within proximity to internal toilets.	
Change rooms, showers and toilets (x4)	75 m² (ea)	To provide accommodation for sporting and other groups as change room. To be non-gender specific to facilitate maximum flexibility of usage, particularly during major events at the precinct.	To be accessible and function as facilities for ovals on either side of pavilion, accessible from both sides.	Each change room to cater for minimum of 22 players + 6 officials at one time.
Umpires room	25 m²	Toilet, basin, shower and small change area.		Umpires rooms need to cater for an increasing number of female umpires. As such the provision of areas where changing can occur in private is required. A minimum of two showers within lockable cubicles, toilet, hand basin, bench seating and clothes/bag hooks

ROOM	AREA (Nominally)	FUNCTION	OCCUPANCY and FUNCTIONAL RELATIONSHIP	DETAIL
First Aid Room	Min 12 m²	Accessible by service road for emergency services		Double door access. Must include bench and hand basin. Large enough to store wheelchair, wall mounted stretcher and bench. Accessible by service road for emergency service vehicles
External Public Toilets	40 m²	To be used as general public toilets for precinct zone.	Either attached to the main building but accessible externally, or separate to the building	Male, female with universal access.
Bin/Waste Compound	15 m²	Store for waste bins for facility and general precinct zone use. All to be accessible via service roads with room to empty bins.		
External Covered Walkways	150 m²	Shaded, weather-protected circulation space	Weather-protected circulation space on both sides of Pavilion	
External Covered Viewing Area	100 m²	Shaded, weather-protected spectator viewing	Dedicated shaded, weather-protected spectator viewing area adjacent sports field.	

3. Two new small multi-use Pavilion Buildings

ROOM	AREA (Nominally)	FUNCTION	OCCUPANCY and FUNCTIONAL RELATIONSHIP	DETAIL
Club Social Room	50 m²	The provision of social/community rooms facilitate opportunities for social interaction, community building, social capital and club sustainability.	Flexibility of the space is desirable to enable it to cater for a variety of community uses (meetings and function). Viewing access to oval spaces.	Doors to external undercover areas
User Group Store	75 m²	To store user group equipment.	Provided for 3 user groups therefore separated internally into 3 separate spaces.	Double door access to each space
Function & Meeting Room Toilets	20 m²	Specific toilets for social rooms	Adjacent to Social Room	Must include universal access amenity. Must meet Health Dept Regulations
Kitchen and Servery	30 m²	To provide kitchen to service the main social space and other events being conducted on oval space.	Adjacent to social room but directly opening onto main oval and/or external entertainment area. Service access	Commercial grade stainless steel benches. Kiosk servery to be separated from main kitchen area and have space for large drinks fridge. Option for servery to be located to service both ovals. Alternatively, 2 servery locations off kitchen to enable use on 'both sides'.
Change rooms, showers and toilets (x4)	60 m² (ea)	To provide accommodation for sporting and other groups as change room. To be non-gender specific to facilitate maximum flexibility of usage, particularly during major events at the precinct.	To be accessible and function as facilities for ovals on either side of pavilion, so either accessible from both sides or 2 and 2 either side.	Each change room to cater for minimum of 15 players at one time.
First Aid Room	Min 12 m²	Accessible by service road for emergency services		Double door access. Must include bench and hand basin. Large enough to store wheelchair, wall mounted stretcher and bench. Accessible by service road for emergency service vehicles
External Public Toilets	30 m²	To be used as general public toilets for precinct zone.	Attached to the main building but accessible externally.	Male, female with universal access.
Bin/Waste Compound	20 m²	Store for waste bins for facility and general precinct zone use. All to be accessible via service roads with room to empty bins.		
External Covered Walkways	150 m²	Shaded, weather-protected circulation space	Weather-protected circulation space on both sides of Pavilion	
External Covered Viewing Area	100 m²	Shaded, weather-protected spectator viewing	Dedicated shaded, weather-protected spectator viewing area adjacent sports field.	

Landscape Architecture

Introduction

This report describes the objectives, design strategies and materials that make up the landscape architecture of the Integrated Sports Complex in South Hedland. The landscape architectural scope for this project consists of master planning for both hard and soft landscape treatments to the complex surrounds including open spaces, building surrounds, playgrounds, pathways, vehicle drop-off and carparks.

Design Philosophy

The landscape vision for the South Hedland Integrated Sports Complex (SHISC) is to create a setting for the redeveloped sports precinct that respects the existing landscape character of the site and wider region, integrating the new sports infrastructure into it's surrounding context.

The landscape design responds to the existing and proposed architectural character, the existing landscape character and the uniqueness of the surrounding regional landscape to create a welcoming and attractive environment to benefit the players, spectators, staff, visitors and the general community.

Design Principles

The proposal illustrated in this report is based on a number of integrated principles to produce an attractive, distinctive and inclusive place which celebrates the South Hedland's character and identity.

The following landscape design principles have been developed to guide the overall landscape character.

These principles are to;

- Develop a landscape identity that respects the existing site and broader landscape context.
- Create a landscape that is legible, comfortable, provides shade and is welcoming.
- Ensure that landscape components complement the built form in terms of function, scale and composition.
- Create vegetation buffer zones to reduce discomfort caused by strong winds.
- Create a safe, functional and aesthetically pleasing environment for people to play, recreate and visit.
- Design a landscape for the long term that minimises irrigation and maintenance.
- Plant shade trees in car park areas to shade both cars and hard surfaces when the bays are empty.
- Explore water sensitive design features integrated with shade and vegetation to provide evaporative cooling effects.

Landscape Context Source: Google

Existing Site Vegetation & Landscape Character

Existing informal mature trees along Hamilton Road.

Existing mature trees next to the netball courts.

Existing AFL Oval, south edge of WanangkuraStadium and mature trees in the

Typical natural Spinifex landscape around South hedland.

Existing Landscape

Landscape Masterplan

A landscape masterplan has been developed using principles set out at the beginning. Refer legends for landscape features proposed in the masterplan.

Circulation System

A hierarchy path system connects the different precincts of the site. Shaded trees are planted along the main path to provide amenity for the users. Different tree species selected by route will help inform the wayfinding strategy.

Planting Character Zones

Plant species are selected based on water usage and reinforced local landscape character. The mass planting and tree arrangement illustrated in this masterplan are based on a number of integrated principles to produce an attractive, distinctive and inclusive place which celebrates the South Heldland's character and identity.

Irrigation Zones

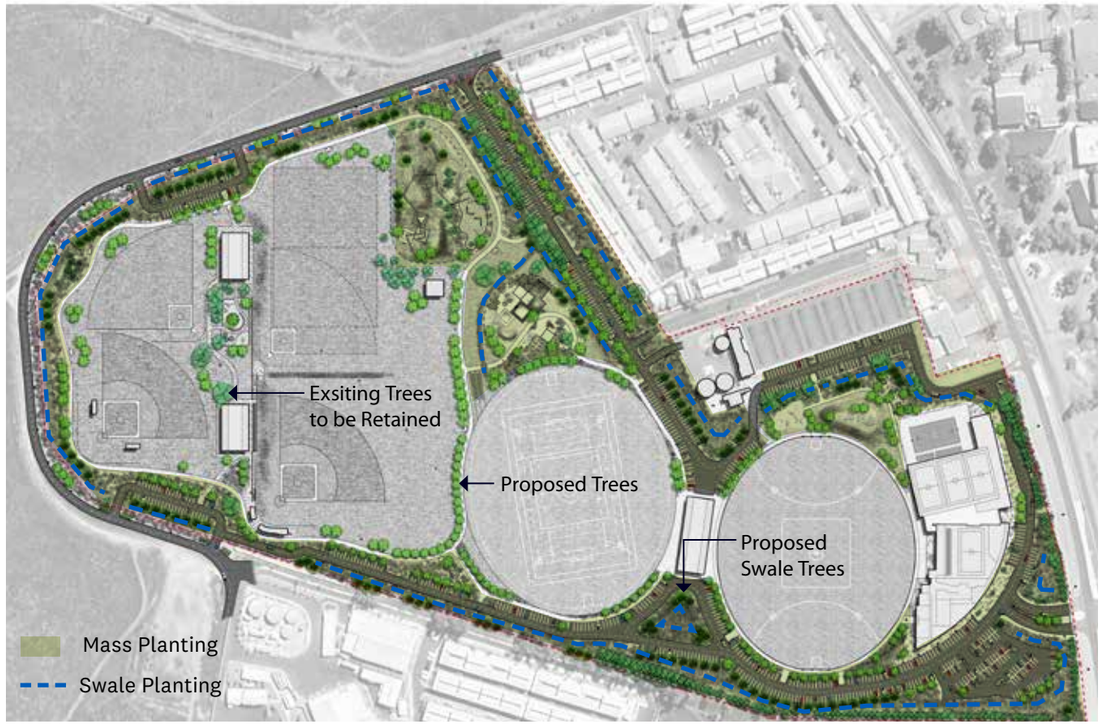
The two formal playfiled are permanent irrigated with high frequency. Softball fields are permanent irrigated with low frequency. Other garden beds and turfed area are set up with establishment irrigation only and WSUD (water sensitive urban design) principles are applied elsewhere to minimise water usage and recycle rainwater.

Feature Areas

The following feature areas are presented using precedent images :

1. Dog Park
2. Adventure Playground

Circulation Diagram



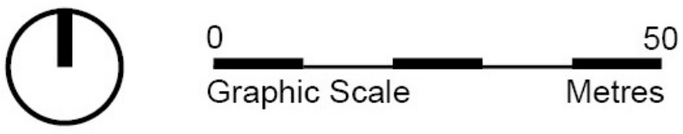
Planting Diagram

Irrigation Diagram

Landscape Detailed Area 1 - Dog Park

Dog Park

The dog park area includes informal play areas with a sculpted and mounded terrain. A range of different surfaces are arranged into ‘pods’ including beach sand, red earth, long grass, turf and gravel beds. Obstacles are arranged around a circuit to allow both dogs and other users form different experiences around the park. Shade is provided by canopy trees and small shade structures. The area is fenced to allow off-leash activity.



Landscape Detailed Area 2 - Adventure Playground

Adventure Playground

The adventure playground area includes both formal and informal play areas with cubic inspired arrangement of play-spaces and equipment. A range of user experiences are organised along the pathway, allowing both incidental and prolonged usage periods. The area includes softfall made of different materials including beach sand, play mulch and rubberised, coloured rebound material. Garden beds with wildflowers and herbs are planted close to activity areas to encourage sensory experience. The area will accommodate all ages of users from young children through to early teenagers by providing a range of equipment including talking tubes, a spinner, monkey bars, climbing frame, slide and fort. Shade is provided by canopy trees and small shade structures. The area is fenced to allow a secure play environment.

Family Areas

The Family Area includes both formal and informal play areas together with seating areas, picnic tables, barbeques, passive resting areas and equipment. A range of functions are provided in these areas allowing long duration and comfortable stays. The area includes softfall of play mulch and is close enough to the basketball court to allow spill over activity in that area. Garden beds with lush bushes and shade trees are planted close to activity areas to provide green respite and shady zones to sit in. The area will accommodate family groups by providing a setting of comfortable meeting and talking places that are close to the car park area to allow easy packing and unpacking of picnics. Shade is provided by both large and small shade structures as well as the canopy trees. The area is unfenced to allow spill-over into adjacent areas.

0 50
Graphic Scale Metres

Landscape Detailed Area 4 - Fitness Stations

8 or 9 fitness stations including shade structures and drinking fountains

Fitness Stations

The Fitness Stations include exercise equipment that is arranged along a series of nodes within the parkland to encourage the completion of a ‘fitness circuit’. Fitness stations will have shade structures, water supply and seating to allow siting areas for recovery. A range of exercise types are provided to allow all-ages use and encourage comfortable participation in health and fitness activity by the community.

Fitness trail to follow proposed shared path around the entire sports area. Footpath to be a minimum of 3.5m wide to allow accessibility to emergency vehicles.

0 50
Graphic Scale Metres

Planting Strategy

Proposed Native Plant Species

BOTANICAL NAME	COMMON NAME	MATURE HEIGHT (m)
TREES		
Acacia coriacea	Dogwood Wattle	10
Brachychiton acuminatus		6
Cupaniopsis anacardiodes	Tuckeroo	10
Corymbia hamersleyana	Hamersley bloodwood	10
Acacia inaequilatera	Kanji Bush	6
Hakea lorea	Bootlace Oak	5
Eucalyptus Victrix	Smooth-barked Coolibah	6
Brachychiton rupestris	Bottle Tree	16
Erythrina vespertilio	Batwing Coral Tree	10
Eucalyptus wandoo	Wandoo	12
Kingia australis	Bullanock	4
Pittosporum angustifolium	Butterbush	4
Xanthorrhoea preissii	Balga	3
SHRUBS		
Acacia colei	Coles Wattle	0.4
Acacia dictyophleba	Waxy Wattle	1
Acacia eriopeda	Pindan Wattle	1.2
Acacia hilliana	Hill's Tabletop Wattle	2
Acacia Ligulata	Dune Wattle	0.8
Acacia synchronicia	Pilbara Weeping Wattle	3
Acacia stellaticeps	Northern Star Wattle	1.5
Acacia maitlandii	Maitland's Wattle	3
Acacia trachycarpa	Minni Ritchi	1
Acacia tumida	Pilbara Pindan Wattle	5
Hypocalymma angustifolium	Pink-flowered Myrtle	1.2
Ricinocarpos undulatus	Wedding Bush	1.5
Styphelia tenuiflora	Common Pinheath	0.6
Tetratheca hirsuta	Black Eyed Susan	0.5
Verticordia forrestii	Forrest's Featherflower	1.2
GROUND COVERS		
Acacia bivenosa	Two-nerved Wattle	0.4
Eleocharis papillosa	Dwarf Desert Spike Rush	0.2
Hibertia scandens	Snake Vine	0.2
Grevillea stenobotrya	Rattle-pod Grevillea	0.1
Ptilotus latifolius	Tangled Mulla Mulla	0.3
Hemiandra pungens	Snakebush	0.2
Tecticornia auriculata	Samphire	0.1
Triodia epactia	Soft Spinifex	0.5
Scaevola spinescens	Currant Bush	0.4

Proposed Exotic Plant Species

BOTANICAL NAME	COMMON NAME	MATURE HEIGHT (m)
TREES		
Tipuana tipu		10
Delonix regia		8
SHRUBS		
Strelitzia reginae	Bird of Paradise	1.5
Cymbopogan ambigus	Lemon Scented Grass	1
Senna artimisioides	Silver Senna	2
Scaevola crassifolia	Cushion Fan Flower	1.2
Ptilotus nobilis	Yellow Talis	1
GROUND COVERS		
Myoporum parvifoliyum	Creeping Boobialla	0.3
Swainsona formosa	Desert Pea	0.4

Native Plant Images

Brachychiton rupestris

Eucalyptus victrix

Eucalyptus wandoo

Exotic Plant Images

Tipuana tipu

Kingia australis

Acacia Ligulata

Tetratheca hirsuta

Delonix regia

Hibertia scandens

Grevillea stenobotrya

Scaevola spinescens

Strelitzia reginae

Economic Development Report

1 Introduction .....

2 Social and Economic Profile of Port Hedland .....

3 The Proposed Redevelopment .....

4 Impact of Expenditure .....

5 Cost Benefit Analysis .....

6 Spatial Analysis .....

Disclaimer: This study, while embodying the best efforts of the investigator is but an expression of the issues considered most relevant, and neither Cole Advisory nor the investigator can be held responsible for any consequences that ensue from the use of the information in this report. Neither Cole Advisory nor the investigator make any warranty or guarantee regarding the contents of the report, and any warranty or guarantee is disavowed except to the extent that statute makes it unavoidable.

1 Introduction

The Town of Port Hedland has identified a long term need for vastly improved sporting and recreation facilities, especially in South Hedland. Whilst sporting facilities currently exist, they are either towards the end of their useful lives, inadequate for the community needs or in a poor state of repair.

Whilst Port Hedland is a relatively wealthy population in general, with a median household income well in excess of the State and national media, there are many pockets of disadvantaged with an above average level of youth unemployment, a high proportion of residents with mental and behavioural problems, above average rates of obesity, and above average rates of many chronic diseases and health risk factors.

Accordingly, the Town of Port Hedland has commissioned a team led by Caribiner Architects and Planners to prepare a comprehensive master plan for the South Hedland Integrated Sporting Precinct. Cole Advisory is pleased to be a part of that team to undertake an independent economic analysis of the proposed precinct.

There are two broad ways in which the economic impact of the proposed development could be assessed. The first is to model the impact of the proposal on local economic activity. This provides good information on the changes to local employment and value added, but does not capture any of the non-market impacts of the proposal such as improvements to health or changes in the enjoyment local residents get out of participating in or viewing sport. The second approach is to undertake a cost benefit analysis. This allows non-market impacts of the proposal to be assessed (and, where possible, monetised) relative to its costs, but does not capture the impact of direct project expenditures on the local region.

Each of the approaches to assessing the project are included in this report, with the results reported in Sections 4 and 5.

These two approaches are complementary in that they assess the impacts from different perspectives, but they are not in any sense additive.

2 Social and Economic Profile of Port Hedland

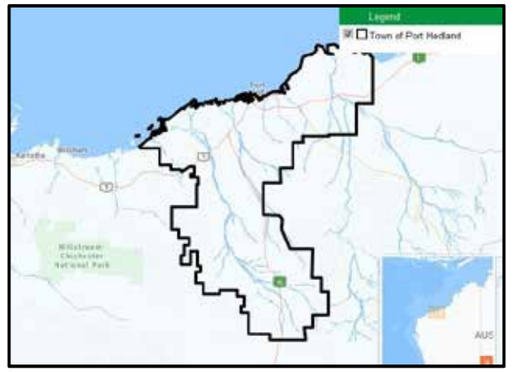
2.1 Overview

The Town of Port Hedland, a place known to the traditional owners as Marapikurrinya, is situated in the Pilbara Region of Western Australia, approximately 1,800 kilometres North of Perth. The local government area includes the residential centres of Port Hedland and South Hedland, as well as the port itself, which includes Australia's largest bulk export facility as well as substantial rail transport facilities, servicing the resources industries, and supporting over 450 million tonnes of throughput. Port Hedland's major industrial precinct, the Wedgefield Industrial Area, accommodates a range of light industries and supporting industries.

Most of the population resides in the suburb of South Hedland which is also the location of the subject sporting precinct.

2.2 Geography

Figure 1 Port Hedland Economic Area



Source: economy id

The Town of Port Hedland local authority area covers an area of over 18,000 km^2 (0.7 per cent of Western Australia's land area) (see Table 1). Port Hedland is located 1,800 kilometres north of Perth. The town includes two residential suburbs, Port Hedland and South Hedland, with the balance of the council area comprised of sparsely populated "Districts".

Table 1 Geography, Town of Port Hedland, Western Australia, 2018

	Port Hedland and Districts	Western Australia
Area (sq/km)	18,000	2,525,500
Per cent of state area (sq/km)	0.7	100
Population density	0.8	1.0

Source: ABS, Regional Population Growth Australia 2017-18, Cat No. 3218.0.

2.3 Population

As of 30 June 2018, the Town of Port Hedland had an Estimated Resident Population (ERP) of 14,975 persons comprising 0.58 per cent of Western Australia's population (see Table 2). As at 30 June 2018 the ERP of Port Hedland and South Hedland was 14,320 persons, accounting for 95.6 per cent of population in the council area.

The Town of Port Hedland lags behind Western Australia in terms of population growth. Over the ten year period between 2005 and 2014, the population of the Town of Port Hedland grew by 0.8 per cent compared with 9.5 per cent across Western Australia. Flat population growth in the council area relative to the rest of the state over the prior ten years likely reflects local economic factors and labour market conditions − lack of employment opportunities and rising unemployment, accentuated by the end of a number of construction cycles at mineral developments in the region. Consequently there is outward migration of labour from the region to Perth, other regional centres, interstate and overseas.

Table 2 Estimated resident population, Town of Port Hedland, Western Australia, 2018

	Port Hedland	South Hedland	Town of Port Hedland	Western Australia
Estimated Resident Population	4,469	9,851	14,975	2,595,192
Per cent of state ERP	0.17%	0.38%	0.58%	100.00%
Change in ERP 2017-18	-14	54	+17	20,999
Change in ERP 2017-18 (%)	-0.31%	0.55%	0.11%	0.80%

Source: ABS (2018), Regional Population Growth Australia, Cat No. 3218.0.

2.4 Economy

Port Hedland's economy is dominated by the mining sectors and associated port activities.

Pilbara Ports Authority operates the major port which predominantly exports iron ore. The port also carries exports of salt and manganese.

Median total personal income in Port Hedland in 2016 was $1,361/week, which is almost double that of the State (see Table 3).

Table 3 Income, Port Hedland, Western Australia, Australia, Census 2016, ABS 2016 Quickstats

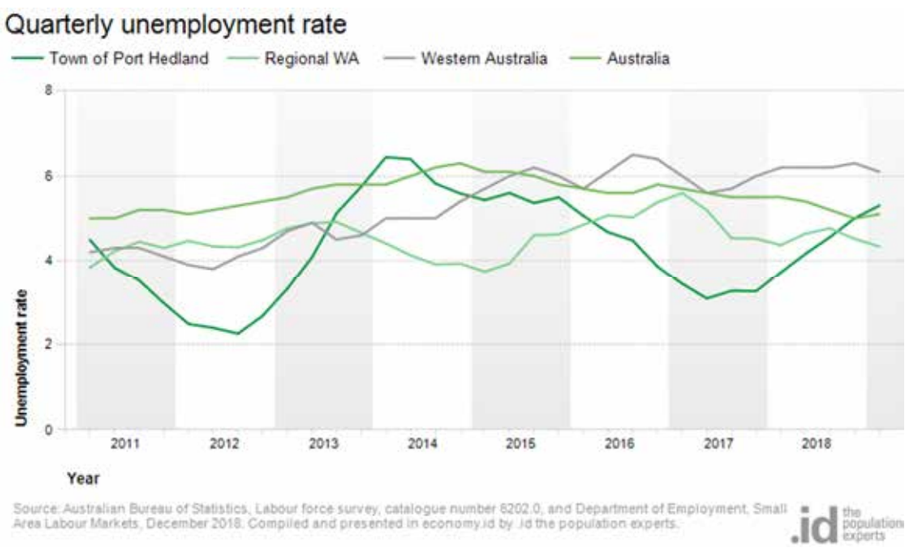
	Port Hedland	Western Australia	Australia
Median total personal income - $/week (2016)	1,361	724	662
Median total household income - $/week (2016)	2,578	1,595	1,438

Primary determinants of income are skill level, qualifications and occupation, with skilled employees receiving higher remuneration than unskilled or semi-skilled workers. In addition, the industry structure is also likely to be a contributory factor. The occupational profile of Port Hedland has a significantly higher proportion of persons working within the mining sector.

2.5 Labour force

Estimates for the rate of unemployment indicate Port Hedland's labour market is performing better than the state average, but not as well as the National average. As at the March quarter of 2019 the rate of unemployment for Port Hedland was 5.3 per cent compared with 6.1 per cent across Western Australia and 5.1 per cent Australia wide (see Figure 2). The graph shows a definite cyclical nature of Port Hedland's unemployment rate, usually coinciding with the positive mining economy and construction cycles.

Figure 2 Quarterly Unemployment ABS, Labour Force Survey, Cat. 6202.0

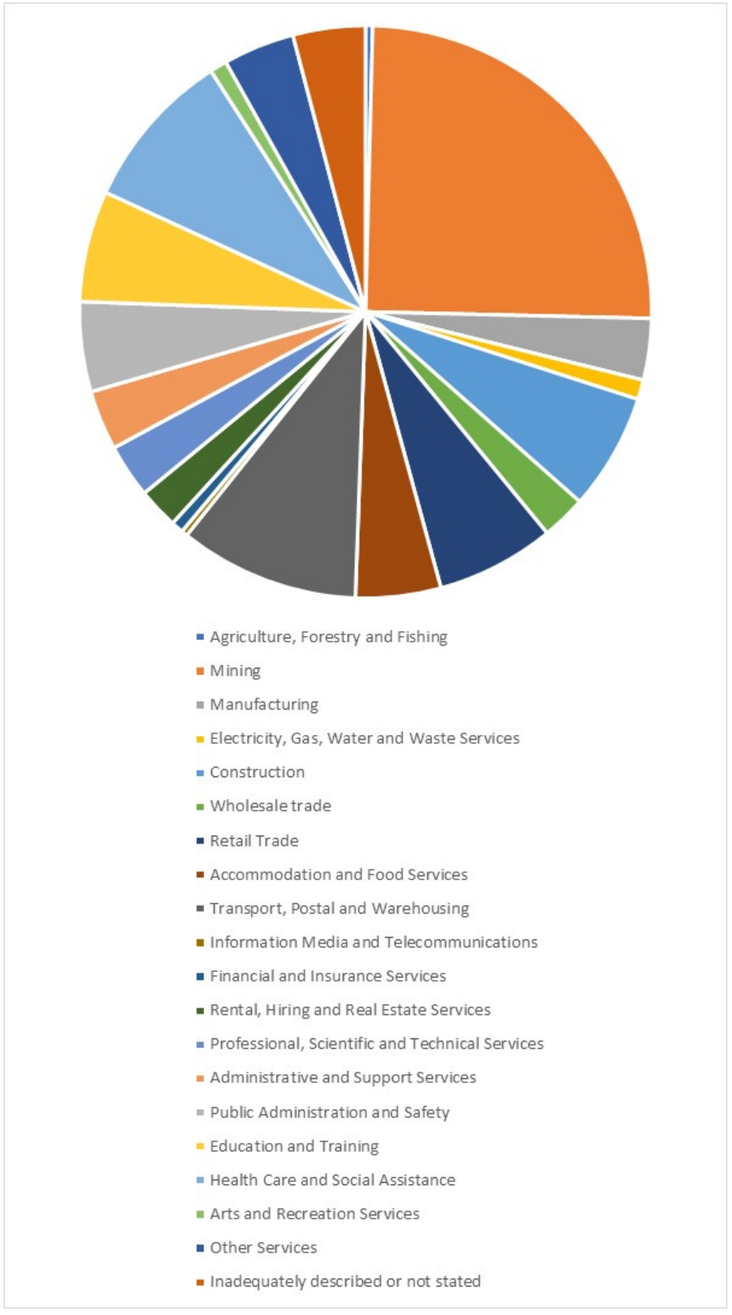


As of 30 June 2018, there were 10,629 local jobs in Port Hedland, compared to 7,415 employed residents. This represents a ratio of 1.43 jobs to residents, an understandable ratio based on the significant FIFO element of the workforce in North-Western Australia.

2.6 Employing industries

Port Hedland employment is dominated by the mining (25%), transport (10.2%) and healthcare (9.1%) industries. Other industries include construction, retail and education/training (see Figure 3).

Figure 3 Employment by industry, Port Hedland, Census 2016



Source: ABS (2016).

2.7 Social disadvantage

The relative socio-economic advantage or disadvantage of statistical regions in Australia is assessed by the ABS using a scoring system known as the Social Economic Indexes for Areas (SEIFA). The SEIFA is standardised such that the average score is 1000, lower scores indicate higher rates of relative disadvantage and vice versa. The Port Hedland statistical area has a SEIFA score of 1019 (ABS 2016) indicating that the area is roughly around the average level of advantage/disadvantage as the entire population of Australia. Indicators from the Social Health Atlas (PHIDU, 2018) indicate equivalent rates of social and economic disadvantage in the Town of Port Hedland compared to Western Australia and Australia (see Table 4). The Town of Port Hedland had a slightly higher proportion of long-term unemployed and youth unemployed (16-24 year olds receiving an unemployment benefit) compared to the state and national average. The Town also maintains a higher level of children within low-income, welfare-dependent families.

Table 4 Social and economic disadvantage, Port Hedland, Western Australia, Australia, 2017

Indicator	Port Hedland	Western Australia	Australia
SEIFA	1019	1016	1000
Age pensioners[1]	45.6%	61.3%	63.6%
People receiving an unemployment benefit longer than 6 months[2]	5%	4.5%	4.3%
Persons aged 16-24 years receiving an unemployment benefit[3]	4.4%	4.0%	3.4%
Children in low income, welfare-dependent families[4]	23.4%	19.5%	20.9%
Pensioner concession card holders[5]	8.7%	16.8%	20.3%

Source: PHIDU (2018) Social Health Atlas of Australia, Local Government Areas, Western Australia, June 2018 release.

It is vitally important to continue to maintain facilities to support those with a social and/or economic disadvantage. The redevelopment of the South Hedland Sporting Precinct Such facilities

2.8 Health

Residents of the Town of Port Hedland have higher levels of self-assessed health, higher rates of many health risk factors such as obesity, and higher rates of many forms of chronic disease (see Table 5). The standout however is that the population has a higher level of mental and behavioural problems. The data on which the estimates are based are self-reported data, reported to interviewers in the National Health Survey, undertaken by Torren University.

Table 5 Health and wellbeing, Town of Port Hedland

Indicator - Age standardised rate per 100 persons	Port Hedland	Western Australia	Australia
Youth Mortality			
Death of Persons aged 15-24 years, 2011-15[6]	161.2	125.6	100.0
Health status			

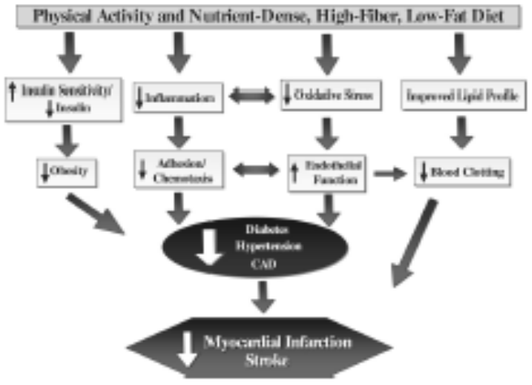
[1] Percent of persons aged 65 years and over at 30 June 2017
[2] Percent of people aged 16 to 64 years
[3] Percent of people aged 16 to 24 years
[4] Percent of all children under 16 years of age
[5] Percent of people aged 15 years and over
[6] All deaths of people aged 15-24 years compared to population aged 15-24 years

Indicator - Age standardised rate per 100 persons	Port Hedland	Western Australia	Australia
Self-assessed health status of fair or poor (persons aged over 15 years)	14.0%	12.9%	14.8%
Estimated population with chronic diseases 2014-15			
Diabetes mellitus (persons aged over 15 years)	4.7%	4.5%	4.4%
High blood cholesterol (persons aged over 18 years)	32.8%	34.8%	32.8%
Estimated total population with mental and behavioural problems	19.9%	14.4%	17.5%
Circulatory diseases - persons aged two years and over	17.4%	15.8%	18.3%
Heart, stroke and vascular diseases	4.1%	4.6%	5.2%
Respiratory diseases	30.8%	30.1%	30.8%
Asthma	9.1%	9.5%	10.8%
Musculoskeletal diseases	29.8%	28.8%	29.9%
Arthritis	15.8%	13.5%	15.3%
Estimates of risk factors 2014-15 (persons aged 18 years and over)			
Low or no exercise in the past week	61.5%	62.8%	66.3%
Total population who were overweight (but not obese)	35.9%	35.8%	35.5%
Total population who were obese	26.2%	24.6%	27.9%

Source: PHIDU (2018) Social Health Atlas of Australia, Local Government Areas, Western Australia, June 2018 release.

It is well-documented the value of sport and recreation in relieving the impacts of chronic diseases and mental health. In their article in the Journal of Applied Physiology, CK Roberts and RJ Barnard specifically noted the benefits of diet and physical activity on the risks of hypertension, diabetes and cardiovascular disease, recommending at least 30 minutes of physical activity per day.

Figure 4 Mechanism by which physical activity and diet reduce the risk of coronary artery disease, hypertension and diabetes[7]



The proposed master plan provides a much more enhanced group of sport and recreation facilities, with a wider range of recreational activities available and more user-friendly facilities. This is likely to attract a greater amount of users, thereby addressing the health needs of a much larger number of the population.

3 The Proposed Redevelopment

Current sports facilities in Port Hedland are either aged or are inadequate for the needs of the community. Council maintenance costs are relatively high and expected to increase in the future. There is therefore a need for modern sports and leisure facilities, as well as a specific destination for sports and recreation within South Hedland.

When sports facilities were established in Port Hedland (at least 30 years ago for many facilities) they were not so much planned as evolved, the result is that facilities are spread throughout Port Hedland.

[7] Effects of exercise and diet on chronic disease, CK Roberts and RJ Barnard, J Appl Physiol 98, 3-3-, 2005

As such, the proposal includes relocating many facilities to the same precinct, and arranging them in such a manner as to encourage economic and social activation of the precinct.

Figure 5 South Hedland Integrated Sporting Precinct Master Plan

Redevelopment in accordance with the proposed master plan will make it possible to host more sports at the precinct. Improving the walking/cycling track currently at the site will enable greater recreational participation. South Hedland Integrated Sporting Precinct will be upgraded with new lighting, new parking, upgrades to the grandstand and Wanangkura Stadium. New clubrooms will be built on site to service the needs of clubs. The Dogs Park and Kids Playground areas will attract new recreational users.

The new precinct will incorporate the latest technology in terms of turf, lighting, circulation and sporting facilities. This in turn will result in a reduction in maintenance costs, and a longer life for the facilities.

Wanangkura Stadium will be expanded, allowing for greater use by indoor sporting teams, including basketball, volleyball, netball. Also, the provision of a specific space for some sports, eg basketball, will mean that their equipment can be permanently set up as opposed to the current situation where equipment must be set up and taken down for each session.

4 Impact of Expenditure

4.1 Assessing economic impact

The economic impact analysis is concerned with estimating the net new economic activity that may occur within Port Hedland as a result of the development of the South Hedland Integrated Sporting Precinct.

Economic Activity arises from two principal sources – the establishment of the park and ongoing expenditure from operations. In calculating economic activity, the direct and indirect flows of activity (see Figure 6) have been taken into account.

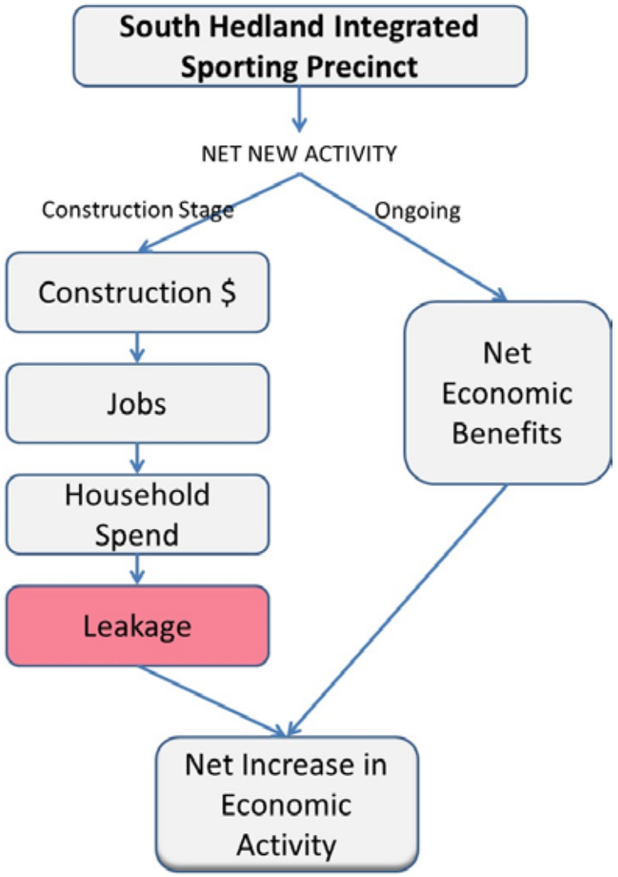


Figure 6 – Economic Flows Diagram

The redevelopment and integration of the South Hedland Sporting Precinct is expected to provide economic benefits to the Town of Port Hedland in two ways –

1. the expenditure on construction of the various elements of the Integrated Sporting Precinct will inject direct and indirect funds into the local economy – jobs will be created, supplies will be purchased, manufacturers and local contractors will be engaged (direct) and in turn those monies will be spent within the local economy (indirect). Some expenditure will occur outside the local economy (leakage), and this is taken into account in determining the net increase in local economic activity.
2. Ongoing jobs will be created, and substantial economic benefits will accrue to the Town of Port Hedland through improvements in efficiencies, the health of the population, value uplifts and smarter, more resilient facilities.

Accordingly, the net economic gain to the Town of Port Hedland by virtue of this new development has been calculated.

Broadly speaking, the economic impact assessment is concerned with estimating the additional employment and expenditure that can be generated in the local economy as a result of the introduction of a new economic driver.

In 2002, the Australian Bureau of Statistics published information as to the construction industry's flow-on effects to other economic activity (otherwise known as "multiplier effect"). This paper identified that, for every $1 million spent on construction in 1996-97, up to 37 job years would be created in the National Economy. This consisted of:

o The initial effect – an initial $1 million of extra output of the construction industry, and related employment in the industry to produce that output;

o A production induced effect – the combination of:

o the first-round effect - the amount of output and employment required from all industries that supply goods and services to the construction industry in order for that industry to produce the initial $1 million of extra output;

o an industrial support effect - the induced extra output and employment from all industries to support the production of the first-round effect;

o a consumption induced effect - the subsequent inducement for extra output and employment due to increased spending by the wage and salary earners across all industries arising from the compensation received for their labour as part of the other effects above.

The intuition of the approach is best illustrated by example. Suppose the Town of Port Hedland spends $1,000 on landscaping services from a local contractor. That landscaping contractor then uses the $1,000 to purchase inputs from "primary" and "intermediate" suppliers. "Primary" suppliers are employees, providers of capital, indirect taxation, and "imports" from suppliers of goods and services located outside of the Port Hedland region. Primary income payments are therefore labour compensation (wages), profits to owners, indirect taxes (net of subsidies) and imports. The landscaping contractor will also purchase inputs (e.g., fuel, plants, soil, tools etc.) from intermediate suppliers in the Town of Port Hedland which, by and large, are other business. Payments to those business enterprises then flow to their own primary incomes and intermediate suppliers. And this process carries on repeatedly, with ultimately all of the payments flowing to primary incomes. The economic impact analysis lets us trace through, and aggregate, this chain of impacts.

