

Project Planning Report
for the
Centre for Biological Timing & Cognition
Department of Psychology
Faculty of Arts & Science

Prepared by:
Campus & Facilities Planning
November 29, 2004

Project Planning Report Centre for Biological Timing and Cognition

I. Committee Membership

The Project Committee for the Centre for Biological Timing and Cognition was comprised of the following individuals:

Elizabeth Sisam (Chair)	Director, Campus & Facilities Planning, Office of the Vice-Provost, Space and Facilities Planning
Prof. Lynn Hasher,	Chair, Department of Psychology
Prof. Martin R. Ralph	Professor, Department of Psychology
Dominic Packer	Graduate Student, Department of Psychology
Frieda Chan	Departmental Manager, Department of Psychology
Prof. Melanie Woodin	Professor, Department of Zoology
Arij Al Chawaf	Graduate Student, Department of Zoology
Marie Branker	Administrative Officer, Department of Zoology
Adrienne De Francesco	Director (Interim), Planning and Infrastructure, Faculty of Arts and Science
Dr. George M. Harapa	University Veterinarian, Office of Vice-President of Research and Associate Provost
Judith Chadwick	Director, Government Research Infrastructure Programs, Office of Vice-President of Research and Associate Provost
Ron Swail	Assistant Vice-President (Interim), Facilities and Services
Eugene Siciunas	Director, Computer and Networking Services, University Computing
Julian Binks	Manager, Projects Planning, Department of Capital Projects
William Yasui	Senior Facilities Planner, Campus and Facilities Planning

II. Terms of Reference

The Project Committee was chaired by Elizabeth Sisam, Director of Campus and Facilities Planning, and was charged with the following terms of reference:

1. Determine a functional layout and the space requirements for the Centre for Biological Timing and Cognition.
2. Make recommendations regarding the location of the Centre and review options for the rodent colony and related support space including the use of the existing and expanded (CCBR) facilities at the Division of Comparative Medicine. Specifically recommend that Dr. Richard Renlund, Director, Division of Comparative Medicine, be invited to provide the appropriate input to the Committee.
3. Respond to the requirements set out in the application to the Canada Foundation for Innovation and any conditions of the award.
4. Determine a detailed space program for the entire Department of Psychology taking into account Council of Ontario Universities' and the University of Toronto's space standards.
5. Identify the capital cost of construction, including renovations, data and communications requirements and the cost of all equipment and furnishings for the Centre and separately for

the Department of Psychology if it is possible to locate the entire Department in close proximity to the Centre.

6. Identify all operating costs for the facility and also any operating costs associated with the possible relocation of the Department of Psychology.
7. Identify all security and occupational health and safety requirements and their related costs.
8. Identify deferred maintenance issues that could impact the project and possible additional sources of funding that could address these particular issues.
9. Identify all communication and computer networks & interfaces that are required by the Department of Psychology and the Centre for Biological Timing and Cognition.
10. Identify all proposed sources of funding.
11. Report by December 30, 2004.

III. Background Information

In 2003, researchers from the Department of Psychology, together with the Toronto Hospital (Western Division), the Centre for Addiction and Mental Health (CAMH), the Peel District School Board, Trent University and Lakehead University, submitted a grant application to the Canada Foundation for Innovation (CFI) requesting funding for research to investigate the impacts of biological timing, environmental cycles, and work schedules on cognitive ability and mental health. The application for a new Centre for Biological Timing and Cognition (CBTC) was successful and notification was provided to the University in March, 2004.

This CFI application requested grant funding for the construction of new facilities to accommodate a rodent colony, testing and observation facilities with human and animal test subjects, research laboratories and associated support facilities.

At the time of CFI submission, a location on the south side of the Ramsay Wright Zoological Laboratories (072) was proposed as a suitable construction site. Since the CFI award was announced, alternate sites were suggested for consideration. The sites included the unfinished floors of the Centre for Cellular and Biomolecular Research (CCBR) along with the use of animal facilities within the Division of Comparative Medicine, and the F. Norman Hughes Pharmacy Building together with 1 Spadina Crescent. These locations required further detailed investigation in the broader Faculty of Arts and Science, and University context with respect to their suitability.

During this period of time, funding became available to complete the remaining floors of the CCBR and the Centre's space allocation plan will now include these additional finished floor levels. This development eliminated the possibility of using the CCBR facilities to accommodate the CBTC within this location.

Upon reviewing the F. Norman Hughes Building location, it was found that the entire Department of Psychology could not be accommodated on this site without a major addition. To fully use the site (Site 18) the workshop and delivery area of 215 Huron Street would have to be relocated, causing the project costs and timing to increase. It was agreed that the Ramsay Wright Building together with space at Sidney Smith Hall would best suit the requirements of the Department of Psychology and allow for full consolidation in the long-term.

The Project Committee also explored whether these alternate sites could accommodate the entire Department of Psychology and consolidate all departmental activities within a single location. Currently, the Department of Psychology is accommodated in Sidney Smith Hall (033), Ramsay Wright Zoological Laboratories (072), and 1 Spadina Crescent (034).

IV. Statement of Academic Plan

Researchers within the Centre for Biological Timing and Cognition (CBTC) will integrate studies of the neural mechanisms underlying cognition and rhythmicity with the application of research findings to human situations. A major research issue of the CBTC will be the impact of work and social schedules on education and achievement in Northern communities with a focus on the needs of aboriginal peoples.

The CBTC will concentrate in four main areas of research:

- ◆ *Neural Basis of Temporal Organization and Learning*; studies of the molecular and neural underpinnings of circadian rhythms, learning, memory and performance; the impact of sleep and rhythm disturbance on these cognitive processes;
- ◆ *Rhythms, Cognition, and Achievement*; study the impact on performance and achievement caused either by rhythm disruption or by mismatches between circadian rhythms, environmental cycles, and rhythms of society (for example, school schedules, shift work, etc.);
- ◆ *Sleep, Cognition, and Mental Health*; study the effects of disturbed circadian rhythms on impairment of mental and physical health including seasonal affective disorder, depression, heart disease, Alzheimer's Disease, and insomnia.
- ◆ *Impact on the Northern Environment*; study the effects of rhythm and sleep disturbances of life in the North, with the cultural needs of aboriginal peoples.

Although the focus of this Planning Report is the accommodation of CBTC's activities at the University of Toronto, the CBTC will also have research facilities located at Trent University, Lakehead University, the Nunavut Cognitive Assessment Facility in Iqaluit, Nunavut, the Sleep and Cognition Facility at the Toronto Hospital (Western Division), the Gene Discovery Laboratory at the Centre for Addiction and Mental Health, and the Cognitive Assessment Facility of the Peel District School Board.

V. Space Program

Existing Space Allocation

Currently, the Department of Psychology is accommodated in three buildings on the St. George Campus. The department is based in Sidney Smith Hall (033) with satellite facilities in 1 Spadina Crescent (054), and the Ramsay Wright Zoological Laboratories (072).

The Department has a total space allocation of 4,540 net assignable square metres (NASM) that is distributed as follows:

Sidney Smith Hall (033)		
o Sub-basement (Level B2)	657	nasm
o Basement (Level B1)	1,594	nasm
o Fourth Floor (Level 04)	596	nasm
o Fifth Floor (Level 05)	186	nasm
Building Subtotal	3,033	nasm

1 Spadina Crescent (054)		
o Basement Floor	157	nasm
o First Floor	290	nasm
o Second Floor	306	nasm
o Third Floor	437	nasm
Building Subtotal	1,190	nasm
Ramsay Wright Zoological Laboratories (072)		
o Basement Floor	146	nasm
o Third Floor	172	nasm
Building Subtotal	318	nasm
Total Departmental Allocation	4,541	nasm

Within the basement and first floor holdings in 1 Spadina Crescent, an animal care facility (of approximately 251 nasm) for mixed species is maintained by the Department. As well, the department has another allocation of 146 nasm on the basement level of Ramsay Wright within the Department of Zoology's Animal Care Facility.

Currently, Psychology researchers associated with the new CBTC are accommodated within the Department's existing space inventory. The CFI proposal includes the construction of new clinical and animal research laboratories, testing and observation suites, research support facilities, and an animal care facility. These new facilities are separate from other existing space allocations and will be dedicated to the research activities that are identified in the CBTC proposal.

The inventory identified above does not include space located at other institutions. All University of Toronto space has been identified.

Departmental Space Requirements

The proposed infrastructure for the CBTC will allow the simultaneous long term recording and analysis of both circadian rhythms and cognitive performance in diverse situations. The CBTC proposal for the St. George Campus involves the construction of a significant amount of new research facilities.

The following space program for the CBTC has been developed:

ROOM NAME/DESCRIPTION	AREA (nasm)
<u>Clinical Research Group</u>	
Human Cognition Testing Rooms (7 @ 6.60 nasm each)	46.20
EEG Testing & Observation Suites (2 @ 13.70 nasm each)	27.40
Eye Testing & Observation Suites (2 @ 6.75 nasm each)	13.70
Group Testing Room	29.65
Psychophysiology Room A (Large)	21.18
Psychophysiology Room B (Small)	7.19
Psychophysiology Analysis & Storage Facility	34.23
Affective Behavioural Testing Room	31.64
Child/Adult Cognitive Testing Room	8.78
Child Cognitive Testing Rooms (2 @ 6.90 nasm each)	13.80
Parent/Child & Peer Interaction Testing Room	6.53

Psychophysiology Testing Room	8.53
Observation Room	8.59
EEG Data Analysis & Data Storage Room	7.74
Stimulus Preparation & Equipment Storage Room	7.66
Waiting Area	16.96
Kitchen	8.58
Computer Room	8.74

Animal Research Group

Molecular Characterization Laboratory	118.94
Mass Spectrometry/Technical Support Facility	9.89
Microscopy Laboratory	16.30
Immunocytochemistry (ICC) Laboratory	61.00
Electrophysiology Research Laboratory (suite of 4 rooms)	31.23
Dialysis/HPL Chromatography Laboratory	20.90
Electrochemistry Facility	13.00
Animal Behavioural Testing & Observation Suites (5 @ 8.90 nasm)	44.50
Exploratory Behaviour Room	28.20
Large Water Maze Test Room	24.70
Small Water Maze Test Room	10.20
Circadian Rhythm Monitoring Rooms (2@ 35.4 nasm; 1@ 17.6 nasm)	88.40
Clean Cage Storage Area	13.30
Scheduling/Co-ordination Room	17.80
Cell Culture Suites (2 @ 10.41 nasm each)	20.82
Surgical Suites (2 @ 10.41 nasm each)	20.82
Research Support Room	10.57

Animal Care Facility

Animal Holding Rooms (3 @ 19.00 nasm; 3 @ 16.46 nasm)	106.38
Surgical Procedures Room	3.00
Support Room (Autoclave)	8.80
Dirty Cage Area/Cage Washing/Clean Cage Storage Room	31.20
Food and Bedding Storage Room	8.80
Gowns and Supplies Storage Room	1.53
Manager's Office and Records Storage Area	11.60
Staff Room	13.40

Total CBTC Area Requirement 1,042. nasm

Detailed descriptions and requirements for each of the programmed rooms are provided in the Room Specification Sheets that can be found in Appendix F.

