

Assumption	Detail	Source
	is insufficient information and data to capture such efficiencies at an aggregate level. Efficiencies relating to automation with robotics in pharmacy are discussed in the economic analysis.	
Existing areas and POC	- Current GBA: - Inpatient & Outpatients building: 25,659m² GBA. - PCS Building: 22,276m² GBA. - Current POC: - Inpatient and Outpatients building: 396 POC. - PCS Building: 52 POC.	Aspex Canberra Hospital Capital Planning SOA for the new PCS Building and the new Inpatient and Outpatient Building (Dec 2023).
Proposed Option 1, 2 and 3 areas and POC	- GBA: - Inpatient & Outpatient Building (inc. basement carparking): 60,122m² GBA. - PCS Building: 33,336m² GBA. - POC: - Inpatient & Outpatient Building: 644 POC. - PCS Building: 70 POC.	2CA Canberra Hospital Capital Planning SOA for the new PCS Building (Dec 2024) Aspex Canberra Hospital Capital Planning SOA for the new Inpatient and Outpatient Building (Dec 2023).
Escalation	- CPI and WPI escalation embedded within each individual cost item. - WPI rate: 3.25% per annum. - CPI rate: 2.65% per annum.	Budget Paper No.1 Statement 2 (page 58)
Forecast Period	- A 20-year forecast period was adopted in estimating WoL costs: - PCS building: Jan-2030 to Dec-2049. - Inpatient and Outpatients building: Mar-2033 to Feb-2053.	
Incremental Costs	WoL costs presented show the difference between the cost of each option and Option 1 (Base Case/Do Minimum).	
Contingency	Additional Contingency for WoL costs has not been included to avoid double counting.	

Indicative Cashflows

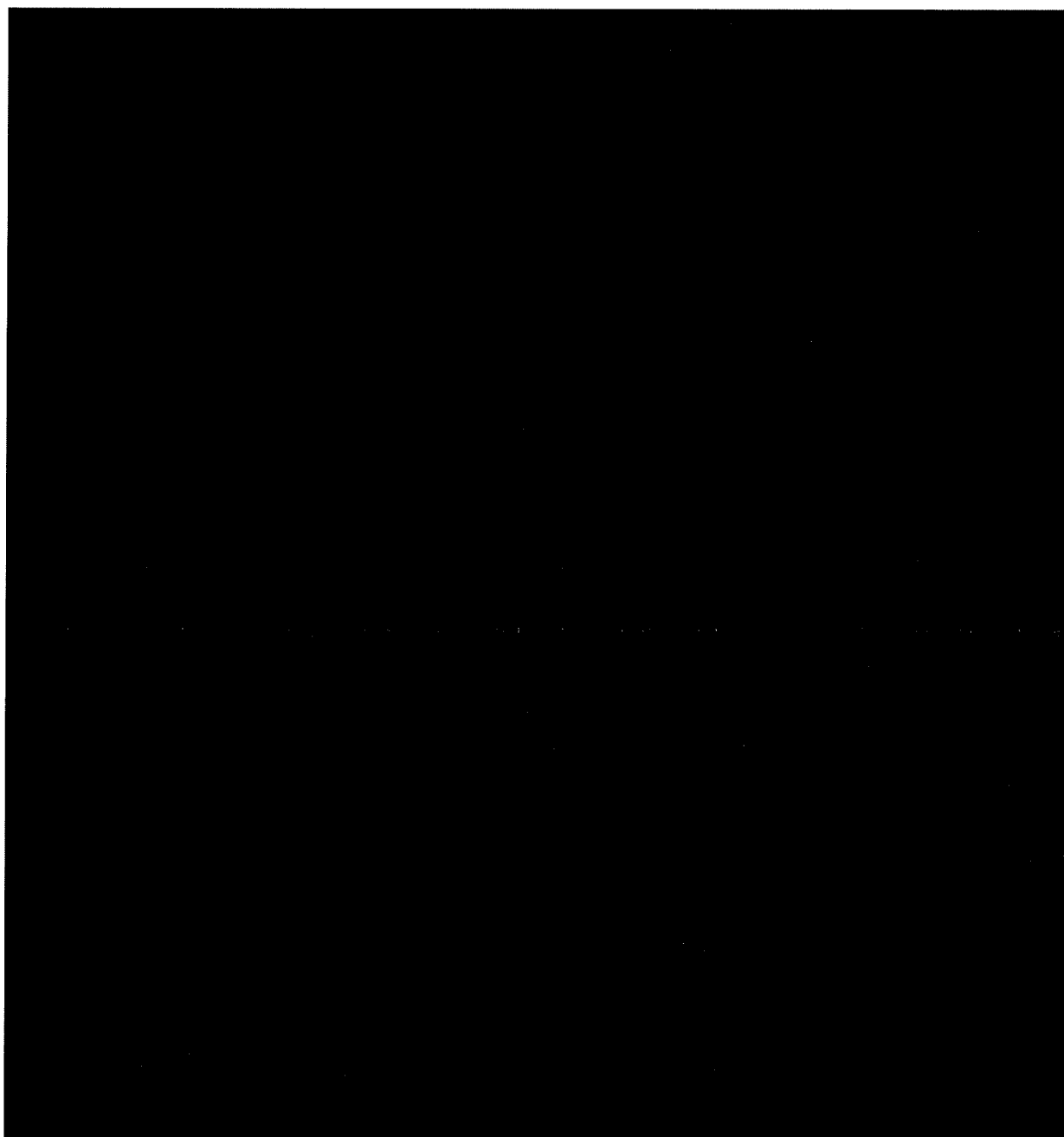
Table 21 and Table 22 outline the estimated WoL cost over a 20-year operating period for the new PCS Building and the new Inpatient and Outpatient Building, respectively. The figures presented illustrate the incremental cost relative to the Base Case. A positive figure indicates an increase in costs over the Base Case, while a negative figure represents a reduction in costs relative to the Base Case. The WoL cashflow estimate comprises:

- Operating costs: the costs and expenses relating to business operations and services conducted in the new PCS Building and Inpatient and Outpatient Building including:
 - Staff salaries: Wages and salary costs for all FTEs, including superannuation.
 - Other staff: Other staff labour expenses including Visiting Medical Officers and Agency Nurse and Non-Contract Services.
 - Non-Staff costs: Expenses including Medical and Surgical Supplies, Pharmaceuticals, Domestic Services Computer & Communication expenses and Grants and Purchased Services.

- Utility costs: Electricity, natural gas, and water costs.
- Repairs and Maintenance costs: Costs including building maintenance, repairs, and work undertaken to inspect, keep, restore, and improve building facilities.
- Escalation: escalation used in the cost modelling process include:
 - CPI: Applied and embedded within the cost estimates. CPI was indexed at 2.65% annually throughout the 20-year forecast period.
 - WPI: Used as indexation for staff salary costs. WPI was indexed at 3.25% annually throughout the 20-year forecast period.

PCS Building

Table 21 shows the incremental WoL costs of the PCS Building under Option 2 and 3. Cost figures show the difference to Option 1.

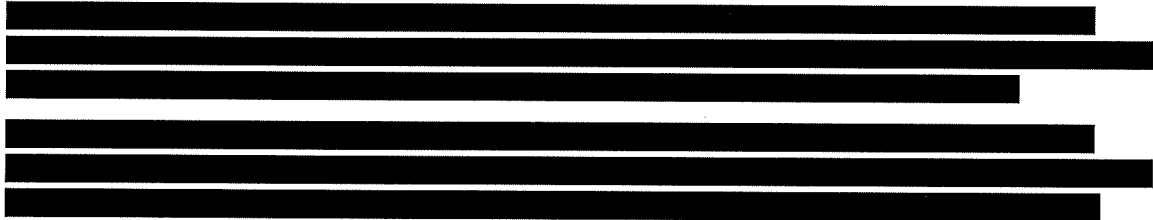
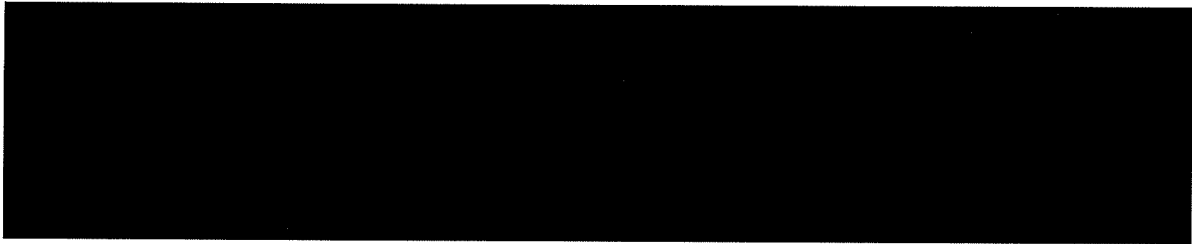


- [REDACTED]
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Inpatient Outpatient Services Building

Table 23 illustrates the incremental WoL costs of the Inpatient and Outpatient building under Options 2 and 3. Please note that the figures reflect the difference / incremental cost relative to Option 1.





Cost Profile

The assumptions around the operational commencement dates for the new PCS Building and the new Inpatients and Outpatient Building are based on the key milestones for the Project. Both buildings have an assumed operational life of 20-years. The assumed operational timings for the new buildings are presented in below, while the annual breakdown of operating costs for the new buildings for each option is presented in the sections below.

PCS Building:

- **Option 1 (Staged):** November 2029 – October 2049
- **Option 2 (Full Shell + Staged Fit-out):** May 2030 – April 2050
- **Option 3 (Single Stage):** July 2030 – June 2050

Inpatient and Outpatient Building:

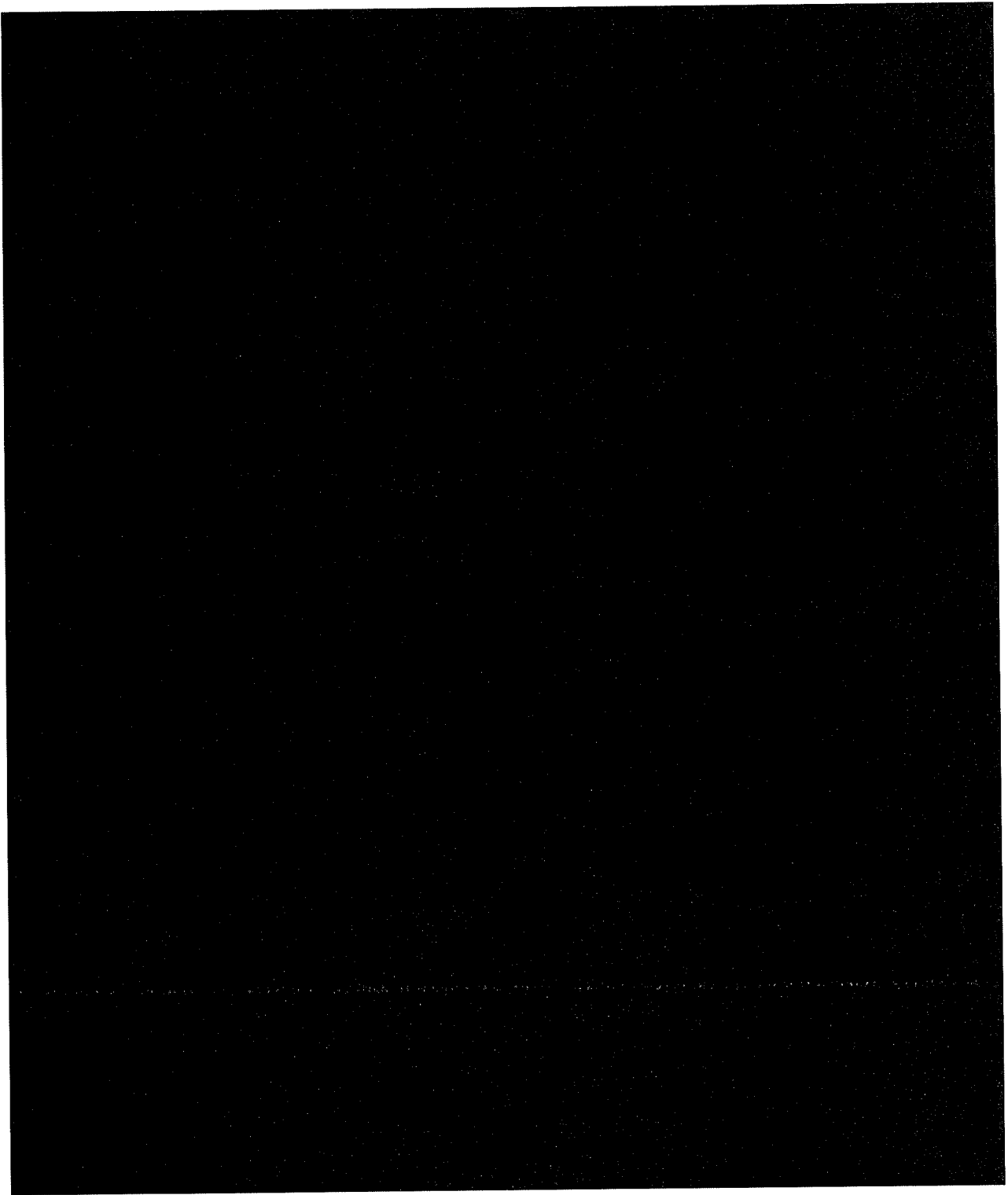
- **Option 1 (Staged):** March 2034 – February 2054
- **Option 2 (Full Shell + Staged Fit-out):** September 2034 – August 2054
- **Option 3 (Single Stage):** November 2034 – October 2054

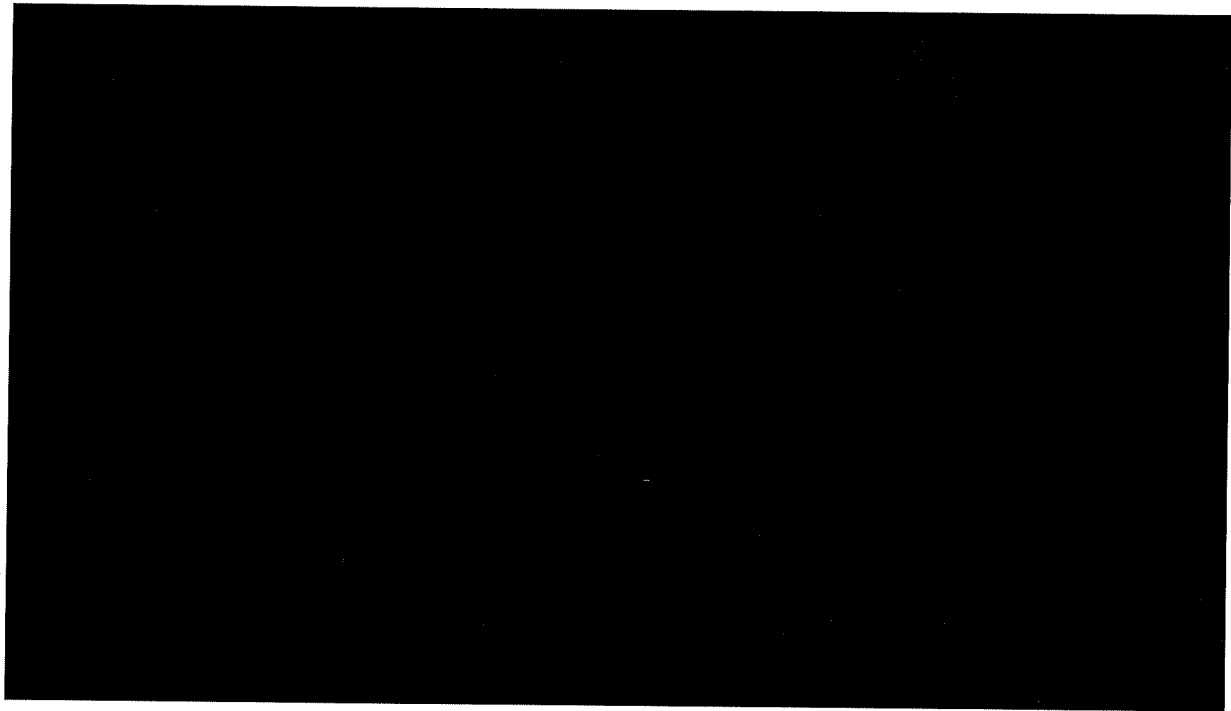
It is important to note with all options for operational costings, the following are excluded and will need to be subject to a subsequent operational commissioning business case:

- ICT costs for application configuration, integration, etc. are not included here as the models of care, workflows and understanding of service delivery are not known at this time; and
- Ongoing operational cost increases for ICT support and maintenance are not included here. They will need to be determined when the detailed fit out of the facilities are known and the ICT operating budget will need to be adjusted accordingly.

PCS Building

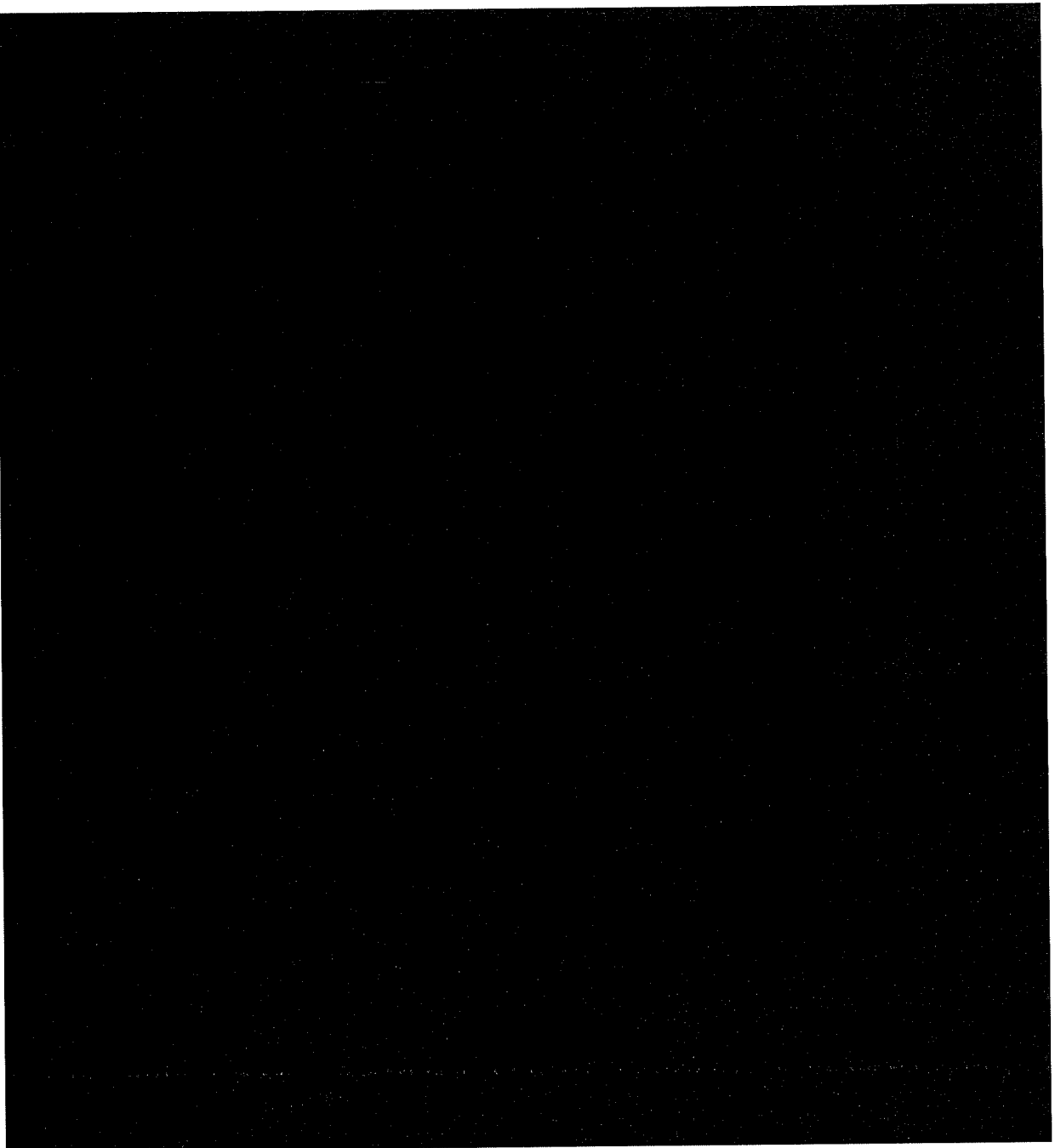
The annual breakdown of operating costs under Options 1, 2 and 3 for the new PCS Building are presented below. Since the assumed operational dates start in-between financial years, costs have been prorated for the first and last financial years presented. The staged nature of options 1 and 2 are notable in the figures below.





Inpatient and Outpatient Services Building

The annual breakdown of operating costs under Options 1, 2 and 3 for the Inpatient and Outpatient Building are presented below. Since the assumed operational dates start in-between financial years, costs have been prorated for the first and last financial years presented.



Notes

- WoL costs are calculated as incremental costs to the Base Case. These costs are based on:
 - Actual cost data (FY23) provided for existing buildings 1, 12 and 10; and
 - Existing and proposed POC/GBA as per the latest SOA's (Dec-2023).
- The operating costs for the new PCS Building and the new Inpatient and Outpatient Building are indicative, based on historical data and cost assumptions that are subject to change. The actual operating costs, which may be impacted by activity levels (i.e., volume of patients) and structural changes to the buildings, may materially differ from indicative costs.
- WoL costs may be further refined as new information becomes readily available following, design, planning and commissioning works.

9.3 Project contingency

Introduction

The project contingency included in the Project Capital Cost are made up of the following risks:

- Design;
- Planning;
- Procurement;
- Stakeholder;
- Site;
- Construction;
- Safety;
- Climate;
- Market;
- Financial; and
- Operational.

For descriptions of the above risks, please refer to Chapter 7 – Risk Analysis.

Interpretation

In this section, P50, P75 and P90 contingency will be presented for the identified risks. In this regard:

- P50 is a mid-point estimate. It represents the project cost with sufficient risk provisions to provide 50% level of confidence in the outcome – i.e., that there is a 50% likelihood that the project cost will not be exceeded.
- P75 represents the project cost with sufficient risk provisions to provide a 75% level of confidence in the outcome – i.e., there is a 75% likelihood that the project cost will not be exceeded. In other words, it represents an estimate that has a 25% chance of being exceeded.
- P90 represents the project cost with sufficient risk provisions to provide a 90% level of confidence in the outcome – i.e., that there is a 90% likelihood that the project cost will not be exceeded. In other words, it represents a conservative position, one that has an anticipated 10% chance of being exceeded.

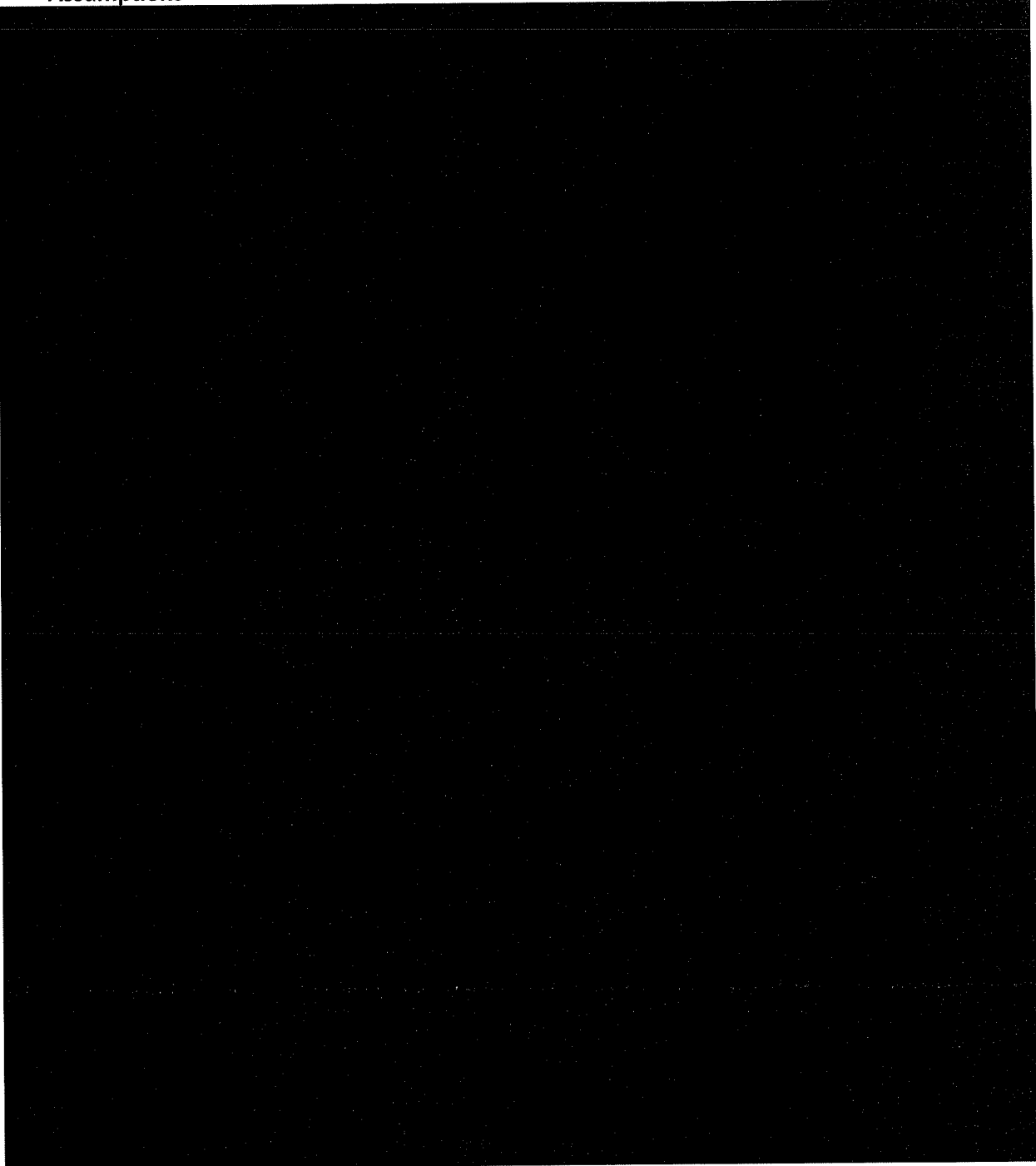
Methodology

ACT Health hosted a series of risk identification and quantification workshops and meetings. The risk identification workshops identified project risks and potential mitigation measures. Subsequent risk quantification workshops were held to seek inputs into:

- The likelihood of a risk event occurring;
- The likely cost and delay impact of a risk event occurring; and
- The likely distribution around anticipated cost and delay impacts.

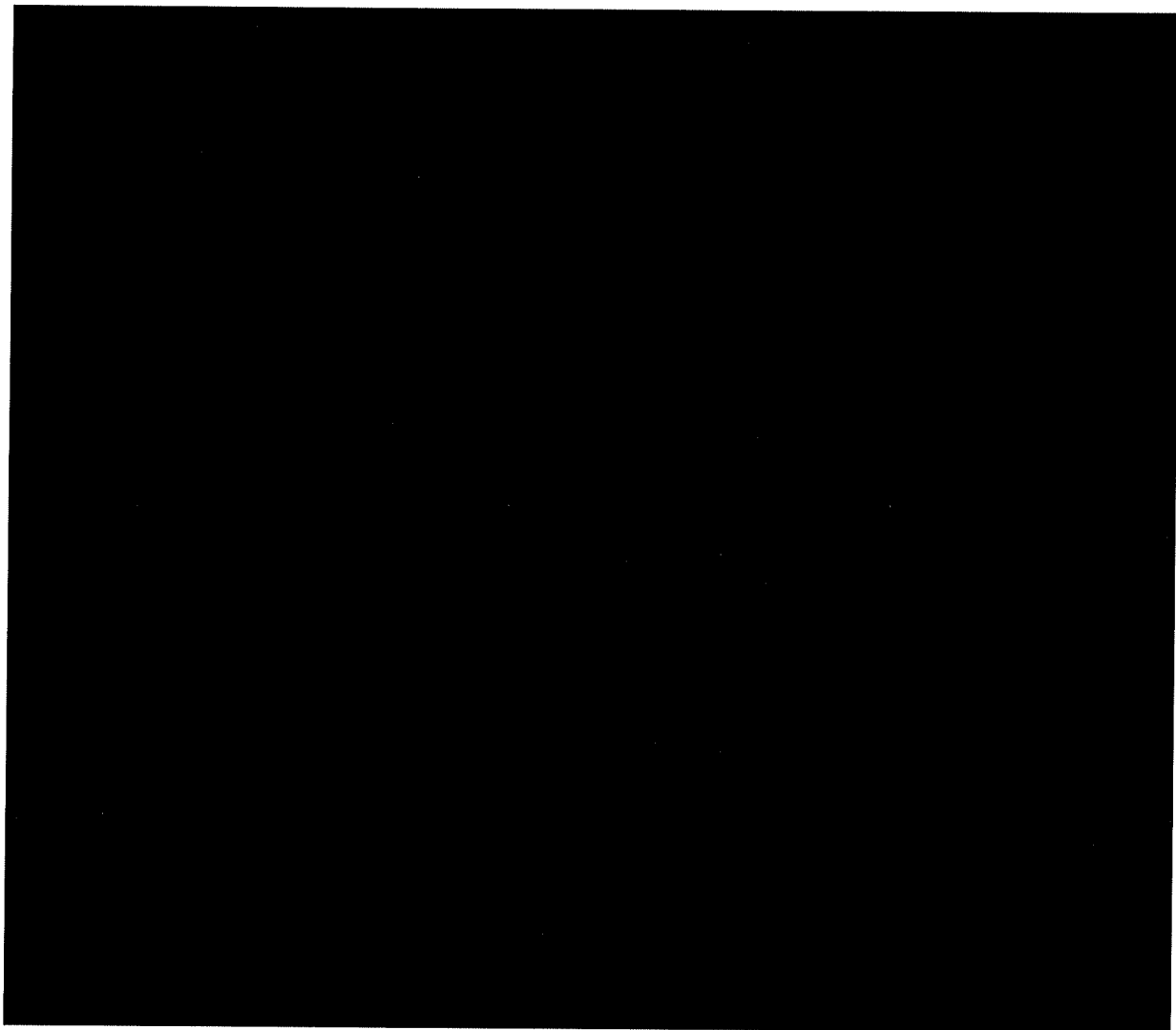
The risk workshops resulted in the identification and costing of the project's key risks. Risks were separately identified as either having a cost or a delay impact (or both). Following these workshops, the project's commercial advisors performed Monte Carlo simulations to estimate the uncertainty levels and probability distributions associated with the project. The aforementioned process resulted in the determination of the project's P50, P75 and P90 project risks and cost estimates (as outlined in Table 26 below).

Assumptions



Capital Cost Contingency

The table below presents the results of the risk quantification process in P50, P75 and P90 terms for Cost Plan B. The proportions shown in the table below are presented for the purposes of understanding the quantum of contingency and to assist in benchmarking with other projects.



Risk Allocation

A proportion of the contingency under Cost Plan B will be 'transferred' to the private sector, with the remaining risk to be 'retained' by the ACT Government. In general, it is anticipated that certain risks will be fully or substantially retained by the Territory respective of the delivery model selected. These risks may include planning and approval risks, as well as contamination risks.

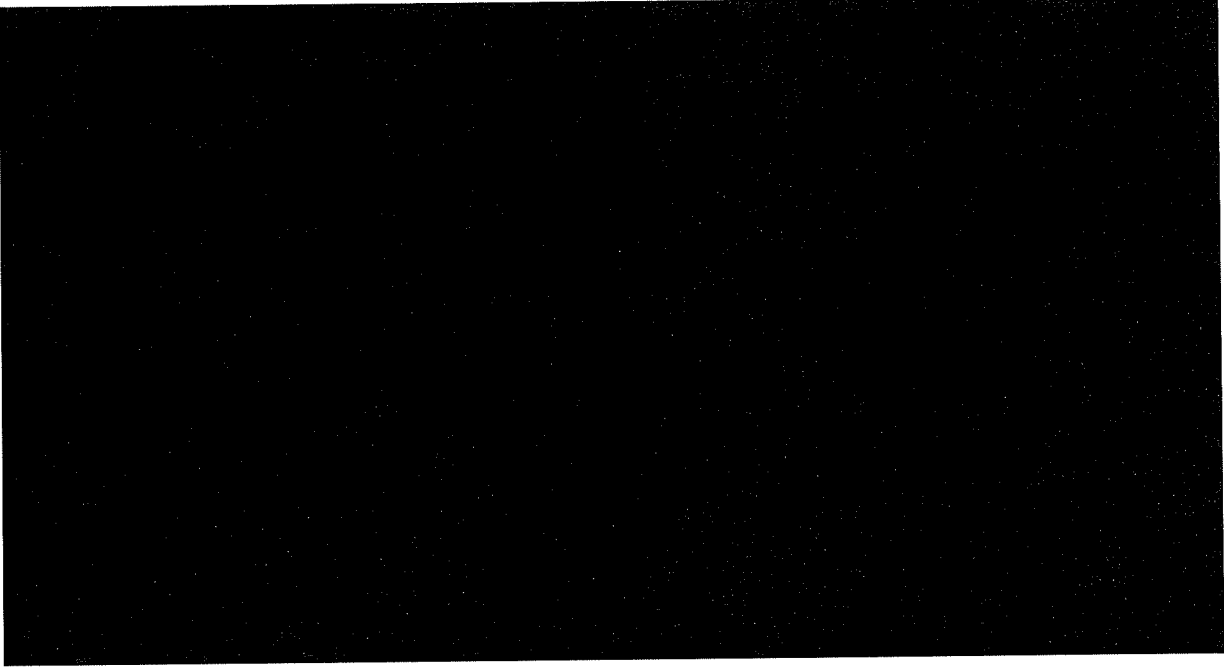
9.4 Funding Related Costs

Methodology

This section explores the 'Funding Related Costs' associated with CHMPP2. These are costs in which ACT Health is seeking direct funding from the Government ahead of project delivery.

Funding and related costs were calculated in two stages:

- Capital costs
 - Capital cost estimates as provided by the cost estimation firm was utilised in estimating all planning and development cost, with the exception of resourcing cost.
- Resource costs
 - Resourcing FTE estimates and their corresponding costs were prepared by ACT Health and Canberra Health Services.

- 
- Sufficient planning and development resource costs are critical to the success of CHMP2:
 - The project involves intricate design and delivery requirements. The project will involve constant coordination with healthcare professionals, hospital staff and stakeholders to ensure seamless process and regular communication.
 - The project involves complexities that arise from the need to integrate new design and delivery elements with the existing hospital clinical and infrastructure services, ensuring minimal disruption to ongoing operations.
 - Additional staging is required to mitigate risks associated with the delivery of these buildings within a live hospital environment. Additional staging is essential to provide thorough planning, monitoring and solution development to maintain business continuity and assure patient, staff and visitor safety during construction.
 - The proposed team structure will ensure the project is able to adhere to CHS construction on campus process and procedures.
 - The proposed team structure supports the capacity to address unforeseen challenges promptly and maintain project timelines with minimal disruption to hospital services.
 - The project requires a diverse team with specialised skills – including clinical infrastructure planning and delivery experience within the context of brownfield hospital projects– to support effective design and delivery, which is crucial for compliance with healthcare standards and CHS infrastructure standards.
 - The proposed team will support engagement with diverse stakeholders, community and end- users, during design and delivery of the project, to ensure a patient-centric build.
 - A governance team will ensure decision -making processes are transparent, supporting overall risk management of the project, ensuring a robust quality assurance process, providing ongoing monitoring as well as reporting to executives and the Minister.

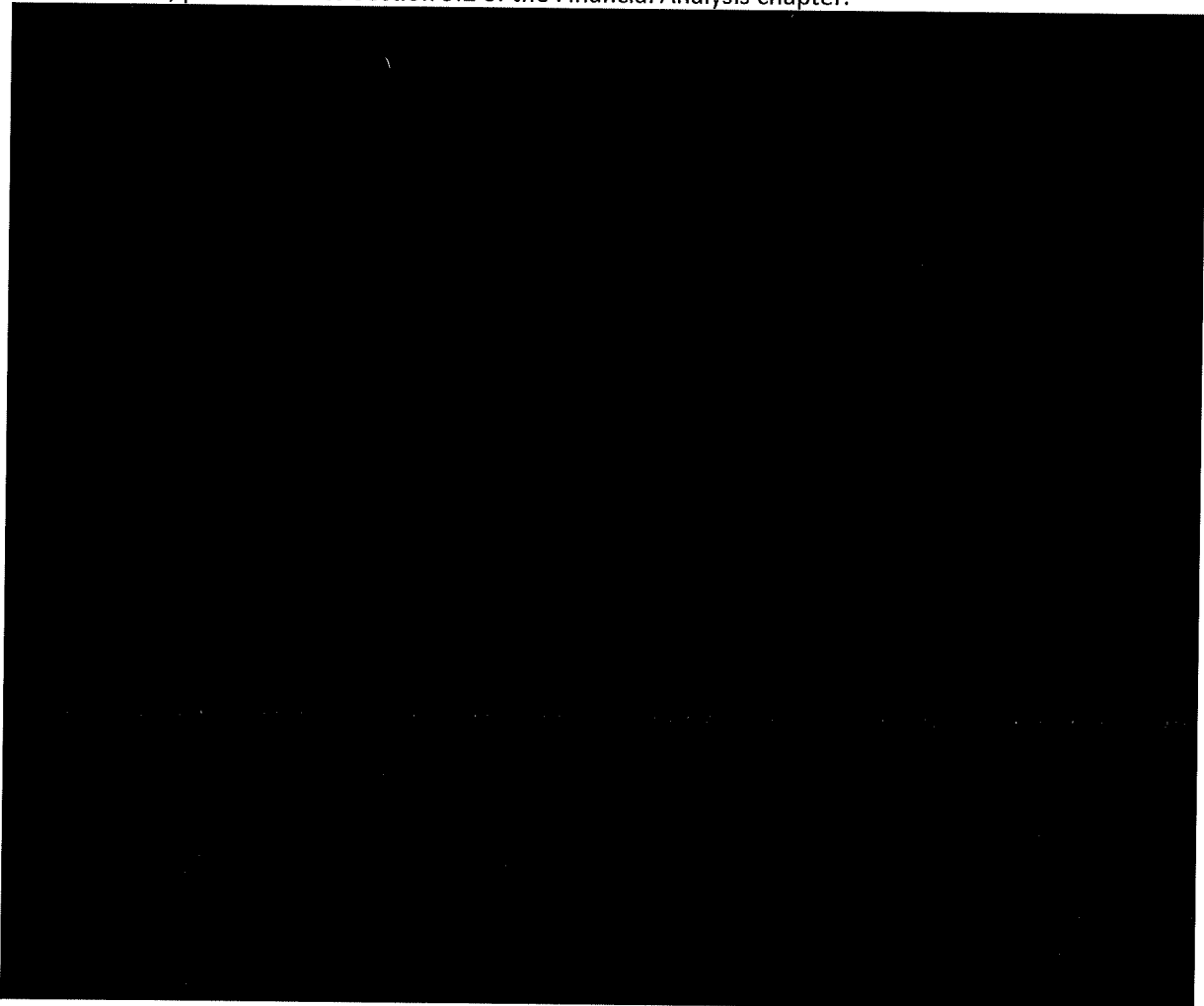
9.5 Summary assessment

Methodology

To produce a summary assessment of total NPV cashflows, all future estimated project capital costs and WoL cashflows are discounted to FY25. The discount rate used in calculation is equal to the current yield (4.11%) of the 10-year Australian Government Bond.

The projection period when summarising all costs spans from FY25 (the first year in which capital costs are incurred) to FY54 (the last financial year of WoL costs assumed for the Inpatient and Outpatient building). This 29-year period captures all projected capital and WoL costs under each of the proposed options.

Future estimated project capital costs include all works proposed under each option. For a breakdown of capital works, please refer to Chapter 6 – Project Scope and for more detail on WoL cost items, please refer to Section 9.2 of the Financial Analysis chapter.



9.6 Funding and financing strategy

In addition to the budget implications outlined in the above section, the following should be noted:

- As the new developments under Cost Plan B will provide important pathology, inpatient and outpatient services for the broader region, not just the Territory, opportunities for funding from the Australian Government should be explored, potentially through Australian

Government Department of Health agreements such as the five-year Heads of Agreement for public hospital funding and health reform.

- Funding opportunities from tertiary education partners in the Territory (i.e., ANU, University of Canberra, Australian Catholic University and Canberra Institute of Technology) should be explored. These partners may leverage the facilities to train their students.
- Operating revenue opportunities (e.g., retail space) will be considered following the assessment of this Business Case and more detailed design development.
- ACT Government may, in its discretion, consider the provisions of partial bid cost reimbursements for shortlisted consortia. As a default policy position, the ACT Partnerships Framework states partial bid cost reimbursements will generally not be paid by the ACT Government.

10. Economic Appraisal

Key messages

- The economic merits of this Project have been assessed through a socio-economic and wider economic benefit analysis. The benefits have been informed by the ILM.
- The social economic analysis identified the following benefits of this Project:
 - Improved asset efficiency and sustainability will be supported through the replacement of ageing facilities with modern, more efficient, and sustainable facilities. Modern hospital facilities are built with the latest sustainable technologies, including more durable materials which are easier to maintain and more resistant to wear and tear.
 - An improved workforce environment, including investment in digitally enabled health infrastructure, will streamline workflows and operations, increasing the efficiency and effectiveness of care delivered.
 - Improved safety and amenity of site will be achieved through the redevelopment of existing facilities in line with contemporary safety and building standards that prioritise the safety, comfort and experience of staff and patients alike. Extension of life investments will ensure that ageing assets are kept operational and safe before services can be decanted into the new buildings. The clearing of the existing Building 4 site and the subsequent transformation of the site into open green space presents an opportunity to enhance overall amenity offering of the campus.
 - Improved patient health outcomes, site access and flow, and satisfaction through a range of project features, including:
 - Improving capacity to reduce current waitlists and accommodate future growth;
 - Future proofing the Canberra Hospital by developing flexible spaces that can adapt to changes in demand over time;
 - Supporting person-centric care by creating more clinical adjacencies which seek to minimise patient travel and maximise the timeliness of care delivered;
 - Improving site accessibility and patient flow by providing linkways between high traffic areas and more building access points to mitigate bottlenecks;
 - Enabling the CH to incorporate more service innovations, including automation of workflows to provide quicker and more effective care; and
 - Supporting research and teaching activities to promote the development of new clinical policies and practices.
- Investment in the construction of CHMPP2 (preferred Option 1) is estimated to deliver 1,179.9 additional jobs (FTE per year over the construction period) [REDACTED]
- A distributional analysis of costs and benefits has been undertaken across the CH workforce, ACT Government, ACT Health, their patients, and the broader community.
- The economic appraisal is supported by the Wellbeing Impact Assessment in line with ACT Treasury guidelines. This can be found in Appendix C-.

10.1 Approach

This chapter presents the approach and key findings of the economic analysis undertaken as part of the CHMPP2 project. The aim of the economic analysis is to assess the anticipated social, economic, and environmental benefits and beneficiaries of each project option described in the Chapter 5 in order to inform the options assessment.

The economic merits of this Project have been assessed using two types of analysis:

- **Socio-economic analysis** provides a qualitative and quantitative assessment of the economic, social, and environmental benefits anticipated to be realised as a result of each project option; and
- **Wider economic benefit analysis** identifies the expected economic impacts. These include direct economic impacts (e.g., additional jobs and output) and indirect economic impacts on industries and consumption, resulting from the capital investment into the Territory that occurs during the construction stage of the project. The economic impacts of each project option are estimated using REMPLAN – an economic analysis and planning tool which uses a range of data sources to forecast the regional economic impact of a proposed investment.⁶⁶

The approach to the economic analysis aligns with common practice in the assessment of health and social infrastructure projects and is in line with the requirements of the ACT Treasury Capital Framework.⁶⁷ Due to the inherent difficulties in monetising the benefits of health care infrastructure projects, a Cost Benefit Analysis (CBA) has not been undertaken for this Project. Instead, a qualitative assessment of the expected socio-economic benefits has been undertaken, supplemented by analysis of the wider economic benefits of the project.

The expected impacts and benefits of each project option have been assessed relative to status quo. The Base Case assumes the continuation of the existing services of the CH within existing buildings and includes ongoing funds for repairs and essential maintenance required for campus buildings.

In line with the ACT Treasury guidelines,⁶⁸ the economic analysis has been supported by the Wellbeing Impact Assessment. This is included in Appendix C -.

The following sections provide an overview of the benefits framework, key assumptions and outlines the results of the economic analysis.

Overview of Benefits Framework

Benefits considered in the economic analysis relied on four strategic benefit categories, informed by the ILM, and presented in Figure . The benefits are arranged into the following categories:

- Asset Efficiency and Sustainability;
- Workforce;
- Safety and Amenity; and
- Health and Wellbeing.

The benefits framework has been developed around five key beneficiaries:

1. Canberra Hospital Workforce;

⁶⁶ Base data source: REMPLAN, Australian Capital Territory (State) (2023 Release 1) – all figures, data and commentary presented in this software are based on data sourced from the Australian Bureau of Statistics (ABS), most of which relates to the 2021, 2016, 2011, 2006 and 2001 Censuses.

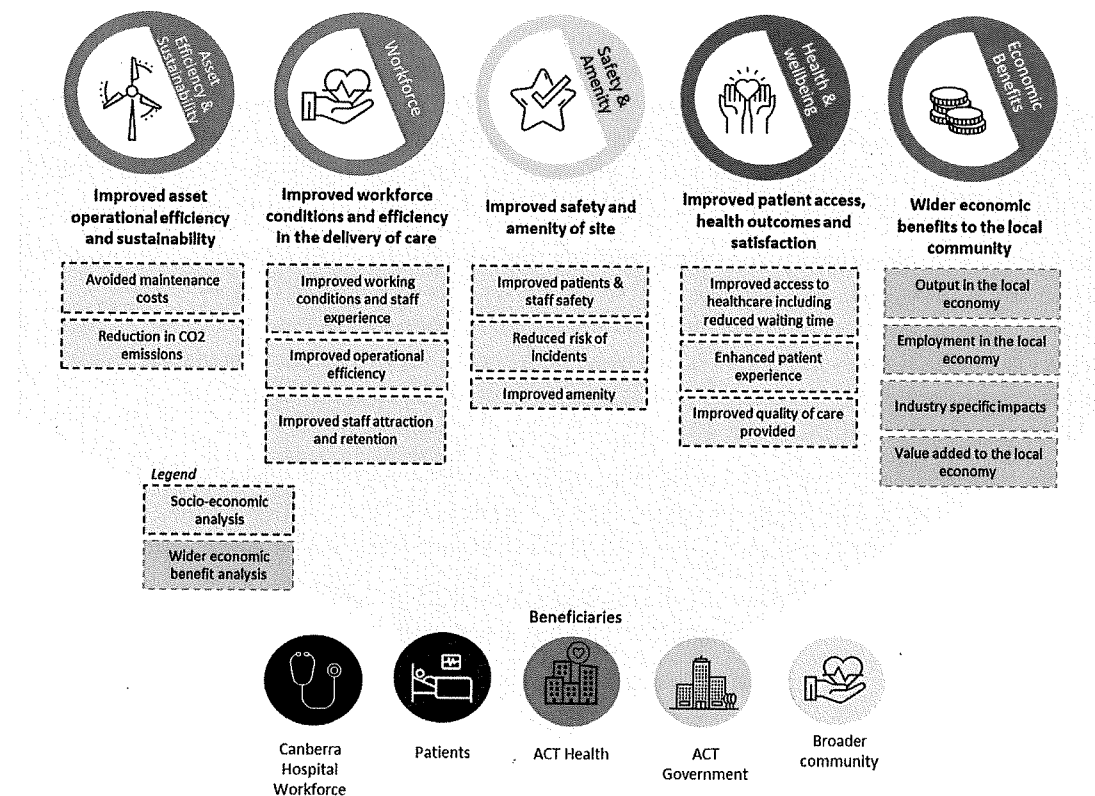
⁶⁷ ACT Government(n.d.) Capital Framework – Detailed Technical Guidance – Economic Appraisal. Retrieved from <https://www.treasury.act.gov.au/capital-framework/prove/business-case/economic-appraisal> on 14 Nov 2023.

⁶⁸ ACT Government(n.d.) ACT Wellbeing. Retrieved from <https://www.act.gov.au/wellbeing/wellbeing-framework/embedding-wellbeing> on 14 Nov 2023.

2. Patients;
3. ACT Health;
4. ACT Government; and
5. The broader community.

Depending on the type of analysis, benefits have been further categorised as either benefits identified in the socio-economic analysis (highlighted in grey) or in the wider economic benefit analysis (highlighted in blue).

Figure 46: CHMPP2 benefits framework



The following table provides a more detailed overview of the CHMPP2 benefits framework including examples of key performance indicators (KPIs) to monitor and track the realisation of desired benefits over time.

Table 29: CHMPP2 Benefits Realisation Framework

Strategic benefit	Benefit	Example benefit measures/(KPIs)
Improved asset operational efficiency and sustainability	Avoided maintenance costs.	Reduction in number of breakdowns and reactive maintenance costs.
	Reduction in CO2 emissions.	- Utility consumption per m². - Reduced electricity consumption per m² compared to respective 2023 period. - Quantity of waste reduction in line with CHR sustainability initiatives target.
Improved working conditions and efficiency in the delivery of clinical care	Improved working conditions and staff experience.	- WHS indicators. - Higher reported satisfaction with working condition.
	Improved operational efficiency.	- Reduced pathology response times. - First dose initiation time.

Strategic benefit	Benefit	Example benefit measures/(KPIs)
		- Reduced time to medication administration. - Reduced time to ED response. - Reduced bed block. - Improvement in admitted national emergency access target.
	Improved staff attraction and retention.	- Reduced staff turnover. - Reduced time to recruitment. - Reduced recruitment costs.
Improved safety and amenity of site	Improved patient and staff safety.	Reduced number of preventable incidents on campus.
	Reduced risk of incidents.	
	Improved amenity.	- Staff, patient and visitor reported satisfaction with the "look and feel" of and amenity provided by the new buildings. - Staff, patient and visitor reported satisfaction with the landscape and urban design of the new developments and the surrounding area.
Improved patient access, health outcomes and satisfaction	Improved access to healthcare.	- Reduced waitlist for endoscopy, gastroenterology and hepatology services. - Reduced waiting time for elective inpatient and outpatient procedures.
	Improved quality of care provided.	- Reduced average length of stay for surgical inpatient services. - Increase in number of procedures/tests offered and/or performed.
	Enhanced patient experience.	Reported patient experience.

The benefits framework and identified benefits are subject to the following key assumptions outlined in Table 30.

Table 30: Key assumptions

Assumption	Detail
Base Case Assumption	A like-for-like replacement and upgrade of several existing buildings in line with current standards and the characteristics of a contemporary and efficient facility. The buildings will be upgraded to comply with current standards (i.e., AS/NZS 2982-2010 and AS/NZS 2243.3-2022 and associated series) and AusHFG guidelines. The buildings include: - A new Pathology and Clinical Services (PCS) Building replacing the existing Buildings 6, 23 and 7. - A new Inpatient and Outpatient Services Building replacing the existing Building 10.
Analysis period for Wider Economic Benefit Analysis	For the period of construction to deliver the parameters of Option 1: - Phase 1: PCS Stage 1 – Sep-28 to Nov-30 - Phase 2: Inpatient and Outpatient Services Building – Nov-31 to Mar-35 - Phase 3: PCS Stage 2 – Jun-35 to Mar-37
Base Year	FY27
Discount Rate	7% (real) - Sensitivity testing at 4% and 10% real

10.2 Socioeconomic Analysis

The socio-economic analysis described in this section includes a qualitative assessment of the economic, social, and environmental benefits that are expected to be realised as a result of investment in the project. All benefits have been assessed against Option 1 (Base Case/Do Minimum) to evaluate the incremental impact realised as a result of investment in either Option 2 or 3.

The approach to the socio-economic analysis is shown the figure below. The assessment of benefits relies on CHS data and research gathered through publicly available sources. Where possible, quantitative evidence has been used to demonstrate the extent of and likelihood of benefits realised.

Figure 47: Approach to the socio-economic analysis

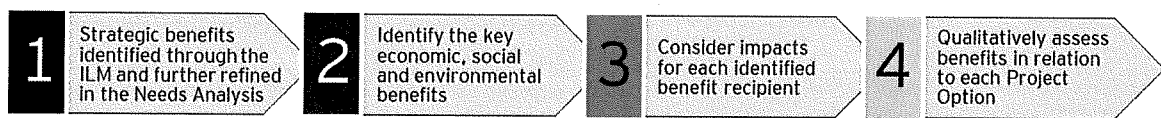
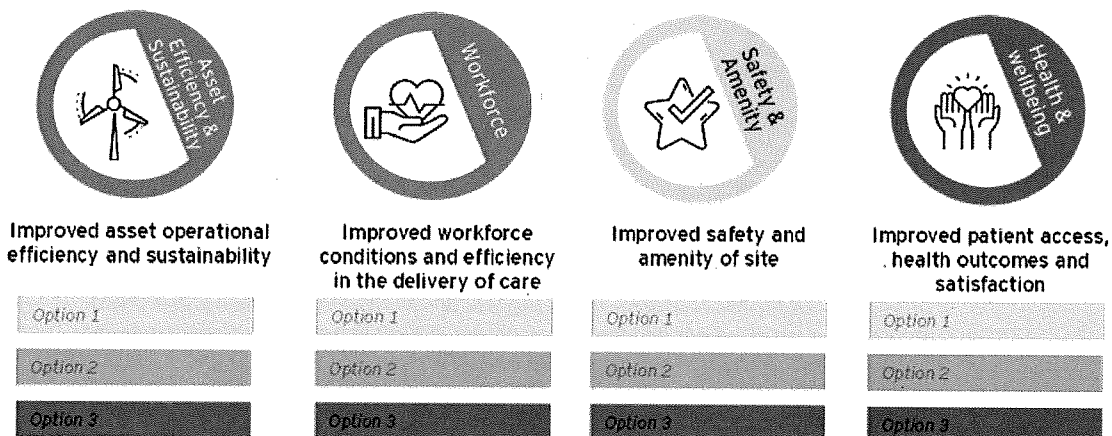


Figure 48 summarises the anticipated economic, environmental, and social benefits expected to be realised by Option 2 and 3. Further detail on each benefit is provided in the following sections.

Figure 48: Overview of the qualitative assessment of benefits



Benefit 1: Improved asset operational efficiency and sustainability

As identified in the Needs Analysis, much of the Canberra Hospital infrastructure in the Project's scope (i.e., Buildings 1, 3, 6, 23, 7, 10 and 12) is nearing the end of its useful life. This has resulted in services being delivered in sub-optimal settings, which is impacting the asset's operational efficiency. The CHMPP2 Options 1-3 seek to replace these assets with modern and fit-for-purpose facilities designed to sustain CH's operations into the future.

Improved Asset Efficiency

The buildings in-scope for the CHMPP2 project are between 14 and 50 years old and for most are approaching the end of their useful life. It is projected that the cost to maintain ageing assets will continue to rise.

. Along with increasing costs, aged assets pose an increased risk of disruption where an identified building fault could present an unacceptable safety risk, forcing temporary closure. However, given known capacity constraints across the CH campus,

closures are not feasible or possible, hence the urgent commencement and implementation of the CHMPP2 is required to reduce and remove this risk.

Modern facilities are built using more durable materials which can be easier and cheaper to maintain over time. [REDACTED]

Given the end state building design will be similar for all options (where delivery staging is the key differentiator), it is expected that the asset efficiency improvements will be commensurate across these options.

Improved Asset Sustainability

The project has been developed in accordance with the *ACT Climate Strategy 2025* which focuses on asset longevity and resilience. This includes:

- Developing sustainable, adaptable and durable buildings, spaces and systems;
- Delivering futureproofed building assets that have considered and integrated efficient growth strategies;
- Transitioning the campus to all-electric power sources via the upgrade of the sites to high voltage (HV) infrastructure; and
- Utilising a range of sustainable design features, such as the integration of natural ventilation which improves indoor air quality, enhances the overall comfort and wellbeing of occupants, reduces the feeling of confinement and saves energy by using mixed mode systems. The provisioning of natural ventilation systems could also allow for more flexible and adaptable building designs, accommodating changing healthcare and research requirements.

The electrification initiative will result in a significant reduction in carbon emissions. The carbon emissions produced from natural gas used to power Buildings 1, 10 and 12 alone equated to 3,890 tonnes in 2019, which accounts for 0.24% of the ACT's total emissions or 4.47% of ACT Governments emissions.^{69,70}

By comparison, tB5 is entirely electric powered and has achieved a four-star Green Star rating – while an improved five-star Green Star rating is being sought from the Green Building Council of Australia.⁷¹ It is expected that the CHMPP2 Project will incorporate similar sustainable design principles as the B5 including:

- Façade design and orientation (i.e., double glazed units) which minimise cooling required in summer and heating required in winter;
- Intelligent heating, ventilation, and cooling systems as well as bespoke acoustic systems which support more energy efficient indoor environments through the regulation of building humidity, temperature, air quality and lighting quality. Together, these systems have the ability to reduce the risk of Hospital Acquired Infections; and
- A holistic Building Management and Control System, which monitors and controls all systems in the building. This allows more real time system monitoring, providing rapid point-

69 Silver Thomas Hanley (2021). Canberra Hospital Master Plan – Zero Emissions Strategy – Building Services Design Report. Accessed on 1 December 2023, retrieved from <https://www.health.act.gov.au/sites/default/files/2021-12/Canberra%20Hospital%20Master%20Plan%20-%20Zero%20Emissions%20Strategy.pdf>.

70 Point Advisory an ERM Group Company (2022). ACT Greenhouse gas inventory for 2021-22. Published by ACT Government. Accessed on 22 January 2023, retrieved from https://www.climatechoices.act.gov.au/_data/assets/pdf_file/0006/2122872/ACT-Greenhouse-Gas-Inventory-Report-2021-22.pdf

71 ACT Government. (2023 June). Australia's first all-electric hospital building. Accessed on 14 December 2023, Retrieved from <https://www.act.gov.au/our-canberra/latest-news/2023/june/australias-first-all-electric-hospital-building>.

in-time feedback about the nature and location of issues as they arise, which has the potential to improve overall operating efficiency.

Identifying, analysing and implementing lessons learnt from the development of B5, enables this project to realise even better outcomes, including (but not limited to):

- **Rooftop solar systems** providing a renewable power source to offset increasing electricity consumption due to the expanded buildings and rising utility costs. Building guidelines recommend a minimum 60% of total roof area dedicated to solar photovoltaics as best practice for a sustainable healthcare facility.
- **Innovative materials** to better insulate buildings from thermal resistance, which can reduce overall energy usage and the impacts of urban heat islands.
 - Canberra has hot summers and cold winters, and it is important to strike a balance between minimising heat retention in the summer and the amount of heating required in the winter.
 - Integrating insulation and thermal resistance strategies can support this outcome and reduce energy demands, for example through high solar reflectance and high emittance roofing materials, with appropriate insulation in roofing and exterior walls (zero ozone depletion potential and no volatile organic compounds).
- **Innovative façade design** such as photovoltaic or thermochromic materials or kinetic façade design.
 - Photovoltaic facades generate solar power similar to photovoltaic roof systems. This has been used in a number of projects across New South Wales and Victoria, however, they appear at present to be untested on a health facility.
 - Thermochromic materials involve the application of a glazing film between two panes of treated glass. The product automatically adjusts the level of tint on the glass throughout the day to optimise natural light, and control temperature and glare.
 - Kinetic facades utilise movement to adjust to changes in the environment and regulate building thermal performance and ventilation, regulate light levels and reduce energy consumption.

The sustainability strategies proposed will realise downstream cost benefits and are expected to lead to a decrease in the operational costs required to run the new buildings. An ESD allowance of 2.5% has been provided in the Cost Plan to enable investment in these strategies.

Benefit 2: Improved workforce conditions and efficiency in the delivery of clinical care

Purpose-built and tech-ready facilities will enable a reduction in manual processes allowing CH staff to dedicate more of their time to delivering quality patient care. A well-designed physical environment with improved amenity, wayfinding, carparking and accessibility, will also improve the overall staff experience increasing retention and attracting new talent to develop and build the next generation health workforce.⁷²⁷³

72 Brook et al., (2019). Characteristics of successful interventions to reduce turnover and increase retention of early career nurses: A systematic review. *International Journal of Nursing Studies* 91, 47-59.

73 Lock, K. F. (2022). Factors affecting the UK junior doctor workforce retention crisis: an integrated review. *CMJ Open* 12: e059397.

Increased operational efficiency through new health technologies

CHMPP2 will ensure facilities are tech ready. This includes investments in:

- Robotic automation systems (e.g., the Pharmacy PillPick Automated Packaging and Dispensing System) to reduce manual handling and the risk of human error, increase output volumes, and decrease turnaround times.
- Modern ICT systems to support the development of a Command Centre intended to enable remote monitoring capabilities, and to increase the delivery of at-home care reducing the burden on face-to-face services delivered inside the hospital walls.

These initiatives have the ability to significantly increase efficiency and worker productivity as well as enabling the adoption of newer contemporary service delivery models built around patient centric care (as discussed under Benefit 4).

Modern ICT will also aid the Pathology Unit to expand its clinical capability. While ACT Pathology currently utilises the latest technology for internal testing (thereby maintaining existing testing turnaround times), the new infrastructure will enable the service to expand the range of testing it performs, which would reduce the number of tests that are currently referred externally. This would have a positive impact on the turnaround times for a wider range of pathology testing services improving the speed with which clinicians can diagnose and treat their patients.

State-of-the art facilities will also support the latest in health technologies such as genome sequencing, genomics technologies, and targeted therapies. This will over time present further opportunities to enhance the efficacy of the treatments delivered through CH, which contributes to Benefit 4.

Improved operational efficiencies from purpose-built facilities

Facilities under the project will be purpose-built, reflecting contemporary service delivery models. Workforce productivity and efficiency will be enabled through design that supports workflows within short travel distances (horizontal and vertical) and more direct patient flows.

Case Study – PillPick Automated Packaging and Dispensing System

Utilising robotic technology, PillPick systems automate various aspects of medication dispensing, distribution, and management, improving efficiency, accuracy, and safety in the medication dispensing process. This will enable a more efficient allocation of resources and allow pharmacy staff to use their time on higher value activities.

The current CH Model of Service requires three pharmacists working each day in a checking role for inpatient medication. The automated unit dose dispensing system would reduce this requirement to one pharmacist per day and enable the other two pharmacists to redirect their time to other higher-value tasks such as medication history reviews, medication management and counselling, ultimately streamlining the overall workflow of the pharmacy. This is estimated to realise workforce efficiencies of \$8.3m over 20 years.

In addition, automated medication dispensing would reduce the risk of human error compared to traditional ward stock systems, contributing to an improvement in patient safety. It has been documented that medication administration related errors occur somewhere between 2% and 3% of Australian hospital patients. * These errors can lead to an increased length of stay associated with an adverse drug event of 2.2 days and an estimated post event cost of \$4,700 per preventable event, on average. **

**Roughead, E. E. et al (2016). The extent of medication errors and adverse drug reaction throughout the patient journey in acute care in Australia. Int J Evid Based Health 14(3):113-122.*

***Bates, D. W. et al (1997). The Costs of Adverse Drug Events in Hospitalized Patients. JAMA 277(4):307-311.*

The new facilities will be built around the workforce and clinical needs of each functional area, including the integration of more clinical adjacencies to ensure patients are able to receive a comprehensive service while minimising the need for internal travel. For example:

1. Consolidating pathology services in the new PCS building will reduce the time required to transfer samples and enable more collaboration across testing and other clinical functionalities.
2. The colocation of Endoscopy Services and the GEHU provides patients referred for endoscopies with direct access to the testing areas which would otherwise require significant travel between buildings.
3. Redesigned clinical areas within the new Inpatient and Outpatient Services Building enable operational flexibility to scale up or down different services depending on the demand and needs.

The new buildings will also enhance patient transfer pathways through improved linkways between buildings. For example:

- Consolidating both Surgical and Medical Outpatients in the proposed Inpatient and Outpatient Services Building will improve access to Medical Imaging as well as improving the resourcing requirements where many outpatients staff are shared across both Surgical and Medical Outpatient disciplines;
- A dedicated linkage connecting B5 to the new PCS Building will enable rapid emergency patient transfers from the Endoscopy suites in the new PCS to the Operating Theatres located in B5.; or
- Co-locating clinical support services in close proximity to B5 will also reduce the distance between clinical and clinical support services, reducing transit times between clinical and administrative areas releasing more time to deliver patient care.

Benefit 3: Improved safety and amenity

The development of modern facilities will address existing safety issues including critical assets deemed non-compliant and/or in a current state that is not in line with existing building standards. The new facilities will also consider design and amenity features which promote comfort and wellness. These benefits are expected to be realised by all project options via the delivery of a large green space due to the demolition and clearing of the existing B4 structure.

Improved safety of patients and staff

Built for the safety standards of their day, aged facilities on the CH Campus are no longer compliant with modern safety standards. The redevelopment of Buildings 6/23/7 and Building 10 in line with modern safety and building standards – including emergency, fire safety, safe work, ventilation, and filtration standards – will reduce the risk to both patients and staff. For example, improved ventilation and filtration systems will play a key role in maintaining healthy air quality levels, reducing the transmission of infections within the hospital environment.

The redevelopment would also address the risk of harm to staff and patients resulting from unintentional contact with either contaminated ground materials (e.g., soil, ground water etc.) or hazardous building materials (e.g., asbestos). It has been noted by the Pharmacy Unit, currently housed in Building 1, that there are existing concerns about internal contamination and dust coating hard to reach areas which if disrupted can create an active airborne hazard. The challenge is that there is no easy access to these areas without requiring a temporary closure of the facility which would cause significant disruption to clinical services and has therefore been deemed an unacceptable outcome. New facilities would include easy to reach and easy to clean surfaces that can be routinely decontaminated, ensuring a safer and more hygienic work environment for staff.

The new facilities will be built to separate public and non-public foot traffic with a specific focus on providing private access to sensitive patients. For example:

- A discreet linkway connecting the Women's Maternity services in Building 11 with theatres in the Perioperative Unit in Building 10 would enable the rapid transfer of emergency birthing patients between buildings with an emphasis on maintaining the patient's privacy and dignity. This will require additional doorways to be built along the existing East-West corridor to block public access and maintain the discreet linkage needed for this purpose;
- Additional non-public doorways on the southern end of Building 10's ground floor to separate public access in Building 10 from the Children's in Building 11;
- A dedicated non-public linkway through a service tunnel and clinical lifts will connect B5 to the Mortuary to allow for the discreet transfer of the deceased while minimising the risk of infection transmission.

Improved site amenity

The CHMPP2 includes several approaches to improve the overall site amenity, including (but not limited to):

- Demolition of Building 4 for Green Space Creation. The clearing of the existing Building 4 site and the subsequent transformation of the site into open green space presents an opportunity to enhance amenity immediately north of the B5 Welcome Hall. This initiative significantly improves the overall amenity offering of the campus.
- Development of vertical green and amenity space in Building 10 (refer to Figure), including open terraces providing patients with access to fresh air, views of the surrounding environment and greenery to enhance the sense of healing and wellbeing. Patients tend to associate a sense of healing and wellbeing with their surrounding environment.⁷⁴ A positive correlation has been shown in the literature between a patient's interaction with green space and their ability to reduce stress, anxiety and depression.⁷⁵

⁷⁴ Douglas, C.H. and Douglas M.R (2004) Patient-friendly hospital environments: exploring the patients' perspective. *Health Expectations* 7 (1) p.61-73.

⁷⁵ Marcus, C.C. (2007) Healing gardens in Hospitals. *Interdisciplinary Design and Research* 1(1).

Figure 49: Artists impression of the vertical amenity in B10



Several other design features will contribute to the improvement of the staff and patient experience. For example:

- New and intuitive wayfinding systems to help staff, patients, carers, and visitors orient themselves and effectively navigate the campus. Wayfinding will be considered as part of the physical design and configuration of the campus to create logical and simple connections and pathways that intuitively guide users from point to point. Over and above the configuration of the site, wayfinding should also comprise a combination of static wayfinding (e.g., signage and maps), dynamic wayfinding (e.g., using digital systems to present more real-time updates), interactive wayfinding (e.g., enabling users to engage with an app, kiosk or other physical system to generate personalised guidance) and auditory and sensory wayfinding (e.g., to accommodate users with auditory or visual impairments).
- The design of each building considers ways to create a sense of wellbeing for all users by maximising natural light, green space, views of the surrounding environment, integrating art and culturally sensitive design features into the building design, and improving acoustics and climate control to provide a more comfortable experience.
- Landscape and urban spaces within and around the new buildings will include apolitical and culturally safe spaces.⁷⁶
- The new PCS Building will accommodate end-of-trip facilities including bike storage, showers and lockers, promoting the use of sustainable transport, which will support reductions in parking demand and have positive impact on the proposed CAPEX for multi-storey basement parking solutions.

⁷⁶ Note: This Business Case also requests additional funding to develop a more comprehensive art and cultural framework will be developed as a separate project to inform the development of culturally sensitive infrastructure.

