Biomedical Science Research Facilities Funding Program

2010 Report
to the Minnesota State Legislature

January 15, 2010

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1.0 Executive Summary

Background

The University has established the goal of becoming one of the top three public research institutions in the world within the next decade. To achieve this goal, the University must expand its faculty by recruiting and retaining the best research talent, and must provide state-of-the-art research facilities.

In 2007, the University asked the State of Minnesota to create the Biomedical Facilities Authority as the mechanism to provide a predictable funding source for planning and building research facilities that, in turn, will allow the University to attract the nation's top research talent. **In 2008, the State established the $292 million Biomedical Science Research Facilities Funding Program.** This dedicated funding program will provide appropriations by the State to the University for up to 75% of the costs to design and construct four new and expanded laboratory facilities on the University's Twin Cities Campus.

Since the creation of the Biomedical Science Research Facilities Funding Program, **the University has made significant progress** in furthering the investment in biomedical science research facilities in Minnesota, including hiring a project director, completing master planning, completing design and starting constriction of the first of the four buildings, and completing pre-design and starting design on the second and third buildings.

District Master Plan: Initiated summer 2008 - Completed spring 2009

The East Gateway District adjacent to the east bank of the Twin Cities Campus represents one of the last non-developed areas available for future campus growth. This 54 acre area is currently utilized by the University as a remote surface parking reservoir.

In recognition of the need to plan for future growth, the University in July 2008 contracted with the Smith Group, a nationally recognized laboratory design and planning firm, to develop a master plan for the East Gateway District where the facilities authorized under the Biomedical Facilities Funding Program will be constructed. This district already contains several research facilities built within the past decade including the Lions Research Building/McGuire Translational Research Facility and Medical Biosciences Building, as well as the new TCF Bank Stadium. The purpose of the master plan is to guide future development in accordance with the mission, objectives and principles of the university.

The vision for the East Gateway District is to develop the District as a cohesive complex of research, support, and athletic facilities that has its own identity, but is integrated with the existing campus. **The District Master Plan proposes a mix of new research and academic facilities, core technical support functions, and new office and retail uses.**

The District will be supported with the development of the Central Corridor LRT line and a proposed multi-modal parking garage and bus transit/transfer facility. A buildout calculation of future development estimated that the District will accommodate approximately 3 to 4 million gross square feet of total new development including 1.9 to 3.0 million gross square feet in new academic and research facilities.

Included in the District and representing the first phase of development is the Biomedical Discovery District. The Biomedical Discovery District will include research buildings previously funded and built by the University, the research facilities funded by the Biomedical Funding Program, and development sites for additional research facilities growth.

After seven months of intense planning work, the East Gateway District Master Plan was completed in spring 2009.

Expansion of the Center for Magnetic Resonance Research: Initiated fall 2008 – to be Completed fall 2010

The first project to be funded by the Biomedical Facilities Program is the expansion and renovation of the University's Center for Magnetic Resonance Research (CMRR) Building.

In the short period of time since its discovery, the magnetic resonance (MR) phenomenon has been utilized to extract an unprecedented wealth of information in chemical and biological sciences. The use of MR to acquire images has lead to magnetic resonance imaging (MRI) as an indispensable tool that permits the visualization of human anatomy with high spatial resolution and the ability to distinguish different types of tissues. The boundaries of this imaging methodology will continue to expand, and currently are focused on the acquisition of physiological, chemical and functional information non-invasively in intact animals and humans.

Expanding the capabilities in imaging and spectroscopy to higher spatial and temporal resolution, higher specificity, and exploiting them in biomedical research and clinical medicine are the central research themes for CMRR. Adding to the rapid new developments in the areas of MRI and MRS is the need to add PET/CT imaging to further explore the function, physiology, metabolism, and anatomy of the cell and larger organs. PET imaging allows for the development of selective markers of disease presence and response to therapy. The addition of small animal PET/CT/SPECT devices coupled with the expanded MRI/MRS devices in CMRR will provide a research environment at least equal to other leading medical centers and will open up the possibility of research grants that were not previously possible. These new facilities will have significant application in cancer research, tumor biology, cardiac diseases, neurosciences and radiology.

In fall of 2008, the University together with the State Designer Selection Board interviewed architects and selected and contracted with RSP Architects to design a 75,000 gross square foot expansion to the existing CMRR building and renovation of existing spaces. The expansion will consist of a one-story addition to the north that will provide space for additional mechanical and support spaces, and a two-story addition to the east that will provide space for additional imaging equipment, offices and a new entrance/lobby.

The premise behind the design for the CMRR expansion follows the same organizational principles used in the current CMRR. In the present facility, research spaces and their associated activities are functionally separated, based on the mode of the test subject – animal or human. Magnetic resonance experiments on animals and human test subjects are conducted in two separate magnet zones. The new expanded program for the CMRR will maintain those organizational principles with separate, magnet and research spaces for both animals and humans and a mixed magnet zone. New to the CMRR research program is that of a clinical imaging center, complete with new MR PET and PET scanners and supportive equipment.

Sited between the existing McGuire Translational Research Facility and the Medical Biosciences Building (MBB), the CMRR will architecturally and physically link the facilities in this section of the East Gateway District. The CMRR expansion will utilize a material palette of glass, precast concrete and metal to present a unified identity for the campus. A skyway to MBB will allow researchers to move between the facilities.

The CMRR expansion will provide space for 20 additional researchers. Combined with the additional imaging equipment, **the Center for Magnetic Resonance Research will become a top imaging facility in the country.**

Construction of the CMRR expansion began in summer of 2009 and completion is scheduled for July 2010. The University will move into the expanded facility later in the year. **The total cost of the project is $53,200,000.**

Cancer Research and Cardiovascular Research Buildings: Initiated spring 2009 – Projected Construction Start in 2011 – Projected Completion in 2013

The second and third projects to be funded by the Biomedical Facilities Program are the Cancer Research Building and the Cardiovascular Research Building. These two projects are being designed and constructed concurrently in order to realize construction and operating efficiencies.

In spring 2009, the University together with the State Designer Selection Board reviewed 24 proposals submitted by architectural teams across the country, and selected and contracted with Architectural Alliance, a Minneapolis architectural firm, to program and design the Cancer and Cardiovascular buildings. Included as part of Architectural Alliance's team are Zimmer Gunsul Frasca Architects (ZGF), a laboratory design specialist, Jacobs Consulting, a nationally recognized laboratory planning firm and Affiliated Engineers, a laboratory engineering specialist.

In the summer of 2009, the University selected and contracted with M.A. Mortenson to be the University's construction manager and provide scheduling, cost estimating and constructability reviews during the design phases.

Programming and pre-design work to determine the size and location for the facility began in July 2009, and continued throughout the summer and fall with extensive workshops involving the consultants, University faculty and staff who will occupy the facility, and other University staff representing the Academic Health Center, Capital Planning, Facilities Management, Environmental Health & Safety, as well as other University departments.

The combined Cancer and Cardiovascular facility will be approximately 280,000 gross square feet in size. This space will be allocated to research laboratories, laboratory support spaces, offices, shared instruments, and lobby and support spaces. Research programs that are anticipated to be housed in the facility include chemoprevention and carcinogenesis, vascular biology and hypertension, cardiovascular imaging, spectroscopy and structural biology, cardiovascular genomics and cardiovascular signaling, metabolism and disease.

The site for the facility is the parking lot located to the north and east of the Medical Biosciences Building (MBB). The Cancer/Cardiovascular facility will designed as the centerpiece of a multi-building district called the Biomedical Discovery District, which will include the CMRR building, Medical Biosciences Building and Lions/MTRF building. The multi-building complex will be interconnected so that faculty and staff will be able to move seamlessly between buildings for collaboration and core support needs. Researchers in Cancer/Cardiovascular facility as well as researchers in other buildings will be able to use the expanded CMRR facility for their research imaging needs.

The Pre-design phase of the project was completed in December 2009.

In January 2010, the project proceeded into design. The first design phase - schematic design - is projected to be complete by May 2010. **The total cost of the combined Cancer/Cardiovascular Research project, including the necessary infrastructure improvements, is estimated to be $200,300,000.** Construction is scheduled to begin in the summer of 2011 and will be complete in the fall 2013. The University plans to occupy the building later in the year.

Fourth Building Project – Will be initiated in 2011 – Projected to be completed in 2015

The fourth project to be funded by the Program is still in the concept phase. The University intends to begin pre-design activities in 2011. The building program, cost, and schedule will be developed during pre-design.

2.0 Appendices

A.1 East Gateway District Master Plan – May 2009

A.2 Schematic Design Report for the Center for Magnetic Resonance Research Expansion and Renovation – February 2009

A.3 Biomedical Discovery District – Predesign Report - March 2010

EAST GATEWAY DISTRICT MASTER PLAN

UNIVERSITY OF MINNESOTA, TWIN CITIES
MAY 15, 2009

ACKNOWLEDGEMENTS

This plan was prepared with the benefit of contributions from University of Minnesota Staff in the following offices:

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EXECUTIVE SUMMARY

INTRODUCTION

The East Gateway District of the Twin Cities campus is an area in significant transition. Historically an industrial railyard serving the vast grain storage and transport needs of the upper Midwest, the District has more recently been utilized by the University of Minnesota as a remote surface parking reservoir. Within the last decade, two new research facilities, the Lions Research Building/McGuire Translational Research Facility (Lions/McGuire Research Facility) and the Center for Magnetic Resonance Research (CMRR), were constructed in the District, with a third research building, the Medical Bioscience Building (MBB), under construction at the time of this report. In addition to research functions in the East Gateway District, the new TCF Bank Stadium is under construction and will open in the fall of 2009. With this pace of new development, the District has become the most rapidly developing area of campus.

In 2008, authorization by the Minnesota State Legislature of bonding for the Biomedical Science Research Facilities Program has committed the University of Minnesota to the construction of four additional research buildings over the next five years. In addition, the Metropolitan Council has committed to the design and construction of the Central Corridor Light Rail Transit (LRT) line to be completed in 2014, with a transit stop planned for the District.

Given this commitment and amount of construction, the East Gateway District will undergo an accelerated pace in its transformation. In short, it is the expectation of the UM East Gateway Project Executive Committee that "the whole fulcrum of the campus will change as a result of this development."

The University of Minnesota and its Capital Planning and Project Management (CPPM) office decided that it was time to undertake a District Master Plan and design guidelines for the district to guide its future development in accordance with the mission, objectives, and principles of the university. This report is the end result of a seven-month planning effort that commenced in July of 2008 to achieve this goal.

The East Gateway District is in the process of transforming from its industrial past to a new future of biosciences research.

PLANNING PROCESS

The CPPM chose a planning team to prepare this District Master Plan and to work collaboratively with the University of Minnesota (University), CPPM staff, and University stakeholders to establish the vision for the East Gateway District. The planning team worked with the CPPM and two committees set up for this planning effort: the Project Executive Committee, responsible for the project oversight, major recommendations, and final recommendation to the University president and Board of Regents; and the Project Steering Committee, responsible for review and comment on the technical content and coordination among University departments to support the plan. The planning team also met with several staff members of various University departments and City of Minneapolis staff to understand the wider planning parameters and objectives for the District.

PLANNING CHALLENGES

The academic, and particularly research needs of the University will continue to grow, yet the University is out of land for expansion. The East Gateway District adjacent to the east bank of the Twin Cities campus represents one of the last non-developed areas available for future campus growth. Therefore, future development of this area should promote a level of density that will use limited land resources wisely.

Along with density, the University should establish a campus type of environment, one in which it can share valuable resources and core technical functions, rather than prepare individual building sites. Developed in this model, the East Gateway District will build an identity as a complete environment with a high level of amenities to attract and recruit top researchers and adjacent private partners.

The East Gateway District is not immediately adjacent to the Academic Health Center, clinical uses, or other core science programs on the main campus. Functional proximity to these related uses will be critical to the District's and program's success. Development of the District must utilize multiple and creative ways to link its users to the main campus, and vice versa, including future transit, campus bus, pedestrian, and bicycle connections. This will also reduce reliance on driving, parking demand, and traffic on local roads.

PLANNING PRINCIPLES

Planning principles were established early in the planning process to guide the creation of the plan. The planning principles for the District are intended to:

1. Provide a supportive academic and research environment.
2. Create an image of architectural distinction, integrity, and brand.
3. Optimize the use of scarce land resources.

Attractive urban spaces and interior lab environments both support innovative research and identity.

4. Maximize flexibility for future development.
5. Strengthen the multi-modal transportation system in the area.
6. Create an attractive, functional, and safe environment for pedestrians and cyclists.
7. Integrate into the existing campus and surrounding community.
8. Build a real sense of community and place for the District.
9. Create a cohesive, memorable system of public spaces.
10. Develop a District that is environmentally and operationally sustainable.

VISION FOR EAST GATEWAY DISTRICT

Develop the East Gateway District as a cohesive complex of research, support, and athletic facilities that has its own identity, but is integrated with the existing campus.

The vision for the East Gateway District is supported by three goals:

- Support the University's goal to be one of the top three public research universities in the country.
- Sustain the vitality and excellence of Minnesota's health research.
- Provide world class facilities and an environment that will attract and retain the top researchers, faculty, and staff in the biomedical sciences and health fields.

The realm of bioscience and biomedical research is constantly evolving. New areas of science and new technologies will emerge that will drive translational research. The structure of bio-research teams will become more interdisciplinary. These trends in turn will have an impact on the physical facilities and districts developed to support these activities—research, clinical, and teaching environments will become more integrated.

To support this research-intensive and collaborative environment, the vision for the East Gateway District is of a vibrant, dynamic, urban research campus, where teams can have access not only to the best facilities and equipment, but also to other researchers in the District, in the University, and in the larger research community.

Future buildings will be grouped into walkable neighborhoods or clusters supported by shared technology and common amenities, seminar spaces, and areas for both formal and informal interaction. The District will include a mix of support, retail, commercial, entertainment, and recreational uses. Light rail transit will conveniently link the District to the main campus and the Academic Health Center, along with a high quality, outdoor pedestrian environment.

DISTRICT MASTER PLAN RECOMMENDATIONS

Recommendations of the East Gateway District Master Plan address urban design and program themes, including:

- Gateways and identity.
- Land use and activity patterns.

- Development framework.
- Development density.
- Building massing.
- Architectural guidelines.
- Landscape and open space elements.
- Circulation, transit, and parking.
- Infrastructure concerns.

SUMMARY OF THE EAST GATEWAY DISTRICT MASTER PLAN

The District Master Plan proposes a mix of new research and academic facilities, core technical support functions, and new office and retail uses within the 54-acre District. Activity in the District will be supported with the development of the Central Corridor LRT line on 23rd Avenue, combining its transit stop with a new multi-modal parking garage and bus transit/transfer facility. A buildout calculation of future development estimated that the District would accommodate approximately 3 to 4 million gross square feet (gsf) of total new development, including 1.9 to 3.0 million gsf in new academic and research facilities. Additional parking garages and smaller surface lots will maintain 4,200 parking spaces in the area as parking support for new development and as shared parking reserve for game days at the football stadium and athletic venues.

The physical development pattern creates a dense, walkable urban research district, with buildings in the 4- to 7-story range. Development is proposed on both sides of 6th Street, taking advantage of the undeveloped land immediately north of the football stadium, bringing research facilities into the pedestrian environment surrounding the stadium and helping to activate the area on non-game days.

Two gateways are proposed for the District: one at the most visible corner of University Avenue and Huron Boulevard/23rd Avenue, and the second at the intersection of Oak and 6th Streets. The first is a prominent corner that will create a foreground to the stadium. The first phase research cluster at the intersection of 23rd Avenue and 6th Street will be visible and accessible from this gateway. The cluster of buildings will be served by a new bio-commons with shared retail, food service, support amenities, and seminar space to create a common area of interaction for the next three buildings developed in the District. As this area builds out, it will be served by the construction of the Stadium Village transit stop of the Central Corridor LRT, scheduled to be completed in the same time frame as the next three buildings funded by state legislation.

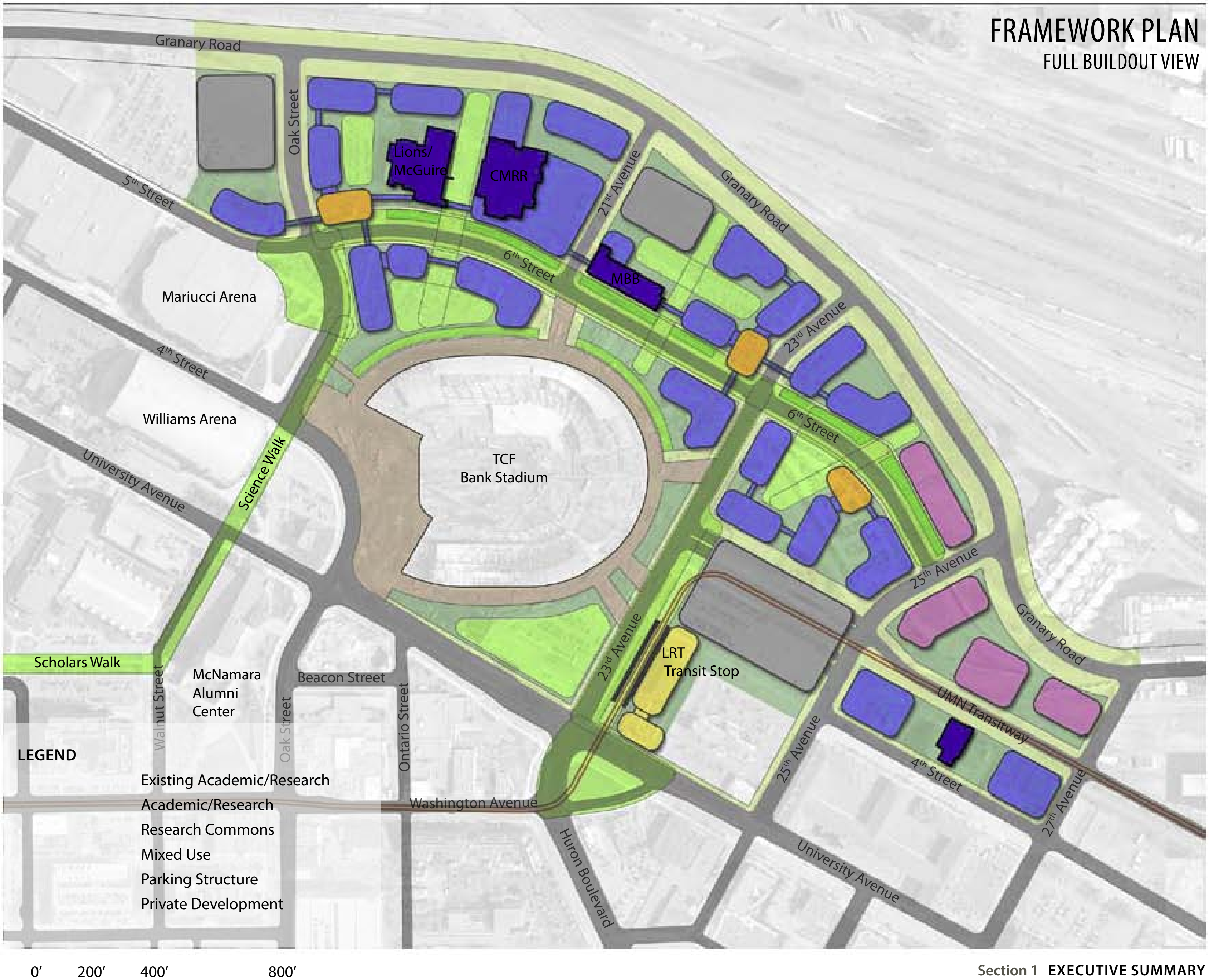
The gateway proposed at 6th and Oak Streets is the nucleus of a second research cluster and bio-commons, visible from University Avenue with a realignment of Oak Street at 6th Street. It is easily linked to the core campus and Academic Health Center by a proposed pedestrian walkway, the Science Walk, that will connect directly to the Scholars Walk at McNamara Alumni Center.

USE OF THE DISTRICT MASTER PLAN

The following District Master Plan report describes in more detail the existing conditions of the District, the organizational concept for the East Gateway District, and its District and architectural guidelines. It is the intent of this report to guide development of the East Gateway District according to the principles established for the plan. It is a flexible guide, describing a framework for development, general massing, building envelopes, open space relationships, and key pedestrian connections, but it does not address specific building footprints or architectural design. It can therefore be adaptable to future program changes and needs within its framework as the District builds out.

DEVELOPMENT SUMMARY

- 54-acre District total
- Approximately 3-4 million gsf of new development
- Total includes 1.9-3 million gsf of new academic and research uses
- Uses future Stadium Village transit stop of the Central Corridor LRT on 23rd and University Avenues
- 300 employees currently within existing development; up to 700 new employees with Phase I development



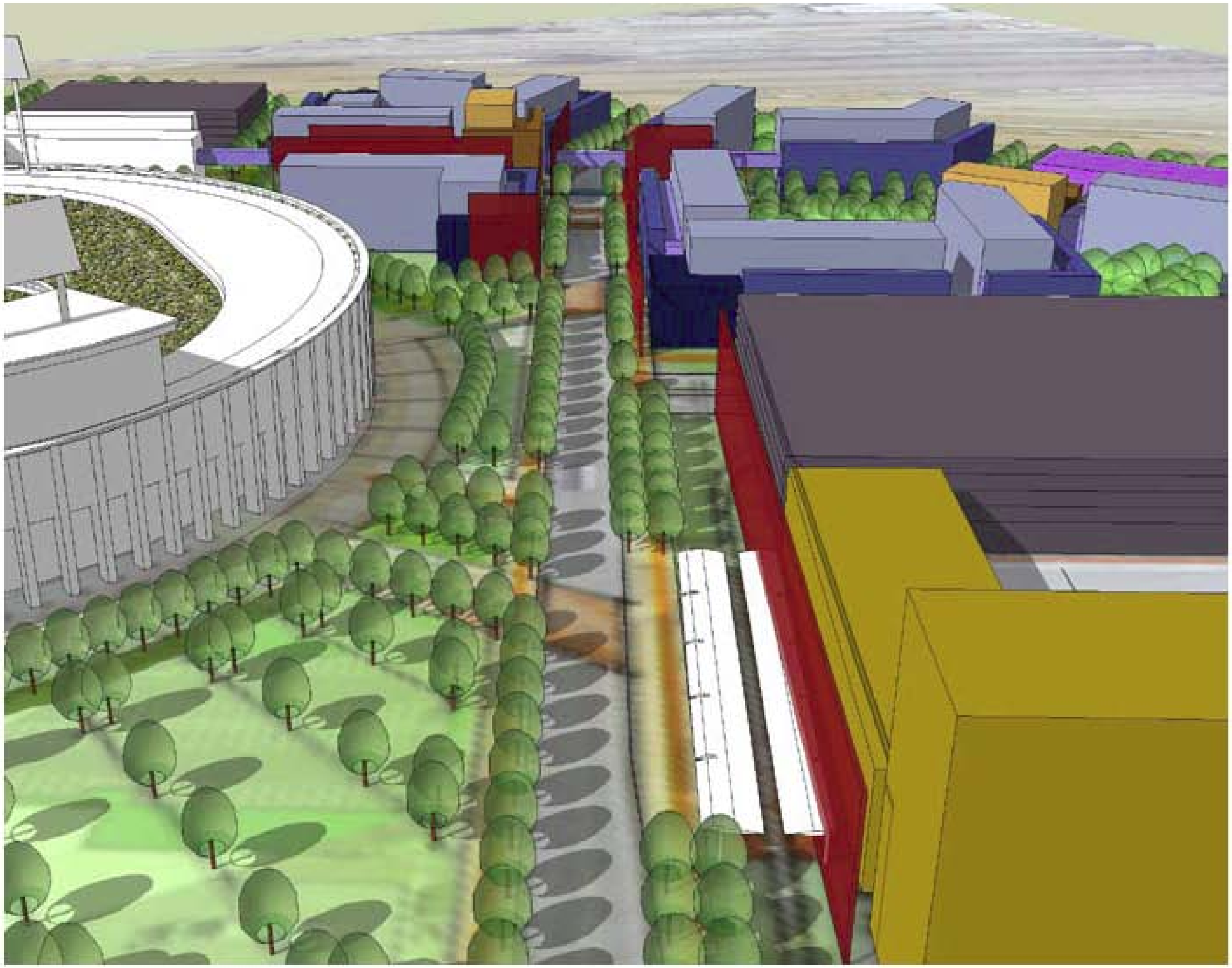
FRAMEWORK PLAN
FULL BUILDOUT VIEW
Granary Road
Oak Street
Lions/ McGuire
CMRR
5th Street
21st Avenue
Granary Road
6th Street
MBB
Mariucci Arena
23rd Avenue
4th Street
Williams Arena
6th Street
TCF Bank Stadium
University Avenue
Science Walk
25th Avenue
Granary Road
LRT Transit Stop
23rd Avenue
Scholars Walk
McNamara Alumni Center
Beacon Street
Walnut Street
Oak Street
Ontario Street
UMN Transitway
25th Avenue
4th Street
27th Avenue
Washington Avenue
Huron Boulevard
University Avenue
LEGEND
Existing Academic/Research
Academic/Research
Research Commons
Mixed Use
Parking Structure
Private Development
0′ 200′ 400′ 800′


ILLUSTRATIVE PLAN
Granary Road
Oak Street
Lions/ McGuire
CMRR
CMRR Expansion
21st Avenue
5th Street
6th Street
MBB
Mariucci Arena
4th Street
23rd Avenue
Williams Arena
Science Walk
TCF Bank Stadium
University Avenue
McNamara Alumni Center
25th Avenue
Support Use
UMN Transitway
4th Street
27th Avenue
Washington Avenue
LEGEND
Research/Office
Academic/Research Lab Areas
Bio-Commons
Mixed Use
Parking Structure
Private Development


OVERALL PERSPECTIVE VIEW
Granary Road
6th Street
4th Street
Oak Street
University Avenue
23rd Avenue
Beacon Street
Oak Street
Ontario Street
Washington Avenue
Huron Boulevard
25th Avenue

23RD AVENUE CORRIDOR

LOOKING NORTH TO 6TH STREET



6^{TH} STREET CORRIDOR
LOOKING EAST TO 23^{RD} AVENUE

OAK STREET GATEWAY

OAK STREET AT 6TH STREET


PHASE I DEVELOPMENT AREA
Granary Road
6th Street
4th Street
Oak Street
University Avenue
23rd Avenue
Beacon Street
Ontario Street
Oak Street
Washington Avenue
Huron Boulevard
25th Avenue

EXISTING CONDITIONS

INTRODUCTION

About This Section

This section describes the various influences, past and present, on the 2008 physical context of the East Gateway District. Topics in this section include the following:

Historical Context
Regional Context
2008-2009 District Inventory
Buildings
Vehicular Circulation
Parking Capacity
Utility Corridors

EAST GATEWAY DISTRICT

The East Gateway District has been slowly transforming from an industrial area to University-related uses for several decades. Rail lines and a few remaining silos at the edge of the University are evidence of the District's recent past. The first use of this District by the University was as surface parking. As the last, large-scale, largely undeveloped land area on campus, it has become a primary location for the University's expanding academic and research programs. The new TCF Bank Stadium and several research and office buildings in the District have begun the transformation of the East Gateway District into a more active academic quadrant of campus.

Located on the eastern edge of campus and facing University Avenue as well as high profile venues like Williams and Mariucci Arenas, the new District has to respond to a variety of surrounding land uses and the needs of a built campus identity.

The site has no major natural features and is relatively flat. Many of the past industrial structures have been removed in recent years to allow for redevelopment. As the site has a fairly intensive industrial past, many recently developed sites have been subject to remediation. This, along with a relatively high water table, likely limits below-grade construction.

Recent construction during the last decade includes Lions/McGuire Translational Research Facility and the Center for Magnetic Resonance Research (CMRR).

A TRANSITIONING DISTRICT
There are still signs of the District's industrial roots in the midst of massive construction with the new stadium and research buildings.

HISTORICAL CONTEXT

For much of the 20th century, the East Gateway District was a heavy industrial railyard. This past is clearly depicted in the 1930s historic image on the opposite page. The last of the silos that existed in the District were demolished in early 2008. However, just outside of the northeast edge of the District, a steel-framed silo of historic significance remains and will be preserved in one form or another.

Additionally, just west of Williams Arena is a historic fire station not owned by the University. This structure also falls outside of the study area on the west side of Oak Street.

As the campus has grown and the railyards have moved elsewhere, the land in the District has slowly been acquired by the University. Prior to the development of TCF Bank Stadium, the District was primarily used as a satellite parking zone. This can be seen in the aerial from 2006 shown below. The development of the stadium, new circulation system, and research buildings has dramatically transformed the District.

2006 CAMPUS AERIAL

Prior to recent stadium construction, the East Gateway District was the last vestige of inexpensive surface parking on the campus.

AERIAL VIEW OF CAMPUS, ca.1930

This historic image, courtesy of the Minnesota Historical Society, depicts the extent of the railyards in the East Gateway District.

REGIONAL CONTEXT

Research Relationships

As translational research has been identified as the primary focus for future academic buildings in the District, the site's relationship to other health related resources on and around the campus is extremely important. The specific centers that are of programmatic significance to the District include the Academic Health Center, the planned Ambulatory Care Clinic, and biosciences in the academic core.

The distance from the East Gateway District to each of these centers is a significant challenge for future research collaboration. The plan will need to address pedestrian and transit connections to link the District to the other centers.

To the east of the site, the city has promoted research-focused development. The University hopes that this development will collaborate and partner with research in the East Gateway District, and is therefore a vital physical connection to create.

Connections

University and 23rd Avenues are the two primary vehicular connections to the campus from the larger region. However, in the long term, the planned Granary Road will also connect the site as a regional bypass.

Other vehicular connections to the main campus are limited due to the removal of through roads from the campus over time. Oak Street is the only remaining north/south connection from the campus to the East Gateway District.

In general, the District is dominated by vehicular traffic. Roads and parking lots still populate the site, and new roads have been constructed around the stadium to serve both its needs as well as the growing needs of new academic buildings.

The transitway that connects the Minneapolis and St. Paul campuses ends at the edge of the new District; campus buses then go around the stadium to enter campus. The transitway to St. Paul is a permanent connection and is an asset to the new District and the neighborhood. Buses operated by Metro Transit also run close to the site, with stops along University and Washington Avenues.

The #16 bus, used by a large part of the University community, connects downtown St. Paul to downtown Minneapolis through the University's Minneapolis campus. Use of the Route #16 will be diminished by the planned Central Corridor LRT line, which should open in 2014. The planned closure of part of Washington Avenue to automobile traffic to allow for the future light rail will have a profound effect on the vehicular circulation patterns of the East Bank campus.

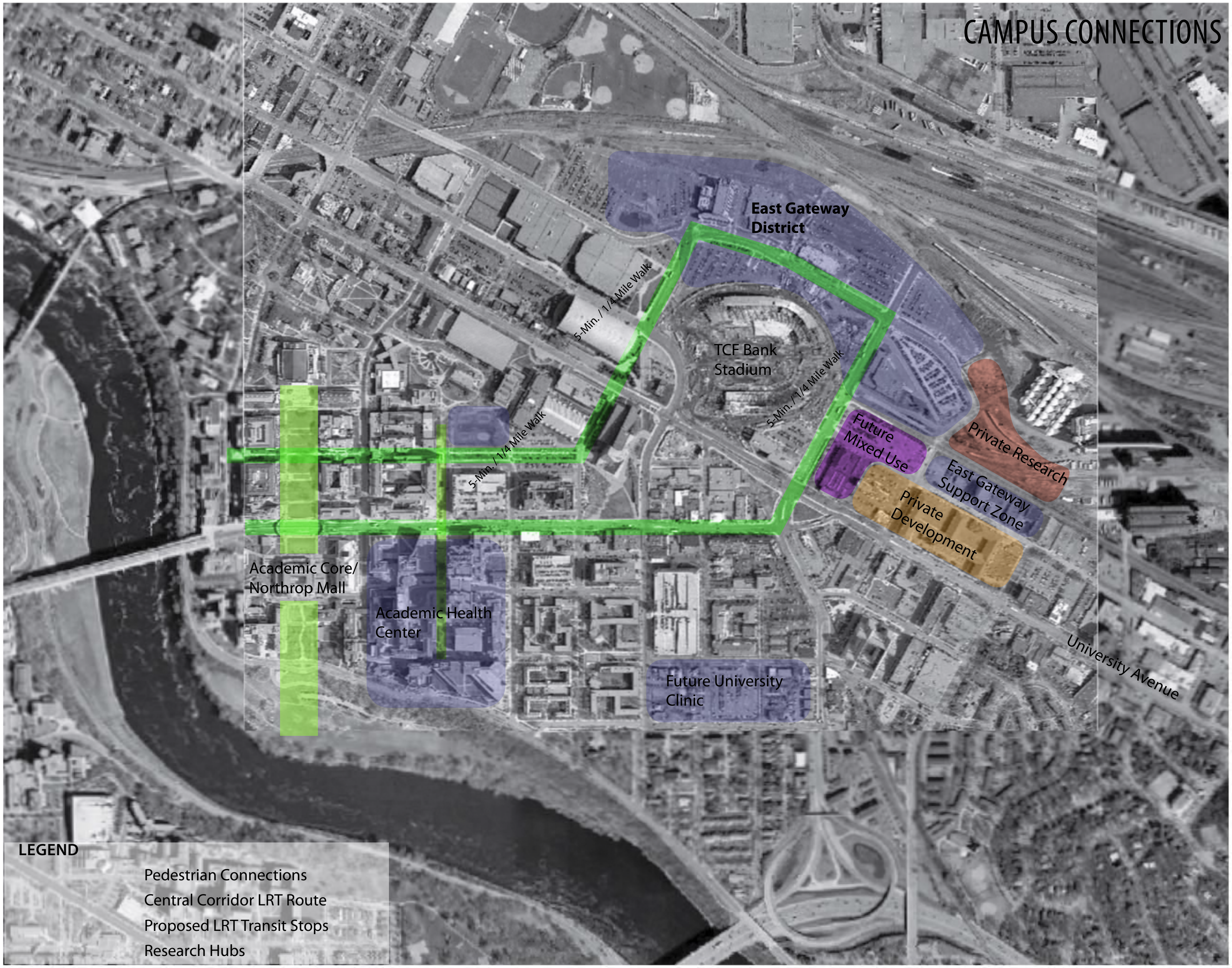
Pedestrian connections to campus are challenging from the East Gateway District. There are only minor sidewalks along very busy streets. Walking from the East Gateway District to almost anywhere on campus requires crossing at least one major thoroughfare. The closest major pedestrian corridor is Scholars Walk, which ends to the southwest of the McNamara Alumni Center.

Surrounding Land Uses

The industrial railyards to the north create an impermeable barrier on the edge of the District. The industrial buildings and silos that remain here connect the history of the East Gateway District to its history as an industrial center.

To the east along University Avenue, the urban fabric of Minneapolis picks up where the University leaves off. Small-scale retail shops, apartments, a hotel, a gas station, and many other buildings are mixed together to serve the needs of the University as well as the residents in the neighborhood. University Avenue is also the campus entrance from the east, giving the East Gateway District its name and subsequent responsibility to define the threshold of the Minneapolis campus. To the northeast, there are aging industrial and warehouse buildings, but private development has begun to plan for biomedical research facilities to complement the academic research programs in the East Gateway District.

The District's southern edge is University Avenue and around the edge of the TCF Bank Stadium. This edge is perhaps the least tangible boundary, as both the scale of the stadium and the variety of buildings along Washington



CAMPUS CONNECTIONS
East Gateway District
5-Min. / 1/4 Mile Walk
TCF Bank Stadium
5-Min. / 1/4 Mile Walk
5-Min. / 1/4 Mile Walk
Future Mixed Use
Private Research
East Gateway Support Zone
Private Development
Academic Core/ Northrop Mall
Academic Health Center
Future University Clinic
University Avenue
LEGEND
Pedestrian Connections
Central Corridor LRT Route
Proposed LRT Transit Stops
Research Hubs

Avenue obscure the transition between districts. University Office Plaza and the Information Technology building, both along University Avenue, help articulate this challenging transition.

To the west, Williams and Mariucci Arenas, along with the new football stadium, connect the District to the adjacent athletic area. The scale of these buildings, unique to their use and capacity, also presents a challenge.

2008-2009 DISTRICT INVENTORY

The following illustrations highlight the existing features of the East Gateway District related to buildings, vehicular circulation, parking, and utilities. These illustrations are intended to provide a baseline for recommendations made later in the report.

1 Medical Biosciences Building Under Construction
2 Lions/McGuire Translational Research Facility from 6th Street
3 Williams Arena
4 View from University and 23rd Avenues
5 TCF Bank Stadium Under Construction
6 Historic Steel Silos
7 Historic Fire Station

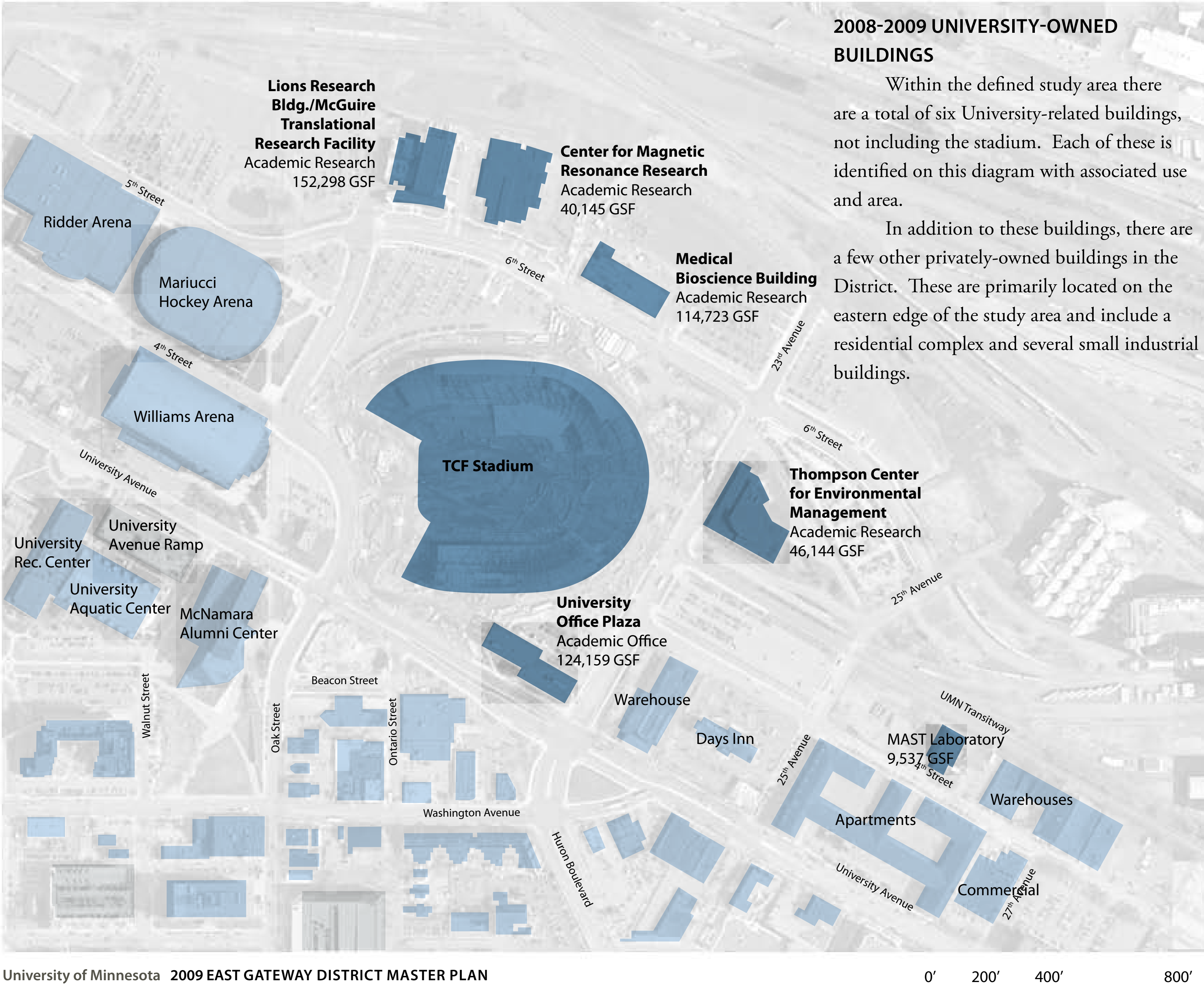

2008 EXISTING CONDITIONS
Lions/ McGuire
CMRR
Oak Street
5th Street
Ridder Arena
Mariucci Arena
6th Street
MBB
4th Street
Williams Arena
23rd Avenue
6th Street
TCF Bank Stadium
University Avenue
Thompson Center for Environmental Management
University Avenue Ramp
University Rec. Center
University Aquatic Center
McNamara Alumni Center
25th Avenue
23rd Avenue
Beacon Street
Walnut Street
Oak Street
Ontario Street
UMN Transitway
MAST Laboratory
25th Avenue
4th Street
Washington Avenue
University Village
Huron Boulevard
University Avenue
27th Avenue

0′ 200′ 400′ 800′

2008-2009 UNIVERSITY-OWNED BUILDINGS

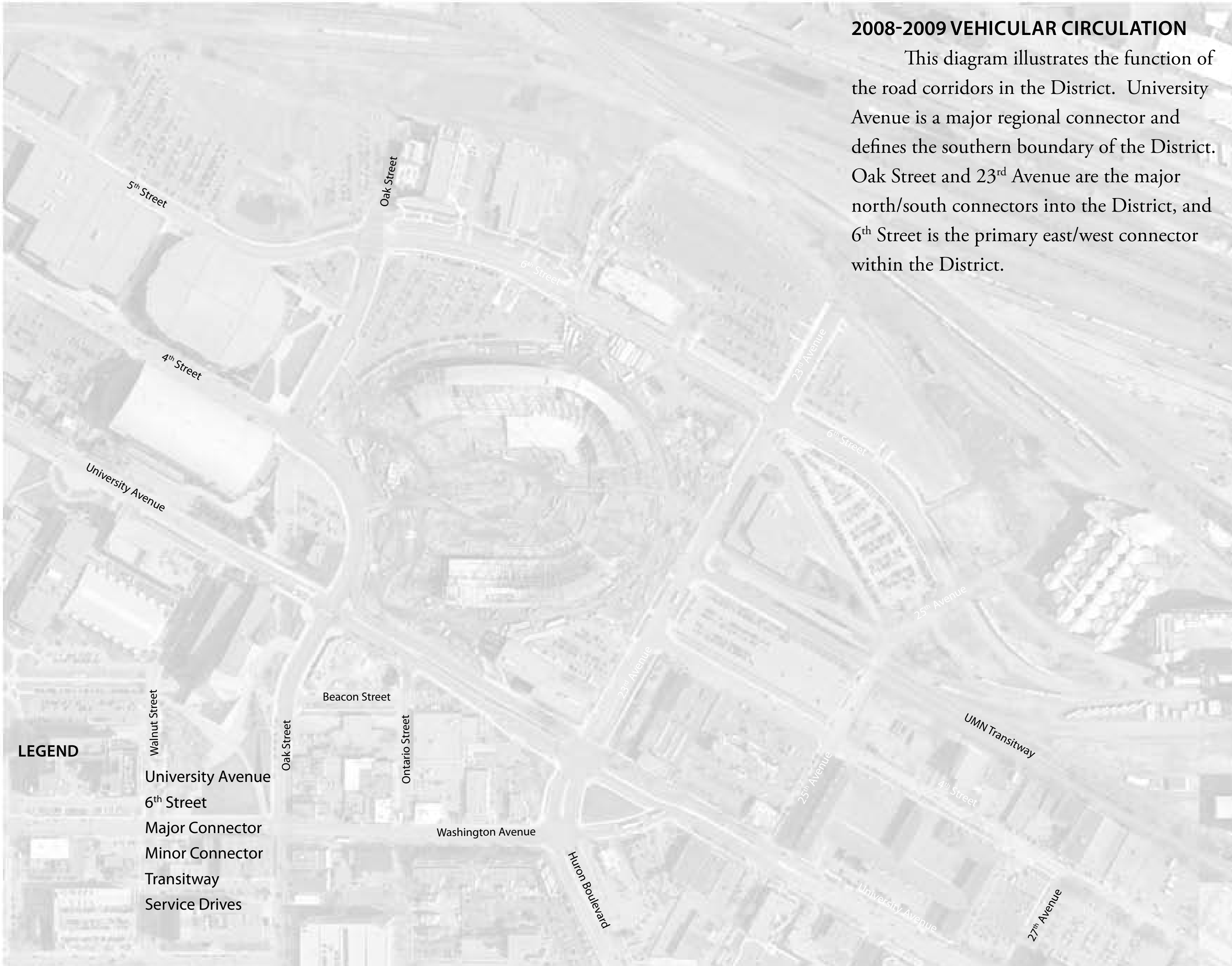
Within the defined study area there are a total of six University-related buildings, not including the stadium. Each of these is identified on this diagram with associated use and area.

In addition to these buildings, there are a few other privately-owned buildings in the District. These are primarily located on the eastern edge of the study area and include a residential complex and several small industrial buildings.



2008-2009 VEHICULAR CIRCULATION

This diagram illustrates the function of the road corridors in the District. University Avenue is a major regional connector and defines the southern boundary of the District. Oak Street and 23rd Avenue are the major north/south connectors into the District, and 6th Street is the primary east/west connector within the District.



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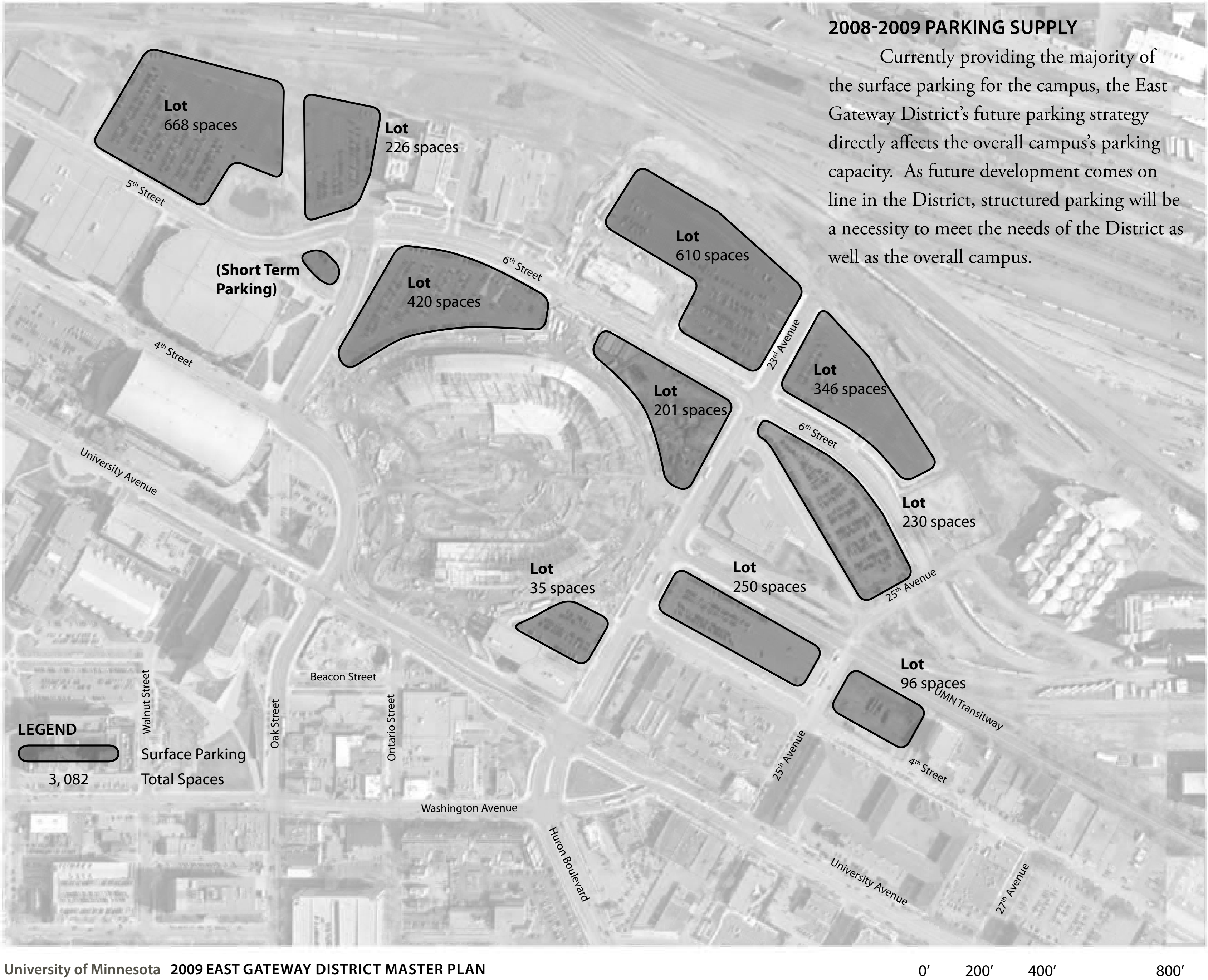
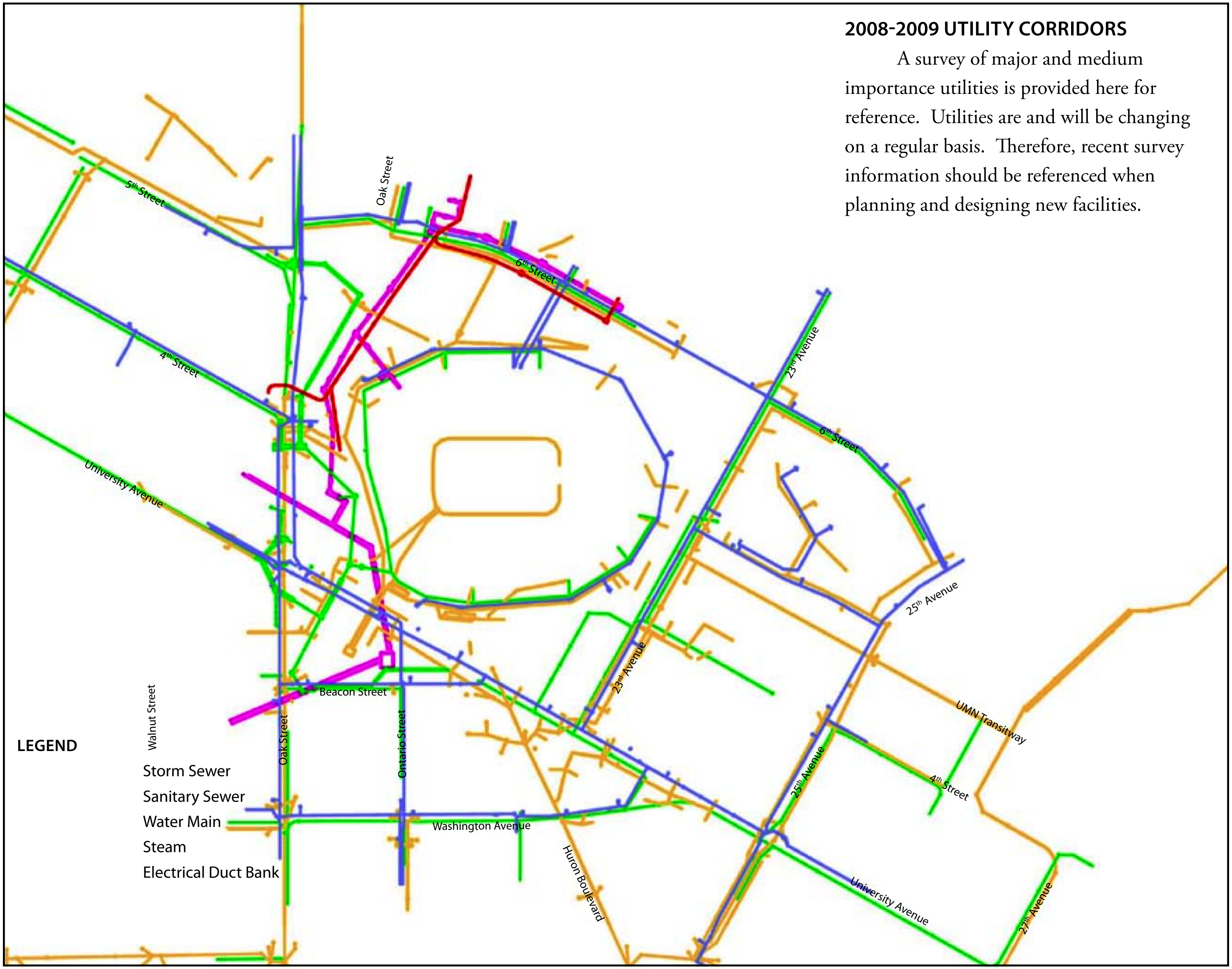
2008-2009 PARKING SUPPLY

Currently providing the majority of the surface parking for the campus, the East Gateway District's future parking strategy directly affects the overall campus's parking capacity. As future development comes on line in the District, structured parking will be a necessity to meet the needs of the District as well as the overall campus.



2008-2009 UTILITY CORRIDORS

A survey of major and medium importance utilities is provided here for reference. Utilities are and will be changing on a regular basis. Therefore, recent survey information should be referenced when planning and designing new facilities.



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DISTRICT ORGANIZATION

INTRODUCTION

This section describes the plan's overall organizational structure. Topics in this section include the following:

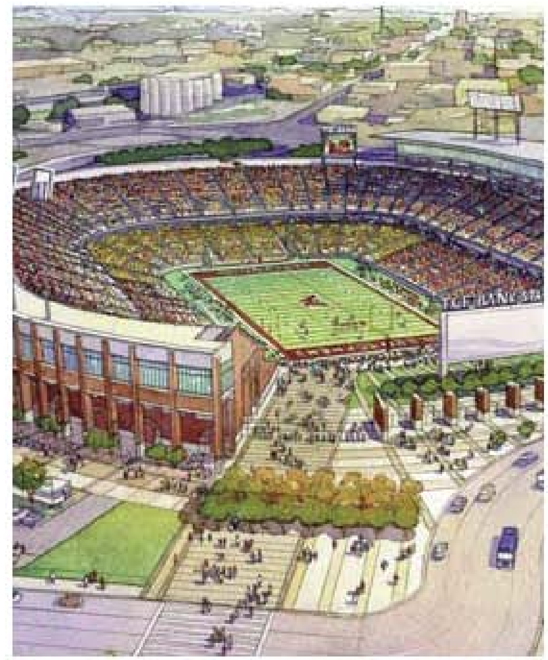
Organizational Concept
Land Use Zones
Research/Academic Zone

Overview

Early in the planning process, the organizational concept was developed to help guide the physical organization of the District. It divides the District into two major edges—academic/research and stadium—and designates where major gateways into the District should occur.

Based on this simple diagram, the District is subdivided into six land use zones. Each zone's intended focus and primary use is described in this section, with most of the attention given to the academic/research zone, which is the focus of this effort.

Within the academic/research zone, there are three research clusters and one lab support cluster planned. Each cluster will include research facilities that share a research commons facility. This common space will function as a social and research hub and will include amenities such as cafes and dining. Additionally, shared research facilities will be located in the commons to reduce duplication and encourage collaboration.



TCF BANK STADIUM
Opening for the 2009 season, the stadium will be the most dominant feature of the East Gateway District.

ORGANIZATIONAL CONCEPT

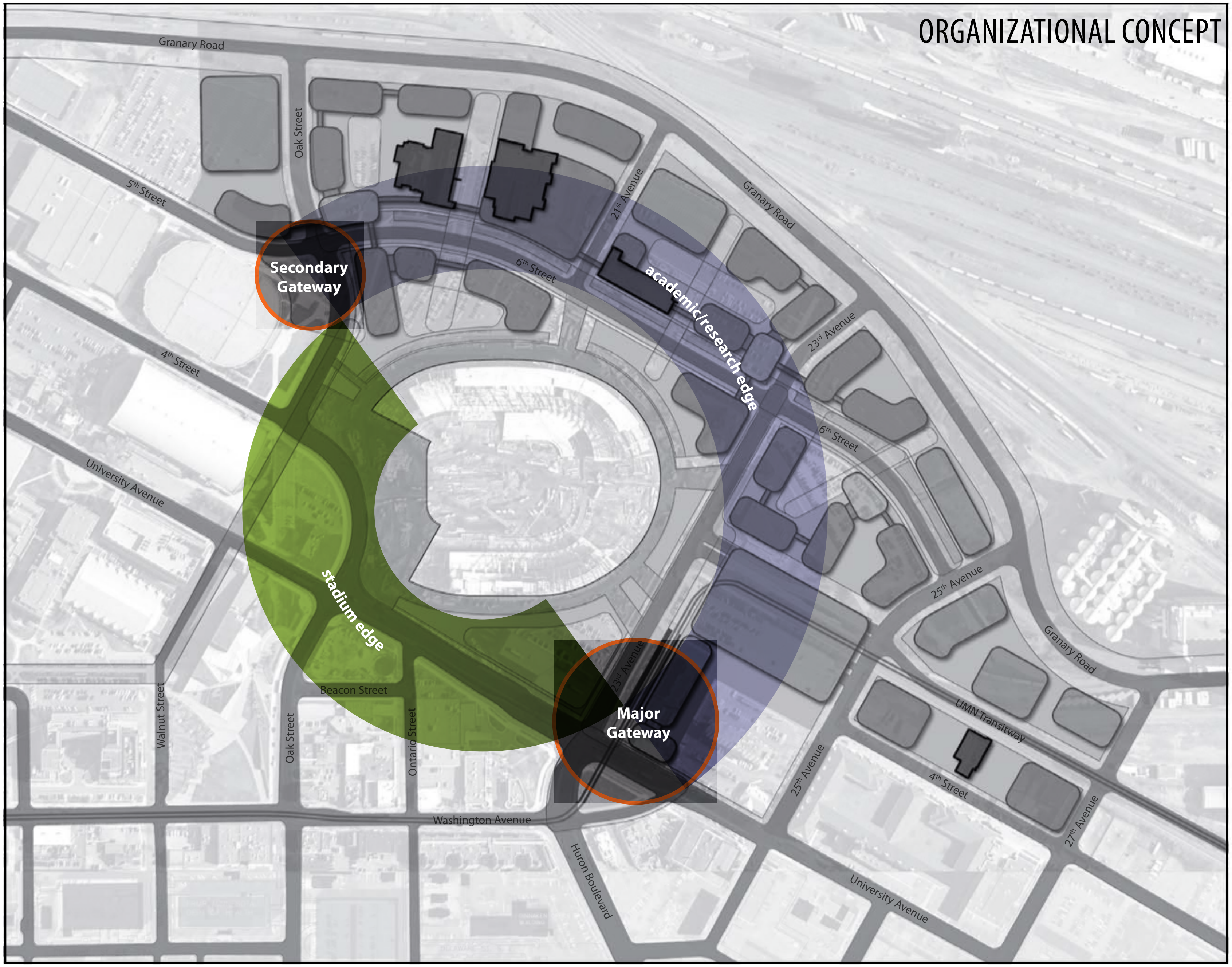
The organizational concept for the East Gateway District grew from two basic planning challenges. First, the research focus of the District must find a way of working with the new TCF Bank Stadium to create a larger image for the entire University. Second, as the Minneapolis campus builds its eastern edge, the symbolic "gateway" role of the District as a campus threshold can be realized.

As the most dominant and identifiable feature of the East Gateway District, TCF Bank Stadium is the major organizing element of the District. Using the stadium as an anchor, the District is divided diagonally from the intersection of Huron Boulevard and University Avenue to the intersection of 6th and Oak Streets (reference the graphic on the following page). This division designates the southwest edge (in green) as the area "owned" by the stadium. This allows the stadium to continue to have a dominant image befitting its identity and presence.

With prominent stadium frontage on University Avenue, the northeast edge will be the primary research and academic focus of the District, and 6th Street and 23rd Avenue will become the primary vehicular and pedestrian routes for the future academic area.

Where each of the arcs meet are opportunities for gateways—formal entrances to the area. The larger of these, at the intersection of Huron Boulevard, 23rd Avenue, and University Avenue, is a true gateway to the University itself. The development of this intersection is crucial to welcoming traffic to the formal University campus.

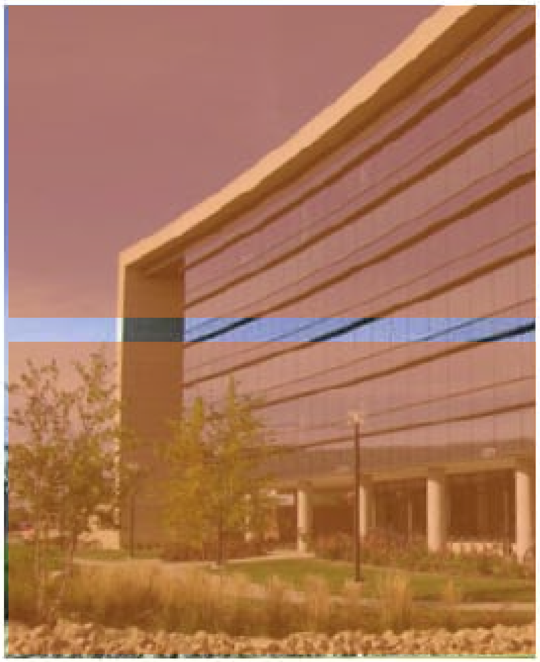
The second gateway at the intersection of 6th and Oak Streets is visible from University Avenue and the campus, and has the potential to become the primary gateway for the research and academic functions of the District, both for the campus to the south and Dinkytown to the west. Although the stadium's presence dominates the southern edge, the gateway at 6th and Oak Streets has the opportunity to create a visual identity for the District and connect it to the existing campus fabric.


ORGANIZATIONAL CONCEPT
Secondary Gateway
Major Gateway
academic/research edge
stadium edge
Granary Road
Oak Street
5th Street
6th Street
21st Avenue
23rd Avenue
25th Avenue
27th Avenue
4th Street
University Avenue
Beacon Street
Walnut Street
Ontario Street
Washington Avenue
Huron Boulevard
UMN Transitway
0′ 200′ 400′ 800′

LAND USE ZONES

Introduction

The land use diagram on the facing page and accompanying text describes the *primary* uses of each zone in the District, with the understanding that mixing uses within the District itself is encouraged. Other uses, such as small-scale retail, restaurants, library, or recreation can be considered for each zone if they support the primary focus of the zone itself. Cafes and restaurants in the East Gateway District will provide amenities for students and faculty, as well as the surrounding athletic venues.



LIONS/MCGUIRE TRANSLATIONAL RESEARCH FACILITY

There are three existing biomedical research facilities in the District that help to organize future planning concepts.

Research/Academic

The research/academic zone is the driver and primary focus of this planning effort. In general, this District is intended to focus on biomedical and translational research facilities and will include parking and support facilities for these activities.

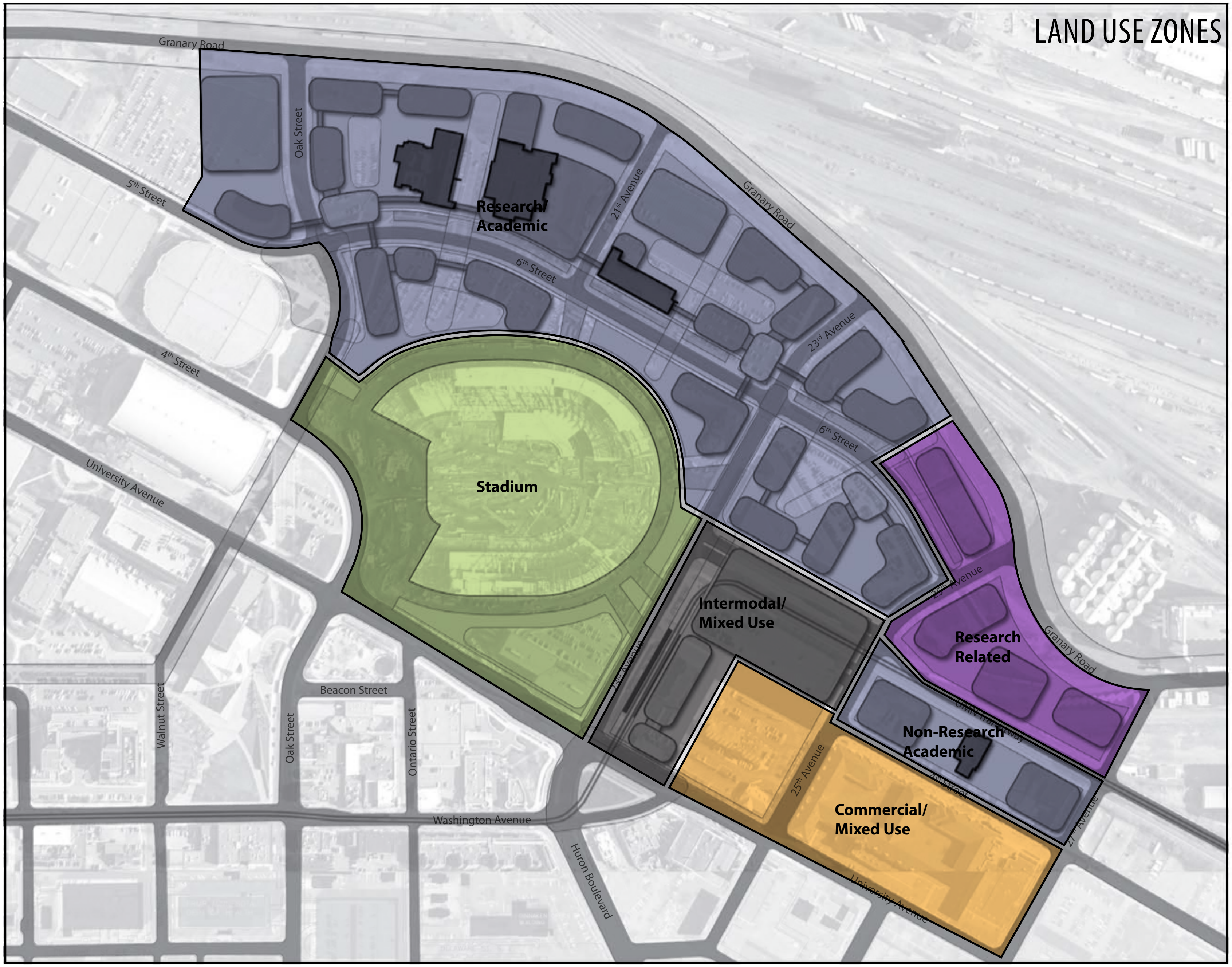
Stadium

Driving the organizational concept, the stadium zone is intended to support the stadium building and its users, provide prominent frontage on University Avenue, and allow space for game day functions to occur. The long-range development for this area will be nearly complete when the stadium is finished later in 2009. There will be no future building on this site, and continued development should work in service to the stadium's prominence and the needs of campus visitors for athletic events.

Intermodal/Mixed Use

With the impending construction of the Central Corridor LRT line through the District, an opportunity exists for both a transit hub to handle the traffic and a way to interface with the existing mixed use along University Avenue. While specific requirements are likely to shift, the current facility is being planned to include a light rail platform, a major parking structure, a bus transfer station for University and Metro Transit buses, and associated rider services like newspaper and coffee stands.

This plan assumes that the platform is located parallel to 23rd Avenue, between University Avenue and the existing transitway to the St. Paul campus. The other elements will be housed in a large, multi-level facility to the northeast of the platform. The mixed use component of the zone is envisioned in a future linear building that parallels the platform and terminates at University Avenue. This facility will help define the intersection and the entrance to the University itself. Specific uses will be determined later, but could include ground floor retail with offices and residential space above.



LAND USE ZONES
Granary Road
Oak Street
5th Street
Research/ Academic
21st Avenue
6th Street
Granary Road
23rd Avenue
6th Street
4th Street
University Avenue
Stadium
Intermodal/ Mixed Use
Research Related
Granary Road
Non-Research Academic
Commercial/ Mixed Use
25th Avenue
27th Avenue
Beacon Street
Walnut Street
Oak Street
Ontario Street
Washington Avenue
Huron Boulevard
University Avenue

0′ 200′ 400′ 800′

Future private development adjacent to the District can complement District design principles for a stronger image and identity.

Non-Research Academic

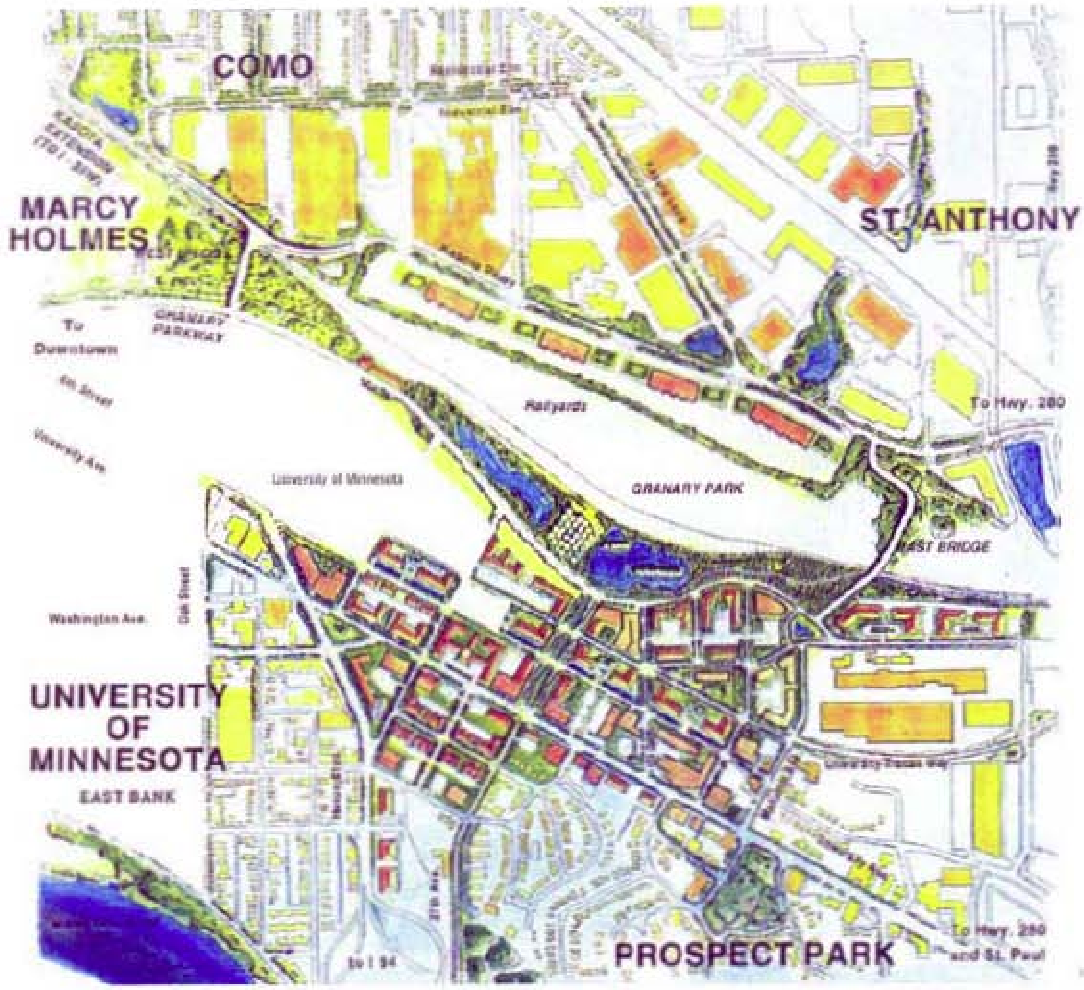
Recently acquired by the University, this zone is an ideal location for support services for the stadium, the District, and the overall campus. The only related facility in this zone is the MAST Laboratory, used by the Civil Engineering Department. Currently, plans are underway to locate land care facilities to the eastern edge of this zone. The remainder of the site, just west of the MAST Laboratory, is intended to serve support functions as needs are better defined over time. Structures built here should reflect the urban and industrial nature of the location and the site, as well as the zone's identity as part of the University.