An area gross-up factor is required to accommodate other building elements; such as, corridors, stairs, elevators, washrooms, telecommunications closets, service chases, mechanical and electrical rooms, etc. Typically, the University of Toronto applies a building gross up factor of 1.80. However, larger factors have been used by the University for similar research facilities that have considerable mechanical and electrical infrastructures (such as animal care facilities). For the CBTC addition, a factor of approximately 2.00 was considered reasonable for its mix of clinical and animal research facilities, and small animal care facility; this factor should also allow the design to accommodate the introduction of natural light (e.g. through light wells) between the CBTC and Ramsay Wright. A total gross area for the CBTC addition of 2,072 gross square metres was used for planning and cost estimating purposes.

VI. Functional Plan

Departmental and CBTC Siting Options

The initial CFI proposal for the CBTC was developed after considering the best location for its activities in relation to the Department's current facilities and functions. The CBTC reviewed a possible expansion of its existing animal care facilities within the site occupied by the Ramsay Wright Zoological Laboratories. The CFI application proposed that a three-storey addition (with ground floor access) could be built over the Ramsay Wright receiving and workshop facilities and stores area that are located on the south side of the ground (basement) level.

Subsequent to the CFI submission, the Faculty of Arts and Science completed a master planning study of its departments and functions. The Faculty plan proposes that the Department of Psychology be consolidated to one facility on the St. George Campus from its three current locations; the new CBTC could provide an opportunity for this departmental consolidation to occur. The following options were considered:

A. Expansion of Original CBTC Addition

The Project Committee initially considered the expansion of the CBTC from a three storey addition to a structure that matched all of the Ramsay Wright's floor levels. Each of the CBTC's proposed floors has a gross area of approximately 675 gsm without a penthouse (the main mechanical and electrical systems were to be accommodated on the third floor of the original CFI proposal).

If the CBTC floor plates could be expanded upwards for another three levels and a mechanical penthouse put on top, then a total building area of approximately 4,640 gsm could be built within the same footprint as the CBTC proposal providing a total assignable area of approximately 2,580 nasm.

With a programmed space requirement of 1,126 nasm for the CBTC, the expanded addition could only provide 1,451 nasm for the consolidation of the Department of Psychology. Assuming that the existing Ramsay Wright facilities could be retained, the Department requires approximately 4,223 nasm to simply match its existing space inventory. Although the animal care facility at 1 Spadina Crescent may not be required after the CBTC is opened, this potential space reduction is not significant (251 nasm) and cannot offset the department's planned growth. This option was rejected as it could not meet the Department's current or future space requirements.

B.F. Norman Hughes Pharmacy Building

With the pending completion of the new Leslie L. Dan Pharmacy Building, the Faculty of Pharmacy is scheduled to vacate its current facilities in the F. Norman Hughes Pharmacy Building in the summer of 2005. This building provides an excellent opportunity and was also considered as a possible candidate to allow for the consolidation of the Department of Psychology and the new CBTC.

The Hughes Pharmacy Building has a total net assignable area of 4,163 square metres of which 3,736 nasm is assigned to the Faculty of Pharmacy, 196 nasm is assigned to the Gerstein Information Centre, 212 nasm is assigned to the Office of Space Management, and 19 nasm to Building and Grounds. In total, 3,932 nasm would be available after Pharmacy moves into its new building; the space assigned to the Office of Space Management, and Building and Grounds will not change.

Under this scenario, it was assumed that the Department of Psychology would vacate all of its space in Sidney Smith Hall, Ramsay Wright Zoological Laboratories and 1 Spadina Crescent. With a current space inventory of 4,540 nasm and a CBTC requirement of 1,126 nasm, the Department of Psychology has a current space requirement of 5,667 nasm (slightly less if the animal care facilities at 1 Spadina Crescent do not have to be duplicated).

Although the Hughes Pharmacy Building is significant in size, the Department of Psychology would still require an addition of 1,734 nasm (3,121 gsm using a 1.80 gross up factor) to meet its current space requirements. The only possible location for an addition would be on the south side of the building in the existing service yard for Facilities and Services shops in 215 Huron Street. Such an expansion to the Norman Hughes Building is identified in the Campus Master Plan (Site 18) but will require that areas of 215 Huron Street be relocated. Unless the remainder of Site 18 is fully utilized, such a solution would not be cost effective.

Because the Hughes addition would be significantly larger (even more so if the Department's future growth is included) than the original CBTC addition onto Ramsay Wright and that the entire Hughes Pharmacy Building would need to be renovated, this option was also considered to be economically unviable and was rejected.

C. Centre for Cellular and Biomolecular Research (CCBR)

A major biomedical research and development facility is under construction on the former Taddle Creek Road and will be connected with the Medical Sciences Building, FitzGerald and Rosebrugh Buildings. Although the CCBR will add a considerable amount of assignable area to the campus inventory and includes a large facility to house transgenic mice, this option was not considered desirable for several reasons.

Except for the main floor of the building, the CCBR will have restricted access as virtually all of its facilities will be assigned to highly sensitive biomedical research. This building was not intended for undergraduate instruction as would be required if the Department of Psychology were to be consolidated to the CCBR location.

The Division of Comparative Medicine (DCM) will operate a large transgenic mouse facility in the basement level of the CCBR. This highly specialized facility will house only mice and would require that Psychology and the CBTC to locate non-mouse species elsewhere.

The CCBR/DCM facility is a Level 2 facility for transgenic mice colonies and when animals are taken from the facility for procedures, testing or observation, they cannot return to the CCBR/DCM. The CBTC's animal-based research activities are significant and would occupy a considerable portion of the CCBR/DCM's available facilities if they were to be wholly accommodated within this facility.

Five research floors in the CCBR were originally unfunded and left unfinished in the original capital project. They have since been fully funded and will now be fitted out for assignment to CCBR researchers. These unfinished floors were initially considered a possibility for CBTC research, but as the funding has been made available, the space is no longer available other than for CCBR researchers.

D. Other Siting Options

With the majority of Psychology's current space inventory within Sidney Smith Hall, consolidation within this building was considered. In addition to its current holdings, the Faculty of Arts and Science would have to identify at least 2,634 nasm within Sidney Smith to

accommodate not only the Department's activities in Ramsay Wright and 1 Spadina but also the requirements of the CBTC.

In order to consolidate Psychology and develop new CBTC facilities completely within Sidney Smith Hall, a considerable amount of space would have to be released. Several departments would have to be identified and suitable accommodations found. Therefore the CBTC facilities could not be built until enough space was released for re-assignment.

Also, Sidney Smith Hall is essentially an academic facility best suited to accommodate undergraduate instruction, academic and administrative office functions, and dry-based graduate and faculty research activities. It would be impractical and expensive to incorporate animal care research facilities, and intensive wet research laboratories as required by the CBTC. This option was also not considered viable.

Campus and Facilities Planning were not able to identify any other potential locations for Psychology's consolidation and the accommodation of the CBTC. The few available development sites on the St. George Campus have been reserved for other initiatives; a new building to accommodate the CBTC and Psychology's current and future needs would not be economically feasible at this time or in the foreseeable future.