As this economic analysis relates only to the local economy of Port Hedland, we have taken account of only the initial effect (9 job years) and the first-round effect (3 job years), amounting to a total of 12 job years per $1 million of construction spend. This has been adjusted for the difference in value of money between 1996 and 2015, and between Perth and Port Hedland.

The resulting job effect, averaged between the initial and first round effect, will be calculated once the cost of construction and construction timeframe have been established.

Since construction is estimated to extend over a multi-year period, the job effect per annum will be calculated.

4.1.1 Limitations of the Approach

There are some important limitations associated with above approach that should be considered when interpreting the results of the analysis.

Box 4.1 Input-output multipliers

An increase in the output of one industry will (at least in gross terms) lead to increased outputs in other sectors due to the purchases for intermediate inputs to production, and the spending of capital and labour income locally. A multiplier measures the total change across the entire regional economy arising from a unit change in the final demand for the output of an industry (the initial "shock" to the model). Multipliers can be calculated for a range for economic variables, such as individual and business income, gross value added, and employment, according to one's interest.

In some cases the interest in the model results will be restricted to Type I impacts, also known as the production impact. This is the impact of the initial expenditure traced through the chain of intermediate good usage for the relevant industry sectors. However, no allowance is made for the expenditure of primary incomes (e.g. increases in local wage and capital income arising from the change in production). The total impact of an output change is derived from the production and consumption impacts. The consumption impact arises when primary factors − e.g. households in receipt of wage income − spend the incomes that they receive.

Most importantly, the results represent the ***gross*** impacts in the absence of capacity constraints. In reality, except in economic downturns where there is substantial unused labour and capital, anything that boosts one form of economic activity is likely to increase wages and returns to capital to attract the additional resources it needs, this in turn leads to reduced economic activity in other sectors or regions. At the national level, the net impact of any new project on employment is likely to only be a small fraction of the gross impact when the national economy is close to full employment, with the benefits coming through increased wages and increased returns to capital. At the regional level (particularly for small regions) net impacts can be much closer to gross impacts as labour and capital can be drawn in from surrounding regions, and there can be existing unemployed labour and capital.

Secondly, an input-output analysis assumes that the industrial structure of the pre-existing regional economy remains unchanged as a result of the new project. This will not necessarily be the case as the structure of the regional economy can change to take advantage of the opportunities arising from the new project. For example, the extent to which mining companies in Western Australia have to source specialist business and financial services from firms interstate is much lower than it was 30 years ago as firms have opened offices in Perth to take advantage of the opportunities arising from Western Australia's resources boom.

Given the scale of the proposed development, and its complementary nature to the existing industry structure of Port Hedland, this limitation is unlikely to be significant.

Finally, in interpreting the modelling impact on employment it should be noted that the estimates of the model effectively represents an increase in estimated hours worked which has been converted to full-time equivalent positions. In many cases the modelled impact (to the extent that the net impact matches the gross impact) will occur through increases in the hours worked by existing employees rather than the creation of new positions.

4.2 Construction Phase Employment

The estimated total spending on construction will occur over a period of time. Total employment during construction will be **calculated once the cost of construction and construction timeframe have been established.**

Given the current level of unemployment in Port Hedland (see Section 2.5) it is regarded as unlikely that the construction activity associate with the redevelopment would cause wage pressures in the local labour market. As such, the net impacts are likely to match the gross impacts.

4.3 Operational Phase

Any change to direct employment in the operational phase, and the extent to which it represents a net increase in total activity is currently unknown and is therefore not included in this analysis.

The redevelopment will give the Town of Port Hedland much greater scope to host sporting events with the potential to attract intrastate and interstate visitors, such as the Masters Games, AFL NAB cup matches, junior and amateur baseball and soccer tournaments, and gymnastics events and competitions. Potential attendance at these events (based on past events) could be around 3,000 visitors for each large-scale event staged at the Precinct, and 1,200 visitors for a smaller event (eg regional netball competition). We have assumed, after consultation with Council, that 2 larger events and 3 smaller events would be able to be secured each year once the redevelopment is completed.

The value of spending associated with these visitor numbers has been calculated using data from the Pilbara Development Commission[8] on the average spend per visitor night in the Pilbara ($110 per night). This gives a total impact of $1.4 million.

Table 6 Annual Visitor Expenditure - Events

Event	Number	Visitors per Event	Nights per Visitor	Total Nights	Spend per Night	Total Spend per Annum
Large	2	3,000	1.5	9,000	$110.00	$990,000.00
Small	3	1,200	1	3,600	$110.00	$396,000.00
TOTAL				12,600		$1,386,000.00

Given the irregular nature of the impacts from event tourism the increases in employment will be larger during the events and lower for the remainder of the year. Businesses are likely to adjust to this through a combination of taking on additional casual employees around an event and through increasing the hours of existing workers.

5 Cost Benefit Analysis

5.1 Methodology

The cost benefit analysis is an economic evaluation, which aims to value costs and benefits of the project for the broad community, irrespective of the incidence of those costs and benefits. A financial analysis, in contrast, focuses on impacts from the point of view of a particular stakeholder.

For the purposes of the economic evaluation we are interested in the value of resources (broadly defined) that are created or consumed. Although information about transactions may be used to value resources, we are not directly interested in transactions that occur. For example, any State Government subsidy to the project is not regarded as a benefit of the project; the benefit lies in the service stream produced by the project. Nonetheless, it can be useful to show transactions in the cost benefit analysis in order to observe the financial impact on particular stakeholders.

The approach taken for the Cost Benefit Analysis is consistent with the guidelines issued by the Australian Government.

The cost benefit analysis was conducted over a period of 25 years commencing in 2020/21. A real discount rate of 7 per cent was applied to the analysis. A residual asset value is included so as to make allowance for the service provided beyond that time.

It has been assumed that the construction activity is spread over the first three years of the analysis period starting in 2020/21 with the new facilities available for community use at the start of 2022/23.

The analysis is conducted in real terms and all cash flows are entered in 2019/20 prices. Therefore no assumptions need to be made about actual inflation outcomes.

Only first round impacts of establishing a new facility are considered. This is done in order to avoid any potentially contentious issues arising from multiplier effects, and difficulties in identifying the extent to which any changes represent a net increase in spending rather than a transfer between uses. A multiplier analysis exploring the potential gross employment and gross value added impacts of the project is provided in Section 4.

5.2 Results of the cost benefit analysis

To be inserted once the detailed costs of construction and ongoing operating costs have been established.

[8] Source: REMPLAN tourism estimates based on TRA 2017 Local Government Area Tourism Profile; East Pilbara (S), Port Hedland (T), Ashburton (S) & Karratha (C) - weighted averages - Domestic overnight & International visitors. TRA Sep 2018 National & International Visitor Surveys; Western Australia - Domestic day visitors.

5.3 Parameters used to assess the base case scenario

The base case scenario is a business as usual scenario. Only necessary expenditures are made. In the base case, some facilities will need modifications to so they meet current building and safety standards. The base case assumes that usage at sports facilities remains unchanged.

5.3.1 Upgrade costs (cost item)

Current sporting facilities in Port Hedland are aged but functional, although not necessarily best fit for purpose. An example of this is the current changerooms for the Kevin Scott Oval, at the rear of the Wanangkura Stadium, which do not provide adequate changeroom facilities for players, opponents and umpires. The grandstand is also inadequate, in that it does not incorporate hospitality facilities, and faces directly into the sun at playing times.

The walking track within the precinct is inadequately lit, and therefore rarely used after dusk.

The following modifications are necessary:

- upgrade to the clubrooms;
- upgrades to the grandstand;
- upgrade change rooms;
- new lighting.

These costs need to be determined.

5.3.2 Ongoing operating costs (cost item)

If the base case proceeds, council will incur maintenance costs on Wanangkura Stadium, Kevin Scott Oval, Maire Marland Reserve and Faye Gladstone Netball Courts. Council will provide estimates of these costs. These costs occur annually from year 1 and are assumed to remain constant in real terms.

The Town of Port Hedland would incur these costs.

5.3.3 User fees charged to clubs (transfer)

Council currently charges minimal amounts to some clubs to use facilities. Under the base case these charges will be unchanged. This is a transfer from sporting clubs to the Town of Port Hedland and is netted out in the analysis.

5.3.4 Value of participation in sports undertaken at South Hedland Integrated Sporting Precinct (benefit item)

Participation in sport at the precinct was estimated from data provided by the council on membership of the respective clubs and the length of sporting seasons.

Responses were received as shown in Table 7.

Table 7 South Hedland Sports Participant Survey

Club/Association	Location	Total Social and Participating Members	Participants		Spectators
			Adults	Children (under 18)	
South Hedland Swans Football Club	Kevin Scott Oval/Wanangkurra stadium	200	160	40	200-1500
Port Hedland Netball Association	Faye Gladstone Netball Courts	365	185	180	Approx 60
Hedland Touch Association	Marie Marland Reserve	197	147	50	50
Port Hedland Cricket Association	Kevin Scott Oval	178	80	98	100
	Colin Matheson Oval	20	20	1	20
Goodline PT	Marie Marland Reserve and Kevin Scott Oval				
Hedland Squash Club	Wanangkura Stadium	We are in recession for now			
Hedland Water Polo	South Hedland Acquatic Centre	248	77	171	50-150
Hedland Gymnastic Club	Hedland Gymnastics Club - 8 Harwell Way, Wedgefield	275	25	250	75+ parent spectators over various
All Hedland Basketball Association	Wanangkura Stadium	130	nil	120	20-40
YMCA	Wanangkura Stadium	105723 p.a	70723	15000	200000
Port Hedland Baseball Association	Marie Marland Reserve	130	80	50	50
Port Hedland Softball Association	MMR	250	100	50	10
South Hedand Cougars Rugby League Football Club	Marie Marland Reserve (Soccer/Rugby Field 2)	90	40		

The value of participation in sports contains two elements, the intangible value of the activity to participants and the health benefits they receive from being physically active.

In the absence of contingent valuation studies on the value placed on sports, we have valued participation based on the time spent playing and training. This is likely to underestimate the value of participation in sport as it effectively assumes that the value of participation is only equal to the value of the time spent, whereas for many players it will be higher.

The value of participants' time is based on the value of time as recommended by Volunteering WA ($23-41 per hour.

The annual health benefit of being physically active is assumed to be $500 in 1998 US dollars[9]. This was converted to a weekly value and applied per match/game participated in. The value was converted to Australian dollars at the average exchange rate in 1998 (RBA, 2010) and then to nominal 2019 values using the change in nominal GDP per capita (ABS). It was assumed to increase at a real rate of 1.5 per cent thereafter.

It has been estimated that the annual cost of badly managed chronic disease is between $322 million and $1billion per year in Australia. This amounts to at least $13 per person. The potential savings through redevelopment of the sporting precinct to encourage exercise is therefore $210,000 per annum.

Value of Participants Time	**1,410 participants**	**$42,300**
Annual Health Benefit	**105,000 participants pa**	
(gym members)	**420 participants**	**$583,000**
Health Savings	**$13 per person**	**$210,000**

[9] Frontier Economics, "The economic contribution of sport to Australia, prepared for The Australian Sports Commission", November, 2009.

5.3.5 Value of watching sports undertaken at South Hedland Integrated Sporting Precinct (benefit item)

The number of spectators attending sport at the venues in question was estimated from data provided by the council on attendance and the length of sporting seasons.

In the absence of contingent valuation studies on the value placed on viewing sports, we have valued attendance based on the time spent watching the game. This is likely to underestimate the value of watching sport as it effectively assumes that the value is only equal to the value of the time spent, whereas for many spectators it will be higher.

The value of spectators' time is based on the value of time as recommended by Volunteering WA ($23-41 per hour).

Value of Spectators Time	**1,150 spectators**	**$34,500**

5.4 Parameters used to assess the redevelop sporting facilities scenario

The policy option under consideration is the proposed redevelopment of sporting and recreation facilities in the South Hedland Integrated Sporting Precinct. Current sporting facilities are beyond their useable life.

5.4.1 Capital works (cost item)

Cost of capital works is not available at this stage.

The Town of Port Hedland would pay these costs.

5.4.2 Operating costs (cost item)

Annual maintenance and operating costs are expected to be 1-2% of capital cost following the redevelopment. The Town of Port Hedland will incur these costs on an annual basis.

Operating costs will be calculated upon receipt of costing and lifecycle information.

5.4.3 Commonwealth government grant (transfer)

It is assumed that the Town of Port Hedland will apply for project funding from the Commonwealth National Stronger Regional Fund. The value of this funding contribution is assumed to be $5 million. This is a transfer from the Commonwealth government to the Town of Port Hedland and is netted out in the analysis.

5.4.4 State government grant (transfer)

It is assumed that the State government will commit $5 million in funding to the project. This will be a transfer from the State government to the Town of Port Hedland and is netted out in the analysis.

5.4.5 Residual asset value (benefit item)

At the end of the analysis period the project will have remaining useable life. A residual asset value is included in the analysis to acknowledge this remaining life. For the purposes of this analysis it is assumed that the useable life of the project is 25 years.

Residual value will be calculated upon receipt of full costing and lifecycle information.

5.4.6 User fees charged to clubs (transfer)

Council will continue to charge sports clubs to use facilities. This is a transfer from sporting clubs to the Town of Port Hedland and is netted out in the analysis.

5.4.7 Function hire of facilities (transfer)

The new facilities will have function facilities available for hire. It is assumed that the annual income from hiring facilities will be $20,000 for the first two years of operation and **$50,000 per year** thereafter. This is an annual transfer from the clubs to council.

5.4.8 Costs of attending functions (transfer)

It is assumed that sporting clubs will charge a margin over the facility hire costs for their functions to raise funds to support their club. In the absence of any clear guide as to the level of this margin it has been assumed that it will mirror the function fees paid to the council. Thus attendees at functions will pay clubs a total of **$40,000 per year**. This is an annual transfer from attendees to the clubs.

5.4.9 Value of additional sports tourism (benefit item)

The redevelopment will give the Town of Port Hedland much greater scope to host sporting events with the potential to attract intrastate and interstate visitors, such as the Masters Games, AFL NAB cup matches, junior and amateur sporting tournaments, and gymnastics events and competitions. Potential attendance at these events (based on past events) could be around 3,000 visitors for each large-scale event staged at the Precinct, and 1,200 visitors for a smaller event (eg regional netball competition). We have assumed, after consultation with Council, that 2 larger events and 3 smaller events would be able to be secured each year once the redevelopment is completed.

The value of spending associated with these visitor numbers has been calculated using data from the Pilbara Development Commission[10] on the average spend per visitor night in the Pilbara ($110 per night). This gives a **total annual impact of $1.4 million**.

Table 8 Annual Visitor Expenditure - Events

Event	Number	Visitors per Event	Nights per Visitor	Total Nights	Spend per Night	Total Spend per Annum
Large	2	3,000	1.5	9,000	$110.00	$990,000.00
Small	3	1,200	1	3,600	$110.00	$396,000.00
TOTAL				12,600		$1,386,000.00

5.4.10 Value of participation in sports (benefit item)

The benefits of participation in sports are calculated on the same basis as for the base case.

[10] Source: REMPLAN tourism estimates based on TRA 2017 Local Government Area Tourism Profile; East Pilbara (S), Port Hedland (T), Ashburton (S) & Karratha (C) - weighted averages - Domestic overnight & International visitors. TRA Sep 2018 National & International Visitor Surveys; Western Australia - Domestic day visitors.

As substantially improved facilities will be available to players it has been assumed that once the redevelopment has been completed participation in each of the sports will increase by 10 per cent, and the participants in recreational activities will increase by 10 per cent.

Value of Participants Time	**1,551 participants**	**$46,530**
Annual Health Benefit	**115,500 participants pa**	
(gym members)	**462 participants**	**$641,300**
Health Savings	**$14 per person**	**$231,000**

5.4.11 Value of watching sports (benefit item)

The benefits of watching sports are calculated on the same basis as for the base case.

As substantially improved facilities will be available to spectators it has been assumed that once the redevelopment has been completed attendance by spectators at each of the sports will increase by 10 per cent.

Value of Spectators Time	**1,265 spectators**	**$37,950**

5.4.12 Income from functions (transfer item)

The new clubrooms buildings will have function facilities allowing sporting clubs to undertake fundraisers. These facilities will be available to the community for hire. In the absence of good data of likely use, it has been assumed that total revenue for sporting clubs will be $40,000 in the first two years of operation and **$100,000 per year** thereafter.

5.4.13 Benefit of attending functions (benefit item)

Attendees at functions hosted by clubs receive a benefit equal to their consumer surplus from the expenditure. It has been assumed that the consumer surplus for attending a sporting club fundraiser or function matches that of charitable donations. Estimates of the consumer surplus from charitable donations vary widely (from 0.5 to 2.0) but a value of 0.7 is a common median estimate.

Using this price elasticity, the value of attending functions is $28,000 for the first two years of operation and **$70,000** thereafter.

5.4.14 Increased population (benefit item)

National and international evidence suggests that improvements to community facilities, including improved sporting facilities, acts to increase migration to a city.

The available data is not sufficient to assess the extent to which the proposed redevelopment will increase Port Hedland's population growth rate.

5.4.15 Increased property values (benefit item)

There is some evidence that redevelopments of sporting infrastructure increase the property values in their immediate surrounds[11].

The Town of Port Hedland has provided a listing of all properties within 1km (walking distance) of the Precinct. This summarised as follows:

[11] Department of Sport and Recreation (Western Australia) 2012, "More than winning: the real value of sport and recreation in Western Australia"

Table 9 Rates for properties within walking distance of precinct

	Total GRV	Rate in Dollar (cents per $)	Total Rates
Residential	$12,946,139	9.6289	$1,246,571
Other	$12,536,414		

Total rates have only been calculated only for residential properties, as these are the only properties that may potentially receive a value uplift from improvement in sporting and recreation facilities at South Hedland Integrated Sporting Precinct.

Using the logic adopted by the Department of Sport and Recreation, there is a potential uplift in rates to the Town of Port Hedland as a result of this development. If such uplift is in the order of 5%, total rates would increase almost **$63,000 per annum**.

6 Summary of Economic Impact

Table 10 Summary of Economic Benefits

	Base Case	Development	Incremental Benefit
CONSTRUCTION CYCLE			
Construction Benefits		TBD	TBD
Construction Jobs		TBD	TBD
ONGOING BENEFITS (Annual)			
Visitors Benefits			$1,386,000
Net Operational Benefits	TBD	TBD	TBD
Value of Participation	$42,300	$46,530	$4,230
Annual Health Benefit	$583,000	$641,300	$58,300
Health Savings	$210,000	$231,000	$21,000
Value of Spectating	$34,500	$37,950	$3,450
Benefit from Functions			$70,000
Potential Rates Uplift		$1,246,571	$1,246,571

Table 10 above provides a summary of the potential benefits to be achieved from the full development of the South Hedland Integrated Sporting Precinct in accordance with the Master Plan.

As well as the potential economic benefits to be achieved through the construction cycle, a total of $2.79 million in economic benefits could be achieved per year from the upgrade and development of the precinct in accordance with the Master Plan.

7 Spatial Analysis

The physical relationship between development elements is an essential driver of economic sustainability of the site as a whole. Providing amenities in the right configuration is important to satisfying the needs of all users, and therefore the investment justification.

The proposed Master Plan for the South Hedland Integrated Sporting Precinct provides a strong purpose of place for the precinct. The economic activation of the precinct is highly dependent upon the appropriate positioning of infrastructure and built form within the precinct, and its relationship to other parts of the precinct.

The Master Plan, in maintaining the entry statement as Wanangkura Stadium, successful provides a place from where the precinct emanates, and from where the various destinations within the precinct can be referenced. This allows the visitor to plan their arrival at the precinct well in advance of their destination.

It is also important that the precinct has been strategically planned for the long term. The strong elements within the precinct, strategically placed to blend recreational and sporting facilities in a manner that ensures their use for the long term, will send the appropriate signal to fringe area landowners and tenants. This area, and its surrounds, will be significantly enhanced by the presence of the new development.

We have identified within Figure 7 below the essential spatial elements of the Master Plan.

Figure 7 Spatial Analysis of Master Plan

7.1 Access – Arrival Points

Decisions about access to any major economic precinct begin five kilometers away from the place. Accordingly arrival points must be planned to create major areas of focus aligning with the following principles:

- Do not allow transport networks to bypass the place;
- Mix of transport nodes is good;
- Arrive at the “front door” of the place, not around the back.

The arrival points, denoted as “A” in Figure 7 above, provide clear points of entry to the precinct. These will be enhanced in the future by the presence of public transport nodes, particularly at Wanangkura Stadium, enabling strong access to the precinct.

7.2 Car Parking and Transport Nodes – Origins

The strategic distribution of car parking throughout the precinct is important to enable access to the wide range of destinations throughout the precinct and to encourage and promote circulation of traffic (vehicle and pedestrian) without interfering with either of these modes of transport.

Car parking is noted as “P” in Figure 7 above.

7.3 Major Attractions – Destinations

It is important that the Master Plan identifies the main destinations throughout the precinct. These destinations have been planned to allow the concurrent use of multiple destinations throughout the precinct while not interfering with the specific attractiveness of each destination.

The Master Plan gives these major destinations special treatment, in that it caters for their specific needs, be that recreational or sporting in nature, and builds the entire centre around them.

Major destinations are identified as “D” in Figure 7 above.

7.4 Pedestrian Movement – Exposure

In achieving economic activation, it is important to channel pedestrian movements throughout the precinct. These are achieved by a strong interrelationship between the elements discussed above.

Economic activation is driven by frequency and concentration of transactions, so it is important to concentrate transactions by pushing people past as many activity corridors as possible. The activity corridors within this precinct are the major destinations, which act as points of interest as pedestrians move throughout the precinct, either on their way to a sporting event or undertaking recreational walking, jogging or cycling.

Pedestrian routes are identified as white arrows in Figure 7 above.

Annex A. Evidence of the Impact of Sports Facilities

Sports have many positive outcomes. These positives accrue not only to people engaged in sports but also to the communities in which they live. Improvements in sports facilities that promote sporting participation will lead to benefits. We summarise these benefits below.

Atherley[12] asserts that sport has a strong role in developing social capital. Improvements in sports on offer should therefore improve the social capital of a community. Putnam[13] states that when social capital is higher places are generally safer, better governed and more prosperous. Further, Tonts[14] refers to sports as a 'glue' that helps keep communities together; sports also create social networks and social bonds. Tonts notes that when a rural Australian town dies out sports clubs are usually the last institutions to close, they tend to last longer than shops, pubs and churches. Such observations show the importance of sports to rural communities in Australia.

Improved sports facilities can be used to attract new residents to towns and they provide alternative places to gather[15].

Frontier Economics[16] noted that there are positive externalities from sport in Australia. These externalities are decreases in the burden of health care funding because of increased mental and physical health, improved social cohesion and improvements in socialisation. Evidence on the relationship between sports and improvements in social cohesion and socialisation is mainly of a qualitative nature. Improvements in social cohesion improve the way in which relationships between members of a community are formed. Improved socialisation leads to community members contributing more to their community, specifically Frontier Economics argue that increased socialisation will reduce participation in antisocial behaviours; sports provide alternatives to antisocial behaviours[17]. Coalter et al[18] noted that sports divert time from delinquent leisure activities but that to be effective in reducing antisocial behaviour sport must be voluntary, committed and salient.

Coalter et al noted that the health benefits associated with physical activity tend to be those to do with the heart and circulation, bones, joints and tendons, metabolism and hormones but the links between mental health and physical activity are not as well established.

Frontier Economics notes World Health Organisation estimates of savings of US $500 per year in health costs for physically active people in developed countries (1998 dollars). When considering an entire community this saving can be sizeable. Further, the World Health Organisation estimates that in the U.S.A. an investment of US $1 in time and equipment for physical activity leads to US $3.20 in medical cost savings (1998 dollars).

Dependent on the location of a new stadium there can be savings to the community in time spent getting to and from venues (Townsville City Council, no date). This will result in savings in petrol costs to the community. The South Hedland Integrated Sporting Precinct proposal is to locate a number of sports and recreational facilities within the same precinct so there should be savings in time and petrol as community members will not have to travel between venues to participate in sports and/or recreational activities.

A proposed multi-sports stadium in Northern Ireland had a number of benefits for the community. There would be increased economic activity from additional events attracted to the complex, potential improvements in participation in sports leading to increased standards and quality of sport played, greater community cohesion and improved community pride[19]. Whilst the proposed facility that PricewaterhouseCoopers related to is larger than that proposed in South Hedland, the development in South Hedland can still lead to these benefits. Further, PricewaterhouseCoopers note other research that indicates new stadiums need to be developed as multi-use facilities to encourage economic growth and research indicating that public sector spending on staging and infrastructure costs for sporting events generate greater value in economic benefits to the community.

Coalter notes that people involved in arts and sports are more likely to contribute to their community in other ways.

People who are fit and healthy are more likely to be productive employees[20]. Improvements in the quality of sporting facilities available to people therefore should lead to improvements in the output of firms and economic gains. Additionally sport can increase a participant's employability as participation in sport increases a person's self- esteem and self-confidence.

Grieve and Sherry[21] note that the main community benefits identified in relation to a new sports facility in Darebin (Victoria) were increased amenity, increased public safety, enhanced community pride and image, increased leisure opportunities and increased social opportunities.

[12] Atherley, K. M. (2006a). Sport, localism and social capital in rural Western Australia, Geographical Research, 44(4), 348-360.
[13] Cited in Department of Sport and Recreation (Western Australia) (2012), "More than winning: the real value of sport and recreation in Western Australia".
[14] Tonts, M. (2005). Competitive sport and social capital in rural Australia, Journal of rural studies, 21(2), 137-149.
[15] Tonts, M. and K. Atherley (2010). Competitive sport and the construction of place identity in rural Australia, Sport in Society, 13(3), 381-398.
[16] Frontier Economics (2009), "The economic contribution of sport to Australia, prepared for The Australian Sports Commission", November.
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[18] Coalter, F; Allison, M and Taylor, J (2000), "The role of sport in regenerating deprived urban areas", Edinburgh: The Scottish Executive Central Research Unit.
[19] PricewaterhouseCoopers (2007), "Proposed multi-sports stadium for Northern Ireland: business case", prepared for Department of Culture, Arts and Leisure (United Kingdom), November.
[20] Department of Sport and Recreation (Western Australia) (2012), "More than winning: the real value of sport and recreation in Western Australia".
[21] Grieve, J. and E. Sherry (2012). Community benefits of major sport facilities: The Darebin International Sports Centre, Sport Management Review, 15(2), 218-229

Civil Concept Design Report

South Hedland Integrated Sports Complex
Town of Port Hedland, Western Australia

Civil Concept Design Report

Project No: PC19120

Date: 23/07/2019

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    - 10.2 Road and Carpark Drainage
    - 10.3 Surface runoff
    - 10.4 Pipes, Pits, and Grades
11. **RETAINING WALLS**
12. **SAFETY IN DESIGN**
13. **OPINION OF PROBABALE COST**

AUSTROADS	Guide to Road Safety,2010

TABLE 2.1 – Relevant Australian Standards

3. DESIGN CRITERIA

Peritas Group has selected the following criteria to form the basis of the civil design.

DESIGN CRITERIA VALUE	
National Construction Code	
Importance Level	2
Geotechnical	
Site Classification (AS2870)	Class S
Roads & Carparks	40 years life for the design traffic as per Austroads
Stormwater Drainage	
Drainage design Criteria (Design Storm Recurrence Interval)	10 Year 1-hour storm retained on site in accordance with Town of Port Hedland requirements 100 Year Storm Event to overflow into Council system.

TABLE 3.1 – Design Criteria

4. BACKGROUND

Port Hedland situated in the Pilbara, is approximately 1700km north of Perth by road with a current estimated residential population of approximately 14,500 people. The town is surrounded by major mining industries and agricultural activities and is the world's largest bulk tonnage export port.

The Town of Port Hedland (Town) has two residential settlements; Port Hedland and South Hedland. Port Hedland is considered the traditional civic and cultural hub. However, 66% of the population live in South Hedland. Most of the community infrastructure and State Government Agency's offices are located in South Hedland.

The South Hedland Sports Precinct is located in Lot 300, Hamilton Road, South Hedland. It is a regional level sporting hub and consists of an array of existing sporting infrastructure. It is well utilised by a number of sporting and community groups and is considered a vital piece of community infrastructure.

The ovals are considered to be in reasonably good condition, however there may some realignment of playing surfaces required to accommodate further growth. The Marie Marland oval in particular receives heavy usage.

The Wanangkura Stadium was constructed in 2012 and has a vibrant and iconic façade. The facility placement is at the forefront of the site on Hamilton Road. There are some issues with its functionality. Previous studies undertaken by the ToPH have suggested expansion of this facility would improve its use and the ability for user groups to develop. There are drainage issues and the facility is subject to flooding during rain events as the car park drains towards the building.

Two (2) master plans for the precinct have been completed, the most recent in 2015. There are a number of smaller recommended works that have since been completed or are in progress.

A larger pavilion to service the sports community that utilise both the Marie Marland Oval and the Kevin Scott Oval identified in earlier Master Plans is considered a requirement and has not been further developed. A clubroom type facility is located within the Wanangkura Stadium, included to provide club facilities to the Kevin Scott Oval. This is underutilised, as the location and design are not well suited for its intended purpose.

It is recognised by council that co-location within the regional sporting precinct may provide benefits to the Community.

The South Hedland Integrated Sports Hub is in response to a number of studies completed by the Town, and the current condition of the SHAC. There are a number of facilities within the sporting precinct that are in good condition and do not require further development

The Town seeks to deliver contemporary facilities for the community that improve the amenity currently afforded and provide fit for purpose facilities that meet the community aspirations now and into the future.

4.1 Design Philosophy

The primary objective is for the designs to be contemporary, functional and flexible community facilities that enhance the existing precinct amenities and are considerate of the climatic conditions of the location.

The ease of management and ease of maintenance should be a consideration of the design, with an emphasis on the durability and adequacy of materials, plant and equipment.

Innovation in design is expected and any new facilities should complement and enhance the overall amenity of the site.

The Town is committed to sustainable procurement and where appropriate shall endeavour to design tenders and quotations to provide an advantage to goods, services and/or processes that minimise environmental and negative social impacts. Sustainable considerations will be balanced against best value for money outcomes.

The Town has an existing welfare center that is need of major repair. The pavilion or extension to the Wanangkura Stadium will be required to meet the requirements of a welfare center. This decision will be determined once a current investigation into the ability to modify the existing stadium structure to meet the requirements of a welfare center are finalised.

4.2 Previous Reports & Issues

The Town of Port Hedland (ToPH) has been working towards providing a better drainage network and enhancing the landscaping at Wanangkura Stadium in South Hedland.

The ToPH has observed a number of flooding and water ponding issues as well as open channel embankment scouring within the Wanangkura Stadium grounds since the stadium, associated car parking and netball courts were constructed in 2011. Several consultants have been engaged in the past by ToPH to review current site conditions and come up with the design solution to address site issues.

The latest report from GHD investigates the optimum solution for the Wanangkura drainage stormwater disposal options, determined as practical in the previous hydrologic assessment of the site. Three options were identified as probable solutions for the current Wanangkura drainage issues. The report presented the basic technicalities of the options and an economic analysis based on high level material and costs estimates in order to recommend the preferred solution for the problem. That also recommends the drainage embankment stabilisation that is most viable in relation to the project requirements.

The objectives of the investigations for Wanangkura Stadium, South Hedland were:

- Improve the overall capacity and operation of the stormwater drainage system, especially on the south and eastern drains, as deficiency on system capacity was identified in the desktop hydrological assessment carried out by GHD previously;
- Develop an effective, reliable and robust solution to address the current flooding and water ponding issues at the site; and
- Improve the amenity of the site to facilitate greater use of this area for recreation purposes.

Based on site survey data (Veris, 2017) and available digital elevation model, local drainage on the site appears to be restricted to the site boundary.

The drainage features of the site comprise a perimeter open drain that wraps around the site, with a northern, southern and western drain sections. The northern drain is preceded by a basin in the north-east corner and flows west. The western drain flows north to join up with the northern drain, then continues north to discharge into a natural channel north of Hudson Way via a culvert. The southern drain flows east and discharges into a retention/infiltration/evaporation pond located in the south-east corner of the site.

The drainage channel is typically trapezoidal with 0.5 – 2m width, 0.5 – 1m depth and a 3H:1V batter slope. Observations from the site visit indicated that there is localised erosion within the channel, creating low pools. A low pool is located in the channel at the area immediately after the confluence of the northern and western drain, which appears to be an intended design feature.

The drainage philosophy adopted at the site was therefore “Stormwater Management Design” rather than “Stormwater Disposal Design”. The stormwater management practices with the drains and basins proposed over the site have a total capacity of 4,270m3, reported to be sufficient to contain a rainfall volume during a 10-year ARI with a 1-hour duration storm event. The design resulted in the following main outcomes:

Based from the economic data analyzed, GHD has therefore concluded that the most economical option for current site is **Option 2 – Gravity-Pumped Flow Hybrid System (South Eastern Basin)**.

This option was selected as the most suitable stormwater disposal method as it is technically feasible, the preferred method in relation to hydraulic performance and constructability and is the most cost-effective option in comparison to the other viable alternatives.

5. SITE PLANNING

5.1 Easements and Land Matters

It is understood that all works will be performed within the site boundaries. We would recommend liaising with Project Manager and Surveyors at the detailed design stage to ensure that land matters have been dealt with in relation to:

- Any Land Amalgamation required
- Easements over redundant services to be removed
- Easement over new services to be registered as appropriate

5.2 REMOVAL OF TREES

It is not anticipated that major tree removal works will be required. Should any trees to be removed check with Project Manager and Planners if clearing permit is required. Applications to be made as necessary.

5.3 Town of Port Hedland

Council has confirmed approval to discharge stormwater to existing drainage swales and drainage system.

The design criteria has been agreed as follows:

- Minor events up to 10 years 1 hour to be managed on site

- Major events up to 100 years to overflow into council drainage system Provide/modify/maintain outlets to external street network as follows:

6. EARTHWORKS AND SITE GRADING

6.1 General Earthworks

The site is relatively flat. It is therefore anticipated that minor earthworks will be required to crate surface falls toward designated drainage infrastructure and prevent on site ponding.

Based on SGS geotechnical site investigation report dated March 2009 the earthworks can be constructed using conventional heavy earthmoving equipment.

The soils on the site are considered suitable for general use, except as structural fill for the foundation works. Where there is presence of minor organics, they should be screened and removed.

Prior to any compaction work, we advise care is taken for the moisture conditioning of the material. Under wet conditions, soil may become too wet and difficult to work and compact. The earthworks contractor will need to advise on the selection of compaction equipment appropriate for the compaction of soil and protect them from becoming overly wet.

In general, the site should be proof rolled with a minimum of five passes with a vibratory roller (minimum mass of 10T). Any loose or areas of weakness should be removed and backfilled with approved granular fill. If boulders or rocks (>300mm) are encountered, they should generally be removed from the works.

Footings should be excavated to the depth of the footing base. The exposed surface should be compacted to achieve a dry density ratio of 95% (Modified compaction) to a depth thickness of 0.3m.

6.2 Imported fill

Based on the results of the site investigation report prepared by SGS in March 2009, the existing on-site materials are suitable for cut to fill operation outside of building areas. Building foundations and subgrade to be prepared in accordance with geotechnical report recommendations.

The existing site materials are silty sands or clayey sands and do not have sufficient permeability. Based on our experience at least 500mm of clean sand material, with permeability rate of 5m/day or more, will be required for the construction of playing fields.

6.3 Site grading

Indicative future site levels are shown on Concept Master Plan. We note that these have been set to achieve general falls across the site and prevent water ponding. A more detailed design will be required in the next stage of the development to achieve cut to fill balance and reduce the amount of imported fill and disposal of the materials from site.

Regarding of the existing draine swales will be required to achieve general flow of the stormwater towards the drainage outfall at Hudson Way. Please refer to Stormwater Drainage clause of the report for more details.

7. ROADWORKS & CAR PARKING

7.1 Design Criteria for Carpark

The general design criteria for the paving and carparks within the development is as follows:

- Ensure design and car parking complies with AS/NZS 2980 and relevant authority requirements including ramp access and gradients.
- The car park is to be built using 25mm thick asphaltic hot mix in accordance with Civil Specifications and drawings.
- Liaise with electrical consultants to determine lighting layouts for the carpark (interface with Electrical consultants)

7.2 Linemarking

Linemarking will be provided to all carparks along with adequate signage as per requirements of AS2890. Areas exposed to high traffic, constant direction change environments, all pedestrian crossings, and safety demarcation lines will be of thermoplastic application and will include reflective beading.

7.3 Pedestrian Footpaths

Footpath to be provided in the location indicated on the attached conceptual plans. Minimum thickness of the footpath to be 100mm concrete unless noted otherwise on drawings. Minimum concrete strengths to be 25MPa. Footpaths in road reserves to be constructed in accordance with Town of Port Hedland Specifications and standards drawings.

7.4 External Paving & Concrete Finishes

Paving or concrete external finishes must be of high slip resistance and must be treated with a stain resistant coating (untreated exposed aggregate finishes are not acceptable). Take into account cleanability when selecting all external finishes.

Minimum concrete strength for external concrete paving to be 32MPA.

7.5 External Paving & Concrete Levels

Paving or concrete external finishes will be finished to the levels specified on civil drawings. Where no levels are shown the Contractor to ensure that finished surfaces marry seamlessly to existing surrounds. Paving and/or concrete to be graded locally to provide falls to stormwater drainage collection points (gullies, SEPS and swales).

Due to flat nature of the site it is anticipated that most of the carpark will drain directly into swales.

In the areas where the existing surface to be resealed without change to the existing levels, the contractor shall make sure that the existing surface has been scarified prior to laying new asphalt.

7.6 Pavement Loads

A range of vehicles will be used in the area to access the site. The total number of vehicles will be calculated as part of Traffic Assessment Report and will be used for the design of the carpark pavements at detailed design stage. The vehicle types might include delivery vehicles, service vehicles including 19m semi-trailers and B-doubles. The following table, extracted from the mainroads.wa.gov.au website, lists the maximum axle group mass limits. These load limits will be used as the load-bearing design requirements for the pavement design.