Benefit 4: Improved patient access, flow and health outcomes

Numerous research studies have highlighted the substantial connection between the physical environment and patient health outcomes.⁷⁷ The project will deliver purpose-built, state-of-the-art hospital facilities to improve patient health and wellbeing by:

- **Improving capacity to reduce current waitlists and accommodate future growth:** The new PCS building will support growth to meet demand and reduce patient waiting times. Capacity uplifts will be enhanced through investments in strategically designed spaces and ICT fostering improved care coordination, efficient patient flows as well as improved workforce productivity and efficiency, reducing pressures on hospital resources and capacity.⁷⁸
- **Future proofing the Canberra Hospital to adapt more easily to change over time:** Delivering flexible infrastructure is at the core of CHMPP2 redevelopment. This would enable areas designed for today's requirements to be easily adapted to meet future changes in the provision and delivery of care. Under Option 1, the delivery of the PCS Building – including the pathology unit – would be staged over time, delivering capacity in line with demand. This will allow ACT Health to stagger its investment, while also maximising the utilisation and operating efficiency of assets delivered.
- **Creating more clinical adjacencies to enhance the experience and delivery of care:** In line with patient centric models of care, CHMPP2 will collocate complementary services to reduce the distance and travel time between services.
- **Improving patient flow through linkways and access points:** where the creation of a clinical adjacency is not possible, the provision of dedicated linkways would provide patients and staff with the most efficient and direct pathway between high traffic areas. This is particularly important for (1) emergency patients requiring rapid transit between services, and (2) in some cases, a discreet and private linkway for emergency birthing patients transiting to theatres in the Inpatient and Outpatient Services Building. For the latter, it has been shown that increased transit times for patients requiring non-elective caesarean sections, can have a significant impact on neonatal condition at birth.⁷⁹
- **Integrating ICT to promote service innovation:** As discussed under Benefit 2, CHMPP2 will include sizeable investments in ICT enabling health technologies such as a prototype laboratory, digital pathology research, DNA extraction and amplification, and enhanced cryogenic services. These investments aim to advance laboratory and medical capabilities through the integration of technological innovations, digitisation of processes, improvements in genetic analysis, and enhanced cryogenic preservation of biological samples. The outcome would be improved patient outcomes, and reduced risk for re-admission, in turn reducing pressure on hospital resources and capacity.
- **Supporting research and teaching activities across the campus:** the new PCS building will include a dedicated research, teaching and learning precinct which consolidates these areas into a single central hub to transform the CH into a destination for the brightest research minds. The provision of continual learning and training in state-of-the-art facilities would also support the retention and attraction of the next generation clinical and non-clinical workforce.

77 Reiling J, Hughes RG, Murphy MR (2008). The Impact of Facility Design on Patient Safety. In: Hughes RG, editor. Patient Safety and Quality: An Evidence-Based Handbook for Nurses. Rockville (MD): Agency for Healthcare Research and Quality (US). Chapter 28.

78 LaPointe, J. (2018 November). Optimizing Healthcare Workforce Management for High-Value Care. News article. Retrieved on 23 January 2024 from <https://revcycleintelligence.com/features/optimizing-healthcare-workforce-management-for-high-value-care>

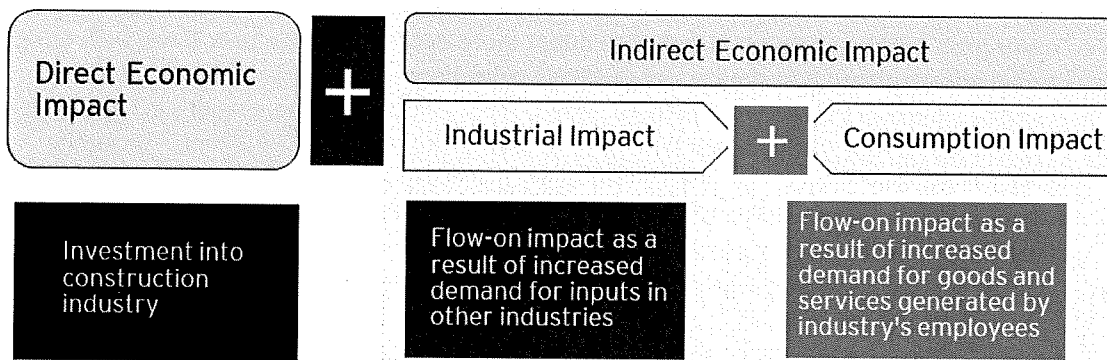
79 Mackenzie, I. Z. and Cooke, I. (2003). What is a reasonable time from decision-to-delivery by caesarean section? Evidence from 415 deliveries. BJOG 109(5): 498-504

10.3 Wider Economic Benefit Analysis

It is expected that the redevelopment of the CH campus will provide a wide range economic benefits for the Territory, stimulating the economy of Woden Valley, and surrounding areas. Wider economic benefits will accrue as a result of the direct investment in the construction industry which will provide a boost in jobs and overall economic output across the region.

The economic benefits have been assessed using an input-output model of the regional economy outlined in Figure .

Figure 50: Approach to Wider Economic Benefit Analysis

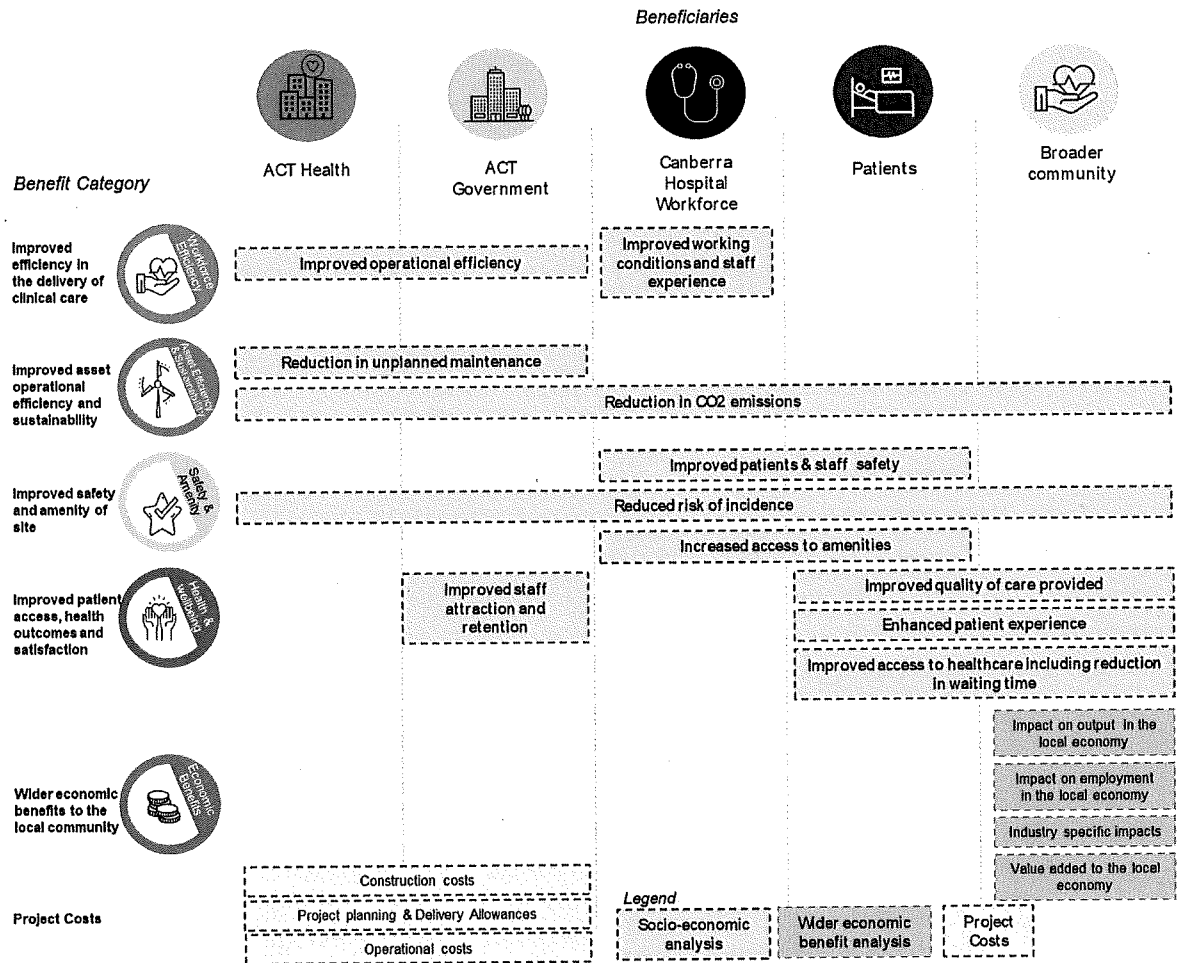


The results of the analysis are presented in Table 31. The Preferred Option (2) will address the problems outlined in the needs analysis and deliver economic benefits through increased construction activity and job creation.

Distributional analysis

The Project will deliver benefits to the Canberra hospital workforce, their patients, ACT Health and ACT Government as well as the broader community. Figure 51 outlines how benefits are expected to be distributed across these groups.

Figure 51: Distributional Analysis



11. Project Governance

Key messages

- Post-Business Case, a new governance framework will be established. This framework will include cross-directorate executive leadership from ACT Health, CHS, iCBR, and ACT Treasury. The Executive Steering Committee will function as the key decision-making body. iCBR will lead implementation.

11.1 Project Governance

The successful delivery of this project necessitated the establishment of strong governance and program management processes. During the development of the Business Case, ACT Health led delivery of the project with support from iCBR and CHS. These stakeholders were engaged through the following mechanisms:

- ACT Health participated in weekly **project status meetings**. These meetings provided an update on each workstream, including key meetings held, issues or challenges which may be hindering progress, and next steps for the workstreams;
- ACT Health, iCBR, CHS attended monthly **Project Control Group (PCG) meetings** which provided strategic oversight and direction. Attendees approved all project findings and recommendations made by the Executive Planning Team (EPT); and
- ACT Treasury, ACT Health, iCBR and CHS attended monthly **Steering Committee meetings** to provide guidance and resolution on any project conflicts or matters that required escalation.

A new governance structure will be implemented during the post-Business Case planning and development stage of the preferred option.

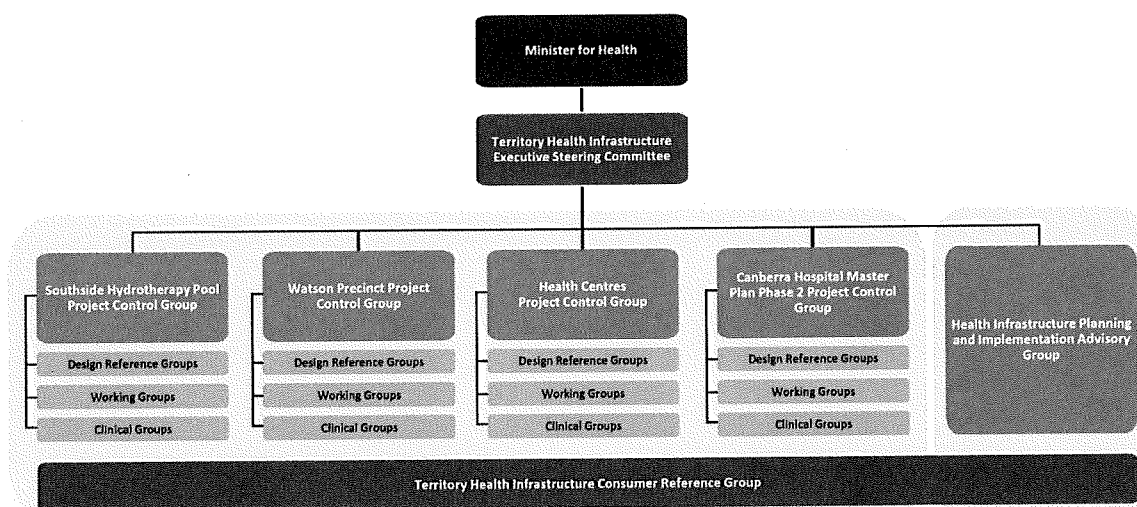
11.2 Recommended governance structure

The broader Territory Health Infrastructure Governance Framework is shown in Figure 52. The framework ensures accountability and transparency throughout project planning and development of the preferred option and delivery (including planning, designer and contract procurement, construction, commissioning, and operations). It provides a whole-of-territory framework that enables collaborative decision making between CH, NH and Community Health infrastructure.

The governance framework allows cross-directorate executive leadership representation from ACT Health, CHS, iCBR and ACT Treasury. The governance structure proposed is consistent with all metropolitan capital projects funded by the ACT Government and managed by ACT Health. iCBR will lead the development and delivery of all phases of work.

Enabling the project to respond flexibly to uncertainties and make decisions based on up-to-date information, the Director-General of the ACT Health, will appoint a Programme Director who will oversee the delivery of a range of ACT Health Infrastructure Projects and establish various PCGs for decanting, demolition, early works and main works. The Executive Steering Committee will act as an accountable decision-making body for the CH.

Figure 52: Governance structure



Notes:

1. The shaded area indicates information sharing and collaboration between infrastructure projects and with the Consumer Reference Group.
2. Design reference groups, working groups and/or clinical groups will be established as required at each stage of the project.

11.3 Governance roles and responsibilities

Roles and responsibilities for the key components of the governance framework for Canberra Hospital are set out in the table below.

Table 59: Roles and responsibilities

Individual/group	Roles and responsibilities
Minister for Health	The Minister for Health is the head of the ACT Health Directorate and has ultimate responsibility for health policy, planning, regulation and public health services, hospitals and healthcare providers in the Territory.
Director-General of ACT Health Directorate	The Director-General will have reporting authority to the Cabinet (the peak-decision making body and approver of the project).
Territory Health Infrastructure Executive Steering Committee	The Executive Steering Committee will oversee and provide collective endorsements and/or approval as necessary for the development of the Project, as well as provide guidance and advice to the Director-General and Deputy Director-General of ACT Health. Responsibilities include: • Setting the strategic direction for the project (subject to Ministerial endorsement) consistent with meeting the Project Objectives and guidance to key individuals. • Assisting in communicating project requirements with the overarching CHS Executive and Board if required and Design and Technical Working Groups. • Ensuring that the project delivers a value-for-money solution that is effective, efficient, and consistent with Government priorities, probity and best practice. • Identifying and monitoring risk and issues management and assist in the establishment of mechanisms to effectively mitigate these. • Ensuring probity is maintained during the life of the Project.
Program Director	The Program Director will implement decisions made by the PCGs and Executive Steering Committee. Responsibilities include: • Overseeing the delivery of key workstreams (including technical, commercial, legal, as well as stakeholder and communication and project management). • Managing interfaces and identify opportunities for efficiencies (e.g., reducing duplication of functions where appropriate). • Ensuring standardisation of processes were appropriate (e.g., reporting methods and templates). Enabling the efficient integration of ACT Health Infrastructure projects with the whole ACT health ecosystem.

Project Control Groups	PCGs will act as decision setting and monitoring bodies. They will oversee, lead, monitor, advise and coordinate all project deliverables in accordance with the desired project objectives. Responsibilities include: • Deliberating on each PCG's activities. • Overseeing and providing guidance on all tasks undertaken by the workstreams. • Escalating issues to the Executive Steering Committee as they arise.
Design Reference Group	The design reference groups comprise of a range of stakeholders including Government and Central Agency and design and technical advisors to provide consultation and feedback on the design and operation of the relevant components of Canberra Hospital.

12. Stakeholder Engagement Plan

Key messages

- During the development of the Business Case, stakeholders were extensively consulted to articulate a clear case for change, test viable delivery models and undertake a robust assessment of project options to enable informed government decision-making ahead of detailed delivery planning post this Business Case. Design and technical advisors were engaged to co-develop key project inputs, such as Service Models, FDB's, SOA's, and Concept Design.
- After the Business Case phase, ACT Government remains committed to working closely with the community, stakeholders, consumers, and our workforce to ensure health facilities are designed to meet the needs of Canberrans now and into the future. Feedback will be considered and used during this phase to contribute to the development of facilities and services for the people of Canberra and the surrounding regions.
- Community and stakeholder involvement in the delivery of the CHMP will enable improved healthcare infrastructure outcomes, including optimal performance for healthcare workers, alignment with First Nations cultural values, better patient treatment and recovery, and more supportive spaces for families.

12.1 Overview to stakeholder and advisors engagement

As Canberra's largest public hospital, developments at CH are of significant community and stakeholder interest. With a range of stakeholders impacted by the CHMPP2 project, a strong and coordinated approach is essential to ensure that their insights are incorporated into the Business Case and all stakeholders are well informed about the benefits of CHMPP2 and its progress.

This section outlines the stakeholder and advisor engagement conducted to date during the development of the Business Case.

The proposed approach post-Business Case is included at Appendix Q - Communications and Strategy Overview – Canberra Hospital Masterplan Implementation – Phase 2.

12.2 Stakeholder Identification and Assessment

In order to identify key stakeholders and determine an appropriate approach for engagement, a communication and engagement framework has been developed around four key activities tailored to each key stakeholder, as summarised in Table 32.

- **Inform** – community and stakeholders will be informed of the scope and benefits and be kept up to date on the project's progress.
- **Consult** – community and stakeholder feedback will be sought to inform key elements of the program, while being kept updated about how their feedback has been considered.
- **Involve** – testing ideas and options with stakeholder and working together on a solution.
- **Collaborate** – working with key stakeholders to identify solutions for some key aspects of the program.
- **Empower** – Internal government decision makers.

Table 32: Stakeholder and Advisor Matrix

Stakeholder Category	Stakeholders	Engagement Approach
Government and Central Agencies	ACT Health Directorate	Collaborate
	Canberra Health Services	Collaborate
	ICBR	Collaborate
	ACT Treasury	Collaborate
	Environment, Planning and Sustainable Development Directorate	Involve
	Digital Solutions Division	Involve
	Environment Protection Authority	Consult
	ACT Emergency Services Agency	Consult
	Transport Canberra and City Services ACT	Consult
	Justice and Community Safety Directorate	Involve
	WorkSafe ACT	Consult
External to Government	Health Care Consumers Association	Involve
Canberra Hospital Expansion (CHE), Campus and Community	Aboriginal & Torres Strait Islander Liaison	Involve
	Disability Reference Group	Involve
	ACT Community Councils	Consult
	ACT Ministerial Advisory Councils	Consult
	Telco & Energy companies servicing site	Consult
	CHE Local Community Reference Group and Community Reference Group	Consult
	Canberra Hospital staff and volunteers (including ANU medical students and staff)	Consult
	Campus tenants	Consult
	Near neighbours - (neighbouring residents and businesses within 500m)	Consult
	Broader ACT Community	Inform / Consult
Design and Technical Advisors	Patients and visitors	Inform / Consult
	Technical advisors	Collaborate

12.3 Stakeholder and Advisors Engagement

Stakeholder and advisors' engagement to date

Engagement to date has been focused around articulating a clear case for change, testing viable delivery models and undertaking a robust assessment of project options to enable informed government decision making ahead of detailed delivery planning post this Business Case.

The project has brought design and technical advisors together with government agencies (including ACT Health, Treasury, CHS and iCBR) to gather, test and validate key inputs into the Business Case including service models, SOA's, FDB's and concept design. There has been a high level of frequent engagement to date with the design and technical advisors, which was used to co-design and co-develop business case outputs. This has been an iterative process and input has been directly implemented in the Business Case and accompanying technical reports.

The extent of stakeholder engagement to date and the impact on the development of the Business Case and other outputs has been provided in Table 33.

Table 33: Business Case Stakeholder engagement

Stakeholder	Stakeholder activity	Purpose	Key Business Case output
Design and Technical Advisors	Regular engagement	To assist with the development of project options and inputs into the business case. Activities included co-design and co-development of the service models, FBDs, SOA's and proof of concept design. Continuous consultation throughout the development of the inputs to occur between the Consortium and Government and Central Agencies on the design of the products and business case outputs.	Development of the following products: • Service Models, FDB's and SOA's • Proof of Concept Design • Demolition and construction feasibility strategy • Decanting and accommodation planning for affected buildings • Whole of site engineering planning to facilitate the Master Plan • Cost planning • Delivery program.
Government and Central Agencies	Executive Planning Workshops	To review and critique design proposals developed by the project design team.	Finalisation of Service Models, FDB's, and SOA's.
	Specialist Planning Team	To manage consultation with specialist technical subcontractors.	
	Options Workshops	To co-design options and Multicriteria Analysis to assess options.	Development of Options and MCA – Chapter 5 – Options Analysis.
	Delivery Model Workshops	To determine the preferred delivery model for the project.	Preferred Delivery Model – Chapter 8 – Delivery Model Analysis.
	Risk Workshops	To identify, classify and quantify potential risk events and develop an accompanying risk register and mitigations plan.	Development of Risk Register and Mitigations Plan – Chapter 7 – Risk Analysis.
	Financial Workshops	To present the financial model framework, validate the proposed approach and present draft model outputs.	Finalisation of Financial Model Framework – Chapter 9 – Financial .

Planned stakeholder and advisor engagement

In line with the ACT Health Infrastructure Communication and Engagement Strategy, seven engagement principles have been adopted:

- Timely;
- Regular frequency;
- Open and transparent;
- Inclusive;
- Respectful;
- Sensitive; and
- First Nations principles.

The Strategy outlines how feedback received during the post business case phase of engagement will be used. It will contribute to developing facilities and services for the people of Canberra and surrounding regions by the people of Canberra and surrounding regions.

Ongoing community and stakeholder engagement will be pivotal in the planning, design and construction of the new facilities at the CH campus. Following this Business Case, ACT Health will engage with stakeholders, health consumers, clinicians and local communities to ensure the next

phase of the CHMP is designed to meet the needs of Canberrans now and into the future. Input will be sought in the detailed planning and development of the preferred option to assist the finalisation of project scope, revised reference design, program, and costs prior to investment submission.

The Strategy makes working with First Nations peoples a priority, significant planning will go into how the government can best consult and involve this community, including through Aboriginal Elders, community leaders and traditional owners.

Ongoing communications will be provided to campus and community stakeholders to keep them informed of the project's progress. As the project progresses into delivery phase a detailed communications strategy will be developed to address operational issues that may arise during the construction phase and inform staff on the changes to Model of Care and / or service delivery, decanting strategies, and temporary access requirements.

Pending a successful investment decision, Design and Technical Advisors will play a crucial role in ensuring the Project's seamless progress through procurement, tendering, contract award, and project delivery. In particular, a Commercial Advisor will lead procurement activities, a Project Management Advisor will oversee project implementation and Legal Advisors will support contract negotiations and finalisation.

The detailed framework for planned stakeholder engagement is outlined in Table 34.

Table 34: Planned Stakeholder and Advisors Engagement

Stakeholder Category	Stakeholder	Phase consulted			Consultation activity and objectives
		Planning and development	Post-investment decision Procurement	Implementation	
Government and Central Agencies	Digital Solutions Division	✓			Workshop(s) to confirm Services Models, FDB's and SOA's and impact of digital health capabilities (telehealth, digital health record etc).
	Transport and City Services ACT	✓			Workshop(s) to confirm services plan for Canberra Hospital redevelopment and site transport accessibility options.
	Environment, Planning and Sustainable Development Directorate	✓	✓		Workshop(s) to refine and confirm revised reference design in consideration of planning requirements (e.g., zoning, overlays, overshadowing etc). Further workshop(s) to refine EOI / RFT documentation in consideration of planning and environmental requirements and support statutory planning applications.
	Environment Protection Authority	✓		✓	Workshop(s) to confirm revised reference design in consideration of environmental impact.
	ACT Emergency Services Agency	✓			Workshop(s) to confirm revised reference design regarding Ambulance access requirements to Canberra Hospital Emergency.
	Transport and City Services ACT	✓	✓		Workshop(s) to confirm revised reference design and alignment to services plan and refine EOI / RFT documentation in consideration of service requirements to site.
	WorkSafe ACT			✓	Frequent meetings throughout construction of Canberra Hospital redevelopment to ensure alignment with WorkSafe protocols.
CHE, Campus and Community	CHE Local Community Reference Group and Community Reference	✓	✓	✓	Monthly meetings throughout the detailed planning phase of the project to generate and prioritise ideas. Meetings will include site visits to the Canberra Hospital campus.
	Health Infrastructure Consumer Reference Group				
	HCCA	✓	✓		To raise awareness of the project, including scope and to enable HCCA to provide input on the proposed services to be delivered by the Project. Additional workshop(s) to refine EOI / RFT documentation in consideration of service requirements to site.
	ACT Ministerial Advisory Councils / ACT Community Councils	✓	✓		Workshop(s) to provide input in revised reference design and ensure alignment with ACT government policies and initiatives around various areas, such as ageing, LGBTQ+, multiculturalism etc. Online consultation to ensure procurement strategy considers ministerial requirements.
	Telco & Energy companies servicing site	✓			Workshop(s) to provide input in revised reference design.

Stakeholder Category	Stakeholder	Phase consulted			Consultation activity and objectives
		Planning and development	Post-investment decision		
			Procurement	Implementation	
	Campus tenants	✓		✓	Drop-in information session(s) to keep stakeholders informed of Project vision, objectives, milestones, and future engagement opportunities. Print/digital updates provide information on the impact of the Project (including, operational issues such as anticipated traffic and noises) and wayfinding.
	Near neighbours (neighbouring residents and businesses within 500m)	✓		✓	Drop-in session(s) to allow stakeholders to voice concerns during project construction and ensure operational phase continues to meet the Project objectives.
	Canberra Hospital staff and volunteers (including ANU medical students and staff)	✓		✓	As above Additional drop-in information sessions to inform staff on the implementation of changes in Model of Care and / or service delivery. Session also provides information on decanting strategies and temporary access requirements. Print/digital updates provided on transition arrangements from existing facilities.
	Community and linguistically diverse (CALD) community	✓		✓	As above. Additionally, using communication channels and partners to better connect with these communities.
	Tertiary education facilities	✓		✓	Program of in-person activation and engagement activities including roadshows, pop-up kiosks, town hall sessions, workshops, forums, event pop-ups and community outreach activities.
	First Nations Peoples	✓		✓	Program of in-person activation and engagement activities – designed specifically with First Nations communities and representatives to be tailored to specific needs and desired delivery methods.
	People with disabilities	✓		✓	Program of in-person activation and engagement activities – designed specifically with people with disabilities and representatives to be tailored to specific needs and desired delivery methods.
	People with specific needs and seldom heard groups	✓		✓	Program of in-person activation and engagement activities including roadshows, pop-up kiosks, town hall sessions, workshops, forums, event pop-ups and community outreach activities.
	Broader ACT Community	✓		✓	Informed through print/digital updates on project information, YourSay platform, vision, objectives milestones and opportunity for community engagement. Community survey with a focus on healthcare service priorities and other facilities important to the community to confirm revised reference design based on community sentiment. Informed of the impact of the Project (including, operational issues such as anticipated traffic and noises) and wayfinding information through print/digital updates.

Stakeholder Category	Stakeholder	Phase consulted			Consultation activity and objectives
		Planning and development	Post-investment decision Procurement	Implementation	
Design and Technical Advisors	Architects and urban planners	✓		✓	Work together to refine scope and confirm revised reference design is structurally feasible through working group sessions. During project implementation and monitoring, workshop(s) will be conducted to confirm project implementation aligns with specified requirements.
	Engineers	✓			Work together to refine scope through working group sessions.
	Clinical and functional planners	✓			Work together to confirm scope aligns with service requirements.
	Quantity surveyors	✓	✓		Work together to confirm revised reference design aligns with cost estimates. During contract award/financial close regular consultations will be held to assist with contract negotiations and finalisation. During implementation, workshop(s) will be held to confirm project delivery aligns with specified requirements.
	Land surveyors and town planners	✓			Work together to confirm revised reference design aligns with land requirements.
	Community and public relation advisors	✓		✓	Work together to ensure external feedback is incorporated in revised design. Workshop(s) to confirm project implementation aligns with specified requirements.
	Commercial/financial advisor		✓		Work together throughout the procurement stages alongside ACT Health, CHS, ICBR and ACT Treasury to ensure all key activities are successfully achieved. Commercial advisor will be engaged as the focal advisor during procurement.
	Legal professionals		✓		Regular consultations to assist with tender process. During contract award/financial close, regular consultations will be held to assist with contract negotiations and finalisation.
	Project managers			✓	Work together throughout the delivery stage alongside ACT Health, CHS, ICBR and ACT Treasury to ensure all key activities are successfully achieved. Project management advisor will be engaged as the focal advisor during the implementation phase.
	Commissioning agent			✓	Workshop(s) to confirm project implementation aligns with specified requirements.
	Risk and change management adviser			✓	Workshop(s) to confirm project implementation aligns with specified requirements.

12.4 Additional Advisor Engagement

Pending a successful investment decision from ACT Treasury, the project will proceed to a final stage of feasibility to progress the proof-of-concept to a concept design in line with PSP guidelines. A provision of \$5m of planning and development funding has been included in Option 2 to procure a commercial advisor and technical team to undertake these activities. This would enable the project to refine the scope, program and cost and move the project into the delivery phase.

13. Timeline

Key messages

- CHMPP2 Delivery Program is set out for the preferred option for the project scope for the business case which is *Option 1 (Base Case/Do Minimum) – Staged*.
- CHMPP2 Delivery Program is anticipated to have the following key milestones:
 - Phase 0: Planning and Development Works (FY26-27)
 - Phase 1: PCS Stage 1 (FY28-31)
 - Phase 2: New Inpatient and Outpatient Services Building (FY29-36)
 - Phase 3: PCS Stage 2 (FY34-39)
- All indicative dates listed are subject to several factors, including submission of documentation to government and confirmation of funding release regarding the CHMPP2 project and delivery.

13.1 Project Timeline

The CHMPP2 *project* represents a significant step forward in the CHMP, underscoring the commitment of the ACT Government to enhance healthcare infrastructure at the Canberra Hospital. As detailed in Chapter 9 – Financial Analysis, CHMPP2 requests funding for further planning and development on Option 1. Following the CHMPP2 project, an investment decision will be made on the procurement and implementation of CHMPP2.

The proposed project timeline has been designed to align with this CHMPP2 investment process. A consistent focus of this project timeline will be placed on program and risk management activities due to the nature of the work being in a live hospital environment. The staged approach to the sequencing of work aims to minimise disruption to the operations of the hospital.

Project Phases and Key Milestones

The CHMPP2 project comprises four phases of work as outlined below.

13.2 Phase 0: Planning and Development Works

Phase 0 involves the continued planning and development of CHMPP2, including progressing the preferred option (identified in this Business Case) to a 50% PSP level.

It is assumed that ACTHD and iCBR have sufficient existing team resources for the remainder of FY25 to commence drafting RFT documentation to procure technical consultants for the PSP 50% works (outlined in Phase 0.1 below).

0.1 PCS PSP 50% Procurement & Appointment

- *PCS PSP 50% Procurement & Appointment* – 3-months – This will run from late September to late mid-December 2025.

0.2 PCS PSP 50% Design & Tender Documentation

- *PCS PSP 50% Design & Tender Documentation* – 12-months – This will be prepared after procurement and appointment of a design consultant team and will run from January 2026 to December 2026. This phase of activities includes the design of the building up to a PSP 50% level for Executive endorsement.

- Following Executive endorsement, there is a nominated period of approximately 6 months for the treasury approval process, following which the release of funding is expected in mid-2027.

13.3 Phase 1: PCS Stage 1

1.1 Enabling and Early Works

The stage includes several key steps outlined below.

- *Demolition strategy and planning* – 6-weeks – This will run from July-August 2027 and involves completion of all detailed planning for the Building 7 demolition works, including the relocation of AOD to a suitable location (subject to further investigation by ACTHD).
- *Appointment of a demolition contractor (incl. enabling works)* – 3-months – This will run from mid-August to mid-November 2027.
- *Building 7 enabling works including refurbishment* – 3-months – This will follow contractor appointment and is expected to run from early-November 2027 to late January 2028.
- *Decanting of Building 7* – 4-weeks – This will effectively take place in February 2028. This stage will ensure that all occupants and functions of the building are relocated effectively.
- *Demolition of Building 7* – 7-months – This is estimated to be completed by mid-September 2028.
- *Note: while not explicitly noted as a contingency period in the master programme, the completion of the Building 7 demolition works have been forecast to complete two weeks before the PCS Stage 1 works are forecast to commence.*

1.2 Construction Works

The construction of the New Pathology and Clinical Support Services Building, located on the site of Buildings 6/23/7 consists of the following activities.

- *Procure [REDACTED] Contractor* – 6-months – This will run from early July 2027 to early December 2027 and will involve undertaking a procurement process to identify and appoint a suitable [REDACTED] Contractor.
- *Design Finalisation and Planning Approval* – 9-months – This will run from December 2027 to September 2028 and involve a design finalisation period, and completion of all pre-construction works required before construction commencement, including planning application submission and approval.
- *Early Works and Main Works* – 26-months – This will run from the end of September 2028 through to November 2030. Subsequent milestones include:
 - *Practical Completion* is expected in November 2030.
 - *CHS Operational Testing and Commissioning* will take place after *Practical Completion* for approximately 3 months, from November 2030 to February 2031.

1.3 Decanting Works – B10

- *Decanting of Building 10 to the new PCS Stage 1 Building* – This includes the following key steps:
 - *Decanting Planning and Enabling Works (incl. IPU and ICU Relocation)* – 5 months – This will run from October 2030 to February 2031.

- *Decant Building 10 incl. Relocation of Existing Teams – 2-months – This will run from February 2031 to April 2031. This involves the physical relocation of existing teams from Building 10 to the newly completed PCS Stage 1 Building.*

13.4 Phase 2: New Inpatient and Outpatient Services Building

The construction of the new Inpatient and Outpatient Services Building on the site of Building 10 is broken down into the following components.

2.1 Enabling and Early Works

This phase comprises the following activities:

- *Demolition Planning – 3.5-months – This will run from early September 2030 to late December 2030 and is focused on identifying the safest and most efficient demolition procedure for Building 10.*
- *Demolition Contractor Procurement – 3.5-months – This will run from late December 2030 until mid-April 2031 and involves undertaking an end-to-end procurement process to select a suitable contractor to undertake the demolition of Building 10.*
- *Demolition of Building 10 – 6-months – This will run from mid-April 2031 to mid-October 2031.*
 - *Note: there is an approximate 6-week demolition contingency period allowed for the demolition of Building 10. This serves as a buffer to manage any unforeseen interruptions or complexities encountered during the demolition work.*

2.2 PSP Design, Contractor Procurement, and Planning Application

- *Procurement of Consultant Team for PSP 50% – estimated 4 months – This activity involves procuring a consultant team to develop the PSP 50% design and is expected to commence in early February 2029 and conclude with the appointment of the consultant team in late May 2029.*
- *Prepare B10 PSP Design & Tender Documentation – estimated 12-months – This activity involves developing the PSP 50% design and getting executive endorsement. It is expected to run from late May 2029 and complete in April 2030.*
- *Procure New Contractor – 6-months – This stage involves managing a tender process to appoint a contractor and will commence in mid-April 2030 and complete by late October 2030.*
- *Design Finalisation – 5-months – Once the contractor is appointed in October 2030, a Design Finalisation period is required. This design review and finalisation period is expected to take five months to complete, concluding in March 2031.*
- *Draft and Lodge Planning Application – 3-months – March-June 2031.*
- *Planning Application and Approval – 6-months – to be completed by November 2031.*

2.3 Construction Works

- *Works Documentation and Procure Early Trades – 9-months – This work will run from mid-March 2031 to late November 2031 and is programmed for completion prior to the Planning Approval expected to be received in late November 2031.*
- *Construction Commencement in late November 2031.*
- *Construction Early Works – 8-months – To be completed in July 2032.*

- *Main Works Installation* – 35.5-months – This will take place from July 2032 to March 2035, marking an overall construction timeline of approximately 3.5 years.
- *Practical Completion* – March 2035, with an additional three-month period for *CHS Operational Testing and Commissioning* to conclude in August 2035, and then *Operational Commencement* of the Inpatient and Outpatient Services Building from August 2035.

2.4 Decanting Works – B1 and B12

Following the completion of the new Inpatient and Outpatient Services Building, services from Building 1 and 12 will need to be relocated. This stage outlines key activities associated with the relocation.

- *Decanting Planning and Contractor Procurement* – 8 months – this activity involves creating a detailed and strategic plan to shift personnel, patients, medical equipment, and other operational assets safely and effectively from Building 1 to the new Inpatient and Outpatient Services Building. Given the complicated nature of relocating medical facilities and patients and ensuring minimal disruption to existing services. This is scheduled to start in December 2034 and end in August 2035.
- *Decanting of Building 1 into the new Inpatient and Outpatient Services Building* – 3 months – This involves executing the strategic plan to shift personnel, patients, medical equipment, and other operational assets safely and effectively from Building 1 to the new Inpatient and Outpatient Services Building. This will be completed by October 2035.
- *Decanting of Building 12* – 3 months – In line with the decanting of Building 1, the decanting of Building 12 will be undertaken concurrently and is expected to be completed by October 2035.

13.5 Phase 3: PCS Stage 2

This phase will deliver the remaining works for the PCS Building and consists of the following activities.

3.1 Appointment and Design Finalisation

- *Procure New Contractor* – 6-months – This stage involves managing a tender process to appoint a contractor and will commence in August 2033 and complete by February 2034.
- *Design Finalisation* – 6-months – Once the contractor is appointed in February 2034, a *Design Finalisation* period is required. This design review and finalisation period is expected to take six months to complete, concluding in August 2033, and will involve a detailed review of the PSP 50% design completed as part of the PCS Stage 1 Phase.
- *Draft and Lodge Planning Application* – 3-months – August-November 2034.
- *Planning Application and Approval* – 8-months – to be completed by June 2035.

3.2 Construction Works

- *Works Documentation and Procure Early Trades* – 9-months – This work will run from early September 2034 to mid-June 2035 and is programmed for completion prior to the Planning Approval expected to be received in June 2035.
- *Construction Commencement* in June 2035.
- *Construction Early Works* – 6-months – To be completed in November 2035.

- *Main Works Installation* – 16-months – This will take place from November 2035 to March 2037, marking an overall construction timeline just under 2 years.
- *Practical Completion* – March 2037, with an additional three-month period for *CHS Operational Testing and Commissioning* to conclude in July 2037, and then *Operational Commencement* of the Inpatient and Outpatient Services Building from July 2037.

3.3 B4 Works

- These works are expected to be removed in next stage of planning, but currently remain for completeness associated with the consultant advice.
- *Decanting Planning and Preparation* – 6 months – This involves developing a detailed plan to prepare for the relocation of ANU Medical School occupants and operations. It will commence in early January 2037 and be completed by mid-June 2037.
- *Decant Building 4 into PCS Stage 2 Building* – 3 months – This includes relocating all ANU Medical School occupants and operations from Building 4 to the newly completed PCS Stage 2 Building. It will begin in mid-June 2037 and finish by early September 2037.
- *Demolition Planning* – 3 months – This will involve preparing for the safe and efficient demolition of Building 4, including obtaining necessary permits. It will run from mid-June 2037 to mid-September 2037.
- *Demolish Building 4* – 7 months – This involves the physical demolition of Building 4 and site clearance. It will start in mid-September 2037 and conclude by late March 2038.
- *Demolition Contingency* – 6 weeks – This allows time for addressing any unforeseen issues during demolition, ensuring the site is prepared for the next phase. It will take place from late March 2038 to early May 2038.
- *Construction of New Open Green Space* – 4 months – This involves creating a new open green space on the site of the demolished Building 4. It will commence in early May 2038 and finish by late August 2038.

Key milestones for each project phase are set out below in Table 35. For more detailed dates, see Appendix R - Project Timeline.

It should be noted that all dates are indicative and subject to several factors including Cabinet decisions regarding the Business Case and proceeding with project delivery. Actual timing will be subject to the completion of the procurement process, planning and environmental approvals and other risks.

Table 35: Implementation milestones and timeframes

Project Phases	Milestones	Est. Start	Est. End
Phase 0: Planning and Development Works	PCS PSP 50% Procurement & Appointment	Sept-25	Dec-25
	Prepare PCS PSP 50% Design Tender Documentation	Jan-26	Dec-26
	Treasury Funding Release	Dec-26	Jun-27
Phase 1: PCS Stage 1	Phase 1: Enabling and Early Works		
	Building 7 Enabling Works and decanting	Nov-27	Jan-28
	Building 7 Decanting	Jan-28	Feb-28
	Building 7 Demolition	Feb-28	Sept-28
	Phase 1: Main Works		
	Procure PCS Building Contractor	Jul-27	Dec-27
	PCS Design Finalisation & Planning Approval	Dec-27	Sept-28
	PCS Stage 1 Construction Commencement	Sept-28	Sept-28
	PCS Stage 1 Practical Completion	Nov-30	Nov-30
	PCS Stage 1 Operational Commencement	Feb-31	Feb-31
	Decanting Planning and Enabling Works (inc. IPU and ICU Relocation)	Oct-30	Feb-31
	Decant Building 10 inc. Relocation of Existing Teams	Feb-31	Apr-31
Phase 2: New Inpatient and Outpatient Services Building	Phase 2: Enabling and Early Works		
	Building 10 Demolition Planning	Sept-30	Dec-30
	Building 10 Demolition Contractor Procurement	Dec-30	Apr-31
	Demolish Building 10 (including Contingency)	Apr-31	Nov-31
	Phase 2: Main Works		
	Engage Consultant Team to Develop PSP 50% Design	Feb-29	May-29
	Prepare New B10 PSP Design Tender Documentation	May-29	Apr-30
	Procure New B10 Contractor	Apr-30	Nov-30

Project Phases	Milestones	Est. Start	Est. End
	B10 Design Finalisation & Planning Approval	Oct-30	Mar-31
	B10 Construction Commencement	Nov-31	Nov-31
	B10 Practical Completion	Mar-35	Mar-35
	B10 Operational Commencement	Aug-35	Aug-35
	Decanting Planning and Contractor Procurement	Dec-34	Aug-35
	Decant Building 1 into new In-patient Building	Aug-35	Oct-35
	Decanting Building 12	Aug-35	Oct-35
Phase 3: PCS Stage 2	Procure PCS Stage 2 Contractor	Aug-33	Feb-34
	PCS Stage 2 Design Finalisation & Planning Approval	Feb-34	Jun-35
	PCS Stage 2 Construction Commencement	Jun-35	Jun-35
	PCS Stage 2 Practical Completion	Mar-37	Mar-37
	PCS Stage 2 Operational Commencement	Jun-37	Jun-37
	Decant ANU Medical into PCS Stage 2 Building	Jun-37	Sept-37
	Demolition of Building 4 (inc. Contingency)	Sept-37	May-38
	New Open Green Space	May-38	Aug-38

13.6 Project Decision Points

Following the review of this Business Case, key project decisions, including project and design approvals, will be carried out in accordance with the governance structure outlined in Chapter 11 – Project Governance, Chapter 12 – Stakeholder Engagement Plan and Advisors Engagement Plan. Table 36 below provides a detailed overview of these decision points.

Table 36: Key project decision points

Project Phases	Approvals	Decision Makers	Anticipated Deadlines
Phase 0: Planning and Development Works	Appoint PSP 50% Consultant Team	ACTHD Project Team & ICBR	Dec-25
	Executive Review of PSP 50% Design	ACTHD Project Team	Dec-26
	Treasury Funding Release	Treasury	Jun-27
Phase 1: PCS Stage 1	B7 Demolition Strategy and Planning Endorsement	ACTHD Project Team & ICBR	Aug-27
	Appointment of B7 Contractor and Contract Execution	ICBR	Nov-27

Project Phases	Approvals	Decision Makers	Anticipated Deadlines
	PCS Stage 1 Contractor Appointment	ACTHD Project Team & ICBR	Dec-27
	PCS Stage 1 Design Endorsement	ACTHD Project Team, ICBR & CHS	Feb-28
	PCS Stage 1 Operational Testing and Commissioning	ACTHD Project Team, ICBR & CHS	Feb-31
	Decanting Planning and Enabling Works Endorsement (Building 10)	ACTHD Project Team & ICBR	Feb-31
Phase 2: New Inpatient and Outpatient Services Building	Appointment of Demolition Contractor and Contract Execution (Building 10)	ACTHD Project Team & ICBR	Apr-31
	Appointment of PSP 50% Design Consultant Team	ACTHD Project Team, ICBR & CHS	May-29
	B10 PSP Design 50% Endorsement	ACTHD Project Team, ICBR & CHS	Apr-30
	B10 Contractor Contract Execution	ACTHD Project Team & ICBR	Oct-30
	B10 Design Endorsement	ACTHD Project Team, ICBR & CHS	Mar-31
	B10 Operational Testing and Commissioning	ACTHD Project Team, ICBR & CHS	Aug-35
Phase 3: PCS Stage 2	PCS Stage 2 Contractor Appointment	ACTHD Project Team & ICBR	Feb-34
	PCS Stage 2 Design Endorsement	ACTHD Project Team, ICBR & CHS	Aug-34
	PCS Stage 2 Operational Testing and Commissioning	ACTHD Project Team, ICBR & CHS	Jun-37
	Endorsement of Building 4 Decanting Plan	ACTHD Project Team, ICBR & CHS	Jun-37

13.7 Recommended Float

Float has only been nominated for the required demolition phases. Otherwise, no explicit float has been introduced in the program, but a consistent amount of contingency has been implemented throughout each phase. A long delivery program that spans across the next 10 plus years has flexibility for adjustment throughout the implementation of the program.

13.8 Project timeline risks, dependencies, constraints and/or deadlines

The primary factors influencing, driving, and potentially constraining the CHMPP2 timeline include the following:

- Conclusion of design consultation activities with design and technical advisers and clinicians (as outlined in Chapter 11 – Project Governance, Chapter 12 – Stakeholder Engagement Plan and Advisors Engagement Plan).

- Confirmation of funding release to enable project establishment and commence delivery of CHMPP2.
- Completion of the planning and DA process, noting separate approvals will be required for the early works and the main works package. Community consultation, and resolution of access requirements will also be key parts of this process.
- The progress of interdependent projects and other infrastructure projects currently and/or planned to be underway, including North Canberra Hospital (not in scope for this Business Case).
- Strategy for the packaging of capital work components, particularly early works, utilities protection and relocation and demolition.
- The recommended delivery model and the necessary procurement process timing.
- The timing and implementation of the proposed decanting strategies for the following:
 - Decanting Buildings 1 and 12 into new Inpatient and Outpatient Services Building.
 - Maintenance of logistics business continuity throughout campus during all works
- Time taken to undertake operational commissioning, particularly with respect to ICT systems, and the transition from existing facilities.

Other risks to the project timeline are outlined in the Risk Register (see Appendix M - and Appendix N -).

13.9 Project Timeline Assumptions

The key assumptions that shape our project's proposed timeline are outlined below:

- An announcement of funding approval is expected in August 2025 with project commencement occurring thereafter.
 - The ACTHD project team recruitment phase is to commence immediately following funding release to establish Project Directors and Senior Leadership.
- [REDACTED]
- [REDACTED]
- Similarly, construction timeframes have been estimated with reference to previous hospital projects of a comparable scale and complexity in ACT and interstate.
 - With respect to decanting and relocation into completed facilities, we have assumed new facilities are fully completed and fit-for-purpose with the intention of cut-over from existing operational facilities – to reduce the operational downtime required. Any transition is assumed to be staff oriented only – and may include minor non-critical operational equipment and does not pertain to major medical equipment etc.

Appendices

Appendix A - ILM Supporting Documentation

Appendix B - Investment Logic Map

Appendix C - Wellbeing Impact Assessment

Appendix D - B6 Functional Design Brief

Appendix E - B10 Functional Design Brief

Appendix F - PCS Schedule of Accommodation

Appendix G - B10 Schedule of Accommodation

Appendix H - Clinical Support Services Service Model

Appendix I - Medical Specialities Service Model

Appendix J - Surgery Service Model

Appendix K - Pathology Service Model

Appendix L - Concept Design Report

Appendix M - Risk Register – Option 1 and 2

Appendix N - Risk Register – Option 3

Appendix O - MBM Cost Plans

Appendix P - MBM Cashflow Profiles

Appendix Q - Stakeholder Engagement Plan and Communication Strategy

Appendix R - Project Timeline

Appendix S - CHS Wayfinding

Appendix T - Health - Average Salary Costing Model 2025-26

Appendix A – ILM Supporting Documentation

ILM Workshop attendees

Organisation		
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

Risk Workshop 1 attendees

Organisation	Attendees
ACT Health	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]

Risk Workshop 2 attendees

Organisation	Attendees
ACT Health	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]

Canberra Hospital Redevelopment

INVESTMENT LOGIC MAP

Initiative

PROBLEM

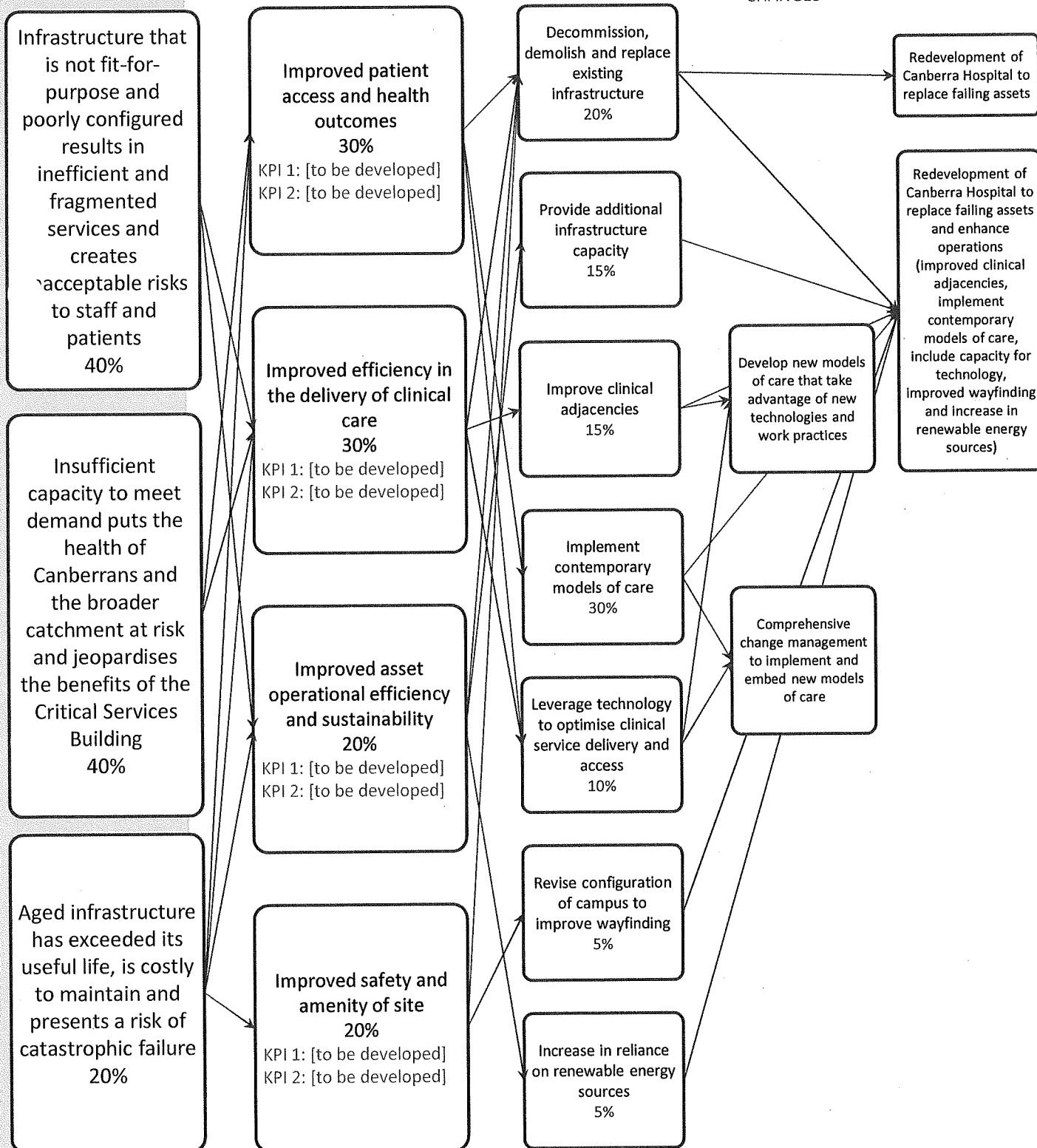
BENEFIT

RESPONSE

SOLUTION

CHANGES

ASSETS



Appendix A – ILM Supporting Documentation

ILM Workshop attendees

Organisation	Attendees
ACT Health	
ACT Treasury	
Major Projects Canberra	

Risk Workshop 1 attendees

Organisation	Attendees
ACT Health	

Risk Workshop 2 attendees

Organisation	Attendees
ACT Health	

Canberra Hospital Redevelopment

INVESTMENT LOGIC MAP

Initiative

PROBLEM

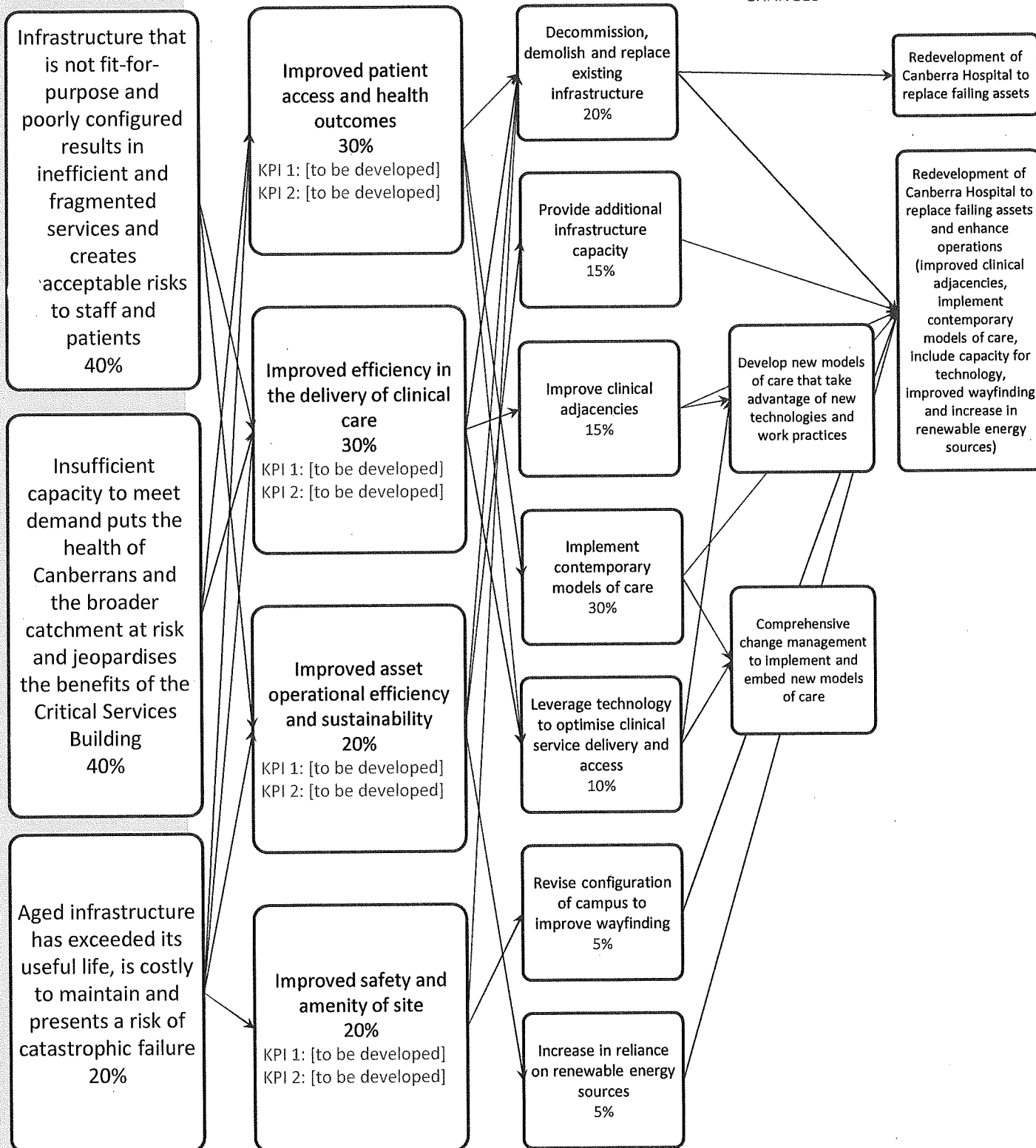
BENEFIT

RESPONSE

SOLUTION

CHANGES

ASSETS



Wellbeing Impact Assessment (WIA)

Canberra Hospital Master Plan Phase 2 – PCS Building

ACTHD

Purpose of proposal

As part of the Canberra Hospital Master Plan, the purpose of this Tier 1 Business Case is to provide a robust basis for the ACT government to make an informed decision about investing in the first stage of Canberra Hospital Master Plan Phase 2 Project (CHMPP2). The proposal for this stage of the CHMPP2 project includes the planning and development of a new Pathology and Clinical Support Services Building. The CHMPP2 aims to upgrade ageing and deteriorating buildings that are increasingly unfit-for-purpose, costly to maintain and unable to meet the growing needs across the Territory and neighbouring catchment areas in the NSW region.

Wellbeing domains and impact description

Access and connectivity	Economy	Education and life-long learning	Environment and climate	Governance and institutions	Health
Housing and home	Identity and belonging	Living standards	Safety	Social connection	Time

Primary domain

Impact description

Health

The key aim of the CHMPP2 project is to replace ageing facilities with modern, more efficient, and sustainable facilities. Informed by the social economic analysis, the CHMPP2 project will deliver the following wellbeing impacts to hospital staff, patients, visitors and the broader community across the ACT catchment areas:

- Improved patient access, health outcomes and satisfaction supported through a number of project features including:
 - Additional capacity to reduce current wait times and accommodate future growth.
 - Built-in flexibility to future-proof the CH campus to shifts in demand.
 - Affording the opportunity for the CH to pursue service innovations.
 - Improved synergies between clinical adjacencies, supporting patient-centric care.
 - Supporting research and teaching activities across the CH campus.

Other domains

Safety

Additional impacts include:

- Improved workforce conditions enabled through the provision of purpose-built facilities, built around the workforce requirements and workflows of each department, resulting in a healthier and happier workforce expected to improve the retention of existing staff and attraction of new staff.
- Additional significant impacts on staff and patient wellbeing through improved safety and amenity of site, ensuring the compliance with modern safety standards, improved hospital's physical amenities and overall environment including additional green space.

Environment and climate

By incorporating facilities with modern sustainability design features, the CHMPP2 Project will deliver improved asset sustainability alongside with environmental benefits in the form of emissions reductions and reduction in utility costs.

Evidence base and data

Provide evidence that your proposal will have the wellbeing impacts described above. Note that it is not enough to only provide evidence that the issue exists.

Evidence

The Canberra Hospital Master Plan (CHMP) released in 2021 proposes phased redevelopment, improved connections between key assets, better-distributed parking, and critical infrastructure upgrades to prevent health and safety risks. It also addresses some of the critical issues and constraints on the campus, being the age and condition of critical assets, lack of open space for redevelopment, and current network and wayfinding through the campus. The master plan was developed with insights from significant community consultation and technical studies.

The Canberra Hospital Strategic Asset Management Plan 2017 provides a comprehensive assessment of all Canberra Hospital Buildings, including the condition, functionality, and aspects across spatial relationships (scale, layout), amenity, environmental comfort, legislative compliance, aesthetics and adaptability.

Building façade inspection reports performed by independent building inspector ARUP, informing about the external safety of buildings.

There is a range of research evidence to inform about the potential impacts on health and wellbeing through improved safety and amenity of facilities and improved working conditions:

- Brook et al., (2019). Characteristics of successful interventions to reduce turnover and increase retention of early career nurses: A systematic review. *International Journal of Nursing Studies* 91. 47-59.
- Lock, K. F. (2022). Factors affecting the UK junior doctor workforce retention crisis: an integrated review. *CMJ Open* 12: e059397.
- Douglas, C.H. and Douglas M.R (2004) Patient-friendly hospital environments: exploring the patients' perspective. *Health Expectations* 7 (1) p.61-73.
- Marcus, C.C. (2007) Healing gardens in Hospitals. *Interdisciplinary Design and Research* 1(1).
- Reiling J, Hughes RG, Murphy MR (2008). The Impact of Facility Design on Patient Safety. In: Hughes RG, editor. *Patient Safety and Quality: An Evidence-Based Handbook for Nurses*. Rockville (MD): Agency for Healthcare Research and Quality (US). Chapter 28.

Source

Canberra Hospital Master Plan 2021

The Canberra Hospital Strategic Asset Management Plan 2017

See references provided

Type of evidence

ACT government data or research

ACT government data or research

ACT government data or research

International data or research

What don't we know?

Investment Logic Mapping undertaken with ACT Health, CHS, MPC and Treasury identified a number of Key Performance Indicators (KPIs) relevant to wellbeing including for patients (e.g., reduced wait times and patient satisfaction) and for the hospital workforce (e.g., reduced turnover and staff satisfaction).

A list of these KPIs can be found below. Data to inform these measures can be collected through the implementation process. However, it is frequently difficult to disentangle the impact of the CHMPP2 on this project from broader external factors which can also impact the outcome of these measures.

Measuring wellbeing outcomes

How will the Government know this proposal has achieved the anticipated wellbeing impacts?

Your thinking on this does not need to be finalised – this is an opportunity to set out ideas about what may need to be measured in order to understand whether this proposal has had the anticipated impact.

What is the measurable outcome?

To determine the success of the CHMPP2 project, a list of KPIs have been identified during the Investment Logic Map Workshop. These KPIs will be monitored to provide measurable outcomes to assess whether the objectives of the proposal have been met and to what extent they are impacting the wellbeing of people, places, and institutions.

1. Improved patient access, health outcomes and satisfaction
 - KPI 1: Reduced total list times
 - KPI 2: Reduced length of stay
2. Improved safety and amenity of site.
 - KPI 1: Reduced total recordable incident rate
 - KPI 2: Increased satisfaction with environment score
 - KPI 3: Increased patient satisfaction
3. Staff retention, attraction and wellbeing
 - KPI 1: Reduced turnover
 - KPI 2: Staff satisfaction (people survey)
 - KPI 3: Reduced average time to recruit new staff
4. Improved operational efficiency and sustainability
 - KPI 1: % decrease in number of instances of unplanned maintenance
 - KPI 2: % reduction in CO2 emissions

How will you measure it?

Data will be collected through CHS and ACT Government data sources.

Evaluation

The proposal does not include the detailed evaluation plan. This Business Case is in the initial planning and development stage with further planning and development to be undertaken later to inform the detailed designs. As part of this detailed design phase, further consideration will be taken to prepare for the data collection and establish the key evaluation design elements and approaches which is expected to be carried out as part of the broader CHMP Program Evaluation.

As part of the Planned Evaluation, it is expected that KPIs will measure the success and contribute to a part of the evaluation/monitoring of benefits. KPIs will be monitored by the Territory Health Infrastructure Executive Steering Committee as outlined in the Stakeholder Engagement Plan included in this Business Case. but how these will be collected and who will be responsible for monitoring? Territory Health Infrastructure Executive Steering Committee as per SEP. As part of the evaluation the detail design will outline the approach to risk monitoring during the construction period as well as beyond to ensure the expected outcomes and benefits as outlined in this Business Case are achieved

Who is impacted?

The CHMPP2 project is expected to impact the Canberra hospital workforce including approx. 7000 staff members, their patients with the annual admission of over 90,000 patients and the broader community, particularly residing in the local community at the Woden Valley site and the broader hospital catchment area in the territory and the surrounding NSW region. It is expected that the project will positively impact around 500,000 people living in those areas who receive trauma and major medical and subspecialty services from the Canberra Hospital. The impact is expected to be equally distributed across different groups of population including elderly, children, Aboriginal and Torres Strait Islander people and people from culturally diverse backgrounds who receive services from the Canberra Hospital.

Will the proposal have a different or disproportionate impact (positive or negative) on any groups?

Being a public hospital, the impact from redevelopment of the Canberra Hospital campus is expected to be equally distributed across different groups of population including elderly, children, Aboriginal and Torres Strait Islander people and people from culturally diverse backgrounds who receive services from the Canberra Hospital.

Gendered impacts

Impacts from redevelopment of the Canberra Hospital campus are expected to be equally distributed across different population groups.

Impacts on Aboriginal and Torres Strait Islander people

Impacts from redevelopment of the Canberra Hospital campus are expected to be equally distributed across different population groups. In line with the ACT Aboriginal and Torres Strait Islander Agreement 2019-2028, the CHMPP2 supports the achievement of target focused on community leadership. During the next stage of planning and development of the CHMPP2 Project, it is expected to engage with the Aboriginal and Torres Strait Islander Liaison as per Stakeholder Engagement Plan to ensure the alignment with the needs and priorities of these communities.

Impacts on future generations

Redeveloped buildings have an asset life of approximately 20 years, supporting the demand and health needs of future generations. There are no negative long-term impacts expected from the CHMPP2 Project.

CABINET

Will the proposal have an impact on or be impacted by climate change?

Emissions reduction

By incorporating facilities with modern sustainability design features, the CHMPP2 Project will deliver improved asset sustainability alongside with environmental benefits in the form of emissions reductions and reduction in utility costs. The key features will include electrification of facilities, provision of enabling infrastructure (e.g., larger power plants) and modern systems (e.g., upgraded heating, ventilation, and air conditioning systems). New buildings will also be constructed using more sustainable and long-wearing materials and using contemporary construction techniques to improve the resilience of the buildings to climate and other environmental events.

It is expected that the delivery of the CHMPP2 project will result in significant reductions in carbon emissions that amounted to nearly 4,000 tonnes in 2019 in Buildings 1, 10 and 12 alone (that are in scope for upgrade and modernisation). Driven by the increase in efficiency from electrification of Buildings, it is expected that the utility cost savings will be approximately \$2.7m over 20-year period. The addition of a precinct energy node will support the electrification needs of the buildings and broader precinct.

Adaptation and risk management

ACTHD acknowledges this proposal will have climate related-risks and continues to keep sustainability as a core principle for all infrastructure projects as we are committed to meet the target of being a zero-emissions ACT health sector by 2040.

This proposal ensures the facilities are built in alignment with all relevant ACT targets, legislation, policy and *Australasian Health Facility Guidelines (AusHFG)* standards.

ACTHD further welcomes the recently released *National Health and Climate Strategy* which sets the direction for adaptation toward net zero emissions. This all electric asset will contribute toward that direction.

Cross-portfolio collaboration and partnerships

Engaged Stakeholders

As part of the CHMPP2 project, a number of stakeholder consultations were undertaken to inform planning and development of the preferred project option. These include the ACT Health Directorate, Canberra Health Services, Major Projects Canberra, and ACT Treasury.

The technical and clinical aspects of the CHMPP2 Project were informed through the engagement with external stakeholders including design and technical advisers.

Results of Engagement

The engagement has led to a comprehensive understanding of project scope, requirements for planning and redevelopment activities and anticipated costs and benefits of the project. Feedback from stakeholders, particularly from ACT Health, Canberra Health Services and Major Projects Canberra has been instrumental in shaping the project's direction.

Engagement Process

The stakeholder engagement process involved a range of methods, including executive planning workshops, specialist planning teams, options workshops, risk workshops, and financial workshops.

A tailored approach was used for different stakeholder groups, categorized into 'Work together', 'Involve', 'Consult', and 'Keep informed', depending on their level of influence and interest.

Future Stakeholder Engagement

Future engagements will involve consultation with stakeholders like the Aboriginal and Torres Strait Islander Liaison and the Environment, Planning and Sustainable Development Directorate.

The engagement will focus on detailed planning and development post-Business Case. This will likely include consultations, co-design sessions, and targeted workshops to finalize the project scope, design, program, and cost.

Barriers to Engagement

Potential barriers may include differing priorities or concerns among stakeholders, logistical challenges in organising engagement sessions, and ensuring effective communication and consensus-building among diverse groups. These barriers will be addressed through advanced planning and communication with the relevant parties.

Consultation with Aboriginal and Torres Strait Islander Representative Bodies

While specific details on consultations with the ACT Aboriginal and Torres Strait Islander Elected Body or other representative bodies are not explicitly mentioned, the plan includes future engagement with the Aboriginal and Torres Strait Islander Liaison. This engagement will be crucial in ensuring that the project aligns with the needs and priorities of these communities and addresses any specific concerns they may have.