Recommended CBTC Location

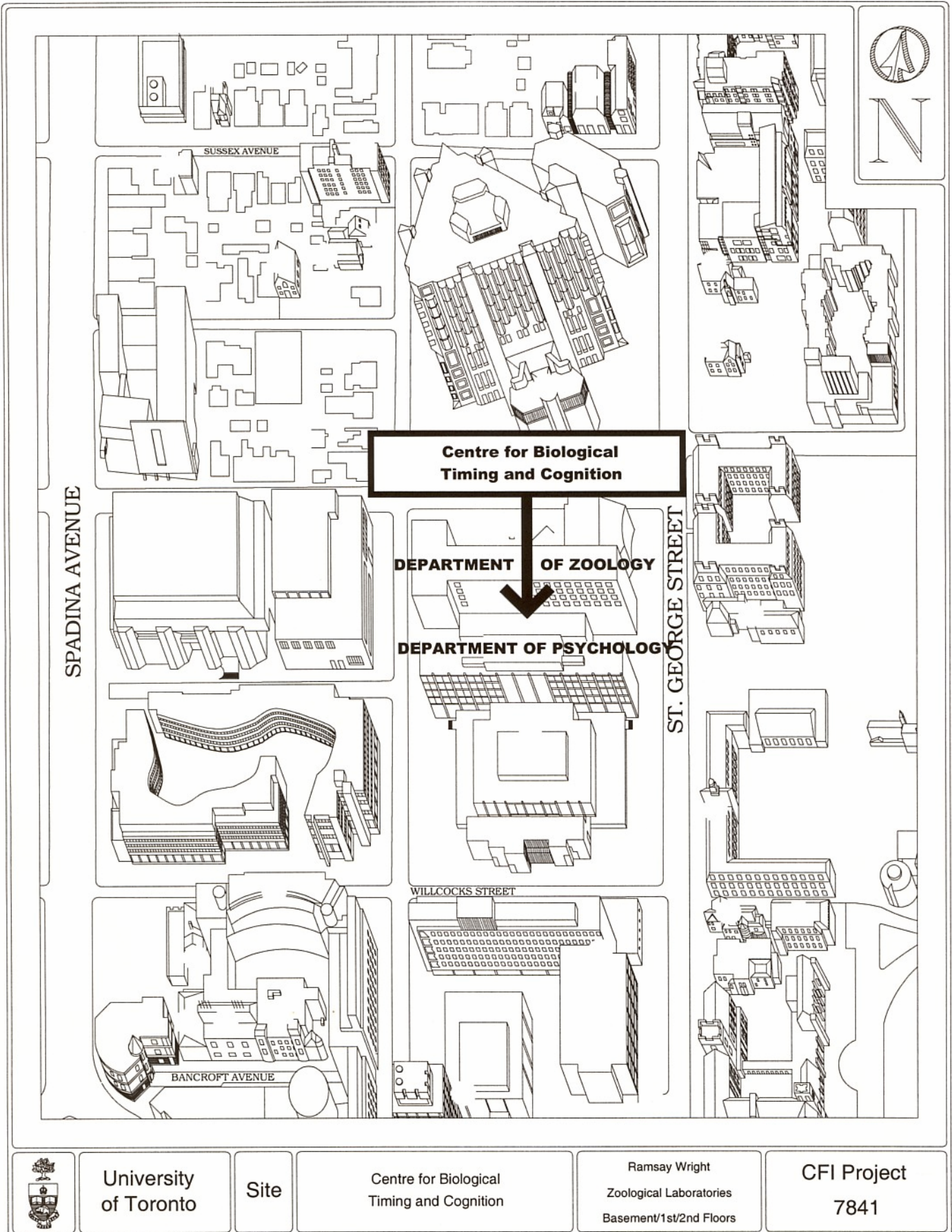
After considerable investigations by the Project Planning Committee and in discussion with the Faculty of Arts and Science, it was determined that the original location for the CBTC was the most logical and that it could be reasonably implemented. This location was not dependent upon the permanent relocation of any other FAS functions or activities and would allow the design, tendering and construction process to begin as soon as governance, CFI and Province of Ontario (OIT, MEDT) approvals to proceed have been obtained.

The consolidation of the Department of Psychology will be accomplished through the consolidation of the Department of Anthropology from its several campus locations to the F. Norman Hughes Pharmacy Building. The available inventory (3,932 nasm) in the Norman Hughes Building can accommodate Anthropology's current allocation of 2,404 nasm leaving surplus space for future departmental expansion and other FAS or university activities.

The Department of Anthropology currently occupies 1,075 nasm in the first basement level of Sidney Smith Hall and another 313 nasm on the first floor. Although some rationalization of space allocations within Sidney Smith will likely be needed to fulfill the FAS master plan, Anthropology's departure will release enough space to accommodate Psychology's current activities in 1 Spadina Crescent. This proposal assumes that the existing animal care facility in the basement of Ramsay Wright will remain in operation and that all animal housing and research requirements will be satisfied by it and the CBTC facility; the 1 Spadina animal care facility will not have to be duplicated.

Although the Department of Psychology will not be completely consolidated within a single location, the CBTC addition will be on the south side of Ramsay Wright immediately opposite Sidney Smith Hall. Consideration will be given during the design of the CBTC addition and for a future connection between Sidney Smith Hall and the Ramsay Wright Building.

A partial isometric campus plan (as included with the CFI application) is duplicated here to illustrate the site for the new CBTC addition.



University of Toronto

Site

Centre for Biological Timing and Cognition

Ramsay Wright
Zoological Laboratories
Basement/1st/2nd Floors

CFI Project
7841

Proposed CBTC Floor Layouts

The CBTC schematic proposal has distributed its space program and associated building facilities into four distinct clusters. Although pedestrian corridor connections will be provided between the CBTC and the corresponding Ramsay Wright floor level, the CBTC will essentially be a separate, stand-alone structure with access to authorized researchers and staff only. The significant portion of the Centre's activities will involve human test subjects and therefore require a public entry to the CBTC that is both convenient and highly visible. It is proposed that the public entrance to the Centre occurs through its connection to the first floor lobby of Ramsay Wright.

The basement level of the Centre will have both elevator and stair entry into the facility that will be accessible by authorized researchers and staff only. The stairs will also act as the facility's main emergency exit from all of its floor levels.

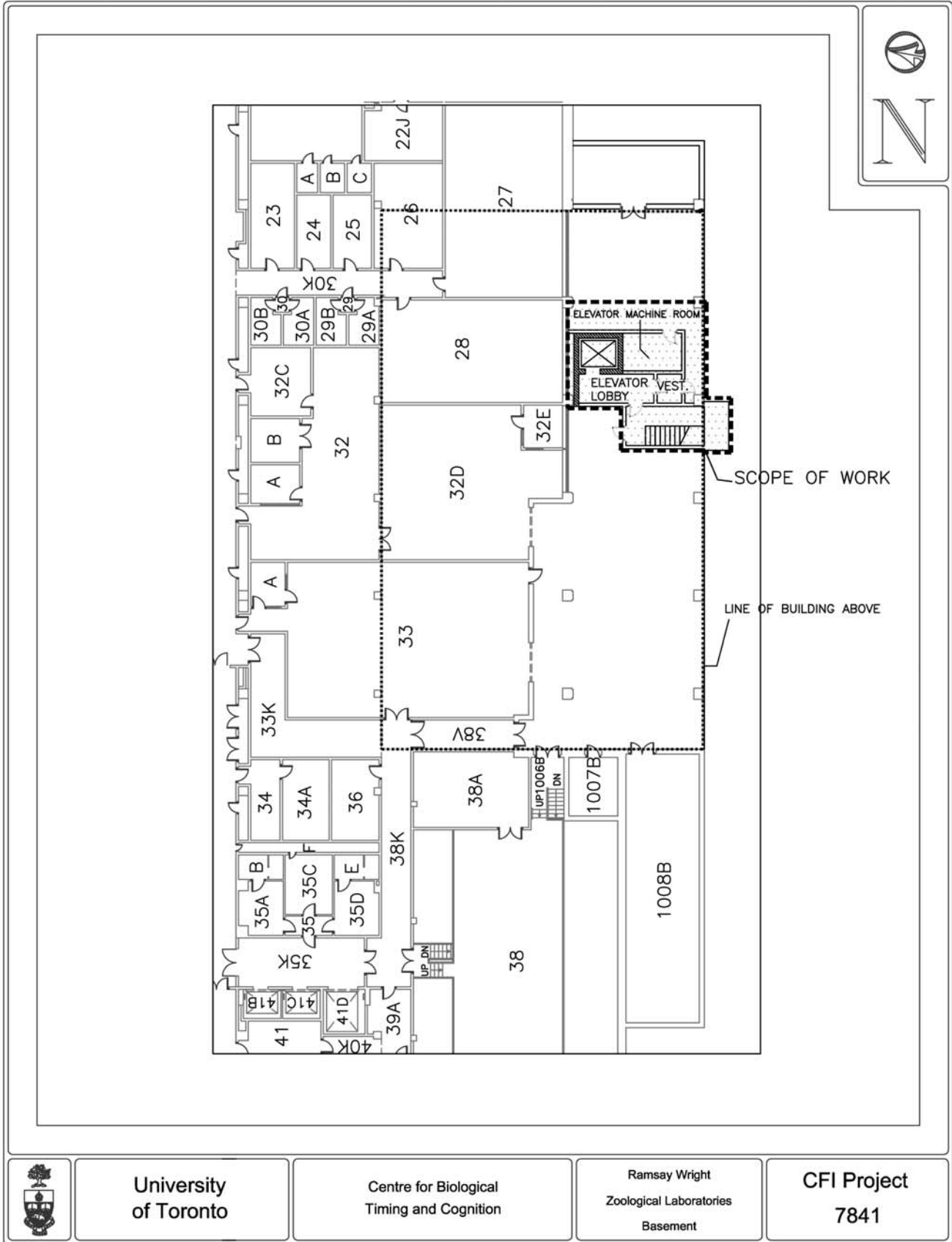
The CBTC functions can be grouped into three relatively distinct activities: clinical (human) research; animal research; and, animal holding. These groupings lend themselves to separation by floor levels and are the basis for the Centre's three floors (above the basement entry). The first floor will accommodate the various human cognition, EEG and eye testing suites, associated support facilities (such as waiting area, kitchen, etc.) as well as a primary research facility (the molecular characterization laboratory). The human testing areas will be accessed by test subjects only through the reception area and all other areas will only be accessible by authorized researchers and staff.