AXLE GROUP	MASS LIMIT (Tonnes)
Single Steer	6
Twin Steer	11
Single	9
Tandem	16.5
Triaxle	20

EXAMPLES
R1-1: 6 + 9 = 15 tonnes
A1-2-3: 6 + 16.5 + 20 = 42.5 tonnes
A2-2-3-3: 11 + 16.5 + 20 + 20 = 67.5 tonnes

Minimum design criteria for the proposed paving based on site CBR value of 12% is as follows:

- 25mm AC7 Hot Mix asphaltic concrete
- 5mm primer seal
- 150mm roadbase CBR>80
- 100mm subbases CBR >40.

8. EXTERNAL WATER SUPPLY & MODIFICATIONS

Not included in civil brief and is addressed in the Hydraulic Engineer design brief.

9. EXTERNAL SEWER SUPPLY & MODIFICATIONS

Not included in civil brief and is addressed in the Hydraulic Engineer design brief.

If there is a requirement for the additional sewer connection to service the development it will need to be addressed at the detailed design stage.

In order to complete the development, it will be necessary to consider a number of items. This includes:

- All proposed connections to be installed in accordance with Water Corporation standards, in particular, Design Standard DS 50, Design and Construction Requirements for Gravity Sewers DN150 to DN600.
- All sanitary plumbing and drainage services shall comply with water regulations and local statutory authority requirements including local health department regulations and Water Corporation WA.

10. STORMWATER DRAINAGE & UNDERGROUND STORAGE

10.1 Roof Runoff and Downpipes

The stormwater services from roof structures shall be designed hydraulically in accordance with the requirements of NCC 2019 with provision for overflow to the external network in accordance with the Local Council requirements.

Liaise with Hydraulic engineers for pumped discharge points and location of downpipes.

10.2 Road and Carpark Drainage

Stormwater within carpark areas will be designed to cater for 1 in 10-year storm events. Events above the 1 in 10-year return period will overflow to the external swales and drains network in accordance with requirements of Local Government Authority or to stormwater detention basins.

10.3 Surface runoff

We note that current GHD hydraulic report suggests that existing drainage around the existing oval does not have sufficient capacity, hence the flooding of the carparks. GHD`s current recommendations are as follows:

- Existing swales around the oval to be regarded to provide additional capacity and stone pitched.
- GHD recommends keeping the existing basin north east of the oval.
- GHD current recommendation (preferred option) is to install a pump station to pump stormwater to Hudson Way. The reason is insufficient invert levels and falls to gravitate existing swales to Hudson Way.

Based on our experience in the area stone pitching or concrete lining of the swales does not provide reasonable outcome in South Headland conditions and most of the time fails. Our recommendation therefore would be to regrade the existing swales without any additional erosion protection. The cost savings for installation of concrete liners or stone pitching could be then used for future maintenance.

We note that the existing swales around the existing oval have general grade of 1 in 750 and could be regraded to have flatter grades but bigger capacity to contain stormwater events up to 100 ARI 1 hour.

We have reviewed the GHD “Report for South Hedland Flood Study” and used is a s a basis of design for the preparation of the Concept Stormwater Management Plan. We note that additional design will have to be performed at detailed design stage to reconfirm the quantities and grades of the swales.

We have therefore allowed for the following stormwater measures to mitigate current site issues and address stormwater drainage for new areas being developed:

- The overall concept of the drainage design has changed to provide sufficient capacity to store 100 ARI 1-hour runoff event on site and discharge into existing council drainage system at 10 years event rates.
- The regrading of the existing swales is required to achieve gravity flow into existing council system in Hudson Way. Some of the swales will be regraded to have 1 in 1500 grade. We note that based on GHD flood study, some of the existing swales in South Hedland have grades up to 1 in 5000 (for example Trumpet Estate Drainage Strategy has an allowance for swales with grades from 1 in 2200 to 1 in 5700).
- Additional basins have been designed around the site to provide sufficient capacity for stormwater events above 10 ARI.
- The existing stormwater drainage system around oval to be separated on east and west catchments and regraded to provide general fall towards Hudson Way. Additional attenuation drainage basins will be built to provide capacity for the rain events up to 100ARI 1 hour.
- The size of the swales has been increased to provide capacity and also to reduce flow velocity to acceptable standards.

- The remaining site is relatively flat with maximum 600mm elevation across the site. That makes the design of the drainage system a really challenging task. As we were not engaged to provide complete drainage assessment of the area, we would have to simplify stormwater management on site to make sure that there is no ponding in the area. As such some of the drainage infrastructure shown on our Conceptual Planning will be oversized to provide some reserve capacities.

- Our current estimates show that for ARI100 rain event we have to provide a total of 10820m3 of storage. We have managed to accommodate approximately 7700m3 of storage within proposed swales around the site and regraded existing swales. The remaining 3200m3 will be allocated to drainage basins, as shown on the attached marked up plan.

- In order to provide sufficient storage and conveyance of the stormwater runoff to the Council drainage outfall at Hudson Way we would require to construct a swale along the boundary of the site as shown on the attached sketch. The width of the swale will vary as shown on the sketches, but normally it will be 2m wide, 3m wide or 4mwide at the bottom of the swale. Minimum 6.8m, 7.8 & 8.8 metres wide at the top. We have indicated on the sketch possible changes to carparks, footpath and other infrastructure that will be required.

- A new drainage basin to be constructed near proposed Dog Park to provide additional storage for events above 5 ARI and up to 100 ARI, with overflow into drainage swale along the boundary.

10.4 Pipes, Pits, and Grades

All grates, grills, and covers installed should be cast iron circular and shall comply with the following:

Areas	Class
Car parking areas	Minimum Class C
Areas subject to heavy vehicle loads	Minimum Class D
Pedestrian Areas	Minimum Class A

All pipes and box culverts should be reinforced concrete. Due to the cover restrictions pipes & box culverts will be Class 4 & 6.

11. RETAINING WALLS

Retaining walls to be constructed in accordance with standard details and civil drawings.

The Contractor to engage Chartered Engineer for certification of the walls being constructed in accordance with the design.

12. SAFETY IN DESIGN

A safety in Design review is recommended at Preliminary Design Stage of the project in accordance with the requirements of the Occupational Safety and Health Act and the Safe Design of Buildings and Structures code of practice.

This Safety in Design report is required to be provided to the Contractor and any relevant subcontractors in accordance with the requirements of the legislation. This report and reports prepared by others together shall form a Safety document that will be used by all stakeholders on the project to ensure that any hazards are addressed.

13. OPINION OF PROBABALE COST

The opinion of probable costs of the development has been prepared in accordance with AACE International Recommended Practice No 18R-97 “Cost estimate classification system – as applied in engineering, procurement, and construction”.

Based on current level of project definition and details the estimate classification has been assessed as being between Class 4 and Class 5 in accordance with the below table.

	Primary Characteristic	*Secondary Characteristic*			
ESTIMATE CLASS	**LEVEL OF PROJECT DEFINITION** Expressed as % of complete definition	**END USAGE** Typical purpose of estimate	**METHODOLOGY** Typical estimating method	**EXPECTED ACCURACY RANGE** Typical variation in low and high ranges [a]	**PREPARATION EFFORT** Typical degree of effort relative to least cost index of 1 [b]
Class 5	0% to 2%	Concept Screening	Capacity Factored, Parametric Models, Judgment, or Analogy	L: -20% to -50% H: +30% to +100%	1
Class 4	1% to 15%	Study or Feasibility	Equipment Factored or Parametric Models	L: -15% to -30% H: +20% to +50%	2 to 4
Class 3	10% to 40%	Budget, Authorization, or Control	Semi-Detailed Unit Costs with Assembly Level Line Items	L: -10% to -20% H: +10% to +30%	3 to 10
Class 2	30% to 70%	Control or Bid/ Tender	Detailed Unit Cost with Forced Detailed Take-Off	L: -5% to -15% H: +5% to +20%	4 to 20
Class 1	50% to 100%	Check Estimate or Bid/Tender	Detailed Unit Cost with Detailed Take-Off	L: -3% to -10% H: +3% to +15%	5 to 100

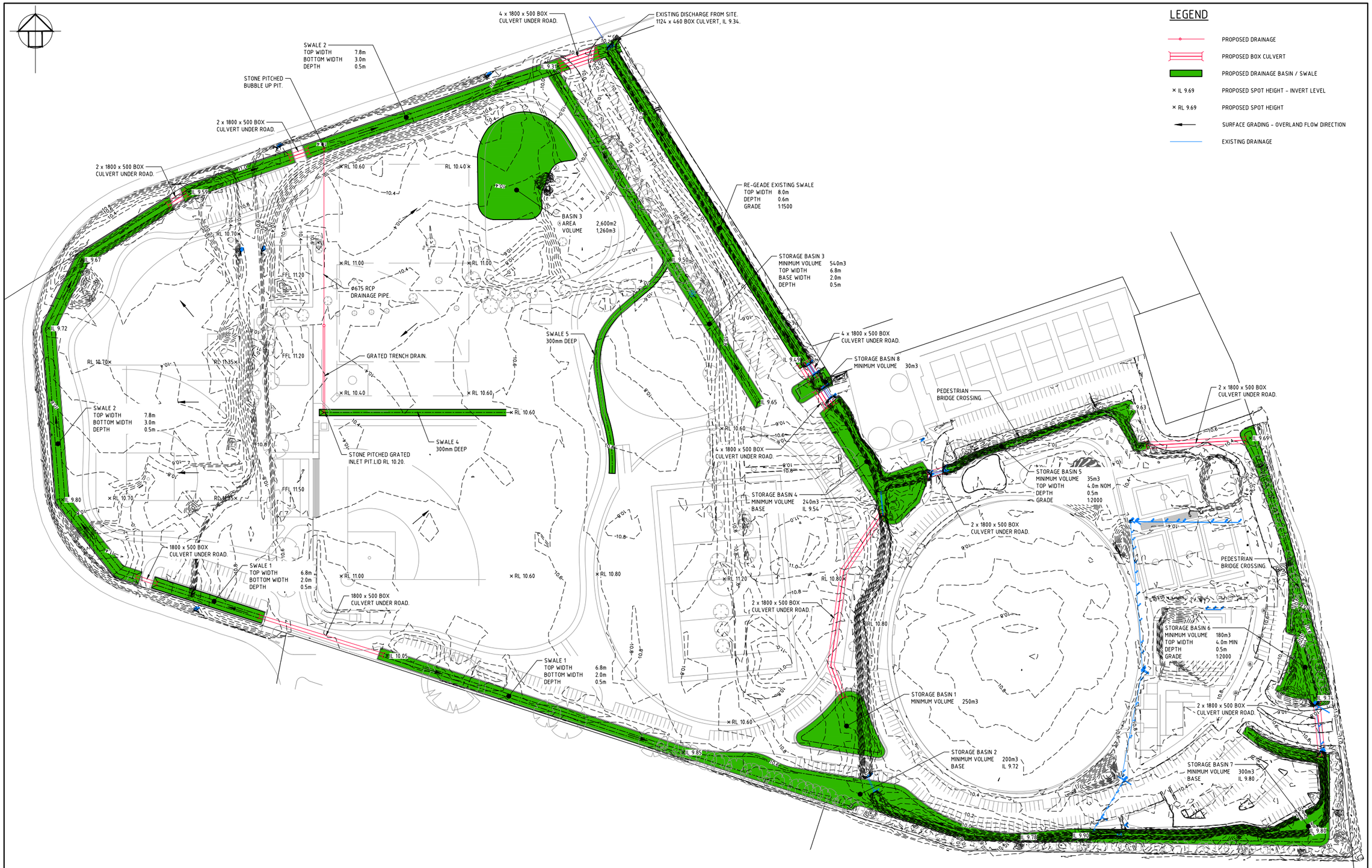
Notes: [a] The state of process technology and availability of applicable reference cost data affect the range markedly. The +/- value represents typical percentage variation of actual costs from the cost estimate after application of contingency (typically at a 50% level of confidence) for given scope.
[b] If the range index value of “1” represents 0.005% of project costs, then an index value of 100 represents 0.5%. Estimate preparation effort is highly dependent upon the size of the project and the quality of estimating data and tools.

As such the expected accuracy ranges of the cost estimates for Class 4-5 estimates are -15% to 30% on the low side and +20% to +50% on the high side, depending on the complexity of the project, appropriate reference information and inclusion of the appropriate contingency.

We therefore has made an allowance for the project contingency of 20% to cover any unforeseen site circumstances. The summary of the opinion of probable cost estimates is provided in the Appendix A.

(Refer to Opinion of Cost Estimation)

Preliminary Drainage Concept Plan (including terrain contours)



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No.	REVISION	BY	DATE
A	ISSUED FOR INFORMATION	AC	19.07.19

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CLIENT: TOWN OF PORT HEDLAND

PROJECT: SOUTH HEDLAND SPORTS FACILITY

DRAWING TITLE: STORMWATER DRAINAGE CONCEPT PLAN

SCALE	AS SHOWN	FILE	PC19120
HORIZONTAL		DESIGN	OO
VERTICAL		DRAWN	AC
SURVEY DATUM	AHD	CHECKED	OO
WAPC No	...	DATE	JULY 19
CADFILE NAME	PC19120-CI-SK2	DRAWING No.	PC19120-CI-SK2
		REV.	A

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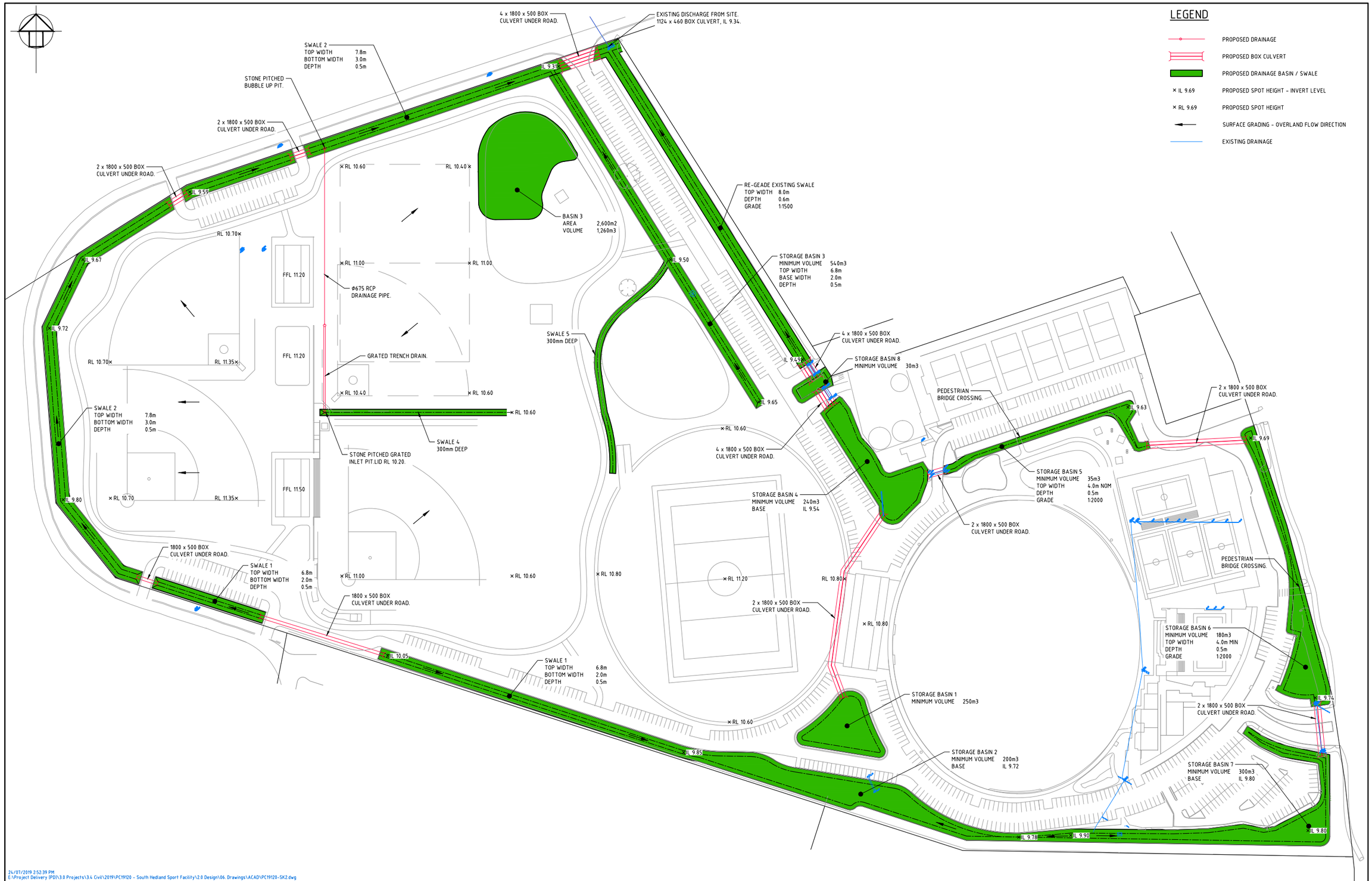
APPROVED .....

Preliminary Drainage Concept Plan (without terrain contours)



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REV.	REVISION	BY	DATE
B	ISSUED FOR INFORMATION	AC	24.07.19
A	ISSUED FOR INFORMATION	AC	19.07.19

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CLIENT: TOWN OF PORT HEDLAND

PROJECT: SOUTH HEDLAND SPORTS FACILITY

DRAWING TITLE: STORMWATER DRAINAGE CONCEPT PLAN

SCALE	AS SHOWN	FILE	PC19120
HORIZONTAL		DESIGN	00
VERTICAL		DRAWN	AC
SURVEY DATUM	AHD	CHECKED	00
WAPC No	...	DATE	JULY 19
CADFILE NAME	PC19120-CI-SK2	DRAWING No.	PC19120-CI-SK2
		REV.	B

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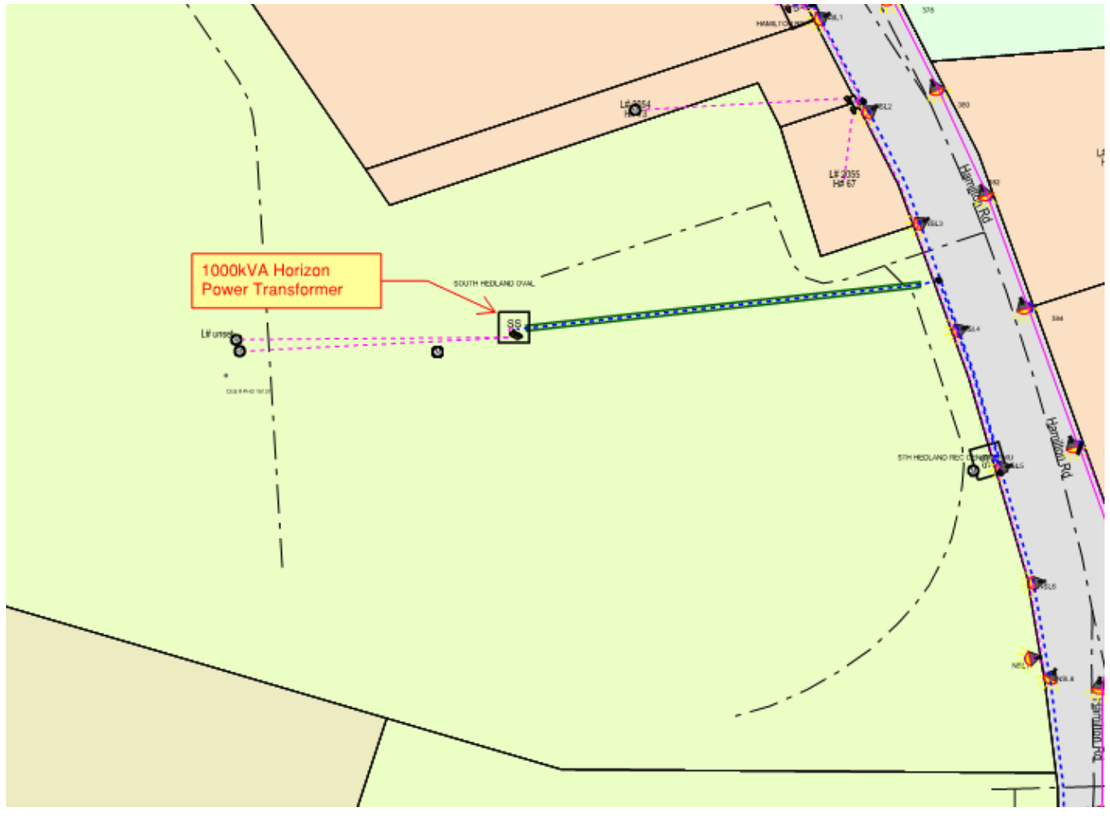
Electrical Services Concept Report

1.1 Existing Services

1.1.1 Power

The existing site is provided with power from a Horizon Power owned transformer. Horizon has confirmed that this transformer is 1000kVA in size and is presently utilising 988.61kVA. A second transformer appears to be located on the eastern verge of the site, however, it is unknown, as to whether this transformer presently serves the site. There is substantial information missing from the current survey information as highlighted below:

- The size and condition of any existing electrical switchboards.
- Spare capacity and energy use of each switchboard
- Below ground conduit routes and pits.
- Condition of existing cabling and circuit protective devices.

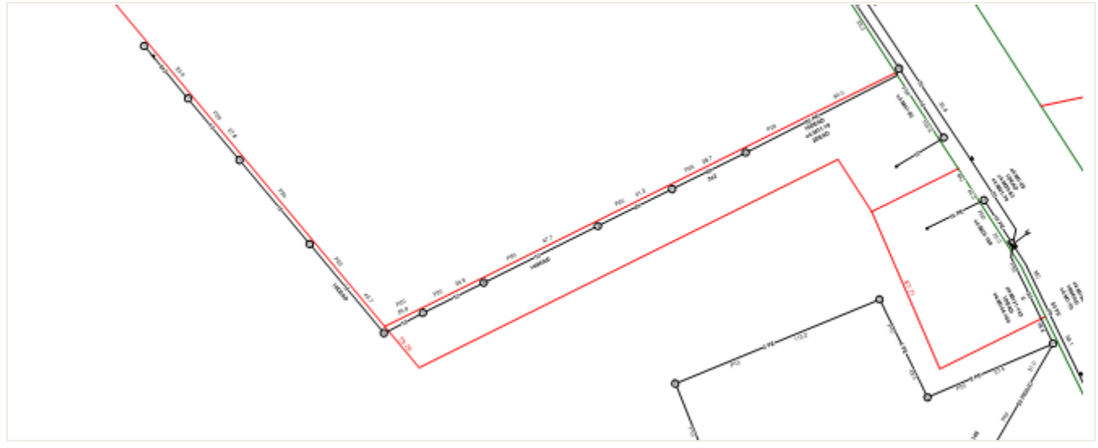


1.1.2 Lighting

The existing site is provided with lighting on the existing oval and the existing baseball field which is assumed to be suitable for reuse. However, this will need to be confirmed with further surveys. The structural condition of columns on site is unknown. The lamp type and power usage is also unknown.

1.1.3 Communications

The existing site is provided with copper and fibre cabling services. This was confirmed by a Dial Before You Dig application, however, the available capacities for additional connections is unknown, until contact is established with the local service provider.



1.2 Impacts of the Proposed Master Plan

1.2.1 The Site

A detailed load analysis has not been completed for the site, however, it is assumed that an additional 500-800kVA of electrical capacity will be required for the sites expansion. The load requirements might be greater than this depending on the required future flexibility for the site.

1.2.1.1 Power

The existing site transformer appears to impact the proposed location of the road ways for the masterplan based on the Horizon Power information provided, however, this is subject to a site review. There is no information on other boards within the existing site arrangement that might have an impact. If the existing transformer needs to be relocated, the design team will need to determine whether any services are connected to the supply from outside of this sites boundary. The additional buildings, sports lighting, public lighting and hydraulic requirements will have an impact on the existing electrical power supply. Electric vehicle car charging might be a further consideration that will also impact the existing infrastructure and final loading capacity.

1.2.2 Lighting

The proposed design will require more lighting. At present the scheme considers new lighting to serve each of the new playing fields to meet the required sports standards. Lighting will also be required for the new roadways, pedestrian walkways, car parks and buildings (internal and external). This will have an impact on the existing electrical power infrastructure and the constrained electrical supply.

1.2.3 Communications

The pavilion buildings will require telephone and internet services for general services and possibly public WIFI services during community use. Security and Fire Services will also require communications connections for remote monitoring. Generally, it is assumed that communications cabling will be routed around the site and that below ground conduits and cable access pits can be located within the masterplan with minimum constraints.

1.2.4 Dry Fire

While some of the buildings are assumed to be smaller than 500m², it is assumed that dry fire (smoke detection) protection is not required. However, the client might want to consider smoke detection being installed in all buildings as a secondary layer of property protection. This will mean installing an interlinked compliant smoke detection system in each of the buildings.

1.3 Design Solutions and Works Required

In summary, it is assumed that to enable the masterplan to function, new electrical services will need to be installed throughout the site as follows:

- New Horizon Power transformer to serve the west of the site.
- Possible additional transformer or new larger transformer to serve the east of the site.
- New Site Main Switchboards to serve the east and west of the site.
- New below ground conduits and pits to provide power to each of the new community pavilion buildings.
- New below ground conduits and pits to provide power to car parks and hydraulic services.
- New below ground conduits and pits to provide lighting to each of the new sports fields.
- New below ground conduits and pits to provide lighting to car parks, roadways and pedestrian walk ways.
- New below ground conduits and pits to provide security services around the site and in buildings.
- New power, lighting and security services to serve the new community pavilion buildings.

It is assumed that the site will require at least one new transformer to serve the west of the sites new pavilions and sports field. An additional second new transformer might be required depending on the final load and design of the east of the sites existing buildings to accommodate the extension, new large pavilion, road ways, pedestrian ways and car parking.

It is assumed that the site will require a new Site Main Switchboard (SMSB) at each of the transformer locations, as part of the works, to provide modern safe switching and protection for the reticulation of power for the masterplan development.

The SMSB will serve distribution boards for each of the proposed areas/buildings and main equipment requirements. This will include The Extension, Large Pavilion, Two Small Pavilions, Sports Field Floodlighting, Pumping and Irrigation.

Submain cabling shall be installed with below ground conduits to serve each Distribution Board with cable access pits for ease of installation and maintenance. Each Distribution Board shall have 20% spare capacity and allow for connection of Photovoltaic Panels.

The Site Distribution Boards (east and west) will be located within the enclosed substation buildings and they will serve the various distribution boards located around site.

All cabling will be routed around the site below ground and with regular access pits at approximately every 50m (maximum) to enable ease of maintenance around the site.

Distribution Boards shall provide power to all mechanical, hydraulic, ICT and Security equipment to include:

- Fire Fighting and Life Safety Systems
- Power
- Lighting (internal and external)
- Ventilation Systems
- General Office / Admin requirements
- BBQ
- Irrigation
- Water Fountain Pumps
- Sewage Pumps
- Storm water Pumps
- Security Intruder Alarm
- Security Access Control
- CCTV System
- ICT Systems
- Tool Storage
- MATV Systems
- Future Electric Vehicle Charging Stations

Each Distribution Board shall be provided with metering to meet NCN 2016 Section J where required.

All of the designs will require enhanced structural stability due to the harsh weather conditions in this location. Photovoltaic panels on rooves will need additional measures to secure them. Lighting columns will be required to be larger and with larger foundations for support. External lighting will need to be of high quality with warranties in the range of 5-10 years to protect products. Surge protection filters and lightning protection system will be required to protection roof mounted plant and external lighting.

1.3.1 Communications Systems

A main ICT comms room is assumed to be located within the Wanangkura Stadium. A fibre connection will be provided to each of the pavilion buildings from this location to serve telephone and comms systems within the buildings and the site.

All cabling will be routed around the site below ground and with regular access pits at approximately every 50m (maximum) to enable ease of maintenance around the site.

A single 800mm x 800mm floor standing rack shall be provided in each of the pavilion buildings. This rack shall house ICT, SEC and MATV equipment.

All infrastructure and distribution requirements shall be provided for NBN connection. Landline Telstra telephone connection and infrastructure shall also be provided and located within the comms room. The comms room is assumed to share and house the electronic security equipment.

If required, Sub-distribution hubs shall be provided around the site to facilitate the comms distribution and cabling distances.

Structured cabling shall be installed within buildings in dedicated containment systems to all data outlets. Fibre cabling shall be used for main backbone cabling and CAT6A shall be used for all horizontal final circuit distribution.

Wireless Access Points shall be provided within the pavilion buildings and with coverage around the spectator areas for general public use of WIFI for internet access.

1.3.2 Security Systems

A security design to protect assets, provides a safe and secure environment and mitigates security risks applicable to a sports precinct which is generally unmanned outside of regular business hours.

The following should also be provided:

- The security system components shall be housed within a common ICT/SEC/MATV rack in and secure room.
- Surveillance and protection of critical infrastructure and high-risk areas through design.
- Security camera surveillance of staff and patron movement within the sports precinct
- Requirements for appropriate access control to the pavilions, stores, change room areas and various areas of the facility
- Requirements for the provision of intrusion detection to be limited to PIR Detection in the pavilion and stadium areas.
- Installation standards to minimise the risk of security devices, cameras and any associated cable infrastructure from being stolen or vandalised.
- Installation standards compliant with relevant licensing, standards, acts, regulations and codes.

A CCTV system will provide:

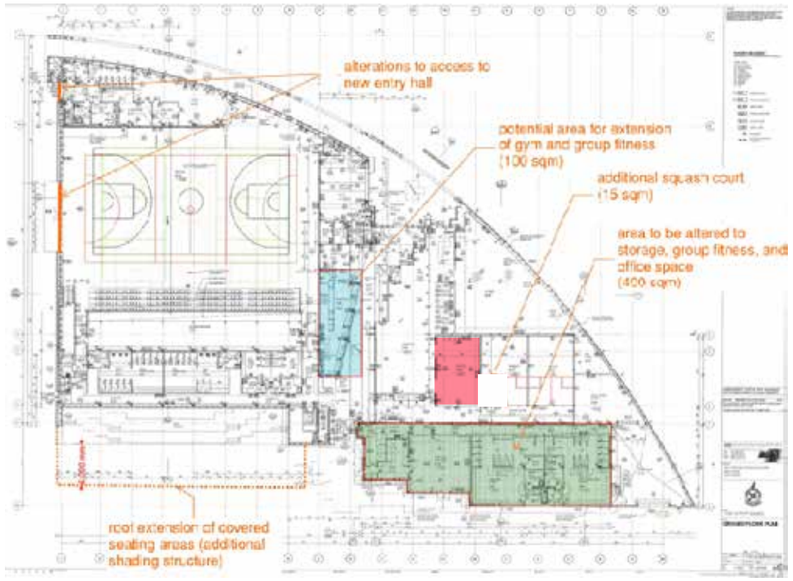
- Record all activity at a high resolution with a high level of detail and quality;
- A 30-day storage capacity should be provided for all video recording either within the building and / or remote from the site if possible.
- Be securely fixed and minimise the risk of cameras, security devices and any associated infrastructure from being stolen or vandalised.
- Cameras are appropriately specified for the environment they are being installed in with a focus on ingress of rain, dust, insects and condensation.

1.3.3 The Buildings

1.3.3.1 Wanangkura Stadium

The Wanangkura Stadium gym & group fitness (100m²), Storage, Group Fitness and Office Space (400m²) is being refurbished. An additional Squash Court (15m²) is also being created. It is assumed that all new services will be provided to each of these areas. This will include low energy usage LED lighting and power to meet all mechanical heating, cooling and ventilation requirements, hydraulic service, general power outlets for admin and cleaning, security and access control, dry fire smoke detection, earthing and surge protection. Each area will be provided with comms and WIFI access points. The electrical Distribution Boards serving these areas will be replaced or upgraded to suite the refurbishments, if required.

The following standard is required to be considered for squash court lighting design: Specifications for Squash Courts – World Squash dated July 2016.



Sketch showing the alterations to the existing Wanangkura Stadium

1.3.3.2 New Extension Building (Basketball)

The new extension building provides indoor basketball courts and will be served by impact proof low energy usage LED lighting (internal and external) and power to meet all mechanical heating, cooling and ventilation requirements, hydraulic service, general power outlets for admin and cleaning, security and access control, dry fire smoke detection, earthing and surge protection. The extension will be provided with comms and WIFI access points. A new electrical Distribution Board will be provided to serve the extension. This will be designed to accept Photovoltaic generation with battery storage and grid exportation.

The following standard is required to be considered for basketball lighting design: Sports Lighting – Lighting for Outdoor Netball & Basketball AS2560.2.4 and Sports Lighting – Lighting of Multipurpose Indoor Sports Centres AS2560.2.2.

1.3.3.3 Large Pavilion Building

The large pavilion building is located in between the existing oval and the new multisport oval. The large pavilion building will include 4 x change rooms, 4 x showers and toilets (adjacent to change rooms), Meeting / Function Hall, Small Meeting Room (to accommodate sporting group and community meetings), Kitchen/Servery (accessible from both sides), Bar, First Aid Room, Umpires Change Room, Public Toilets, Spectator Viewing Area (on both sides), User Group / Club Storage, Club memorabilia display area and Emergency vehicle access.

The building will be served by architectural low energy usage LED lighting (internal and external) and power to meet all mechanical heating, cooling and ventilation requirements, hydraulic service, general power outlets for admin and cleaning, security and access control, dry fire smoke detection, earthing and surge protection. The building will be provided with comms and WIFI access points via a comms rack installed within the building. A new electrical Distribution Board will be provided to serve the extension. This will be designed to accept Photovoltaic generation with battery storage and grid exportation.

1.3.3.4 Two Small Pavilion Buildings

The smaller pavilions will provide club room facilities to the west of the existing baseball diamond to service new diamond sports and new active open space. They will provide change rooms, kiosk facilities, small social space, storage and undercover spectator viewing to the permanent baseball diamond and new active open space location. These club room facilities will also service the extended active open space area for rectangular sports and diamond sports.

The buildings will be served by architectural low energy usage LED lighting (internal and external) and power to meet all mechanical heating, cooling and ventilation requirements, hydraulic service, general power outlets for admin and cleaning, security and access control, dry fire smoke detection, earthing and surge protection. The buildings will be provided with comms and WIFI access points via a comms rack installed within the building. A new electrical Distribution Board will be provided to serve the extension. This will be designed to accept Photovoltaic generation with battery storage and grid exportation.

1.3.4 The Sports Fields

The following standards are required to be considered when designing sports field lighting:

- Sports Lighting – Lighting for Football (all codes) AS2560.2.3.
- Sports Lighting – Lighting for Baseball and Softball AS2560.2.6
- Cricket Australia Guidance Note 4 dated September 2015.
- Control of obtrusive effects of outdoor lighting AS4282
- Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment. AS/NZS CISPR15:2011

All lighting will be low energy usage LED lighting.

1.3.5 The New Oval

The new oval is being designed to accommodate AFL, Rugby, Touch Rugby and Soccer. The lighting design for this will need to comply with Sports Lighting – Lighting for Football (all codes) AS2560.2.3 to meet the requirements of all four sports. The final location and quantity of lighting poles and lamp heads will be determined during the Concept Design Stage when lighting calculations are completed. The below illustration shows the example pole locations for a 6-pole scheme.

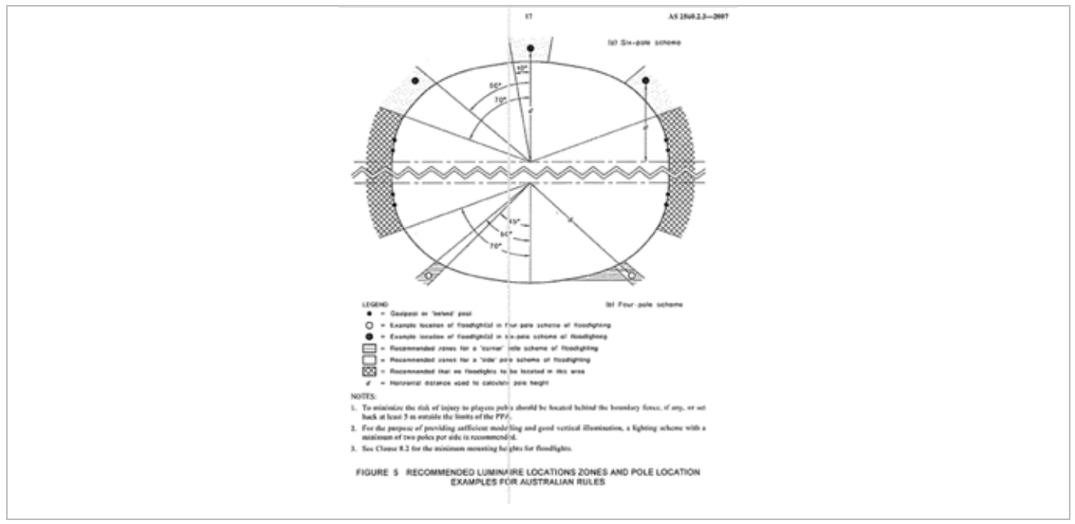


FIGURE 5 RECOMMENDED LUMINAIRE LOCATIONS ZONES AND POLE LOCATION EXAMPLES FOR AUSTRALIAN RULES

1.3.6 Existing Baseball Field

The existing baseball field lighting is assumed to meet 'recommendations' of AS2560, as it is a relatively new installation. One of the lighting poles encroaches the new master plan softball field layout and will require repositioning. The below illustrations show an example for an 8-pole layout for baseball. Alternative options for 6 and 8 pole layouts can be assessed during the Concept Design Stage when lighting calculations are completed. There is no known data on the lighting output of the existing installation, although it is assumed to be relatively new. Lighting levels will need to be assessed to verify compliance of the existing scheme and the final location of the lighting poles to meet AS2560. All lighting will be low energy usage LED lighting.

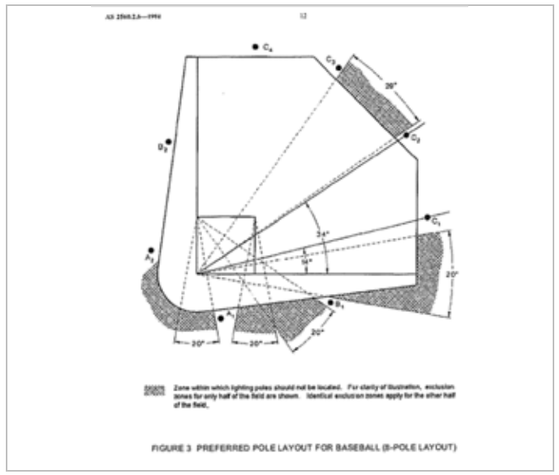


FIGURE 3 PREFERRED POLE LAYOUT FOR BASEBALL (8-POLE LAYOUT)

1.3.7 New Baseball and Softball Fields

The baseball and softball fields will require lighting in accordance with AS2560. The below illustrations show examples for an 8-pole layout for baseball and softball. Alternative options for 6 and 8 pole layouts can be assessed during the Concept Design Stage when lighting calculations are completed. All lighting will be low energy usage LED lighting.