Commercial/Mixed Use and Research Related

These two zones reflect the long-range planning vision of the city as outlined in the *Southeast Minneapolis Industrial (SEMI)/Bridal Veil Refined Master Plan* (SEMI Master Plan), May 2001. This area falls into the South Redevelopment Area, which is defined by the plan to have a balance of uses, including light industrial, office, research, medium- to high-density residential, and limited retail/service areas. Additionally, the plan calls for "relatively dense" development of 3- to 5-story buildings. While the University does not control either of these zones, they are included here in order to plan for a successful physical transition between University functions and private development.

Consistent with the SEMI Master Plan, the research related zone is expected to develop into research-oriented facilities. The University hopes to build partnerships with private research groups that wish to be adjacent to biomedical and translational research facilities. Alternatively, other campus research functions that would benefit from co-location to the biomedical facilities would be established in this area. Future access to road and regional transit will support job growth and economic development in the region. These partnerships could allow for the sharing of ideas and resources related to the benefit of both the private groups and the University.

Architecturally, this zone should be encouraged to visually complement the University's research facilities. Also consistent with the SEMI Master Plan, these zones should provide a mix of commercial and residential uses that support both the University and the larger region.



SEMI MASTER PLAN

The 2001 SEMI Master Plan laid the foundation for the uses proposed for the private research and commercial/ mixed use zones in the East Gateway District.

Research buildings can articulate some of the different functions and common spaces within.

RESEARCH/ACADEMIC ZONE

Within the East Gateway District, a program-based organizational concept was developed to encourage interaction, provide support, and subdivide the District into three smaller research clusters. All research facilities are organized around a central space, called a research commons. The research commons acts as the nucleus for each cluster, providing elements of public and shared space amid substantial private or semi-private office and laboratory spaces. The existing space suggests that three clusters could exist in the District along with a smaller core lab support cluster.

Research/Academic Clusters

The west research cluster includes the Lions/McGuire Translational Research Facility. This cluster, when complete, will also be the first set of buildings when the District is accessed from the campus gateway at 6th and Oak Streets.

The east research cluster includes the MBB and is currently planned as the first phase of new development in the District. Specific challenges of this cluster will include creating a link to the planned intermodal transit station in the District, establishing a cohesive image of the East Gateway District, and creating a successful connection to the existing facilities in the District as well as the rest of the campus.

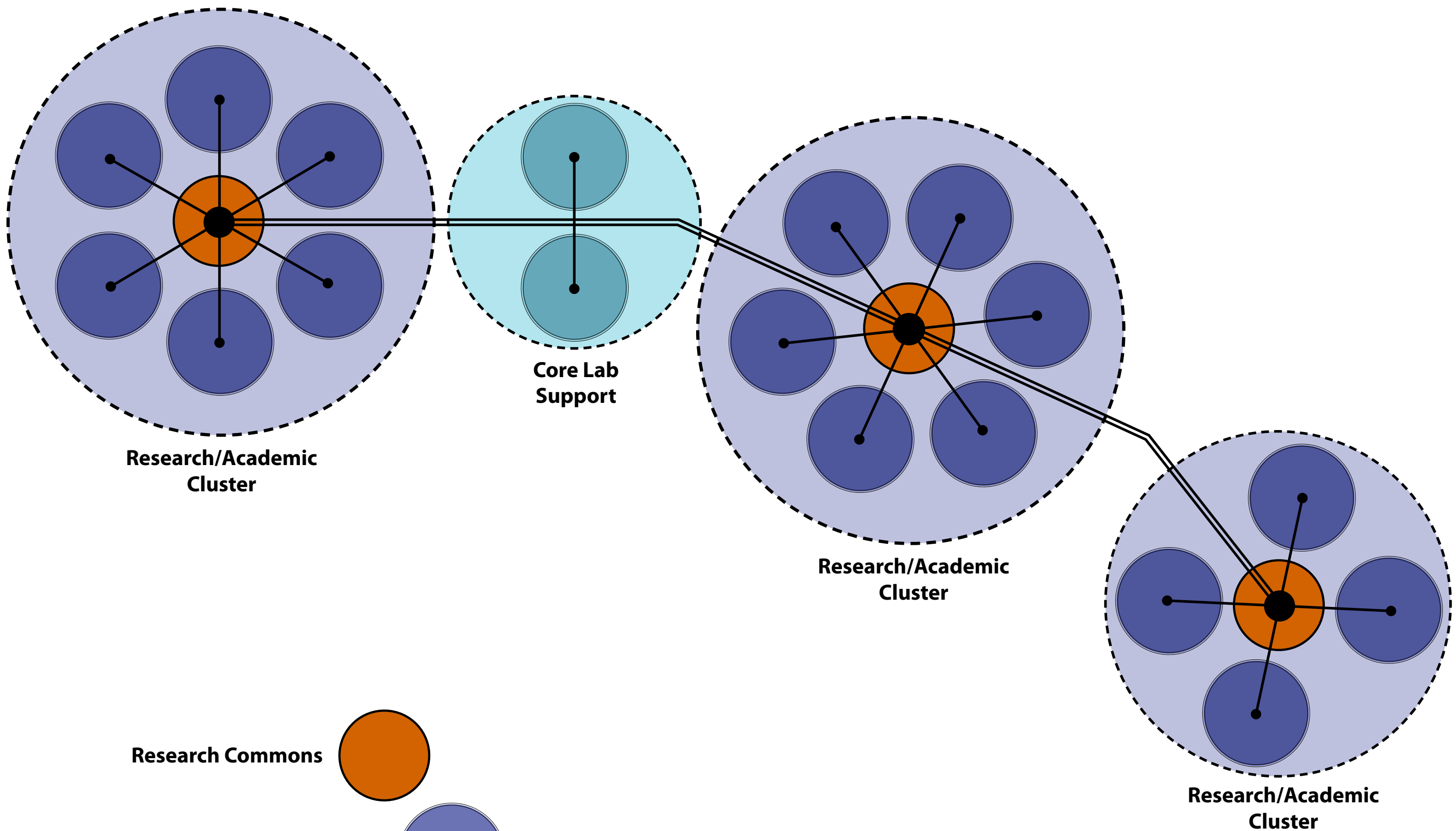
The southeast research cluster will likely be the last to develop. Of particular challenge in this cluster is the Thompson Center for Environmental Management. Use of the environmental management/waste facility is critical to activities that occur in the District, but the building's orientation and functional traits do not contribute to the core-focused concept of building clusters. As the east and west clusters develop, the role of this third cluster and its relationship to the research related zone will become more clear.

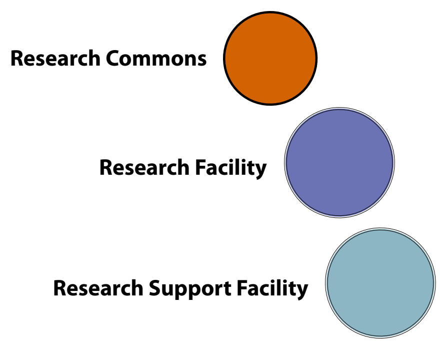
Core Lab Support

The core lab support cluster includes the CMRR and the core support functions housed in the MBB, specifically its vivarium space. The design of the CMRR facility's first expansion is currently being designed and is scheduled to be completed in 2010. The imaging functions in this facility will serve the larger District and University. Contingent on future land holding, the site may support one additional renovation/expansion in the future. The MBB has been designed with vivarium space within the building. While this vivarium space could be expanded, future programmed phases will need to evaluate the optimal locations for such facilities in proximity to future researchers. Vivaria facilities should not be located visible to primary street frontages.

Research Commons

In order to share expensive lab resources and provide non-proprietary space for University staff and researchers, research commons spaces





RESEARCH/ACADEMIC ORGANIZATIONAL CONCEPT

This diagram illustrates the relationships and connectivity between research clusters planned in the East Gateway District.

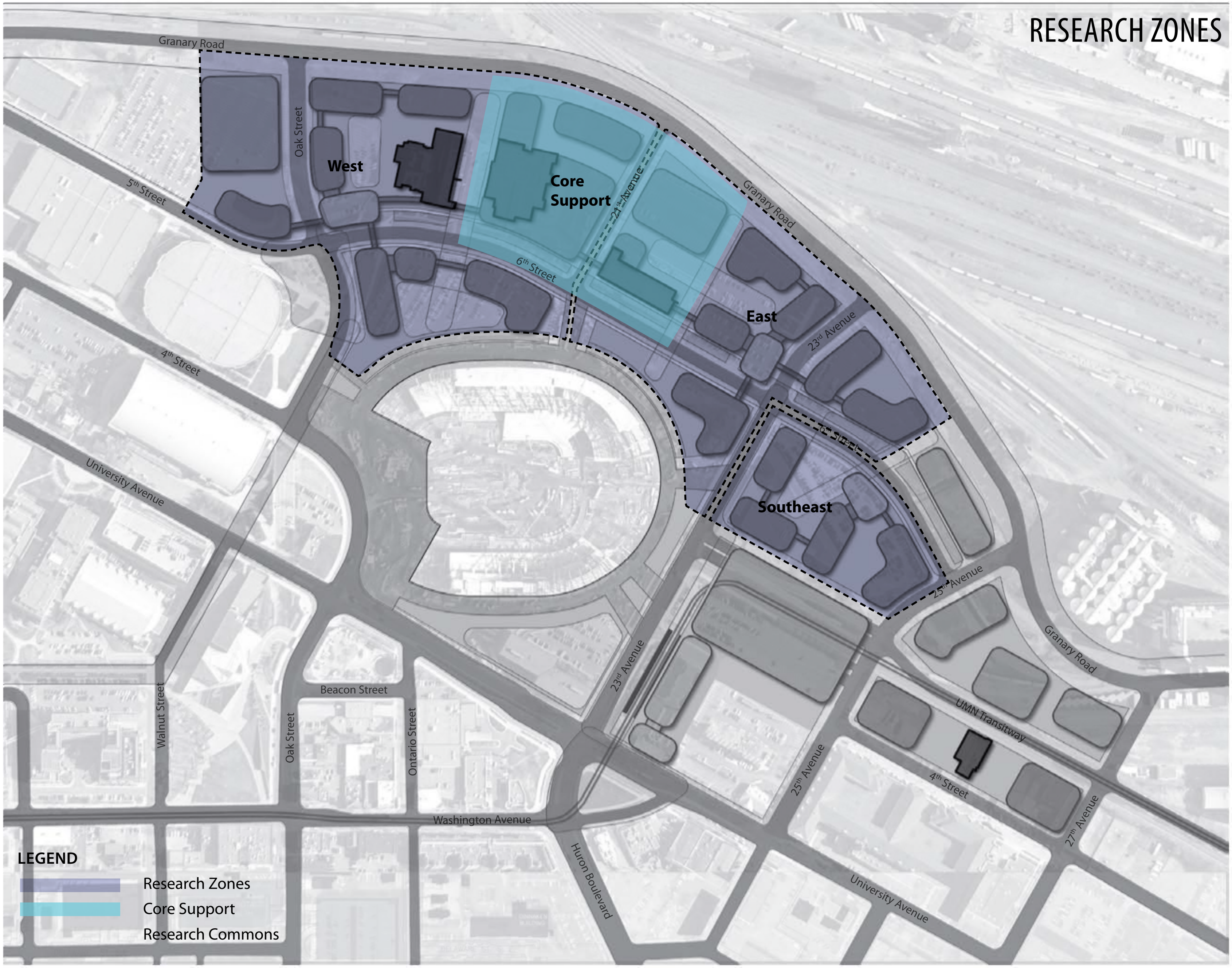
RESEARCH COMMONS CHARACTER
Research commons are intended to be social hubs and house shared research equipment for each research cluster in the District.

are planned for each research cluster. The first commons will be built with the east research cluster. Each commons is planned to be the center of activity for each cluster. Internally and externally, the research commons should be designed to represent the larger identity of the cluster. Architecturally, these are public beacons to the wider research community in a series of buildings that could otherwise appear closed and impenetrable.

Functionally, the research commons can serve two roles. First, they house shared research instrumentation and would typically be spread to each research building in the District. By centrally locating expensive equipment, facilities become more efficient to operate.

Building on the idea of bringing researchers together to a central location, the commons can serve a second function, that of a social hub and gathering space. University staff and students as well as researchers can access cafes and other amenities such as conferencing/ seminar spaces.

The specific program for each research commons will be evaluated in the context of the research programs that are planned for adjacent buildings.


RESEARCH ZONES
Granary Road
Oak Street
West
5th Street
Core Support
21st Avenue
Granary Road
6th Street
East
23rd Avenue
4th Street
Southeast
University Avenue
25th Avenue
Granary Road
UMN Transitway
Beacon Street
23rd Avenue
Walnut Street
Oak Street
Ontario Street
25th Avenue
4th Street
27th Avenue
Washington Avenue
Huron Boulevard
University Avenue
LEGEND
Research Zones
Core Support
Research Commons

0′ 200′ 400′ 800′

RESEARCH LAB ENVIRONMENT
High floor to floor dimensions, natural daylighting, and shared commons spaces provide a collaborative environment.

UNIVERSITY OF MINNESOTA BIOMEDICAL SCIENCES OCCUPANCY DENSITIES

	UM MRI*	UM Cancer	UM Cardio	UM Inf Des/Neuro	Total Program
NSF @ .50 to .55	28,000	66,000	66,000	49,800	209,800
NSF @ .55 to .60	30,800	72,000	72,000	54,000	228,800
Principal Investigators	10	40	40	30	120
Occupants	70	280	280	210	840
NSF/PI					1165-1270
NSF/Occupant	400	235	235	235	249-272
GSF	56,000	120,000	120,000	90,000	386,000
GSF/Occupant	800	429	429	429	459

*MRI is a core support lab

PROGRAM VALIDATION

As part of the East Gateway District Study, the planning team considered the initial program for the four facilities funded by the state. These include the following:

CMRR Expansion	56,000 sf
Cancer Biomedical Building	120,000 sf
Lillehei Cardiovascular Research	120,000 sf
Infectious Disease/Neuroscience	90,000 sf

The planning team worked with the Project Steering Committee to validate the initial program for the four facilities. The planning team benchmarked the occupancy densities and proposed gsf per occupant against peer facilities and found the program to be within comparable ranges. The planning team also evaluated a range of percentages for net square feet to gsf, establishing a 55% building efficiency target for each facility.

The planning team and the Project Steering Committee then evaluated the percentage of dedicated space to shared space by space type typical for biomedical research buildings. This helped determine parameters for the amount of shared space that might be part of the proposed commons for each research cluster.

The planning team also compared the percentage of open labs, lab support areas, primary investigator offices, staff support space, interaction space, and conferencing space against peer research facilities, and tested a number of different lab footprints as part of the development of the framework plan for the District.

UNIVERSITY OF MINNESOTA BIOMEDICAL SCIENCES ALLOCATION OF SPACES "Typical" Project - Percent of Area		
	Biomedical	Physical Sciences
Laboratory	25% to 30%	35% to 45%
Lab Support	25% to 30%	15% to 20%
Research Office	15% to 20%	20% to 25%
Total Dedicated Space	65% to 80%	70% to 90%
Interaction	4% to 6%	5% to 10%
Vivarium	4% to 6%	-
Core Facilities	7% to 10%	0% to 7%
Non-Scientific Support	2% to 8%	2% to 8%
Building Support	2% to 3%	2% to 3%
Other	1% to 2%	1% to 2%
Total Shared Space	20% to 35%	10% to 30%

UNIVERSITY OF MINNESOTA BIOMEDICAL SCIENCES ALLOCATION OF SPACES UM East Gateway District Potential Program		
	Biomedical	
Laboratory	30%	
Lab Support	30%	
Research Office	15%	
Total Dedicated Space	75% to 80%	
Interaction	5%	
Vivarium	5% to 10%	
Core Facilities	15%	Electron Microscopy Facility
Non-Scientific Support	2% to 7%	Central Dining/Conference
Building Support	2%	
Other	1%	
Total Shared Space	25% to 30%	

DISTRICT DESIGN GUIDELINES

INTRODUCTION

About This Section

This section describes the district level urban design framework that will guide future development. Topics in this section include:

Development Area
Development Framework
Height and Density
Transit Connections
Vehicular Circulation and Service
Pedestrian Connections
Parking
Landscape and Open Space
Art Opportunities
Utilities and Infrastructure

PLANNING PRINCIPLES

Development principles were established early in the planning process to guide the creation of the plan. The planning principles for the District are intended to:

1. **Provide a supportive academic and research environment.**
2. **Create an image of architectural distinction, integrity, and brand.**
3. **Optimize the use of scarce land resources.**
4. **Maximize flexibility for future development.**
5. **Strengthen the multi-modal transportation system in the area.**
6. **Create an attractive, functional, and safe environment for pedestrians and cyclists.**
7. **Integrate into the existing campus and surrounding community.**
8. **Build a real sense of community and place for the District.**
9. **Create a cohesive, memorable system of public spaces.**
10. **Develop a District that is environmentally and operationally sustainable.**

It is the intent of this section to guide development of the East Gateway District according to the principles established for the plan. This section describes a framework for development, general massing, building envelopes, open space relationships, key pedestrian connections, circulation, parking, infrastructure, and public art recommendations.

The urban framework provides a long-term view of the District at build out. In the short term, there are a select number of existing facilities that must be accommodated in the District Master Plan, that in the long term are re-envisioned in another location or configuration. They include the University Office Plaza office building on University Avenue at 23rd Avenue, and the Fay Thompson Center for Environmental Management on 23rd Avenue at 4th Street.

The landscape and pedestrian spine of Scholar's Walk on campus mitigates the variety of scale and massing behind it.

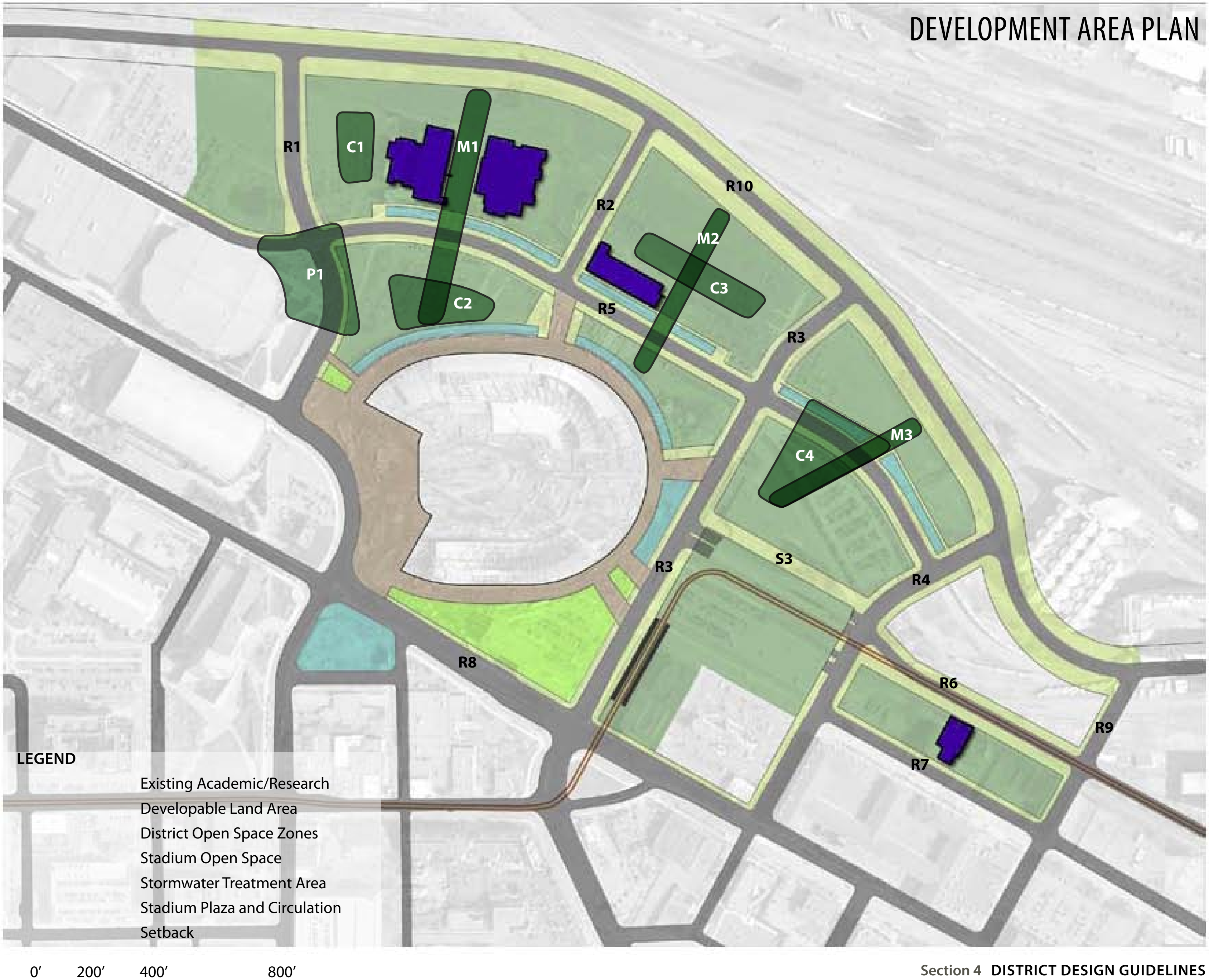
RIGHT-OF-WAY AND OPEN SPACE CORRIDOR DESCRIPTIONS		
Element	Location	Description
Roadways		
R1	Oak, 6th to Granary	100' Right-of-Way, No Setbacks
R2	21st, 6th to Granary	80' Right-of-Way, No Setbacks
R3	23rd, University to Granary	90' Right-of-Way, 10' Setback on East Side of Road Only
R4	25th, University to Granary	100' Right-of-Way, No Setbacks
R5	6th, Oak to 25th	80' Right-of-Way, 40' Setback on North for Swale
R6	Transitway	100' Right-of-Way, Verify with Central Corridor Plan
R7	4th, 25th to 27th	Use City-Defined Right-of-Way, Approximately 80'
R8	University	Use City-Defined Right-of-Way and Setback Encourage 15'-20' Pedestrian Zone
R9	27th, University to Granary	Use City-Defined Right-of-Way and Setback
R10	Granary	100' Right-of-Way with 25' Setback Will Need to be Refined During Granary Development
Open Spaces		
P1	Oak and 6th Plaza	Flexible Open Space to Define Plaza
C1	Courtyard West of Lions	Approximately 100' x 200'
C2	Courtyard North of Stadium	Approximately 130' x 300'
C3	Courtyard North of MBB	Approximately 100' x 420'
C4	Courtyard on Thompson Site	Approximately 120' x 240' (South of 6th)
M1	Mall Between Lions & CMRR	Minimum of 100' Wide
M2	Mall East of MBB	Minimum of 75' Wide
M3	Mall North of Thompson	Minimum of 75' Wide
Other		
S1	Setback North of Intermodal	Minimum of 50'

DEVELOPMENT AREA

The Development Area Plan (shown on the facing page) is a physical framework that establishes the desired character and relationship of built areas to open space and the public realm of the District. It defines the build-to lines along streets and right-of-ways in order to create a consistent street wall for future buildings. The framework also establishes key open space zones and pedestrian malls that subdivide the larger blocks into a more human scale pattern, and delineates the developable areas within the District.

This plan offers maximum flexibility for future building decisions, yet preserves the absolutely necessary components of the plan. The light green areas of the plan represent all of the land that is developable in the District.

The table on the left describes each non-buildable zone in terms of its flexibility to be modified, specific location, and recommended size. Because the District is within the larger urban street network, some of the descriptions defer to city-defined right-of-ways and setbacks. Most of the open space descriptions are flexible except for malls, which should be consistent throughout.


DEVELOPMENT AREA PLAN
R1
C1
M1
R2
R10
M2
P1
C2
C3
R5
R3
M3
C4
R3
S3
R4
R8
R6
R9
R7
LEGEND
Existing Academic/Research
Developable Land Area
District Open Space Zones
Stadium Open Space
Stormwater Treatment Area
Stadium Plaza and Circulation
Setback
0′
200′
400′
800′

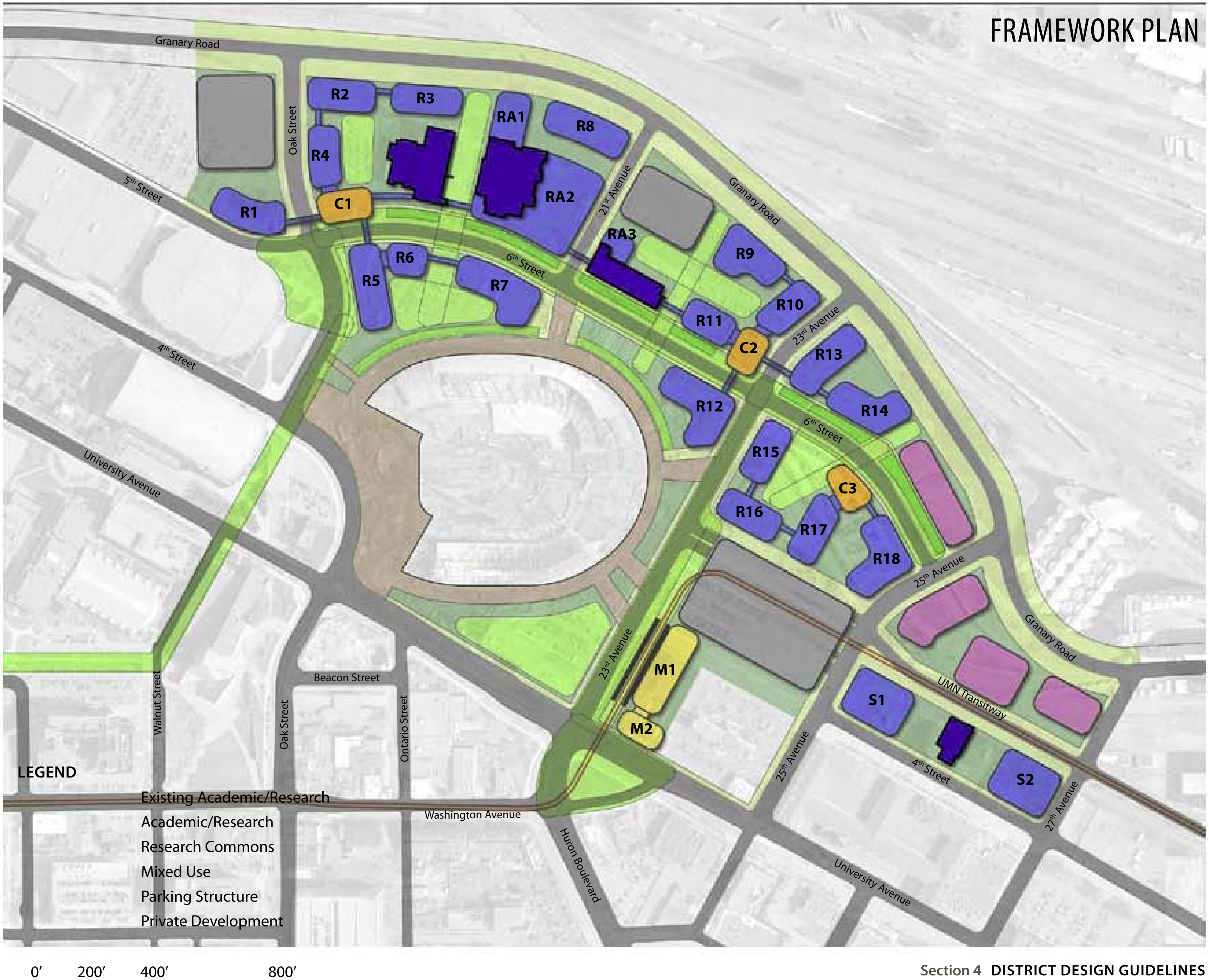
DEVELOPMENT POTENTIAL					
Zone	Ground Floor	Low Range		High Range	
	sq. ft.	floors	gsf	floors	gsf
Research/Academic					
R1	22,800	4	91,200	7	159,600
R2	21,000	4	84,000	7	147,000
R3	19,450	4	77,800	7	136,150
R4	18,750	4	75,000	7	131,250
R5	26,350	4	105,400	7	184,450
R6	11,600	4	46,400	7	81,200
R7	31,550	4	126,200	7	220,850
R8	26,500	4	106,000	7	185,500
R9	26,000	4	104,000	7	182,000
R10	19,000	4	76,000	4	76,000
R11	16,250	4	65,000	4	65,000
R12	32,850	4	131,400	4	131,400
R13	25,800	4	103,200	7	180,600
R14	24,550	4	98,200	7	171,850
R15	19,100	4	76,400	7	133,700
R16	21,300	4	85,200	7	149,100
R17	20,450	4	81,800	7	143,150
R18	29,900	4	119,600	7	209,300
Research Addition					
RA1	16,900	1	16,900	1	16,900
RA2	59,100	1	59,100	1	59,100
RA3	7,250	1	7,250	4	29,000
Commons					
C1	16,300	4	65,200	7	114,100
C2	13,250	4	53,000	4	53,000
C3	13,200	4	52,800	7	92,400
Support					
S1	30,200	2	60,400	2	60,400
S2	30,200	2	60,400	2	60,400
Mixed-Use					
M1	28,350	6	170,100	6	170,100
M2	11,150	10	111,500	10	111,500

DEVELOPMENT FRAMEWORK

The Development Framework Plan on the facing page combines the Development Area Plan from page 41 with some assumptions of how buildings could be organized in the District. The building zones, coded by primary use, are laid out using typical dimensions for each use type. Research and commons building zones are all 100 feet wide, which could be wider or narrower depending on the specific lab configuration.

The table on the left lists each building zone, defines the base gsf, and provides a low and high range for the number of floors and subsequent total gsf. This table is provided as a range of potential development and gives some indication as to the potential height the building could achieve. The actual gsf per building will vary depending on number of floors, configuration of the base floor, existence of a lower level, and whether penthouse space is provided or not.

The phase one area of development is identified by the block defined by 6th Street north to the future Granary Road extension, and from 21st Street to 23rd Avenue.

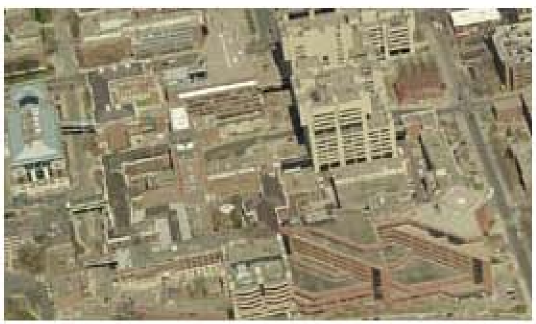

FRAMEWORK PLAN
Granary Road
Oak Street
5th Street
R1
R2
R3
R4
C1
RA1
R8
RA2
21st Avenue
Granary Road
RA3
R9
R5
R6
6th Street
R7
R10
R11
C2
23rd Avenue
R13
4th Street
R12
R14
6th Street
R15
University Avenue
C3
R16
R17
R18
25th Avenue
Granary Road
23rd Avenue
M1
UMN Transitway
S1
Beacon Street
Walnut Street
Oak Street
Ontario Street
M2
25th Avenue
4th Street
S2
27th Avenue
LEGEND
Existing Academic/Research
Academic/Research
Research Commons
Mixed Use
Parking Structure
Private Development
Washington Avenue
Huron Boulevard
University Avenue
0′
200′
400′
800′

NORTHROP MALL FAR ANALYSIS

Area: 22.7 acres

GSF: 1.2 million (above grade)

FAR: 1.2



AHC EAST BANK CAMPUS

Area: 25.0 acres

GSF: 3.1 million (above grade)

FAR: 2.9

HEIGHT AND DENSITY

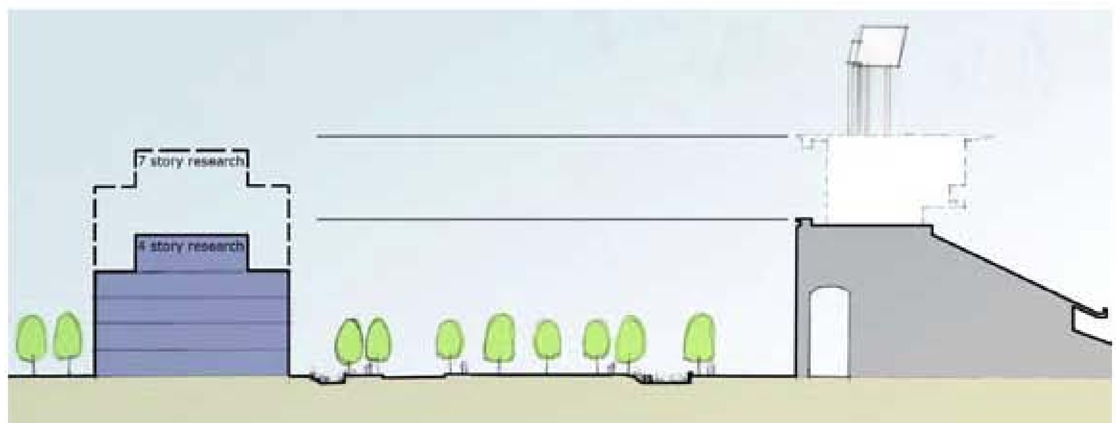
Using the table from page 42, an overall Floor Area Ratio (FAR) can be calculated for the District. Due to the non-typical building typologies of the entire District (i.e., stadium, intermodal station, etc.), the FAR was only calculated for the academic/research zone. This allows for a direct comparison to other research, clinical service, and academic districts.

The table to the right describes a high and low range of FAR that could be achieved in the zone based on the assumptions of height listed in the table on page 42. Since FAR is a function of density, the planned gsf of parking structures and existing facilities were also included in the calculation.

As a benchmarking exercise, the Northrop Mall and the AHC East Bank campus were analyzed to determine their FAR. These references allow for a better understanding of how the East Gateway District might look at a particular FAR. The analysis for each is summarized to the left. The low and high ranges proposed for the academic/research zone fall between the existing FAR of the Campus Mall and AHC East Bank campus.

Within the District, the plan recommends a building height minimum of 4 stories and a maximum of 7 stories. It is further recommended that the two gateway nodes have an increased height over the rest of the District, with buildings at 6th and Oak Streets recommended at 7 stories. This would result in an FAR range average of 1.7. Proposed mixed use buildings at the University Avenue/23rd Avenue intersection are recommended to reach 10 to 15 stories to create a true urban gateway and presence on Huron and University Avenues.

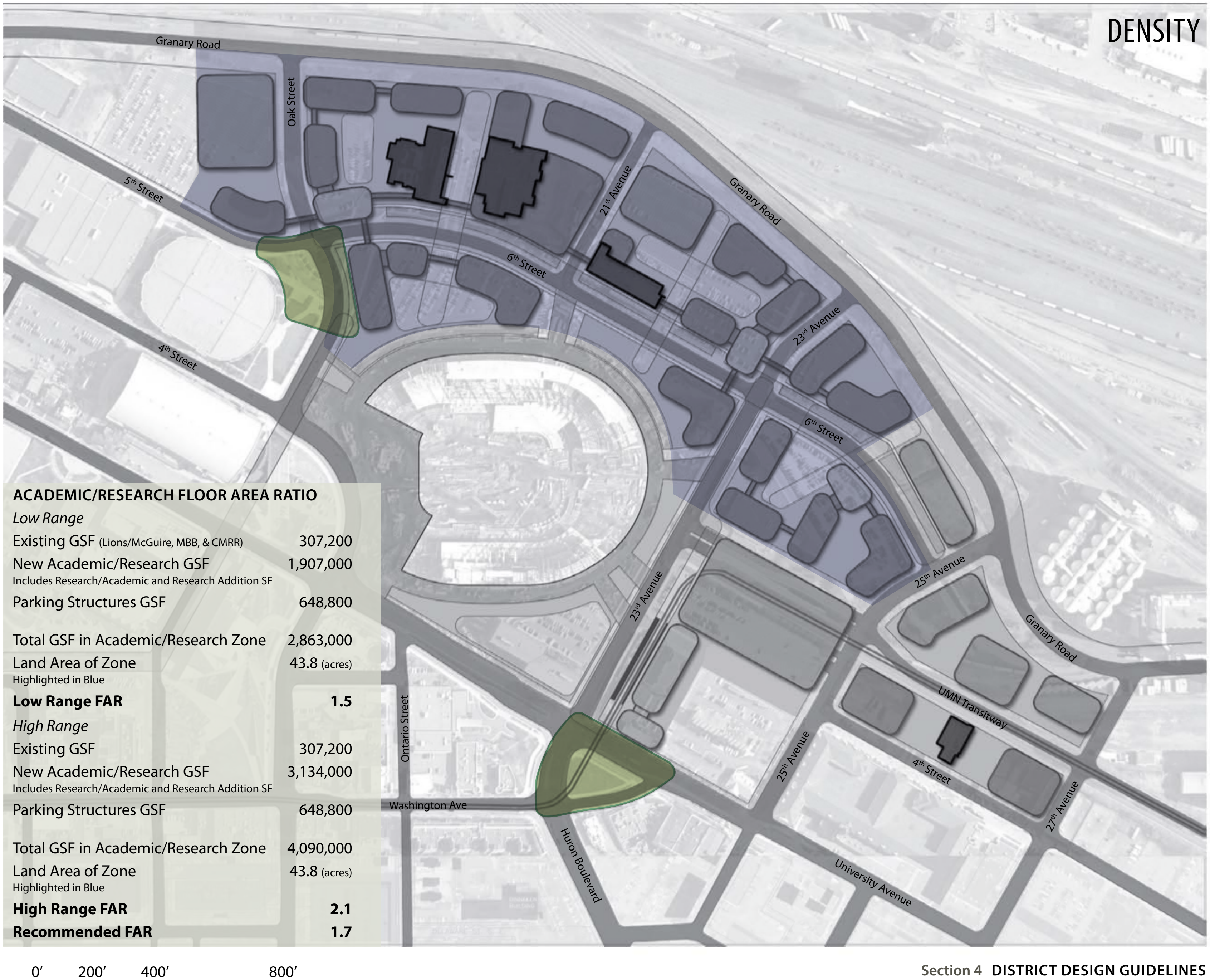
Overall, academic/research buildings between 4 and 7 stories will remain below the established height of the TCF Bank Stadium, as illustrated in the diagram below.



BUILDING HEIGHT

This section illustrates the potential height relationship of 4- and 7-story research buildings to the TCF Bank Stadium.

DENSITY



ACADEMIC/RESEARCH FLOOR AREA RATIO

Low Range	
Existing GSF (Lions/McGuire, MBB, & CMRR)	307,200
New Academic/Research GSF Includes Research/Academic and Research Addition SF	1,907,000
Parking Structures GSF	648,800
Total GSF in Academic/Research Zone	2,863,000
Land Area of Zone Highlighted in Blue	43.8 (acres)
Low Range FAR	**1.5**
High Range	
Existing GSF	307,200
New Academic/Research GSF Includes Research/Academic and Research Addition SF	3,134,000
Parking Structures GSF	648,800
Total GSF in Academic/Research Zone	4,090,000
Land Area of Zone Highlighted in Blue	43.8 (acres)
High Range FAR	**2.1**
Recommended FAR	**1.7**

TRANSIT CONNECTIONS

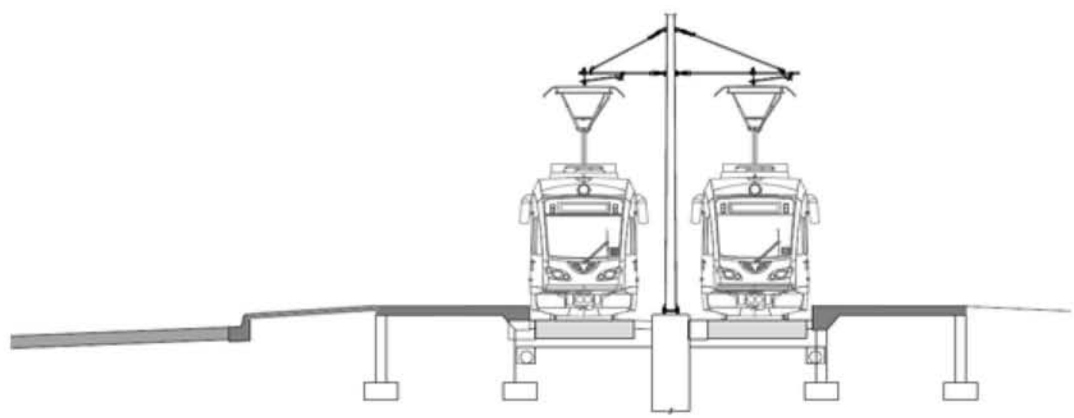
A key principle of the District Master Plan is the development of an integrated transportation system emphasizing pedestrians and transit. Due to the East Gateway District's distance from the academic core, transit will be critical to ensuring connectivity to other research components on campus.

The primary connection to the rest of the university will be the planned Central Corridor LRT line. The line is planned to make stops in the East Gateway District and at the academic core at Washington Avenue and Union Street. Additionally, the proposed intermodal station will have a bus transfer station on the first floor. From there, users can access local and regional bus systems.

In addition to these connections, maintaining a direct shuttle connection between the District and the Academic Health Center will also be beneficial.

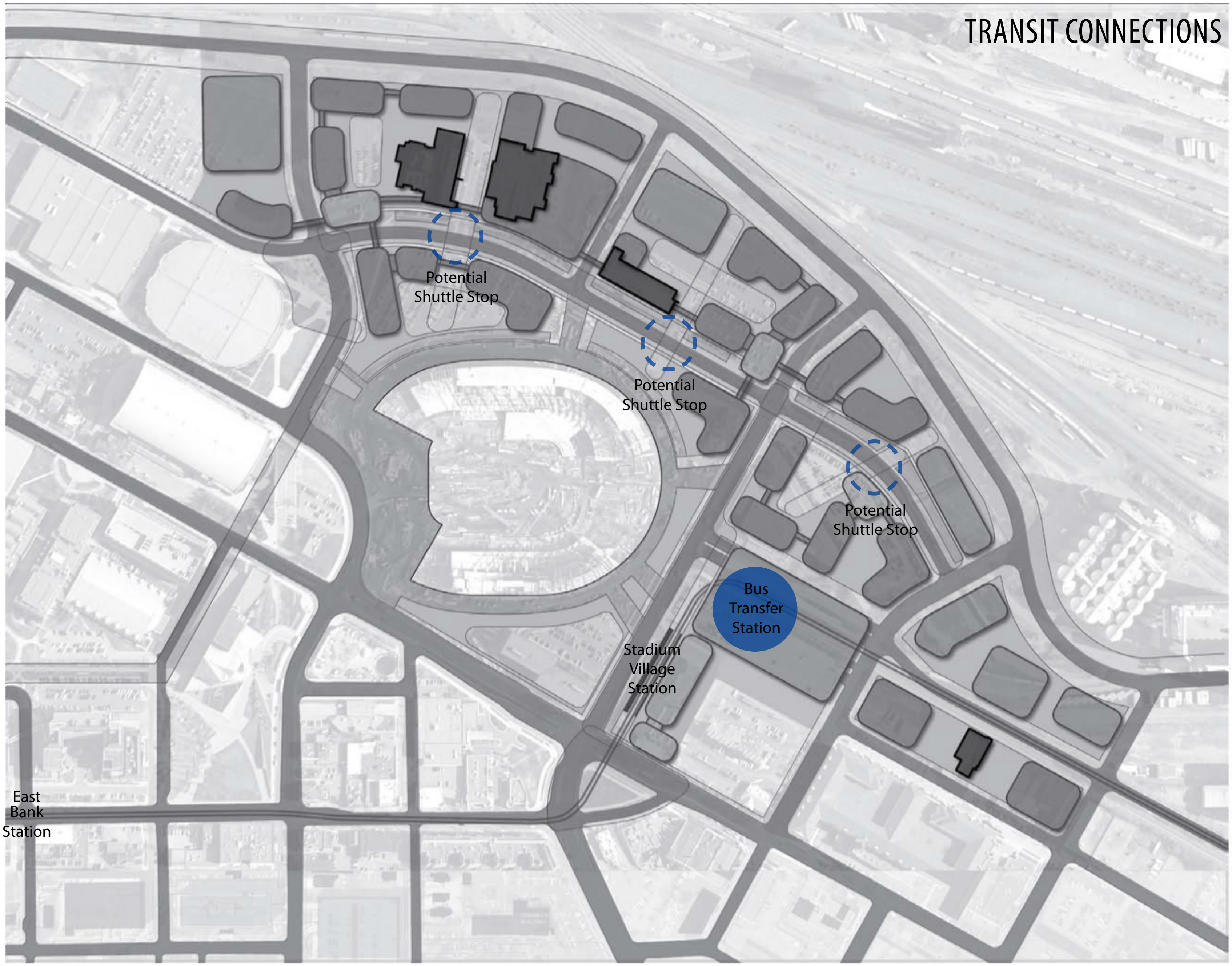
LIGHT RAIL

The planned Central Corridor LRT line will play a major role in connecting the East Gateway District to the academic core of campus.



STADIUM VILLAGE STATION

This is the planned section of the Stadium Village platform with 23rd Avenue on the left of the diagram.


TRANSIT CONNECTIONS
Potential Shuttle Stop
Potential Shuttle Stop
Potential Shuttle Stop
Bus Transfer Station
Stadium Village Station
East Bank Station
0′ 200′ 400′ 800′

University Avenue at 23rd Street will be an important gateway in the future.

Proposed development and Light Rail Transit will enliven the pedestrian streetscape on 23rd Avenue.

VEHICULAR CIRCULATION AND SERVICE

Much of the proposed road network was recently implemented to accommodate the TCF Bank Stadium, to be completed in 2009. This network constitutes a substantial investment in infrastructure; therefore, the plan works with it as much as possible. Having been planned to accommodate future academic activity in the District, the planning team feels that the road network will perform reasonably well without major upgrades.

The East Gateway District is defined to the south by University Avenue. Along with Huron Boulevard, from the south, they provide regional access to the District. When Granary Road is realized in its entirety, it will be a third regional connection. As it is planned, the District will be bordered on the north and south by major vehicular corridors. The only internal east/west connection in the District is 6th Street. Internally, the District will have several north/south connectors that complete the local road network and tie the major east/west corridors together, improving access and visibility into the District, particularly from the future Granary Road.

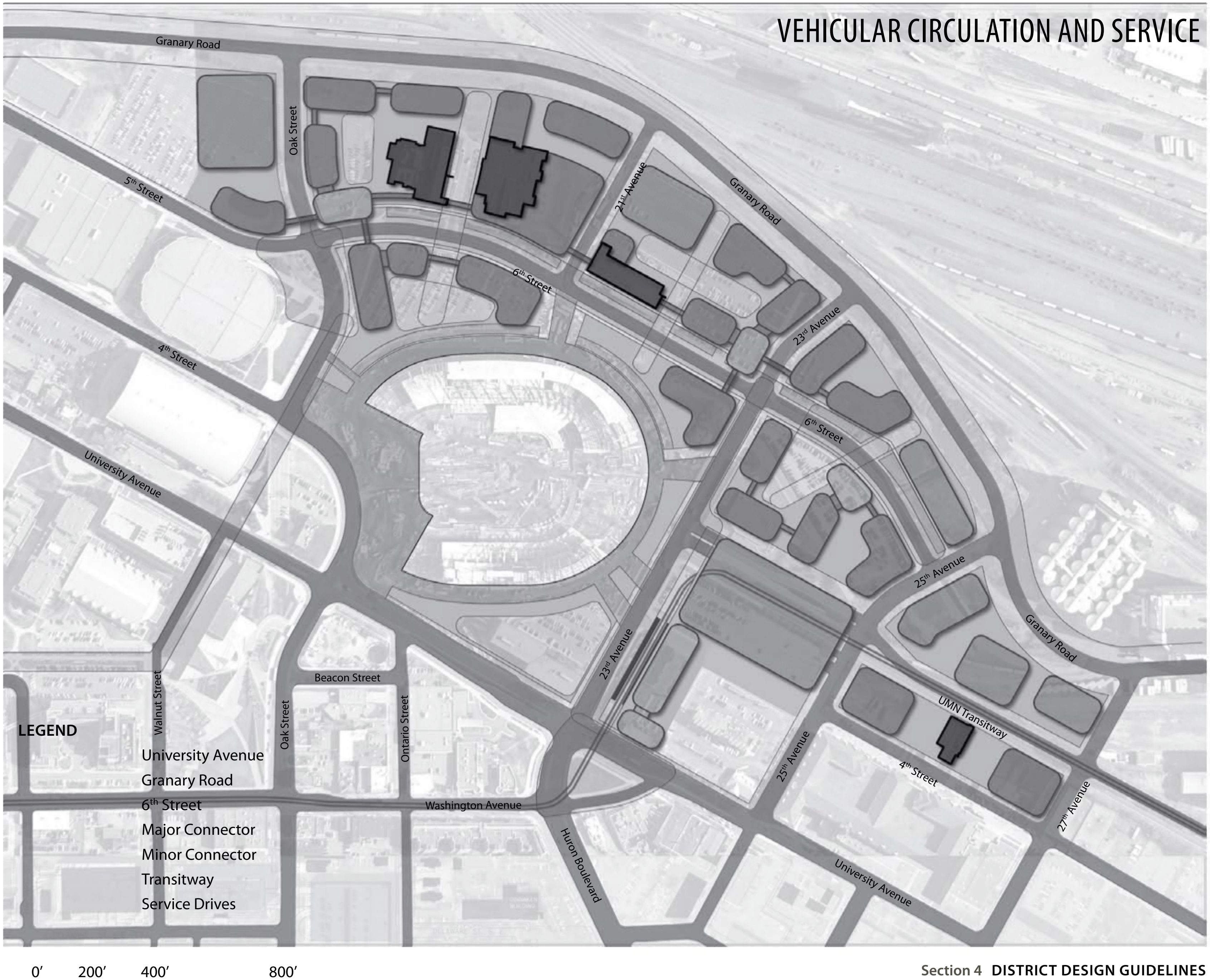
Road Improvements

Two road realignments are proposed in the District: Oak Street at 6th Street, and 23rd Avenue north of 6th Street. Oak Street was re-routed from its original alignment to improve its intersection with University Avenue and accommodate traffic movement for the new stadium. Plans to extend Oak Street north of 6th Street would take it immediately west of the Lions/McGuire Translational Research Facility. However, a major water main and storm line remains in the old alignment of Oak Street, requiring a permanent easement.

Keeping both the easement and the currently planned Oak Street extension would result in a narrow parcel of land between the two corridors, not suited for development. The District Master Plan therefore proposes a future realignment of Oak Street at 6th Street, utilizing the former right-of-way as the new road alignment. This will require a reconstruction of the intersection of 6th and Oak Streets. This move allows consolidation of buildable land west of the Lions/McGuire Translational Research Facility for a new research cluster and gateway site on the west edge of the District.

In order to create more prominent views to the research cluster on 23rd Avenue, the plan proposes a realignment of the road north of 6th Street to close the view from University Avenue. This will create more visibility and identity for the academic and research facilities at 6th Street and 23rd Avenue, rather than lead to open views of the railyards beyond.

A shift in the alignment of the bus transitway between 23rd and 25th Avenues is also proposed to accommodate future construction of a multi-modal parking structure and its exit ramps.


VEHICULAR CIRCULATION AND SERVICE
Granary Road
Oak Street
5th Street
21st Avenue
Granary Road
6th Street
4th Street
23rd Avenue
6th Street
University Avenue
25th Avenue
Granary Road
23rd Avenue
Beacon Street
Walnut Street
Oak Street
Ontario Street
UMN Transitway
25th Avenue
4th Street
27th Avenue
Washington Avenue
Huron Boulevard
University Avenue
LEGEND
University Avenue
Granary Road
6th Street
Major Connector
Minor Connector
Transitway
Service Drives
0′
200′
400′
800′

Sixth Street will become an important east/west connector in the District.

Setbacks on 6th Street have been designed for stormwater management.

Road Function and Hierarchy

University Avenue and 4th Street are major roadways that operate as one-way pairs starting at Oak Street and University Avenue. These corridors carry significant volumes of through traffic for the city and District. Their right-of-ways will be maintained in the District Master Plan.

Granary Road

The future Granary Road extension is envisioned as a regional connector and parkway. It will border the District on its north side, and is expected to carry significant traffic when completed. For planning purposes, the vehicular network within the District has been planned with limited new intersections at Granary Road to Oak Street, and 21st, 23rd, and 25th Avenues. Service drives will generally not be allowed from the parkway.

Granary Road should be treated as a front door/address street for future development. The proposed right-of-way and setback on Granary Road will allow for an approximate 25-foot landscape buffer on the southern, University-owned side of the road. This will include sufficient space for a multipurpose trail on its south side, and depending on final road design and layout, a potential bike trail on its north edge.

6th Street

The only east-west connector that traverses the District is 6th Street. It is a multi-functional street, accommodating vehicular traffic, campus bus traffic, pedestrian movement, and stormwater management. Its proposed cross-section allows for a 40-foot setback from edge of curb to building façades, able to accommodate stormwater swales planned and constructed, with pedestrian walks on both sides of the swales. As the District is further built out, increased pedestrian traffic in the District across 6th Street may necessitate installation of additional pedestrian crosswalks.

Primary Connectors

Oak Street, 23rd Avenue, and 25th Avenue are the primary north/south routes. They will extend to Granary Road, providing direct connection from Granary Road to University Avenue. Their proposed cross-section includes approximately 24 feet for pedestrian walks and landscape zones between the curb and building façade.

Secondary Connectors

As Granary Road is completed, secondary streets at 21st and 27th Avenues are proposed from 6th Street to Granary Road to complete the street grid of the District and provide access to service drives and future parking decks.

Service Drives

Service drives for the District will be accessed off of Oak Street and 21st, 23rd, and 25th Avenues. Service access for facilities south of 6th Street is recommended off of the service corridor constructed around the stadium. Here, the service drive doubles as a major pedestrian route, particularly on game days, and must be designed and maintained to a higher level of quality. Where feasible, service functions and loading docks should be consolidated. They should be screened from public streets, adjacent pedestrian walks and courtyard spaces. In some cases, retrofitting existing loading docks with screening (walls or fencing) should occur as additions or renovations of buildings are undertaken. As future phases are programmed, combined loading docks into one central location to serve a grouping of buildings should be evaluated. As much as is feasible, service drives should incorporate pervious pavement to reduce run-off.

Design service corridors to provide efficient and consolidated access for loading and deliveries while creating a safe, attractive pedestrian environment. Service corridors must interact with open space elements (pedestrian malls) at a limited number of crossings. Design of corridors should manage speed, use pervious materials, and contain strategically placed signage and lighting. The design should offset other negative effects through planting and/or structures.

Service drives and corridors should be attractively designed and support pedestrians and vehicles.

The service drive on Walnut Street can provide a direct pedestrian connection from the main campus to the East Gateway District.

Walnut Street can be designed to accommodate both pedestrians and service access.

The character of Scholars Walk should be extended to the District along Walnut Street.

Active uses at the street level and safe mid-block crossings enhance the pedestrian environment. Where needed, skywalks should enhance users' experience.

PEDESTRIAN CONNECTIONS

A rich network of pedestrian walks that connect District destinations to transit stops, parking, area retail, and the main campus is fundamental to promoting a sense of place and reduced reliance on the automobile. The District Master Plan delineates this network of primary and secondary pedestrian routes.

Primary and Secondary Routes

Primary routes reinforce the primary street corridors and paths of the District, on 6th Street, 23rd Avenue, Oak Street, and the proposed Science Walk, and the north/south malls and sidewalks that connect Granary Road into the District. Secondary routes are assumptions of future pedestrian movement, but less volume than primary routes. Primary routes may include wider walkways and paving, special wayfinding, and other site amenities.

Several primary pedestrian routes are proposed to break up the long blocks on 6th Street and 23rd Avenue. New mid-block crossings should be installed at these locations to slow traffic and provide a safer crossing. New, consistent mid-block crossing standards can be developed that will alert motorists to slow down and yield to pedestrians. One new pedestrian crossing signal may be warranted at the intersection of the proposed Science Walk and University Avenue. Further study should be conducted to determine if this can be a fully signalized intersection. The East Gateway District Master Plan includes conceptual recommendations for potential above-grade skyway connections, should future programming show demand for such facilities.

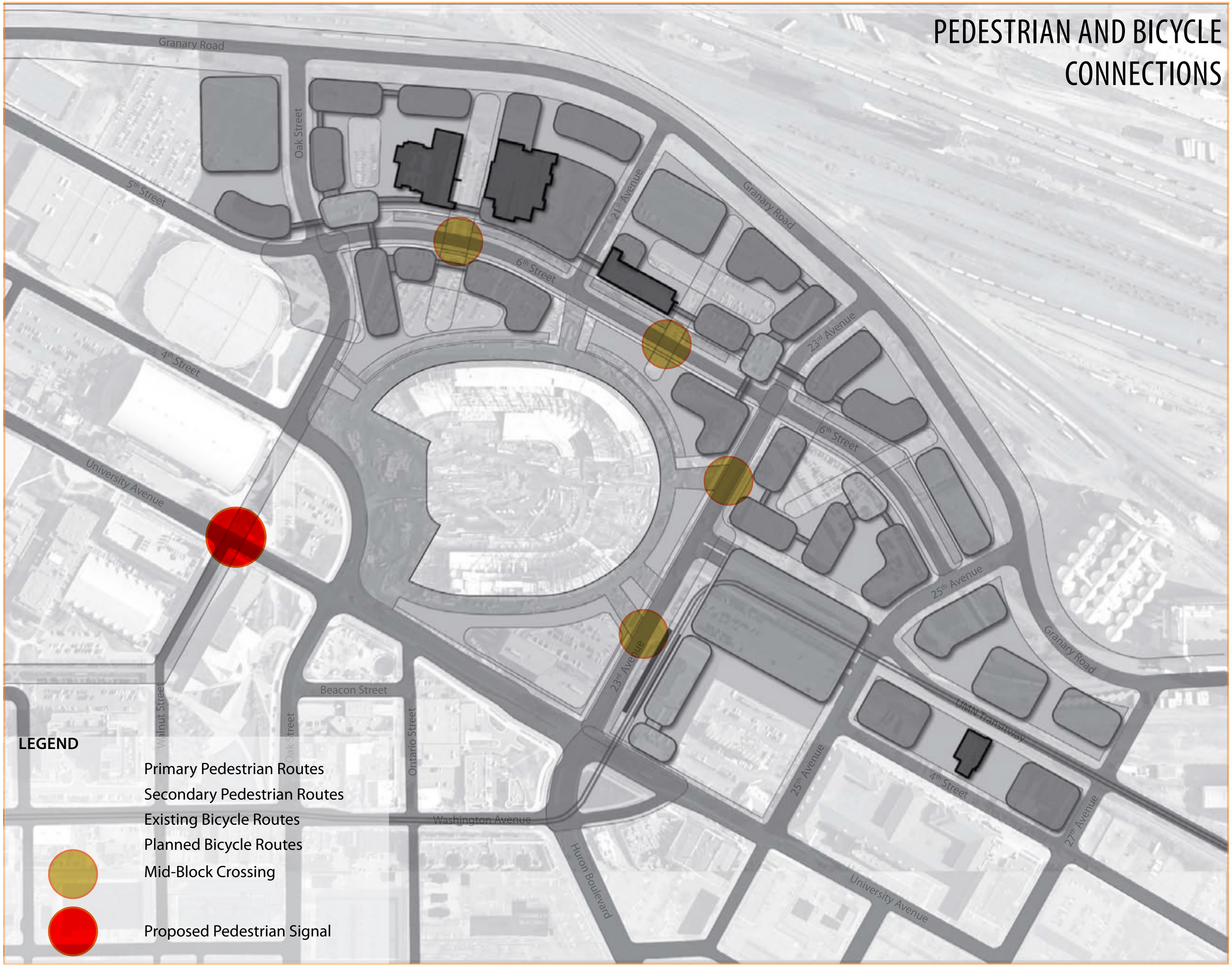
Skyway Guidelines

- Skyways in the District will transport:
  a) Research materials.
  b) Building occupants or visitors moving between research buildings.
- Skyways will not be built to connect the District to other campus venues or facilities.
- Skyways will connect buildings within research clusters when at-grade connections would disrupt open space elements or service corridors.
- Buildings will be designed to accommodate through-traffic circulation at the skyway level.
- Skyway connections should occur at a distance from intersections to allow for visibility and wayfinding at the street level.

Streetscape Character

Street cross-sections have been planned with enough distance between buildings and curb lines to allow room for sidewalks, a landscape zone at the curb, and a landscape zone at the building edge. The street edge landscape zone provides some buffer against traffic on the adjacent road. Street trees and tree pits could include a "green streets" design, using the planter area as a filter for local sidewalk run-off.

PEDESTRIAN AND BICYCLE CONNECTIONS



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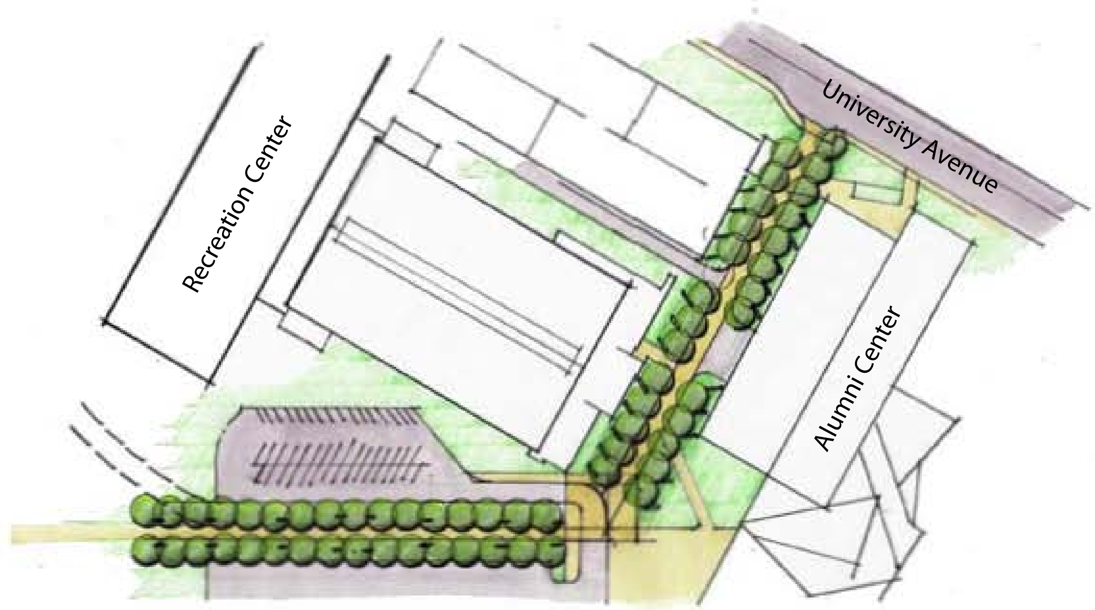
The landscape at the building edge provides interest along building façades without major entrances or active ground floor uses.

To activate and maintain a quality pedestrian realm, future buildings should include active uses and transparency at the ground level and at major building entries fronting 6th Street and 23rd Avenue. Street trees, pedestrian-scale lighting, site furniture, and wayfinding should be incorporated into a unified streetscape design that creates a contemporary, unique identity for the District, while harmonizing with previous campus site furniture standards. Energy-efficient lighting sources, drought-tolerant plantings, and porous pavement should be used for all pedestrian routes.

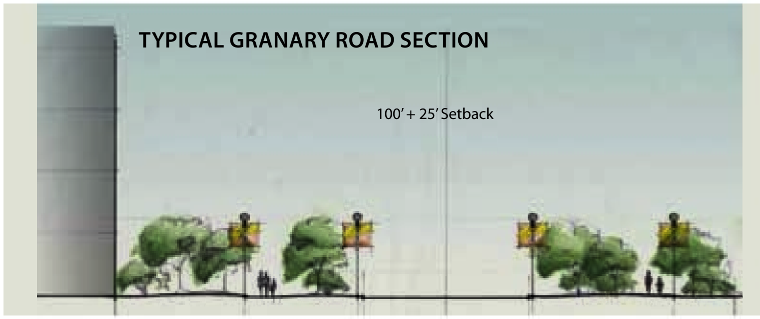
Science Walk Extension

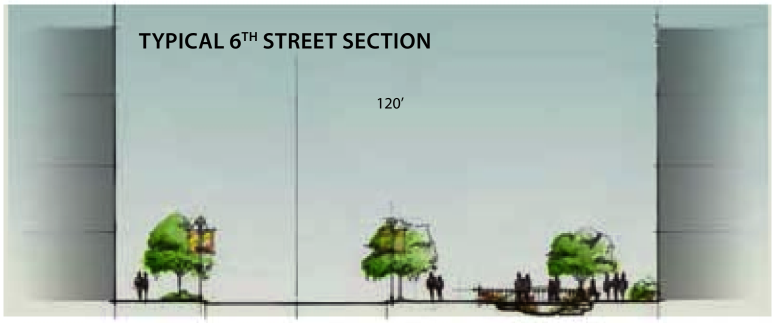
One of the main pedestrian connections from the East Gateway District to the main campus is proposed along the old alignment of Oak Street, from 6th Street to Walnut Street and Scholars Walk. This route is currently used and designed as a service road to access loading docks at the McNamara Alumni Center and the Recreation Center. The plan proposes a re-design of this visual and physical axis as a major pedestrian route and an extension of Scholars Walk into the District. The re-design should continue to accommodate occasional delivery trucks and access to the loading dock of the Recreation Center. The Scholars Walk extension will take advantage of this pedestrian route with interpretive graphics that tell the story of the research conducted by the University.

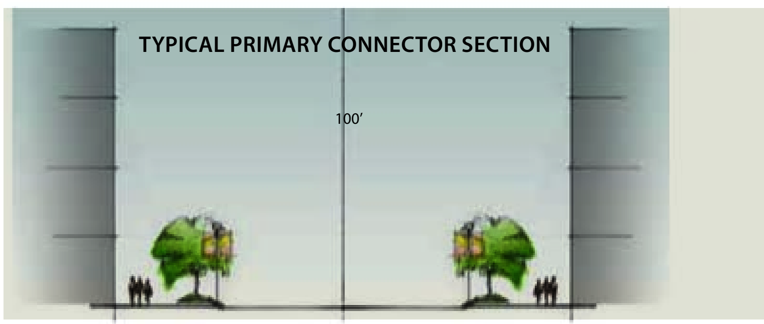


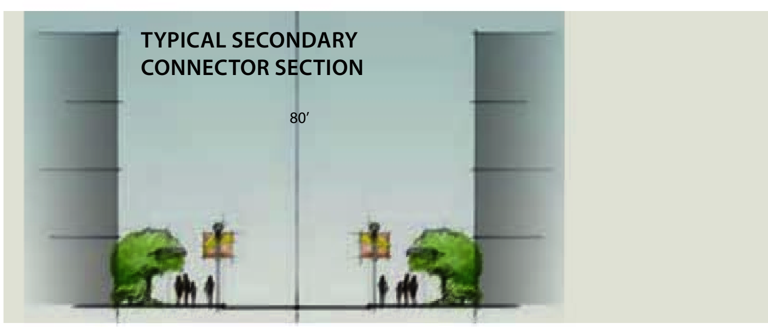
Plan view sketch of the Science Walk extension from Scholars Walk

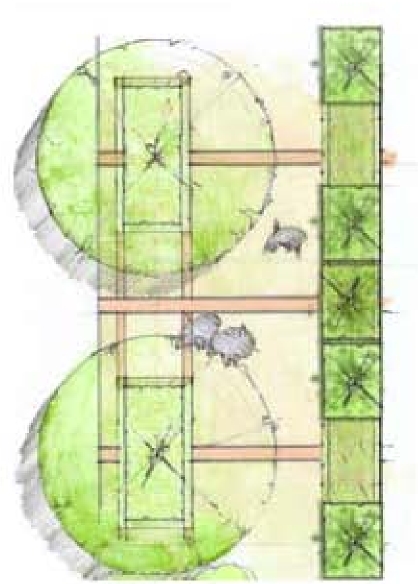

CONNECTIONS TO CAMPUS
MBB
Lions/
McGuire
CMRR
TCF Bank
Stadium
Oak Street
Mariucci Arena
Williams Arena
University Avenue
Ontario Street
Beacon Street
4th Street
Science Walk
McNamara Alumni
Center
Oak Street
University
Recreation Center
University Aquatic
Center
Future LRT
Walnut Street
Washington Avenue
Scholars Walk
Harvard Street

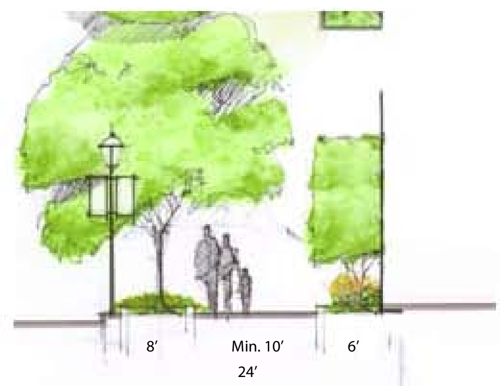




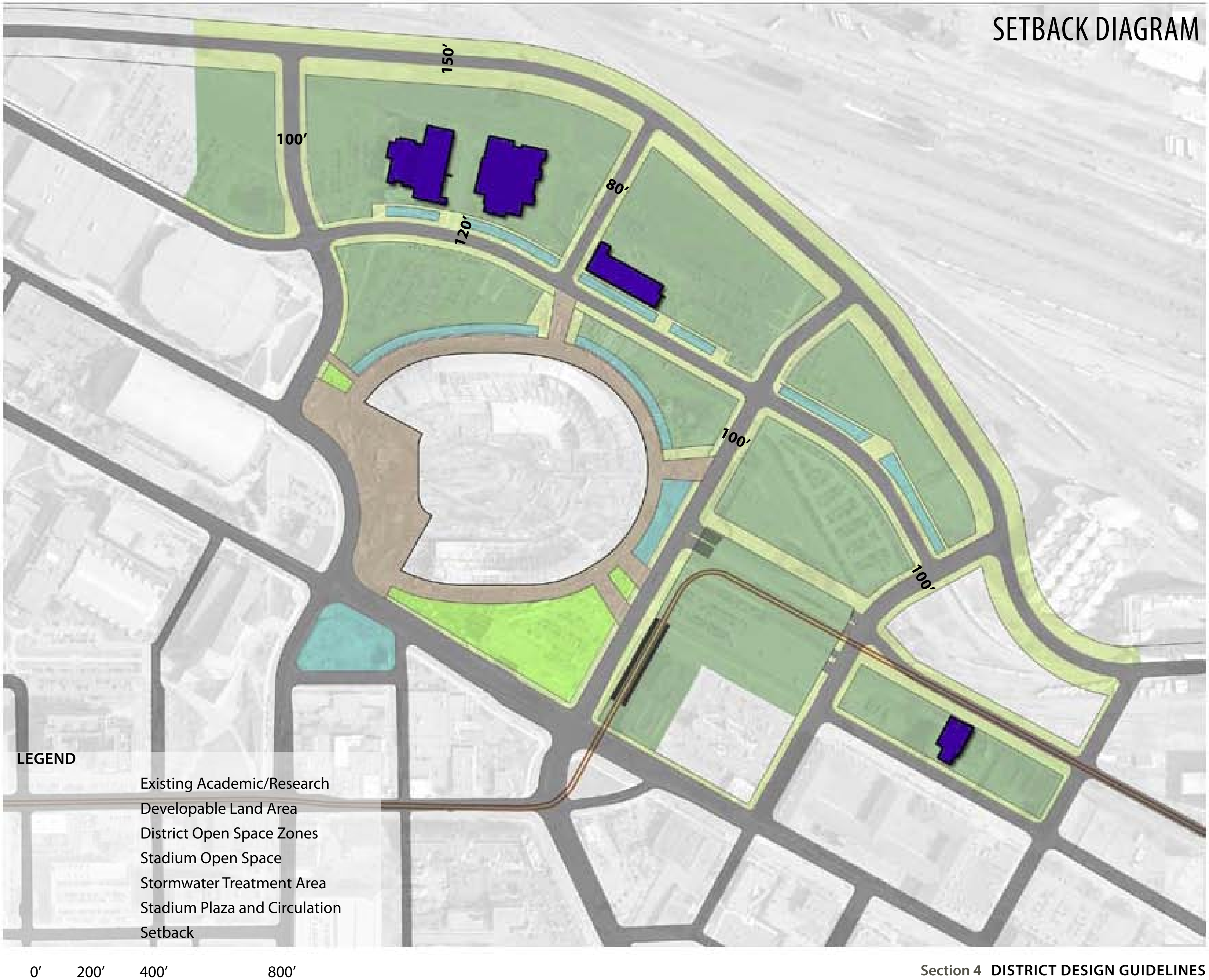








Typical Streetscape


SETBACK DIAGRAM
150'
100'
80'
120'
100'
100'
LEGEND
Existing Academic/Research
Developable Land Area
District Open Space Zones
Stadium Open Space
Stormwater Treatment Area
Stadium Plaza and Circulation
Setback
0'
200'
400'
800'

CREATIVE PARKING SOLUTIONS
Consider mixed use parking structures, tucking convenience parking along service walks and incorporating green paving systems into parking lots.