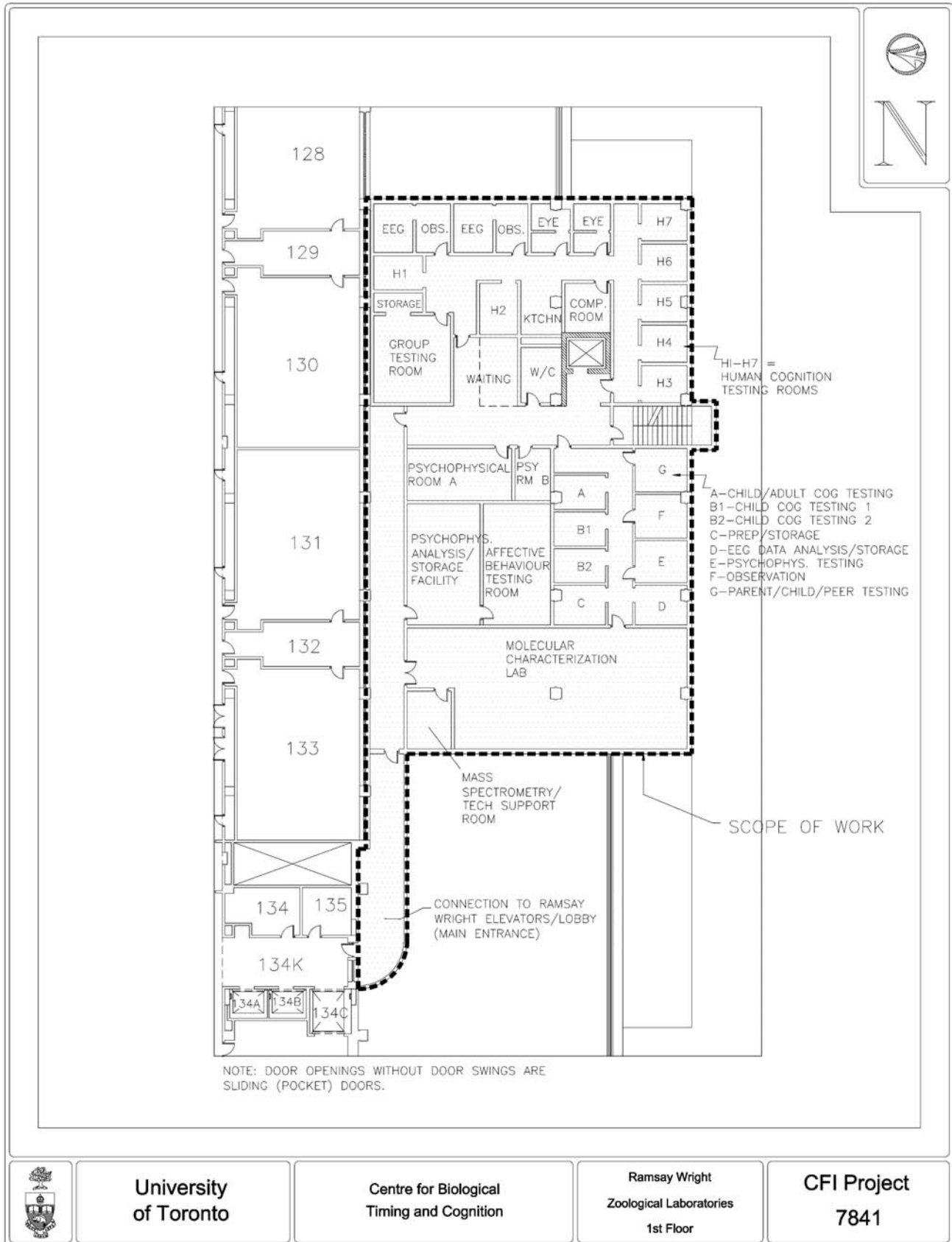
The second floor will accommodate the Centre's animal-based research and will contain circadian and behaviour testing and observation suites, cell culture suites, primary research facilities (such as electrophysiology, electrochemistry, dialysis, microscopy) and support functions (such as surgery, monitoring, etc.). This floor will only be accessible by authorized researchers and staff.

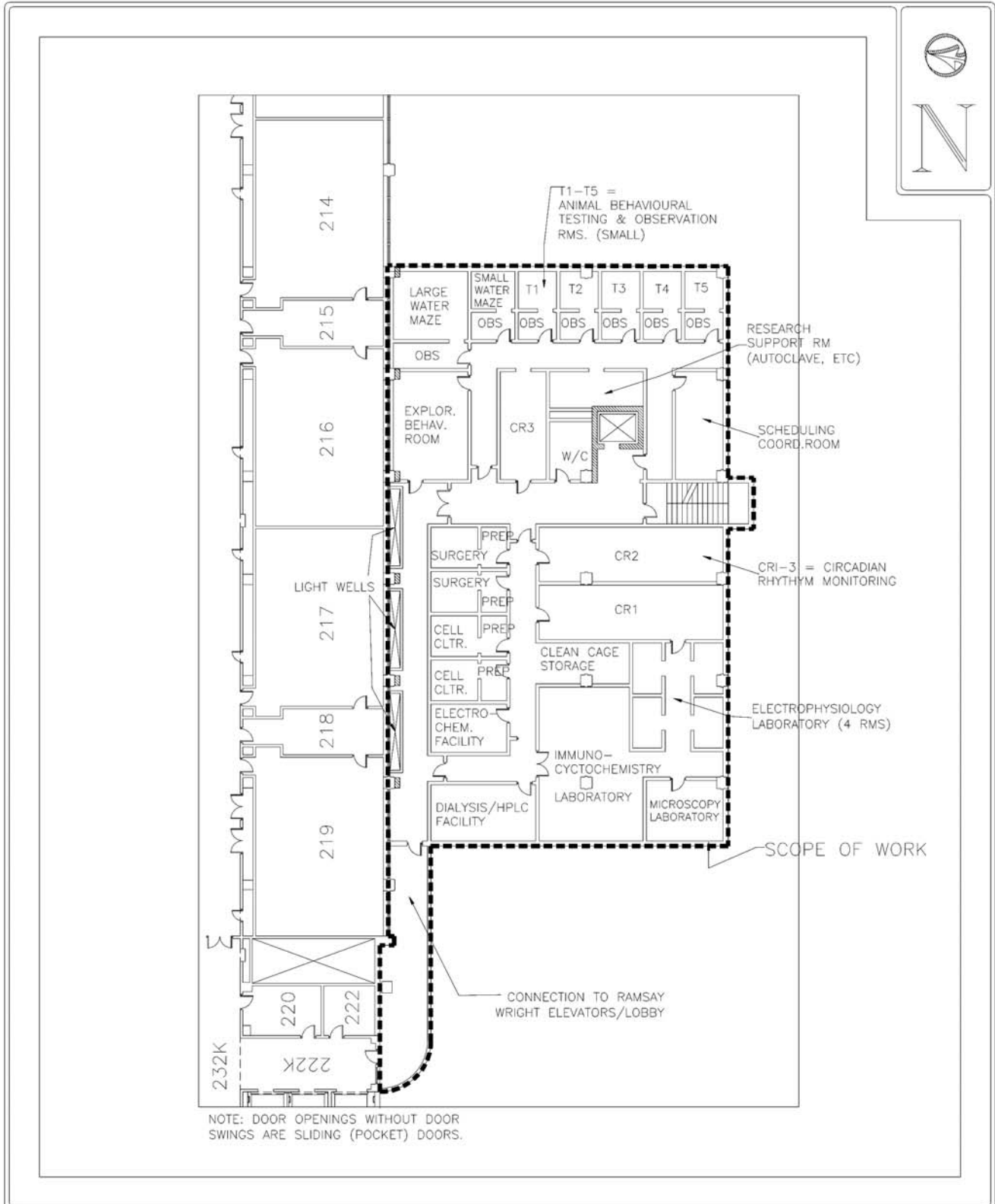
The third floor will accommodate the animal care facility and will be accessible to authorized animal care staff only. There will be distinct flow of animals and materiel from the entry into the clean side of the holding facility, through the facility, and out the dirty side of the facility; dirty cages, waste, etc. will not enter clean areas of the facility nor cross the path of animals or materiel moving into clean areas. This facility will be properly secured for animal care and holding, and will be designed to meet the certification criteria as administered by the Canadian Council on Animal Care.


The animal care facility does not require the entire floor plate of the third floor and it is recommended that the remaining space house the addition's mechanical and electrical systems. These mechanical and electrical areas will need to have independent access from the animal care facility; that is, building maintenance and repair staff do not need to pass through the animal care facility. This floor area will also likely accommodate the facility that is needed to accommodate the entry of voice and data communication service to the CBTC and their distribution throughout the building.

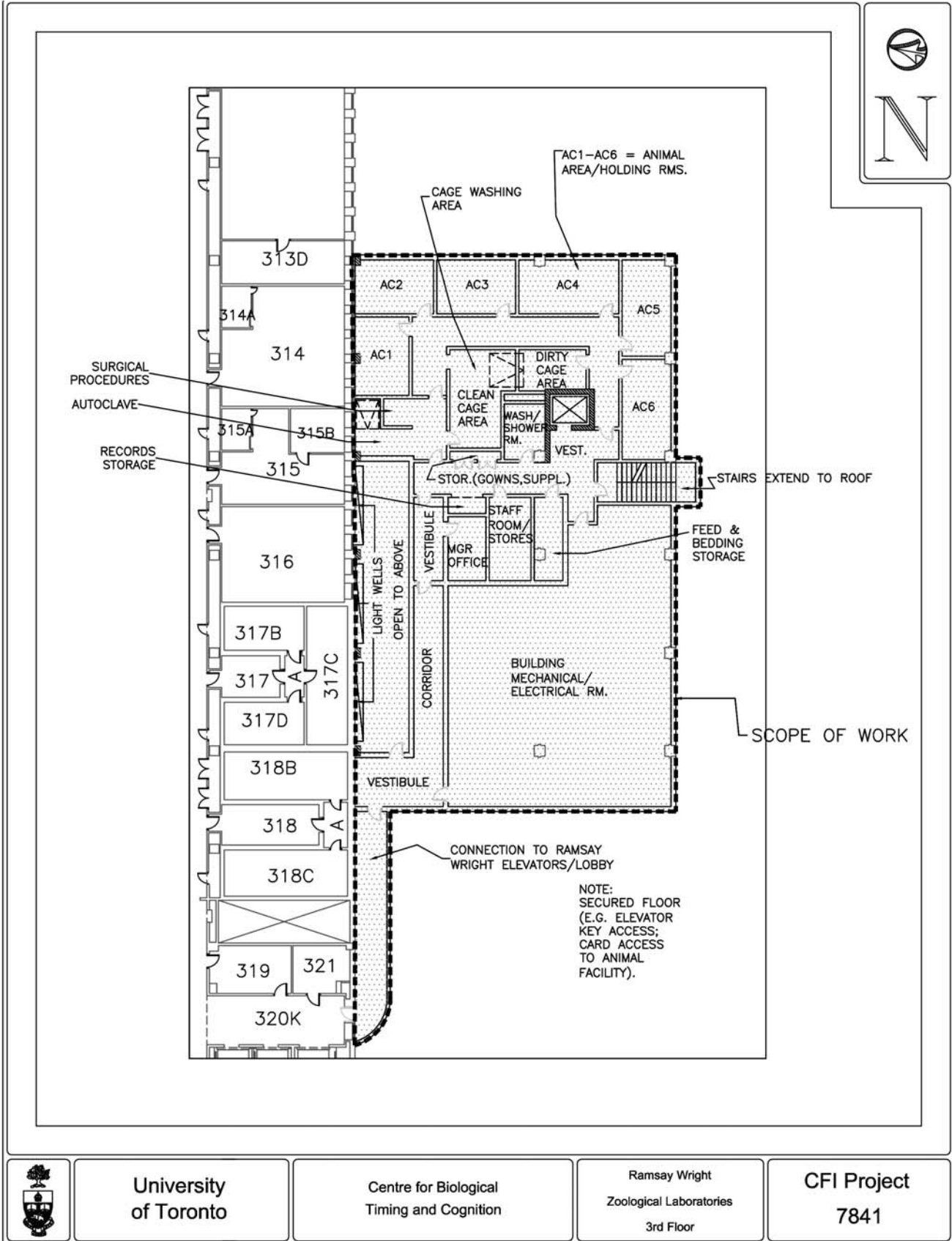
The proposed location and floor plans for the Centre for Biological Timing and Cognition as developed from the original CFI proposal follow; these floor plans have been developed to demonstrate that the distribution of the space program within the recommended floor plate and throughout the floors is reasonable. The consultants will review the space program and refine the schematic plans in the process of design development and the preparation of contract documents through regularly scheduled design and implementation meetings with the Project Committee and its working groups.