Functional Design Brief - Building 6

CANBERRA HOSPITAL CAPITAL REDEVELOPMENT

Version 1.5
25 January 2024

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Version Control

VERSION	ISSUED TO	CHANGES MADE	ISSUED BY	DATE OF ISSUE
1.0	Internal Use Only	Initial FDB Draft by Building	Aspex Consulting	12 October 2023
1.1	Internal Use Only	Draft FDB by Building	Aspex Consulting	23 November 2023
1.2	ACT Pathology	Second draft FDB by building (with edits)	Aspex Consulting	9 January 2024
1.3	Canberra Health Services	Second draft FDB by building (clean)	Aspex Consulting	9 January 2024
1.4	Internal Use Only	Draft FDB Refinement	Aspex Consulting	16 January 2024
1.5	Canberra Health Services	Draft Final FDB	Aspex Consulting	25 January 2024

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LIST OF ABBREVIATIONS

ACH	Air Changes per Hour	EUS	Endoscopic Ultrasound
ACT	Australian Capital Territory	FBC	Full Blood Count
ADC	Automated Dispensing Cabinets	FDB	Functional Design Brief
AED	Automated External Defibrillator	FFP	Fresh Frozen Plasma
AFER	Automated Endoscope Reprocessor	FFPE	Formalin Fixed Paraffin Embedded
AI	Artificial Intelligence	FISH	Fluorescence In-Situ Hybridisation
AIDS	Acquired Immune Deficiency Syndrome	FM	Facility Management
AMS	Antimicrobial Stewardship	FNA	Fine Needle Aspirate
ANU	Australian National University	FOH	Front of House
AP	Anatomical Pathology	FRD	Functional Relationship Diagram
ARCBS	Australian Red Cross Blood Service	FTE	Full-Time Equivalent
AusHFG	Australasian Health Facility Guidelines	GDA	Gross Departmental Area
B	Building	GEHU	Gastroenterology & Hepatology Unit
BMT	Bone Marrow Transplant	GI	Gastrointestinal
BOH	Back of House	GP	General Practitioner
BSC	Biological Safety Cabinets	HCV	Hepatitis C
CCTV	Closed Circuit Television	HEPA	High Efficiency Particulate Absorbing (filter)
CH	Canberra Hospital	HIV	Human Immunodeficiency Virus
CHS	Canberra Health Services	HLA	Human Leukocyte Antigen
CJD	Creutzfeldt-Jakob Disease	HPU	Health Planning Unit
COVID	Coronavirus Disease	HSC	Hematopoietic Stem Cell
CRI	Colour Rendering Index	HSCT	Hematopoietic Stem Cell HSP Health Services Plan
CSB	Critical Services Building	HSP	Health Service Plan
DG	Diagnostic Genomics	HTM	Healthcare Technology Management
DHR	Digital Health Record	HVAC	Heating Ventilation and Cooling
DNA	Deoxyribonucleic Acid	ICT	Information Communication Technology
DOSA	Day of Surgery Admission	IHC	Immunohistochemistry
ED	Emergency Department	IPU	Inpatient Unit
EM	Electron Microscopy	IVF	In Vitro Fertilization
ERCP	Endoscopic Retrograde Cholangiopancreatography	LIS	Laboratory Information System

LN2	Liquid Nitrogen	POCT	Point of Care Testing
MALDI	Matrix-Assisted Laser Desorption/ Ionisation	PPE	Personal Protection Equipment
MALDI-TOF	Matrix-Assisted Laser Desorption/ Ionisation – Time Of Flight	PPMS	Peri-Natal Post-Mortem Service
MDT	Multi-Disciplinary Team	RBC	Red Blood Cell
MHSSU	Mental Health Short Stay Unit	RCPA	Royal College of Pathologists of Australasia
NAT	Nucleic Acid Test	RSI	Repetitive Strain Injury
NATA	National Association of Testing Authorities	SNP	Special Nucleotide Polymorphism
NGS	New Generation Sequencing	SoA	Schedule of Accommodation
NPAAC	National Pathology Accreditation Advisory Committee	SOP	Standard Operating Procedures
NSW	New South Wales	SQM	Square Meter
OBGYN	Obstetrician and Gynaecologist	SSBA	Security Sensitive Biological Agent
OPU	Outpatient Unit	TLA	Total Laboratory Automation
PC2	Physical Containment Level 2	UCH	University of Canberra Hospital
PC3	Physical Containment Level 3	UPS	Uninterruptible Power Source
PCR	Polymerase Chain Reaction	UV	Ultraviolet
PEG	Percutaneous Endoscopic Gastrostomy	VMO	Visiting Medical Officers
POC	Points of Care	VOC	Volatile Organic Compounds
		WSI	Whole Slide Imaging
		WYC	Women Youth and Children

1. Overview

1.1. BACKGROUND

Canberra Hospital (CH) is the main tertiary hospital for the Australian Capital Territory (ACT) and for South-Eastern parts of rural NSW. CH is a 600-bed hospital providing trauma services and most major medical and surgical sub-specialty services.

Considerable capital redevelopment is underway, with the current construction of a new Critical Services Building (CSB) in Building 5 (Phase 1) and planning underway for Phase 2 of the redevelopment, which is the focus of this Functional Design Brief (FDB).

1.2. PURPOSE

This FDB for Phase 2 Redevelopment focuses on all services that are planned to be relocated to the new Building 6, namely:

- Pathology;
- Procedural Suites, including endoscopy, bronchoscopy, and fluoroscopy;
- Gastroenterology and Hepatology Unit (GEHU) Outpatients;
- Pre-admission Clinic and Surgical Bookings;
- Pharmacy;
- Staff Administration;
- Mental Health Short Stay Unit (MHSSU);
- Learning and Teaching;
- Research;
- Front of House (FOH) for Building 6; and
- Back of House (BOH) for Building 6.

This FDB translates the Service Model into design requirements, which in turn will inform the architect's concept designs, and eventually – business case.

This document describes the functions, operational requirements, design elements, and defines important relationships and adjacencies for each service (listed above) as described in the *Canberra Hospital Surgical Specialities Service Model*, *Canberra Hospital Medical Specialities Service Model*, *Canberra Hospital Pathology Service Model*, and the *Canberra Hospital Clinical Support Services Service Model*.

The existing points of care (POC) will be transitioned into the Phase 2 Redevelopment in a like-for-like functional capacity, adopting contemporary standards according to the Australasian Health Facility Guidelines (AusHFG)¹ and considering efficient configuration of POC.

There is an additional FDB for Phase 2 Redevelopment that is separately provided for the new Building 10, which incorporates medical and surgical inpatient services, medical and surgical outpatient services (except GEHU outpatients), sleep disorders unit, discharge/transit lounge, hospital in the home, dialysis, perioperative services (i.e. women youth and children

1. Australasian Health Facility Guidelines, updated 2023. Available: <https://healthfacilityguidelines.com.au/>

obstetric theatres), medical imaging (Core Medical Imaging for CH), staff administration (for Building 6 related functions), Building 10 BOH and Building 10 BOH.

1.3. APPROACH

This FDB has been developed in partnership with the Canberra Health Services (CHS) Clinical Liaison and Health Facility Planning team in the Capital Project Delivery, Infrastructure and Health Support Services Division.

1.4. OVERALL POINTS OF CARE

A POC breakdown for all services in new Building 6 is in Table 1-1 below:

Table 1-1: Canberra Hospital Phase 2 Redevelopment New Building 6 POC Summary

Outpatient Specialty Service	POC (Phase 2 Redevelopment)
Endoscopy	
Bronchoscopy Procedure Room	2
Endoscopy Procedure Rooms	5
Fluoroscopy Room	1
Stage 1 Recovery Bays	8
Stage 2 Recovery Bays	10
Endoscopy Total	26
Outpatient Units	
GEHU Outpatients	14
Pre-admission Clinic and Surgical Bookings	8
Outpatient Unit (OPU) Total	22
Mental Health Short Stay Unit	
Mental Health Short Stay Unit Total	12
Clinical Support Services	
Pathology	7
Pharmacy	4
Clinical Support Services Total	11
Total POC (Building 6) = 71	

1.5. FUNCTIONAL RELATIONSHIPS

The functional relationships for Canberra Hospital Phase 2 of the redevelopment, are outlined in Figure 1-1 below.

The relative importance of functional relationships between departments is provided in the matrix in Figure 1-2.

The most important functional adjacencies for the Phase 2 redevelopment include:

- Inpatient Units (IPUs) – medical and surgical, in the same building (Building 10);
- Outpatients in the same building as the respective IPUs;
- Medical Imaging easily accessible to inpatients and outpatients;
- Pharmacy in the same building as Pathology to enable synergy in relation to the set-up of pneumatic tubes;
- Outpatients accessible to carparking;
- Obstetric theatres directly adjacent to the birthing suite in B11;
- Endoscopy easily accessible to the operating theatres in B5; and
- Administration for B5 clinical services to be located in B6.

Figure 1-1: Complete Functional Adjacencies, Phase 2 redevelopment

Relationship Matrix 22.08.2023																												
Building 5					Clinical Support					Inpatients										Outpatients				Tt&R		WYC		
Emergency Department	B5 Med Imaging	Critical Care (ICU/CCU)	Operating Theatres/Cath Lab	Sterilisation Services	Medical Imaging - New Core	Pathology	Pharmacy	Health Information Services	Cardiology Diagnostics	Specialist Medicine	MAPU	Palliative Care	Day Medical Unit	Addiction Medicine	Specialist Surgery	Day Surgery Unit	Endoscopy	Mental Health SSU	HITH	Medical Outpatients	Cardiology/Cardiothoracic Outpatients	Surgical Outpatients	Interventional Radiology	Addiction Medicine Outpatients	Learning & Teaching	Research		
	x	1	1	1	5	5	5	5	5	4	4	5	5	5	4	5	5	2	5	5	5	5	5	5				
	x	1	1	5	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5				
		x	1	5	5	5	5	4	3	3	3	3	3	5	5	3	5	5	5	5	5	5	5	5	5			
			x	1	5	5	5	5	5	5	3	3	3	5	5	3	4	4	5	5	5	5	5	5	5	5		
Building 5	Emergency Department	B5 Med Imaging	Critical Care (ICU/CCU)	Operating Theatres/Cath Lab	Sterilisation Services	Medical Imaging - New Core	Pathology	Pharmacy	Health Information Services	Cardiology Diagnostics	Specialist Medicine	MAPU	Palliative Care	Day Medical Unit	Addiction Medicine	Specialist Surgery	Day Surgery Unit	Endoscopy	Mental Health SSU	HITH	Medical Outpatients	Cardiology/Cardiothoracic Outpatients	Surgical Outpatients	Interventional Radiology	Addiction Medicine Outpatients	Learning & Teaching	Research	
	x	1	1	1	5	5	5	5	5	5	4	4	5	5	5	4	5	5	2	5	5	5	5	5	5			
	x	1	1	5	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5			
		x	1	5	5	5	5	5	4	3	3	3	3	5	5	3	5	5	5	5	5	5	5	5	5	5		
			x	1	5	5	5	5	5	5	3	3	3	5	5	3	4	4	5	5	5	5	5	5	5	5	5	
Clinical Support	Medical Imaging - New Core MI	Pathology	Pharmacy	Health Information Services	Cardiology Diagnostics	Specialist Medicine	MAPU	Palliative Care	Day Medical Unit	Addiction Medicine	Specialist Surgery	Day Surgery Unit	Endoscopy	Mental Health SSU	HITH	Medical Outpatients	Cardiology/Cardiothoracic Outpatients	Surgical Outpatients	Interventional Radiology	Addiction Medicine Outpatients	Learning & Teaching	Research	WYC Emergency Caesarean Theatres	WYC				
Inpatients	Specialist Medicine	MAPU	Palliative Care	Day Medical Unit	Addiction Medicine	Specialist Surgery	Day Surgery Unit	Endoscopy	Mental Health SSU	HITH	Medical Outpatients	Cardiology/Cardiothoracic Outpatients	Surgical Outpatients	Interventional Radiology	Addiction Medicine Outpatients	Learning & Teaching	Research	WYC Emergency Caesarean Theatres	WYC									
	x	1	1	2	5	4	4	5	5	2	3	3	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
	x	1	1	2	5	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
	x	1	1	2	5	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
	x	1	1	2	5	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
Outpatients	Medical Outpatients	Cardiology/Cardiothoracic Outpatients	Surgical Outpatients	Interventional Radiology	Addiction Medicine Outpatients	Learning & Teaching	Research	WYC Emergency Caesarean Theatres	WYC																			
Tt&R	Emergency Caesarean Theatres	Learning and Teaching	Research	WYC Emergency Caesarean Theatres	WYC																							
WYC	Emergency Caesarean Theatres	Learning and Teaching	Research	WYC Emergency Caesarean Theatres	WYC																							

Legend
 1 Directly adjacent (Horizontal / Vertical)
 2 Easily accessible (less than 3 minutes)
 3 Accessible 3 to 5 minutes
 4 Accessible 6 to 10 minutes
 5 Accessible 10 minutes plus

Adjacency is with WYC Birthing Suite

Figure 1-2: Functional Relationships Adjacency Matrix for Medical IPUs and Outpatients

Relationship Matrix	Medical Imaging - building 5	Pathology	Pharmacy	Health Information Services	Cardiology Diagnostics	Dermatology	Respiratory and Sleep	Infectious Diseases	Endocrinology and Diabetes	Gastroenterology	Hepatology	Palliative Care	Renal Medicine (incl Dialysis)	Rheumatology	Neurology and Stroke	General Medicine	Day Medical (& HITH)	Addition Medicine	Clinical Trials	General Surgery	Endoscopy	Orthopaedics	Ophthalmology	Otolaryngology Head and Neck	Maxillofacial surgery	Mental Health Short Stay Unit	Plastic Surgery	Outpatient clinics (med and surg)	Teaching, training and research
Medical Imaging - New Core In-Scope MI	3																												
Pathology		x																											
Pharmacy			x																										
Health Information Services				x																									
Cardiology Diagnostics					x																								
Dermatology						x																							
Respiratory and Sleep							x																						
Infectious Diseases								x																					
Endocrinology and Diabetes									x																				
Gastroenterology										x																			
Hepatology											x																		
Palliative Care												x																	
Renal Medicine (incl Haemodialysis)													x																
Rheumatology														x															
Neurology and Stroke															x														
General Medicine																x													
Day Medical (& HITH)																	x												
Clinical Trials																		x											
General Surgery																			x										
Endoscopy																				x									
Orthopaedics																					x								
Ophthalmology																						x							
Otolaryngology Head and Neck																							x						
Maxillofacial surgery																								x					
Mental Health Short Stay Unit																									1				
Plastic Surgery																										x			
Outpatient clinics (med and surg)																											x		
Teaching, Training and Research																												x	

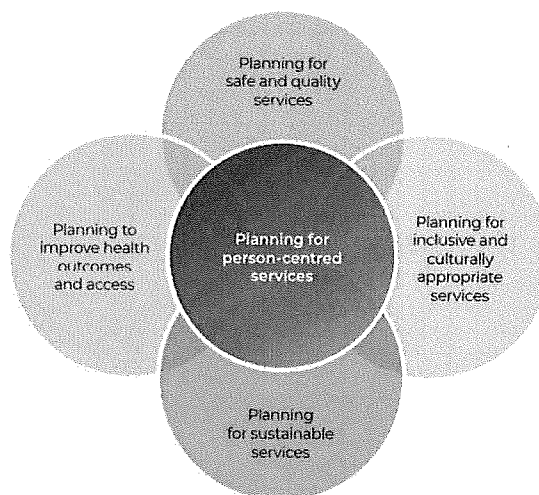
Legend 1 directly adjacent (Horizontal / Vertical) 2 easily accessible (less than 3 minutes) 3 accessible (3 - 5 minutes)

2. Context

2.1. ACT PLANNING PRINCIPLES

The following principles underpin the ACT Health Services Plan 2022-2030². These principles also accord with the development of the previously developed Medicine Service Model.

Figure 2-1: ACT Health Service Planning Principles



Person-centred services - The ACT Government consults with consumer and carers so that services are planned to treat consumers with dignity and respect; the ACT Government makes it easier for people to access services equitably, to move between services across the health system, and to partner with health professionals to participate in decisions about the services provided to them.

Inclusive and culturally appropriate services - The ACT Government consults with groups underrepresented in the healthcare system so that services are planned to be inclusive and culturally appropriate and targeted to specific health needs where necessary.

Safe and quality services - Planning is guided by evidence-informed policy directions, and the ACT Government continually strives to plan for services that improve health outcomes, experiences of receiving care, experiences of providing care, and effectiveness and efficiency of care.

Health outcomes and access - Planning is guided by evidence-informed policy directions, with specific focus on at-risk and priority population groups, planning the right service, at the right time, in the right place, by the right team, every time.

Sustainable services - The ACT Government maximises the use and efficient allocation of limited resources by taking a Territory-wide approach to planning services across the ACT public health system, guided by clear role delineations, service levels, and evidence informed policy directions: service planning activities are prioritised based on need.

2. ACT Government, Health, *ACT Health Services Plan 2022-2030*, available <https://www.health.act.gov.au/about-our-health-system/planning-future/act-health-services-plan-2022-2030#:~:text=The%20ACT's%20population%20is%20growing,and%20effective%20care%20for%20everyone.>

2.2. CANBERRA HEALTH SERVICE VISION AND SERVICE DIRECTION

CHS' vision is to **'Create exceptional health care together'**. Improving the quality of healthcare across the ACT is a key priority for CHS as it aims to be the safest healthcare system in Australia, delivering high-quality, person-centred care that is effective and efficient.

Specifically, CHS will provide health care that is:

- Person-centred: providing care that is respectful, responsive, and focused on the patient's needs;
- Safe: avoiding harm to patients from care that is intended to help them;
- Effective: providing services based on scientific knowledge and which produce a clear benefit;
- Timely: reducing waits and sometimes harmful delays;
- Efficient: avoiding waste and reducing unit costs; and
- Equitable: providing care based on clinical need, and that does not vary in quality because of a person's personal circumstances.

2.2.1. Consumer Principles

A fundamental component of patient-centred care is recognising and understanding the consumer perspective of the service. Central to patient-centred care are the themes of Participation, Communication, Experience and Support. These themes form the basis for Consumer Care Principles, the guiding principles for this FDB. The Consumer Care Principles are:

- Participation: consumers (and where appropriate their family members and carers) will be equal partners within the multidisciplinary care team, enabling them to be actively involved in their own care;
- Communication: embedding frequent and meaningful communication with consumers, their family members, and carers, about their care for their entire hospital journey, including discharge;
- Experience: care is delivered in a way that supports the consumers' experience of safety and fosters trust; and
- Support: recognising the importance of involving family and carers in the consumer's care and recovery throughout their health journey.

2.2.2. CHS Future Directions

CHS' future service directions are set out in the *ACT Health Services Plan, 2022–2030*.³ The desired outcomes from each of the directions are also articulated. These are outlined below.

Addressing key areas of service demand and reform

- Improve health outcomes and access to care, with a particular focus on priority population groups.
- Support access to the services experiencing most significant demand pressures.
- Ensure our services are flexible and inclusive to respond to individual needs and circumstances.

3. ACT Government, Health, *ACT Health Services Plan 2022-2030*, available <https://www.health.act.gov.au/about-our-health-system/planning-future/act-health-services-plan-2022-2030#:~:text=The%20ACT's%20population%20is%20growing,and%20effective%20care%20for%20everyone.>

Transitions of care

- Improve health outcomes and access to care.
- Make it easier for patients, families, and service providers to navigate the service system.
- Address issues of patients 'falling through the gaps' as they move between services and care settings such as between hospital and the community.
- Break down the barriers and silos between services.

The ACT's role as a local, Territory and regional service provider

- Improve access to care closer to home in a safe and sustainable way.
- Reduce unwarranted variation between services.
- Maximise the efficient use of health resources to meet the needs of the community.

Strengthening core ACT Government funded clinical support services

- Improve patient outcomes and reduce length of stay in hospital.
- Ensure that our clinical support services have the appropriate capacity and capability to support new and expanded clinical services.
- Optimise clinical decision making in determining the most appropriate treatment and care for patients.

2.2.3. Learning, Teaching and Research

CHS' *Clinical Learning and Teaching Strategy 2023 – 2027*⁴ provides the overarching vision, goals and strategic commitments to clinical learning and teaching. The six Strategic Commitments are:

- Strengthen governance and processes to prioritise and enable learning and teaching.
- Prepare and support the clinical workforce to work safely and effectively at the leading edge of their practice.
- Develop and support the clinical workforce to deliver effective, innovative, evidence-based teaching and point of care clinical supervision.
- Establish collaborative environments that maximise and enable effective, innovative, and efficient learning and teaching.
- Foster and strengthen strategic partnerships for learning and teaching with clinicians, consumers and carers, communities, and academia.
- Promote, share, and celebrate learning and teaching.

To achieve these strategic commitments, and to develop a contemporary health precinct, a holistic approach to integrated education, training and research activities into the clinical areas will be key. For clinicians, access to teaching and learning will be built into the flow of their day. This means rooms available on each unit or a shared area readily accessible to clinical (patient) areas, as well as the necessary audiovisual equipment to record and transmit the education and training. To complement the integrated clinical spaces, a teaching and learning hub would provide greater opportunities for education.

Refer to the Clinical Support Service Model for more information on Learning, Teaching and Research.

4. ACT Government, *Clinical Learning and Teaching Strategy 2023 – 2027*. Available: https://www.canberrahealthservices.act.gov.au/_data/assets/pdf_file/0012/2222040/69e04bc4df49dfd4a9ff49375fe0a3bcfd9dd628.pdf

2.3. OVERARCHING DRIVERS FOR CHANGE

The above strategic and policy positions articulated by ACT Health and CHS are underpinned by a range of drivers for change. The Territory, like other jurisdictions, are facing increasing challenges that are forcing changes in the way people seek and access services. Some of these challenges which are driving change are described below.

The ACT Health Services Plan (2022 to 2030) provides context within which the FDB needs to be considered. The *ACT Health Services Plan* indicates that the Territory's population increased by 14% between 2016-2021 and is projected to increase by 9.7% over the decade to 2030. It is also ageing with those in the 70+ age category increased 34% between 2016-21 and is forecast to rise a further 22.7% by 2030, more than doubling the growth rate for the total population. In addition to population growth and ageing, there are important factors that drive change for the Territory:

Ageing population and increasing chronic disease – the demand for health services is increasing as people live longer with more chronic and multi-morbid conditions. The aged population are high users of health services;

Access for vulnerable population groups – some population groups in Australia experience health inequalities. Aboriginal and Torres Strait Islanders and people from low socioeconomic areas are likely to have poorer health compared to the general population;

Increasing service demand – for planned and emergency surgery, chronic disease, cancer services, and mental health. These have been exacerbated due to the COVID-19 pandemic;

Climate change – has been causing more extreme weather events, such as bushfires and floods. Instances of heat stress, smoke inhalation, food insecurity, and mental health and wellbeing issues are increased for people experiencing extreme weather events; and

COVID-19 – the delivery of healthcare has rapidly changed since the beginning of the COVID-19 pandemic, especially in terms of how and where care is delivered, with a virtual and care closer to home becoming the norm. COVID-19 patients have caused greater pressure on health system capacity, especially in general IPUs and for multidisciplinary teams treating people experiencing the effects of 'long COVID'. Additionally, workforce availability has been significantly impacted, with burnt out staff choosing to leave their professions and with the usual immigrant workforces being unavailable.

3. Design principles of the patient environment

This section outlines the facility wide design principles. Design elements that are specific to specialties are identified in the relevant sections.

3.1. OUTPATIENT CLINICS

The overarching planning principles for outpatient clinics are derived from the AusHFG for Ambulatory Care and Community Health - HPU 0155.⁵

The outpatient clinics in B6 are pre-admission clinic & surgical bookings and GEHU outpatients. This provides close access to the gastroenterologists working in the endoscopy suites in B6. The remaining outpatient clinics are located in B10.

Patient drop-off zones should be present to enable easy patient access.

The outpatient services require:

- Reception / Waiting area(s);
- Consumer amenities (for example public toilets);
- Patient areas with consult, interview, and treatment rooms, and patient toilets, and height/weight bays;
- Clinical support services including clean and dirty utility rooms and general stores;
- Staff areas, including offices, workstations, meeting rooms, file stores, photocopy stores beverage bays, staff rooms, property bays and staff toilets; and
- Potentially, learning and teaching spaces.

Clinical Support Services such as pathology collection, medical imaging and pharmacy should also be accessible to the outpatient service.

Configuration

The reception / waiting area is the main visitor entry point to the unit. This should be well sign-posted to assist with wayfinding.

The reception should oversee the waiting area and should control access to the patient treatment areas.

Seating in waiting areas should be arranged to allow for separation of groups in an informal way. Rows of seating should be avoided. Views to nature or televisions should be provided for entertainment. Seating should also consider the needs of elderly, children, bariatric patients, and those with a disability.

Standardised rooms may include consult rooms supported by interview rooms and/or treatment rooms.

5. Australasian Health Facility Guidelines, HPU 0155 Ambulatory Care and Community Health. Revision 7.0. Date published: September 2020. Available: https://aushfg-prod-com-au.s3.amazonaws.com/HPU_B.0155_7%202.pdf

3.2. ALLIED HEALTH

Allied Health professionals are integral to the multidisciplinary care of outpatients.

A multi-purpose gymnasium will also be available for therapy with Allied Health practitioners, focusing on mobility, strength, and activities of daily living.

Sufficient space is required for safe assessment of mobilisation and activities of daily living, including stairs. Depending on the service mix, a shared therapy unit may be required with plinths and therapy tables, interview rooms, large storage areas for equipment and mobility aids, and a larger therapy area. Many patients attending allied health therapy are physically incapacitated to some extent, and areas are required to accommodate patients using walkers, wheelchairs, and motorised scooters.

3.3. ELDERLY PATIENTS

The elderly population often present with multiple comorbidities and frailty. Services should support the maintenance and restoration of these patients. Spaces for assessment, such as cognitive assessment, and in-unit therapy is important. They can also be prone to falls, therefore, non-slip surfaces should be considered for all patient areas, hi-lo beds should be available for patients who are at risk of falling, and consideration could also be made to having bed alarms installed.

Access close to where patients are being treated is also important for those who are non-ambulant. Patient drop-off zones in front of buildings will be important, as well as consideration of additional building entrances, especially for day-stay services.

3.4. FAMILY / CARERS

Family and carers who are visiting, or staying overnight with patients, will require a fold out chair to bed in the patient's room, somewhere to sit away from the unit, a quiet room for groups of relatives, a beverage bay and access to bathroom facilities. Interview rooms need to be available for private family meetings.

An environment that is considerate of patients and families from culturally and linguistically diverse backgrounds, including Aboriginal and Torres Strait Islander people, is an important consideration. A multi-faith spaces need to be available on the campus.

3.5. BARIATRIC PATIENTS

A patient would be considered a bariatric patient if they weigh over 150kgs, whilst super bariatric patients are those that weigh 250kg to 400kgs. In the procedural suites and the outpatient areas, the equipment to support safe staff handling of bariatric and super bariatric patients will include ceiling mounted hoists, and either floor scales long enough to take the bed, or specialised beds with built-in scales.

Areas accommodating bariatric or super bariatric patients will need to have provision for wider doorways, larger space for turning, lift access and the storage of beds, electric bed movers, chairs, and wheelchairs.

Sufficient storage space is required for all bariatric equipment.

3.6. PATIENTS WITH BEHAVIOURS OF CONCERN

As in many other health services across Australia, CHS has experienced an increase in the number of incidents of violence directed to staff by patients, consumers, and visitors. The design of the built environment is important to minimise the risk of occupational violence and aggression occurring. Specifically, the design should incorporate:

- Low stimulation rooms;
- Comprehensive CCTV;
- Access controls and duress alarms (fixed and mobile);
- Dual egress in a proportion of clinical consultation rooms and interview rooms;
- Line of sight from nurse's stations to the rooms allocated with higher-risk patients;
- Reception in waiting areas; and
- Interview rooms to undertake screening.

3.7. STAFF

Staff require secure areas and amenities that are not accessible to patients. Staff also require offices and workstations within clinical zones. Meeting or education rooms, staff rooms with kitchenettes and handover rooms are also required.

The number of offices, workstations, break-out bays, and meeting rooms are outlined in the Schedule of Accommodation. The allocation of work areas is based on:

- Activity based working environment aligned with contemporary workplace design standards;
- The number of staff on-site who require a desk space, but do not have either a permanent or workflow related place within a department;
- Shared Meeting Rooms;
- Future COVID working arrangements; and
- Whole of facility shared functions (staff tea rooms, toilets, showers, and end of trip facilities).

Staff offices/workspaces should:

- Collocate workspaces for related services, where possible. Support areas such as tutorial rooms, beverage areas, central printing, and staff toilets should be shared, when office spaces are collocated;
- Collocation should consider identifying and grouping staff and services who might be handling similar confidential information, and should also consider the acoustics and noise levels within shared workspaces;
- Include activity-based workstations that are flexibly designed, reflecting changing patterns of work including employment hours, type of work undertaken, job share and multi-site appointments;
- Small meeting rooms for private meetings / confidential conversations;
- Support increased collaboration between health professionals and a focus on multidisciplinary teamwork, including integration, collaboration, and multidisciplinary interaction;
- Be easy to reconfigure to meet changing needs;
- Ensure adequate storage space for both work related and employee personal items; and

- Include staff only, 'patient free' break out areas, providing a sanctuary away from the work environment.

The area allocations will be consistent with the CHS Staff Accommodation Policy.

The specific configuration of staff and skills mix for the services provided in B6 will be determined closer to the commencement of the services through the development of a comprehensive workforce strategy. General workforce requirements are outlined below.

Medical staff:

Full-time staff or Visiting Medical Officers, Fellows, Registers and Residents will typically carry out day-to-day management of patients.

Nursing staff:

As per a Level 5/6 Clinical services there are specific requirements for the nursing workforce in relation to skill mix, clinical supervision, education, and expertise. Workforce and skill level of the nurses required to provided day to day care should be based on the patient number and care acuity within each unit and adhere to the minimum Nursing Hours per Patient Day as set out in the ACT Public Sector Nursing and Midwifery Enterprise Agreement and ACORN standards. Roles include Registered Nurses, Enrolled Nurses, and Assistants in Nursing.

Allied Health professionals:

The range of allied health professionals may include but not be limited to: Pharmacists, Physiotherapists, Occupational therapists, Social Workers, Speech Pathologists, Medical Physicists and Allied Health assistants.

Executive and Administrative staff:

Clinical support staff consisting of Medical, Nursing, Allied Health positions in managerial roles who are closely integrated with service provision and clinical day-to day activities. Administrative staff vary from clerical to managerial roles.

Clinical and non-clinical support staff:

Clinical support persons will assist with service operations and patient flow such as manual handling, patient transfers, medical equipment and imprest supply management, cleaning, waste management and specimen couriers.

Refer to Section 14 for the design principles of all Front of House areas, and to Section 15 for Back of House services.

4. Surgery Classification

Although surgery is a relatively small component of the relocating services (endoscopy is the only surgical service relocating to B6), the classification of the surgery influences the patient pathway, and therefore capacity and supporting allied health functions.

Surgery may be classified as planned, emergency, or other surgery. Planned surgery can be booked in advance. A GP will refer a patient to a surgeon who will determine whether a patient requires planned surgery, and then place the patient on the Planned Surgery Waiting List.

People on the Planned Surgery Waiting List will be assigned an urgency category (1, 2 or 3) depending on the seriousness of their condition. These are defined as:⁶

- Category 1: Procedures that are clinically indicated within 30 days.
- Category 2: Procedures that are clinically indicated within 90 days.
- Category 3: Procedures that are clinically indicated within 365 days.

Emergency surgery is required to treat trauma or acute illness after a presentation at the emergency department (ED) or by helicopter transfer. Surgery may be required immediately, or later. Emergency surgery also includes unplanned surgery if someone on the Planned Surgery Waiting List has deteriorated in condition.⁷

Surgery takes place in Building 5, with the exception of the endoscopy suites in new Building 6 (as detailed below) and the WYC obstetric theatres in B10 (as detailed in the B10 FDB).

6. ACT Government, Health, *Waiting Time, and Elective Surgery Access Policy: Managing Elective Surgery patients in ACT public Hospitals*, July 2016. Available: <https://health.act.gov.au/sites/default/files/2019-02/Waiting%20Time%20and%20Elective%20Surgery%20Access%20Policy.docx>

7. ACT Government, Health, *Waiting Time and Elective Surgery Access Policy: Managing Elective Surgery patients in ACT public Hospitals*, July 2016. Available: <https://health.act.gov.au/sites/default/files/2019-02/Waiting%20Time%20and%20Elective%20Surgery%20Access%20Policy.docx>

5. Gastroenterology and Hepatology

The *Gastroenterology and Hepatology unit (GEHU)* will perform endoscopies and outpatient services.⁸ Endoscopy is used for screening and treating disease. The endoscopy procedures include:

- Gastroscopy - an endoscope (a long, thin flexible tube with a video camera at the tip) is passed through the mouth, the oesophagus, the stomach and the first part of the small bowel.
- Colonoscopy – an endoscope is passed through the rectum, the large bowel and part of the small bowel.
- Flexible sigmoidoscopy - an endoscope is passed through the rectum and the lower part of the large bowel.
- Endoscopic Retrograde Cholangial-Pancreatography (ERCP) - an endoscope is passed through the mouth, the oesophagus, the stomach and the first part of the small intestine where the bile duct and pancreatic duct connect.
- Endoscopic Ultrasound (EUS) – a special endoscope with a built-in ultrasound probe is passed through the mouth, the oesophagus, the stomach and the first part of the small bowel. It can be used to help diagnose certain conditions.
- Percutaneous Endoscopic Gastrostomy (PEG) insertion, replacement and trouble shooting. A PEG tube is a feeding tube that goes through the abdominal wall and into the stomach.
- Fibroscan - a scan that measures the stiffness of the Liver.
- Ascitic taps.

There are also two Bronchoscopy suites in which endobronchial ultrasound, radial probe and endobronchial ultrasound will be performed. There is also one fluoroscopy suite. All these procedures would typically be undertaken as day procedures.

The GEHU outpatient clinics will be collocated or proximal to the procedural suites and provide care for people with problems with the liver, people who have Inflammatory Bowel Disease, pancreato-biliary disorders, and post-procedural patients. The main functions of the outpatient clinics are:

- Specialist consultation and examination;
- Clinics for patients with hepatitis, liver disease, inflammatory bowel disease, inherited gastrointestinal cancer and complex gastrointestinal disorders;
- Support and follow up for participants in the National Bowel Cancer Screening Program;
- Endoscopic service (gastroscopy, colonoscopy), colon cancer screening, GI bleeding, and interventional endoscopy for early gastrointestinal cancers (*refer to the Surgical Service Model for more information*);
- Endoscopic ultrasound and ERCP for examination of the duodenum (beginning of small bowel), gallbladder, liver, and pancreas for the selection of patients for day case treatment or in-patient procedures;
- Pre-operative / procedural assessment;
- Follow up and monitoring the condition of patients after day case procedures; and

8. Victoria State Government Department of Health and General Surgeons Australia, Better Health Channel, *Endoscopy*, updated 2014. Available: <https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/endoscopy>

- Discharging patients from the care of the hospital with referral, if necessary, to other health care providers.

5.1. SPECIFIC DESIGN REQUIREMENTS

The Endoscopy suites are based on the AusHFG HPU B.0270 Day Surgery / Procedure Unit and the HPU 0190 – Sterilising Services and Endoscope Reprocessing Unit. There are several functional zones within the unit, as described below.

5.1.1. Main entry, admissions and waiting area

On the day of surgery, patients will be clerically and clinically admitted via a Day of Surgery Admission (DOSA). Facilities will include a reception, waiting area, interview/consultation rooms, and change areas (including toilets) for patients to change out of their street clothes and into a hospital gown.

Patients then proceed to the anaesthetic prep room. Ambulant patients will be walked, and a wheelchair / trolley will be provided to those who require additional support.

Procedural preparation within the anaesthetic prep room will involve assessment by an anaesthetist and the proceduralist. Anaesthesia for the procedure may be local, regional, conscious sedation or general anaesthesia. All procedure rooms should be capable of supporting patients having a range of anaesthesia.

The unit will provide visual and acoustic privacy between clerical / waiting, pre-surgical and family waiting zones.

5.1.2. Procedure rooms

There will be seven procedure rooms, with five for endoscopy and two for Bronchoscopy (which will be used by Respiratory physicians, noting one of the two bronchoscopy procedure rooms will be negative pressured). There will also be one fluoroscopy room which will be shielded. Each procedure room will require a standard design meeting the requirements of the AusHFG. A standard design will allow for future flexibility in function for each room. Each procedure room will require specialist air handling, provision of contemporary surgical and anaesthetic pendants and access to surgical gases and air.

The procedure rooms will be supported by shared Sterile Stock and a scrub-up room. An Endoscopy Reprocessing area will also be adjacent to the procedure rooms which will allow rapid reprocessing of equipment. The reprocessing area will have:

- A clean-up room for high level disinfection;
- A dirty reprocessing room where scopes are received, leak tested and manually pre-cleaned in a height adjustable cleaning sink, prior to loading into a pass-through automated endoscope reprocessor (AFER);
- A clean room where processed scopes are unloaded from the AFER and stored in a Controlled Environment Endoscope Storage Cabinet, or an equivalent system; and
- A chemical store.

A general guide is that one procedure room will require the capacity to process at least two endoscopes at a time and requires storage sufficient to accommodate the number of endoscopes in the fleet. This will vary based on projected caseload, with the expected caseload being 10,000 to 12,000 procedures per year.

There should be a linkway connecting the rear of B5 to endoscopy in B6 to enable fast transfer of emergency cases to theatre, and for the rapid response of additional anaesthetists or proceduralists to the endoscopy suites when required.

5.1.3. Recovery

Following the procedure, the recovery stages used will routinely include:

- Stage 1 recovery is a dedicated area where post-procedure patients are recovered from anaesthesia under 1:1 supervision.
- Combined Stage 2 recovery is used to manage patients who are transferred from Stage 1, or those patients who have had little or no sedation and bypass Stage 1 recovery.

Patients return to their IPU from Stage 1 or are discharged home from Stage 2.

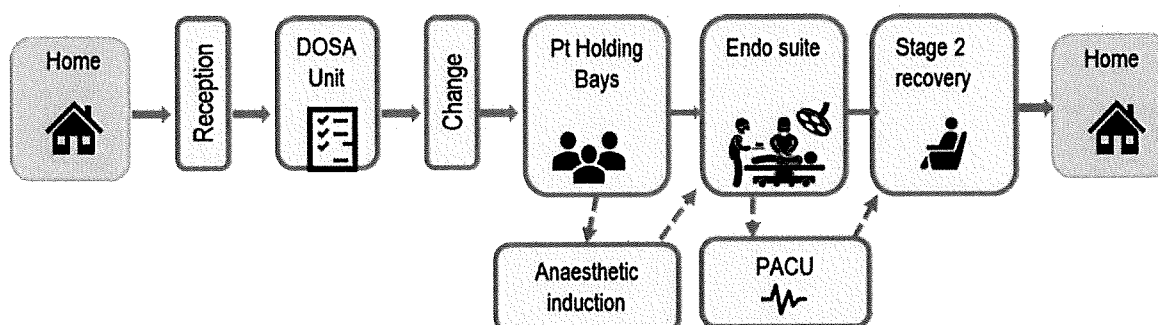
5.2. OPERATIONAL MANAGEMENT

5.2.1. Hours of operation

The GEHU outpatient and procedural service routinely operates Monday to Friday from 09:00am - 5:00pm for outpatient clinics and from 06:30am to admit and prepare procedural patients. Procedure lists will generally be conducted between 08:00am and 5:00pm. Patient recovery services might extend to 9:00pm at night.

5.2.2. Patient pathway

The patient pathway for endoscopy / bronchoscopy is outlined below.



5.2.3. Clinical support services

Clinical support services for the Phase 2 redevelopment incorporates the following services, which are split between the two new buildings (building 6 and building 10):

- Pharmacy;
- Medical Imaging;

- Pathology;
- Health Information Services;
- Learning and Teaching; and
- Research.

Pathology, Learning & Teaching and Research are relevant for building 6, and will be detailed in section 7 11 and 12 of this document. Remaining clinical support services will be detailed in a separate FDB (for building 10).

Refer to Sections 14 and 14 for Front of House and Back of House Services.

5.2.4. Family and carer support

Refer to Section 3.4 for the general requirements for family and carer support.

5.2.5. Staff support

Refer to Section 3.7 for the general requirements for staff.

In the Endoscopy / Bronchoscopy suite there is also a requirement for male/female change rooms which will include toilets, showers, and lockers; a staff room; a meeting / tutorial room; and staff work areas to support the service. Staff work areas will need to consider training and education requirements.

5.3. FUNCTIONAL CONTENT

The GEHU procedure unit has 32 POC, including recovery. There are also 14 outpatient clinic spaces.

6. Pre-admission Clinic and Surgical Bookings

6.1. DESCRIPTION OF SERVICE

Pre-Admission Clinic is an ambulatory space for the assessment of a patient's suitability for surgery, and the key risks that CH would anticipate for patients. The Service Model at CH is that all planned surgical admissions will attend a preadmission appointment prior to the surgery date.

Surgical bookings manage all planned surgery bookings and is the best point of contact if a patient's condition has changed or if they are no longer ready for surgery. Surgical bookings are an administrative service.

6.2. SPECIFIC DESIGN REQUIREMENTS

The specific design for pre-admission is for sufficient clinic spaces to undertake efficient assessments by anaesthetists and nurses. The assessment spaces are equivalent to a consultation room in outpatients. Surgical bookings should be collocated with the preadmission clinics.

6.3. OPERATIONAL MANAGEMENT

6.3.1. Hours of operation

The preadmission clinic will operate on certain days of the week, during business hours. Surgical bookings will also operate during business hours.

6.3.2. Patient pathway

As preadmission is an ambulatory service, patients will arrive, have their consultation, and return home.

6.3.3. Clinical support services

Clinical support services for the Phase 2 redevelopment incorporates the following services, which are split between the two new buildings (building 6 and building 10):

- Pharmacy;
- Medical Imaging;
- Pathology;
- Health Information Services;
- Learning and Teaching; and
- Research.

Pathology, Learning & Teaching and Research are relevant for building 6, and will be detailed in section 7 11 and 12 of this document. Remaining clinical support services will be detailed in a separate FDB (for building 10).

Refer to Sections 14 and 16 for Front of House and Back of House Services.

6.3.4. Family and carer support

Refer to Section 3.4 for the general requirements for family and carer support.

6.3.5. Staff support

Refer to Section 3.7 for the general requirements for staff.

6.4. FUNCTIONAL CONTENT

There are 8 POC for preadmission clinics on a like-for-like basis as well as the administrative area for Surgical Bookings.

7. Pathology

7.1. INTRODUCTION

The Phase 2 Redevelopment Project involves developing like-for-like services into new facilities. However, this will not necessarily be like-for-like space for Pathology services, as new evidence, new technologies, changes in clinical practice, more efficient or innovative ways of working may result in contemporary like-for-like services.

These two sections (7 and 8) will include input from ACT Pathology and incorporate key elements of a high-level FDB prepared for ACT Pathology by L2D Architects.

The sections will also describe each of the main pathology services. In doing so, they incorporate the scope and clinical level of service, specimen pathway, functional relationships and adjacencies, integration and work processes necessary for articulating a functional brief.

7.2. CONTEXT

ACT Pathology is expected to continue to operate at the highest clinical level (Level 6) and will also need to operate in a particularly dynamic environment, with important considerations in relation to:

- The inadequacies of the current facility to meet acceptable, contemporary standards;
- Operational efficiency and design considerations to deliver on its core functions; and
- The rapid pace of the convergence and emergence of technologies that will need to be embedded into a future pathology service. Future capacity and capability will be driven by technology developments.

Therefore, this section describes the potential impact of the changes to pathology services that can be expected in the future. *This is a critically important consideration for the FDB as it will underpin ACT Pathology's strategic direction and its propensity to thrive in a dynamic, technology driven environment.*

7.3. OVERARCHING DESIGN ELEMENTS

There are several overarching design elements for pathology. The new facility needs to:

- Incorporate a 'Core Lab' as a major component of the new facility. The Core Lab will be a large open space, highly automated, capable of expansion and can operate 24/7. The Core Lab is designed to be at the heart of the clinical operations for pathology services;
- Incorporate as many diagnostic pathology functions as possible to be on the same floor as the Core Lab to improve coordination and collaboration between specialties, enable the greater use and flexibility of equipment, and reduce unnecessary movement of specimens as well as the need for multiple support facilities. Ideally, the Core Laboratory, Diagnostic Genomics, Microbiology & Molecular Pathology need to be located on the same floor as each other due to the close functional connectivity;
- Designing for the future includes, amongst other things, introducing digital pathology and a prototype laboratory;

- Contemporary overarching design elements that emphasise safety, quality and the value of the workforce; and
- Incorporate support areas, noting the following support functions may be located on a different level to the Core Laboratory if needed:
 - ▶ Pathology Administration (e.g. Exec area, admin support [including AP admin], Quality team, and meeting rooms);
 - ▶ Staff room;
 - ▶ Interaction space – shared space e.g. large screens, microscope teaching. showcase, education;
 - ▶ Training Room/seminar space;
 - ▶ Digital Pathology research space;
 - ▶ Staff utilities e.g. lockers, showers, change rooms;
 - ▶ Pathology reception;
 - ▶ Mortuary;
 - ▶ Pathology Museum;
 - ▶ Collection centre;
 - ▶ Central consumable stored e.g. bulk stores e.g. RT, 4C, -20C, -80C;
 - ▶ Freezer Farm Biobank;
 - ▶ Chemical stores;
 - ▶ Cryogenic processing and storage facility⁹; and
 - ▶ Digital Pathology Support.

A feature of the design is to **maximise the connectivity between functional clinical units**, meaning as many clinical services (that require testing and assessments) being contiguous with each other as possible, ideally over a minimum number of floors without compromising functional capability.

The extent that ACT Pathology is accommodated over multiple levels, is to perpetuate fragmentation and inefficient practices that currently exist. Maximising the area of the 'floor plates' of the new facility footprint will be important to the new site.

7.4. SCHEDULE OF ACCOMMODATION

The areas specified in the schedule of accommodation (SoA) are summarised below. Pathology's FDB and SOA have been based on the assessed area required by L2D Architects, with some adjustments. These areas may be further refined as part of a more detailed examination based on:

- Agreed functions of a contemporary pathology laboratory;
- Building yields and available area; and
- Capital budget.

All of which have the potential to impact the scale of the proposed pathology facility. Therefore, the area requirements for Pathology in this table remain indicative.

The net usable areas for pathology have been grossed up to include internal circulation at different rates, ranging from 20% to 40%, with a total estimated Gross Departmental Area

9. In the event the cryogenics facility is on a different level, specialised considerations for liquid nitrogen supply to lab must be considered when determining location, distance and height from potential liquid nitrogen source vessel as pressure is critical.

(GDA) of 8,355sqm, detailed breakdowns are provided in Table 7-1. The current area for pathology is 6,589 sqm GDA.

Table 7-1: Indicative Area Requirements (Gross Departmental Area in Sqm)

SERVICE TYPE	L2D PROPOSED	PROPOSED	GROSSING (PROPOSED) %
Pathology Administration	612	553	6.6%
Centralised Storage and Support	528	408	4.9%
Digital Informatics	192	36	0.4%
Core Laboratory	2,709	2,523	30.2%
Collections	582	389	4.7%
Anatomical Pathology	1,486	1,603	19.2%
Diagnostic Genomics	871	789	9.4%
Microbiology & Molecular Path	1,538	1,283	15.4%
Pathology Museum	270	0 ¹⁰	0.0%
Mortuary	749	675	8.1%
Autopsy	108	96	1.1%
Total GDA Sqm	9,645	8,355	100.0%

The proposed estimates, although reduced from the L2D estimates, nevertheless include:

- A Core Lab area that can provide for further growth of automation;
- New space for digital informatics, a prototype lab, and interaction spaces;
- Provision for pandemic response;
- Substantially enhanced diagnostic genomics and new DNA amplification spaces; and
- Contemporary laboratory standards, including enhanced Physical Containment Level 2 (PC2) and Physical Containment Level 3 (PC3) facilities, amongst others.

As a frame of reference, if modifications are required to the proposed area below, adjustments would be considered in the following cascading order of importance:

1. Having sufficient space;
2. Core Laboratory, Microbiology & Molecular Pathology, and Diagnostic Genomics collocated on the same floor;
3. Laboratory space takes precedence over administrative space; and
4. Having amenity and support but not as important as all the above.

7.5. PATHOLOGY SERVICES VISION AND DRIVERS FOR CHANGE

ACT Pathology aspires to be a leading tertiary pathology service with a national reputation for excellence.

The environment within which pathology services operate, offer both significant opportunities and challenges in achieving this vision. This is summarised below.

¹⁰. Moved into "Learning and Teaching"

"The next decade will see a profound transformation in Pathology. Several major drivers of change, including total automation, genomics, precision medicine, informatics and digital pathology – as well as a consumer-led revolution in healthcare leadership – are converging to reshape the way that Pathology services are designed, delivered and governed.

This has major implications for ACT Pathology, for Canberra Health Services, and for the community. In particular, the Pathology service model will see a significant shift towards convergent diagnostic technologies, genomics and personalised medicine, digital enablers, a focus on the value of data and shared clinical decision making, collaboration, and consumer-led co-design.

A key challenge is to embrace these new service models, whilst ensuring that we retain our leadership role – our trusted voice - in diagnostic excellence. This is especially true for our leadership and expertise with emerging diseases such as COVID-19, in which the ACT community has placed its trust"¹¹.

In turn, then, designs for a new Pathology building at the Canberra Hospital site must be sufficiently agile to cater for this future. Agility to provide workspaces that support new diagnostic technology and automation, new digital systems and infrastructure, and new ways of working with others – while at the same time supporting modern practices in infectious disease diagnosis and pandemic management to keep the ACT community safe into the future.

Pathology services will operate at the highest level of clinical capability¹² for pathology (Level 6) and service the ACT and south-eastern NSW catchment. ACT Pathology *will continue to offer an extensive range of pathology services, be agile and adjust to new areas of pathology testing regimes, embrace current and emerging opportunities to innovate, and deliver the highest quality across all service types*. As noted, this will include embracing:

- Converging and Emerging Technologies;
- Workforce Co-Design, Flexibility and Planning for Uncertainty;
- Teaching and Research; and
- Consumer and Community Engagement.

7.5.1. Converging Technologies

Laboratory workflows, human tasks and governance are being fundamentally reshaped and standardised; driven by converging technologies. This is the clear trend in the pathology sector and endorsed by ACT Pathology staff¹³.

Manual diagnostic methods are replaced with automation, which improves reliability, reduces and standardises turnaround time, and reduces error. More recently, more radical automation of workflows (such as sample "track" systems) and standardisation of instrumentation and IT connectivity are breaking down traditional laboratory structures and transforming the way that laboratories function.

11. Glenn Edwards, 'Future State Issues Impacting Building Design for Pathology', July 2023, unpublished.

12. NSW Role Delineation of Clinical Services,(2021). The NSW Role Delineation of Clinical Service is used as the default clinical capability framework for NSW, Victoria and ACT, unless there is a specific jurisdictional capability framework

13. Glenn Edwards, op.cit.

This trend is well established in core laboratories such as Chemistry and Haematology. However more and more diagnostic equipment systems in these departments will be connected to automated track systems. This underscores the need for a strict approach to “open plan”, since the expansion plans of many laboratories have been thwarted by under-estimating this requirement, with office and load -bearing structures limited the opportunity for extension of automated tracks. With increased automation comes more sophisticated integrated IT solutions which allows for increased workplace flexibility i.e., scientists can perform extensive work remotely.

Microbiology and Molecular Pathology is also being transformed by automation, which in turn is in part enabled by digital technology (e.g. plate reading via digital images). This trend will continue across all diagnostic areas, and laboratory design must allow for flexibility and expansion within a relatively short period of time.

Thus, laboratory workflows, human tasks and governance are being fundamentally reshaped and standardised. The design of new laboratory spaces is evolving to exploit this convergence of technology and workflow and ensure that the consequent value of these new models can be fully enabled.

7.5.2. Emerging Technologies

Increased application of emerging technologies is particularly relevant to the rapidly developing fields of **genomics** and the broader use of **artificial intelligence** (AI) and digital pathology for diagnosis, and patient treatment/management.

Genomic technologies are evolving to bring new insights into disease and diagnosis – and enabling a new era of personalised medicine. This revolution is still relatively new, and yet laboratories are already evolving the way we work. This includes a much deeper collaboration with clinicians, with consumers and with technology partners. Genomic technologies are also breaking down traditional boundaries within Pathology laboratories, with new collaborations between genomic experts and haematologists, anatomical pathologists, microbiologists, and infectious disease experts – and this collaborative approach is growing, as it makes traditional boundaries within laboratory workplaces increasingly redundant¹⁴.

Digital technologies, using AI, are driving transformation within pathology laboratories, most notably for Whole Slide Imaging (WSI) in Anatomical Pathology, Haematology, Immunology and Diagnostic Genomics, which enables workforce flexibility and greater collaboration with interstate clinical experts. There is now an National Pathology Accreditation Advisory Committee (NPAAC) standard for validating WSI use by Pathologists, and many Australian laboratories are rapidly gearing up for this.

WSI is shaping as a game changer for the workforce shortage in healthcare and pathology, and potentially allowing CHS to provide more effective diagnosis and timely care for people in the ACT and neighbouring regions during workforce shortages. “second opinion” reviews are able to be referred simply including to overseas expert services.

WSI also enables a new generation of AI tools as aids for the pathologists in their diagnostic task, with likely benefits for both task efficiency and diagnostic accuracy.

14. Ibid.

WSI has significant implications for digital technology infrastructure, including extensive image storage and transmission. Digital infrastructure is therefore a key design element for a new Pathology laboratory build.

AI and data analytics are also enabling a new approach to delivering clinical value across all of Pathology. In addition to internal real-time monitoring of laboratory processes, enhanced analytics and AI-driven decision making will enable a new generation of clinical diagnostics informaticians. These roles will work collaboratively together, across CHS and beyond, to drive new models of clinical decision making, audit and evidence-based policy. This approach will allow greater transparency, greater collaboration, and greater value – and also provide a powerful platform for CHS researchers, including a growing research opportunity in clinical decision science.

Thus, with the recent implementation of the Epic digital health record (DHR), and a suite of other analytical and AI tools, CHS Pathology is well-placed to drive this new approach to clinical decision support. IT infrastructure and spaces for collaboration (physical and virtual) will be critical enablers of success.

A summary of the above technologies as well as other potential innovative service developments are described below in Table 7-2. Many of the innovations are inter-related and capable of being developed independently, or inter-dependently in driving innovation.

Table 7-2: Innovations Identified from Specialty Sections are Described Below

FUTURE TREND/ INNOVATION	DESCRIPTION
Next Generation (Genome) Sequencing (NGS)	- NGS is a parallel or deep (DNA) sequencing technology which has revolutionised disease diagnostics and screening over the recent years. Using this technology, NGS has become a part of routine clinical practice, as it helps to detect oncogenic and disease-causing genetic variants and enables a deeper understanding of complex diseases. This translates into diagnosis with genetic changes incorporated into essential criteria for classification of disease, prognosis, identification of targetable chemotherapies, disease monitoring, and screening. This revolution will reduce morbidity and will prolong survival in the population of the ACT and surrounds. - Expansion of NGS into multiple areas of healthcare is an immediate next step in the future direction, especially to support CH oncologists and haematologists who are actively seeking for ACT Pathology to develop this technology.
Omics Technologies and Integration	Similar to the way that multidisciplinary teams approach works in healthcare, the multi-omics approach (including technologies such as genomics, transcriptomics, epigenomics, proteomics, and metabolomics) will provide a much more holistic view of disease mechanisms, which not only works to enhance the accuracy of diagnosis, but also enables personalised treatment strategies based on individual patient profiles. The drive towards individually targeted therapies is compelling, it is expected to continue to increase the level of testing, workforce expertise and need for individualised reports, particularly in cancer treatments. <i>It is likely that in the not-so-distant future, the 'omics revolution' for personalised diagnoses and treatments could become core business for ACT Pathology¹⁵</i>
Biomarkers and Predictive Models	Support that predicts disease progression, treatment response, and patient outcomes. It is an important area of research in haematology and has the potential to make a massive difference to patient outcomes alongside other technologies such as the omics revolution.

15. Noting ACT Pathology already does gene assessment, epigenetics and protein expression as part of standard cancer reporting at the time this report was prepared.

FUTURE TREND/ INNOVATION	DESCRIPTION
Immuno and Targeted Therapies	CAR T-cell therapy and immune checkpoint inhibitors are new treatment options for patients with haematological disorders (including malignancies). ACT residents who are currently candidates for CAR-T cell therapies currently have to travel interstate to undergo a cell collection procedure and return 2-3 weeks later for infusion and post-therapy care. Patients must live within 30 minutes of the hospital for 4-5 weeks. Availability of this service in ACT will support patient-centred and value-based care models and improve timely access to novel treatments.
Artificial Intelligence (AI) [and Whole Slide Imaging]	In all facets of pathology, it is expected that AI will mark its presence. AI and machine learning will help automate processes (analysing big data sets), provide decision support information and security checks that are not systematically built into day-to-day processes. These developments are not expected to reduce staff or the footprint of the Pathology facility but instead give ACT Pathology more capacity to increase the range and level of services offered. "WSI is shaping as a game changer for the workforce shortage in healthcare and pathology, and potentially allowing CHS to provide more effective diagnosis and timely care for people in the ACT and neighbouring regions. AI and data analytics are also enabling a new approach to delivering clinical value across all of Pathology. In addition to internal real-time monitoring of laboratory processes, enhanced analytics and AI-driven decision making will enable a new generation of clinical diagnostics informaticians"¹⁶.
Automation of Current Manual Steps in Processes	These innovations are to incrementally acquire technology that automates some steps in the process as part of a longer-term plan to automate all steps. This will progressively occupy existing workstations. The Pathology facility will need to design flexible core spaces for automated equipment and sensitively design workstations adjacent to automated equipment in the same specialty. In some instances, there will be cross over periods where both new automated technologies and existing manual processes are retained before phasing out.
Development of a Core Laboratory	Urgent testing on existing instruments is likely to shift to a Core Laboratory operating 24/7 and operated by multi-disciplinary pathology staff. Robotics will be extended to accommodate more of the high-volume testing of a Core Laboratory. Further details are provided in section 7.8.
Robotic Extensions taking on more Volume	As more technology moves into the Core Laboratory, so too will be the opportunity to extend the robotics to fully automate the routine testing.
Urgent Testing on Instruments Moved to the Core Laboratory.	The Core Laboratory concept will focus on 24/7 service delivery centralised to an area of the laboratory adjacent to specimen reception. Technologies and tests will move into the Core Lab (as per GeneXpert COVID and Flu A/B urgent testing) from various disciplines.
Recycling and Sustainability	Each Department will have equipment and technology designed to help recycle, particularly plastics and reagents/solvents. It will be a necessary development for Pathology services to demonstrate their 'green credentials'. Manufacturers will focus on reducing heat output and power consumption (e.g. Abbott Alinity i), which will help laboratories manage excess heat in the laboratory and the architectural designs for air conditioning/flow in the location of the equipment.
Point of Care Testing (POCT) Innovation	Enabling increasingly more rapid and accurate testing at the patient's bedside or in remote settings.
Liquid Biopsies	Liquid Biopsies have emerged as a non-invasive cancer diagnostic tool, which may assist in the early detection, residual disease monitoring, and treatment response.

16. Ibid.

FUTURE TREND/ INNOVATION	DESCRIPTION
Screening Opportunities	There will be opportunities to support community screening programs and personalised wellness testing expanding the range of services from predominantly diagnostic (i.e. HbA1C testing on microsamples self-collected from the community and microbiome analysis).
Quality Assurance and Standardised Practices/Processes	A growing focus to ensure high-quality laboratory testing and harmonisation across different laboratories, including the standardisation of reference intervals, establishment of proficiency testing programs, and implementation of quality management systems to enhance the accuracy and reliability of laboratory results.

7.5.3. Workforce Co-Design, Flexibility and Planning for Uncertainty

The convergence of technologies and the consequential convergence of workforce collaboration, means that the design of facilities will change to reflect this convergence.

The design of facilities will necessarily have two major elements:

- Integrated design that requires a higher level of functional adjacencies than was previously the case in laboratories; and
- Flexible design of space, which translates to more open spaces.

7.5.4. Teaching and Research

As noted above, CHS has articulated 'CHS' 'Clinical Learning and Teaching Strategy 2023 – 2027', and a *Research Strategy 2021-2025*. Learning & Teaching, and Research are outlined in detail in sections 11 and 12. These strategies underpin the approach for pathology and align in important respects including:

- Embedding a research ethos is facilitated by the use of multi-purpose spaces including flexible laboratories and real and virtual research; and
- Research will increasingly be informed and facilitated by digital technologies. Indeed, it is likely that several informatics-based activities will form the core of research in Pathology, including Artificial Intelligence and clinical decision support science (whilst supported and/or confirmed by manual testing).

7.5.5. Consumer and Community Engagement

Consistent with the broader service delivery principles consumers and the community will become more active participants in their health care. This will be manifest in:

- Individually tailored treatments. New technology and tools that enable pathology the opportunity to develop a genuine consumer-led co-design model, that will be in the vanguard of its kind in Australia;
- Care closer to home is now the preferred model of care for any chronic, non-urgent care. This has been made possible via the widespread adoption of telehealth and telemonitoring, particularly for diabetes, chronic obstructive pulmonary disease, and renal medicine. Telemonitoring is performed using sensors, other wearable devices, or apps to record data which is relayed to the healthcare team;

Changes in condition outside set parameters will also alert healthcare providers in real time. Pathology too will need to adapt to remote patient pathology testing;

- Consumers empowerment is transforming service models for Pathology. In the ACT there are already an overwhelmingly positive response to the direct-to-consumer test result reporting via MyDHR. Consumers are also actively driving discussions on genomics, cancer testing, pre-natal diagnosis, and others. This will only continue. We will require real and virtual spaces with public access to facilitate this engagement; and
- Services developed and delivered will need to be increasingly designed around the principles of Value-Based Health Care (Better Value Care). This is a contemporary service model designed to develop patient-focused care in a meaningful (structured) way to create enhanced outcomes (value) to the patient and value to the funder. This is a potentially important, albeit radical model to consider in the development of (a selected number of) clinical services that can be 'clustered to deliver end to end' outcomes for patients. The model transcends current structures that are not designed to deliver value to the patient and where there are only very blunt outcome indicators.

All these trends are inter-related and can have a major impact on the organisation, service options available, and how services are delivered.

7.6. GENERAL CONTEXT

7.6.1. ACT Pathology

ACT Pathology operates as a tertiary (Level 6) pathology laboratory, and includes the (specialist) disciplines of:

1. Pre-Analytics (collection services, and specimen reception);
2. Anatomical Pathology (including Histology, Immunohistochemistry and Cytology);
3. Chemical Pathology (Routine Chemistry, Endocrinology, Special Chemistry and POCT);
4. Diagnostic Genomics;
5. Haematology (including General Haematology, Haemostasis, Blood Product Transfusion Service, Immunophenotyping, and Bone Marrow Transplantation);
6. Immunopathology and Infectious Immunoassay;
7. Microbiology (including Bacteriology, Mycobacteriology, Mycology, Parasitology and Virology);
8. Molecular Pathology; and
9. Mortuary Services (see section 8).

Support departments include Pathology Administration, Information & Communication Technology (ICT), Quality, Pathology Museum (gross anatomical teaching), and Pathology Research. ACT Pathology employs more than three hundred personnel.

The role of ACT Pathology is to deliver routine and specialist pathology service to all CHS services, private hospitals, and community GPs and medical specialists with accurate, reliable and timely information obtained from scientific tests, investigations and examinations.

As is usual with tertiary-level pathology services that it also provides consultative services regarding the correct interpretation of test reports, and actively participates (or can lead) multi-disciplinary care team patient reviews.

ACT Pathology also provides important teaching functions for the ANU. Indeed, ACT Pathology is a leading provider of candidates seeking Registrar places in pathology owing to the positive experience in pathology by undergraduates.

7.6.2. Service Principles

As a clinical support service, operating at the highest clinical capability, ACT Pathology can be expected to:

- Be accessible and responsive to all clinical areas requiring the reporting of pathology results;
- Deliver specialised pathology services across the full spectrum of pathology types, including new and emerging pathology specialties/branches;
- Ensure contemporary practices and the application of leading-edge technologies that materially improves patient diagnoses, treatment and outcomes;
- Operate efficiently and sustainably;
- Actively participate in multi-disciplinary care models to deliver holistic patient treatment regimes;
- Develop a clinically capable workforce across the specialty areas, including through teaching and training as a core part of the role of pathology; and
- Actively participate in learning, teaching and research.

7.6.3. Testing Panel Volumes

ACT Pathology perform approximately 2.5 to 2.6 million testing panels annually¹⁷ based on testing panel volumes since FY19-20, which demonstrates that the overall testing volume has been steady with a tendency toward a modest upward trend, as detailed in Table 7-3 below.

The pathology subspecialties with the highest percentage of testing volumes (excluding COVID Polymerase Chain Reaction [PCR]) are Chemical Pathology, Immunopathology & Infectious Immunoassay (55% in FY21-22), Haematology & Transfusion (19%), and Microbiology (4%), with all remaining subspecialties each contributing to approximately 1% or less of total testing volumes (noting that the number of tests does not correlate with test complexity).

It is difficult to assess ACT Pathology's trends relative to maintaining market share due to COVID "Refer Out" services, that is, potential activity foregone, has increased by 5% over the period. It may nevertheless reflect ACT Pathology's current services are not keeping pace with referrer demand at the high end of the testing spectrum, particularly diagnostic genomics.

Table 7-3: Pathology Testing Panel Volumes By Subspecialty, By Year¹⁸

Pathology Subspecialty	2019-20	2020-21	2021-22	Raw Change 19-20 to 2021-22	% Change 19-20 to 2021-22	% of total 21-22 Excl. COVID
Chemical Pathology, Immunopathology & Infectious Immunoassay	1,661,806	1,756,151	1,748,351	86,545	5%	67.8%
Haematology	523,564	537,756	531,487	7923	2%	20.6%
Microbiology	127,840	124,093	121,327	-6513	-5%	4.7%

17. Excluding COVID effect. If we include COVID effect the numbers would be 2.5 – 3.2 million tests annually between FY19-22.

18. Note testing numbers are significantly underestimated due to data reporting panels, not individual tests. For example, a Liver Function test is counted as 1, but may be made up of 6 individual tests.

Pathology Subspecialty	2019-20	2020-21	2021-22	Raw Change 19-20 to 2021-22	% Change 19-20 to 2021-22	% of total 21-22 Excl. COVID
Transfusion	53,448	56,472	56,021	2573	5%	2.2%
Molecular Pathology (excl. COVID PCR)	39,980	40,304	34,491	-5,489	-14%	1.3%
Research	34,650	34,094	32,427	-2,223	-6%	1.3%
Anatomical Pathology	34,265	33,157	30,221	-4,044	-12%	1.2%
Diagnostic Genomics	2,131	2,452	1,978	-153	-7%	0.1%
Refer out	19,766	20,312	20,695	929	5%	0.8%
Total Excluding COVID PCR	2,497,450	2,604,791	2,576,998	79,548	3%	100.0%
Coronavirus PCR	31,821	201,101	579,791	547,970	1722%	N/A
Grand Total	2,529,271	2,805,892	3,156,789	627,518	25%	N/A

7.6.4. Future Demand

Forecasting the future volume of pathology specimens if fraught with complexities, not least of which is changing practice and development of new services.

Outlined below are estimates of future demand:

- For Anatomical Pathology, demand growth is based on the current ratio of specimens to total operating theatre procedures, including endoscopes. By 2035/36, there is expected to be an additional 33.7% surgical/procedural separations, resulting in an additional 7,973 AP examinations.
- For pathology tests other than for Anatomical Pathology:
 - ▶ Applying current rates of tests for hospital services only and extrapolate for the growth in hospital activity, excluding operating theatres, is expected to result in 37.7% growth in demand, or 631,990 additional testing panels; and
 - ▶ For other more routine tests, the expected demand is based on the relative utilisation of medical services of an ageing population, applied against expected community referral rates, would see demand growth of 28.3%, or 259,665 tests.
- An important part of the ACT Pathology work is also new types of tests, such as Genomics. The test volumes have been increasing steadily, and substantial growth is expected in the emerging area of diagnostics; and
- The provision of novel cell therapy products would increase the service demand on ACT Pathology's BMT/cell processing facility in the coming years. The manufacturing and storage of specialised therapies such as CAR-T cells will increase the regulatory, facility and operational demands of Haematology's BMT Laboratory. Although numbers are expected to be small initially (~10% growth), the complexity of processing would increase over time.

19. Plus 2,145 send outs.

20. Plus 2,603 send outs.

7.6.5. Referral Services

ACT Pathology is able to deliver all testing expected of a tertiary pathology laboratory or is able to refer out. For those tests that are not actually performed by ACT Pathology, the tests are referred to specialist referral interstate laboratories. ACT Pathology endeavours to use referral laboratories that provide the best quality testing for the respective test in an efficient manner and that have NATA accreditation to perform the respective test. Over time, ACT Pathology is looking to be able to undertake all tests in house.

7.7. FUNCTIONAL RELATIONSHIPS AND SCALE

This section provides information on the functional relationships between the different pathology departments and support services. These relationships are becoming increasingly complex due to converging and emerging technologies and the need for enhanced operational efficiencies.

A future state Pathology service impacts significantly on Building Functional Design. It is a major consideration, particularly in the context of the futureproofing of the laboratory.

Functional Relationship Diagrams (FRDs) were developed by ACT Pathology and L2D Architects as subject matter experts. Figure 7-1 diagrammatically shows the functional relationships and the associated complexities for a contemporary pathology laboratory. The diagram provides an overview. The existing departments considered in this design are:

- Collection Services;
- Specimen Reception;
- Anatomical Pathology;
- Chemical Pathology;
- Diagnostic Genomics;
- Haematology & Transfusion;
- Immunopathology & Infectious Immunoassay;
- Microbiology;
- Molecular Pathology; and
- Mortuary.

Other diagrams relating to specific service functions are incorporated into the relevant specialist descriptions below. There are specific L2D Architect FRDs in most of the specific specialty sections below, including mortuary (**Error! Reference source not found.**), diagnostic genomics (Figure 7-6), microbiology & molecular pathology (Figure 7-4), and anatomical pathology (Figure 7-5).

Key overarching relationships in the design include:

- A Core Lab;
- The further development of highly automated processes for core subspecialties;
- Administrative support functions;
- Laboratory support functions; and
- Centralised supplies, waste and refrigeration spaces.