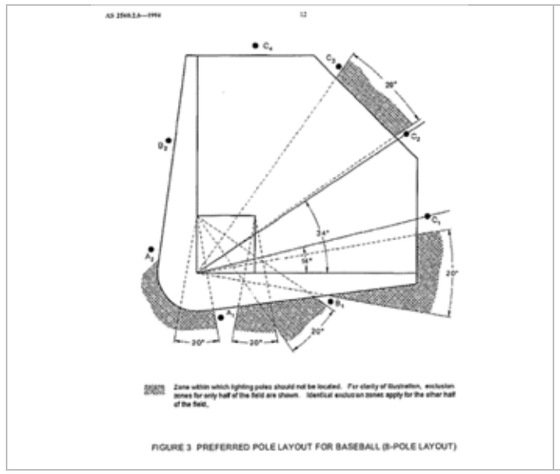


FIGURE 3 PREFERRED POLE LAYOUT FOR BASEBALL (8-POLE LAYOUT)

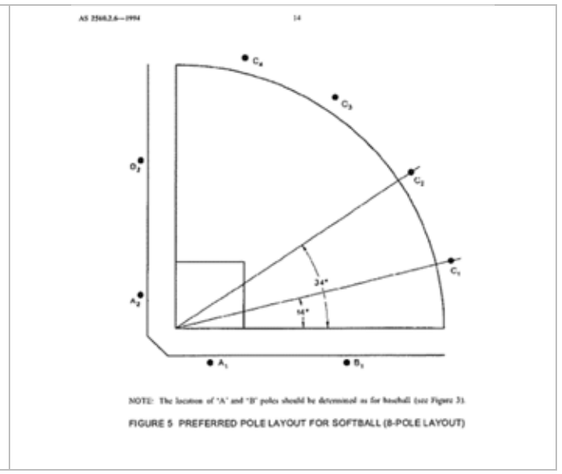


FIGURE 5 PREFERRED POLE LAYOUT FOR SOFTBALL (8-POLE LAYOUT)

1.3.8 The Shared Use Running Track and Pedestrian Ways

The shared used running track and pedestrian ways are assumed to meet: AS/NZS 1158.3.1 Category P3. They will be provided with LED luminaires on 6m steel poles.

The lighting for these pathways will be controlled as follows:

- Sunday to Thursday - ON at dusk, OFF at midnight; Friday and Saturday – ON at dusk, OFF at dawn

All cabling will be routed around the site below ground and with regular access pits at approximately every 50m (maximum) to enable ease of maintenance around the site.

1.3.9 Play Areas

The play areas and dog park are assumed to be Category P3. They will be provided with LED luminaires on 6 m steel poles.

The lighting for the play and park areas will be controlled as follows:

- Sunday to Saturday - ON at dusk, OFF at 9pm

All cabling will be routed around the site below ground and with regular access pits at approximately every 50m (maximum) to enable ease of maintenance around the site.

1.3.10 The Car Parks and Roadways

The car parks are assumed to meet: AS/NZS 1158.3.1 Category P11b and Disabled bays to AS/NZS 1158 Category P12. They will be provided with LED luminaires on 6 m steel poles.

The lighting for the car parks will be controlled as follows:

- Sunday to Thursday – ON at dusk, OFF at midnight; Friday to Saturday – ON at dusk, OFF at dawn

The roadways are assumed to meet: AS/NZS 1158.3.1 Category P3. They will be provided with LED luminaires on 6 m steel poles.

The lighting for the roadways will be controlled as follows:

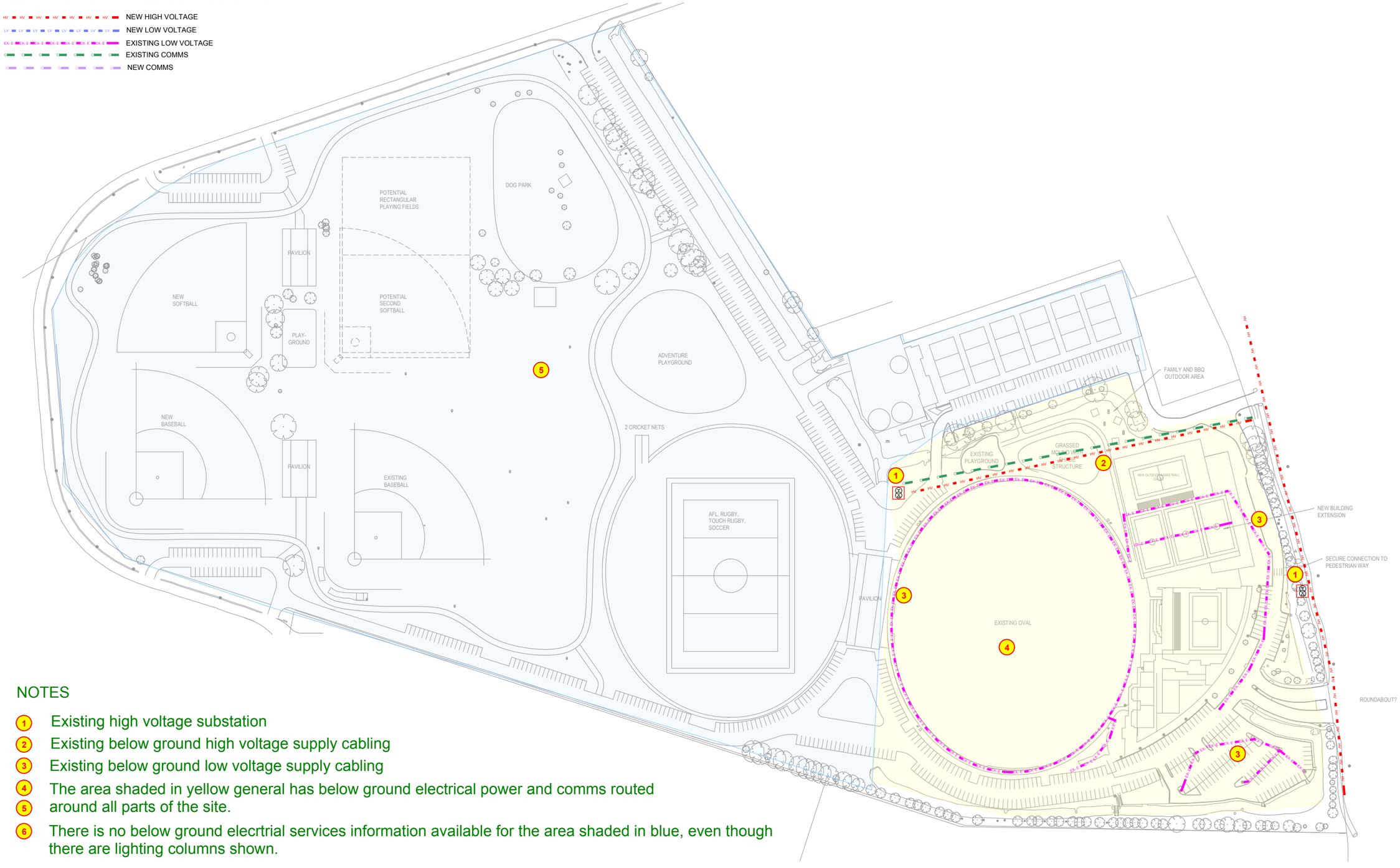
- Sunday to Thursday - ON at dusk, OFF at midnight; Friday and Saturday – ON at dusk, OFF at dawn

Car parks will also be provided with a nominal amount of electric vehicle car charging stations and below ground conduits and pits for a future uptake of 20% car parking bays to require car charging stations.

All cabling will be routed around the site below ground and with regular access pits at approximately every 50m (maximum) to enable ease of maintenance around the site.

ELECTRICAL AND COMMS LEGEND AND LINE TYPE

- NEW HIGH VOLTAGE
- NEW LOW VOLTAGE
- EXISTING LOW VOLTAGE
- EXISTING COMMS
- NEW COMMS



NOTES

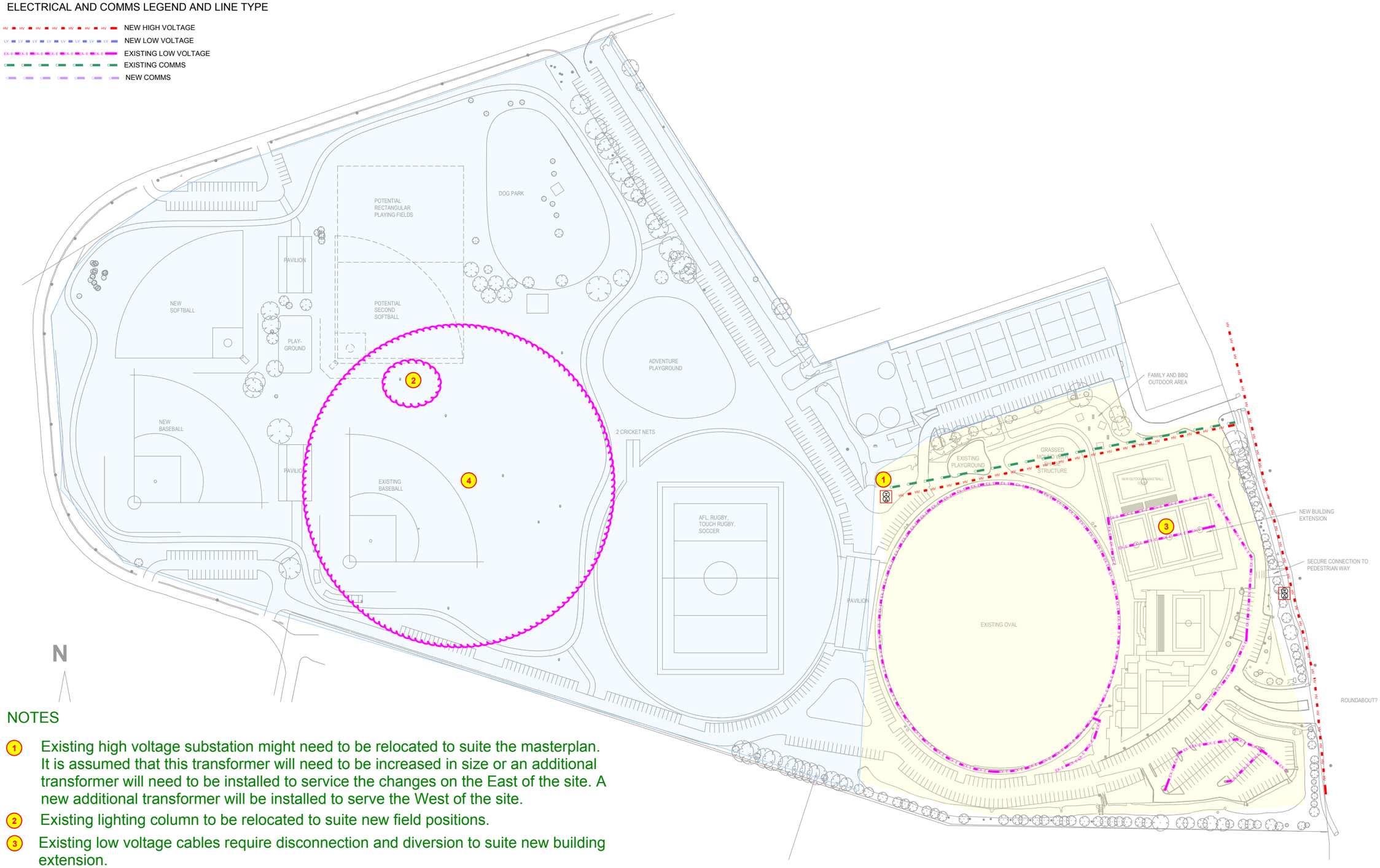
1. Existing high voltage substation
2. Existing below ground high voltage supply cabling
3. Existing below ground low voltage supply cabling
4. The area shaded in yellow general has below ground electrical power and comms routed around all parts of the site.
5. There is no below ground elecrtrial services information available for the area shaded in blue, even though there are lighting columns shown.

EXISTING ELECTRICAL AND COMMS INGROUND SERVICES BASED ON CURRENT SURVEY INFORMATION

11-07-2019 FOR REVIEW AND COMMENTS ONLY

ELECTRICAL AND COMMS LEGEND AND LINE TYPE

- NEW HIGH VOLTAGE
- NEW LOW VOLTAGE
- EXISTING LOW VOLTAGE
- EXISTING COMMS
- NEW COMMS



NOTES

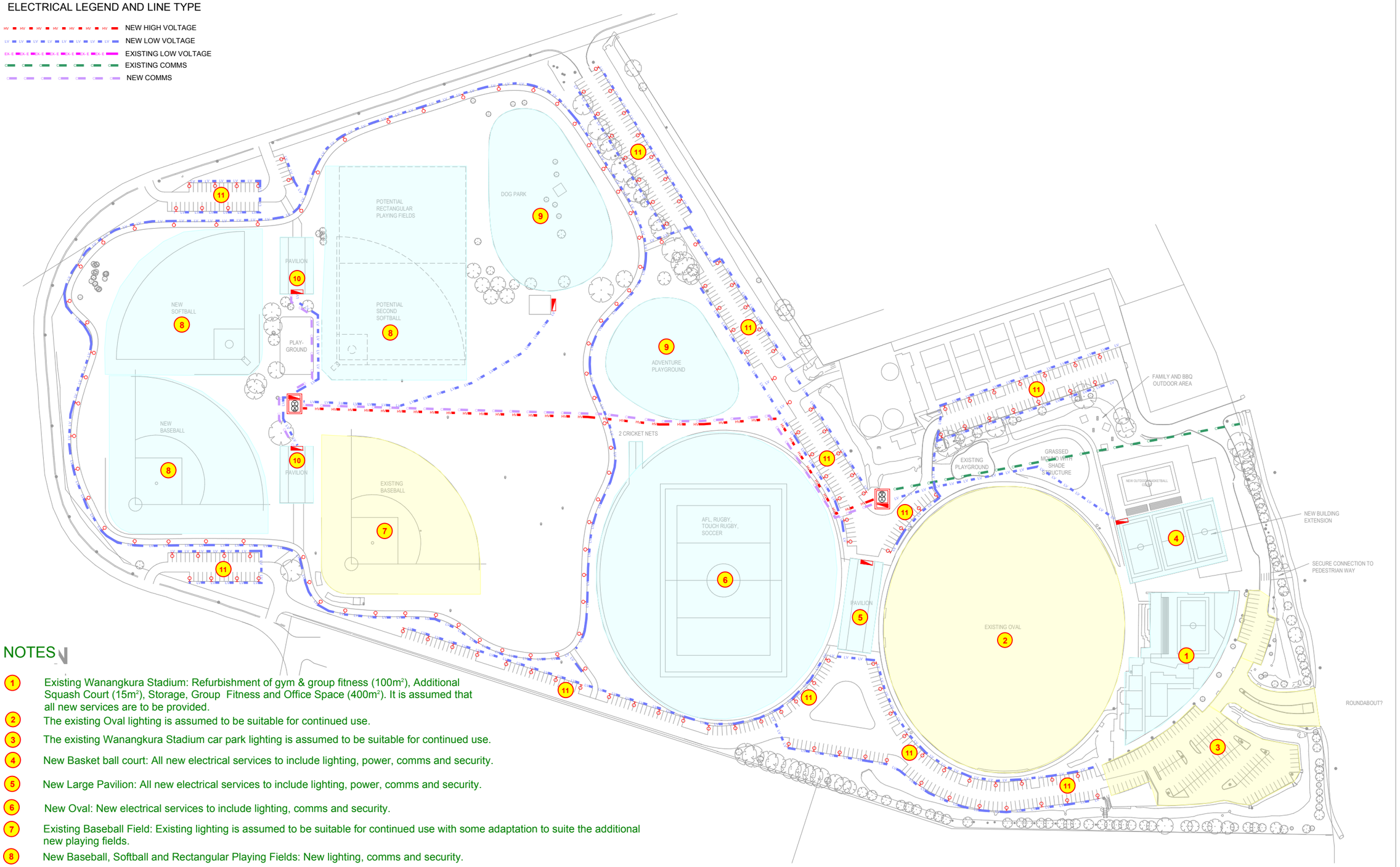
1. Existing high voltage substation might need to be relocated to suite the masterplan. It is assumed that this transformer will need to be increased in size or an additional transformer will need to be installed to service the changes on the East of the site. A new additional transformer will be installed to serve the West of the site.
2. Existing lighting column to be relocated to suite new field positions.
3. Existing low voltage cables require disconnection and diversion to suite new building extension.
4. Below ground cabling serving lighting columns needs to be identified and will potentially require diverting.

EXISTING SERVICE IMPACT ON THE PROPOSED MASTERPLAN

11-07-2019 FOR REVIEW AND COMMENTS ONLY

ELECTRICAL LEGEND AND LINE TYPE

- NEW HIGH VOLTAGE
- NEW LOW VOLTAGE
- EXISTING LOW VOLTAGE
- EXISTING COMMS
- NEW COMMS



NOTES

1. Existing Wanangkura Stadium: Refurbishment of gym & group fitness (100m²), Additional Squash Court (15m²), Storage, Group Fitness and Office Space (400m²). It is assumed that all new services are to be provided.
2. The existing Oval lighting is assumed to be suitable for continued use.
3. The existing Wanangkura Stadium car park lighting is assumed to be suitable for continued use.
4. New Basket ball court: All new electrical services to include lighting, power, comms and security.
5. New Large Pavilion: All new electrical services to include lighting, power, comms and security.
6. New Oval: New electrical services to include lighting, comms and security.
7. Existing Baseball Field: Existing lighting is assumed to be suitable for continued use with some adaptation to suite the additional new playing fields.
8. New Baseball, Softball and Rectangular Playing Fields: New lighting, comms and security.
9. New Adventure Play Ground and Dog Park: New electrical services to include lighting, power (BBQ's), security and comms.
10. New Pavilions: New electrical services to include lighting, power, comms and security.
11. New Car Parks: New electrical services to include lighting and power (Electrical Vehicle Charging Stations).

NEW SERVICES

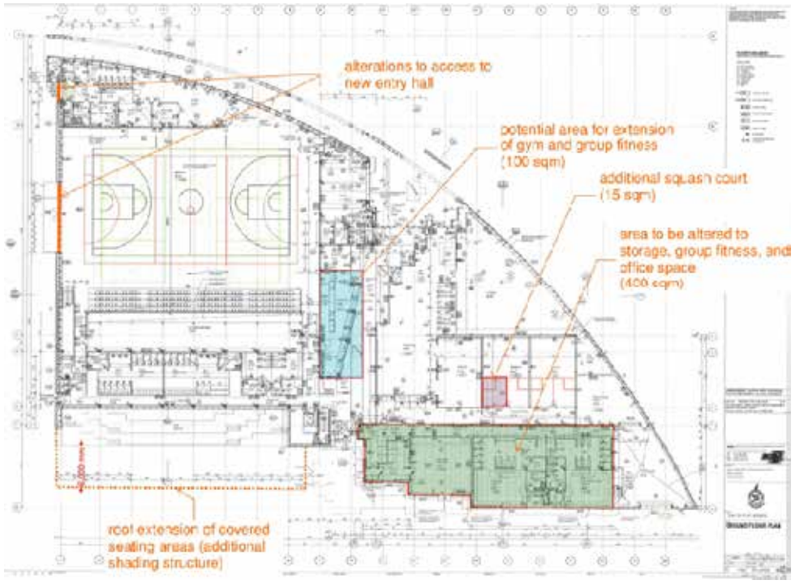
11-07-2019 FOR REVIEW AND COMMENTS ONLY

Mechanical Services Concept Report

3.1 Introduction

This Mechanical Services section outlines the recommended Heating, Ventilation & Air-Conditioning (HVAC) strategies for the following areas,

- Large pavilion building
- Two new small pavilion buildings
- Modifications to the existing Wanangkura Stadium which includes,
    - Extension of gym and group fitness area (approx. 100 sqm)
    - Alteration for storage, group fitness and office space (approx. 400 sqm)
    - Addition of one squash court (approx. 15 sqm)
    - New extension building (Basketball)



Sketch showing the alterations to the existing Wanangkura Stadium

Outside air will be supplied to conditioned areas at the rate prescribed in the Building Code of Australia (BCA) and AS1668.2 Part 2, 2012.

The mechanical plant to be designed to maintain comfort conditions based on the design criteria nominated within Section 10.3 of this report.

3.2 Codes and Standards

Australian Standards and Codes shall be used in respect of all materials and workmanship including but not limited to those listed elsewhere in the specification.

All ventilation and air conditioning systems are generally designed and installed to comply with the requirements of the NCC, and all referenced and relevant standards, and with the requirements of all authorities having jurisdiction.

Current relevant Standards that are applicable to the mechanical installation include:

- BCA/NCC Building Code of Australia.
- AS 1324 Air filters for use in Air Conditioning and General Ventilation.
- AS1677.2 Also comply with the recommendations of SAA HB 40.1 and SAA HB 40.2.
- AS 1668.2 The use of mechanical ventilation and air-conditioning in buildings.
- AS 2107 Acoustics.
- AS 3000 SAA wiring rules.
- AS 3013 Electrical installations, wiring systems for specific applications.
- AS 3500 Sanitary Plumbing and Drainage
- AS 3666 Microbial Control
- AS 4254 Ductwork for air handling systems in buildings
- AS 5601 Gas Installations.

3.3 Design Criteria

Item	Design Criteria	
External conditions	Summer	39.5°C DB, 28°C WB
	Winter	9°C DB
Internal Conditions	Summer	24°C DB maximum
	Winter	21°C DB minimum
	Humidity	Design Point Nominal 60% RH, not controlled
People Load	People Sensible	80W (170W for sports activity)
	People Latent	50W (260W for sports activity)
Equipment Load	Kitchen	30 W/m^2 plus specific cooking equipment or specific fittings (assumed)
	Office space	25 W/m^2 plus specific AV equipment or specific fittings (assumed)
	Meeting/ function halls	15 W/m^2 plus specific AV equipment or specific fittings (assumed)
	Reception/ waiting room	8 W/m^2 plus specific AV equipment or specific fittings (assumed)
Lighting	10 W/m^2 (assumed)	
Occupancy	Based on AS1668.2 or to meet specific room occupancy	
Ventilation	10 L/s per person	
Filtration	G4 on internal units and F9 on external intakes for outside air.	

3.4 Design Solutions and Works Required

3.4.1 Large Pavilion Building

Office, first aid and multi-purpose rooms will be provided with heating and air conditioning by independent air-cooled reverse cycle DX split systems comprising of an external condensing unit and indoor fan coil unit.

All systems will be provided with interconnecting refrigerant pipework, power and controls cabling, thermal insulation, brackets, vibration mounts and local hard-wired wall mounted digital display controller.

Typical wall mounted, ceiling recessed cassette and ducted fan coil unit

Typical outdoor condenser unit

The community Pavilion will be provided with heating and air conditioning by independent air-cooled reverse cycle DX split systems comprising of an external condensing unit and indoor fan coil unit.

All systems will be provided with interconnecting refrigerant pipework, power and controls cabling, thermal insulation, brackets, vibration mounts and local hard-wired wall mounted digital display controller.

The storage/ amenities areas will be mechanically exhausted in accordance with AS1668.2 (2012).

The storeroom/ bathroom exhaust fans will be interconnected to programmable and adjustable time clock to operate the fan during operational hour as agreed with the client. This time clock can be adjustable to meet the client requirements.

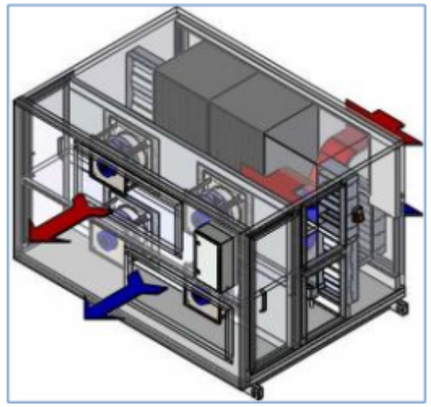
The kitchen exhaust system will comprise of a vertical discharge exhaust fan, galvanised sheet metal ductwork, exhaust hood and local on/off controller.

Make-up air will be provided by a packaged air handling unit which is electrically interlocked with the kitchen exhaust fan to ensure both systems operate simultaneously.

3.4.2 Two Small Pavilion Buildings

It is assumed that the space can be classified as naturally ventilated via openable windows / doors.

When windows and door may be closed for operational reasons, the space will be conditioned via a roof mounted packaged variable air volume air-handling unit (AHU), incorporating heat recovery. The introduction of a heat recovery ventilator will significantly improve the effectiveness of the natural ventilation in the building, boosting fresh air when windows are open as well as providing greater flexibility to close windows during hot/ cold or noisy days. Heat recovery will also temper the outside air, providing improved comfort for significant proportions of the year without active intervention.



Heat Recovery Ventilator

The areas are proposed to have a central heat recovery ventilator to provide supplementary fresh air to all conditioned areas. The system will operate during normal hours to boost fresh air to these spaces during natural ventilation mode, while enabling a limited amount of outside air supply to be delivered even if windows are closed. It is also proposed to be used during out-of-hours in a night purge configuration.

Control will be provided by wall mounted sensors and switches with functions for manual on and off and auto off.

All ductwork containing conditioned air will be insulated in accordance with the BCA.

Roof Mounted AHU

Carbon dioxide (CO_2) sensor will be incorporated into the new AHUs to reduce outside air when there is low occupancy levels and increase outside air when there is high occupancy levels.

The sensors will be located in the conditioned areas.

Air flow measurement will be installed into the outside air intakes for the system to allow for control of the outside air in conjunction with the levels of CO_2 in the space. The quantity of ventilation will be controlled by the CO_2 sensor by modulating the outside air and return air motorised dampers in a coordinated fashion to maintain the concentration of CO_2 at the desired level.

3.4.3 Existing Wanangkura Stadium

3.4.3.1 Extension of Gym and Group Fitness Area

The space will be conditioned via a roof mounted packaged variable air volume air-handling unit (AHU), incorporating heat recovery. Due to the high outside air requirement for the gym and group fitness area, the introduction of a heat recovery ventilator will boost and temper the fresh air while reducing the outside air load on the AHUs, providing improved comfort for significant proportions of the year without active intervention.

Control will be provided by wall mounted sensors and switches with functions for manual on and off and auto off.

All ductwork containing conditioned air will be insulated in accordance with the BCA.

Carbon dioxide (CO_2) sensors will be incorporated into the new AHUs to reduce outside air when there is low occupancy levels and increase outside air when there is high occupancy levels.

The sensors will be located in the conditioned areas.

Air flow measurement will be installed into the outside air intakes for the system to allow for control of the outside air in conjunction with the levels of CO_2 in the space. The quantity of ventilation will be controlled by the CO_2 sensor by modulating the outside air and return air motorised dampers in a coordinated fashion to maintain the concentration of CO_2 at the desired level.

3.4.3.2 Alteration for Storage, Group Fitness and Office Space

The group fitness and office space will be conditioned via a roof mounted packaged variable air volume air-handling unit (AHU), incorporating heat recovery. Due to the high outside air requirement for the gym and group fitness area, the introduction of a heat recovery ventilator will boost and temper the fresh air while reducing the outside air load on the AHUs, providing improved comfort for significant proportions of the year without active intervention.

Control will be provided by wall mounted sensors and switches with functions for manual on and off and auto off.

All ductwork containing conditioned air will be insulated in accordance with the BCA.

Carbon dioxide (CO_2) sensor will be incorporated into the new AHUs to reduce outside air when there is low occupancy levels and increase outside air when there is high occupancy levels.

The sensors will be located in the conditioned areas.

Air flow measurement will be installed into the outside air intakes for the system to allow for control of the outside air in conjunction with the levels of CO_2 in the space. The quantity of ventilation will be controlled by the CO_2 sensor by modulating the outside air and return air motorised dampers in a coordinated fashion to maintain the concentration of CO_2 at the desired level.

The storage areas will be mechanically exhausted in accordance with AS1668.2 (2012).

The storeroom exhaust fan will be interconnected to programmable and adjustable time clock to operate the fan during operational hour as agreed with the client. This time clock can be adjustable to meet the client requirements.

3.4.3.3 Addition of One Squash Court

The new squash court is proposed to be added within the existing squash court area. We assumed the existing HVAC system is sufficient to cater for the relatively small area added.

3.4.3.4 New Extension Building (Basketball)

The space will be conditioned via a roof mounted packaged variable air volume air-handling unit (AHU), incorporating heat recovery. Due to the high outside air requirement for the area, the introduction of a heat recovery ventilator will boost and temper the fresh air while reducing the outside air load on the AHUs, providing improved comfort for significant proportions of the year without active intervention.

Control will be provided by wall mounted sensors and switches with functions for manual on and off and auto off.

All ductwork containing conditioned air will be insulated in accordance with the BCA.

Carbon dioxide (CO_2) sensor will be incorporated into the new AHUs to reduce outside air when there is low occupancy levels and increase outside air when there is high occupancy levels.

The sensors will be located in the conditioned areas.

Air flow measurement will be installed into the outside air intakes for the system to allow for control of the outside air in conjunction with the levels of CO_2 in the space. The quantity of ventilation will be controlled by the CO_2 sensor by modulating the outside air and return air motorised dampers in a coordinated fashion to maintain the concentration of CO_2 at the desired level.

3.5 Plant Efficiency and Sustainable Design

The new plant will be selected to minimise energy consumption within operational parameters imposed by the systems functional requirements. Air conditioning plant will include energy efficient features where they can be demonstrated to be economic on a life cycle cost basis.

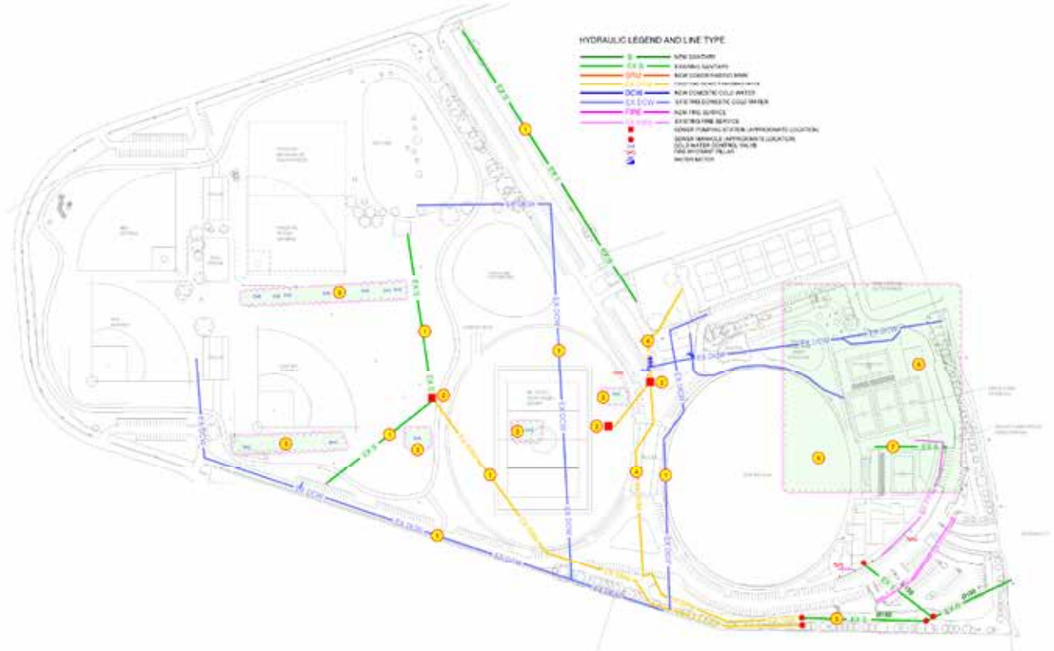
Energy efficiency measures include:

- NCC Section J Compliance.
- Maintain outside air at minimum rates consistent with code and functional requirements.
- High efficiency electric motor drives on all main systems.
- Minimise system duct pressure losses by appropriate duct sizing and configuration.
- Higher levels of insulation to ducting and pipework.
- Incorporation of heat recovery on rooftop AHUs where beneficial.

2.1 Existing Services

Existing private services including, but not limited to the existing water main, DIA40 and DIA80 pressurised sewer lines and DIA150 sewer main are located within the site footprint. There is substantial information missing from the current survey information which is required to make a more detailed analysis as highlighted below. This will need to be obtained via survey prior to commencement of any detailed design.

- The size and invert level of the sanitary lines between the baseball and cricket nets.
- Sewer pumping station.
- Cold water valves are shown without cold water pipework (size and invert level)
- The location and the invert level of the sewer pipe serving the existing stadium.



2.1.1 Sanitary

The existing sanitary system is effectively split into 3 parts. The first of these is the gravity system which runs from the existing facilities in three distinct areas and is collected at lifting stations. The three buildings served by these gravity lines are:

- To the south of the dog park.
- The main pavilion.
- The netball courts.

The second part of the system is the pressurised sewer main running from three lifting stations:

- To the west of the multi-sport rectangular pitch.
- To the west of the main pavilion.
- To the north west of the main pavilion.

The rising sewer mains from these lifting stations can run a greater distance than gravity lines and are collected at the beginning of the third part of the system. This is located in the south east corner of the site and is the sewer main which runs by gravity to the municipal sewer on Hamilton Road.

2.1.2 Domestic Water and Water for Fire Services

The domestic cold water is supplied from the street main located on Hamilton Road to the site wide underground water network. From this network the existing buildings are served. It is unknown at this time whether each building is provided with a separate water meter, or whether there is one bulk meter for the site.

There are 2 fire hydrants shown on the existing information served by fire water mains. It is assumed they are connected to the sitewide water network, however they could also have a separate connection to the main on Hamilton road. This will need to be confirmed in the detailed design stage.

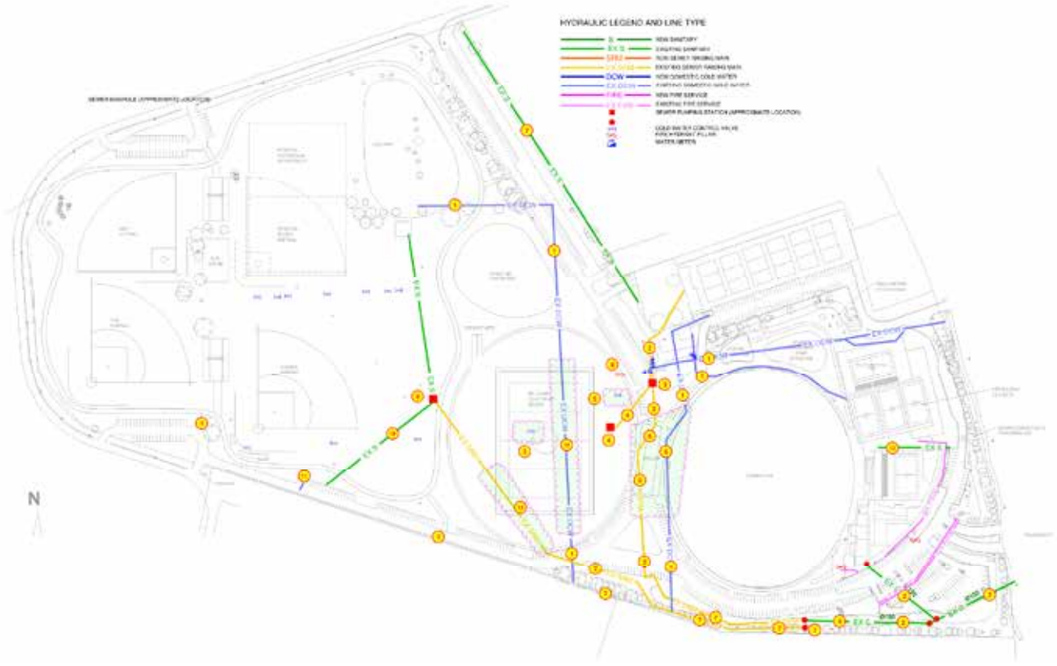
2.1.3 Stormwater Drainage System

Stormwater drainage is from the roofs and balconies of all existing buildings, it connects into the sitewide stormwater network which will be developed by the civil engineer.

2.2 Impacts of the Proposed Master Plan

There will be multiple impacts to the existing services based on the masterplan layouts, these will effect cold water, sewers and fire hydrant systems as follows:

- The existing cold water pipe to the southern boundary must be buried at least 750mm below ground due to the vehicular loading. A survey is required to confirm the invert level and size of the water pipe.
- The existing sewer pressure pipe located below the car parks must be buried at least 500mm below ground due to the vehicular loading. Survey is required to confirm the invert level and size of the pipe.
- The existing sewer pumping station under the car park to the north west of the existing oval must be able to withstand the vehicular loading. Survey is required to confirm the installation details, invert level and the cover type.
- Existing sewer pumping station and the associated pipework adjacent to the multi-sport rectangular pitch is to be demolished.
- Existing sewer and cold water pipe must be re-routed to avoid the new pavilion building. Demolish the pipework in the new pavilion site and refer to the new work for the new pipework.
- Existing inground hydraulic pipe to the south of the oval may be impacted by the proposed landscape design. Coordination is required to ensure the buried pipes will not be impact by the trees in future.
- The existing external fire hydrant to the north east of the multi-sport rectangular pitch is to be demolished and the pipe capped off.