	<p align="center">University of Toronto</p>	<p align="center">Centre for Biological Timing and Cognition</p>	<p align="center">Ramsay Wright Zoological Laboratories 2nd Floor</p>	<p align="center">CFI Project 7841</p>
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University of Toronto

Centre for Biological Timing and Cognition

Ramsay Wright
Zoological Laboratories
3rd Floor

CFI Project
7841

VII. Environmental Impact

Environmental Protection Policy

The University of Toronto is strongly committed to the development and maintenance of exemplary strategies that are aimed at enhancing not only the campus but also the global environment. This commitment is set out in the University's *Environmental Protection Policy*, dated 7 March 1994 and is reproduced in Appendix A.

This policy has had, and will continue to have, important impact on construction projects that range from siting policy to material selection. The University does not under-estimate the difficulties in making the most effective environmental choices nor can the budget implications of such choices be ignored. On campus, buildings represent the single most important element that affects the environment; they give it a recognizable form and are major consumers of natural resources in their construction and operation. Building design professionals have an inherent responsibility to foster good environmental practices as do building users and university administrators.

In order to encourage building designs that meet the University's environmental policy, an environmental section has been incorporated into the University's *Design Standards Manual*. This section obligates the design team to adhere to a set of environmental design principles:

- When making decisions about designs, processes and products that influence resource use (e.g., energy, water, materials) and other environmental impacts (e.g., indoor air quality, lighting, waste management), alternative choices, including innovative but proven alternatives, be considered;
- When making decisions about life cycle costs to consider those which also offer environmental benefits; and,
- To assess environmental impact broadly – recognizing that impacts in one area must be assessed in relation to others so that the “system” can be effective.

Notwithstanding the University's environmental goals, this Project Committee does want to clarify that any environmental design strategies cannot compromise the specified requirements of the Centre for Biological Timing and Cognition.

Environmental Design

Although the CBTC will not be as large as the Ramsay Wright Zoological Laboratories, this structure represents a significant addition to St. George Campus' building stock. Its size and intensive animal and clinical research activities will result in environmental implications; such as, increases in energy and water consumption, hazardous and non-hazardous waste generation, etc. From a simplistic standpoint, better environmental designs can greatly reduce operating costs over the life of the building; conversely, a poor design can add considerably to not only the University's operating costs but also can provide a less than comfortable working environment for its users.

Because of the CBTC site and size, the design team should pay particular attention to:

- building orientation, form and envelope to maximize the use of natural energy or passive strategies such as the use and control of sunlight, ventilating air movements, and diurnal and seasonal temperatures,

- minimize energy use for heating, cooling and lighting through the careful design of the building envelope, mechanical and electrical systems, and the use of low energy fixtures in combination with natural daylight and task lighting wherever possible,
- water conservation through the use of water saving fixtures and close-looped equipment cooling systems,
- metering of energy and water use in the building, or parts of it,
- building materials, finishes (e.g. paint), furnishings (e.g. carpets) and furniture which are not only emission-free (to provide building occupants with highest quality of indoor environment) but also were the most environmentally friendly in their manufacture and installation,
- provision of recycling depots for source-separation of waste throughout the building to meet the needs of the University's recycling and waste reduction programs,
- conveniently locating waste receptacles to minimize litter,
- creating a sufficiently large central area for the consolidation of and access to recycled materials and waste,
- directing rainwater (roof) runoff from the City's storm water system and other sources of 'gray' water to satisfy landscaping needs,
- using water penetrable systems in outdoor areas where hard landscaping is required to minimize flows to the City's storm water system, and choosing paving materials to assist the University in minimizing the amount of salt used in snow and ice clearance,
- the design of roofs and access to them to permit future use as campus open space by building users, where practical,
- the landscape design to promote local plant species that require low maintenance,
- the design of outdoor spaces for all-season use, with shade and cool air movement for the summer, and sun-trapping and wind shelter for winter use.

Notwithstanding the University's stated desire to minimize the environmental impact on new capital construction projects, the intensive animal research and holding activities do not make the CBTC an appropriate candidate for certification through the LEED (Leadership in Energy and Environmental Design) Green Building Rating System®.

VIII. Special Considerations

Campus Planning

The proposed location for the CBTC addition is not one of the development sites identified within the University of Toronto Area Part II Plan. Specific building and site development criteria related to municipal by-laws are not defined for the area above the basement podium of the Ramsay Wright Zoological Laboratories or for the site between this building and Sidney Smith Hall. Zoning review and possibly Committee of Adjustment variances will be required as part of the municipal approvals.

The design team will also have to consider life and building safety issues between the new facility and the Ramsay Wright Building, limiting distance factors identified in the Ontario Building Code between the CBTC and Sidney Smith Hall as well as sensitivities related to natural light for the occupants of both existing buildings.

Construction Site Constraints

The new CBTC will be a difficult undertaking not only for the surrounding neighbours but also for the contractors. The site between Ramsay Wright and Sidney Smith is narrow and small providing very little ground area for the placement of construction crane, office and storage trailers and materials and for the movement of equipment.

The accompanying partial campus plan indicates the probable extent of the construction site. It also indicates the possible area for locating trailers and site entry, and identifies areas that need to be protected during the construction period.

Notably the naturalized landscaped area to the north of the existing service ramp must be protected at all times and must remain available for public access throughout construction. The small park-like area adjacent to Huron Street can be used for construction purposes but must be returned to its original condition after construction is complete. The incoming utility services for Ramsey Wright are located (and exposed) in this park area at the north end of the basement podium and must be properly protected from accidental damage.

Throughout the CBTC's construction, the University and the building operations staff of Sidney Smith and Ramsay Wright will need to co-ordinate access through the construction site. Although alternatives have been or will be developed for most of those functions and activities associated with the area between the two buildings (see section on *Secondary Effects*), not all activities or needs can be re-directed to other locations.

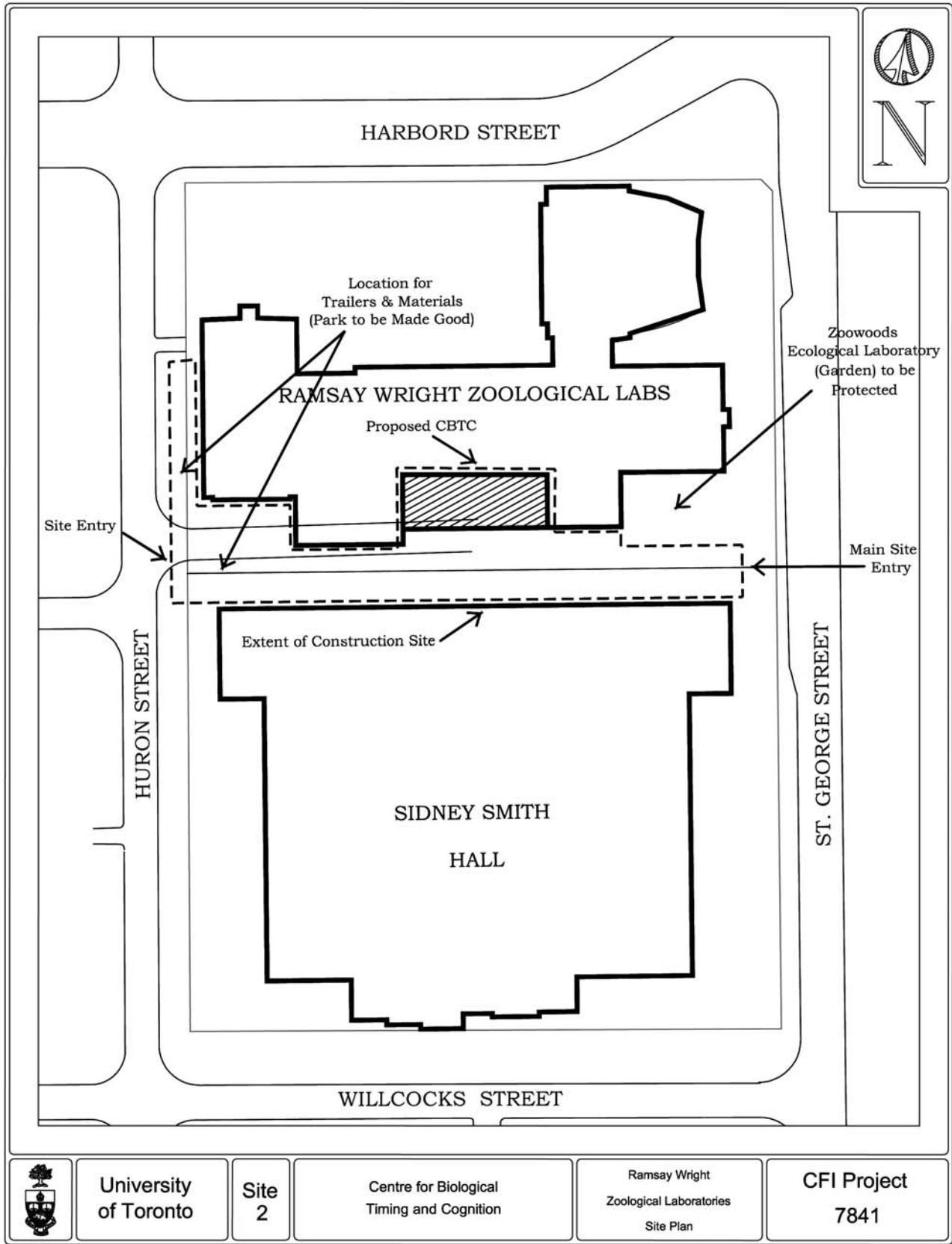
Standards of Design and Construction

Although the CBTC will be constructed within a confined site between two existing buildings of substantial mass, the new facility can still have a presence when viewed by passers-by who are travelling along St. George and Huron Streets, and by the occupants of Ramsay Wright and Sidney Smith. However, the design must still be discrete and not draw undue attention as the CBTC will accommodate a significant amount of animal research and will contain an animal care facility.