The FRDs also include new (expanded) functions, comprising:

- A prototype laboratory;

Figure 7-1: Pathology Functional Relationships (Department Overview) – by L2D Architects



FUNCTIONAL RELATIONSHIP DIAGRAM - Overview - All Departments

ST. PAUL, MINN., Dec. 22.—(AP) —
The St. Paul Police Department
has received information from
a confidential source that a
man, who is believed to be
a member of the Black
Panther Party, has been
seen in the city of St. Paul.
The man is believed to be
a member of the Black
Panther Party and is
believed to be a member
of the Black Panther Party.
The man is believed to be
a member of the Black
Panther Party and is
believed to be a member
of the Black Panther Party.
The man is believed to be
a member of the Black
Panther Party and is
believed to be a member
of the Black Panther Party.

- Digital Pathology Research;
- DNA Extraction and Amplification, and enhanced cryogenic services; and
- An 'interaction space'.

Historically, the above disciplines have functioned as independent silos, with minimal cross collaboration. It is clear, that the future of Pathology requires significant integration, convergence and cross collaboration of departments.

As a first step departments are more consolidated, forming larger integrated 'Groups', including:

- Collection Services and Specimen Reception (Pre-Analytics);
- Core Laboratory departments (Haematology²¹, Chemical Pathology, Immunopathology & Infectious Immunoassay and Specimen Reception), and noting that these department functions may also have components that are not necessarily part of the Core Lab;
- Microbiology and Molecular Pathology;
- Anatomical Pathology and Diagnostic Genomics; and
- Mortuary and Autopsies.

Notwithstanding, the above, there are some (non-testing) functions that are potentially able to be separated. Essentially, these are the non-clinical testing area, such as:

- Pathology Administration (e.g., executive area, administrative support including, Quality Team, meeting rooms etc);
- Staff Amenities (except for those required in the 24/7 lab)
- Interaction Space – shared space (e.g., large screens, microscope teaching, showcase, education);
- Training Room;
- Digital Pathology Research Space;
- Pathology Reception;
- Mortuary;
- Pathology Museum;
- Collection Services;
- Central Consumable Storage (e.g. bulk stores, Walk-in Cold Room and Freezer Room)
- Central Waste Store;
- Chemical Stores;
- Freezer Farm Biobank;
- Cryogenic processing and storage facility; and
- Courier Services.

Figure 7-2 shows functional adjacencies for pathology services. These are similar to the relationships described within the FRDs, except expressed in terms of the relative importance of proximity.

There are critically important adjacencies relating to the Core Lab and, very close proximity for the other diagnostic pathology services, with easy access to clinical support functions.

21. Including BMT/Cell Processing Laboratory.

Figure 7-2: Functional Adjacencies Matrix

Relationship Matrix		Pathology Core																					
		Specimen Reception (Preactalytics)	Haematology and Transfusions	Chemical Pathology	Immunopathology - Serology, Infectious Immunoassay (automated)	Immunopathology - Other	Haematology - Bone Marrow Transplant	Chemical Pathology - Special Chem, POCT	Anatomical Pathology	Diagnostic Genomics	Microbiology and Molecular Pathology	Pathology administration	Collections Centre	Mortuary services	Prototyping Lab	Digital Informatics	Centralised Storage and Waste	Liquid Nitrogen Dewar	Freezer Farm and Biobank	ACT Pathology Research	Mortuary and Loading Dock Access	Courier Services	Slides and blocks storage
Pathology Core	Specimen Reception (Preactalytics)	x	1	1	1	1	1	2	1	1	3	2	-	1	3	3	3	2	-	-	1	-	
	Haematology and Transfusions (automated)	x	1	1	1	1	1	2	1	1	3	2	-	1	3	3	3	1	-	-	-	-	
	Chemical Pathology (automated)		x	1	1	1	1	2	1	1	3	2	-	1	3	3	3	2	-	-	-	-	
	Immunopathology - Serology, Infectious Immunoassay (automated)			x	1	1	1	2	1	1	3	2	-	1	3	3	3	2	-	-	-	-	
	Immunopathology - Other				x	1	1	2	1	1	3	2	-	1	3	3	3	2	-	-	-	-	
	Haematology - Bone Marrow Transplant					x	1	2	2	2	3	2	-	2	3	3	3	2	-	-	-	-	
	Chemical Pathology - Special Chem, POCT						x	1	2	2	3	2	-	2	3	3	3	2	-	-	-	-	
	Anatomical Pathology							x	1	2	3	2	-	2	3	3	3	1	-	-	-	-	
	Diagnostic Genomics								x	1	3	2	-	2	3	3	3	1	-	-	-	-	
	Microbiology and Molecular Pathology									x	3	2	-	2	3	3	3	-	1	-	-	-	
	Pathology administration										x	-	-	-	-	-	-	-	-	-	-	-	
	Collections Centre											x	-	-	-	-	-	-	-	-	-	-	
	Mortuary services												x	-	-	-	-	-	-	1	-	-	
	Prototyping Lab													x	-	-	-	-	-	-	-	-	
	Digital Informatics														x	-	-	-	-	-	-	-	
	Centralised Storage and Waste															x	-	-	-	-	-	-	
	Liquid Nitrogen Dewar																x	-	2	-	-	-	
	Freezer Farm and Biobank																	x	-	-	-	-	
	ACT Pathology Research																		x	-	-	-	
	Mortuary and Loading Dock Access																			x	1	-	
	Courier Services																				x	-	
	Slides and blocks storage																						

Legend
1 directly adjacent (Horizontal / Vertical)
2 easily accessible (less than 3 minutes)
3 accessible (3 - 5 minutes)

7.7.1. Pre-Analytics

Pre-Analytics is the 'front door' to pathology. It maintains the pathology test register, manages distribution of test results and is responsible for patient care in collection areas. Pre-Analytics is custodian of patient specimens up to handover to other specialist departments. The functional relationships around Pre-Analytics is demonstrated in the Core Laboratory FRD in Figure 7-3.

Pre-Analytics department comprises two distinct services:

■ Collection Services.

- ▶ Customer engagement;
- ▶ Phlebotomy/specimen collection to support CH and non-CH services;
- ▶ Glucose Tolerance Testing;
- ▶ Electrocardiogram;
- ▶ Fine Needle Aspiration;
- ▶ Home Collection Service;

- ▶ Couriers;
- ▶ Client and service advocacy;
- ▶ Dispatch of tests to specialist labs for testing;
- ▶ Patient and client enquiries;
- **Specimen Reception.**
 - ▶ Pre-analytical request registration;
 - ▶ Specimen receipt;
 - ▶ Receipt of samples via the (Lampson) Pneumatic tube system from connected ward locations;
 - ▶ Specimen processing;
 - ▶ Loading, unloading and monitoring of the specimen tracking system;
 - ▶ Delivery of test results and reports;
 - ▶ Management of clinical trial samples; and
 - ▶ Referral of samples.

7.7.2. The Core Laboratory

The concept of a centralised laboratory has been progressively evolving since the late 19th Century. Contemporary laboratories have the Core Lab at the 'heart' of its operations as automation and quality control become more important.

The future Pathology facility will employ the Core Lab concept with a 24/7 service delivery. The Core Lab includes Specimen Reception, Haematology & Transfusion, Chemical Pathology, Immunopathology & Infectious Immunoassay. It is critical for these departments to be collocated for:

- Efficient triage of patient samples;
- Connection of analysers to core laboratory track system;
- Growth space to allow for the track to expand with additional instrumentation connected;
- Sharing of like technology;
- Sharing of generic workspaces e.g. centrifuges, storage spaces;
- Cross training of technical staff in the use of similar technology; and
- Centralise 24/7 critical services.

Technologies and tests will move into this space from various disciplines, as well as extended robotics to accommodate more of the high-volume testing of a Core Laboratory. Analysers which can be connected to an automated track system, will be connected to it as much as possible.

The Core Lab comprises four main departments:

- Specimen Reception;
- Haematology & Transfusion;
- Chemical Pathology; and
- Immunopathology & Infectious Immunoassay.

It is critical that the Core Lab departments are adjacent to each other in the Core Lab area.

The Core Lab has several critical design features, including:

- A large open space that can:
 - ▶ Accommodate an automated track system. With this comes the connection of the analysers to the Core Lab track system.
 - ▶ Accommodate infrastructure to allow a single sample transport system ('Tempus') to connect from critical locations e.g. ED, directly into the automated track system to allow for minimal touch points and optimal turnaround time of urgent samples, facilitating triage of patients.
 - ▶ Enable reasonable expected growth in robotics and other automated instrumentation.

Shared spaces for automation (robotics) creates a unique place to design. The robotic lines require structured and ordered space that is expandable and interchangeable. The "track" configuration (typically along a central spine with 'arms') is critical to the interconnectivities of the robotic stations that connect to the track. It is essential to design the space with direct and clear access in order to gain the most benefit from the expensive robotic lines.

- A reception space that receives and efficiently triages patient samples/ specimens (from multiple collection sources);
- Sharing of like technology, and generic workspaces (such as biosafety cabinets, centrifuges, storage);
- Cross training of technical staff in the use of similar technology; and
- Centralise core 24/7 critical services;
- Scientific staff will remain specialised within a particular department, instead of being cross trained.

There are other important components of each individual department described in sections below.

The Core Lab FRD is as illustrated in Figure 7-3.

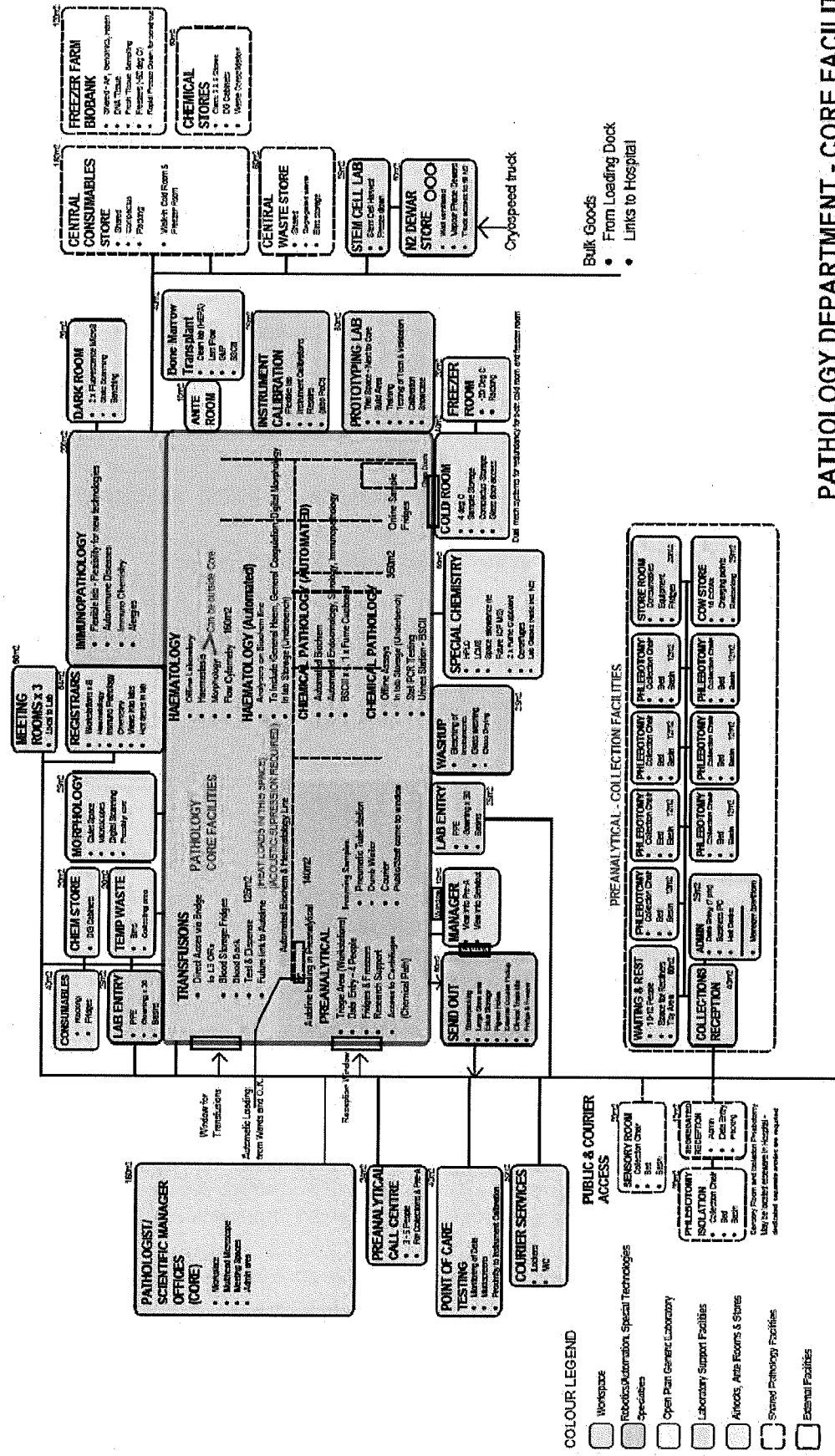
7.7.3. Microbiology and Molecular Pathology

Microbiology and Molecular Pathology are combined as a single operational discipline due to the significant clinical overlap, shared specimens, movement of traditional microbiology to molecular based staff and ability to cross train staff.

Both Microbiology and Molecular pathology are moving to an increased level of robotics and the FRD (Figure 7-4) is based around some key principles:

- Molecular Pathology must be adjacent to Diagnostic Genomics to allow shared laboratory space and equipment e.g. PCR Clean Preparation, Specimen Preparation, DNA Amplification.
If not co-located with Diagnostic Genomics, then shared areas would need to be duplicated on the other floor, including, PCR set up, specimen preparation and DNA amplification;
- Molecular Pathology should also be adjacent to the core laboratory.
More instrumentation is being enabled to connect to track systems, with Molecular Pathology robotics likely able to connect to a track system when the Pathology building is opened – this is already possible with Roche instrumentation;

Figure 7-3: Functional Relationships for Pathology Department – Core Facilities and Immunopathology



**PATHOLOGY DEPARTMENT - CORE FACILITIES
AND IMMUNOPATHOLOGY**

MICROBIOLOGY / MOLECULAR PATHOLOGY



- Much microbiology testing will move to tracked robotics, which has an increased floor print e.g. Kiestra;
- Molecular Pathology has moved and will further embrace increased robotics e.g. Roche 6800;
- The spaces will be open plan wherever possible, with some exceptions including the PC3 facility; and
- Provision of sufficient space to allow fast scale up of services e.g. pandemic.

7.7.4. Anatomical Pathology & Diagnostic Genomics

In the future DG will be performing tests obtained from Haematology, Oncology (through AP) and from other departments through pre-analytical specimen reception.

There will be significant expansions within Diagnostic Genomics in the near future, taking advantage of new technologies such as cell free Deoxyribonucleic Acid (DNA)/Ribonucleic Acid (RNA), liquid oncology, and NGS – hence an expansion in the floor space to accommodate this would be critical.

Diagnostic Genomics utilises similar technologies and laboratory equipment as Molecular Pathology, so rather than duplicating laboratory space, Diagnostic Genomics and Molecular Pathology should be colocated to allow for the sharing of laboratory facilities and optimisation of space usage.

The area proposed to be shared are the DNA Amplification laboratory with separate PCR set up and specimen preparation areas for both departments.

If Diagnostic Genomics is not co-located with Molecular Pathology, then shared areas would need to be duplicated on the other floor, including DNA amplification.

The Diagnostics Laboratory will need to have close relationships with, and to have sample workflows established from Anatomical Pathology, Haematology, Immunopathology and specimen reception.

Anatomical Pathology site visits demonstrated that, new laboratories, even after a relatively short period of time e.g. 5 years, outgrow the space. This is due to the high level of manual labour, especially in areas such as cut up grossing. As workload increase, space requirements also increase due to additional staff a workplace. It is therefore critical to over spec the anatomical Pathology laboratory to ensure ACT Pathology can keep pace with future clinical requirements.

AP registrars will be located in a dedicated space to allow for their workstations/microscope, as well as registrars of other departments.

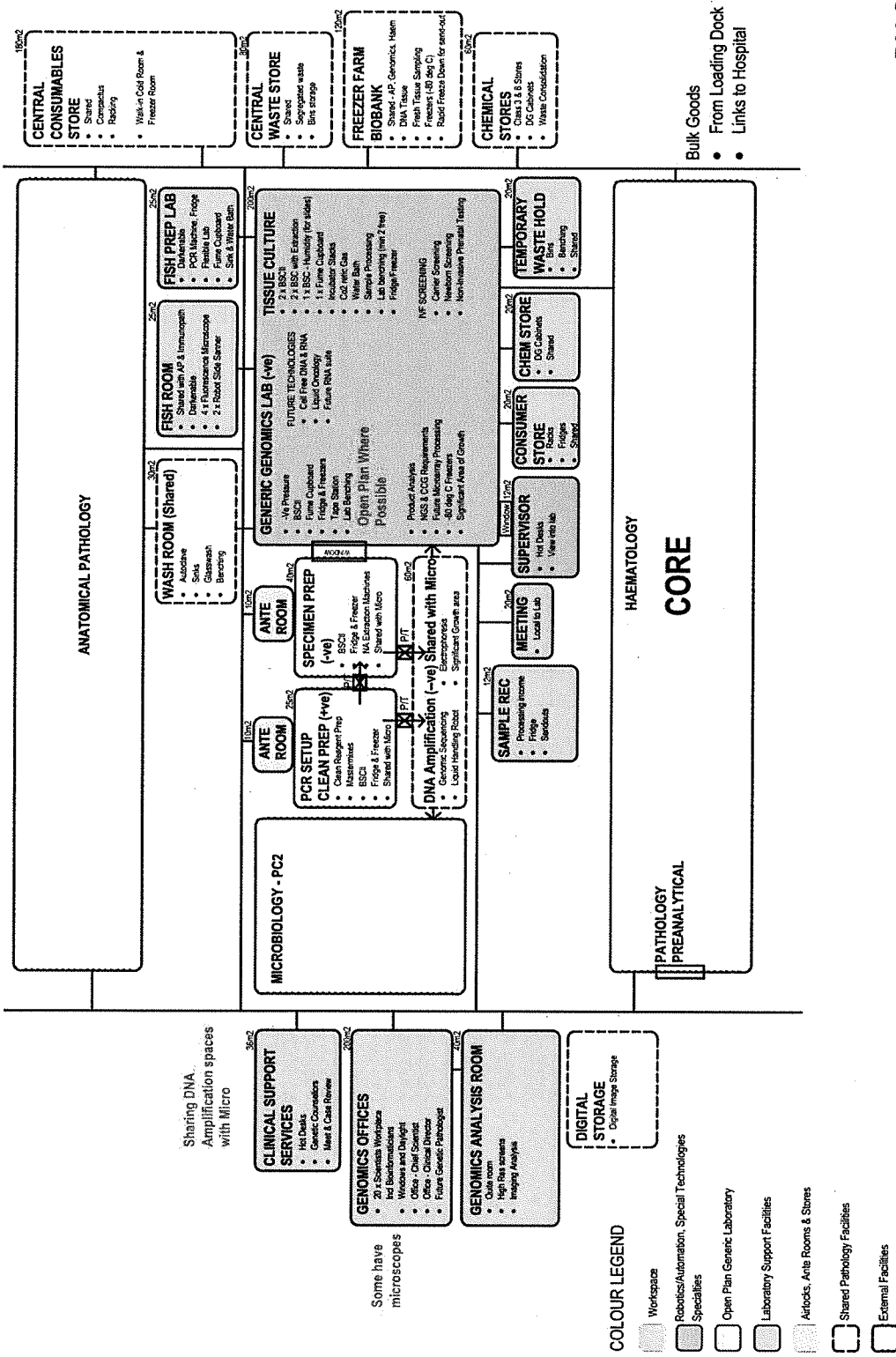
There is no requirement for Mortuary Services or the Pathology Museum to be colocated with the other AP units, but there will be a strong association between these services.

Anatomical Pathology and Diagnostic Genomics' FRDs are as illustrated in Figure 7-5 and Figure 7-6.

ANATOMICAL PATHOLOGY



Figure 7-6: Diagnostic Genomics



DIAGNOSTIC GENOMICS

7.7.5. Mortuary

The Mortuary Service includes:

- **The acceptance and safe repository** of bodies during and after business hours²² for persons who have died at CH (and other sites as required), as well as potentially other deceased persons depending on the capacity for storing at the Forensic Medical Centre.

Non-autopsy services, including *Body Release*: CH's services involve the release of bodies to appropriate Funeral Homes/Transport Companies/Religious Organisations²³, including the management of relevant/necessary paperwork.

- **Perinatal post-mortem service (PPMS)**²⁴: autopsy procedures conducted on deceased perinatal bodies where deaths occurred during pregnancy, or during and (just) after birth, at CH.

Perinatal anatomical pathology is highly specialised, with the quality and clinical utility of reports requiring a higher degree of expertise/experience of the pathologist, scientist and technical staff.

Perinatal post-mortems and limited adult autopsies are the main types of post-mortem examinations undertaken at ACT Pathology - a recognised centre of excellence for the provision of this service.

The PPMS Care Coordinator also supports families during a difficult and sensitive time by providing family-focused care and consultation with relevant health care teams to identify the cause of death, providing answers to the families.

It is important that the design caters for sufficient body storage of the projected population growth in Canberra (noting that a dedicated mortuary has not yet been confirmed for the new North Canberra Hospital) as well as providing sufficient capacity for pandemic response.

The FRD for Mortuary Service is as illustrated in Figure 7-7.

7.7.6. Prototyping Laboratory

The concept of a Prototyping Laboratory would be implemented in the new Pathology facility. It is an important aspect of futureproofing. This is an initiative that expands on the current functional capacity. It is a practice that is increasingly being adopted by pathology services, which will allow space to:

- Prototype new equipment, or showcase and trial a supplier's technology;
- Be able to trial robotics before the expense of acquiring them, which is invaluable;
- Conduct early trials and testing/commissioning of new technology to speed up the compliance period; and
- Ultimately being able to be used as future expansion subject to priorities.

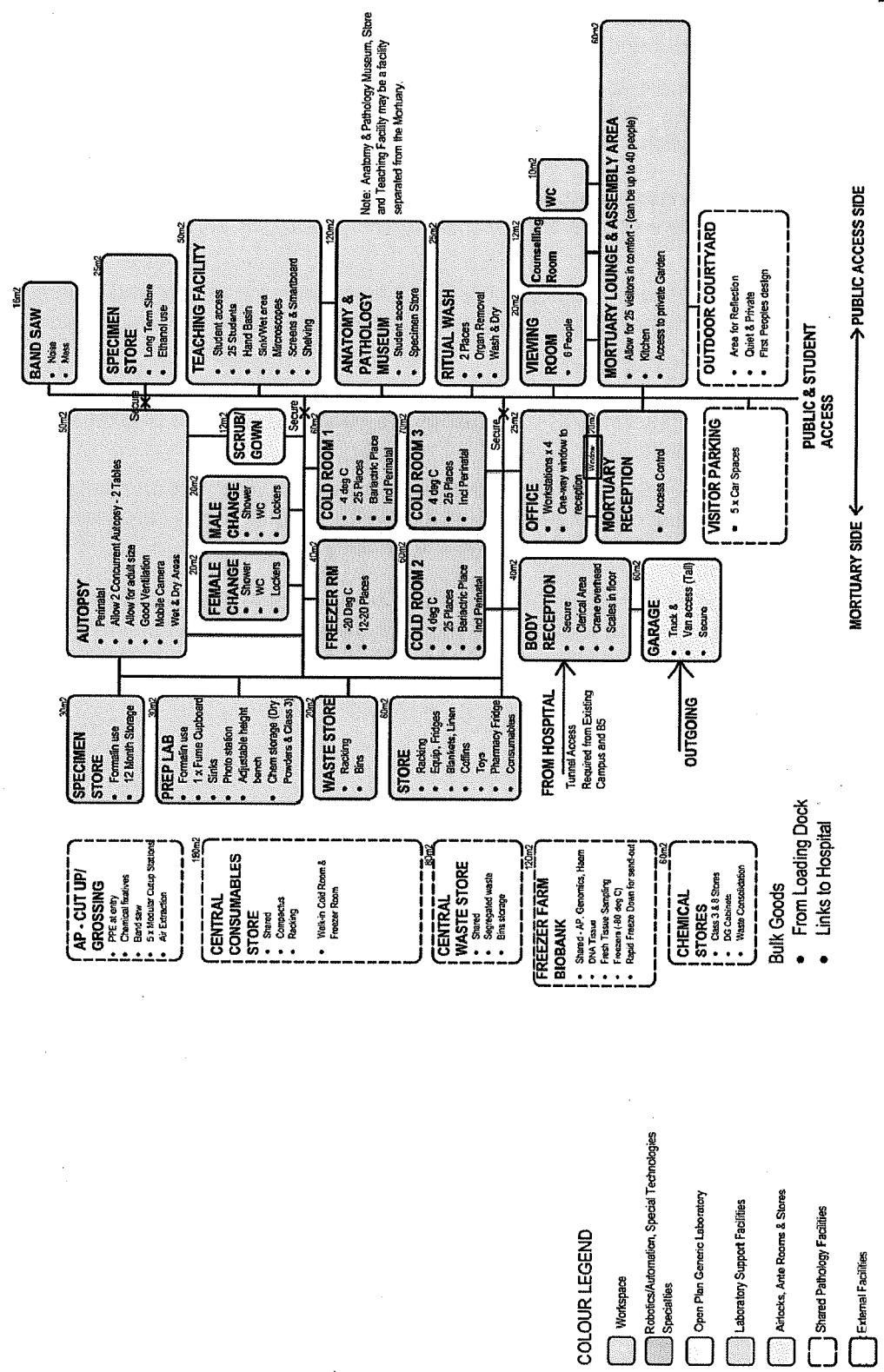
It is a single open plan area contiguous with the Core Lab.

22. ACT Pathology, Anatomical Pathology Introduction.

23. ACT Pathology, Anatomical Pathology Introduction.

24. NSW Health Pathology, Clinical Services Plan 2019 – 2025 Version 2:2021.

Figure 7-7: Mortuary



MORTUARY

7.7.7. Digital Pathology

The concept of Digital Pathology will also be fully embedded into the new Pathology facility, including:

- A modular functional space;
- Management of current interfacing and IT connections with dashboards to manage offline problems;
- Data Centre (off site, could be digital reference library/storage); and
- Digital admin (to be with all other admin staff).

7.8. GENERAL DESIGN PRINCIPLES

General design principles apply to all pathology spaces unless otherwise indicated.

- **Collocated and contiguous specialist pathology functions.**

The facility is to provide as much generic open plan laboratory space as possible, space must be open plan unless there is a specific reason to have a specialised room/facility. Maximising open space provides flexibility around inter-changeability of workstations and automated equipment, which will change over time.

Space is defined based on technological similarities rather than traditional departmental silos. This accords with contemporary practice for pathology (as noted above).

The layout is to be highly interactive, reflecting the strong interconnection, visibility and flows between the different Pathology subspecialties, between administration and laboratory, and between pathologists/registrars, scientists and technical staff. Fewer walls are key to this project.

Labs with successful open plan models tend to employ an "office precinct" model – on the same floor as but not fully adjacent to wet lab spaces. Thus, there is an emphasis on hot-desking in flexible workstation spaces.

- Within the context of open plan laboratory space there will be a continuing need for **specialised rooms and equipment**.
- **Future proofing** would mean that:
 - ▶ The core facilities are built to AS2243.3, 2022 (Microbiological) standards for PC2 certification for the handling of Risk Group II Organisms even though the space is to be certified PC1 for most of the activities. In this context, a fully PC2 compliant core facility would be possible even though most spaces will not need to operate under PC2 controls. Designing to PC2 does not come at a financial impost, and is appropriate for health, safety and cleanability considerations.
 - ▶ The FRDs in section 7.7 indicate which functions are to be in PC2 containment, and the Briefing Record outlines this in more detail. The key areas of PC2 containment are Microbiology and parts of Molecular Pathology Biology; and
 - ▶ The PC3 facility is a high containment facility and is subject to decay testing to enable the required annual decontamination via fumigation.
- **Future proofing also means new functions**, including:
 - ▶ Digital support, data centre and digital storage, high resolution and high reliability digital capability;

- ▶ Prototype laboratory, as detailed above; and
- ▶ Workforce connection spaces.
- Provide a workplace that is planned to enable a combination of quiet spaces for focused work as well as rooms for group activities in order to **promote peak performance and outputs**. The design will *minimise the number of office spaces to maximise break out spaces and meeting rooms for private and collaborative discussions*.
- **Patient-centred care specimen collection.** Depending on the location of the pathology facility relative to outpatients, there may be a need to have a second collection centre to enable easy access for patients.
- Design for grieving families and for **cultural sensitivity and safety** in relation to mortuary services.
- From a service model perspective, decoupling mortuary and autopsy services from diagnostic pathology may need to be considered in the interests of **patient-centred care and operational efficiency** by locating the mortuary closer to where its services are likely to be of greater use, namely the medical inpatient building, in preference to long transport times of deceased persons, as well as creating discreet routes of travel for the deceased for privacy and dignity preservation. This includes National Capital Private Hospital patients;
- **Ventilation and Air Quality**
 - ▶ Heating, Ventilation, and Air Conditioning (HVAC) systems play a crucial role in maintaining air quality and temperature control in the laboratory;
 - ▶ The HVAC system should be properly designed, installed, and maintained to ensure effective air distribution, filtration, and removal of contaminants; and
 - ▶ The system should be equipped with high-efficiency particulate air (HEPA) filters to remove airborne particles, including microorganisms.
- **Lighting** is critical in all areas but more so in the open plan generic spaces with the robotic lines and technology.
 - ▶ Illumination Levels: the recommended illumination levels vary depending on the specific tasks performed in different areas of the laboratory. General working areas may require around 300-500 lux, while microscopy areas may need higher levels of illumination, typically between 1000 and 1500 lux;
 - ▶ Natural lighting is important for staff when reading culture and conversely Ultraviolet (UV) exposure on reagents/analysis can be detrimental;
 - ▶ Uniformity of Lighting: lighting should be uniform across the laboratory to minimise shadows and variations in visibility. Uneven lighting can lead to difficulties in accurately interpreting microscopic specimens or distinguishing subtle colour changes, potentially affecting the accuracy of results;
 - ▶ Colour Rendering Index (CRI) measures how accurately a light source represents colours compared to natural light. A higher CRI (ideally above 90) is desirable to ensure accurate identification and interpretation of colour changes in stained specimens or indicators;
 - ▶ Control of Glare and Reflections: the design should minimise glare and reflections on surfaces, such as microscope lenses, slides, and computer screens, to avoid visual discomfort and potential errors. Non-reflective surfaces, matte finishes, and proper positioning of lighting fixtures help control glare and reflections;

- ▶ Task Lighting: task lighting is essential in areas where specific visual tasks, such as microscopy or reading culture plates, are performed. Adjustable task lighting, such as adjustable arm lamps or gooseneck lamps, can be utilised to provide targeted illumination and enhance visual clarity for detailed work; and
- ▶ Emergency Lighting: emergency lighting systems should be in place to provide visibility and safety during power outages or other emergencies. Backup power sources, such as battery-powered lighting fixtures or emergency generators, should be installed to ensure adequate illumination for safe evacuation or continuation of critical task.

■ Temperature

This section applies to all departments with a large number of equipment:

- ▶ HVAC systems play a crucial role in regulating temperature in laboratories and may include air conditioning units, heat exchangers, fans, and ductwork to distribute conditioned air effectively;
- ▶ It is recommended that heat load calculations are conducted for the department to determine the amount of heat generated by equipment and the required cooling capacity to ensure that HVAC systems are appropriately sized to handle the heat load and maintain optimal temperature conditions;
- ▶ The design might also consider dividing into zones to optimise temperature control and to place equipment generating significant heat in strategically placed locations to avoid localised heat buildup. Proper airflow management, such as supply and return air vents, can help direct cool air towards heat-generating equipment and remove hot air efficiently. The design could include ventilation strategies to remove heat from the space by increasing the air exchange rate or adjusting ventilation settings;
- ▶ Proper insulation of laboratory walls, ceilings, and equipment could also be included in the design to prevent heat transfer to the surrounding environment. Insulating materials with high thermal resistance reduce heat loss or gain, minimizing the impact on overall temperature control;
- ▶ Careful placement and spacing of equipment will be essential for effective heat management. Overcrowding or improper placement impeding airflow, leading to heat buildup should be avoided in the design; and
- ▶ The design could also include automated systems (with alarms and alerts) that can adjust HVAC settings based on preset parameters to maintain a comfortable temperature.

■ Acoustic control

- ▶ The design should consider noise control measures to allow scientists to concentrate, particularly during analytical processes including blood film reviews;
- ▶ Consideration to be given to ceiling acoustic and wall treatment where applicable. Ceiling noise abatement has the added opportunity of designing that adds colour and form to the ceilings – noting that they will be expansive over the large generic laboratories.

- **Laboratory space.** Laboratories are serviced by power/data and gases and shelving suspended from the ceiling above the bench tops to free up space on the floor and to facilitate changeable and modular systems. laboratory benches are to be loose and removable.

■ **Offices**

- ▶ Pathologist and scientific leadership offices/workspaces are to be located on the same level as the corresponding laboratory space in an administration area of the floor, to ensure the laboratory space is open plan and not disrupted by office spaces.
- ▶ Allocation of offices is to accord with the *CHS Accommodation Guidelines*.
- ▶ Workspaces for all scientists and some registrars (including supervisory positions) will be in the form of open-plan desks based within laboratory spaces; quiet office/workspace will be provided for scientific leadership roles (in close proximity to the laboratory if possible) as per CHS accommodation policy; and
- ▶ Anatomical Pathologists are an exception for office requirements where their microscopes are located inside their work point, which for many is in an office with natural light (direct or indirect) and long sightlines beyond the building. While this is not a regulatory requirement, it is highly relevant and practical for the type of work conducted. AP registrars also need a dedicated space.

■ **Staff Spaces**

- ▶ Creating a welcoming and comfortable work environment for staff can be challenging;
- ▶ Team members need ready access to break-out spaces for local meetings with minimal disruption to work. Each core team requires access to small, functional meeting spaces with glass windows and AV facilities, located near laboratory spaces;
- ▶ Common meeting areas should be spacious, comfortable and well-equipped. Where feasible these should be multi-purpose e.g. for teaching and “town hall” meeting purposes; and
- ▶ Staff spaces should acknowledge the demands placed on overnight staff – including safety, rest areas and lighted access to vehicles and transport.

- **Centralised support facilities.** Laboratory level storage is via the Centralised Consumables Store (one per level if more than one level) to maximise usable laboratory space and operational efficiency. Same concept goes with the Centralised Waste Store, Centralised Chemical Store, Centralised Equipment Storage, Centralised Record Storage²⁵, Central Lab Services (e.g., Uninterrupted Power Source room, Compressed air, RO water system), Freezer Farm Biobank, and Centralised cryogenic processing and storage facility. Further details are provided in section 7.8.1.

- **Health and safety** as being at the forefront of all considerations – and during the further design stages it will become critical to the planning outcomes:

- ▶ A logical layout that is ordered but yet expandable;
- ▶ The workflow has key access points that need adequate space to allow operators to do their work unencumbered and not crowded by other activities or instruments;
- ▶ Clearly articulated travel paths that are wide enough for ease of movement;
- ▶ Sightlines and visual control will enhance safety;
- ▶ Allows trolley-based movements;
- ▶ On floor biological safety cabinets to provide easy access in event of a health or containment risk; and
- ▶ Appropriate allocation of hygiene and safety stations clearly demarcated.

25. BMT cell processing records storage/retention requirements and secure access to BMT staff only (this could be a lockable cabinet in common space).

- **Building services reticulation and backbone to be flexible and adjustable**, and ordered to avoid “mess” but be serviceable and able to be upgraded and interchanged with new technologies and equipment.
- **Floor Loading.** All departments will likely have an increased number of analysers and equipment that is heavy and becoming heavier. The design should ensure that the floor load capacity and point loads are designed for current and future equipment.
- Ideally, design for the “**science on display**” concept that opens science to the broader community and population. This increasingly popular concept can greatly enhance the awareness and importance of a hospital pathology department and engage with the hospital staff and also the public where applicable. These could include accessible viewing of the functioning laboratory for the public with an extensive use of glass walls, glazing, and graphics on glass.
- **Sustainability.** It is likely that equipment to help recycle plastics, chemicals and other recyclables will be added to the future laboratory state and will require additional space and workstations.

7.8.1. Storage

Pathology storage is an extremely important consideration for a highly efficient laboratory. Storage is a crucial to the design of a pathology laboratory for several reasons:

- **Efficiency of Workflow:** organised storage ensures that equipment, specimens, and reagents are easily accessible, reducing the time technicians spend searching/gathering items;
- **Safety:** many substances used in pathology labs are hazardous. Correct storage reduces the risk of accidental exposure, spills, or other incidents. For example, chemicals need to be stored in specific cabinets, and sharps need their own designated disposal containers;
- **Preservation of Specimens:** many samples and specimens have specific storage requirements to ensure their integrity. Temperature-controlled storage is essential for certain biological samples, while others might need protection from light or moisture;
- **Optimal Use of Space:** laboratories often have a lot of equipment, samples, and reagents, but may not have a vast amount of space. Efficient storage solutions can maximise the available space, allowing labs to accommodate more resources, function more effectively and have the ability to reconfigure spaces as technology evolves;
- **Regulatory Compliance:** many jurisdictions have regulations regarding the storage of certain substances, especially biohazardous materials. Proper storage ensures that the laboratory remains compliant with these regulations, avoiding legal complications and potential shutdown;
- **Reduction of Cross-Contamination:** organised storage helps to prevent cross-contamination by ensuring that items are stored in designated areas, reducing the chance of samples or equipment coming into unintended contact. This is important for all laboratory spaces but even more so in disciplines where microorganisms are grown or replicated;
- **Inventory Management:** good storage practices, when paired with an efficient inventory management system, ensure that the lab is well-stocked but not over stocked. It can help

to track expiration dates, lot numbers, and ensure that perishable items are used before they degrade;

- **Protection of Equipment:** proper storage can extend the life of equipment by protecting it from environmental factors, accidental damage, or misuse;
- **Cost Savings:** efficient storage systems can lead to reduced waste (from expired or degraded reagents and samples) and fewer equipment damages. This can translate to substantial cost savings over time;
- **Aesthetic and Morale:** a well-organised space is more pleasant to work in and can boost staff morale. A tidy, organised lab can also present a more professional appearance to visitors or inspectors;
- **Flexibility and Scalability:** a well-designed storage system can adapt to the changing needs of the laboratory. As the lab grows, adopts new techniques, or phases out old ones, flexible storage can accommodate these changes without a complete redesign;
- **Proximity to Delivery Entry Points:** positioning storage locations close to delivery entry points ensures quick and efficient transfer of materials without interrupting the lab's main workflow. When deliveries are received, they can be promptly stored without having to move through active work zones, reducing potential disruptions, contamination risks, and the time taken for materials to reach their designated storage area; and
- **Redundancy in Storage Systems:** having backup or redundant storage systems especially for critical items like temperature-sensitive samples, ensures service continuity. If a primary fridge or freezer fails, the redundant system can act as an immediate backup, minimising downtime and potential loss of valuable samples or reagents.

This not only ensures the safety and viability of stored products but also provides peace of mind for the laboratory staff, knowing that there's a safety net in place.

The main principles for the storage of pathology specimen include²⁶:

- Specimens must be stored under appropriate storage conditions that permit reliable retrieval;
- Laboratories must demonstrate storage conditions are fit for purpose and retain supporting documentation, including records of storage temperatures;
 - ▶ Recommended general storage temperatures are as follows:
 - Refrigeration 2 to 8°C;
 - Freezer -20°C or lower; and
 - Deep freezer -70°C or lower.
 - ▶ Some types of refrigerators and freezers involve “freeze/thaw” cycles as part of their auto-defrost features. Specimens stored in these types of refrigerators/freezers should not be intended for later testing of analytes that are degraded by such freeze/thaw cycles.

26. Australian Commission on Safety and Quality in Health Care, Requirements for the Retention of Laboratory Records and Diagnostic Material, Tier 3B Document, Ninth Edition 2022, chapter 1, available at https://www.safetyandquality.gov.au/sites/default/files/2022-04/retention_standard_ninth_edition_2022.pdf.

- Storage of blood and blood products, including stem cells and cell therapy products, must be in accordance with AS 3864 Medical Refrigeration Equipment – for the storage of blood and blood products²⁷;
- Specimen refrigerators and freezers must not be used for storage of food or drink; and
- Use of specimen refrigerators and freezers for storage of tissue specimens intended for transplantation or use as a therapeutic device requires that the laboratory must comply with the regulatory requirements of the TGA²⁸ and other relevant regulatory codes.

The types of storage for the Pathology redesign include the following, a table of storage categories and icons can be found in the Appendix:

- **Room Temperature Storage:**
 - ▶ Paper/Stationery: ensure a dry, cool environment to prevent dampness, which might degrade paper quality;
 - ▶ Reagents:
 - Use chemical-resistant shelving units with adjustable shelves for varying bottle sizes; and
 - Spill trays or containment systems are essential to prevent spills from contaminating other products.
 - ▶ Chemicals:
 - Store in well-ventilated cabinets specifically designed for chemical storage. Flammable cabinets are required for certain solvents; and
 - Shelves must be clearly labelled based on the chemical class and use secondary containment systems.
 - ▶ Gas Supply
 - Reticulated gases from an external loading dock area are preferred, where possible, to minimise WHS issues and avoid requirements for extensive storage facilities within laboratory spaces.
 - Ideally Pathology will not be storing any gas cylinders within laboratory spaces; and
 - Reticulated supply of LN2 to cryogenic storage and cell processing laboratory
 - ▶ Records, Samples, Slides, Blocks:
 - Slides and blocks require specialised cabinets or drawers to protect from light, dust, and physical damage. This is typically an extremely heavy store with a cabinet designed to store 10,000 slides having a combined weight over 300kg (see Appendix A5 for calculations);
 - It is crucial to consider the floor load capacity, ensuring it can handle the weight of fully loaded storage units;
 - Ensure that units have durable and smooth sliding mechanisms, as the weight can make drawers challenging to open and/or close;

27. SAI Global. Australian Standard AS3684: Medical refrigeration equipment – For the storage of blood and blood products. Sydney (AU): Standards Australia; 1997

28. Therapeutic Goods Administration. Australian Regulatory Guidelines for Biologicals (ARGB) [Internet]. Canberra (AU): TGA; 2017 [viewed 17 January 2018]. Available from: <https://www.tga.gov.au/publication/australian-regulatory-guidelines-biologicals-argb>.

- Reinforce shelving or racking solutions to prevent sagging or potential collapse;
 - Records can be stored in conventional filing cabinets. However, fire-resistant options should be considered for enhanced security; and
 - Samples should be kept in labelled containers on open or closed shelving, away from direct sunlight, reagents and clean areas.
- ▶ Equipment:
 - Bulky equipment should be stored on sturdy tables or workbenches;
 - Smaller equipment can be stored in cabinets or on open shelves; and
 - Ensure electrical outlets are nearby for equipment requiring power.
- **Refrigeration (2-8°C):**
 - ▶ Reagents:
 - Use laboratory-grade refrigerators. Must not store with samples or food to prevent cross-contamination;
 - Store reagents on separate, labelled shelves;
 - Walk-in Refrigerator and Freezer Unit with glass doors offer a multitude of benefits in a pathology laboratory, especially when they are used for storing critical reagents (see Appendix A6 for Walk-in Refrigeration considerations); and
 - Blood and cell therapy products to meet relevant refrigeration, monitoring and security standards.
 - ▶ Samples:
 - Use laboratory refrigerators with adjustable shelving. Store samples in labelled containers or racks.
 - ▶ Food:
 - Should be kept separate from any lab materials. Use dedicated, clearly labelled refrigerators.
 - ▶ Bodies:
 - Walk-in refrigerators or cold rooms are necessary. Ensure they're easy to clean and maintain.
- **Frozen Storage (-20°C):**
 - ▶ Samples:
 - Use laboratory-grade freezers with adjustable shelves or racks;
 - Maintain a regular defrosting schedule; and
 - Walk-in Freezer component to be part of the Walk-in Refrigerator Unit (see Appendix A6 for Walk-in refrigeration considerations)
 - ▶ Bodies:
 - Specialised mortuary freezers are necessary. Consider systems with built-in alarms for temperature fluctuations.
- **Other Frozen Storage:**

- ▶ Use specialised freezers for temperatures other than -20°C, and ensure they have adjustable shelving; and
- ▶ For samples stored in liquid nitrogen (LN2), use cryogenic storage systems. These systems should be insulated and come with safety precautions for handling.
- **Incubated Storage:**
 - ▶ Laboratory incubators, predominantly set at 37°C, but adjustable for a range of temperatures. Ensure uniform temperature distribution.
- **Waste Storage:**
 - ▶ Chemical Waste: store in designated, well-labelled containers with tight-fitting lids to ensure containment in case of spills;
 - ▶ Biohazardous Waste: use biohazard bags and containers, ensure they're sealable and stored away from general waste;
 - ▶ Sharps: store in puncture-resistant sharps containers, and replace when $\frac{3}{4}$ full;
 - ▶ Liquid Laboratory Waste: store in leak-proof containers, preferably secondary containment systems;
 - ▶ General Laboratory Waste: Use labelled trash bins, with clear separation from biohazardous or chemical waste;
 - ▶ Other General Waste: use standard trash bins, placed conveniently around the laboratory; and
 - ▶ Recycling: use labelled bins for different recyclables (paper, plastic, glass), and ensure they are emptied regularly.

Note, a separate lift is recommended to transport these waste products out of the building.

The design of the new Pathology facility will centralise as much stock and storage as possible in the Central Consumable stores. Smaller quantities of approximately 1 week of stock will be stored close to the laboratory areas.

The following types of storage will be employed:

- **Freezer Farm Biobank** with controlled freezing capability will be shared with AP, DG and Haematology;
- Cryopreservation of specimen will be done using **mobile LN2** within the laboratory, retrieved from the **cryogenic processing and storage facility** located next to loading dock (for LN2 deliveries);
- Stock will be retrieved from the dedicated **Central Consumables Store** with a location strategically placed to optimise workflow, note the Central Consumables Store contains a **Walk-in Cold Room & Freezer Room** for storage of stock, specimens and reagents that require temperature control;
- Sustainability and Waste management
 - ▶ General (non-chemical) waste will be disposed to the dedicated **Central Waste Store** next to the Central Consumables Store, where items are segregated into different types of bins, awaiting (efficient) collection by the waste disposal service; and
 - ▶ It is likely that equipment and consumables (such as plastics, chemicals and other recyclables) will be added to the future laboratory state and may require specifically designated space in waste collection and disposal.

- Chemical waste (i.e., used specimens) will be consolidated at the **Central Chemical Store** (containing Class 3 & 8 stores) for careful disposal/incineration;
- **Centralised Equipment Storage** will be used to store the laboratory equipment when it's not in use. This includes the analysers themselves, as well as smaller equipment and supplies like pipettes, tubes, and personal protective equipment. It may also include back-up technologies which are typically more like small Point of Care testing analysers; and
- There remains a need for other **Record Storage** even though the development of DHR is being rolled out across CHS. Record Storage is of particular consideration for the new facility.

7.8.2. Specimen Retention

The general minimum retention times are provided below in Table 7-4, with some variation from department to department specified in sections below²⁹.

Table 7-4: General Minimum Retention Times for Pathology

	RECORD/MATERIAL	MINIMUM RETENTION TIME
3-2-1	Personnel records	Period of employment + 4 years
3-2-2	All quality control, quality assurance and quality management records	4 years
3-2-3	Equipment maintenance	Life of equipment + 4 years
3-2-4	Laboratory methods/procedures (manuals)	4 years ³⁰
3-2-5	Referring doctor's request, laboratory records such as records of analysis, calculations and observations from which the result is derived	4 years ³¹
3-2-6	Digital images or graphical output used in diagnosis ³²	4 years
3-2-7	All specimens, unless otherwise specified under the separate disciplines	7 days from date of receipt or until 2 days after the final report is issued (whichever date is later)
3-2-8	Copy of original report, or ability to reprint the information content of an original report unless a longer period is specified under the separate disciplines	7 years for adults 7 years from the age of majority for minors

7.8.3. Disposal

Laboratories must dispose of specimens and patient records in accordance with relevant state/territory legislative requirements as per Appendix A8.

- Documents with identifying patient details should be shredded or disposed of in another secure manner; and

29. Australian Commission on Safety and Quality in Health Care, Requirements for the Retention of Laboratory Records and Diagnostic Material, Tier 3B Document, Ninth Edition 2022, chapter 2, available at https://www.safetyandquality.gov.au/sites/default/files/2022-04/retention_standard_ninth_edition_2022.pdf.

30. The retention time of 4 years refers to the circumstance where a laboratory method/procedure/in-vitro diagnostic (IVD) device has been superseded or replaced by a new and unrelated methodology. However, where a laboratory method/procedure/IVD has simply been modified, the full history of all earlier versions/modifications of that particular IVD must continue to be retained.

31. Storage of scanned facsimile images and associated records of these intermediary documents is a satisfactory alternative to retention of the original document. For those areas where material is retained for longer than 4 years, the laboratory may wish to consider retaining the associated records for a corresponding period. Although there is no minimum retention time for paper request forms after validated scanning has been performed, it would be prudent to retain them for as long as is necessary to exclude the possibility of scanning failure.

32. Except where specific guidelines for image retention are made.

- Any organs retained at autopsy with consent of next-of-kin, should be disposed of as outlined in the National Code of Ethical Autopsy Practice unless otherwise stipulated by the next-of-kin.

Laboratories must have a policy to address patient requests for returned specimens, including instructions for the disposal of specimens.

7.8.4. Safety

- There will be provision of clear signage that:
 - ▶ No food or drink may be brought into, or consumed in, the designated laboratory area;
 - ▶ Gowns must be worn at all times in the laboratory area;
 - ▶ Disposable gloves are recommended and must be worn if handling open specimens or potentially contaminated instrumentation;
 - ▶ Personal protective equipment must be removed and hands washed when exiting the laboratory into clean spaces.
- Hand wash basins, safety showers and eyewash stations will be made available and strategically dispersed throughout each laboratory floor;
- The handling of LN2 carries risks that must be managed, including:
 - ▶ Personal Protective Equipment (PPE): personnel working with LN2 should wear appropriate PPE, including insulated gloves, face shields or goggles, and cryogenic aprons or lab coats. PPE protects against the extreme cold temperatures and potential splashes or spills;
 - ▶ Handling and Transfer: LN2 should be handled and transferred using approved containers and equipment designed for cryogenic materials. Cryogenic gloves and tools, such as tongs or transfer vessels, should be used to prevent direct contact with LN2 and minimise the risk of injuries; and
 - ▶ Cryogenic Spills: In the event of a cryogenic spill or LN2 exposure, proper procedures should be followed. This may include evacuating the affected area, notifying appropriate personnel, and using absorbent materials specifically designed for cryogenic spills to contain and clean up the spill.

7.9. SPECIFIC DESIGN ELEMENTS BY DISCIPLINE

7.9.1. Pre-analytics

Scope of Service

Pre-Analytics is the 'front door' to pathology. It maintains the pathology test register, manages distribution of test results and is responsible for patient care in collection areas. Pre-analytics is custodian of patient specimens up to handover to other specialist departments.

Pre-Analytics department comprises two distinct services:

- **Collection Services.**
 - ▶ Customer engagement;

- ▶ Phlebotomy/specimen collection to support CH and non-CH services;
 - ▶ Glucose Tolerance Testing;
 - ▶ Electrocardiogram;
 - ▶ Fine Needle Aspiration;
 - ▶ Home Collection Service;
 - ▶ Couriers;
 - ▶ Client and service advocacy;
 - ▶ Dispatch of tests to specialist labs for testing; and
 - ▶ Patient and client enquiries.
- **Specimen Reception.** Pre-analytical request registration;
 - ▶ Pre-analytical request registration;
 - ▶ Specimen receipt;
 - ▶ Receipt of samples via the (Lampson) Pneumatic tube system from connected ward locations;
 - ▶ Specimen processing;
 - ▶ Loading, unloading and monitoring of the specimen tracking system;
 - ▶ Delivery of test results and reports;
 - ▶ Management of clinical trial samples; and
 - ▶ Referral of samples.

Specimen Pathway

Specimens are received from the following places:

- Inpatient and outpatient services at CH;
- Other public and private hospitals in the ACT and parts of NSW;
- Community medical practitioners; and
- Collection centres operated by ACT Pathology.

Upon receipt of the specimen and the checking of the specimen details, the specimen is registered in the Laboratory Information System (LIS). This becomes a critical step in the quality, tracking and risk management of pathology's work.

Collection Services

Collection services comprise:

- Patient arrival and registration - with referral and identification;
- The specimen is collected from the patient (by various methods depending on the specimen); and
- Once collected, the specimen is appropriately handled and transported to specimen reception.

Specimen Reception

Specimens are delivered to Reception by:

- Pneumatic Tube from some areas of the Hospital;
- Hospital staff;
- ACT Pathology couriers; and
- ACT Pathology staff including Anatomical Pathology staff who perform the collection (e.g., fine needle aspiration).

Specimen reception has two main functions: 'logging' the specimen into the laboratory's information management system with cross-checking of the requisite details and forwarding the specimen to the Core Laboratory for routine testing or other appropriate department for processing. Each of the specialty areas have their own process(es) and systems that are described below (sections 3.2 to 3.8).

Specific Design Elements for Pre-Analytics

The design of the Pre-analytics services must incorporate the following elements:

Space and Zoning;

- **Customer service:** part of the pathology administration/customer service space is for a customer support team that acts like a call centre. This area will be made up of a mix of:
 - Offices for key management staff; and
 - Open plan for the support team.
- **The Collection Area** requires:
 - Most importantly, to be located in an area that is easily accessible to patients;
 - Careful zonal planning to ensure visibility of the waiting room, and comfort for patients while waiting;
 - Space for a reception desk, computers, and patient registration. This should be designed to be the first part of the patient journey and also positioned to ensure the staff can supervise the waiting room;
 - Waiting areas to be comfortable and may include amenities such as water dispensers, magazines, televisions as well as play area for children;
 - Sufficient seating for patients, keeping in mind peak times but also access to reclining seating whether that be in a collection room or the waiting space;
 - Sufficient collection rooms to cope with peak demand, particularly early mornings where patients have been asked to fast or hold their bladder;
 - Sufficient space for a phlebotomy (reclining) chair or bed, a side table for equipment, and movement space for the phlebotomist. The room should be designed to ensure patient privacy and comfort;
 - A secure area for storing specimens before they are transported, even though the specimens will be delivered to the laboratory (presumably upstairs) promptly after collection;
 - Provision of space for supplies such as:
 - Needles, tubes, tourniquets, gloves, and other necessary items; and
 - Mobile collection trolleys. A dedicated storage space may be required for access to these trolleys (for both restocking and usage) such as internal trolley parking

bays. This must be carefully considered because collection trolleys don't stack like chairs or shopping trolleys.

- ▶ Restrooms should be available for patients, especially if they need to provide urine samples or if they are waiting for extended periods;
- ▶ A staff room, and personal lockers for storage;
- ▶ A space for administrative tasks, separate from the public areas. This could be included as part of the Pathology Administration.
- ▶ A dedicated space or storage for biohazardous waste, sharps disposal, and general trash, on top of the centralised waste storage;
- ▶ Easy access to emergency exits for safety considerations, and the layout should account for the easy flow of patients to avoid crowding or bottlenecks;
- ▶ Compliance with regulations for people with disabilities, including provision of ramps, wide doorways, and accessible restrooms;
- ▶ Parking and Transportation as important considerations to encourage patients to attend the collection centre;
- ▶ Consideration should be given to security relating to patient records, cash handling (if payments are made on-site), and any other sensitive materials;
- ▶ That the design must comply with NPAAC Requirements:
 - Collection premises must comply with all applicable laws and regulations;
 - The current approval certificate must be visibly displayed;
 - Patients and carers must not enter Laboratory testing areas to gain access to the collection rooms;
 - Easily cleanable surfaces must be available for clerical work, Specimen collection and Specimen handling;
 - Suitable, secure storage area for supplies must be available and accessible only to staff;
 - Floor coverings in the immediate collection and storage areas must have a non-porous surface;
 - There should be provision to accommodate carers as required;
 - Toilet doors should be lockable from the inside and unlockable from the outside in case of emergency. The doors should be removable or open outward for purposes of access;
 - Hours of operation should be displayed; and
 - Collection areas should have adequate space for furniture to enable patients to be seated or to be recumbent according to medical requirements as well as a work surface for the collection staff.

- **Specimen Reception** will be an essential part of the core laboratory.

Ventilation and Air Quality

As per "General Design Principles" in section 7.8.

Lighting

As per “General Design Principles” in section 7.8.

Temperature

As per “General Design Principles” in section 7.8.

Acoustic Control

Call centres can become noisy, making it difficult for staff to hear calls clearly. Consideration in design should be given to soundproofing, acoustic panels, or high partitions between workstations to mitigate noise. Noise-cancelling headsets can also be beneficial.

Floor Loading

As per “General Design Principles” in section 7.8.

Sustainability

As per “General Design Principles” in section 7.8.

Storage and Specimen Retention

Storage

Collection Centres store the following:

- Collection Materials:
 - ▶ Vacutainer tubes (with various additives), needles, butterfly needles, tourniquets, syringes, needle disposal containers, blood collection chairs;
 - ▶ Sterile urine containers, sometimes containers with preservatives;
 - ▶ Sterile swab kits for throat swabs, nasal swabs, wound swabs, etc;
 - ▶ Stool Collection kits with or without preservatives;
 - ▶ Sputum containers, semen analysis containers, etc; and
 - ▶ Trolleys with consumables for hospital collections.
- Personal Protective Equipment (PPE):
 - ▶ Gloves, masks, gowns or aprons, face shields or goggles, hand sanitisers, and antiseptic hand wash.
- Initial Processing Equipment:
 - ▶ Centrifuges (for spinning down blood samples), tube racks, and sample mixers.
- Storage Equipment:
 - ▶ Storage cabinets for non-chilled/frozen samples awaiting pickup or transport; and
 - ▶ Trolley storage is required for those used for collections performed throughout the hospital.
- Transport Materials:
 - ▶ Sealable plastic bags and containers for samples, transport coolers with ice packs or gel packs, and transport paperwork or pouches.

- **Waste Containers:**
 - ▶ Sharps containers for used needles;
 - ▶ Biohazard bins for contaminated waste; and
 - ▶ General waste bins.
- **Paperwork and Administrative Materials:**
 - ▶ Patient forms, pathology request forms, stationery, pens, computer systems (for electronic record-keeping and tracking), printers, labels, and label printers.
- **Cleaning and Disinfection Supplies:**
 - ▶ Surface disinfectants, cleaning cloths or wipes, spill kits for biohazards.
- **Informational Materials**
 - ▶ Brochures or handouts about various tests, preparation instructions for certain tests (like fasting blood tests or 24-hour urine collections), privacy notices.
- **Emergency Supplies:**
 - ▶ Basic first aid kit, emergency contact numbers, and potentially an automated external defibrillator (AED) depending on regulations and centre size.
- **Comfort Supplies:**
 - ▶ Items like tissues, band-aids, cotton balls, and sometimes a small snack or juice (especially useful if a patient feels faint after a blood draw).
- **Staff Refrigerator:**
 - ▶ For food storage.
- **IT Server Room/Storage:**
 - ▶ **Backup Power:** Uninterruptible Power Source (UPS) and cooling systems. Server rooms generate heat, so they need cooling to maintain an optimal temperature;
 - ▶ **Portable or Dedicated Air Conditioning Units** to keep the room cool;
 - ▶ **Fans or Ventilation Systems** to assist in circulating air;
 - ▶ **Racks or Cabinets:** these structures hold the servers and other equipment, helping to keep the room organised;
 - ▶ **Environmental Monitors** to track temperature and humidity;
 - ▶ **Security Systems:** may include cameras or access logs for those entering the room;
 - ▶ **Fire Suppression solutions;**
 - ▶ **Smoke Detectors** to alert staff to potential fire hazards; and
 - ▶ **Physical Security** with restricted access.

Specimen reception is a pivotal section in any pathology laboratory. It serves as the primary interface between the laboratory and referrers, handling specimens that come in for testing. The processing of specimens requires mostly at workstation storage of stationery and waste.

The key storage area for specimen reception is for eskies and other specimen transport equipment that are waiting for retrieval by couriers. These could be empty and will be used by couriers in future transportation of specimens and packages ready for delivery to another laboratory for testing (that the laboratory doesn't currently perform).

Pre-Analytics also need to be consistent with the broader pathology specimen storage principles as outlined in section 7.8.1.

Specimen Retention

ACT Pathology is required to meet NPAAC requirements for the tracking and retention of laboratory records and diagnostic material. The relevant requirements for Pre-Analytics are outlined in section 7.8.2, with some additional requirements for specimen reception detailed below³³:

- Laboratories must have policies and procedures in place regarding the tracking of specimens which are referred into or out of the laboratory, for the purposes of traceability;
- Laboratories that refer a specimen with prolonged retention requirements to a second laboratory must document the release and return of the specimen.
 - ▶ This requirement relates specifically to stained histological, cytological and bone marrow slides and/or blocks referred or requested for second opinion or additional testing;
 - ▶ Laboratories must not retain referred materials with prolonged retention requirements without the consent of the original/referring pathologist; and
 - ▶ Laboratories that receive a referral specimen with prolonged retention requirements must ensure its safe and prompt return to the original laboratory at the completion of review or additional testing. This does not apply to spare slides or recut slides upon which additional testing was performed, which should normally be retained in the laboratory performing the additional testing.
- Laboratories performing additional review or testing on any referral specimen must provide a copy of any report to the original laboratory to ensure continuity of the medical record.

Key Functional Relationships

Internal Relationships

Collection Services has a close clinical relationship with Specimen Reception. However, it does not need to be immediately proximal to the Specimen Reception or any other pathology function if patient-centred care considerations outweigh proximity (collection services must be close to outpatient public access/parking/ pickup/drop-off). There are other mechanisms such as pneumatic tubes that can reduce the need for close proximity.

Specimen Reception will be a part of the Pathology Core Laboratory services in the new facility along with (automated) Chemical Pathology, (automated) Haematology, and (automated) Immunology/Infectious Immunoassay, as one of its main future functions will be loading and unloading the tracking system.

External Relationships

Collection Services is the most outward facing department of ACT Pathology. It works with all CH departments, other CHS services, private health service providers, as well as pathology laboratories outside of CHS. Collection Services is strategically positioned to impact ACT Pathology's reputation and reflect 'customer needs'.

Specimen Reception is to be closely linked with courier services.

33. Australian Commission on Safety and Quality in Health Care, Requirements for the Retention of Laboratory Records and Diagnostic Material, Tier 3B Document, Ninth Edition 2022, available at https://www.safetyandquality.gov.au/sites/default/files/2022-04/retention_standard_ninth_edition_2022.pdf.

Management and Operational Support Services

Hours of Operation

Pre-Analytics services at the new Pathology facility will operate 24 hours a day, 7 days a week and 365 days a year, with reduced resourcing after-hours and weekends³⁴.

Collection services may also be offered outside of this building, if this is the case, hours of operation of this (other collection) service will be in line with the building and staff arrangements.

Service Integration and Collaboration

As noted above, Pre-Analytics is the 'front door' of the pathology service, and always available at the hospital site to receive specimens from CH, other hospitals and other collection sites across the ACT.

An important current and future function of the Pre-Analytics services is the capacity to further develop and maintain the market share for pathology services, which means:

- Maintaining its availability;
- Maintaining and improving its collaboration with community referrers and its responsiveness, including the timely collection of specimens; and
- The corresponding need for timely testing and reporting of results that is the responsibility of the Pathology Core Laboratory and each department.

This also means having compatible ICT platforms for receipt of referrals and for reporting results in a timely manner: a core requirement of current and future Pathology services.

Major Equipment List

Current major equipment for Collection Services and Pre-Analytics services is detailed in the Appendix. This list is generated from a combination of ACT Pathology's equipment audit (in black), as well as other sources including NATA accreditation documents and department walk-through.

This list is generated from a combination of ACT Pathology's equipment audit (in black), and other sources including NATA accreditation documents and department walk-through.

Table A9-1 and Table A9-2 includes but is not exclusive to analysers and mixers, incubators and imaging systems, fridges and freezers, heat plates, centrifuges, and page writers.

Workforce Model

The workforce model³⁵³⁶ determines the effectiveness of clinical capability of Pre-Analytics services. It is both the number of FTE as well as how staff are organised to meet demand in a timely manner that will be important to the viability of pathology as a business unit.

Current staffing levels provided in tables below, and total 99.1 FTE.

34. ACT Pathology, 02508 02501 86751 aid.

35. ACT Pathology, SR Staff List - January 2023

36. ACT Pathology, January 2023 Customer Service Staff List.

Table 7-5: Staffing by Workforce Category, Collection Services

Staff Category	Headcount	FTE
Customer Services Manager	1	1.0
Collections Manager	1	1.0
Collections Educator	1	1.0
Customer Liaison Officer	1	1.0
Receptionists	21	16.0
Phlebotomists	53	39.5
Pathology Courier	15	8.6
Total	93	68.1

Table 7-6: Staffing by Workforce Category, Specimen Reception

Staff Category	Headcount	FTE
Manager	1	1.0
Senior Technical Officers	5	5.0
Team Leaders	4	4.0
Technical Officers	28	21.0
Total	38	31.0

Staffing numbers are at a point in time and will not reflect future FTE or workforce mix needs.

The Future State

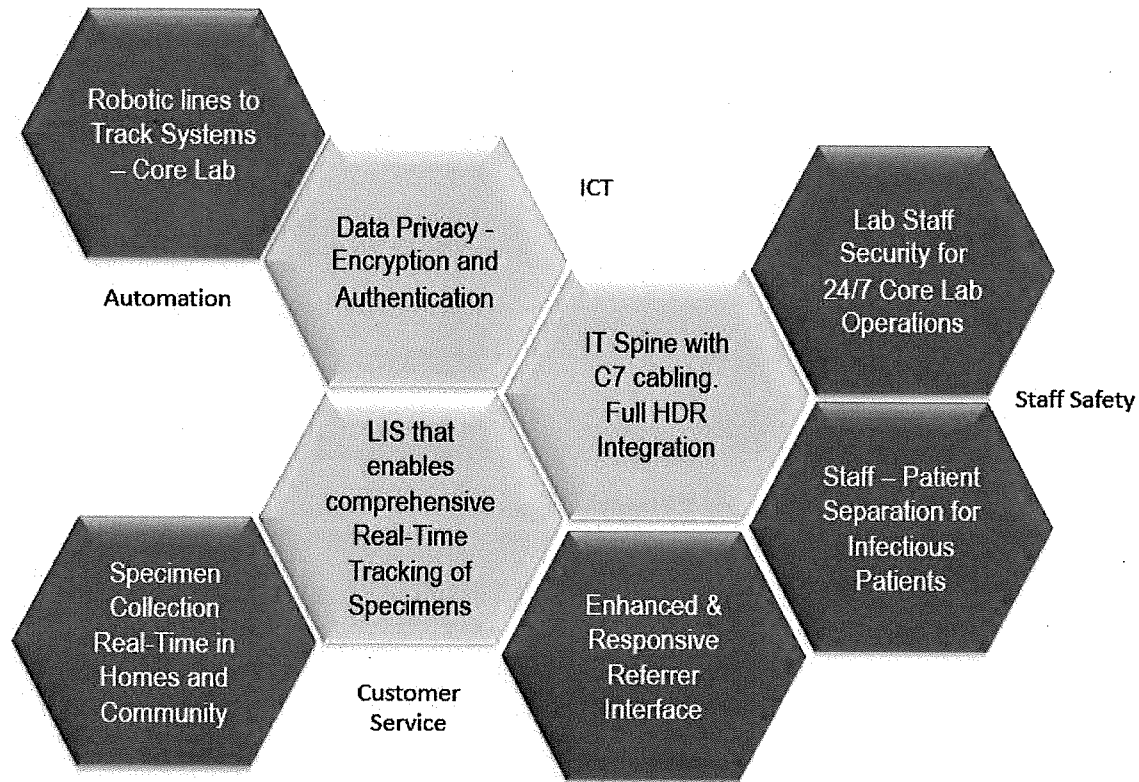
It is proposed that the current traditional Pre-Analytics model would be progressively developed to a fully digital service.

Ideally, there would be further automation of collection and reception of specimens, thereby increasing operational efficiencies and reducing risks associated with specimen identification and tracking.

The design of the Pre-Analytics area would effectively integrate Pre-Analytics with the Core Lab to maximise operational efficiencies.

Over time, this is expected to enable the enhanced automation, a robust ICT spine, enhanced customer service, and staff safety, as identified in Figure 7-8 below.

Figure 7-8: Future State for Pre-Analytics



7.9.2. Anatomical Pathology

Scope of Service

Test Volumes

Anatomical Pathology (AP) performs approximately 30,000 tests annually and is considered one of the most labour-intensive disciplines. The bulk of the testing is histology, which accounts for approximately 75% of the workload. The breakdown of testing, section and volume is provided Table 7-7 noting a slight decline year-on-year, which is most likely related to COVID.

