Modifications to

MACQUARIE UNIVERSITY PRIVATE HOSPITAL

Project Application MP 06-0172

SECTION 75W APPLICATION

Submitted to
NSW Department of Planning
On behalf of Macquarie University Private Hospital

Prepared by

Health Projects International Pty Limited
Architects and Health Facility Planners

Contact: Anne Lamb
Telephone 02 9460 4199
Facsimile 02 9460 4299
E-mail alamb@healthpi.com.au

20 September 2007

Health Projects International © HPI
Suite 1, Ground Floor,
68 Alfred Street,
Milsons Point, NSW, 2061
ACN 066 856 595
ABN 00 066 856 595

1.0 Table of Contents

2.0 Introduction

This report accompanies an application to the Minister of Planning under Section 75W of the *Environmental Planning and Assessment Act 1979 (EP&A Act)* to modify the Project Approval (MP 06-0172) granted by the Minister of Planning on 13 May 2007.

The Project approval relates to the construction of a new private hospital, in two stages, on a site (referred to as Site 2) in Macquarie University Research Park, North Ryde.

The changes proposed to the exterior of the building are;

- Addition of a single level (at level 2) to the bridge connecting the Hospital to the Specialist Centre
- Realignment of the connection point of said bridge to Specialist Centre.
- Construction in Stage 1 of the concrete slab for the extension of the operating theatres over the loading dock, originally proposed to be done as part of Stage 2. A direct consequence of this is that the substation serving the building, is required by Energy Australia to be moved so that is has direct access to a street frontage.

In addition, changes are proposed in spaces located underground which will increase the floor area, but will have no impact on the exterior of the building (ie in terms of modifications to the façade or expansion of the building footprint) as they are all located underground. They include:

- Addition of a PET Radiopharmaceutical Laboratory with an area of 420m2 (including a Cyclotron and associated infrastructure) on Basement 2
- Addition of one Radiotherapy Bunker and Brachytherapy Room and Associated Spaces on Basement 2

The addition of a Bio-Mechanical Lab with an area of 205m2 on Basement 1 will require minor modifications to the façade.

The purpose of this report is to:

- Describe the proposed modifications:
- Discuss/assess the potential environmental effects of the said modifications

This environmental assessment has been prepared by Health Projects International on behalf of Macquarie University Private Hospital, a joint venture between Dalcross Hospital and Macquarie University, the proponent of this project.

3.0 Proposed Modifications to Project Approval

3.1 Existing Consent

On 13 May 2007, the Minister of Planning approved the Project Application (MP 06-0172) for the following development on the subject site:

- *Demolition of all buildings, structures and landscaping at No. 2 Technology Place;*
- *Staged construction of an **18,709sq.m**, **208 bed, 6 storey** private at No. 3 Technology Place; including basement carpark for 218 vehicles, associated site landscaping and infrastructure works and a pedestrian bridge across Technology Place (connecting to No. 2 Technology Place);*
- *Amendments to the basement, internal layout and facade of the building approved on No. 2 Technology Place;*
  and
- *Use of the proposed building at No. 2 Technology Place as specialist consulting rooms and the like in conjunction of the private hospital constructed at No. 3 Technology Place;*

Condition A2 states that the development must be undertaken in accordance with the following plans and documentation:

Drawing No	Issue No	Title	Date
MACQ-A-PL-LOC	3	Location Plan	4 September 2006
MACQ-A-SITE	4	Location Plan	7 September 2006
MQB1-A-P-B1	8	Basement 1	14 May 2007*
MQB1-A-P-B2	7	Basement 2	14 May 2007*
MQB1-A-P-G	7	Ground	14 May 2007*
MQB1-A-P-1	7	Level 1	3 October 2006
MQB1-A-P-2	6	Level 2	3 October 2006
MQB1-A-P-3	6	Level 3	3 October 2006
MQB1-A-P-4	5	Level 4	3 October 2006
MQB1-A-P-5	7	Level 5	3 October 2006
MQB1-A-P-6	1	Level 6	3 October 2006
MQB1-A-P-R	1	Roof	3 October 2006
MQB1-A-E1	9	Elevations	14 May 2007*
MQB1-A-E2	9	Elevations	14 May 2007*
MQB1-A-S1	8	Sections	14 May 2007*
MQB1-A-S2	7	Sections	3 October 2006