The design team must be able to not only satisfy the programmatic requirements of the CBTC but also produce a building design that complements the architecture of Ramsey Wright and respects the design of Sidney Smith Hall. A suitable working environment must be created for the occupants of the CBTC with good quality construction and finishes consistent with recent peer research buildings at the University of Toronto.

As well as complying with current building codes and regulations, the design team should review and incorporate (where applicable) the University's own approved design standards. The design team must employ best architectural and engineering practices in accommodating the Centre's animal and clinical research activities, and must readily comply with all applicable guidelines and regulations, the Canadian Council on Animal Care's (CCAC) *Guidelines on: The Design and Development of Laboratory Animal Facilities*. (Note that the CCAC document has been revised and a draft was issued on June 17, 2002.)

Although the current CCAC guidelines are in force, the revised guidelines may supersede them during the life of this project. The current guidelines and the draft document will be made available to the project team by the University Veterinarian, who will also be required to review the design and details of the proposed animal facility prior to sign-off.



Other Design Considerations

The Project Committee endeavoured to develop a space program and functional plan that will satisfy the immediate and future research needs of the CBTC. These efforts are particularly significant because the CFI award guidelines specify that the CBTC maintains its activities and infrastructure for five years following the finalization of the award. This will be accomplished through regular reports throughout this period (that is expected to end in April 2010).

The proposed development of the CBTC will have a potentially profound affect on the occupants of the south side of Ramsay Wright. With the CBTC nesting up tight to significant portions of the first, second and third floors, the existing fenestration in these areas will be impacted. The design must consider the best possible layout of CBTC programmed space to minimize this impact and to develop an architectural response that will allow the introduction of natural light to the interface between these two buildings.

The design team must also be aware of the probable need to incorporate and accommodate existing Ramsay Wright service elements (such as an air grill in the loading dock area and the exhaust from the emergency generator) into the CBTC design and must co-ordinate its efforts with the design team that are responsible for the new suites of walk-in environmental chambers (these will likely have an exterior service chase leading from the mechanical penthouse to these suites on the third, fourth, fifth and sixth floors).

Accessibility and Security

As stated in the description of the functional plan, human subjects will have access to the clinical research facilities of the CBTC through a connection with Ramsay Wright's main (first) floor elevator lobby. This main entry provides full access to individuals with disabilities.

The remaining floor areas will be accessible by authorized researchers and personnel. The CBTC design will include a passenger elevator and stairwell that originate from the basement (ground) level; these elements will not only provide a secure and separate access for authorized staff and deliveries but also a second means of emergency egress from the CBTC.

A significant amount of the building program for the CBTC involves the testing and care of research animals and the security system for this building must be appropriately designed and operated.

Computing and Communications Services

The Department of Psychology will extend its existing computer network from a new communications facility on the sixth floor of the Ramsay Wright into the CBTC (third floor); the system will be maintained by departmental staff. Wiring closets will be necessary on each floor of the new facility.

Voice communication must be available in research laboratories and several other locations (such as the manager's office in the animal care facility and the waiting area for clinical testing facilities).

Deferred Maintenance

The CBTC will be a new standalone structure built upon and next to an existing science building. As such, there are no issues of deferred maintenance related to the building.

It should, however, be noted that concurrent projects are underway in Ramsay Wright to decommission and remove obsolete glycol refrigerant chilling system, remediate mould contamination, and construct new free-standing, walk-in environmental chambers. As well, future improvements are planned to rectify the existing problems with heating, air conditioning and ventilation.

Please see “Infrastructure Upgrades” in the section that follows.

IX. Resource Implications

Construction Cost Estimate

The quantity surveying firm of Curran McCabe Ravindran Ross Incorporated was retained in April 2003 to review the site, concept drawings, and room data sheets, and to prepare a construction cost estimate for inclusion with the original CFI submission. As the intent and the content of the CBTC have not changed significantly from the original conceptual design, the rationale for the initial CFI construction cost estimate has not changed. However, at the time of the CFI submission, it was assumed that funding would be awarded in time for a construction tender date of August 2004.

A construction tender date of August 2005 is now anticipated, resulting in potential cost escalation within the construction industry. An escalation factor has been applied to the original construction cost and is now projected to be \$9,264,300. With the inclusion of the construction contingency and the applicable portion of the Goods and Services Tax (GST), the construction cost is now estimated to be \$10,146,000 (at point of tender, August 2005). This estimate is included in the total project cost (TPC) estimate below and is duplicated in Appendix B.

Operating Costs

Operating costs for net additional space is the responsibility of the Faculty and is normally estimated on the basis of comparison with existing peer buildings of similar size and occupancy. Based on the latest direct and indirect operating costs (fiscal year 2002/2003) for the Ramsay Wright Zoological Laboratories of \$171 per net assignable square metres (nasm), the CBTC with a programmed area total of 1,042 nasm has an estimated annual operating cost of approximately \$178,000; actual costs will not be realized until the CBTC has been fully operational for at least one complete cycle. The net additional operating costs will become the responsibility of the Faculty of Arts and Science.

Infrastructure Upgrades

The electrical service requirements for the CBTC are substantial. The existing electrical loop that currently serves Sidney Smith and Ramsay Wright must be replaced with new cabling and new underground conduit in order to provide an adequate and secure electrical service to the CBTC. A letter from the University’s Utilities and Building Operations Department describing the existing electrical service and proposed upgrades is included in Appendix C. The cost estimates for the CBTC project has included an allowance of \$500,000 for this work.

Landscaping and Site Improvements

The CBTC development will not affect the existing landscaped environment or present any opportunities to undertake any site improvements because the addition is being constructed over the existing Ramsay Wright facilities. However, the well-being of the existing east garden should be protected and be made available to the public throughout construction. If the

landscaped area to the west within the project site is to accommodate trailers and material storage during construction, then this area (and any other disturbed landscaped areas) must be returned to its original condition as part of the general construction contract.

Equipment Costs

The CFI submission included a significant amount of research equipment and instrumentation. A complete list of equipment that is to be purchased and accommodated within the CBTC is provided in Appendix E. Unit costs are not displayed in this list as purchase prices are still under negotiation with manufacturers and suppliers. A number of items in the equipment list are fixed elements (such as fume cabinets, autoclaves, etc.) that would be normally included in the construction project for co-ordination purposes. This equipment list and estimated costs has been shown under a separate table in Appendix E. This built-in equipment is estimated to have a value of \$426,000.

Computing and Communications Costs

Beyond the infrastructure costs (i.e. conduits, junction boxes, etc.) included in the construction cost estimate, an allowance of \$20,000 has been included to cover the extension of voice and data communication services from the sixth floor of Ramsay Wright to the new CBTC closet..

Furnishings Costs

The total project cost estimate includes an allowance of \$35,000 for the purchase of miscellaneous loose furniture and furnishings (such as chairs and tables in testing/observation rooms, stools in laboratories, etc.) that are required to make the CBTC's research facilities functional.

Moving Costs

An allowance for moving costs has not been included because the CBTC is a new building that will accommodate new equipment, furniture and furnishings. Some researchers may need to relocate existing items for other Psychology facilities into the CBTC, but it has been agreed moving these items would be the responsibility of the CBTC or the Department of Psychology.

Secondary Effects

Although the CBTC is new construction, it will have a significant impact on the Ramsay Wright Zoological Laboratories. Foremost is that the addition will be built on top of the building's shipping and receiving facilities and the Department of Zoology's central workshop, stores and wet research facilities (notably rooms 026, 027, 028, 032D, 032E and 033). The roof structure must be penetrated to allow for the construction of main support elements for the addition and also the existing roof (fabric) will need to be removed and replaced with a new floor (for the CBTC).

It will not be possible to maintain the operations in these locations during the structural reinforcing and foundation work for the CBTC. Some of Zoology's operations will be relocated elsewhere throughout the duration of the construction project and other activity will be suspended only during the foundation/structural work (depending on duration of this work).

On the basement level, workshop activities will have to be moved elsewhere and the stores function will be interrupted. Zoology is still investigating the availability of alternate space elsewhere in Ramsay Wright for accommodating its displaced staff and for the relocation of shop equipment. An existing storage facility on the sixth floor of the Ramsay Wright Building is

currently being considered for a temporary workshop by the department. This location will need to have appropriate HVAC and exhausting (for activities such as painting, welding and plastic fabrication that produce toxic by-products) supplied and upgrades in other building services (plumbing, sinks, electrical service and lighting); these costs will be covered by the CBTC project.

The department's stores function will need to be relocated, but a final location has yet to be finalized. Currently, a student study area (room 010) is being considered. These relocation costs are also included within the budget.