PARKING

In order to accommodate future development, surface parking lots will be replaced by structured parking in three locations: west of Oak Street off of 5th Street; a mid-District location east of 21st Avenue north of 6th Street; and the proposed multi-modal deck and transit stop on 23rd Avenue at 4th Street. Ramps will be distributed within a 3- to 5-minute walk of all facilities.

The current parking total is 3,082 spaces, all surface parking. Proposed parking is approximately 4,200 spaces, including up to 3,300 spaces in the three proposed decks. Smaller surface parking lots of 20 to 30 vehicles will be located throughout the District. A multipurpose space proposed at the southeast corner of the stadium has been included in the parking count. This area should be designed as a green, landscaped foreground to the TCF Bank Stadium, with pervious pavement, able to accommodate occasional parking and vendors/concessions on game days.

At the lower range density, the parking ratio of spaces to square feet (sf) of development is approximately 1/500 to 600. The ratio of parking to development will vary depending on building type. Guidelines of spaces/use follow (assumes no transit):

- Wet lab 1 space/500 sf
- Dry lab 1 space/350 sf
- Office 1 space/250 sf

Assuming a mode split in the future of 70/30 (70% use single occupancy vehicles; 30% walk or use transit, carpool, or bike), that would reduce the guidelines as follows:

- Wet lab 1 space/700 sf
- Dry lab 1 space/500 sf
- Office 1 space/350 sf

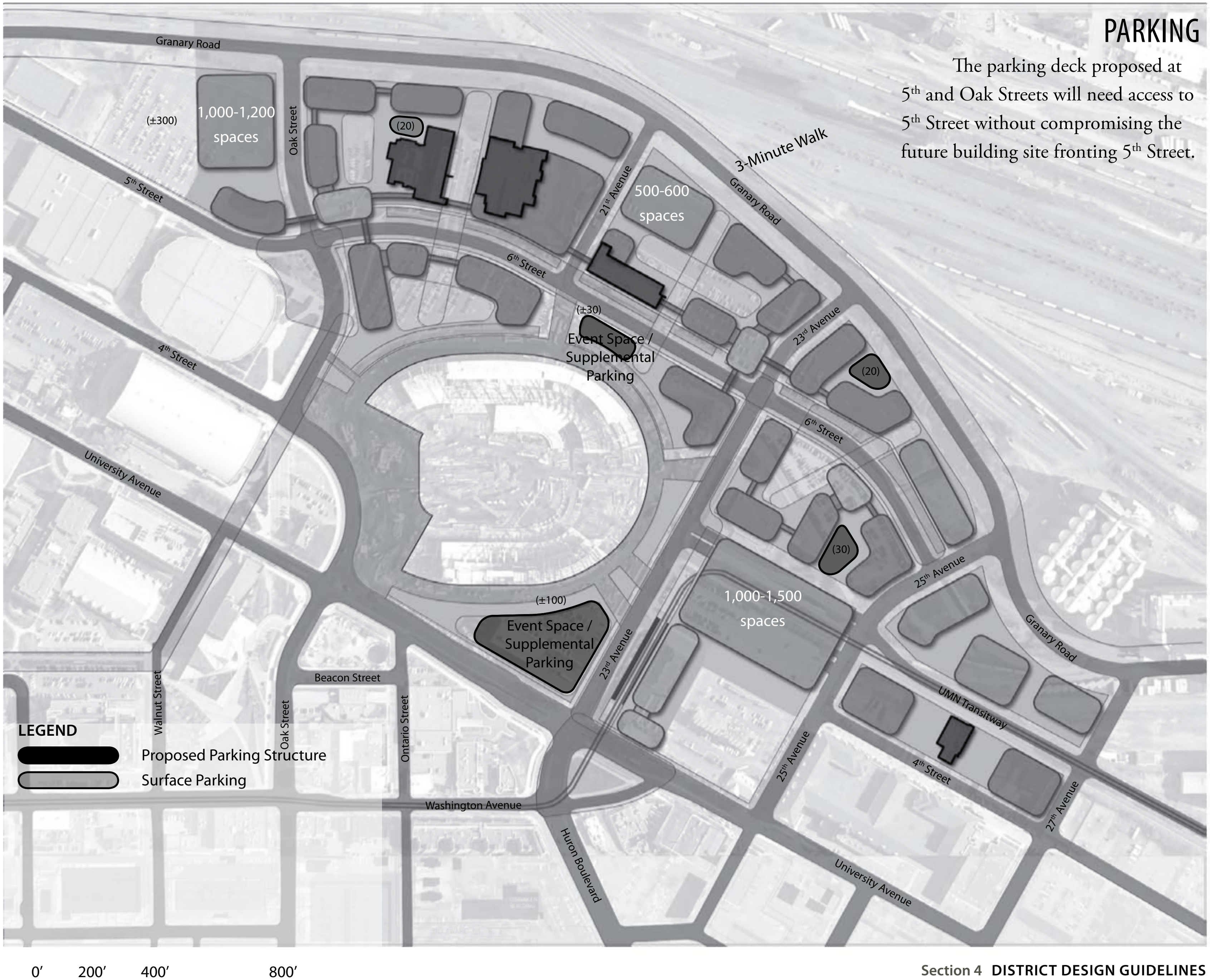
The long-term parking strategy for the East Gateway District will depend in large part on the nature of future uses and construction of the Central Corridor LRT line. The University should continue to encourage Transportation Demand Management strategies to curb demand for single occupancy vehicles and to promote transit ridership.

SRF Consultants conducted a parking analysis for the East Gateway District Master Plan based on future built conditions to year 2015, testing for the lower density target, and including construction of the Central Corridor LRT line. SRF Consultants assumed that a new 2-lane roadway and extension of 25th Avenue from University Avenue to Huron Boulevard will be constructed as well as a reconfiguration of the intersection of 25th Avenue and Huron Boulevard. They found that with these proposed improvements, future roads and intersections would be capable of handling three parking ramps at the proposed sizes.

Parking ramps will be a strong part of the visual character of the District and should be guided by the architectural design guidelines. Active ground floor uses should be planned for the front façade of decks adjacent to primary corridors and pedestrian routes.

PARKING

The parking deck proposed at 5th and Oak Streets will need access to 5th Street without compromising the future building site fronting 5th Street.



Pedestrian malls in the District need continuity under skywalk connections.

LANDSCAPE AND OPEN SPACE

Early objectives for the East Gateway District emphasized the creation of a cohesive, memorable system of public spaces. To achieve this goal, the District Master Plan proposes an interconnected network of public and semi-public spaces to balance the proposed density of the District with a sense of physical order, openness, and human scale.

Just as the east bank of the Twin Cities campus is formed by a hierarchy of malls, quadrangles, courtyards, and streets, the open space proposed for the East Gateway District is shaped by a hierarchy of similar elements that include:

- Pedestrian malls.
- Courtyards.
- Gateways and plazas.
- Streets and the public realm.

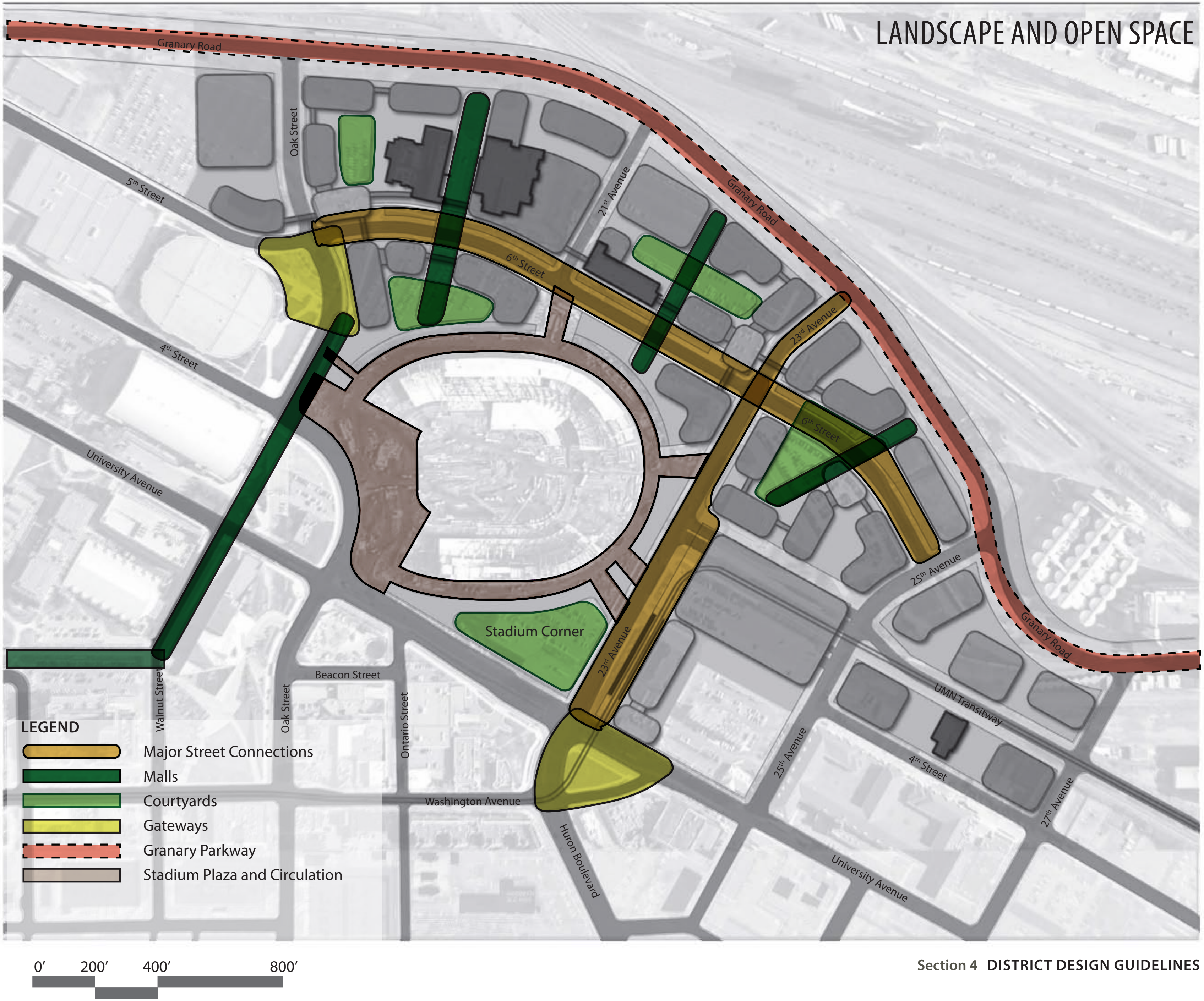
Pedestrian Malls

At lengths of 700 to 800 feet, the current development pattern of over-scaled blocks and roadways designed to the automobile do not enhance the pedestrian experience. The creation of a smaller block pattern with a series of pedestrian malls every 300 to 400 feet will provide more connections through the District, breaking up the scale of the mega-blocks into a more human-scaled urban grid. These pedestrian malls are proposed as similar in scale and character to existing pedestrian routes and former streets on the main campus, such as Church Street north of Washington Avenue and Scholars Walk. Their landscape character will emphasize a linear pattern of movement, open sight lines, and an enhanced pedestrian environment with shade, landscape, lighting, site furniture, and public art.

Enclosed connections between buildings should occur above the first story level as skywalks when crossing pedestrian malls, to allow continuous north/south pedestrian movement. In limited circumstances, if above-grade connections are not feasible, at-grade connections between buildings could be considered only if recessed from the primary frontage of the façade, with transparency and doorways to allow visual access and pedestrian movement through the connection.

Courtyards

Courtyards support the social life and intellectual exchange of a campus. A blend of enclosure and openness, the proposed courtyards will make the District a place made of many smaller places—some more intimate; some more engaging. They are intended to provide informal outdoor space for the immediate building occupants, with visibility and accessibility to other District users. Their landscape character can range from informal, unscripted space to more formal, programmed, and unique environments. Courtyards should include a rich palette of landscape and pedestrian amenities, including outdoor seating, shade, lighting, and plantings for color and seasonal interest.

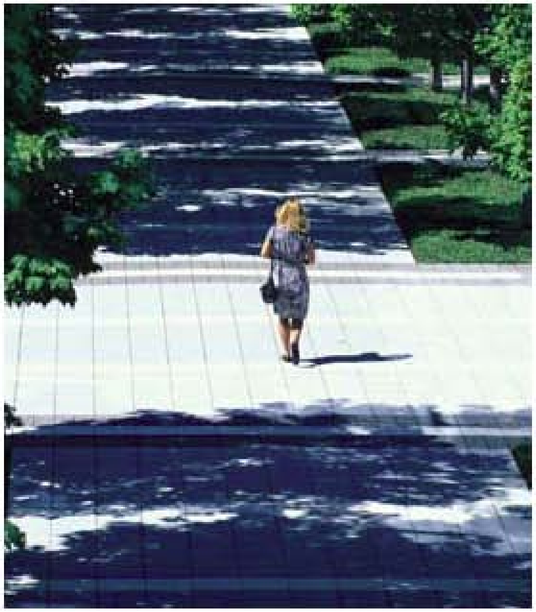


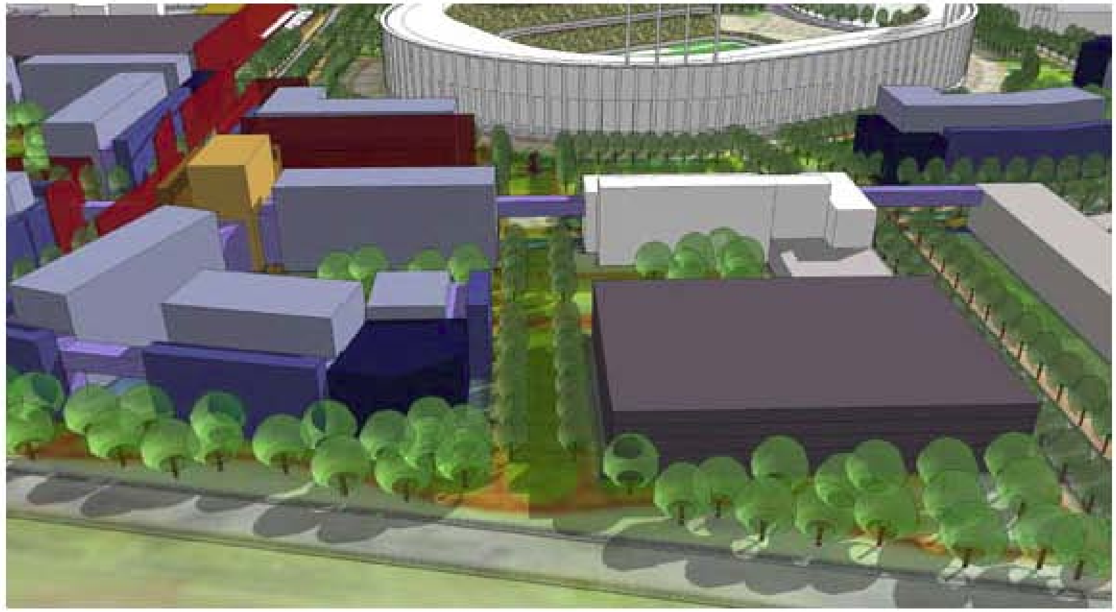
LANDSCAPE AND OPEN SPACE
Granary Road
Oak Street
5th Street
6th Street
21st Avenue
Granary Road
23rd Avenue
6th Street
4th Street
University Avenue
25th Avenue
Stadium Corner
23rd Avenue
Granary Road
UMN Transitway
Beacon Street
Walnut Street
Oak Street
Ontario Street
25th Avenue
4th Street
27th Avenue
Washington Avenue
Huron Boulevard
University Avenue
LEGEND
Major Street Connections
Malls
Courtyards
Gateways
Granary Parkway
Stadium Plaza and Circulation
0′
200′
400′
800′

ILLUSTRATIVE PLAN

The Illustrative Plan conveys the intended scale and character of Distinct open space and pedestrian connections.

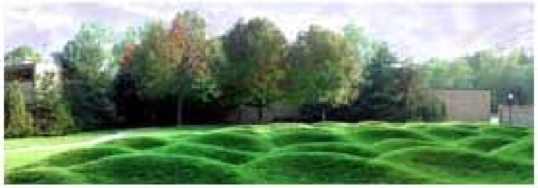
0′ 200′ 400′ 800′





Pedestrian malls provide important breaks within District blocks, adding open space, views, and pedestrian access throughout the District.

As linear elements, pedestrian malls should be clearly articulated with a lush landscape, canopy trees, pedestrian lighting and furnishings, and pervious pavement.



INTERNAL COURTYARDS
Internal courtyards are intended as outdoor rooms that can feature interpretive art, daylight, views, landscape, and pedestrian gathering spaces.

Gateways and Plazas

Two major spaces will anchor the East Gateway District—a major plaza at University Avenue and Huron Boulevard, and a new plaza on the corner of a realigned Oak Street at 6th Street. Both of these gateway plazas are intended as foreground open spaces allowing uninterrupted views to new research and mixed use facilities surrounding the space. New buildings should be oriented to the gateway plazas, with active building bases and major entrances opening onto the space.

The plaza proposed at Oak and 6th Streets serves as a foreground plaza for new research buildings and the Mariucci Arena. This space is envisioned as an urban plaza able to accommodate a high volume of foot traffic on event days. It should be designed with street trees, hardscape areas, lighting, site furnishings, special features such as water or civic art, and high quality materials and finishes. The plaza should easily connect both physically and visually to the proposed Science Walk.

Currently the landscaped berm that divides traffic on Washington Avenue, Huron Boulevard, and University Avenue is proposed as a gateway plaza and a highly urban space surrounded by taller, mixed use buildings, creating a true architectural gateway to the East Gateway District. Major building entries and active ground floor uses should be incorporated to enliven this plaza, with pedestrian amenities and an elegant urban landscape to mitigate the traffic and transit activity of this key corner.

Stadium Corner

Stadium Corner is the southeast corner of the stadium block, and is currently occupied by a university office building. In the long term, that building should be replaced with a multipurpose open space that can accommodate game day vendors and concessionaires, and the foot traffic arriving by the Central Corridor LRT line across 23rd Avenue. A flexible landscape zone within a grid of canopy trees will bring down the scale of the space and make it inviting for pedestrians on non-game days.

Streets and the Public Realm

Streets within the East Gateway District are the backbone of the pedestrian experience. The two primary corridors in the District are 23rd Avenue and 6th Street, which link the District to Stadium Village and the future transit center on 23rd Avenue, and to the athletic area and Dinkytown on 5th/6th Streets. The character of 23rd Avenue on the east side of the District has multiple purposes. It is both a part of the stadium block and part of the vehicular and pedestrian entry to the East Gateway District. With construction of the Central Corridor LRT transit stop and a proposed multi-modal parking deck and bus transit center, 23rd Avenue will also become a significant pedestrian corridor.

A series of vegetated swales in the 6th Street right-of-way will accommodate the District's stormwater run-off. As the District builds out, more sophisticated models to capture and treat run-off should be incorporated that include porous pavement, seatwalls, and other linear elements. Pedestrian walks should be constructed on both sides of the bio-swales with connecting paths across to improve pedestrian access to future facilities.

Sustainable Landscape

Sustainable design methods for treating urban storm run-off can be incorporated into the open space network of the District as features within courtyards and pedestrian malls, and along the 6th Street corridor. Porous paving should be used for all pedestrian hardscape areas to encourage infiltration. Plant material of native and drought-tolerant species should be used throughout.

The University of Cincinnati provides an excellent example of an urban plaza and gateway to an athletic stadium.

The 6th Street rain gardens can include a more urban edge and refinement.

6th Street Cross-Section

PUBLIC ART

Public art in the District should be scaled to its space and include interpretive elements.

ART OPPORTUNITIES

Public art will give identity, branding, and a memorable sense of place to the East Gateway District. It will provide interpretive opportunities to explain the research done within the District and its impact to the University, city, state, and country.

The District Master Plan proposes a number of locations for future public art installations as part of the open space network, organized in a hierarchy dependent on the scale and spatial relationship to their surroundings.

Gateway Scale Opportunities

Two gateway locations are identified: one at the Stadium Corner on University and 23^{rd} Avenues, and the second at the intersection of Oak and 6^{th} Streets. Public art in these locations will need to be monumental in scale, visible from a distance, and in proportion to the scale of its plaza space and adjacent buildings such as the stadium, arena, and future research buildings. It must be legible from many vantage points, yet engaging at a pedestrian scale.

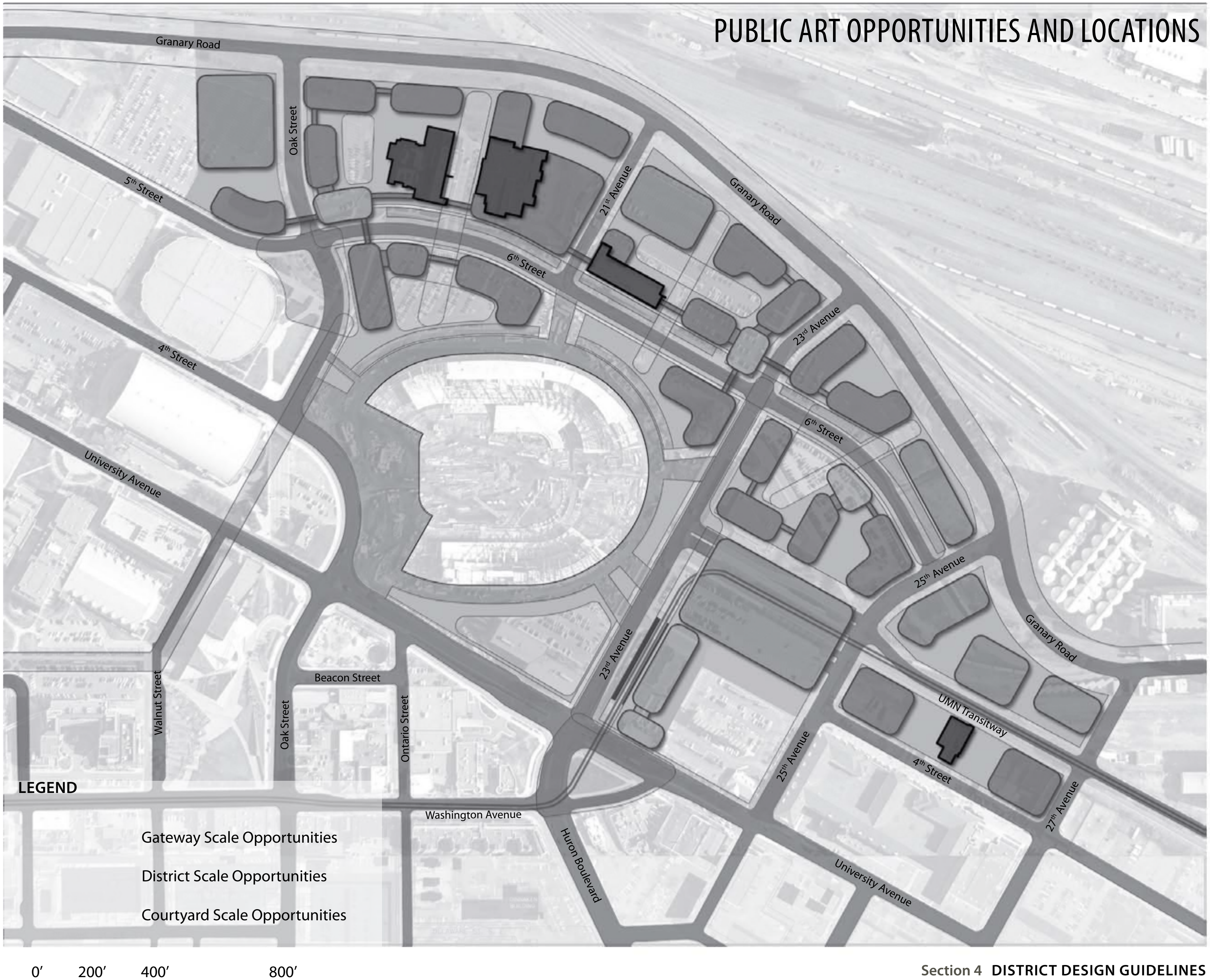
District Scale Opportunities

Located at the terminus of major view corridors along the pedestrian malls, these spaces are scaled and situated in a smaller proportion of open space than gateway spaces; however, these locations often have the stadium as a backdrop. Public art at the District scale should be visible and accessible by many within the District.

Courtyard Scale Opportunities

Located within research courtyards, public art at this level is more intimate—legible at a more personal scale. It helps animate the courtyard experience within a cluster of buildings. It may also be viewed from many upper floor vantage points.

PUBLIC ART OPPORTUNITIES AND LOCATIONS



UTILITIES AND INFRASTRUCTURE

Due to the integral nature of the infrastructure system compared with the rest of the campus, this plan does not include an exhaustive utility study. Rather, utility and infrastructure conditions were analyzed to determine potential modifications and challenges to implementing the District Master Plan.

Parallel to this study, the University is evaluating campus-wide infrastructure needs. This study along with future studies will be necessary to effectively implement an efficient and sustainable infrastructure network.

Utility Concerns

There were two medium and one major potential concern identified through this study. Each concern is identified in the diagram on the facing page and described in the adjacent table. While the footprints that create these points of concern are flexible, the plan suggests looking at the possibility of relocating these utilities when it is time to move forward with the specific facilities to allow optimal development.

Through the planning process, the one major area of concern was determined to be worth considering for relocation in the future because of the quality of space that would be created at the Oak and 6th Streets gateway. Additionally, the steam line in question may have to be upgraded to provide additional supply. Decisions about when to relocate utilities at the Oak and 6th gateway will be assessed based on financial and development opportunity parameters. This phase of development is anticipated to occur in the long term future.

UTILITY CORRIDORS
Major utilities should be kept to roads and open space corridors to preserve future building footprints.

Infrastructure Expansion

As noted on the plan on the facing page, the current electric and steam supply lines do not exist to 23rd Avenue. This poses a problem for the first phase of research buildings discussed later in this report. These utilities will need to be extended before opening any new research facilities east of where they currently end.

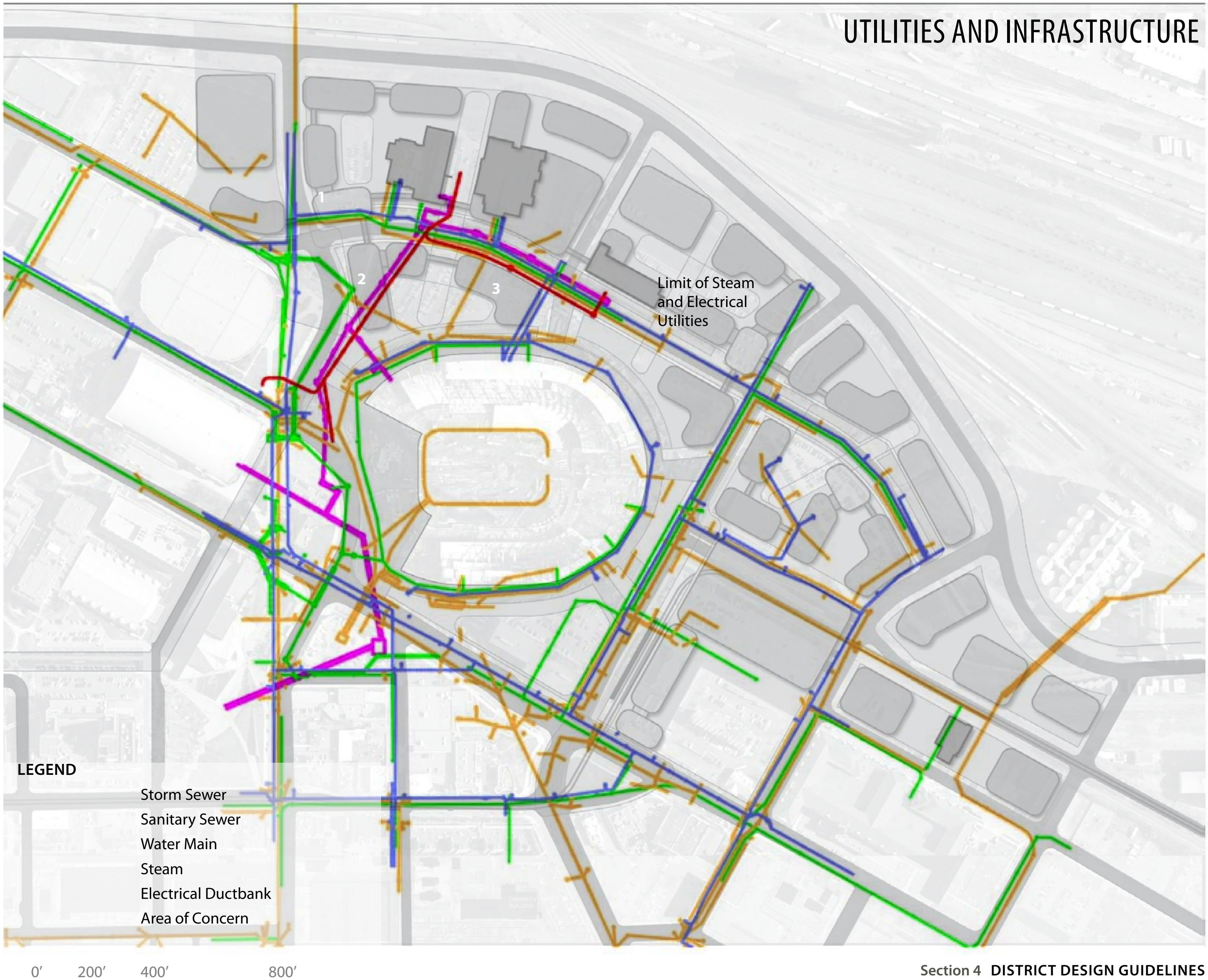
The Utility Master Plan, approved in 2009, suggests that a new power generation plant may be required by approximately 2020. This may include the acquisition of a 5- to 10-acre site northeast of campus.

Infrastructure Corridors

When infrastructure is expanded, it is extremely important that lines and tunnels be implemented outside of potential development zones. Open space corridors and roadways are ideal locations for utilities even if they result in slightly longer utility runs. The major area of concern identified in the plan was created because the line was built along the shortest path through a parking lot rather than the existing roadway.

FUTURE UTILITY MODIFICATIONS/ AREAS OF CONCERN

1. Proposed research facility is over a 12" water main. This is a medium impact.
2. Proposed research facility is over an electrical ductbank and a steam supply. The ductbank is a medium impact. The steam supply is a major impact.
3. Proposed research facility is over a 36" storm sewer. This is a medium impact.


UTILITIES AND INFRASTRUCTURE
1
2
3
Limit of Steam and Electrical Utilities
LEGEND
Storm Sewer
Sanitary Sewer
Water Main
Steam
Electrical Ductbank
Area of Concern
0′
200′
400′
800′

ARCHITECTURAL DESIGN GUIDELINES

The architecture of the East Gateway District will help define a new area of campus. The University hasn't undertaken the planning, design, and construction of a district of this size and scale since the West Bank area was developed in the 1960s. The District buildings must work together as parts of the District and a part of campus, while still respecting the design intent and programmatic requirements of individual buildings.

CAMPUS DISTRICT

The Twin Cities campus is loosely organized into districts, each easily identified by name or landmark: Northrop Memorial Auditorium or Mariucci Arena, for example, identify not only the name of a place but also identify the campus areas they occupy. These identities define the district and provide a means of orientation. Each district is held together by elements common or unique to that district. These elements include commonalities related to location, use, formal order, or arrangement within a district, to more architectural commonalities such as age, massing, materials, geometry, fenestration, and level of ornamentation.

With a long history as the "back" of campus, the East Gateway District has a number of challenges to overcome to integrate fully into the University's built fabric. These challenges represent a collective opportunity for architects and designers to fully connect the new district into a large and diverse campus.

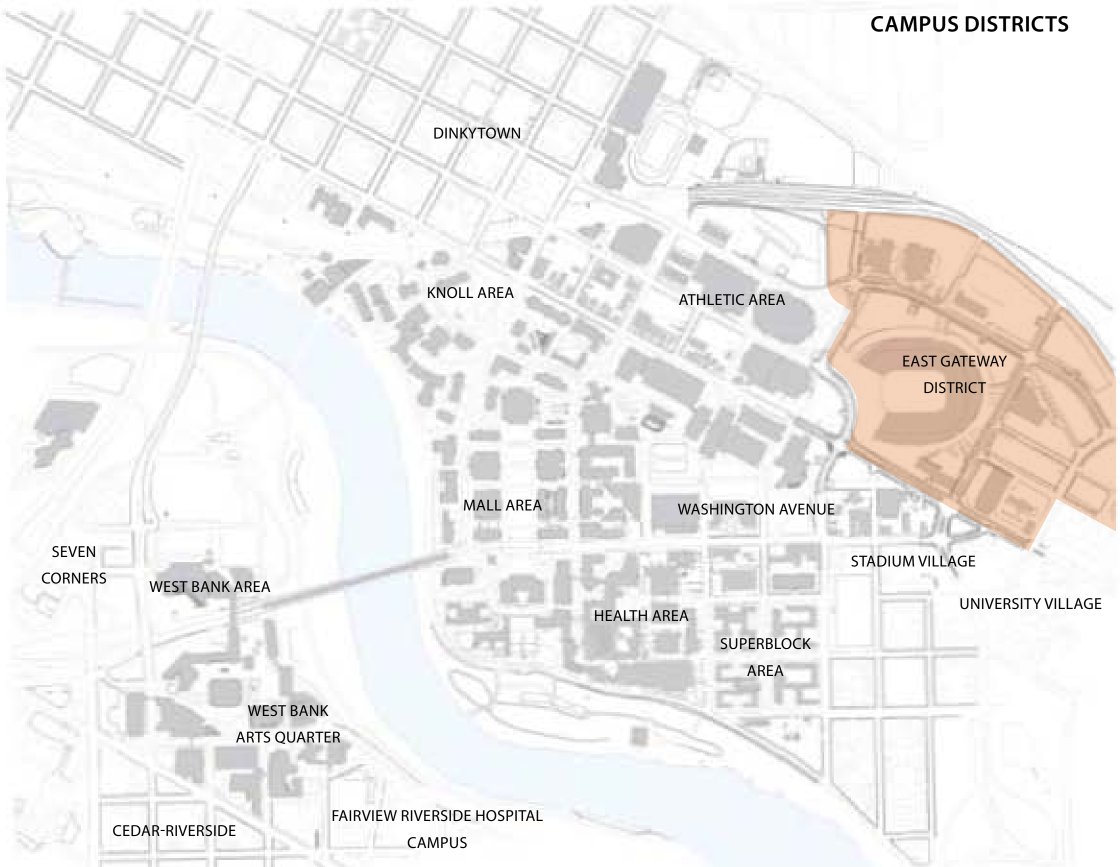
PHILOSOPHY

The overarching philosophy of the architectural guidelines as a response to the challenges facing the District is threefold: first to unify the District as a place of biosciences research; second, to integrate the new District into the existing campus; and third, to identify the District as a research center at the University of Minnesota. The architectural guidelines work to be a descriptive impetus for design rather than prescribing definite rules or standards.

EAST GATEWAY DISTRICT CHALLENGES

1. **District at the Back/District at the Edge**
   The addition of the TCF Bank Stadium and recent research buildings has begun to shift the perception of "back door" for this part of campus. The District's location at the edge of campus, adjacent to athletic venues and close to active retail uses south of University Avenue, creates the opportunity for integrating the District more fully into the campus and urban fabric. The condition of "edge" therefore can become an opportunity for "gateway," a type of new threshold into campus.

2. **Inconsistent Context**
   The stadium and arenas have set one built example for the District. They are of one type and character—traditional, monumental, and brick. Recent research buildings of the District provide a second architectural context, with more glazing and articulation of massing and scale. Rail lines and historic silos are the sole remnants of the industrial history of the area, providing



a third context in the District. A design opportunity lies in incorporating each of these influences as parts of a broad whole, and an impetus for the design of contemporary science and research buildings.

3. **Stadium Dominates the District**
The new TCF Bank Stadium is large by almost any architectural standard. Its proximity to other athletic venues adds to the feeling that this area can only house buildings of a similar scale. New buildings should address the scale and materiality of the athletic venues, but must also mediate between their sheer size and the more human-scaled, contemporary environment of future research buildings.

Mariucci Arena

Northrop Mall

Academic Health Center

ARCHITECTURAL CONTEXT

Architecturally, the University's campus is extraordinarily diverse. The variety of architectural styles embodies the past 150 years of American architectural history. Richardsonian Romanesque, PWA Moderne, International Style, New Brutalism, examples of the various historic revivals from the turn of the twentieth century, and the contemporary eclectic styles of the last twenty years are all represented on campus.

Lively neighborhoods have developed at the edges of campus, home to small-scale restaurants; retail establishments; and staff, faculty, and student housing. They are equally diverse in building size, age, and use. These neighborhoods are important to the vitality and definition of the campus.

The recent University master plan recognizes the eclectic nature of the campus and architectural styles over its evolution. However, the principles of the campus-wide master plan also strive for cohesiveness in the campus environment, through appropriate scale, common materiality, buildings that shape positive outdoor space, the treatment of primary entrances, etc. This does not imply that new construction should copy historic styles, but rather look to successful examples on campus that embody these principles and create memorable places.

DESIGN PRINCIPLES

1. Commons facilities within buildings form centers for multi-building development and interaction.
2. Commons facilities will be architecturally iconic to address their unique role in the District.
3. Lab buildings will have circulation corridors fronting Oak Street, 6^{th} Street, and 23^{rd} Avenue.
4. Offices, support spaces, and circulation elements will be separately articulated.
5. Major street walls will be predominantly masonry.
6. Bridges and walkways will be uniquely designed to complement adjacent buildings.
7. Building bases should feel open and use glazing as a dominant material and provide weather cover near doorways.
8. Ground level façades on Oak Street, 6^{th} Street, and 23^{rd} Avenue will have as much transparency and activity visible to the street as possible to animate the pedestrian environment.
9. An integrated landscape of terraces, water, and planting will accent building entrances.
10. Courtyards will be landscaped and accessible.


Primary Building Façades
Commons
Offices, Circulation, and Services
Labs and Support

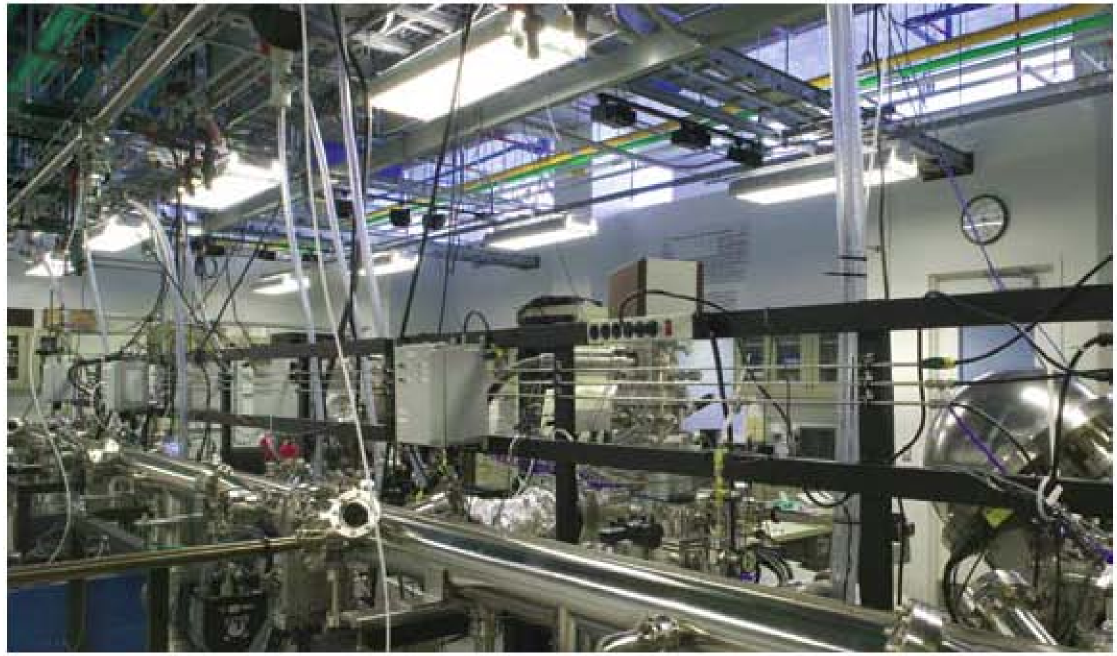
ARCHITECTURAL CHARACTER

Architectural Character

1. Use predominately brick, with limited areas of stone, metal, or other accent materials for building exteriors.
2. Provide a variety of heights, textures, and scales.
3. Construct buildings of not less than 3 stories nor more than 7 stories.
4. Use large glass walls to enhance entrances, important internal circulation events, and courtyards.
5. Connect buildings with interesting bridges and walkways.
6. Design and arrange internal and external space to support connectivity and collaboration.
7. Design commons facilities within buildings to be iconic through massing, materials, and lighting.
8. Accent building entrances with integrated landscape of terraces, water, and planting.
9. Achieve at least USGBC LEED® Gold certification for all buildings and landscapes.

Research Pragmatics

1. Use predominately modular open labs capable of adapting to future wet or dry programs.
2. Provide at least 15-foot floor height with a minimum 22-foot structural span throughout.
3. Locate adequate support spaces between labs and corridors.
4. Aggregate principal investigator offices around areas for casual interaction and collaboration.
5. Provide natural light to labs and offices.

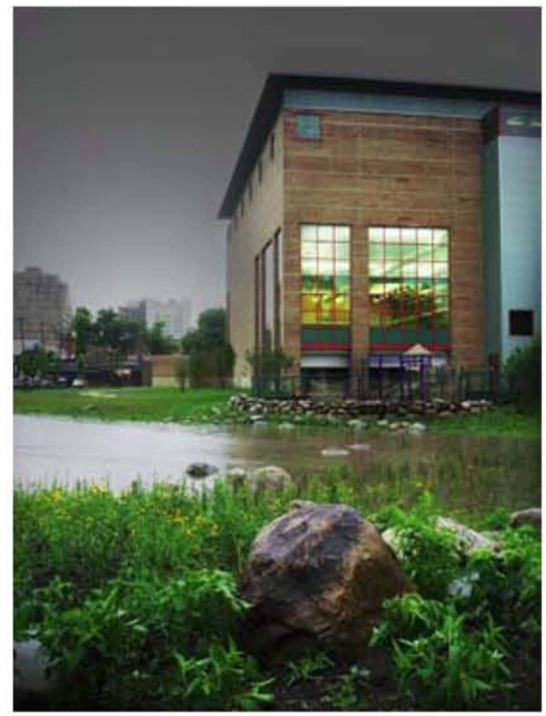


Interaction

1. Develop a program model to achieve 55% efficiency to support casual collaborative spaces.
2. Provide artwork and display areas that describe scientific inquiry in formal public areas.
3. Locate small lounges, atria, staircases, seminar spaces, and conference rooms to foster interaction.
4. Provide a variety of soft seating, tables and chairs, and adjoining flexible storage space.
5. Locate interaction areas along the path of travel between labs, offices, and circulation corridors.
6. Zone multiple areas from formal to completely unscripted throughout.
7. Provide technology, white boards, coffee kitchens, a variety of soft seating, and tables and chairs.
8. Allow for display of various media illustrating current areas of inquiry.

Sustainability

1. Require all new buildings to attain USGBC LEED® Gold certification.
2. Continue to implement the East Gateway Stormwater Management strategy, including green roofs, bio-swales, and infiltration planters.
3. Develop traffic/transit plans to leverage the intermodal station and existing campus transit systems.
4. Similar to the existing Scholars Walk, create a Science Walk display that tells the story of the University's commitment to the interrelated challenges of the biosciences and environmental sustainability.




PHASE I DEVELOPMENT AREA
Granary Road
6th Street
4th Street
Oak Street
University Avenue
23rd Avenue
Beacon Street
Oak Street
Ontario Street
Washington Avenue
Huron Boulevard
25th Avenue

PHASE 1 DEVELOPMENT PLAN

The East Gateway District Master Plan is an extension of the Twin Cities Campus Master Plan, approved by the Board of Regents in March 2009.

The District Master Plan will be used to guide future development decisions and influence operations decisions in the District. Planning and design efforts will refer to the District Master Plan when projects are being defined, sites are selected, and in both pre-design and schematic design stages of development.

Project Development and Approvals

Specific objectives and strategies for capital projects affecting land use, buildings, open spaces, landscape, and infrastructure will be determined in consultation with the District Master Plan.

The ultimate responsibility for day-to-day administration of the District Master Plan is held by the Vice President of University Services. Projects will be reviewed at the pre-design and schematic design level of detail by Planning and Architecture staff, who will provide analysis and recommendations to the Biomedical Discovery District Executive Committee.

Phasing and Planning Horizon

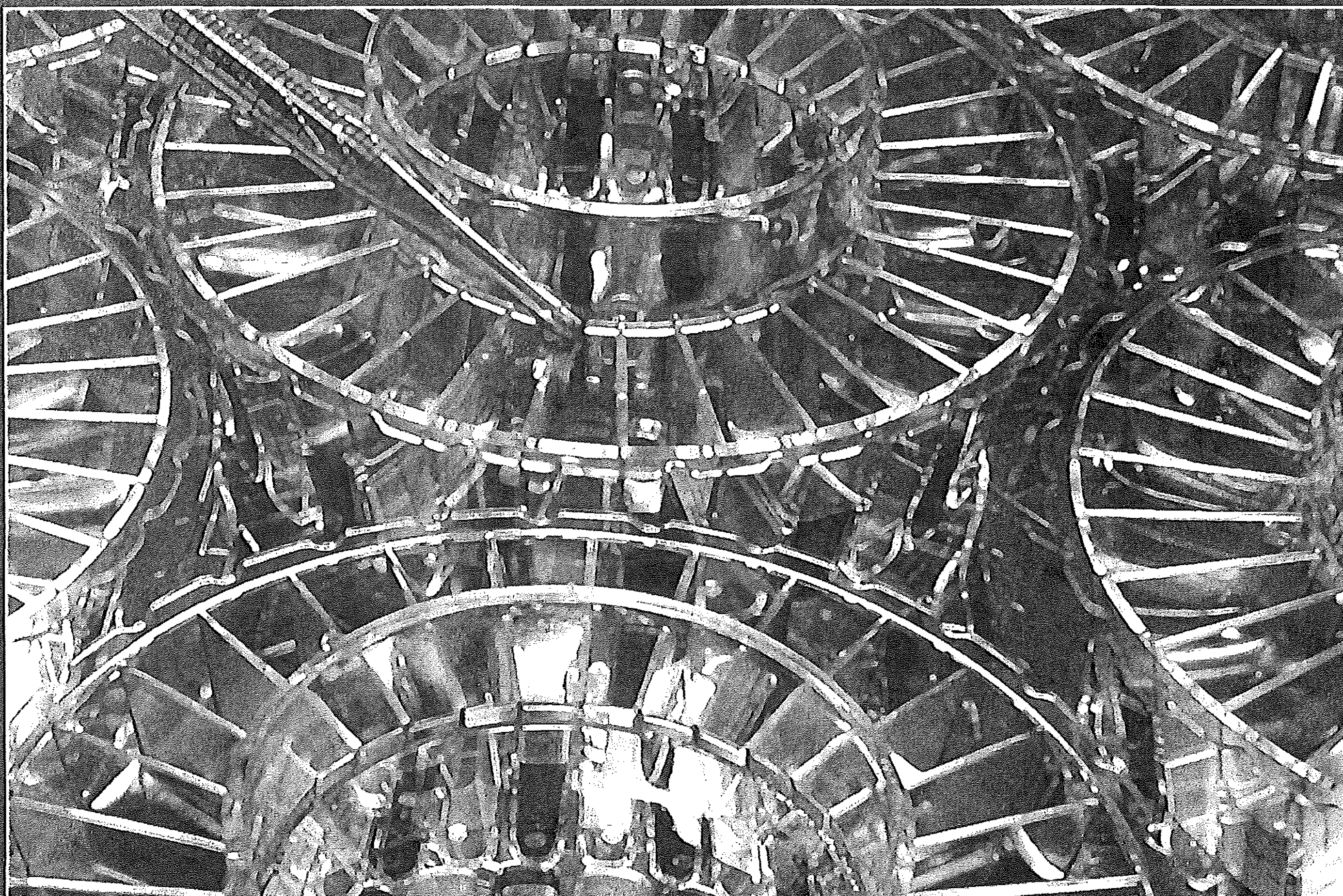
Near-term activities, projected within 0-5 years, are expected to include:

1. Coordinated site planning, programming, and construction of biomedical research facilities in the area noted as Phase 1 on the following diagram by summer 2009.
2. Expanded additional energy capacity (steam and chilled water for heating and cooling) to support these buildings as buildout occurs. Distribution networks are planned for orderly expansion in this District coincident with the first phase of building construction.
3. Construction of a realigned segment of 23rd Avenue, north of 6th Street in the first phase of building development.
4. Commencement of stadium events in September 2009, consisting primarily of University of Minnesota football games and other athletic events.
5. Commencement of the Central Corridor LRT service by approximately 2014, operated and owned by Metropolitan Council.
6. Development of a multi-modal parking facility adjacent to the Stadium Village LRT platform by 2010.

Long-term activities, more than 5 years into the future, are expected to include:

1. Redevelopment of key sites for University-related use, including the Thompson Center for Environmental Management (501 23rd Avenue SE) and the 2221 University Office Plaza building (2221 University Avenue SE)
2. Development of two other parking/multi-modal facilities within the District, and sized to meet reductions in parking demand and increasing use of regional and on-campus transit.

Updates on project activities within the District may be found at the Capital Planning and Project Management website at http://www.cppm.umn.edu



Biomedical Discovery District|Predesign

University of Minnesota
Twin Cities Campus
6th Street SE
Minneapolis, MN 55455
University Project #09-02
December 18, 2009

DRAFT FOR PRELIMINARY REVIEW

Architectural Alliance
Zimmer Gunsul Frasca Architects
Jacobs Consultancy
Damon Farber Associates

Appendices

1.0 EXECUTIVE SUMMARY

1.1 Background

The University of Minnesota has established the goal of becoming one of the top three public research institutions in the world within the next decade. To achieve this goal, the University needs to expand its faculty by recruiting and retaining top research talent and provide technologically sophisticated research space.

In 2007, the University asked the Minnesota State Legislature to create the Biomedical Facilities Authority as the mechanism to provide a predictable funding source for planning and building research facilities that will advance the biomedical sciences in Minnesota.

In 2008, the State of Minnesota established the $292 million Biomedical Science Research Facilities Funding Program. This dedicated funding program will provide appropriations to the University for up to 75% of the costs to design and construct new and expanded research laboratory facilities on the University's campus.

With capital funding secured, the University initiated Phase I of the newly named Biomedical Discovery District, that when complete will provide the buildings and related infrastructure to house 110 research faculty and 480 research assistants and additional support staff.

Phase I of the Biomedical Discovery District consists of a 74,655 square foot renovation and expansion to the University's Center for Magnetic Resonance Research (CMRR) building that will be completed in 2010. When completed the CMRR facility will house the world's largest 16.4 tesla animal magnet and the world's largest 10.5 tesla human imaging magnet.

1.2 Program

Phase II of the Biomedical Discovery District consists of an approximate 273,600 gross square foot research laboratory facility focusing on cancer and cardiovascular research together with common support space for research animal care, shared instruments, food service, and conferencing. A program summary is shown below:

Cancer Research	50,338 NSF
Cardiovascular Research	50,804 NSF
Research Commons (Animal Care and Shared Instrumentation)	34,193 NSF
Public Commons (Food Service and Conferencing)	9,990 NSF
Total NSF	145,325 NSF
Efficiency Factor	0.53%
Total GSF	**273,612 GSF**

1.3 Site

The site of Phase II of the Biomedical Discovery District project is in the East Gateway District between 6th Street to the south, the future Granary Road to the north, 21st Avenue, and 23rd Avenue. The site is shared with the existing Medical Biosciences Building (MBB) and has adjacencies to CMRR, Lions Research Building/McGuire Translational Research Facility (MTRF), TCF Bank Stadium, and the future LRT East Gateway station.

1.4 Phase II Construction Budget

Cancer Building	$47,747,400
Cardio Building	$39,181,700
Public Commons	$7,468,130
Research Commons	$27,975,310
Skyway to CMRR	$1,929,360
Skyway to MBB	$556,570
Sitework	$8,492,030
Total Construction Cost	**$133,350,500**

1.5 Schedule

Predesign Complete	December 2009
Schematic Design	December 2009 - April 2010
Design Development	April - September 2010
Construction Documents	July 2010 - June 2011
Construction	November 2010 - December 2012

1.6 Summary

The following summarizes key aspects of the Biomedical Discovery District Predesign:

New Research Labs & Support Space: 273,600 GSF

Occupants: 645 Occupants

Anticipated Date of Occupancy: Spring 2013

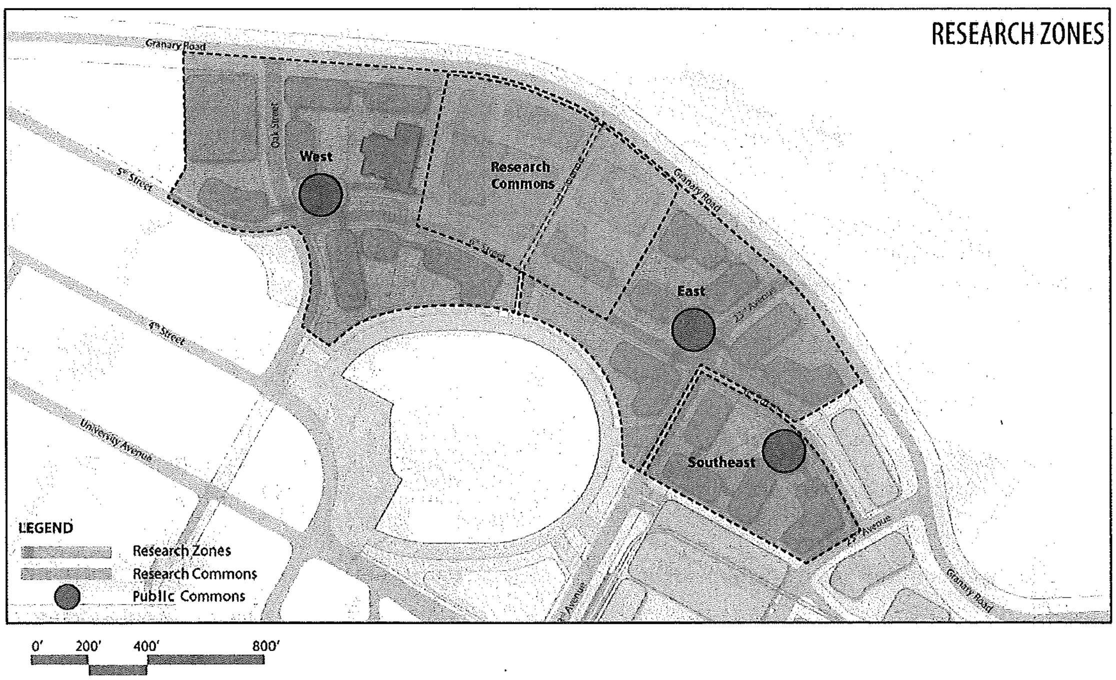
Estimated Total Project Cost: $133,350,500

2.0 STATEMENT OF NEED

2.1 Overview

The University of Minnesota's Academic Health Center is one of the largest and most comprehensive centers in the nation comprising six health professional schools, five allied health programs, and fifteen interdisciplinary centers. To support the University's goal to become one of the top three public research universities in the world, new facilities and new models for delivering health sciences research, education, and clinical care are needed. State of the art facilities that enhance collaboration and connectivity to existing facilities are necessary in order to maximize previous investments in the area. Building upon the University's strong foundation in bioscience research and discovery, the Biomedical Discovery District project will provide the necessary facilities and infrastructure to attract and retain the leading research talent in these fields.

Projected space needs are expected to expand beyond the capacity of existing facilities in the near future for both the Cardiovascular Research and Cancer Research programs. In order to provide a world class level of research, flexible facilities that easily adapt to the changing needs of the sciences while also allowing for collaboration by various groups of researchers are necessary. Core common facilities will enable researchers to have access to necessary equipment while increasing the likelihood of higher utilization.



2.2 Programmatic Need

2.2.1 Cancer Research

Two specific programs identified for possible inclusion in this project based on the need to expand their current space and plans for future growth:

Chemoprevention and Carcinogenesis faculty: This is a formal Masonic Cancer Center (MCC) program led by Stephen Hecht. His program members currently occupy the 7th floor of MCCRB. In addition there are members housed in College of Pharmacy space. This coherent, successful, and active multidisciplinary research program has currently outgrown its space needs. In addition to this program, Dr. Hecht also directs MCC's Analytical Biochemistry shared resource. Dr. Hecht has applied for two major instrumentation grants via the American Recovery and Reinvestment Act. If successful, these new instruments will require additional housing.

Mouse models faculty: Many of the MCC investigators use mouse models. While not confined to a single cancer program, these investigators have common interests and also have substantial interaction between existing facilities in the BDD. For example, CMRR and MCC investigators are actively collaborating. Interaction between program members in Immunology (housed in MBB) and MCC also are evident. In addition, a barrier animal facility is being planned for the BDD. Preclinical research in cancer prevention and treatment involve interactions between investigators of several cancer research programs. Dr. David Largaespada directs the MCC Mouse Genetics shared resource. Dr. Largaespada will also serve as a resource for other investigators within the AHC and the core facility could move to the new building.

2.2.2 Cardiovascular Research

13 overlapping areas of cardiovascular research currently exist or will be established with the expansion of the research facilities. Several specific programs could be housed in the project based on the need for expansion and the proximity to other centers of excellence within the biomedical research district.

Vascular Biology and Hypertension: These programs would benefit with the consolidation onto contiguous research space. Existing faculty members that would possibly benefit from consolidation currently have their laboratories in Jackson Hall, Phillips Wangersteen Building (PWB), KE and Varsity Club Research Center (VCRC) buildings.

Cardiovascular Imaging, Spectroscopy and Structural Biology: These programs would also benefit from consolidation into contiguous research space. Moreover, they would benefit by having close proximity to the CMRR facility.

Cardiovascular Genomics: In an attempt to synergize with other genomics related programs and an opportunity for recruitment and growth, this program would benefit by relocating to the new building.

Cardiovascular signaling, metabolism and disease: Potential aggregation of CV investigators present and to be recruited in CV implication of diabetes, obesity and metabolism. Heart failure, ischemic cardiomyopathy and arrhythmia could also be envisioned.

2.2.3 Research and Public Commons

Research and public common support space will be developed as a shared resource for the entire district. These types of spaces have been included based on the identified research in the area:

- Genomics sequencing center
- Advanced Optical Imaging
- Animal care facilities
- Conferencing
- Food service & amenities

Animal care facilities: A primarily mice only facility with the flexibility to expand the "barrier facility" based on need is required for the type of research currently programmed for the district. Additionally, the facility will need to be operationally efficient. Vivaria procedure space will require fume hoods vented to the outside so that experiments can be done with carcinogenic agents. There is also a projected need for quarantine and BSL2 containment rooms.

Conferencing Space Needs: There are multiple facilities in the district which have conference and meeting facilities available. It will be important to provide localized meeting facilities to encourage collaboration.

Other District Amenities: There is a need for large gathering space to serve as interaction space with appropriate seating and kiosks with information on the current research in the district. Food service that would serve as an amenity for the district is a possibility. Hotel office spaces for visiting scientists that cannot be reassigned as permanent office space for building occupants are necessary to provide flexibility and collaboration. Additionally, the opportunity exists to consolidate the Lillehei Heart Institute (LHI) Museum and the Jesse Edwards Museum to establish an educational center focused on cardiovascular disease, education, and future innovation made possible by the research in the district.