* The drawings noted thus relate to a letter received on 7th June 2007, from the Department noting that conditions B4 and B21 have been satisfied.

3.2 Schedule of Proposed Amendments

The following modifications are changes proposed, which are illustrated on the attached drawings (Refer to **Appendix** 1) to the exterior of the building are;

1. Addition of a single level to the bridge connecting the Hospital to the Specialist Centre.

This modification has occurred to provide an additional access point for the Specialists, University Staff and students. The addition of the level below the currently approved bridge link will not impede traffic access in the future (emergency or construction vehicles) into the University as there will be some 8500mm clearance to the underside.

2. Realignment of the connection point of bridge to Specialist Centre.

The bridge connection to the Specialist Centre has been moved to the west due to further development in the interior planning, to accommodate the requirements of the University (Australian School of Advanced Medicine). The changes to the façade and internal layout of the Specialist Centre (LDA 676/2001) will be the subject of a separate Section 96 application to Ryde Council.

3. Construction in Stage 1 of the concrete slab for the extension of the operating theatres over the loading dock, originally proposed to be done as part of Stage 2.

The proponent wishes to bring forward the construction of the concrete support structure for the additional 4 operating suites on Level 1, as it will have less impact on the day to day running of the loading dock in the future.
A direct consequence of this is that the substation serving the building, is required by Energy Australia to be moved so that is has direct access to a street frontage.(Innovation Drive).
This in turn, has required the movement of the access to the loading dock from Research Park Drive to Innovation Drive and the placement of the Electrical Substation adjacent to the substation (formerly located on Basement 1)
The construction of the shell of the future fire stair which will provide fire egress for the additional 4 operating suites.

4. Addition of a PET Radiopharmaceutical Laboratory on Basement 2.

The proponents wish to locate a Radiopharmaceutical Laboratory (including the Cyclotron and associated infrastructure) with an area of 420m2 in Basement 2 of the Hospital. A detailed brief on this facility and its operation is contained in Appendix 3.

As the proposed facility is located underground it will have no impact on the exterior of the building (ie in terms of modifications to the façade or expansion of the building footprint) but will increase the floor area.

5. Addition of Bio-Mechanical Laboratory on Basement 1.

The laboratory with an area of 205m2, will be located in space previously designated as Plant. Further development of the design has shown that this area is no longer required for services so it has become available for other uses. As the space is adjacent to the external wall facing Talavera Road, its use as a laboratory space has been considered. The primary objective of the Laboratory is to understand successful implants and assess failures through implant retrieval analysis and improve new designs.

A detailed brief on this facility and its operation is contained in Appendix 4.

As the proposed laboratory is located within the existing building envelope it will not expand of the building footprint but will increase the gross floor area and require some modifications to the façade, ie

- changing existing openings from louvers to glazing
- moving existing fire exit to the north along the eastern wall
- moving existing Gas meter and Fire Hydrant booster to the south along the eastern wall

6. Addition of one Radiotherapy and one Brachytherapy Bunker and Associated Spaces on Basement 2

Due to interest generated by the facility, it is proposed to add another Radiotherapy bunker, plus a room for Brachytherapy including associated infrastructure on Basement Level 2.

As the proposed facilities are located underground within the existing building envelop, they will have no impact on the exterior of the building (ie in terms of modifications to the façade or expansion of the building footprint) but will increase the floor area.