Two rooms (020 and 028) currently house fish and are within the construction vicinity; these will need to be moved elsewhere in Ramsay Wright. A suitable location has yet to be determined because these fish require specific environmental conditions and other building services (non-municipal water, compressed air). The facility that houses the CQUEST computers might be suitable and the cost to convert this room and to move the animals will be a project cost.

There are three types of deliveries through the existing loading area (stores room 033). Type 1 involves small, but very frequent deliveries (such as mail and parcels) that can be re-directed to the building's main entrance. Type 2 deliveries involve feed, bedding and other consumables associated with the animal care facility. The Department will work with the suppliers to ensure that shipments are suitably sized to be deliverable through the main entrance. Type 3 deliveries involve large or awkward items that will not fit through the front doors. These deliveries will remain to this location and must be co-ordinated to occur at suitable times and with appropriate safety measures to allow them through the construction site.

The CBTC project will also disrupt access to the service entry in the basement of Sidney Smith. Small deliveries for this building can be re-directed to the main entrance (either from St. George Street or Huron Street). Deliveries to the cafeteria will be arranged to be delivered from Willcocks Street directly into the food services area.

There are five parking spaces within the construction zone that are assigned to Zoology vehicles used to transport animals and field equipment. Four of these vehicles are vans and will be temporarily parked at 1 Spadina Crescent (because these vehicles may be too tall for underground parking facilities). The remaining vehicle is a small car that can be relocated to another parking lot. The cost for these parking spots at other locations must be borne by the project until the permanent spots are returned to Zoology. Occasional access to the current loading dock will be required to move animals and field equipment; this access will need to be co-ordinated with the contractor.

Although not directly under the CBTC, Ramsay Wright's volatile storage facility is located next to the loading dock in room 1007B. The safe operation of this facility cannot be compromised and if there is a need to shut down this location, then the contractor will need to supply an approved, portable volatile chemical storage unit (that's conveniently and securely located).

The project cost estimate includes an allowance of \$76,900 to accommodate the costs associated with the aforementioned secondary effects.

The Project Committee recognizes that construction activities will generate significant levels of noise and vibration that may seriously inhibit on-going research in laboratories and the BIO program instructional laboratories located on the south side of Ramsay Wright (including sleep research being conducted by Professors Peever and Stephenson). The relocation of the instructional laboratory sessions of the BIO programs affected by the construction will be managed Faculty of Arts and Science. The contractor will have to work closely with Zoology's

administrative officer and the University Veterinarian to consider the potential impact of construction activities to the well-being of animals within the building and to the possible need to schedule interruptions in certain building activities.

Total Project Cost Estimate

For the 2003 CFI application, the Capital Projects Office prepared a total project cost (TPC) estimate of \$12,097,560, including all soft costs normally attributed to capital projects.

However, the original estimate assumed that escalation to an August 2004 construction tender date and due to a later award date, an adjustment in escalation to the construction cost to a tender date of August 2005 has been made.

As well, the initial CFI estimate assumed that any secondary effects, moving expenses, furniture, furnishings and non-CFI equipment and other indirect costs (e.g. financing charges) would be the responsibility of the Faculty of Arts and Science and the Department of Psychology. Additional allowances have been included in the TPC estimate to allow them to be included in the entire award with no additional funding required.

The current project cost estimate now includes allowances for built-in equipment, loose furniture and furnishings, secondary effects, etc. The cost estimate does not include an allowance for finance charges because funding from the Faculty of Arts and Science will be available and flow as needed at the front end of the project. It has been assumed that the CFI, OIT and MEDT funds will flow in a timely manner thereafter. Therefore, a funding deficit in the capital project account is not anticipated.

Based on the need to make these adjustments, the Centre for Biological Timing and Cognition is now projected to have a total project cost (TPC) estimate of \$13,161,000 and is detailed in Appendix B.

X. Funding Sources and Cash Flow Analysis

The CBTC was successful in receiving \$25,140,502 from the Canada Foundation for Innovation and the Ontario Innovation Trust for construction, equipment purchases, personnel training and other soft costs. CBTC funds are to be contributed as follows:

Funding Source	Amount
Canada Foundation for Innovation	\$10,056,201.
Province of Ontario (Ontario Innovation Trust)	6,929,728.
Province of Ontario (Ministry of Economic Development And Trade)	3,126,473.
Corporate Partners	2,561,375.
Faculty of Arts & Science	2,466,725.
 Total Funding Sources	 \$25,140,502.

Of this total award, \$13,161,000 will be directed towards the construction aspect of the CBTC facility. Funding sources for the construction of the CBTC are as follows:

Faculty of Arts and Science	\$2,466,725
CFI	5,347,137.50
OIT & MEDT	5,347,137.50
Total	\$13,161,000

The Capital Projects Office has prepared a projected cash flow for the CBTC construction portion of the project based on the schedule that follows below. An allowance for finance costs is not required because the funds from the Faculty of Arts and Science is assumed to be available from the start of the project and will meet projected expenditures until CFI and OIT monies are secured. The cash flow analysis can be found in Appendix E.

XI. Project Schedule

In order to fulfill the requirements of the CFI award, the project will need to meet these benchmark dates:

Architect selected	December 2004
Construction tender process completed	August 2005
Construction contract awarded/construction start	September 2005
Construction completed	December 2006

XII. Recommendations

That, the Planning and Budget Committee recommend to the Academic Board:

1. THAT the project scope as identified in the Project Planning Report for the Centre for Biological Timing and Cognition at the University of Toronto be approved.
2. THAT the project scope as identified in the Project Planning Report which requires the construction of additional floors on the south section of the Ramsay Wright Building be approved at a cost of \$13,161,000 from the following funding sources:
 - i) A cash contribution in the amount of \$2,466,725 from the Faculty of Arts and Science,
 - ii) A contribution in the amount of \$5,347,137.50 awarded by the Canada Foundation for Innovation, and
 - iii) A contribution in the amount of \$5,347,137.50 awarded by the Ontario Innovation Trust and the Ministry of Economic Development and Trade.

APPENDIX A:
Environmental Protection Policy
and
Environmental Checklist

University of Toronto Environmental Protection Policy

PREAMBLE

The University of Toronto is committed to being a positive and creative force in the protection and enhancement of the local and global environment, through its teaching, research and administrative operations. Recognizing that some of its activities, because of their scale and scope, have significant effects on the environment, the University as an institution, and all members of the university community, have the responsibility to society to act in ways consistent with the following principles and objectives:

FUNDAMENTAL PRINCIPLES

- Minimization of negative impacts on the environment
- Conservation and wise use of natural resources
- Respect for bio-diversity

SPECIFIC OBJECTIVES

In adopting these fundamental principles, the University will be guided by ethical attitudes towards natural spaces, and will take all reasonable steps to meet the following objectives:

- Minimize energy use, through efficient management and practice
- Minimize water use, through efficient management and practice
- Minimize waste generation through reduction, reuse and recycling
- Minimize polluting effluent and emissions into air, land and water
- Minimize noise and odour pollution
- Minimize and where possible eliminate use of chemicals, including outdoor salt, pesticides herbicides and cleaning agents
- Include bio-diversity and environmental concerns in planning and landscape decisions
- Meet and where possible exceed environmental standards, regulations and guidelines

IMPLEMENTATION

To implement this Environmental Protection Policy:

- An Environmental Protection Advisory Committee (EPAC) will be established consisting of administrative staff, academic staff and student groups, to be chaired by a member of the University's academic staff. The Committee will provide advice to the Assistant Vice-President, Operations and Services, on programs to meet the environmental protection objectives. Membership of the committee will be made known to the community to ensure that new and existing initiatives are brought forward for consideration. The meetings of EPAC will be open.
- Facilities and Services, through the Waste Management Department will facilitate the development, implementation and evaluation of environmental protection programs, and will liaise with the EPAC and all three campuses on the programs.
- In this role Facilities and Services will:
 - Regularly review university policies to ensure consistency with this policy;
 - Carry out appropriate environmental audits and pilot projects;
 - Undertake education and training programs to inform the University Community about this and how its members, both personally and collectively, can best meet the objectives set forth in it;
 - Inform all contractors, service operations and users of University facilities that they must comply with the requirements of the policy;
 - Annually issue a report concerning the University's impact on the environment, summarizing initiatives undertaken and identifying matters which require particular attention.

Approved by Business Board of the Governing Council on March 7, 1994.

Environmental Checklist for Users Committees (5/99)

1. General planning principles: Consideration of alternatives, Life cycle approach
2. Minimize Energy Use
 - a) Thermal Energy: Heating, Cooling
 - b) Lighting/Use of Natural Light
 - c) Ventilation/Windows
 - d) Machinery/Equipment
 - e) Orientation of Building - effect on building energy needs
 - f) Roof Design
3. Minimize Water Use (Maximize Reuse)
 - a) Flushing
 - b) Washing - hands and body
 - c) Building Cleaning
 - d) Drinking
 - e) Experimental/Labs
 - f) Equipment Cooling
 - g) Outdoor Vegetation - choice and watering (see #4)
4. Utilization and Diversion of Rainwater
 - a) Use of Roof Water
 - b) Porous Pavements
5. Waste Management (offices, classrooms, food outlets, outdoors, construction/demolition)
 - a) Reduction
 - b) Reuse
 - c) Recycling
 - d) Treatment and Disposal - possible on campus
6. Effluent and Emissions (reduce, reuse, recycle, dispose)
 - a) Indoor (Air Toxicity, Noise, Odours, Ventilation)
 - b) Outdoor Air - laboratory emissions
 - c) Water - Hazardous Wastes
 - d) Land
7. Reduce Harmful Chemicals
 - a) Outdoor Salts
 - b) Pesticides/Herbicides
 - c) Cleaning Agents
8. Outdoor Environment
 - a) Encourage Bio-diversity (encourage and protection of species)
 - b) Landscaping/Shading - effect on building energy needs in summer and winter
 - c) Use of outdoor space (e.g. rest areas, roof gardens)
9. Monitoring and Metering of Use of Resources and Wastes
 - a) Water
 - b) Electricity
 - c) Heat
 - d) Wastes
10. Visibility of Environmental Concerns
 - a) Pilot Projects
 - b) Posters/Displays
11. Material Choice (Use of endangered/exotic materials, off-gassing)
 - a) Building Fabric
 - b) Fixtures and Furnishings

APPENDIX B:
Total Project Cost Estimates
for
Centre for Biological Timing & Cognition

Project Title: Centre for Biological Timing & Cognition

Table 1: Total Project Cost Estimates

Column 1 will be completed with the Project Planning Report.
 Column 1-5 will be included in the Project Implementation Report.