3.0 PROGRAM ANALYSIS

3.1 Program Summary & Itemized Spaces

3.1.1 Program Summary

		Total Rooms	Total Occupants	Occupants/Room	NSF / Room	NSF/Occupant	Total NSF	Building Efficiency	Total GSF
SUMMARY									
Cancer Building									
Office							11,156		
Laboratories & Support							39,182		
Total Cancer Building							**50,338**		
Cardiovascular Building									
Office							14,636		
Laboratories & Support							36,168		
Total Cardiovascular Building							**50,804**		
Research Commons									
Shared Instruments							9,975		
Vivarium							24,218		
Total Research Commons							**34,193**		
Public Commons									
Building Amenity							6,500		
Building Support							3,490		
Total Public Commons							**9,990**		
TOTAL PROGRAMMED NSF							145,325		
Building Efficiency									
Cancer								0.55	**92,363**
Cardiovascular								0.55	**93,218**
Research Commons								0.50	**68,126**
Public Commons								0.50	**19,904**
TOTAL GSF									273,612

3.1.2 Itemized Program Spaces - Cancer Research

Room Type	Space	Total Rooms	Total Occupants	Occupants/Room	Room Size	NSF / Room	NSF/Occupant	Total NSF
	Biology Laboratories							
1.1.1	Lab Module	24	96	4	10'-6" x 27'	285	71	6,840
	Total Biology Laboratories	**24**						**6,840**
	Biology Laboratories Support							
	Support Rooms	24			10' x 20'			4,800
1.2.1	Fume Hoods	6		0		100		600
1.2.2	Tissue Culture	8		0		200		1,600
1.2.3	Cold Lab	3		0	10' x 10'	100		300
1.2.4	Variable Temp Room	1		0	10' x 10'	100		100
1.2.5	Glasswash	1		0		800		800
1.2.6	Procedure Room	6		0		200		1,200
1.2.7	Autoclave Room	2		0	10' x 5'	50		100
1.2.8	Dry Darkroom	2		0	10' x 5'	50		100
1.2.9	Linear Equipment Room	1		0	12' x 126'	1,700		1,512
	Total Biology Laboratories Support	**54**						**6,312**
	Chemistry Laboratories							
1.3.0	Lab Module	42	168	4	10'-6" x 27'	285	71	11,970
1.3.1	Fume Hood Lab Module	28		0	10'-6" x 24'	270		7,560
	Total Chemistry Laboratories	**70**						**19,530**
	Chemistry Laboratories Support							
1.3.2	Tissue Culture	4		0		200		800
1.3.3	Instrumentation	4		0		200		800
1.3.4	Large Isolation Lab	1		0		400		400
1.3.5	Small Isolation Lab	2		0		200		400
1.3.6	Cold Lab	2		0		100		200
1.3.7	Linear Equipment Galley	4		0	12' x 20'	240		960
1.3.8	Procedure Room	1		0		100		100
1.3.9	Chemical Storage	3		0		100		300
	Total Chemistry Laboratories Support	**21**						**3,960**
	Analytical Biochemistry							
1.4.1	Mass Spectrometer	1		0		1,500		1,500
1.4.2	NMR	1		0		800		800
1.4.3	Office	2	4	2	10' x 12'	120	60	240
	Total Analytical Biochemistry	**4**						**2,540**
	TOTAL CANCER LABORATORIES NSF							**39,182**
	Biology Offices							
1.5.1	Faculty Office	16	16	1	10' x 12'	120	120	1,920
1.5.2	Senior/Flex Office	8	8	1	10' x 12'	120	120	960
1.5.3	Admin Support	5	5	1	10' x 8'	80	80	400
1.5.4	Hotelling Desks	11	11	1	10' x 6'	60	60	660
	Total Biology Offices	**40**						**3,940**
	Chemistry Offices							
1.6.1	Faculty Office	14	14	1	10' x 12'	120	120	1,680
1.6.2	Senior/Flex Office	7	7	1	10' x 12'	120	120	840
1.6.3	Admin Support	4	4	1	10' x 8'	80	80	320
1.6.4	Hotelling Desks	18	18	1	10' x 6'	60	60	1,080
	Total Chemistry Offices	**43**						**3,920**
	Office Amenity							
1.7.1	Large Conference Room	1	24	24		500	21	500
1.7.2	Medium Conference Room	2	16	16		350	22	700
1.7.3	Small Conference Room	2		0		250		500
1.7.4	Collaboration Space w/Pantry	4		0		250		1,000
1.7.5	Copy/Fax/Mail	2		0		100		200
1.7.6	Lockers (1.5 SF/Person)	1.5	264	264		264	1	396
	Total Office Amenity	**13**						**3,296**
	TOTAL CANCER OFFICE NSF							**11,156**

3.1.3 Itemized Program Spaces - Cardiovascular Research

Room Type		Total Rooms	Total Occupants	Occupants/Room	Room Size	NSF / Room	NSF/Occupant	Total NSF
	Biology Laboratories							
2.1.1	Lab Module	66	264	4	10'-6" x 27'	285	71	18,810
	Total Biology Laboratories	66						18,810
	Biology Laboratories Support							
	Support Rooms	66		0	10' x 20'	200		13,200
2.2.1	Procedure Rooms	15		0	10' x 20'	200		3,000
2.2.2	Procedure Rooms	16		0	10' x 10'	100		1,600
2.2.3	Fume Hoods	17		0		100		1,700
2.2.4	Tissue Culture	22		0		200		4,400
2.2.5	Cold Lab	6		0	10' x 10'	100		600
2.2.6	Variable Temp Room	1		0		100		100
2.2.7	Glasswash	3		0		200		600
2.2.8	CV Physiology	1		0		300		300
2.2.9	Histology	1		0		800		800
2.2.10	Dry Darkroom	2		0	10' x 5'	50		100
2.2.11	Linear Equipment Room	1		0		4,158		4,158
	Total Biology Laboratories Support	151						17,358
	TOTAL CARDIOVASCULAR LABORATORIES NSF							36,168
	Biology Offices							
2.3.1	Faculty Office	33	33	1	10' x 12'	120	120	3,960
2.3.2	Senior/Flex Office	17	17	1	10' x 12'	120	120	2,040
2.3.3	Admin Support	9	9	1	10' x 8'	80	80	720
2.3.4	Hotelling Desks	28	28	1	10' x 6'	60	60	1,680
	Total Biology Offices	87						8,400
	Office Amenity							
2.4.1	Large Conference Room	3	75	25		600	24	1,800
2.4.2	Small Conference Room	3		0	12' x 20'	300		900
2.4.3	Collaboration Space w/Pantry	6		0		240		1,440
2.4.4	Copy/Fax/Mail	2		0	10' x 12'	100		200
2.4.5	Lockers (1.5 SF/Person)	1	264	264		396	2	396
2.4.6	Museum	1		0		1,500		1,500
	Total Office Amenity	16						6,236
	TOTAL CARDIOVASCULAR OFFICE NSF							14,636

3.1.4 Itemized Program Spaces - Research Commons

Room Type						Total Rooms	Total Occupants	Occupants/Room	Room Size	NSF / Room	NSF/Occupant	Total NSF
	Shared Instruments											
		Biomedical Genomics Center										2,400
4.1.1			Sample Drop-Off			1		0		100		100
4.1.2			Lab			1		0		1,800		1,800
4.1.3			Storage			1		0		100		100
4.1.4			Manager Office			1		0		100		100
4.1.5			Tech Office			1	5	5		300	60	300
		Cellular Imaging										3,275
4.2.1			Confocal Mic			3		0		225		675
4.2.2			Multi-Photon Mic			1		0		225		225
4.2.3			Microscopy			2		0		150		300
4.2.4			Laser			1		0		375		375
4.2.5			Flow Cytometry			1		0		1,200		1,200
4.2.6			Prep Lab			1		0		200		200
4.2.7			Manager Office			1		0		150		150
4.2.8			Tech Office			1	3	3		150	50	150
		Small Animal Imaging										1,800
4.3.1			Imaging Room			8		0		150		1,200
4.3.2			Prep Room			1		0		150		150
4.3.3			Tech Office			2		0		150		300
4.3.4			Office			1		0		150		150
		Undetermined Core				1		0		2,500		2,500
	Total Shared Instruments					**29**						**9,975**
	Vivarium											
		Animal Holding Rooms										9,248
5.1.1			Animal Holding Room			22		0	20' x 20'	400		8,800
5.1.3			Quarantine			4		0		112		448
		Procedure/Laboratory										3,500
			Procedure Room									2,200
5.2.1				Procedure Room		6		0		200		1,200
5.2.3				Necropsy		2		0	10' x 15'	150		300
5.2.4				X-Ray Irradiator		1		0	10' x 10'	100		100
5.2.5				Treatment/Pharmacy		1		0		100		100
5.2.6				Small Procedure Room		1		0		100		100
5.2.7				Surgical Suite		1		0		400		400
			Mouse Genetics Laboratory									1,300
5.3.1				Large Animal Holding Room		1		0	20' x 20'	400		400
5.3.2				Small Animal Holding Room		2		0	10' x 10'	100		200
5.3.3				Office		1		0		100		100
5.3.4				Injection/Cryo		1		0	10' x 12'	500		500
5.3.5				Locker/Shower		1		0		100		100
		Animal Support										8,650
5.4.1			Cage Wash			1		0	40' x 100'	4,000		4,000
5.4.2			Clean/Sterile Equipment Storage			1		0	40' x 30'	1,200		1,200
5.4.3			Decentralized Clean/Sterile Storage			4		0		200		800
5.4.4			Decon			1		0	10' x 20'	200		200
5.4.5			Shop			1		0		200		200
5.4.6 & 7			Laundry Shipping & Receiving			2		0		100		200
5.4.8			Animal Receiving			1		0		200		200
5.4.9			Bedding Storage			1		0	20' x 20'	400		400
5.4.10			Vacuum System Equipment Room			1		0	10' x 15'	150		150
5.4.11			Detergent Storage			1		0	5' x 20'	100		100
5.4.12			Pre-Decon Feed/Expend Storage			1		0	20' x 20'	400		400
5.4.13			Post-Decon Feed/Expend Storage			1		0	10' x 20'	200		200
5.4.14			Expendable Storage			2		0		200		400
5.4.15			Refuse/Biological Waste Storage			1		0		30		30
5.4.16			Ice Flaker Alcove			2		0	4' x 2'-6"	10		20
5.4.17			Water Treatment Room			1		0	10' x 15'	150		150

Room Type				Total Rooms	Total Occupants	Occupants/Room	Room Size	NSF / Room	NSF/Occupant	Total NSF
		Office/Amenity								2,820
5.5.1			DVM	1		0	10' x 12'	120		120
5.5.2			Facility Manager Office	1		0	10' x 12'	120		120
5.5.3			Non-Barrier Facility Supervisor Office	1	2	2	10' x 12'	120	60	120
5.5.4			Non-Barrier Vet Tech Office	1	3	3		120	40	120
5.5.5			Non-Barrier Lockers	2	40	20		400	20	800
5.5.6			Non-Barrier Break Room	1	20	20		300	15	300
5.5.7			Non-Barrier Research Gowning	1		0		200		200
5.5.8			Barrier Facility Supervisor Office	1	2	2	10' x 12'	120	60	120
5.5.9			Barrier Vet Tech Office	1	2	2	10' x 12'	120	60	120
5.5.10			Barrier Lockers	2	20	10		200	20	400
5.5.11			Barrier Break Room	1	10	10		200	20	200
5.5.12			Barrier Research Gowning	1		0		200		200
	Total Vivarium			80						24,218
	TOTAL RESEARCH COMMONS NSF									34,193

3.1.5 Itemized Program Spaces - Public Commons

Room Type				Total Rooms	Total Occupants	Occupants/Room	Room Size	NSF / Room	NSF/Occupant	Total NSF
	Building Amenity									
6.1.1		Seminar Room		1	125	125		2,250	18	2,250
6.1.2		Board Room		1	30	30		600	20	600
6.1.3		Lobby/Atrium/Seating		1		0		2,250		2,250
6.1.4		Food Service		1		0		1,000		1,000
6.1.5		Coffee Shop		1		0		400		400
	Total Building Amenity			5						6,500
	Building Support									
7.1.1		Loading Dock		1		0		750		750
7.1.2		Loading Dock Internal Staging		1		0		300		300
7.1.3		Dock Manager		1		0	10' x 12'	120		120
7.1.4		Lactation Room		1		0		100		100
		RMBS								
7.1.5			Reception	1		0		200		200
7.1.6			Building Manager	1		0		120		120
7.1.7			Mail Room	1		0		100		100
7.1.8		Shift Room		1		0		200		200
7.1.9		Custodial Equipment		1		0		400		400
7.1.10		General Storage		1		0		400		400
7.1.11		Flammable Chemical Waste Storage		1		0	10' x 15'	150		150
7.1.12		Yellow Bag Waste		1		0		25		25
7.1.13		Infectious Waste Storage Closets		1		0	5' x 5'	25		25
7.1.14		Liquid N2 Dispensing Room		1		0	10' x 10'	200		200
7.1.15		Bicycle Storage & Showers		1		0		400		400
	Total Building Support			15						3,490
	TOTAL PUBLIC COMMONS NSF									9,990

3.2 Visual Program

CANCER SPACE PROGRAM

BIOLOGY

BIOLOGY LAB MODULE- 24 @ 285 SF

BIOLOGY SUPPORT

FUME HOOD- 6 @ 100 SF

TISSUE CULTURE- 8 @ 200 SF

COLD LAB- 3 @ 100 SF

VARIABLE TEMP ROOM- 1 @ 100 SF

GLASS WASH- 1 @ 800 SF

PROCEDURE ROOM- 6 @ 200 SF

AUTOCLAVE ROOM- 2 @ 100 SF

DRY DARKROOM- 2 @ 50 SF

LINEAR EQUIPMENT ROOM- 1 @ 1,512 SF

ANALYTICAL BIOCHEMISTRY

MASS SPEC- 1 @ 1500 SF

OFFICE- 1 @ 120 SF

NMR- 1 @ 800 SF

CHEMISTRY

CHEMISTRY LAB MODULE- 42 @ 285 SF

CHEMISTRY FUME HOOD LAB MOD- 28 @ 270 SF

CHEMISTRY SUPPORT

TISSUE CULTURE- 4 @ 200 SF

INSTRUMENTATION- 4 @ 200 SF

ISOLATION LAB- 1 @ 400 SF

ISOLATION LAB- 2 @ 200 SF

COLD LAB- 2 @ 100 SF

LINEAR EQUIPMENT GALLEY- 4 @ 240 SF

PROCEDURE ROOM- 1 @ 100 SF

CHEMICAL STORAGE- 3 @ 100 SF

BIOLOGY OFFICES

BIO FACULTY OFFICE- 16 @ 120 SF

BIO SENIOR/ FLEX OFFICE- 8 @ 120 SF

BIO ADMIN SUPPORT- 5 @ 80 SF

BIO HOTELLING DESKS- 11 @ 60 SF

SHARED OFFICE

LARGE CONFERENCE ROOM- 3 @ 400 SF

SMALL CONFERENCE ROOM- 3 @ 240 SF

COLLABORATION SPACE- 6 @ 240 SF

COPY/ FAX/ MAIL- 2 @ 100 SF

LOCKERS- 288 @ 1.5 SF

CHEMISTRY OFFICES

CHEM FACULTY OFFICE- 14 @ 120 SF

CHEM SENIOR/FLEX OFFICE- 7 @ 120 SF

CHEM ADMIN SUPPORT- 4 @ 80 SF

CHEM HOTELLING DESKS- 18 @ 60 SF

CARDIOVASCULAR SPACE PROGRAM

BIOLOGY

BIOLOGY LAB MODULE- 66 @ 285 SF

BIOLOGY SUPPORT

PROCEDURE ROOMS- 15 @ 200 SF

PROCEDURE ROOMS- 16 @ 100 SF

FUME HOODS- 17 @ 100 SF

TISSUE CULTURE- 24 @ 200 SF

COLD LAB- 6 @ 100 SF

VARIABLE TEMP ROOM- 1 @ 100 SF

GLASS WASH- 3 @ 200 SF

CV PHYSIOLOGY- 1 @ 300 SF

HISTOLOGY- 1 @ 800 SF

DRY DARKROOM- 2 @ 50 SF

LINEAR EQUIPMENT ROOM- 1 @ 4,158 SF

BIOLOGY OFFICES

BIO FACULTY OFFICE- 33 @ 120 SF

BIO SENIOR/ FLEX OFFICE- 17 @ 120 SF

BIO ADMIN SUPPORT- 9 @ 80 SF

BIO HOTELLING DESKS- 28 @ 60 SF

SHARED OFFICE

LARGE CONFERENCE ROOM- 1 @ 500 SF

MEDIUM CONFERENCE ROOM- 2 @ 350 SF

SMALL CONFERENCE ROOM- 2 @ 250 SF

COLLABORATION SPACE- 4 @ 250 SF

COPY/ FAX/ MAIL- 2 @ 100 SF

LOCKERS- 288 @ 1.5 SF

RESEARCH COMMONS SPACE PROGRAM

VIVARIUM

AMINAL HOLDING ROOM- 22 @ 400 SF

QUARANTINE- 4 @ 112 SF

PROCEDURE ROOMS

PROCEDURE ROOMS- 6 @ 200 SF

NECROPSY- 2 @ 150 SF

X-RAY IRRADIATOR- 1 @ 100 SF

TREATMENT/ PHARMACY- 1 @ 100 SF

SMALL PROCEDURE ROOM- 1 @ 100 SF

SURGICAL SUITE- 1 @ 400 SF

MOUSE GENETICS LAB- 1 @ 1,400 SF

AMINAL HOLDING ROOM - 1 @ 400 SF

ANIMAL HOLDING ROOM- 2 @ 100 SF

OFFICE- 1 @ 100 SF

INJECTION/ CRYO- 1 @ 500 SF

LOCKER/ SHOWER- 1 @ 100 SF

RODENT IMAGING (SPACE ACCOUNTED FOR IN IMAGING)

CAGE WASH- 1 @ 4,000 SF

CLEAN/ STERILE EQUIPMENT- 1 @ 1,200 SF

CLEAN/ STERILE STORAGE- 4 @ 200 SF

DECON- 1 @ 200 SF

SHOP- 1 @ 200 SF

LAUNDRY (SHIPPING & RECEIVING)- 2 @ 100 SF

CLEAN ANIMAL DOCK (SEE BUILDING SUPPORT)

ANIMAL RECEIVING- 1 @ 200 SF

BEDDING STORAGE- 1 @ 400 SF

VACUUM SYSTEM EQUIPMENT- 1 @ 150 SF

PRE-DECON FEED/ EXPEND STOR- 1 @ 400 SF

POST-DECON FEED/ EXPEND STOR- 1 @ 200 SF

EXPENDABLE STORAGE- 2 @ 200 SF

REFUSE AND BIO WASTE STORAGE- 1 @ 30 SF

ICE FLAKER ALCOVE- 2 @ 10 SF

WATER TREATMENT ROOM- 1 @ 150 SF

RESEARCH COMMONS SPACE PROGRAM (CONT'D)

VIVARIUM OFFICE

DVM- 1 @ 120 SF

FACILITY MANAGER OFFICE- 1 @ 120 SF

NON-BARRIER FACILITY SPVR OFFICE- 1 @ 120 SF

NON-BARRIER VET TECH OFFICE- 1 @ 240 SF

NON-BARRIER LOCKERS- 2 @ 400 SF

NON-BARRIER BREAK ROOM- 1 @ 300 SF

NON-BARRIER GOWNING- 1 @ 200 SF

VIVARIUM BARRIER OFFICE

BARRIER FACILITY SPVR OFFICE- 1 @ 120 SF

BARRIER VET TECH OFFICE- 1 @ 120 SF

BARRIER LOCKERS- 2 @ 200 SF

BARRIER BREAK ROOM- 1 @ 200 SF

BARRIER GOWNING- 1 @ 200 SF

CORE LAB

UNDETERMINED CORE- 1 @ 2500 SF

BIOMEDICAL GENOMICS CENTER

SAMPLE DROP OFF- 1 @ 100 SF

LAB- 1 @ 1,800 SF

STORAGE- 1 @ 100 SF

MANAGER OFFICE- 1 @ 100 SF

TECH OFFICE- 1 @ 300 SF

CELLULAR IMAGING

CONFOCAL MIC- 3 @ 225 SF

MULTI-PHOTON MIC- 1 @ 225 SF

MICROSCOPY- 2 @ 150 SF

LASER- 1 @ 375 SF

FLOW CYTOMETRY- 1 @ 1,200 SF

PREP LAB- 1 @ 200 SF

MANAGER OFFICE- 1 @ 150 SF

TECH OFFICE- 1 @ 150 SF

SMALL ANIMAL IMAGING- 8 @ 150 SF

PREP ROOM- 1 @ 150 SF

TECH OFFICE- 2 @ 150 SF

OFFICE- 1 @ 150 SF

PUBLIC COMMONS SPACE PROGRAM

BUILDING SUPPORT

DOCK- 1 @ 750 SF

DOCK INTERNAL STAGING- 1 @ 300 SF

DOCK MANAGER OFFICE- 1 @ 120 SF

LACTATION ROOM- 1 @ 100 SF

RECEPTION- 1 @ 200 SF

BUILDING MANAGER OFFICE- 1 @ 120 SF

MAIL ROOM- 1 @ 100 SF

SHIFT ROOM- 1 @ 200 SF

CUSTODIAL EQUIPMENT- 1 @ 400 SF

GENERAL STORAGE- 1 @ 400 SF

FLAMABLE CHEM WASTE STORAGE- 1 @ 150 SF

YELLOW BAG WASTE- 1 @ 25 SF

INFECTIOUS WASTE- 1 @ 25 SF

LN2 DISPENSING ROOM- 1 @ 200 SF

BICYCLE STORAGE AND SHOWERS- 1 @ 400 SF

SHIPPING/ RECEIVING SECURE STOR

SECURITY/ FIRE OFFICE

SINGLE OCCUPANCY RESTROOM

JANITORIAL ROOM

CUSTODIAL SUPERVISOR OFFICE

IT OFFICE

IT ELEC REPAIR SHOP

IT SERVER ROOM

RESEARCH EQUIPMT STOR ROOM

FLAMMABLE CHEM STORAGE

HAZMAT RECEIPT AND DELIVERY

SWIPE TEST ROOM

RADIOACTIVE WASTE STOR

EMERGENCY RESPONSE CLOSET

BLDG WASTE CART HOLD

RECYCLING BINS

CARDBOARD BALER

CYLINDER STOR ROOM

BULK CO2 DISPENSING ROOM

CUSTODIAL STAFF LOCKERS

CUSTODIAL STAFF LOUNGE

BUILDING MAINTAINANCE SHOP

BUILDING MAINTAINANCE OFFICE

ATTIC STOCK

COLLABORATIVE SPACE

SEMINAR ROOM- 1 @ 2,250 SF

MEETING ROOM

BOARD ROOM- 1 @ 600 SF

LOBBY/ ATRIUM/ SEATING- 1 @ 2,250 SF

FOOD SERVICE- 1 @ 1,000 SF

COFFEE SHOP- 1 @ 400 SF

TABLE/ CHAIR STOR

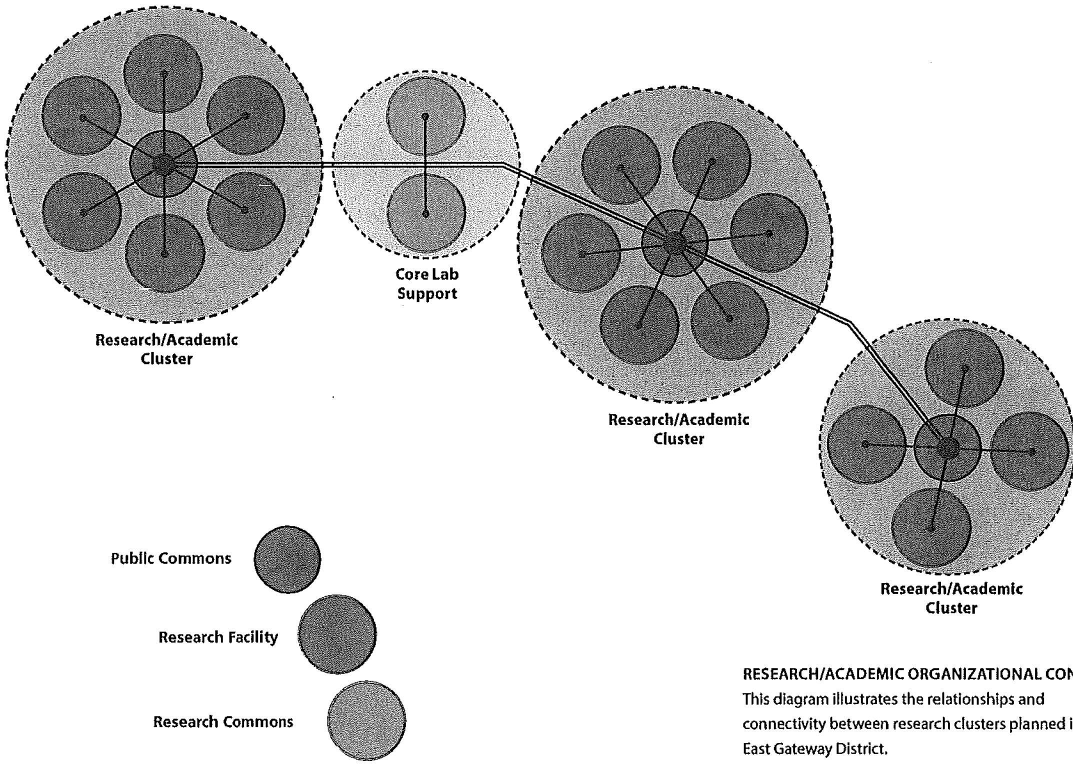
CATERING PREP ROOM

AV/ CONTROL/ STOR ROOM

VENDING AREA

3.3 Program Diagramming

3.3.1 Research Cluster Organizational Concept



RESEARCH/ACADEMIC ORGANIZATIONAL CONCEPT
This diagram illustrates the relationships and connectivity between research clusters planned in the East Gateway District.

Research/Academic Zone
Within the East Gateway District, a program-based organizational concept was developed to encourage interaction, provide support, and subdivide the District into three smaller research clusters. All research facilities are organized around a central space, called the Public Commons. The public commons acts as the nucleus for each cluster, providing elements of public and shared space amid substantial private or semi-private office and laboratory spaces. The planning suggests that three clusters could exist in the District along with a smaller core lab support cluster.

Research/Academic Cluster
Phase II of the Biomedical Discovery District is located in the east research cluster with the MBB. Specific challenges of this cluster will include creating strong connection to the planned intermodal transit station in the District, establishing a cohesive image of the East Gateway District, and creating a successful connection to the existing facilities in the District as well as the rest of the campus.

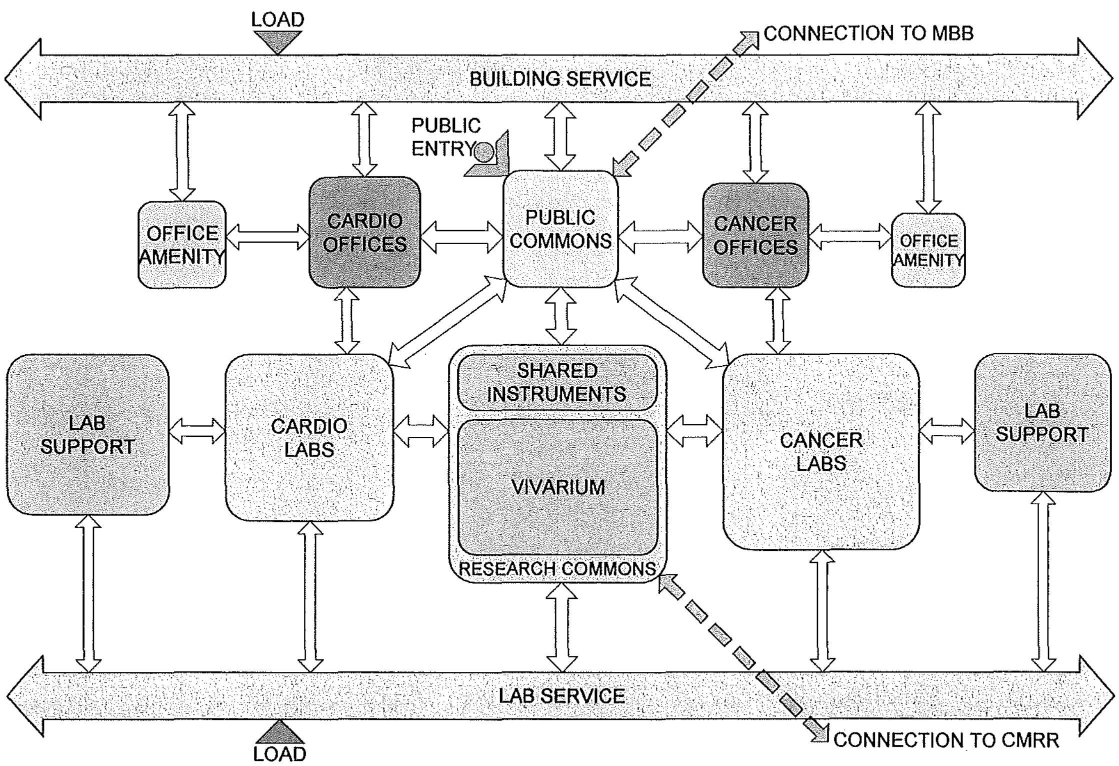
Research Commons
In order to share expensive lab resources and provide non-proprietary space for University staff and researchers, a research commons is planned at the center of the district. This Research Commons will house Animal Care, Shared Instrumentation, and Imaging. Functionally, the research commons can serve two roles. First, they house shared research instrumentation and would typically be spread to each research building in the District. By centrally locating expensive equipment, facilities become more efficient to operate.

Public Commons
Internally and externally, the research commons should be designed to represent the larger identity of the cluster. Architecturally, these are public beacons to the wider research community in a series of buildings that could otherwise appear closed and impenetrable.

Building on the idea of bringing researchers together to a central location, the commons can serve a second function, that of a social hub and gathering space. University staff and students as well as researchers can access cafes and other amenities such as conferencing/seminar spaces.

3.3.2 Adjacency Diagram

The following adjacency diagram is intended to demonstrate simple relationships and be suggestive of office to lab to commons ratio. The diagram is not indicative of plans and should be used only to understand programmatic relationships.



In terms of programmatic relationships, much like in the research cluster organizational concept diagram, both the Public and Research Commons are hubs which have important relationships to other primary program elements. The Public and Research Commons also have connections to other facilities in the district.

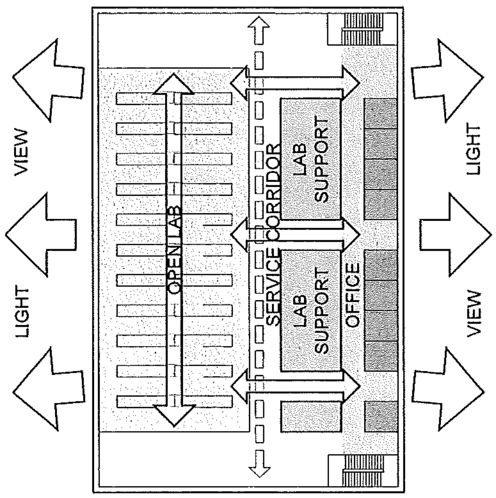
Service can be divided into two categories, building and lab. Access to service and service access to program spaces are crucial relationships, which significantly impact the function of the building.

The office-lab and lab-support relationships are important in terms of user satisfaction and building efficiency.

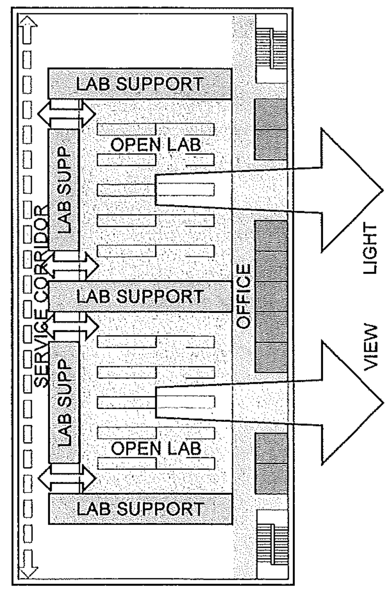
3.3.3 Use Relationship Diagram

The following diagrams represent the office-lab relationships explored during the Predesign phase. After meetings with User Groups and the Executive Committee the Separated office-lab relationship was selected.

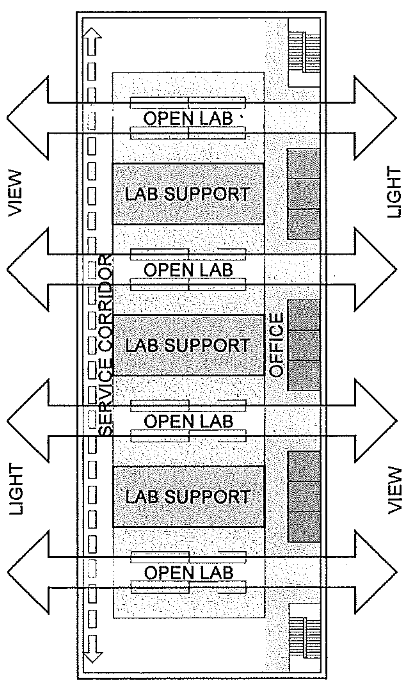
LAMINATED



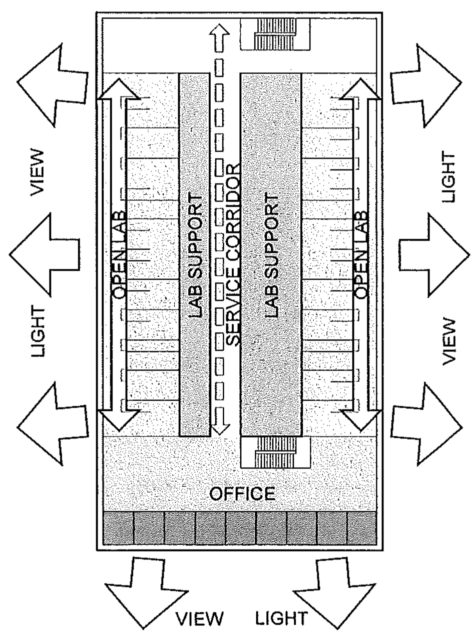
REVERSE LAMINATED



TRANSPARENT



SEPARATED



The Separated scheme was selected for ease of wayfinding, interaction connections between office areas, function of service, separation of lab and building service, access to lab support without disturbing labs, and flexibility in terms of research groups and future changes to the building and its occupants.

3.4 Program Benchmarking

3.4.1 Building Efficiency Comparison

The following table contains building efficiency data for projects with similar programmatic requirements and/or GSF.

Building	Net Assignable SF (ASF)	Building Gross SF (GSF)	Net to Gross Ratio	Multiplier
University of Minnesota Medical Biosciences Building	60,900	118,860	52%	1.95
University of Minnesota Masonic Cancer Research Building	96,000	178,400	54%	1.86
University of Minnesota Nils Hasselmo Hall	147,000	271,000	54%	1.84
University of Minnesota Molecular and Cellular Biology Building	151,000	263,000	57%	1.74
Fred Hutchinson Cancer Research Center	138,729	265,360	52%	1.91

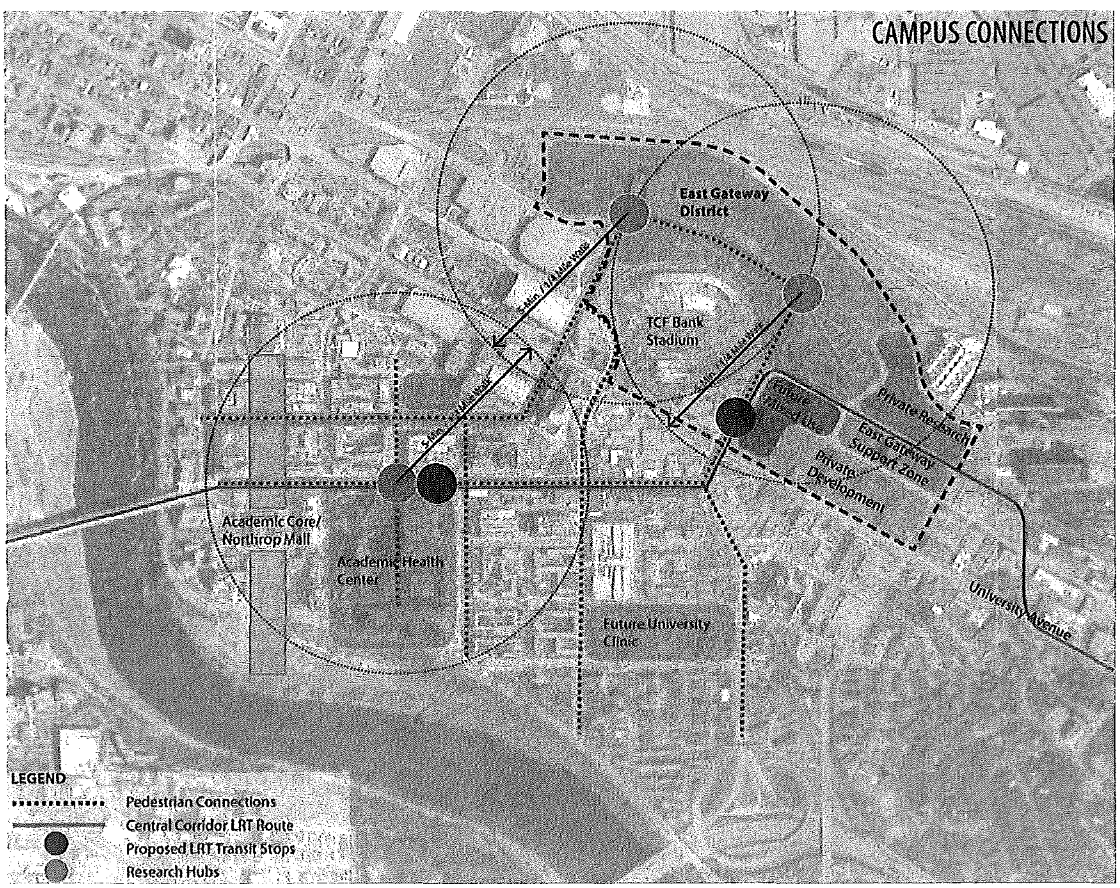
Net Assignable SF (ASF) = assignable square feet (programmable space)
Building Gross SF (GSF) = gross square feet (total enclosed area of the building)
Net to Gross Ratio = ASF/GSF (building efficiency)
Multiplier = GSF/ASF

4.0 SITE ANALYSIS

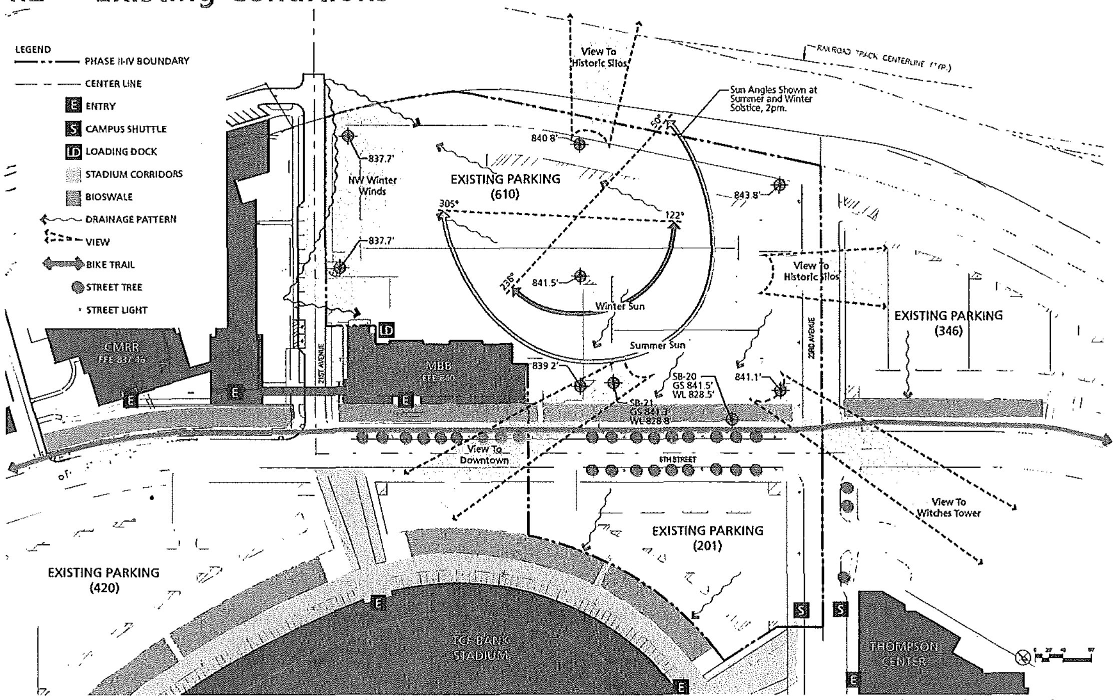
4.1 Overview

The East Gateway District of the Twin Cities campus is an area in significant transition. Historically an industrial rail yard serving the vast grain storage and transport needs of the upper Midwest, and more recently utilized by the University of Minnesota as a remote surface parking reservoir, the district has been transformed within the last decade into a research hub with the building of three new research facilities: the Lions Research Building/McGuire Translational Research Facility (Lions/McGuire Research Facility), the Center for Magnetic Resonance Research (CMRR), and the Medical Bioscience Building (MBB).

Phase II of the Biomedical Discovery District will further the University's objective to create a university setting that reinforces the scale, materials, and open space character of the existing Twin Cities campus. Connecting to the existing research facilities in the district and providing easy access to the existing University of Minnesota campus and Academic Health Center, via light rail, parking, and pedestrian routes, are of primary importance. Located north of the new TCF bank stadium completed in the fall of 2009, the site for Phase II of the Biomedical Discovery District will be visible from the future LTR stop located on 23rd Avenue. This view corridor down 23rd Avenue creates significant opportunities for entry and identity at the corner of 6th Street and 23rd Avenue both for the project and the district as a whole. Additionally, reinforcing the established building edge along 6th Street provides the opportunity to tie into the existing pedestrian connections to the other research facilities in the district. By concentrating the project to this area of development, open site area will be consolidated to allow for a future lab building that integrates both functionally and architecturally into the established research fabric.

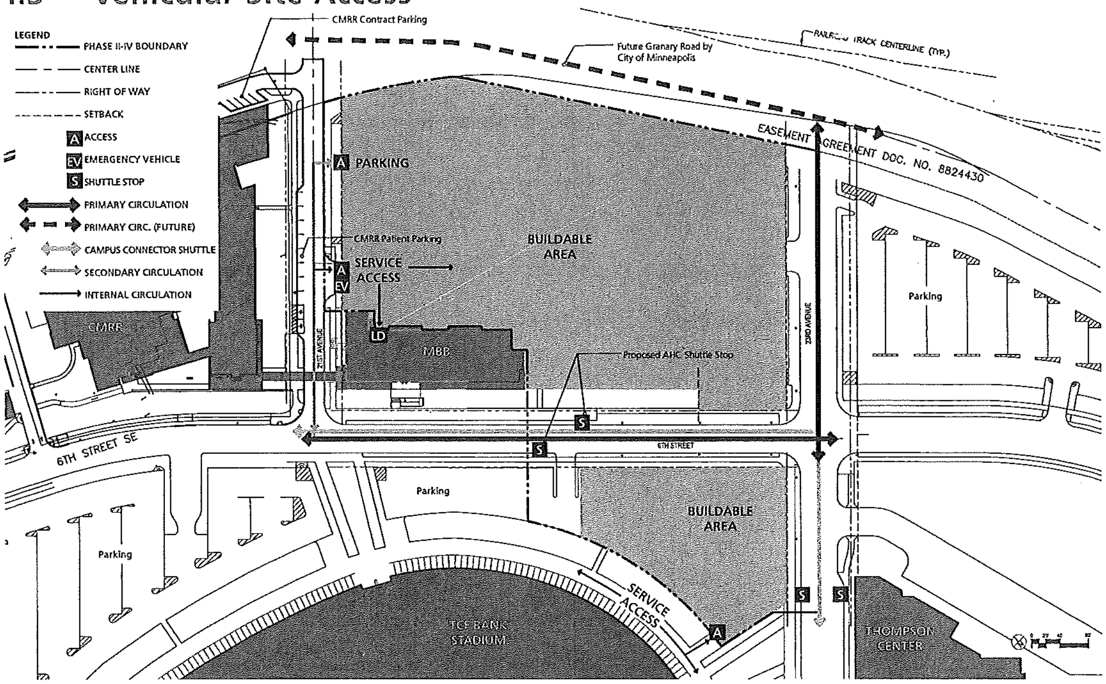


4.2 Existing Conditions



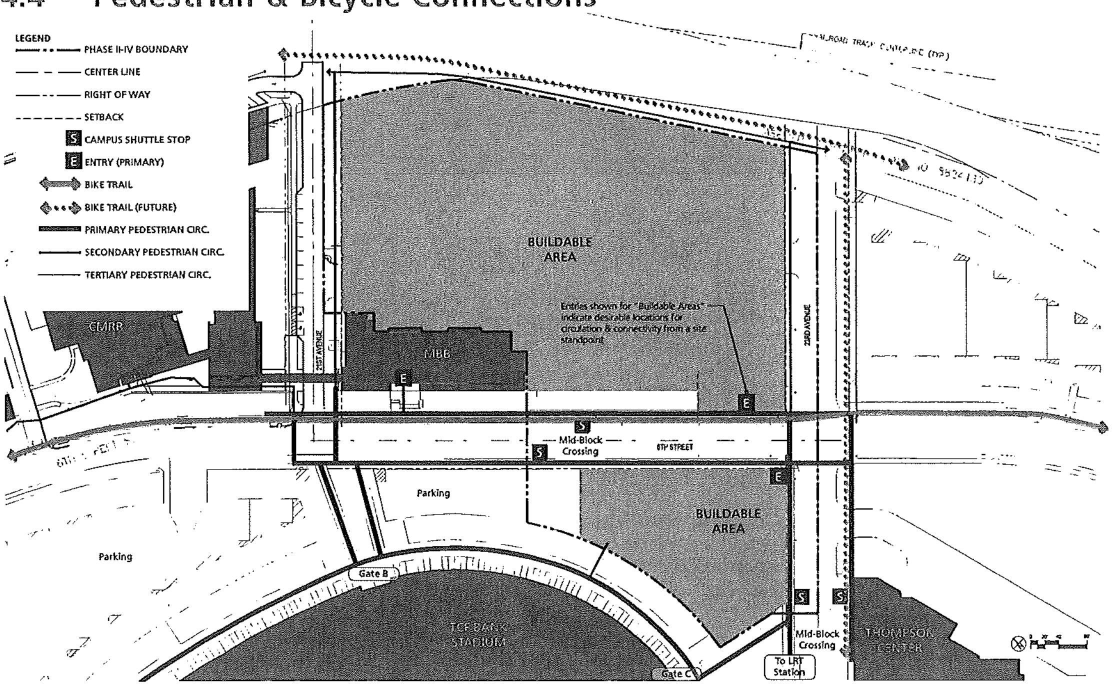
The existing site for the Biomedical Discovery District Phase II Project is currently surface parking. Connections to CMRR, to the west of the site, and MBB, bordering the southwest corner of the site, are important design drivers. The service dock for MBB is located on the north side of the building and accessed from 21st Avenue. Though no development exists directly north of the site, the planned Granary Road will form a northern border to the site and is expected to have high vehicular traffic. Given this future possiblity, this undeveloped edge should not be treated as a back door.

4.3 Vehicular Site Access



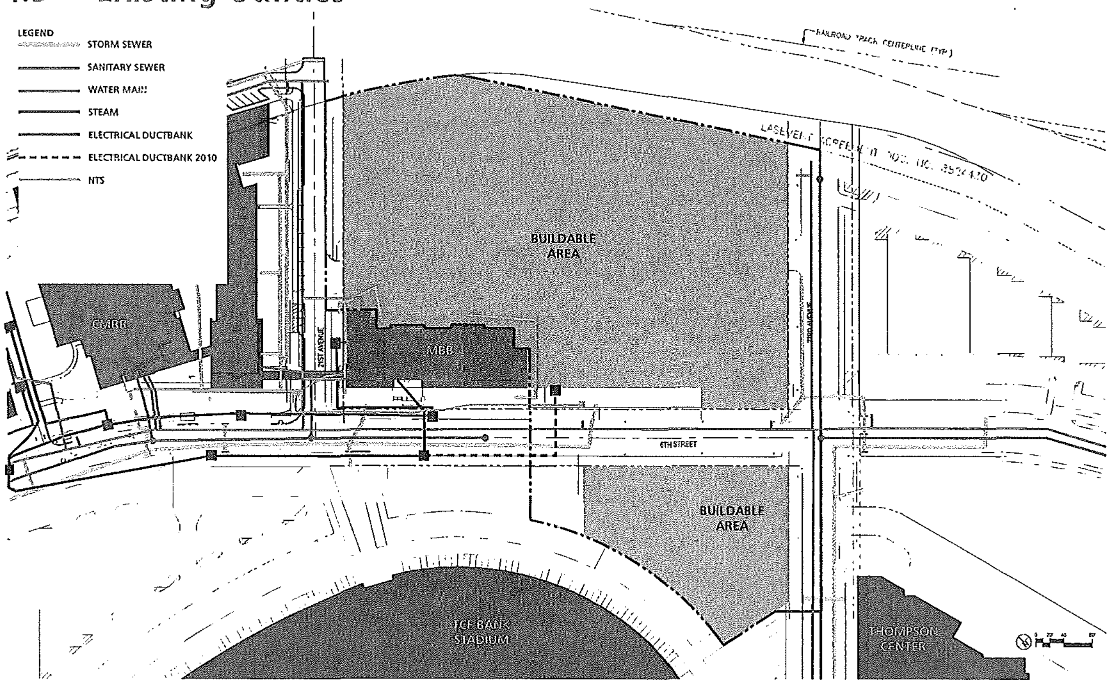
After the future Granary Road is built, vehicular circulation will occur on all sides of the site. Parking access and consolidated receiving with MBB will occur off of 21st Avenue.

4.4 Pedestrian & Bicycle Connections



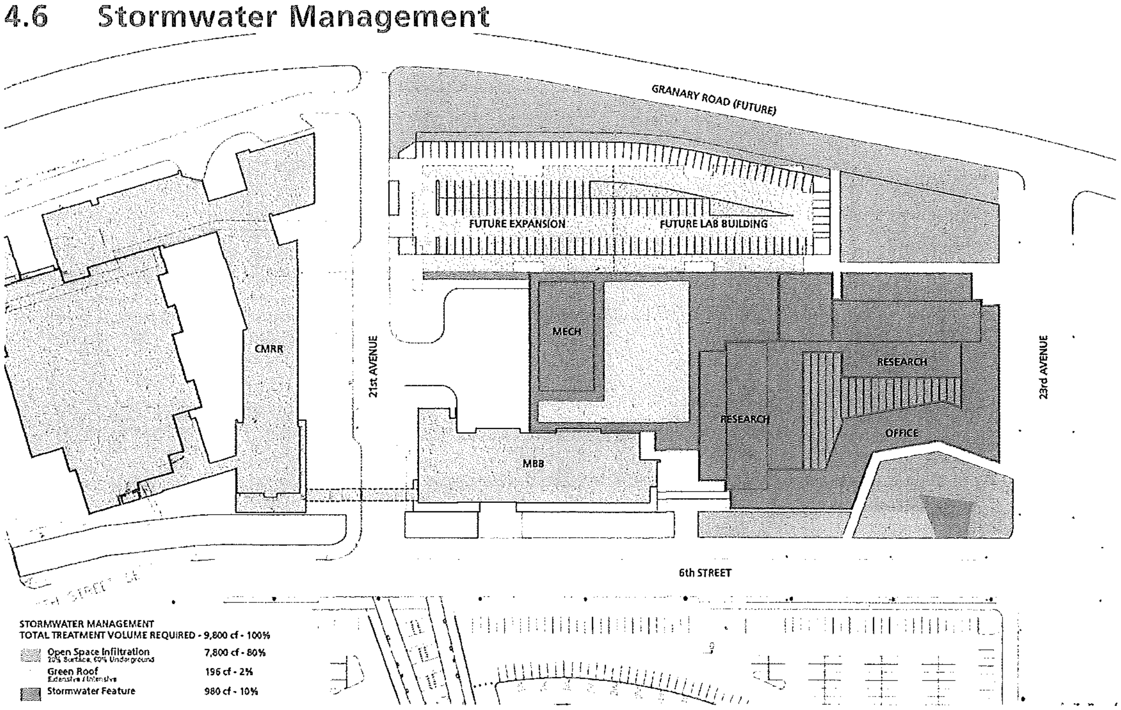
Primary pedestrian and bicycle circulation around the site occurs on 6th Street. The Stadium Village LTR Station is located two blocks south of the site. Heavy pedestrian traffic to/from the station is expected on 23rd Avenue. The main entry for the BDD Phase II project will be located at the northwest corner of 6th Street and 23rd Avenue to address pedestrian flow. Shuttle service will run along 6th Street and have a mid-block stop between 21st and 23rd Avenues.

4.5 Existing Utilities



Existing utilities run to the west and south of the site. The absence of utilities running through the site allows for a large number of building configurations.

4.6 Stormwater Management



Stormwater treatment on the site will occur through a variety of above and below grade infiltration solutions. The strategy includes the use of innovative infiltration techniques like permeable pavement, bioswales and passive infiltration systems.

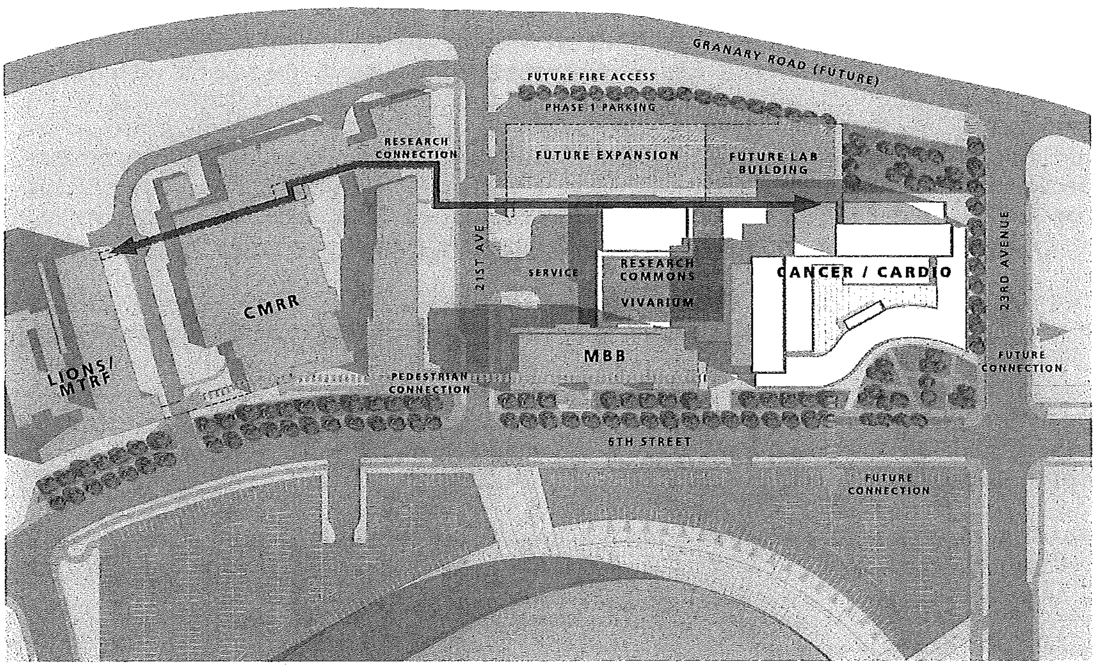
5.0 BUILDING CONCEPTS

5.1 Guiding Planning Principles

The following planning principles were developed by the University and approved by the Executive Committee:

- An image of architectural distinction, integrity, and brand with a real sense of community and place.
- An interconnected, collaborative, research environment that leverages common shared support space and resources.
- Optimized use of scarce land resources, maximizing flexibility for future development.
- Flexible, open, lab space to support the evolving needs of interdisciplinary, translational research.
- A cohesive, memorable system of public open spaces.

5.2 Site Plan



5.3 Predesign Concept Narrative

The Phase II Biomedical Discovery District Project incorporates space for Cancer and Cardiology programs, research commons functions shared by building users and researchers within the larger Discovery District, and public commons functions such as seminar rooms and a café that are also available to the greater Discovery District. This mixture of activities and research functions is organized into a site approach that emphasizes connections, both within the building and to the larger district, in order to maximize research synergies, avoid duplication of equipment, and optimize accessibility. The pre-design concept and site approach preserves the opportunity for a dynamic and visible image for the project that will be further developed in the coming architectural design phases.

The site concept also reflects the importance of accessibility and visibility of the Cancer, Cardiovascular, and shared common functions with other Discovery District users. An internal corridor connects researchers to the MBB building and thus to other researchers in the existing buildings within the Discovery District. Accessibility of building program elements and building users to the proposed light rail station, district parking, campus pedestrian routes, and meeting spaces in the TCF Bank Stadium are important external linkages to the campus context that will enhance the function of the Phase II Project. The University's objective to "build a campus" and create a new Biomedical District that reinforces the scale, materials, and open space character of the existing Twin Cities campus is addressed in this site concept.

The Pre-design Concept suggests that Cancer and Cardiovascular research laboratory programs are housed in two laboratory blocks that flank the entrance lobby at the corner of 6th Street and 23rd Avenue. Above this lobby, faculty and researcher workspace for both Cancer and Cardiology are located in close proximity to these two research blocks and integrated to enhance interaction and flexibility, thus creating a dynamic discovery environment for researchers. Shared public functions such as café and meeting rooms are envisioned at the ground floor, enhancing the vitality of the district and facilitating easy access for other researchers in the district.

This site plan and entrance configuration optimizes the accessibility to the building for researchers utilizing the new light rail stop planned at the corner of 23rd and University, facilitating strong connections to the campus and the existing Academic Health Center.

This general building configuration responds directly to researcher desires to maintain strong and direct connections between the laboratory wings on the upper floors and the research and instrumentation common spaces located at the ground floor. Shared service elevators and common utilities connect directly to the service/loading dock and to on-grade shared research commons that are located west of the Cancer/Cardio laboratory blocks to facilitate important functional connections to the CMRR Facility to the west and to existing MBB research common spaces to the south. The high water table that is present on the site precludes significant basement space on the site, so this shared research commons is located on a single story at-grade.

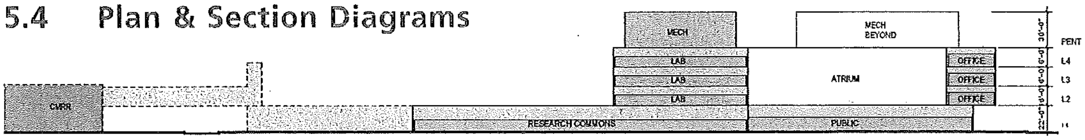
The northwestern portion of this two-block site is reserved for future development, and the site concept maintains a flexible approach to this area. The future lab building program can be constructed on this site and directly connected to the Phase II building, facilitating faculty and researcher interaction, sharing of public common resources, and sharing of building services. In addition, this flexible site can address future needs within the district for additional shared research common functions, future imaging and magnet needs, or other additional parking or building program elements.

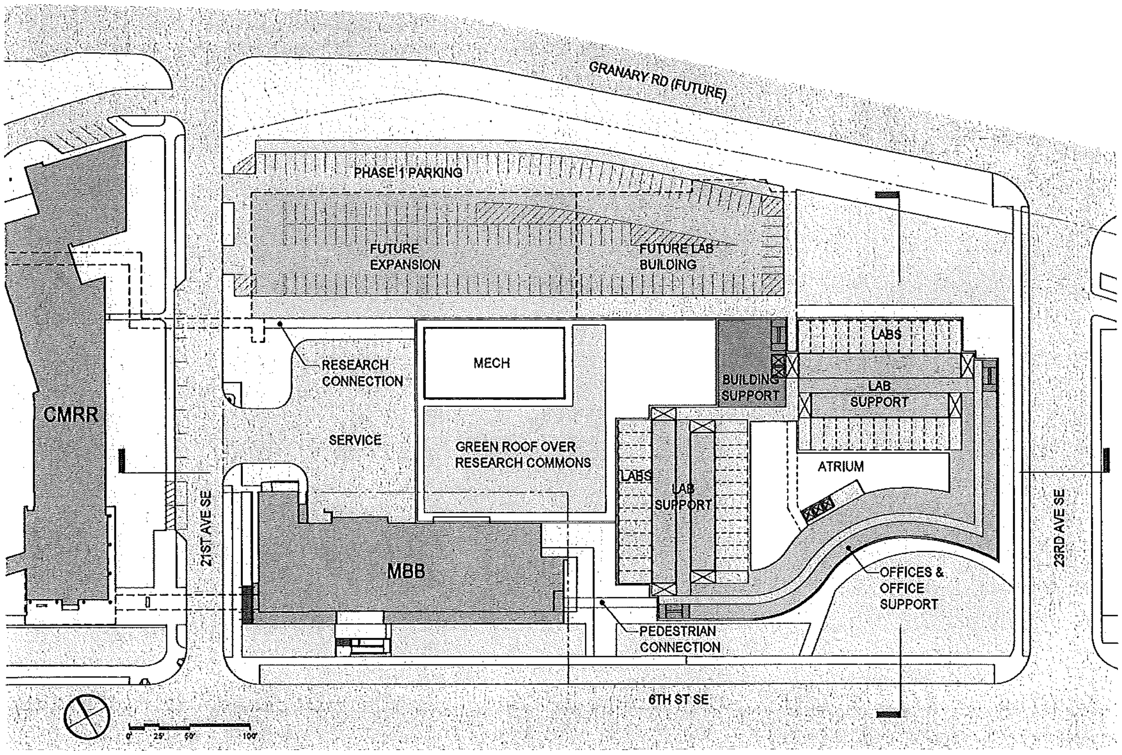
These future site program elements offer significant flexibility to address evolving needs within the District. For the Phase II project, this area will be utilized as surface parking for building or district users with an on-grade entrance to the Cancer/Cardio building.

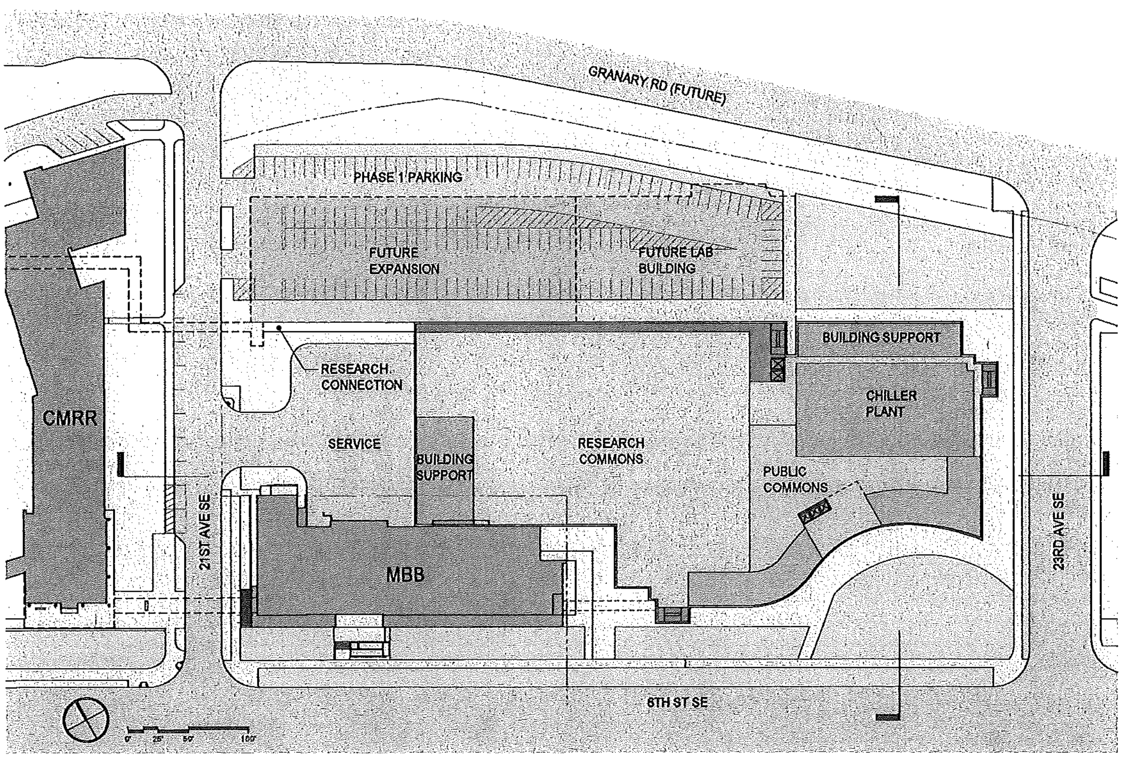
The Site Concept for the Phase II Biomedical Discovery District Project addresses all of the important functional and operational connections identified during the programming process: the pedestrian connections between researchers throughout the Discovery District, the functional and service connections between buildings in the District, the internal connections that enhance research and discovery, and the external connections to the Campus at-large. The Site Concept provides the opportunity for an exciting and visible image that will enhance the Discovery District and the broad objectives of the Project.

The site concept reflects input from building user groups and Academic Health Center representatives, culled from a series of interactive programming workshops. These workshops highlighted the long-term importance of connections between laboratory research spaces, common research spaces included in this program, and MRI and Imaging functions housed in the CMRR facility and its addition currently under construction. These workshops also generated an organizational model for research that was informed by benchmarking of top-tier research institutions and evaluating the strengths and weaknesses of existing biomedical buildings on the Twin Cities campus.

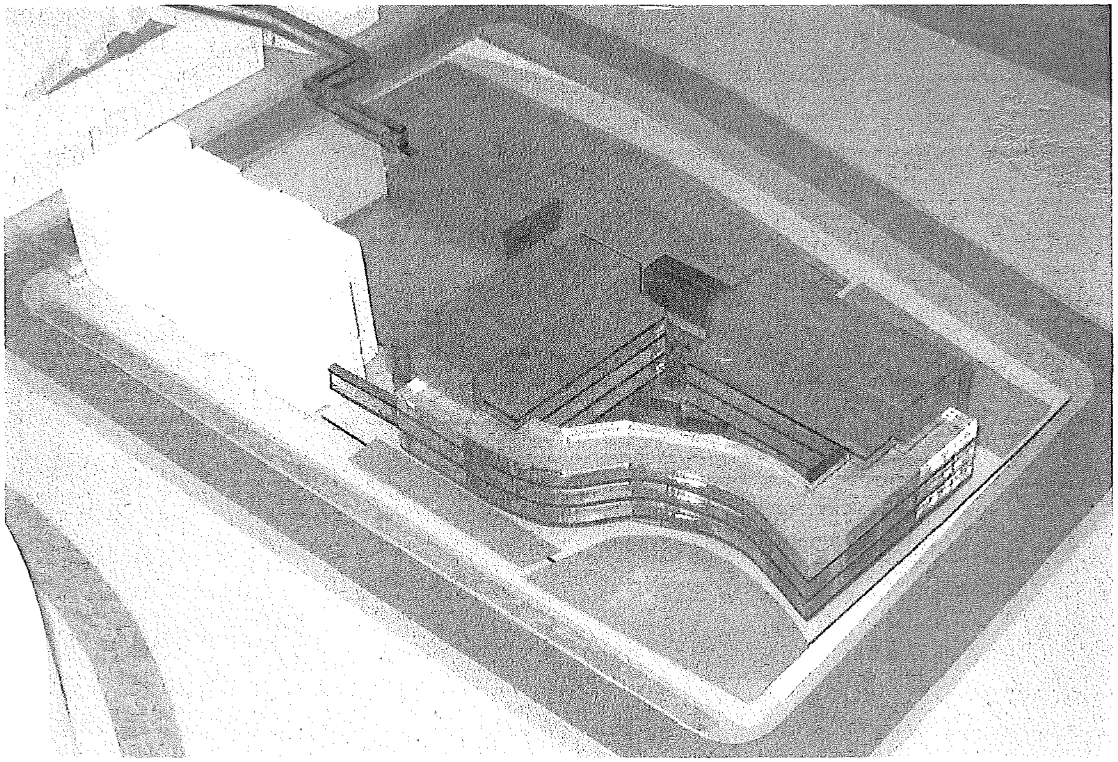
5.4 Plan & Section Diagrams

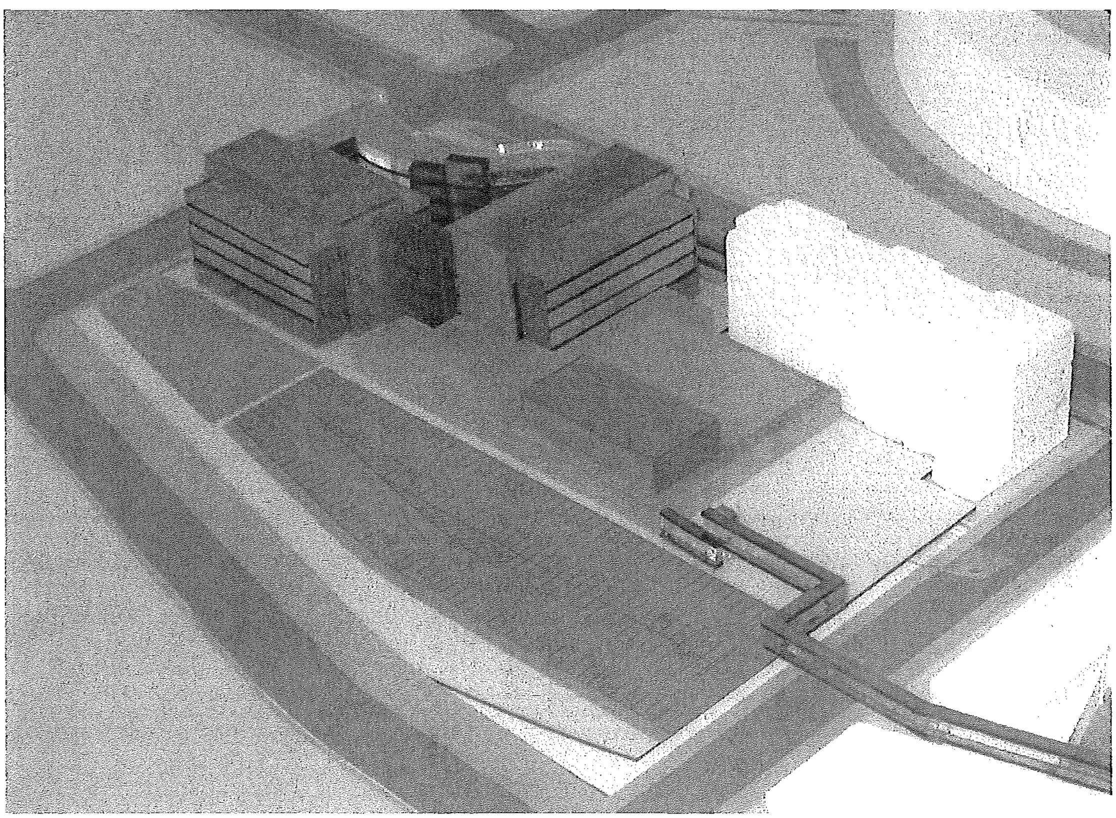






5.5 Model Images





6.0 COST ANALYSIS

Executive Summary

Building	*Building Area GSF*	*Cost per GSF*	*Total Cost*
Cancer Building	**96,506**	**$ 494.76**	**$ 47,747,412**
Cardio Building	**95,006**	**$ 412.41**	**$ 39,181,712**
Public Commons	**19,400**	**$ 384.95**	**$ 7,468,126**
Research Commons	**62,700**	**$ 446.18**	**$ 27,975,306**
Subtotal	**273,612**	**$ 447.25**	**$ 122,372,556**
Skyway to CMRR	**2,800**	**$ 689.06**	**$ 1,929,361**
Skyway to MBB	**800**	**$ 695.71**	**$ 556,568**
Sitework		**$ 31.04**	**$ 8,492,029**
Subtotal	**277,212**	**$ 481.04**	**$ 133,350,513**
Future Lab Building Allowance	**75,000**	**$ 513.33**	**$ 38,500,000**
Total Construction Cost	**352,212**	**$ 487.92**	**$ 171,850,513**

6.1 Cost Model

Cancer Building

UniFormat System Level 2	System Area	Cost per System	Cost per GSF	Total Cost
Foundations	8,070	$ 40.00	$ 3.34	$ 322,800
Basement Construction				
Superstructure	96,506	$ 44.00	$ 44.00	$ 4,246,264
Exterior Enclosure	59,420	$ 80.00	$ 49.26	$ 4,753,632
Roofing	27,000	$ 18.00	$ 5.04	$ 486,000
Interior Construction	95,256	$ 41.06	$ 40.53	$ 3,911,211
Stairs	488	$ 1,250	$ 6.32	$ 610,000
Interior Finishes	96,506	$ 20.00	$ 20.00	$ 1,930,120
Conveying	10	$ 45,000	$ 4.66	$ 450,000
Plumbing	96,506	$ 21.00	$ 21.00	$ 2,026,626
HVAC	96,506	$ 143.29	$ 143.29	$ 13,828,579
Fire Protection	96,506	$ 3.50	$ 3.50	$ 337,771
Electrical	96,506	$ 43.55	$ 43.55	$ 4,202,836
Equipment	95,256	$ 22.45	$ 22.16	$ 2,138,620
Furnishings	95,256	$ 18.00	$ 17.77	$ 1,714,608
Special Construction	95,256	$ 1.00	$ 0.99	$ 95,256
Selective Building Demolition				
Site Preparation				
Site Improvements				
Site Civil / Mechanical Utilities				
Site Electrical Utilities				
General Requirements	96,506	$ 39.14	$ 39.14	$ 3,777,724
Subtotal Construction Cost				$ 44,832,047
Sac & Wac Charge Allowance				By Owner
Building Permit			0.75%	$ 336,240
Subtotal				$ 45,168,287
Design Contingency (Incl in $/System)			0.00%	$ -
Estimating / Const. Cont. (Incl in $/System)			0.00%	$ -
Subtotal				$ 45,168,287
Bond and Insurances			1.56%	$ 704,625
Subtotal				$ 45,872,912
Fee			1.65%	$ 756,903
Total Construction Cost				$ 46,629,815
Preconstruction				$ 185,000
Start Date / Escalation	Fall 2010		2%	$ 932,596
Total Cost				$ 47,747,412
Gross Building Square Footage			$ 494.76	$ / GSF
Gross Building Square Footage		96,506		
Total Site Area				
Building Footprint Area				
Net Site Area				

Cardio Building

UniFormat System Level 2	System Area	Cost per System	Cost per GSF	Total Cost
Foundations	8,070	$ 40.00	$ 3.40	$ 322,800
Basement Construction				
Superstructure	95,006	$ 44.00	$ 44.00	$ 4,180,264
Exterior Enclosure	58,760	$ 80.00	$ 49.48	$ 4,700,832
Roofing	27,000	$ 18.00	$ 5.12	$ 486,000
Interior Construction	93,756	$ 40.00	$ 39.47	$ 3,750,240
Stairs	488	$ 1,250	$ 6.42	$ 610,000
Interior Finishes	95,006	$ 20.00	$ 20.00	$ 1,900,120
Conveying	7	$ 45,000	$ 3.32	$ 315,000
Plumbing	95,006	$ 21.00	$ 21.00	$ 1,995,126
HVAC	95,006	$ 84.05	$ 84.05	$ 7,985,254
Fire Protection	95,006	$ 3.50	$ 3.50	$ 332,521
Electrical	95,006	$ 43.55	$ 43.55	$ 4,137,511
Equipment	93,756	$ 13.72	$ 13.54	$ 1,286,332
Furnishings	93,756	$ 18.00	$ 17.76	$ 1,687,608
Special Construction	93,756	$ 1.00	$ 0.99	$ 93,756
Selective Building Demolition				
Site Preparation				
Site Improvements				
Site Civil / Mechanical Utilities				
Site Electrical Utilities				
General Requirements	95,006	$ 32.16	$ 32.16	$ 3,055,767
Subtotal Construction Cost				$ 36,839,132
Sac & Wac Charge Allowance				By Owner
Building Permit				$ 276,293
Subtotal				$ 37,115,425
Design Contingency (Incl in $/System)				$ -
Estimating / Const. Cont. (Incl in $/System)				$ -
Subtotal				$ 37,115,425
Bond and Insurances				$ 579,001
Subtotal				$ 37,694,426
Fee				$ 621,958
Total Construction Cost				$ 38,316,384
Preconstruction				$ 99,000
Start Date / Escalation		Fall 2010	2%	$ 766,328
Total Cost				$ 39,181,712
Gross Building Square Footage			$ 412.41	$ / GSF
Gross Building Square Footage		95,006		

Public Commons

UniFormat System Level 2	System Area	Cost per System	Cost per GSF	Total Cost
Foundations	23,100	$ 40.00	$ 47.63	$ 924,000
Basement Construction				
Superstructure	19,400	$ 44.00	$ 44.00	$ 853,600
Exterior Enclosure	20,713	$ 80.00	$ 85.41	$ 1,657,008
Roofing	8,000	$ 18.00	$ 7.42	$ 144,000
Interior Construction	19,400	$ 35.00	$ 35.00	$ 679,000
Stairs	44	$ 950	$ 2.15	$ 41,800
Interior Finishes	19,400	$ 20.00	$ 20.00	$ 388,000
Conveying	3	$ 45,000	$ 6.96	$ 135,000
Plumbing	19,400	$ 15.00	$ 15.00	$ 291,000
HVAC	19,400	$ 36.00	$ 36.00	$ 698,400
Fire Protection	19,400	$ 3.25	$ 3.25	$ 63,050
Electrical	19,400	$ 20.00	$ 20.00	$ 388,000
Equipment	19,400	$ 9.00	$ 9.00	$ 174,600
Furnishings	19,400	$ 2.00	$ 2.00	$ 38,800
Special Construction				
Selective Building Demolition				
Site Preparation				
Site Improvements				
Site Civil / Mechanical Utilities				
Site Electrical Utilities				
General Requirements	19,400	$ 29.03	$ 29.03	$ 563,153
Subtotal Construction Cost				$ 7,039,411
Sac & Wac Charge Allowance				By Owner
Building Permit				$ 52,796
Subtotal				$ 7,092,206
Design Contingency (Incl in $/System)				$ -
Estimating / Const. Cont. (Incl in $/System)				$ -
Subtotal				$ 7,092,206
Bond and Insurances				$ 110,638
Subtotal				$ 7,202,845
Fee				$ 118,847
Total Construction Cost				$ 7,321,692
Preconstruction				Incl
Start Date / Escalation		Fall 2010	2%	$ 146,434
Total Cost				$ 7,468,126
Gross Building Square Footage			$ 384.95	$ / GSF
Gross Building Square Footage		19,400		

Research

UniFormat System Level 2	System Area	Cost per System	
Foundations	55,700	$ 40.00	$
Basement Construction			
Superstructure	62,700	$ 44.00	$
Exterior Enclosure	28,840	$ 80.00	$
Roofing	34,000	$ 18.00	$
Interior Construction	62,700	$ 40.00	$
Stairs	44	$ 950	$
Interior Finishes	62,700	$ 20.00	$
Conveying	2	$ 45,000	$
Plumbing	62,700	$ 33.00	$
HVAC	62,700	$ 67.50	$
Fire Protection	62,700	$ 3.25	$
Electrical	62,700	$ 32.00	$
Equipment	62,700	$ 44.00	$
Furnishings	62,700	$ 10.00	$
Special Construction	62,700	$ 1.00	$
Selective Building Demolition	1	$ 500,000	$
Site Preparation			
Site Improvements			
Site Civil / Mechanical Utilities			
Site Electrical Utilities			
General Requirements	62,700	$ 33.65	$
Start Date / Escalation		Fall 2010	
Gross Building Square Footage			$

Commons			Skyway to CMRR				Skyway to MBB				Sitework				
Cost per GSF	*Total Cost*	*Total Cost*	*System Area*	*Cost per System*	*Cost per GSF*	*Total Cost*	*System Area*	*Cost per System*	*Cost per GSF*	*Total Cost*	*System Area*	*Cost per System*	*Cost per GSF*	*Total Cost*	*Total Cost*
35.53	$ 2,228,000	$ 3,797,600	2,800	$ 30.00	$ 30.00	$ 84,000	$ 800	$ 30.00	$ 30.00	$ 24,000					$ 3,905,600
44.00	$ 2,758,800	$ 12,038,928	5,600	$ 35.00	$ 70.00	$ 196,000	$ 1,600	$ 35.00	$ 70.00	$ 56,000					$ 12,290,928
36.80	$ 2,307,184	$ 13,418,656	10,315	$ 80.00	$ 294.72	$ 825,216	$ 3,646	$ 80.00	$ 364.56	$ 291,648					$ 14,535,520
9.76	$ 612,000	$ 1,728,000	3,600	$ 18.00	$ 23.14	$ 64,800	$ 800	$ 18.00	$ 18.00	$ 14,400					$ 1,807,200
40.00	$ 2,508,000	$ 10,848,451	2,800	$ 20.00	$ 20.00	$ 56,000	$ 800	$ 20.00	$ 20.00	$ 16,000					$ 10,920,451
0.67	$ 41,800	$ 1,303,600													$ 1,303,600
20.00	$ 1,254,000	$ 5,472,240	2,800	$ 15.00	$ 15.00	$ 42,000	$ 800	$ 15.00	$ 15.00	$ 12,000					$ 5,526,240
1.44	$ 90,000	$ 990,000	4	$ 35,000	$ 50.00	$ 140,000									$ 1,130,000
33.00	$ 2,069,100	$ 6,381,852	2,800	$ 2.50	$ 2.50	$ 7,000	$ 800	$ 2.50	$ 2.50	$ 2,000					$ 6,390,852
67.50	$ 4,232,250	$ 26,744,483	2,800	$ 8.50	$ 8.50	$ 23,800	$ 800	$ 8.50	$ 8.50	$ 6,800					$ 26,775,083
3.25	$ 203,775	$ 937,117	2,800	$ 3.25	$ 3.25	$ 9,100	$ 800	$ 3.25	$ 3.25	$ 2,600					$ 948,817
32.00	$ 2,006,400	$ 10,734,748	2,800	$ 9.00	$ 9.00	$ 25,200	$ 800	$ 9.00	$ 9.00	$ 7,200					$ 10,767,148
44.00	$ 2,758,800	$ 6,358,352													$ 6,358,352
10.00	$ 627,000	$ 4,068,016													$ 4,068,016
1.00	$ 62,700	$ 251,712													$ 251,712
7.97	$ 500,000	$ 500,000	1	$ 250,000	$ 71.43	$ 200,000	$ 1	$ 50,000	$ 62.50	$ 50,000					$ 750,000
											303,283	$ 2.50		$ 758,208	$ 758,208
											204,743	$ 21.71		$ 4,444,971	$ 4,444,971
											204,743	$ 7.55		$ 1,546,766	$ 1,546,766
											204,743	$ 3.00		$ 614,229	$ 614,229
33.65	$ 2,109,549	$ 9,506,192	2,800	$ 51.96	$ 51.96	$ 145,488			$ 52.46	$ 41,969				$ 640,363	$ 10,334,013
	$ 26,369,358	$ 115,079,947				$ 1,818,604				$ 524,617				$ 8,004,536	$ 125,427,705
	By Owner	By Owner				By Owner				By Owner				By Owner	By Owner
	$ 197,770	$ 863,100				$ 13,640				$ 3,935				$ 60,034	$ 940,708
	$ 26,567,128	$ 115,943,047				$ 1,832,244				$ 528,552				$ 8,064,570	$ 126,368,412
	$ -	$ -				$ -				$ -				$ -	$ -
	$ -	$ -				$ -				$ -				$ -	$ -
	$ 26,567,128	$ 115,943,047				$ 1,832,244				$ 528,552				$ 8,064,570	$ 126,368,412
	$ 414,447	$ 1,808,712				$ 28,583				$ 8,245				$ 125,807	$ 1,971,347
	$ 26,981,575	$ 117,751,758				$ 1,860,827				$ 536,797				$ 8,190,377	$ 128,339,760
	$ 445,196	$ 1,942,904				$ 30,704				$ 8,857				$ 135,141	$ 2,117,606
	$ 27,426,771	$ 119,694,662				$ 1,891,531				$ 545,655				$ 8,325,518	$ 130,457,366
	Incl	$ 284,000				Incl				Incl				Incl	$ 284,000
2%	$ 548,535	$ 2,393,893		Fall 2010	2%	$ 37,831		Fall 2010	2%	$ 10,913		Fall 2010	2%	$ 166,510	$ 2,609,147
	$ 27,975,306	$ 122,372,555				$ 1,929,361				$ 556,568				$ 8,492,029	$ 133,350,513
446.18	$ / GSF	$ 447.25			$ 689.06	$ / GSF			$ 695.71	$ / GSF					$ 481.04
62,700		273,612			2,800				800						277,212
													303,283		303,283
													98,540		173,640
													204,743		245,554

6.2 Building Data

DESCRIPTION	Cancer Building	Cardio Building	Public Commons	Research Commons	Skyway to CMRR	Gross Square Footage
Cancer Building						
Level 1	0					0
Level 2	26,600					26,600
Level 3	26,600					26,600
Level 4	20,436					20,436
Share of chiller plant	8,070					8,070
Penthouse	14,800					14,800
						0
Cardio Building						
Level 1		0				0
Level 2		26,200				26,200
Level 3		26,200				26,200
Level 4		20,036				20,036
Share of chiller plant		8,070				8,070
Penthouse		14,500				14,500
						0
Public Commons						
Level 1			19,400			19,400
Loading dock			incl			incl
Soffit area						
Research Commons						
Level 1				55,700		55,700
Penthouse				7,000		7,000
Building Connections						
Cancer to Cardio					0	0
Cardio to MBB (skyway 80')					800	800
Vivarium to CMRR (skyway 280')					2,800	2,800
TOTALS	96,506	95,006	19,400	62,700	3,600	277,212

Non-GSF Areas	Foundation Area (A1)	Basement Const. (A2)	Structure Area (B1)	Perim. Dist. l.f.	Articulation Factor	Floor to Floor Ht v.f.	Exterior Enclosure (B2)	Roofing Area (B3)
	0		0			22.00	0	
			26,600	728	10%	16.00	12,804	
			26,600	728	10%	16.00	12,804	
			20,436	728	10%	16.00	10,338	27,000
	8,070		8,070	220	10%	22.00	5,324	
			14,800	550	10%	30.00	18,150	
	8,070		96,506			122.00	59,420	
	0		0		10%	22.00	0	
			26,200	728	10%	16.00	12,804	
			26,200	728	10%	16.00	12,804	
			20,036	728	10%	16.00	10,338	27,000
	8,070		8,070	220	10%	22.00	5,324	
			14,500	530	10%	30.00	17,490	
	8,070		95,006			122.00	58,760	
	19,400		19,400	703	10%	22.00	17,013	8,000
	incl		incl	incl			incl	
3,700	3,700						3,700	
							20,713	
	55,700		55,700	709	10%	22.00	17,158	34,000
			7,000	354	10%	30.00	11,682	
							28,840	
	0		0		5%	16.00	0	
	800		1,600	217	5%	16.00	3,646	800
	2,800		5,600	614	5%	16.00	10,315	2,800
	3,600		7,200				13,961	3,600
3,700	98,540	0	280,812			0.66	181,694	99,600

6.3 Assumptions & Clarifications

Comparison To MBB

- Substantially more site area and upgraded site finishes are anticipated for the Biomedical Discovery District.
- The Cancer Building will have 70 fume hoods and the Cardio Building will have 18 fume hoods versus the 16 fume hoods in MBB.
- The BDD will have several connections to other buildings which the MBB project did not have. This will add $9.09/sf to the total cost.
- The BDD will not have a "back of building" elevation as the MBB project did.
- The MBB costs have been escalated from 2007 to today (6% total escalation).