Table 7-7: Anatomical Pathology Test Volumes – 2019-20 to 2021-22

Year	Histology	Cytology	Immuno-histochemistry	Perinatal Autopsies	Total
2019/2020	Not known	Not known	Not known	Not known	34,265
2020/2021	25,106	7567	Not known	95	33,157
2021/2022	22,507	7237	Not Known	77	30,221

Specialty Scope

AP is a specialty of pathology that involves the study of human organs and tissues and has a large role in cancer diagnoses. The tissues examined usually include biopsy material taken

from a patient in the operating theatre, on the ward, outpatients or during autopsy, and allows clinicians to give the most appropriate advice and treatment to patients³⁷. A significant numbers of referrals also come from external specialists and GPs.

AP has roles in the following areas, noting the most significant volumes of work are for “tissues of living patients”³⁸:

- Determining the cause of disease;
- The effect(s) these diseases have on the body and specific organs or tissues;
- The choice of treatment to be given;
- Prediction of prognosis; and
- Determining cause of death.

There are three sub-divisions within anatomical pathology; histology, cytology and mortuary services³⁹.

Histology

Histology focuses on microscopic structure of tissue obtained from biopsies or surgical procedures, processed (see below) and then examined by an anatomical pathologist under a microscope. There are several important components of histology that impact on the Service Model and the design of future AP space.

Immunohistochemistry (IHC) is a form of specialised staining employed on both histology and cytology samples. IHC uses antibodies to detect specific antigens in tissue samples and provides information about the location and intensity of antigen expression, giving a more detailed and specific analysis than traditional histology. This includes tumour markers (proteins) that are overexpressed in certain types of cancer (like HER2/neu in breast cancer), amongst many others.

Cytology

Cytology examines cells or cluster of cells under a microscope. Cytology includes examinations most often related to body fluids, cervical screening tests and fine needle aspirations. Cytology scientists attend many interventional radiology procedures to provide on-site rapid assessment of samples for diagnostic adequacy.

Mortuary services

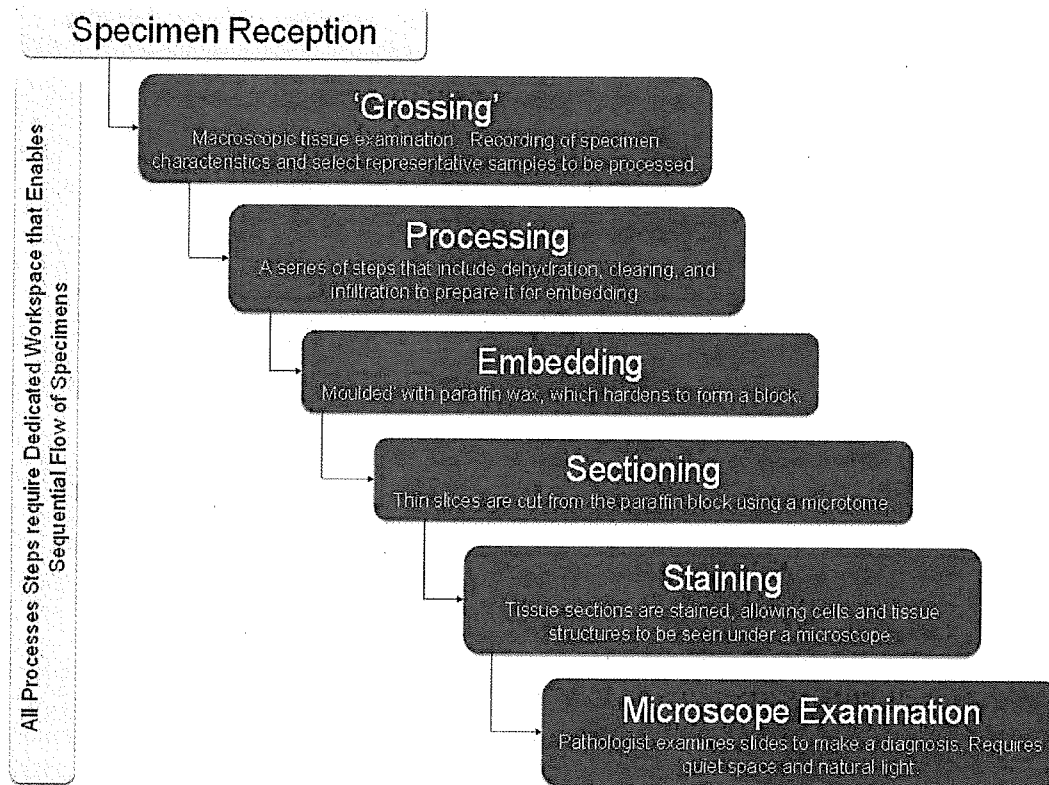
See section 8.

Specimen Pathway

Following receipt and registration of specimens (from Pre-Analytics), processes in AP follow a generally linear flow, but with recursive loops through parts of the process if additional work or stains are required. There are slightly different pathways for each of the units as indicated in the following schematic diagram.

37. NSW Health Pathology, Clinical Services Plan 2019 – 2025 Version 2:2021, <https://pathology.health.nsw.gov.au/wp-content/uploads/2022/10/Clinical-Services-Plan.pdf>
38. NSW Health Pathology, Clinical Services Plan 2019 – 2025 Version 2:2021, <https://pathology.health.nsw.gov.au/wp-content/uploads/2022/10/Clinical-Services-Plan.pdf>
39. Note Mortuary Services is detailed in section 8.

Figure 7-9: Unidirectional Specimen Flow for Histology



All findings/reports - including diagnosis and recommendations for treatment and/or management - are then documented, which is the principal means of communication with other clinicians involved in relation to overall patient care and management.

After analysis, specimens must be stored for a period of time (before disposal) based on CHS policies and statutory requirements. Disposal is similarly governed by policy and regulation/protocols, as biohazardous waste.

It is evident from the above description that AP requires space for receiving and managing/storing and processing a large variety of tissue types. Each of the stages of tissue examination requires dedicated space to ensure effective management and control of the tissue. Each process is sequential requiring the organisation of the histology unit to be established in a unidirectional and logical flow sequences.

Many of the process steps are currently manual but with an increasing propensity to automate most of these manual steps.

The pathologist may request additional sectioning and staining (including immunohistochemistry or in situ hybridisation) in order to make a diagnosis (looped workflow).

In some cases, specimens are sent fresh (rather than in formalin) for frozen section examination. Fresh tissues are also triaged and divided for examination by multiple other departments (for example, lymph nodes for Microbiology and Flow cytometry as well as Histology).

Triaging of samples is a large component of AP, requiring a close collaboration between scientists and pathologists. Close proximity is therefore essential.

For Cytology, the processes are a truncated version of Histology.

Specific Design Elements for Anatomical Pathology

Space and Zoning

Operationally, AP and Diagnostic Genomics (DG) may be managed as a single department. The closer working relationship will provide an opportunity to better leverage new technologies (genomics and imaging in particular) and the evolving, closer professional relationships that are already emerging

AP site visits demonstrated that, new laboratories, even after a relatively short period of time (e.g. 5 years) outgrow the space. This is due to the high level of manual labour, especially in areas such as cut up grossing.

As workloads increase, space requirements also increase due to additional staff required. It is therefore critical to provide adequate expansion space for AP to ensure ACT Pathology can keep pace with future clinical requirements.

AP registrars will be located in a dedicated space to allow for their workstations/microscope, unlike registrars of other disciplines.

Other design considerations for AP include the following:

- *Modularised functions and adjacencies* of the following functions within AP that enable efficient work flow;
- *Reception and Specimen Accessing Area*: this is where specimens first arrive. The area should be designed to log, label, and sort specimens and route them to the appropriate next stage. It should have computer terminals for logging specimens and adequate storage for specimen containers;
- *Grossing Area*: this area is dedicated to the examination and dissection of large tissue samples. It should be equipped with adjustable-height tables, good lighting, and necessary tools. Ventilation is crucial due to the use of fixatives like formalin.

Some labs utilise downdraft tables to evacuate fumes. It is recommended that ventilation specialists be consulted for the final solution design noting that formalin and xylene fumes are heavier than air and tend to be present in higher levels closer to the floor and benches. This zone may need to be close to the imaging device (Faxitron) if samples require X-rays before dissection, as well as cassette printers for voice recognition dictation;

- *Processing Area*: tissue samples are processed to remove water and infiltrate them with paraffin wax. Automated tissue processors are commonly used. Given the use of solvents like xylene, ventilation and chemical fume hoods are essential as well as other ventilation systems, note this area should not be part of an open plan lab as a result;
- *Embedding Area*: after processing, tissues are embedded in paraffin blocks. This zone requires embedding centres, which are heated workstations designed for this purpose. Typically, this is a manual area that design can underestimate growth requirements and not allocate enough space for addition of future workstations. Close proximity to the processing area can enhance workflow efficiency;
- *Sectioning Area*: paraffin-embedded tissues are sectioned using microtomes to create thin slices suitable for microscopy. This area requires adequate bench space for microtomes, storage for blocks awaiting sectioning, and a setup for floating out and

mounting sections onto slides. It should also be free from drafts and not located within main thoroughfare;

- *Staining Area*: once sectioned, tissues are stained to highlight different structures. Automated and manual staining stations are set up here. The area should be designed to manage the chemical reagents used for staining, with chemical storage and waste disposal considerations;
- *Slide Scanning* (Whole Slide Imaging): at this stage, before a pathologist examines the slide under a traditional microscope, the slide can be scanned to produce a high-resolution digital image⁴⁰. This digital slide can be viewed on a computer monitor, allowing for zooming in or out, much like using a microscope. Digital annotations and measurements can be made directly on the digital image;
- *Microscopy*, diagnosis and reporting: pathologists (usually in individual office spaces) make a diagnosis using either the traditional microscope or the digital image, depending on their preference and the infrastructure available. Digital images allow for easy sharing and help to facilitate consultations with other experts or multidisciplinary team members. The design should prioritise ergonomic considerations, given the long hours pathologists may spend at the microscope. It should be quiet, with adjustable lighting to reduce eye strain; and.
- *Special Stains and Immunohistochemistry Area*: some specimens require special stains or IHC for accurate diagnosis. This zone should be equipped with the necessary equipment, reagents, and fume hoods.
- *Electron Microscopy (EM)*: this specialised technology employs ultrathin sections of tissues embedded in hard resin and examined at a cellular or subcellular level. It is particularly relevant to the examination of renal biopsies. Electron Microscopy requires draft and vibration free areas for section cutting, and a stable platform free from vibration and electromagnetic fields. A separate sample processing area is required due to the nature of chemicals used.

Ventilation and Air Quality

The design will include following considerations for air quality and ventilation, including:

- Proper ventilation is required in histology laboratories to reduce the exposure to chemicals by ensuring those lingering in the air will leave the room without circulating back in;
- SafeWork Australia describes the risk management approaches with which organisations (including laboratories) must comply, such as:⁴¹
 - ▶ Formaldehyde has a workplace exposure standard of 1 ppm averaged over eight hours; and
 - ▶ Formaldehyde also has a secondary 15-minute (time weighted average) exposure standard of 2ppm; and
 - ▶ Risks to health and safety from exposures to hazardous chemicals must, so far as is reasonably practicable, be eliminated.
- In addition to solutions to manage ventilation, there will need to be systems to regularly monitor air quality which may be facilitated with an inbuilt design:

40. However noting that this is additive technology, which means everything else has to be done perfectly prior to this to get the best quality image.

41. NSW Government, 2017, Workplace exposure standards and air monitoring - WHS Regulation 2017, Formaldehyde - technical fact sheet, available at [https://www.safework.nsw.gov.au/resource-library/hazardous-chemicals/formaldehyde-fact-sheets/formaldehyde-technical-fact-sheet#:~:text=Formaldehyde%20has%20a%20workplace%20exposure,average\)%20exposure%20standard%20of%202ppm](https://www.safework.nsw.gov.au/resource-library/hazardous-chemicals/formaldehyde-fact-sheets/formaldehyde-technical-fact-sheet#:~:text=Formaldehyde%20has%20a%20workplace%20exposure,average)%20exposure%20standard%20of%202ppm)

- ▶ The design will need to balance the benefits of room separation/isolation versus workflow efficiencies of a more open planned space. Key factors will be the extent to which ventilation systems can operate effectively in more open spaces;
- ▶ Bench and floor scavenging is required in laboratory areas employing solvents and formaldehyde;
- ▶ No recirculation of air on the floor; and
- ▶ Provision of sufficient clean air return.

Lighting

- Gross examination:
 - ▶ These areas require good general illumination. A common recommendation is between 500 and 1000 lux, but this can vary based on the specific task;
 - ▶ More detailed tasks might require higher illuminance;
 - ▶ Microscopy areas, while primarily dependent on the microscope's internal illumination, should also have comfortable ambient lighting to reduce eye strain, typically around 500 lux. Overhead lighting should be designed to minimise shadows, which could obscure details of the specimen;
 - ▶ The CRI is a measure of a light source's ability to reveal the true colour of objects compared to a natural light source. A higher CRI (close to 100) is desirable in pathology labs since accurate colour differentiation is crucial, especially during gross examination;
 - ▶ It's also essential to minimise glare, which can cause eye strain, especially during prolonged observations. *Matte finishes on benches and walls* can help, as can the strategic placement of light fixtures.
- Pathologist offices
 - ▶ Adjustable lighting can be beneficial, allowing pathologists to increase or decrease light intensity based on the task or personal preference. Dimmable lights or task-specific lighting solutions can offer this flexibility which will be important in office spaces as well as where microscopes are used for group sessions;
 - ▶ When using microscopes, it's crucial to have a consistent and high-quality light source. LED-based illumination systems on microscopes offer consistent, bright light with good colour rendition;
 - ▶ Soft ambient lighting in areas where pathologists read slides or write reports can help reduce eye strain and fatigue; and
 - ▶ Employment of the 20:20:20 rule can also assist in avoiding eye strain (look 20 feet away for 20 seconds every 20 minutes).

Temperature

As per "General Design Principles" in section 7.8.

Acoustic Control

The following noise related considerations should be addressed when designing an AP laboratory:

- **Equipment Noise** – equipment like microtomes, centrifuges, automated staining machines, and tissue processors can generate significant noise. It's essential to position such equipment in areas where they cause minimal disruption and, if possible, enclose or insulate them to minimise noise;
- **Ventilation and HVAC Systems** - these systems are vital for safety and comfort but can be noisy. Quieter HVAC units, sound traps, or silencers, and ductwork can be considered;
- **Acoustic Zoning** – different areas of the lab will have different noise levels and requirements. For instance, microscopy rooms should be quieter than areas where equipment runs frequently. Proper zoning can help segregate these areas;
- **Acoustic Materials** – implement sound-absorbing materials in the lab's design. This includes acoustic ceiling tiles, wall panels, and flooring that dampens noise;
- **Workstations and Layout** – the arrangement of workstations can influence noise propagation. Open lab designs might be collaborative, but they can also spread noise more easily. Considerations should be made to strike a balance between open spaces and compartmentalised areas;
- **Doors and Partitions** – acoustically rated doors and partitions can help reduce noise transmission between different sections of the lab. This is especially crucial for rooms where precision work or delicate procedures are conducted;
- **Flooring Materials** – rubber or certain vinyl tiles can dampen the sound compared to hard tiles or concrete;
- **The way specimens, slides, and tools are stored and handled** can produce noise. Soft-close drawers, padded storage racks, and careful handling procedures can minimise these incidental noises; and
- **Buffer Spaces** – utility rooms, storage areas, or corridors could be designed in to act as buffer spaces, absorbing and preventing noise from traveling between different areas of the lab.

Floor Loading

As per "General Design Principles" in section 7.8.

Sustainability

As per "General Design Principles" in section 7.8.

Storage and Specimen Retention

Storage

Storage requirements for an Anatomical Pathology department include:

- **Reagent Storage:** some can be kept at room temperature and some needs to be refrigerated (2-8 degrees Celsius) within the Centralised Walk-in Cold Room and Freezer Room;
- **Specimen Storage:** specimens will be kept in the Centralised Walk-in Cold Room and Freezer Room, or simply a well-ventilated space next to the AP lab for formalin-fixed specimens. Note disposal tissues are to be stored in the freezer room, and cytology specimens are to be stored in a refrigerated storage for two weeks.

- **Slide storage:** refer to appendix A5 for blocks and slides storage considerations;
- **Paraffin block storage:** refer to appendix A5 for blocks and slides storage considerations;
- **Chemicals Storage** (solvents and flammables);
- **Equipment Storage:** some laboratory equipment (such as analysers) may be stored away when not in use within the Centralised Equipment Store;
- **Record Storage:** some space for record storage will need to be allocated as some physical records (such as patient records, quality control records, and maintenance logs) may still need to be kept on site despite ACT Pathology moving towards complete electronic record-keeping using DHR; and
- **Waste Storage:** Waste storage will be organised at two distinct levels in a multi-floor structure. At the workstation level, individual waste containment solutions will be tailored to the immediate needs of each specific workstation, ensuring efficient and safe waste disposal during daily operations. On the floor level, centralised waste storage areas will be designated to consolidate waste from various workstations, facilitating easier collection, segregation, and eventual disposal. This dual-level approach ensures both immediate waste management needs and broader floor-wide requirements are adequately addressed.

Anatomical Pathology also need to be consistent with the broader pathology specimen storage principles as outlined in section 7.8.1.

Specimen Retention

ACT Pathology is required to meet National Pathology Accreditation Advisory Committee's Requirements for the retention of laboratory records and diagnostic material. The relevant retention period for Anatomical Pathology accords with section 7.8.2 unless otherwise specified below⁴².

Table 7-8: Minimum Retention Times for Anatomical Pathology

	RECORD/MATERIAL	MINIMUM RETENTION TIME
3-6-1	Copy of original report, or ability to reprint the information content of an original report	10 years or 7 years from the age of majority for minors (whichever is the greater)
3-6-2	Slides: ■ Sections of fixed tissue preserved in mounting medium ■ Sections of fixed tissue assessed by FISH ■ Sections of unstained, fixed tissue not in permanent mounting medium (unstained spares) ■ Sections of unfixed tissue not in permanent mounting medium (including immunofluorescence slides)	10 years (where the diagnosis is made on the slide); otherwise 4 years if the diagnosis is made on a digitised image 6 months 1 month See Table 3-2, row 3-2-7
3-6-3	Digital images used for diagnostic analysis	10 years (where diagnosis is made solely on the image); otherwise see Table 3-2, row 3-2-6

42. Australian Commission on Safety and Quality in Health Care, Requirements for the Retention of Laboratory Records and Diagnostic Material, Tier 3B Document, Ninth Edition 2022, available at https://www.safetyandquality.gov.au/sites/default/files/2022-04/retention_standard_ninth_edition_2022.pdf.

	RECORD/MATERIAL	MINIMUM RETENTION TIME
3-6-4	Blocks: Tissue embedded in paraffin wax or any other permanent embedding medium, including for ultrastructural study	10 years ⁴³
3-6-5	Specimens for intra-operative frozen section diagnosis: ▪ The original sections used for diagnosis, preserved on slides in permanent mounting medium. ▪ Residual tissue from which the frozen sections were prepared, embedded in paraffin blocks. ▪ All other blocks of paraffin embedded tissue from the same specimen/s from which tissue has been selected for frozen section examination	10 years ²⁸
3-6-6	▪ Frozen tissue blocks, including specimens for immunofluorescence studies	1 month at -70°C or lower
3-6-7	▪ Containers with no residual tissue ▪ Unblocked wet tissue from specimens removed at surgery	1 month from date of issue of report 1 month from date of issue of report

Table 7-9: Minimum Retention Times for Cytology

	RECORD/MATERIAL	MINIMUM RETENTION TIME
3-7-1	Copy of original report, or ability to reprint the information content of an original report	10 years or 7 years from the age of majority for minors (whichever is the greater)
3-7-2	Exfoliative non-gynaecological cytology and fine needle aspiration (FNA) slides and cell blocks	10 years ⁴⁴
3-7-3	Gynaecological (cervical) cytology slides	10 years
3-7-4	Residual specimens of sputum, urine and other body fluids following preparation of cytology slides	See Table 3-2, row 3-2-7
3-7-5	Specimens received in liquid-based fixative	1 month ⁴⁵
3-7-6	Digital images used for diagnostic analysis e.g. semi-automated Thin Prep screening images	6 years

Key Functional Relationships

Internal Relationships

Within the department, Histology, Immunohistochemistry/Special Stains, EM and Cytology should be located together, as a single coherent unit. This is the primary functional relationship for AP.

As the next most important relationship, AP should be located proximal to (or contiguous with) Diagnostic Genomics. Anatomical Pathology and Diagnostic Genomics will be managed as a single department in the future. The closer working relationship will provide an opportunity to better leverage new technologies (genomics and imaging in particular) and the evolving, closer professional relationships that are already emerging.

43. Where the report or specimen relates to a paediatric patient, the retention period for anatomical pathology and cytology specimens should be the greater of 10 years or 7 years from the age of maturity.

44. Where the report or specimen relates to a paediatric patient, the retention period for anatomical pathology and cytology specimens should be the greater of 10 years or 7 years from the age of maturity.

45. Unless otherwise stated in the Requirements for laboratories reporting tests for the National Cervical Screening Program.

Anatomical Pathology site visits demonstrated that, new laboratories, even after a relatively short period of time e.g., 5 years, outgrow the space. This is due to the high level of manual labour, especially in areas such as cut up grossing. As workload increases, space requirements also increase due to additional staff and workplace. It is therefore critical to over spec the Anatomical Pathology laboratory to ensure ACT Pathology can keep pace with future clinical requirements. AP registrars will be located in a dedicated space to allow for their workstations/microscope, unlike registrars of other disciplines.

There is no requirement for Mortuary Services or the Pathology Museum to be collocated with the other AP units, but there will be a strong association between these services.

External Relationships

The key requirement for AP is similar to all other areas of pathology. The ICT connectivity and the IT platforms need to be robust in order that:

- Anatomical pathologists are able to communicate with other medical practitioners, with sufficient bandwidth to display high fidelity images; and
- Regular and constructive relationships with all referrers, including timely provision of results.

Management and Operational Support Services

Current Location

AP is currently located on Levels 1, 3 and 5, Building 10, CH as indicated:

- Histology (Level 3);
- Immunohistochemistry (Level 5);
- Cytology (Level 3); and
- Mortuary services (Level 1).

Additionally, archived 'slides and blocks' are stored in the basement primarily due to the weight of the blocks and also due to storage constraints on level 3 where a smaller store area is kept. The laboratory is required to retain slides and blocks generated as part of the diagnostic process for as many as 28 years.

The locations indicate that the nature of the department is too fragmented and operates inefficiently from over-crowded spaces. The FB proposes a consolidation of AP, an increase in area, and with strong connection with DG.

Hours of Operation

Usually, AP operates five days a week Monday to Friday, with laboratory staff present from 5.30am to 8.00pm. Additional rostered shifts occur during extended hours, weekends and Public Holidays i.e., Easter and Christmas-New Year break.

AP supplements the usual operating times with a 24/7 out-of-hours on-call service for emergency/urgent tissue analysis, which includes:

- A pathologist on-call, out-of-hours;

- Scientists on-call to assist pathologist with any Frozen Section and Renal Biopsy which occur after-hours, as well as attending to the laboratory if processor and/or other instrumentation issues arise.

Major Equipment List

Current major equipment for AP is detailed in Appendix Table A9-3. The department is regularly adding new tests or changing technology, current range includes but is not exclusive to tissue Processors, Roche VENTANA HE 600 system, Roche BenchMark Special Stains system, Spectra Stainer, Embedding Centres, Hologic T/P processor, Elitech Aerospray PAP Stainer, Pixarray Imager, Leica Microtomes (Histology), fridges/freezers, centrifuges/cytofuge, ovens, cassette writer, microscopes, balances, safety and biohazard cabinet, and water baths.

See Table A10-1 for future equipment list for all departments.

Workforce Model

The workforce model reflects the clinical capability level of AP, with staffing levels provided in Table 7-10 below. The staffing complement includes clinical director, anatomical pathologists, registrars, chief scientist, administration support, laboratory/pathology scientists and technical officers.

Table 7-10: Staffing by Workforce Category, Anatomical Pathology⁴⁶

Category	Section/Unit	Head Count	FTE
Director	All	1	1
Deputy Director	All	1	1
Pathologists	All	13	11.1 ⁴⁷
Registrar	All	7	6.4 ⁴⁸
Chief Scientist	All	1	1
Scientific Supervisor	AP	1	1
Scientific Supervisor	Cytology	1	1
Senior Scientist	Histology	2	2
Senior Scientist	IHC	1	1
Senior Scientist	Cytology	1	1
Base Grade Scientist	Histology and IHC	13	11.4
Cytoscreener	Cytology	6	5.8
Technical Officer	Histology and IHC	4	4
Administration Support	All	4	4

46. ACT Pathology, March 2022, ASSESSMENT INFORMATION DOCUMENT SUPPLEMENT – NCSP.

47. There are 11.1 FTE pathologists plus an ANU-funded pathologist for running the undergraduate pathology course, this ANU funded position is not part of the FTE count for this table.

48. There is a 0.2 FTE honorary registrar, not part of the FTE count for this table.

Category	Section/Unit	Head Count	FTE
Current Total		56	51.7

Staffing numbers are at a point in time and will not reflect future FTE or workforce mix needs.

A Future State

The future for AP is relatively clear. It incorporates a service model that has very significant investment in automation, particularly WSI, and embracing of the omics revolution as proposed in section 7.5. The future state has a significant elimination of manual processes.

Whole Slide Imaging and Artificial Intelligence

It is certain that AI and machine learning will assist AP with the automated evaluation of *digital slides*, improving accuracy, and reducing the time taken for manual diagnosis. This will reduce the workloads for Anatomical Pathologists.

The evolution to AI will be incremental. In the first instance, AI will be used as a clinical decision support tool. Nevertheless, even making the strategic decision to use slide imaging as a decision support tool for AP, it will require significant investment in the technology.

The technology currently exists and will continue to improve over time. *Whole Slide Imaging and Digital Pathology* technology can create digital slides that can be viewed on a computer, eliminating the need to manually handle glass slides. The digital images are easily shared and stored but will require additional digital storage capacity

Digital technologies in pathology are rapidly moving beyond imaging to guiding diagnosis. Some manufacturers are developing technology, dyes and analytic platforms to meet future demand and improve patient outcomes using nanotechnology. These new technologies are mostly replacing the staining technology and the scanner for new types of digital immunohistochemistry.

Integrated Automation and Tracking Solutions

While many steps of the pathology workflow are already automated, there is potential for even more automation using advanced robotics.

There are current automated processes for AP that are not yet operating at ACT Pathology. This is where 'leap frogging' investment is a key consideration. Indicatively:

- For histology and IHC workflow, individual components and workstations could become more automated, which highlights the need to design for open spaces as well as structural design of flooring to handle additional machinery and its weight;
- *Processing*: Automated tissue processors are a crucial part of the workflow in many labs including ACT Pathology. Future advancements in processing could involve more efficient or rapid methods, or using alternative chemicals that are safer or more environmentally friendly but will mostly be replacing equipment with similar sized equipment;
- *Embedding*: Automation of the embedding process is already available for simple specimen transfers and with advancements in robotics and machine learning, there will be more automated embedding systems in the future;

- **Sectioning:** Sectioning is currently primarily a manual task, as it requires a high degree of precision and skill. Automated microtomes are available with automatic, semi-automatic, and manual options available to meet a variety of circumstances and it's possible that with advancements in robotics and machine vision, more automated sectioning could become possible. Despite this advancement, however, scientists will still be just as needed and wanted as they will need to manage this process, with the automation part acting predominantly as a way to reduce manual labour and hence prevent repetitive strain injury (RSI); and
- **Staining:** Automated stainers are already widely used in histopathology labs. Advancements will be the replacement of current technology with new technology that offers more and/or better features.

Omics and individual therapies

The drive towards individually targeted therapies is expected to continue to increase the level of testing, workforce expertise and need for individualised reports, particularly in cancer treatments. *Perhaps more relevant, Diagnostic Genomic, and the 'omics revolution' for personalised diagnoses and treatments will become core business for ACT Pathology.*

7.9.3. Chemical Pathology

Chemical Pathology is the largest of the pathology departments by volume of testing. Examinations are broadly applicable to detect substances in blood and body fluids, measures cancer markers, hormones, poisons, and therapeutic and illicit drugs.

Scope and Capacity of Services

Chemical Pathology operates as a Level 6 laboratory⁴⁹.

Test Panel Volumes

Chemical Pathology's test panel volumes are combined with Immunopathology & Infectious Immunoassay, performing more than 1 million tests annually. The year-by-year breakdown is as below.

Table 7-11: Chemical Pathology, Immunopathology & Infectious Immunoassay Test Panel Volumes – 2019-20 to 2021-22

Year	Total
2019/2020	1,661,806
2020/2021	1,756,151
2021/2022	1,748,351

Specialty Scope

Chemical Pathology comprises four distinct sub-sections:

⁴⁹ NSW Role Delineation of Clinical Services,(2021). The NSW Role Delineation of Clinical Service is used as the default clinical capability framework for NSW, Victoria and ACT, unless there is a specific jurisdictional capability framework

- Routine Chemistry;
- Endocrinology;
- Special Chemistry; and
- Point of Care Testing (POCT).

Routine Chemistry (in Core Lab)

Routine chemistry focuses on the analysis of bodily fluids such as blood, urine, and cerebrospinal fluid. It involves the measurement of various chemical components and biomarkers present in these fluids to evaluate the normal functioning of organs, diagnose and monitor diseases, assess and monitor treatment efficacy, and detect abnormalities or imbalances within the body. The tests for routine chemistry are typically automated. Chemical pathology tests are expected to be part of the routine 'Core laboratory' processes.

Common tests include:

- Blood glucose tests to diagnose and monitor diabetes;
- Lipid profiles to assess cardiovascular health and disease risk;
- Liver and kidney function tests to detect conditions such as hepatitis, cirrhosis, and renal failure;
- Electrolyte panel to assess the body's fluid balance, acid-base balance, and overall electrolyte status.

These functions would be undertaken in laboratories, including levels 3 to 6 clinical capability.

Endocrinology (in Core Lab)

Endocrinology focuses the study of endocrine disorders, including:

- Hormone assays;
- Metabolic markers;
- Bone markers;
- Steroid hormone analysis; and
- Pituitary hormone assessment.

Endocrinology involves the integration of laboratory test results with other clinical findings to help diagnose and manage endocrine-related conditions. Endocrinologists, along with chemical pathologists, registrars and laboratory scientists, collaborate to interpret these results accurately and provide optimal patient care. Endocrine pathology would be typically undertaken in Level 3 to 6 laboratories.

Special Chemistry

Special Chemistry focuses on advanced and specialised laboratory testing for the diagnosis and management of complex or rare diseases. It involves the analysis of specific analytes, biomarkers, or metabolic pathways that may not be included in routine chemistry panels. Special chemistry would only be undertaken in a Level 6 laboratory.

Point of Care testing

POCT is the performance of specific laboratory tests outside the traditional laboratory setting using portable or handheld devices, which typically include but are not limited to:

- Glucose monitoring;
- Coagulation monitoring;
- Electrolyte analysis;
- Cardiac markers;
- Haemoglobin analysis; and
- Lipid profiling.

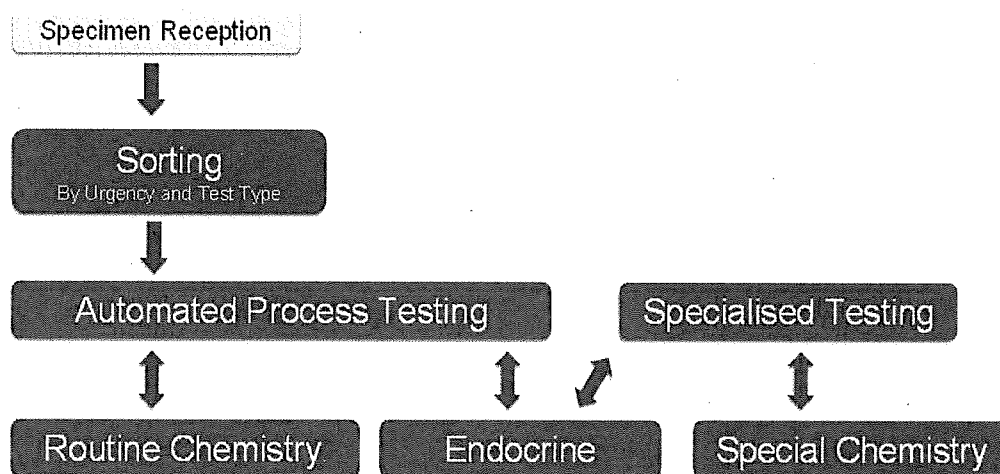
POCT enables immediate, real time test results, convenience, and the ability to make prompt clinical decisions at the patient's bedside, clinic or even patient's home. However, these devices also come with limitations in terms of accuracy, precision, and the range of tests they can perform compared to central laboratory analysers.

Specimen Pathway

The specimen pathway for Chemical Pathology is described below.

Specimens are received in specimen reception as for all specialty areas. The sample then typically follows the steps in Figure 7-10.

Figure 7-10: Specimen Pathway for Chemical Pathology



The pathway is multi-directional following the automated testing step where sample also have specialised tests or second sample tests or are transferred to another department for further testing.

All findings/reports - including diagnosis and recommendations for treatment and/or management - are then documented, which is the principal means of communication with other clinicians involved in relation to overall patient care and management.

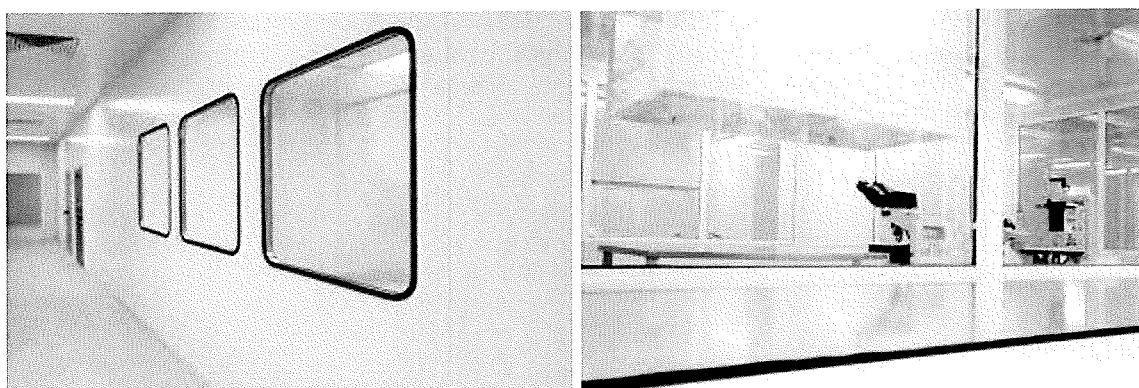
After analysis, specimens may be stored for a period of time (before disposal) based on CHS policies and statutory requirements. Disposal is similarly governed by policy and regulation/protocols, as biohazardous waste.

Specific Design Elements for Chemical Pathology

Space and Zoning

The chemical pathology section is part of the Core laboratory and while most of the chemical pathology section will be better suited in an open plan environment, mass spectrometry may be located separately inside a controlled environment. Ideally the design would ensure that staff are visible to supervisors and remain connected to the rest of the team (see Figure 7-11).

Figure 7-11: Some Design Examples for Mass Spectrometry



Ventilation and Air Quality

The design will include the following considerations for air quality and ventilation:

- The non-automated section of chemical pathology segment includes mass spectrometers. Mass spectrometers are sensitive instruments that require specific air quality and environmental conditions to function optimally. These are typically housed in enclosed rooms;
- Temperature Stability: the laboratory room temperature should be stable, typically the same as the other parts of the chemical pathology/core section i.e. between 20-25°C. The temperature stability ensures consistent performance and calibration of the instrument. It's essential to monitor and maintain temperature within specified limits as prescribed by the mass spectrometer's manufacturer;
- Humidity Control: humidity should be controlled, with levels typically kept below 60% relative humidity. Excess moisture can influence ionisation processes, potentially affect the equipment's internal components, and lead to corrosion over time;
- Vibration and Mechanical Stability: mass spectrometers, especially those with high-resolution capabilities, can be sensitive to vibrations. The laboratory should be isolated from sources of vibration or equipped with vibration-damping tables or platforms. Sources of nearby vibration could include the robotic track system;
- Clean, Dust-Free Environment: dust and other particulate matter can interfere with the instrument's operation. It's beneficial to have air filtering systems in place to ensure the lab remains as dust-free as possible but may also be kept in a separate room;
- Gas Supply: many mass spectrometers, especially those coupled with chromatography systems, require high-purity gases (e.g., helium, nitrogen, argon). It's essential to ensure a consistent and uncontaminated gas supply. Gas cylinders should be stored safely, and appropriate gas purifiers should be in place;
- Ventilation and Fume Hoods: some sample preparation steps might involve volatile or hazardous chemicals. Proper ventilation and fume hoods should be available to ensure the safety of laboratory personnel and to prevent contamination of the laboratory atmosphere;

- **Electrical Supply:** stable and clean power is essential. Power fluctuations or interruptions can affect mass spectrometer performance or even cause damage. UPS or backup power systems might be necessary, especially for critical applications;
- **Magnetic Fields:** for mass spectrometers that operate based on magnetic principles (e.g., magnetic sector instruments), it's crucial to keep the instrument away from any external magnetic fields or sources of electromagnetic interference i.e. robotic tracks; and
- **Airborne Contaminants:** laboratories should be kept free from volatile organic compounds (VOCs) or other potential sources of chemical interference, as these can influence the mass spectrometer's readings.

Lighting

As per "General Design Principles" in section 7.8.

Temperature

- For the macro environment, this should be 20-25°C like the rest of the laboratory. The department should have a controlled room temperature to ensure optimal operation of automated analysers. The temperature should be maintained within a specific range recommended by the manufacturers of the instruments; and
- In a micro setting, refrigerated environments need to be 2-8°C and freezer temperatures need to be -20°C which can be accommodated by the Walk-in Cold Room and Freezer.

Acoustic Control

Automated robotic track systems in chemical pathology laboratories, and analysers, can produce noise. The level of noise depends on the specific system, its components, and the operational state.

Factors contributing to noise can include:

- Movement of the Robot Arms;
- Conveyor Systems;
- Centrifuges and Decappers; and
- Alerts and Alarms.

Careful design of the laboratory can make a difference. Keeping the Total Laboratory Automation (TLA) system centralised and away from workstations or areas where staff spend prolonged periods can help. Other considerations can include:

- Acoustic Barriers or other acoustic dampening solutions; and
- The use of vibration-dampening floor materials can reduce noise transmission, especially if the system is on an upper floor.

The laboratory can also help to reduce noise by ensuring that the system is well-maintained.

Floor Loading

As per "General Design Principles" in section 7.8.

Sustainability

As per “General Design Principles” in section 7.8.

Storage and Specimen Retention

Storage

Chemical Pathology, Haematology and Immunopathology departments operate as part of a broader core laboratory and in an open plan design. The types of storage required need to include:

- **Reagent Storage:** some can be kept at room temperature and some needs to be refrigerated (2-8 degrees Celsius) within the Centralised Walk-in Cold Room and Freezer Room;
- **Specimen Storage:** specimens will be kept in the Centralised Walk-in Cold Room and Freezer Room;
- **Consumable Storage:** there is also a need for free standing fridge/freezers for the storage of regular use consumables;
- **Equipment Storage:** some laboratory equipment (such as analysers) may be stored away when not in use within the Centralised Equipment Store;
- **Record Storage:** some space for record storage will need to be allocated as some physical records (such as patient records, quality control records, and maintenance logs) may still need to be kept on site despite ACT Pathology moving towards complete electronic record-keeping using DHR; and
- **Waste Storage:** Waste storage will be organised at two distinct levels in a multi-floor structure. At the workstation level, individual waste containment solutions will be tailored to the immediate needs of each specific workstation, ensuring efficient and safe waste disposal during daily operations. On the floor level, centralised waste storage areas will be designated to consolidate waste from various workstations, facilitating easier collection, segregation, and eventual disposal. This dual-level approach ensures both immediate waste management needs and broader floor-wide requirements are adequately addressed.

The non-automated spectrometry section within the department may necessitate the use of gas cylinders. This demands particular design measures to safely secure these cylinders and safeguard the surrounding area.

Chemical Pathology also need to be consistent with the broader pathology specimen storage principles as outlined in section 7.8.1.

Specimen Retention

ACT Pathology is required to meet National Pathology Accreditation Advisory Committee's Requirements for the retention of laboratory records and diagnostic material. The relevant retention period for Chemical Pathology accords with Table 7-4 unless otherwise specified below in Table 7-12⁵⁰.

50. Australian Commission on Safety and Quality in Health Care, Requirements for the Retention of Laboratory Records and Diagnostic Material, Tier 3B Document, Ninth Edition 2022, available at https://www.safetyandquality.gov.au/sites/default/files/2022-04/retention_standard_ninth_edition_2022.pdf.

Table 7-12: Minimum Retention Times for Chemical Pathology

	RECORD/MATERIAL	MINIMUM RETENTION TIME
3-10-1	Serum, plasma, other body fluid and tissue specimens	As per Table 3 2, row 3-2-7

Key Functional Relationships

Internal Relationships

Chemical Pathology has a close clinical relationship with Specimen Reception (mainly due to volumes), Haematology and Immunopathology & Infectious Immunoassay (due to the move to automating as much of the analysis process as possible). This will include a direct pneumatic tube.

Specimen Reception, Automated Chemistry and Automated Haematology/transfusion will be joined by Automated Immunopathology & Infectious Immunoassay to form the **Core Laboratory**, as illustrated in Figure 7-3. Aspects of Microbiology and Molecular Pathology are increasingly becoming more automated and could also form part of the core laboratory in the future – These areas must be collocated in an open plan configuration as per the L2D functional designs

While the Chemical Pathology department manages both automated and manual testing, it is necessary that the automated processes are contiguous, and integral to the Core Lab.

External Relationships

The key requirement for Chemical Pathology is similar to all other areas of pathology. The ICT connectivity and the IT platforms need to be robust in order that:

- Chemical pathologists are able to communicate with other medical practitioners, with sufficient bandwidth to display high fidelity images; and
- Regular and constructive relationships with all referrers, including timely provision of results.

The future development of this specialty will require close and frequent communication with referrers to build the specialty and broaden the scope of services.

Management and Operational Support Services

Hours of Operation

Routine Chemistry and Endocrinology operates 24/7 every day of the year. The remainder of Chemical Pathology (that is, Specialised Endocrinology, Special Chemistry and POCT) routinely operate between 8.30am – 5.00pm Monday – Friday⁵¹.

51. ACT Pathology, Chemical Pathology.

Major Equipment List

Current major equipment for Chemical Pathology is detailed in Appendix Table A9-4. The department is regularly adding new tests or changing technology. The current equipment includes:

- Routine Chemistry and Endocrinology: Abbott Pre-analytical track system, Abbott Alinity c/i modules, Roche E411, Diasorin Liason XL; Advanced osmometer Osmo 1, Wescor Chlorocheck.
- Special Chemistry: Shimadzu HPLC, Thermofisher Evolution 201 spectrophotometer, Thermofisher FTIR spectrophotometer, Shimadzu LC-MS;
- Point of Care Testing: Alere Affinion HbA1c analyser, Werfen Gem 5000 blood gas analyser, Abbott iSTAT; and
- General: centrifuges, balances, Labguard temperature probes, timers, pipettes, waterbath, temperature-controlled incubator, purified water system, biological safety cabinets, fume cabinet, fridges and freezers.

See Table A10-1 for future equipment list for all departments.

Workforce Model

The workforce model⁵² reflects the clinical capability level of Chemical Pathology, with staffing levels provided in Table 7-13 below. The staffing complement includes clinical director, chemical pathologists, registrars, chief scientist, laboratory/pathology scientists and technical officers.

Table 7-13: Current Staffing by Workforce Category, Chemical Pathology

Category	Section/Unit	Head Count	FTE
Director	All	1	1
Pathologist	All	1	0.5
Registrar	All	1	1
Chief Scientist	All	1	1
Senior Scientists	Routine Chemistry	2	2
Base Grade Scientists	Routine Chemistry	15	12.68
Technical Officers	Routine Chemistry	2	2
Senior Scientist	Endocrinology	1	1
Base Grade Scientist	Endocrinology/	1	1
Senior Scientist	Special Chemistry	1	1
Base Grade Scientist	Special Chemistry/ Routine/Chemistry	1	1
Senior Scientist	POCT	1	1
Base Grade Scientist	POCT	1	1
Current Total		29	26.18

52. ACT Pathology, Chemical Pathology.

Staffing numbers are at a point in time and will not reflect future FTE or workforce mix needs.

Future State

The future for the high volume and routine Chemical Pathology testing will be a progressive elimination of the remaining manual processes.

7.9.4. Diagnostic Genomics

Diagnostic Genomics is a rapidly evolving area of pathology that has the potential to have significant impacts on the future development of medicine. DG is likely going to change the way we understand and manage cancer and disease-causing constitutional variants through diagnosis, screening, and monitoring. This will revolutionise disease diagnosis, tailored curative treatments, and clinical management based on each individual patient's genetic information.

At ACT Pathology, the DG laboratory initially operated as a cytogenetics lab, providing karyotype and Fluorescence In Situ Hybridization (FISH) services to various medical specialties, at which time only a small number of DNA extractions were performed manually. By 2000, the lab moved to its current location, initially equipped with very basic infrastructure and equipment, but experienced significant expansion and diversification over the 15 years from 2008 to 2023. During this period:

- The FISH service expanded to include analysis of paraffin embedded tumour samples from Anatomical Pathology;
- The number of DNA extraction requests increased from a handful to hundreds per year;
- The lab started performing multiple PCR-based assays, with specific PCR machines;
- Traditional karyotyping transitioned into molecular-based karyotyping using Single Nucleotide Polymorphism (SNP)s array technology, necessitating additional analytical software and scientists; and
- New technology, such as NGS has come to the fore, and is being developed for 2024/2025.

Demand has rapidly increased. The scale of operation, and the breadth of testing, has not been able to keep pace with the demand.

Scope of Service

Test Volumes

DG performs ~2,000 tests annually and is considered one of the smallest specialties. The noted decline in activity is principally due to COVID and higher levels of 'Refer Outs' (>2500, many of which will be performed in-house in the future with the development of NGS.

Table 7-14: Diagnostic Genomics Test Volumes – 2020-21 to 2022-23 (Projected)

Year	Diagnostic Genomics
2019/2020	2,131
2020/2021	4,597 (2,452 + 2,145) send outs
2021/2022	4,581 (1,978 + 2,603) send outs

Specialty Scope

Technology advances have merged molecular genetics and cytogenetic laboratories over time, into the area of genomics. As a discipline, there are three broad categories of genomic testing:

- **Cancer genomics.** This includes familial cancer predisposition testing; tumour profiling (e.g. solid tumours, haematological tumours), predictive selection of therapeutic cancer drugs, and monitoring of disease progression; and
- **Constitutional Genomics.** This includes inherited conditions (e.g. cystic fibrosis, haemochromatosis, population specific conditions), congenital disease diagnosis, pre-conception and post-conception screening, and post-natal genomic diagnostics (e.g. products of conception, fetal demise including post-mortem cases, newborn, and paediatric).

From the above potential scope of DG, ACT Pathology focuses predominantly on⁵³:

- **Cancer diagnostic genomics** for haematological disorders and solid tumours utilising conventional karyotyping, FISH, single gene assays, and NGS; and
- **The investigation of fetal death** utilising SNP microarray, fertility investigations and rapid diagnosis of neonates utilising conventional karyotyping, and FISH.

Specimen Pathway

Typical genomic tests performed include⁵⁴:

- Conventional Karyotyping (haematological and constitutional);
- FISH, including the analysis of formalin fixed paraffin embedded (FFPE) tissue, solid tumor (haematological and constitutional);
- Cryopreservation of cells;
- SNP Microarray (products of conception);
- DNA extraction and storage;
- Single Gene PCR Molecular Assays; and
- NGS (2024).

DG at ACT Pathology is currently modest, however, as a burgeoning specialty, there are active plans and considerable scope to invest in technologies and workforce to significantly develop this specialist field by 2025 and into the future. The area proposed for DG offers a considerable expansion.

Specimens are received in specimen reception as for all specialty areas.

The pathway requires close proximity to molecular pathology. To comply with regulatory requirements, the department also needs to include a separate clean room for PCR preparation noting separate isolated spaces are required to reduce risk of contamination of specimens.

Specific Design Elements for Diagnostic Genomics

The department **currently** comprises of:

53. ACT Pathology, Diagnostic Genomics.

54. ACT Pathology, Diagnostic Genomics.

- Office space which provides a quiet area for analysis;
- Main laboratory for cell culturing and harvest, banding, sample and reagent preparation; including PCR preparation and PCR amplification;
- Dark room for FISH analysis and automated slide scanning;
- DNA extraction; and
- PCR reagent preparation room for molecular assays.

Future Required Design Elements

Into the future, as DG will be managing testing of samples from AP, haematology, immunopathology and Pre-analytics, close working relationships will need to be established with all these departments to establish sample workflows and to better leverage new technologies.

As mentioned above, there will be **significant expansions** within Diagnostic Genomics in the near future, taking advantage of new technologies such as NGS-based tests on different sample types (including cell free DNA/RNA i.e. liquid biopsies), hence an expansion in the floor plate to accommodate this is critical.

DG utilises similar technologies and laboratory equipment as Molecular Pathology. Instead of duplicating laboratory space, DG and Molecular Pathology would benefit from being adjacent to each other to allow for the sharing of laboratory facilities (including equipment) and optimisation of space. The areas proposed to be shared would be DNA/RNA Amplification/Sequencing laboratories and could also include PCR setup rooms.

It would be challenging to design DG to be completely open plan given the requirements for isolated rooms to reduce contamination risk in accordance with regulatory guidelines. This includes but is not exclusive to PCR Amplicon and Reagent Preparation (which require positive pressured rooms), sample preparation (NGS/PCR), DNA/RNA amplification, DNA/RNA extraction (where a dedicated lab area is preferred), tissue processing (which comes with its associated fumes), and a dark room for fluorescence-based assays. There is also a requirement for some quiet space for quiet tasks such as software-based desktop analysis.

The immediate future state of the laboratory would be to ensure the PCR requirements meet all regulatory requirements, such as a separate clean room for PCR preparation to reduce risk of contamination.

Given the proximity to the Molecular Pathology department, consideration could be given to creating a central DNA/RNA Amplification/Sequencing room that meets the space requirements for both, but retains the same flow noting that this would be separate to the dedicated PC3 facilities.

Ideally, a PCR laboratory should have three rooms, each designed for specific tasks:

- The first room should be positive pressured and used exclusively for pre-PCR Amplicon and Reagent Preparation activities;
- The second room should be used for sample preparation, where air pressure is slightly positive to prevent aerosols from flowing in; and
- The third room should be a dedicated area for nucleic acid amplification and product analysis. Air pressure should be slightly negative to ensure that amplicon aerosols don't leave the room.

In the case that a three-room PCR laboratory is not feasible, the alternative is to set up 2 areas in the same room: pre-PCR Amplicon and Reagent Prep, and Sample Prep, but ensure they are as far from one another as possible.

The laboratory design must ensure **unidirectional workflow**, such that no materials or reagents used in the amplification and analysis areas can ever be taken into the pre-PCR space without a thorough decontamination. This means that dedicated equipment for each area is required, e.g., two different sets of pipettes.

This unidirectional workflow also applies to laboratory staff, where personal protective equipment must be changed when going back to the pre-PCR area, as it may have been contaminated by amplicon aerosols.

Another precautionary measure for the PCR laboratory, in addition to spatial separation, is **temporal separation**. For example, consideration can be given to set up all PCR reactions in the morning and perform the amplification and analysis steps in the afternoon. This may limit flexibility but will prevent contamination issues, and hence the risk of having to repeat experiments.

The key design feature around space is the adjacency to Molecular and Anatomical Pathology departments so that equipment and facilities can be shared.

Sample Flow

There should be a unidirectional flow to the sample processing commencing with tissue processing steps like histology. The design should consider whether an adjacency to the histology section can result in shared spaces. This should support appropriate workflows for specimen loading/tracking of shared samples between laboratories in the DHR and their storage.

Ventilation and Air Quality

The design will need to consider replicating the Anatomical Pathology (solvent extraction) ventilation requirements for areas where tissues are processed in a similar manner to histology tissues.

Lighting

DG General: refer to the design requirements in Anatomical Pathology and Molecular Pathology. Lighting in the analysis offices need careful consideration to reduce glare on screens.

In addition, a dark room is required for FISH wet lab processing. This wet lab dark room is different from the analysis room.

FISH is a molecular cytogenetic technique used to detect and locate specific DNA sequences on chromosomes. FISH uses fluorescent probes that bind to only those parts of a chromosome with which they show a high degree of sequence complementarity. The visualisation and interpretation of FISH results require specialised equipment and lighting conditions:

- Darkened Room: fluorescent signals can be faint, so FISH analysis is typically done in a darkened room to maximise the contrast between the fluorescent signals and the background. This also prevents fluorescence from fading (UV sensitive);

- **Ultraviolet (UV) Light Source:** UV light source is essential for exciting the fluorescent dyes. However, it's important to note that prolonged exposure to UV light can damage the fluorophore and reduce the fluorescence intensity. Therefore, the room should be able to be darkened and protected from UV light. Modern fluorescence microscopes often use high-intensity mercury or xenon lamps as light sources, though LED sources are becoming more common due to their longer lifespan and consistent output; and
- Probes can fade if exposed to light, hence the preference of sample preparation in a dark room. Current designs have FISH testing being conducted in separate rooms from the rest of the department(s) or open planned laboratory sections.

Temperature

The DG department should have a controlled room temperature to ensure optimal operation of automated analysers. The temperature should be maintained within a specific range recommended by the manufacturers of the instruments. Typically, the room temperature range for DG laboratories are maintained at room temperature. Samples and reagents are typically stored at 4-8C, -18C to -22C, and -80C. Access to cold and freezer storage is critical.

Acoustic Control

As per "General Design Principles" in section 7.8.

Floor Loading

As per "General Design Principles" in section 7.8.

Sustainability

As per "General Design Principles" in section 7.8.

Storage and Specimen Retention

Storage

DG requires various types of storage for different purposes noting it shares processing similarities with closely linked departments – Microbiology and Molecular Pathology.

The types of storage for DG department includes:

- **Specimen Storage:** specimens will be kept in the Centralised Walk-in Cold Room and Freezer Room, and frozen tissue bank;
- **DNA samples and Next-Generation sequencing libraries (future);** these require -20C and -80C freezers;
- **Cell lines or tissues and cytogenetics (LN2);**
- **Equipment Storage:** some laboratory equipment may be stored away when not in use within the Centralised Equipment Store;
- **Chemical storage:** diagnostic genomics assays utilise alcohols, acids, and phenols. Space for flammable cabinets, acid storage, and solvents is required with easy/close access to reduce WHS risks for the transportation of wichesters;

- **Record Storage:** some space for record storage will need to be allocated as some physical records (such as patient records, quality control records, and maintenance logs) may still need to be kept on site despite ACT Pathology moving towards complete electronic record-keeping using DHR; and
- **Waste Storage:** waste storage will be organised at two distinct levels in a multi-floor structure. At the workstation level, individual waste containment solutions will be tailored to the immediate needs of each specific workstation, ensuring efficient and safe waste disposal during daily operations. On the floor level, centralised waste storage areas will be designated to consolidate waste from various workstations, facilitating easier collection, segregation, and eventual disposal. This dual-level approach ensures both immediate waste management needs and broader floor-wide requirements are adequately addressed.

Specific waste storage for DG includes:

- ▶ Biological Waste: DG laboratories work with biological materials that may be potentially infectious or biohazardous, including:
 - Specimens: biological samples collected for testing or research that are no longer required; and
 - Contaminated Materials: items contaminated with potentially infectious materials, such as gloves, pipettes, Petri dishes, and disposable labware.Biohazard waste will need to be autoclaved (sterilised using high-pressure steam) before disposal. There will need to be an autoclave accessible to these departments as well as a separate system built into the PC3 facility.
- ▶ Chemical Waste: DG laboratories utilise various chemicals for experiments, staining techniques, or disinfection. Chemical waste includes:
 - Hazardous and/or dangerous substances: acids, alcohols, solvents require safe and separated/isolated storage (such as flame store cabinets);
 - Reagents: expired or unused reagents, solutions, or media;
 - Stains: used staining solutions or dyes that are no longer required; and
 - Chemicals: discarded chemicals, such as disinfectants, fixatives, or solvents.
- ▶ Sharps: needles, syringes, or other sharp objects used in the laboratory for specimen collection or other procedures;
- ▶ General Laboratory Waste: DG laboratories also generate general laboratory waste, including:
 - Packaging: packaging materials, such as cardboard boxes, plastic wrap, or Styrofoam used for delivery or storage of laboratory supplies;
 - Recycling;
 - Non-Contaminated Waste: non-hazardous waste that does not fall under biological or chemical waste categories, including paper towels, disposable gloves, or non-infectious plastic items; and
 - Glassware: broken or discarded glassware, including test tubes, slides, or glass pipettes.
- ▶ Liquid Waste: DG laboratories may produce liquid waste, such as liquid cultures and media and buffer solutions.

DG also needs to be consistent with the broader pathology specimen storage principles as outlined in section 7.8.1

Specimen Retention

ACT Pathology is required to meet National Pathology Accreditation Advisory Committee's Requirements for the retention of laboratory records and diagnostic material. The relevant retention period for DG accords with section 7.8.2 unless otherwise specified below in Table 7-15⁵⁵.

Table 7-15: Minimum Retention Times for DG

	RECORD/MATERIAL	MINIMUM RETENTION TIME
3-2-1	Copy of original report, or ability to reprint the information content of an original report - Constitutional genetic testing - Somatic genetic testing	100 years (effectively indefinite) 10 years ⁵⁶
3-2-2	Cytogenetics: - Analysis records/karyotypes/digital images including FISH images. - Stained microscope slides in permanent mounting medium - Fixed chromosome cell suspension or FISH slides - Original specimens and containers	4 years 4 years 6 months 1 month from date of issue of report
3-2-3	Cytogenetics/biochemical genetics/molecular genetics: Tissue cultures/cell culture lines - Rare clinically significant variants - Common clinically significant variants or clinically non-significant	For indefinite cryopreservation As per Table 7-4, row 3-2-7
3-2-4	Biochemical genetics: Specimens of plasma, serum and urine - Original container - Analytic aliquot	7 days 3 months after date of issue of report
3-2-5	Neonatal screening (dried blood spot): - Specimen (Guthrie) cards - Records	2 years See row 3-2-1 above
3-2-6	Molecular genetics: - Nucleic acid extracts for somatic or constitutive testing - Nucleic acid extracts or frozen plasma for NIPT	3 months ⁵⁷ 12 months
3-2-7	Bioinformatic genetic data - Read data (e.g. FASTQ) or aligned reads (e.g. BAM) - Variant call files - Microarray analysis files	4 years from date of issue of report 10 years 4 years

55. Australian Commission on Safety and Quality in Health Care, Requirements for the Retention of Laboratory Records and Diagnostic Material, Tier 3B Document, Ninth Edition 2022, available at https://www.safetyandquality.gov.au/sites/default/files/2022-04/retention_standard_ninth_edition_2022.pdf.

56. Where the report relates to a paediatric patient, the retention period should be the greater of 10 years or 7 years from the age of maturity.

57. From date of issue of the report for an individual, or from completion of a family study where the proband's sample is required as a control, or from completion of testing; whichever of the three periods is the longest.

Key Functional Relationships

Internal Relationships

The functional relationships for Diagnostic Genomics are described in section 7.7 and illustrated in Figure 7-6.

External Relationships

Diagnostic genomics needs to be co-located with molecular pathology for shared facilities (DNA/RNA Amplification/Sequencing room). Location also needs to consider sample flow from AP, Haematology, and Pre-analytics. The location of shared fridge and freezer storage, including tissue banking, need to be within reasonable proximity as well.

Diagnostic Genomics receives a significant and important volume of samples from external referrers (private in vitro fertilization [IVF] clinics, GP's, private obstetrician and gynaecologist [OBGYN] clinics), and blood collections from outpatient collection centres. The key requirement for DG is similar to all other areas of pathology. The ICT connectivity and the IT platforms need to be robust in order that:

- Genomic pathologists are able to communicate with other medical practitioners, with sufficient bandwidth to display high fidelity images;
- Regular and constructive relationships with all referrers, including timely provision of results; and
- Analytical software is securely housed, backed-up, and located on virtual servers with ample space and speed to allow timely genomic analysis by multiple users. Karyotype, FISH, SNP array and NGS are software based, using large data files and high-resolution images hence breakdowns in processing speed and file back-up poses clinical risk.

The future development of this specialty will require close and frequent communication with referrers to build the specialty and broaden the scope of services.

Management and Operational Support Services

Current Location

The department is currently co-located on level 4 with Microbiology and Molecular Pathology.

Hours of Operation

DG operates largely within business hours, 8.30am – 5.30pm Monday to Friday, with a Saturday roster in place to harvest bone marrow cultures and prepare peripheral blood cultures⁵⁸.

On-call service is provided for emergency analysis between 9.00am – 5.00pm Saturdays and Sundays as well as public holidays, covered by experienced laboratory scientists at HP3 level or above.

58. ACT Pathology, Diagnostic Genomics.

Major Equipment List

Current major equipment for DG is detailed in Appendix Table A9-5. Key equipment includes but is not exclusive to PCR analysers, Extractors, Freezers, Refrigerators, Thermocyclers, Robotics, Biological Safety Cabinets (BSC II), Fume hoods, Incubators, Ovens, Humidity Cabinets, Water baths and Microscopes.

See Table A10-1 for future equipment list for all departments.

Workforce Model

The workforce model⁵⁹ reflects the clinical volumes and capability level of DG, with staffing levels provided in Table 7-16 below. The staffing complement includes clinical director, chief scientist, senior scientists, HP2 scientists and technical officers.

The workload is currently divided into two streams – *constitutional and oncology genomics*, each stream supervised by a senior scientist, under a single leadership model.

The senior scientists get rotated regularly to ensure they gain experience in each other's area. A similar process applies to the scientific and technical staff, with movement between tests to multi-skill all team members for redundancy planning, and to prepare for times of staff shortage:

- All HP2 staff will gain experience in all aspects of DG laboratory bench work and analysis; and
- Technical officers will gain experience in most aspects of DG lab bench work and ancillary tasks, but do not perform analysis with the exception of FV/FII Genexpert tests.

Table 7-16: Staffing by Workforce Category, Diagnostic Genomics

Category	Section/Unit	Head Count
Clinical Director	1	1
Supervising Pathologists/Clinical Supervisors	1	8 (part-time components, multiple individuals)
Supervising Scientist (HP4)	1	1
Senior Scientist (HP3)	2	2
Base Grade Scientist (HP2)	5	6
Technical Officer (TO1)	1	1
Total	11	19

Staffing numbers are at a point in time and will not reflect future FTE or workforce mix needs.

A Future State

As previously noted, the specialty of genomics is both exciting and challenging with the potential it offers health practice. There is more scope to invest in genomics than in any other specialty.

59. ACT Pathology, Diagnostic Genomics.

A future state is possible with the design of the DG area of pathology likely to significantly expand, and develop, over time. (see accompanying Schedule of Accommodation):

- **NGS** is a parallel or deep (DNA) sequencing technology which has revolutionised genomic research over the recent years. Current lab space limitation is a constraint to the procurement of a NGS, which would be highly relevant and substantially beneficial to the work of DG. In many cases is now the frontline test for diagnosis and treatment of various cancers and this will only expand further. Plans to implement this technology by 2024/2025 are underway with significant future growth anticipated.
- **Integrating multiple omics technologies**, similar to the way that multidisciplinary teams approach works in healthcare, the multi-omics approach (including technologies such as genomics, transcriptomics, epigenomics, proteomics, and metabolomics) will provide a much more holistic view of disease mechanisms, which not only works to enhance the accuracy of diagnosis, but also enables personalised treatment strategies based on individual patient profiles. The drive towards individually targeted therapies is expected to continue to increase the level of testing, workforce expertise and need for individualised reports, particularly in cancer treatments.

It is likely that in the not-so-distant future, the 'omics revolution' for personalised diagnoses and treatments could become core business for ACT Pathology.

- ▶ Increased integration of genomics into routine clinical practice – essential for timely diagnosis of cancer, for prognostication and to identify targeted treatments;
 - ▶ Pharmacogenomics;
 - ▶ Screening for disease: including minimal residual disease in cancer patients, and carrier screening in parents/families; and
 - ▶ Tissue banking to allow for retesting of samples.
- **Automation of Manual Steps.** Common to all specialties, there will be opportunities to automate more manual steps with automated machines and AI assisted software.
 - **AI and machine learning** are being much more widely used in pathology as algorithms and pattern recognition can help humans perform much faster, much more accurately with much less effort. Together, they will play a significant role in analysing and interpreting large-scale genomic data, and identification of disease patterns moving forward. AI-assisted technology is already utilised in DG for slide scanning and image analysis; this will increase in the future.

The future for DG is expected to incorporate a service model that has very significant investment in automation and multiple omics technologies, this includes a variety of new equipment that ACT Pathology does not currently have. The automation will be predominately focused on NGS (genetic sequencing), reagent testing, DNA extraction, quality testing and advances in omics technologies (possibly in partnership with others).

The current space allocations have been increased to accommodate for these new equipment additions and strategic direction to meet the patient demands and requirements for testing in the jurisdiction.

The strategic decision is to commence DG (and Molecular Pathology) in the new building with a **substantial investment in automated equipment**, which will place ACT Pathology at the fore of DG and Molecular Pathology across jurisdictions. The scale of the investment is being determined as part of a future capital investment funding and business case.

7.9.5. Haematology

Haematology is concerned with blood and its components. Haematology tests enable the diagnosis, treatment, and prevention of blood disorders and disorders of blood producing tissues/organs. Haematology testing is one of the most widely used forms of pathology.

Scope of Service

Test Volumes

The Haematology department's highest volume of work is for FBC testing with over 290,000 tests annually. The comparison of two sections and the total testing is provided below. The decline in number of tests is most likely due to COVID.

Table 7-17: Haematology Test Volumes – 2019-20 to 2021-22

Year	Blood Transfusion	Haematology (incl. coagulation & immunophenotyping)	Total
2019/2020	53,448	523,564	577,012
2020/2021	56,472	537,756	594,228
2021/2022	56,021	531,487	587,508

Specialty Scope

In this context of CHS, the Haematology department⁶⁰ is 24/7 has a number of subspecialties including:

- General Haematology;
- Morphology;
- Coagulation;
- Immunophenotyping; and
- Transfusion Bone Marrow Transplant (BMT).

In addition, there is critical connectivity required by haematology department with units across the CH, mainly with the Haematology Ward (Building 3 in the oncology building) and Apheresis Unit (Building 19 with blood donations). It is expected that the Haematology Ward and Apheresis Unit will remain in their current locations.

For Haematology services in the new pathology facility:

■ Haematology laboratory services

This encompasses all forms of blood cell analysis (such as blood cell morphology and physiology, haematological malignancies, coagulation disorders, bone marrow disorders, overseeing blood transfusions, and haemoglobinopathies (inherited blood disorders).

Routine tests include patient sample testing, storage and management of FBC, blood films, routine and special coagulation; flow cytometry, haemoglobinopathy testing, and haematological genetic testing.

60. ACT Pathology, Haematology Transfusion BMT.

Given ACT Pathology is a regional transfusion centre, catering to a potentially large number of trauma-related transfusion cases, is an important function of the transfusion service.

■ Bone Marrow Transplant

BMT is a highly specialised service. It is an integrated team that collect, process, store and issue Human Haemopoietic Progenitor Cells, ready for use. The service is clinically integrated with the Canberra Regional Cancer Service and affiliated with the BMT+CT Network in NSW.

The BMT Unit is involved with approx. 50 stem cell collections and 35 transplants per year. CH haematologists determine the suitability of each patient for transplant.

The ACT Pathology Haematology department has a purpose-built cryogenic storage facility adjacent Building 10, fitted with reticulated LN2 supply and oxygen monitoring. The facility houses three LN2 storage tanks dedicated to haematopoietic progenitor cell storage, a -80 freezer and a controlled rate freezer. Transport vessels are also stored in this facility (two permanent, others when products are shipped in or out). LN2 bulk supply is located outside of the building for convenient refilling by external contractors and for safety.

Specimen Pathway

Specimens are received by the laboratory from the specimen reception area, similar to all other pathology specialties. Specimens arrive at reception via pneumatic tube, CH staff, couriers Australian Red Cross Blood Service (ARCBS), and external transport (such as taxis). Urgent testing is commonly delivered by hospital staff, and couriers if external to CH.

Blood products are delivered by the ARCBS for crossmatch and received by blood transfusion services (closely proximate to the hospital/specimen reception access point), which requires careful verifying and documenting that the products match what has been requested to ensure accuracy and traceability (by barcoding).