The impact of all the proposed changes on the Gross Floor Area at the completion of Stage 2, and Floor Space Ratio calculations are summarised in the following table:

Floor Level	Stage 1 GFA m2 (As approved)	Stage 1 GFA m2 (As amended)	Difference	Stage 2 GFA m2 (As approved)	Stage 2 GFA m2 (As amended)	Difference
Basement B1	130.5	338.4	+207.9	130.5	338.4	+207.9
Basement B2	894	1654.5	+760.5	894	1654.5	+760.5
Ground	4192	4197	+5	4192	4197	+5
Level 1	4442.5	4264	-178.5	5021.5	4871	-150.5
Level 2	1782	1882	+100	1782	1882	+100
Level 3	2230	2183	-47	2230	2183	-47
Level 4	2230	2183	-47	2230	2183	-47
Level 5	0	0	0	2230	2183	-47
Totals	15,901	16,701.9	+800.9	18,709	19,491.9	+781.9
FSR	**1.69**	**1.78**		**1.99**	**2.07**	

The floor space ratio is just outside the allowable 2:1 of Ryde Councils Draft DCP 55.

4.0 Assessment of Modifications

4.1 Section 75W Modification of Ministers Approval

Under Section 75W of the *Environmental Planning and Assessment Act 1979 (EP&A Act)* a proponent may request the Minister to modify the Project Approval.
Modification of an approval means changing the terms of the Ministers approval, including:

a) revoking or varying a condition of the approval or imposing an additional condition of the approval, and
b) changing the terms of any determination made by the Minster under Division 3 in connection with the approval

4.2 Environmental Planning Instruments and Development Control Plans

This sections deals with compliance under the Act, specifically with

- Compliance with relevant planning instruments
- Consistency with major planning policies including the Metropolitan Strategy
- Potential social, environmental and economic issues including traffic stormwater, Building Code of Australia and access

The proposal complies with all relevant environmental planning instruments.

4.2.1 **Metropolitan Strategy**

The proposed changes to the development remain consistent with the aims of the Metropolitan Strategy, including -
A2.1.1 Highlights the need to increase opportunities for innovation and skills development. The development of hospitals and research institutions are key magnet infrastructure that will promote the goals of innovation and skills development.
The MUPH project clearly has the potential to act as a focus to generate growth in the surrounding areas, and the proposed synergy with Macquarie University will accommodate skills development.

A2.3.1 Identifies “magnet infrastructure” including research and medical knowledge infrastructure.
The Metro Strategy clearly identifies the MUPH project as “magnet infrastructure” with the potential to drive investment in research and medical knowledge, therefore reinforcing Macquarie Park as a specialized centre.

4.2.2 **Impacts on other similar developments**

The proposed development will offer services, currently unavailable in NSW/Australia. The proposed changes to the development will have positive impacts, by way of providing additional medical facilities and services, reducing the pressure on existing facilities throughout NSW and provide ancillary services in the new private teaching hospital.

4.2.3 **Planning Scheme Ordinance 1979 (Ryde PSO 1979)**

The site is currently zoned Business Special (Research and Development) 3(h) under the Ryde PSO 1979. The proposed changes to the development are permissible with consent.

The site has a maximum FSR of 2:1. The proposed development will have an FSR of approximately 2.07:1. The proposed development will exceed the control, but as the majority of additional space is located underground, and will not substantially alter the approved building footprint, is it considered to be acceptable.

4.2.4 **City of Ryde Development Control Plan 2006**

The development is subject to the City of Ryde DCP (2006) which includes controls on:

- Waste minimisation and waste management;
- Car parking;
- Access for people with disabilities;
- Storm water management and disposal; and
- Energy and water efficiency.

It is considered that the proposed modifications to the hospital provide additional services that are consistent with the above controls.

4.2.5 **Draft DCP No. 55 - Macquarie Park Corridor**

The Draft DCP 55 sets a six storey height limit on this area of the Macquarie University precinct. The proposed modifications do not increase the building height.