General

- Cardio to MBB connection is 80' x 10'
- Cardio to CMRR connection is 280' x 10'
- Refer to building data sheet for building massing assumptions.
- The chiller plant includes 2,500 gsf of shell space for future expansion. Chillers and cooling towers in this space are not included.

Foundations

- A clean, buildable site is anticipated.
- Shallow foundations are assumed.

Basement Construction

- Basement work is not anticipated by this estimate.

Superstructure

- A concrete frame is anticipated.
- Building connections and penthouses are anticipated to be steel framed.

Exterior Enclosure

- Encosure area is based on the measurable building perimeters and floor to floor heights from the documents provided by Architectural Alliance. A 10% articulation factor has been added to each
- Enclosure materials assumed to be a blend of brick, metal panels, and glass.

Roofing

- Base estimate includes a membrane roofing system. Green roofs will be carried forward as an alternate.
- Extensive skylights, metal or other ornamental roofing materials are not anticipated.

Interior Construction

- Interior construction utilizes data from similar projects to establish estimated cost.
- Significant amounts of "premium" items such as fire rated glass, special doors, ornamental handrail, etc. are not anticipated.

Stairs

- Stairs are assumed to be "back of house." A "grand stair" is not anticipated.

Interior Finishes

- Finishes are based on similar projects.

Conveying

- Five elevators are anticipated. Two service and three passenger.
- An elevator is anticipated at each end of the skyway to CMRR.

Plumbing
- Lab gases are based on similar projects.

HVAC
- Use of campus steam is anticipated.
- This cost model assumes an on-site chiller plant with a total capacity of 2,500 Tons.

Fire Protection
- A fully sprinkled building is anticipated.
- Significant areas of pre-action or FM200 systems are not anticipated.
- A fire pump is included.

Electrical
- 3 Generators @ 1,500 KW each with parallel switch gear are included.
- A complete security system is included.
- Raceway for telecom is included. Cabling and equipment by Owner.
- A uninteruppted power supply (UPS) system is included.

Equipment
- Equipment costs of $7,072,120 are anticipated based on historical data. This compares favorably with the preliminary budget provided by Jacobs of $4,097,414 for contractor furnished equipment plus cost of fume hoods per count provided. Fume hood count is 70 for Cancer and 18 for Cardio.
- Per the accepted alternate, the number of Chemistry research fume hoods in the Cancer Building was changed from 1 fume hood per two people (90 FH's) to 1 fume hood per three people (60 FH's).
- Animal racks and caging are anticipated to be owner furnished and installed.
- Coffee shop food service equipment in the public commons is included. A full service kitchen is not anticipated.
- Vivarium cage washing robotics are not included.

Furnishings
- Lab casework is assumed to be wood veneer with epoxy resin countertops.

Special Construction
- Lead lining and shielding is anticipated.
- Water features are not antcipated.

Selective Building Demolition
- An allowance of $750,000 is included for tie-in work at MBB and CMRR.

Site Preparation
- A clean, buildable site is anticipated.
- It is assumed that any hazardous soil removal will be used as daily cover at local landfill.

Site Improvements
- Site improvements are based on estimated quantities provided by Damon Farber.

Site Civil / Mechanical Utilities
- Utility costs are based on comparison to similar projects.
- A chilled water line from BDD to the intersection of 6th Street and the service road between CMRR and Lions is included for future connection.

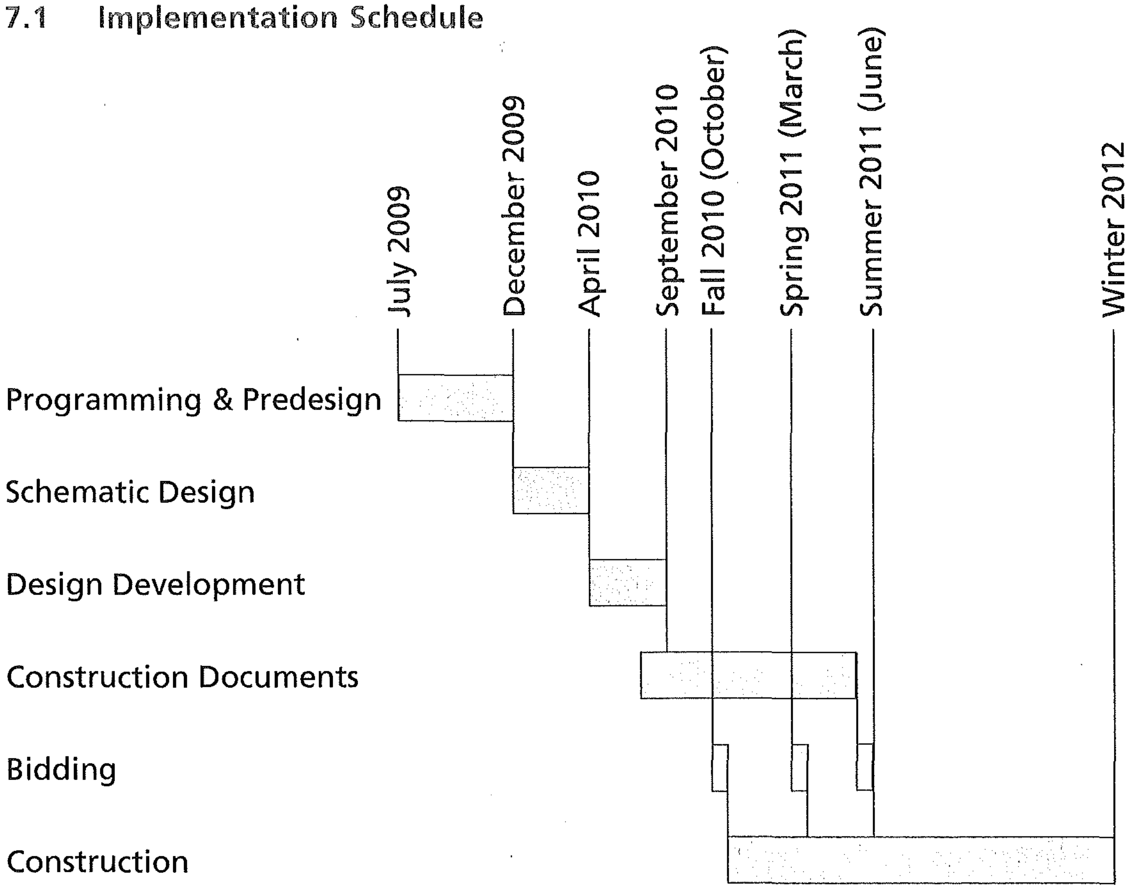
Site Electrical Utilities
- Site electrical is based on comparison to similar projects.

6.4 Project Alternates

Alt.	Description		Cost	Accepted
1	Delete 6 lab modules & associated office space - Cancer (6,163 GSF)	$	(2,433,700)	Yes
2	Delete 6 lab modules & associated office space - Cardio (6,163 GSF)	$	(1,992,200)	Yes
3	Eliminate (1) AHR (vivarium space) by deleting 12 lab modules (727 GSF)	$	(272,600)	
4	Reduce number of fume hoods (30 total) in Cancer Building - assume 3 people per fume hood in lieu of 2 people per hood for chemistry research	$	(1,006,300)	Yes
5	Eliminate mechanical infrasturure for fume hoods deleted in Item 4 above	$	(635,800)	
6	Utilize 6' fume hoods in lieu of 8' fume hoods (90 hoods) for chemistry research	$	(228,900)	
7	Increase vivarium space by 5,600 GSF for MTRF and MBB	$	2,100,000	
8	Increase vivarium space by 4,000 GSF for Building 3	$	1,500,000	
9	Reduce quantity of flex offices from 35 to 25 (2,200 GSF)	$	(285,600)	
10	Reduce quantity of hoteling offices from 59 to 39 (2,000 GSF)	$	(259,600)	
11	Shell one entire lab floor (25,300 GSF) - Cancer	$	(4,329,500)	
12	Shell one entire lab floor (25,300 GSF) - Cardio	$	(4,061,400)	
13	Install a green roof above the vivarium in lieu of a membrane roof	$	720,500	
14	Change the coffee shop to a full service kitchen	$	532,000	
15	Decrease space allocated for mechanical penthouse (GSF reduction TBD)		TBD	
16	Change the ratio of chemistry research to biology research (Cancer program stays in Hasselmo?)		Design Needed	

7.0 PROJECT SCHEDULE

7.1 Implementation Schedule

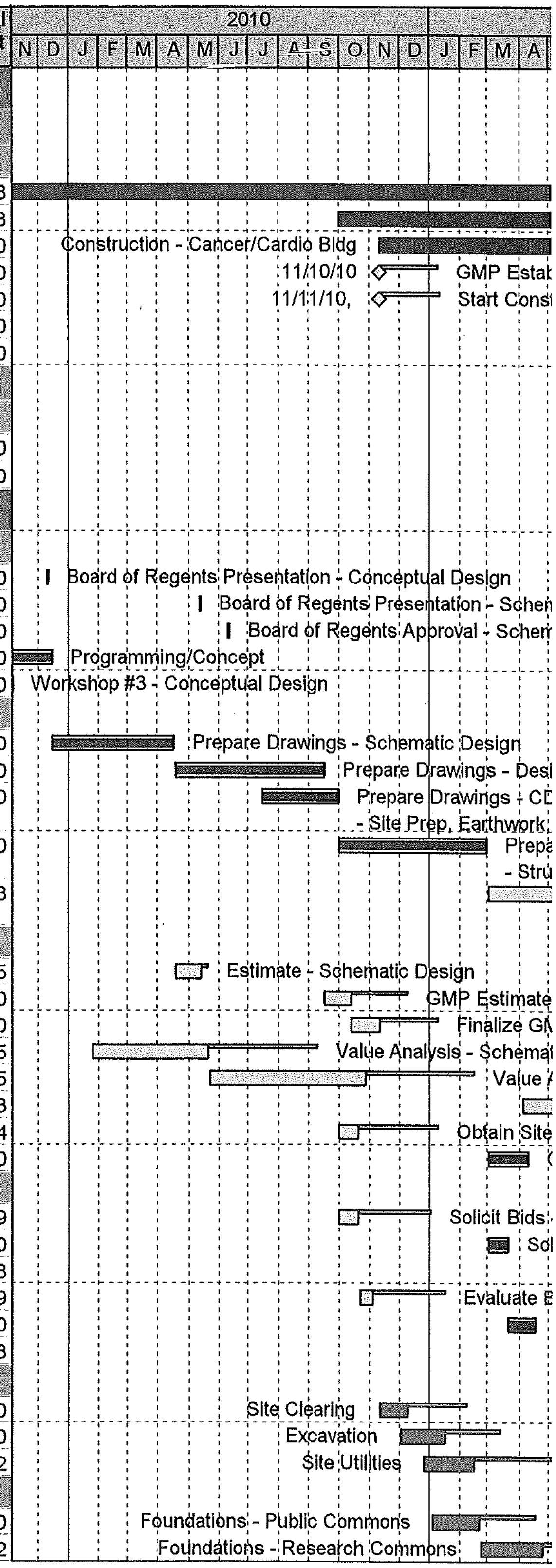


7.2 Project Delivery

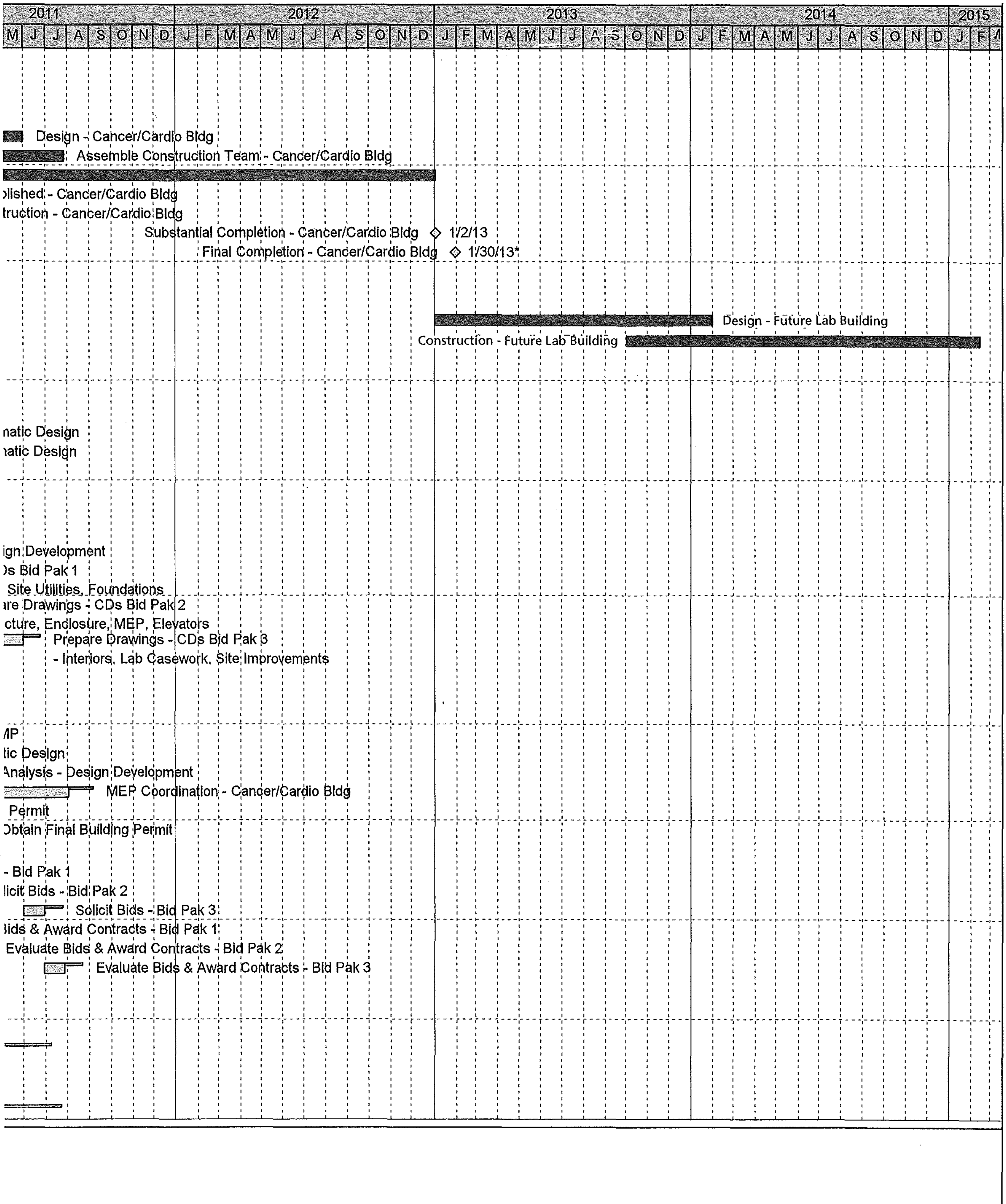
The University of Minnesota anticipates that it will be using the Construction Manager at Risk method of project delivery. Through the CM at Risk method, the selected contractor is involved in the early stages of the design process providing information and feedback on construction costs. The University publicly bids for the Contractor at Risk and requires that all subcontractors also be selected in a competitive and open bid process. In order to maintain a start date for construction by Fall 2010, it is anticipated that the project will utilize three construction bid packages.

7.3 Building Schedule

Activity Name	Orig. Dur'n	Start	Finish	Total Float
Summary and Milestones				
Cancer/Cardio Bldg				
Project Summary and Milestones				
Design - Cancer/Cardio Bldg	402	11/2/09	5/31/11	18
Assemble Construction Team - Cancer/Cardio Bl	209	10/1/10	7/27/11	18
Construction - Cancer/Cardio Bldg	545	11/11/10	1/2/13	0
GMP Established - Cancer/Cardio Bldg	0		11/10/10	40
Start Construction - Cancer/Cardio Bldg	0	11/11/10		40
Substantial Completion - Cancer/Cardio Bldg	0		1/2/13	0
Final Completion - Cancer/Cardio Bldg	0		1/30/13*	0
Future Lab Building				
Project Summary and Milestones				
Design - Future Lab Building	277	1/2/13	1/31/14	0
Construction - Future Lab Building	350	10/1/13*	2/13/15	0
Cancer/Cardio Bldg				
Planning and Development				
Board of Regents Presentation - Conceptual Des	2	12/10/09*	12/11/09	0
Board of Regents Presentation - Schematic Desi	2	5/13/10*	5/14/10	0
Board of Regents Approval - Schematic Design	2	6/10/10*	6/11/10	0
Programming/Concept	30	11/2/09	12/14/09	0
Workshop #3 - Conceptual Design	4	11/2/09	11/5/09	0
Design				
Prepare Drawings - Schematic Design	87	12/15/09	4/16/10	0
Prepare Drawings - Design Development	105	4/19/10	9/15/10	0
Prepare Drawings - CDs Bid Pak 1	55	7/15/10	9/30/10	0
Prepare Drawings - CDs Bid Pak 2	104	10/1/10	2/28/11	0
Prepare Drawings - CDs Bid Pak 3	65	3/1/11	5/31/11	18
Pre-Construction Services				
Estimate - Schematic Design	20	4/19/10	5/14/10	5
GMP Estimate	20	9/16/10	10/13/10	40
Finalize GMP	20	10/14/10	11/10/10	40
Value Analysis - Schematic Design	85	1/25/10	5/21/10	75
Value Analysis - Design Development	110	5/24/10	10/27/10	75
MEP Coordination - Cancer/Cardio Bldg	85	4/5/11	8/3/11	23
Obtain Site Permit	15	10/1/10	10/21/10	54
Obtain Final Building Permit	30	3/1/11	4/11/11	0
Assemble Construction Team				
Solicit Bids - Bid Pak 1	15	10/1/10	10/21/10	49
Solicit Bids - Bid Pak 2	15	3/1/11	3/21/11	0
Solicit Bids - Bid Pak 3	20	6/1/11	6/28/11	18
Evaluate Bids & Award Contracts - Bid Pak 1	10	10/22/10	11/4/10	49
Evaluate Bids & Award Contracts - Bid Pak 2	20	3/22/11	4/18/11	0
Evaluate Bids & Award Contracts - Bid Pak 3	20	6/29/11	7/27/11	18
Site Preparation and Excavation				
Site Clearing	20	11/11/10	12/9/10	40
Excavation	30	12/3/10	1/17/11	40
Site Utilities	35	12/27/10	2/14/11	102
Foundations				
Foundations - Public Commons	35	1/4/11	2/21/11	40
Foundations - Research Commons	45	2/22/11	4/25/11	62



Project Summary	Procurement	Neg Float Bar
Milestone	Construction	Critical Work
Pre-Construction	Total Float	Actual Work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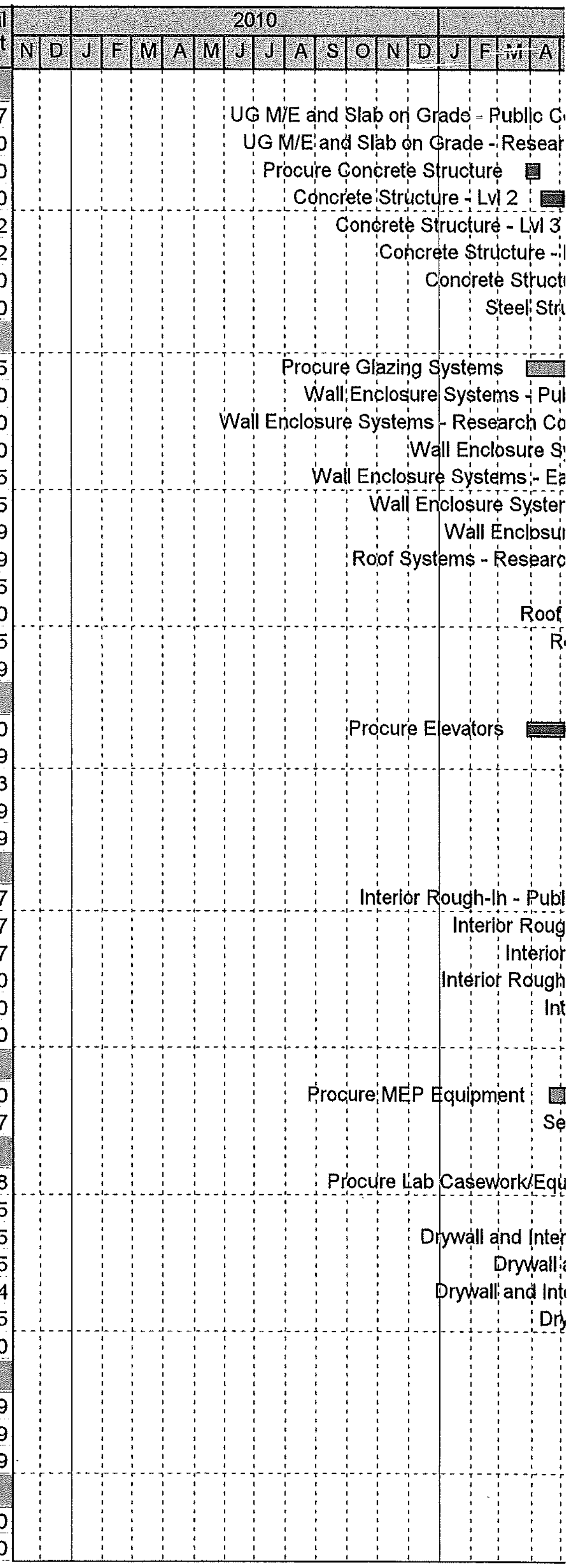
Solicit Bids - Bid Pak 3
Bids & Award Contracts - Bid Pak 1
Evaluate Bids & Award Contracts - Bid Pak 2
Evaluate Bids & Award Contracts - Bid Pak 3

Activity Name	Orig. Dur'n	Start	Finish	Total Float
Structure				
UG M/E and Slab on Grade - Public Commons	24	8/11/11	9/14/11	27
UG M/E and Slab on Grade - Research Commons	36	9/22/11	11/10/11	70
Procure Concrete Structure	10	3/29/11	4/11/11	0
Concrete Structure - Lvl 2	92	4/12/11	8/19/11	0
Concrete Structure - Lvl 3	54	5/24/11	8/9/11	2
Concrete Structure - Lvl 4	54	7/7/11	9/21/11	2
Concrete Structure - Roof	54	8/22/11	11/4/11	0
Steel Structure - Penthouse	20	11/7/11	12/5/11	30
Enclosure				
Procure Glazing Systems	80	3/29/11	7/20/11	45
Wall Enclosure Systems - Public Commons	29	9/27/11	11/4/11	30
Wall Enclosure Systems - Research Commons	51	8/5/11	10/17/11	30
Wall Enclosure Systems - Offices	70	10/18/11	1/26/12	30
Wall Enclosure Systems - East Labs	62	8/4/11	10/31/11	25
Wall Enclosure Systems - North Labs	66	10/11/11	1/13/12	25
Wall Enclosure Systems - West Labs	60	12/22/11	3/16/12	39
Roof Systems - Research Commons	35	9/13/11	10/31/11	49
Roof Systems - Offices	14	1/19/12	2/7/12	25
Roof Systems - East Labs	10	11/29/11	12/12/11	30
Roof Systems - North Labs	11	1/4/12	1/18/12	25
Roof Systems - West Labs	10	3/8/12	3/21/12	39
Conveying Systems				
Procure Elevators	85	3/29/11	7/27/11	0
Elevators - Offices	125	4/12/12	10/8/12	39
Elevators - East Labs	85	12/13/11	4/11/12	33
Elevators - North Labs	85	1/19/12	5/16/12	59
Elevators - West Labs	85	3/22/12	7/20/12	39
Interior Rough-In				
Interior Rough-In - Public Commons	62	9/15/11	12/12/11	27
Interior Rough-In - Research Commons	143	1/16/12	8/3/12	27
Interior Rough-In - Offices	89	11/14/11	3/20/12	27
Interior Rough-In - East Labs	113	10/5/11	3/14/12	0
Interior Rough-In - North Labs	116	1/24/12	7/5/12	0
Interior Rough-In - West Labs	114	5/11/12	10/22/12	0
Equipment				
Procure MEP Equipment	125	4/19/11	10/13/11	90
Set/Connect MEP Equipment	200	1/16/12	10/24/12	27
Drywall and Interior Finishes				
Procure Lab Casework/Equipment	60	7/28/11	10/20/11	18
Drywall and Interior Finishes - Public Commons	71	8/16/12	11/26/12	25
Drywall and Interior Finishes - Research Commo	175	3/21/12	11/26/12	25
Drywall and Interior Finishes - Offices	82	2/8/12	6/1/12	25
Drywall and Interior Finishes - East Labs	98	1/6/12	5/22/12	14
Drywall and Interior Finishes - North Labs	99	4/26/12	9/14/12	5
Drywall and Interior Finishes - West Labs	98	8/14/12	1/2/13	0
Site Improvements				
Roads and Parking Lots - Site	45	5/1/12	7/3/12	19
Hardscape - Site	45	7/9/12	9/10/12	19
Landscape - Site	20	8/27/12	9/24/12	19
Project Close-Out				
Systems Testing and Start-Up - Cancer/Cardio B	85	8/31/12	1/2/13	0
Clean-Up and Punchlist - Cancer/Cardio Bldg	30	12/18/12	1/30/13	0



Project Summary
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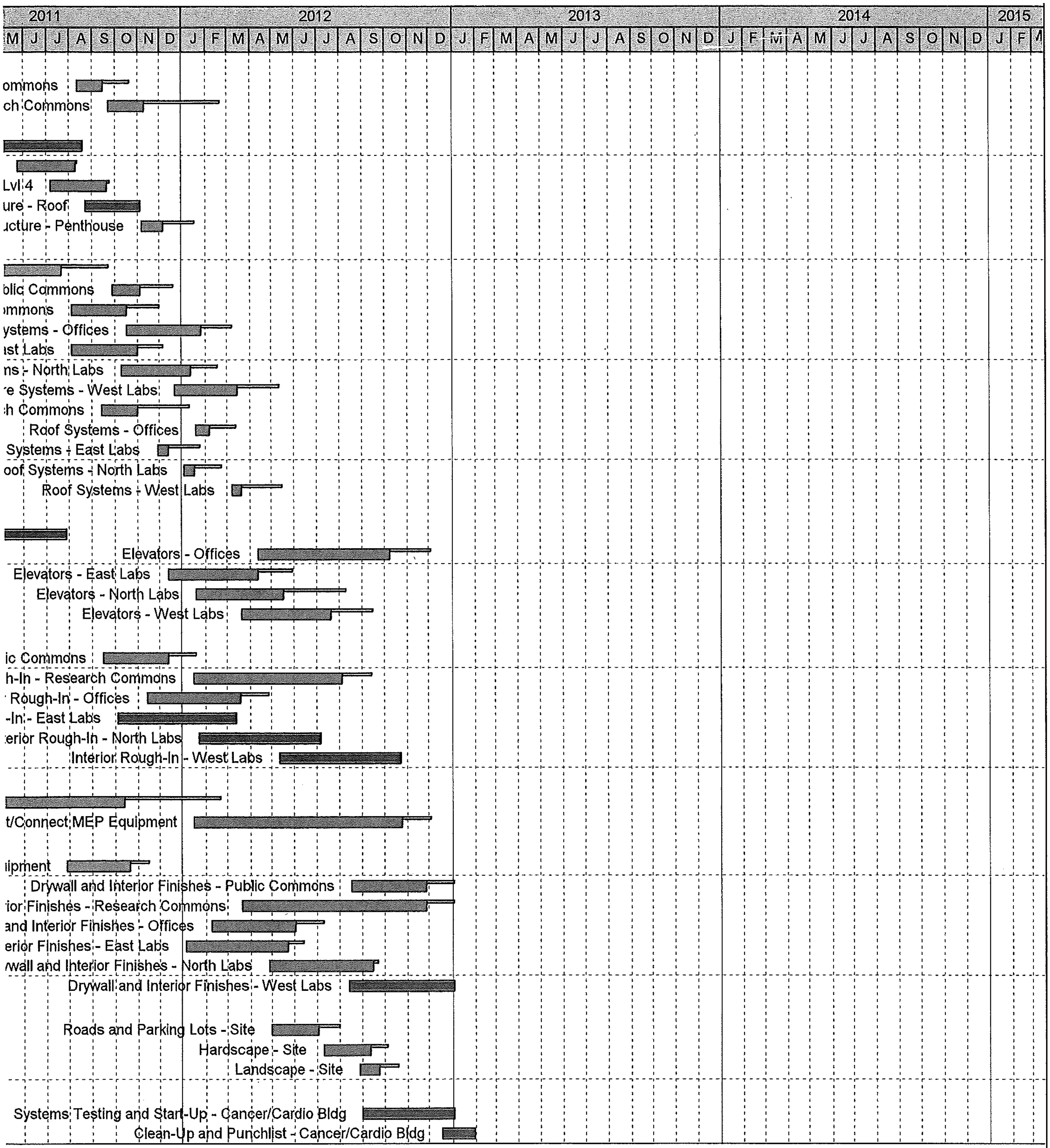
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Drywall and Interior Finishes - West Labs
Roads and Parking Lots - Site
Hardscape - Site
Landscape - Site
Systems Testing and Start-Up - Cancer/Cardio Bldg
Clean-Up and Punchlist - Cancer/Cardio Bldg

A.1 PROJECT TEAM

The University of Minnesota

Project Executive Committee

Frank Cerra, MD, Sr. VP, Health Sciences, Dean , Health Sciences Medical School
Timothy Mulcahy, VP, Health Sciences Research
Kathleen O'Brien, VP, University Services
Richard Pfutzenreuter III, VP, CFO, Budget & Finance
Thomas Sullivan, Sr. VP, Academic Affairs & Provost

Project Coordination Team

Cathy Abene, Sr. Engineer, Facilities Energy Management
Bob Baker, Director, Parking & Transportation
Wendy Burt, Director, Public & Community Affairs
Lonetta Hanson, Program Associate, Parking & Transportation
Richard Johnson, Program Director, Biomedical Discovery District
Chad Kulas, Program Associate, Public & Community Affairs
Monique MacKenzie, Planner, Facilities Management - Planning & Programing
Orlyn Miller, Director, Planning, Facilities Management - Planning & Programing
Ann Schwind, Chief Administrative Officer, Medical School
Gary Summerville, Director, CPPM
Brian Swanson, Budget Officer, Budget & Finance
Jeanie Watson, Assoc. VP of Development, Minnesota Medical Foundation
Lorelee Wederstrom, Director, Facilities, Academic Health Center
Sue Weinberg, Director, Real Estate
Sally Westby, Assistant, University Services

Program Leadership Team

Daniel Garry, Director-Cardio, Medical School
Cynthia Gillett, Director, Research Animal Resources
Mostafa Kaveh, Associate Dean, Research & Planning - IT
Charles Moldow, Vice Dean, Research, Medical School
Mark Paller, Executive Vice Dean, Medical School
Douglas Yee, Director, Masonic Cancer Center

Cardiovascular User Group

Robert Bache, Professor, Dept. of Integrative Biology & Physiology
Michael Kyba, Asst. Professor, Pediatric Hem/Onc/BMT
Russell Luepker, Professor, Epidemiology
Joseph Metzger, Director, Dept. of Integrative Biology & Physiology
John Osborn, Professor, Physiology
Rita Perlingeiro, Assoc. Professor, Medicine
Doris Taylor, Professor, Integrative Biology/Physiology
David Thomas, Professor, Biochemistry/ Molecular Biology
Jay Zhang, Professor, Medicine

Cancer User Group

Steven Carmella, Fellow, Masonic Cancer Center
Sabine Fritz, Research Facilities Coordinator, Masonic Cancer Center
Stephen Hecht, Program Leader, Masonic Cancer Center
David Largaespada, Program Leader, Masonic Cancer Center
Tucker LeBien, Assoc. Director, Environmental Health Sciences
Lisa Peterson, Professor, Masonic Cancer Center
Yoji Shimizu, Program Leader, Masonic Cancer Center
Mary Sumpmann, Assoc, Director for Administration, Masonic Cancer Center
Peter Villatla, Sr. Research Associate, Masonic Cancer Center

Vivarium User Group

Cynthia Gillet, Director, Research Animal Resources
Roland Gunther, Assoc. Director, Research Animal Resources
Greg Steinhagen, Sr. Research Associate, Research Animal Resources

Architectural Alliance

Architect

Tom DeAngelo, Principal in Charge
Carey Brendalen, Project Manager
Mamie Harvey, Project Programmer

Zimmer Gunsul Frasca Architects, LLP

Associated Architect

Allyn Stellmacher, Design Partner
Jan Willemse, Technical Design Partner
John Chau, Designer
Taka Soga, Laboratory Specialist
Chris Chatto, Sustainability Specialist

Jacobs Consultancy / GPR

Laboratory Consultant

Josh Meyer, Project Principal
Richard Kalish, Project Manager

Affiliated Engineers, Inc.

MEP Engineer

Michael Broge, Principal Engineer
Jeff Parker, Mechanical Engineer
Scott Largent, Piping Engineer
Mike Hanson, Thermal Infrastructure Engineer
Steve Miller, Electrical Engineer
Craig Vesley, Fire Protection Engineer
Kelly Knapp, Project Coordinator

Damon Farber Associates

Landscape Architect

Damon Farber, Managing Partner
Tom Whitlock, Project Manager
Joan MacLeod, Project Designer

Elert & Associates

Technology

Will Craig, Multimedia Systems
Tony Chojnowski, Security & Cabling

Eriksen Roed and Associates

Structural Engineer

Jim Roed, Structural Engineer

ESI Engineering, Inc.

Vibration and Acoustic Consulting

Barry Whiteaker, Professional Engineer

Pierce Pini & Associates, Inc.
Civil Engineer
Ronda Pierce, Principal Civil Engineer

Mortenson Construction
Construction Manager at Risk
Ken Sorenson, Project Director
Blair McNeil, Senior Project Manager
Clark Taylor, Cost Estimator

Cost Planning and Management International - CPMI
Cost Estimating
Peter Goodwin, Cost Consultant

University of Minnesota
Resources
John Cook, Engineering Records

A.2 SAFETY ANALYSIS

A.2.1 Applicable Codes

The codes and standards listed below are minimum requirements.

Code Type:	Code Title:
Building	2007 Minnesota State Building Code (2006 IBC w/Amendments)
Plumbing	2007 Minnesota State Plumbing Code
Electrical	2008 National Electrical Code
Energy	2007 Minnesota Energy Code
Gas	2006 International Fuel Gas Code
Fire	2003 Minnesota State Fire Code (2006 IFC w/Amendments)
Life Safety	2006 Life Safety Code - NFPA 101
Accessibility	2007 Minnesota Accessibility Code - Chapter 1341
Ventilation/IAQ	2007 Minnesota State Mechanical Code (2003 IMC w/Amendments)
Elevator	ASME A17.1 Safety Code for Elevators and Escalators

Predesign Code Assumptions:

- Construction Type: 1B
- Occupancy: B
- H Storage: H4

A.2.2 References & Guidelines

In all cases, the most recently adopted and currently enforced editions of the referenced standards apply.

- American Institute of Architects Center for Advanced Technology Facilities Design. Guidelines for Planning and Design of Biomedical Research Laboratory Facilities. AIA 1999.
- American National Standards Institute. ANSI Z358.1: Emergency Eyewash and Shower Equipment.
- American National Standards Institute. ANSI/AIHA Z9.5: Laboratory Ventilation.
- American National Standards Institute. ICC/ANSI A117.1: Accessible and Usable Buildings and Facilities.
- Americans with Disabilities Act (ADA). 1990.
- Architectural and Transportation Barriers Compliance Board. Code of Federal Regulations 36 CFR Part 1191: American With Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities. 1991.
- Lawrence Berkeley National Laboratories. A Design Guide for Energy-Efficient Laboratories, 1998.
- National Fire Protection Association. NFPA 101: Life Safety Code.
- National Institutes of Health. NIH Design Policy and Guidelines. Clinical Center; Research Laboratory; Vivarium; Reference Materials. http://des.od.nih.gov/planning/nihpol.htm.
- National Research Council. Guide for the Care and Use of Laboratory Animals. National Academy Press 1996.
- National Research Council. Occupational Health and Safety in the Care and Use of Research Animals. National Academy Press 1997.
- National Research Council, Prudent Practices in the Laboratory: Handling and Disposal of Chemicals, National Academy Press 1995.
- Occupational Safety and Health Administration, Labor. Code of Federal Regulations: 29 CFR Ch. XVII. § 1910.1450 Occupational Exposure to Hazardous Chemicals in Laboratories.
- U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, and National Institutes of Health. Biosafety in Microbiological and

Biomedical Laboratories. 4th ed. HHS Publication No. (CDC) 93-8395.

- U.S. Green Building Council. Leadership in Energy and Environmental Design (LEED) Green Building Rating System. http://www.usgbc.org/programs/leed.htm.
- Building, Benchmarks, and Beyond: B3 State of Minnesota Sustainability Building Guidelines. http://www.msbg.umn.edu.

A.3 COMMUNITY IMPACT ASSESSMENT

A.3.1 Community & Neighborhood

The site selected for the Biomedical Discovery District is located on the eastern edge of campus and is the most rapidly developing area of campus. The land was historically an industrial railyard and surface parking more recently. Within the last decade, three new research facilities and the TCF Bank Stadium have been constructed in the East Gateway District.

The industrial railyards to the north create an impermeable barrier on the edge of the District. The future Granary Road will further define the north edge of the Campus while providing access from the north at 21st and 23rd Avenues. To the east along University Avenue, the urban fabric of Minneapolis picks up where the University leaves off. Small-scale retail shops, apartments, a hotel, a gas station, and many other buildings are mixed together to serve the needs of the University as well as the residents in the neighborhood. To the northeast, there are aging industrial and warehouse buildings, but the city and private development has begun to plan for biomedical research facilities to complement the academic research programs in the East Gateway District. The District's southern edge is University Avenue and around the edge of the TCF Bank Stadium. To the west, Williams and Mariucci Arenas, along with the new football stadium, connect the District to the adjacent athletic area.

The construction of Phase II of the Biomedical Discovery District will increase the development density of the East Gateway District, but the adjacent non-University neighborhoods will not be significantly impacted.

A.3.2 Traffic, Transportation, & Parking

The East Gateway District currently provides the majority of the surface parking for the campus. The site for the Biomedical Discovery District Phase II development currently has 610 spaces. As future development occurs on the site and within the District, structured parking will be a necessity to meet the needs of both the District and the overall campus.

The Stadium Village LRT Station, which should open in 2014, will bring more pedestrians into the East Gateway District and reduce the parking needs of both the District and the overall campus.

The existing University of Minnesota shuttle and campus circulator service have stops on 23rd Avenue and Oak Street. The AHC also runs a shuttle to serve and connect the Lyons, MBB and CMRR buildings. An additional AHC shuttle stop is anticipated on 6th Street between MBB and the future Phase II development.

A.3.3 Pedestrian Access & Circulation

The above mentioned Light Rail, shuttles, and campus circulator service will provide pedestrian access to the East Gateway district. Primary pedestrian and bicycle routes are planned for 6th Street, 23rd Avenue, and the future Granary Road. Pedestrian routes will also occur along 21st Avenue and at the mid-block of 6th Street between 21st Avenue and 23rd Avenue.

Skyways will connect buildings within research clusters when at-grade connections would disrupt open space elements or service corridors. A public skyway will connect the Phase II development to the BDD. A service skyway will connect the Phase II development to the CMRR.

A.3.4 Noise and Air Pollution

Relative to the TCF Bank Stadium and existing research facility noise, the Biomedical Discovery District Phase II development will not significantly impact noise levels in and around the site.

The building will be appropriately vented and ducted to prevent any air pollution to the surrounding area. A wind tunnel study will be performed to assure appropriate ventilation.

A.4 DESIGN GUIDELINES

A.4.1 Master Plan/District Guidelines

Master Plan Guiding Principles
The Master Plan is driven by the belief that an integrated, beautiful, well-maintained university campus will advance the institution's academic mission. A sustainable attractive environment that fosters discovery and connections is integral to University's reputation and competitiveness in the world.

The foundational principles that describe the Master Plan's core values:
1. Cultivate a genuine sense of community.
2. Strengthen connections to adjacent communities.
3. Create a cohesive, memorable system of public spaces.
4. Provide a compatible and distinctive built environment.
5. Steward historic buildings and landscapes.
6. Foster a safe, secure and accessible campus environment.
7. Preserve and enhance natural systems and features.
8. Integrate transportation systems to emphasize pedestrians, bicycles and transit.
9. Optimize the use of campus land and facilities and apply best practices.
10. Utilize the campus as a living laboratory to advance the university's mission.
11. Make the campus environmentally and operationally sustainable.

Planning Challenges
The academic, and particularly research needs of the University will continue to grow, yet the University is out of land for expansion. The East Gateway District adjacent to the east bank of the Twin Cities campus represents one of the last non-developed areas available for future campus growth. Therefore, future development of this area should promote a level of density that will use limited land resources wisely.

Along with density, the University should establish a campus type of environment, one in which it can share valuable resources and core technical functions, rather than prepare individual building sites. Developed in this model, the East Gateway District will build an identity as a complete environment with a high level of amenities to attract and recruit top researchers and adjacent private partners.

The East Gateway District is not immediately adjacent to the Academic Health Center, clinical uses, or other core science programs on the main campus. Functional proximity to these related uses will be critical to the District's and program's success. Development of the District must utilize multiple and creative ways to link its users to the main campus, and vice versa, including future transit, campus bus, pedestrian, and bicycle connections. This will also reduce reliance on driving, parking demand, and traffic on local roads.

East Gateway District Planning Principles
Planning principles were established early in the planning process to guide the creation of the plan. The planning principles for the District are intended to:
1. Provide a supportive academic and research environment.
2. Create an image of architectural distinction, integrity, and brand.
3. Optimize the use of scarce land resources.
4. Maximize flexibility for future development.
5. Strengthen the multi-modal transportation system in the area.
6. Create an attractive, functional, and safe environment for pedestrians and cyclists.

7. Integrate into the existing campus and surrounding community.
8. Build a real sense of community and place for the District.
9. Create a cohesive, memorable system of public spaces.
10. Develop a District that is environmentally and operationally sustainable.

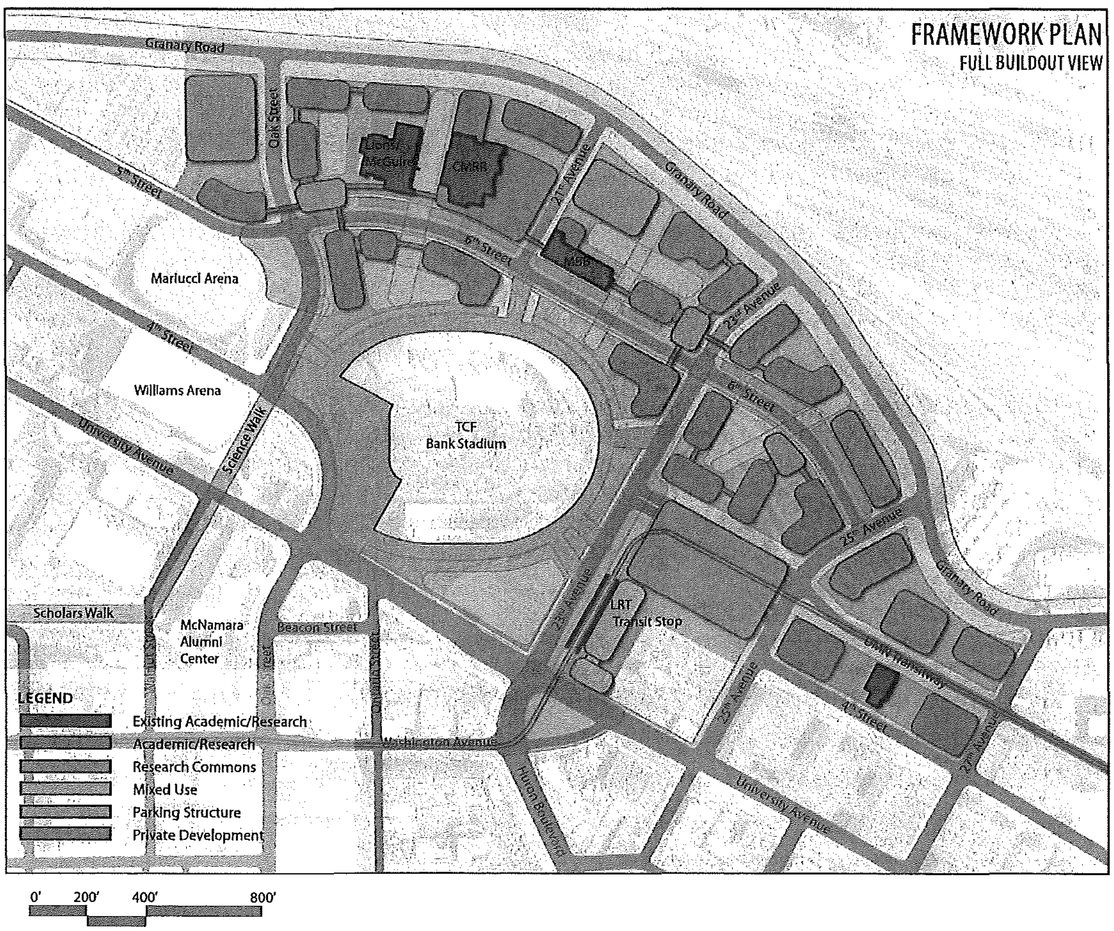
Vision for the East Gateway District
Develop the East Gateway district at a cohesive complex of research, support and athletic facilities that has its own identity, but is integrated with the existing campus.

A.4.2 Site Guidelines

The following Framework Plan illustrates a few important site planning expectations from the East Gateway District Master Plan:

- "Holding the corner" with public commons at 6th Street and 23rd Avenue to visually connect to the LTR station to the south and provide connections across 6th and 23rd for future expansion.
- Creating a mid-block visual break between buildings on 6th Street to support green space, daylight, and a more regular, square urban block rhythm.
- Saving the north portion of the site for a parking ramp or future building.

The Framework plan also conveys the intended scale and character of District open space and pedestrian connections.



A.4.3 Architectural Design Guidelines

The overarching philosophy of the architectural guidelines as a response to the challenges facing the District is threefold: first to unify the District as a place of biosciences research; second, to integrate the new District into the existing campus; and third, to identify the District as a research center at the University of Minnesota. The architectural guidelines work to be a descriptive impetus for design rather than prescribing definite rules or standards.

The recent University master plan recognizes the eclectic nature of the campus and architectural styles over its evolution. However, the principles of the campus-wide master plan also strive for cohesiveness in the campus environment, through appropriate scale, common materiality, buildings that shape positive outdoor space, the treatment of primary entrances, etc. This does not imply that new construction should copy historic styles, but rather look to successful examples on campus that embody these principles and create memorable places.

Design Principles:

1. Commons facilities within buildings form centers for multi-building development and interaction.
2. Commons facilities will be architecturally iconic to address their unique role in the District.
3. Lab buildings will have circulation corridors fronting Oak Street, 6th Street, and 23rd Avenue.
4. Offices, support spaces, and circulation elements will be separately articulated.
5. Major street walls will be predominantly masonry.
6. Bridges and walkways will be uniquely designed to complement adjacent buildings.
7. Building bases should feel open and use glazing as a dominant material and provide weather cover near doorways.
8. Ground level facades on Oak Street, 6th Street, and 23rd Avenue will have as much transparency and activity visible to the street as possible to animate the pedestrian environment.
9. An integrated landscape of terraces, water, and planting will accent building entrances.
10. Courtyards will be landscaped and accessible.

Architectural Character:

1. Use predominately brick, with limited areas of stone, metal, or other accent materials for building exteriors.
2. Provide a variety of heights, textures, and scales.
3. Construct buildings of not less that 3 stories nor more than 7 stories.
4. Use large glass walls to enhance entrances, important internal circulation events, and courtyards.
5. Connect buildings with interesting bridges and walkways.
6. Design and arrange internal and external space to support connectivity and collaboration.
7. Design commons facilities within buildings to be iconic through massing, materials, and lighting.
8. Accent building entrances with integrated landscape of terraces, water, and planting.
9. Achieve at least USGBC LEED® Gold certification for all buildings and landscapes.

Research Pragmatics:

1. Use predominately modular open labs capable of adapting to future wet or dry programs.
2. Provide at least 15' floor height with a minimum 22' structural span throughout.
3. Locate adequate support spaces between labs and corridors.
4. Aggregate principal investigator offices around areas for casual interaction and collabora-

tion.

5. Provide natural light to labs and offices.

Interaction:

1. Develop a program model to achieve 55% efficiency to support casual collaborative spaces.
2. Provide artwork and display areas that describe scientific inquiry in formal public areas.
3. Locate small lounges, atria, staircases seminar spaces, and conference rooms to foster interaction.
4. Provide a variety of soft seating, tables and chairs, and adjoining flexible storage space.
5. Locate interaction areas along the path of travel between labs, offices and circulation corridors.
6. Zone multiple areas from formal to completely unscripted throughout.
7. Provide technology, white boards, coffee kitchens, a variety of soft seating, and tables and chairs.
8. Allow for display of various media illustrating current areas of inquiry.

A.4.4 Sustainability Guidelines

The University directs the A/E to include sustainable design features to the greatest extent possible within the budget and other design restraints. Essential feature of a project shall include:

- Planning for Conservation: This includes reducing the need for space if possible, reusing existing buildings and designing for adaptability.
- Sustainable Sites: This includes development in environmentally appropriate areas, reduced site disturbance, prober stormwater management and sustainable landscape design.
- Water Efficiency: This includes water-efficient landscaping and water use deduction within a building.
- Energy Efficiency: This includes optimizing energy performance so the building uses at least 60 percent less energy than the energy benchmark analysis stipulates. It also includes using renewable energy sources and commissioning building systems.
- Indoor Environmental Quality: This includes controlling indoor pollutant sources, using low-emitting materials, providing effective ventilation and thermal comfort, as well as daylight and views where appropriate.
- Materials: This includes reducing material use and selecting materials with a low environmental impact. Examples include materials that are recycled, salvaged, local rapidly renewable and durable.
- Waste: This includes reducing and recycling construction waste, and designing elements within the building to aid in the efficient managing of waste/recycling during building operations.

The East Gateway District Master Plan provided the following sustainability guidelines:

1. Require all new buildings to attain USGBC LEED® Gold certification.
2. Continue to implement the East Gateway Stormwater Management strategy, including green roofs, bio-swales, and infiltration planters.
3. Develop traffic/transit plans to leverage the intermodal station and existing campus transit systems.
4. Similar to the existing Scholars Walk, create a Science Walk display that tells the story of the University's commitment to the interrelated challenges of the biosciences and environmental sustainability.

A.6 STUDIES & REPORTS THAT INFORM THIS DOCUMENT

Campus Master Plan
University of Minnesota, Twin Cities
March, 2009

East Gateway District Master Plan
University of Minnesota, Twin Cities
May 15, 2009

Transforming the University, AHC Precinct Plan Task Force Report
University of Minnesota, Twin Cities
May 5, 2006

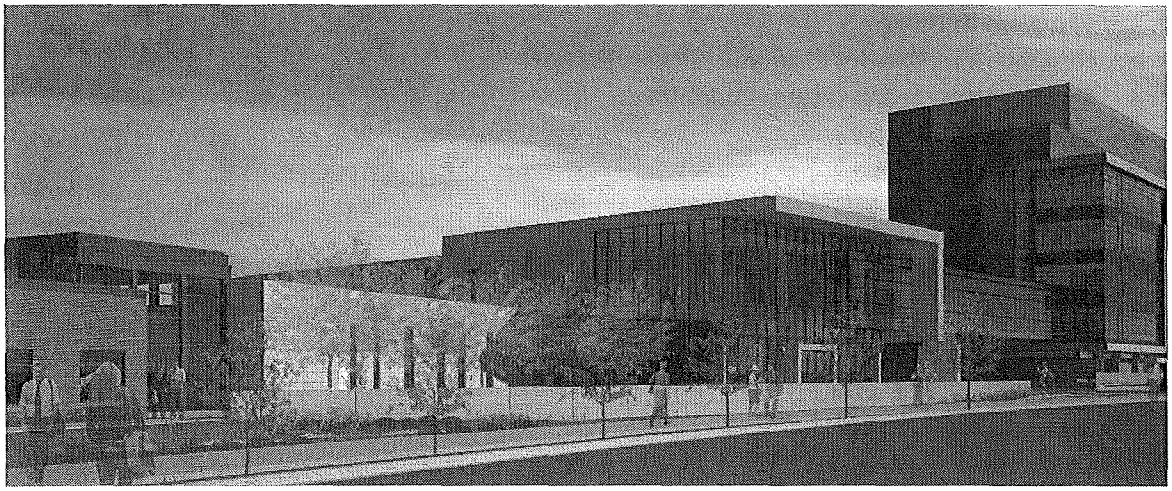
Report on committee meetings for the Facility Supporting Interdisciplinary Research in Cancer
Douglas Yee, M.D., Director, Masonic Cancer Center
April 16, 2009

Report on committee meetings for the Facility Supporting Interdisciplinary Research in Cardiovascular Biology
Daniel J. Garry, M.D., Ph.D., Director, Lillehei Heart Institute, Chief, Cardiovascular Division
April 20, 2009

Biomedical Discovery District, Research Commons - Program Statement of Need
Ashley Haase, Dan Garry, Charles Moldow, Dough Yee, Mark Paller, Rick Johnson, Monique MacKenzie, Lorelee Wederstrom
April 17, 2009

Biomedical Research Facilities Space Assignment/Utilization Principles
July 30, 2008

RSP ARCHITECTS, LTD.
1220 MARSHALL STREET NE
MINNEAPOLIS, MN 55413



SCHEMATIC DESIGN FOR:

THE CENTER FOR MAGNETIC RESONANCE RESEARCH EXPANSION AND RENOVATION

Bldg. #180
2021 6th Street SE, Minneapolis MN
Department of Radiology

UNIVERSITY OF MINNESOTA
MINNEAPOLIS CAMPUS
UM Project: 01-180-08-1687
February 17, 2009

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PROGRAM ANALYSIS

Statement of Need

In the short period of time since its discovery, the magnetic resonance (MR) phenomenon has been utilized to extract an unprecedented wealth of information in chemical and biological sciences. The use of MR to acquire images was demonstrated in 1973, leading to magnetic resonance imaging (MRI) as an indispensable clinical tool that permits the visualization of human anatomy with high spatial resolution and the ability to distinguish different types of tissues. The exquisite anatomical information provided by MRI, a spectacular achievement in itself, has in retrospect only been a prelude as the boundaries of this imaging methodology have been relentlessly expanded and recently focused on the acquisition of physiological, chemical and functional information non-invasively in intact animals and humans. It is now possible to map areas of altered neuronal activity in the human brain with unprecedented spatial resolution (a method developed at the University of Minnesota), map connections between different functional areas of the brain, detect numerous intracellular compounds non-destructively and thus follow cellular chemistry in health and disease, measure organ perfusion in humans and intact animals under normal and pathological conditions, evaluate oxygen extraction and consumption and obtain this information together with anatomical and biochemical data in the same study session from the same subject, all non-destructively. This rapid pace of discoveries and accomplishments continues unabated with the development of magnets with ever increasing field strengths and increasingly sophisticated methods that utilize these higher static fields. The Center for Magnetic Resonance Research (CMRR) at the University of Minnesota has played a groundbreaking role in all of these developments.

Expanding the capabilities in imaging and spectroscopy to higher spatial and temporal resolution, higher specificity, and exploiting them in biomedical research and clinical medicine are the central research themes for CMRR. Towards this goal, CMRR pioneered the use of higher magnetic fields. In 1991, CMRR was one of the first sites to develop a 4 Tesla system for human brain studies when the highest magnetic field used was 1.5 Tesla. Despite contravening notions at the time, the CMRR was the first to show the advantages of high field strengths for imaging and spectroscopy.

The success of CMRR's 4 Tesla human work was complemented early with work in small animal models using a 9.4T, 31-cm bore magnet large enough to accommodate rodents but not humans. High field, small animal work was followed by investigations in the human brain at 7 Tesla for the first time in the world. As a result of CMRR accomplishments at high magnetic fields, today numerous laboratories are in the process of establishing 3 to 7 Tesla systems, to attain research capabilities similar to that CMRR has pioneered and enjoyed in the last decade. We, however, recently were able to move to working at 9.4 Tesla in the human brain for the first time, aided by grants from the Keck foundation and NIH. If CMRR is to stay ahead of the competition that is being established by the large investments that are being made in numerous research institutions throughout the world, it is imperative further steps are taken to keep the research capabilities in CMRR ahead of the competition. In an effort to do this, CMRR is currently in the process of implementing a very high field 16.4T magnet capable of performing animal model studies.

At the same time, magnetic resonance imaging technology has become an indispensable tool for many disciplines, including psychology, psychiatry, cardiology, neurosurgery, neurology, radiology and in research areas including tumor biology, cancer diagnosis and treatment, stem cell research, and cardiac energetics. Faculty from these departments cannot compete in the research funding unless they have access to ready use of routinely usable instruments such as 3 Tesla and 1.5 Tesla. In this respect, the installment of a 3 Tesla system in CMRR a few years ago as a "service" system to researchers at the University of Minnesota has proven extremely successful. This 3T mainly is for the use of brain research. There are similar, but currently, unmet needs in the U of M community, in particular in the area of cancer and stem cell research. Therefore, an expansion that can house instruments both for animal and human work to meet these needs is essential for the welfare of the research activity at the University of Minnesota.

Adding to the rapid new developments in the areas of MRI and MRS is the need to add PET/CT imaging to further explore the function, physiology, metabolism, and anatomy of the cell and larger organs. PET imaging allows for the development of selective markers of disease presence and response to therapy. The addition of small animal PET/CT/SPECT devices coupled with the expanded MRI/MRS devices in CMRR will provide a research environment at least equal to other leading medical centers and should open the possibility of research grants that were not previously possible. CMRR's success with high field MR will be extended into newly conceived combined MR/PET devices. By combining the instrument imaging and spectroscopy capability of MR with the PET modality, this new area of instrumentation will open new doors to explore the whole body and will uniquely position CMRR in the international research community. The combined PET Center with novel drugs and chemical probes and the addition of MR/PET will allow basic and clinical researchers to explore diseases as never before. These new facilities have significant application in cancer research (diagnosis and therapy), tumor biology, cardiac diseases, neurosciences, nuclear medicine and radiology.

Program Summary

The premise behind the planning for the CMRR's expansion follows the same organizational principles used in the current CMRR. In the present facility, research spaces and their associated activities are functionally separated, based on the mode of test subject. Magnetic resonance experiments on both animal and human test subjects are conducted in two separate magnet zones. The Research Animal Resource facility makes up the third major programmatic component and supplies researchers with animal test subjects.

The new expanded program for the CMRR strives to maintain those organizational principles with new magnet and research spaces in two new building expansions, combined with the reassignment and interior remodeling of existing magnets and support spaces. The existing range of animal magnets remains dedicated to animal research, with the reassignment of one human magnet space to an animal magnet space. Reassignments of magnet spaces in the current human range, allow for the creation of a mixed magnet zone. A third, completely new range becomes home to new research suites, incorporating larger human/animal magnets and human PET scanners. This new range of magnets will occur in new building construction that will parallel 21st Avenue SE to the East.

New to the CMRR research program is that of a clinical imaging center, complete with new MR PET and PET scanners and supportive equipment. This program makes up the fourth major function incorporated into the expanded CMRR. As many commonalities exist between prep, patient care, and research activities for both the traditional MR programs the new clinical PET programs, these new clinical functions will be housed in the same building expansion along 21st Avenue SE which supports the new human magnets. The clinical scanners work in conjunction with special pharmaceuticals, processed in new radiochemistry facilities that will anchor the new magnet range at the North end. This department will comprise a cyclotron, a hot and cold lab, offices and support spaces. This expansion will have a second floor and will house new administrative and conferencing spaces.

A building expansion to the North will house new lab spaces, a 17T vertical bore magnet and pre-clinical imaging facilities. The RAR will also expand North in response to the anticipated growth in animal-related magnetic resonance research. A new receiving zone and a second level mechanical penthouse will complete the North Expansion.

The increase in anticipated human research activity in both the traditional MR mode and the new PET mode requires an expansion to the current GCRC (human research subject) spaces. Growth in this department will occur as both a remodeling of current GCRG spaces and an additional patient care support zone within the new clinical imaging area.