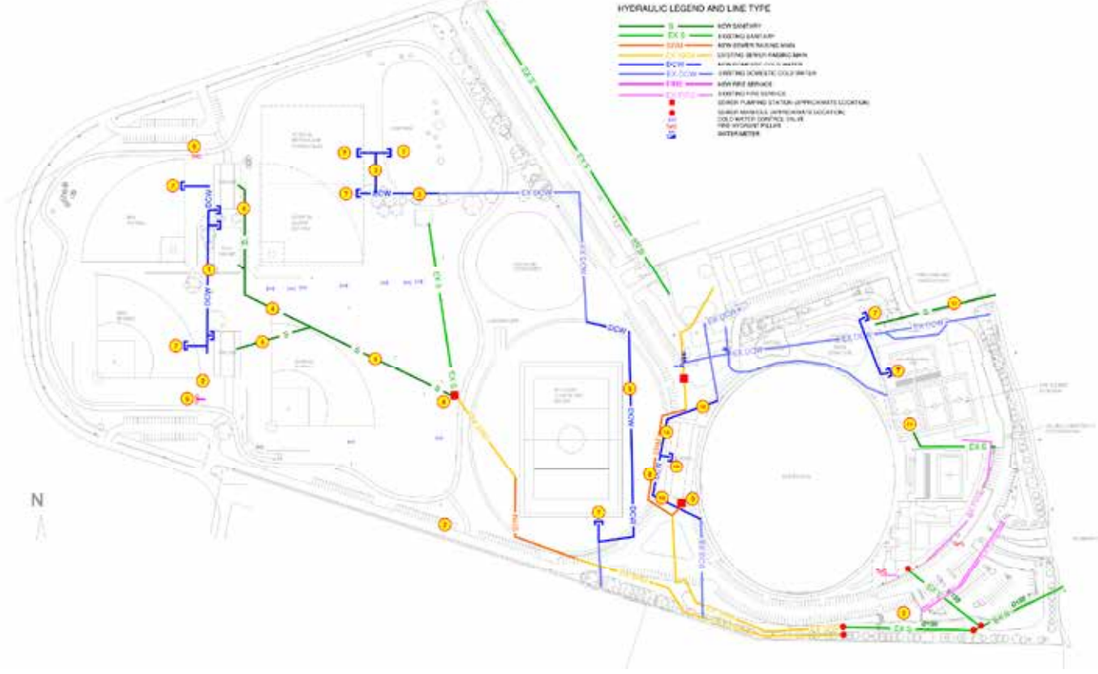


2.3 Design Solutions and Works Required

2.3.1 Sitewide

To enable the masterplan to function new pipework will need to be installed throughout the site as follows:

- New DIA65 cold water to serve the proposed building and playing fields.
- New DIA100 fire service pipe to serve the proposed building.
- New DIA40 cold water to serve the proposed playing fields.
- New DIA100 sewer pipe drains to the new sewer pumping station located between the existing baseball field and the multi-sport rectangular pitch.
- New cold water pipe and pressure sewer line to the west of the new pavilion. The size of the existing pipes is currently unknown, but the size of the new pipes will need to be the same.
- Two new external fire hydrants to serve new buildings (minimum 10m away from the protected building).
- New DIA25 cold water pipe to serve new playing fields.
- New sewer pumping station to the west of the oval serving the proposed building. DIA65 pressure sewer will connect to the existing pressure sewer pipe
- New ø100 sewer pipe serving the new building to the east of the oval. Connection to the assumed existing sewer pipe, further survey is required.
- New ø100 sewer pipe serving the new field to the east of the oval and connect to the existing sewer main in Hamilton Road.



2.3.2 The Buildings

2.3.2.1 Wanangkura Stadium

The Wanangkura Stadium gym & group fitness (100m²), Storage, Group Fitness and Office Space (400m²) is being refurbished. An additional Squash Court (15m²) is also being created. It is assumed that new hydraulic services will be provided to each of these areas.

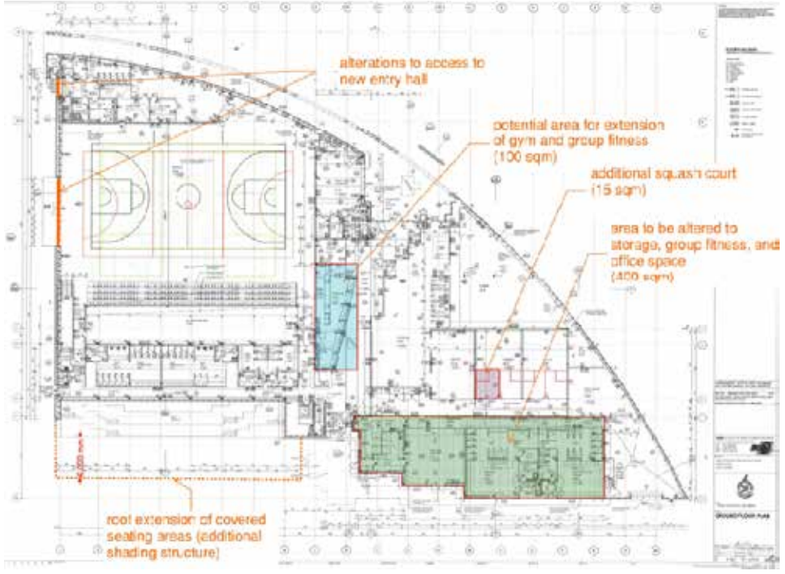
The building will be provided with a new metered water supply in line with AS/NZS3500, AS/NZS5601 from the existing site water infrastructure. The supply will extend all points of demand. The pressure and flow information will determine if there is a requirement for booster pumps and water storage tanks. Low flow fittings will be utilised for taps, WCs and the like.

Local electric storage hot water units will be provided near the amenities areas within the building. Tempering valves and Thermostatic mixing valves shall be provided to all necessary fixtures. Further investigation can be carried out during detail design to explore the use of heat pumps and solar hot water to provide the hot water as they are far more efficient than standard electric heaters, but also have a higher capital cost.

A rain water storage tank should be considered for the building. However due to the intense heavy rain periods and long dry periods in the region, this may lead to stagnation in the tank rendering it unfeasible.

The sewer drainage will be provided to collect all the waste from the fixtures and condensate from the cooling plant. A floor waste gully shall be in each toilet area to contain any leaks. The addition of black and grey water treatment facilities shared with the rest of the site should be reviewed in the detailed design stage as the capital cost will be high, but beneficial in the dry climate of Port Hedland. Recycled greywater could be used for toilet flushing, while properly treated black water could be sued for irrigation.

As this is an existing building it is assumed the existing stormwater drainage system will be retained.



Sketch showing the alterations to the existing Wanangkura Stadium

2.3.2.2 New Extension Building (Basketball)

The new extension building provides indoor basketball courts and associated amenities.

The building will be provided with a new metered water supply in line with AS/NZS3500, AS/NZS5601 from the existing site water infrastructure. The supply will extend all points of demand. The pressure and flow information will determine if there is a requirement for booster pumps and water storage tanks. Low flow fittings will be utilised for taps, WCs and the like.

Local electric storage hot water units will be provided near the amenities areas within the building. Tempering valves and Thermostatic mixing valves shall be provided to all necessary fixtures. Further investigation can be carried out during detail design to explore the use of heat pumps to provide the hot water as they are far more efficient than standard electric heaters, but also have a higher capital cost.

A rain water storage tank should be considered for the building. However due to the intense heavy rain periods and long dry periods in the region, this may lead to stagnation in the tank rendering it unfeasible.

The sewer drainage will be provided to collect all the waste from the fixtures and condensate from the cooling plant. A floor waste gully shall be in each toilet area to contain any leaks.

Downpipes shall be positioned in accordance with AS/NZS3500 to collect all roof water off the building. The downpipes will be utilised to reticulate the collected rainwater to the harvesting tank system, or the stormwater drainage system designed by the civil engineer depending on the approach taken.

The extent of the downpipes is to the ground floor and / or to the tank. The continuation of the downpipes / tank overflow to the Legal Point of Discharge nominated by the council or water authority will be carried out by the Civil Engineering consultant.

2.3.2.3 Large Pavilion Building

The large pavilion building is located in between the existing oval and the new multisport oval. The large pavilion building will include 4 x change rooms, 4 x showers and toilets (adjacent to change rooms), Meeting / Function Hall, Small Meeting Room (to accommodate sporting group and community meetings), Kitchen/Servery (accessible from both sides), Bar, First Aid Room, Umpires Change Room, Public Toilets, Spectator Viewing Area (on both sides), User Group / Club Storage, Club memorabilia display area and Emergency vehicle access.

The building will be provided with a new metered water supply in line with AS/NZS3500, AS/NZS5601 from the existing site water infrastructure. The supply will extend all points of demand. The pressure and flow information will determine if there is a requirement for booster pumps and water storage tanks. Low flow fittings will be utilised for taps, WCs and the like.

Local electric storage hot water units will be provided near the amenities areas within the building. Tempering valves and Thermostatic mixing valves shall be provided to all necessary fixtures. Further investigation can be carried out during detail design to explore the use of heat pumps to provide the hot water as they are far more efficient than standard electric heaters, but also have a higher capital cost.

A rain water storage tank will not be considered for the building due to its small roof and hence catchment area.

The sewer drainage will be provided to collect all the waste from the fixtures and condensate from the cooling plant. A floor waste gully shall be in each toilet area to contain any leaks.

A grease trap will be provided for the kitchen drainage in a well ventilated and maintainable area.

Downpipes shall be positioned in accordance with AS/NZS3500 to collect all roof water off the building. The downpipes will be utilised to reticulate the collected rainwater to the stormwater drainage system designed by the civil engineer depending on the approach taken.

The extent of the downpipes is to the ground floor. The continuation of the downpipes to the legal point of discharge nominated by the council or water authority will be carried out by the civil engineering consultant.

2.3.2.4 Two Small Pavilion Buildings

The smaller pavilions will provide club room facilities to the west of the existing baseball diamond to service new diamond sports and new active open space. They will provide change rooms, kiosk facilities, small social space, storage and undercover spectator viewing to the permanent baseball diamond and new active open space location. These club room facilities will also service the extended active open space area for rectangular sports and diamond sports.

The building will be provided with a new metered water supply in line with AS/NZS3500, AS/NZS5601 from the existing site water infrastructure. The supply will extend all points of demand. The pressure and flow information will determine if there is a requirement for booster pumps and water storage tanks. Low flow fittings will be utilised for taps, WCs and the like.

Local electric storage hot water units will be provided near the amenities areas within the building. Tempering valves and Thermostatic mixing valves shall be provided to all necessary fixtures. Further investigation can be carried out during detail design to explore the use of heat pumps to provide the hot water as they are far more efficient than standard electric heaters, but also have a higher capital cost.

A rain water storage tank will not be considered for the building due to its small roof and hence catchment area.

The sewer drainage will be provided to collect all the waste from the fixtures and condensate from the cooling plant. A floor waste gully shall be in each toilet area to contain any leaks.

A grease trap will be provided for the kitchen drainage in a well ventilated and maintainable area.

Downpipes shall be positioned in accordance with AS/NZS3500 to collect all roof water off the building. The downpipes will be utilised to reticulate the collected rainwater to the stormwater drainage system designed by the civil engineer depending on the approach taken.

The extent of the downpipes is to the ground floor. The continuation of the downpipes to the legal point of discharge nominated by the council or water authority will be carried out by the civil engineering consultant.

Transport Impact Assessment

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1. Executive Summary

Site Context

- South Hedland Sports Precinct is a regional level sporting hub and at present consists of various sporting infrastructure. Facilities which are in good condition are planned to be retained on the grounds while new community and sporting facilities are to be added.

Technical Findings

- The proposed development is expected to generate a total of 3,730 VPD vehicular trips per day and 1,479 vehicular trips in the peak hour. The existing land uses currently can generate up 2,455 vehicular trips per day and 999 vehicular trips in the peak hour.
- According to the WAPC Guidelines with additional 1,275 vehicular trips per day and 480 vehicular trips in the peak hour the proposed development would have high impact on the surrounding road network. However, KCTT believe that the surrounding streets have sufficient capacity to accommodate additional traffic flows having in mind the peak traffic generation of the development would be on the weekends when the traffic volumes on the road network are lower.

Relationship with Policies

- Town of Port Hedland Local Planning Scheme No. 5 stipulates a requirement of 684 parking bays. The proposed number of bays is approximately 700 depending on the final plans. KCTT believe that the proposed parking provision should be more than sufficient to cater for the requirements of all the patrons of proposed land uses.
- Town of Port Hedland does Local Planning Scheme does not offer bicycle parking rates therefore KCTT have referred to Guide to Traffic Management Part 11: Parking. Installation of 3 long term and 38 short term bicycle parking spaces should be considered in order to promote alternative transportation modes. Additionally, having in mind that the subject site is a recreational facility it is highly likely patrons would cycle to their destination.
- The Building Code of Australia stipulates a requirement of 14 accessible car parking bays. KCTT suggest having 14 parking bays marked as accessible throughout the complex in order to comply to the requirements and provide an inclusive environment to people with disabilities.
- KCTT have examined warrants for deceleration lanes on the main entrance. A 70m right turn deceleration lane has already been provided as part of the existing development. This provision meets the requirement in full. Having in mind the increase in traffic volumes an extension of the deceleration lane could be considered.

Conclusions

- The proposed amendment of the sporting hub will see the space used more evenly throughout the year. The increase in estimated peak use would be less than 50% of existing traffic and can be successfully catered for within the existing network. Current configuration of the entry point can sustain the increase in traffic without further improvements.

- Parking provided is sufficient to meed the demand during peak operation. If the proposed parking fails to meet demand of a particular event, temporary parking should be set up in portions of the hub unused at the time of event. Provision of surplus parking (well in excess of the requirement) is likely to lead to antisocial behaviour and the space taken by parking bays surplus to the requirement can be much valued play space.

- Drivers should be made aware of pedestrian movement through the precinct through urban design response (not oversizing circulation isles, small kerb radii, occasional difference in paving, prominent pedestrian crossings, speed humps where isles exceed 100m in length etc.) and appropriate signage. All parking areas should be designated as shared zones with speed limit of 10km/h.

- Running / walking track through the complex is designed to allow access to an emergency vehicle should requirement arise.

- Accessibility principles should be considered in concept and detailed design of the precinct enabling patrons of varying motor skills to enjoy the space. For this purpose ACROD bays should be installed throughout the precinct – preferably in such manner that two ACROD bays can share manoeuvring space. Manoeuvring space can be positioned to allow for creating pedestrian connections. Pram ramps or flush kerbs should be installed wherever pedestrian path and / or crossing are introduced.

- Waste collection points in pavilions should be positioned in such manner that waste collection vehicle can easily access the collection point (please refer Appendix 3). Given low frequency of collections, it is not deemed that designated parking bays are required, however areas which are meant to be kept clear can be marked on pavement to prevent illegal parking.

- Provision should be made for cyclist through allowing for installation of bicycle racks and appropriate end of trip facilities (which can be conveniently located near locker rooms).

Transport Impact Assessment
KC00751.000 South Hendland Integrated Sports Precinct

2. Transport Impact Assessment

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2.1 Location

Lot Number	300
Road Name	Hamilton Road
Suburb	South Hedland
Description of Site	South Hedland Sports Precinct is a regional level sporting hub and consists of various existing sporting infrastructure. Facilities that are good condition are planned to remain on the grounds and several new community facilities are to be added.

2.2 Technical Literature Used

Local Government Authority	Town of Port Hedland
Type of Development	Sporting complex
Are the R-Codes referenced?	NO
Is the NSW RTA Guide to Traffic Generating Developments Version 2.2 October 2002 (referenced to determine trip generation / attraction rates for various land uses) referenced?	YES
Which WAPC Transport Impact Assessment Guideline should be referenced?	Volume 2 - Planning Schemes, Structure Plans & Activity Centre Plans Volume 5 - Technical Guidance
Are there applicable LGA schemes for this type of development?	YES
If YES, Nominate:	
Name and Number of Scheme	Town of Port Hedland Local Planning Scheme No. 5
Are Austroads documents referenced?	YES

2.3 Land Uses

Land Uses (Existing and Proposed)

Land use	Yield
1. Wanangkura Stadium (existing)	1 basketball court
2. Extension to Wanangkura Stadium – 3 indoor basketball courts	3 basketball court
3. Outdoor covered basketball court with spectator seating	1 basketball court
4. Playground for small kids (existing) – potential future upgrade	-
5. Netball pavilion + outdoor netball courts (existing)	6 courts
6. AFL / Cricket oval (existing)	1 oval
7. Community multi-sport pavilion including change-rooms	≈ 1,100 m^2
8. New multi-purpose oval	1 oval
9. Destination adventure playground for all ages *Multiple shade structures recommended* *Allocated area for future provision*	-
10. Cricket nets (relocated)	2 cricket nets
11. New dog park (fenced off)	-
12. Passive recreation area	-
13. Existing Baseball diamond to remain (upgraded)	1 diamond
14. Existing pavilions to be removed	-
15. New baseball diamond	1 diamond
16. New baseball pavilion including change rooms	≈ 680 m^2
17. Playground for small kids *Of baseball, softball, and touch rugby players* *Shade structure recommended*	-
18. New softball diamond	1 diamond
19. Potential second softball / potential area for future full size rectangular playing field *(e.g. soccer, rugby, hockey)*	2 fields
20. Potential future pavilion to rectangular playing fields	≈ 680 m^2
21. Grassed mound for spectator viewing *Enlarged and shade structure added*	-
22. Outdoor trail for running and skating *1.2km circle route* *Potential outdoor fitness and exercise equipment* *Shade structures and drinking fountains recommended*	1 trail
23. Family & BBQ Outdoor Area *Shade structures recommended*	-

Transport Impact Assessment
KC00751.000 South Hendland Integrated Sports Precinct

2.4 Local Road Network Information

How many roads front the subject site? 3 roads

Name of Roads Fronting Subject Site / Road Classification and Description:

Road 1

Road Name	**Hamilton Road**
Number of Lanes	• two way, one lane each direction, undivided - north of North Circular Road • two way, two lanes per direction, divided – between North Circular Road and Forrest Circle • two way, one lane each direction, undivided - south of Forrest Circle
Road Reservation Width	• 40m - north of North Circular Road • 20m - south of North Circular Road
Road Pavement Width	• 7m - north of North Circular Road • 7m per direction, 5.5m median – between North Circular Road and Forrest Circle • 8.5m - south of Forrest Circle
Classification	• SLK [0.00-1.56] - Rural Local Road / Regional Distributor • SLK [1.56-1.68] - Rural Local Road / Local Distributor • SLK [1.68-2.92] - Significant Urban Local Road / Local Distributor • SLK [2.92-3.42] - Rural Local Road / Access Road
Speed Limit	• SLK [0.00-1.41] - 80kph • SLK [1.41-2.64] - 60kph • SLK [20.64-3.42] – 50kph
Bus Route	YES
If YES Nominate Bus Routes	870, 871, 872
On-street parking	NO

Road 2

Road Name	Hudson Way
Number of Lanes	two way, one lane (no linemarking), undivided
Road Reservation Width	40m
Road Pavement Width	7m
Classification	Rural Local Road / Access Road
Speed Limit	50kph
Bus Route	NO
On-street parking	NO

Road 3

Road Name	Parola Court
Number of Lanes	two way, one lane (no linemarking), undivided
Road Reservation Width	20m
Road Pavement Width	7m
Classification	Rural Local Road / Access Road
Speed Limit	n/a
Bus Route	NO
On-street parking	NO

Name of Other Roads within 400m radius of site, or roads likely to take increased traffic due to the development:

Road 1

Road Name	North Circular Road West
Number of Lanes	two way, one lane each direction, undivided
Road Reservation Width	40m
Road Pavement Width	7m
Classification	Rural Local Road / Regional Distributor
Speed Limit	80kph
Bus Route	NO
On-street parking	NO

Road 2

Road Name	Forrest Circle
Number of Lanes	two way, one lane each direction, undivided
Road Reservation Width	40m
Road Pavement Width	7m
Classification	• SLK [0.00-0.21] - Rural Local Road / Access Road • SLK [0.21-1.71] - Rural Local Road / Regional Distributor
Speed Limit	• SLK [0.21-0.48] - 50kph • SLK [0.21-1.71] - 60kph
Bus Route	NO
On-street parking	NO

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2.5 Traffic Volumes

Road Name	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)		Heavy Vehicle %	Date of Traffic Count	*If older than 3 years multiply with a growth rate of 3% per annuum*
			AM Peak Time - AM Peak VPH	PM Peak Time - PM Peak VPH	*If HV count is Not Available, are HV likely to be in higher volumes than generally expected?*		
Traffic Volume – Average Monday to Friday							
Hamilton Road	South of Great Northern Highway	5,389	05:30 – 676	17:00 – 629	20.1	2014/ 2015	6,065
	South of North Circular Road - Southbound*	4,647	08:00 - 345	17:00 - 437	8.0	Jun 2019	–
Wallwork Road	South of Pinga Street	10,574	07:30 – 736	16:30 – 987	11.0	2016/ 2017	–
Powell Road	West of Hamilton Road	2,260	05:00 – 336	17:15 – 319	20.2	2015/ 2016	2,469
Parker Street	South of North Circular Road	1,914	07:15 – 184	16:30 – 170	31.1	2018/ 2019	–
Great Northern Highway	South of Powell Road	3,098	05:15 – 204	17:00 – 229	45.4	2017/ 2018	–
Traffic Volume – Average on Weekends **							
Hamilton Road	South of North Circular Road - Southbound*	3,109	10:00 – 264	18:00 - 270	8.6	Jun 2019	–
Wallwork Road	South of Pinga Street	8,021	11:30 – 653	12:00 – 603	10.6	2016/ 2017	–
Powell Road	West of Hamilton Road	1,965	05:00 – 281	17:00 – 276	17.3	2015/ 2016	2,147
Parker Street	South of North Circular Road	1,014	10:30 – 83	17:30 – 79	57.8	2018/ 2019	–
Great Northern Highway	South of Powell Road	2,817	05:00 – 177	17:15 – 193	47.0	2017/ 2018	–

Note - These traffic counts have been received from the Town of Port Hedland*
*Note ** - It is expected the subject site peak activity would be on weekends.*

Road 3

Road Name	Parola Court
Number of Lanes	two way, one lane (no linemarking), undivided
Road Reservation Width	20m
Road Pavement Width	7m
Classification	Rural Local Road / Access Road
Speed Limit	n/a
Bus Route	NO
On-street parking	NO

Name of Other Roads within 400m radius of site, or roads likely to take increased traffic due to the development:

Road 1

Road Name	North Circular Road West
Number of Lanes	two way, one lane each direction, undivided
Road Reservation Width	40m
Road Pavement Width	7m
Classification	Rural Local Road / Regional Distributor
Speed Limit	80kph
Bus Route	NO
On-street parking	NO

Road 2

Road Name	Forrest Circle
Number of Lanes	two way, one lane each direction, undivided
Road Reservation Width	40m
Road Pavement Width	7m
Classification	• SLK [0.00-0.21] - Rural Local Road / Access Road • SLK [0.21-1.71] - Rural Local Road / Regional Distributor
Speed Limit	• SLK [0.21-0.48] - 50kph • SLK [0.21-1.71] - 60kph
Bus Route	NO
On-street parking	NO

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2.7 Vehicular Parking

Local Government	Town of Port Hedland
Local Government Document Utilised	Local Planning Scheme No. 5

Description of Parking Requirements in accordance with Scheme:

***Private Recreation/ Public Recreation*:**

- *1 bay for every 10 m² unmarked indoor floor area,*
- *1 bay for every 20 m² pool, skating or other free-movement area,*
- *1 bay for every player accommodated on marked courts or lanes,*
- *1 bay per 4 spectator/audience seats, and*
- *1 bay per employee at peak operation.*

All other non-specified areas and facilities at the local government's discretion

As the proposed development is still in the early planning stage and the details of each land use are not known, KCTT have assessed the general parking demand that could arise for the proposed land uses.
Given the current layout and use the following is assumed as the "worst case" scenario (the largest number of fields in simultaneous use with highest number of participants):

- 2 Baseball courts
- 2 Softball courts
- 2 AFL courts
- 5 Basketball courts
- 6 Netball courts

However, considering that some of these sports are winter sports and some summer sports (respective club seasons do not overlap) – this 100% utilisation of the space is not likely to occur in this format. Therefore, the plausible worst case scenario for parking demand could be:

- 2 rugby courts
- 2 AFL courts
- 5 basketball courts
- 6 netball courts

It is safe to assume there won't be more than 1,000 spectators at any one time (inclusive of employees in canteen and maintenance personnel) who are unrelated to players in any way (traveling in separate vehicles). However, this will depend on the allowed for capacity of the stands, mounds and clubrooms.

Calculation of Parking

Land Use	Requirement	Yield	Total Parking
Rugby	*1 bay for every player accommodated on marked courts or lanes*	2 courts 34 players 4 umpires	76
AFL		2 courts 44 players 4 umpires	96
Basketball		5 courts 20 players 3 umpires	115
Netball		6 courts 20 players 2 umpires	132
Spectators	*1 bay per 4 spectator/audience seats*	980 spectators	245
Employees	*1 bay per employee at peak operation*	20 employees	20
		Total Car Parking Requirement	**684**

Total Volume of Parking Provided by Proponent	**≈700 parking bays**

Justification

Since the parking calculations are based on currents assumptions, allowed number of parking bays leaves room for changes to development plans.

KCTT believe that the proposed parking provision should cater for the needs of all the patrons of proposed land uses. Furthermore, event / overflow parking can be organised on grassed areas of the sport complex which are not used at the time of the event.

Parking for passenger vehicles should be designed to comply to Class 2 requirements of AS2890.01 as an absolute minimum (2.5 x 5.4m). Given that Port Headland has significant portion of larger 4x4 vehicles, it is desirable to create parking bays which exceed dimensions specified by AS2890.01.

To minimise the possibility for antisocial driving behaviour within parking area, the following methods may be considered:

- Smaller kerb radii – kerb radius should be 6 metres wherever possible; the visual narrowing of the intersection drives the road users to reduce their operating speed limit;
- Slow Points / Blisters – these should be considered on longer stretches of parking; this type of traffic management method can be combined with the retention of existing vegetation;
- Pedestrian crossings should be positioned so they offer unobstructed sight distances to pedestrians preparing to cross. Pedestrians should be clearly visible to drivers in on-coming traffic. Pedestrian crossings should have pram-ramps which would provide greater accessibility for more vulnerable road users.
- Speed humps on isles which exceed 100m in length.

Have Vehicle Swept Paths been checked for Parking?	YES

If YES, provide description of performance:

Navigability of the layout was tested for standard waste collection vehicle (8.8m long). Running track was designed to allow access to emergency vehicles (ambulance and fire truck to newly proposed pavilions). Refer to Appendix 3

2.8 Bicycle Parking

Local Government	Town of Port Hedland
Reference Document Utilised	Local Planning Scheme No. 5 Guide to Traffic Management Part 11: Parking

Description of Parking Requirements in accordance with Scheme:

Town of Port Hedland does Local Planning Scheme does not offer bicycle parking rates therefore KCTT have referred to Guide to Traffic Management Part 11: Parking.
The following rates have been provided as guidance only:

Indoor recreation facility

Employee/resident parking spaces - 1 per 4 employees (class 1 or 2)

Visitor/shopper parking spaces - 1 per 200 m^2 GFA (class 3)

Major sports ground

Employee/resident parking spaces - 1 per 1500 spectator places (class 1)

Visitor/shopper parking spaces - 1 per 250 spectator places (class 3)

As explained in section 2.7 it can be assumed there won't be more than 1,000 spectators at any one time (inclusive of employees in canteen and maintenance personnel) who are unrelated to players in any way (traveling in separate vehicles). However, this will depend on the allowed for capacity of the stands, mounds and clubrooms.

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Parking Requirement in accordance with regulatory documents

Land Use	Requirement	Yield	Total Bicycle Parking requirement: Minimum Long-term Parking (Employee spaces)	Total Bicycle Parking requirement: Minimum Short-term Parking (Visitor spaces)
Indoor facilities	*E- 1 per 4 employees* *V - 1 per 200 m^2 GFA*	≈ 7,000m^2 assumed 5 employees*	2	35
Outdoor facilities	*E- 1 per 1500 spectator places* *V - 1 per 250 spectator places*	735 spectators*	1	3
	Total Bicycle Parking Requirement		**3**	**38**

*Note * - It is it is assumed that the indoor facilities (4 basketball courts) would take up 25% of employees and spectators.*

Justification

Installation of 3 long term and 38 short term bicycle parking spaces should be considered in order to promote alternative transportation modes. Additionally, having in mind that the subject site is a recreational facility it is highly likely patrons would cycle to their destination.

2.9 ACROD Parking

Class of Building	Class 9b - an assembly building, including a trade workshop, laboratory or the like in a primary or secondary school, but excluding any other parts of the building that are of another Class
Does this building class require specific provision of ACROD Parking?	YES
Reference Document Utilised	Building Code of Australia

Description of Parking Requirements:

Class 9b — (b) Other assembly building — (i) up to 1000 carparking spaces; - 1 space for every 50 carparking spaces or part thereof

Parking Requirement in accordance with regulatory documents

Land Use	Requirements	Yield	Total Parking
Integrated Sports Precinct	*1 space for every 50 carparking spaces or part thereof*	700 parking bays	14
	Total Volume of ACROD Parking Required		**14**

Justification

KCTT suggest having 14 parking bays marked as accessible throughout the complex in order to comply to the requirements.

2.10 Delivery and Service Vehicles

Guideline Document used as reference	NSW RTA Guide to Traffic Generating Developments
Requirements	
Other uses - 1 space per 2,000m2	

Parking Requirement in accordance with regulatory documents

Land Use	Minimum Requirements	Yield	Total Parking
Integrated Sports Precinct	*1 space per 2,000m2*	≈10,000*	5
*Note * - Approximate cumulative yield of buddings throughout the complex.*			
	Total Volume of Service and Delivery Parking Required		5

Justification

These rates have been provided as guidance only, once more detailed areas are known service and delivery parking provision can be reassessed. Some of the services which are co-located can share the delivery and service vehicle bays.

2.11 Calculation of Development Generated / Attracted Trips

What are the likely hours of operation?	Monday - Thursday 5:30–21:30 Friday 5:30AM–20:00 Saturday - Sunday 7:00–15:00
What are the likely peak hours of operation?	07:00 – 08:00 AM Peak 15:00 – 16:00 PM Peak
Do the development generated peaks coincide with existing road network peaks?	NO
Guideline Document Used	NSW RTA Guide to Traffic Generating Developments
Rates from above document:	***3.8 Recreational and tourist facilities.*** ***Overview.*** *Recreational and tourist facilities are site and type specific in their operation and traffic generation, often with seasonal variations in usage. Ideally, analysis of proposed developments should be based on surveys of similar developments. If this is not possible a first principles analysis is required.* ***3.8.1 Recreation facilities.*** *Analysis should be based on the predicted 85 percentile usage rather than usage at capacity, taking into account weekly and seasonal variations. For example, the weekly peak hour traffic generation of a proposed golf course might be assessed over several months, to establish a distribution of usage.*
Guideline Document Used	Transportation Engineers (ITE) Common Trip Generation Rates (9th edition)
Rates from above document:	***Multipurpose Recreational Facility:*** • *Daily - 90.38 VPD/acre = 36.57 VPD/ha* • *AM peak - 1.92 VPH/acre = 0.78 VPH/ha* • *PM peak - 5.77 VPH/acre = 2.33 VPH/ha*

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The data provided in the ITE Manual is based on a small sample and is to be used with caution. KCTT believe that the rates provided would not adequately represent the traffic impact of the subject site.
Therefore, we have derived rates based on the expected usage of the subject site.

The greatest traffic demand would be on weekend tournaments. Considering that some of these sports are winter sports and some summer sports (their seasons do not overlap) – this 100% utilisation of the space is not likely to occur. Therefore, the plausible worst case scenario for traffic demand could be netball, basketball and AFL/Rugby tournaments would be held at the same time with games held from 07:00 to 15:00 (8h).

It is expected that 40% of the total number of spectators would remain on the grounds throughout the day and the other 60% would be coming and going as the games finish. For the purposes of traffic calculation, it is assumed that the number of spectators for AFL/Rugby is approximately twice as high as the number of spectators for Netball/Basketball. Given that in practice AFL and Rugby league games usually occur on a differing weekend day (one on Saturday, one on Sunday) for purpose of this calculation we will assume that AFL games occur concurrently with Netball / Basketball games.

The patrons will make one vehicular trip arriving to the development and one vehicular trip departing from the development. It is expected that the peak period of the development would be at the start or end of the tournament. It should be noted that it is expected that players/umpires and employees would not all arrive at the same time their arrivals and departures would be spread out throughout the day; therefore, they are excluded from peak hour traffic calculations.
It is assumed that the average car occupancy would be approximately 3 persons per car for spectators and 1 person per car for players/umpires/employees. Parents dropping of their children to games will not generate additional traffic.
Therefore, traffic generation rate can be derived as follows:

- Peak traffic generation:
  - 1 VPD / 3 spectators = 0.33 VPD/spectator
- Daily traffic generation:
  - 2 VPD / 3 spectators = 0.67 VPD/spectator
  - 2 VPD / player/umpire/employee

The table below provides an overview of these assumptions.

Game type	Game duration	Number of players/ umpires per court	Number of courts	Games per court / day	Number of spectators per court / at any one time*	Number of spectators per court / day*	Number of employees per court/day
Netball	1h	20 players 2 umpires	6	8	75	390	1
Basketball	1.5h	20 players 3 umpires	5	5	75	255	2
AFL	2h	44 players 4 umpires	2	4	155	434	2

*Note * - It is expected that 40% of the total number of spectators would remain throughout the day and the other 60% would coming and going as the games finish.*

FUTURE TRAFFIC						
Game type	**Number of players/ umpires/ employees per court**	**Number of courts**	**Number of spectators per court / day**	**Rates**	**Daily Traffic Generation**	**Peak Hour Traffic Generation**
Netball	23	6	390	*Peak traffic generation: 0.33 VPD/spectator*	**1,844**	**772**
Basketball	25	5	255	*Daily traffic generation: 0.67 VPD/spectator*	**1,104**	**421**
AFL	50	2	434	*2 VPD / player/umpire/employee*	**782**	**286**
				TOTAL FUTURE TRAFFIC	**3,730 VPD**	**1,479 VPH**

EXISTING TRAFFIC						
Game type	**Number of players/ umpires/ employees per court**	**Number of courts**	**Number of spectators per court / day**	**Rates**	**Daily Traffic Generation**	**Peak Hour Traffic Generation**
Netball	23	6	390	*Peak traffic generation: 0.33 VPD/spectator*	**1,844**	**772**
Basketball	25	1	255	*Daily traffic generation: 0.67 VPD/spectator*	**220**	**84**
AFL	50	1	434	*2 VPD / player/umpire/employee*	**391**	**143**
				TOTAL EXISTING TRAFFIC	**2,455 VPD**	**999 VPH**

TOTAL ADDITIONAL TRAFFIC	**1,275 VPD 480 VPH**

What is the total impact of the new proposed development?

According to the WAPC Guidelines with additional 1,275 vehicular trips per day and 480 vehicular trips in the peak hour the proposed development would have high impact on the surrounding road network. However, KCTT believe that the surrounding streets have sufficient capacity to accommodate additional traffic flows having in mind the peak traffic generation of the development would be on the weekends when the traffic volumes on the road network are lower.

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2.12 Traffic Flow Distribution

How many routes are available for access / egress to the site?	Two routes • Total traffic from the proposed development: ○ 3,730 VPD / 1,479 VPH • Additional traffic on the road network: ○ 1,275 VPD / 480 VPH
Route 1	
Provide details for Route No 1	To/from the south via Hamilton Road
Percentage of Vehicular Movements via Route No 1	70% • Total traffic – 2,611 VPD / 1,035 VPH • Additional traffic – 892 VPD / 336 VPH
Route 2	
Provide details for Route No 2	To/from the north via Hamilton Road
Percentage of Vehicular Movements via Route No 2	30% • Total traffic – 1,119 VPD / 444 VPH • Additional traffic – 383 VPD / 144 VPH
What is the expected distribution of traffic amongst crossovers?	1. Hamilton Road – north (existing) = 10% 2. Hamilton Road – south (existing) = 60% 3. Parola Court – east = 2.5% 4. Parola Court – west = 2.5% 5. Hudson Way – west – *potential* = 2.5% 6. Hudson Way – middle (existing) – *potential = 2.5%* 7. Hudson Way – east (existing) = 20%

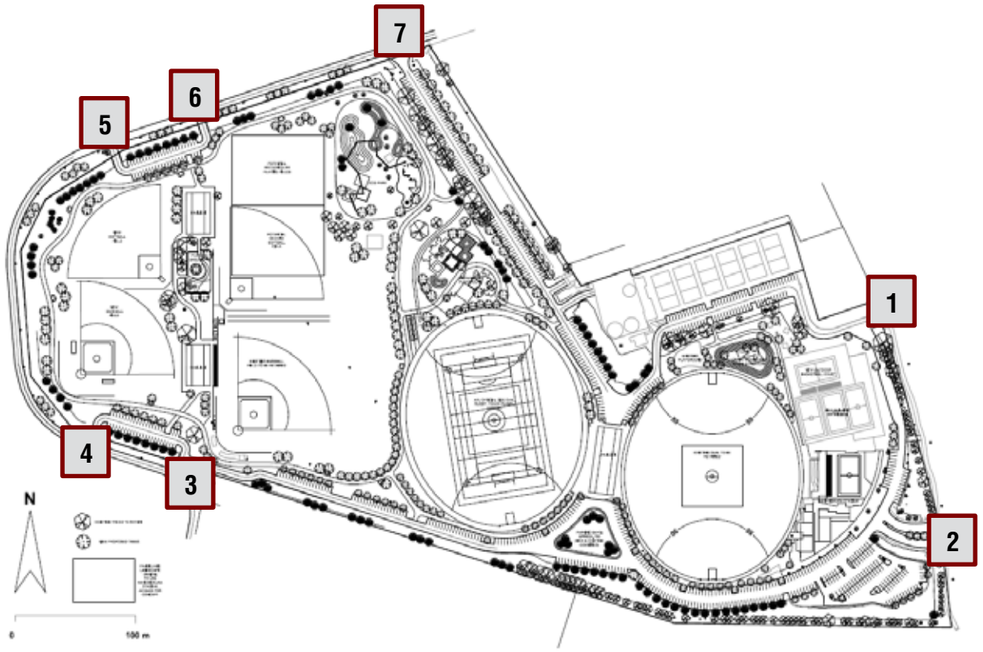
2.13 Vehicle Crossover Requirements

Are vehicle crossovers required onto existing road networks?	YES
How many existing crossovers?	1. Hamilton Road – north 2. Hamilton Road – south 3. Hudson Way – west 4. Hudson Way – east
How many proposed crossovers?	1. Hamilton Road – north (existing) 2. Hamilton Road – south (existing) 3. Parola Court – east 4. Parola Court – west 5. Hudson Way – west – *potential* 6. Hudson Way – middle (existing) – *potential* 7. Hudson Way – east (existing)

If there are greater numbers of new crossovers, than existing, provide justification:

Additional crossovers are proposed in order to provide adequate service to all fields and facilities without creating vehicle queuing or forcing visitors to walk long distances to their desired destination within the complex.