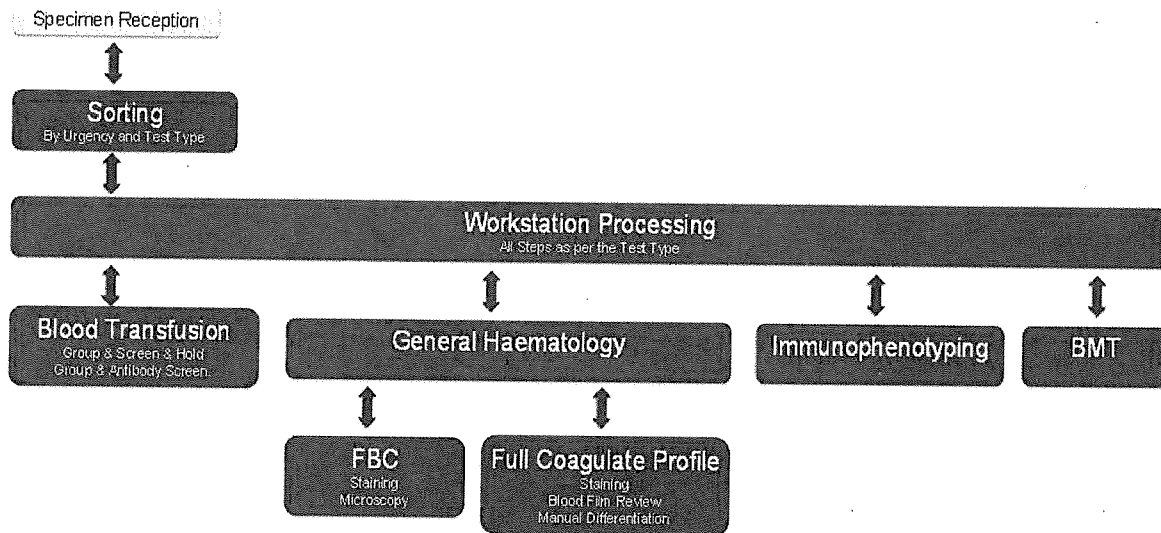
BMT laboratory receives BMT/cell therapy products (delivered by nurses) which require strict inspection and label verification procedures.

The process steps for haematology are not necessarily sequential or require unidirectional flow.

The key process is the **automation of specimen analysis**, integrated with the Core Lab, followed by reporting of results. If there are queries in relation to the results, a second sample is assessed and/or the sample is manually assessed.

In relation to **transfusion services**, various tests are performed on the blood products to ensure compatibility with the intended recipient prior to any patient transfusion. These tests include ABO and Rh typing, antibody screening, and crossmatching. Blood products are then released for transfusion by the blood transfusion services. For **BMT**, all processing is performed in a biological safety cabinet.

Figure 7-12: Specimen Pathway for Haematology



The **blood bank** section is located in close proximity to the hospital/specimen reception access point to allow for easy collection of blood products. Immunophenotyping (flow cytometry) and BMT are located behind the more automated sections.

The specimen flow in the new facility will need to accommodate:

- Blood transfusion services with blood bank refrigerators close to the hospital/specimen reception access point;
- Automated haematology and coagulation testing; and
- BMT and immunophenotyping behind automated areas.

Storage and specimen retention are also part of the pathway, detailed below.

Specific Design Elements for Haematology

The following elements should be considered in relation to the design of Haematology department in the relocated Pathology facility:

Space and Zoning

Located within the Core laboratory, the haematology section is envisioned predominantly in an open-plan setting. However, considering the specialised requirements, BMT subsection should be positioned within a controlled environment.

It is important for the design to promote visibility, ensuring that staff members are easily overseen by supervisors, fostering a sense of connectivity within the team. For a harmonious visual appeal, the enclosed design allocated for the BMT should echo the layout of Chemical Pathology's mass spectrometry area, achieving a symmetrical aesthetic.

Within transfusion services, there is currently a blood irradiator which uses a radioactive source. This requires a separate room with security measures built in. Decision has not yet been made as to whether ACT Pathology will continue to irradiate blood on site, therefore a blood irradiator should be incorporated for now and reviewed at a future stage.

Ventilation and Air Quality

For the BMT laboratory space where cell processing occurs, it's essential to maintain a controlled environment to prevent contamination of the transplant product. Below are specific ventilation and air quality requirements for a BMT lab that are in addition to the Core Laboratory:

- **Positive Air Pressure:** BMT units often maintain positive air pressure relative to the corridor or adjacent spaces. This ensures that when doors are opened, air flows out of the room rather than in, preventing the ingress of potential contaminants;
- **Temperature and Humidity Control:** maintaining a controlled environment is critical. BMT units and laboratories should have HVAC systems capable of regulating both temperature and humidity. Specific settings can vary and will depend on specifications of the equipment in the area;
- **Regular Monitoring and Maintenance:** The ventilation system should be regularly checked and maintained to ensure its efficiency. This includes routine checks of the filters, airflow rates, and pressure differentials;
- **LN2** is used in BMT laboratories for the cryopreservation of stem cells and other biological samples. When LN2 evaporates, it turns into nitrogen gas, which is inert and non-toxic, however, nitrogen gas can displace oxygen in a confined space. If the oxygen concentration drops below safe levels (typically below 19.5% at sea level), it can lead to asphyxiation. This is a significant hazard when using large quantities of LN2, especially in poorly ventilated areas.

Additionally, if LN2 is stored in a sealed container, the evaporation of nitrogen can lead to an increase in pressure. This can potentially lead to the container bursting or exploding. It's essential to use only containers designed for LN2 storage and to ensure they have pressure-relief mechanisms.

The extreme cold associated with LN2 can lead to condensation and ice formation, which can make surfaces slippery and pose a risk of falls. The floor design should consider this:

- ▶ Ensure adequate ventilation in areas where Ln2 is used or stored. This is to prevent the build-up of nitrogen gas and subsequent oxygen displacement;
- ▶ Install oxygen monitors (and cameras for monitoring) in areas with significant LN2 usage. These monitors can provide an alert if oxygen levels drop below safe thresholds; and
- ▶ Carefully plan where LN2 containers will be stored in, how they can be well-ventilated, and how they are guaranteed to remain upright.

Lighting

For blood film reviews:

- Blood films should be adequately illuminated to provide sufficient brightness for clear visualisation of cells and structures. Insufficient lighting can lead to difficulty in identifying subtle abnormalities or distinguishing cell types. It is important to ensure that the brightness of the lighting is appropriate for comfortable and accurate examination;
- Reflections on the glass slide or coverslip can hinder visibility and make it difficult to interpret blood film findings. Anti-glare coatings on the microscope lenses and proper positioning of the light source can help minimise reflections and improve clarity;
- A cool light source, such as a daylight-balanced LED or fluorescent light, is preferred when reading blood films. Cool light sources provide a balanced colour temperature that closely

mimics natural daylight, which helps ensure accurate colour perception and differentiation of cellular components;

- Colour Rendering Index (CRI) measures how accurately a light source represents colours compared to natural light. A higher CRI (ideally above 90) is desirable to ensure accurate identification and interpretation of colour changes in stained specimens or indicators;
- While the microscope's illumination is crucial, the ambient lighting in the room also plays a role in the comfort and efficiency of the morphologist;
- The room's ambient light should not produce glare on the microscope or the slides;
- Indirect ambient lighting is preferred, as it reduces reflections and shadows that might interfere with slide examination;
- Room lighting should be adjustable. Different staining techniques and specific cellular features may require different lighting levels to enhance visibility and contrast. Also, some morphologists prefer dimmer ambient light to contrast with the bright microscope field, while others may want brighter room light to reduce eye strain when transitioning between looking through the microscope and reading labels or entering data. This may present a challenge in zoning lighting within an open plan environment.

Adjustable light sources, such as adjustable desk lamps or microscope illuminators, can be used to optimise the illumination according to the specific requirements;

- The lighting should be adjusted to optimise contrast, allowing for better visualisation of cellular details. Adjusting the angle or direction of the light source can help enhance contrast by creating shadows and highlighting specific features of interest; and
- Consideration should be given to the comfort of the examiner's eyes during prolonged periods of reading blood films. Lighting should be gentle on the eyes, providing adequate but not overly bright illumination.

Temperature

As per "General Design Principles" in section 7.8.

Bone Marrow Transplant

The BMT area must comply with Requirements For Procedures Related To The Collection, Processing, Storage And Issue Of Human Haemopoietic Progenitor Cells (Sixth Edition 2021)⁶¹. The main, but not all of the key requirements are:

- Haematopoietic Progenitor Cell products are stored using various procedures and temperatures depending on the required duration of storage;
- There must be physically separate areas designated for the storage of products during quarantine, before issue and for non-conforming products;
- Oxygen monitors must be installed in all areas where LN2 storage tanks are located;
- Video cameras with central monitoring are also recommended so that staff in the BMT can be observed in case they are overcome by any increase in nitrogen in the air and lose consciousness;

61. National Pathology Accreditation Advisory Council. (2021). Requirements for Procedures Related to the Collection, Processing, Storage and Issue of Human Haemopoietic Progenitor Cells (Sixth Edition 2021). Retrieved from https://www.safetyandquality.gov.au/sites/default/files/2022-08/tier_4_requirements_for_procedures_related_to_the_collection_processing_storage_and_issue_of_human_haemopoietic_progenitor_cells_sixth_edition_2021.pdf.

- Products stored in a liquid state must be maintained within specified temperature range to maintain viability and function, to inhibit infectious agents and for a period of time not to exceed that specified in the standard operating procedures;
- Materials that may adversely affect products must not be stored in the same refrigerators or freezers as the cellular products;
- Refrigerators and freezers for product storage must have a system to monitor the temperature continuously and record the temperature at least every four hours;
- There must be a mechanism to ensure that levels of LN2 in LN2 freezers are maintained constantly to ensure that products remain within the specified temperature range; and
- Storage devices for products or reagents for product processing must have alarm systems that are active continuously.

Acoustic Control

Automated robotic track systems in chemical pathology laboratories, and analysers, can produce noise. The level of noise depends on the specific system, its components, and the operational state. Factors contributing to noise can include:

- Movement of the Robot Arms;
- Conveyor Systems;
- Centrifuges and Decappers; and
- Alerts and Alarms.

Careful design of the laboratory can make a difference. Keeping the TLA system centralised and away from workstations or areas where staff spend prolonged periods can help. Other considerations can include:

- Acoustic Barriers or other acoustic dampening solutions; and
- The use of vibration-dampening floor materials can reduce noise transmission, especially if the system is on an upper floor.

The laboratory can also help to reduce noise by ensuring that the system is well-maintained.

Floor Loading

As per "General Design Principles" in section 7.8.

Sustainability

As per "General Design Principles" in section 7.8.

Storage and Specimen Retention

Storage

Haematology, Chemical Pathology and Immunopathology departments operate as part of a broader core laboratory and in an open plan design. The types of storage required need to include:

- **Reagent Storage:** some can be kept at room temperature and some needs to be refrigerated (2-8 degrees Celsius) within the Centralised Walk-in Cold Room and Freezer Room;
- **Specimen Storage:** specimens will be kept in the Centralised Walk-in Cold Room and Freezer Room;
- **Equipment Storage:** some laboratory equipment (such as analysers) may be stored away when not in use within the Centralised Equipment Store;
- **Record Storage:** some space for record storage will need to be allocated as some physical records (such as patient records, quality control records, and maintenance logs) may still need to be kept on site despite ACT Pathology moving towards complete electronic record-keeping using DHR; and
- **Waste Storage:** Waste storage will be organised at two distinct levels in a multi-floor structure. At the workstation level, individual waste containment solutions will be tailored to the immediate needs of each specific workstation, ensuring efficient and safe waste disposal during daily operations. On the floor level, centralised waste storage areas will be designated to consolidate waste from various workstations, facilitating easier collection, segregation, and eventual disposal. This dual-level approach ensures both immediate waste management needs and broader floor-wide requirements are adequately addressed.

In addition to general storage requirements for the core laboratory (above), Haematology department also requires various other types of storage for different purposes. These include:

- **Blood Transfusion Services – Blood Bank Storage** needs to be proximal to haematology laboratory space and requires precise temperature control (and alarmed) to ensure the viability and safety of blood components, including:
 - ▶ Whole blood and red blood cell (RBC) units are typically stored at temperatures between 1°C and 6°C (and alarmed), which helps maintain structural integrity and extend their shelf life; and
 - ▶ Plasma and platelet units, on the other hand, are frozen and stored at temperatures below -18°C or -30°C, respectively, to prevent degradation and maintain their therapeutic properties.
- **BMT.** The BMT Laboratory, also referred to as a cell therapy processing facility, is a specialised medical facility that manages, receives, tests, processes, stores and issues hematopoietic stem cells for transplantation. Proper storage in such departments is critical given the sensitive nature of the transplant material and the vulnerability of patients undergoing transplantation. Here are the specialised storage requirements for a BMT department:
 - ▶ Hematopoietic Stem Cell (HSC) storage requires:
 - Fresh product storage: monitored refrigerated storage meeting requirements of transfusion medicine/blood refrigerators at 2-8°C with 24/7 monitoring and alarms;
 - Cryopreservation: stem cells for transplantation are often cryopreserved using controlled-rate freezing methods to ensure cell viability. These cells are stored in LN2 freezers at very low temperatures (often -196°C);
 - Cryogenic processing and storage facility: special LN2 storage vessels store cryopreserved cells indefinitely in the vapour-phase of LN2. Nitrogen storage tanks access a supply of LN2 (at a specific pressure) at all times to enable automatic filling. Nitrogen storage tanks are equipped with alarms to monitor temperature and LN2 levels; and

- Refrigerated storage: chemotherapy drugs, growth factors and cytokines used to stimulate stem cell growth, often require refrigeration.
- ▶ Waste Storage requires:
 - Biohazardous Waste; and
 - Chemical Waste.
- ▶ Reagents for the BMT laboratory require cold storage and they could be stored with other reagents requiring cold storage in the shared Walk-in Cold Room and Freezer Room.

Haematology also needs to be consistent with the broader pathology specimen storage principles as outlined in section 7.8.1.

Specimen Retention

ACT Pathology is required to meet National Pathology Accreditation Advisory Committee's Requirements for the retention of laboratory records and diagnostic material. The relevant retention period for Haematology accords with section 7.8.2 unless otherwise specified below in Table 7-18 and Table 7-19⁶².

Table 7-18: Minimum Retention Times for Haematology

	RECORD/MATERIAL	MINIMUM PERIOD OF RETENTION
3-16-1	Blood Films ^{EN8} ▪ Clinically Significant ▪ Not Clinically Significant	▪ 1 Year ▪ 1 Month
3-16-2	Plasma for Special Haemostasis testing	1 month @ -20C or lower
3-16-3	Blood Specimens, Other than 3-16-1 and 3-16-2	As per Table 3-2, row 3-2-7 for purposes of identification and traceability, noting that repeat testing may not be technically reliable after 2 days
3-16-4	Bone Marrow slides and reports	▪ 10 years for adults ▪ 7 years from the age of majority for minors
3-16-5	Flow Cytometry ▪ Reports ▪ Graphical Output used in diagnosis	▪ 10 years for adults, 7 years from the age of majority for minors ▪ As per Table 3-2, row 3-2-6

Table 7-19: Minimum Retention Times for Immunohaematology (Blood Transfusions)

	RECORD/MATERIAL	MINIMUM PERIOD OF RETENTION
3-17-1	Lab records of blood products received and issues ^{EN9}	20 years
3-17-2	Lab records of all immunohaematology testing ^{EN9}	20 years

Key Functional Relationships and Adjacencies

Internal Relationships

62. Australian Commission on Safety and Quality in Health Care, Requirements for the Retention of Laboratory Records and Diagnostic Material, Tier 3B Document, Ninth Edition 2022, available at https://www.safetyandquality.gov.au/sites/default/files/2022-04/retention_standard_ninth_edition_2022.pdf.

Haematology has a close clinical relationship with Specimen Reception and courier services (in relation to Blood Bank),

Due to the 24/7 nature of timely service delivery and the integral part that haematology has for the Core Lab, automated Haematology processes will be contiguous with automated Chemical Pathology, automated Immunopathology & Infectious Immunoassay specimen reception to form the new **Core Laboratory**, as illustrated in Figure 7-3.

There are also some functional links to Diagnostic Genomics with molecular haematology processes focusing on the molecular and genetic aspects of haematological disorders and involves the analysis of specific genes, chromosomal abnormalities, or molecular markers associated with various blood disorders (including leukemias, lymphomas, and inherited blood disorders). While important in the overall diagnostic reporting, the three related processes do **not** require adjacency in the design, however it would be ideal.

The proximity of the Blood Bank to automated Pre-analytics (hence Pathology Core Laboratory) will be an important relationship in the design.

Implied in the functional adjacencies and central to the increase in convergence technology, pathologists, registrars, and scientists will have greater synergy working alongside each other in the laboratory (which acts as a “watchdog” system for the blood results). Close proximity needs to be developed as much as possible within the new facility.

External Relationships

The key requirement for Haematology is similar to all other areas of pathology. The ICT connectivity and the IT platforms need to be robust in order that:

- Haematologists are able to communicate with other medical practitioners, with sufficient bandwidth to display high fidelity images; and
- Regular and constructive relationships with all referrers, including timely provision of results.

Haematology also has critical relationships with accreditation and regulatory bodies. In addition to the NATA requirements, BMT must comply with *Requirements For Procedures Related To The Collection, Processing, Storage And Issue Of Human Haemopoietic Progenitor Cells* (Sixth Edition 2021)⁶³.

Management and Operational Support Services

Current Location

Haematology is currently located on Level 2, Building 10.

Hours of Operation

Haematology laboratory services is a 24/7 service with a more limited range of services offered after-hours (6pm to 7:30am Monday to Friday, all day Saturdays Sundays and public holidays).

63. National Pathology Accreditation Advisory Council. (2021). Requirements for Procedures Related to the Collection, Processing, Storage and Issue of Human Haemopoietic Progenitor Cells (Sixth Edition 2021). Retrieved from https://www.safetyandquality.gov.au/sites/default/files/2022-08/tier_4_requirements_for_procedures_related_to_the_collection_processing_storage_and_issue_of_human_haemopoietic_progenitor_cells_sixth_edition_2021.pdf.

Responsiveness

Turnaround times of reports and access to haematologists for secondary consultations is critically important for the business of pathology, and a sustainability client base.

Major Equipment List

Current major equipment for Haematology is detailed in Appendix Table A9-6. Key equipment used in Haematology laboratory includes but is not exclusive to blood bank refrigerators, freezers (includes freezers for fresh frozen plasma and platelets), incubators for platelets, plasma thawers, aggregometers, ROTEM Sigma (Viscoelasticity haemostasis testing analyser), refrigerators, microscopes, eSR analysers, stainers, cytometer, flow cytometers, biological safety cabinets, LN2 storage tanks, controlled rate freezers, centrifuges, coagulation analysers and haematology analysers.

See Table A10-1 for future equipment list for all departments.

Workforce Model

The workforce model reflects the clinical capability level of Haematology, with staffing levels provided in Table 7-20 below. The staffing complement includes clinical director, specialist haematologists, registrars, laboratory manager, chief scientist, senior scientists, scientists, and technical officers. Like the Department of Microbiology, the Pathologists have a clinical role as well and are fractional appointments to the laboratory.

Table 7-20: Staffing by Workforce Category, Haematology

Position	Headcount	FTE
Clinical Director	1	0.4
Pathologists	7	1.7
Registrars	3	3
Laboratory Manager	1	1
Chief Scientist	1	1
Senior Scientists (HP4)	2	2
Senior Scientists (HP3)	7	6.8
Base Grade Scientists	20	18.3
Technical Officers	4	3.6
Total	46	37.8

Staffing numbers are at a point in time and will not reflect future FTE or workforce mix needs.

A Future State

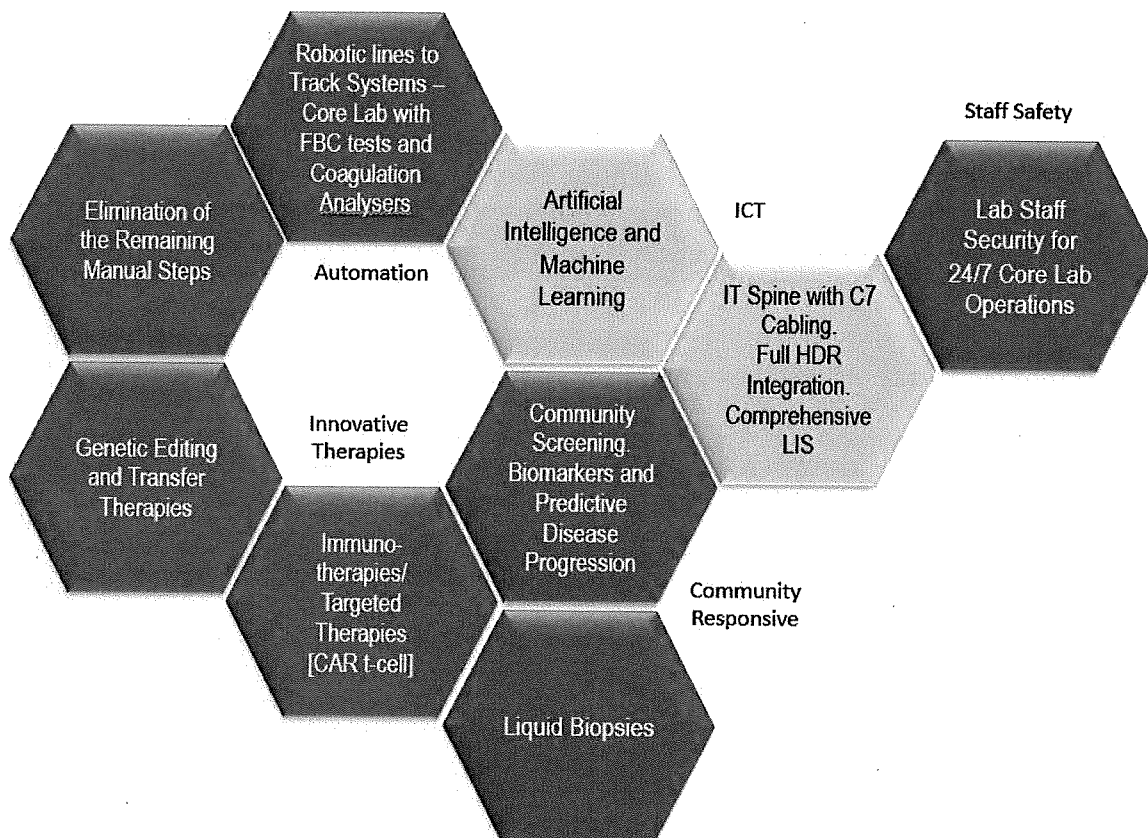
Haematology is a pathology discipline that continues to evolve.

Figure 7-13 below identifies the expected developments for haematology. As with other specialties, all of the developments are inter-related. Many are inter-dependent. The principal drivers are developments that:

- Continue to automate manual processes;
- Fully integrate with the Core Lab;
- A robust ICT spine and AI capability;
- Develop innovative therapies. At the forefront of these new therapies would be CAR T-cell therapies, genetic editing and transfer therapies more generally;
- Response to specific community needs that pathology can lead, such as community screening predictive disease progression and liquid biopsies; and
- Staff Safety.

The future for the interface between haematology and genomics and molecular pathology will continue to evolve as it develops capability to extend its functional capability to better align with capacity of interstate laboratories.

Figure 7-13: Future State for Haematology



7.9.6. Immunopathology and Infectious Immunoassay

Immunopathology is a particularly challenging area of pathology. Testing and investigating for immune disorders from specimens are often only part of the solution to a definitive diagnosis

and treatment pathway. There is a crucial liaison role between the complex testing of specimens and patient management advice of other physicians.

Scope of Service

Test Volumes

Immunopathology & Infectious Immunoassay's test panel volumes are combined with Chemical Pathology, performing more than 1 million tests annually. The year-by-year breakdown is as below.

Table 7-21: Chemical Pathology, Immunopathology & Infectious Immunoassay Test Panel Volumes – 2019-20 to 2021-22

Year	Total
2019/2020	1,661,806
2020/2021	1,756,151
2021/2022	1,748,351

Specialty Scope

At ACT Pathology, Immunopathology and Infectious Immunoassay embodies two Pathology disciplines – Immunopathology and Infectious Immunoassay.

A typical range of tests include:

Immunopathology

- Auto-immune serology: testing for organ specific and systemic autoimmune disease with indirect immunofluorescence and more specific antibody tests;
- Specialised immunochemistry: Immunopathology supervises all immunochemistry which includes determination of complement levels, immunoglobulin testing, serum and urine electrophoresis, serum and urine immunofixation, CSF IEF,
- Allergy testing;
- Immunogenetics: HLA B27 testing; and
- Flow cytometry for B and T cell enumeration, and characterisation of B cell subsets: performed in Haematology but interpreted and overseen by Immunology.

Also importantly, Immunopathology testing overlaps with other areas, such as:

- HIV testing (with Microbiology);
- Flow cytometry (with Haematology);
- Endocrine testing (with Chemical Pathology);
- Complex therapeutic monitoring (with therapeutic drug monitoring);
- Human Leukocyte Antigen (HLA) and other genetic testing (with Diagnostic Genomics / Molecular Pathology); and
- Some individual tests also cross disciplines (such as latent tuberculosis and H Pylori – a common digestive tract infection).

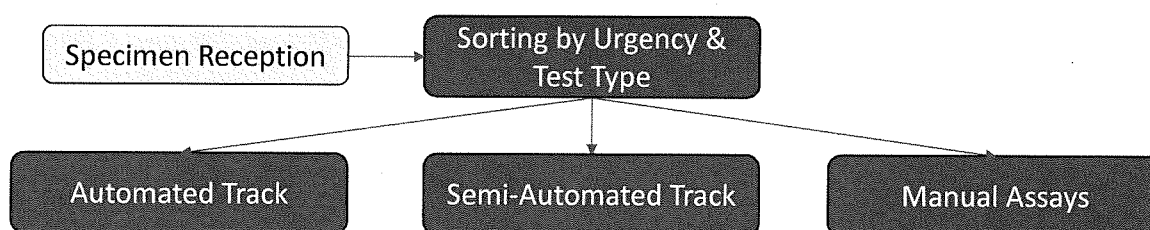
Infectious Immunoassay

An infectious immunoassay test detects the presence of infectious agents, such as bacteria, viruses, parasites, or fungi, in a patient's sample (e.g., blood, urine, or respiratory secretions). It involves the use (i.e., the presence or absence) of specific antibodies or antigens that can bind to target molecules associated with the infectious agent to indicate a current or past infection. With respect to the model of care, Infectious Immunoassay range of testing is not necessarily unidirectional and involves a high level of automation but with important manual testing and second sample testing.

Specimen Pathway

Specimens are retrieved from Specimen Reception (where they are registered) and transported by hand from Level 2 to Level 6, specific pathway is described in Figure 7-14.

Figure 7-14: Specimen Pathway for Immunopathology and Infectious Immunoassay



Specific Design Elements for Immunopathology and Infectious Immunoassay

The following elements should be considered in relation to the design of Immunopathology & Infectious Immunoassay department in the relocated Pathology facility.

Space and Zoning

In the new design, the following orientations should be adopted:

- The automated elements of Immunopathology and Infectious Immunoassay will be fully incorporated into the Core Lab, with staff having expertise in both Immunopathology and Infectious Immunoassay reporting the testing;
- Many Immunopathology and Infectious Immunoassay tests are semi-automated or manual and cannot be performed within a 'true core' laboratory. These tests would be performed in specialised laboratory areas adjacent to the core laboratory; and
- Immunopathology and Infectious Immunoassay can be designed to act independently as there are no inter-departmental dependencies. However, it would be beneficial to be adjacent to flow cytometry and the core laboratory.

Ventilation and Air Quality

The design will include the following considerations for air quality and ventilation:

- **Temperature Stability:** the laboratory room temperature should be stable, typically the same as the other parts of the core laboratory section i.e. between 20-25°C. The temperature stability ensures consistent performance and calibration of the instrument. It's essential to monitor and maintain temperature within specified limits as prescribed by the mass spectrometer's manufacturer;

- Humidity Control: humidity should be controlled, with levels typically kept below 60% relative humidity. Excess moisture can influence ionisation processes, potentially affect the equipment's internal components, and lead to corrosion over time;
- Clean, Dust-Free Environment: dust and other particulate matter can interfere with the instrument's operation. It's beneficial to have air filtering systems in place to ensure the lab remains as dust-free as possible but may also be kept in a separate room;
- Gas Supply: It's essential to ensure a consistent and uncontaminated gas supply. Gas cylinders should be stored safely, and appropriate gas purifiers should be in place;
- Ventilation and Fume Hoods: some sample preparation steps might involve volatile or hazardous chemicals. Proper ventilation and fume hoods should be available to ensure the safety of laboratory personnel and to prevent contamination of the laboratory atmosphere;
- Electrical Supply: stable and clean power is essential. UPS or backup power systems might be necessary, especially for critical applications; and
- Airborne Contaminants: laboratories should be kept free from volatile organic compounds (VOCs) or other potential sources of chemical interference.

Lighting

As per "General Design Principles" in section 7.8.

Temperature

- For the macro environment, this should be 20-25°C like the rest of the laboratory. The department should have a controlled room temperature to ensure optimal operation of automated analysers. The temperature should be maintained within a specific range recommended by the manufacturers of the instruments; and
- In a micro setting, refrigerated environments need to be 2-8°C and freezer temperatures need to be -20°C which can be accommodated by the Walk-in Cold Room and Freezer.

Acoustic Control

Automated robotic track systems in immunopathology laboratories, and analysers, can produce noise. The level of noise depends on the specific system, its components, and the operational state. Factors contributing to noise can include:

- Movement of the Robot Arms;
- Conveyor Systems;
- Centrifuges and Decappers; and
- Alerts and Alarms.

Careful design of the laboratory can make a difference. Keeping the TLA system centralised and away from workstations or areas where staff spend prolonged periods can help. Other considerations can include:

- Acoustic Barriers or other acoustic dampening solutions; and
- The use of vibration-dampening floor materials can reduce noise transmission, especially if the system is on an upper floor.

The laboratory can also help to reduce noise by ensuring that the system is well-maintained.

Floor Loading

As per “General Design Principles” in section 7.8.

Sustainability

As per “General Design Principles” in section 7.8.

Storage and Specimen Retention

Storage

Immunopathology and Infectious Immunoassay, Chemical Pathology and Haematology departments operate as part of a broader core laboratory and in an open plan design. The types of storage required need to include:

- **Reagent Storage:** some can be kept at room temperature and some needs to be refrigerated (2-8 degrees Celsius) in a Centralised Walk-in Cold Room and Freezer Room;
- **Specimen Storage:** specimens will be kept in the Centralised Walk-in Cold Room and Freezer Room;
- **Equipment Storage:** some laboratory equipment (such as analysers) may be stored away when not in use within the Centralised Equipment Store;
- **Record Storage:** some space for record storage will need to be allocated as some physical records (such as patient records, quality control records, and maintenance logs) may still need to be kept on site despite ACT Pathology moving towards complete electronic record-keeping using DHR; and
- **Waste Storage:** Waste storage will be organised at two distinct levels in a multi-floor structure. At the workstation level, individual waste containment solutions will be tailored to the immediate needs of each specific workstation, ensuring efficient and safe waste disposal during daily operations. On the floor level, centralised waste storage areas will be designated to consolidate waste from various workstations, facilitating easier collection, segregation, and eventual disposal. This dual-level approach ensures both immediate waste management needs and broader floor-wide requirements are adequately addressed.

Immunopathology and Infectious Immunoassay also needs to be consistent with the broader pathology specimen storage principles as outlined in section 7.8.1.

Specimen Retention

ACT Pathology is required to meet National Pathology Accreditation Advisory Committee's Requirements for the retention of laboratory records and diagnostic material. The relevant retention period for Immunopathology⁶⁴ accords with section 7.8.2 Table 7-4 unless otherwise specified below in Table 7-22 and Table 7-23⁶⁵.

64. Note the relevant section for Infectious Immunoassay has been placed in the Microbiology section.

65. Australian Commission on Safety and Quality in Health Care, Requirements for the Retention of Laboratory Records and Diagnostic Material, Tier 3B Document, Ninth Edition 2022, available at https://www.safetyandquality.gov.au/sites/default/files/2022-04/retention_standard_ninth_edition_2022.pdf.

Table 7-22: Minimum Retention Times for Immunopathology

	RECORD/MATERIAL	MINIMUM PERIOD OF RETENTION
3-20-1	Serum, plasma, other body fluid and tissue specimens	As per Table 3-2, row 3-2-7
3-20-2	Frozen tissue blocks, including specimens for immunofluorescence studies	1 month at -70°C or lower
3-20-3	Immunofluorescence slides	As per Table 3-2, row 3-2-7
3-20-4	Digital images used for diagnostic analysis	As per Table 3-2, row 3-2-6

Table 7-23: Minimum Retention Times for Immunohaematology (blood transfusion)

	RECORD/MATERIAL	MINIMUM PERIOD OF RETENTION
3-21-1	Laboratory records of blood products received and issued ⁶⁶	20 years
3-21-2	Laboratory records of all Immunohaematology testing ⁵²	20 years

Key Functional Relationships

Internal Relationships

Immunopathology and Infectious Immunoassay have a close relationship with other departments. The two specialties with highly integrated pathways include:

- Haematology (immunophenotyping); and
- Chemical Pathology (operational support for analysers on the track system).

Automated Immunopathology & Infectious Immunoassay will be joined by Specimen Reception, Automated chemical pathology and Automated Haematology to form the new **Core Laboratory**, as illustrated in Figure 7-3.

External Relationships

The key requirement for Immunopathology & Infectious Immunoassay is similar to all other areas of pathology. The ICT connectivity and the IT platforms need to be robust in order that:

- Immunopathologists and Clinical Microbiologists are able to communicate with other medical practitioners, with sufficient bandwidth to display high fidelity images; and
- Regular and constructive relationships with all referrers, including timely provision of results.

The future development of this specialty will require close and frequent communication with referrers to build the specialty and broaden the scope of services.

⁶⁶. Should be done in accordance with the *Requirements for transfusion laboratory practice*.

Management and Operational Support Services

Current Locations

At present, Immunopathology and Infectious Immunoassay is split over two levels, (Level 2 and Level 6). This is not conducive the operational efficiency and carries quality risks.

Hours of Operation

Immunopathology and Infectious Immunoassay operates in extended business hours from 8.30am – 8.00pm Monday to Friday, with pathologist and scientist on-call out-of-hours for urgent requests⁶⁷.

Major Equipment List

Current major equipment for Immunopathology and Infectious Immunoassay is detailed in Appendix Table A9-7.

Key equipment used in Immunopathology laboratory includes but is not exclusive to Electrophoresis Systems, Chemiluminescence Analyser, EIA Plate Analyser, EIA Platforms, Microscopes, Freezers (-20), Refrigerators, Deionised Water System, Biological safety cabinets (BSC II), and Immunoassay analysers.

Workforce Model

The workforce model reflects the clinical capability level of Immunopathology & Infectious Immunoassay, with staffing levels provided in Table 7-24 below. The staffing complement includes clinical director, Immunopathologists, registrar, chief scientist, senior scientists, scientists and technical officers.

Table 7-24: Staffing by Workforce Category, Immunopathology & Infectious Immunoassay⁶⁸

Staff Category	Headcount	FTE
Clinical Director	1	0.5
Pathologists	2	0.5
Registrar	1	1.0
Chief Scientist	1	1.0
Senior Scientists	3	3.0
Base Grade Scientists	10	9.1
Technical Officers	2	2.0
Total	20	17.1

Staffing numbers are at a point in time and will not reflect future FTE or workforce mix needs.

67. ACT Pathology, 02508 02501 86750 aid.

68. Microbiology/Infectious Immunoassay clinical Director and Pathologist are represented in the Microbiology workforce category.

A Future State

The future for the high volume and routine Immunopathology and Infectious Immunoassay testing will be a progressive elimination of the remaining manual processes, where possible.

The future is to invest in the remaining automated processes into the new facility, particularly the automations to extend the Core Laboratory. Immunopathology will be contiguous with the Core Lab, and:

- **Automate manual processes, where possible.**
- **Immunotherapies and targeted therapies.** Immunogenomics is an emerging field that integrates Immunopathology and genomics to understand the genetic basis of immune responses and immune-related diseases. Immunopathologists have the opportunity to identify novel biomarkers, therapeutic targets, and individualised treatment approaches, as has been the case with CAR T-cell therapy and immune checkpoint inhibitors.
- **Community screening.** There will be opportunities to support community screening programs and personalised wellness testing expanding the range of services from predominantly diagnostic (i.e., COVID).
- **Artificial Intelligence.** AI and machine learning will help automate processes (analysing big data sets in Immunopathology). Like other specialties, Immunopathology will be in a position to utilise AI as a decision support tool and security checks that are not systematically built into current day-to-day processes.
- **Collaborative research initiatives:** The complex nature of immune-related diseases necessitates interdisciplinary collaborations and the integration of diverse expertise. Future trends in immunopathology are likely to involve increased collaborations among immunologists, pathologists, geneticists, bioinformaticians, and clinicians from various specialties and various settings to facilitate the sharing of knowledge, resources, and data, leading to a deeper understanding of immune-mediated diseases and the development of more effective diagnostic and therapeutic approaches.

7.9.7. Microbiology

Microbiology is the identification of infectious agents (such as bacteria, viruses, fungi and parasites) that are responsible for causing infectious diseases.

It also explores the susceptibility of organisms to antibiotics to help decide on treatment, across a spectrum of activities including infection control and public health (including most recently the response to COVID-19).

Scope of Services

Microbiology operates as a Level 6 clinical capability.

Test Volumes

Microbiology performs around 120,000 tests annually, with much of it manually processed.

Testing involves the following sample types: blood, urine, faeces, sputum, synovial fluids, cerebrospinal fluid, spore strips for environmental investigations and/or infection control, and aspirates of bacterial isolates, biopsy specimens, bronchoalveolar lavage, bronchoalveolar washings, cerebrospinal fluid, cervical swabs, dry swabs, ear swabs, eye swabs, faeces, fine needle aspirates (FNA), fluids; gastric aspirates; genital swabs; human breast milk, nasal swabs; nasopharyngeal swabs, operative specimens; oral sites, post-operative wounds, pus, respiratory specimens, skin, tissues and more.

Table 7-25: Microbiology Test Panel Volumes – 2019-20 to 2021-22

Year	Microbiology
2019/2020	127,840
2020/2021	124,093
2021/2022	121,327

Speciality Scope

At ACT Pathology, services provided by the Department of Microbiology at a tertiary-level 6 lab, and includes:

- **General bacteriology** – isolation and identification of pathogens;
- **Virology** – limited testing for respiratory and gastrointestinal viruses, using immunochromatographic or molecular techniques. Viral cultures are no longer performed locally;
- **Mycology** – isolation and identification of pathogenic fungi, including dermatophytes;
- **Mycobacteriology** – isolation and identification of mycobacterium tuberculosis complex and mycobacterium avium/intracellular group;
- **Parasitology** – microscopy for enteric parasites and helminths (including hydatids);
- **Antimicrobial** susceptibility testing and reporting;
- **POCT e.g. Covid 19;** and
- Testing for organisms of **public health** significance in collaboration

Microbiology is an enabler of Antimicrobial Stewardship, including a registrar who has dual roles in both departments.

Specimen Pathway

Microbiology mainly receives tissue samples from the following places:

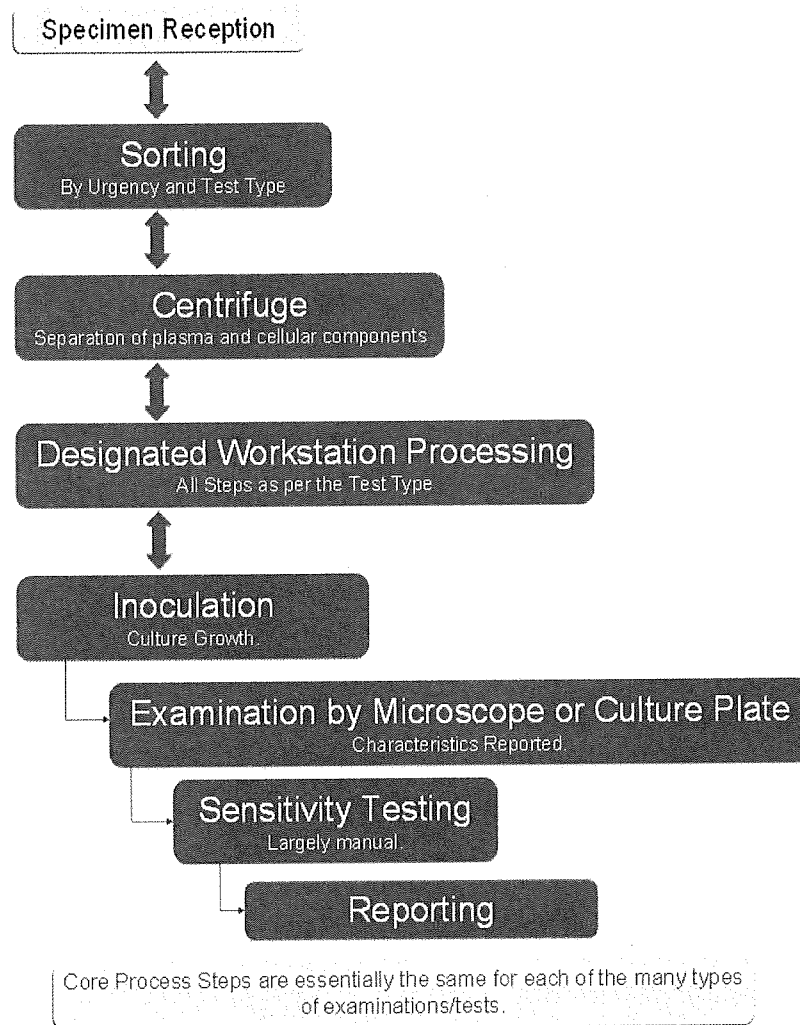
- Inpatient and outpatient services, TCH; and
- Other public and private hospitals in the ACT and parts of NSW.

The core steps are not unidirectional. The workflow is partly sequential and often requires movements to and from workstations.

Movement of specimens by staff between other areas of Pathology (e.g. shared specimens, should be transported by the safest route to other pathology units where there are shared specimens.

The specimen pathway impacts service models and related issues of ongoing storage, teaching and operational efficiencies that are able to be introduced.

Figure 7-15: Specimen Pathway for Microbiology



Specific Design Elements for Microbiology

Space and Zoning

To streamline workflow and staff training, the laboratory is divided into the:

- Specimen set up;
- **Processing Sections** that manage **microscopic examinations** from all specimen types;
- **Analytical Sections** perform **culture plate reading and interpretation**, and identification and susceptibility testing on all significant isolates, from all specimen types; and
- **Additional sections for specialist areas.** These include:
 - ▶ Mycology – processing of specimens requiring fungal examination; and

► Mycobacteriology/PC3 laboratory.

The microbiology department should be designed to be mostly open plan to allow flexibility for equipment and workflow reconfiguration with no specific flow to workstations but rather access to biological safety cabinets, Stock, incubators and anaerobic chambers where required.

The general laboratory space should meet the standards for a PC2 laboratory (AS/NZS 2243.3:2022)⁶⁹.

Office spaces for staff who are directly supervising the laboratory (i.e., Chief Scientist, Supervising Microbiologist and Registrars) should have direct access to the laboratory but preferably are not situated within the PC2 laboratory – for instance they may have windows and door (access controlled) into the laboratory but also are also accessible external to the laboratory via another entrance.

Entries, walkways, locations of hand washing/hand hygiene facilities and hooks for PPE within the PC2 laboratory should be considered to ensure compliance with PPE requirements and hygiene at the point of entry and exit to the laboratory.

Microbiology will require access to a PC3 facility that meets AS/NZS 2243.3:2022 standards, as well as the Commonwealth Government Security Sensitive Biological Agents legislative Standards⁷⁰. The facility is used when working with high-risk or highly infectious agents that may pose significant health risks.

PC3 facilities are designed to provide a higher level of containment compared to PC2 facilities, offering additional safeguards to protect laboratory personnel, the surrounding environment, and public health. PC3 facilities are typically utilised in diagnostic laboratories where high-risk pathogens need to be identified and managed. This includes handling clinical specimens that may contain dangerous or contagious agents that require enhanced containment measures.

This PC3 facility should:

- Be larger than the current PC3 laboratory to also enable basic molecular testing including a benchtop extractor;
- Have a pass-through autoclave for waste management;
- Be able to safely manage Security Sensitive Biological Agent (SSBAs);
- Be within/adjacent to the PC2 Microbiology/Molecular laboratories with visibility within the PC3 from the PC2 areas for staff safety and security; and
- Have access to shower facilities – preferably in the vicinity/same floor as the PC3 laboratory.

There must be a separate area/room for mycology within the Microbiology Department to minimise the risk of laboratory fungal spores contaminating culture plates. The area requires a BSC, microscope, bench space, computer, temperature adjustable incubators.

Safety and Security

The department requires appropriate safety and security features to:

- Adhere to PC2/PC3/SSBA regulations;

69. Standards Australia, 25 November 2022, AS/NZS 2243.3:2022 Safety in Laboratories, Part 3: Microbiological Safety and Containment, available at <https://store.standards.org.au/product/as-nzs-2243-3-2022>.

70. <https://www.health.gov.au/sites/default/files/documents/2022/06/ssba-standards.pdf>

- Monitor access to the area;
- Restrict access to the area using electronic swipe cards; and
- Ensure the design allows for staff access via a single entry only so that gowns/hand washing facilities are easily accessible when going in and out.

Office and Workspaces

The department requires offices, write-up areas, analysis areas, which do not require PC2 conditions and should be outside of the PC2 area but adjacent/visible of the laboratory for operational reasons.

The required offices spaces include:

- An office for the Director;
- An office for the Chief Scientist for each laboratory;
- Supervising microbiologist and registrars work area – needs to be directly accessible and visible by laboratory staff of microbiology/molecular but preferably outside of PC2 – shared work area with at least 3 separate workspaces;
- Shared office spaces/hot desks for quality assurance activities – within the vicinity of the laboratories – one workspace for each laboratory (microbiology/molecular/infectious immunoassay);
- Future space for analysis/culture reading with introduction of automation for microbiology;
- Future space for genomic analysis for molecular pathology; and
- Non-Clinical Office Areas for pathologists.

Ventilation and Air Quality

The design will include the following considerations for air quality and ventilation:

- **Adequate Air Exchange:** the laboratory should have a sufficient air exchange rate to ensure proper ventilation and reduce the concentration of airborne contaminants. The specific air exchange rate may vary based on the size of the laboratory, the number of occupants, and the activities performed. Generally, a minimum of 6-12 air changes per ACH is recommended;
- **Engineering Controls:** the laboratory should be equipped with appropriate engineering controls to manage and control airborne contaminants. These controls may include the use of fume hoods, laminar flow cabinets, or biosafety cabinets (BSCs) to provide containment and prevent the release of hazardous substances;
- **HVAC Systems:** HVAC systems play a crucial role in maintaining air quality and temperature control in the laboratory. The HVAC system should be properly designed, installed, and maintained to ensure effective air distribution, filtration, and removal of contaminants. The system should be equipped with HEPA filters to remove airborne particles, including microorganisms;
- **Filtration:** HEPA filters should be used in the HVAC system and other ventilation devices to remove airborne particles, including potentially infectious microorganisms. The filters should be regularly inspected, cleaned, or replaced to maintain their effectiveness;
- **Directional Airflow:** the laboratory should have a well-designed airflow pattern that ensures directional airflow from clean to potentially contaminated areas. This helps prevent the spread of contaminants within the laboratory. Typically, airflow should be from

areas with lower risk (e.g., clean work areas) to areas with higher risk (e.g., sample processing areas);

- **Pressure Differentials:** maintaining appropriate pressure differentials between different areas of the laboratory is important. Negative pressure differentials should be maintained in areas where potentially hazardous materials are handled to prevent the release of airborne contaminants. Positive pressure differentials should be maintained in clean areas to prevent the entry of contaminants from adjacent spaces;
- **Normal airflow patterns** in the department must be designed to minimise cross-contamination between the three areas previously described; and
- **Odour Management:** Microbiology laboratories can sometimes have strong odours due to the presence of microbial cultures, chemical reagents, and organic matter. The design will include consideration of the following to deodorise the spaces:
 - ▶ Air purification systems;
 - ▶ Easy access to clean and disinfect equipment and workstations;
 - ▶ Proper waste management areas;
 - ▶ Odour absorption and control systems; and
 - ▶ Consider how to isolate the odours from other parts of the laboratory.

Lighting

CRI: Microbiology laboratories often require accurate colour perception. The CRI is a measure of a light source's ability to render colours faithfully compared to natural light. Higher CRI values (close to 100) are preferred to ensure accurate identification of colour changes in stained specimens or growth media.

For Mycology, some fungi are sensitive to light, and their growth or sporulation can be influenced by exposure to light. Dimmable lighting or controlled light exposure might be necessary for specific procedures or for cultivating certain fungal species.

Some Matrix-Assisted Laser Desorption/ Ionisation (MALDI) matrices are light-sensitive. Ambient light can impact sample preparation, especially if the matrix begins to degrade or prematurely polymerise. This is more of a consideration for sample preparation areas than for the instrument itself.

Temperature

Matrix-Assisted Laser Desorption/ Ionisation – Time Of Flight (MALDI-TOF) instruments are typically recommended to be operated in a room where the temperature is stable. Sudden temperature fluctuations can influence the calibration and stability of the instrument. Manufacturers often suggest an optimal temperature range, commonly between 18°C and 24°C (64°F to 75°F).

High humidity and dust can adversely affect the instrument, particularly during sample preparation. The matrix used in MALDI-TOF can be hygroscopic, meaning it can absorb moisture from the air, which can interfere with crystal formation and subsequently impact the quality of the spectra. It's generally recommended to maintain a relative humidity below 60%, though specific recommendations can vary based on the manufacturer and model.

For Mycology, some fungi prefer moist conditions. However, excessive humidity can also promote the growth of unwanted organisms and can affect laboratory equipment. Humidity

levels should be controlled and monitored, especially if the lab is located in a region with high ambient humidity.

Acoustic Control

As per "General Design Principles" in section 7.8.

Floor Loading

As per "General Design Principles" in section 7.8.

Sustainability

As per "General Design Principles" in section 7.8.

Storage and Specimen Retention

Storage

Microbiology requires various types of storage for different purposes noting it shares processing similarities with closely linked departments – Molecular Pathology and Diagnostic Genomics.

The types of storage for Microbiology department includes:

- **Reagent Storage:** some can be kept at room temperature and some needs to be refrigerated (2-8 degrees Celsius) within the Centralised Walk-in Cold Room and Freezer Room;
- **Specimen and Isolates Storage:** specimens will be kept in warm rooms as well as the Centralised Walk-in Cold Room and Freezer Room;
- **Culture media;**
- **Control strains;**
- **Antibiotics and antifungals for susceptibility testing;**
- **Incubators including anaerobic and CO2 incubators;**
- **Equipment Storage:** some laboratory equipment may be stored away when not in use within the Centralised Equipment Store.
- **Record Storage:** some space for record storage will need to be allocated as some physical records (such as patient records, quality control records, and maintenance logs) may still need to be kept on site despite ACT Pathology moving towards complete electronic record-keeping using DHR; and
- **Waste Storage:** waste storage will be organised at two distinct levels in a multi-floor structure. At the workstation level, individual waste containment solutions will be tailored to the immediate needs of each specific workstation, ensuring efficient and safe waste disposal during daily operations. On the floor level, centralised waste storage areas will be designated to consolidate waste from various workstations, facilitating easier collection, segregation, and eventual disposal. This dual-level approach ensures both

immediate waste management needs and broader floor-wide requirements are adequately addressed. Specific waste storage for Microbiology includes:

▶ Biological Waste

Microbiology laboratories work with biological materials that may be potentially infectious or biohazardous, including:

- Cultures: microbial cultures, such as bacteria, fungi, viruses, or parasites, that are no longer needed;
- Specimens: biological samples collected for testing or research that are no longer required; and
- Contaminated Materials: items contaminated with potentially infectious materials, such as gloves, pipettes, Petri dishes, and disposable labware.

Biohazard waste will need to be autoclaved (sterilised using high-pressure steam) before disposal. There will need to be an autoclave accessible to these departments as well as a separate system built into the PC3 facility.

▶ Chemical Waste

Microbiology laboratories utilise various chemicals for experiments, staining techniques, or disinfection. Chemical waste includes:

- Reagents: expired or unused reagents, solutions, or media;
- Stains: used staining solutions or dyes that are no longer required; and
- Chemicals: discarded chemicals, such as disinfectants, fixatives, or solvents.

▶ Sharps: needles, syringes, or other sharp objects used in the laboratory for specimen collection or other procedures;

▶ General Laboratory Waste

Microbiology laboratories also generate general laboratory waste, including:

- Packaging: packaging materials, such as cardboard boxes, plastic wrap, or Styrofoam used for delivery or storage of laboratory supplies;
- Non-Contaminated Waste: non-hazardous waste that does not fall under biological or chemical waste categories, including paper towels, disposable gloves, or non-infectious plastic items; and
- Glassware: broken or discarded glassware, including test tubes, slides, or glass pipettes.

▶ Liquid Waste

Microbiology laboratories may produce liquid waste, such as liquid cultures and media and buffer solutions.

Microbiology also needs to be consistent with the broader pathology specimen storage principles as outlined in section 7.8.1.

Specimen Retention

ACT Pathology is required to meet National Pathology Accreditation Advisory Committee's Requirements for the retention of laboratory records and diagnostic material. The relevant retention period for Microbiology accords with section 7.8.2 unless otherwise specified below in Table 7-26.

Table 7-26: Minimum Retention Times for Microbiology

	RECORD/MATERIAL	MINIMUM RETENTION TIME
3-22-1	Slides - Wet preparations - Immunofluorescence slides - Gram stains - Ziehl-Neelsen stains - Other stained slides	Nil (discard) 7 days 2 weeks 6 weeks 2 weeks
3-22-2	Isolates ⁷¹ - Clinically significant⁷² - Not clinically significant	5 days Discard
3-22-3	Serum/plasma for infectious Immunoassay - All sera unless specified below - Antenatal sera - Reactive syphilis sera - Source and recipient sera from body fluid exposure (needle-stick), where this has been notified to the laboratory	4 months 12 months 12 months 12 months
3-22-4	Urine specimen for microbiological examination	3 days from date of issue of report, under refrigeration
3-22-5	Molecular Pathology: - Nucleic acid for diagnostic microbiological examination – extract or original specimen - Nucleic acid for screening examination – extract or original specimen	1 month from date of issue of report ⁷³ 1 month from date of issue of report ⁷⁴

Key Functional Relationships and Adjacencies

Internal Relationships

Microbiology has a close clinical relationship with Molecular Pathology, infectious diseases, Infection Prevention and Control, and Antimicrobial Stewardship

In particular, Microbiology and molecular laboratories need to be adjacent to enable seamless flow of specimens, staff and intellect between the units. Microbiology/Molecular and Anatomical Pathology could be adjacent due to shared specimens and processes while Diagnostic Genomics and Molecular could be adjacent due to shared equipment and processes (histopathology processing).

Microbiology and Molecular Pathology are currently functioning as two separate departments but would benefit from being combined as a single operational department in the new Pathology Facility due to the significant clinical overlap, shared specimens, movement of traditional microbiology to molecular based staff and ability to cross train staff.

71. Unless addressed by the Security Sensitive Biological Agent (SSBA) legislation.

72. Clinically significant isolate is considered to be all blood culture and sterile isolates, plus any cultured isolate which is reported by the laboratory as a potential pathogen (in contrast to contaminants and commensal flora).

73. Except during the period of the COVID-19 pandemic where the retention period for both positive and negative COVID-19 test samples is reduced to one week after results are released. See also fact sheet on retention period for COVID-19 test samples on the Commission website.

74. Unless otherwise stated in the Requirements for laboratories reporting tests for the National Cervical Screening Program.

Both Microbiology and Molecular pathology are moving to an increased level of robotics, and the FRD (see Figure 7-4) is based around the following key principles:

- Much of Microbiology testing will move to tracked robotics, which will increase size of the required floor print e.g. Kiestra;
- Molecular Pathology has moved and will further embrace increased robotics e.g. Roche 6800;
- Molecular Pathology must be adjacent to DG to allow sharing of laboratory space and equipment e.g. PCR Clean Prep, Specimen Prep, and DNA Amplification;
- Molecular Pathology should also be adjacent to the Core Laboratory. More and more instrumentations are being enabled to connect to track systems over time, with Molecular Pathology robotics likely being able to connect to a track system when the new Pathology Facility opens – this is already possible with Roche instrumentation.

It should be noted that only approximately 50% of the processing and analysis can be automated for Molecular Pathology, hence the department will always require its own contained laboratory for in house/low volume assays.

- The spaces will be open plan wherever possible, exceptions of which include the mycology lab, the mass spectrometry, and the PC3 facility; and
- There will be sufficient space to allow a fast scale-up of services if needed, e.g. pandemic.

External Relationships

The key requirement for Microbiology is similar to all other areas of pathology. The ICT connectivity and the IT platforms need to be robust in order that:

- Specialist Microbiologists are able to communicate with other medical practitioners, with sufficient bandwidth to display high fidelity images; and
- Regular and constructive relationships with all referrers, including timely provision of results.

Specialist Microbiologists and senior laboratory scientists work collaboratively with Infectious Diseases, Antimicrobial Stewardship, Infection Prevention and Control and Occupational Medicine Unit to provide support services across Canberra Health Services and ACT Health related to infection prevention, diagnosis and management.

Many specialists are employed within two or more of these units and collocation should improve collaboration and information flow, resulting in improved integration and better patient care, including research and teaching.

The infection related services could include:

- Clinical Microbiology staff specialists;
- Infectious Diseases staff specialists, registrars and administrative staff;
- Infection Prevention and Control and Occupational Medicine Unit nursing, administrative staff and specialist (typically an Infectious Diseases physician);
- Antimicrobial Stewardship Team – pharmacist, epidemiologist, registrar, specialist (typically an Infectious Diseases physician); and
- If Pharmacy was also located within the same building, this would connect well with the Antimicrobial Stewardship team.

Management and Operational Support Services

Current location

The department is currently co-located on level 4 with Molecular Pathology and Diagnostic Genomics.

Hours of Operation

Microbiology operates 8.00am – 10.30pm Monday to Friday and 8.00am – 9.30pm Saturdays and Sundays, with pathologist and scientist on-call out-of-hours for urgent requests⁷⁵.

Major Equipment List

Current major equipment for Microbiology is detailed in Appendix Table A9-8. Key equipment used in Microbiology laboratory includes but is not exclusive to Autoclaves (pass through from PC3 and benchtop), Steam Steriliser, Reverse Osmosis Water Unit, Mycobacteria Analyser, Biological Safety Cabinets (BSC II), Carbon Dioxide Incubators, Freezers, Microscopes, Maldi Biotyper Analyser, Vitek 2 Analyser, Blood Culture Analysers, and Biofire Filmarray Torch system.

See Table A10-1 for future equipment list for all departments.

Workforce Model

The workforce model⁷⁶ reflects the clinical capability level of Microbiology, with staffing levels provided in Table 7-27 below. The staffing complement includes clinical director, specialist microbiologists, registrars, chief scientist, senior scientists, laboratory scientists, and technical officers. Some of the pathologists have a dual role, working with the laboratory as a staff specialist and a clinical role in the hospital as an Infectious Disease Clinician.

Table 7-27: Staffing by Workforce Category, Microbiology

Staff Category	Headcount	FTE
Clinical Director - Microbiology	1	0.6
Specialist Microbiologists	4	1.45
Registrar	2	1.5
Chief Scientist	1	1.0
Supervising Scientist	1	1.0
Senior Scientists	4	4.0
Base Grade Scientists	13	12.5
Quality Control Officer	1	1.0
Technical Officers	4	3.0

75. ACT Pathology, Microbiology.

76. ACT Pathology, 02508 02501 86766 tasl - Microbiology.

Staff Category	Headcount	FTE
Total	31	26

Staffing numbers are at a point in time and will not reflect future FTE or workforce mix needs.

A Future State

The future for the moderate volume and routine microbiology testing will be a progressive elimination of the substantial manual processes including reviewing the culture plates (plate readers) and NGS capability. AI is likely to have a significant impact on microbiology, either as an aid/tool or as the main diagnostic instrument.

This requires investment in the remaining automated processes into the new facility. The development of plate reader capability and NGS are critical developments for the future of microbiology.

The proposed areas provide for growth and development of microbiology.

7.9.8. Molecular Pathology (Microbiology)

Molecular pathology (Microbiology) focuses on the study and diagnosis of disease at a molecular level. This means that there is significant crossover with other pathology Departments, especially Microbiology. The Molecular Pathology Department perform diagnostic assays based on molecular biology techniques. Most tests are based on the initial isolation of nucleic acid from a variety of diagnostic specimens including but not limited to blood, swabs, plasma, CSF and respiratory specimens/nasopharyngeal aspirates.

Scope of Service

Molecular Pathology operates as a Level 6⁷⁷ service.

Test Volumes

The Molecular Pathology was the most impacted department from the COVID-19 pandemic with workload increasing more than 20-fold at its peak.

Table 7-28: Molecular Pathology Test Volumes – 2020-21 to 2022-23 (Projected)

Year	Molecular Pathology (excl COVID PCR)	Molecular Pathology Total
2019/2020	39,980	71,801
2020/2021	40,304	241,405
2021/2022	34,491	614,282

Specialty Scope

⁷⁷ NSW Role Delineation of Clinical Services, (2021). The NSW Role Delineation of Clinical Service is used as the default clinical capability framework for NSW, Victoria and ACT, unless there is a specific jurisdictional capability framework

Molecular Pathology (Microbiology) ranges from high throughput, more automated assays (using larger equipment) to low throughput, often in-house traditional assays which require dedicated operational units as outlined below:

- The Nucleic Acid Extraction Laboratory;
- The PCR Set-up Laboratory (Clean Room); and
- The PCR Analysis Laboratory.

All three units are physically separated from each other to mitigate the risk of cross-contamination within the laboratory. The three units have differing levels of cleanliness and sterility. The PCR Set-up Laboratory is essentially the cleanest section with no sample derived nucleic acid followed by the Nucleic Acid Extraction Laboratory where sample nucleic acid extractions are carried out. Finally, the PCR Analysis Laboratory is considered the lowest level clean area where all PCR amplifications occur.

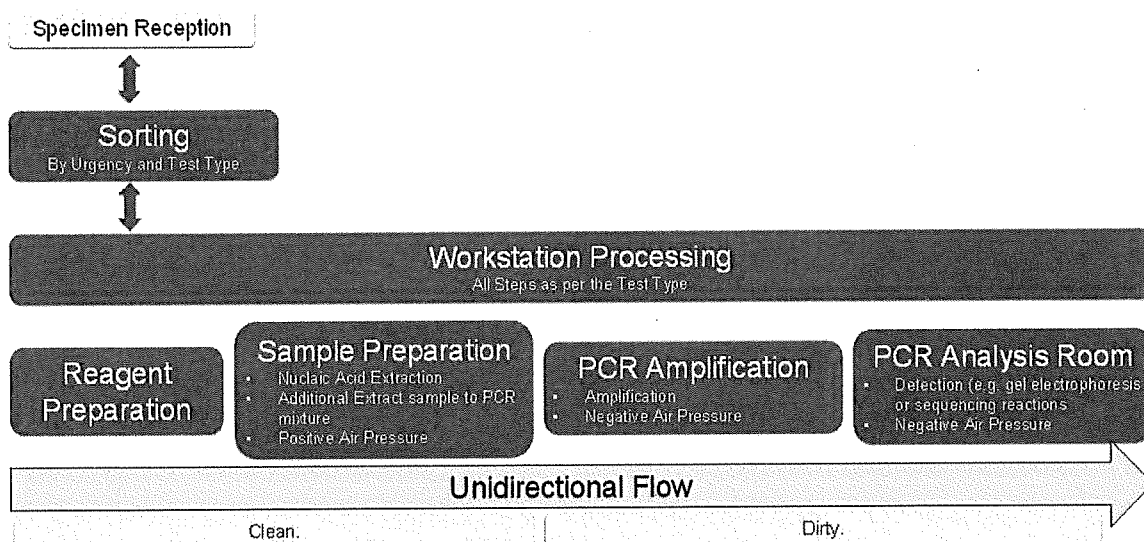
Molecular Pathology shares the following with Microbiology:

- The wash up room (shared with Microbiology) containing autoclaves and water filtration system; and
- The media room (shared with Microbiology) containing the centrifuge and the balance.

Specimen Pathways

Specimens are received by the laboratory from the specimen reception area, similar to all other pathology specialties. Specimens arrive at reception via pneumatic tube, CH staff, couriers, and external transport (such as taxis). Urgent testing is commonly delivered by hospital staff, and couriers if external to CH.

Figure 7-16: Schematic Specimen Pathway for Molecular Pathology (manual tests only)



The process steps for Molecular Pathology are summarised in Figure 7-16. There are seven core steps:

- Sorting specimens by test(s) required and the urgency of the test;
- There is a split pathway:

- ▶ Specimens are sent to Molecular pathology if specimens are not shared by other laboratories; and
- ▶ HIV Viral Load, Hepatitis C (HCV), PCR, HBV viral load and CMV viral load requests are sent to These specimens are generally sent directly to the Separations Laboratory where serum/plasma is fractionated and stored at 4°C pending collection by Molecular Pathology staff.

Movement of specimens by staff between other areas of Pathology (e.g. shared specimens, should be transported by the safest route to other pathology units where there are shared specimens.

- Allocation to staff/workstation based on the test required;
(Most tests performed in Molecular Pathology are batched. Some tests are performed more urgently and on request [such as Monkeypox, Meningococcal or Measles PCR]).
- Reagent Preparation
- Sample Preparation;
- PCR Amplification;
- PCR Analysis; and
- Reporting.

Specific Design Elements for Molecular Pathology

Space and Zoning

The department must meet NPAAC Requirements for Medical Testing of Microbial Nucleic Acids⁷⁸ for accreditation by the National Association of Testing Authorities Australia (NATA).

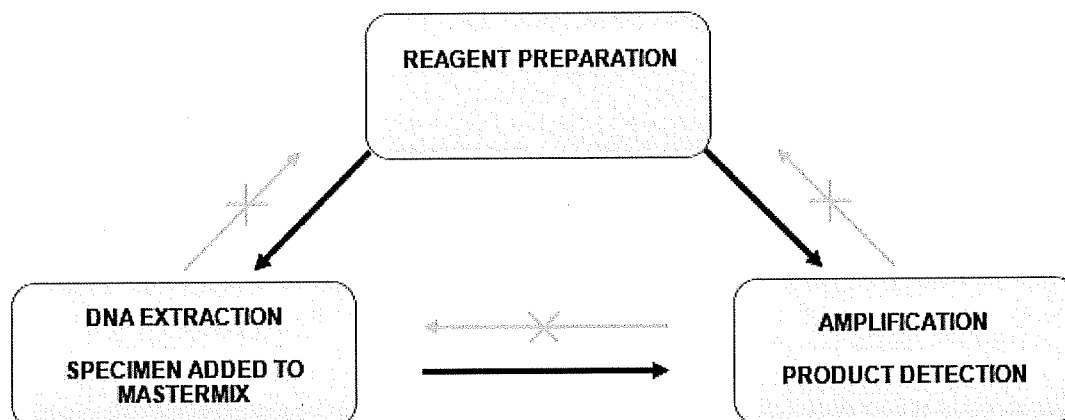
Minimum standards for a Nucleic Acid Test (NAT) assay using target amplification can be summarised as:

- Laboratories undertaking NAT assays should be configured to minimise the risk of contamination of specimens and reagents by other specimens in the laboratory or by amplified material;
- At least three contained areas must be provided in order to reduce the risk of cross-contamination and carry-over contamination. The normal airflow pattern between each of the areas and the layout of the laboratory must be designed to minimise the potential for aerosol cross-contamination. The three contained areas required are for:
 - ▶ The preparation of reagents;
 - ▶ The extraction of nucleic acids from specimen and for the addition of specimen DNA to tubes containing master mix before PCR amplification; and
 - ▶ Amplification and product detection.

A schematic representation of areas required to minimise cross-contamination is presented below in Figure 7-17. These separate areas may be separate rooms or contained areas such as within an instrument. The latter is an important consideration as instrument capabilities are progressing rapidly towards there being no required room separations.

78. National Pathology Accreditation Advisory Council, 2013, Requirements for Medical Testing of Microbial Nucleic Acids (Second Edition 2013).

Figure 7-17: A Minimum of Three Contained Areas Are Required for a NAT Assay



Instruments capable of producing aerosols such as vortex mixers, PCR machines and centrifuges should be placed at as great a distance from preparation areas as possible. If material from the first-round PCR is to be subjected to further amplification, such as in a nested PCR, these materials must be handled in a fourth separate area.

Reagents must be limited to the appropriate areas. Amplified nucleic acid specimens must not be taken into the reagent preparation area. Specimens and amplicons must be stored separately from reagents. The movement of specimens must be unidirectional, that is, from pre-amplification to post-amplification areas. Only sealed PCR amplification tubes and tube racks are to be carried between the pre-amplification area and the post- amplification area.

The Molecular Pathology department will have access to the PC3 facility (shared with Microbiology), which is used when working with high-risk or highly infectious agents that may pose significant health risks. PC3 facilities are designed to provide a higher level of containment compared to PC2 facilities, offering additional safeguards to protect laboratory personnel, the surrounding environment, and public health. PC3 facilities are typically utilised in diagnostic laboratories where high-risk pathogens need to be identified and managed. This includes handling clinical specimens that may contain dangerous or contagious agents that require enhanced containment measures.