Response to District Plan and Site Guidelines

Efficient Utilization of Land and Facilities
Sited between the McGuire Translation Research Facility (MTRF) and the new Medical Biosciences Building (MBB), the CMRR will architecturally and physically link the facilities in this portion of the new East Gate District.

Image / Architectural Character
The linear building will span the city block between the existing buildings, using the palette of glass, precast concrete and metal to present a unified identity for the campus. An on-grade walkway to MTRF and a skyway over 21st Street SE to MBB will allow researchers to move between the facilities.

Open Space / Landscape
Perimeter landscaping will have safety perimeter fencing integrated with plantings consistent with the campus context. Storm water run-off may be accommodated within swales along the south and east sides of the building. A central courtyard will provide additional green space, but will be carefully planted to allow maintenance on the highly sophisticated equipment within the CMRR

Circulation
The CMRR is a secure facility, both for the security of the research, as well as the safety of visitors and patients. Though it requires a controlled access, it will have an architectural dialogue with the campus. The architecture will provide security, while giving a sense of the people within the building.

Orientation Focus
With a new emphasis on receiving the clinical research visitor, a celebrated entrance, adjacent to that of the nearby MBB is planned to be on axis with that of the NE portal of the new football stadium across 6th Street SE. Public spaces within will take advantage of large glazed zones, offering views back to the stadium and future campus development.

Set Backs
The CMRR will respect current setbacks, observed at the adjacent MBB. New development for the CMRR will align with that of the adjacent MBB as required to permit a logical connection via the new skyway. Along new 21st Avenue SE, new construction will rest farther than the permitted setback minimum to allow for the potential of site parking and various landscape options.

Service Requirements

Access to the current CMRR is achieved via a service drive West of the facility. This drive connects to 6th Street SE and provides access to the current CMRR Receiving Bay. A new receiving zone is being established towards the NE corner of the site and will be accessed from a one-way service drive behind the new expansion which in turn connects to extended 21st Avenue SE. The new North Service Drive will also extent West completing a loop behind the building, linking 6th Street SE to 21st Avenue SE. The existing West Receiving Bay will primarily serve the CMRR's Research Animal Resource Facility and the new East Receiving Bay will primarily support the deliveries of magnet related materials.

Utilities

New electrical service will be derived from existing University manhole 2097 located on the access road between the current CMRR building and the existing MTRF building. This manhole contains University feeders that will be spliced and extended to supply two sources of power to the CMRR building to comply with University standards. A new four (4) barrel ductbank will be constructed from manhole 2097 to a new manhole directly outside of the CMRR addition vault room at the NW corner of the building. Individual conduits and 15kV, copper, shielded, type EPR primary cables will then be installed from the new manhole location underground to the new CMRR building medium voltage vault room.

Heating will be provided to the building means of a 120 psig high pressure steam (HPS) service connection direct buried from Vault #8 and routed along the West side of the existing and around the NW corner to the new expansion mechanical room.

An existing 8" combined water service to the existing building is connected to an existing 12" water main within 6th Street SE. This provides for both fire and domestic water to the existing building. This service connection will remain and waterline connections within the proposed addition will be made to the existing line. New and existing 15" RCP storm water sewers for both the main building and new expansion will connect back to an existing 24" reinforced concrete pipe (RCP) storm sewer located in 6th Street SE. A new 4" ductile iron pipe (DIP) sanitary sewer will serve the proposed addition and will connect to an existing 8" sanitary sewer within 21st Avenue SE or a 10" sanitary sewer in 6th Street SE.

Response to Architectural Design Guidelines

Architectural Style

New constructions will be flat roofed one and two story masses that derive their principle design queues from the massing and scale of the existing adjacent structures. Building mass expansions reflect the unique program requirements found within and are extenuated by changes in material or fenestration. New building mass and profile is contained within the site setbacks established by the neighboring research facilities.

Building Facade

Site constraints and interior programmatic priorities influenced an expansion strategy where new program became concentrated in a partially separate mass, with minimal connection to the main facility. With the main facility entrance, now associated with the new construction and closer to the adjacent MBB, moderate architectural treatments will be employed to play down the role of the original façade's entrance and to bridge the connection between the new and the existing.

Building Structural System

High magnet fields of the initial magnetic research programs dictated that the original CMRR structure be primarily wood structure and framing with some instances of CMU bearing walls. Though interior partitions around the new magnets may also be of wood framing, newer magnet shielding technologies will permit a change in overall expansion construction to cast in place reinforced concrete. A change in structural systems will allow for greater expanses of open areas within, higher floor to floor ratios and less restrictions on new construction size limits as determined by the local building codes.

Building Fenestration

Windows and exterior service and entry doors have been located logically, responding to the direct needs of the interior program. For instance, interior educational environments that would benefit from natural lighting have been planned with large banks of exterior windows. Research and lab areas not necessarily requiring much natural lighting or exterior views are provided with less and intermittent fenestration. In these areas, window placement may actually be a direct response to an externally driven design pattern and not from internal programmatic needs. Support or service areas requiring no natural daylighting generally have not been designed to support any exterior windows. Main entrances and commons areas benefit from nearly entirely glazed walls given pedestrians a glimpse of the activity within while acting as material break between potentially large areas of masonry wall. Color and reflectivity will complement the impression found in the adjacent MBB or MTRF.

Roof Systems

New constructions will be roofed in a single-ply mechanically fastened EPDM membrane. Though the original building's flat roof is of a ballasted built up system, the new system will help to meet sustainability goals by lowering energy costs. The new system will also relate to that on the neighboring MBB.

Detail and Ornament

In keeping with the post agricultural industrial urban aesthetic promoted within the emerging East Gateway District Plan, ornamentation will be minimal. Instead, overriding character for these new constructions will be enforced through expression of mass, proportion and material detail, not embellishment.

Interior Elements

Interior finishes will again reflect the quality of the adjacent lab buildings and the existing CMRR. Durable and cost effective, materials will respond to functional requirements. Circulation within the building will be clearly organized, with security access to control movement as necessary. Due to the high magnet fringe fields anticipated within the CMRR expansion, architectural construction and finish systems near the new magnets will limit ferrous materials. Other metals such as aluminum, copper and stainless steel are acceptable alternatives to steel and will be used whenever possible for clamps, clips, hangers, wires, nails, screws and other miscellaneous construction accessories.

Project Assumptions

Beyond the initial programmatic requirements set forth by the University, various site, infrastructural and district factors were evaluated during the development of the CMRR Expansion Program. These considerations have bearings on the physical character of the expanded CMRR as well as the anticipated construction costs.

West Connecting Link

Site constraints and interior programmatic priorities influenced an expansion strategy where new program became concentrated in a partially separate mass, with minimal connection to the main facility. This project assumes that the desired connection link between the MTRF to the West and the CMRR will not be feasible with the present expansion strategy and would require a substantial re-design to accommodate.

Northward Expansion of Project Site

This project assumes that the current Northern boundary to the present CMRR site will be extended further north by 80 feet. This property extension is crucial for the intended expansion configuration and necessary for the additional service drive required to properly access the building expansion areas.

Extension of Perimeter Streets

This project assumes that development of 21st Avenue SE, beyond the point at which it terminates at the MBB, will be necessary to properly access the proposed East Receiving Bay, which is justified to the NE corner of the proposed Expansion. Additionally, a one way service drive connecting the 21st Avenue SE extension to the MTRF's service drive at the West will complete a loop around the expanded CMRR.

Future CMRR Building Growth

Open space has been set aside for a future magnet bay construction. This occurs as a notch in the North Expansion between the cyclotron and the new chemistry labs. Development of this space into new building construction will compromise access to the NE receiving bay and service loop. Additional property may be required to remedy this situation.

Removal of Existing Soils

An existing bermed area to the East of the existing CMRR was consolidated and left on site after completion of the original CMRR construction. These soils may contain potentially hazardous materials and will require removal for construction of the two expansions. Costs for this material removal are assumed to be a part of the overall CMRR Expansion Construction costs.

Code Analysis

Applicable codes

- 2007 Minnesota State Building Code
- 2006 International Building Code
- 2000 Minnesota Energy Code
- 2007 Minnesota State Fire code
- 2006 International Fire Code
- 2000 Life Safety Code - NFPA 101
- 2005 National Electrical Code
- 2003 Minnesota State Plumbing Code
- 2004 Minnesota State Mechanical Code
- 2000 International Mechanical Code
- 2000 International Fuel Gas Code

Occupancy:

IBC Section 304

Existing Occupancy:

B - Research, Education above 12th Grade
B - Labs - Chemical use is below Table 307.1(1) & 307.1(2).

New Addition Occupancy:

B - Research, Education above 12th Grade
B - Labs - Chemical use is below Table 307.1(1) & 307.1(2).
A - Seminar Rooms
B - Skyways

Type of Construction:

IBC Chapter 6, Tables 601, 602, 704.8

Existing Construction Type:	Type V - B (Table 503)
Proposed New Construction Type:	Type II - A (Table 503)

Height and Number of Stories:

IBC Table 503 and Section 504

Existing Height:	21' (Street Floor elev. to Top of Roof elev.)
Proposed New:	36' (Street Floor elev. to Top of second Floor Roof elev)

Existing Stories:	one story above the grade plane.
Proposed New:	two stories above the grade plane.

Fire Protection System:

Existing Building has a complete automatic fire protection system.
Propose New Building with a complete automatic fire protection system.

Allowable Floor Area:

IBC Table 503 and Section 506

Type V-B Allowable Floor Area per Floor:	9,000 SF	(Table 503)
Type V-B Allowable Height:	2 Stories	(Table 503)
Type II-A Allowable Floor Area per Floor:	37,500 SF	(Table 503)
Type II-A Allowable Height:	5 Stories	(Table 503)

Type V-B Building Maximum Allowable Area: 36,000 SF (Section 506)
(Building Area Increase for Frontage (506.2) and 1 story (506.4).
Aa = (At+(At x If)+(At x Ix)) = 9,000 + (0)+(9,000 x 3) = 36,000 SF

Area Existing	40,800 SF
Area New Addition first floor	40,300 SF
Area New Addition second floor	20,000 SF
MBB Skyway	1,450 SF
Total New	102,550 SF

Fire Resistive Requirements:

2 hr Fire Wall between assumed buildings.

Table 601

BUILDING ELEMENT	TYPE V	TYPE II
Structural Frame	0	1hr
Bearing Walls		
Interior	0	1hr
Exterior	0	1hr
Nonbearing Walls and Partitions		
Exterior	0 per Table 602	0hr
Nonbearing Walls and Partitions		
Interior	0	0hr
Floor Construction	0	1hr
Roof Construction	0	1hr

Minimum Plumbing Fixtures:
Table 2902.1

First Level			
B Office	81,050 sf ÷ 100 sf/occ.= 810	1WC per 50	18
Second Level			
B Office	20,000 sf. ÷ 100 sf/occ.= 200	1WC per 50	4
Occ.	1002		22

	Fixtures Required	Fixtures Provided
Female Water Closets	11	11
Male Water Closets	11	9
Male Urinals		3
Female Lavatories	7	8
Male Lavatories	7	8

CMRR BUILDING TOTALS	
AREA NAME	TOTAL GSF
EXISTING BUILDING	40866 SF
NORTH EXPANSION	12217 SF
ELECTRICAL EXPANSION	1577 SF
CYCLOTRON EXPANSION	3536 SF
EAST EXPANSION	20007 SF
SOUTH LINK EXPANSION	2982 SF
EAST SECOND FLOOR	15246 SF
NORTH MECHANICAL	4760 SF
MBB SKYWAY CONNECTION	1462 SF
	102652 SF

SD PROGRAM PAGE 1			
AREA / FUNCTION	ACTUAL ASF TOTAL	EXPANSION PROGRAM ASF	RENOVATION
OFFICE	127 SF		
WORKROOM	182 SF		
WORKROOM	179 SF		
OFFICE	141 SF		
OFFICE	134 SF		
OFFICE	132 SF		
OFFICE	123 SF		
TERMINAL	248 SF		
SOFTWARE OFFICE	491 SF		
OPEN OFFICE	215 SF		EXTENSIVE
OPEN OFFICE	799 SF		
OFFICE	128 SF		
OFFICE	128 SF		
OFFICE	236 SF		
OFFICE	133 SF		
OFFICE	122 SF		
OPEN OFFICE	217 SF		EXTENSIVE
OPEN OFFICE	207 SF		EXTENSIVE
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OPEN OFFICE	3693 SF	3572 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
	10128 SF		

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CMRR EXPANSION

SCHEMATIC DESIGN SPACE PROGRAM

Project No.: 6059.003.26

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SD PROGRAM PAGE 2			
AREA / FUNCTION	ACTUAL ASF TOTAL	EXPANSION PROGRAM ASF	RENOVATION
HUMAN PHYSIOLOGY	147 SF	142 SF	EXTENSIVE
PATIENT	147 SF	142 SF	EXTENSIVE
PATIENT	134 SF	142 SF	EXTENSIVE
SOILED	79 SF	80 SF	EXTENSIVE
NURSE	197 SF	200 SF	EXTENSIVE
CLEAN	72 SF	72 SF	EXTENSIVE
TOILET	47 SF		
LAB A - WET	289 SF		
LAB B - HISTOLOGY	406 SF		
LAB C - PHANTOM	492 SF		
ANIMAL PHYSIOLOGY	322 SF		
TOILET	76 SF	75 SF	EXTENSIVE
FLEX	138 SF	100 SF	EXTENSIVE
OFFICE	139 SF	120 SF	EXTENSIVE
ANIMAL PHYSIOLOGY	331 SF	385 SF	
ANIMAL PHYSIOLOGY	331 SF	385 SF	
CHEM LAB	1036 SF	1000 SF	
	4383 SF		

SD PROGRAM PAGE 3			
AREA / FUNCTION	ACTUAL ASF TOTAL	EXPANSION PROGRAM ASF	RENOVATION
CONTROL 4.0	189 SF		
4.0T	539 SF	557 SF	EXTENSIVE
RF ROOM 4.0 / 7.0	2009 SF		
ANALYSIS	149 SF		
CONTROL 7.0	192 SF	264 SF	
CONFERENCE	305 SF		MINIMAL
PROCEDURE 4.7	358 SF	355 SF	EXTENSIVE
SERVER	242 SF		
RF ROOM 9.4	655 SF		
PROCEDURE 9.4	331 SF		
CONTROL 9.4	178 SF		
9.4T	396 SF		
PROCEDURE 9.4	317 SF		
RF ROOM 4.7 / 9.4	526 SF		
CONTROL 16.4	375 SF		
16.4T	336 SF		
PROCEDURE 16.4	326 SF		
CONTROL 4.7	245 SF		
EQUIP ACCESS 4.7	85 SF		
7.0T	557 SF		
9.4T	608 SF		
4.7T	393 SF		EXTENSIVE
RF ROOM 16.4	565 SF		
CONTROL 9.4	434 SF		
MRI MOCK-UP	174 SF		
MRI ROOM	91 SF		
STAGING 4.0	100 SF	100 SF	EXTENSIVE
7.0T	608 SF	742 SF	
MR / PET	430 SF	533 SF	
STAGING 7.0	100 SF	100 SF	EXTENSIVE
STAGING 3.0	100 SF	105 SF	
STAGING 10.5	103 SF	85 SF	
STAGING 7.0	100 SF	100 SF	
STAGING MR / PET	80 SF	100 SF	
CONTROL 7.0	223 SF	248 SF	
PROCEDURE 10.5 / 7.0	309 SF	316 SF	
RF ROOM 10.5	888 SF	630 SF	
RF ROOM 3.0 / 7.0	1333 SF	1264 SF	
10.5T	608 SF	875 SF	
CONTROL 10.5	241 SF	305 SF	
3.0T	392 SF	561 SF	
CONTROL 3.0	223 SF	308 SF	
CONTROL MR / PET	186 SF	308 SF	
RF ROOM MR / PET	300 SF	360 SF	
SERVER / TELECOM	341 SF	500 SF	
	17240 SF		

RSP Architects Ltd.
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SD PROGRAM PAGE 4			
AREA / FUNCTION	ACTUAL ASF TOTAL	EXPANSION PROGRAM ASF	RENOVATION
TOILET	64 SF		
LOCKER ROOM	63 SF		
LOCKER ROOM	63 SF		
TOILET	64 SF		
PRIMATES	385 SF		
ANTE ROOM	115 SF		
PRIMATES	178 SF		
FLEX ROOM	178 SF		
PIGS	214 SF		
DOGS	274 SF		
OFFICE	85 SF		
HOUSEKEEPING	75 SF		
FOOD & BEDDING	124 SF		
CLEAN CAGE	364 SF		
PREP	91 SF		
SCRUB	86 SF		
SURGERY	267 SF		
CAGE WASH	378 SF		
PRIMATE	328 SF	242 SF	
ANIMAL	244 SF	242 SF	
ANIMAL	244 SF	290 SF	
PRIMATE	328 SF	385 SF	
ANIMAL PROCEDURE	244 SF	261 SF	
DIRTY CAGE	271 SF	300 SF	
ANIMAL	244 SF	242 SF	
ANTEROOM	178 SF	118 SF	
	5146 SF		

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SD PROGRAM PAGE 5			
AREA / FUNCTION	ACTUAL ASF TOTAL	EXPANSION PROGRAM ASF	RENOVATION
WOMEN	168 SF		
MEN	163 SF		
STORAGE	95 SF		
RECEIVING	725 SF		
STORAGE	100 SF		
STORAGE	160 SF		
JANITOR	75 SF		
COPY / MAIL	115 SF		
CONFERENCE	221 SF		
OPEN OFFICE	859 SF	1050 SF	MINIMAL
STORAGE	297 SF	500 SF	
ELEC. SHOP	735 SF	786 SF	EXTENSIVE
MECHANICAL SHOP	289 SF	644 SF	
VESTIBULE	130 SF	93 SF	
STAIR A	235 SF	248 SF	
CONFERENCE	311 SF	270 SF	
SEMINAR	1873 SF	1900 SF	
MEN	203 SF	170 SF	
WOMEN	202 SF	175 SF	
RECEIVING	704 SF	1007 SF	
LOUNGE	986 SF	668 SF	
SHOWER	87 SF	120 SF	
SHOWER	87 SF	120 SF	
CONFERENCE	299 SF	477 SF	
STAIR B	328 SF	236 SF	
ELEVATOR	80 SF	65 SF	
TELECOM	128 SF	100 SF	
GUEST BREAK	241 SF	150 SF	
SEMINAR PREP	115 SF	160 SF	
CONFERENCE	173 SF	214 SF	
MEN	252 SF	210 SF	
WOMEN	252 SF	210 SF	
LOBBY / WAIT	1775 SF	794 SF	
COATS / LOCKERS	232 SF	192 SF	
COPY / PRINT	102 SF	80 SF	
	12798 SF		

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SD PROGRAM PAGE 6			
AREA / FUNCTION	ACTUAL ASF TOTAL	EXPANSION PROGRAM ASF	RENOVATION
WATER SERVICE	91 SF		
EQUIPMENT ROOM	267 SF		
MECHANICAL	2076 SF		
CHILLERS & PUMPS	444 SF		
BOILERS	578 SF		
ELECTRICAL	511 SF		
TELECOM	128 SF		
OFFICE	118 SF	80 SF	
GENERATOR	256 SF		
MEDIUM VOLTAGE VAULT	512 SF	470 SF	
MECHANICAL	3266 SF	2160 SF	
ELECTRICAL	587 SF	470 SF	
MECHANICAL	385 SF	662 SF	
ELECTRICAL	119 SF	71 SF	
CHILLER ROOM	713 SF	459 SF	
	10049 SF		

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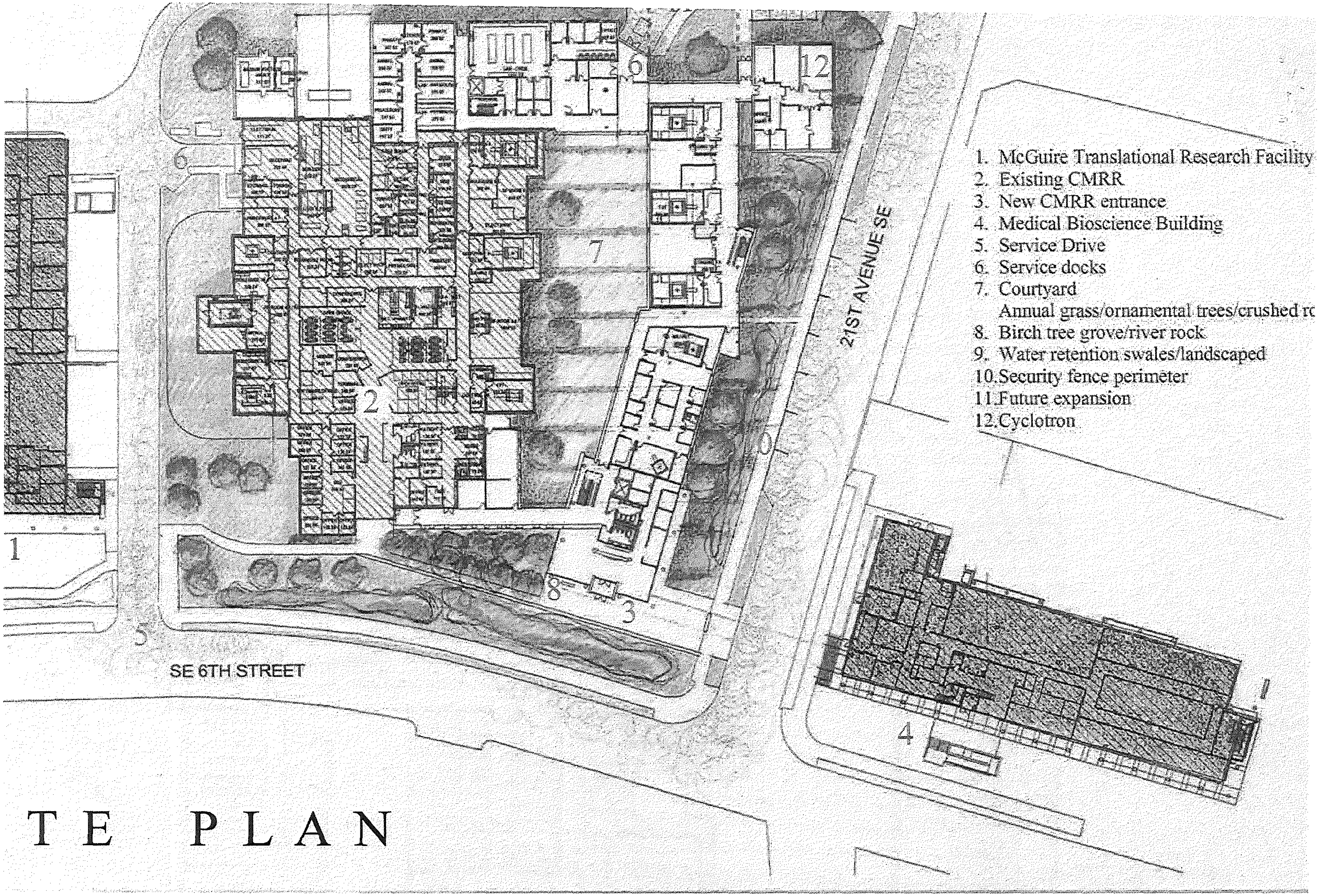
SD PROGRAM PAGE 7			
AREA / FUNCTION	ACTUAL ASF TOTAL	EXPANSION PROGRAM ASF	RENOVATION
CHEM LAB	578 SF	600 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
ANIMAL UPTAKE	80 SF	50 SF	
HOT LAB	80 SF		
TISSUE	133 SF	100 SF	
TISSUE	133 SF	150 SF	
17.0T	384 SF	360 SF	
MICRO PET	287 SF	200 SF	
CYCLOTRON VAULT	528 SF	600 SF	
HOT LAB	379 SF	725 SF	
CONTROL	64 SF		
DISTRIBUTION	261 SF		
CHEMISTRY	425 SF	725 SF	
QC LAB	390 SF		
OFFICE	119 SF	120 SF	
OFFICE	119 SF	120 SF	
PATIENT	165 SF	150 SF	
PATIENT	164 SF	150 SF	
PATIENT	162 SF	150 SF	
UPTAKE	81 SF	76 SF	
UPTAKE	81 SF	76 SF	
RADIOPHARMACY	54 SF	40 SF	
STAGING	80 SF	76 SF	
STAGING	80 SF	76 SF	
HOT TOILET	81 SF	50 SF	
NURSE	1270 SF	326 SF	
CONTROL PET / CT	206 SF	160 SF	
PET / CT	430 SF	360 SF	
RF ROOM PET / CT	135 SF	400 SF	
STAFF AREA	407 SF	120 SF	
VIEWING	118 SF	150 SF	
CONFERENCE	186 SF	220 SF	
	8256 SF		


1. McGuire Translational Research Facility
2. Existing CMRR
3. New CMRR entrance
4. Medical Bioscience Building
5. Service Drive
6. Service docks
7. Courtyard
Annual grass/ornamental trees/crushed r
8. Birch tree grove/river rock
9. Water retention swales/landscaped
10. Security fence perimeter
11. Future expansion
12. Cyclotron
21ST AVENUE SE
SE 6TH STREET

TE PLAN

MEDIUM VOLTAGE VAULT
GENERATOR
ELECTRICAL
ELECTRICAL
RECEIVING
STORAGE
STORAGE
BOILERS
MECHANICAL
CHILLERS & PUMPS
JANITOR
PROCEDURE 4.7
4.7T
CONTROL 4.7
EQUIP. ACCESS 4.7
PROCEDURE 16.4
16.4T
RF ROOM 16.4
CONTROL 9.4
RF ROOM 4.7/9.4
PROCEDURE 9.4
CONTROL 9.4
9.4T
ANIMAL
ANIMAL
RAR PROCEDURE
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PRIMATE
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PRIMATE
LAB - PHYSIOLOGY
CAGE WASH
CLEAN CAGE
SURGERY
FOOD & BEDDING
HOUSEKEEPING
SCRUB
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PIGS
FLEX ROOM
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LOCKER ROOM
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MICRO PET
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CONTROL 9.4
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PROCEDURE 9.4
MRI MOCK-UP
RF ROOM 9.4
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CONTROL 7.0
7.0T
STAGING
ANALYSIS
RF ROOM 4.0/7.0
STAGING 4.0
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CONTROL PET/CT
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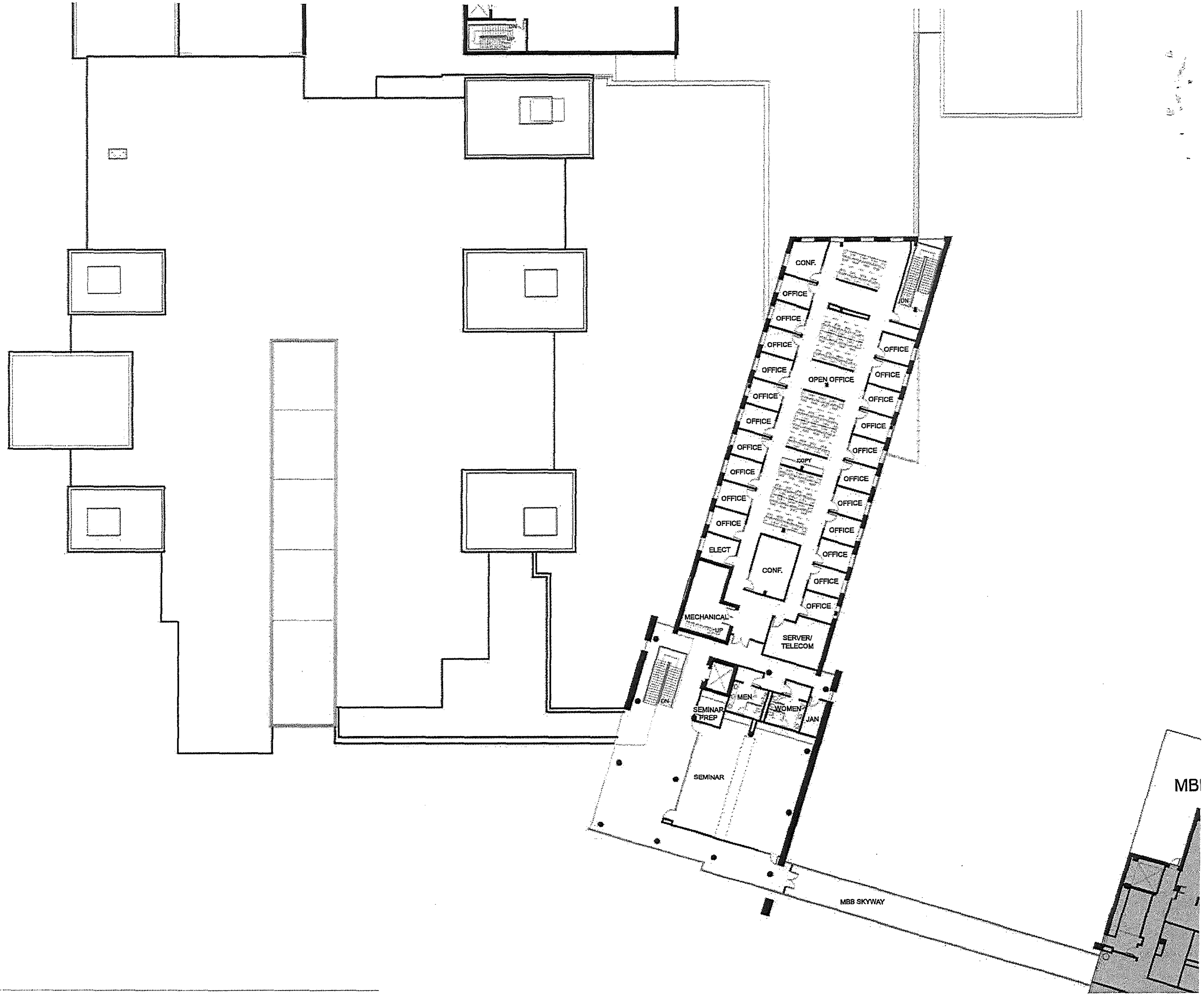

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MEDIUM VOLTAGE VAULT
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STORAGE
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BOILERS
MECHANICAL
CHILLERS & PUMPS
ANIMAL
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CAGE WASH
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MICRO PET
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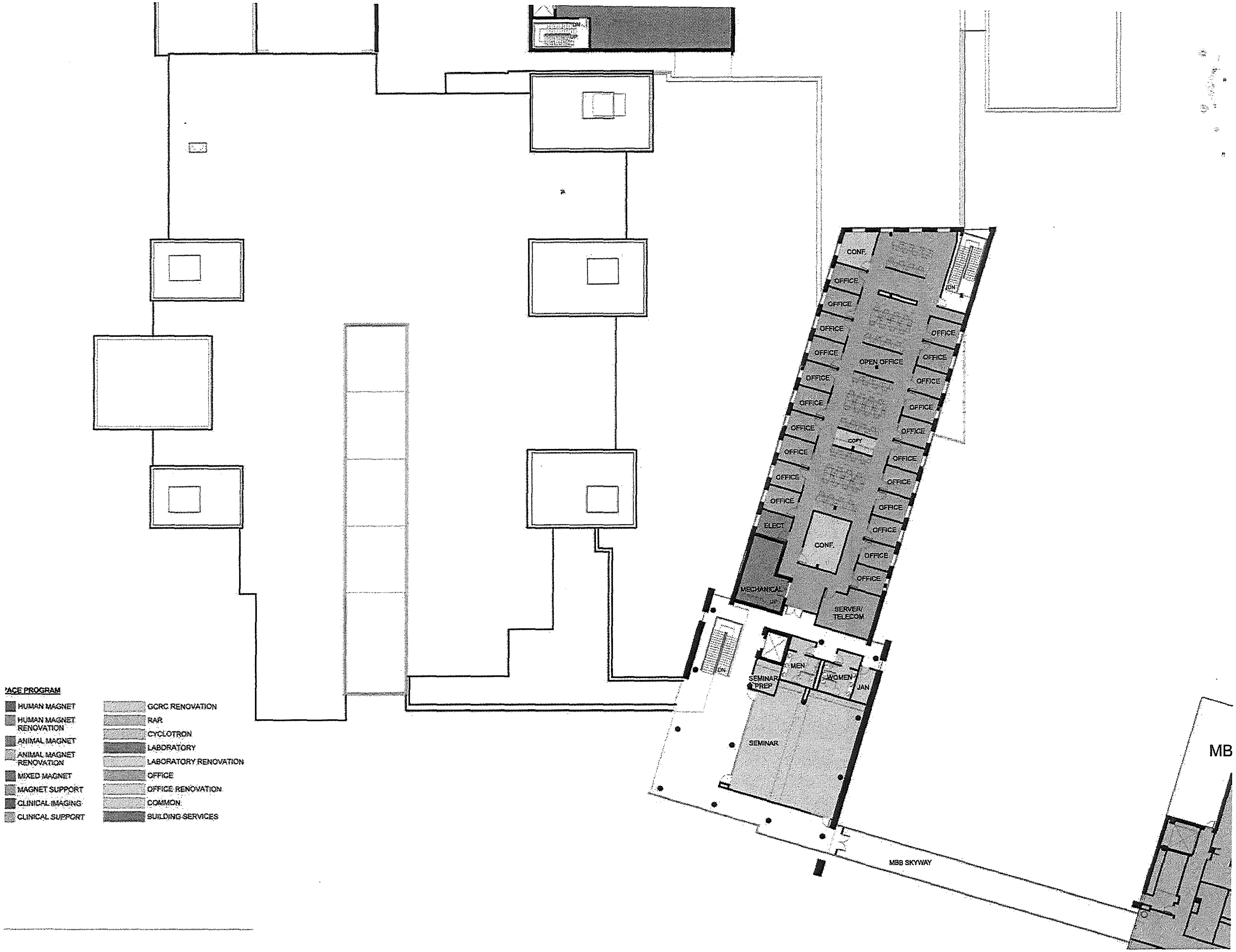
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COMMON
BUILDING SERVICES


MEDIUM VOLTAGE VAULT
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ELECTRICAL
RECEIVING
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BOILERS
MECHANICAL
CHILLERS & PUMPS
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9.4T
PROCEDURE 9.4
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RF ROOM 9.4
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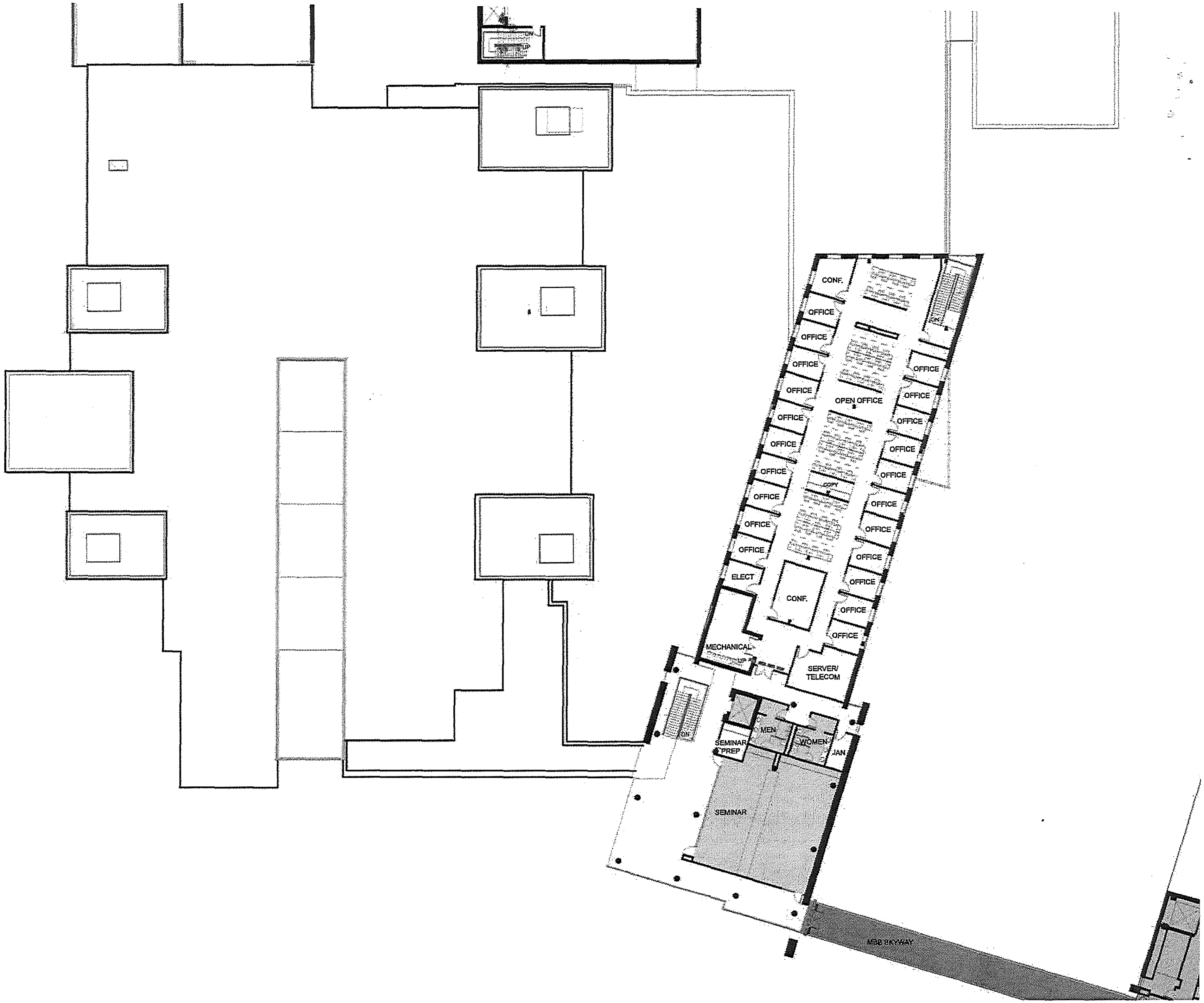
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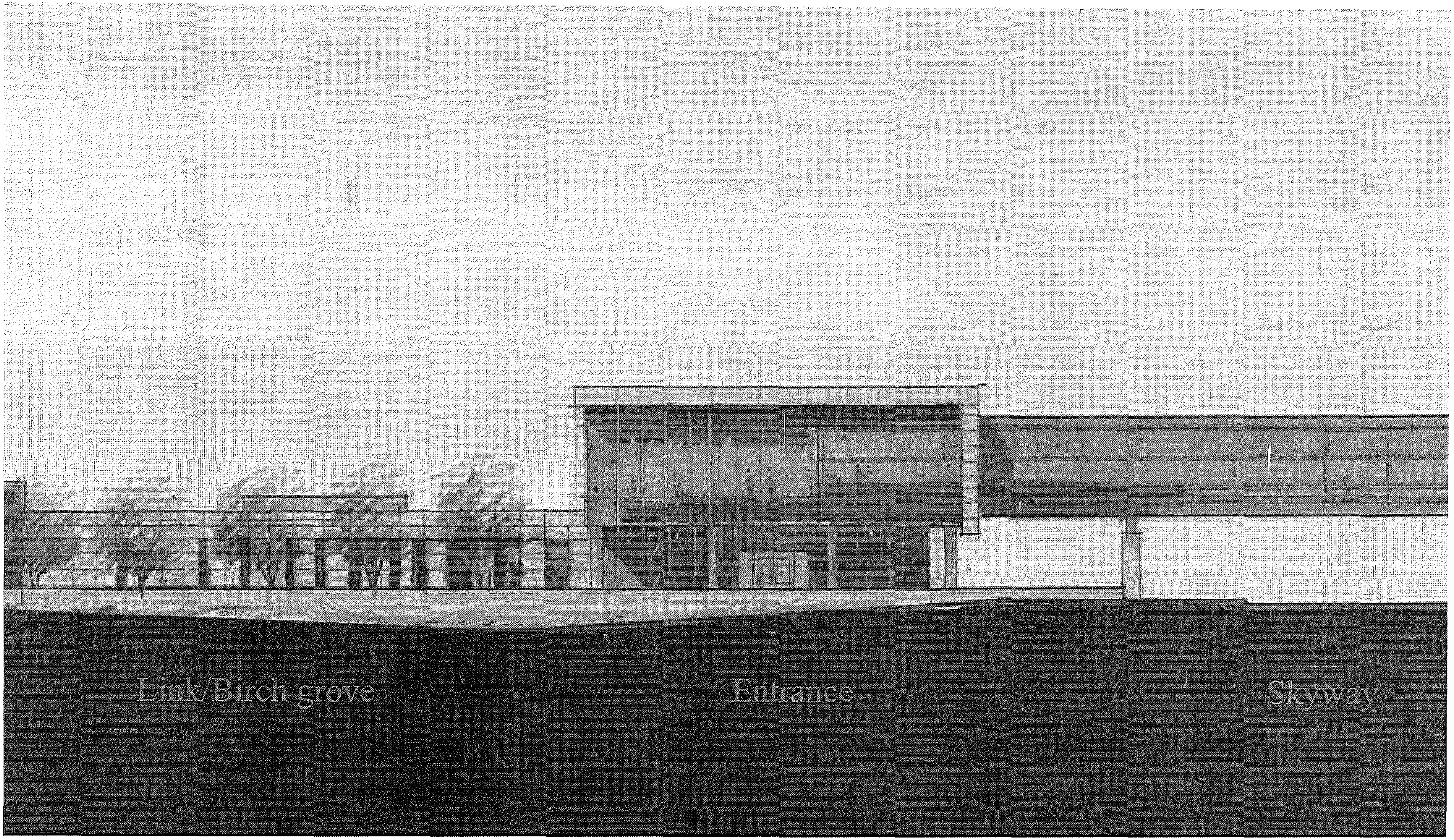
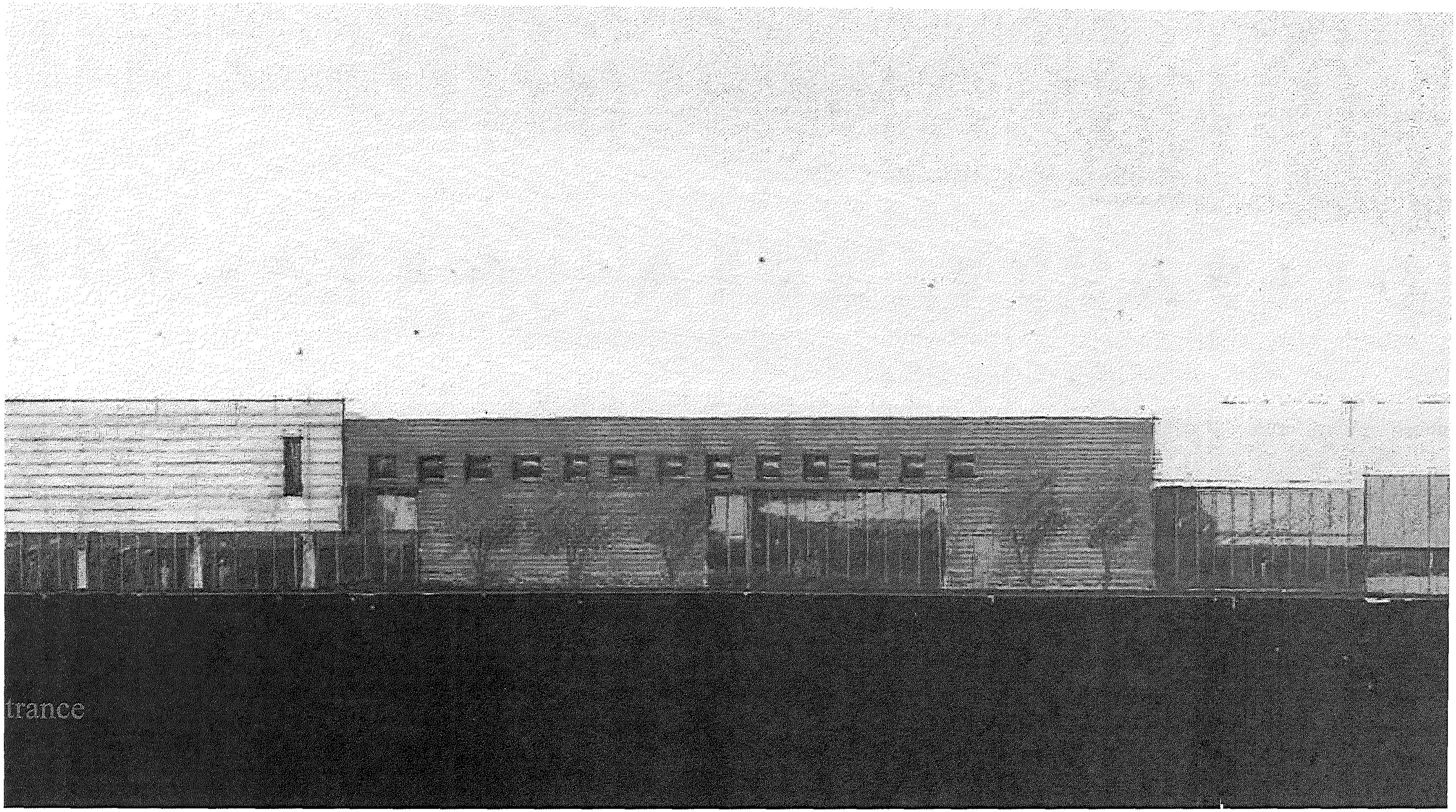
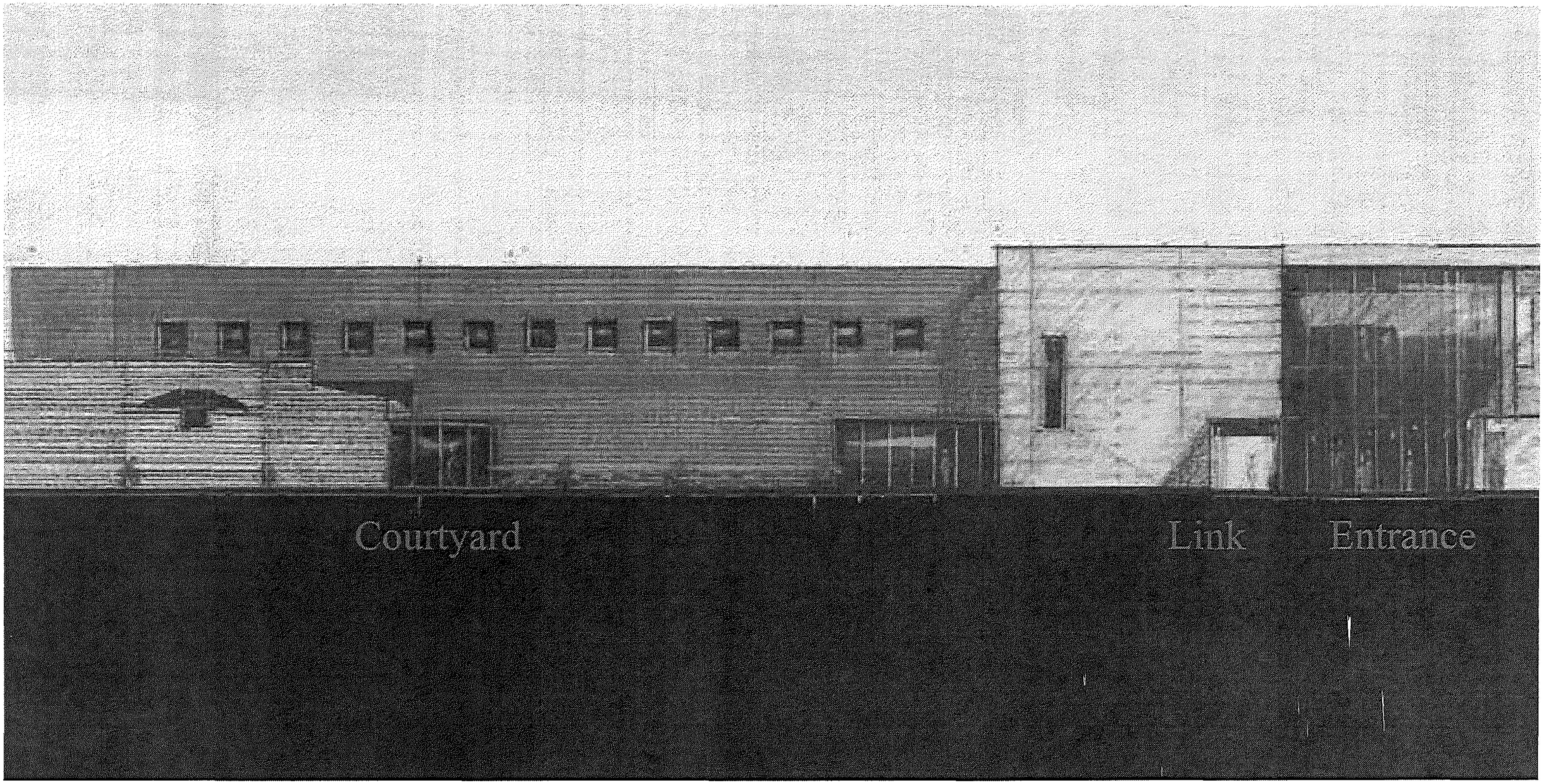


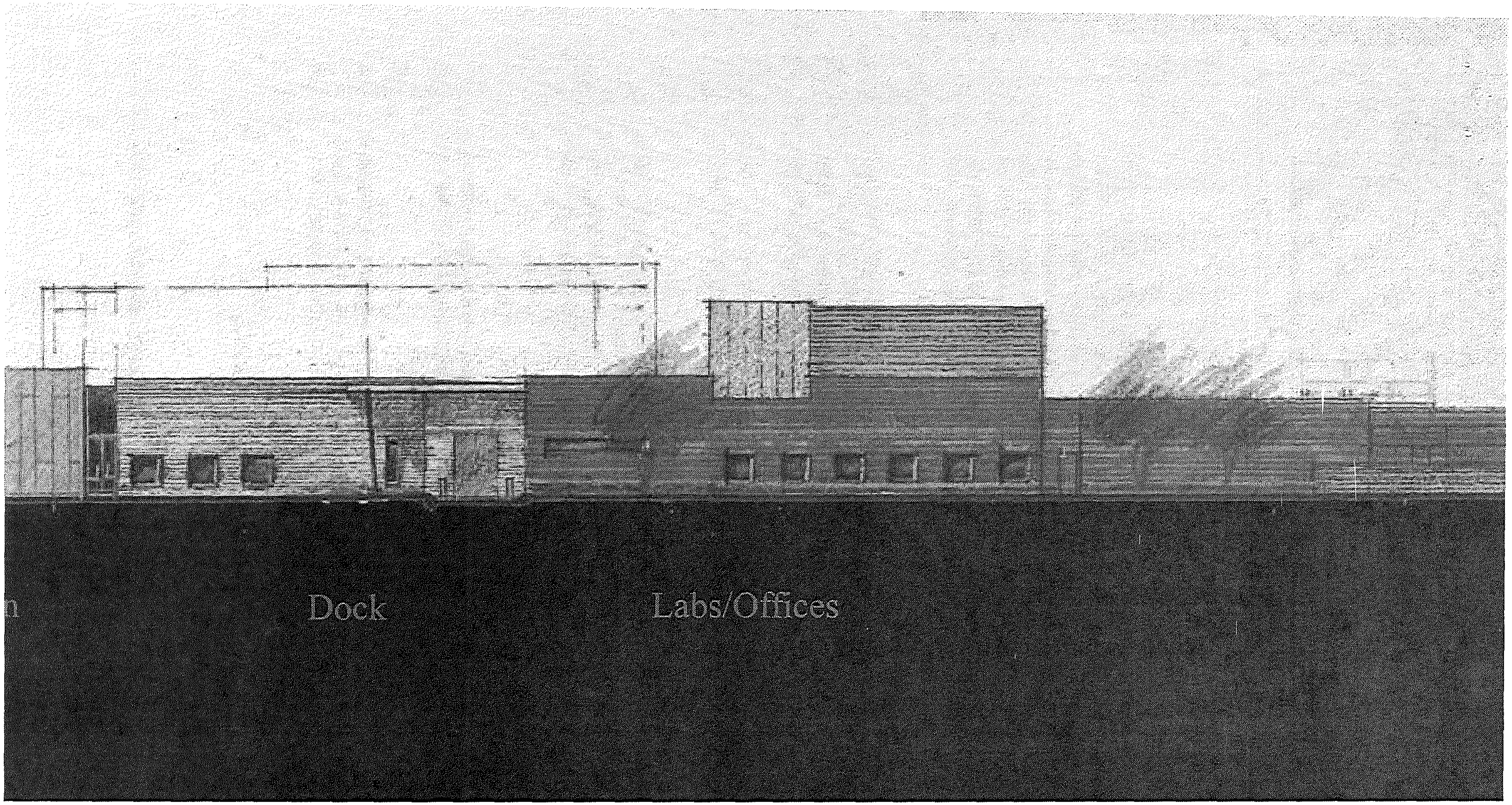
SOUTH ELEVATION



AST ELEVATION



OURTYARD WEST ELEVATIO



ORTH ELEVATION

DESIGN NARRATIVE

CIVIL

Soils

The soil correction within the existing facility consisted of excavating approximately six feet below the finished floor elevation to the existing natural sands. Sand was imported to the site to use as fill but did not meet specifications so on-site soils were mined from the area adjacent to the proposed building. The unsuitable imported sand and on-site excavated material was then used as fill in the "mined" areas and also disposed of in the 12' high berm on the east side of the site. Since these soils are not suitable for construction and may contain petroleum and thus contaminated, they will need to be removed from site and brought to a landfill to accommodate the proposed addition. The mined area is located on the west and northwest corner of the adjacent parking lot.

The soil excavation for the proposed addition will consist of excavating the poor and contaminated soils approximately 15-25 feet. The removal of these soils will need to be coordinated with University of Minnesota Department of Environmental Health & Safety (DEHS). Imported fill will be necessary to bring the grades to the required depth throughout the building footprint and parking lot area.

There is an existing modular block retaining wall on the east side of the existing building adjacent to the berm. This wall will be removed as the berm is removed

Information on the existing soils was taken from A Final Special Inspection Report for The University of Minnesota Center for Magnetic Resonance Research prepared by Braun Intertec Corporation, Project BAXX-96-836, dated May 28, 1998 and Limited Phase II Environmental Site Assessment University of Minnesota Center for Magnetic Resonance Research prepared by Meisch & Associates, Ltd. dated August 6, 2002.

Pavement

On the west side of the existing building, there is an existing bituminous driveway that is shared with the adjacent building to the west (MTRF.) The driveway allows dumpster truck and delivery access to the loading dock on the northwest corner of the existing building.

On the east side of the existing building, there is an existing parking lot that contains six parking stalls (one for an ADA accessible vehicle, one for University staff and four general parking spaces.) There is an ambulance driveway that leads to an existing overhead door and there is a bump-out in the driveway to allow an ambulance to turn around.

The parking lot and ambulance driveway will be removed for the new addition.

Proposed 21st Avenue SE will be extended to the north edge of the proposed CMRR addition. The existing curb cut and parking lot along 6th Street SE will be removed. A proposed new parking area along an extended 21st Avenue SE will consist of approximately ten parking stalls (one for an ADA accessible vehicle) for patient parking.

There will be concrete curb and gutter along the parking areas, street and service driveway.

There is an existing bituminous path within the right-of-way on the south side of the existing building that follows the roadway. There is another concrete sidewalk just north of this path that follows this same line. There are stairs from the bituminous path to the concrete path that allows access to the existing main entrance of the building. This main entrance will be relocated to the east side of the proposed addition and thus the concrete stairs and sidewalk will be removed and sidewalks to the main entrance will be relocated.

Concrete stoops will be placed at all egress locations.

Storm Sewer

There is an existing 24" reinforced concrete pipe (RCP) storm sewer located in University-owned 6th Street SE. There is a 15" RCP storm sewer that connects the roof drain system of the existing building located in the vicinity of the existing main entrance. There is another 15" RCP sewer line and catch basin/manhole system on the east side of the building that collects the storm water runoff from the existing parking lot. Both sewer lines connect to the 24" main line. This roof drain was rerouted to discharge to the on-site rain gardens that infiltrate and drain to the storm sewer that discharges to the new stormwater pond located on the southwest side of the TCF stadium.

A second 15" RCP storm sewer will be added to accommodate the proposed roof area of the addition. The storm sewer will connect to the new storm water management system for the addition.

Storm Water Management

The City of Minneapolis is the local governing unit for the Mississippi Watershed District. The CMRR addition will have to provide stormwater management for rate control to meet the pre-developed discharge and water quality to remove 70% TSS (total suspended solids) on its own site. Given the constraints of the available open space on the site, a surface pond cannot fit on the site. Instead a combination of systems may need to be designed to handle the runoff for the existing and proposed building. NURP (Nationwide Urban Runoff Program) Standards will need to be followed.

An extension of the existing 6th Street SE bioswales, North along 21st Avenue SE may be considered as a site feature as well as a means to control storm water runoff. Additionally, stormwater runoff, storage may be required in an underground tank system, with controlled release features to delay passage into the local stormwater main. The tank could be located on the east side of the building. A pump lift station and emergency generator would be required to connect to the storm sewer in 6th Street SE as the storm sewer system is shallow and a gravity drained outlet will not work.

Sanitary Sewer

There is an existing 10" vitrified clay pipe (VCP) sanitary sewer located within University-owned 6th Street Southeast. A 6" VCP sanitary sewer connection serves the existing building and is approximately located at the existing main entrance. This sewer will remain and serve the existing building.

There is an 8" DIP Class 52 cement-lined sanitary sewer located in 21st Avenue SE. This ends at a sanitary manhole that connects a service line to the new MBB facility. A new 4" ductile iron pipe (DIP) will be needed to serve the proposed addition. This connection will be made to the existing sanitary sewer within 21st Avenue SE or 6th Street SE.

Water main

There is an existing 12" ductile iron pipe (DIP) water main located within University-owned 6th Street SE. There is a fire hydrant connection at the southeast corner of the site between the parking lot driveway and 21st Avenue SE. There is an existing 8" DIP water main located within 21st Avenue SE. There is an 8" DIP stub to the north. There is a fire hydrant on the CMRR side of the street.

A new fire hydrant will need to be placed near the northeast corner of the proposed addition to maintain fire coverage for the entire building. The 8" DIP line within 21st Avenue SE will be extended to northeast side of the building to the new fire hydrant.

There is an existing 8" combined water service to the existing building that is connected to the existing 12" water main within 6th Street SE. This provides for both fire and domestic water to the existing building. This service connection will remain and waterline connections within the proposed addition will be made to the existing line.

Fence

There is existing black, wrought-iron fencing along the perimeter of the high magnetic field line on both the west and east sides of the existing building. Within this fence, there is landscaping rock from the building to the fence line and warning signage pertaining to the high magnetic field.

The fencing and rock will be relocated on the east side of the building to accommodate the proposed addition. The relocated fence will be placed along the 1 Gauss line of the new magnets. The landscaping rock will be placed as it is currently, from the building to the fence line. Existing warning signage will need to be properly located on the fence.

Other Utilities

There are existing light poles, underground electrical lines and conduits and telecommunications lines on the south side of the building. The poles and lines will need to be relocated to accommodate the proposed addition and new light poles will be added to the site to provide exterior lighting for the new addition and parking lot. Refer to the electrical narrative.

Existing piping for steam and condensate lines are located within 6th Street SE and the CMRR addition can connect to it. See mechanical narrative for further discussion of chilled water and steam and condensate piping.

Erosion & Sediment Control

A Storm Water Pollution Prevention Plan (SWPPP) will be prepared for the addition in accordance with the Minnesota Pollution Prevention Control Agency (MPCA) requirements for projects that disturb over one acre of land. The SWPPP will describe the practices that will be implemented to control erosion on the site and the release of pollutants into the storm water systems; create an implementation schedule to ensure that the practices described in the SWPPP are implemented and to evaluate the plan's effectiveness in reducing erosion, sediment, and pollutant levels in storm water discharged from the site; and describe the final stabilization/termination design to minimize erosion and prevent storm water impacts after construction is complete.

Silt fence, rock construction entrance, catch basin inserts, dewatering station and a concrete washout structure will be required for on-site use. Additional erosion and sediment control will be required on site throughout the duration of the project.

Landscape

All landscape work design will be done by the University of Minnesota staff. The University may want to salvage some of the plants on site prior to construction and this will need to be coordinated during design and construction. The addition will need to be properly staged to protect existing trees and plantings. Materials or vehicles cannot be stored in these areas and must be done outside the areas that are not to be disturbed.

ARCHITECTURE / STRUCTURE

Overview

Architectural Overview

The proposed CMRR Expansion and Renovation will provide facilities to accommodate the expanding programs. The first project in the Biomedical Research Facilities approved by the 2008 Minnesota legislature, it will provide approximately 62,000 gross square feet of additional space for research labs, offices and support spaces.

Envelope

Foundations

Foundation walls for the new expansion typically will be of poured concrete walls and footings to below frost depth. Due to the high water table in the immediate area, there will be no basement level. Ground floor construction will be reinforced concrete slab on grade over a 6" minimum sand cushion and vapor barrier over grade. Rooms supporting small magnets will require thicker concrete slabs isolated from adjacent floor slabs to provide seismic attenuation. Rubber isolation pads ½ thick, the entire depth of the slab, will provide that transient vibration isolation.

The soil borings for this addition have not been completed at this point, but based on the existing construction we anticipate the structure will be supported by conventional spread and wall footings with a bearing capacity of 3000 psf. Perimeter footings will be dropped for frost protection.

Larger magnets may require an additional perimeter steel shield, which will increase the need for a substantial concrete foundation to support the weight of the steel shield, plus and additional depth of concrete to support the weight of the magnet. These composite foundations may achieve a total depth of up to 8' below grade. These composite foundations will also require perimeter vibration isolation from adjacent floor slabs. Foundations designed for steel shield assemblies will require a continuous waterproofing application on the foundation side walls as well as the underside of the supportive foundation slab to protect the steel against potential moisture migration.

North expansion of existing building

This portion of the building includes mechanical rooms, electrical rooms, the dock, the animal holding areas, and some lab areas. The roof structure for this portion of the building is anticipated to consist of 8" precast plank spanning no farther than 30 feet, and supported by masonry bearing walls and steel beams and columns as required. The mechanical room floor system anticipated to consist of a 12" precast plank with a 2" minimum structural topping supported by masonry bearing walls and steel beams and columns as required. The first floor slab will be a 5" reinforced slab on grade at the loading dock, mechanical and electrical rooms and a 4" slab on grade with welded wire fabric or fibermesh in the remainder of this area.

East Wing

This area included the new human magnets and scanners, the new entry to the facility, pre-function area, seminar rooms and mechanical penthouses. The following is the structural system being considered for this area:

Roof and floor structure will consist of a cast-in-place concrete pan and joist system with flat beams. Based on 20' x 28' bays, the joist slab will consist of 30" wide pan forms with 6" wide joists. The pan forms will be 14" high and the slab over the domes will be 5" thick for an overall thickness of 19". Beams will typically be 30" wide by 19" deep. The mechanical floors will be similar to the typical floors, but the depth of the pans will be 20" with a 5" slab for an overall thickness of 25"and the joists will be 7" wide. Beams for the mechanical floors will typically be 30" wide by 25" deep. Reinforcing steel is estimated to be 4.2 psf for the typical floor and roof and 4.2 psf at the mechanical floors. Drop beams may be required around stair and elevator openings, at the perimeter of the slab when supporting heavy exterior wall loads, and where the skyway to MBB connects to this building. Columns are estimated to be 20 to 24" square.

North Addition

Roof and floor structure will consist of precast plank slabs supported by precast inverted tee beams. Based on 20' x 28' bays, the precast plank will typically be 8" thick with a 2" minimum topping at the floors and un-topped at the roofs. The inverted tee beams will be 16" wide by 16" deep with 4" wide by 8" deep haunches to support the plank. The mechanical room floors will be 12' thick plank with 2" minimum topping. The inverted tee beams in these areas will be 16" wide by 24" deep with 4" wide by 12" deep haunches to support the plank. Additional precast beams may be required around stair and elevator openings, at the perimeter of the slab when supporting heavy exterior wall loads, and where the skyway to MBB connects to this building. Columns are estimated to be 16 to 18" square.

Skyway to MBB

The floor and roof structure for the skyway will consist of a composite slab supported by composite beams. The beams will be supported by a pair of steel trusses that will span from the CMRR project to an intermediate support and then across 21st Avenue SE to the second floor of the MBB.

Roofing

The roofing system envisioned for the new expansions will be primarily single layer mechanically fastened EPDM membrane over rigid insulation and fibreboard. Heavy duty walk pads will be placed around all serviceable roof top equipment.

Exterior Finishes

Exterior material finish pallet will be complementary of the neighboring MBB and MTRF. Principle facades facing both 6th Street SE and 21st Avenue SE will be primarily a smooth, buff-tone precast concrete with accents of red brick. Clear anodized aluminum will be used for wall capping and other accents. Finishes along the North Expansion will be primarily of red brick and precast accents to match the existing CMRR finishes. The Cyclotron component will be sheathed in copper panel. Mechanical air louvers will be of a clear anodized

Fenestration

South facing facades will utilize large expanses of curtain wall glazing. Smaller punch-hole windows will be of clear anodized aluminum frames and glazing. Interior glazed zones facing the inner courtyard will be of clear anodized curtain wall glazing. Portions of the North courtyard curtain wall will be removable to facilitate the transfer of magnets out of the facility, through the courtyard. Glazing within curtain wall systems will be 'Panelite' insulating glass units. Color and reflectivity will complement the impression found in the adjacent MBB or MTRF.

Interior Environment

Interior Architecture

Interior partition systems will vary in construction depending on the function of the spaces being defined. Most interior partitions of administrative, general office, research subject care, and most research lab areas will typically be of wood stud framing with 5/8" gyp. bd. sheathing. Moisture resistant gyp. bd. or cement board will be substituted in spaces requiring an added level of durability or moisture resistance. Stud size may vary depending on application. Some interior partitions separating radioactive sensitive areas within the clinical imaging zone will require an additional layer of lead shielding to provide local radiation protection

Partitions defining the new magnet rooms will also be of wood frame construction with 5/8" gyp. bd. sheathing each side. Stud size will be from 6" to 10" deep, depending on the required height of the wall. The new CT PET and MR PET scanner rooms will require lead sheets in the perimeter walls for radiation protection.

Interior partitions throughout the RAR, including animal holding rooms, physiology labs and procedure rooms will typically be 8" hollow core CMU filled with sand for sound attenuation purposes. Additional layers of gyp. bd. may be applied for aesthetic or other programmatic purposes.

The cyclotron Room will require perimeter walls of reinforced poured concrete with an additional layer of lead sheeting for radiation protection. The poured concrete walls may be up to 12" thick. Other "hot" rooms in the CMRR will also require a layer of lead shielding in the partitions. Those rooms include the MR PET, the CT PET, the Micro PET and the Uptake Rooms.

Interior Finishes

Though most partitions will be painted, some may receive other specialty coatings or decorative wall finishes, again, based on the function. Spaces requiring an added level of durability or moisture resistance will be finished in an epoxy paint or coating system. These spaces may include wet labs, procedure rooms, and RAR rooms.

Flooring throughout labs, magnet control rooms, procedure rooms, storage rooms, clinical areas and will be of a seamless flooring material with integral coved base. Finish materials may include broadcast resinous epoxy or sheet vinyl. RF Equipment rooms supporting magnet spaces will receive raised aluminum access flooring. Concrete surfaces below the access flooring will be sealed to minimize "dusting" from the concrete. Office and administrative type spaces will receive carpet. Terrazzo, stone or ceramic tile floor materials will be explored for use the main public circulation, reception, waiting and break areas. Building services such as mechanical, electrical, receiving and the like will be sealed concrete. Flooring materials in primary circulation nodes will be terrazzo.

Ceilings throughout the CMRR will be predominantly Acoustical Ceiling Tile with aluminum grid. Instances of painted gyp. bd. ceilings or soffiting will also be used to accent spaces or provide transitions of ceiling material, ceiling heights or transitions between functions. Other decorative ceiling treatments and lighting options will be explored for the main entrance waiting and reception areas.

Doors and Frames

New interior door frames will be clear anodized aluminum with doors of flush wood, stained and varnished, with glass half lites. Plain sliced maple veneers will match the doors in the existing CMRR spaces. Glass fronted offices and conference rooms will be of clear anodized frames with tempered glazing.

Doors and frames to the Exterior will be of aluminum and glass in principle facades and hollow metal in back of house areas. An overhead articulating door will be used in the new Receiving area.

Casework

New lab scientific casework for wet labs and procedure rooms shall be MDF and plastic laminate construction with either solid surface counter or P-lam counter tops. Storage cabinetry shall be of MDF and P-lam construction. Due to the high magnet fringe fields anticipated within the CMRR expansion, built-in furnishings, equipment and accessories will limit ferrous materials. Other metals such as aluminum, copper and stainless steel are acceptable alternatives to steel when metal interior accents or fabrications are used.

Vertical Conveyance

An elevator located at the front entrance will provide vertical conveyance to second level office, administrative and seminar spaces. A second elevator will serve second level mechanical spaces above the new lab spaces in the North Expansion and will be sized adequately to accommodate the anticipated maintenance needs for that mechanical room.

Mechanical

Overview

Design Intent Document

This document is intended to represent the design intent and schematic design level description of mechanical systems for the CMRR Expansion project at the East Bank campus of the University of Minnesota.

General

The following building systems are described in this document:

- HVAC Systems
- Fire Protection Systems
- Laboratory/Medical Gases
- Domestic Water Systems
- Plumbing Systems

Code Compliance

The design of this facility will be in compliance with the current NFPA, IBC, IMC, IFC, MN Plumbing Code, and approved Minnesota amendments, Minnesota Codes and local code officials as of the date indicated in the construction documents. Construction methods shall adhere to the latest edition of the University standards, SMANCA and ASHRAE guidelines.

- 2000 Life Safety Code
- Minnesota State Building Code (SBC) 2003
- Minnesota Accessibility Code 1999 (MN Rules Chapter 1341)
- International Building Code (IBC) 2000
- Minnesota State Fire Code (SFC) 2003
- International Fire Code (IFC) 2000
- Minnesota State Mechanical Code 2004 (MN Rules Chapter 1346)
- International Mechanical Code (IMC) 2000
- International Fuel Gas Code (IFGC) 2000
- Minnesota Plumbing Code 2003 (MN Rules Chapter 4715)
- National Electrical Code (NEC) 2005
- 1999 Minnesota State Energy Code (Chapters 7676 + 7678)

General Building

This facility consists of a 62,000 square foot addition to the Center for Magnetic Resonance Research facility on the East Bank campus of the University of Minnesota. The facility will be constructed to support additional research and clinical magnets, expand the vivarium and increase the office and circulation areas of the building.