Refer to image below for crossover locations.



How close are proposed crossovers to existing intersections?	All crossovers are located more than 200m from existing intersections. Crossover 3 is located within 10m from the northern entrance to Ess Gateway Village.
Does this meet existing standards?	YES
Are auxiliary lanes warranted?	YES

2.14 Warrants for BA, AU and CH Turn Treatments

Warrants for auxiliary lanes have been examined for AM and PM traffic flow for the following intersection(s):

- Crossover 2 / Hamilton Road

in accordance with *MRWA Supplement to Austroads Guide to Road Design - Part 4, Appendix A Intersections - General* section A.8.

As per MRWA methodology the following equation should be used to determine the turning treatment warranted:

$$x = \frac{1}{471.50} \times Q_M^{0.912} \times Q_i^{1/2.46} \times (1 + 0.75 \times \%HV/100)$$

where:

1. Q_M is calculated based on Austroads GTM Part 6 – 2017, Figure 2.27.
2. %HV, calculated as the weighted average % heavy vehicles for Q_M.
3. Q_i is either Q_R or Q_L.
4. If Q_i is less than 3, only a basic treatment is warranted.
5. For four lane and six lane single carriageways refer to *Austroads Guide to Traffic Management Part 6*, (2017), Figure 2.27, for adjustments to Q_M:

   " On four- or six-lane two-way roads: the major road traffic volume parameter (QM) for right turns uses the full opposing flow QT2 and only the traffic flow in the nearest lane of the following flow QT1. For left turns, the major road traffic volume parameter (QM) uses only the traffic flow in the leftmost through lane of the following flow QT2"

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Hamilton Road has a speed limit of 60kph in this location i.e. the design speed would be 70kph. Therefore, the following formula is used:

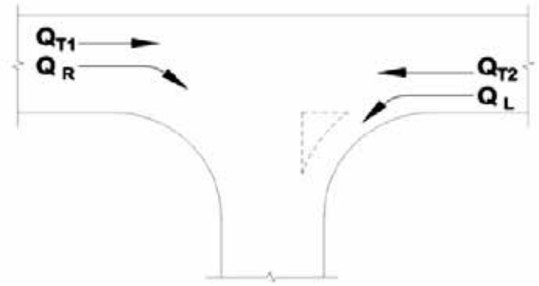
For Design Speeds 70 km/h ≤ Design Speed < 100 km/h

- If x < 1.5, only a BAR / BAL treatment is warranted
- If 1.5 ≤ x < 3.3, an AUR / AUL(S) treatment is warranted
- If x ≥ 3.3, a CHR / (AUL or CHL) treatment is warranted

The left and right-turn warrants have been analysed for the expected year of completion of the proposed development 2020.
The expected peak hours of the development 07:00-08:00 in the AM when it is expected than 80% of the peak traffic would be accessing the subject site.
Passing traffic volumes for 2020 used to determine the warrants are the traffic data received from the Town of Port Hedland fro Hamilton Road (South of North Circular Road – Southbound June 2019).
The traffic on Hamilton Road (southbound) is 104 VPH in the between 07:00 and 08:00 on weekends. For the purposes of this calculation is assumed that the directional split is 50/50. These figures have been increased using a 3% growth rate per annum to assess the warrants in the opening year of the proposed development - 2020.

Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings

Figure 2.27: Calculation of the major road traffic volume Q_M



Road type	Turn type	Splitter island	Q_M (veh/h)
Two-lane two-way	Right	No	= Q_{T1} + Q_{T2} + Q_L
		Yes	= Q_{T1} + Q_{T2}
	Left	Yes or no	= Q_{T2}
Four-lane two-way	Right	No	= 50% x Q_{T1} + Q_{T2} + Q_L
		Yes	= 50% x Q_{T1} + Q_{T2}
	Left	Yes or no	= 50% x Q_{T2}
Six-lane two-way	Right	No	= 33% x Q_{T1} + Q_{T2} + Q_L
		Yes	= 33% x Q_{T1} + Q_{T2}
	Left	Yes or no	= 33% x Q_{T2}

Source: TMR (2016a).

Calculation of turn treatment warrants

	Four-lane two way
	Crossover 2 - Hamilton Road
	Weekend 2020
	AM peak
Q_{T1}	107
HV% - Q_{T1}	8.6
Q_R	213
HV% - Q_R	0.0
Q_{T2}	107
HV% - Q_{T2}	8.6
Q_L	497
HV% - Q_L	0.0
$Q_{M\text{-RIGHT TURN no splitter island for left turns}}$	658
HV% - Q_{MR} no splitter island for left turns	5.73
$Q_{M\text{-LEFT TURN}}$	54
HV% - Q_{ML}	8.60
X_R no splitter island for left turns	7.26
X_L	1.06
Right turn treatment no splitter island for left turns	**CHR**
Left turn treatment	**BAL**

Table 5.2: Deceleration distances required for cars on a level grade

Design speed of approach road (km/h)	Length of deceleration D – including diverge taper *T* (m)										Diverge length L_e[3] for lane widths (m)	
	Stop condition[1] (m)		Design speed of exit curve (km/h)[2]									
	0	0	20	30	40	50	60	70	80	90	3.5 m[4]	3.0 m[4]
	Comfortable 2.5 m/s²	Maximum 3.5 m/s²	Comfortable average rate of deceleration 2.5 m/s²									
50	40	30	30	25	15						33	27
60	55	40	50	40	30	15					40	33
70	75	55	70	60	50	40	20				47	40
80	100	70	95	85	75	60	45	25			54	44
90	125	90	120	110	100	85	70	50	25		60	50
100	155	110	150	140	130	115	100	80	55	30	67	57
110	185	135	180	175	160	150	130	110	90	60	74	62

A 70m right turn deceleration lane has already been provided as part of the existing subject site as required. Having in mind the increase in traffic volumes an extension of the deceleration lane could be considered.

2.15 Public Transport Accessibility

How many bus routes are within 400 metres of the subject site?	Three
How many rail routes are within 800 metres of the subject site?	None

Bus / Rail Route	Description	Peak Frequency	Off-Peak Frequency
870	South Hedland – Port Hedland via Port Hedland Boulevard Shopping Centre, Pretty Pool and Cooke Point	20 minutes	no service
871	South Hedland Circular Route – Clockwise via Throssell Road, Stanley Street, Paton Road, Brolga Way and Steamer Avenue	2 hours	no service
872	South Hedland Circular Route – Anticlockwise via Throssell Road, Steamer Avenue, Brolga Way, Paton Road and Stanley Street	2 hours	no service

2.16 Pedestrian Infrastructure

Describe existing local pedestrian infrastructure within a 400m radius of the site:

Classification	**Road Name**
Unclassified Pedestrian Path	Hamilton Road, Forrest Circle, Hedditch Street, Lawson Street, Roberts Street, Corboys Place, Somerset Crescent, Nimingarra Court, Welsh Street, Parker Street
Does the site have existing pedestrian facilities	YES
Does the site propose to improve pedestrian facilities?	YES

If YES, describe the measures proposed.

Pedestrian connection throughout the complex.

What is the Walk Score Rating?

45 | Car-Dependent. Most errands require a car.

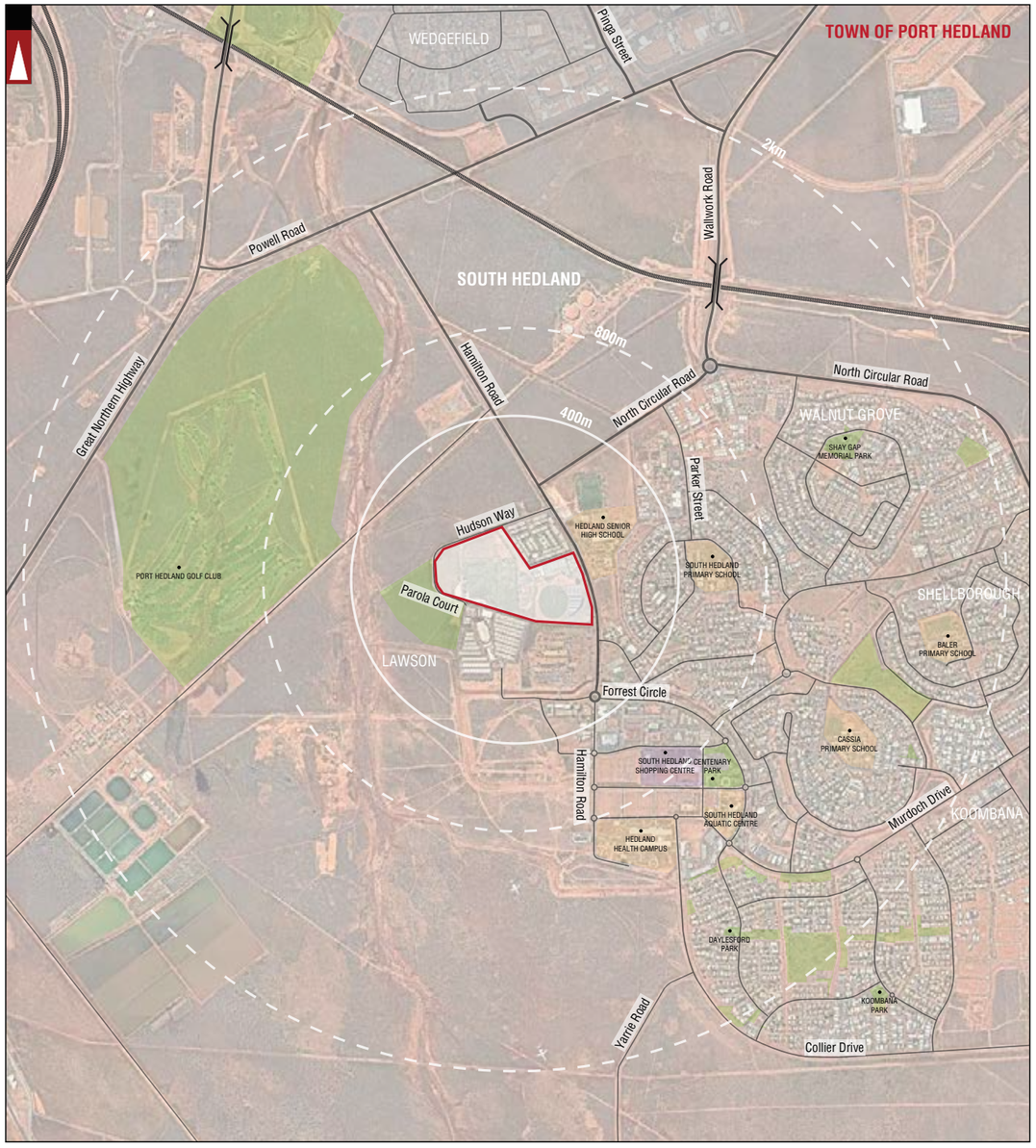
While it may not be expected that many people arrive on foot, pedestrian movement inside complex will be high. It is important to designate parking areas as shared space through choice of materials and signage where required.

Speed humps can be designed as wombat crossings allowing pedestrians to safely cross from one area to another.

2.17 Cyclist Infrastructure

Are there any PBN Routes within an 800m radius of the subject site?	NO
Are there any PBN Routes within a 400m radius of the subject site?	NO
Does the site have existing cyclist facilities?	NO

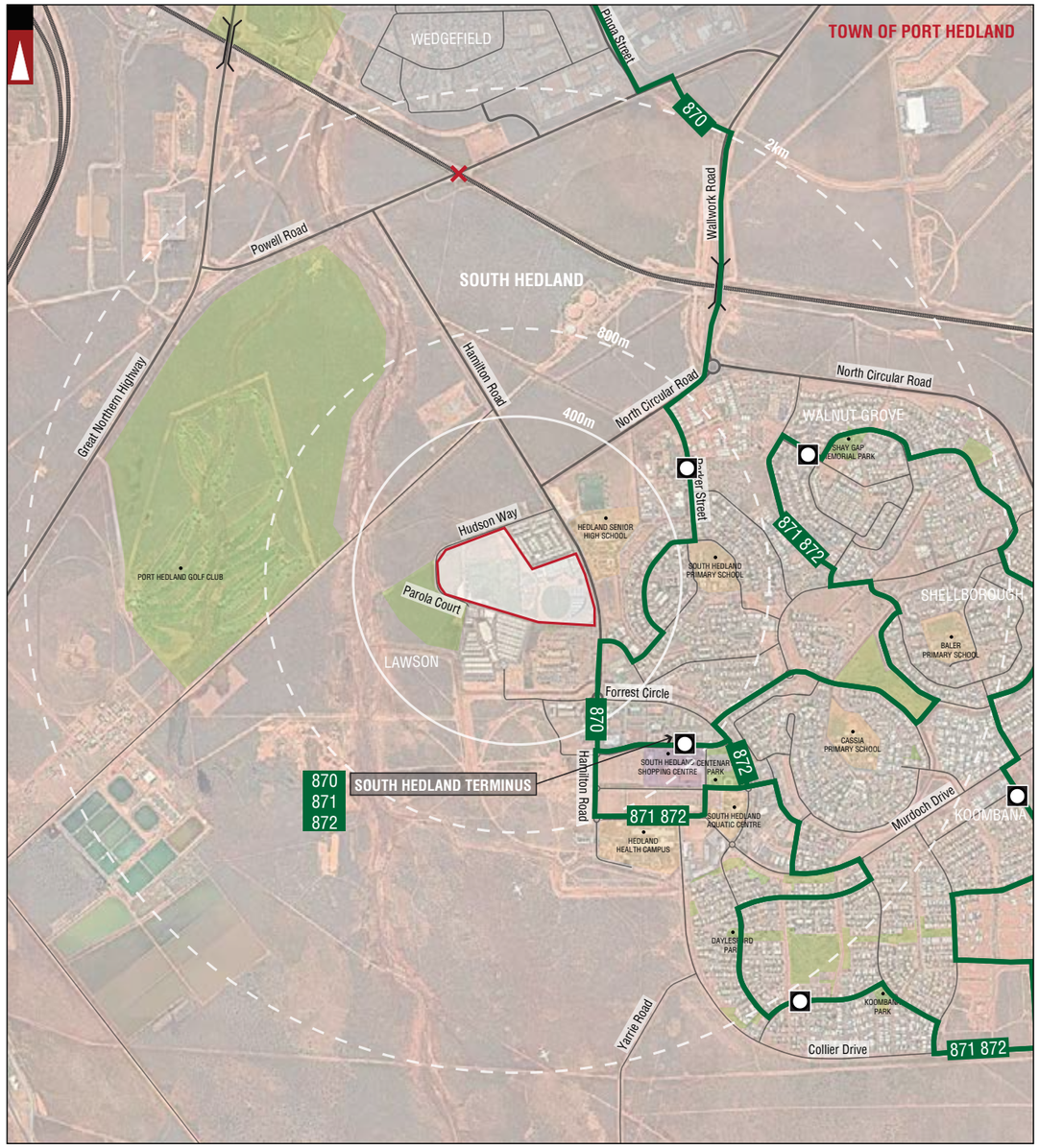
Installation of 3 long term and 38 short term bicycle parking spaces should be considered in order to promote alternative transportation modes. Additionally, having in mind that the subject site is a recreational facility it is highly likely patrons would cycle to their destination.



PARKS AND RECREATION
PUBLIC PURPOSE
SHOPPING AREA
INDUSTRIAL AREA
ROAD
Hay Street STREET NAME
RAILWAY
ROAD BRIDGE
LOCATION BOUNDARY
DISTANCE FROM LOCATION
TOWN OF PORT HEDLAND LOCAL GOVERNMENT NAME
SOUTH HEDLAND SUBURB

LEGEND

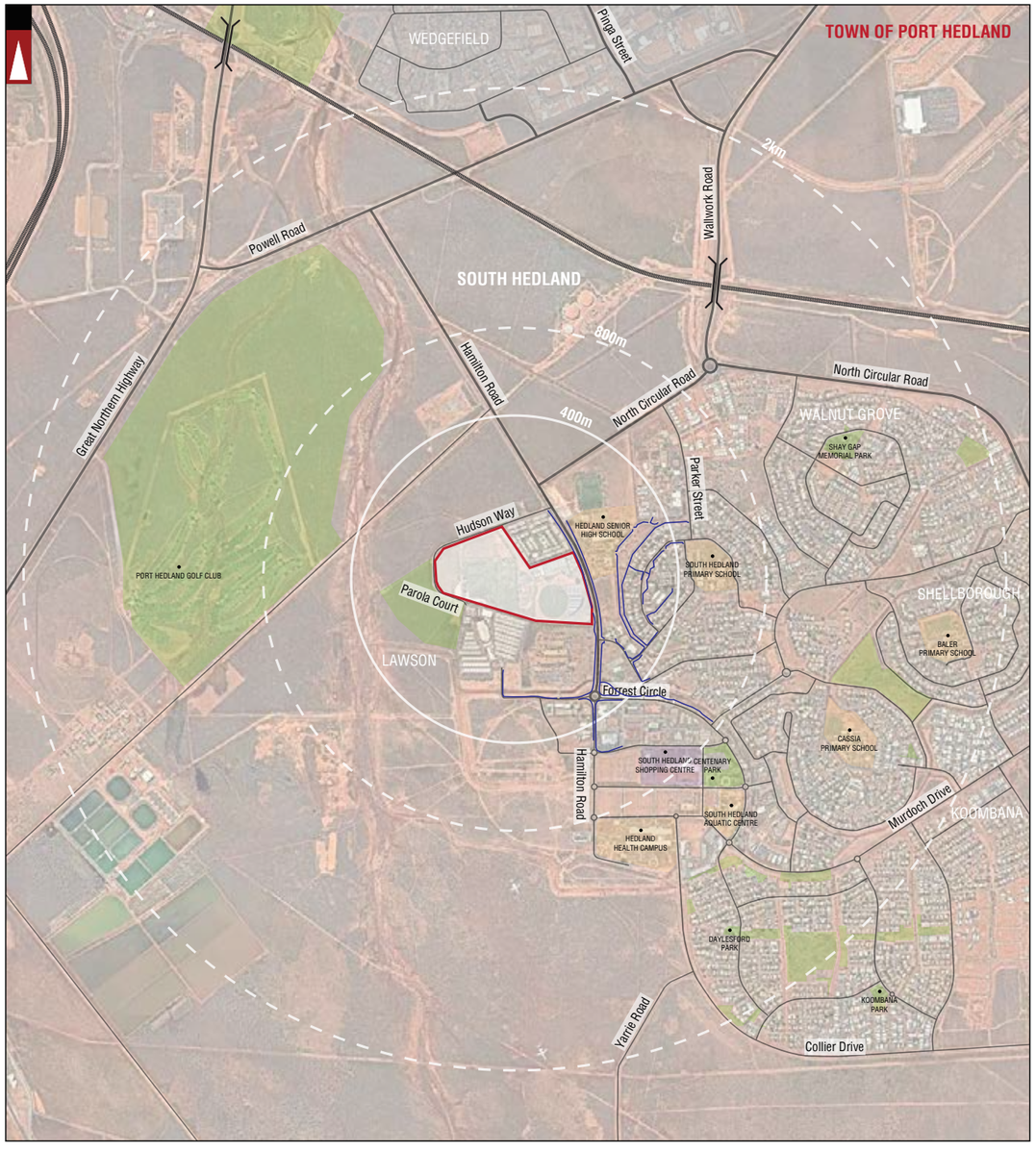
			PROJECT: SOUTH HEDLAND INTEGRATED SPORTS PECINCT	DRAWN BY:	Civil & Traffic Engineering Consultants Suite 7 No 10 Whipple Street Balcatta WA 6021 PH: 08 9441 2700 WEB: www.kctt.com.au
			TITLE: LOCALITY PLAN - 2KM RADIUS	A.N.	
A	19-07-2019	ISSUED FOR REVIEW	DRAWING NUMBER: KC00751.000_ S01		
No	DATE	AMENDMENT			



PARKS AND RECREATION
PUBLIC PURPOSE
SHOPPING AREA
INDUSTRIAL AREA
ROAD
Hay Street STREET NAME
RAILWAY
ROAD BRIDGE
LOCATION BOUNDARY
DISTANCE FROM LOCATION
TOWN OF PORT HEDLAND LOCAL GOVERNMENT NAME
SOUTH HEDLAND SUBURB
TIMED STOP
RAILWAY CROSSING
BUS ROUTES
103 BUS ROUTE NUMBER

LEGEND

			PROJECT: SOUTH HEDLAND INTEGRATED SPORTS PECINCT	DRAWN BY:	Civil & Traffic Engineering Consultants Suite 7 No 10 Whipple Street Balcatta WA 6021 PH: 08 9441 2700 WEB: www.kctt.com.au
			TITLE: PUBLIC TRANSPORT PLAN - 2KM RADIUS	A.N.	
A	19-07-2019	ISSUED FOR REVIEW	DRAWING NUMBER: KC00751.000_ S03		
No	DATE	AMENDMENT			



PARKS AND RECREATION · PUBLIC PURPOSE · SHOPPING AREA · INDUSTRIAL AREA · ROAD · Hay Street STREET NAME · RAILWAY · ROAD BRIDGE · LOCATION BOUNDARY · DISTANCE FROM LOCATION · TOWN OF PORT HEDLAND LOCAL GOVERNMENT NAME · SOUTH HEDLAND SUBURB · PEDESTRIAN PATH

LEGEND

			PROJECT: SOUTH HEDLAND INTEGRATED SPORTS PECINCT	DRAWN BY: A.N.
			TITLE: PEDESTRIAN PATHS PLAN - 400M RADIUS	
A	19-07-2019	ISSUED FOR REVIEW	DRAWING NUMBER: KC00751.000_ S04	
No	DATE	AMENDMENT		

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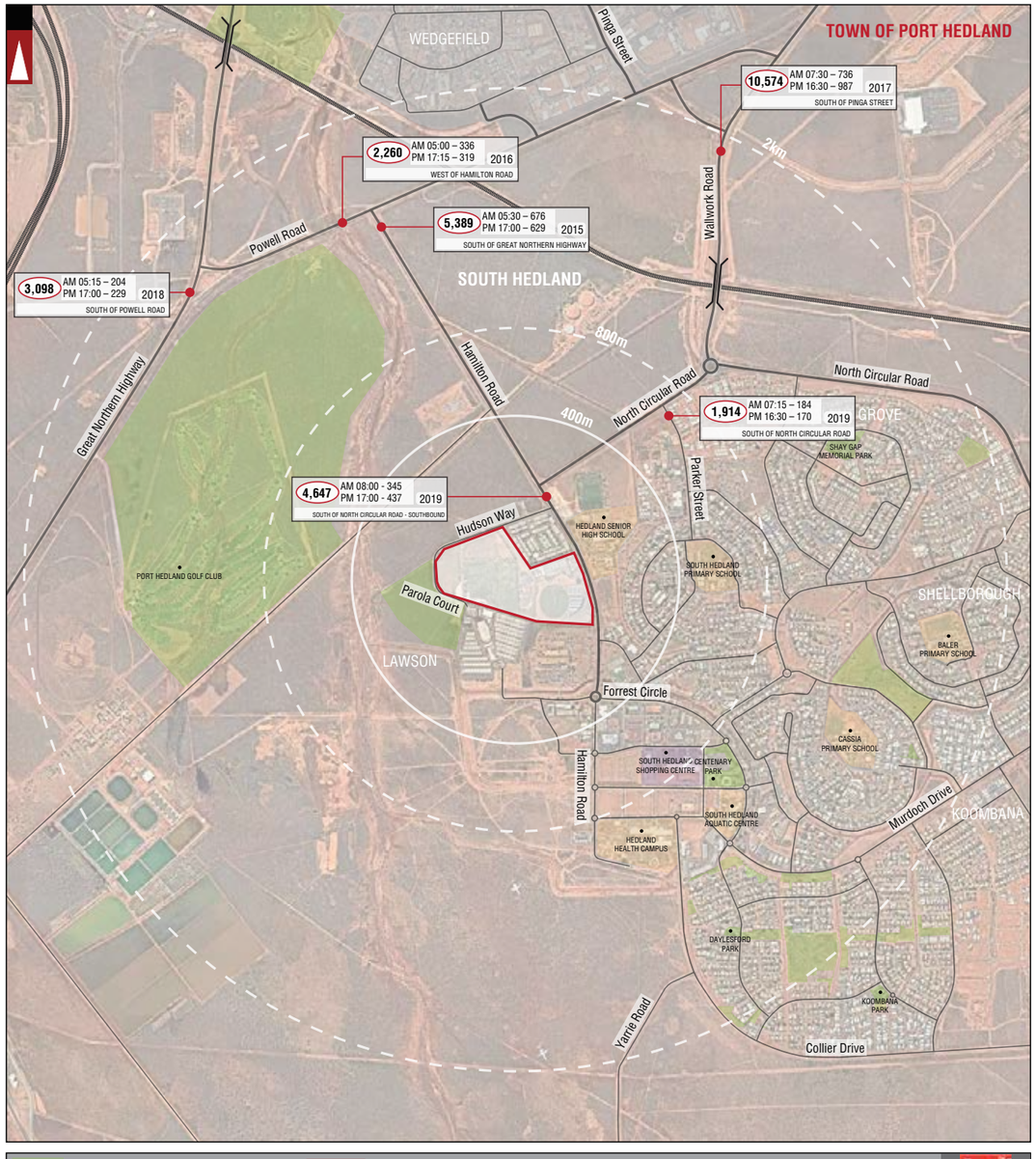

PARKS AND RECREATION · PUBLIC PURPOSE · SHOPPING AREA · INDUSTRIAL AREA · ROAD · Hay Street STREET NAME · RAILWAY · ROAD BRIDGE · LOCATION BOUNDARY · DISTANCE FROM LOCATION · TOWN OF PORT HEDLAND LOCAL GOVERNMENT NAME · SOUTH HEDLAND SUBURB · 5,512 NUMBER OF VEHICLES PER DAY · AM 1145 – 381 PM 1630 – 480 NUMBER OF VEHICLES PER AM PEAK HOUR NUMBER OF VEHICLES PER PM PEAK HOUR · 2014 YEAR · EAST OF HARLOW ROAD LOCATION

LEGEND

			PROJECT: SOUTH HEDLAND INTEGRATED SPORTS PECINCT	DRAWN BY: A.N.
			TITLE: EXISTING TRAFFIC COUNTS - 2KM RADIUS	
A	19-07-2019	ISSUED FOR REVIEW	DRAWING NUMBER: KC00751.000_ S05	
No	DATE	AMENDMENT		

Civil & Traffic Engineering Consultants
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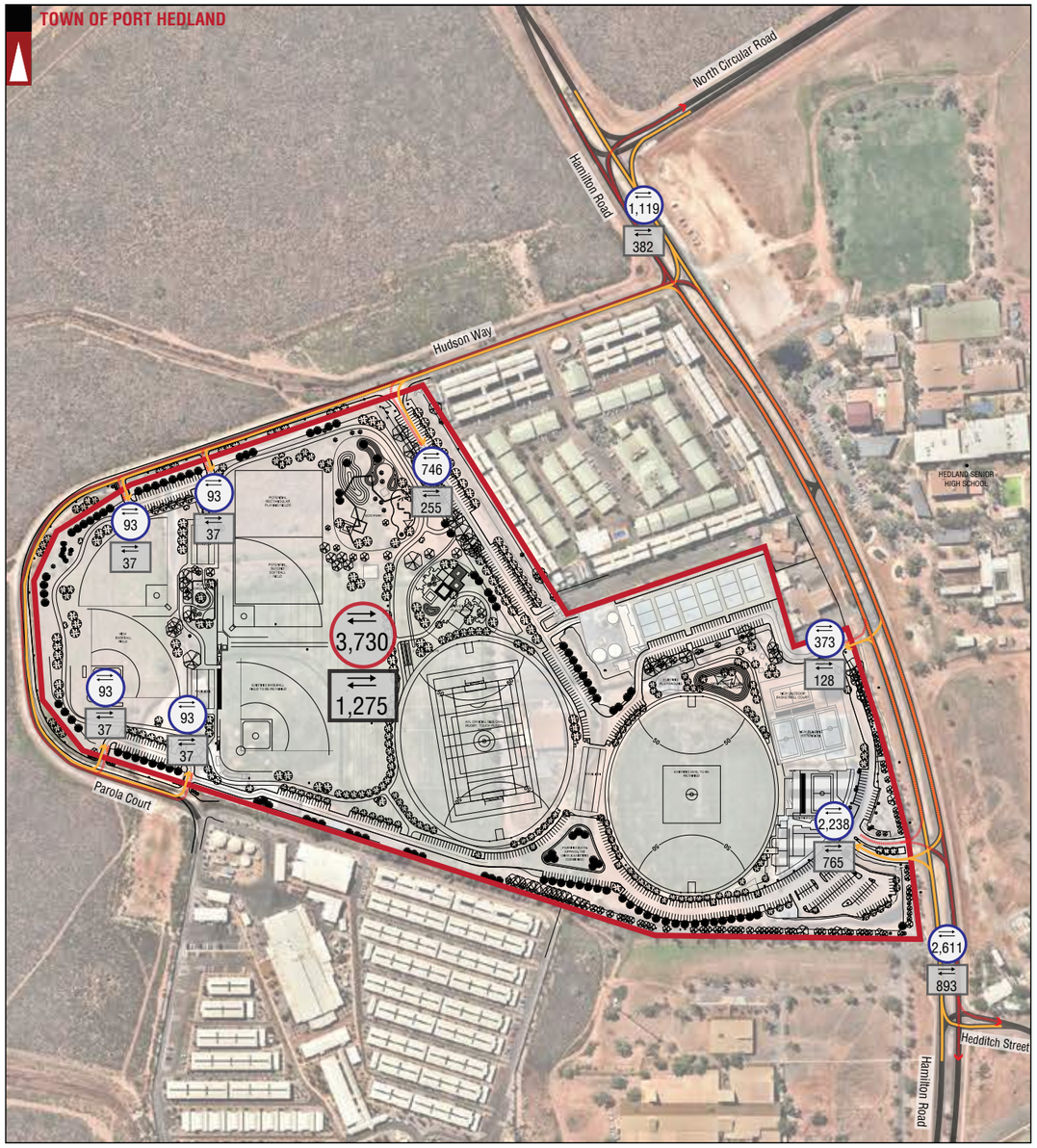


LOCATION BOUNDARY
ROAD (VARIED WITH ROAD WIDTH)
Hay Street — STREET NAME
1,389 — Total Expected Traffic Generation from the proposed development
503 — Total Expected Traffic Generation from Subject Site on the specific section of road - **IN and OUT direction**
1,275 — Additonal Expected Traffic Generation from the proposed development
128 — Additional Expected Traffic Generation from Subject Site on the specific section of road - **IN and OUT direction**
Traffic Flow IN Direction
Traffic Flow OUT Direction

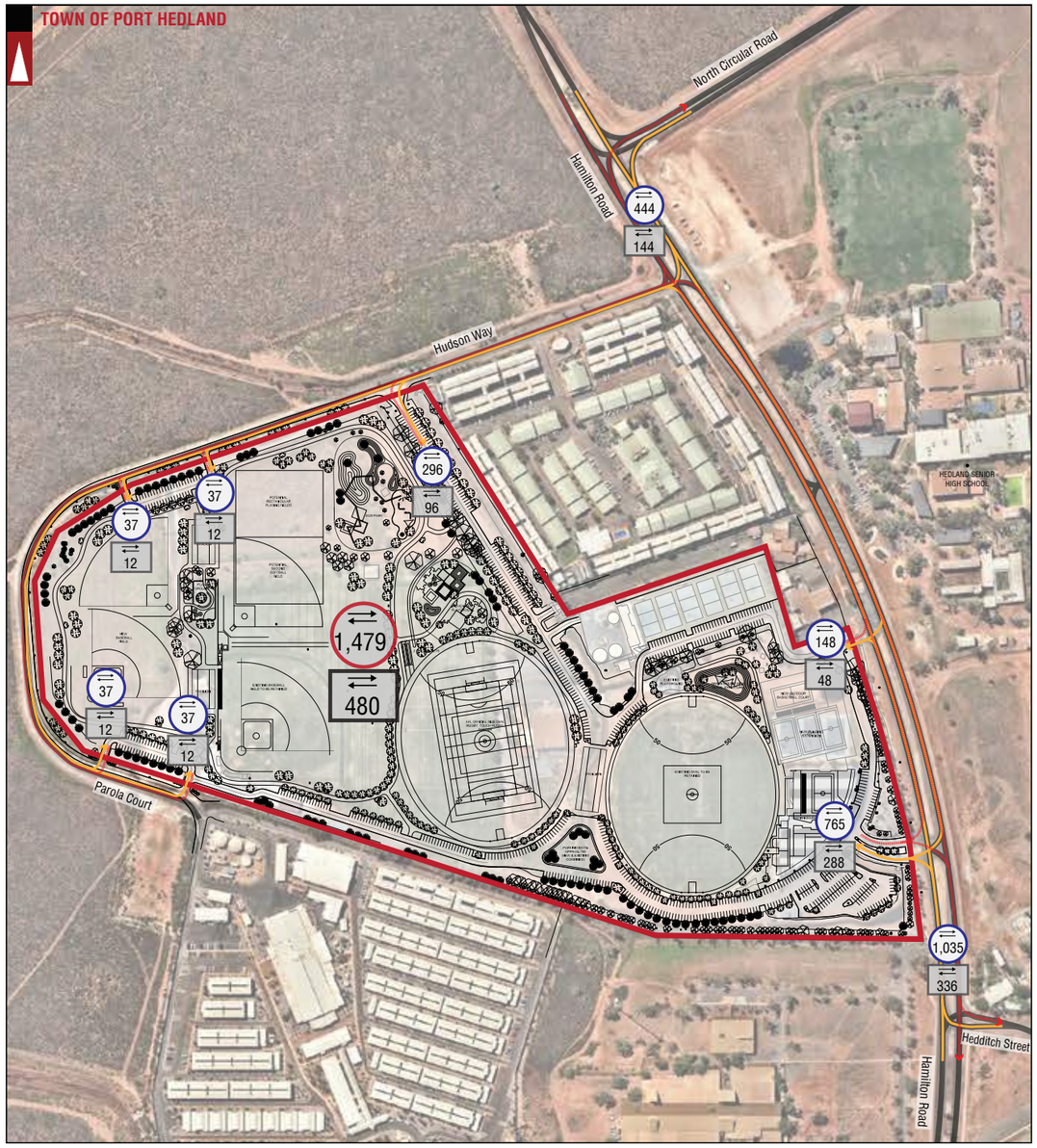
NOTE: THE PLAN IS COURTEOUSY OF CARABINER

LEGEND

No	DATE	AMENDMENT
A	22-07-2019	ISSUED FOR REVIEW

PROJECT: SOUTH HEDLAND INTEGRATED SPORTS PECINCT
TITLE: TRAFFIC FLOW DIAGRAM
DRAWING NUMBER: KC00751.000_S06
DRAWN BY: A.N.

Civil & Traffic Engineering Consultants
Suite 7 No 10 Whipple Street Balcatta WA 6021
PH: 08 9441 2700
WEB: www.kctt.com.au



LOCATION BOUNDARY
ROAD (VARIED WITH ROAD WIDTH)
Hay Street — STREET NAME
1,389 — Total Expected Traffic Generation from the proposed development - Peak hour
503 — Total Expected Traffic Generation from Subject Site on the specific section of road - **IN and OUT direction** - Peak hour
1,275 — Additonal Expected Traffic Generation from the proposed development - Peak hour
128 — Additional Expected Traffic Generation from Subject Site on the specific section of road - **IN and OUT direction** - Peak hour
Traffic Flow IN Direction
Traffic Flow OUT Direction

NOTE: THE PLAN IS COURTEOUSY OF CARABINER

LEGEND

No	DATE	AMENDMENT
A	22-07-2019	ISSUED FOR REVIEW

PROJECT: SOUTH HEDLAND INTEGRATED SPORTS PECINCT
TITLE: TRAFFIC FLOW DIAGRAM - PEAK HOUR
DRAWING NUMBER: KC00751.000_S07
DRAWN BY: A.N.