4.2.6 **Environmental Impacts**

There will be acceptable environmental impacts associated with the proposed modifications to the building and it is considered that the proposal will not result in any other environmental impacts over and above those relating to the approved development.

Suitability of the site

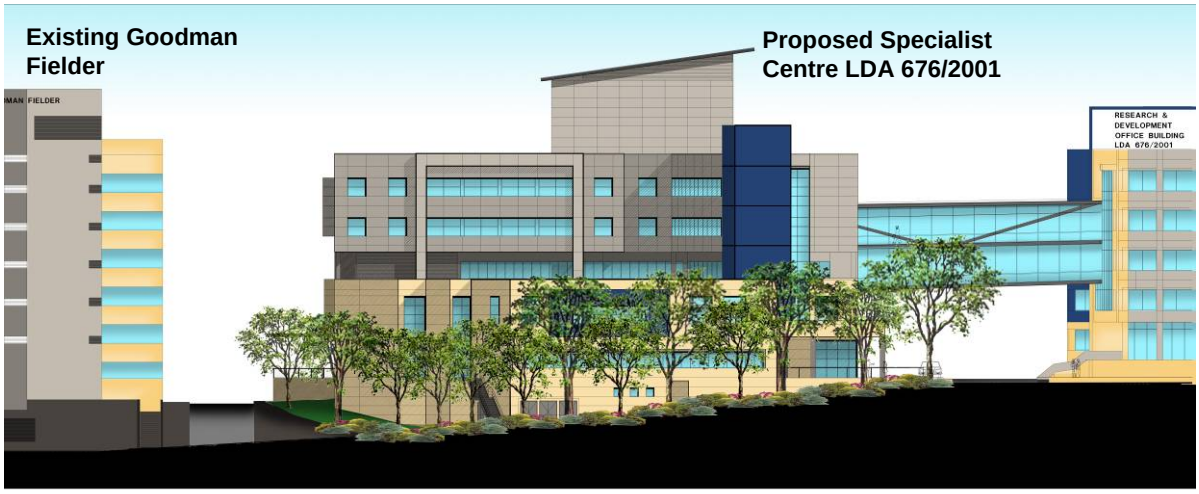
The proposed modifications to the development will not alter the suitability of the hospital for the site, rather it will offer improved operational benefits.

Visual impact

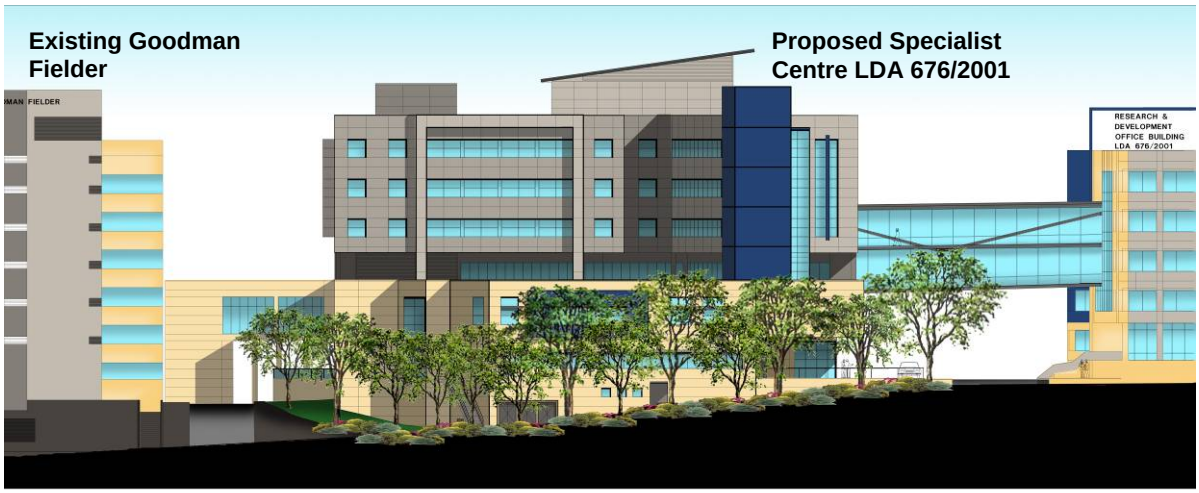
As most of the proposed changes occur in basement spaces located underground they will not have any impact on views over and above those relating to the approved development.