HVAC Systems

Design Conditions

Outdoor Temperatures and Humidity

The following table lists the outdoor dry bulb and wet bulb temperatures that will be used to calculate the building envelope cooling load for each month. The monthly data is based on the 1.0% values from Chapter 27, Table 4B in the 2001 ASHRAE Fundamentals Handbook for Minneapolis-St. Paul. The building cooling loads will be evaluated for each of the twelve months to determine the peak building load for all possible incident solar angles.

The Winter Design dry bulb temperature represents the Minnesota Energy Code Heating Design Condition and corresponds to the 0.4% winter design condition in Chapter 27, Table 1A in the 2001 ASHRAE Fundamentals Handbook for Minneapolis-St. Paul. This will be used to calculate the maximum heating envelope load for the building.

Outdoor Design Conditions

Minneapolis, St. Paul. Elevation 837 ft			
Month	Dry Bulb (°F_{db})	Mean Coincident Wet Bulb (°F_{wb})	Humidity Ratio (Grains/Lb)
January	39.6	34.9	23.2
February	45.4	39.4	27.1
March	61.8	51.6	42.2
April	77.6	59.9	51.0
May	85.7	66.0	66.9
June	91.0	72.3	92.7
July	93.7	74.5	101.6
August	91.3	73.9	101.8
September	85.7	70.6	91.6
October	76.2	62.2	63.7
November	60.4	52.8	49.0
December	43.0	38.2	27.3
Winter Design	-16	—	2.3

Instantaneous winter outside air loads such as air handling unit pre heat coils will be calculated using a winter design dry bulb temperature of -20°F. Instantaneous summer outside air loads such as AHU coils and energy recovery coils will be calculated using extreme design conditions of 92°F dry bulb and 75°F wet bulb.

Indoor Temperature, Humidity, and Ventilation Design Criteria

Summer and winter interior space conditions listed in the following table are based upon the Minnesota Energy Code, University of Minnesota construction standards, and information gathered from equipment manufacturers. Outside air ventilation rates and exhaust rates are based on ASHRAE standard 62.2001 Addendum N Table 2.

Space Type	Summer Indoor Conditions		Winter Indoor Conditions		Outside Air Ventilation Rate			Exhaust Rate		
	Max. Temp (F)	Max. RH (%)	Min. Temp (F)	Min. RH (%)	cfm/ person	cfm/ft^2	Ac/hr	cfm/ft^2	Ac/hr	Notes
Break	74	50	70	20	5	.06	-	0.7	-	
Circulation	74	50	70	20	5	.06	-	-	-	
Control	74	50	70	30	5	.06	-	-	-	
Cool Down	74	50	70	30	5	.06	-	-	-	
Custodial	74	50	70	20	-	-	-	-	4	2
Cyclotron	70	50	70	45	-	-	-	-	-	5
General Office	74	50	70	20	5	.06	-	-	-	
Chemistry Lab	74	50	70	20	-	-	10	-	10	6
Lobby	74	50	70	20	5	.06	-	-	-	
Mechanical	85	-	55	-	5	.06	-	-	6	4
Micro-PET	74	50	70	30	5	.06	-	-	-	
MRI	72	50	75	25	5	.06	10	-	-	
N.T.S.	74	50	70	30	5	.06	-	-	-	
RF Room	70	50	70	35	5	.06	-	-	-	
Storage	78	-	65	-	-	-	-	-	-	
Toilet	75	-	70	-	-	-	-	-	4	1,2
Vestibule	-	-	60	-	-	-	-	-	-	3
Vivarium	74	50	72	35	-	-	-	-	15	6

General Notes: Building summer humidity levels will be indirectly controlled at the AHU cooling coil.
Blank cells indicate the parameter is not applicable to that type of space.

Specific Notes

1. Toilet rooms will be exhausted at the rate specified or 75 cfm/water closet or urinal, whichever is greater.
2. Space will be ventilated by transfer air from adjacent ventilated spaces.
3. Mechanical cooling or ventilation will not be provided.
4. Mechanical cooling will not be provided. Space temperature will be maintained by mechanical ventilation.
5. Exhaust rate for the cyclotron room will be based on the minimum requirement of 500 cfm for each cyclotron. This space will be .05 negative with respect to adjacent areas.
6. Must comply with Appendix L of University Construction Standards with 2 Pascal negative pressure with respect to public spaces.

Internal Heat Gains

Internal loads due to people, lights, and equipment were determined based on the schematic plans and correspondence with RSP Architects. The internal cooling loads were calculated using the equipment heat release data listed table below. These values are subject to change upon review of equipment submittals from the owner and future furniture plans provide by RSP Architects.

Equipment	Heat Gain (Watts)	Notes
Cyclotron – to chilled water	20,500	
Cyclotron – to room air	4,000	
Cyclotron – Support Cabinets	11,000	
Desktop Laser Printer	100	
Desktop PC and Monitor	135	
Facsimile Machine	20	
Flat Screen Monitor (17")	100	
Flat Screen Monitor (40")	200	
Laptop PC	45	
Microwave Oven (1 ft3)	400	

Equipment	Heat Gain (Watts)	Notes
Office Copier (non-vented)	400	
Overhead Projector	400	
Refrigerator / Freezer (18 ft3)	340	
Transformer – 3- phase 75 KVA	1890	
Transformer – 3-phase 45 KVA	1280	
Vending Machine – Cold Beverage	600	
Vending Machine - Snack	250	
Video Projector	800	

The heat release from occupants is determined based on an average sensible load of 250 Btu/hr per person and an average latent load of 200 Btu/hr per person. Lighting load estimates are based on AHSRAE Standard 90.1-1999 Table 9.3.1.2.

Noise Criteria

The HVAC related background sound levels will be designed to meet the following noise criteria in the spaces listed. The following guidelines are based on the design guidelines listed in the 2007 ASHRAE Applications Handbook, Chapter 47, Table 42.

Space	Sound Criteria Level
Vivarium	NC 30 or less
Conference Rooms	NC 35 or less
Office – Private, Open Office	NC 35 or less
Corridors and Lobbies	NC 40 or less
Laboratories	NC 45 or less

Notes: 1. Diffusers shall be selected for 10dB lower than the room NC rating at rated flow to account for field installation.

The ambient noise levels from the mechanical systems will be designed to meet the following noise standards as specified in the Minnesota Rules part 7030.0040 for residential areas.

Daytime		Nighttime	
L_{50} (1)	L_{10} (2)	L_{50} (1)	L_{10} (2)
60 dbA	65 dbA	50 dbA	55 dbA

Notes: 1. Maximum sound pressure allowed at the nearest point of human activity for a sound source operating 50% of the time.
2. Maximum sound pressure allowed at the nearest point of human activity for a sound source operating 10% of the time.

Central Heating and Cooling Systems

Heating will be provided to the building means of a 120 psig high pressure steam (HPS) service connection direct buried from Vault #8 and routed along the West side of the existing building. The 4" HPS and condensate will be metered via University remote monitoring system (provided by University Energy Management) and then piped to a dual PRV station with manual bypass located in the Mechanical Penthouse. The steam meter will have a 100:1 turndown ratio. The steam and condensate meters will have a 3-valve bypass for servicing. The low pressure side of the building steam supply PRV station will have a steam pressure relief valve vented to the outdoors.

Two steam to heating water converters will be provided and each will be sized for 100% of the building connected load of 4,000,000 Btu/hr. The low pressure steam will be piped to the heat exchangers and to the humidifiers serving the air handling units.

The heating water system will be filled with clean water which will be circulated throughout the facility via two (100%) redundant pumps with variable frequency drives by means of variable primary pumping controlled by pressure differential.

The air handling unit preheat coils will be served via a shell and tube heat exchanger off of the main building loop. The air handler heating water system will be filled 35% propylene glycol (by volume) and pumped by two (100%) redundant pumps with variable frequency drives.

Cooling will be provided to the building via one, packaged air cooled chiller sized, one split chiller with remote condenser and a dry cooler. The cooling system will be sized for the full building cooling load estimated at 350 tons. The dry cooler (120 tons) will be provided to make chilled water when ambient conditions are below 30°F. The packaged air cooled chiller (175 tons) will be provided to make chilled water when ambient conditions are above 40°F. The split chiller (175 tons) with remote condenser will be provided to make chilled water when ambient conditions are between -16°F and 80°F. The dry cooler will be filled with 35% propylene glycol and will transfer cooling energy via a plate and frame heat exchanger. The packaged chiller, remote condenser and dry cooler will be located on the roof above the vivarium room. Each chilled water primary loop will include two (100%) redundant pumps with variable frequency drives. The chilled water pumps, air separator, heat exchanger and expansion tanks will be located within an enclosed mechanical room. All chilled water equipment will be configured with isolation valves and drain ports located at each the unit for servicing, flushing and filling. The chiller and chilled water system will be filled with clean water and will be circulated throughout the facility via two (100%) redundant pumps with variable frequency drives. A side stream or inline type water filtration system will be provided on the chilled water building loop to mitigate suspended particulates. All central station air handling units will be designed with full airside economizer, however winter operation of the chilled water system is necessary for the dedicated computer room cooling units and MRI equipment.

Cooling will be provided to the cyclotron machine by one 10.0 ton re-circulating loop chiller. The chiller will be dedicated to the cyclotron machine, and will have an air cooled condenser mounted on the roof. The chiller will be provided with a packaged de-ionized water system to treat the make-up water to the chiller and maintain it at 10.0 megohms.

Isolation valves, control valves, air vents, etc. in finished spaces shall be installed concealed but readily accessible.

Humidification Systems

Steam to steam humidifiers will be provided in the mechanical room to provide clean steam to the central station air handling units serving the animal holding, research, and cyclotron areas. An Electric humidifier will be provided for the air handling unit serving the office and administration areas. Make-up water for the humidifiers will be taken from city water. City water will also be piped to the humidifiers on the computer room cooling units and local magnet room humidifiers.

Air Handling Equipment

The cyclotron and adjacent lab spaces will be heated and cooled by one 11,000 cfm 100% outside air variable air volume (VAV) air handling unit (SUP-001). This unit will have isolated supply and exhaust air streams. The supply side will consist of an outdoor air damper, 30% pre-filters, 80% final filters, 50% glycol pre-heat coil, steam humidifier, pumped energy recovery coil, chilled water cooling coil, supply fan and VFD. The exhaust side will consist of 30% pre-filters, a pumped energy recovery coil, exhaust fan with VFD and exhaust damper. The supply and exhaust fan speeds will modulate to maintain a constant duct pressure. Each terminal unit will be programmed to have an airflow differential between its associated supply and exhaust VAV to control pressure relationships relative to the lab spaces. Duct mounted sound attenuators may be required depending on the location of the unit with respect to the space and the acoustical characteristics of the spaces served.

The animal holding areas will be heated and cooled by one 9,800 cfm 100% outdoor air variable air volume (VAV) air handling unit (SUP-002). This unit will have isolated supply and exhaust air streams. The supply side will consist of an outdoor air damper, 30% pre-filters, 80% final filters, 50% glycol pre-heat coil, steam humidifier, pumped energy recovery coil, chilled water cooling coil, supply fan and VFD. The return side will consist of 30% pre-filters, a pumped energy recovery coil, exhaust fan with VFD and exhaust damper. The supply and exhaust fan speeds will modulate to maintain a constant duct pressure. Each terminal unit will be programmed to have an airflow differential between its associated supply and exhaust VAV to control pressure relationships relative to the animal holding spaces. Duct mounted sound attenuators may be required depending on the location of the unit with respect to the space and the acoustical characteristics of the spaces served.

The magnet and laboratory spaces in the building will be heated and cooled by a single variable air volume (VAV) air handling unit (SUP-003) at 24,000 cfm. This unit will consist of a return fan, outdoor/return/relief air dampers, mixing box, air blenders, 30% pre-filters, 80% final filters, 50% glycol pre-heat coil, steam humidifier, chilled water cooling coil, supply fan and VFD. The supply fan speed will modulate to maintain a constant supply duct pressure. Duct mounted sound attenuators may be required depending on the location of the unit with respect to the space and the acoustical characteristics of the spaces served. Return air from non laboratory spaces will be provided with a ducted return system back to the fan.

The office and administration spaces in the building will be heated and cooled by a single variable air volume (VAV) air handling unit (SUP-004) at 30,000 cfm. This unit will consist of a return fan, outdoor/return/relief air dampers, mixing box, air blenders, 30% pre-filters, 80% final filters, 50% glycol pre-heat coil, electric humidifier, chilled water cooling coil, supply fan and VFD. The supply fan speed will modulate to maintain a constant supply duct pressure. Duct mounted sound attenuators may be required depending on the location of the unit with respect to the space and the acoustical characteristics of the spaces served.

The skyway will be air conditioned by a four dedicated fan coil units with chilled water cooling coils. The overhang areas will be heated with two heating only fan coil units.

Computer Room Cooling Units

The control rooms will have a packaged air conditioning system to maintain temperature and humidity levels during all seasons regardless of the building occupancy schedule. These units will be stand-alone cooling units connected to the central chilled water loop.

The telecommunication rooms will have a packaged air conditioning system to maintain temperature levels during all seasons regardless of the building occupancy schedule. This system will be a stand-alone cooling unit connected to the central chilled water loop.

The new server room will be served by a packaged air conditioning system to maintain temperature and humidity levels during all seasons regardless of occupancy schedule. These units will be stand-alone cooling units. One will be connected to the central chilled water loop. An all-season DX computer room cooling unit with roof mounted remote condenser will be provided for redundancy in the server room.

Magnet Support Equipment Cooling

Cooling equipment supporting the new magnets will be provided by the magnet vendor. This equipment will be cooled with chilled water supplied from the central chilled water loop. A dedicated tertiary pump with a VFD will be provided to circulate the chilled water flow through the magnet cooling equipment.

HVAC Terminal Units and GRDs

1. Variable Air Volume Terminal Units (VAV Boxes)

The air handling units will distribute air to VAV reheat terminal units serving each individual temperature control zone. Each VAV box shall have its own wall mounted DDC space temperature sensor to control its supply air damper and two-way hot water reheat valve and/or perimeter heating valve.

VAV's serving multiple rooms shall have their respective thermostats located in a representative area/space, (i.e. a space with two exposures or high cooling load.).

2. Grilles, Registers and Diffusers

Finished spaces will be supplied with linear style diffusers. Exhaust grilles in the restrooms will be specified as aluminum. Volume dampers will be provided to allow airflow balancing. Eggcrate ceiling grilles will be used to return air from the occupied spaces.

All grilles, registers and diffusers located within the magnet rooms will be completely non-ferrous.

3. Miscellaneous Heating Units

Horizontal hot water unit heaters will provide heating in mechanical rooms and non-public spaces with exterior wall or roof exposures. Recessed hot water cabinet unit heaters will provide heating for entrance vestibules. These areas will not be air-conditioned.

Finned tube radiation will be provided at areas of high concentrations of glass such as the skyway, ground floor link, and perimeter corridors.

4. General Exhaust

Dedicated exhaust system(s) will be provided for the following applications; toilet rooms, copy/print rooms, and janitors closets. All general exhaust ductwork will be G90 coated galvanized steel.

5. Laboratory Exhaust

Fume hood exhaust will be provided by roof mounted utility set exhaust fans with stainless steel exhaust stacks.

In addition, a 1,000 cfm dedicated exhaust system will be provided to exhaust the vent below the cyclotrons, the floor trenches, and the exhaust from the hydrogen storage cabinet, hot cells, and mini cells. All of the air from these sources will be drawn through a carbon adsorption air filter for removal of radioactive isotopes. This filtration system will be provided with dedicated exhaust fan that will discharge through a utility set exhaust fan. An air monitoring system will be provided on the common exhaust duct immediately upstream of the laboratory exhaust fans. All cyclotron and laboratory exhaust ductwork will be type 304 stainless steel. Laboratory spaces containing hazardous biological, radiological or chemical hazards will be directly exhausted with no recirculating return air.

At each magnet, a purge exhaust fan with Oxygen sensors will be provided for emergency exhaust of the area within the RF shield and for the RF rooms. A dedicated humidifier will be provided for humidification of the supply air serving the magnet rooms. A new quench vent will be provided for the magnets and will discharge out the side wall of the new structure.

6. Ductwork

All supply and outdoor air ductwork shall be externally insulated. All ductwork shall be concealed. Flexible duct runs shall not exceed 4 feet. All new ductwork serving shall be G90 galvanized steel.

All new supply, exhaust, and return ductwork will be constructed of aluminum within the magnet and RF rooms. All duct hangers and supports within these areas will be non-ferrous.

All HVAC systems shall be tested and balanced by a NEBB certified contractor. All new supply, return, and outside air ductwork shall be pressure tested to be less than 5% of the supply volume at twice the normal operation static. A minimum of two signed balance reports will be required.

Control Systems

It is the intent of this project to upgrade the temperature control system in the existing building in conjunction with the new DDC system serving the building expansion.

The existing Honeywell XL Plus system serving the existing facility will be removed and all existing controls will be re-connected to the new control system serving the expansion area. The University will provide temperature control shop drawings for the contractors use in bidding this work.

A direct digital control (DDC) system will be installed to monitor and control HVAC equipment in the new expansion. The DDC system will conform to current University BACnet requirements. DDC field panels shall be provided for each piece of equipment for programming, trouble shooting and alarming. Equipment failures and alarms shall notify one central programmable DDC front end. The central panel shall be capable of enable/disable and initiate lead/lag sequences for all equipment. The central panel shall be programmable to allow single point adjustment of time of day sequences, provided by the Owner. The building alarm will be sent to BSAC. All DDC equipment connected to emergency power will be connected to a UPS. The following table is an abbreviated list of the equipment intended to be controlled in the expansion area.

System	Tag	Qty	AI	DI	AO	DO	Total
Steam Pressure Reducing Station	PRV-1	1					0
Steam and Condensate Meters		2	1				2
Condensate Pumps	CP-X	3	2	2	2	2	24
Glycol Pumps	P-X	2	1	1	1	1	8
Heating Water Pumps	P-X	2	1	1	1	1	8
Steam to Water Heat Exchanger	HX-X	2			1		2
Heat Recovery Pump	HRP-1	1	1	1	1	1	4
Package Air Cooled Chiller	CH-1	1	2	1	1		4
Chilled Water Primary Pump	P-X	8		1		1	16
Air Cooled Chiller w/ Remote Condenser	CH-2	1	2	1	2	2	7
Dry Cooler	DC-001	1				6	6
Chilled Water Secondary Pumps	P-X	2	2	1	2	1	12
Computer Room Cooling Unit	CRCU-X	2	1	1	1		6
Cyclotron Chiller & Condenser	CH-003	1	2	2	2	2	8
Magnet Cooling Booster Pump	P-X	5	1	1	1	1	20
Cyclotron Air Handling Unit	SUP-1	1	12	6	12	6	36
Return Fan	REF-1	1	3	3	1		7
SUP-001 Supply VAVs	VAV-X	9	3		2		45
Steam to Steam Humidifier	HUM-1	1	1	1	1	1	4
Animal Holding Air Handling Unit	SUP-2	1	12	6	12	6	36
Return Fan	REF-2	1	3	3	1		7
SUP-002 Supply VAVs	VAV-2	11	3		2		55
SUP-002 Exhaust VAVs	VAV-2	11	1		1		22
Steam to Steam Humidifier	HUM-X	1	1	1	1	1	4
Research Air Handling Unit	SUP-3	1	12	6	12	6	36
Return Fan	REF-3	1	3	3	1		7
SUP-003 Supply VAVs	VAV-X	41	3		2		205
Steam to Steam Humidifier	HUM-X	1	1	1	1	1	4
Office Air Handling Unit	SUP-4	1	12	6	12	6	36
Return Fan	REF-4	1	3	3	1		7
SUP-004 Supply VAVs	VAV-X	49	3		2		245
Fan Coil Units - Cooling Only	FCU-X	5	1		1	1	15
Fan Coil Units - Heating Only	FCU-X	2	1		1	1	6
Unit Heaters - HW	UH-X	2	1		1	1	6
Unit Heaters - Elec	UH-X	1					0
Cabinet Unit Heaters	UH-X	5	1		1	1	15
Finned Tube Radiation		15	1		1		30

System	Tag	Qty	AI	DI	AO	DO	Total
General Lab Exhaust Fan	EXH-X	2		1		1	4
Fume Exhaust Fan	FUM-X	3		1		1	6
Helium Purge Fan	EXH-X	10		1		2	30
Elevator Equipment Room Exhaust	EXH-X	2		1		1	4
Toilet Exhaust Fan	EXH-X	3		1		1	6
Transformer Vault Ventilation		1	1	1		1	3
Emergency Generator Ventilation		1	1	1		1	3
Medical Air Compressor		1	1		1		2
Lab Air Compressor		1	1		1		2
Lab/Medical Vacuum Pump		1	1		1		2
De-ionized Lab water		1	1		1		2
Totals =							**1,019**

Duct and Pipe Sizing Criteria

1. Duct Sizing Criteria:

Ducts shall be sized with either the following maximum air velocities or pressure drops, whichever results in the larger duct. Maximum velocities are based on Chapter 47, Table 3 in the 2003 ASHRAE Applications Handbook for rectangular ductwork in spaces with an RC of 35 (NC of 35) or less.

(1) Supply Air
- (a) Mechanical rooms
  - (i) Maximum velocity = 1800 FPM
  - (ii) Maximum pressure loss = 0.10"/100 ft
- (b) Vertical mains (within shaft enclosure)
  - (i) Maximum velocity = 1800 FPM
  - (ii) Maximum pressure loss = 0.10"/100 ft
- (c) Horizontal branch ducts (upstream of terminal units)
  - (i) Maximum velocity = 1600 FPM
  - (ii) Maximum pressure loss = 0.10"/100 ft
- (d) Runouts (downstream of terminal units, above acoustical ceiling)
  - (i) Maximum velocity = 1400 FPM
  - (ii) Maximum pressure loss = 0.08"/100 ft

(2) Return and exhaust air
- (a) Mechanical rooms
  - (i) Maximum velocity = 1800 FPM
  - (ii) Maximum pressure loss = 0.08"/100 ft
- (b) Vertical mains (within shaft enclosure)
  - (i) Maximum velocity = 1800 FPM

(ii) Maximum pressure loss = 0.08"/100 ft

(c) Horizontal branch ducts

(i) Maximum velocity = 1600 FPM

(ii) Maximum pressure loss = 0.08"/100 ft

(d) Runouts to individual rooms

(i) Maximum velocity = 800 FPM

(ii) Maximum pressure loss = 0.08"/100 ft

(3) NC 30 Spaces (supply, exhaust, and return)

(a) Horizontal branch ducts

(i) Maximum velocity = 1160 FPM

(ii) Maximum pressure loss = 0.08"/100 ft

(b) Runouts to individual grilles and diffusers shall be the same size as the diffuser inlet or a maximum as follows:

(i) Maximum velocity = 750 FPM

(ii) Maximum pressure loss = 0.08"/100 ft

(4) Maximum velocity through sound attenuators is 1600 FPM

2. Pipe Sizing Criteria:

Hydronic piping for building heating and cooling systems shall be sized based on the following criteria:

(1) Smaller than or equal to 2"

(a) Maximum velocity = 7fps

(2) Larger than 2"

(a) Maximum pressure drop = 4 ft w.g./100 ft pipe

(b) Design pressure drop = 3 ft w.g./100 ft pipe

Fire Protection Systems

Classification

The building will be fully sprinklered in accordance with NFPA Chapter 13. Hazard classification is light hazard with some areas being Ordinary Hazard Group 1.

Fire Protection System

The existing combination domestic water and fire water service in the existing building is large enough to serve the existing building and the new addition. Water pressure to the building is adequate to serve this fire suppression system therefore a fire pump is not required.

Provide double interlocked pre-action dry pipe sprinkler system covering three MRI magnet scan rooms, the two computer equipment support rooms, and the PET room. The new valving and equipment will be located in the existing mechanical room. Provide FM-200 fire suppression system below the raised floor in the two computer equipment support rooms. Locate the FM-200 controls and equipment in the computer equipment support rooms.

Pre-action system may be provided in electrical equipment areas, depending on final size and voltage. A new air compressor and dry pipe valves will be installed to serve the new systems. The remainder of the facility will be served by a wet sprinkler system.

Sprinkler heads will be quick response type. Sprinklers in areas with finished ceilings will be concealed head type with flush, white painted escutcheons. Sprinklers in unfinished spaces will be exposed upright head with rough brass finish.

Laboratory/Medical Distribution Systems

Medical Air Compressor System

The existing medical air compressor system is a duplex system with 2 compressors at 1 HP each. Increase the capacity of the existing system with the addition of a third 1 HP compressor. Modify the existing control system. Replace the existing duplex refrigerated air dryer system with a new larger cycling type refrigerated air dryer system to be able to accommodate the increased load. Each individual dryer will be selected to handle the capacity of 2 compressor pumps running.

Lab Air Compressor System

The existing lab air compressor system is a duplex system with 2 compressors at 2 HP each. Increase the capacity for the existing system with the addition of a third 2 HP compressor. Modify the existing control system. Replace the existing duplex refrigerated air dryer system with a new larger cycling type refrigerated air dryer system to be able to accommodate the increased load. Each individual dryer will be selected to handle the capacity of 2 compressor pumps running.

Lab/Medical Vacuum Pump System

The existing lab/medical vacuum pump system is a duplex system with 2 pumps at 3 HP each. Increase the capacity of the existing system with the addition of a third 3 HP pump. Modify the existing control system.

Laboratory/Medical Gases

Configuration

New laboratory gases (lab vacuum, lab air, medical vacuum, medical air, oxygen, nitrous oxide and carbon dioxide) will be connected to existing piping manifolds located in the existing mechanical room. Provide lab/medical gas wall and /or benchtop outlets in accordance with NFPA 99, standards for health care facilities.

Lab Gases and Services:

1. De-ionized (Purified) Laboratory Water System:

De-ionized water piping systems shall be sized at 3psi pressure loss per hundred feet of pipe on a flush tank system curve.

2. Laboratory Vacuum System:

All new laboratory vacuum piping shall be designed, specified, installed and tested in accordance with NFPA 99, Standard for Health Care Facilities. Vacuum shall be provided at a minimum of 21 in Hg at the furthest inlet. Design based on one (1) scfm per inlet. Diversity factors shall be applied based on the maximum number of inlets. Diversity factors are as follows:

LABORATORY VACUUM SYSTEM DIVERSITY FACTORS		
Number of Outlets	Use Factor – Percent	Minimum Outlets
1-5	100	---
6-12	80	5
13-33	60	10
34-80	50	21
81-150	40	40
151-315	35	61
316-565	30	111

3. Natural Gas System:

Size any main for 2psig with a 1psi pressure drop per 100 ft. Size any run-out after the pressure regulator for as 7" with a .30psi pressure drop per 100 ft. Capacity for the piping system shall be based on actual equipment demand, plus 7 cfh per laboratory outlet with diversity factors applied based on the number of outlets. An emergency gas solenoid shut-off valve shall be provided at each lab module activated by an EPO switch. Valves shall not be located above any ceiling spaces. Diversity factors are as follows:

NATURAL GAS SYTEM DIVERSITY FACTORS		
Number of Outlets	Use Factor – Percent	Minimum Outlets
1-8	100	---
9-16	90	9
17-29	80	15
30-79	60	24
80-162	50	48
163-325	40	82
326-742	35	131
743-1570	30	260

4. Laboratory Compressed Air System:

All new laboratory compressed air piping shall be designed, specified, installed and tested in accordance with NFPA 99, Standards for Health Care Facilities. Branches to pipe gallery floors will be provided with pressure regulators to reduce system pressure as required. A maximum pressure of 15 psig will be supplied to laboratory outlets. The distribution system shall be based on one (1) scfm per outlet, with diversity factors applied based on the number of outlets, plus actual demands of any equipment requiring this service. Diversity factors are as follows:

COMPRESSED AIR SYSTEM DIVERSITY FACTORS		
Number of Outlets	Use Factor – Percent	Minimum Outlets
1-2	100	---
3-12	80	3
13-38	60	10
39-115	40	25
116-316	30	50
317-700	20	95

Domestic Water Systems

Service

The existing combination domestic water and fire water service in the existing building is large enough to serve the exiting building and the new addition. Domestic water piping serving the new addition will connect to the existing service. All piping in finished spaces shall be concealed. All water piping shall be insulated.

Domestic Cold Water

A domestic cold water main will be routed from the existing water service room to each of the plumbing fixtures where it will provide domestic cold water to each of the toilet groups. The domestic cold water will serve the domestic water heater, plumbing fixtures, laboratory equipment, and serve as make-up water for the hydronic mechanical systems. Backflow prevention shall be provided where connections are made to non-potable use fixtures. A takeoff valve with deduct meter will be provided for future irrigation. Two dedicated connections will be provided for each of the cyclotron chillers for make-up water.

Domestic cold water piping systems shall be sized at 3psi pressure loss per hundred feet of pipe on a flush valve system curve.

Domestic cold water piping downstream of the last water closet and all laboratory cold water piping shall be sized at 3 psi pressure loss per hundred feet of pipe on a flush tank system curve. Piping run-outs to individual laboratories may be sized at 5 psi pressure loss per hundred feet of pipe.) Piping shall be sized to maintain a pressure of 25 psig at the farthest flush valve and 30 psig at the hydraulically most remote safety shower. Water velocity in the distribution piping system will not exceed 6 feet per second and provisions shall be made to reduce any water hammer with water hammer arrestors. All of the piping in the domestic water system will be insulated. All branches off the domestic cold water distribution main providing service to mechanical equipment shall be provided with backflow preventors.

Domestic hot water and laboratory hot water piping systems shall be sized at 3psi pressure loss per hundred feet of pipe on a flush tank system curve. The maximum hot-water temperature produced will be 140 degrees F with service to laboratory sinks, lavatories, showers, general purpose sinks, service sinks, and other specific equipment mixed to 120 degrees F as required.

Domestic Hot Water

Domestic hot water will be provided by electric water heaters, one located in each of the new mechanical rooms. The water heaters will consist of a vertical tank. Hot water will be provided to restrooms and hand washing sinks. The water heating system will be sized to handle 100% of the estimated domestic hot water demand of the new addition.

The domestic hot water distribution system will utilize a recirculation system. The recirculation system will allow more efficient balancing of the circulation system to provide hot water on demand. Having hot water on demand will eliminate wasting of water by running the faucets until the desired hot water temperature is provided. A domestic hot water circulation pump will maintain a maximum temperature drop of 5°F in its respective system. The domestic hot water return system will be balanced to maintain an 115° F return water temperature at the hot water generator.

Plumbing Systems

Sanitary Sewer and Vent

The new addition will have a new 6" sanitary service that will connect to the existing city sanitary sewer located in the street. All plumbing fixtures will be routed by gravity to the new sanitary sewer system. All above ground sanitary and vent piping will be CPVC.

A trench drain will be provided in the dirty cage rooms with water hose connection.

Storm Drainage

This building will be provided with a roof drainage system, which will be connected to a new storm water management system provided by the Site Utility contractor. The roof drainage system will be capable of conveying four (4) inches of rainfall per hour. This building will be provided with a secondary overflow drainage system that will be sized for 2 times the code required rainfall rate. The overflow system will drain to site. All above ground storm water piping will be CPVC.

Plumbing Fixtures

The plumbing fixtures will be based on the standard manufactures as defined in the University design standards. Any deviation from these manufactures will be submitted and approved by the engineer prior to inclusion into the systems design.

1. Water Closets

Water closets are to be a low water consumption type with flush valves that provide 1.6 gallons per flush. Water closets are to be vitreous china, wall hung with chair carrier, and manually operated flush valve.

2. Urinals

Urinals are to be a low flow water consumption type with flush valves that provide 1.0 gallon per flush. Urinals are to be vitreous china, wall hung with carrier, and automatic battery operated sensor flush valve.

3. Faucets

All faucets are to be provided with integral flow restricting devices to limit water flow to 0.5 gpm. Public lavatories will be equipped with single lever faucets. Faucets are to be constructed of lead-free waterways. There will be automatic battery operated sensor faucets in the lab area only.

4. Lavatories

All lavatories are to be standard wall hung, or counter-top mounted, vitreous china, with carrier.

5. Service Sinks

Service sinks will be floor set, molded stone with backsplash. Faucets will be of wall-mounted mixing type with integral vacuum breaker, wall brace, lever handles, and threaded hose end spout. New countertop sinks, stainless steel with single lever faucet.

6. Electric Water Coolers

Electric Water Coolers are to be of the high-low type configuration. Water will be supplied to the drinking fountains from the domestic cold-water distribution system. Bubblers are to be constructed with lead-free waterways.

7. Wall Hydrants

Wall hydrants will be the key operated type with integral vacuum breaker. Isolation and drain valves are to be provided for each hydrant at accessible locations.

8. Eyewash and Emergency Showers.

Emergency eyewash and showers will be provided at all fume hoods and a minimum of one eyewash station in wet labs. Floor drains will be provided at each emergency eyewash and shower location.

ELECTRICAL

Overview

Design Intent Document

This document is intended to represent the design intent and schematic design level description of electrical systems for the CMRR Expansion project at the East Bank campus of the University of Minnesota.

General

The following building systems are described in this document:

- Power Distribution System
- Lighting Systems
- Fire Alarm System
- Voice/Data Systems
- Security Monitoring
- Specialty Sound Systems

Code Compliance

The electrical design of this facility shall comply with the current NFPA, IBC, National Electric Code (NEC), approved Minnesota amendments, Minnesota Codes and local code officials as of the date indicated in the construction documents.

- 2000 Life Safety Code
- Minnesota State Building Code (SBC) 2003
- Minnesota Accessibility Code 1999 (MN Rules Chapter 1341)
- International Building Code (IBC) 2000
- Minnesota State Fire Code (SFC) 2003
- International Fire Code (IFC) 2000
- National Electrical Code (NEC)
- 1999 Minnesota State Energy Code (Chapters 7676 + 7678)

General Building

This facility consists of a 62,000 square foot addition to the Center for Magnetic Resonance Research facility on the East Bank campus of the University of Minnesota. The facility will be constructed to support additional research and clinical magnets, expand the vivarium and increase the office and circulation areas of the building.

Scope of Work

1. Work under this contract includes complete electrical systems for the building expansion, including (but not limited to):

    a. Coordinate phasing of all work with all other construction trades

    b. Providing all site electrical work required for new building construction

c. Construction of a new four (4) barrel duct bank from existing University manhole 2097 to a new manhole at the CMRR building

d. Construction of new medium-voltage electrical service vault

e. Providing a new 3000 ampere, 277/480V, 3-phase, 4-wire main switchboard, with TVSS for the building addition.

f. Interconnection of the new addition switchboard and existing building switchboard through a system bus tie circuit breaker

g. Providing distribution panelboards and transformers to accommodate lighting and power needs.

h. Providing a new 400 kW, 277/480V, 3-phase, 4-wire emergency generator and two (2) new 4-pole with transfer switches rated at 100A and 260A.

i. Replacement of existing 260A transfer switch located inside current building electrical room with 4-pole unit.

j. Refeeding of existing 70A transfer switch located inside current building electrical room.

k. Extension of direct-buried building ground grid system conductor around addition

l. Extension of building lightning protection system to the addition roof, including connections to rooftop mechanical equipment.

m. Electrical renovations including new lighting, power, and systems in remodeled building areas from existing systems, as feasible.

n. Provide 120V and 480V connections to elevator machine room equipment.

o. Provide all required connections to HVAC equipment and Owner furnished equipment

p. Provide raceway system for voice/data cabling and Local Area Network (LAN) systems

q. Provide fire alarm devices for the new addition. Devices shall be connected to the existing addressable system.

University Standards

The electrical design of this facility is to be in compliance with University of Minnesota Division 16 Construction Standards, 2002 (Revised 2006).

Power Distribution Systems

Utility Power Distribution

The current CMRR building is served from Xcel Energy through an exterior pad-mounted transformer. During construction, this utility feed will be de-energized. The process shall include:

- Installation of termination cabinet on west side of property for rerouting of direct buried primary cabling on north side of building.

- Coordination with Xcel Energy for removal of the transformer and removal of direct-buried conductors within the building addition footprint.
- Removal of the secondary feeders to the building
- Removal of the underground conduit up to the building foundation wall where it will be capped- off and sealed
- Removal of the transformer pad

The new electrical service will be derived from existing University manhole 2097 located on the access road between the current CMRR building and the existing Lions Research building. This manhole contains University feeders #21 and #33 that will be spliced and extended to supply two sources of power to the CMRR building to comply with University standards. A new four (4) barrel ductbank will be constructed from manhole 2097 to a new manhole directly outside of the CMRR addition vault room. Individual conduits and 15kV, copper, shielded, type EPR primary cables will then be installed from the new manhole location underground to the new CMRR building medium voltage vault room.

The power distribution scheme for the CMRR building will be a common bus primary selective scheme in accordance with University standards. A medium voltage vault room will be constructed inside the building that will house 13.8 kV primary switches and two (2) 1500/2000 kVA AA/FFA 13.8 kV primary to 277/480V secondary transformers. A total of two (2) separate switch and transformer lineups will be installed in the vault room – one lineup shall supply power to the new building addition's 3000A switchboard and one lineup shall supply a new 3000A main circuit breaker and bussed cable pull section that will backfeed the existing building's 3000A switchboard.

A 3000A tie circuit breaker will be installed to interconnect the building switchboards onto a common bus. Kirk key interlocks will be installed on the primary switches and the switchboard circuit breakers in accordance with University standards. The current ground fault protection, service ground, and 3000A main circuit breaker installed on the existing switchboard will be removed during construction.

Main and tie breakers shall be drawout power circuit breakers with CSIG solid state trip and distribution circuit breakers will be drawout insulated case type breakers. Main distribution equipment will contain customer metering per University standards.

Emergency Generator

The current CMRR building has a 200 kW, 277/480V, 3-phase, 4-wire diesel generator installed in a weathertight enclosure outside the building. This generator has two (2) output circuit breakers installed that feed two (2) existing transfer switches – one for egress/life safety and one for equipment. During construction, this generator and associated exterior underground conduit & wiring will be removed. The existing generator will be turned over to the University.

The CMRR building addition will contain an indoor generator room with a new 400 kW, 277/480V, 3-phase, 4-wire diesel generator with a 2 hour stand-alone day tank and pump. A 400 gallon external fuel tank will be provided to accommodate longer run time, as described below. The new generator will have a total of four (4) output circuit breakers that feed the building's life safety and equipment branch systems. These circuit breakers shall be sized as follows:

- 1 – 70A/3P breaker to re-feed the existing building's life safety branch transfer switch

- 1 – 260A/3P breaker to re-feed the existing building's equipment branch replaced transfer switch
- 1 – 100A/3P breaker to feed the building addition life safety branch transfer switch
- 1 – 250A/3P breaker to feed the building addition equipment branch transfer switch

The fuel system for the generator shall be sized to provide a minimum of 12 hours of running time at 100% loading.

Building Power Distribution

Provide a 277/480V, 3-phase, 4-wire, 1600A MLO switchboard fed from the building addition's 3000A switchboard. Locate switchboard in the new penthouse. This switchboard shall serve all new mechanical loads and will feed new equipment panelboards as described in the "Magnet Power" section.

Provide 480V and 208V panelboards as required for lighting and facility loads. Provide step-down transformers as required to serve the 120/208V system.

All panelboard/switchboard busses shall be copper. Transformers located in the facility shall have aluminum windings to comply with non-ferrous construction requirements. Panelboards shall utilize bolt-on breakers. All distribution equipment shall use circuit breakers.

All wires 3/0 AWG and smaller shall be copper. Wires 4/0 AWG and larger can be copper or aluminum. Aluminum conduit shall be used in all specified non-ferrous construction areas. Raceways in other areas of the building shall be rigid metal conduit, intermediate metal conduit, electrical metallic tubing, or electrical non-metallic tubing (PVC), as indicated.

At a minimum, provide the following receptacles for each space specified below:

- 4 duplex receptacles per hard wall office on a dedicated circuit
- Power connections as required to open office modular furniture
- 4-6 duplex receptacles for conference rooms based on room size & layout
- 4 duplex receptacles (2 normal, 2 isolated ground) per magnet room
- Convenience duplex receptacles on 50' centers for all corridor/connecting link/skyway spaces
- 1 GFI duplex receptacle per toilet room at sink
- 2 general purpose GFI duplex receptacles with weatherproof while-in-use covers for each animal holding area. Provide a total of 2 GFI simplex receptacles with weatherproof while-in-use covers and dedicated 20 Amp circuits for portable electric heater connections.

For spaces such as laboratories, magnet control rooms, etc. provide receptacle quantities and layout to match Owner described functions for the room. Provide power connections to all Owner furnished equipment such as refrigerators, ice machines, microwaves, etc.

Magnet Power

Provide the following power distribution infrastructure to each magnet system RF equipment room (For estimating purposes only). All feeders to the panels originate from the penthouse switchboard. Panelboard feeders, where feasible, may be routed under the new courtyard area to panel served. All other feeders shall be concealed in accessible ceilings:

- Cyclotron – One (1) 277/480V, 3-phase, 4-wire, 250A MLO panel, one (1) 75kVA, delta-wye, K-13, dry-type, shielded transformers, and one (1) 120/208V, 3-phase, 4-wire, 225A MCB panel, 84 space
- 3.0T Magnet and MR/PET - One (1) 277/480V, 3-phase, 4-wire, 250A MLO panel, one (1) 75kVA, delta-wye, K-13, dry-type, shielded transformer, and one (1) 120/208V, 3-phase, 4-wire, 225A MCB panel, 84 space
- PET CT Magnet- One (1) 277/480V, 3-phase, 4-wire, 125A MLO panel and one (1) 120/208V, 3-phase, 4-wire, 225A MCB panel, 84 space

From these panels, provide power connections including conduit, wiring, and terminations to all RF room process equipment. Route all branch circuits and feeders under the raised flooring system in the RF room to the designated equipment location.

All process equipment in the RF room is provided by the magnet supplier. Terminate branch circuits by either a hard wired connection to the equipment or to a specified receptacle called out by the equipment supplier. Connections from process equipment to the individual magnets are provided by the magnet supplier, unless otherwise noted.

All electrical devices (lights, conduit, wire, etc.) installed inside the magnet room space shall be of non-ferrous construction.

UPS Power

Provide a 40 kilowatt (kW) 480V to 208Y/120V Uninterruptible Power Supply (UPS) to feed the expanded computer server room and telecom closet. The UPS will be backed-up by a feed from the new emergency generator's equipment branch. The cooling system for the UPS space shall be backed-up by the emergency generator.

All DDC equipment connected to emergency power circuits shall have a local UPS.

Grounding

An existing direct-buried ground system currently encircles the building and is a bare 4/0 AWG copper wire installed at 2'-0" below grade with 20' ground rods installed at each corner of the building and at 80' OC spacing. This grounding system will be extended to encompass the entire new building footprint. An exothermic weld shall be made at the northwest and southwest corners of the existing grounding system that remains for tie-in connections to the new grounding system footprint for the building. Bond building's grounding system to building water main service (if metallic) and structural steel, including rebar in concrete footings.

For building interior spaces, provide connections from the grounding system to the RF shield for each magnet room. Provide connections from the grounding system to ground bars installed below raised floors in RF equipment rooms. Bond raised floor pedestals in RF equipment rooms to the ground bar.

Lightning Protection

An existing lightning protection system is installed on the existing CMRR building's roof. Provide a complete extension of this system for the building addition. System shall be tied into the ground grid described above. Install air terminals on rooftop mechanical equipment.

Lighting Systems

Exterior Lighting

Provide new walkway and building lighting fixtures to match existing HID fixtures onsite.

Interior Lighting

All fluorescent fixtures shall have electronic ballasts and utilize T-8 lamps, unless otherwise noted.

Provide 2'-0" x 4'-0," direct/indirect, metal, perforated center-basket, fluorescent light fixtures in the following areas:

1. Office spaces
2. Student spaces
3. Conference spaces
4. All other interior spaces, except as noted below

Provide chain-hung, 2-lamp, premium Industrial light fixtures in the following areas:

1. Mechanical Rooms
2. Electrical Rooms
3. Storage Rooms

Provide recessed LED downlight light fixtures in the following areas:

1. Hallways
2. Magnet Rooms (fixtures in magnet rooms shall be of nonferrous construction)

Provide recessed, wet location, gasketed, two-lamp, dual-ballast, compact fluorescent, downlight fixtures in the following area(s):

1. Animal Holding areas

Provide thermoplastic LED exit signs for egress signage as required per NFPA 101. Connect fixtures to dedicated circuit from life safety panels.

Emergency egress lighting shall be through standard light fixtures connected to dedicated circuits from life safety panels. Egress levels will comply with code standards.

Lighting Controls

Provide relays/contactors for exterior lighting control by the new energy management system and photocell.

All spaces shall be controlled by occupancy sensor or building management system, except where use of such control will jeopardize occupants. All occupancy sensors shall be dual-technology type.

All dual-level lighting controls shall be configured to provide partial power lighting automatically. The occupant can then manually increase the light levels. The lighting control system shall "sweep" lights off based on a preset time schedule. Once off, the lights shall resume at partial power once occupancy is again detected.

Provide dual-level switching in office spaces, student areas, and seminar/conference areas.

Provide single-level switching in mechanical, electrical, and storage rooms.

Provide relays/contactors for energy management system timed dual-level control of lighting in animal holding areas.

Illumination Levels

The Illuminating Engineering Society's (IES) Illuminance Selection Procedure is used for establishing target maintained illumination levels throughout all areas. Specific influences of glare, task complexity, surface reflectance, ceiling brightness, and usage are addressed with this procedure. Lighting levels will be designed within the following levels:

1. Mechanical Rooms: 20 FC
2. Electrical Rooms: 20 FC
3. Storage Rooms: 20 FC
4. Conference Rooms: 30-50 FC
5. Office Space: 30-50 FC
6. Student Areas: 30-50 FC
7. Hallways: 10-20 FC
8. Magnet Rooms: 30-70 FC
9. Animal Holding Spaces: 50-70 FC

The State of Minnesota Energy Code and Local codes take precedence for maximum power density allowances and select area minimum light levels.

Fire Alarm System

General

Provide new fire alarm initiating devices and notification appliances for the addition. Expand the existing Notifier AFP-400 addressable system to accommodate the new devices as required. Comply with University standards, NFPA, and the American's with Disabilities Act Accessibility Guidelines (ADAAG).

Make fire alarm connections to fire suppression systems, air handling systems, and other specialty systems, as required.

Voice/Data Systems

General

Telecommunications infrastructure design shall be performed by others. Provide all required pathways for cabling and infrastructure installation. Comply with University sizing, routing, and grounding standards.

Provide two (2) 4" conduits from the existing server room to the new 2nd floor server room location. Field route conduits as required through the existing ceiling space.

All cable tray systems installed in the building shall be aluminum (non-ferrous) construction, including connecting hardware. Main run cable trays shall be provided in the corridors with J-hook cable management to all locations except the specified non-ferrous construction areas.

Magnet/RF Rooms/Non-ferrous Construction Areas

All wiring installed in these areas shall have aluminum conduit installed from the outlet to the nearest main cable tray location.

For the RF Rooms, provide a matrix of cable trays above the ceiling and below the raised floor from the magnet equipment to the magnet room penetration panels (filters or wave guides).

For the magnet rooms, provide cable trays on the wall and above the ceiling from the penetration panels to the front and rear of the magnet.

Security Monitoring

General

Security infrastructure and design shall be provided by others. Provide all required pathways for cabling and infrastructure installation. Comply with University sizing, routing, and grounding standards.

Card access system design will be provided in the project. Biometric door access control devices shall be provided in the building in lieu of traditional card readers. Nine complete thumbprint scanners systems will be provided.

All new exterior doors shall be prepared for electric strike, door contacts, and door power supplies.

Specialty Systems

Paging

Provide complete expansion to the existing overhead paging system to accommodate speakers in the new addition commons and corridors.

Intercom

Provide standalone intercom systems between magnet rooms and control rooms (typical of seven systems).

Magnet Room Video Cameras

Provide conduit and rough-ins for the video cameras located in the "Uptake" Room. Provide monitoring for these cameras in the PET/CT and MR/PET Control Rooms.

CMRR Renovation & Expansion

Project # 01-180-08-1687
Schematic Design Package Review Comments
Package Issue Date: February 17, 2009
Comments Due Date: February 17, 2009
Project Manager: Kevin Ross

CAPITAL PLANNING & PROJECT MANAGEMENT

Item No.	Description	Architect's Response
	Academic Health Center	
	Andreas Papanicolaou (612) 624-8412 papan004@umn.edu	
1	The proposed elevation design of the south facade of the corridor linking the new expansion with the existing building at the south: CMRR users and I raised this as an issue during the SD presentation and following considerable discussion and suggestion from Kamil, I understood that RSP was to further study this and arrive to a solution/expression that uses more glass/transparency and is mid way between what they presented and a curtain wall.	**The current design was met with favorable reaction from many. RSP will continue to study it further**
	Kamil Ugurbil (612) 626-9591 ugurb001@umn.edu	
	Site / Arrival Issues	
2	Parking: Where will the increased volume of research/clinical subject's park and how will the spaces be controlled?	**A parking lot is located across 6th Street SE, but is outside the scope of this project.**
3	Ambulance: There is concern about ambulance or non-ambulatory arrival through the north entrance. The subject's pathway passes through potential high magnetic fields before the patient screening process would typically occur. Could an entrance for an occasional, scheduled, arrival, be placed on the east side near the small conference room off of the lobby? The building overhang could provide a small canopy.	**Specific requirements will need to be reviewed.**
4	Off Hours Visitor: Will there be space within the vestibule for a visitor bench?	**The Vestibule is large enough to accommodate a visitors bench.**

Item No.	Description	Architect's Response
5	Southern facade: The southern façade, the main façade of the building, still leaves much to be desired room the point of view of architectural unity and harmony with the facades of the TRF and MBB buildings. While the new section with its glass front and the precast concrete frame plays on the themes evident in MBB and TRF then we have three other different and non-harmonious themes playing in the existing (and now unaltered brick section, then aluminum frame clear glass and finally the new largely precast concrete corridor. I believe the predsign addressed this point much better. I know cost is an issue but current facade will leave this section the campus without an architectural punch. While ultimately funds should be spent for programmatic purposes, value of architectural attractiveness should not be underestimated. Beauty is appreciated by humans and leads to a positive assessment. Tis critical in a place like Minnesota where it is so difficult to recruit.	**Careful attention has been paid to the architectural character of this area of campus, balanced with a responsiveness to the budget. The current design responds to the architectural vocabulary of the TRF and MBB buildings, the East Gate Campus master plan, sustainable concerns and budget restraints. Per item 1 above, further options will be presented for review.**
6	In general, as much as possible natural light should be added. Southern façade should be largely glass. This is not necessarily detrimental to energy consumption. A southern glass façade with a dark concrete floor will serve positively for heating in w inter while a closely planted deciduous tress can be used to block the sunlight in the summer. Link Corridor: Could more glass and natural light be added to the link between the new addition and the existing building?	**Per item 1 above, further options will be presented for review.**
7	Could TRF/CMRR collaborative researchers' use the new door located near the old CMRR entrance door to make the pathway between the buildings convenient?	**A new door will be provided at the existing atrium space to allow easy access to the ongrade path to MTRF Building**
8	Receiving: How will receiving work if the future expansion occurs?	**When the future expansion occurs the receiving area will need to be included at the northwest corner of the expansion. The status of the proposed Granary Road right-of way, along with it's location, elevation profile, and width will help determine the CMRR service road and truck circulation modifications needed to accommodate the receiving area relocation.**
	Room Adjacency Issues	
9	Viewing Room: Could the small conference room near the Lobby be used as the Viewing Room? This would allow the now designated Viewing/Conference Room to be used as only a conference room.	**The small conference room will be relabeled viewing room.**
10	Electrical Shop: The location of the electrical shop in the current design (adjacent to the 7T) is not good since we will not move the 7T ; consequently, the location will be in a high magnetic field environment which really is not suitable for an optimally functional electrical mechanical shops. There is also the desire to locate the mechanical shop with the electrical shop. Could the new Electrical Shop be created as an 'L' shaped space where the proposed Conference and Mechanical Shop and a portion of the open office were located The natural light from the high atrium windows is appreciated in the open office area.	**The Mechanical Shop, where shown, will be relabeled Electrical Shop and be expanded to the south.**

Item No.	Description	Architect's Response
11	Mechanical Shop: Could the existing Electrical Shop become the Mechanical Shop.	**The existing Electrical Shop will be relabeled Mechanical Shop.**
12	Animal Physiology: Could a door be added to the corridor side of the new Animal Physiology rooms for access to the space without going through the RAR area?	**A door will be provided to allow access from the RAR side of the Animal Physiology Room and from the Research corridor side of the room.**
13	Human Physiology Room: Could a Human Physiology Room (for electrical recordings) be added within the GCRC area, or one of the patient rooms becomes the Human Physiology Room?	**One of the Patient Rooms will be relabeled Human Physiology.**
14	10.5/7.0 Procedure Room: Could the 10.5/7.0 Procedure Room be adjacent to the 10.5T system instead of the 7.0T system?	**The shared 10.5/7.0T Procedure Room will be relocated to be adjacent to the 10.5T system instead of the 7.0T system.**
15	Coffee Alcove: Could coffee alcoves with a sink be added in a couple of locations, particularly to the small conference rooms and in alcoves set for informal gatherings, for convenience?	**RSP will study locations for two coffee counter locations.**
16	Toilets. There is currently a shortage of toilets within the facility, and there is concern about the number of toilets for the expansion.	**The existing CMRR currently has a total of 9 water closets and urinals for 41,000 SF. The schematic plans currently have a total of 26 water closets and urinals for 102,000 SF. This fixture count currently exceeds the required IBC Building Code by 4 fixtures.**
17	Animal / Human Separation: Could full width doors be kept within the corridor at the 9.4T procedure room and a new pair be added at the 7.0T control room to control visual access at the animal systems?	**Pairs of doors will be placed within the corridors to separate the research animal circulation from the human research circulation.**
18	Telecom Separation: The CMRR Server Room must be separated from the University Telecom Room.	**The Server Room will be separated from the University Telecom Room by a wire mesh partition. Separate entrances will be maintained.**
	Offices and Workstations:	
19	Workstations: There is concern about the adjacency and quantity (too many in one place) of workstations within the defined areas.	**The quantity of desired workstations relative to the available space resulted in the density shown. RSP will continue to work with the users to reach a desirable solution.**
	Michael Garwood (612) 626-2001 gar@umn.edu	
	John Strupp (612) 626-0361 strupp@umn.edu	
	Drawing A01	
20	New Service Dock interferes with future expansion.	**See response to Issue No 8.**
21	Is the north side elevator required or can it be eliminated for cost savings?	**The elevator service to the new Mechanical Room is required by the University Standards.**
	Drawing A02	
22	The Server Room and Telecom room are shown as one room but they must be two separate rooms although it is desirable to have them adjacent to allow for cable pass-thru.	**See response to Issue No 18.**
23	The Server Room is too small; The Server/Telecom room shown is only 341 SF while the Server room itself should be 375+125 according to the Design Space Program dated 12/10/08.	**The Server Room will be enlarged.**

Item No.	Description	Architect's Response
24	The Server, Mechanical & Electrical rooms do not need to be on an outside wall, it would be desirable to use that space instead for offices with windows to provide more natural light.	**The programmed amount of offices are shown, all with exterior windows in the addition. The project team will explore other options for the electrical room. The mechanical room will need to be on the outside wall.**
25	Provide acoustic isolation in the wall of the office adjacent to the electrical room or it may not be usable due to transformer hum noise.	**All office walls will have acoustical treatment. The project team will provide additional noise isolation at this room.**
26	Provide acoustic isolation in the wall of the office adjacent to the server room or it may not be usable due to air conditioning noise.	**RSP will study the noise and vibration generated by the cooling unit and design partitions to minimum STC of 45 to dampen the noise/vibration.**
27	It would be highly desirable to add a sky light above the open office area.	**Natural lighting options will be studied as part of the open office solution.**
	SD Report	
28	On page 44, under "Computer Room Cooling Units" it states that the existing server room will be relocated to the new addition which is not true, but rather there will be an additional server room located in the new addition.	**The existing Server Room will remain and a new Server Room will be constructed with the addition. The description will be corrected to reflect this. We will revise mechanical cooling system to match architectural program.**
29	On page 49, under Fire Protection Systems there is reference to MEG instead of PET. The server room should also be included in the list of rooms to have double interlocked pre-action dry pipe sprinkler system or preferably the server room fire protection should use a clean agent (e.g. Novec).	**We will provide Clean Agent Fire Protection systems in the server rooms with pre-action.**
30	On page 62, under "Voice/Data Systems" is the intent of the last sentence to provide conduit from the existing telecom room to the telecom rooms in the new addition? If not, please add such an item.	**Conduit or cable tray from the existing Telecom Room to the new Telecom Rooms will be provided.**
31	On page 62, under "Security Monitoring" it calls for biometric door access, but the current thinking is to use passive RFID cards although high magnetic field compatibility needs to be verified.	**This will be evaluated during DD.**
32	On page 62, under "Intercom" add item to provide intercom/phone from each vestibule to each control room.	**This will be added.**
	Preliminary Room Data	
33	Phone/Data (fiber optic) is missing from fixture list on most rooms while it should be listed on virtually every room with a few exceptions such as WC.	**This will be added.**
34	Seminar Room - add requirement for in-floor power and data outlets for each row of tables when room is configured for computer training sessions.	**This will be added.**
35	Magnet Room - add requirement for helium recovery piping.	**A space will be provided for the helium recovery system. The size and quality of the piping will be investigated. It is our understanding that this is not currently in the scope of the project. Helium recovery system will be priced separately.**
36	Add 150 SF room for housing helium recovery system.	**A space will be provided for the helium recovery system.**
37	# Server room - * add cable management racks, * access control system (e.g. passive RFID) * add conduit to UPS in electrical room for "on-battery" signal * add cooling system fail-over control system.	**This will be added.**

Item No.	Description	Architect's Response
	Peter Andersen (612) 626-2001 peter@cmrr.umn.edu	
38	Eliminate the double doors between the new receiving area (north side of building) and the adjacent storage room so together they form one larger room.	**The double doors separating the storage from the receiving area will be eliminated.**
39	The scissors lift in the new receiving area should stow flush with the floor and any railings should be removable so the space the lift occupies can be used when the scissors lift is not needed. The scissors lift should have a load capacity of about 5000 lbs. and dimensions of approximately 4 ft x 5 ft.	**The scissor lift selection will be reviewed with Facilities.**
40	The new receiving area should have a I-beam and trolley mount chain hoist (such as McMaster Carr #3313T2 or equivalent with the proper chain length for the ceiling height) on the ceiling to accommodate a load of 1 ton.	**The structure will be designed to accommodate the trolley chain hoist.**
41	Please keep doors in hallways between receiving areas and Magnet areas to a minimum, only those required by codes.	**Other than the code required doors or doors provided to separate the animal research subject circulation from the human research subject circulation will be eliminated.**
42	All doorways to RF rooms , control rooms and magnet rooms should be at least a 1.5 door widths wide.	**Doors to the RF Rooms will utilize a pair of doors, 3'-0" leaf and a 2'-0" leaf.**
43	RF rooms should have easy access to the chilled water loop for needed equipment connections through final filter assemblies similar to the filters we have installed in existing building.	**We will comply.**
44	RF rooms should have a matrix of overhead cable trays below the ceiling to the magnet room penetration panels and magnet control room.	**This will be evaluated during DD, this is typically what has been provided in the existing RF rooms.**
45	Magnet rooms should have penetration filter panels and waveguides on walls adjacent to RF rooms and control rooms and cable trays leading from these panels to front and rear of magnet.	**See response to Issue No 44.**
46	Chilled water loop should have a whole building particulate filtration system .	**Will Comply. A side stream or inline type filter will be provided in the Mechanical Penthouse.**
47	Please provide the proper piping to allow for flushing of the chilled water components to avoid introducing large amounts of particulates to building chilled water loop when switching between warm and cold weather modes.	**Will Comply. Equipment located outside will be installed with isolation valves and drain taps to ensure that particulates are not mixed during flushing and filling.**
48	Magnet rooms should have LED or fiber optic type lighting systems.	**This will be evaluated during DD.**
	Jeramy Kulesa (612) 625-8847 kulesa@cmrr.umn.edu	
	Jerry Froelich (612) 626-2371 froel005@umn.edu	

Item No.	Description	Architect's Response
49	As you can see from the comments below, our greatest concern about the design has to do with Subject/patient flow; parking, entry to building, admission/ registration, confidentiality, GCRC management, Imaging, and discharge. What we are attempting to construct in terms of clinical research is a unique approach and in particular, very different then what has been constructed at the University of Minnesota. CMRR will continue to be a premier academic facility with quiet areas for intellectual work and there will be a new wing, which will have significant activity with a large number of Clinical Subjects, which includes children and ill patients. The success of the clinical center depends on the large number of subjects and the lack of parking and "drop off" for the subjects will deter the growth that is needed.	**The parking options and reservation process will be reviewed with University Parking & CPPM.**
	CMRR Clinical Logistics:	
50a	Eight scanners are intended for human subjects, five are full-time human scanners, and three are shared human/animal scanners: 1. PET/CT 2. MR/PET (What is the Tesla strength of this magnet, and how high does the Gauss bubble reach? Ask Dr. Garwood. He said the height of the gauss bubble might not be symmetrical. There is no shielding indicated in the ceiling. There is grad student study-carrel space above this scanner. Will credit cards, pagers and keys —for instance— potentially be affected by the magnet system below?) 3. 3T Human 4. 4T Human 5. 7T Human 6. 7T Human/animal 7. 10.5 T Human/animal 8. 9.4 T Human/animal	**The boundaries of the magnetic field will be provided by the CMRR and plotted on the plans and sections to identify the high field areas. The existing center has many zones within the building which will affect credit cards and other magnetic sensitive items. Lockers will be provided outside of these zones.**
50b	There are ten patient care places: 1 "staging MR/PET" 2 "staging" 6 "patient" 1 "flex"	
50c	At capacity, the center can accommodate eight patients in scanners and ten in staging and prep areas. That is, at full capacity, the center can accommodate eighteen patients at a time.	