Items	Project Planning Report	Concept Design	Design Devel't	Drawings @ 90%	Tender	100% Complete
Construction Cost (Note A)	9,264,300					
Construction Contingency	653,400					
Applicable GST	229,100					
Total Construction Costs, including taxes	\$10,146,800					
Infrastructure Upgrades in Sector (Note B)	500,000					
Secondary Effects (Note C)	76,900					
Demolition	51,200					
Landscaping	20,500					
Permits & Insurance	98,200					
Professional Fees	1,306,300					
Computing Infrastructure (Note D)	20,000					
Telephone Terminations (Note E)	5,000					
Audio/Visual	0					
Moving	0					
Staging	0					
Furnishings: Department	35,000					
Furnishings: Classrooms	0					
Equipment (Note F)	426,000					
Security & Access Systems (Note G)	46,000					
Signage: Interior & Exterior	10,300					
Signage: Donor Recognition	10,300					
Groundbreaking & Building Opening	5,000					
Miscellaneous	20,100					
Project Contingency	383,400					
Finance Costs (Note H)	0					
Total Project Cost Estimate GST included	\$13,161,000	\$0	\$0	\$0	\$0	\$0

Prepared by: jcb Nov 10 2004

Notes:

- A includes estimated escalation to August 2005: \$8,430,750 per CMRR + \$733,000 escalation + \$100,000 mechanical site services.
- B Replacement of electrical service cabling (by Utilities).
- C Relocations allowance; upset amount, anything over by FAS.
- D Connection from main servers on 6th floor RW to data closet in CBTC.

- E Allow for minor relocates and adds.
- F See fixed equipment schedule.
- G Card access to main entrance doors & elevator only.
- H See cash flow estimate: assumes project funded as necessary to avoid charges.

APPENDIX C:

**Sector Electrical
Service Upgrade**



To: Julian Binks, PMDC
From: Andy Fok, Utilities & Bldg. Operations
Date: 8 October, 2004
Re: Electrical Service at Ramsay Wright and Sidney Smith

Both Ramsay Wright and Sidney Smith are fed electrically from our Central Electrical Distribution (CED) system at 4,160 Volts in the form of a loop system. In normal operation, the loop is open in the mid-point and it becomes 2 radial feeders, one feeding Ramsay Wright, and the other feeding Sidney Smith. The criterion is such that in case a fault occurs along the loop, switching operation can be done to isolate the fault and close the loop so that power can be fed to the affected building from the other path of the loop.

The increased occupancy, equipment and renovations over the past years have caused great increase in electricity demands in both buildings. A recent load study has identified an overload situation during the peak demand periods in summer. Sidney Smith has a peak building load of 1,000 KVA and a chiller peak load of 513 KVA. Ramsay Wright has a peak building load of 1,225 KVA and a chiller peak load of 511 KVA. The total peak load in the loop becomes 3,249 KVA. However, the existing loop cable, which is 500 MCM in size, can only handle 2,846 KVA. An overloading of 403 KVA has occurred.

Since we operate the loop as 2 radial feeders in normal operation, each section of the loop only handles half of the load, so the overloading situation is not an immediate problem. However, we have lost the 100% redundancy. If there is a fault anywhere along the loop during the peak demand period, we'll have to shed loads in both buildings in order to close the loop.

A proposed plan is to replace the existing 500 MCM cable with 750 MCM cable which is the largest size of cable that can be put in the existing cable ducts. The new cable will have a capacity of 3,602 KVA. This can definitely solve the overloading problem. And the new spare capacity can support the loads of the additional floors at Ramsay Wright which is estimated to be 300 KVA.

However, if a new centralized chiller is to be installed in Ramsay Wright to supply the cooling to Ramsay Wright, Sidney Smith and Warren Stevens, then a careful evaluation of future loads and demands must be done in order to avoid future overloading problems.

Andy Fok

Copies: Bruce Dodds
Lewis Wong

APPENDIX D:
Cash Flow Analysis

Centre for Biological Timing and Cognition

Cashflow Model - Preliminary

Approval in December 2004 and tendered in August 2005.

Cash flow by quarter

Quarter	aug- oct 2004	nov-jan 2004-5	feb-apr 2005	aug-oct 2005	nov-jan 2005/6	feb-apr 2006	may-jul 2006	aug-oct 2006	nov-jan 2006/7	feb-apr 2007	totals
Approval & Cons. Select											
Design											
Tender & Construction											

comp
1-Aug

Funding:

CFI	\$0	\$0	\$0	\$617	\$1,045	\$1,045	\$1,326	\$1,327	\$0	\$0	\$0	\$5,360
OIT		\$0	\$0	\$617	\$1,045	\$1,045	\$1,326	\$1,327	\$0	\$0	\$0	\$5,360
A&S		\$140	\$423	\$1,356	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,440
Subtotal	\$0	\$140	\$423	\$2,590	\$2,090	\$2,090	\$2,652	\$2,654	\$0	\$0	\$0	\$13,160

Expenditure:

Prof fees & permits.	\$0	\$140	\$423	\$66	\$66	\$66	\$66	\$65	\$0	\$0	\$0	\$1,413
Construction	\$0			\$2,524	\$2,024	\$2,024	\$2,024	\$2,025	\$0	\$0	\$0	\$10,621
Furn, equip, misc.		\$0	\$0	\$0	\$0	\$0	\$563	\$563	\$0	\$0	\$0	\$1,126
Subtotal	\$0	\$140	\$423	\$2,590	\$2,090	\$2,090	\$2,653	\$2,653	\$0	\$0	\$0	\$13,160

Net Cash Flow

Net Cash Flow	\$0	\$0	\$0	\$0	\$0	\$0	(\$1)	\$1	\$0	\$0	\$0	
1 Interest rate	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%	3.75%	3.75%	4.00%	4.00%	4.50%	
Open balance	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$1)	(\$0)	(\$0)	\$0	
Change	\$0	\$0	\$0	\$0	\$0	\$0	(\$1)	\$1	\$0	\$0	\$0	
Int exp	\$0	\$0	\$0	\$0	\$0	\$0	(\$0)	(\$0)	\$0	\$0	\$0	(\$0) est. project intr. expense.
Close balance	\$0	\$0	\$0	\$0	\$0	\$0	(\$1)	(\$0)	(\$0)	(\$0)	\$0	

Notes:

1 expect to pay money market rate plus 0.25% for short term financing.

APPENDIX E:
Canada Foundation for Innovation
Equipment List

CFI Equipment List Part A:

A significant amount of loose equipment, instrumentation, etc. will be purchased through the CFI program; those items that will be located in CBTC facilities at the University of Toronto include (those items that have been identified as CFI equipment purchases but will be included in the construction contract are listed separately):

- NETWORK IBM Core server p690 (UT)
- NETWORK IBM p630 site servers (TWH,LAK)
- NETWORK IBM mobile site Intellistation Z Pro (UT,LAK,TWH)
- NETWORK IBM workstations Intellistation E Pro
- NETWORK IBM Networking equipment
- NETWORK IBM Palm PDAs
- NETWORK IBM implementation, training, development
- (EGI) 128-Channel Geodesic EEG/ERP Systems - Equipment
- (EGI) 128-Channel Geodesic EEG/ERP Systems- software
- (EGI) 128-Channel Geodesic EEG/ERP Systems- warranties
- SMI eye tracking device
- Mini-logger Series 2000 physiological data recorder system
- Actiwatch AW-SCORE activity monitor systems (UT, LAK, TWH)
- Mobile modular laboratories
- Vital View Temperature/Activity monitoring system
- Vital View lab animal locomotor activity monitoring system
- Long term activity recording chambers
- Animal behavioural testing system
- (UT) Ventilated animal housing - mice
- (UT) Ventilated animal housing - rat, hamster
- (UT) AniGARD II animal transfer stations
- (UT) Surgery - Anesthesia systems
- (UT) Portable anesthesia systems
- (UT) Sterotaxic surgical instruments
- Laminar flow hood
- Incubators - multi gas
- Microscopy/electrophysiology workstations
- Tissue fluorescence readers
- Electrochemistry system
- In vivo microdialysis Rodent workstation
- Steroetaxic instrument for microdialysis implantation
- High performance liquid chromatography system - rev. phase
- HPLC - microbore
- 2-D High performance liquid chromoatography
- Proteinchip biology system
- Genetic analysis suite
- Ultracentrifuge and rotor
- Bench top centrifuges
- High performance centrifuge
- Thermal cycler
- Microplate reader
- Electroporation
- Freezer (-80°C)
- Refrigerated storage - refrigerators
- Refrgerated storage - freezers
- Refrigerator/freezers
- Glassware washer/dryer
- Refrigerated orbital shaker/incubator
- Water baths

UV/Vis split beam spectrophotometer
 Class II laminar flow hood
 Refrigerated storage - glass door refrigerator
 (UT) Pharmaceutical refrigerator
 Cryostat
 Tissue processor
 Radial microtome
 Embedding station
 vibrating microtomes
 Programmable slide stainer
 UT Cognitive acquisition lab

CFI Equipment List Part B:

Centre for Biological Timing & Cognition

Equipment built-in and included in capital construction project

25	Autoclave	Steris	\$87,156
26	Cage washer	Scientek	\$86,665
30	Autoclave	Steris	\$123,600
33	Water purification system	Fisher	\$36,506
62	Fume hood - acid	Building Costs	\$47,200
63	Fume hood - organic	Building Costs	\$44,816
			\$425,943

APPENDIX F:

**Space Program Data Specification Sheets
for
CBTC Addition to
Ramsay Wright Zoological Laboratories
(available under separate cover)**