The Molecular Pathology department typically requires various spaces and zoning to support its operations and ensure efficient workflow, including:

- **Sample Reception and Processing Area:** this area is dedicated to receiving and handling patient samples received via Specimen Reception. It includes spaces for sample accessioning, labelling, and initial processing (such as centrifugation, aliquoting, and storage). Adequate bench space and storage facilities for samples and reagents are necessary;
- **Nucleic Acid Extraction Area:** this zone is designed for nucleic acid extraction from patient samples. It should be equipped with dedicated workstations, safety cabinets, and equipment specifically designed for the extraction process, such as automated extraction systems, centrifuges, and refrigerated storage for extracted nucleic acids;
- **PCR and Amplification Area:** this area is dedicated to the amplification and preparation of nucleic acids for further analysis. It includes bench space, thermal cyclers, PCR workstations, and appropriate safety cabinets or hoods to prevent contamination;

- Sequencing and Analysis Area: this zone is equipped with equipment and resources for DNA sequencing and data analysis. It includes DNA sequencers, computer workstations for data analysis, and software for interpreting sequencing results;
- Quality Control and Validation Area: this space is dedicated to quality control measures, ensuring the accuracy and reliability of laboratory results. It may include equipment for running positive and negative controls, validating assays, and monitoring assay performance;
- Reporting and Documentation Area: this zone is designated for the analysis and interpretation of molecular pathology results, as well as generating reports. It includes computer workstations, software for data analysis, reporting tools, and a secure area for maintaining patient records and confidentiality;
- Equipment and Instrumentation Area: this area is allocated for specialised equipment and instrumentation required for Molecular Pathology testing, such as DNA analysers, real-time PCR machines, sequencers, and other molecular analysis platforms. Sufficient space, power supply, and proper ventilation are necessary to accommodate these instruments; and
- Ancillary Spaces: additional ancillary spaces may include storage areas for reagents, supplies, and consumables, as well as dedicated spaces for equipment maintenance and calibration. These areas help maintain efficient operations and ensure the availability of necessary resources.

Ventilation and Air Quality

The design will include consideration of the following to deodorise the spaces.

Adequate Air Exchange: the laboratory should have a sufficient air exchange rate to ensure proper ventilation and reduce the concentration of airborne contaminants. The specific air exchange rate may vary based on the size of the laboratory, the number of occupants, and the activities performed. Generally, a minimum of 6-12 air changes per hour (ACH) is recommended.

Engineering Controls: the laboratory should be equipped with appropriate engineering controls to manage and control airborne contaminants. These controls may include the use of fume hoods, laminar flow cabinets, or biosafety cabinets (BSCs) to provide containment and prevent the release of hazardous substances.

Filtration: HEPA filters should be used in the HVAC system and other ventilation devices to remove airborne particles, including potentially infectious microorganisms. The filters should be regularly inspected, cleaned, or replaced to maintain their effectiveness.

Directional Airflow: the laboratory should have a well-designed airflow pattern that ensures directional airflow from clean to potentially contaminated areas. This helps prevent the spread of contaminants within the laboratory. Typically, airflow should be from areas with lower risk (e.g., clean work areas) to higher risk areas (e.g., sample processing areas).

Pressure Differentials: maintaining appropriate pressure differentials between different areas of the laboratory is important. Negative pressure differentials should be maintained in areas where potentially hazardous materials are handled to prevent the release of airborne contaminants. Positive pressure differentials should be maintained in clean areas to prevent the entry of contaminants from adjacent spaces.

Monitoring and Alarm Systems: air quality monitoring systems can be installed to continuously monitor parameters such as temperature, humidity, and air particulate levels. Alarm systems can be implemented to alert personnel in case of deviations or unsafe conditions.

Matrix-Assisted Laser Desorption/Ionisation – Time Of Flight (MALDI-TOF): the operation of MALDI-TOF mass spectrometers, like many precision instruments, can be influenced by environmental conditions. Dust and contaminants can influence sample preparation and instrument performance. It's essential to maintain a clean environment, particularly during the sample preparation phase. This is why the technology is often situated in an enclosed space (refer to Chemical Pathology – Mass spectrometry section for further details).

Lighting

CRI measures how accurately a light source represents colours compared to natural light. A higher CRI (ideally above 90) is desirable to ensure accurate identification and interpretation of colour changes in stained specimens or indicators.

Temperature

As per “General Design Principles” in section 7.8.

Acoustic Control

As per “General Design Principles” in section 7.8.

Floor Loading

As per “General Design Principles” in section 7.8.

Sustainability

As per “General Design Principles” in section 7.8.

Storage and Specimen Retention

Storage

Molecular Pathology requires various types of storage for different purposes noting it shares processing similarities with closely linked departments – Microbiology and Diagnostic Genomics.

The types of storage for Molecular Pathology department includes:

- **Reagent and PCR products Storage:** some can be kept at room temperature and some needs to be refrigerated (2-8 degrees Celsius) within the Centralised Walk-in Cold Room and Freezer Room;
- **Specimen and Isolates Storage:** Molecular Pathology specimens include purified nucleic acids, they will be kept in the Centralised Walk-in Cold Room and Freezer Room;

- **Equipment Storage:** some laboratory equipment may be stored away when not in use within the Centralised Equipment Store.
- **Record Storage:** some space for record storage will need to be allocated as some physical records (such as patient records, quality control records, and maintenance logs) may still need to be kept on site despite ACT Pathology moving towards complete electronic record-keeping using DHR; and
- **Waste Storage:** waste storage will be organised at two distinct levels in a multi-floor structure. At the workstation level, individual waste containment solutions will be tailored to the immediate needs of each specific workstation, ensuring efficient and safe waste disposal during daily operations. On the floor level, centralised waste storage areas will be designated to consolidate waste from various workstations, facilitating easier collection, segregation, and eventual disposal. This dual-level approach ensures both immediate waste management needs and broader floor-wide requirements are adequately addressed. Specific waste storage for Molecular Pathology includes:
 - ▶ **Biological Waste:** Molecular Pathology laboratories work with biological materials that may be potentially infectious or biohazardous, including:
 - Cultures: microbial cultures, such as bacteria, fungi, viruses, or parasites, that are no longer needed;
 - Specimens: biological samples collected for testing or research that are no longer required; and
 - Contaminated Materials: items contaminated with potentially infectious materials, such as gloves, pipettes, Petri dishes, and disposable labware.Biohazard waste will need to be autoclaved (sterilised using high-pressure steam) before disposal. There will need to be an autoclave accessible to these departments as well as a separate system built into the PC3 facility.
 - ▶ **Chemical Waste:** Molecular Pathology laboratories utilise various chemicals for experiments, staining techniques, or disinfection. Chemical waste includes:
 - Reagents: expired or unused reagents, solutions, or media;
 - Stains: used staining solutions or dyes that are no longer required; and
 - Chemicals: discarded chemicals, such as disinfectants, fixatives, or solvents.
 - ▶ **Sharps:** needles, syringes, or other sharp objects used in the laboratory for specimen collection or other procedures;
 - ▶ **General Laboratory Waste:** Molecular Pathology laboratories also generate general laboratory waste, including:
 - Packaging: packaging materials, such as cardboard boxes, plastic wrap, or Styrofoam used for delivery or storage of laboratory supplies;
 - Non-Contaminated Waste: non-hazardous waste that does not fall under biological or chemical waste categories, including paper towels, disposable gloves, or non-infectious plastic items; and
 - Glassware: broken or discarded glassware, including test tubes, slides, or glass pipettes.
 - ▶ **Liquid Waste:** Molecular Pathology laboratories may produce liquid waste, such as liquid cultures and media and buffer solutions.

Molecular Pathology also needs to be consistent with the broader pathology specimen storage principles as outlined in section 7.8.1.

Specimen Retention

ACT Pathology is required to meet National Pathology Accreditation Advisory Committee's Requirements for the retention of laboratory records and diagnostic material. The relevant retention period for Molecular Pathology accords with section 7.8.2 unless otherwise specified below in Table 7-29.

Table 7-29: Minimum Retention Times for Molecular Pathology

	RECORD/MATERIAL	MINIMUM RETENTION TIME
3-2-3	Cytogenetics/biochemical genetics/molecular genetics: Tissue cultures/cell culture lines ▪ Rare clinically significant variants ▪ Common clinically significant variants or clinically non-significant	For indefinite cryopreservation As per Table 7-4, row 3-2-7
3-2-6	Molecular genetics: ▪ Nucleic acid extracts for somatic or constitutive testing ▪ Nucleic acid extracts or frozen plasma for NIPT	3 months ⁷⁹ 12 months

Key Functional Relationships and Adjacencies

Internal Relationships

Molecular Pathology has a close clinical relationship with Microbiology and operationally can share laboratory space with DG. Molecular and Microbiology laboratories need to be adjacent if possible to enable seamless flow of specimens, staff and intellect between the two departments.

In terms of other adjacencies, Microbiology and Molecular should be adjacent as much as possible due to shared specimens and processes, while DG and Molecular Pathology should be adjacent due to shared equipment for WGS.

Molecular Pathology and Microbiology are currently functioning as two separate departments, within the same clinical discipline, but would benefit from being combined as a single operational department in the new Pathology Facility due to the significant clinical overlap, shared specimens, movement of traditional microbiology to molecular based staff and ability to cross train staff.

Both Molecular pathology and Microbiology are moving to an increased level of robotics, and the FRD (see Figure 7-4) is based around the following key principles:

- Much of Microbiology testing will move to tracked robotics, which will increase size of the required floor print e.g. Kiestra;
- Molecular Pathology has moved and will further embrace increased robotics e.g. Roche 6800;
- Molecular Pathology must be adjacent to DG to allow sharing of laboratory space and equipment e.g. PCR Clean Prep, Specimen Prep, and DNA Amplification;

⁷⁹. From date of issue of the report for an individual, or from completion of a family study where the proband's sample is required as a control, or from completion of testing; whichever of the three periods is the longest.

- Molecular Pathology should also be adjacent to the Core Laboratory. More and more instrumentations are being enabled to connect to track systems over time, with Molecular Pathology robotics likely being able to connect to a track system when the new Pathology Facility opens – this is already possible with Roche instrumentation;
- The spaces will be open plan wherever possible, exceptions of which include the PC3 facility; and
- There will be sufficient space to allow a fast scale-up of services if needed, e.g. pandemic.

External Relationships

The key requirement for Molecular Pathology is similar to all other areas of pathology. The ICT connectivity and the IT platforms need to be robust in order that:

- Molecular Pathologists are able to communicate with other medical practitioners, with sufficient bandwidth to display high fidelity images; and
- Regular and constructive relationships with all referrers, including timely provision of results.

Management and Operational Support Services

Current location

The department is currently co-located on level 4 with Microbiology and Diagnostic Genomics.

Hours of Operation

Molecular Pathology Operates Monday- Friday 0730-1800, with a weekend winter service. Urgent testing moving to the Core Laboratory expanding from GeneXpert platforms to also include technology with broader menus (ie BioFire FilmArray for Meningococcal infections).

Major Equipment List

Current major equipment for Molecular Pathology is detailed in Appendix Table A9-9 Key equipment used in Molecular Pathology laboratory includes but is not exclusive to PCR analysers, Extractors, Freezers, Thermocyclers, Robotics, Biological Safety Cabinets (BSC II) and fume hoods.

See Table A10-1 for future equipment list for all departments.

Workforce Model

The workforce model⁸⁰ reflects the clinical capability level of Molecular Pathology, with staffing levels provided in Table 7-30 below. The staffing complement includes clinical director, pathologists, registrar, chief scientist, and laboratory/pathology scientists.

80. ACT Pathology, 02508 02501 86766 tasl - Molecular Pathology.

Table 7-30: Staff and Workforce Category for Molecular Pathology

The Clinical Director, Pathologists, and Registrar for Molecular Pathology are the same as for Microbiology.

Position	Headcount	FTE
Director	1	0.6
Pathologists	5	1.6
Registrar (also Microbiology)	1	1
Chief Scientist	1	1
Senior Scientist	2	2
Base Grade Scientist	4	4
Technical Officer	1	1
Total	15	11.2

Staffing numbers are at a point in time and will not reflect future FTE or workforce mix needs.

A Future State

The future for Molecular pathology is similar to that of DG. The future is likely to embrace a service model that has very significant investment in automation and multiple omics technologies, this includes a variety of new equipment that the laboratory does not currently have. The automation will be predominately focused on WGS and metagenomics, DNA extraction, quality testing, and advances in omics technologies (possibly in partnership with others). Microbial Genomics and Metagenomics as established technologies for public health purposes but over the next 5 -10 years will transition more into routine clinical diagnostics.

Provision has been made for enhanced area allocation to enable the expected growth.

7.10. CLINICAL AND NON-CLINICAL SUPPORT SERVICES

This section identifies the range of inter-dependencies that ACT Pathology has with other clinical and non-clinical services.

7.10.1. Clinical Support Services

Pathology itself is principally a clinical support service to almost all other medical specialties delivering patient care at TCH, private hospitals and community referrers.

There is minimal clinical interdependency with:

- Medical Imaging; or
- Pharmacy, except for microbial stewardship and community testing.

Quality and Infection Control is the exception. There is considerable inter-dependency between pathology and quality and infection control; a core consideration in all pathology departments.

Quality Department

The Quality Department supports the systems and structures that enable assurance of the the quality and consistency of testing and reporting. The role of quality is to:

- Ensure **standard operating procedures** (SOPs) for all laboratory processes;
- Establishing and maintaining a comprehensive **quality management system**;
- Designing and implementing **quality control measures**;
- Implementing and overseeing **quality assurance programs**;
- **Compliance and accreditation** including ISO 15189-2012 (AS ISO 15189-2013), NATA ISO 15189, NPAAC requirements and guidelines, and all other relevant NATA and Australian standards including statutory regulations and good laboratory practice standards;
- Leading **quality improvement initiatives**;
- Providing **training and education programs** for laboratory personnel to ensure they are knowledgeable about quality standards, procedures, and best practices.; and
- **Liaising with external organisations, regulatory bodies, and accreditation agencies** to stay updated on industry standards, guidelines, and best practices, including the participation in external proficiency testing programs and collaborate with other laboratories for benchmarking and knowledge sharing.

Teaching

Teaching and training is a core and integrated element of the provision of pathology services. The teaching and training occurs at both post-graduate and undergraduate level.

ACT Pathology is funded by the ANU to undertake pathology teaching for Medical undergraduates and postgraduate degrees through the School of Medicine and Psychology. Training of registrars in disciplines other than pathology is also required to assist them in passing the pathology components of their exams.

ACT Pathology prides itself on attracting pathology registrars in significant numbers.

It is expected that teaching and training will continue to be integral to the service model for pathology. This translates to dedicated teaching and research spaces, and spaces within the clinical specialties for pathology related activities.

Gross Pathology Teaching

This is commonly called the Museum, which houses gross pathology specimens. The Museum is not critical to day-to-day functions, however, it is important that:

- Easy access is provided at all times for staff to maintain/repair precious specimens when needed;
- If appropriately located, public access needs to be carefully controlled so that it is for education/learning purposes only, mainly to medical undergraduates and other junior medical staff; and
- The Museum should be adjacent to a teaching space allowing for tutorials and clinicopathologic conferences involving pathology case materials and wet specimens.

Research

Research at CH is detailed in section 12, and the research projects and functions undertaken by ACT Pathology are core to its operations.

It is anticipated that the core research functions for pathology will migrate with the pathology services into the new facility. There are discrete research activities undertaken by ANU that are not integral to ACT Pathology and are not expected to be included in the scope of the new Pathology facility. These research activities may be well suited to be accommodated in a dedicated research facility on campus.

Prototyping

ACT Pathology does not currently have a prototype laboratory and is part of the proposed expansion of function as articulated in the L2D high level FDB.

A prototyping laboratory is a concept that is being increasingly adopted by modern pathology services. It provides a dedicated area to prototype new equipment or showcase and trial a supplier's technology. Trialling robotics before the expense of acquiring the equipment can be invaluable. It can also be helpful to conduct early trials and testing/commissioning of new technology to speed up the compliance period. It may also provide a capacity to be used in a future expansion or core activities.

DNA Extraction and Amplification

ACT Pathology has a limited capability for DNA extraction as part of the DG functions. This is an area that has been highlighted for major expansion in the future. The proposed increase in area if included in the expanded space for DG. This can be a shared function with any future (PC2) pandemic readiness area.

Cryogenic Processing and Storage Facility

ACT Pathology has a LN2 tank (Cryogenic store) adjacent to and connected into Building 10 currently. This supports the small DG service.

An expanded cryogenic service is proposed for the new pathology service, with expanded functionality that is likely to require expanded storage of ultra-low temperature samples

Cryogenic storage must adhere to best safety principles and should be collocated that incorporates the correct provisions for oxygen depletion detection, alarms and ventilation systems. Ideally, cryo-storage is on a well-ventilated external wall. There is likely to be a requirement for vapour phase and full immersion dewars.

Cryo-speed truck access is a requirement as well as the exclusion zone during filling process.

Digital Pathology

The service could be located off-site or on-site. It would nevertheless require a 'digital backbone' with sufficient bandwidth (Cat 6 or 7 level capability) to support real-time digital pathology operations, as well as off-site and remote work by Pathologists.

7.10.2. Non-Clinical Support Services

Pathology Administration

Pathology Administration manages the business unit that is ACT Pathology. This includes:

- Operations oversight and management;
- Quality;
- Human resources management;
- Financial management,
- Data management and reporting;
- Strategic planning;
- Clinical and non-clinical liaison with the rest of CH services;
- Communications and public relations; and
- Engagement in research and education activities.

Enabler Services

There are an important range of non-clinical services that will be described in the Functional Design Brief, including:

- Logistics: This includes the collection, transport and storing of specimens, particularly couriers, and other supply chain requirements for supplies
- ICT: This is an increasingly critical enabler for pathology services. This includes ICT standardisation, high bandwidth the communicate with clinical personnel, remote monitoring of POCT, enhanced automated testing and reporting processes, meta-data analytics, and many other areas.
- Bio-Medical engineering;
- Maintenance and equipment repair (at CH and by manufacturers);
- Ventilation and air quality, Lighting, Temperature controls and Noise abatement;
- Store replenishment;
- Waste disposal; and

Access and Safety, amongst others.

8. Mortuary Services

Mortuary services will be incorporated in the new Pathology facility building.

This may need to be revisited depending on the location of Pathology relative to core clinical areas on the campus, the travel distances, and having to use shared public pathways for transporting deceased persons.

8.1. SCOPE OF SERVICE

The mortuary service will include:

- **The acceptance and safe repository** of bodies during and after business hours⁸¹ for persons who have died at CH, as well as potentially other deceased persons depending on the capacity for storing at the Forensic Medical Centre;

Non-autopsy services including Body Release: CH's services involve the release of bodies to appropriate Funeral Homes/Transport Companies/Religious Organisations⁸², including the management of relevant/necessary paperwork;

- **Perinatal post-mortem service (PPMS)**⁸³: autopsy procedures conducted on deceased perinatal bodies where deaths occurred during pregnancy, or during and (just) after birth, at CH.

Perinatal anatomical pathology is highly specialised, with the quality and clinical utility of reports requiring a higher degree of expertise/experience of the pathologist, scientist and technical staff. The majority of postmortem examinations provided by ACT Pathology are perinatal postmortems.

The PPMS Care Coordinator⁸⁴ also supports families during a difficult and sensitive time by providing family-focused care and consultation with relevant health care teams to identify the cause of death, providing answers to the families.

Full adult autopsies are no longer performed at CH and are performed at the Forensic Medical Centre (Botany Rd Phillip), although we are renewing our scope of accreditation to include limited autopsies for post-mortem biopsy and organ retrieval for consented research.

8.2. PATHWAYS

Coronial Matters

ACT Pathology provides a temporary storage location for the coroner if they cannot arrange direct transfer at the time of passing.

Non-Coronial Deaths

81. ACT Pathology, Anatomical Pathology Introduction.

82. ACT Pathology, Anatomical Pathology Introduction.

83. NSW Health Pathology, Clinical Services Plan 2019 – 2025 Version 2:2021.

84. This is a Midwife on ward function.

Mortuary pathways⁸⁵ begin with the **Verification** and then **Notification** of Death. The mortuary service either undertakes or supports other CH staff in all subsequent processes, including:

- **Documentation** mainly associated with death certificates;
- **Care of the Deceased** is another important step in the process, focusing on maintaining the dignity of the deceased patient and supporting the family; and
- **Release of the deceased person** and transfer to a Funeral Home.

There may also be services provided by the mortuary service including documentation/ certificates, and particular processes for:

- Perinatal deaths;
- Infectious diseases (as noted in Table 8-1);
- Death of a patient in the Perioperative Unit;
- Radioactive or Cytotoxic substances;
- Bariatric and tall stature patients in inpatient settings;
- Deceased person who's next of kin are unable to claim them or there is no next of kin.

Table 8-1: Infectious Diseases a Deceased Person is Suspected or Known to have been Exposed to, List A vs List B⁸⁶

List A Does <i>not</i> require hermetically sealed bag	List B Does require hermetically sealed bag
Acquired Immunodeficiency Syndrome (AIDS)	Anthrax
Acute Viral Hepatitis (Unclassified)	Diphtheria
Hepatitis A, B, C, D	Creutzfeldt-Jakob Disease (CJD)
Human Immunodeficiency Virus Infection (HIV)	Plague
Meningococcal Disease	Small Pox
Rabies	Yellow Fever
Active tuberculosis	(Any) Viral Haemorrhagic Fever including: Lassa, Marburg, Ebola, and Congo Crimean Fevers
COVID-19	

8.3. SPECIFIC DESIGN ELEMENTS FOR THE MORTUARY

Space and Zoning

The design of a forensic mortuary is, to a significant extent, determined by the workflow of forensic examinations and the related activities that take place within the facility. The design can help guide the process from the arrival of a body to the completion of a forensic examination and the subsequent tasks, including:

- **Arrival and Reception**
 - ▶ The body arrives, often accompanied by personal effects;

85. ACT Health Canberra Health Services, 22 Sept 2021, Canberra Health Services Procedure - Providing Care after Death.

86. ACT Health Canberra Health Services, 22 Sept 2021, Canberra Health Services Procedure - Providing Care after Death.

- ▶ A discreet unloading zone should be close to the body reception area, ideally via a garage with sufficient clearance for a range of vehicles;
- ▶ There will need to be a workstation for cataloguing and storing personal effects; and
- ▶ There should be sufficient space to unload the body and move the body to weighing stations. This is typically an open atrium like space.
- **Body Storage:** the body is transferred to a refrigerated holding area or cooler. Consider the need for specialised storage, e.g., for decomposed bodies.
- **Case Review:** before the autopsy, the forensic pathologist reviews the case details, including any available medical records, police reports, and preliminary investigations. Office space or a designated area for such reviews is essential.
- **Autopsy:** the body is moved to an autopsy suite(s). All required instruments, protective equipment, and facilities (e.g., sinks, tables) should be readily available.

Other Mortuary design considerations include:

- Unlike the laboratory environments, many of the spaces will require separation/access restriction;
- The design should be flexible to accommodate evolving technologies and practices. Ensuring efficient flow, minimising unnecessary movements, and segregating 'clean' and 'dirty' zones will contribute to a functional and efficient facility;
- Good lighting, efficient ventilation, and easy-to-clean surfaces. Samples for histology, toxicology, microbiology, etc., are collected during the autopsy. These samples are then processed or sent to the relevant laboratory spaces;
- **Body Preparation for Release:** after the autopsy, the body is prepared for release, either for burial or cremation. A dedicated area for body preparation, restoration, and cleaning is necessary;
- **Reporting:** forensic pathologists need space to compile their findings, write reports, and consult with colleagues. Office spaces or dedicated report-writing areas, equipped with necessary IT infrastructure, are essential. However it is noted that most Anatomical Pathologists would chose to do this in their routine offices.
- Viewing space is ideally located adjacent to the autopsy suite(s);
- Provision for offices, meeting rooms, storage areas, as well as other administrative spaces; and
- Given the sensitive nature of the work, there should be security measures throughout the facility, including controlled access points, CCTV, and secure zones.

While primarily focused on indoor activities, a mortuary design may also benefit from well-designed outdoor spaces. These spaces can cater to both functional requirements and the socio-cultural needs of those visiting or working at the facility. Some important outdoor spaces for mortuaries may include:

- **Arrival and Departure Zone:** a private and respectful space where bodies can be brought in or taken out. This area should be shielded from public view and have easy access to the main mortuary area;
- **Visitor Parking:** adequate parking for grieving families, officials, or other visitors should be available and clearly demarcated;
- **Private Family Waiting or Gathering Area:** an outdoor garden or seating area where families can gather before or after viewing their deceased loved ones. This space should offer privacy, serenity, and a natural setting;

- **Smoking or Ritual Area:** some cultures and individuals might have specific rituals, including smoking rituals, to honour the deceased. A dedicated outdoor space for this, which adheres to local smoking regulations, is important and away from solvents and other flammables;
- **Reflection or Memorial Garden:** a peaceful garden area where families can reflect and remember their loved ones. This can also be a therapeutic space for staff;
- **Service or Utility Area:** an area designated for services like waste management, laundry pickups, or other utility needs. This space should be separated from the main visitor areas to maintain privacy and cleanliness;
- **Staff Break Area:** working in a mortuary can be emotionally taxing. Providing an outdoor break space for staff where they can relax and detach for a short time is crucial for well-being management;
- **Secure Delivery and Storage:** a dedicated area for the safe and secure delivery of supplies, equipment, and chemicals, separated from main visitor and body arrival zones;
- **Barrier Plantings:** planting shrubs or trees strategically to provide privacy, reduce noise, and shield sensitive areas from public view; and
- **Water Features:** the sound of flowing water can be soothing for many. Inclusion of a fountain or a small pond can enhance the tranquillity of outdoor spaces.

Ventilation and Air Quality

Below are some considerations for ventilation and air quality in the mortuary space.

- **Negative Pressure:** autopsy rooms and certain storage areas should maintain negative pressure relative to adjoining spaces. This ensures that odours, contaminants, or potential airborne pathogens from the autopsy area do not spread to other parts of the facility;
- **Air Changes per Hour (ACH):** ACH is a measure used in ventilation planning and design to describe how many times the entire volume of air within a specific space or room is replaced by fresh or filtered air in one hour. If a room has an ACH of 6, it means the entire volume of air in that room is replaced six times in an hour. Autopsy suites should have a high number of air changes per hour to remove contaminants effectively. Typically, this might range from 6-12 ACH, but the exact number might vary based on local guidelines or the size and design of the facility;
- **Exhaust Systems:** should be designed to direct air away from intake vents, building air systems, and pedestrian areas. This ensures that contaminated air doesn't re-enter the building or affect nearby area;
- **Air Filtration:** HEPA filters should be employed to capture fine particulates and potential pathogens, ensuring clean air circulation;
- **Odour Control:** given the nature of work in a mortuary, effective odour control is essential. This not only makes the environment more pleasant but is crucial when there are family members or other visitors in adjacent spaces like viewing rooms. Activated charcoal or other specialised filters can help in managing odours;
- **Special Considerations for Hazardous Materials:** in cases where chemicals or hazardous materials (e.g., formalin) are used, there should be effective fume hoods or localised exhaust systems. This ensures that fumes are captured and removed directly at the source (refer to anatomical pathology section for more details);
- **Emergency Ventilation:** in the event of a significant chemical spill or release of hazardous fumes, emergency exhaust systems should be in place to quickly remove contaminant;.

- Regular Monitoring and Maintenance: air quality should be routinely monitored to ensure safety standards are maintained. This might include checking for chemical concentrations, particulate levels, or microbial contaminants. Regular maintenance of the ventilation system ensures it operates efficiently and safely; and

Lighting

The needs of a mortuary might change over time. Designing a lighting system that allows for adaptability and adjustments can be beneficial:

- Task Lighting:
 - Examination and Autopsy Areas: these require bright, shadow-free lighting to ensure accurate visual assessment during examinations. Adjustable or movable lighting fixtures can be beneficial;
 - Workstations: areas where paperwork, documentation, or computer-based tasks are done will require focused task lighting that minimises glare on screens and documents;
 - Ambient Lighting: for non-examination areas like corridors, waiting areas, or offices, the lighting should create a calm and peaceful ambiance. Soft, indirect lighting can be appropriate;
- CRI: A high CRI is crucial in autopsy or examination areas. It ensures that the true color of tissues and samples is accurately represented. Typically, a CRI of 90 or above is recommended;
- Dimmable Lights: having the option to dim lights can be valuable, especially in areas where different tasks or ceremonies might take place;
- Natural Light: while mortuaries traditionally might not prioritise natural light due to their nature and function, introducing natural light can improve the well-being of staff and provide a more pleasant environment. However, considerations for privacy and the potential effects of sunlight on decomposing bodies or samples must be addressed;
- Mood Lighting for Viewing Rooms: If the mortuary has rooms where families come to view or spend time with the deceased, soft and comforting lighting is essential. This can help create a more serene and peaceful environment for grieving families.
- Safety and Navigation: areas like corridors, entrances, and exits should be adequately lit for safety. Emergency exit paths should have backup lighting in case of power failures;
- UV or Specialised Lighting - In some instances, special lighting might be needed for particular examinations or tasks. For example, UV lights can help highlight certain bodily fluids or tissue changes; and
- Energy Efficiency - Given the potential for long hours of operation, using energy-efficient lighting options like LED can lead to significant energy and cost savings over time; and
- Consider the ease of replacing or maintaining lighting fixtures, especially in areas that need to be kept sterile or clean.

Temperature and Humidity Control

Apart from air quality, controlling temperature and humidity is essential. Cool temperatures are necessary in storage areas to prevent decomposition. In autopsy areas, a comfortable temperature ensures staff comfort. Humidity control is crucial for preserving evidence and preventing mould growth.

Flooring

Non-slip floor covering for floors that may get wet is critical.

Acoustic Control

The following are some of the noise considerations when designing the space:

- Conversations, especially those involving grieving families or sensitive topics, should be private. Walls, doors, and partitions should be soundproofed to ensure conversations remain confidential;
- Examination and autopsy rooms should also have a degree of acoustic privacy to prevent potentially distressing sounds (i.e. power tools) from being heard in adjacent spaces;
- External Noise Intrusion: proper insulation and soundproofing materials can reduce noise intrusion from adjacent roads;
- Equipment Noise: certain equipment used in a mortuary, such as saws, refrigeration units, or ventilation systems, can generate noise. These should be sound-insulated or located in areas where noise will have the least impact;
- Flooring Materials: soft, sound-absorbing flooring materials can reduce noise from foot traffic and moving equipment like trolleys;
- Reverberation Control: large, hard surfaces can cause sounds to reverberate and amplify. Using acoustic panels or ceiling tiles can help in reducing reverberation;
- Dedicated Quiet Areas: spaces for reflection, counselling, or private conversations should be especially quiet. Ensure these areas are distant from noisy equipment or operations and well-insulated;
- Designing buffer zones, such as storage areas or corridors, between noisy spaces and quiet spaces can help reduce noise transmission;
- Doors and Windows: using acoustically rated doors (especially for examination rooms and consultation areas) as well as double-glazed windows can also help in reducing external noise intrusion;
- Ventilation and HVAC Noise: the design of the ventilation system should minimise noise. Using silencers, sound traps, or specifying low-noise HVAC units can be beneficial;
- Notification Systems - Instead of loud bells or alarms, consider using light-based signals or vibration alerts. If audio alerts are necessary, ensure they are gentle and not jarring; and
- External Spaces: if the mortuary has outdoor spaces, consider the potential noise sources affecting them. The design should ensure that the environment respects both the deceased and the living.

Floor Loading

The following is a list of items with considerable impact on the load design:

- Static Loads:
 - ▶ Storage Racks and Cabinets: these can get quite heavy, especially when fully loaded with bodies or specimens. The weight of stainless-steel cabinetry, refrigerated units, and their contents can add up;
 - ▶ Autopsy Tables and Equipment which includes permanent fixtures like autopsy tables, large sinks, and specialised equipment; and
 - ▶ Personnel.
- Dynamic Loads:
 - ▶ Body Transfer Systems: Motorized lifts, hoists, or conveyance systems used for moving bodies will add to the dynamic loads on the floor.
 - ▶ Mobile Equipment: this includes items like portable X-ray machines, carts, or other mobile tools that might be moved in and out of autopsy rooms or storage areas; and
 - ▶ Trolleys and Carts: these are used frequently in mortuaries to move bodies and samples. Consider their weight when loaded to capacity.
- Impact Loads:
 - ▶ While not directly related to loading, ensure that the floor is waterproof and has adequate drainage, especially in autopsy areas. A sloped floor towards drains can be beneficial; and
 - ▶ Some equipment, like large refrigeration units or mechanical body transfer systems, might produce vibrations. This isn't strictly related to static or dynamic load but can affect the integrity and lifespan of the flooring system.

8.4. STORAGE AND SPECIMEN RETENTION

Mortuary services require specific storage facilities and equipment to handle and preserve deceased bodies with dignity and in accordance with public health standards. Here are the primary storage requirements for mortuary services:

- Body Refrigeration Units;
- Stainless steel trays are used for holding bodies, and the racking system allows for efficient use of space in refrigeration units;
- Bariatric Storage;
- Temporary Freezer Units;
- Space for Autopsy Tables;
- Body Hoists and Lifts;
- PPE Storage;
- Histology and Sample Storage: after autopsies, tissue samples might be taken for further histological examination. These samples need to be stored in formalin-filled containers or other preservative solutions and might require refrigeration or freezing;
- Chemical storage cabinets for storing disinfectants, formalin, and other chemicals used in the autopsy process;
- Instrument Storage: for autopsy tools like scalpels, saws, forceps, and other instruments.
- Documentation and records storage systems for organising and storing records related to each case, including autopsy reports, photographs, and other relevant documents;

- Waste Storage and Disposal: bins and containers for biohazardous waste, sharps containers for needles and blades, and general waste bins;
- Facilities or storage for larger waste items, such as body parts or organs that are not returned to the body, until they can be appropriately disposed of;
- Secure Storage for personal items that come with the deceased. These items are catalogued and stored until they can be returned to the family or next of kin;
- Emergency equipment storage for equipment like defibrillators, first aid kits, and other emergency tools in case of any incidents; and

Given the sensitive nature of their work, mortuaries must maintain strict standards of cleanliness, respect for the deceased, and adherence to legal and ethical guidelines. Mortuary services also need to be consistent with the broader pathology specimen storage principles as outlined in section 7.8.1.

8.5. KEY FUNCTIONAL RELATIONSHIPS

Internal Relationships

Mortuary services' internal functional relationship is denoted in Figure 7-2. The department often shares staff with AP, however, there are no functional relationships that require mortuary to be proximal to any other pathology department.

External Relationships

Mortuary services work closely with clinical staff within inpatient services and emergency departments. They coordinate or support the transfer of deceased individuals from hospital units to the mortuary and ensure proper documentation.

There will typically have a working relationship with local funeral homes or funeral directors and will involve interactions with authorities such as coroners, and ACT Health to comply with regulations regarding body transportation, handling, and burial/cremation procedures.

8.6. MANAGEMENT AND OPERATIONAL SUPPORT SERVICES

Hours of Operation

Mortuary's normal opening hours are Monday to Friday: 8:00-4:00pm. On weekends, the department is open for releases, body wash and viewing only, which is organised by the out of hours shift coordinator and performed by hospital (non-pathology) staff.

8.7. MAJOR EQUIPMENT LIST

Current major equipment for the Mortuary is detailed in Appendix Table A9-10. Key equipment used in Mortuary includes but is not exclusive to Balances, Freezers, Refrigerators, Fume Cabinets, Safety Cabinets, Thermometers, Safety Showers, Examination Tables, Cameras, Body Trolleys, TVs, Bone Saws, Metal Shelves, Lifters, Lounge, Chairs, Beds, and Flammable Liquid Cabinets.

8.8. WORKFORCE MODEL

The workforce model reflects the clinical capability level of mortuary services, with staffing levels provided in Table 8-2 below. The staffing complement includes a mortuary team leader, a mortuary assistant, as well as some shared staffing arrangements with AP. Note, this shared arrangement is not explicitly detailed in Table 8-2.

Table 8-2: Staffing by Workforce Category - Mortuary

Staff Category	Headcount	FTE
Mortuary Team Leader	1	1.0
Mortuary Assistant	1	1.0
Current Total	2	2

Staffing numbers are at a point in time and will not reflect future FTE or workforce mix needs.

8.9. MORTUARY KEY CHALLENGES/FUTURE SERVICE TRENDS

The future for mortuary services will need to consider the following service trends:

- **Discrete body transition:** Deceased persons are frequently being transferred from department to mortuary via hospital corridors/grounds that are shared with the public. It will be important for future transfers not to be undertaken through public spaces. Only underground tunnels and staff only areas should be used.
Opportunities should also be sought as part of the facilities developments to:
 - ▶ Automate body transits; and
 - ▶ Maintain integrity and prevent contamination.
- **Cultural sensitivity and inclusivity:** Along with all other parts of CHS, mortuary services place a strong emphasis on cultural sensitivity and inclusivity, ensuring that practices and services accommodate diverse cultural and religious traditions;
- **Technology integration:** The Mortuary services should leverage advances in technology to better coordinate and transit deceased patients and ensure efficient administration of regulations; and
- **Sustainable practices:** with growing environmental consciousness, there might be a shift towards more eco-friendly practices in mortuary services. This could include options for natural or biodegradable materials.
- **Scale.** The proposed capacity for the new mortuary service as indicated in the L2D FB is for 75 deceased persons.

Whilst there are expected to be some changes to the technology platforms and streamlined operations in the mortuary, the basic Service Model will not change substantially. It is expected that there might be reduced space required for mortuary services given the reduced role and volumes for adult autopsies.

9. Pharmacy

9.1. DESCRIPTION OF SERVICE

The Pharmacy Service is a core clinical support function that supports the provision and quality (safe and effective) use of medicines throughout the health service.

The Pharmacy service at CHS operates at a Level 6 clinical capability. It is critically important that Pharmacy continues to operate at the highest clinical capability level as many other clinical services depend on Pharmacy being able to consistently function at Level 6⁸⁷.

A Level 6 service means the provision of a comprehensive range of pharmacy functions that includes but not restricted to:

- Clinical pharmacy advice and support to all health service providers at CH in matters relating to quality use of medications in patient care;
- 24-hour on-call arrangements;
- Medication distribution to inpatient, outpatient, and discharged patients;
- Medication distribution to CHS health care locations in the community;
- Sterile manufacturing of cytotoxic medications for inpatients and approved outpatients, and clinical reviews of cytotoxic medicines;
- Pharmacological support for clinical trials;
- Sterile and non-sterile compounding, including infusions, ophthalmological preparations, and total parenteral nutrition;
- Provision of specialised pharmacy services for renal dialysis, drug and alcohol, oncology, and cystic fibrosis;
- Support of contemporary practice with pharmacy as part of a Multi-Disciplinary Team (MDT), particularly for clinical areas with complex or poly-pharmacy patients;
- Medication information distribution and promoting medication safety in the health service; and
- Quality and risk management programs in line with current NSQHS Standards as appropriate.

9.2. SPECIFIC DESIGN PRINCIPLES

The overarching planning principles for the Pharmacy unit are derived from the AusHFG for Pharmacy Units, HPU 560.

The overarching design principle for Pharmacy in the Phase 2 redevelopment is to automate and replace functions with robots to the greatest extent possible. Robots can organise medicines and prepare prescriptions, monitor medicine expiration dates, perform stock control and automate orders.

Further specific design principles relevant to pharmacy include:

- A reception/waiting area and an interview area for patient counselling;

87. NSW Ministry of Health, NSW Health Guide to the Role Delineation of Clinical Services, Fourth Edition, October 2019, available: <https://www.health.nsw.gov.au/services/Publications/role-delineation-of-clinical-services.PDF>.

- An after-hours drug store which may be located close to clinical areas, or on the periphery of the pharmacy with internal and external access;
- An automated packing and dispensing system (*PillPick*);
- Pneumatic tube infrastructure and system for medications;
- Provision for bulk store, distribution, and support;
- Pharmacy Administration areas;
- Two contained aseptic production units;
- Provision of pharmacy dedicated space for clinical trials;
- Medication Inventory - In addition to the stock control and the reliance on an imprest system to deliver timely medicines for all clinical purposes, the on-site storing of medications is expected to change, with reduced space due to an efficient imprest system, and increased space needs due to the ever-increasing range and type of pharmaceutical products that need to be available. Therefore, it is expected that overall inventory space will not reduce;
- Storage requirements - Pharmaceutical products have different storage requirements including some that are refrigerated (at different temperatures). Others will also require temperature monitoring, even if not refrigerated;
- Regulatory storage requirements - There are regulatory requirements for the secure storage of restricted (scheduled) medications that are applicable within the pharmacy, at satellite pharmacies and in patient areas; and
- Distribution - The distribution systems are likely to change significantly in the future. There are low tech systems such as pneumatic tubes and Automated Dispensing Cabinets (ADCs) as well as robotics and Artificial Intelligence (AI).

9.3. OPERATIONAL MANAGEMENT

9.3.1. Hours of operation

Pharmacy services currently operate from 8.30am-4.30pm Monday to Friday with extended hours (emergency service) from 4:30pm-7.00pm, and on Saturdays and Sundays from 9.00am-4:30pm. There is:

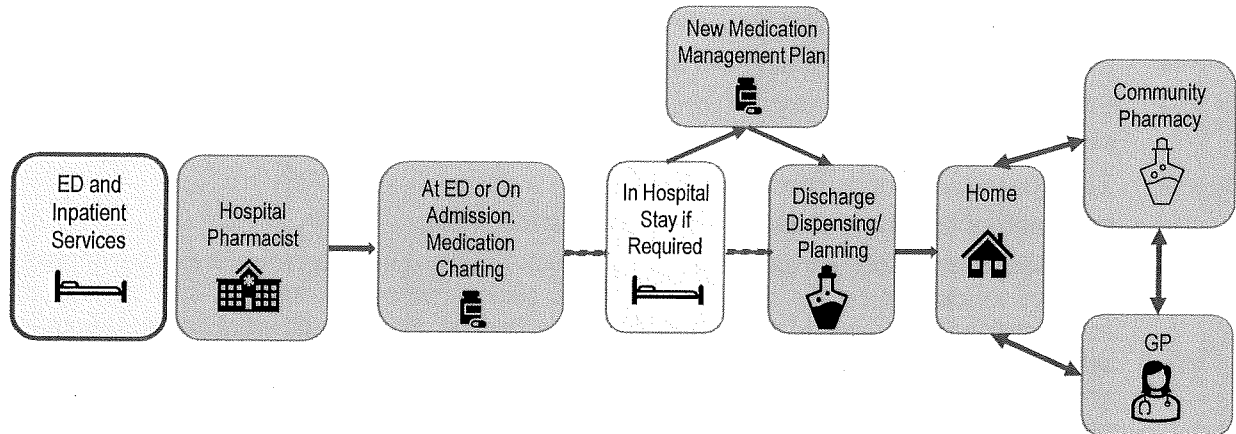
- A remote clinical pharmacy service (5pm to 1am weekdays and 2pm to 10pm Saturdays);
- A limited pharmacy service for surgery that commences at 7am;
- An emergency on-call pharmacy service for all other times; and
- A plan to move towards a 24-hours, 7 days service model in the future.

9.3.2. Patient journey

The respective patient pathways for inpatients and outpatients at CH in relation to the pharmacy service is shown in Figure 9-1 and Figure 9-2 and described below.

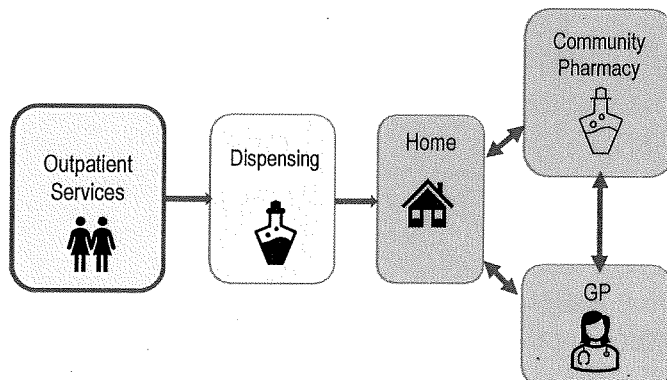
For inpatients, a hospital pharmacist will visit the patient while they are admitted. The patient's current medications will be discussed, and any changes to medications after treatment, if known. Discharge pharmacy services include dispensing of medication (with a default supply equivalent to the quantity outlined under the Pharmaceutical Benefits Scheme) and arranging services with the patient's local community pharmacy.

Figure 9-1: ED and Inpatient Pathway in Relation to Pharmacy Service



For outpatients, some medications may be dispensed by the hospital at the time of the specialist outpatient service. Most often these are medications that are usually only available at hospital pharmacies. Otherwise, scripts are dispensed at the patient's community pharmacy of choice.

Figure 9-2: Outpatient Pathway in Relation to Pharmacy Service



9.3.3. Family and carer support

The pharmacists may involve families / carers when counselling patients, according to the patients' wishes.

9.3.4. Staff support

Pharmacy staff will require a beverage bay, and/or a staff room with kitchenette facilities within the department. Staff will also require access to end of trip facilities.

9.4. FUNCTIONAL CONTENT

There are currently five pharmacies across CHS:

- Main Pharmacy and dispensary, Building 1 Level 2 (street level);

- (Specialist) Oncology Pharmacy, Building 19, Level 3, Canberra Region Cancer Centre. Whilst this pharmacy is not accessible to patients, pharmacists visit clinics to provide services to oncology patients alongside their treating physicians/specialists;
- Justice Health Pharmacy, Building 3, Level 2;
- North Canberra Hospital; and
- University of Canberra Hospital (UCH) Pharmacy.

The main pharmacy in B1 is the in-scope Pharmacy service for this FDB as it represents the criterion of 'like-for-like' relocation.

CHS has a clear preference for a consolidation of the main pharmacy with the on-campus pharmacy satellites. This would increase space requirements that are not like-for-like. Whilst this can be a consideration, the satellite consolidation is not a contemporary direction for tertiary pharmacies. It would appear that there is likely to be greater net benefits from maintaining high volume satellite services (such as oncology) in preference to consolidation. These are obviously important issues that need further consideration in the refinement process in future planning stages.

9.5. FUNCTIONAL ADJACENCIES

Pharmacy has functional relationships with **all clinical services at CH and other campuses**. There are some clinical relationships that are stronger and more prominent than others, which may have influence over the following:

- ADCs; and/or
- Regularly assigned pharmacists to patient planning meetings and clinical areas; and
- IPU rounds for newly admitted patients.

Notwithstanding the critical and close clinical support provided by pharmacy, the central pharmacy does not need to be proximal to other clinical services.

External relationships include:

- Healthcare providers (e.g., GPs, specialists, and allied health practitioners): providing medication management such as drug selection, tailored patient (medication) service, advice about drug interactions, dosage requirements/adjustments, and alternative therapies;
- Regulatory Agencies (such as Pharmacy Board of Australia, TGA and AHPRA) to ensure ongoing compliance;
- Health Authorities in relation to regulatory regimes and antimicrobial stewardship (AMS);
- Research Institutions and Universities;
- Medicines procurement and distribution services;
- Quality and risk management programs in line with NSQHS Standards current as appropriate;
- Aboriginal programs and services including relevant referral pathways; and
- Community pharmacies.

9.6. WORKFORCE

Staff and skills mix for the main Pharmacy Service would ensure consideration of the range of general and specialised pharmacy skills, experience, and core competencies to manage the range of pharmacy services expected of a Level 6 service. In addition, a future workforce would be able to support more teaching and research positions, particularly in new clinical practices, individual therapies, and safer use of medicines.

10. Mental Health Short Stay Unit

10.1. DESCRIPTION OF SERVICE

The Mental Health Short Stay Unit (MHSSU) is a standalone mental health inpatient unit designed to facilitate short admissions of up to 48 hours. All clients must be assessed in a face-to-face assessment by a Psychiatry Registrar for an admission to MHSSU. Admissions from other sources are also considered, pending assessment of suitability by MHSSU consultants.

The MHSSU provides:

- Psychosocial assessment, short term stabilisation, brief therapeutic intervention, and organisation of follow up care for primary mental health issues, provided by the multidisciplinary team (medical, nursing, allied health clinicians);
- Medical assessment and support for concurrent physical health issues;
- Assessment and treatment for concurrent AOD issues;
- Other supports as required, e.g., Aboriginal Liaison Officers, peer workers; and
- Close liaison with community health providers (e.g., Community MH Teams, General Practitioner (GPs), family and carers, as well as NGO supports.

Clients are deemed ineligible for MHSSU admission if they are:

- Likely to require a mental health admission extending beyond 48 hours;
- Under the age of 18 years;
- Not assessed as medically stable by a member of the ED medical staff;
- Exhibiting aggressive behaviours;
- Exhibiting signs of delirium, overt confusion, or decreased level of consciousness;
- Have a primary diagnosis of dementia, developmental disability, or traumatic brain injury (unless they are experiencing a significant psychiatric disorder);
- Frail elderly; or
- Intoxicated from alcohol or other drugs; or
- Experiencing a primary diagnosis of drug or alcohol related conditions without significant mental health co-morbidities.

Clients who are referred from the ED (or other sources) and accepted as eligible and appropriate for care are formally admitted to the unit for observation and management.

The MHSSU is an approved and gazetted facility and can accommodate clients under specific legislative arrangements, including under the Mental Health Act 2015 (Section 80) and the Crimes Act 1900 (Section 309).

10.2. SPECIFIC DESIGN REQUIREMENTS

Refer to Section 3 for the design principles of the patient environment.

The MHSSU will comprise separate rooms with ensuites. There will also be an open lounge area with kitchen or kitchenette. There should be no ligature points in the unit.

10.3. OPERATIONAL MANAGEMENT

10.3.1. Hours of operation

The MHSSU operates 24 hours per day, seven days per week.

10.3.2. Patient journey

Many of the admissions to MHSSU will likely come via the CH ED, however a smaller number of direct admissions from community teams as well as admissions from other hospitals e.g., Northside, are expected.

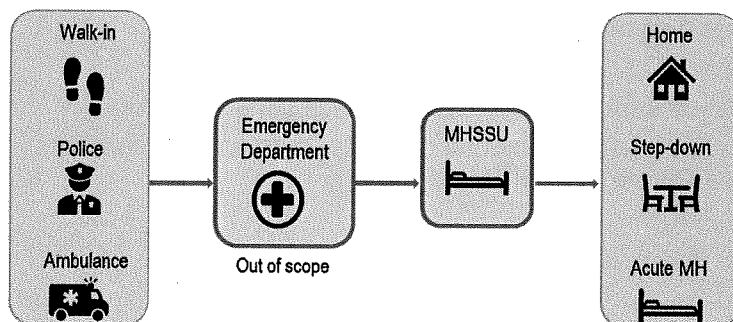
Following transfer to the MHSSU, clients will be admitted as an inpatient to the unit.

Clients will typically depart the MHSSU to one of three major destinations.

- Most clients return to their usual accommodation within the community after receiving treatment in the MHSSU.
- Some clients may be referred to adult step-down mental health services in their local area if active monitoring and support is required.
- A small percentage of clients may be transferred to a longer stay acute mental health service for ongoing treatment and care.

The patient journey for MHSSU is outlined below.

Figure 10-1: MHSSU client pathway



10.3.3. Clinical support services

Clinical support services are outlined in the separate Clinical Support Services Service Model which has been developed for the Phase 2 redevelopment and incorporates:

- Medical Imaging;
- Pharmacy;
- Health information services;
- Pathology; and
- Infection prevention.

Refer to the Pathology and Clinical Support Service Models for more information on specific requirements.

10.3.4. Family and carer support

Refer to Section 3 for the general requirements for family and carer support.

10.4. FUNCTIONAL CONTENT

The MHSSU currently operate 6 POC within the existing ED facility in Building 12. It is functionally proposed to increase the unit to 12 POC.

The unit will require specific design requirements that are proximal to the current Behaviour Assessment Unit in the Building 5 ED.

10.5. FUNCTIONAL ADJACENCIES

Internal:

- ED;
- Pharmacy;
- Pathology;
- Allied health;
- Medical specialties.

External:

- Ambulance and non-emergency patient transfer services;
- PACER (Police, Ambulance and Clinician Early Response); and
- Community Mental Health programs.

The ED is a critical adjacency, whilst the Adult MH unit is also an important adjacency.

11. Learning and Teaching

11.1. DESCRIPTION OF SERVICE

CHS has a current strategy that set the direction for learning and teaching; *The Canberra Health Services, Clinical Learning and Teaching Strategy 2023 – 2027*.

CHS Office of Research and Education has been tasked to develop and implement the strategy across the organisation to strengthen CHS' position as tertiary academic teaching health service and fully integrate learning, teaching and research as core functions.

As an academic teaching health service, CHS takes a multidisciplinary approach to clinical learning and teaching, providing learners with the exposure to complex patients, rare diseases and learning and teaching that allows them to work and learn from all disciplines involved, including the consumers and carers themselves.

- Learning and teaching programs: The health service offers diverse programs, including medical, nursing, and allied health professional training. These programs emphasise evidence-based practice, interprofessional collaboration, and the acquisition of clinical skills.
- Clinical placements: The health service provides clinical placements for students, enabling them to gain practical experience under the guidance of experienced healthcare professionals.
- Continuing education: The health service promotes lifelong learning among its staff by offering professional development opportunities, conferences, and workshops.

11.2. SPECIFIC DESIGN PRINCIPLES

The way forward can be marked by different 'signposts' of progress toward an academic tertiary teaching hospital. Learning and teaching is proposed to progressively develop multi-disciplinary learning experiences, and active consumer and carer engagement. This means building in:

- *Collaboration and Interprofessional Learning.*
- *Experiential learning* such as simulation spaces and clinical skills labs. These are hands on learning away from patient treatment spaces.
- *Networking and knowledge exchange.*
- *Technology integration*

This means designing for three different tiers of learning/teaching, where:

- Tier 1 is embedding spaces where patients are treated/managed including outpatient rooms, IPU areas and clinical examination spaces. These developments would bring CH up to contemporary standards and practices common in newly developed tertiary hospitals;
- Tier 2 are spaces on IPUs and **proximal to patient treatment areas** that enable review, collegiate discussions, and virtual learning experiences through meeting/ consultation rooms. and

Tier 3 is teaching/learning spaces that are for more formal learning and teaching away from patient areas that, for an academic tertiary hospital, could be expected to have larger auditorium spaces, academic administration space, teaching demonstration spaces, such as the gross anatomy museum or the bone lab (shell spaced only initially), hi-fidelity simulation spaces for different clinical settings, and consumer experience spaces used for teaching and learning. The tier 3 type services may be well-suited to a future phase of development.

The tier 1 and 2 teaching/learning elements are proposed to be designed into the 'fabric' of the new facilities. Tier 3 elements should be integrated with research due to the functional relationships that exist.

11.3. OPERATIONAL MANAGEMENT

11.3.1. Hours of operation

Teaching and learning generally occurs during business hours and may occur before or after hours occasionally for those staff who cannot easily leave their work area.

11.4. FUNCTIONAL CONTENT

Tier 1 and 2 embedding includes learning spaces on each IPU of around 15-20 sqm. There is also a more formal teaching space of 1,000 sqm has been factored into the Phase 2 redevelopment.

11.5. FUNCTIONAL ADJACENCIES

The adjacencies are described within each of the Tiers above.

11.6. WORKFORCE

Dedicated teaching and training staff will provide training to staff, and these staff should have consolidated offices close to the clinical areas.

11.7. ADDITIONAL SCOPE

The ANU Medical School is located in Building 4 which contains teaching facilities and a library for medical students. The ANU building was not in original scope of the Phase 2 redevelopment project, it has been recently included as additional scope but is subject to value management.

The ANU Medical School (i.e., Building 4) currently occupies a total space of. 2,188 sqm GDA.

12. Research

12.1. DESCRIPTION OF THE SERVICE

CHS has a current strategy that sets the direction of research; *The Canberra Health Services, Research Strategy 2021-2025*.

The CHS Office of Research and Education has been tasked to develop and implement the strategy across the organisation to strengthen CHS' position as tertiary academic teaching health service and fully integrate learning, teaching, and research as core functions.

As an academic teaching health service, CHS takes a multidisciplinary approach to clinical learning and teaching, providing learners with the exposure to complex patients, rare diseases and learning and teaching that allows them to work and learn from all disciplines involved, including the consumers and carers themselves.

- Learning and teaching programs: The health service offers diverse programs, including medical, nursing, and allied health professional training. These programs emphasise evidence-based practice, interprofessional collaboration, and the acquisition of clinical skills.
- Clinical placements: The health service provides clinical placements for students, enabling them to gain practical experience under the guidance of experienced healthcare professionals.
- Continuing education: The health service promotes lifelong learning among its staff by offering professional development opportunities, conferences, and workshops.

12.2. SPECIFIC DESIGN PRINCIPLES

The most important considerations for Research for the Phase 2 Redevelopment Project are learning and teaching and clinical trials, and include:

- Collaboration and Interprofessional research.
- Networking and knowledge exchange
- Technology integration.

In the longer-term, it is envisaged that a dedicated facility (or facilities) that provide a research capability. From the descriptions, it is expected that the research would include some of what it does now, such as clinical trials but also new research that covers a range of categories including:

- Cutting edge clinical research (in a clinical environment such as diagnostic genomics);
- Primary and translational research needing wet labs;
- Therapy and clinical practice research;
- Trialling of new equipment/devices; and
- Broader public health/epidemiological research with different CHS patient cohorts.

Research spaces are complex to define, design and deliver. Current research at CHS is highly dependent on individual clinician researchers and divisional capabilities to support them. The

research strategy is designed to build greater **consistency and rigour** around CHS sponsored research.

The research environment is made even more complex for CHS by the recent ACT Government announcement of a new major investment in a science and research facility in Canberra associated with the ANU.

Although the environment is evolving, there are key options and working assumptions on which research would be supported and jointly developed with third party academic institutions. There is again a tiered approach to research, where:

- **Tier 1.** Embedded research into patient treatments (such as clinical drug trials, testing of new equipment/techniques etc). Whilst this does not usually require additional patient space, it does require the incorporation of the function (clinical trials) and related spaces into the core design;
- **Tier 2.** Research spaces proximal towards other clinical support areas that support clinicians engage with research and have access to appropriate facilities, (i.e. wet lab access or sample processing facilities for preclinical research activities). One example would be genomic research and newly developing clinical areas such as CAR-T cell therapies; and
- **Tier 3.** Research space, or specific commercialisation research can be away from patient areas. The tier 3 type research may be well-suited in a separate facility that remains clinically connected and would benefit from being on-campus. It is critical that this development be undertaken in collaboration with academic institutions.

Like teaching and learning, the tier 1 and 2 research elements are proposed to be designed into the 'fabric' of the new facilities. It is becoming increasingly common for research precincts/areas in organisations⁸⁸ to support research projects on the basis of their contribution to the organisation's sustainability, especially for newly built facilities.

12.3. OPERATIONAL MANAGEMENT

12.3.1. Hours of operation

Research predominantly takes place during business hours.

12.4. FUNCTIONAL CONTENT

A total GDA of 2,072 sqm has been factored into the Phase 2 redevelopment for Research.

12.5. WORKFORCE

There are dedicated staff participating in Research, which varies with different projects and clinical trials.

88. Such as Walter & Eliza Hall, Royal Brisbane Hospital, Peter MacCallum Cancer Institute, Royal Prince Alfred, and The Alfred Hospital Burnet Building

13. Staff Administration

13.1. OFFICE ACCOMMODATION

This section describes in-scope *administrative functions/spaces* related to Phase 2 Redevelopment that were not relocated in the development of building 5 or new building 10.

They include the following administrative services that are in Buildings 1 and 3:

- ED administration;
- Infection control administration;
- ICU administration; and
- Department of Surgery administration.

13.1.1. Administrative Spaces

The number of administrative spaces is outlined in the Schedule of Accommodation, including:

- 12m² two-person shared offices;
- 9m² single person offices;
- 4.4m² workstations;
- 2.2m² (open plan) workstations/hot desks;
- Breakout/huddle spaces (booths for staff to have meeting huddles, make private phone calls and allow 1:1 working);
- Meeting room(s) shared across the facility; and
- Support spaces such as a photocopy store, toilets, showers, change rooms, lockers, a staff beverage bay & a staff room/dining area, property bays, and general storage spaces.

Administration areas are for staff only. Access is by electronic access key.

The allocation of spaces is based on:

- Activity based working environment aligned with contemporary workplace design standards;
- The number of staff on-site who require a desk space, but do not have either a permanent or workflow related touchdown point within a department;
- Shared Meeting rooms;
- Future COVID working arrangements; and
- Whole of facility shared functions (staff beverage and dining areas, storage spaces, toilets, showers, and end of trip facilities).

13.1.2. Office Accommodation design Principles

The principles that underpin the provision of office accommodation at the new Inpatient, outpatient and Pathology facilities include:

- Australasian Health Facility Guidelines;

- Canberra Health Services Office and Workstation Accommodation Policy⁸⁹:
 - ▶ **Comply with legislative and industrial requirements.** This includes ensuring safety is a key consideration in the design and provision of office and workspaces to reduce the risk of injury;
 - ▶ **Enable and facilitate the ability to perform duties safely and effectively.** This includes the allocation of offices or other enclosed space on a demonstrated needs basis with shared offices or workspaces encouraged to increase space utilisation. Staff with multiple roles or working at multiple locations are not to be allocated more than one dedicated office or workspace. This also involves avoiding allocating spaces that risk impacting a building classification or compromising safety systems;
 - ▶ Encourage collaboration. This includes **adoption of open plan work environments and contemporary office designs** to ensure work settings are positioned within zones of amenity that have appropriate acoustic levels and meet workplace privacy and patient confidentiality requirements; and
 - ▶ **Flexible and adaptable to meet changing needs.** This includes ensuring future flexibility to accommodate changing requirements. This may include minimising built-in furniture and equipment that is fixed to floors, ceilings, core walls and external walls;
 - ▶ **The Policy also outlines that:**
 - An extra-large single office accommodation (18m²) is only allocated to someone that carries out a high level/volume of confidential information, typically the Chief Executive Officer;
 - A large single office accommodation (12m²) is only allocated to someone that carries out administrative functions in a degree of privacy including small meetings, typically the Deputy Chief Executive Officer, Chief Operating Officer, Executive Director, Executive Group/Branch Manager, Clinical Directors, Medical, Nursing and Allied Health. Visiting Medical Officer (VMO) that occupies the equivalent position of Clinical Director of a Department/Service Academic Professor;
 - A standard single office accommodation (9m²) is allocated to someone (>0.7 FTE) that carries out administrative functions in a degree of privacy including rosters, reports, counselling, and interviewing staff, typically Staff Specialists, Assistant Directors of Nursing, Allied Health Managers, Nurse Managers, Clinical Nurse Consultants, Business Support Managers;
 - A shared two-person office accommodation (12m²) is allocated to two people (<0.7 FTE) that carry out administrative functions in a degree of privacy, typically Research Fellows, VMOs and any staff referred to in Office C.
 - An individual 4.4m² workstation will be allocated to staff that spend the majority of the day at their desk; and
 - A 2.2m² workstation will be allocated for intermittent use by visiting staff/consultants and is not designed as the primary workplace but a space to attend ad hoc functions; and
 - Shared offices or workspaces must be encouraged, wherever possible, to promote cost effective office accommodation.
- **Open Plan** is described as making the optimal use of large, open spaces and minimises the use of small, enclosed rooms such as private offices;

89. Canberra Health Services, 6 June 2023, Office and Workstation Accommodation Policy

- **Collocate workspaces for related services, where possible.** Support areas such as reception points, waiting areas, tutorial rooms, beverage areas, central printing, and staff toilets should be shared when office spaces are collocated, and justified by operational requirements;
- Collocation should consider **identifying and grouping staff and services** who might be handling similar confidential information, and should also consider the acoustics and noise levels within shared workspaces;
- **Include activity-based workstations that are flexibly designed**, reflecting changing patterns of work including employment hours, type of work undertaken, job share and multi-site appointments;
- **Multiple breakout/meeting rooms** will be provided for private meetings / confidential conversations;
- Support increased collaboration between health professionals and a **focus on multidisciplinary teamwork**, including integration, collaboration, and multidisciplinary interaction;
- Include **staff only, 'patient free' areas**, providing a sanctuary away from the work environment;
- Ensure **adequate storage space** for both work related and employee personal items, such as staff lockers; and
- **Public amenities** are to be provided when office spaces are collocated with clinical areas to cater for visitors to the administrative area.

The area allocations will also be consistent with the **CHS Accommodation Principles**⁹⁰, as per Table 13-1 below:

Table 13-1: Canberra Health Services Accommodation Principles⁹¹

CATEGORY	PRIORITISATION	HEALTH SERVICES
1	Clinical staff delivering the CH based patient care requiring direct patient contact.	Nursing and midwifery staff, allied health staff, medical staff, specialists, medical imaging, medical physics/radiation engineering staff.
2	Administration staff directly supporting the delivery of CH based patient care. Support services providing direct support to the delivery of CH based patient care.	Reception, pathology, clinical support administrative staff such as service coordinators. Food services, biomedical, facilities maintenance, IPU Services, health assistants, Sterilizing Services, cleaning, security, fleet/parking, mail, fire/emergency management, Switchboard, contract management, localised supply services, critical IT systems support staff.
3	Line management of clinical staff.	ADON, DON, Clinical Directors, Allied Health and Administration Managers for these teams.
4	Support services providing auxiliary support to the delivery of CH based patient care.	People & Culture (HR) and Finance Business Partners Quality, Safety, Innovation, and Improvement Work Health Safety Insurance and Legal Liaison Unit Medico legal functions Capital Project Delivery Clinical Liaison Officers

90. Canberra Health Services, Feb 2023, Canberra Health Services Accommodation Principles.

91. Note: On campus accommodation to be prioritised for Categories 1 to 3, Categories 4 and 5 to be accommodated off campus; Off-campus accommodation to be a mixture of dedicated health locations or ACT government office accommodation, Health Services examples provided do not cover all workforce areas and are provided for guidance only, CHS Accommodation Principles have been developed specifically to inform allocation of space on CH campus. However, where applicable, the principles can be applied to non-CH campus locations.

CATEGORY	PRIORITISATION	HEALTH SERVICES
		Chief Information Officer Territory Wide Surgical Services.
5	Other support services	Finance and Business Information, Capital Project Delivery, Canberra Hospital Foundation, People & Culture, Strategy and Policy, Media and Strategic Communications

14. Front of House

Each of the new buildings in the Phase 2 redevelopment will require FOH services. These are described below.

14.1. ENTRY

The public spaces and FOH services and amenities are those which require location in the main entrance or thoroughfare of the hospital and are easily accessible for patients, families, carers, and staff.

The building entry will become the pivotal point for all arrivals, enquiries and redirection of patients and visitors accessing any of the services in the building.

Arrival at the facility should be a smooth and streamlined process from drop-off locations, car parking and pedestrian circulation areas. The entry should be highly visible, identifiable and provide the most direct route to clinical areas and points of care. The foyer should accommodate commercial space as befits the scale of the building, patient/guest convenience, and proximity of other like commercial facilities.

The commercial spaces typically include a café, retail pharmacy, aids, and appliances, etc.

Other facilities will typically include trolleys, wheelchairs, adequate toilets for relatives /carers to wait, including male and female public and disabled toilets, a parenting/breastfeeding room with baby change facilities within the toilets, and an adult change space. At least one the buildings will also have a multi-faith space off the front foyer.

Entry will be designed to ensure staff and patient safety. Patients will enter the buildings via the main entry and be dispersed to the various departments from a central reception and waiting point. Patients being transported to an inpatient unit via non-emergency vehicles will access the facility via a dedicated entry.

Access to the hospital from the staff car park will be accommodated at a location closely accessible from the car park. Controlled access for staff will be provided via swipe cards.

14.2. MAIN RECEPTION

The design of the FOH should provide a light, open and welcoming arrival sequence for patients. Care should be taken to ensure that the first impression is welcoming and calm environment that appears efficient and orderly even during busy periods. To support this, internal circulation should be designed in simple intuitive ways to assist in preventing long complicated routes or decision-making processes to ensure people are able to easily navigate around the facility.

The reception should be located so that it is immediately visible to all visitors upon entry to the main foyer. The reception desk will accommodate between two and four workstations that suit the scale of the building. Attention will need to be given to the acoustic requirements of the main telephony functions. An area behind the reception is required for photocopying, scanning and label printers. The design of the reception desk should consider the view from the patient's perspective as well as accommodating deep counter tops and design features to protect staff.

Furthermore, it should provide for visibility of the waiting spaces, amenities, and access points. The use of soundproof glass and other sound attenuation is required for these areas.

14.3. SECURITY

In general, design would facilitate and control of after-hours public access by authorised persons. All external doors and access points must be capable of being closed and locked after-hours, which is the role of the Security Department. Design must allow for staff and patients to access the facility after-hours.

Areas that staff will have access to after-hours include staff amenities, car park and bike lockers. Staff will have access to clinical and non-clinical areas based on need. All areas should be controlled by staff swipe cards. Security personnel should have the ability to lock certain areas of the building in threatening situations of Code Grey or Code Black emergency codes.

Design features that enable natural surveillance will be a feature of the new buildings, including controlled access, observation and a safe and secure environment that incorporates the elimination of climbing, jumping, and any potential self-harm fixtures/fittings e.g., ligature points, height of balustrades and handrails etc. The reception area and Security control room should be adjacent to one another each with full visibility to the entrance lobby. Security Services will be extended to provide a high profile but non-intrusive service on a planned preventative and reactive basis 24hrs a day and shall always be manned by competently trained Security Staff.

This may include, but not be limited to, the following:

- Closed circuit television (CCTV);
- Access control;
- Alarms – fixed and mobile duress systems;
- Intercom and communications;
- Physical security (barriers, walls doors, locks, bollards);
- Visitor management system;
- Patient and staff tracking;
- Photo identification; and
- Intruder detection.