Those occurring above ground such as the enclosure of the loading dock, and the proposed new location of the substation will have limited impact on regional views, as it will be obscured by existing buildings. These proposed changes have the added benefit of screening the loading dock and its activities from the view of adjacent buildings.

The impact of the two storey bridge link will be mitigated by treating it as light and transparent structure that spans the road rather than a solid panel wall that dominates the roadway under and blocks viewing lines along Technology Place.



Streetscape Stage 1



Streetscape Stage 2

Height, scale and bulk
The proposed modifications do not increase the building height, bulk, or scale as most of the proposed changes occur in basement spaces located underground or within the existing envelope.

The public interest
The proposed modifications to the development will have negligible environmental impacts and will not significantly alter the nature of the development. Most will not be visible to those passing the site, but will have added benefits in terms of the provision of services and are therefore considered in the public interest.

Traffic and Car Parking
The traffic and carparking generated by the proposed modifications will not be significant as there will be no additional patient numbers and minimal extra staff due to the new services. The current approval requires that the parking numbers do not exceed 218 spaces. The proposed modification will not reduce his number.

BCA Compliance
The proposed modifications have been checked against BCA and are capable of compliance. The development will be privately certified for BCA compliance. The package of documentation forming the Construction Certificate (CC) will demonstrate full BCA compliance.

Impact on the environment
All tissues and devices tested in the Biometric Laboratory will be handled in accordance to occupational health and safety (OH&S) guidelines, ASTM F6+2 retrieval protocols, Australian Quarantine guidelines and Organization for Standardization (ISO) standards.

The clinical research facility will follow the Australian Therapeutic Goods Administration (TGA) regulations and Good Clinical Practice/International Conference Harmonisation guidelines.

The Cyclotron and Radiopharmacutical Laboratory will comply with relevant State legislation, regulations and statutory requirements. Plans and specifications of the facility will be assessed for radiation protection by a certified physicist or other suitably qualified expert as required by the Australian Radiation and Nuclear Safety Agency. The assessment will specify the type, location and amount of protection required according to the final selection and layout, and this will be incorporated into the building.

During operation of the facility, RANZCR/NATA Standards and Occupational Health and Safety Standards will be in use to monitor staff safety, including but not limited to;

- Use of Lead aprons
- Lead screening
- Badges are worn and regularly monitored.
- Limitation of exposure time

Solar access and overshadowing
The current shadow analysis diagrams have been checked against the proposed modifications and have shown that the extent of shading is minor compared to when the wards are completed on Level 5 in Stage 2 and accordingly the proposal will not have any negative impact in the short term as a result of overshadowing.

5.0 Conclusion

The proposal to modify the Project Approval for Macquarie University Private Hospital has been assessed in accordance with relevant requirements of Section 75W of the EP&A Act.

The assessment of the proposal has demonstrated that the proposed modifications are consistent with the objectives of planning instruments and supports the Sydney Metropolitan Strategy. The primary objective of the modifications is to enhance the services currently proposed to be provided on site.