Civil & Traffic Engineering Consultants
Suite 7 No 10 Whipple Street Balcatta WA 6021
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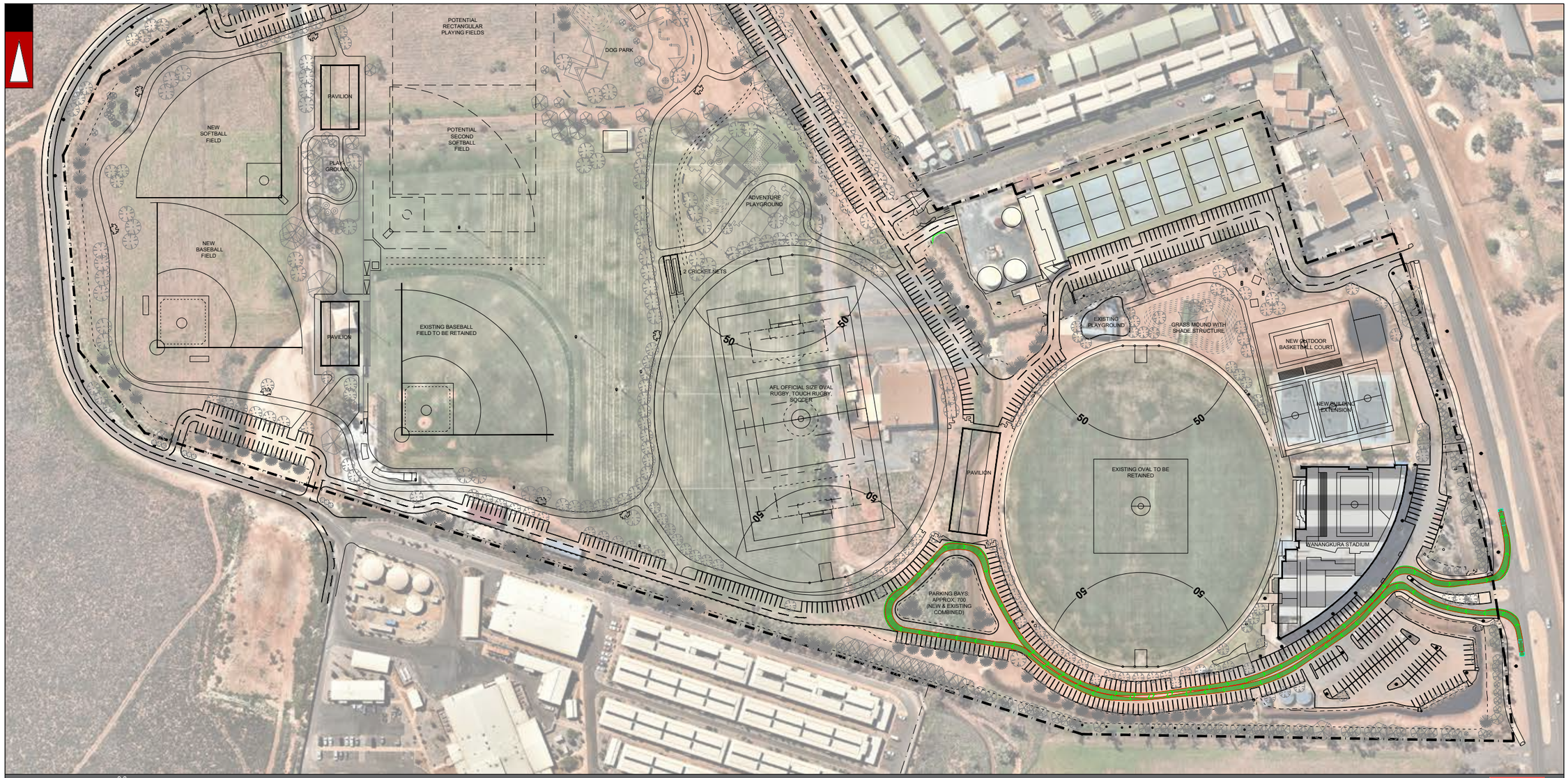

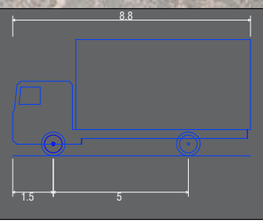

Service Vehicle (8.8 m)	
Overall Length	8.800m
Overall Width	2.500m
Overall Body Height	4.300m
Min Body Ground Clearance	0.427m
Track Width	2.500m
Lock to Lock Time	4.00s
Kerb to Kerb Turning Radius	12.500m

- Lot boundary
- Wheel Path (Forward Vehicle Motion)
- Vehicle Chasis Envelope (Forward Vehicle Motion)
- Wheel Path (Reverse Vehicle Motion)
- Vehicle Chasis Envelope (Reverse Vehicle Motion)

Certified System Quality ISO 9001 SAI GLOBAL

LEGEND

NO	DATE	AMENDMENT
A	22-07-2019	ISSUED FOR REVIEW

PROJECT:
South Hedland Integrated Sports Precinct

TITLE:
Vehicle Turning Circle Plan - Service Vehicle (8.8m)

DRAWING NUMBER:
KC00751.000_S20

DRAWN BY:
N.M.

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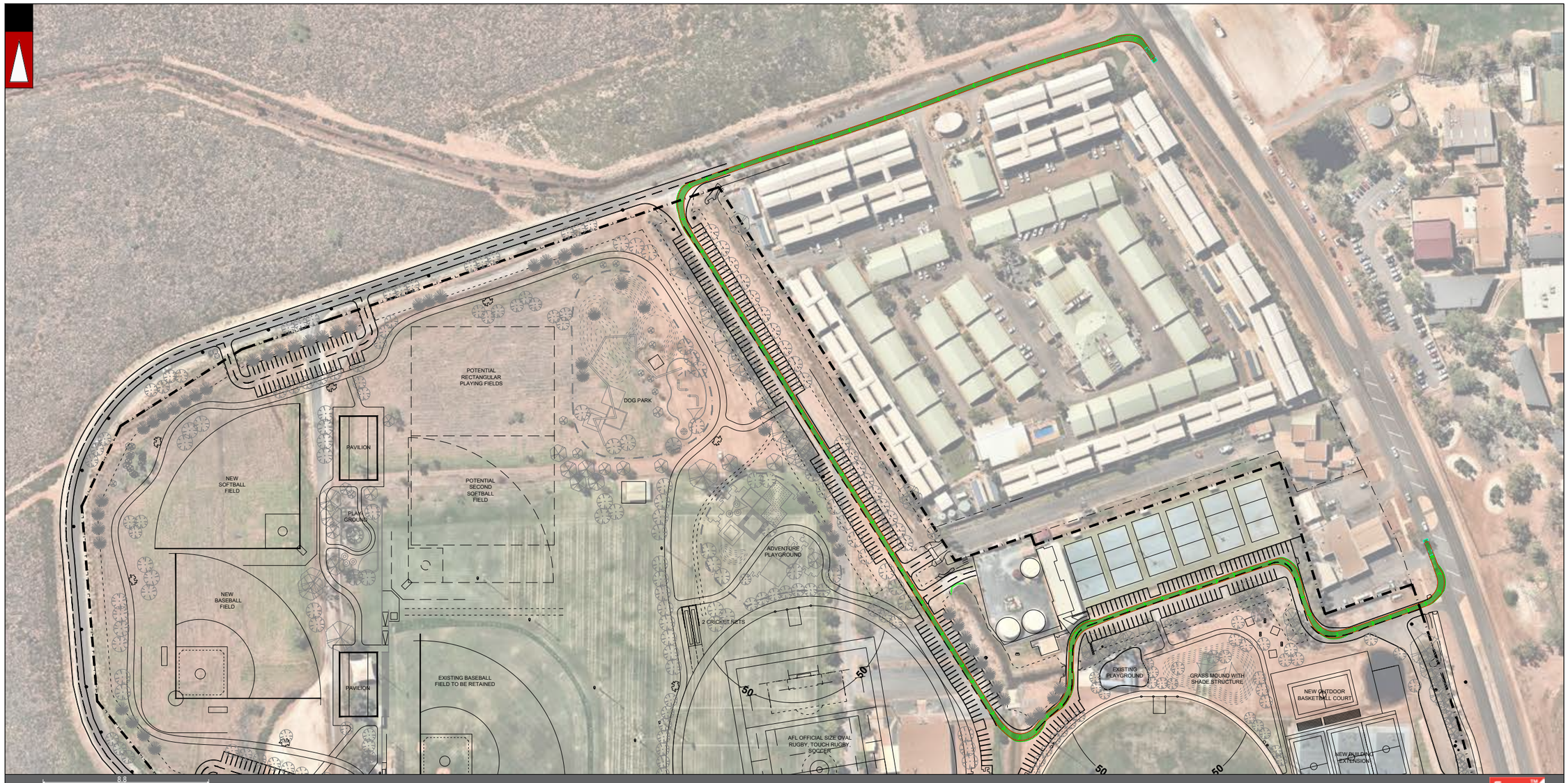

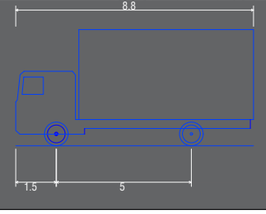

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- Wheel Path (Reverse Vehicle Motion)
- Vehicle Chasis Envelope (Reverse Vehicle Motion)

Certified System Quality ISO 9001 SAI GLOBAL

LEGEND

NO	DATE	AMENDMENT
A	22-07-2019	ISSUED FOR REVIEW

PROJECT:
South Hedland Integrated Sports Precinct

TITLE:
Vehicle Turning Circle Plan - Service Vehicle (8.8m)

DRAWING NUMBER:
KC00751.000_S21

DRAWN BY:
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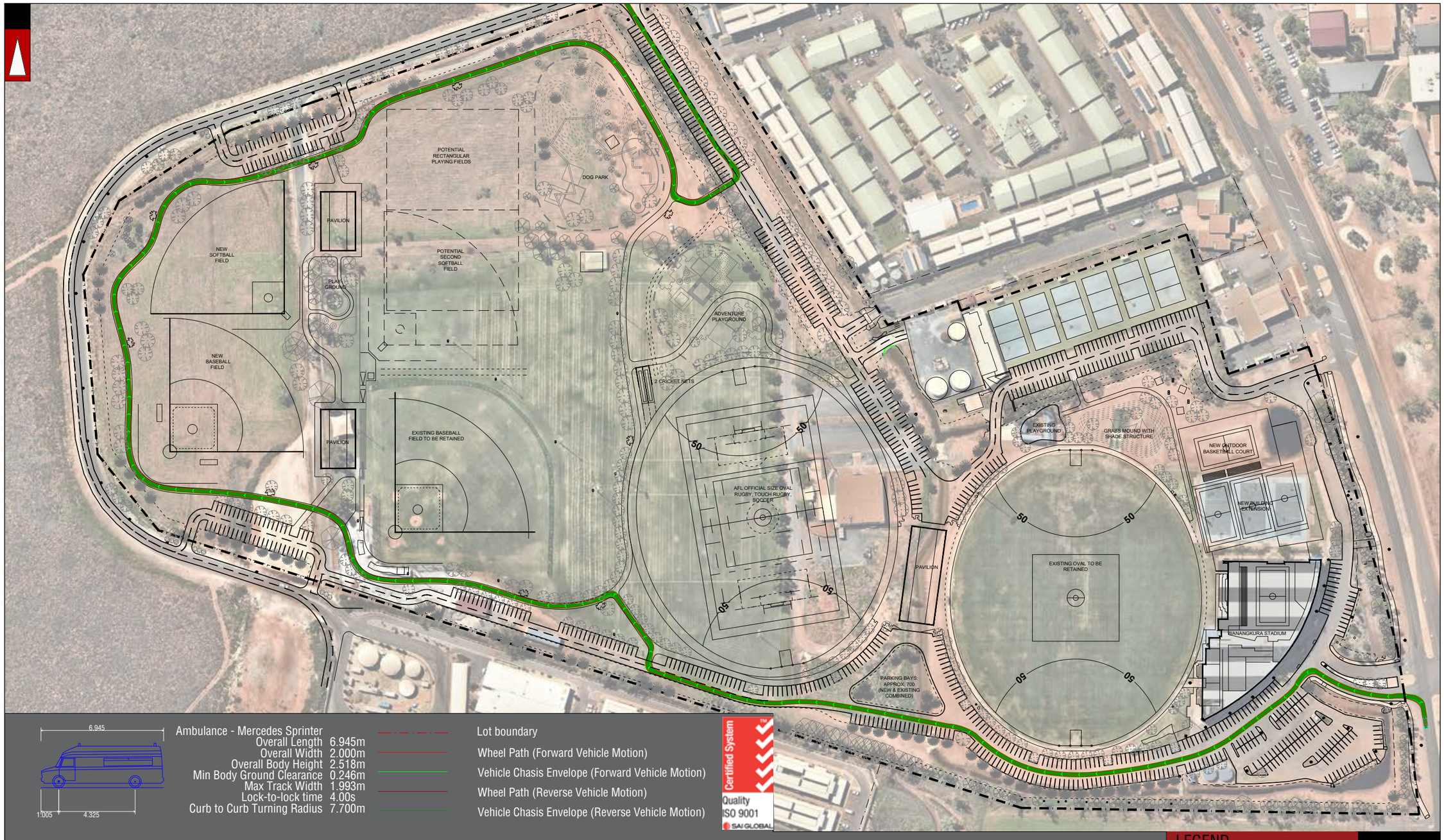


			PROJECT: South Hedland Integrated Sports Precinct	DRAWN BY:	Civil & Traffic Engineering Consultants Suite 7 No 10 Whipple Street Balcatta WA 6021 PH: 08 9441 2700 WEB: www.kctt.com.au
			TITLE: Vehicle Turning Circle Plan - Ambulance Mercedes Sprinter (6.945m)	N.M.	
A	22-07-2019	ISSUED FOR REVIEW	DRAWING NUMBER: KC00751.000_S22		
NO	DATE	AMENDMENT			

ESD - Environmentally Sustainable Design Initiatives

1.0 Environmentally sustainable design

1.1 Introduction

1.2 Town of Port Hedland's policies and regulatior

1.3 Sustainability Initiatives

2.0 Liveability

2.1 Climate change – adaptation and mitigation

2.2 Sustainable passive transport

2.3 Healthy and active living

2.4 Community and culture

2.5 Safety

3.0 Economic prosperity

3.1 Local and responsible procurement

4.0 Environmental responsibility

4.1 Energy efficiency

4.2 Water efficiency

4.3 Renewable technology

4.4 Waste

4.5 Reducing light pollution

5.0 Leadership and governance

5.1 Raising awareness

5.2 Codes, ratings and benchmarks

6.0 Design excellence

6.1 Materials

6.2 Minimising heat island effect

6.3 Passive design and building fabric

6.4 Indoor Environment Quality (IEQ)

Executive Summary

This report outlines possible ESD initiatives for the South Hedland Integrated Sports Complex project with the background of ecological sustainable design objectives. As the project is still considered to be at an early stage, many of these initiatives will need to be assessed and discussed further during the design process.

The Pilbara's Port City Growth Plan – Appendix B was used to form a basis of this report including the following main principles:

Sustainability principle	Addressed ?	Comments
Enhance liveability	✔	Refer to Section 2.0 Different aspects of liveability were assessed, and initiatives considered to be included in the project. These include adaptation and mitigation of climate change, active and passive transport measures, safety and others fostering a healthy and happy community.
Create opportunities for economic prosperity	✔	Refer to Section 3.0 and to the Economic Development Section of this report
Foster environmental responsibility	✔	Refer to Section 4.0 The assessment mainly looks at how environmental impacts as results from demolition, construction and operation can be minimised.
Demonstrate visionary leadership and strong governance	✔	Refer to Section 5.0 Mandatory requirements are outlines together with possible benchmarks and sustainability frameworks.
Embrace design excellence	✔	Refer to Section 6.0 Design excellence looks at passive design initiatives, materials selection and impacts on indoor environment quality and heat island effect.

1.0 Environmentally sustainable design

1.1 Introduction

The project is located in South Hedland which is part of the Town of Port Hedland. Port Hedland is located in the north of the state of Western Australia (WA) and is the second largest town in the Pilbara region, with an urban population of almost 14,000 people.

The site of the South Hedland Sports Precinct is located on Hamilton Road in South Hedland. It is a regional level sporting hub and consists of an array of existing sporting infrastructure. It is well utilised by a number of sporting and community groups and is considered a vital piece of community infrastructure. The proposed design seeks to deliver contemporary facilities that minimise environmental and negative social impacts. This section of the Masterplan report outlines the environmentally sustainable design (ESD) strategy for the proposed development.

Figure 1: The existing Wanangkura Stadium on the site

1.2 Town of Port Hedland's policies and regulations

The following policies and regulations were reviewed as a basis for this report:

- Town of Port Hedland, Local Planning Scheme No. 5, 16 October 2018
- Pilbara's Port City Implementation Plan, 2012
- Pilbara's Port City Growth Plan – Appendix B, 2012
- Port Hedland Parks and Paths Strategy, Draft Report, 5 March 2019

1.2.1 Local Planning Scheme No. 5

The Local Planning Scheme No. 5 outlines general development requirements including definitions of land types and zoning requirements. The scheme also provides further guidance on car parks, landscaping and special control but no further detail on sustainable design requirements.

1.2.2 Pilbara's Port City Implementation Plan

In December 2015, a multi-disciplinary team developed the Pilbara's Port City Growth Plan providing a high-level strategic blueprint to facilitate the sustained growth of Port Hedland into Pilbara's Port City, with a population of 50,000 people. This Growth Plan is based on the State Planning Framework and will act as the Council's Local Planning Strategy to form the basis for subsequent Town Planning Scheme 5 (TPS5) review.

Appendix B of the Plan sets out the draft sustainability framework for the City, provides key opportunities for sustainable developments and outlines an assessment strategy of the plan against key sustainability principles.

While the framework is a working document and is meant to be a guidance for the current and future planning stages of the Pilbara's Port City Growth Plan, it also has potential to become the sustainability framework for the Town of Port Hedland and community groups.

The principles outlined in the sustainability framework are:

- enhance **liveability**
- create opportunities for **economic prosperity**
- foster **environmental responsibility**
- demonstrate visionary **leadership and strong governance**
- embrace **design excellence**.

These principles were used as the basis for this report and initiatives under each principle outlined in the sections below.

Figure 2: Sustainability principles. Source: Appendix B, Pilbara's Port City Growth Plan

1.3 Sustainability Initiatives

The following sections outline a set of potential sustainability initiatives that may be considered for the South Hedland Integrated Sports Complex. Below is a key for the tables in the following sections:

CAPEX (Capital Expenditure)		**OPEX (Operational Expenditure)**		**Recommended?**	
$	Low	$	Low	✓	Yes
$$	Low-med	$$	Low-med	×	No
$$$	Med-high	$$$	Med-high	?	TBC
$$$$	High	$$$$	High		

2.0 Liveability

2.1 Climate change – adaptation and mitigation

With ongoing global warming, adaptation and resilience to climate change become more and more important for buildings as well as to infrastructure and urban planning. Adaptation prepares buildings and occupants to sudden changes and extreme events that may occur as a result of climate change. These changes include substantial increases in average and extreme temperatures, water scarcity, longer and more drought periods and fires.

This section discusses the current and future impacts of climate change and possible technologies and solutions to mitigate these impacts. The following table presents an assessment of different initiatives that may be included in the project.

Table 1: Climate change adaptation and mitigation initiatives

Initiative	Description	CAPEX	OPEX	Initiative incorporated	Res-ponsibility	Notes
Climate Change Adaptation Plan	Assessment of potential threats and risks associated with climate change and how these risks can be mitigated.	$	$	✔	Sustainability	Should be considered, refer Section 2.1.2
Climate Change Resilience Plan	Informing occupants on disaster prevention, safety and response, e.g. emergency contacts and shelters, etc.	$	$	✔	Sustainability	Should be considered, refer Section 2.1.2

2.1.1 Current climate

The National Construction Code (NCC) defines eight climate zones in Australia to cater for the different heating and cooling requirements across the continent. South Hedland is located in Climate Zone 1 which is a semi-arid climate with a tropical savanna climate influence defined by high humidity summers and warm winters.

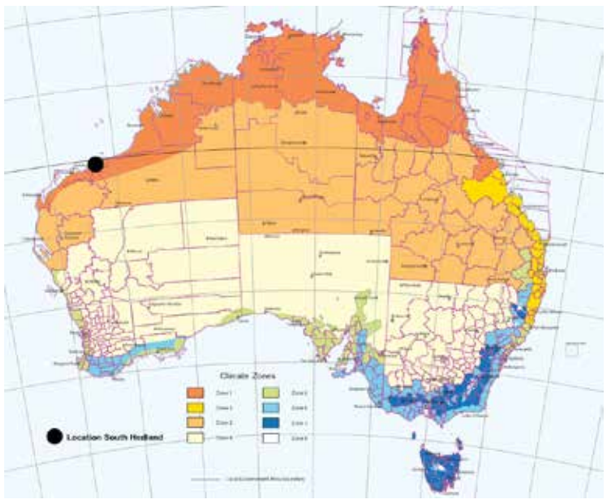
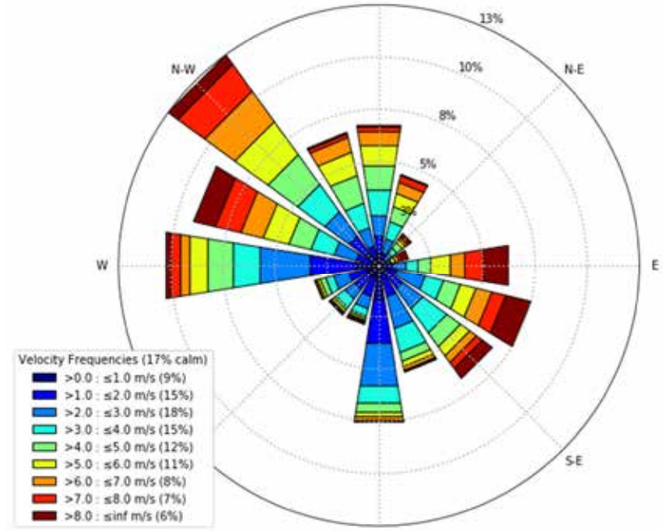


Figure 3: NCC Climate Zones – Port Hedland location

South Hedland is warm to hot all year round, with mean maximum temperatures of 36.4 °C in January and 27.1 °C in July. Maximum temperatures in summer are usually moderated by a warm but humid sea breeze. South Hedland is very sunny, averaging over 10 hours of sunshine per day annually and receiving around 218.9 clear days annually. Dewpoint in the warmer months typically ranges from 19 °C to 22 °C.

The wind conditions across the project site will be driven by the Port Hedland climate prevailing winds. The wind rose below from the local observation site at the nearby Port Hedland Airport shows strong prevailing north-westerly winds throughout the year.



The wind rose diagram shows three key pieces of information

- Wind direction
- Wind strength
- Wind frequency

Colour shows wind strength

i.e. yellow is 5.0-6.0 m/s

Length of each wedge indicates a fraction of time.

Figure 4: Port Hedland Airport all day wind rose - a full year wind profile

The Bureau of Meteorology (BOM) and other science agencies employ a range of atmospheric, terrestrial and marine sensors to track climatic trends. BOM's State of the Climate report from 2016 expresses that Australia's climate has warmed since national records began in 1910, especially since 1950.

Mean surface air temperature has increased by around 1.0°C since 1910. Australia's top five warmest years on record included each of the last three years—2013, 2014 and 2015; 2013 was Australia's warmest year on record.

2.1.2 Future Risks for the Site

With the increasing influence of Climate Change, annual average temperatures around the site are projected to be between 0.6 and 1.4ºC above what was measured between 1986 and 2006 by 2030.

These figures exponentially increase towards the end of the century with annual average temperatures expected to rise between 1.5 and 5.3ºC, depending on which mitigation measures will be implemented in the coming decade. While the predictions of rainfall are more uncertain, there is a possibility that annual rainfall may decrease up to 24% for the worst-case scenario by 2090.

The town of Port Hedland is also situated within a cyclonic area with exposure to very high winds which are likely to increase.

The specific potential future climate risks that should be considered in the proposed design are:

- Protection from red dust infiltration, which could increase with greater wind speeds and more frequent storms / cyclones.
- Increased climate temperatures and solar radiation
- More frequent bushfires
- Decrease rainfall, lack of potable water
- Heavier rainfalls
- Energy network blackouts
- High winds and increased frequency of storms
- Increased evaporation rates and soil moisture

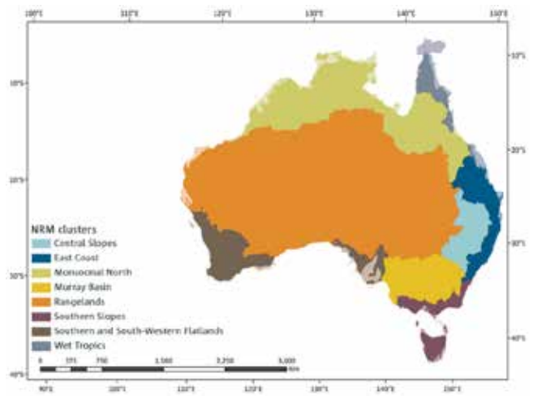


Figure 6: Eight clusters (areas) are defined in Australia for climate change modelling. South Hedland is within the Rangelands Cluster (orange)

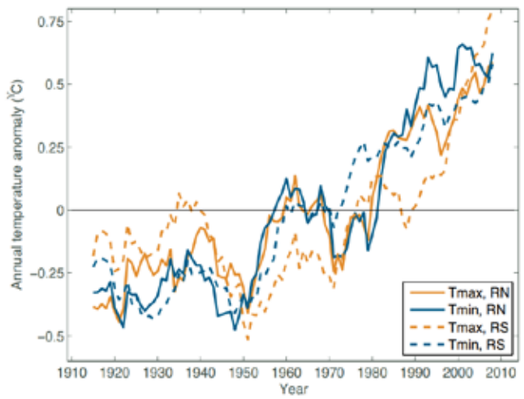


Figure 6: Observed annual mean of daily maximum and minimum temperatures for the north Rangelands cluster (solid lines) (Source: Climate Change in Australia)

A Climate Change Adaptation Plan can be prepared to identify risks associated with climate change in more detail and to develop suitable mitigation measures that can be incorporated in the masterplan and building design.

In addition to the design of the project, the Town of South Hedland has already developed an Emergency Management Strategy under the WA Emergency Management Act 2005 which includes procedures and measures to prepare the local community for extreme events connected to climate change.

2.2 Sustainable passive transport

This section discusses the possible technologies and solutions related to the sustainable transport options for the development. Sustainable projects facilitate a reduction of the dependency of occupants on private car use as an important means of reducing overall greenhouse gas emissions. The use of motor vehicles directly contributes to climate change in two ways; through the high amounts of energy required to produce cars and build and maintain supporting road transport infrastructure and services; and the direct emissions that result from car operations.

If reliance on individual motor vehicle transportation is to be reduced, it is necessary to maximise alternative transportation options. This may include initiatives that encourage and make possible the use of mass transport options and cycling or walking.

The following table presents an assessment of different initiatives that may be included in the project.

Table 2: Sustainable passive transport initiatives

Initiative	Description	CAPEX	OPEX	Initiative incorporated	Res-ponsibility	Notes
EV charging bays	Providing the infrastructure or provision for the future installation of infrastructre for electric vehicles. Green Star credits are awarded when 5% of parking is for electric vehicles and charging infrastructure is provided for each space	$$	$$	✔	Electrical	Should be considered
Car sharing scheme	Parking spaces can be allocated for car share vehicles.	$	$	?	Architect	
Promoting small vehicles	Consider allocating car bays on desired locations to smaller vehicles and motorbikes	$	$	?	Transport	
Promoting public transport	For example, through an online system informing when the next bus leaves, etc.	$	$	?	Architect	
Design for flexibility	Consider less car bays may be needed in the future - what would happen with the vacant spaces?	$	$	✔	Architect	Should be considered

2.3 Healthy and active living

This section discusses the possible technologies and solutions related to the healthy and active living for the development. The following table presents an assessment of different initiatives that may be included in the project.

Table 3: Healthy and active living initiatives

Initiative	Description	CAPEX	OPEX	Initiative incorporated	Res-ponsibility	Notes
Encourage sports and other active outdoor activities	Due to the nature of the project, the encouragement of sports and active recreational activities is in the project's DNA. Secure pathways and sports grounds including sufficient lighting and high-quality materials should an enjoyable experience for all users.	$	$	✔	Architect	Is incorporated into the design
Bicycle parking and facilities	Provide bike parking opportunities to users and staff. Ideally bike parking is safe, easily accessible and can be observed from public places for surveillance.	$	$	✔	Transport	Should be considered
Local food production, edible gardens	The masterplan can look to introduce edible gardens for the community to maintain and utilise.	$	$	?	Landscape	Can be considered.

2.4 Community and culture

The State Planning Strategy states with regards to strengthening local communities and culture: *Fostering the development of safe, friendly and inclusive communities. Providing places and space that reflect and enhance the unique character, indigenous and non-indigenous heritage and identity of the area.*

The following table outlines an assessment of initiatives that could be implemented with regards to community and culture.

Table 4: Community and culture initiatives

Initiative	Description	CAPEX	OPEX	Initiative incorporated	Res-ponsibility	Notes
Community events	Community events could be organised for users to foster the community feel of the development.	$	$	✔	Client	Should be considered
Online platform for social interaction	An online platform can be set-up (accessible on the metering screens for example) providing a platform for: ▪ general communication ▪ meetings for activities (e.g. sports groups, etc.) ▪ exchange platform (for example, tools, skills, etc.)	$	$	?	Client	Could be considered
Communal bookshelf / library	Bookshelf in a common area to encourage social interaction	$	$	✔	Architect	Should be considered
Recognition of culture and heritage	Research and identify the cultural and heritage background of the site and implement measures to translate the findings into elements of the project design. This can be an Interpretation Plan including an implementation strategy.	$	$	✔	Client	Should be considered
Art	Consider public art on the building, can also relate to the cultural background of the site	$	$	✔	Architect	Should be considered

2.5 Safety

Safety measures should always be considered when developing a masterplan. Only a safe and secure environment will ensure that the community extensively uses the proposed facilities and feels comfortable to spend time on their own or with their friends and families. The following measures should therefore be considered:

Table 5: Safety initiatives

Initiative	Description	CAPEX	OPEX	Initiative incorporated	Res-ponsibility	Notes
CPTED Assessment	A Crime Prevention Through Environmental Design (CPTED) assessment can be carried out integrating design solution in an early stage to ensure a safe and secure environment	$	$	✔	Client	Should be considered (refer to Section 2.5.1)

2.5.1 CPTED Assessment

The planning and design of places, spaces and buildings can assist in reducing crime by the application of improvements to lighting, fencing, landscaping and surveillance of the area from buildings and land use. People's behaviour, particularly in terms of the possibility of offending, as well as an individual's perception about their safety, can be influenced by the design of that environment. Good design can reduce opportunities for offending and improve feelings of safety.

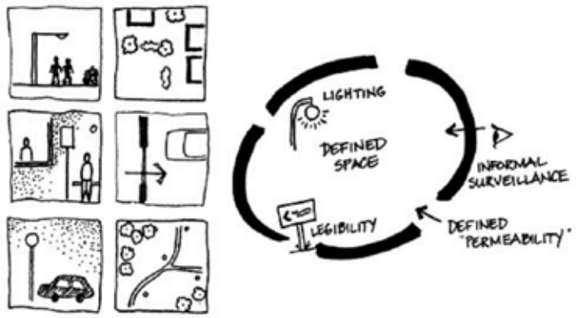
Crime prevention through environmental design (CPTED) involves the application of a range of design principles to an area or site to minimise the potential for that site to facilitate and support criminal behaviour. Today crime prevention through environmental design goes beyond physical and social factors and aims to reduce opportunities for crime by increasing the risks and efforts for offenders as well as reducing the rewards. Crime prevention through environmental design recognises that it has to be part of a holistic approach to crime prevention including community, social and environmental strategies.

There is no single prescriptive method for designing out crime; however, crime prevention through environmental design practitioners and educationalists in Australia, recognise a set of accepted principle headings which can be considered and developed at a local level. Designing out crime principles are based on five design and usage concepts:

1. Surveillance;
2. Access Control;
3. Territorial Reinforcement;
4. Target Hardening (Security Measures); and
5. Management and Maintenance.

Sub concepts of the above headings include:

a. Lighting;
b. Natural Surveillance and Sightlines;
c. Signage;
d. Building Design;
e. Land Use Mix;
f. Landscaping;
g. Spaces Safe from Entrapment



3.0 Economic prosperity

This section discusses the initiatives fostering economic prosperity for the development. The initiatives given below are only a small snapshot of what can be considered. The Economic Development Section of this report should be reviewed for further inputs and details.

The following table presents a selection of different initiatives that may be included.

Table 6: Economic prosperity initiatives

Initiative	Description	CAPEX	OPEX	Initiative incorporated	Res-ponsibility	Notes
Sharing economy	Car-sharing, etc.	$	$	?	Client	Can be considered, likely not suitable for this project
Responsible materials and procurement	Local labour and materials, ensuring that responsible and fair practices are in place and human rights are respected.	$	$	✔	Architect	Should be considered
Connection to local entities	Partnerships with local businesses, workshops and training from local specialists, regular events and markets promoting local businesses and organisations	$	$	✔	Client	Is likely to be implemented

3.1 Local and responsible procurement

The economic resilience of a region can be achieved through the use of products or materials that are manufactured regionally or nationally. The building industry is a significant user of materials, products and services and has key influence on the supply chain within Australia.

Use of local services, materials and products as well as local labour should be encouraged in the design and specifications of the project.

4.0 Environmental responsibility

Buildings consume considerable natural resources in their construction, operation and demolition. This section of the report provides details about the potential impacts caused by the construction projects and how these impacts can be reduced.

The project should aim to reduce the total embodied energy and carbon considered in the construction and aim to maximise the operational efficiency of the building's services to provide and enhance user's provisions for the minimum amount of energy and water. Furthermore, methods for maintaining operational efficiency will be investigated to ensure that the benefits are maximised over the life of the building.

4.1 Energy efficiency

The construction industry is responsible for around 20% of Australia's carbon footprint. These emissions include embodied energy and water consumption that goes into the site during construction as well as operational energy and water usage of the completed development, maintenance during the life span and the demolition at the end of the development's life. This section outlines possible strategies to reduce the masterplan's energy demand and greenhouse gas emissions.

Table 7 below summarises an assessment of different strategies on the masterplan and general planning level.

Table 7: Energy efficiency initiatives - masterplan and general

Initiative	Description	CAPEX	OPEX	Initiative incorporated	Res-ponsibility	Notes
External lighting sensing	Sensing on the external lighting should be considered. Photocells and timer switching will help to reduce energy consumption from the external lighting.	$	$	✔	Electrical	Standard inclusion
External light fittings	Downward facing external lights to avoid further light pollution	$	$	✔	Electrical	Should be considered
Car park lighting with Solar cells	Car park lighting that absorbs solar radiation during the day to provide lighting during the night. http://orcasolarlighting.com.au/solar_car_park_lighting.html	$	$	✔	Electrical	Should be considered
Internet of Things / BMS	The Internet of things is the network of devices such as vehicles, and appliances that contain electronics, software, sensors, actuators, and connectivity which allows these things to connect, interact and exchange data. Also includes buildings.	$	$	x	Electrical	Not necessary

Table 8 below summarises an assessment of different strategies on the building level.

Table 8: Energy efficiency initiatives - buildings

Initiative	Description	CAPEX	OPEX	Initiative incorporated	Res-ponsibility	Notes
Lighting	Low-energy, LED lighting. This should be standard practice.	$	$	✔	Electrical	Standard inclusion
PIR (occupancy sensing)	Reduces energy use based on occupancy. Standard practice.	$	$	✔	Electrical	Standard inclusion
Daylight sensing	Reduces energy use based on available sunlight. Standard practice.	$	$	?	Electrical	Can be considered in building's common areas
Ceiling fans / De-stratification fan	By utilising ceiling fans, the use of the HVAC can be reduced.	$	$	?	Interiors	Can be considered. To be confirmed whether practical in a sports facility.
Greater temperature bands	Although not a technology type, greater temperature set points should be considered to reduce HVAC use in the new building.	$	$	?	Mechanical	Can be considered.
Economy Cycle	Economy cycle is a strategy that uses outside air directly for space cooling, with the aim to reduce the energy consumption by reducing operation of AC equipment. This strategy provides the added benefit of improved IAQ by significantly increasing outside air ventilation rates during periods of mild weather. When ambient temperatures are within acceptable ranges during the mornings and evenings, and more so in the winter, economy cycle should be utilised.	$	$	x	Mechanical	Unlikely to be feasible for this facility.
Building Management System (BMS)	Improved management of the building services	$	$$	✔	Electrical	Standard inclusion
Metering and sub-metering	Sub-metering systems use a number of carefully placed energy meters 'downstream' of the main utility meter to pinpoint how different parts of the building are using energy. This should be standard practice.	$	$	✔	Electrical	Standard inclusion
Upgrade all existing meters / sub-meters	Upgrade of all existing meters in all other parts of the development, to ensure a cohesive and complete understanding of the total energy and water used on the site. Can also read back to a central BMS. This will resolve many future problems and help optimise maintenance of the site.	$	$	✔	Electrical	Should be considered
Live Displays	Live displays could be installed that show the masterplan's energy, water and waste consumption in comparison to other sites. This would be linked to the BMS.	$	$	?	Electrical	Can be considered.
Power Factor Correction	For buildings that have a poor 'power factor' during peak periods, 'power factor correction' equipment can be installed which reduces the apparent power drawn from the grid, thereby saving money.	$	$	✔	Electrical	Should be considered
Commis-sioning and Building Tuning	Comprehensive pre-commissioning and commissioning activities should be undertaken for all building systems. This should be standard practice. Further to commissioning, seasonal building tuning should be undertaken on the building for at least 12 months following occupancy to ensure systems are performing to their design potential at full and part load conditions.	$	$	✔	Main Contractor	Standard inclusion
CO_2 monitoring	A significant component of the mechanical services energy is in treating outside air (OA) - this is due to population loads and also climatic conditions. Reducing the quantity of OA in off-peak periods will reduce operating costs against minimal installation costs.	$	$	?	Mechanical	Depends on HVAC strategy

4.2 Water efficiency

The water consumption of Western Australian households is the second highest in Australia with an average of 241,000 litres, well above the Australian average of 190,000 litres. A reduction of water usage does not only alleviate pressure from the local water supply but also means reduced costs of living for communities in WA.

Reduction in operational water consumption may be achieved through maximisation of water-efficiency within a project, as well as through the utilization of reclaimed water sources.

The following table assesses possible strategies to reduce the masterplan's potable water demand.

Table 9: Water efficiency initiatives

Initiative	Description	CAPEX	OPEX	Initiative incorporated	Res-ponsibility	Notes
Water Efficient Fixtures	Low flow fittings; taps, basins, WCs, appliances etc.	$	$	✔	Architect	Should be considered
Taps with Sensors	By installing automatic taps, water wastage from leaving taps open is reduced. Automatically shutting of taps based on a timer will also assist in reducing the usage of water by limiting the flow to a nominally recommended amount.	$	$	✔	Architect	Should be considered
Rainwater Harvesting	Rainwater harvesting involves the collection, storage and distribution of rainwater from the roof and other areas, for use inside and outside the building.	$$	$	✔	Hydraulics	Should be considered.
Greywater System	A greywater system utilises the wastewater from showers, baths, spas, hand basins, laundry tubs and washing machines.	$$	$$	?	Hydraulics	Requires feasibility study
Blackwater System	A blackwater system utilises the wastewater from toilets.	$$	$$$	X	Hydraulics	Likely not suitable
Air Wells	Air Wells, such as the Cloud Fisher or Warka Water, collect water from the air via condensation. Wind drives humid air through vertically suspended fine nets. Water condenses on the net which then falls into a collector tray at the base of the net. These are particularly important in dry, arid climates where lack of potable water is an issue. http://www.warkawater.org/ https://www.aqualonis.com/	$$	$$	X	Sustainability	Not suitable for this project
Stormwater	Stormwater is precipitation runoff over ground-level surfaces that does not soak into the ground but has not entered a waterway such as a stream or lake. Stormwater can be harvested and reused for irrigation, wash applications, cooling tower make-up or process water, dust suppression, backup fire protection, vehicle washing, and other non-potable uses.	$$	$$	?	Civil	Could be considered, depends on civil concept
eWater Cleaning	eWater is produced by applying an electrical charge to a mixture of ordinary tap water and salt. Known as electrolysis, this process splits the water mixture into positive and negative ions, creating two highly effective and remarkably safe solutions on opposing ends of the pH scale: alkaline for cleaning and acidic for antimicrobial sanitising. https://www.ewatersystems.com/	$$	$$	?	Client	Could be considered
Drip-Irrigation	Drip irrigation is a type of micro-irrigation system that has the potential to save water and nutrients by allowing water to drip slowly to the roots of plants, either from above the soil surface or buried below the surface. The goal is to place water directly into the root zone and minimize evaporation.	$	$	✔	Landscape	Will be implemented, refer to Landscape Section
Native vegetation	Native vegetation should be used were possible to reduce the demand for irrigation	$	$	✔	Landscape	Will be implemented, refer to Landscape Section

4.2.1 Sanitary fittings

User's water consumption is a major contributor to potable water usage. The following water fixture WELS ratings should be considered to ensure the efficient use of potable water by building users.