14.4. PATIENT REGISTRATION, WAITING AND WAY-FINDING

Many hospitals are using self-register systems for patients presenting to outpatient departments and all other areas where patients can self-register. Self-registration kiosks will be located near sub-wait areas to reduce traffic and congregation of groups in the main entry foyer and for smooth patient flow. Consideration of the area's design should also promote the transition of people away to other areas (be it waiting areas with comfortable seating or directly clinical and non-clinical areas) in a fast and efficient manner to assist in promoting a non-congested and calm front entrance experience.

Appropriate internal spaces should be provided adjacent to all entrances for people to sit and wait, including patients waiting for pick up or transfer that are welcoming, user friendly and designed in a manner which does not congest the entrances they are near.

The incorporation of key place making and wayfinding features which may take the form of site-specific artworks, display areas or installations within the “front of house” design and throughout public spaces, should include an emphasis on visual connection and orientation.

Signage will be prominent, uniform, concise, written in plain English and include Braille indicators. Universal pictograms will be used where possible. In addition, the connection with the outside world, and nature, as well as access to natural light should be emphasised throughout the design features. Walls in the foyer including all corridor walls should have appropriate noggins and lighting to enable hanging of artwork and associated lighting. Power and data will need to be dispersed along the walls within the main foyer to enable the fixing of various electronic and interactive patient entertainment screens.

14.5. CULTURAL RESPONSIVENESS

Public confidence in any hospital is an important part of its public image and CH seeks to create an image which is welcomed by the community. As such, the design must respect the special needs and multicultural sensitivities ranging from children to elderly patients and their families /carers, including staff of the facility, whilst providing a comfortable and welcoming environment for all its visitors.

The CH aims to be culturally responsive through the provision of an environment that is respectful and relevant to the health beliefs, health practices, culture and linguistic needs of the diverse populations and community of its catchment. As such, design of public spaces needs to incorporate the use of public artworks or design features that recognise and celebrate this cultural diversity.

Implicit in the cultural consideration underpinning the design features is the principle of recognition of the traditional landowners and incorporation of Aboriginal heritage. The design should provide a culturally safe service and environment that is spiritually, socially, and emotionally safe, as well as physically safe for Aboriginal and Torres Strait Islander people; where there is no assault challenge or denial of their identity, of who they are and what they need.

15. Back of House

The BOH service will provide the functionality to meet the logistics needs of the new buildings in the Phase 2 redevelopment. Potential components of the BOH services are described below. Please note the exact components of BOH will be determined after the concept design phase.

15.1.1. Linen Services

Centrally delivered and distributed to the new buildings.

- Linen will be distributed to linen stores and departmental linen bays by cleaning staff. Clean linen supplies shall be stored on trolleys in designated linen bays in all patient areas. Restocking will be by impress system;
- Dirty linen will be collected from the source and stored in dirty linen hampers in dirty utility rooms and disposal rooms. Collection and transfer to a central soiled linen holding room at the loading dock will occur on a regular basis; and
- Departments that require specific sterile linen will have this supplied on their exchange trolley.

15.1.2. Supply and Materials Management

- General store for non-clinical stock – toilet rolls / paper towels;
- All stock arrives, sufficiently broken down so that pallet delivery capacity is not required, and then distributed to departments;
- Dialysis fluids will be distributed to departments from a central facility;
- Additional space for excess stock over the busy periods (Easter/Christmas when suppliers are shut);
- Pharmacy – bulk supply of drugs will be delivered straight to the Pharmacy department; and
- A 500L chemical cabinet located in the general store will be sufficient for the storage of cleaning chemicals and alcohol-based hand gels.

15.1.3. Cleaners Storage

- A Store - Cleaners will be required for central storage of chemicals and supply items, equipment, including storage space for 2-3 floor scrubbers; and
- Cleaners Rooms will be required in clinical areas, with some shared between services.

15.1.4. Waste

- Waste management and removal will be managed locally. Waste management and removal will be as per Industry Code of Practice for the Management of Clinical and Related Waste, which includes appropriate segregation of waste and no decanting of waste between source and site removal;
- Waste will be segregated at the source and will include general, clinical, cytotoxic, and recyclable waste as a minimum;

- Clinical Waste (contaminated waste): Designated mobile bins for contaminated waste will be provided in dirty utility and sub-dirty utility rooms of all departments;
- General (dry) Waste: Designated mobile bins will be provided in all departments according to the volume generated;
- Recyclable Waste: Paper, cardboard, glass, aluminium, and plastics will be placed in co-mingled bins for collection on a regular basis. These will be also provided within the food retail;
- Sharps: Tamper proof, disposable containers will be provided in all clinical areas for disposal of sharps at point of use. Filled containers will be secured and held in the dirty utility room or disposal room to await collection by designated staff. Collection will occur on a regular basis. Sharps containers will also be provided in all public toilets. When full, containers will be changed by the cleaning teams;
- Cytotoxic Waste: Designated lockable colour coded (usually purple lids) mobile bins will be provided to the Pharmacy and any other location that prepares or administers cytotoxic agents;
- Dirty Utility Rooms will accommodate 2 x 660L bins for general waste and co-mingle recycling, and 2 x 240L clinical waste bins. Waste will be removed from Dirty Utility rooms and Disposal rooms once daily. Waste will be moved through the facility via service corridors and lifts;
- General and cardboard waste will be compacted prior to removal. Separate general waste and cardboard compactor are to be accommodated adjacent to the dock area. Adequate vehicle manoeuvring space appropriate to the type of compactor is required;
- Waste removal from site by an external contractor will be managed under the relevant contract process. Emergency spill kits are to be readily available within the area; and
- Service corridors and lifts are required to facilitate back of house movement of waste.

15.1.5. Food services

- There will be commercial food services in the foyer for staff, patients, and their families/carers;
- The café will require heating and chilling;
- Patient food services will be managed by CH and include:
 - ▶ Full catering service for inpatient areas;
 - ▶ Light meals and snacks (for example sandwiches, fruit, biscuits, and beverages) as required for specific Day services (for example haemodialysis). Fresh food orders for these services will be delivered daily and stored in fridges and designated storage areas. Fresh food will be distributed by trolley to the designated service;
- All dry goods (tea, coffee, and sugar), long life juice and milk will be purchased externally and delivered to the central store to be distributed as required; and
- Beverage making facilities will be provided for use in staff rooms throughout the facility. In addition, a beverage bay will be located for use by staff, visitors, and patients as appropriate. Beverage bays in patient areas will be secured as required. Beverage supplies will be ordered by the unit from the central store.

15.1.6. Medical Gases

- Special facilities will be provided for the storage of gas bottles, flammable products, and liquid oxygen. Deliveries will be direct to the medical gas compound, complemented by localised gas bottle storage facilities adjacent to clinical units;

- Plant rooms will incorporate requirements for medical gases; and
- A Dewar system developed for pathology.

15.1.7. Healthcare Technology Management

- Healthcare Technology Management (HTM) is a business unit within the Medical Services Division of CHS. HTM is responsible for the healthcare technology management (planning, assessment, risk assessment, procurement, installation, acceptance, commissioning, strategic maintenance planning, maintenance, replacement, and disposal of CHS inventory of medical equipment, medical electrical systems and medical IT-networks, a significant component of which is located on the CH campus.
- HTM services undertake the on-site support, servicing and repair of mobile medical equipment including management of medical gases;
- HTM requires access to documentation, operations and maintenance manuals, certifications, policies, and standards. All medical equipment assets will be recorded including all necessary details relating to procurement, maintenance, operation, compliance, and certification;
- Dirty and clean equipment will be handled and stored separately in line with infection control guidelines;
- Servicing and maintenance of high-end technology including imaging equipment will be provided by equipment vendors under maintenance contracts; and
- HTM workshop for the servicing and repair of mobile medical equipment will be equipped with medical gases and a sink for cleaning.

15.1.8. Information, Communication and Technology

- Information Communication Technology (ICT) impacts nearly every aspect of patient care, treatment, research, and facility operations, and is fundamental to the development of effective integrated care and advances in health care outcomes. ICT will drive coordination and integration of health care and communication, with greater information sharing between staff and patients within the community hospital setting;
- Integrated systems between the CHS campuses, and where possible co-located partner service providers, will support:
 - ▶ Continuity of care for patients that may utilise more than one service;
 - ▶ Clinical staff in their decision making;
 - ▶ Efficient and coordinated management of patient flow;
 - ▶ Best practice clinical care;
 - ▶ Future service planning to meet the catchment's needs through the collection and analysis of activity data;
 - ▶ Wearable patient monitoring technology;
 - ▶ A proportion of consulting rooms will have telehealth/visual capacity;
- The ability to harness future technologies in a way that will enhance service delivery relies on the provision of adequate and future-proofed infrastructure. This should be capable of proactive development and adoption rather than reactive reconfiguration, sufficient server space to store and support programming, and implementation of a Wireless network solution within the hospital. This will be achieved through:
 - ▶ Integrated digital records, internal referrals, discharge, triage, and referral letters; and
 - ▶ Optimised use of mobile phone technology, teleconferencing and Telehealth;

- Of particular significance will be the development of ICT able to manage the emerging integration of clinical practice with Artificial Intelligence applications in clinical diagnosis, particularly for the clinical support services of pathology, medical imaging and pharmacy;
- Use of robotics; and
- Provision be made for enable remote, real time clinical monitoring of patients in their homes.

ICT Infrastructure

- ICT infrastructure and systems will comply with eHealth standards for data centres, communications rooms, cabling lengths etc., with additional capacity to support progress to units a virtual health environment and meet other ongoing changes in technology. Communication rooms are required on all floors;
- Sufficient redundancy is required to enable the adoption of emerging technologies that enhance patient care outcomes and the efficiency and effectiveness of service delivery. The selection of ICT systems and devices will enable the development of an integrated health care information and facility management system;
- Fixed duress alarms will be provided in public facing areas (for example, reception desks and some higher-risk services). Mobile duress infrastructure will be provided in designated areas as relevant;
- Nurse call infrastructure will be provided in designated clinical rooms / chairs;
- Overhead voice paging and overhead annunciation will be controlled by the main reception / switchboard;
- Wireless capability sufficient to support staff and the public in all areas of CH.

Facilities and Asset Management

The Facilities Management Section of Infrastructure and Health Support Services is responsible for the facilities management services across all CHS properties and buildings, plant and non-clinical equipment. Facilities Management is responsible for the coordination of:

- High quality and timely planned and reactive maintenance
- Technical and trade skill repairs
- Strategic asset management
- Property leasing
- Utilities
- Safety and Risk; and
- Contract management

Building services will be monitored and managed through the existing integrated information system. Services on the system include electric power, illumination, HVAC, security and access, fire alarms, lifts, other mechanical and electrical building systems.

Digital Health Record

- CH has recently adopted a Digital Health Record (DHR);
- Clinical and patient information systems are integrated to allow the easy exchange of information between services;

- The DHR will provide a consolidated view of a patient's clinical information, including discharge summaries, private imaging, and pathology;
- Patient information will be entered at the point of care. Interactive computer screens and tablets will be required in some settings to facilitate patient and staff signatures on relevant digital documentation;
- Business continuity planning will ensure there is sufficient capacity to accommodate down time procedures; and
- Workstations on wheels may be required (and appropriate storage for same) in some clinical areas.

Patient/Visitor Information

- Patient access to clinics will be supported by new technologies such as electronic notice boards, way-finding technology, Wireless internet, reminder notices for pending bookings made by SMS and email, on-line bookings, mobile telephones, and patient registration on arrival for appointments;
- ICT will be used to support self-management and health literacy and to promote healthy choices, for example health kiosks, web-based education;

E-Health/Telehealth and Audio-visual Services

- Information technology will facilitate innovative models of service delivery including telehealth/virtual consultations for patients and other service providers; biometric measurement; provision of consultative/liaison services; education and training etc.
- Opportunities for home based tele-linked consultations for patients with special needs will be developed, for example offsite family conferences with community and hospital staff utilising streaming, consultations with hospital and other health care providers in real time through streaming;
- Videoconferencing/telehealth facilities will be provided in all clinical areas to facilitate the provision of consultation services, and education and training with outreach facilities, affiliated medical practitioners, affiliated universities etc.;
- An audio-visual service will provide a range of support services within a multimedia, ICT enabled environment;
- Videoconferencing equipment will be located according to need as per to the standard health service AV provision. High-end equipment will be provided in large, centralised venues, with portable and desk-based technology to be available in other areas;
- Internet based desktop video conferencing will use Microsoft Teams-like applications;
- Patient care and clinical workspaces will require ICT connectivity to support point of care clinical documentation, results review, and access to real time patient journey information;
- Consult rooms have capability to send information directly to the patient and patient's GP by email and have access to telehealth; and
- Terminals will be investigated for clinical care and entertainment/education use by patients undergoing extended medical procedures (for example, palliative care and renal dialysis).

A1. Role Delineation

The Role Delineation for clinical services provided by Canberra Hospital were obtained from the ACT Health Services Plan; 2022 - 2030⁹²

Service	2021		
	Canberra Hospital	UCH	CPHB
Core services			
Anaesthesia and recovery	6	NPS	4
Operating Suite	6	NPS	4
Intensive Care Service	6	NPS	4
Nuclear Medicine	6	NPS	4
Radiology and Interventional Radiology	6	2	5
Pathology	6	2	5
Pharmacy	6	2	5
Emergency medicine			
Emergency Medicine	6	NPS	4
Medicine			
Acute Stroke Services	5	NPS	4
Cardiology and Interventional Cardiology	6	NPS	4
Chronic Pain Management Services	4	3	NPS
Clinical Genetics	4	NPS	NPS
Dermatology	5	NPS	3
Drug and Alcohol Services	5	NPS	1
Endocrinology	6	NPS	3
Gastroenterology	6	NPS	4
General and Acute Medicine	6	NPS	4
Geriatric Medicine	6	5	4
Haematology	6	NPS	3
Immunology	6	NPS	4
Infectious Diseases	6	2	5
Neurology	5	NPS	4

92. ACT Government, Health, *ACT Health Services Plan 2022-2030*, available <https://www.health.act.gov.au/about-our-health-system/planning-future/act-health-services-plan-2022-2030#:~:text=The%20ACT's%20population%20is%20growing,and%20effective%20care%20for%20everyone.>

Oncology — medical	6	NPS	2
Oncology — radiation	6	NPS	NPS
Palliative Care	4	NPS	2, CHH 6
Rehabilitation Medicine	2	6	2
Renal Medicine	6	NPS	2
Respiratory and Sleep Medicine	6	NPS	3
Rheumatology	5	NPS	2
Sexual Assault Services	4	NPS	1
Sexual Health	5	NPS	NPS

Surgery

Burns	4	NPS	2
Cardiothoracic Surgery	5	NPS	NPS
ENT Surgery	6	NPS	4
General Surgery	6	NPS	4
Gynaecology	6	NPS	4
Neurosurgery	6	NPS	NPS
Ophthalmology	5	NPS	3
Oral Health	6	NPS	NPS
Orthopaedic Surgery	6	NPS	4
Plastic Surgery	5	NPS	4
Urology	6	NPS	4
Vascular Surgery	6	NPS	4

Child and family health services

Maternity	6	NPS	5
Neonatal	5	NPS	3
Paediatric Medicine	5	NPS	2
Surgery for Children	4	NPS	2
Youth Health	4	NPS	NPS

Mental Health

Adult Mental Health	5	2	4
Child and Youth Mental Health	4	NPS	NPS
Older Persons Mental Health	4	NPS	4

A2. Schedule of Accommodation

Refer to the associated Schedule of Accommodation (SOA) in excel format.

A3. ACT Health Policies, Strategies and Plans

The following policies, strategies and plans are relevant to the ongoing enhancement and accessibility of pathology and other clinical services as they are developed in the new Pathology facility.

ACT Government policies, strategies and plans

- Accessible, Accountable, Sustainable: A Framework for the ACT Public Health System 2020-2030
- Healthy Canberra: ACT Preventative Health Plan 2020-2025
- ACT Health Digital Health Strategy 2019 –2029
- ACT Wellbeing Framework
- ACT Drug Strategy Action Plan 2018 –2021
- ACT Carers Strategy
- ACT Aboriginal and Torres Strait Islander Agreement 2019-2028
- ACT Climate Change Strategies 2019-2025
- ACT Women's Plan 2016-2026
- Capital of Equality Plan 2019-2020
- ACT Mental Health Strategic Plan –under development
- Other Policies, Strategies and Plans

Ongoing Territory-wide planning

- ACT Child and Adolescent Clinical Services Plan
- ACT Mental Health Services Plan
- Joint planning framework with Southern New South Wales Local Health District Planning Team
- Models of care and facility planning for Canberra Hospital Expansion Project
- Models of care and facility planning for Centenary Hospital for Women and Children expansion
- Other Specific Services Plans

Canberra Health Services planning

- Canberra Health Services' Strategic Plan, 2020 –2023
- Canberra Health Services' Clinical Services Plan 2021-2031
- Canberra Health Services: COVID-19 Recovery Roadmap 2020
- Canberra Hospital Master Plan
- Implementation and enabling plans

A4. Pathology Clinical Capability Framework

Pathology role descriptions below are for all six levels of pathology. ACT Pathology is a Level 6 pathology service.⁹³

LEVEL	SERVICE SCOPE	SERVICE REQUIREMENTS	WORKFORCE
NPS	No planned service.		
1	Blood and diagnostic specimen collecting services available.	Supported by a timely courier service to a National Association of Testing Authorities / Royal College of Pathologists of Australasia (NATA/RCPA) accredited laboratory for testing. Collection policies and procedures established by the accredited laboratory. Referral pathways to relevant Aboriginal programs and services. Compliance with the quality and safety requirements as determined by NATA and the National Pathology Accreditation Advisory Council (NPAAC)	Workforce requirements in accordance with standards and guidelines specified by the NPAAC; accredited for compliance by NATA.
2	As for Level 1. In addition, a range of urgent tests available. Tests may be performed by appropriately trained health workers using approved Point of Care Testing devices (see NSW Health PD2018_028 Managed Point of Care Testing (PoCT) Service.)	As for Level 1. In addition, comply with NSW Health PD2018_042 Blood Management.	As for Level 1.
3	As for Level 2. In addition, an accredited Category B (Branch) ¹ laboratory providing core pathology services, either on-site or through networked arrangements. Range of tests available varies according to clinical need. Will usually include basic haematology (e.g. full blood count, cross matching, blood grouping and basic coagulation), biochemistry (e.g. liver and renal function tests, electrolytes) and microbiology (e.g. urine microscopy, Gram staining)	As for Level 2. In addition, under the overall control of, with specialist scientific and clinical supervision from, an accredited laboratory. 24 hour on call access to Category G laboratory	As for Level 1.
4	As for Level 3. In addition, part of a service network providing some specialist diagnostic tests (e.g. fine needle aspiration, frozen section, bone marrow biopsy) and/or an expanded range of tests.	As for Level 3. In addition, provide an extended hours service to meet agreed clinical needs.	As for Level 1.
5	As for Level 4. In addition, accredited as Category B or G ² laboratory. Provide access to comprehensive range of pathology services, either on-site or through networked arrangements. Provide support for clinical trial and research activities. May act as 'hub' laboratory, providing diagnostic and clinical	As for Level 4. In addition, provide 24 hour access to comprehensive range of pathology services	As for Level 1.

93. <https://www.health.nsw.gov.au/services/Publications/role-delineation-of-clinical-services.PDF>.

LEVEL	SERVICE SCOPE	SERVICE REQUIREMENTS	WORKFORCE
	services for other hospitals or laboratories in the region or pathology network.		
6	As for Level 5. In addition, accredited as Category G laboratory. Provide comprehensive range of core clinical, laboratory and business support services as part of the clinical management team. Perform testing of a complex technical nature in a range of fields to support clinical services. May initiate and lead clinical trial and research activities. May operate reference laboratories and provide public health services for the State	As for Level 5	As for Level 1.

1. Category B (Branch): This category is used for a laboratory that is either: an integral part of a Category G laboratory apart from its geographic location, or a part of a regional pathology service. A Category B laboratory shall have a documented agreement with a Category G laboratory to ensure that the range of pathology tests provided and the standard of work in the laboratory is under the direction and control of a designated supervising pathologist or senior scientist of an accredited Category G laboratory⁹⁴.

2. Category G (General): These categories are used for both large and small multidiscipline or general laboratories providing comprehensive services. It is also used for limited or single discipline laboratories⁹⁵. Introduction of PoCT and specialised testing has resulted in new categories of laboratories for these sites. For further information please contact NSW Health Pathology.

94. NPAAC (2018) Requirements for Supervision in the Clinical Governance of Medical Pathology Laboratories. Fifth edition. Commonwealth of Australia, Canberra

95. NPAAC (2018) Requirements for Supervision in the Clinical Governance of Medical Pathology Laboratories. Fifth edition. Commonwealth of Australia, Canberra

A5. Anatomical Pathology Blocks and Slides Storage Weight Calculations

Blocks and Slides

Glass Slides:

- A typical glass slide weighs about 10 grams; hence,
- If storing 1,000 slides, the weight will be approximately 10 kg just for the slides.

Paraffin Blocks:

- The weight of a paraffin block will vary based on its size, but a standard tissue block can weigh between 15-30 grams; hence
- If storing 1,000 blocks, the weight will be between 15-30 kg for the blocks alone.

Storage Cabinets/Units:

- The weight of the storage solution itself (e.g., cabinets, drawers, shelving units) can vary widely based on the materials used (e.g., metal, wood) and the size of the unit:
 - ▶ A small metal cabinet may weigh between 30-50 kg; and
 - ▶ Larger, multi-drawer units designed for holding thousands of slides or blocks may weigh several hundred kilograms, even when empty.

Calculations

Given these figures, for a large storage cabinet designed to hold 10,000 slides, the slides alone might weigh 100 kg. If the cabinet itself weighs 200 kg, the combined weight could reach 300 kg.

Similarly, for a unit designed to store 10,000 blocks, the blocks might weigh between 150-300 kg. Adding the weight of the cabinet could bring this total up substantially.

A6. Walk-in Refrigerator and Freezer with Glass Doors

Features:

- Size: Walk-in Refrigerator and Freezer Units provide ample space, catering to the storage needs of a busy pathology laboratory;
- Glass Doors: these provide transparency for easy visibility of stored items without the need to open the door;
- Adjustable Shelving: many units come with adjustable shelves, allowing customisation based on storage needs;
- Temperature Monitoring: essential for maintaining reagent integrity, most modern units include digital temperature displays and alarms for deviations and will save the laboratory considerable time in monitoring and maintaining multiple refrigerators; and
- Energy-efficient Lighting: LED lighting systems provide ample illumination while being energy-efficient and producing minimal heat.

Advantages:

- Efficiency: quick visual checks without the need to open the door minimise temperature fluctuations, preserving reagent quality;
- Accessibility: larger walk-in spaces allow for better organisation, making it easier to access specific reagents, especially when in a time sensitive environment;
- Safety: glass doors ensure that users don't accidentally leave behind items that could fall or spill when the door is closed;
- Energy Conservation: being able to locate items before opening the door reduces the amount of time the door is open, conserving energy and maintaining a stable internal temperature; and
- Inventory Management: visual access simplifies inventory checks and ensures timely restocking.

Considerations:

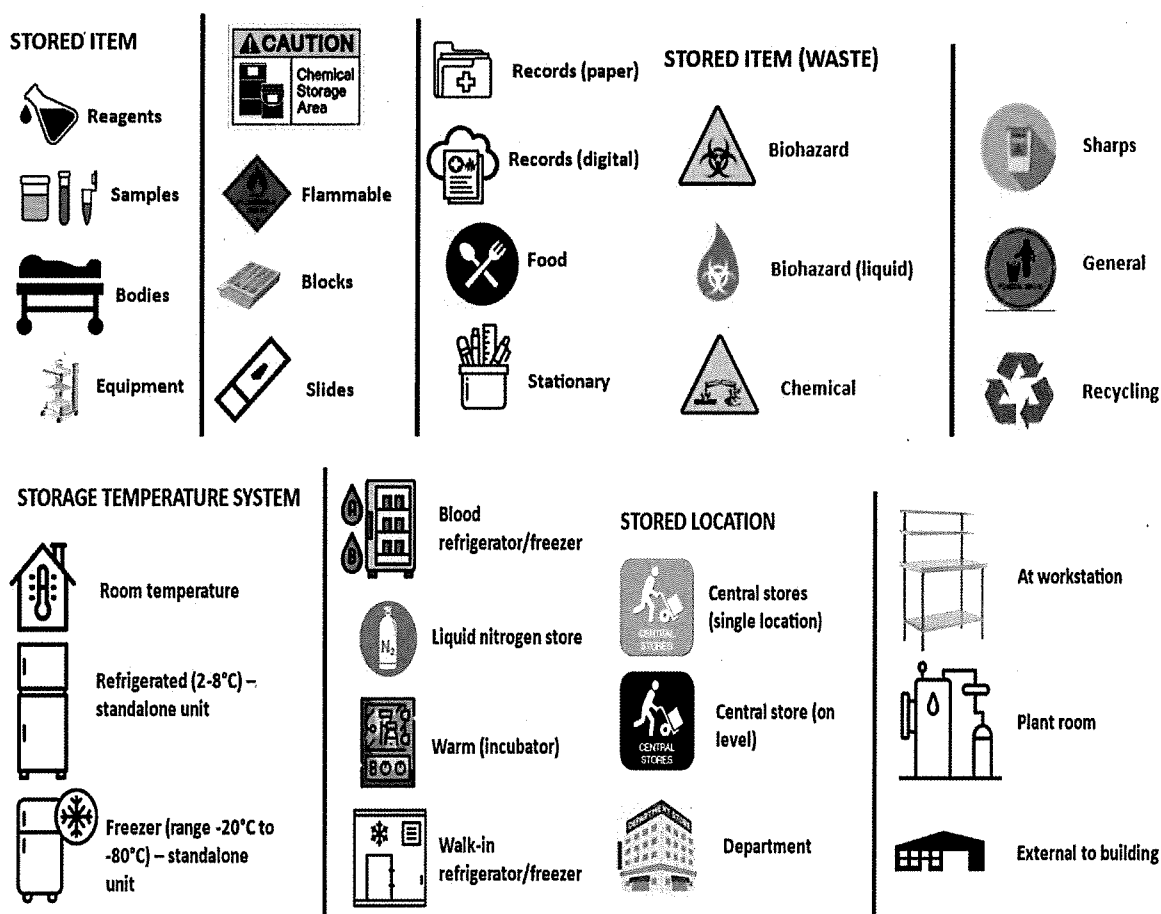
- Initial Investment: Walk-in Units with glass doors might be more expensive initially than their counterparts without doors or of smaller sizes;
- Maintenance: glass doors need regular cleaning to maintain visibility. Furthermore, the gaskets and seals of the door should be checked regularly to ensure they are in good condition to prevent temperature leakage;
- Space Requirements: ensure that the lab's design can accommodate the size of the walk-in refrigerator or freezer. There should be enough space for easy access and ventilation;
- Backup Power: given that these units store critical reagents, ensure there is a backup power solution in case of power outages;
- Temperature Uniformity: larger spaces might have temperature gradients. It's essential to regularly monitor various points in the storage area to ensure uniform temperature, especially if storing sensitive reagents; and
- Redundancy: it will be worth considering having multiple of these on each floor with testing departments in case of failure of components and scheduled maintenance.

A7. Table of Storage Categories and Icons

The following images are how storage can be categorised for each department. The stored items can be stored at one or more temperature systems, in one or more locations.

A centralised storage system could be established to handle all stock intended for laboratory departments. This central hub would offer long-term storage for bulk orders and items suitable for room temperature. Additionally, it would serve as a primary distribution centre for products requiring colder storage conditions or for smaller orders. These items could then be stored either at the central storage area on a specific floor or directly within the respective department.

Waste storage will be organised at two distinct levels in a multi-floor structure. At the workstation level, individual waste containment solutions will be tailored to the immediate needs of each specific workstation, ensuring efficient and safe waste disposal during daily operations. On the floor level, centralised waste storage areas will be designated to consolidate waste from various workstations, facilitating easier collection, segregation, and eventual disposal. This dual-level approach ensures both immediate waste management needs and broader floor-wide requirements are adequately addressed.



A8. Legislation Relating to the Retention and Disposal of Laboratory Records and Diagnostic Materials

Table A5-1: Relevant Legislations Which May Affect Retention Requirements, by Jurisdiction⁹⁶

JURISDICTION	LEGISLATION AND GUIDELINES
New South Wales	Health Practitioner Regulation (NSW) Regulation 2016 Public Health Regulation 2012 State Records Act 1998 Health Care Records – Documentation and Management (Policy Directive 2012), Document Number PD2012_069 Human Tissue Act 1983
Queensland	Queensland Health (Pathology Laboratory Records) Retention and Disposal Schedule 2006 Coroner's Act 2003 Transplantation and Anatomy Act 1979 Public Records Act 2002
Northern Territory	Northern Territory Governments Record Disposal Schedule, Medical Pathology Services, Department of Health (2017/8)
Australian Capital Territory	Health Records (Privacy and Access) Act 1997 Public Health Act 1997 Medical Treatment (Health Directions) Act 2006 Health Act 1933
Victoria	Health Services Act 1988 Public Records Act 1973
South Australia	Freedom of Information Act 1991 South Australian Health Commission Act 1976 State Records Act 1997 Transplantation and Anatomy Act 1983
Tasmania	Anatomy Examinations Act 2006 Health Act 1997 Human Tissue Act 1985 Public Health Act 1997
Western Australia	Patient Information Retention and Disposal Schedule version 4, 2014 State Records Act 2000

96. Australian Commission on Safety and Quality in Health Care, Requirements for the Retention of Laboratory Records and Diagnostic Material, Tier 3B Document, Ninth Edition 2022, available at https://www.safetyandquality.gov.au/sites/default/files/2022-04/retention_standard_ninth_edition_2022.pdf.

A9. Current Major Equipment List

Current major equipment for ACT Pathology is listed below in tables Table A9-1 to Table A9-9.

This list is generated from a combination of ACT Pathology's equipment audit (in black), and other sources including NATA accreditation documents and department walk-through.

Table A9-1: Collection Services Current Major Equipment List

CC Name	Asset No.	Asset Type	Local Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Bench or Floor
CAS EXECUTIVE	003377	REFRIGERATOR/FREEZER - PATHOLOGY	FREEZER (FZ047)		LIEBHERR MEDICAL, REFRIGERATOR	901637301	10.06.011	597 X 654 X 1884	Floor
CAS EXECUTIVE	007458	REFRIGERATOR/FREEZER - PATHOLOGY	FREEZER (F4)		WHIRLPOOL, REFRIGERATOR	NO SERIAL	10.06.011	787 X 659 X 864	Floor
CAS EXECUTIVE	523933	HEAT PLATE - PATHOLOGY	HEAT PLATE	HP-3000	LAB COMPANION, HEAT PLATE	NO SERIAL	10.06.011	140 x 190 x 105	Bench
CAS EXECUTIVE	523934	HEAT PLATE - PATHOLOGY	HEAT PLATE	HP-2000	LAB COMPANION, HEAT PLATE	NO SERIAL	10.06.011	140 x 190 x 105	Bench
CAS EXECUTIVE	523935	MIXER - PATHOLOGY	MIXER		RATEK, VORTEX MIXER	NO SERIAL	10.06.011	125 X 160 X 135	Bench
CAS EXECUTIVE	523936	CENTRIFUGE - PATHOLOGY	MINI-CENTRIFUGE	QS7000	EDWARDS GROUP, QIKSPIN MINI CENTRIFUGE QS7000	3590	10.06.011	132 X 150 X 120	Bench
CAS EXECUTIVE	523940	MIXER - PATHOLOGY	MIXER	VM1	RATEK, VORTEX MIXER VM1	S11020972	10.06.011	125 X 160 X 135	Bench
CAS EXECUTIVE	523943	MIXER - PATHOLOGY	MIXER	VORTEX GENIE	SCIENTIFIC INDUSTRIES INC, VORTEX GENIE	AN1245	10.06.011	165 x 122 x 165	Bench
CAS EXECUTIVE	523944	CENTRIFUGE - PATHOLOGY	CENTRIFUGE	MIKRO 120	HETTICH ZENTRIFUGEN, CENTRIFUGE MIKRO 120	0002878-02-00	10.06.011	231 x 292 X 199	Bench
CAS EXECUTIVE	523945	MIXER - PATHOLOGY	MIXER	MS8	RATEK, MAGNETIC STIRRER MS8	204012195	10.06.011	300 X 350 X 90	Bench
CAS EXECUTIVE	523946	ANALYSER - PATHOLOGY	ANALYSER	TRANS-BLOT	BIORAD, TRANS-BLOT TURBO TRANSFER SYSTEM	6900BR1700	10.06.011	260 X 211 X 204	Bench
CAS EXECUTIVE	523948	CENTRIFUGE - PATHOLOGY	CENTRIFUGE	MIKRO 120	HETTICH ZENTRIFUGEN, CENTRIFUGE MIKRO 120	000259-02-00	10.06.011	231 x 292 X 199	Bench
CAS EXECUTIVE	523949	INCUBATOR - PATHOLOGY	INCUBATOR	MD-02N-220	MAJOR SCIENCE, DRY BATH INCUBATOR MD-02N-220	080821021	10.06.011	298 X 200 X 88	Bench

CC Name	Asset No.	Asset Type	Local Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Bench or Floor
CAS EXECUTIVE	523950	HEAT PLATE - PATHOLOGY	HEAT PLATE	SDBH10	SELBY, SINGLE DRY BLOCK HEATER SDBH10	71296853	10.06.011	95 X 75 X 50	Bench
CAS EXECUTIVE	523951	HEAT PLATE - PATHOLOGY	HEAT PLATE	DBH10	RATEK INSTRUMENTS, DRY BLOCK HEATER DBH10	611018946	10.06.011	95 X 75 X 50	Bench
CAS EXECUTIVE	H206733	ANALYSER - PATHOLOGY	ANALYSER CYTOMETER	FACSCA NTO II	BD BIOSCIENCES, FACSCANTO II FLOW CYTOMETER	V3389620198 3	10.06.011	914 X 635 X 635	Bench
CAS EXECUTIVE	H206734	CENTRIFUGE - PATHOLOGY	CENTRIFUGE	5810 R	EPPENDORF, CENTRIFUGE 5810 R	5811AL16406 4	10.06.011	610 X 700 X 350	Bench
CAS EXECUTIVE	H205567	IMAGING SYSTEM, CHEMIDOC	IMAGING SYSTEM, CHEMIDOC	CHEMIDO C MP	BIORAD, CHEMIDOC MP, IMAGING SYSTEM	734BR6159	10.06.019	360 X 600 X 960	Bench
CAS EXECUTIVE		COURIER DATA LOGGERS							

Table A9-2: Specimen Reception Current Major Equipment List

CC Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Bench or Floor
SPECIMEN RECEPTION	UNIVERSAL 320	HETTICH, ZENTRIFUGEN UNIVERSAL 320	0006538-10	BCHC.01.01.012	401 X 695 X 346	Bench
SPECIMEN RECEPTION	1401	HETTICH ZENTRIFUGEN, UNIVERSAL 320 D-78532 1401	0000558-01-00	GCHC.01.01.141	401 X 695 X 346	Bench
SPECIMEN RECEPTION	EBA 270	HETTICH ZENTRIFUGEN, EBA 270	0008697	GCHC.01.01.141	326 x 400 x 239	Bench
SPECIMEN RECEPTION	UNIVERSAL 320	HETTICH, ZENTRIFUGEN UNIVERSAL 320	0004908-03-00	TCHC.01.01.102	401 X 695 X 346	Bench
SPECIMEN RECEPTION	UNIVERSAL 320	HETTICH, ZENTRIFUGEN UNIVERSAL 320	0000520-01-00	UCPH.01.02.148	401 X 695 X 346	Bench
SPECIMEN RECEPTION	TC50 - 860310	PHILIPS, PAGEWRITER TC50, CARDIOGRAPH	CND1942493	01.07.130	310 x 405 x 130	Bench
SPECIMEN RECEPTION	32A	HETTICH, ZENTRIFUGEN ROTOFIX 32 A	0042954-05	WCWIC.01.01.010	366 x 430 X 257	Bench
SPECIMEN RECEPTION		Lamson Tube Stations				Floor/Wall/Ceiling
SPECIMEN RECEPTION		Bactek Blood Culture System				Bench
SPECIMEN RECEPTION		PCs and Monitors (n = 15)				Bench
SPECIMEN RECEPTION		Digital Thermometers				

Table A9-3: Anatomical Pathology Current Major Equipment List

CC Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Bench or Floor	Notes
ANATOMIC PATHOLOGY	EG1150C	LEICA, ANALYSER EG1150C	11538	10.03.006	360 X 650 X 360	Bench	
ANATOMIC PATHOLOGY	HISTOCARE	LEICA, HISTOCARE SPECTRA ST	176	10.03.006	1354 x 785 x 943	Floor	
ANATOMIC PATHOLOGY		MILESTONE, BONE STATION FIXATION/DECALCIFICATION SYSTEM	141900034	10.03.006	340 X 495 X 410	Bench	
ANATOMIC PATHOLOGY	7522	ELITECHGROUP, AEROSPRAY CYTOLOGY SLIDE STAINER/ CYTOCENTRIFUGE 7522	7522200148	10.03.CYTOLOGY LAB	570 X 540 X580 (lid open)	Bench	
ANATOMIC PATHOLOGY	5810	EPENDROF, CENTRIFUGE 5810	5810IH867136	10.03.CYTOLOGY LAB	700 X 608 X 345	Bench	
ANATOMIC PATHOLOGY	5702 R	EPENDROF,5702 R CENTRIFUGE	5703CL512330	10.03.060	320 X 240 X 400	Bench	
ANATOMIC PATHOLOGY	LABOFUGE 300	HERAEUS, LABOFUGE 300 CENTRIFUGE	75003230	10.03.057	380 x 475 X 315	Bench	
ANATOMIC PATHOLOGY	UNIVERSAL 32 R	HETTICH ZENTRIFUGEN, CENTRIFUGE UNIVERSAL 32 R	3467-01-0000019	10.05.018	420 x 660 X 300	Bench	
ANATOMIC PATHOLOGY	MIKRO 20 2004	HETTICH ZENTRIFUGEN, MIKRO 20 2004 CENTRIFUGE	1033	10.03.059	281 x 553 X 260	Bench	
ANATOMIC PATHOLOGY	1050	TED PELLA, 1050 CENTRIFUGE	1050-01141	10.03.059	197 X 203 X 165	Bench	
ANATOMIC PATHOLOGY	SHANDON CYTOSPIN 4	THERMO ELECTRON CORPORATION, SHANDON CYTOSPIN 4	CY2482 0501	10.03.CYTOLOGY LAB	405 X 620 X 620	Bench	
ANATOMIC PATHOLOGY	ETNA-S-D3067	FUJITSU, CELSIUS W510	YL8B023093	10.03.057	186 X 481 X 430	Bench	
ANATOMIC PATHOLOGY	655850	LEICA, CONTROLLER FOR LEICA UC7	529779	10.03.060	est 150 X 100 X 200	Bench	
ANATOMIC PATHOLOGY	655850	LEICA, CONTROLLER FOR LEICA UC7	529776	10.03.060	est 150 X 100 X 200	Bench	
ANATOMIC PATHOLOGY	EM KMR3	LEICA, LEICA EM KMR3	531601	10.03.060	est 300 X 200 X 250	Bench	
ANATOMIC PATHOLOGY	UC7	LEICA, LEICA EM UC7	522903	10.03.060	est 400 X 500 X 400	Bench	

CC Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Bench or Floor	Notes
ANATOMIC PATHOLOGY	UC7	LEICA, ULTRAMICROTOME LEICA UC7	529904	10.03.060	est 400 X 500 X 400	Bench	
ANATOMIC PATHOLOGY	135	FISHER SCIENTIFIC COMPANY, 135	121	10.03.CYTOLOGY LAB	355 X 355 X 100	Bench	
ANATOMIC PATHOLOGY	TFB 35	MEDITE MEDIZINTECHNIK, TFB 35	9044350209	10.03.CYTOLOGY LAB	430 X 300 X 90	Bench	
ANATOMIC PATHOLOGY	TFB	THERMOLINE SCIENTIFIC, TFB FLOTATION BATH	Not Accessible	10.03.	355 X 355 X 100	Bench	
ANATOMIC PATHOLOGY	TFB	THERMOLINE SCIENTIFIC, TFB FLOTATION BATH	25434	10.03.	355 X 355 X 100	Bench	
ANATOMIC PATHOLOGY	TFB	THERMOLINE SCIENTIFIC, TFB FLOTATION BATH	54910	10.03.	355 X 355 X 100	Bench	
ANATOMIC PATHOLOGY	TFB	THERMOLINE SCIENTIFIC, TFB FLOTATION BATH	Not Accessible	10.03.	355 X 355 X 100	Bench	
ANATOMIC PATHOLOGY	TFB	THERMOLINE SCIENTIFIC, TFB FLOTATION BATH	Not Accessible	10.03.CYTOLOGY LAB	355 X 355 X 100	Bench	
ANATOMIC PATHOLOGY	5000NU	GALLAY SCIENTIFIC, 5000NU FUME CABINET	20831	10.03.CYTOLOGY LAB	1350 X 805 X 2100	Floor	
ANATOMIC PATHOLOGY	HF151	THERMOLINE SCIENTIFIC, INCUBATOR	0805L0232CE	10.05.018	est 740 x 840 x 2010	Floor	
ANATOMIC PATHOLOGY	BX53F2	OLYMPUS, EVIDENT CORPORATION, OPTICAL MICROSCOPE, BX53F2	2L54199	10.03.039	275 X 614 X 469	Bench	
ANATOMIC PATHOLOGY	BX53F2	OLYMPUS, EVIDENT CORPORATION, OPTICAL MICROSCOPE, BX53F2	2L56033	10.03.036	275 X 614 X 469	Bench	
ANATOMIC PATHOLOGY	BX53F2	OLYMPUS, EVIDENT CORPORATION, OPTICAL MICROSCOPE, BX53F2	2L56036	10.03.037	275 X 614 X 469	Bench	
ANATOMIC PATHOLOGY	AXIO IMAGER.A2	CARL ZEISS, AXIO IMAGER.A2, MICROSCOPE	3527001470	10.03.063	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO LAB.A1	CARL ZEISS, AXIO LAB.A1 MICROSCOPE	3136003351	10.03.060	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO LAB.A1	CARL ZEISS, AXIO LAB.A1 MICROSCOPE	3136003349	10.03.012	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO LAB.A1	CARL ZEISS, AXIO LAB.A1 MICROSCOPE	3136003350	10.03.012	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO PLAN 2	CARL ZEISS, AXIO PLAN 2 MICROSCOPE	233868	10.03.042	460 X 390 X 645	Bench	

CC Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Bench or Floor	Notes
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	3321001578	10.03.042	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	3323000285	10.03.037	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	3321001612	10.03.033	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	3321002214	10.03.012	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	3321001613	10.03.033	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	3321001619	10.03.042	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	3321001629	10.03.033	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	3323000302	10.03.033	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	3136003352	10.03.CYTOTOLOGY LAB	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	3321001903	10.03.012	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	3321002024	10.03.012	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	3321002023	10.03.012	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	3321002011	10.03.034	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	3321002015	10.03.042	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	3321001940	10.03.042	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	1E50395	10.03.012	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	AXIO SCOPE.A1	CARL ZEISS, AXIO SCOPE.A1 MICROSCOPE	3321002012	10.03.031	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	STANDARD 25	CARL ZEISS, STANDARD 25, MICROSCOPE	9233	10.03.031	460 X 390 X 645	Bench	
ANATOMIC PATHOLOGY	DM4000 B LED	LEICA, DM4000 B LED MICROSCOPE	405128	10.03.017	est 275 X 614 X 469	Bench	

CC Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Bench or Floor	Notes
ANATOMIC PATHOLOGY	HISTOCORE AUTOCUT	LEICA, HISTOCORE AUTOCUT ROTARY MICROTOME	1294	10.03.CYTOLOGY LAB	477 X 620 X 295	Bench	
ANATOMIC PATHOLOGY	BH2	OLYMPUS BH2 MICROSCOPE	224962	10.03.012	190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BH-2	OLYMPUS BH-2 MICROSCOPE	224962	10.03.012	190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BH2	OLYMPUS, BH2 MICROSCOPE	1329	10.03.031	190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BH-2	OLYMPUS, BH-2 MICROSCOPE	243981	10.03.042	190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BH-2	OLYMPUS, BH-2, LIGHT MICROSCOPE	235227	10.03.012	190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX41TF	OLYMPUS, BX41TF MICROSCOPE	4K11304	10.03.012	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX41TF	OLYMPUS, BX41TF MICROSCOPE	0C22868	10.03.CYTOLOGY LAB	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX41TF	OLYMPUS, BX41TF MICROSCOPE	7D08448	10.03.CYTOLOGY LAB	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX41TF	OLYMPUS, BX41TF MICROSCOPE	4J24187	10.03.033	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX46F T2	OLYMPUS, BX46F T2 MICROSCOPE	8H48160	10.03.012	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX46F T3	OLYMPUS, BX46F T3 MICROSCOPE	0K47242	10.03.012	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX46F T3	OLYMPUS, BX46F T3 MICROSCOPE	0K47243	10.03.012	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX50F	OLYMPUS, BX50F MICROSCOPE	4M00595	10.03.037	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX51TF	OLYMPUS, BX51TF MICROSCOPE	3F15727	10.03.021	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX51TRF	OLYMPUS, BX51TRF MICROSCOPE	6A15933	10.03.058	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX51TRF	OLYMPUS, BX51TRF MICROSCOPE	4F06283	10.03.058	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX53F	OLYMPUS, BX53F MICROSCOPE	3E43826	10.03.034	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX53F	OLYMPUS, BX53F MICROSCOPE	3E44007	10.03.CYTOLOGY LAB	est 190 X 380 X 277	Bench	

CC Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Bench or Floor	Notes
ANATOMIC PATHOLOGY	BX53F	OLYMPUS, BX53F MICROSCOPE	3E44005	10.03.034	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX53F	OLYMPUS, BX53F MICROSCOPE	3F44062 201306	10.03.037	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX53F2	OLYMPUS, BX53F2 MICROSCOPE	9M49990 201912	10.03.037	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX53F2	OLYMPUS, BX53F2 MICROSCOPE	9H51026 201908	10.03.020	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	BX53F2	OLYMPUS, BX53F2 MICROSCOPE	0L40974 202011	10.03.041	est 190 X 380 X 277	Bench	
ANATOMIC PATHOLOGY	CX31RBSF	OLYMPUS, CX31RBSF	9L02871	10.03.012	233 X 368 X 411	Bench	
ANATOMIC PATHOLOGY	BX53F2	OLYMPUS, DP74 CAMERA	SERIAL NOT ACCESSABLE	10.03.037			
ANATOMIC PATHOLOGY		PROSITECH, OXTL SERIES ZOOM STEREO MICROSCOPE	20151016D	10.03.059	300 X 300 X 381	Bench	
ANATOMIC PATHOLOGY	IK-HR2D	TOSHIBA, CMOS COLOR CAMERA IK-HR2D	12510004	10.03.012			
ANATOMIC PATHOLOGY	HISTOCORE AUTOCUT	LEICA, HISTOCORE AUTOCUT ROTARY MICROTOME	1334	10.03.CYTOLOGY	477 X 620 X 295	Bench	
ANATOMIC PATHOLOGY	RM 2255	LEICA, RM 2255 MOTORIZED ROTARY MICROTOME	2916/07.2008	10.03.CYTOLOGY LAB	413 X 618 X 305	Bench	
ANATOMIC PATHOLOGY	RM 2255	LEICA, RM 2255 MOTORIZED ROTARY MICROTOME	2914/07.2008	10.03.CYTOLOGY LAB	413 X 618 X 305	Bench	
ANATOMIC PATHOLOGY	RM 2255	LEICA, RM 2255 MOTORIZED ROTARY MICROTOME	2917/07.2008	10.03.CYTOLOGY LAB	413 X 618 X 305	Bench	
ANATOMIC PATHOLOGY	RM 2255	LEICA, RM 2255 MOTORIZED ROTARY MICROTOME	2913/07.2008	10.03.CYTOLOGY LAB	413 X 618 X 305	Bench	
ANATOMIC PATHOLOGY	RM 2255	LEICA, RM 2255 MOTORIZED ROTARY MICROTOME	14050338780	10.03.CYTOLOGY LAB	413 X 618 X 305	Bench	

CC Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Bench or Floor	Notes
ANATOMIC PATHOLOGY	1200	DYNAFLOW, 1200 FUME CABINET	16051-2	10.03.059	1200 x 890 x 1550	Floor	
ANATOMIC PATHOLOGY	LF 300	ARCTIKO, LF 300 BIOMEDICAL FREEZER	11.11.132	10.03.059	520 X 700 X 1997	Floor	
ANATOMIC PATHOLOGY	LF 700	ARCTIKO, LF 700 FRIDGE	42115899	10.03.CYTOTOLOGY	720 X 860 X 1997	Floor	
ANATOMIC PATHOLOGY	LR 700	ARCTIKO, LR 700 BIOMEDICAL REFRIGERATOR	29.10.9181	10.03.CYTOTOLOGY	720 X 860 X 1997	Floor	
ANATOMIC PATHOLOGY	BC-400G	LABGEAR AUSTRALIA, LABCHILL BC-400G	962002200448	10.03.059			
ANATOMIC PATHOLOGY	ECO 1.2 ABC	BIOAIR, SAFEMATE ECO 1.2 ABC	U5303	10.03.CYTOTOLOGY	1380 X 840 X 1450		
ANATOMIC PATHOLOGY	BHA-180	CLYDE-APAC, SAFETY CABINET, BHA-180	3998/1094	10.05.018	860 X 660 X 560	Bench	
ANATOMIC PATHOLOGY	THIN PREP 5000	HOLOGIC, THIN PREP 5000 PROCESSOR	U5303	10.03.CYTOTOLOGY	560 X 860 X 660	Bench	
ANATOMIC PATHOLOGY	LEICA EG 1150C-A	LEICA BIOSYSTEMS, LEICA EG 1150C-A	7725/03.2010	10.03.042	360 X 650 X 360	Bench	
ANATOMIC PATHOLOGY	DRS-2000J-D2	SAKURA, TISSUE-TEK DRS CYTOLOGY SLIDE STAINER	49310065	10.03.058	1150 x 490 x 660	Floor	
ANATOMIC PATHOLOGY	6468373001	VENTANA MEDICAL SYSTEM, SS BENCHMARK SPECIAL STAINS STAINER (ROCHE)	5110450	10.03.	508 X 630 X 1354	Floor	
ANATOMIC PATHOLOGY	AQUABATH	BARNSTEAD, LAB-LINE AQUABATH	506N0003	10.05.018	149 X 133 X 152	Bench	
ANATOMIC PATHOLOGY	Tracking system	Roche Ventana HE 600 system			1420 X 690 X 2020	Floor	645kg
ANATOMIC PATHOLOGY		Spectra Stainer			1354 X 785 X 1060 (hood open)	Floor	215kg
ANATOMIC PATHOLOGY		Elitech Aerospray PAP Stainer			570 X 540 X 580 (Lid open)	Bench	
ANATOMIC PATHOLOGY		Pixarray Imager					
ANATOMIC PATHOLOGY		Ovens					
ANATOMIC PATHOLOGY		Cassette writer					

CC Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Bench or Floor	Notes
ANATOMIC PATHOLOGY		Balances					
ANATOMIC PATHOLOGY		Embedding Centres					

Table A9-4: Chemical Pathology Current Major Equipment List

CC Name	Asset No.	Asset Type	Local Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Bench or Floor	Notes
CLINICAL CHEMISTRY	H2065 05	ANALYSER - PATHOLOGY	ALINITY PRO, SOFTWARE - GLP SYSTEMS TRACK		ABBOTT, GLP SYSTEMS TRACK, ALINITY PRO SOFTWARE	OCN02 89200	10.02.0 07	Need from lab	Floor	Part of track area
CLINICAL CHEMISTRY	H2065 00	ANALYSER - PATHOLOGY	ALIUOTER MODULE (AM) - GLP SYSTEMS TRACK, (ALIUOTER / AM)		ABBOTT, GLP SYSTEMS TRACK, ALIUOT MODULE (CM)	M04A00 0087	10.02.0 07	Need from lab	Floor	Part of track area
CLINICAL CHEMISTRY	H2065 04	ANALYSER - PATHOLOGY	AMS, SOFTWARE - GLP SYSTEMS TRACK		ABBOTT, GLP SYSTEMS TRACK, AMS SOFTWARE	OCN02 89100	10.02.0 07	Need from lab	Floor	Part of track area
CLINICAL CHEMISTRY	H2065 13	ANALYSER - PATHOLOGY	ANALYSER - GLP SYSTEMS TRACK (A078)	LIAISON XL RACK	DIASORIN, LIAISON XL RACK	221000 0409	10.02.0 07	1500 X 900 X 1500	Floor	Part of track area
CLINICAL CHEMISTRY	H2065 14	ANALYSER - PATHOLOGY	BUFFER MODULE (BM) - GLP SYSTEMS TRACK		ABBOTT, GLP SYSTEMS TRACK, BUFFER MODULE (BM)	M02A00 0185	10.02.0 07	Need from lab	Floor	Part of track area
CLINICAL CHEMISTRY	H2055 87	ANALYSER - PATHOLOGY	CENTRIFUGE MODULE (CM) - GLP SYSTEMS TRACK, (CENTRIFUGE / CM1)		ABBOTT, GLP SYSTEMS TRACK, CENTRIFUGE MODULE (CM)	M05A00 0138	10.02.0 07	Need from lab	Floor	Part of track area
CLINICAL CHEMISTRY	H2055 88	ANALYSER - PATHOLOGY	CENTRIFUGE MODULE (CM) - GLP SYSTEMS TRACK, (CENTRIFUGE / CM2)		ABBOTT, GLP SYSTEMS TRACK, CENTRIFUGE MODULE (CM)	M05A00 0136	10.02.0 07	Need from lab	Floor	Part of track area

CC Name	Asset No.	Asset Type	Local Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Benches or Floor	Notes
CLINICAL CHEMISTRY	H2055 89	ANALYSER - PATHOLOGY	DECAPPER MODULE (DM) - GLP SYSTEMS TRACK		ABBOTT, GLP SYSTEMS TRACK, DECAPPER MODULE	NO SERIAL	10.02.07	-	Floor	Part of track area
CLINICAL CHEMISTRY	H2055 85	ANALYSER - PATHOLOGY	GLP SYSTEMS TRACK	ALINITY	ABBOTT, GLP SYSTEMS TRACK, ALINITY	AAS076	10.02.07	Need from lab	Floor	Part of track area
CLINICAL CHEMISTRY	H2065 02	ANALYSER - PATHOLOGY	INPUT/OUTPUT MODULE (IOM) - GLP SYSTEMS TRACK, (IOM 2)		ABBOTT, GLP SYSTEMS TRACK, INPUT/OUTPUT MODULE (IOM)	M01A00 0215	10.02.07	Need from lab	Floor	Part of track area
CLINICAL CHEMISTRY	H2065 18	ANALYSER - PATHOLOGY	LOADER MODULE - GLP SYSTEMS TRACK		ABBOTT, GLP SYSTEMS TRACK, LOADER MODULE	M07A01 0060	10.02.07	Need from lab	Floor	Part of track area
CLINICAL CHEMISTRY	H2065 10	ANALYSER - PATHOLOGY	PEPPER MODULE 1 (C) - GLP SYSTEMS TRACK (A164)		ABBOTT, GLP SYSTEMS TRACK, PEPPER MODULE 1 (C)	AC0267 6	10.02.07	1190 X 1170 X 1340	Floor	Part of track area
CLINICAL CHEMISTRY	H2065 09	ANALYSER - PATHOLOGY	PEPPER MODULE 2 (I) - GLP SYSTEMS TRACK (A166)		ABBOTT, GLP SYSTEMS TRACK, PEPPER MODULE 2 (I)	AI20418	10.02.07	1190 X 1170 X 1340	Floor	Part of track area
CLINICAL CHEMISTRY	H2065 11	ANALYSER - PATHOLOGY	PEPPER RSM, COMPUTER - GLP SYSTEMS TRACK		ABBOTT, GLP SYSTEMS TRACK, COMPUTER	SCM20 344	10.02.07	Need from lab	Floor	Part of track area
CLINICAL CHEMISTRY	H2065 06	ANALYSER - PATHOLOGY	SALT A MODULE 1 (C) - GLP SYSTEMS TRACK (A163)		ABBOTT, GLP SYSTEMS TRACK, SALT A MODULE 1 (C)	AC0267 5	10.02.07	1190 X 1170 X 1340	Floor	Part of track area
CLINICAL CHEMISTRY	H2065 07	ANALYSER - PATHOLOGY	SALT A MODULE 2 (I) - GLP SYSTEMS TRACK (A165)		ABBOTT, GLP SYSTEMS TRACK, SALT A MODULE 2 (I)	AI20417	10.02.07	1190 X 1170 X 1340	Floor	Part of track area
CLINICAL CHEMISTRY	H2065 08	ANALYSER - PATHOLOGY	SALT A MODULE 3 (C) - GLP SYSTEMS TRACK (A162)		ABBOTT, GLP SYSTEMS TRACK, SALT A MODULE 3 (C)	AC0265 7	10.02.07	1190 X 1170 X 1340	Floor	Part of track area

CC Name	Asset No.	Asset Type	Local Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Bench or Floor	Notes
CLINICAL CHEMISTRY	H2065 03	ANALYSER - PATHOLOGY	SALT RSM, COMPUTER - GLP SYSTEMS TRACK		ABBOTT, GLP SYSTEMS TRACK, COMPUTER	SCM20196	10.02.07	Need from lab	Floor	Part of track area
CLINICAL CHEMISTRY	H2065 01	ANALYSER - PATHOLOGY	SCREWCAPPER MODULE - GLP SYSTEMS TRACK, (SCREWCAPPER / SCCM)		ABBOTT, GLP SYSTEMS TRACK, SCREWCAPPER MODULE	NO SERIAL	10.02.07	Need from lab	Floor	Part of track area
CLINICAL CHEMISTRY	H2065 17	ANALYSER - PATHOLOGY	STORAGE LEFT - GLP SYSTEMS TRACK (R062)		ABBOTT, GLP SYSTEMS TRACK, STORAGE LEFT	M13B000013	10.02.07	Need from lab	Floor	Part of track area
CLINICAL CHEMISTRY	H2065 16	ANALYSER - PATHOLOGY	STORAGE RIGHT - GLP SYSTEMS TRACK (R063)		ABBOTT, GLP SYSTEMS TRACK, STORAGE RIGHT	M13A010040	10.02.07	Need from lab	Floor	Part of track area
CLINICAL CHEMISTRY	H2055 86	ANALYSER - PATHOLOGY	TUBE ASSESSMENT MODULE (TAM) - GLP SYSTEMS TRACK, (IOM 1)		ABBOTT, GLP SYSTEMS TRACK, TUBE ASSESSMENT MODULE (TAM)	M03A000130	10.02.07	Need from lab	Floor	Part of track area
CLINICAL CHEMISTRY	N/A	UPS	UPS - Alinity	2SB2E-C09	Alinity UPS 10Kva				Bench	Part of track area
CLINICAL CHEMISTRY		Analyser		17040700	GEM 5000			330 X 416 X 472	Bench	Rapid testing area
CLINICAL CHEMISTRY		Analyser		17040701	GEM 5000			330 X 416 X 472	Bench	Rapid testing area
CLINICAL CHEMISTRY	H3004 55	ANALYSER - PATHOLOGY	ANALYSER (A134)	3400	WESCOR, CHLOROCHOK CHLORIDOMETER 3400	3400170511	10.02.07	205 X 220 X 360	Bench	
CLINICAL CHEMISTRY	H1021 02	CENTRIFUGE - PATHOLOGY	CENTRIFUGE (C005)	UNIVERSAL 320	HETTICH ZENTRIFUGEN, UNIVERSAL 320	5680100	10.02.07	395 X 520 X 346	Bench	
CLINICAL CHEMISTRY	H1021 06	CENTRIFUGE - PATHOLOGY	CENTRIFUGE (C023)	UNIVERSAL 320R	HETTICH, CENTRIFUGE UNIVERSAL 320R	000445-01-00	10.02.07	395 X 520 X 346	Bench	

CC Name	Asset No.	Asset Type	Local Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Bench or Floor	Notes
CLINICAL CHEMISTRY	H2055 82	CENTRIFUGE - PATHOLOGY	CENTRIFUGE (C065)	75003530/02	ABBOTT, CENTRIFUGE 75003530/02	220890	10.02.0 07	Need from lab	Floor	
CLINICAL CHEMISTRY	H2056 29	CENTRIFUGE - PATHOLOGY	CENTRIFUGE (C075)	MIKRO 200R	HETTICH ZENTRIFUGEN, CENTRIFUGE MIKRO 200R	000244 7-03-00	10.02.0 07	110 X 220 X 100	Bench	
CLINICAL CHEMISTRY	H2056 07	CENTRIFUGE - PATHOLOGY	CENTRIFUGE (C095)	5072	EPPENDORF, CENTRIFUGE 5702	5702DP 936447	10.02.0 07	535 X 608 X 345	Bench	
CLINICAL CHEMISTRY	H3006 70	CENTRIFUGE - PATHOLOGY	CENTRIFUGE (C109)	5072	EPPENDORF, CENTRIFUGE 5702	5702HL 146363	10.02.0 07	535 X 608 X 345	Bench	
CLINICAL CHEMISTRY	H2065 12	ANALYSER - PATHOLOGY	COBAS E411 - GLP SYSTEMS TRACK (A101)	COBAS E 411	HITACHI, COBAS E 411	1488-20	10.02.0 07	1700 X 950 X 1090 (top cover open)	Floor	
CLINICAL CHEMISTRY	H2065 21	ANALYSER - PATHOLOGY	COMPUTER FOR LCMS ANALYSER SYSTEM		DELL, OPTIPLES 7070, COMPUTER FOR MASS SPECTROMETER	Could Not Access	10.02.0 08	221 X 523 X 569 + 622 X 238 X 460 (screen)	Bench	
CLINICAL CHEMISTRY	52344 5	ANALYSER - PATHOLOGY	COMPUTER FOR SPECTROPHOTOMETER (A108)	2537-OM6	LEVOVO, THINKPAD I5 - COMPUTER FOT THERMOSCIENTIFIC NICOLET IS5	1S2537 OM6R8 G7CC7	10.02.0 08	221 X 523 X 569 + 622 X 238 X 460 (screen)	Bench	
CLINICAL CHEMISTRY	H2025 55	REFRIGERATOR/FR EEZER PATHOLOGY	FREEZER (F020)	ULUF 450	ARCTIKO, ULUF 450 ULTRA LOW TEMPERATURE FREEZER	NO SERIAL	10.02.0 07	720 x 885 x 1990	Floor	
CLINICAL CHEMISTRY	H2055 84	REFRIGERATOR/FR EEZER PATHOLOGY	FREEZER (RFJ207)	MDF-U72V	SANYO, ULTRA-LOW TEMPERATURE FREEZER, MDF-U72V	511158 95	10.02.0 07	770 X 875 X 1990	Floor	
CLINICAL CHEMISTRY	H3007 62	ANALYSER - PATHOLOGY	LCMS ANALYSER SYSTEM (A149)	LCMS-8040	SHIMADZU, LIQUID CHROMATOGRAPH MASS	O10575 6	10.02.0 08	1180 x 540 x 610	Floor	

CC Name	Asset No.	Asset Type	Local Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Benches or Floor	Notes
					SPECTROMETER SYSTEM LCMS-8040					
CLINICAL CHEMISTRY	H2025 51	REFRIGERATOR/FR EEZE-PATHOLOGY	REFRIGERATOR (CLFR13)	PR 1440	ARCTIKO, PR 1440 LAB FRIDGE	12.11.4 7.56	10.02.0 07	1370 x 682 x 1440	Floor	
CLINICAL CHEMISTRY	H2025 59	REFRIGERATOR/FR EEZER PATHOLOGY	REFRIGERATOR (D121)	PR 700	ARCTIKO, PR 700 BIOMEDICAL REFRIGERATOR	11.11.9 543	10.02.0 07	720 x 860 x 1997	Floor	
CLINICAL CHEMISTRY	H2025 52	REFRIGERATOR/FR EEZER PATHOLOGY	REFRIGERATOR (R028)	LR 700	ARCTIKO, LR 700 BIOMEDICAL REFRIGERATOR	11.11.9 537	10.02.0 07	720 x 860 x 1997	Floor	
CLINICAL CHEMISTRY	H2025 53	REFRIGERATOR/FR EEZER PATHOLOGY	REFRIGERATOR (R028)	LR 700	ARCTIKO, LR 700 BIOMEDICAL REFRIGERATOR	13.11.2 443	10.02.0 07	720 x 860 x 1997	Floor	
CLINICAL CHEMISTRY	H1003 84	SAFETY CABINET - PATHOLOGY	SAFETY CABINET (SC007)	BHA120	CLYDE APAC, FUME HOOD BHA120	396399 4	10.02.0 07	1420 X 805 X 1535	Floor	
CLINICAL CHEMISTRY	H3008 18	SAFETY CABINET - PATHOLOGY	SAFETY CABINET (SC028)	ECO 1.2 ABC	BIOAIR, SAFEMATE ECO 1.2 ABC	U4594	10.02.0 07	1075 X 795 X 1450	Floor	
CLINICAL CHEMISTRY	H3000 12	ANALYSER - PATHOLOGY	SPECTROPHOTOMETER (A104)	EVOLUTION 201	THERMO FISHER SCIENTIFIC, EVOLUTION 201 UV-VISIBLE SPECTROPHOTOMETER	5A4T14 6003	10.02.0 07	622 X 486 X 279	Bench	
CLINICAL CHEMISTRY	H3000 48	ANALYSER - PATHOLOGY	SPECTROPHOTOMETER (A108)	NICOLET IS5	THERMOSCIENTIFIC, NICOLET IS5, ID7 ATR, SPECTROPHOTOMETER	ASB150 2888	10.02.0 08	626 X 698 X 276	Bench	
CLINICAL CHEMISTRY	H2065 22	ANALYSER - PATHOLOGY	UPS FOR LCMS ANALYSER SYSTEM		ABB POWERVALUE, UPS FOR MASS SPECTROMETER	190711-966100 06	10.02.0 08	290 X 711 X 660	Bench	
CLINICAL CHEMISTRY	H2056 08	WATERBATH PATHOLOGY	WATER BATH (WB005)	18007A-1CEQ	THERMO SCIENTIFIC, LAB LINE WATER BATH	300029 772	10.02.0 07	390 X 420 X 230	Bench	

CC Name	Asset No.	Asset Type	Local Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Bench or Floor	Notes
CLINICAL CHEMISTRY		Analyser		SIL-20AC	AutoSampler ECD		Special Chemistry	260 X 500 X 415	Bench	Part of HPLC instrumentation
CLINICAL CHEMISTRY		Analyser		SIL-20AC	AutoSampler PDA		Special Chemistry	260 X 500 X 415	Bench	Part of HPLC instrumentation
CLINICAL CHEMISTRY		Analyser		CBM-20A	Communications Module		Special Chemistry	260 X 420 X 14	Bench	Part of HPLC instrumentation
CLINICAL CHEMISTRY		Analyser		DGU-20A3	Degasser ECD		Special Chemistry	260 X 420 X 72	Bench	Part of HPLC instrumentation
CLINICAL CHEMISTRY		Analyser		DGU-20A5	Degasser PDA		Special Chemistry	260 X 420 X 72	Bench	Part of HPLC instrumentation
CLINICAL CHEMISTRY		Analyser		Decade II	Detector ECD		Special Chemistry		Bench	Part of HPLC instrumentation
CLINICAL CHEMISTRY		Analyser		SPD-M20A	Detector PDA		Special Chemistry	260 X 420 X 14	Bench	Part of HPLC instrumentation
CLINICAL CHEMISTRY		Analyser		Dell	Monitor		Special Chemistry		Bench	Part of HPLC instrumentation
CLINICAL CHEMISTRY		Analyser		Dell	PC		Special Chemistry		Bench	Part of HPLC instrumentation

CC Name	Asset No.	Asset Type	Local Name	Model No.	Model Name	Serial No.	Current Location	Dimension (W X D X H mm)	Bench or Floor	Notes
CLINICAL CHEMISTRY		Analyser		p2015	Printer		Special Chemistry		Bench	Part of HPLC instrumentation
CLINICAL CHEMISTRY		Analyser		LC-20AD	Pump ECD		Special Chemistry	260 X 420 X 14	Bench	Part of HPLC instrumentation
CLINICAL CHEMISTRY		Analyser		LC-20AD	Pump PDA		Special Chemistry	260 X 420 X 14	Bench	Part of HPLC instrumentation
CLINICAL CHEMISTRY		Water tank		PA40/80	Water Tank 1		Core lab			
CLINICAL CHEMISTRY		Water tank		PA40/81	Water Tank 2		Core lab			
CLINICAL CHEMISTRY		Roller		VF3D001 800	Bacto Scilogex Roller		Core lab	160 x 280 x 85	Bench	
CLINICAL CHEMISTRY		UPS		2SB1E-CB14,15,16	Alinity UPS 20Kva		Core lab		Bench	
CLINICAL CHEMISTRY		UPS		2SB2E-CB10	Alinity UPS 6Kva		Core lab		Bench	
CLINICAL CHEMISTRY		balance		83293001 46	Ohaus balance		Core lab	201 x 317 x 303	Bench	
CLINICAL CHEMISTRY		balance		14200300 8	Shinko balance		Core lab	190 x 265 x 85	Bench	
CLINICAL CHEMISTRY		balance		AX205	Mettler Toledo balance		Core lab	195 X 484 X 292	Bench	