It is considered that the proposed modifications;

- are consistent with planning controls relating to the site
- will not result in environmental impacts over and above the those relating to the existing approved development
- result in positive social environmental and economic benefits
- will complement teaching and research services already proposed at the University adjacent

6.0 Appendix 1 - Design Drawings

Three sets of plans have been enclosed showing the design changes to the existing Project Application:

6.1 Stage 1 Changes

These changes are highlighted on the following drawings and include but are not limited to those noted below:

Drawing No	Issue No	Title	Proposed changes
MQB1-A-P-B1	9	Basement 1	▪ Addition of Bio-Mechanical Lab ▪ End trip toilets/ showers as required by Condition B22 of Approval ▪ Redistribution of parking spaces due to additional bunker
MQB1-A-P-B2	8	Basement 2	▪ Addition of a PET Radiopharmaceutical Laboratory (including a Cyclotron and associated infrastructure) ▪ Addition of one Radiotherapy Bunker and Brachytherapy Room and Associated Spaces
MQB1-A-P-G	8	Ground	▪ Construction of the concrete slab for the extension of the operating theatres over the loading dock, originally proposed to be done as part of Stage 2. ▪ Substation moved to Innovation Drive street frontage. ▪ Access to loading dock moved to Research Park Drive
MQB1-A-P-1	8	Level 1	Construction of the concrete slab for the future extension of the operating theatres
MQB1-A-P-2	7	Level 2	Additional level to bridge link and realignment of the connection point of bridge to Specialist Centre on Site 2.
MQB1-A-P-3	7	Level 3	Realignment of the connection point of bridge to Specialist Centre on Site 2.
MQB1-A-P-4	5	Level 4	Realignment of the connection point of bridge to Specialist Centre on Site 2.

Drawing No	Issue No	Title	Proposed changes cont
MQB1-A-E1	10	Elevations	▪ Construction of the concrete slab for the extension of the operating theatres over the loading dock, originally proposed to be done as part of Stage 2. ▪ Substation moved to Innovation Drive street frontage. ▪ Access to loading dock moved to Research Park Drive
MQB1-A-E2	9	Elevations	Additional level to bridge link and realignment of the connection point of bridge to Specialist Centre
MQB1-A-S1	8	Sections	▪ Addition of Bio-Mechanical Lab ▪ Additional level to bridge link
MQB1-A-S2	7	Sections	Additional level to bridge link

6.2 Stage 2 Changes

Drawing No	Issue No	Title	Proposed changes
MQB2-A-P-G	3	Ground	▪ Substation moved to Innovation Drive street frontage. ▪ Access to loading dock moved to Research Park Drive
MQB2-A-P-1	2	Level 1	Substation moved to Innovation Drive street frontage.
MQB2-A-P-2	2	Level 2	Additional level to bridge link and realignment of the connection point of bridge to Specialist Centre on Site 2.
MQB2-A-E1	3	Elevations	▪ Substation moved to Innovation Drive street frontage. ▪ Additional level to bridge link and realignment of the connection point of bridge to Specialist Centre
MQB2-A-E2	3	Elevations	Additional level to bridge link and realignment of the connection point of bridge to Specialist Centre
MQB2-A-S1	3	Sections	▪ Addition of Bio-Mechanical Lab and Radio Pharmacy ▪ Additional level to bridge link
MQB2-A-S2	2	Sections	Additional level to bridge link

7.0 Appendix 2 – PET Radiopharmacy Brief

Macquarie University Private Hospital PET Radiopharmacy

Introduction

The aim is to locate the facility (including the Cyclotron) within the confines of Macquarie University Private Hospital so that the researchers, specialists in various medical fields and nuclear medicine practitioners can maximize the benefits associated a cyclotron located next to an imaging centre, particularly as it allows researchers and physicians alike to capitalize on a cyclotron's ability to produce short-lived imaging radioisotopes such as Carbon 11, Oxygen 15 and Nitrogen 13 in addition to the primary agent FDG. Additional benefits will be gained from accessing the pool of intellectual excellence located at the new Macquarie University Private Hospital in terms of ongoing research, as well as the provision of cutting edge medicine.