Table 10 - Target WELS ratings

Fixture / Equipment Type	WELS Rating
Taps	6 Star
Toilets	4 Star
Showers	3 Star
Clothes Washing Machines	5 Star
Dishwashers	6 Star

4.2.2 Rainwater harvesting and irrigation

The concept of rainwater harvesting is to collect, retain and re-use rainwater that provides a non-potable water source and reduce the demand for mains fed domestic cold water.

Collected rainwater can be used for many applications including:

- Toilet flushing
- Irrigation
- Appliances
- Outdoor cleaning

Rainwater harvesting options will be explored further parallel with the development of the civil concept for the site.

A major amount of potable water usage goes back to landscape irrigation. To reduce the amount of water used for the landscaped areas on the ground floor, a drip system with moisture sensor control is explored for irrigation.

4.3 Renewable technology

New technologies have seen a rapid growth in the recent years through an increasing awareness about the impacts of climate change and the need to significantly reduce greenhouse gas emissions in the next decade.

A number of technologies, such as Solar PV have seen a significant decline in costs and are now slowly considered to be standard practice. Others, such as battery storage, are expected to follow suit in the coming years but currently still require relatively high capital costs.

The table below outlines an array of options for new technologies, many of them are not feasible for this project at the moment due to its relatively small size. However, this may change in the near future.

Table 11: Renewable technology initiatives

Initiative	Description	CAPEX	OPEX	Initiative incorporated	Res-ponsibility	Notes
Photovoltaics (PVs)	Roof mounted	$$	$$	✔	Electrical	Could be considered, to be checked against dust and cyclone
	Building Integrated Photovoltaics (BIPV) (e.g. solar roof tiles)	$$$	$$$	X	Electrical	
	With batteries	$$	$$	?	Electrical	
	PV-T panels combine electricity and hot water	$$	$$	✔	Electrical	
Solar Hot Water (SHW)	Flat plate	$$	$$	?	Hydraulics	PV or PV-T should be considered
	Evacuated tube	$$	$$	?	Hydraulics	
	Heat pump system	$$	$$	✔	Hydraulics	
Solar glass	Solar Glass windows generate electricity from solar radiation and can be installed in place of the regular glazed window or in the building's facade – or as curtain wall. Solar glass windows are double glazed, high strength, durable and transparent. For every 10 m^2 of glass approximately 1 KW of power can be produced.	$$$	$$	X	Electrical	Not suitable for this project
Wind Technology	Wind turbine technology is used to convert kinetic energy from the wind into electrical energy. Usually requires large amounts of land to install turbines which typically generate between 500kW to 2MW.	$$	$$	?	Sustainability	Could be considered
Co-generation	Cogeneration (also called 'CHP') systems generate electricity from combustion (typically of natural gas, but biogas is also possible), and use the waste heat to provide hot water. 'Trigeneration' refers to the same process but waste heat is also used by an 'absorption chiller' to create chilled water. The electricity produced by these systems is cleaner than grid electricity in most locations, but when natural gas prices rise faster than electricity prices they become less financially viable. Maintenance requirements also need to be considered. Larger buildings or groups of buildings with a constant high demand for hot water are ideal candidates.	$$$	$$$	X	Mechanical	May not be suitable due to the small size of the project
Tri-generation	(see above)	$$$	$$$	X	Mechanical	
Geothermal or ground source heat pumps (GSHPs)	Ground source heat pumps (sometimes called 'geothermal') use the relatively stable temperature of the earth to make heating and cooling systems more efficient. This involves running a liquid through pipes buried in the ground - sometimes horizontally a few metres deep, other times vertically in bores up to 100m deep. Installation should be by a specialist contractor.	$$$	$$	?	Mechanical	Likely not suitable due to high costs
Hydrothermal	Hydrothermal energy is the process of obtaining heat or energy from a large body of water. "Heat", in this case should not be associated with high temperature (as it may be with geothermal energy) but rather a relative heat content or relative temperature difference.	$$$	$$	X	Mechanical	Not suitable for this project due to its location
Fuel Cells	Fuel cells use the chemical energy of hydrogen to generate electricity, without combustion or harmful emissions. Through an electrochemical process, the fuel cell separates hydrogen into its basic elements and combines it with oxygen from the air to produce electricity, clean water, and usable heat. Exhaust heat is captured by the co-generation equipment, which is used to pre-heat the hot water system. May require substantial maintenance.	$$$	$$$	X	Mechanical	Not suitable for this project.
Biomass and Biofuel	Biomass boilers generate heat through the combustion of biomass fuel, usually wood chip or wood pellets. If correctly managed, the use of biomass fuel is considered to be a near carbon neutral process, because the combustion of the materials releases the same volume of CO2 as would be produced from the decomposition of the organic material, with the main difference being the speed of the release. The emission factor for biomass is significantly lower than that for natural gas, and overall considered more beneficial for the environment	$$	$$	X	Mechanical	Not suitable for this project
Biogas	A biogas digester can be used to turn methane from agricultural waste management systems into fuel for generators https://www.ameresco.com/solution/biogas/	$$	$$	X	Mechanical	Not suitable for this project

4.3.1 Solar photovoltaic (PV) panels

Solar Photovoltaic (PV) panels can be considered for the development. However, economic feasibility, suitability of fixtures to strong winds/cyclones and panels to dust need to be considered.

4.4 Waste

The main objectives for the waste management strategies for construction and operational waste are to ensure that waste is avoided and recycled during design, construction and operation.

Waste within a building construction context can be avoided by encouraging the selection of lower-impact and long-term materials. Operational waste to landfill can be reduced by providing the relevant and easily accessible facilities for recyclable waste and other waste that can be diverted from landfill such as organic waste, batteries or e-waste.

The following table summarises the specific initiatives included in the design in relation to waste management:

Table 12: Waste initiatives

Initiative	Description	CAPEX	OPEX	Initiative incorporated	Res-ponsibility	Notes
Recycling waste strategy	Recycle all forms of waste setting high targets and minimising general waste to landfill	$	$	✔	Waste	Standard inclusion.
Composting / Organic Waste Strategy	Recycle all forms of food and organic waste. Identify waste streams and incorporate a strategy that reduces food / organic waste to landfill.	$	$$	X	Waste	Likely not feasible due to not enough organic waste on site
Organic / Food Waste Dehydration	Install a dehydration plant to deal with organic and food waste. GaiaRecycle is unique as an on-site, odour-free process that produces two sterile reusable resources – water and biomass. http://www.ecoguardians.com.au/products/gaia-recycle	$$	$$	X	Waste	
Operational Waste Management Plan (OWMP)	The project team should aim to prepare and implement an Operational Waste Management Plan (OWMP) for the project in accordance with best practice approaches and this is reflected in the building's design. This would outline strategies and targets for the building's waste, with the aim of minimising waste and maximising recycling of waste.	$	$	✔	Waste	Should be considered
Anaerobic Digester	Anaerobic digestion is a collection of processes by which microorganisms break down biodegradable material in the absence of oxygen. Anaerobic digestion is widely used as a source of renewable energy. The process produces a biogas, consisting of methane, carbon dioxide and traces of other gases. Biogas can be used directly as fuel, in combined heat and power gas engines or upgraded to natural gas-quality biomethane. The nutrient-rich digestate also produced can be used as fertilizer.	$$$	$$$	X	Sustaina-bility	Not suitable for this project
Minimise Construction Waste	The main contractor should minimise the total amount of waste sent to landfill when compared against a typical building. The project should target at least 60% of the waste generated during construction and demolition being diverted from landfill.	$	$	✔	Main Contractor	Standard inclusion
Designing out waste principles (refer to Section 4.4.1 below)	Re-use of materials	$	$	✔	Architect	Should be considered
	Design for deconstruction and flexibility	$	$	✔	Architect	
	Design for off-site construction	$	$	✔	Architect	
	Design for Waste Efficient Procurement	$	$	✔	Architect	
	Design for materials optimisation	$	$	✔	Architect	

4.4.1 Waste from demolition and construction

In 2014-15 Australia produced the equivalent of 565 kg per capita of municipal waste and 831 kg of construction and demolition waste. While around 60% of this waste is recycled, a large part still goes to landfill. A reduction of both construction and operational waste should therefore be an important target of the proposed development.

The UK Waste and Resources Action Programme (WRAP) published a Guideline outlining the case for taking action to Design out Waste in the construction industry.

Waste should not be considered in isolation; it is part of the overall consideration of sustainability in construction, which includes factors such as carbon impact, resource depletion and water use. All of these issues are interlinked and, in general, techniques that reduce waste will also reduce the carbon impact. In many cases, design solutions that reduce waste will

also be quicker and offer cost savings compared to conventional solutions.

The guideline is based on five key principles that design teams can use during the design process to reduce waste:

- **Design for Reuse and Recovery** - There are a few benefits of reused materials including lower embodied carbon in the building, potentially lower material costs and also enhancing the narrative of the building design.
  Can recycled products be used in the design? Can excavation materials be used as aggregates?
- **Design for Off Site Construction** - Prefabricated construction methods are considered to be more energy and waste efficient because production processes can be better controlled and made more efficient in the factory than on site, e.g. better machinery, less cut-offs, better reuse of materials, material cycles, etc.
- **Design for Materials Optimisation** - Can innovative designs or materials be used for structures to reduce material use? Can the design, form and layout be simplified without compromising the design concept? Can the design be coordinated to avoid/minimise excess cutting and jointing of materials that generate waste? Is there repetition and coordination of the design, to reduce the number of variables and allow for operational refinement (e.g. reusing formwork)?
- **Design for Waste Efficient Procurement** - Has research been carried out by the design team and/or WRAP's Net WasteTool used to identify where on-site waste arises? Can construction methods that reduce waste be devised through liaison with the contractor and specialist subcontractors? Have the project specifications been reviewed to select elements/components/materials and construction processes that reduce waste? Has the programme been developed to include opportunities for reuse or recycling of materials on site? Have appropriate KPIs and targets for waste been set and included in contracts for the whole supply chain?
- **Design for Deconstruction and Flexibility** - Is the design adaptable for potential expansion or alternative use in the future? Does the design contain anything that would make it difficult to deconstruct or recycle the structure or element at the end of its life? Does the design incorporate reusable/recyclable components and materials? Can the components be maintained, upgraded or replaced without creating excessive waste?

Further information can be accessed online: http://www.wrap.org.uk/

4.4.2 Operational waste management

A dedicated waste storage area should be provided for the separation and storage of recyclable waste during operation, allowing for the different waste streams to be separated and match the local recycling scheme. Different streams should include landfill, recycling and possibly organic/food waste.

It is likely that drinking bottles will form a large part of recycled waste on site. A sufficed amount of water fountains for refilling bottles and a separate waste stream for water bottles should be considered.

Some further strategies to reduce operational waste include:

- Innovative waste separation and collection strategies to allow materials to be isolated for reuse;
- A purchasing policy which aims to minimise waste from products and packaging, encourage the use of products which have minimum environmental impact; and
- Manufacturers and suppliers to be encouraged to take full responsibility for the life cycle impact of products including ownership at end of life.

4.4.3 Composting organic waste strategy

The development could explore the possibility of recycling all forms of food and organic waste by Identifying waste streams and incorporate a strategy that reduces food or organic waste going to landfills. This may only be feasible when external tenants such as a café or kiosk is considered and enough organic waste is available.

4.5 Reducing light pollution

The term light pollution describes an excessive amount of artificial light in the night environment which is mainly caused by upward shining external light fittings in urban areas, but also by other light sources that illuminate the night sky. Light sources causing light pollution are also considered to be inefficient from a lighting design but also from an energy point of view.

Other negative effects of light pollution include disruptions for animals and humans leading to disturbed circadian rhythms and reduced health and wellbeing, light cluttering and interference with night sky and star visibility and astronomical research. The project targets to reduce the impact of light pollution in selecting light fittings that shine downwards and have a limited initial point illuminance.

5.0 Leadership and governance

5.1 Raising awareness

A key reason for the lack in uptake of sustainable building practices in some sectors has been the lack of engagement with users and the broader community on how such practices can benefit them.

As an example, in the case of residential developments, buyers are unlikely to value a sustainable building over a non-sustainable one as there is a lack of understanding of the benefits that a sustainable building can bring, and owners and occupants are often unable to make an accurate determination of the benefits in relation to cost.

To raise awareness to the benefits of sustainable practices, effective marketing and education can be carried out based on user's surveys before and after the completion of the project or other kinds of research. Information screens or boards informing visitors and users about community initiatives but also about any other sustainability initiatives taken could be introduced together with the relevant online information.

5.2 Codes, ratings and benchmarks

5.2.1 National Construction Code - Section J

If the buildings have conditioned spaces, the development is required to comply with the National Construction Code (NCC) Section J for Energy Efficiency. NCC.

Section J covers items including:

- Building fabric;
- External glazing;
- Building sealing;
- Air movement;
- Air conditioning;
- Artificial lighting and power;
- Hot water supply;
- Access to maintenance.

A standard Section J assessment, including the NCC glazing calculator will be carried out to determine U-Values of glazing and R-values of walls, floors and roofs. To optimise glazing and insulation the application of an energy model approach can be considered.

5.2.2 Green Star Communities

Due to the relatively small size and specific function of the masterplan, a Green Star Communities rating my not be feasible for this project. However, Green Star Communities provides a good framework to how sustainable masterplans can look like which can be considered regardless.

Figure 8: Categories - Green Star Communities

5.2.3 Lifecycle assessment

Beside certifications such as Green star and regulatory frameworks such as the NCC, the project can also set its own benchmarks. An example to do so would be carrying out a lifecycle assessment (LCA).

An LCA looks at the environmental impacts of a building or a masterplan. Standard approach cradle to grave analysis which looks at all materials used in a project from obtaining the resources for manufacturing the products to construction in the project, the projects life and finally demolition and waste generation.

The LCA process and the impacts assessed are defined in EN15978 and usually describe a range of environmental impacts including the project's influence on climate change. An LCA could be carried out for the project and be compared to a 'business as usual case' (BAU) to identify the effectiveness of the sustainability measures applied in the project. The Green Star Communities tool awards points based impact reductions compared to the BAU case of between 35 and 110%.

While a classic LCA only considers environmental impacts, it is also possible to extend this analysis social and financial impacts.

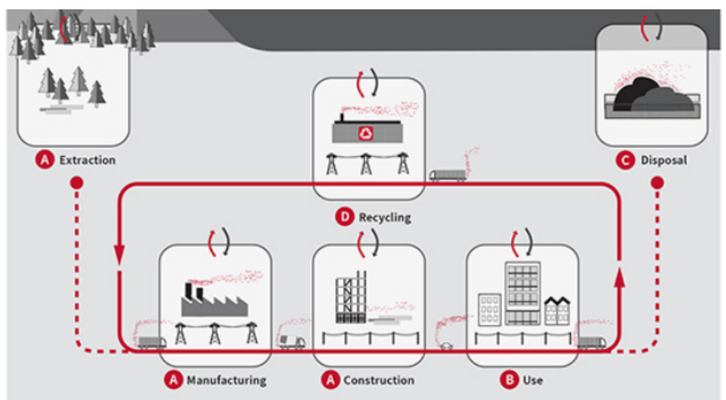


Figure 9: Principle of lifecycle assessment (Credit Meghan Lewis, ENR)

6.0 Design excellence

Many aspects associated with sustainability should be considered in the early planning stages of a project to be integrated into the design of urban design, buildings and interior design. Excellent design leads to comfortable and user-friendly buildings and public spaces creating a save and healthy spaces while minimising environmental impacts.

Table 13 below summarises an assessment of different strategies for both masterplan and building level.

Table 13: Design excellence initiatives – for both masterplan and buildings

Initiative	Description	CAPEX	OPEX	Initiative incorporated	Res-ponsibility	Notes
Timber	All timber used within the building and masterplan should be certified from a sustainable source (PEFC, FSC, AFS) or recycled / reused timber. Should be standard practice.	$	$	✔	Structural	Standard inclusion
Responsible steel	Steel should be low embodied carbon steel from a responsible steel maker (e.g. One Steel, Fero)	$	$	✔	Structural	where steel is applicable
Portland cement reduction in concrete	All specified concrete should reduce the amount of Portland cement in the concrete where possible. The target should be 40% reduction.	$	$	?	Structural	where concrete is applicable
Warm mix asphalt	Warm mix asphalt is an alternative to any specified hot mix asphalt for civil works. Using warm mix techniques reduces energy consumption and carbon emissions.	$	$	?	Civil	Could be considered
Modular construction	The team should consider modular construction techniques. This could save on costs and construction time. Also refer to Section 4.4.1)	$	$	?	Structural	Could be considered
Biophilic design / connection to nature	Biophilia is defined as the inherent human inclination to affiliate with nature. Biophilic design, an extension of biophilia, incorporates natural materials, natural light, vegetation, nature views and other experiences of the natural world into the modern built environment.	$	$	?	Architect	Could be considered for the buildings
PVC	PVC plastic is uniquely toxic among plastics because of its highly toxic ingredients which readily migrate into the environment during its production, its use, and its disposal. The building should target specifying no PVC for the entire new development or PVC specified as best practice.	$	$	✔	Architect	Should be considered
Crushed recycled concrete subbase	Crushed recycled concrete can also be used as the dry aggregate for brand new concrete if it is free of contaminants. Also, concrete pavements can be broken in place and used as a base layer for an asphalt pavement through a process called rubblization. This will save significant amounts of greenhouse gas emissions.	$	$	?	Structural	Could be considered
Fabric structures	Fabric structures can be quickly and easily constructed, easily expanded or moved as needs change. Constructed to withstand wind, snow loads, and other severe weather conditions. designed to meet and in many cases exceed local and international building codes.	$	$	?	Structural	Can be considered
Self-healing concrete	Concrete with the capacity to repair its own cracks and imperfections. When it comes to using concrete in construction, structural integrity is a major concern. As a result, a great deal of time and effort is put into ensuring that the concrete is in excellent condition.	$	$	X	Structural	Likely not feasible for this project
Structural 3D printing	This process is driven by industrial robots fitted with welding machines that can print lines of various metals in mid-air, starting from an anchored surface—similar to drawing a structure in space—by incrementally fusing molten metal in short lengths and allowing it to cool.	$	$	X	Structural	Likely not feasible for this project
Avoiding Heat Island Effect	The use of light roof materials combined with shaded and landscaped areas can reduce the heat island effect significantly and contributes to further energy savings	$	$	✔	Architect	Should be considered

Table 14 below summarises an assessment of different strategies on building level.

Table 14: Design excellence initiatives - buildings

Initiative	Description	CAPEX	OPEX	Initiative incorporated	Res-ponsibility	Notes
Solar passive design	Use solar passive design principles such as north-south orientation, sufficient shading, cross-ventilation, minimised window area to the western façade.	$	$	✔	Architect	Standard inclusion
Insulation	Thermal mass will be essential particularly in the roofs and the façades. The building should aim to go beyond minimum compliance to ensure reduced energy consumption and enhance occupant comfort. This should be standard practice.	$	$	✔	Architect	Standard inclusion
Shading	Shading is a critical component to the building design. Large overhangs, both vertical and horizontal, should be incorporated, and the north facing glazing should aim to reduce the amount of direct solar radiation for all times during the year.	$	$	✔	Architect	Standard inclusion

Glazing	High thermal performance glazing will be essential. It will also be important to ensure as clear glazing as possible for better views and visual transmittance.	$	$	✔	Architect	Standard inclusion
Electro-chromic glazing	Electrochromic glass (a.k.a. smart glass or dynamic glass) is an electronically timetable glass used for windows, skylights, facades and curtain walls. Electrochromic glass, which can be directly controlled by building occupants, is popular for its ability to improve occupant comfort, maximize access to daylight and outdoor views, reduce energy costs and provide architects with more design freedom.	$$$	$$$	X	Architect	Likely not feasible for this project
Ethylene tetrafluoro ethylene (ETFE)	ETFE is a co-polymer resin that is extruded into a thin film. The plastic-like material is transparent but can be treated to be translucent, is extremely light-weight, very durable and resistant to corrosion. ETFE could be used for skylights if any are proposed but may be an expensive inclusion.	$$	$	?	Architect	Could be considered for smaller areas
Air tightness	Airtightness is the fundamental building property that impacts infiltration and exfiltration (the uncontrolled inward and outward leakage of outdoor air through cracks, interstices or other unintentional openings of a building, caused by pressure effects of the wind and/or stack effect). Air tightness testing has been now integrated into the Green Star Design and As Built tool and is expected to become more and more relevant.	$	$	?	Architect	Could be considered
Thermal breaks	Thermal bridging occurs when a more conductive (or poorly insulating) material allows an easy pathway for heat flow across a thermal barrier. Thermal breaks avoid this occurrence and prevent heat gain / loss and allows the building to run more efficiently. Wall- floor junctions, wall-roof junctions, extending balcony slabs, etc. Are critical points to be considered.	$	$	✔	Architect	Should be considered
Algae façade	A 'bio-adaptive facade' uses live microalgae growing in glass louvres to generate renewable energy and provide shade at the same time. The algae are continuously supplied with liquid nutrients and carbon dioxide via a water circuit running through the facade. When they are ready to be harvested they are transferred as a thick pulp to the technical room inside the building and fermented in a biogas plant. This technology is very much untried and not widely tested.	$$$	$$$	X	Architect	Not suitable for this project
Green roofs	Include green landscaping of the roofs which can absorb large amounts of solar radiation and has a positive environmental impact.	$	$	?	Architect	Should be considered
Volatile Organic Com-pounds (VOCs)	The project team should specify ultra-low VOC products for the paints, adhesives, sealants and flooring, and ultra-low or no formaldehyde for engineered woods. Should be standard practice.	$	$	✔	Architect	Should be considered
Insulating concrete forms	Concrete is poured into forms that serve as insulation layers and remain in place as a permanent part of the structure. The technology is used in freestanding walls and building blocks.	$	$	X	Structural	Likely not feasible for this project
Structural insulated panels	Insulating panels made from foam can help save up to 50 percent in energy costs over other materials.	$	$	?	Structural	Can be considered
Auto-claved aerated concrete	Autoclaved aerated concrete (AAC) is concrete that has been manufactured to contain many closed air pockets. It is lightweight with a moderate embodied energy content and performs well as thermal and sound insulation, due to the aerated structure of the material and its unique combination of thermal insulation and thermal mass. AAC is light, does not burn, is an excellent fire barrier, and is able to support quite large loads. It is relatively easy to work with and can be cut and shaped with hand tools. AAC comes in the form of blocks, storey-height wall panels, and floor or roof panels. http://yourhome.gov.au/materials	$	$	?	Structural	Can be considered

6.1 Materials

The design team should actively target a reduced carbon footprint during construction and embodied energy within building materials. At least 60% of the steel used for reinforcing bars and mesh used should be produced using energy-reducing manufacturing methods. Timber used for construction works should be either certified as responsibly sourced recycled material.

All PVC should be avoided. If no suitable replacement for PVC is available, best practice PVC should be specified.

Embodied carbon comprises a major proportion of the total carbon footprint of a building. An option to provide a life cycle analysis (LCA) of total carbon and environmental footprint should be considered at key design stages to ensure that design options are prioritised in terms of life-cycle impact and embodied energy/water rather than just day one impacts. (Also refer to Section 5.2.3)

6.2 Minimising heat island effect

The heat island effect describes the condition where urban areas have a higher average temperature than its rural surroundings owing to the make-up of the built environment. The use of light roof materials combined with shaded and landscaped areas can reduce the heat island effect significantly and contributes to further energy savings.

6.3 Passive design and building fabric

Passive design principles and a well performing building fabric are key elements to environmentally sustainable design. Good solar orientation, low U-Values of glazing and high R-Values of walls and roofs minimise the conductive energy loss or gain and result in an improved energy rating as well as a reduced overall carbon footprint of the project.

Major passive design principles to consider are:

- North-south orientation of buildings
- Minimise glazing to western facades
- Sufficient shading to northern, western and eastern facades
- High performance glazing
- Well insulated walls and roofs
- Good daylight in buildings without glare
- Natural ventilation and sufficient cross ventilation for night purging.

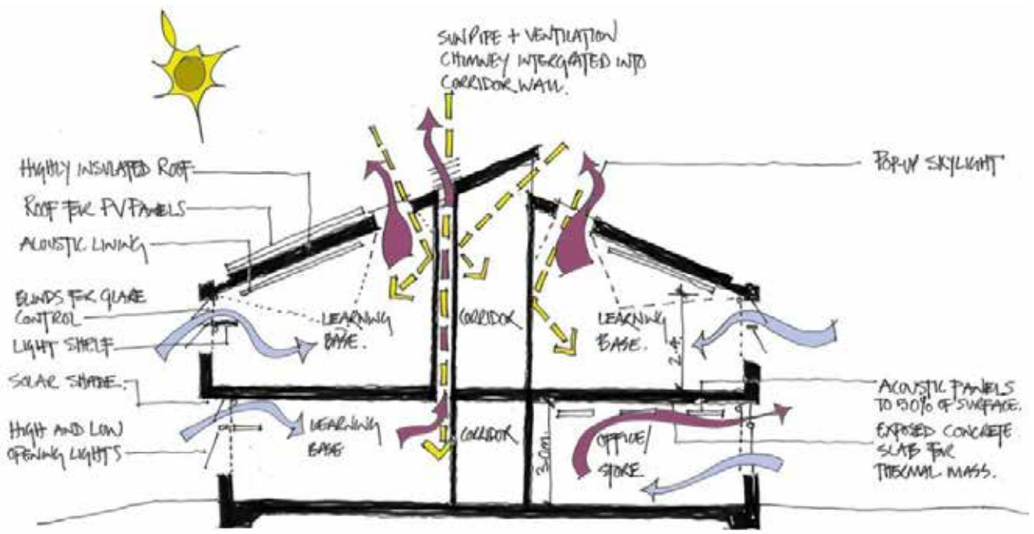


Figure 10: Passive design sketch - CUNDALL Energy Coast UTC, UK

6.4 Indoor Environment Quality (IEQ)

With users spending a considerable time in buildings, it is essential that buildings provide a comfortable and healthy environment for everyone. The team may investigate several initiatives to enhance the indoor environment through a multitude of different technologies and design features.

6.4.1 Daylight

Appropriate day lighting is essential for users' wellbeing, connection to the outdoors and for energy efficiency. However, excessive daylight can cause glare which is a major indoor environment quality (IEQ) concern and should be avoided

6.4.2 Emissions & Toxicity

Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors than outdoors.

VOCs are emitted by a wide array of products numbering in the thousands (typically paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers). The development should aim to specify materials with a low emissions content including low-VOC and low formaldehyde content to avoid unnecessary contamination of indoor air.

6.4.3 Thermal comfort

The human body regulates its core temperature via the hypothalamus within a narrow range of 36 to 38 degrees. An indoor environment that is too hot or too cold can affect mood, performance and productivity. However, at which temperature a person feels comfortable varies significantly from person to person. To control internal comfort and minimise excessive heat loss in winter and heat gains in summer, a number of strategies will be investigated for the proposed development:

- Facade design and glass selection is very important; heat gains and losses must be moderated, and thermal bridging should be avoided. Double glazing can be considered for this development to improve the thermal performance of the building envelope. A Section J building envelope assessment will be carried out for the buildings at a later planning stage to
- The good performance glazing will additionally help to manage acoustic disturbances from outdoors. Separated parting walls between apartments will also reduce noise impacts from neighbouring flats.
- The facade should be well sealed to avoid draughts and air leakage which can cause significant heat losses and increase occupant discomfort.

Opinion of Cost Estimate

South Hedland Sports Precinct Masterplan
29/07/2019

DONALD CANT WATTS CORKE

Precinct		Summary Total
Building Works		$25,877,500
External Works and Services		$27,520,660
Construction Works Sub-Total		**$53,398,160**
Design Contingency	8%	$4,004,862
Construction Contingency	10%	$5,740,302
Regional Loading	45%	$28,414,496
Professional Fees @ 12%	12%	$7,577,199
Construction Works Sub-Total		**$99,135,019**

Exclusion :

Excludes GST
Excludes abnormal ground conditions / contamination / remedial works etc
Excludes major services diversions
Excludes future roads
Excludes major utility upgrades / contributions & headworks

Excludes FF&E
Excludes client costs, legal costs, site costs, agents fees, finance etc
Excludes land purchase costs
Excludes Client Representative / Project Management Fee / Professional Fees
Excludes escalation - costs are current day
Excludes % for Public Art
Excludes ESD to buildings, playing surfaces and recreation areas.
Costs assume Competitive Tender process with local builders using basic pallette of materials

Notes :

OPC based on indicative proposal drawings provided
Works within site boundary only
All quantities and rates are provisional therefore subject to adjustment
All external works and service allowances are Provisional
OPC based on Landscape scope and budget from AECOM dated 26 July 2019
OPC based on Civil scope and budget from Peritas dated 24 July 2019

Drawings Used:

Landscape Plan issued 24 July 2019 - refer attached.

South Hedland Sports Precinct Masterplan
FUNCTIONAL AREA BUDGET BREAKDOWN
Precinct
29/07/2019

DONALD CANT WATTS CORKE

FUNCTIONAL AREA	Precinct Qty	Unit	Rate	Total
New Buildings				
Extension to Existing Stadium				
Indoor Courts	2350	m2	$3,500	$8,225,000
New Entry Hall	650	m2	$3,000	$1,950,000
Ancillary areas	800	m2	$3,000	$2,400,000
Circulation to above	470	m2	$2,750	Included
External Covered Area	150	m2	$1,500	$225,000
Allowance for cover to external new external courts	1,850	m2	$1,000	$1,850,000
Works to Existing Stadium				
Alterations to access to New Entry Hall	1	Item	$250,000	$250,000
Extension of Gym and Group Fitness	100	m2	$3,000	$300,000
Additional Squash Court	65	m2	$4,000	$260,000
Storage, group fitness and office space	400	m2	$3,000	$1,200,000
Roof Extension	400	m2	$1,500	$600,000
Large Multi Purpose Pavillion				
Large Multi Purpose Pavillion and Change	685	m2	$4,500	$3,082,500
Circulation to above	171	m2	$3,000	Included
External Covered Area	390	m2	$1,500	$585,000
Waste / Bin	1	Item	$20,000	$20,000
Small Pavillion				
Small Pavilion and Change Room	460	m2	$4,500	$2,070,000
Circulation to above	115	m2	$3,000	Included
External Covered Area	250	m2	$1,500	$375,000
Waste / Bin	1	Item	$20,000	$20,000
Small Pavilion				
Small Pavilion and Change Room	460	m2	$4,500	$2,070,000
Circulation to above	115	m2	$3,000	Included
External Covered Area	250	m2	$1,500	$375,000
Waste / Bin	1	Item	$20,000	$20,000
Indicative Buildings Sub-Total				**$25,877,500**
External Works Generally				
Allowance for demolition	1	Item	$250,000	$250,000
Allowance for site clearance	1	Item	$105,000	$105,000
Allowance for earthworks	1	Item	$2,160,000	$2,160,000
Allowance for soft landscaping	99,700	m2	$15	$1,495,500
Allowance for swales	1	Sum	$250,000	$250,000
Allowance for footpath	6,300	m2	$50	$315,000
Allowance for roads and carparking	14,000	m2	$120	$1,680,000
Allowance for removing trees	1	Item	$10,500	$10,500
Allowance for trees	200	No	$5,000	$1,000,000
Allowance for Preliminaries	10%	Item		$726,600
Allowance for ESD to above only	10%	Item	$7,266,000	$726,600
External Recreation				
Allowance for shade structure to mounds	1,500	m2	$400	$600,000
Allowance for shade structures to dog park	1	Item	$100,000	$100,000
Allowance for hard landscaping; retaining etc	1	Item	$200,000	$200,000
Allowance for bins, seats, bike racks, signage etc	1	Item	$200,000	$200,000
Allowance for BBQ and pavillion	3	No	$125,000	$375,000
Allowance for adventure playground	1	Item	$2,800,000	$2,800,000
Allowance for kids playground	1	Item	$250,000	$250,000
Allowance for dog park equipment	1	Item	$75,000	$75,000
Allowance for exercise stations	9	No	$50,000	$450,000
Allowance for other hardscape areas	1	Sum	$400,000	$400,000
Allowance for Preliminaries	10%	Item		$545,000
External Sports Areas				
Allowance for playing fields (soccer, AFL, cricket and baseball)	1	Sum	$5,000,000	$5,000,000
Allowance for running track	3,850	m2	$150	$577,500
Allowance for shade structures to above	1	Item	$50,000	$50,000
Allowance for baseball mouldings and fence	4	No	$50,000	$200,000
Allowance for cricket nets	2	No	$20,000	$40,000
Allowance for Preliminaries	10%	Item		$586,750
External services				
Allowance for irrigation	1	Item	$2,100,000	$2,100,000
Allowance for stormwater /water	1	Item	$400,000	$400,000
Allowance for sewer	1	Item	$200,000	$200,000
Allowance for electrical and lighting	1	Iten	$1,000,000	$1,000,000
Allowance for sport lighting	23	No	$75,000	$1,725,000
Allowance for pumps/tanks/hydrants	1	Item	$200,000	$200,000
Allowance for communications	1	Item	$75,000	$75,000
Allowance for security	1	Item	$75,000	$75,000
Allowance for Preliminaries	10%	Item		$577,210
Indicative External Works and Services Sub-Total				**$27,520,660**
Estimated Total Current Day Construction Budget				**$53,398,160**

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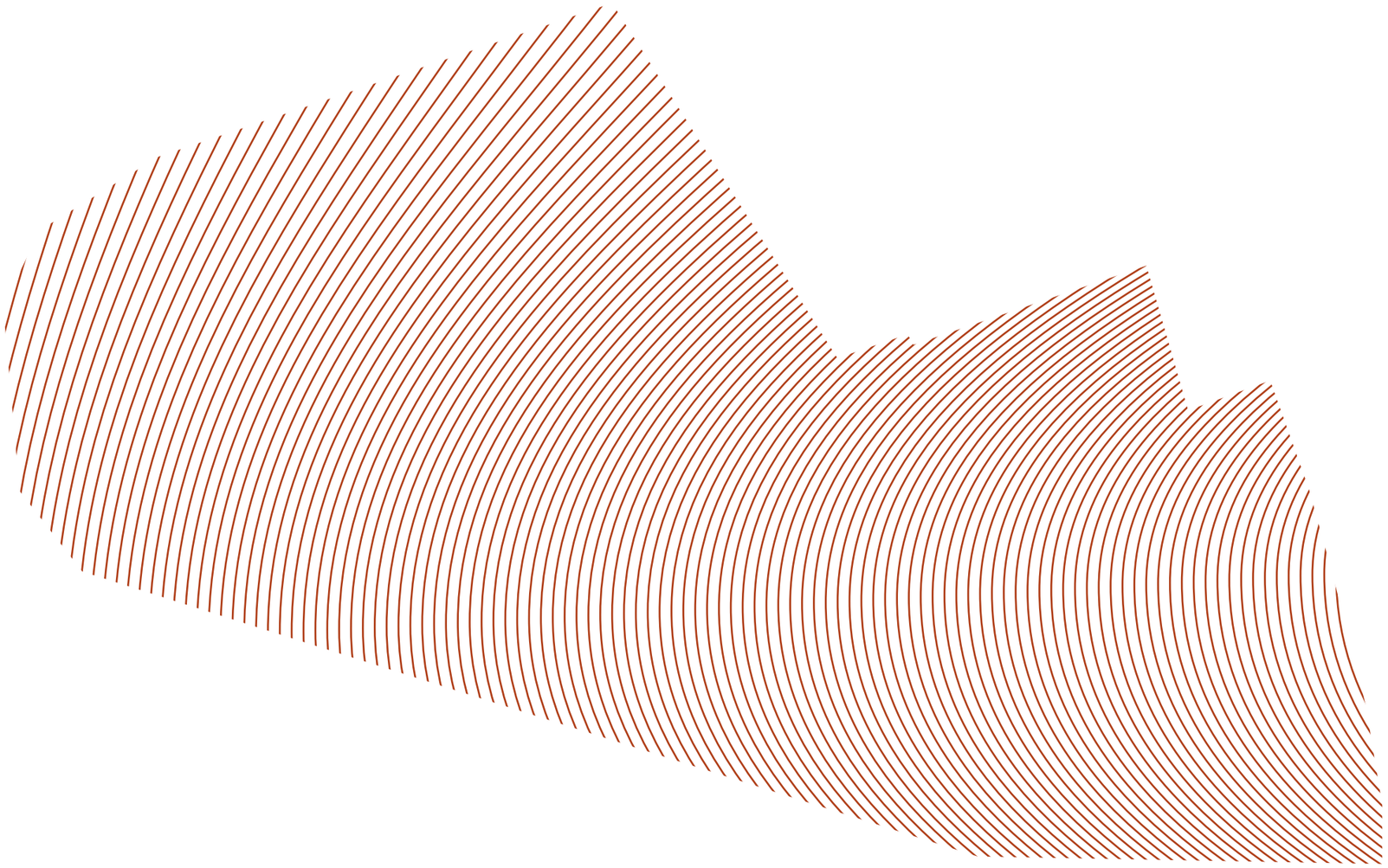
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