Carbon 11 is the PET (positron emission tomography) radioisotope of choice to evaluate targeting molecular entities. It is a radioisotope that is chemically identical to components of biologically active molecules under evaluation as targeting agents. Its production and incorporation into PET molecules will provide the basis for future products. It is currently used for labeling molecules to evaluate their biodistributions by research scientists and clinicians.

The facilities and scientific capabilities will be available to researchers, collaborate in the investigational studies to evaluate new moieties (it means a half or portion/share/part) for PET imaging during off-production hours. This will, in turn, attract the collaboration of an elite group of researchers, foster discovery and publications, and lead to the commercialization of new specific disease targeting products.

However, to achieve this goal the cyclotron must be within close proximity to the PET imaging facilities (currently located on the ground floor). Carbon-11 has a half-life of 20.3 minutes. That is, half of the produced radioactivity disappears every 20.3 minutes (1/2 after 20.3 minutes, ¼ after 40.6 minutes etc.). Its production, incorporation into the moieties under research, its injection into patients, and image acquisition must be accomplished within less than 2 to 3 half lives to obtain useful biodistribution data of the molecules under investigation.

The proposed PET Radiopharmcy will consist of a cyclotron and GMP compliant production laboratories.

The major market for PET is currently in the diagnosis and staging of cancer patients. In particular, lung, colon, breast, cervical, prostate, head and neck, lymphoma, melanoma, and oesophageal cancers are the prime diagnostic targets. The primary targeting radiopharmaceutical currently used is a radiolabelled glucose called Fluoro-Deoxy Glucose (FDG) and the attached radiolabel is Fluorine-18. The growth of PET procedures is expected to continue. Although the prominent focus of PET is still oncology, applications in cardiology and neurology are increasing.

Since FDG is a radiopharmaceutical, its production must be compliant with the related Therapeutic Goods Administration (TGA) requirements for Good Manufacturing Practice (GMP).

New PET radiopharmaceuticals and molecular targeting agents that will measure biochemical processes to assess patient response to therapy by measuring cellular response to therapy rather than metabolism are under investigation and in the pipeline. Their commercialization will aid in the treatment, monitoring and therapy planning for breast cancer, prostate cancer, brain cancer, bone cancer and other common cancers. Furthermore, as the availability of PET increases and its capabilities become more viable to referring physicians, its applications in oncology, cardiology, and neurology are also expected to increase.

Cyclotron

The Cyclotron is an electric/electronic device used to manufacture the radiolabel – Floruine-18. This is achieved by introducing into the device hydrogen atoms which are then accelerated to a very high velocity using high frequency (radio frequency) electrical fields along an increasing circular path in a very high vacuum. The accelerated hydrogen atoms are then extracted from the device and made to impinge on a special target of Oxygen to produce the Fluorine-18. Placing the device within a concrete enclosure provides sufficient shielding to protect the operator.

The Flourine-18 is then transported to the GMP-compliant production laboratory where it is incorporated into the Deoxy Glucose molecule to make FDG. The finished product is assessed for quality and sterility in the quality control laboratory prior to shipment to the end user.

Functional Requirements
The spatial relationships are critical in the planning of the Unit to ensure that functionality is achieved and occupational health and safety issues are met.

A Cyclotron is proposed and this will require a “bunker” with concrete walls and ceiling of approximately 2.1 m thick. The clear floor to ceiling measurement should be no less than 2.7 m.

An anti room or technical room is required adjacent to the Cyclotron room to accommodate equipment and to allow for the removal of the entrance “block”. This space should be accessible for the removal, if necessary, of the Cyclotron in the future.

The quality control and production rooms should be adjacent to the Cyclotron and the store should be adjacent to the production room.

Access into the store room and production should be via airlocks.

Airlock access is also required to enter the Unit and to access the packing and dispatch area.

Office Accommodation is required for up to 4 persons.

Two laboratory spaces (hot cells, GMP) are required for further quality control and research and development purposes (perhaps a third laboratory space is required for the production of Carbon II).

To operate the PET radiopharmacy will require 150A 3 phase 50 Hz standard power supply at a minimum. The installation of a transformer may vary depending on each cyclotron manufactures specifications.

8.0 Appendix 3 – Biomechanical Laboratory Brief

Macquarie University Private Hospital Biometrics Research Laboratory

Introduction

The goal of the Macquarie Biomechanics Laboratory is to elevate the current high standard of patient care and introduce orthopaedic excellence for the Macquarie Biomechanics Laboratory through research and improvement of implants and patient outcomes.

In 2004 there were 3.4 million Australians living with arthritis. This represents approximately 16.7% of the population. Overall prevalence is expected to increase further over time due to Australia's ageing population. By 2020, one in five Australians (20%) will have arthritis in some form, while every one in ten Australians will have osteoarthritis (Access Economics Report, 2005).

Normal ambulation (movement/load) produces an elastic deformation of bone and this produces dynamic equilibrium between activity of the osteoblasts (bone deposition) and osteoclasts (bone reabsorption) (Bombelli, 1983). When this equilibrium shifts, the result is degradation and change in the joint's biomechanical behavior. It produces a cascade of biochemical events that ensures joint degradation or Osteoarthritis.

Due to the complex cascade of biochemical events a cure for degenerative joint disease has not been found. The cost to the community and to individuals is enormous. The costs range from social, emotional and financial. The individual symptoms can cost the patient in the physical sense including pain, stiffness, increase in weight, increase in heart disease and depression. The current treatment for Osteoarthritis usually includes several months of conservative management followed by joint replacement.

Joint replacement is successful in reducing pain and improving mobility for the patient with debilitating arthritis. The problem with joint replacement is that technology has not allowed a joint replacement to last longer than, on average, 15 years. The Australian and New Zealand joint implant industry was approximately $480 million in 2006, this equates to approximately 65,000 joint replacements.

The ability to produce long-term in vivo performance of implants is of vital interest. By focusing on improvements in joint replacement design and retrieval analysis on failed implants, this laboratory will be vital in the coordination of research projects and providing training for future Orthopaedic consultants in the nuances of highly effective basic science and clinical research.

The primary objective is to understand successful implants and assess failures through implant retrieval analysis and improve new designs.

Other objectives for the Macquarie Biomechanics Laboratory are:

To provide retrieval analysis for failed implants.

a. Provide extensive analysis of the failed implant using wear and histology analysis techniques.
b. All tissues and devices will be handled in accordance to occupational health and safety (OH&S) guidelines, ASTM F6+2 retrieval protocols, Australian Quarantine guidelines and Organization for Standardization (ISO) standards.

To provide a biomedical, biomechanical and clinical research facility for orthopaedic surgeons to explore clinical research projects.

a. Provide a clinical research facility that follows the Australian Therapeutic Goods Administration (TGA) regulations and Good Clinical Practice/International Conference Harmonisation guidelines.
b. Provide an expert facility to nurture new clinical research projects.
c. Provide clinical outcome feed back for the Macquarie hospital for their Orthopaedic patient population.

To provide education programs for visiting orthopaedic registrars and fellows.

a. Providing education programs for registrars/fellows on how to become a successful clinical researcher.
b. Provide support for the registrars/fellows on manuscript writing and publishing.
c. Provide training on presentation of scientific data.

Implant and tissue retrieval analysis.

a. *Histology* – Particle analysis, soft tissue response, bone analysis, bone implant interfaces.
b. *Wear* – bearing surfaces
c. Biomechanical testing
d. Fracture analysis

X-ray analysis

a. *Clinical review* – fellows
b. *Martel software* – wear, implant position
c. *RSA (radiosteremetric analysis)*
d. CAD based fluoroscopic kinematic analysis.

Clinical trials

Phase 4 Postmarket – patient outcome (new implants)