Item No.	Description	Architect's Response
50d	Many of the patients on NIH studies have both scanner visits and non-scanner study-related visits to the clinical center. Patients may have between two and five follow-up "clinical" visits for labs and other quality of life assessments. Some of these QOL assessments are lengthy, and may take up to two hours of direct patient-nurse time to complete. Because of the Protected Health Information (PHI) being discussed, HIPAA-compliant conference areas are required. The clinics do not like to have NIH follow-up visits taking up clinic space. CMRR study patients will reasonably need to be accommodated at CMRR for all their study-related visits.	
50e	At any one time, the clinical center may have one patient in each scanner, one patient in a staging area preparing to be scanned and one patient in post-scan staging, preparing for discharge. With eight scanners that may mean that as center utilization develops, twenty-four scan-related patients may be in the center at a time. In addition, there may be two to five patients (per scanner) returning to the center for follow-up studies for labs and quality of life assessments. That means that there could be from sixteen to forty patients' having follow-up visits at one time. Although this may be "worst" case, we are developing this to be "best" case.	
50f	ACRIN studies are funded by NCI (National Cancer Institute). All ACRIN patients have cancer. Some of them are responding well to treatment, some are not. However, it's safe to say the ACRIN patients are sick. They are not at their best. Every patient will need some level of accommodation. For the convenience of sick patients, the center needs 24 close and convenient parking spaces. At times, many more patient-designated parking spaces will be needed.	
	Construction Comments:	
51	Need to handle Patient/subject drop off.	**Drop-off and parking options and reservation process will be reviewed with University Parking.**
52	Need for more parking close to front door. Can there be angled parking with 2 handicap spots and a "drop off" staff? Need 12 spots (2 handicap and 10 CMRR reserved).	**Parking will be reviewed with University Parking.**
53	Reception desk, handle 2 people with computer terminals and a separate private space for filling out confidential forms.	**This will be accommodated in the design of the reception desk.**
54	Waiting areas: consider 2 areas, one for adults and one for children with TV's. Seating for 22 people. Coat rack or closet.	**The lobby design will be further developed in DD with these considerations.**
55	Need to verify with codes that clinical space can bill 3rd party companies and CMS.	**The design team will verify the needs for clinical space.**
56	Bike rack, ? Overhang to protect bikes.	**Area will be shown in DD documents**
57	Assignment of office spaces to better look at staff flow relative to program area.	**Office space will be assigned by building users.**
58	Verify final layout of Amplantz Laboratory with Dr's Cressman and Golzarian.	**Per review meeting - Dr. Dietz will review.**
59	Verify final layout of Hammer Laboratory with Dr. Hammer.	**Per review meeting - Dr. Dietz will review.**

Item No.	Description	Architect's Response
60	For security look at non-magnetic keycard system like the hospital and parking services utilize. The card assignment could be assigned by CMRR administration to reduce University personnel and to better manage the students, etc. The system also keeps a log of door entry and can control times of access.	**Security Control Options will be reviewed by University Security.**
61	ADA bathroom in the patient uptake area.	**Bathrooms are required to meet current code including ADA.**
62	Function of the office in front lobby by vending? Can this be used as part of subject check in?	**Reception/building management will be determined by the University and CMRR**
63	Communication system between security doors and front desk and ? how to address after hours access of subjects. Can the system be tied into digital phone system to do a broadcast to phones after-hours? This type of communication needs to be at all doors marked in the "security drawing" (red dots).	**A phone/intercom was requested in the vestibule.**
64	Are we using modular furniture or casework or a mixture? It would be nice to have a welcoming lobby with casework and "nice" materials.	**The intent is to have a 'welcoming lobby', which will include millwork.**
65	Chairs in waiting areas need to be both comfortable and durable.	**Agreed**
66	There needs to be spaces in the waiting area for wheel chair patients.	**Agreed. Should wheelchair storage be provided and if so, how much?**
67	The "viewing / conference" room will hopefully be fully utilized for image interpretation of the clinical / research studies at CMRR and be linked to hospital to read examinations remotely. We plan to have a full time radiologist in this area to cover injections, sedation and patient emergencies.	**A Viewing Room has been defined. It will be served by fiber optic for data / images.**
68	A "Crash" cart will be needed in the clinical center for emergencies.	**Space for a crash cart will be defined during DD.**
69	Power IV injectors are needed for the PET/CT and MR/PET. Perhaps they can be mobile as there many be a need for power injectors in other scanner rooms and they are expensive.	**Power IV injectors will be defined in the owners FF&E.**
70	Video cameras in "uptake" room with monitor in PET/CT control room and MR/PET Control room.	**Security and observation systems will be reviewed with users.**
71	In uptake rooms have chairs that can recline. Have curtain and separate light control. The patients will wear earphones to provide quiet atmosphere. In patient uptake and prep rooms the flooring needs to be sealed flooring incase there is a radioactive spill.	**Floor covering material will be reviewed for compatibility with radioactive materials.**
72	There was a design where there were 3 or 4 parking spots by the Cyclotron facility. We will need to have these as part of the reserved parking for the cyclotron.	**These are shown on the site plan. Parking will be reviewed with University Parking.**
73	I need to hold off on full internal design of the cyclotron facility, we believe that we will have a partner in this facility and the design will need to accommodate their needs.	**Further development of the plan will occur when the Cyclotron system is determined.**
	Miscellaneous Notes and Corrections to Document:	
74	Page 7, 3rd line "exentuated"?	**Noted and changed.**
75	Page 8, 6th line, "affective" to "effective"?	**Noted and changed.**
76	Page 65, Jerry Froelich, U of M, Radiology, not Med School.	**Noted and changed.**

Item No.	Description	Architect's Response
	Roland Gunther (612) 624-0448 gunth001@umn.edu	
	Questions	
77	What will be done in the physiology labs within the new vivarium space? If live primates will be used, it would be beneficial to have the labs adjacent to the primate rooms, with connecting doors for transferring primates back and forth.	**The procedures will be similar to those being done in the Ghose Lab.**
78	Does the procedure room need to be so large (247 sq ft)? Most procedure rooms are about 150-175 sq. feet. Specialized equipment?	**The Procedure Room function within the RAR will be similar to the Procedure rooms near the animal MRI suites.**
79	Will the Ghose lab move to one of the new physiology labs within the new vivarium space? If not and his primates will be housed in one of the new primate rooms, they would have to be moved through the entire combined length of the old and new vivarium corridors on a regular basis (often every day). Primates are BSL-2 animals, so all people would need to vacate the corridor while the primates pass and would have to stay out of the corridor until it gets mopped with disinfectant afterwards. The room in which the Ghose primates are currently housed, room 172, has no drains and does not function well as a primate room.	**Three physiology labs will be provided, one existing and two new. The existing lab will remain. The two new will be reconfigured to be adjacent to the primate rooms. The cost of adding floor drains in Room 172 will be priced and the Project Committee will determine inclusion.**
	Comments	
80	The primate rooms must have doors opening to the corridor as well as to the anteroom because the primate banks need to go back and forth to the cagewasher. The banks cannot pass through the anteroom.	**The primate rooms will be reconfigured to allow doors for cart movement.**
81	The closer the primate rooms are to the dirty cagewash room, the better because they would have to traverse a shorter portion of the corridor. Primates are BSL-2 animals, so all people would need to vacate the corridor while the primates pass and would have to stay out of the corridor until it gets mopped with disinfectant afterwards.	**The primate rooms will be shifted closer to the dirty cage room.**
82	The dirty cage room needs to be larger to accommodate primate banks and rodent racks. Can it be enlarged at the expense of the procedure room (resulting eg. in 270 sq ft for cageroom, 175 sq. ft for procedure room)?	**The dirty cage room will be enlarged.**
83	The dirty cage room needs a trench drain and waterhose connection (I believe that is already in the plans).	**Will Comply. A trench drain and water hose connection will be provided in the new dirty cage room.**
84	The dirty cagewasher room in the old vivarium area needs a trench drain. A drain similar to the one on the clean side of the cagewasher would work great.	**The cost of adding a trench drain will be priced and the Project Committee will determine inclusion.**
85	The procedure room needs an externally vented biosafety cabinet (I believe that is already in the plans).	**A vented biosaferty cabinet will be added.**
86	I forgot to mention this in the past. The primate rooms should have guardrails on the walls to prevent damage to the walls from cageracks bumping into them. The other RAR primate rooms have had them installed because of damage problems.	**Cart rails or sloped curbs will be provided to manage the carts.**

Item No.	Description	Architect's Response
87	If there is no redundancy in the heating system for the vivarium, the rooms should have extra 20 amp circuits (2 per room) to enable the use of portable electric heaters in case of a heat outage. Extra circuits were installed in the MTRF vivarium after completion of construction, after a heat outage occurred.	**Electrical circuits will be added.**
	Vivarium Layout	
88	Four possible vivarium room configurations are attached under separate cover	**Option 2 is now incorporated into the plan.**
	LANDCARE	
	[illegible]	
89	Please show existing trees to remain and those to be removed.	**This will be reflected in the DD documents.**
90	Where will construction staging occur?	**Staging area will be on the north side of proposed 21st Avenue SE. This will be reflected in the DD documents.**
91	Can the courtyard space be used to handle stormwater or is that precluded by need for equipment access?	**The courtyard is needed for future equipment access. In terms of stormwater, we don't want to encourage the roof water to enter the courtyard as there is no surface overflow in this area. The courtyard will be pervious but it will not handle the roof stormwater runoff.**
92	How will the existing bioswales be protected during construction?	**The existing bioswales will be impacted during construction and will be rebuilt to match incorporate the new bioswales on the east side of the building and the site changes therein. DD documents will reflect these elements.**
	Capital Planning & Project Management	
	[illegible]	
93	STATEMENT OF NEED: 4th paragraph, page 3, "...in the area of cancer and stem research." Add the word "cell".	**Noted and changed.**
94	RESPONSE TO DISTRICT PLAN AND SITE GUIDELINES, Efficient Utilization of Land and Facilities, Page 5: "...in this portion of the new East Gate Campus." Add the word "way", delete campus, add district.	**Noted and changed.**
95	RESPONSE TO DISTRICT PLAN AND SITE GUIDELINES, Image Architectural Character, Page 5: Remove reference to TRF link.	**Noted and changed.**
96	RESPONSE TO DISTRICT PLAN AND SITE GUIDELINES, Image Architectural Character, Page 5: Add "...similar to other bioswales in the district.	**Noted and changed.**
97	RESPONSE TO DISTRICT PLAN AND SITE GUIDELINES, Utilities, Page 6: Will the referenced connection to the existing 24" RCP be allowed by code?	**The building roof drains will connect to the bioswales and stormwater management treatment systems. The stormwater treatment systems will connect to the existing storm sewer. This will be reflected in the DD documents.**
98	PROJECT ASSUMPTIONS, West Connecting Link, page 9: Correct the typo MTFF should be MTRF.	**Noted and changed.**
99	SITE PLAN: Add a directional arrow to the one-way service drive.	**Noted and changed.**

Item No.	Description	Architect's Response
100	SITE PLAN: Identify the street parking on 21st Avenue.	**Noted and changed.**
101	FIRST FLOOR PLAN: Where is recycling currently staged in the existing building? University Standards require a Recycling Room.	**Currently recycling occurs in the existing receiving area.**
102	FIRST FLOOR PLAN: Access to the Elevator Equipment Room through a Storage Room is not desired.	**The entrance to the Elevator Equipment Room will be moved from the storage area.**
103	SECOND FLOOR: Appears that the CMRR server room is shared with Telecom? Or is this not really a Telecom closet for University NTS? Telecom should be a dedicated closet.	**The Server Room will be separated from the Telecom Room.**
104	CIVIL NARRATIVE, PAGE 31: Change Environmental Health Services to Environmental Health & Safety.	**Noted and changed.**
105	CIVIL NARRATIVE: Page 32, Concrete stairs have already been removed.	**Noted and changed.**
106	CIVIL NARRATIVE: Page 33, Add narrative for telecommunications infrastructure. What does it consist of? Where is it coming from? This can be obtained from Terry Teschner at NTS.	**The current building is serviced from an existing telecommunication manhole located on the south side of the building according to the original building electrical documents. Two, four-inch conduits are installed underground from this manhole to the existing data room. This arrangement will be replicated for the new building addition subject to confirmation from Terry Teschner with NTS.**
107	CIVIL NARRATIVE: Page 34, there are no chilled water lines in 6th Street.	**Noted and changed.**
108	APPENDIX, PARTICIPANTS: Add Tom Ritzer, Landscape Architect.	**Noted and changed.**
	Andrew Chin (612) [illegible]	
109	Revise project number on SD Report; should read #01-180-08-1687	**Noted and changed.**
110	Use consistent Project Title throughout: 'Center for Magnetic Resonance Research Expansion and Renovation'	**Noted and changed.**
111	Inconsistent room labels between SD Report and Drawings for 2 rooms near main entrance: - Vending / Guest Break - Storage / No Room Label	**Noted and changed.**
112	What is the purpose of dead-end corridor east of Telecom room? Can the three rooms (guest break, office, conference) be shifted or expanded north to better utilize space?	**Further study will be done to evaluate an accessible unisex toilet available on the visitor side of the control point.**
113	Restrooms at front entry - is there an opportunity to move entrance in-front of security to make restrooms accessible to clinical research participants and guests?	**Further study will be done to evaluate an accessible unisex toilet available on the visitor side of the control point.**
114	Identify location for post mounted building sign near new entry	**Building sign location will be defined in DD as bioswail development is refined.**
115	Appendix; Prelim Equip List - Add column for responsible party	**Noted and changed.**
	Gary Summerville (612) 625-9388 [illegible]	**Noted and changed.**

Item No.	Description	Architect's Response
116	The original predesign (correct me if I am wrong) included a skyway link to MTRF. The project does not include this link. The question is: Does the current design for he CMRR Addition accommodate the construction of a skyway link to MTRF in the future if it was required by the academic / research program and the funding was provided.	**The predesign showed the possibility of the skyway and labeled it as future link. The current design would utilize an on grade link.**
117	The north side of the building needs more study and architectural development. An effort should be made to enhance the visual expression of the north side by studying the south and east elevations. As I remember we had this same issue with MBB and the design team enhanced the north side to make it more compatible with the balance of the building. The intent should not to make the north look the same as the south and east, however, it should be reflective. The north side of the building will have a lot of exposure from Granary Road and the neighbor to the north.	**Agreed. Further study will be done once MEP input is complete.**
118	The skin of the cyclotron need more study. Do we want to introduce another skin material just for the cyclotron?	**Further study is being done on this element.**
119	I understand the acquisition of land to the north needed for the project has not been concluded. What is the schedule for University ownership of this land. When we present the project to the Regents in March, we may have some new Regents. I am not sure how the design of a building on land not owned by the University should be disclosed to the Regents.	**The northward expansion of the site is described under project assumptions.**
120	In the Regents data sheet I recommend you include the extension of 21st Avenue to the north in the description for the scope of the work.	**The extension of 21st Avenue SE is described under project assumptions.**
	[redacted]	
121	South Elevation: consider a different fenestration shape (not these progressively variable width vertical rectangle slots) along this main facade that is more in keeping with the rest of this building and reflective of fenestration patterns on adjacent AHC buildings.	**Further study is being done on this elevation.**
122	East Elevation: Introduction of copper siding at the cyclotron is not desirable for building context, district precedent and environmental reasons.	**Further study is being done on this elevation.**
123	West Courtyard Elevation: Reconsider the custom eyebrow shaped fenestration.	**This element is consistent with the existing building and adjacent fenestration in the courtyard. Further studying is being done.**
124	North Elevation: New Service dock needs to be minimized visually as this building has four principle facade views.	**Further study is being done on this elevation.**
125	Ambulance/patient entrance is no longer shown. If east entrance will be used for that purpose, better door operation/access (double electrically operable door system?) should be considered, along with curbside parking restrictions.	**The non-ambulatory entrance will be studied as definition of research subject parking is determined.**
126	Curbside parking along 21st Avenue SE needs to be addressed with University Parking & Transportation Services.	**A meeting will be held with University Parking & Transportation Services.**

Item No.	Description	Architect's Response
	ENVIRONMENTAL HEALTH & SAFETY	
	Janet Dalgleish (612) 626-7095 dalgl006@umn.edu	
	Dawn Errede (612) 626-2330 erred001@umn.edu	
127	No return air allowed (p.46) from areas with hazardous biological, radiological or chemical hazards (e.g. animal holding and research labs)	**Will Comply. Will discuss with EHS in greater detail.**
128	Please detail the make and model of oxygen sensors and humidifier and their maintenance needs (p.47).	**Oxygen sensor will be consistent with manufacturer being tested as part of 16.4T project (MSA). Humidifier requirements are currently being researched.**
129	No acid waste neutralizing basin needed (p. 53).	**Acid waste neutralizing basis will be removed from scope of project.**
130	Research labs must comply with Appendix L of the univ. construction standards, including -showers and eyewashes in labs with fume hoods -2 Pascals negative with respect to public spaces -etc.	**Will Comply.**
131	No UV lights required in biosafety cabinets.	**Will Comply.**
132	Wet labs without fume hoods must have at least an eyewash.	**Will Comply. Eyewash stations will be provided in lab areas.**
133	Ensure exhaust adequate to control odors in copy/print room	**Will Comply. A dedicated exhaust fan will be provided in the copy/print r**
	Neil Carlson (612) 626-5714 carls001@umn.edu	
134	No recirculation of laboratory exhaust. Please set up method to collect and send the animal bedding to compost.	**Laboratory exhaust will not be recirculated. It is our understanding that the bedding requirements do not justify a collection system.**
	Brian Vetter (612) 626-5247 vette001@umn.edu	
135	Detailed shielding plans for ionizing radiation control must be submitted to and approved by the Minnesota Department of Health prior to start of construction. This includes shielding for the PET/CT facility in addition to the cyclotron.	**RSP will work with EHS to prepare the required submittals.**
136	Quench venting was not found mentioned in the MR/PET facility section.	**Will comply.**
	Van-Anh Tang (612) 626-7957 tang0039@umn.edu	
137	Stormwater: -In accordance to plan sheet A01, there will be two additional bio-swales on the east side of the building expansion (along 21st Ave. SE), but in the Project Report an underground tank system was suggested. Please clarify which option will be used. -Submit runoff calculation (from new building) to DEHS. -NPDES/Construction application will be reviewed and signed by DEHS. SWPPP must be developed by Architect/Engineer and approved by DEHS prior to submittal of NPDES application to MPCA.	**DD documents will develop the stormwater treatment system more thoroughly. Calculations and SWPPP will be submitted to DEHS approval prior to NPDES submittal. Narrative will be revised to reflect the bioswale concept.**

Item No.	Description	Architect's Response
138	Air Emissions Issues: -Form "Air Emission Checklist - Internal Combustion Engines" (for new generator) must be completed and submitted to DEHS as soon as possible. Based on the size and type of generator, the University Air Emission Permit may need to be amended prior to start of construction. -Stack vent of generator must be located at least 10 ft. above highest roof line.	**The Air Emissions Checklist has been submitted to EHS.**
139	Fuel tank: -Please specify fuel tank size and location; MPCA tank registration may be required. Let me know if you have any questions. 626-7957	**The external tank will have a 400 gallon capacity. We will provide the location in the DD phase.**
	ENERGY MANAGEMENT	
	Nirmal Jain (612) 626-0645 nirmal@umn.edu	
	Tom Moran (612) 626-0661 moran004@umn.edu	
140	Page 58 indicates that the bulk of the building conduit will be EMT (ferrous). Page 59 calls for non-ferrous materials in the magnet room only. Should non-ferrous materials be used beyond the footprint of the magnet room?	**The strength of the existing fields are being verified to define the boundaries. The new MRI systems are being designed and fields may vary with the schematic assumptions. We will review and advise.**
	Jay Denny (612) 624-3554 denn0013@umn.edu	
141	The office and lab temperature ranges are too narrow. Winter temperatures of 70 degrees should be used.	**Will Comply.**
142	The new fire system should be configured for walk-test capabilities.	**Will Comply after further investigation**
143	All dual level lighting controls should be configured to provide partial power lighting automatically. The occupant can then increase the light levels if needed. All lights should turn off based on occupancy. Once off, the lights should resume at partial power when occupancy is again detected.	**This will be evaluated in more detail during the DD phase.**
144	All DDC equipment connected to emergency power should have a UPS.	**Will Comply.**
145	All new refrigerated air dryers should be cycling type.	**Will Comply.**
146	The new lab vacuum system should have a VFD.	**Will investigate feasibility.**
147	The new lab air compressor should have a VFD.	**Will investigate feasibility.**
148	The steam and condensate system shall be monitored by the University remote metering system. The equipment is provided by Energy Management at a flat rate to the project. Fee TBD. Networking requirements will be provided during DD.	**Will comply.**
149	The DDC control system must conform to current University BACnet requirements as per the latest Energy Management specifications which supersede the current University Standards.	**Will Comply.**
150	General exhaust should have heat recovery and a way to turn down the flow during unoccupied or low use hours.	**Heat recovery may be a viable option depending on the percentage of building make up outdoor air. EMCS will control exhaust systems to shut down during unoccupied hours. Energy recovery systems will be investigated based 5 year payback analysis.**

Item No.	Description	Architect's Response
151	Have chilled beams been considered for the skyway as a way to reduce the amount of air that must be delivered to the space?	**Will investigate feasibility during DD.**
152	Specify radiant in-floor heat for vestibules. It eliminates the CUH maintenance and dries the floor better. This would work well for the skyway also.	**Will investigate feasibility during DD.**
153	Is redundancy required for the magnet cooling tertiary pump? Can the secondary pumps provide enough flow in an emergency?	**Our intent is to provide bypass w/ check valves on tertiary pumped equipment to a set flow and use the pumps to maintain specific required pressures at those locations.**
154	Can the computer room units be converted to or augmented with water-to-water heat pumps? We can use the heat removed from the process loads to heat the outside air. A heat recovery chiller/heat pump in series with the dry cooler would also work.	**Will investigate feasibility and payback analysis during DD.**
155	The skyway is a glass box pointed towards the sun. We need to find a way to either block as much of the solar heat gain in the winter as we can or we need to find a way to return that heat to the building where it is needed. Will there be shades for the winter or overhangs for the summer?	**Architectural shading will be investigated.**
156	The office and laboratory AHUs should be configured such that all relief air can be routed through the 100% OA units when appropriate.	**Will investigate feasibility during DD.**
157	Specify bypasses around all in-line heat recovery coils (supply and exhaust) to minimize pressure drop when the coils are not active. Consider adding bypasses to all AHU heating and cooling coils.	**Will investigate feasibility during DD.**
158	Please comment on the exhaust VAV box flow sensor requirements for the vivarium spaces. The concern is that animal room exhaust can be relatively dirty and can foul pitot type flow sensors. Consider vortex shedding or orifice ring sensors.	**Will investigate this option during DD.**
159	Is the cyclotron exhaust considered to be general exhaust or something more harmful? If it is simply general exhaust, consider using a heat recovery wheel instead of the pumped coil.	**It is our understanding that the cyclotron exhaust is potentially radioactive. The exhaust air will be treated with carbon filters prior to dispersing to the atmosphere.**
160	The heating and reheat systems should be designed as low temperature systems. Heat recovery chillers should be considered given the process loads present in the facility. Water-to-water or air-to-water heat pumps may also be an attractive way to recover energy and avoid the need for remote DX condensing units.	**Will investigate feasibility during DD.**
161	All HVAC pumps should be designed for minimum pressure drop. Inlet suction diffusers should not be used and the lowest pressure drop combination of discharge valves should be used (probably not a triple duty valve).	**Will investigate based on 5 year payback analysis.**
162	I strongly recommend designing the system such that the old and new hot water systems are combined. This will provide fuel source redundancy along with mechanical system redundancy.	**Will investigate feasibility during DD.**
163	If coil pumps are substituted for the glycol system, please comment on the availability of freeze resistant coils for this application.	**Will investigate feasibility during DD.**

Item No.	Description	Architect's Response
164	Consider eliminating the secondary glycol loop for AHU heating and replace with coil pumps for freeze protection. It would eliminate an entire set of pumps and heat exchangers but we will have to weigh the savings vs. the risk of freeze up.	**Will investigate feasibility during DD.**
165	The condensate meter must have a 3-valve bypass installed to allow for annual rebuilds of the turbine meter.	**Will comply.**
166	The steam meter should have a turndown of 100:1 and must be installed with a 3-valve bypass (unless an insertion type is used).	**Will comply.**
167	The specification should include a special inspector to evaluate the sound performance of the facility. Otherwise, this task can be included with the commissioning spec.	**Will comply.**
168	NC 25 in the vivarium seems like it might be hard to achieve with all the hard surfaces. Is this the correct target?	**Will review and advise. NC 30 may be more appropriate.**
169	Pages 58 and 59 outline the use of ferrous and non-ferrous materials. Should the restriction go beyond the magnet room and be determined by the Gauss lines, not the building rooms? Or is shielding in place around the magnet room, in which case the given Gauss lines are inaccurate?	**The strength of the existing fields are being verified to define the boundaries. The new systems are being designed and fields may vary with the schematic assumptions. We will review and advise.**
	[redacted]	
170	"Ring and string" Our standards call for cable tray and/or conduit. The existing building is constructed this way, and the addition should match the existing building. With the magnets there will be EMI concerns, that conduit will help shield from.	**The University is currently evaluating this item as part of the Value Analysis process.**
171	(2) 4" EMT conduits from existing MDF to new telecomm room. We will require (3) 4" EMT for NTS use only.	**Will comply.**
172	The blueprints show a Server/Telecomm room on the 2nd Floor. Is this for our use? If so, we do not share space. This should be a telecomm room only.	**The Server Room will be separated from the Telecom Room by a wire mesh partition.**
	ENVIRONMENTAL HEALTH & SAFETY	
	Mike Austin (612) 626-6436 austi001@umn.edu	
173	Provide local exhaust ventilation at cage dumping locations.	**Will comply.**
174	Provide a snorkel exhaust drawing at least 100 cfm at each location where anesthetic gases will be used.	**Will comply.**
	ENERGY MANAGEMENT	
	Scott McCord (612) 626-1156 mcco0361@umn.edu	
175	I see that the Cyclotron has very tight control for the ambient conditions required for the unit. Is the Architect specifying increased thermal mass and an extra tight building enclosure around the Cyclotron to allow some control and maintenance response cussion?	**The Cyclotron is shown in a separated building appendage. The device itself will be contained in a 12" thick concrete walled room. As specific equipment is selected, the design team will provide systems to support the needs of the specific equipment.**

Item No.	Description	Architect's Response
176	Will there be any provisions to tie mechanical systems together for redundancy or cost savings purposes? It appears both the hot water and chilled water systems on the original building are primary-secondary loops which would make it fairly easy to tie the systems together for redundancy purposes.	**At this time, neither the hot water or chilled water systems are tied together. We will evaluate the cost and benefit of this further during the DD phase.**
177	It appears that there are substantial process heat loads in the facility due to process and computer/server loads that the designer should be looking at recycling into the outside air makeup for the building in winter operation to reduce the operation cost.	**We will evaluate during the DD phase.**
178	High pressure steam pressure on a design day is estimated to be around 120-130 psi and therefore will determine the PRV sizes. The relief valve needs to be sized with an entering steam pressure of 240 psi, as that is the relief pressure of the safety valve on the steam plant (although the building may never see over 200 psi).	**We will comply.**
179	The chilled water system narrative seems to mirror the existing building, but seems complex for the process load. It calls for 600 tons of refrigeration cooling capacity (plus 120 tons of drycooler capacity) with a design load of 350 tons. Is the intent to have N+1 chillers? See comment [#176] above about utilizing some of the redundancy already in the existing building.	**During the Value Analysis process, the redundancy of the chiller plant has been removed. The current chiller plant size is 350 tons.**
180	The intent as I understand of the selection of a split chiller instead of two air cooled chillers is so that a chiller can remain available without filling the bundle without glycol and adding a heat exchanger. The narrative calls for the single split unit to be available for ambient conditions -16 to 80 degrees F. Is it the designers intent to select the chiller with the design 92 degrees F similar to the air cooled chiller? What about two split chillers with free cooling valving installed and eliminate the dry cooler and air cooled chiller?	**Yes, we will design to these ambient conditions. We will evaluate the option of 2 split chillers during the DD phase.**
181	What is the power density of the server room? We have been encouraging many other projects to utilize rear door, overhead mounted coil, or some other style of close-coupled water side cooling systems for cooling these areas. Unless policed well, the CRCUs in many of the existing data centers on campus will only deliver about 50-75% of the rated tonnage and rooms can still experience hot spots.	**The power density will be determined during the DD phase. We will evaluate cooling options for these rooms during the DD phase.**
182	If you want redundancy outside of the chilled water, you can install a DX water chiller with automated valving with a head-pressure control for winter conditions.	**This option will be evaluated during the DD phase.**
183	Compressed Air and Vacuum Systems: Please evaluate the existing load on both compressed air and the vacuum pump systems by logging system usage before upsizing the systems. Our engineers and technicians have recently found many systems that are extremely oversized in a few recent upgrades.	**We will request this existing load data and will review it against the existing capacity.**
	PARKING & TRANSPORTATION SERVICES	**Set up Mtg w/ Prk & Tran**

Item No.	Description	Architect's Response
	Michael Ramolae (612) 626-9266 ramol001@umn.edu	
184	A minimum of three Official University/Vendor parking stalls should be provided to service the building.	**Noted. Narrative will reflect three stall minimum.**
185	Bicycle parking should be provided at the building entrance.	**Bicycle Parking will be provided**
186	The parallel parking on the west side of 21st Ave. has an awkward access route, and would require an HC curb cut.	**HC access through the curb to the side walk will be studied.**
187	All new street areas should be posted either "no parking" or "fire lane" where there is no designated parking.	**Noted. This will be reflected in the DD documents.**
	Perkins+Will Architects (skyway link) **Dave Dimond (612) 851-5101 dave.dimond@perkinswill.com**	
188	CPPM requested that Perkins+Will review the skyway concept for coordination with the MBB connection point, resulting in the following comments:	
189	"Scheme looks good. Thanks for sharing. The proposal would be most successful if the sky bridge could span without columns - in particular on the MBB side."	
190	NOTE: Jim Roed has confirmed that a column is not expected to be required on the MBB side of the street if the skyway bridge design can meet the following requirements: there are two embed plates (8'-8" on center) on the face of the concrete beam at level 2 between grid C.2 & D. Each embed plate is designed for a dead load of 35 kips and a live load of 35 kips.	**We will review both the potential of column less span and columns at each side to increase or decrease the span. Cost & structural capacity will be considered.**
	Chris Fischer	
191	"I agree that the scheme seems clean and in keeping with the intentions of the district for materials and expression. It would be nice to see a site plan.	
192	The skyway connection at MBB was designed to receive the bridge without a column on our side of the street (i.e. the exterior beam at floor 2 was designed to take the load), but it will still be good to get Jim Roed's Blessing.	
193	The Sky Bridge itself seems a little tall and will be impacting MBB's third floor as currently rendered. Could it be shorter and align with the top of the metal panel since we have floor to ceiling glass at this location and a pretty gracious floor to floor of 14'8".	**We will review the height and its impact on MBB>**
194	In order to get over the bottom lip of the Precast on MBB the structure will need to be a full height truss or an upturned beam."	**We will review this detailing in DD Documents.**
	DISABILITY SERVICES [illegible]	

Item No.	Description	Architect's Response
195	Show location of power doors for entrance and restrooms.	**We will indicate this in the DD Documents.**
196	Is there a space for an accessible unisex restroom? Perhaps the room North of the elevator would work for a unisex restroom.	**We will indicate this in the DD Documents.**
	ELEVATOR SHOP Patty Erickson (612) 625-2506 erick022@umn.edu	
	No comment	
	ZONE - FACILITIES MANAGEMENT Paul Krueger (612) [illegible]	
	No comment	
	BUILDING CODE DIVISION Ann Jacklitch (612) 624-1196 ajacklitch@umbuildingcode.com	
	BSAC Bob Uphus (612) 625-0385 uphus001@umn.edu	
	DEPARTMENT OF CENTRAL SECURITY Robert Janoski (612) 624-1730 janoski@umn.edu	
	Classroom Technical Services Chuck Bottemiller (612) 625-6664 botte001@umn.edu	
	Mortenson Constructio[illegible] Barry Morgan (763) 287 [illegible]	

APPENDIX

The exhibits that follow are furnished in support of the programmatic content provided in this report's Narratives, Drawing and Diagrammatical Images.

Participants
Project Advisory Committee members and design team members whose collaboration is responsible for this project and the content of this report.

Magnet Systems Diagram
The various magnet systems are identified, defining type, shielding requirements and special constructions. Anticipated fringe fields for one and five gauss lines are also defined.

Room Data Sheets
Detailed descriptions of room functions, material finishes, equipment needs and specialized design or construction considerations.

Preliminary Equipment List
A list of anticipated new equipment ranges from new fume hoods and laminar flow hoods in wet lab areas to the sophisticated electronics that will drive the new research magnets and scanners.

Equipment References
References for the larger scanners and radiochemistry equipment which may be procured for use with this facility.

- Cyclotron
- Hot Cell and Mini Cell (Cyclotron)
- PET CT
- Micro PET (Multimodality system)
- Actively Shielded 7.0 Tesla Magnet – Provisional Specifications
- 10.5 Tesla Magnet - Specifications

Steel Magnet Shielding
Images provided for reference illustrate how steel plates will be assembled to form sides, tops and bottoms of a steel shielding assembly which may be required for two of the programs larger research magnets. Steel shields such as this will limit the higher strength magnetic fields to a tighter range.

Attachments

Large scaled drawings of images used in the Book Report provided to aid review. Drawings include:

- Ground Floor Plan
- Second Floor Plan
- Roof Plan
- Exterior Elevations
- Building Sections

Participants

University Of Minnesota

Charles Moldow	U of M, Med School
Ann Schwind	U of M, Med School
Orlyn Miller	U of M, CPPM
Lorelee A Wederstrom	U of M, AHC
Andreas Papanicolaou	U of M AHC
Kamil Ugurbil	U of M, Radiology
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Jerry Froelich	U of M, Radiology
Charles Dietz	U of M, Radiology
Karen Kowalik	U of M, Radiology
Patrick Bolan	U of M, Radiology
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Peter Andersen	U of M, Radiology
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Rick Johnson	U of M, CPPM
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Andrew Chan	U of M, CPPM
Monique MacKenzie	U of M, CPPM

Architectural Consulting

Ted Davis	RSP Architects
Bryan Gatzlaff	RSP Architects
Judd Brasch	RSP Architects
John Merten	RSP Architects
Dustin Bennis	RSP Architects

Civil & Structural Consulting

Rhonda Pierce	Pierce Pini
Jim Roed	Ericksen Roed

Mechanical and Electrical Consulting

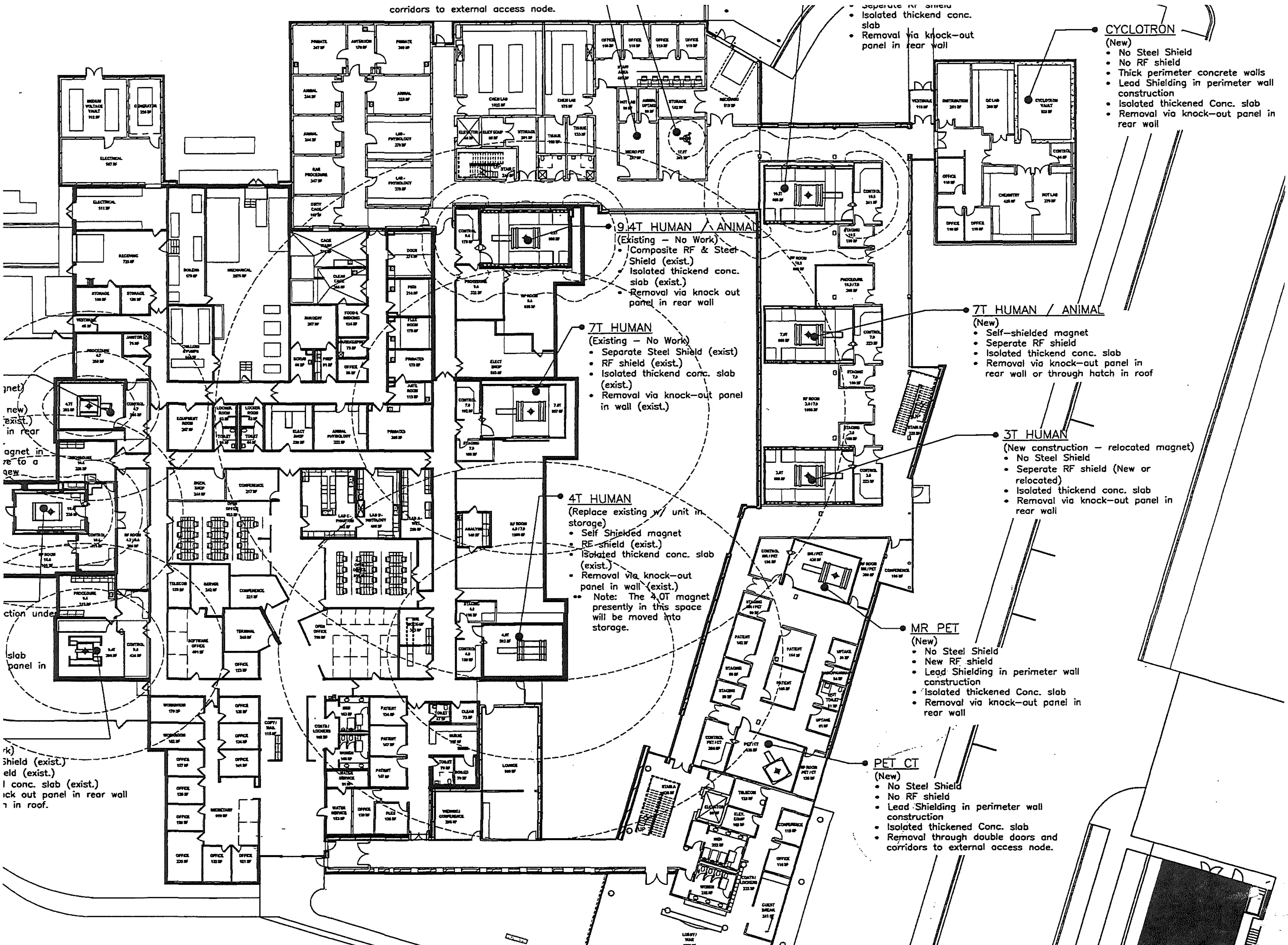
Bob Kilgore	Sebesta Blomberg
Mark Dieser	Sebesta Blomberg
Doug Lucht	Sebesta Blomberg
Brian Kelly	Sebesta Blomberg

General Contracting

Blair McNeil	M.A. Mortenson Company
Barry Morgan	M.A. Mortenson Company

Cost Estimating

Andrew White	Faithful and Gould
Chad Chapman	Faithful and Gould



MAGNET SYSTEMS DIAGRAM

SCALE: 1/16" = 1'-0"

UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Administrative

Room Type	Use Category	Room Number
Private Office		

A. Function Summary:

Private office to support tenured, tenure-track and anticipated future recruits.

B. Adjacency:

No adjacency required, however it would be advantageous to locate some offices near the magnets. Others should be near other administrative support spaces.

C. Number of Occupants: 1 ea

D. Area: 120 sf standard – 150 / 200 sf for director

E. Architectural Design

Finishes	▪ Floors - Carpet
	▪ Wall base – Vinyl base
	▪ Walls – painted gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ None anticipated
	▪
	▪
	▪
Built In Equipment	▪ Non Anticipated
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Window Treatments	▪
▪ Office Furniture	▪
▪ Phone, Data (Fiber Optic)	▪
▪	▪
▪	▪
▪	▪
▪	▪

UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Administrative

Room Type	Use Category	Room Number
Open Office		

A. Function Summary:

Open office areas to support Grad Students, PIs, technicians, civil servants etc. who would in support of current and future CMRR faculty.

B. Adjacency:

No adjacency required, however it would be advantageous to locate smaller cells of open office space associated with faculty-related teams

C. Number of Occupants: varies

D. Area: varies

E. Architectural Design

Finishes	▪ Floors - Carpet
	▪ Wall base – Vinyl base
	▪ Walls – painted gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile and / or gyp bd. soffit accents
Special Construction	▪ None anticipated
	▪
	▪
	▪
Built In Equipment	▪ Non Anticipated
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Window Treatments	▪
▪ Work Station Furniture	▪
▪ Phone, Data (Fiber Opric)	▪
▪	▪
▪	▪
▪	▪
▪	▪

1220 Marshall Street NE
Minneapolis, MN 55413-1036
612.677.7100 main
612.677.7499 fax
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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Administrative

Room Type	Use Category	Room Number
Building Manager's Office		

A. Function Summary:

Private office to support a designated building facilities and maintenance manager.

B. Adjacency:

Location should be in conjunction with front reception area.

C. Number of Occupants: 1 ea

D. Area:

E. Architectural Design

Finishes	▪ Floors - Carpet
	▪ Wall base – Vinyl base
	▪ Walls – painted gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ None anticipated
	▪
	▪
	▪
Built In Equipment	▪ Non Anticipated
	▪ Building Systems Automation Control
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Window Treatments if windows are present	▪
▪ desk	▪
▪ chair	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Research Subject Areas

Room Type	Use Category	Room Number
Soiled Holding		

A. Function Summary:

Serves as temporarily holding of wastes, and laundry facilities.

B. Adjacency:

Located within a zone designated as GCRC, in close proximity to the Nurse's Station, patient procedure rooms and Clean storage.

C. Number of Occupants: 1 ea

D. Area: 80 sf (renovated existing space)

E. Architectural Design

Finishes	▪ Floors – Sheet vinyl
	▪ Wall base – Vinyl base
	▪ Walls – painted gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ None anticipated
	▪
	▪
	▪
Built In Equipment	▪ Laundry Tub
	▪ Storage Cabinetry
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Washing Machine (or laundry services)	▪
▪ Dryer (or laundry services)	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Research Subject Areas

Room Type	Use Category	Room Number
Patient Procedure		

A. Function Summary:

Serves to temporarily house research subjects whom may require some basic clinical care.

B. Adjacency:

Located within a zone designated as GCRC, in close proximity to the Nurse's Station and clean / soiled storage spaces.

C. Number of Occupants: 1 ea

D. Area: 150 sf (renovated existing space)

E. Architectural Design

Finishes	▪ Floors – Sheet vinyl
	▪ Wall base – Vinyl base
	▪ Walls – painted gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ None anticipated
	▪
	▪
	▪
Built In Equipment	▪ Hand sink & vanity
	▪ Storage Cabinetry
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Exam Table	▪
▪ Chair	▪
▪ Soap, paper towel disp.	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Research Subject Areas

Room Type	Use Category	Room Number
Nurse Work Area		

A. Function Summary:

Flexible work space to support work activities for CMRR resident Nurse, visiting nurse and Clinical Imaging Nurse serving visiting research subjects.

B. Adjacency:

Located within a zone designated as GCRC, in close proximity to the patient procedure rooms, soiled Holding and Clean storage.

C. Number of Occupants: 2 ea

D. Area: 120 sf (renovated existing space)

E. Architectural Design

Finishes	▪ Floors – Sheet vinyl
	▪ Wall base – Vinyl base
	▪ Walls – painted gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ None anticipated
	▪
	▪
	▪
Built In Equipment	▪ Work Counter / Transaction Counter
	▪ Base cabinets
	▪ Wall Cabinets
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Refrigerator	▪
▪ Sink, soap, paper towel dispensers	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Research Subject Areas

Room Type	Use Category	Room Number
Nurse Office		

A. Function Summary:

Private office space for CMRR resident Nurse, and Clinical Imaging Nurse

B. Adjacency:

Located within a zone designated as GCRC, in close proximity to the Nurse Work area or adjacent to Clinical Imaging areas.

C. Number of Occupants: 1 ea

D. Area: 120 sf (renovated existing space)

E. Architectural Design

Finishes	▪ Floors – Carpet
	▪ Wall base – Vinyl base
	▪ Walls – painted gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ None anticipated
	▪
	▪
	▪
Built In Equipment	▪
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Work Station / Office furniture	▪
▪ Phone, data	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

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Research Subject Areas

Room Type	Use Category	Room Number
Flex Room		

A. Function Summary:

Flexible administrative type space, adaptable in layout which can support a variety of administrative or research subject type needs.

B. Adjacency:

Located within a zone designated as GCRC, in close proximity to the Nurse Work area and the Patient Procedure Rooms.

C. Number of Occupants: 1 ea

D. Area: 100 sf (renovated existing space)

E. Architectural Design

Finishes	▪ Floors – Sheet Vinyl
	▪ Wall base – Vinyl base
	▪ Walls – painted gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ None anticipated
	▪
	▪
	▪
Built In Equipment	▪
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Treadmill	▪
▪ Table, workstation or Control counter	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

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Research Subject Areas

Room Type	Use Category	Room Number
Clean Storage		

A. Function Summary:

Serves to store clean linens, cleaning supplies, medical supplies etc. in support of the GCRC.

B. Adjacency:

Located within a zone designated as GCRC, in close proximity to the Nurse's Station and patient rooms.75

C. Number of Occupants: 1 ea

D. Area: 75 sf (renovated existing space)

E. Architectural Design

Finishes	▪ Floors – Sheet vinyl
	▪ Wall base – Vinyl base
	▪ Walls – painted gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ None anticipated
	▪ 42" Doors
	▪
	▪
Built In Equipment	▪ None Anticipated
	▪ Cart Rails or sloped base
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Storage Shelving	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Research Wet Labs

Room Type	Use Category	Room Number
Lab - Chemistry		

A. Function Summary:

Wet lab space dedicated to research activities heavily involved with manipulating chemical compounds.

B. Adjacency:

Located near other lab spaces. Proximity to Tissue Culture labs is beneficial.

C. Number of Occupants:

D. Area: 500 sf modules

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – epoxy coating on gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ None anticipated
	▪
	▪
	▪
Built In Equipment	▪ Lab casework
	▪ Work Sinks
	▪ Lab Gasses
	▪ Fume Hood
	▪ Chemical Storage Cabinets

F. Furniture, Fixtures & Equipment

▪ Drying Rack for Glassware	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Research Wet Labs

Room Type	Use Category	Room Number
Lab – Tissue Culture		

A. Function Summary:

Research lab space dedicated to research activities heavily involved with manipulating tissues.

B. Adjacency:

Located near other lab spaces. Proximity to Chemistry labs is beneficial.

C. Number of Occupants:

D. Area: 150 sf modules

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – epoxy coating on gyp. bd.
	▪ Ceilings – epoxy coating on gyp. bd.
Special Construction	▪ UV Lighting in conjunction with traditional fluorescent
	▪ Sealed light fixtures
	▪ HEPA filtered Supply and Return
	▪
Built In Equipment	▪ Lab casework
	▪ Work Sinks
	▪ Lab Gasses
	▪ Laminar Flow Hood w/ UV lighting
	▪

F. Furniture, Fixtures & Equipment

▪ Incubator	▪
▪ Refrigerator	▪
▪ Gas bottle racks	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Research Wet Labs

Room Type	Use Category	Room Number
Lab – Animal Physiology		

A. Function Summary:

Research lab space dedicated to research activities heavily involved with the manipulation of animal test subjects.

B. Adjacency:

Located near other lab spaces. Proximity to Chemistry labs and tissue culture labs is beneficial.

C. Number of Occupants:

D. Area: 300 sf modules

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – epoxy coating on gyp. bd.
	▪ Ceilings – epoxy coating on gyp. bd.
Special Construction	▪
	▪
	▪
	▪
Built In Equipment	▪ Lab casework
	▪ Work Sinks
	▪ Lab Gasses
	▪ Surgery lights
	▪ Snorkel exhaust

F. Furniture, Fixtures & Equipment

▪ Surgery table	▪
▪ Refrigerator	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Research Wet Labs

Room Type	Use Category	Room Number
Animal Procedure		

A. Function Summary:

A work room configured to support activities associated with prepping animal test subjects ready for use with the associated nearby magnet.

B. Adjacency:

Located near the associated research magnet, but more likely accessed from the magnet's control room. The RF Equipment room is nearby. Other adjacent spaces may include a staging room if the magnet is also used with human test subjects. An analysis room may also be nearby.

C. Number of Occupants:

D. Area: 330 sf

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – epoxy coating on gyp. bd.
	▪ Ceilings – ACT tile
Special Construction	▪
	▪
	▪
	▪
Built In Equipment	▪ Lab casework (some locking)
	▪ Work Sinks
	▪ Lab Gasses
	▪ Exhaust snorkel for odors, anesthesia, exhaust.
	▪ Surgery lights
	▪ Flushing Wall Sink

F. Furniture, Fixtures & Equipment

▪ Surgery table	▪
▪ Refrigerator	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

RAR

Room Type	Use Category	Room Number
Animal Holding - General		

A. Function Summary:

A work room configured to house research animals.

B. Adjacency:

Located within the zone designated as Research Animal Resources. This room should open on to the main corridor. Similar to Primate Rooms but larger to accommodate larger animals in larger cages, such as dogs, pigs, sheep, etc.

C. Number of Occupants:

D. Area: 242 sf

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – epoxy coating on gyp. bd.
	▪ Ceilings – Painted gyp. bd.
Special Construction	▪ Sealed light fixtures
	▪ Trench drain(s) at end of room with covers
	▪ Lighting Control
	▪ 42" wide doors w/ 12x12 vision panel (darkened)
Built In Equipment	▪ Cart Rails / sloped base
	▪ Water, sink, SS bench
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Cage Banks for Primates	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

RAR

Room Type	Use Category	Room Number
Animal Holding - Primate		

A. Function Summary:

A work room configured to house research animals.

B. Adjacency:

Located within the zone designated as Research Animal Resources. This room should open on to the main corridor and should also have a secondary connection to an adjacent Ante-Room. One Ante-Room can serve two primate rooms.

C. Number of Occupants:

D. Area: 212 sf

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – epoxy coating on gyp. bd.
	▪ Ceilings – Painted gyp. bd.
Special Construction	▪ Sealed light fixtures
	▪ Trench drain(s) at end of room with covers
	▪ 42" wide doors w/ 12x12 vision panel (darkened)
	▪ Lighting Control
Built In Equipment	▪ Cart Rails / sloped base
	▪ Water, sink, SS bench
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Cage Banks for Primates	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

RAR

Room Type	Use Category	Room Number
Ante-Room		

A. Function Summary:

A smaller, intermediate room, adjacent to a Primate Holding Room, configured to support the prepping of research primates for experiment and to provide a means of security for the primate during transfers from cage.

B. Adjacency:

Located within the zone designated as Research Animal Resources. This room should open on to the main corridor and should also have a secondary connection to one or two adjacent Primate Rooms.

C. Number of Occupants:

D. Area: 160 sf

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – epoxy coating on gyp. bd.
	▪ Ceilings – Painted gyp. bd.
Special Construction	▪ Sealed light fixtures
	▪ Lighting Control
	▪ 42" wide doors
	▪
Built In Equipment	▪
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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RSP ARCHITECTS

UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

RAR

Room Type	Use Category	Room Number
Dirty Cage Storage		

A. Function Summary:

A work room used to temporarily house dirty animal cages prior to being washed in a nearby cage washer.

B. Adjacency:

Located within the RAR and as near as possible to the Cage Wash Room.

C. Number of Occupants:

D. Area: 300 sf

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – epoxy coating on gyp. bd.
	▪ Ceilings – ACT tile
Special Construction	▪ Wall guards / sloped base
	▪ 42" wide doors
	▪
	▪
Built In Equipment	▪
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

RAR

Room Type	Use Category	Room Number
Break Room (RAR)		

A. Function Summary:

A room suitable for personnel to meet to have lunch, take a break or conduct collaborative meetings.

B. Adjacency:

Located within the RAR. Other adjacencies are not so important.

C. Number of Occupants: 8

D. Area: 120 sf

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or VCT
	▪ Wall base –vinyl base
	▪ Walls – paint on gyp. bd.
	▪ Ceilings – ACT tile
Special Construction	▪ No exterior windows or skylights out of security concerns
	▪
	▪
	▪
Built In Equipment	▪ Upper and lower wall cabinets
	▪ Sink
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Table	▪
▪ Chairs	▪
▪ Microwave	▪
▪ Refrigerator	▪
▪ Coffee Maker	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Magnet Component

Room Type	Use Category	Room Number
Magnet Room		

A. Function Summary:

Large open room with high ceiling or roof structure, configured to house a large magnet and any associated shielding.

B. Adjacency:

Located immediately adjacent to a control room and an RF equipment room. Additional adjacent spaces may include a staging room, an analysis room and/or an animal procedure room.

C. Number of Occupants:

D. Area: 360 +/- sf

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – paint on gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile or exposed roof structure
Special Construction	▪ Thickened slab to support weight of magnet
	▪ Thickened slab to support weight of shield (for non self-shielding types)
	▪ MRI compatible lighting (LED or Fiber optic)
	▪ Humidification
	▪ Vibration isolation measures
	▪ Steel magnet shield (for non self-shielding types)
	▪ RF shield
Built In Equipment	▪ Cable management racks
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Magnet Component

Room Type	Use Category	Room Number
RF Equipment Room		

A. Function Summary:

Equipment that drives the nearby magnet is housed in this room.

B. Adjacency:

Located immediately adjacent to the associated magnet room and its control room. Additional adjacent spaces may include a staging room, an analysis room and / or an animal procedure room.

C. Number of Occupants:

D. Area: 400 +/- sf

E. Architectural Design

Finishes	▪ Floors – Aluminum access flooring
	▪ Base – Vinyl or Rubber
	▪ Walls – paint on gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ Recessed floor slab for access flooring
	▪ Pre-action fire suppression
	▪
	▪
	▪
Built In Equipment	▪ Cable management
	▪ Temperature control equipment
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Storage Cabinets	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Magnet Component

Room Type	Use Category	Room Number
Control Room		

A. Function Summary:

The control and operation of the research magnet is handled in this room.

B. Adjacency:

Located immediately adjacent to the associated magnet room and the RF equipment room. Additional adjacent spaces may include a staging room, an analysis room and / or an animal procedure room.

C. Number of Occupants:

D. Area: 300 +/- sf

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – paint on gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ None anticipated
	▪ Window to MRI Room (shared and human magnets)
	▪
	▪
	▪
Built In Equipment	▪ Desk height work counter with recessed cable tray
	▪ Cable Trays
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Phone, Data	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

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Magnet Component

Room Type	Use Category	Room Number
Staging Room (gowning)		

A. Function Summary:

Small private rooms where human research subjects converse with a researcher or nurse for interviewing and consenting purposes. This room may also be used for gowning purposes.

B. Adjacency:

Located immediately adjacent to the entrance to an associated magnet. Maybe accessed from the Control Room. The RF equipment room is also nearby. An additional adjacent space may include an animal procedure room and on occasion, an analysis room. Staging Rooms will also be located near the lobby and scanners of the Clinical Imaging area.

C. Number of Occupants:

D. Area: 100 sf

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – paint on gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ None anticipated
	▪
	▪
	▪
	▪
Built In Equipment	▪
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Occasional chair	▪
▪ Bench or Exam table	▪
▪ Gown Storage Racks	▪
▪ Clothes Lockers / secure closet	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data
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Magnet Component

Room Type	Use Category	Room Number
PET CT		

A. Function Summary:

Large open room with high ceiling or roof structure, configured to house a large scanner and any associated shielding.

B. Adjacency:

Located in the vicinity of the Clinical areas and immediately adjacent to a control room and an RF equipment room. Cooldown rooms for animal and human test subjects and a dedicated unisex toilet room should be nearby. An additional adjacent space may include a staging room. The MR PET may be next door.

C. Number of Occupants:

D. Area: 360 +/- sf

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – paint on gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile or exposed roof structure
Special Construction	▪ Thickened slab to support weight of scanner
	▪ Lead shielding in perimeter walls (radiation Control)
	▪ Temperature Control
	▪
	▪
Built In Equipment	▪ Cabinets for Storage
	▪ Cable management
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Magnet Component

Room Type	Use Category	Room Number
MR PET		

A. Function Summary:

Large open room with high ceiling or roof structure, configured to house a large scanner and any associated shielding.

B. Adjacency:

Located in the vicinity of the Clinical areas and immediately adjacent to a control room and an RF equipment room. Uptake rooms and a dedicated unisex toilet room should be nearby. An additional adjacent space may include a staging room. The PET CT may be next door.

C. Number of Occupants:

D. Area: 360 +/- sf

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – paint on gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile or exposed roof structure
Special Construction	▪ Thickened slab to support weight of scanner
	▪ Lead shielding in perimeter walls (Radiation Control)
	▪ Vibration Control measures
	▪ RF Shield
	▪
Built In Equipment	▪ Cable Management (Control Room)
	▪ Temperature control for Equipment Room
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

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Magnet Component

Room Type	Use Category	Room Number
Analysis Room		

A. Function Summary:

Wet lab space configured to support analysis and review activities of post-scanning testing results.

B. Adjacency:

Located nearby the 7.0Ts, the 4.0T and the 12.0T magnets.

C. Number of Occupants:

D. Area: 150 sf

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – epoxy coating on gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ None anticipated
	▪
	▪
	▪
Built In Equipment	▪ Lab casework
	▪ Work Sinks
	▪ Lab Gasses
	▪
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

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Magnet Component

Room Type	Use Category	Room Number
Magnet Component Storage		

A. Function Summary:

Storage space requested to temporarily house magnet related equipment and components, such as magnet gradients.

B. Adjacency:

Located in the vicinity of each the Animal, Human or Combined Magnet zones and off of a central corridor.

C. Number of Occupants:

D. Area: Varies

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – paint on gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ Wide doors for cart access
	▪
	▪
	▪
Built In Equipment	▪ Storage Cabinets
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Shared Facilities

Room Type	Use Category	Room Number
Waiting-Break Room		

A. Function Summary:

A large open space where visitors (guests, research subjects and maybe family) are initially received as they arrive to the CMRR. Visitors can wait in a variety of seating options including soft seating or table and chair configurations. Guest vending in the break area will offer beverages or snacks for casual consumption.

B. Adjacency:

Located off of the main entry vestibule and in conjunction with the main CMRR reception area. This zone would be secured from the rest of the CMRR's programmatic spaces. Public toilets and coats and lockers would also be adjacent and within the public zone.

C. Number of Occupants:

D. Area:

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or VCT / Carpet or other decorative finishes
	▪ Wall base –vinyl base, stone, wood or other decorative materials
	▪ Walls – paint on gyp. bd. / wall coverings, other decorative finishes
	▪ Ceilings – ACT tile / painted gyp. bd. soffits or bulkheads
Special Construction	▪
	▪
	▪
	▪
Built In Equipment	▪ Upper and lower wall cabinets
	▪ Sink
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Table	▪
▪ Chairs	▪
▪ Vending Machines	▪
▪ **Recycling Center**	▪
▪ Window Treatments	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Shared Facilities

Room Type	Use Category	Room Number
Lockers		

A. Function Summary:

A space configured to support lockers for CMRR personnel and guests to place valuables while at the facility.

B. Adjacency:

Located within the public zone and nearby the main waiting/ Break area. Public toilets would also be nearby.

C. Number of Occupants: 100 +

D. Area:

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or VCT / Carpet or other decorative finishes
	▪ Wall base –vinyl base, stone, wood or other decorative materials
	▪ Walls – paint on gyp. bd. / wall coverings, other decorative finishes
	▪ Ceilings – ACT tile / painted gyp. bd. soffits or bulkheads
Special Construction	▪
	▪
	▪
	▪
Built In Equipment	▪ Lockers (locking)– wider to allow for winter coats, back packs etc
	▪ Coat rod and parcel shelf
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

Shared Facilities

Room Type	Use Category	Room Number
Conference Room Small-Medium		

A. Function Summary:

A space designed for smaller meetings of four to eight occupants.

B. Adjacency:

No specific Adjacency is required, but located near offices is desirable. Some can be interspaced throughout the facility.

C. Number of Occupants: 4 to 8

D. Area: 120 sf to 200 sf

E. Architectural Design

Finishes	▪ Floors – Carpet
	▪ Wall base –vinyl base
	▪ Walls – paint on gyp. bd. / wall coverings
	▪ Ceilings – ACT tile / painted gyp. bd. soffits or bulkheads
Special Construction	▪
	▪
	▪
	▪
Built In Equipment	▪
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Conference Table	▪
▪ Chairs	▪
▪ White boards	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Shared Facilities

Room Type	Use Category	Room Number
Conference Room large		

A. Function Summary:

A space designed for larger meeting groups of up to sixteen people

B. Adjacency:

No specific Adjacency is required, but located near offices is desirable.

C. Number of Occupants: 16

D. Area: 380 sf

E. Architectural Design

Finishes	▪ Floors – Carpet
	▪ Wall base –vinyl base
	▪ Walls – paint on gyp. bd. / wall coverings
	▪ Ceilings – ACT tile / painted gyp. bd. soffits or bulkheads
Special Construction	▪ Adjustible lighting
	▪
	▪
	▪
Built In Equipment	▪ Projection Screens
	▪ Overhead projector
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Conference Table	▪
▪ Chairs	▪
▪ Window Treatments if windows are present	▪
▪ White Boards	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Shared Facilities

Room Type	Use Category	Room Number
Seminar Room		

A. Function Summary:

A very large space designed for very large meetings and seminar activities. This space would not have fixed seating but stackable chairs and narrow tables, which can be configured in a variety of ways.

B. Adjacency:

Located on the second level, and accessible from the main circulation areas, linking to the skyways. Toilet rooms should also be nearby as well as an elevator. A widening of the public corridor can serve as a prefunction area.. A Prep room with sink and refrigerators nearby would benefit catered events.

C. Number of Occupants: 80 plus

D. Area: 1900 sf

E. Architectural Design

Finishes	▪ Floors – Carpet
	▪ Wall base –vinyl base
	▪ Walls – paint on gyp. bd. / wall coverings
	▪ Ceilings – ACT tile / painted gyp. bd. soffits or bulkheads
Special Construction	▪ Adjustible lighting
	▪ Higher ceiling
	▪ Lighting Control
	▪
Built In Equipment	▪ Projection Screens
	▪ Overhead projector
	▪ Teleconferencing technology
	▪ Sound system
	▪

F. Furniture, Fixtures & Equipment

▪ Linear tables	▪
▪ Stacking Chairs	▪
▪	▪
	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Shared Facilities

Room Type	Use Category	Room Number
Prep Room		

A. Function Summary:

This room provides a space where catered meals for special events can be temporarily stored or set up.

B. Adjacency:

Located adjacent to the seminar room with access to the seminar room and an adjacent circulation node.

C. Number of Occupants:

D. Area: 100 sf

E. Architectural Design

Finishes	▪ Floors – VCT tile or sheet vinyl
	▪ Wall base –vinyl base
	▪ Walls – paint on gyp. bd. / wall coverings
	▪ Ceilings – ACT tile
Special Construction	▪
	▪
	▪
	▪
Built In Equipment	▪ Base and overhead cabinetry
	▪ Kitchen type sink
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Refrigerator (s)	▪
▪	▪
▪	▪
	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Shared Facilities

Room Type	Use Category	Room Number
Electrical Shop		

A. Function Summary:

A room with built in work counters where CMRR personnel can perform maintenance on various types of magnet related components.

B. Adjacency:

Location near research spaces but outside of significant magnet fringe fields is preferable.

C. Number of Occupants: 2

D. Area:

E. Architectural Design

Finishes	▪ Floors – sheet vinyl or VCT
	▪ Floor base – vinyl base
	▪ Walls - painted gyp. bd.
	▪ Ceilings – ACT
Special Construction	▪ Soldering Exhaust snorkels
	▪
	▪
	▪
Built In Equipment	▪ Work counter and base cabinets
	▪ Power Strips
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Power, Data	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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Shared Facilities

Room Type	Use Category	Room Number
Copy - Print		

A. Function Summary:

Space serves to support CMRR faculty and staff with zones where printers and copiers can be located. Also, localized storage of printing supplies and other clerical materials and supplies.

B. Adjacency:

Location should be near open office areas on both floors.

C. Number of Occupants: 1

D. Area: 80 sf

E. Architectural Design

Finishes	▪ Floors - Carpet
	▪ Wall base – Vinyl base
	▪ Walls – painted gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ None anticipated
	▪
	▪
	▪
Built In Equipment	▪ Base and overhead cabinets
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Copier	▪
▪ Printer	▪
▪ Paper / Toner storage	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Shared Facilities

Room Type	Use Category	Room Number
Break Room		

A. Function Summary:

A room suitable for CMRR personnel to meet to have lunch, take a break or conduct casual meetings.

B. Adjacency:

Located near other office or admin type spaces. Other adjacencies are less important.

C. Number of Occupants: 44

D. Area: 650 sf

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or VCT or Carpet
	▪ Wall base –vinyl base
	▪ Walls – paint on gyp. bd. or wall covering
	▪ Ceilings – ACT tile and/or painted gyp. bd. soffits
Special Construction	▪
	▪
	▪
	▪
Built In Equipment	▪ Upper and lower wall cabinets
	▪ Sink
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Table	▪ Window Treatments
▪ Chairs	▪
▪ Microwave	▪
▪ Refrigerator	▪
▪ Coffee Maker	▪
▪ Ice Machine	▪
▪ Dish Washer	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Shared Facilities

Room Type	Use Category	Room Number
Showers		

A. Function Summary:

Locker and shower facilities for CMRR personnel. Showers should be ADA accessible.

B. Adjacency:

None expressed, but connected to toilet rooms would be beneficial.

C. Number of Occupants: 3

D. Area: 120 sf

E. Architectural Design

Finishes	▪ Floors – Ceramic Tile
	▪ Wall base – Ceramic Tile
	▪ Walls – Ceramic Tile – Painted gyp. bd in non-wet areas
	▪ Ceilings – Painted gyp. Bd.
Special Construction	▪ Accessible stalls and with seats and grab bars
	▪ Floor Drains
	▪ Sink
	▪ Shower Stall & Plumbing
Built In Equipment	▪ Lockers
	▪ Vanity w/ sink
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Shared Facilities

Room Type	Use Category	Room Number
Receiving		

A. Function Summary:

New receiving zone dedicated to Magnet and Clinical deliveries only. Space will also be set aside for temporary staging of larger magnet related items such as gas dewers and gradients.

B. Adjacency:

Interior public corridors leading to new Magnet and Scanner Range – justified towards the NE portion of available site.

C. Number of Occupants:

D. Area:

E. Architectural Design

Finishes	▪ Floors – Sealed Concrete
	▪
	▪ Walls – painted gyp. bd. or CMU
	▪ Ceilings – Exposed structure – painted
Special Construction	▪ Wall guards, corner guards
	▪ Security Doors
	▪ Rated wall construction per code
	▪ Rated fire doors per code
	▪ Overhead coiling dock door
	▪ Structured overhead beam for pulley mount
	▪ Recessed floor for Scissors lift
	▪
Built In Equipment	▪ Recessed Scissors lift
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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RSP ARCHITECTS

UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Shared Facilities

Room Type	Use Category	Room Number
Server Room		

A. Function Summary:

A computer server room

B. Adjacency:

Outside of the magnetic fringe fields, near or adjacent to a telecommunications closet.

C. Number of Occupants: 2

D. Area:

E. Architectural Design

Finishes	▪ Floors –VCT or p-lam on access flooring
	▪ Floor base – vinyl base
	▪ Walls - painted gyp. bd.
	▪ Ceilings – ACT
Special Construction	▪ Raised Access Flooring
	▪ Redundant HVAC Cooling Capacity
	▪ "Clean Agent" Fire suppression system
	▪ UPS power
	▪ No water piping above Server Room Ceiling
Built In Equipment	▪
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Shared Facilities

Room Type	Use Category	Room Number
Telecom Closet		

A. Function Summary:

A room or closet to handle telecommunications needs.

B. Adjacency:

Outside of the magnetic fringe fields, near or adjacent to the new server room.

C. Number of Occupants:

D. Area:

E. Architectural Design

Finishes	▪ Floors –VCT
	▪ Floor base – vinyl base
	▪ Walls - painted gyp. bd.
	▪ Ceilings – ACT
Special Construction	▪ UPS power
	▪ No water piping above telecommunications closet ceiling
	▪
	▪
	▪
Built In Equipment	▪
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Shared Facilities

Room Type	Use Category	Room Number
Vestibule		

A. Function Summary:

The primary entry portal one enters the building through. Outer doors would be secure after hours. Inner doors are always secure.

B. Adjacency:

Located at main entrance, and before one enters into the general CMRR lobby / waiting area.

C. Number of Occupants:

D. Area:

E. Architectural Design

Finishes	▪ Floors – tile
	▪ Wall base –stone, wood, tile or other decorative materials
	▪ Walls – paint on gyp. bd. / wall coverings, other decorative finishes
	▪ Ceilings – ACT tile / painted gyp. bd. soffits or bulkheads
Special Construction	▪ Secure inner and outer doors
	▪
	▪
	▪
Built In Equipment	▪ Bench for temporary seating
	▪ Card Access at outer and inner door
	▪ Receptionist control security at inner door
	▪ Phone
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Shared Facilities

Room Type	Use Category	Room Number
Corridors - public		

A. Function Summary:

Principal circulation arteries, connecting to main building reception areas and ground and second level skyway links.

B. Adjacency:

Interior public corridors adjacent to skyway links

C. Number of Occupants:

D. Area:

E. Architectural Design

Finishes	▪ Floors - terrazzo
	▪ Base - terrazzo
	▪ Walls – painted gyp. bd., wall covering or other decorative materials
	▪ Ceilings – ACT or painted gyp.
Special Construction	▪
	▪
	▪
	▪
Built In Equipment	▪
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Shared Facilities

Room Type	Use Category	Room Number
Corridors – General CMRR		

A. Function Summary:

Secondary internal circulation arteries, connecting CMRR programmatic spaces and main public reception areas.

B. Adjacency:

Interior public corridors connection CMRR programmatic spaces.

C. Number of Occupants:

D. Area:

E. Architectural Design

Finishes	▪ Floors – epoxy resin
	▪ Base – epoxy resin –integral with floor
	▪ Walls – painted gyp. bd.
	▪ Ceilings – ACT
Special Construction	▪ Wall guards, corner guards
	▪ Security Doors
	▪ Rated wall construction per code, where applicable
	▪ Rated fire doors per code, where applicable
Built In Equipment	▪
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Shared Facilities

Room Type	Use Category	Room Number
Corridors - Skyway		

A. Function Summary:

Primary circulation arteries, connecting the CMRR to adjacent building.

B. Adjacency:

West skyway would be elevated and connects the CMRR to the adjacent MBB. Skyway access would be adjacent to public areas within the CMRR and near the second level Seminar Room.

C. Number of Occupants:

D. Area:

E. Architectural Design

Finishes	▪ Floors – Terrazzo
	▪ Base – Terrazzo
	▪ Walls – Metal & glass, painted gyp. bd.
	▪ Ceilings –painted gyp. bd., ACT or other pre- finished modular ceiling construction
Special Construction	▪ Security Doors
	▪ Elevated construction
	▪
	▪
Built In Equipment	▪
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Shared Facilities

Room Type	Use Category	Room Number
Toilets		

A. Function Summary:

Public toilet facilities to serve CMRR visitors, guests, faculty and staff.

B. Adjacency:

Public toilets would be located near the main entrance, reception and waiting area and within the secured zone. Toilets would also be located adjacent to the second level Seminar Room. Additional toilets would be dispersed throughout the CMRR to meet or exceed Building Code minimum fixture counts.

C. Number of Occupants: varies

D. Area: varies

E. Architectural Design

Finishes	▪ Floors – ceramic or porcelain tile
	▪ Base – ceramic or porcelain tile
	▪ Walls – ceramic or porcelain tile, painted gyp. bd. or decorative wall fabric.
	▪ Ceilings –painted gyp. bd. or ACT
Special Construction	▪ Floor Drains
	▪
	▪
	▪
Built In Equipment	▪ Toilet partitions
	▪ Vanity with sinks
	▪ Wall mirrors
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Toilet room accessories	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Clinical Imaging

Room Type	Use Category	Room Number
Lobby		

A. Function Summary:

A medium sized open waiting area, planned in conjunction with the Clinical Nurse's work area.

B. Adjacency:

Located in the clinical imaging area, and adjacent to the nurse area.

C. Number of Occupants: 20

D. Area: 300 sf

E. Architectural Design

Finishes	▪ Floors – Carpet
	▪ Wall base –vinyl base, stone, wood or other decorative materials
	▪ Walls – paint on gyp. bd. / wall coverings, other decorative finishes
	▪ Ceilings – ACT tile / painted gyp. bd. soffits or bulkheads
Special Construction	▪ Security Control
	▪ Phone or page system
	▪
	▪
Built In Equipment	▪
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Side Table(s)	▪
▪ Occasional Chairs	▪
▪ Window Treatments if windows are present	▪
▪ Phone / data	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Clinical Imaging

Room Type	Use Category	Room Number
Cyclotron Vault		

A. Function Summary:

Large open room with high ceiling or roof structure, configured to house the main cyclotron equipment.

B. Adjacency:

Located away from the magnet fringe fields of nearby magnets and away from mechanical room equipment. This room should be adjacent to the control room and the hot and cold labs that are support the cyclotron. Location should also be on the perimeter of the facility with an un-obstructed exterior wall or roof plane to assist with future cyclotron removal or replacement.

C. Number of Occupants: 2

D. Area: 600 sf

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy or sealed concrete
	▪ Wall base – Integral vinyl base or integral quartz epoxy or none at all
	▪ Walls – paint on gyp. bd. and paint on concrete
	▪ Ceilings – Acoustical Ceiling Tile or exposed roof structure
Special Construction	▪ Thickened slab to support weight of cyclotron plus vibration control
	▪ Thick concrete perimeter walls to 8 or 10 feet AFF, transitioning to painted gyp. bd. to roof structure.
	▪ Lead shielding in perimeter walls (radiation control)
	▪ Knock-out panel location in exterior wall (for removal & reinstallation)
	▪ Shielded pathway for delivery of "dosing" material via. Capillary tubes to adjacent hot labs.
Built In Equipment	▪ Cyclotron
	▪ Filtered charcoal exhaust
	▪ Processed chilled water DI
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Cyclotron Siemens Eclipse or sim.	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Clinical Imaging

Room Type	Use Category	Room Number
Lab – QC (Cyclotron)		

A. Function Summary:

Wet lab space dedicated to research activities involved with manipulating chemical compounds and isotopes, processed in the hot cells of the nearby Hot Lab.

B. Adjacency:

Located near the Cyclotron and Hot lab,

C. Number of Occupants:

D. Area:

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – epoxy coating on gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪
	▪
	▪
	▪
Built In Equipment	▪ Lab casework
	▪ Work Sinks
	▪ Lab Gasses
	▪ Fume Hood
	▪ Chemical Storage Cabinets

F. Furniture, Fixtures & Equipment

▪ Gas Chromatograph	▪
▪ HPLC	▪
▪ 2 mini cells	▪
▪ Laminar Flow Hood	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Clinical Imaging

Room Type	Use Category	Room Number
Lab – Hot (Cyclotron – Pharmacy)		

A. Function Summary:

Wet lab space dedicated to activities involved with processing radionuclides created in the cyclotron.

B. Adjacency:

Located adjacent to the Cyclotron with capillary tubes at ceiling for delivery of radionuclides from cyclotron.

C. Number of Occupants:

D. Area:

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – epoxy coating on gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ Shielded capillary tubes at clg. And connected back to cyclotron
	▪
	▪
	▪
Built In Equipment	▪ Lab casework
	▪ Work Sinks
	▪ Lab Gasses
	▪ Laminar Flow hood
	▪

F. Furniture, Fixtures & Equipment

▪ Drying Rack for Glassware	▪
▪ 2 hot cells	▪
▪ 4 mini cells	▪
▪ Methyl Iodine Module	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Clinical Imaging

Room Type	Use Category	Room Number
Lab – Chemistry (Cyclotron)		

A. Function Summary:

Wet lab space dedicated to activities involved with developing ligands for use with radionuclides, which are produced by the cyclotron.

B. Adjacency:

Located near the Cyclotron, the Hot Lab and the QC lab.

C. Number of Occupants:

D. Area:

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – epoxy coating on gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪
	▪
	▪
	▪
Built In Equipment	▪ Lab casework
	▪ Work Sinks
	▪ Lab Gasses
	▪ Fume Hood
	▪ Chemical Storage Cabinets

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Clinical Imaging

Room Type	Use Category	Room Number
Distribution (Cyclotron)		

A. Function Summary:

Wet lab space where doses are calibrated and products are packaged for release.

B. Adjacency:

Located near the Cyclotron

C. Number of Occupants:

D. Area:

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl or quartz epoxy
	▪ Wall base – Integral vinyl base or integral quartz epoxy
	▪ Walls – epoxy coating on gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪
	▪
	▪
	▪
Built In Equipment	▪ Lab casework
	▪ Work Sinks
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Storage Cabinets	▪
▪ Dose calibrator	▪
▪ Refrigerator	▪
▪	▪
▪	▪
▪	▪
▪	▪

UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Clinical Imaging

Room Type	Use Category	Room Number
Imaging Review (reading)		

A. Function Summary:

A medium sized room furnished with perimeter desk surfaces and monitors where researchers can review imaging scans with other faculty, the patient and / or the patient's party member(s).

B. Adjacency:

Located near the Nurse and lobby area of the clinical imaging area.

C. Number of Occupants: 10

D. Area: 150 sf

E. Architectural Design

Finishes	▪ Floors – Carpet
	▪ Wall base –vinyl base
	▪ Walls – paint on gyp. bd. or wall covering
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪ None anticipated
	▪
	▪
	▪
	▪
Built In Equipment	▪ Work counter – seated height
	▪ Lighting Control
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Task chairs	▪
▪ Computers & Monitors	▪
▪ Overhead open shelving	▪
▪ Phone, Data	▪
▪	▪
▪	▪
▪	▪

UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Clinical Imaging

Room Type	Use Category	Room Number
Patient Uptake (Cooldown)		

A. Function Summary:

Private temporary holding rooms dedicated to the clinical imaging area where doses are administered and for use by research subjects who are required to wait out a period until radioactivity in their systems decays to a safe level.

B. Adjacency:

Located within the clinical imaging area and close to the unisex toilet room and both the PET CT and the MR PET scanners.

C. Number of Occupants: 1

D. Area: 76 sf

E. Architectural Design

Finishes	▪ Floors – Sheet vinyl or VCT
	▪ Wall base – vinyl base
	▪ Walls – Painted Gyp Bd.
	▪ Ceilings – Acoustical Ceiling Tile or painted gyp. bd.
Special Construction	▪ lead plates in perimeter walls (radiation control)
	▪
	▪
	▪
	▪
Built In Equipment	▪
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Occasional Chair	▪
▪ Side table	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Clinical Imaging

Room Type	Use Category	Room Number
Cool Down (Animal)		

A. Function Summary:

Small, temporary holding room near the Micro PET scanner for the temporary holding of small caged animals required to wait out a period until radioactivity in their systems decays to a safe level.

B. Adjacency:

Located near the Micro PET scanner and the RAR.

C. Number of Occupants: 1

D. Area: 50 sf

E. Architectural Design

Finishes	▪ Floors – Sheet vinyl or VCT
	▪ Wall base – vinyl base
	▪ Walls – Painted Gyp Bd.
	▪ Ceilings – Acoustical Ceiling Tile or painted gyp. bd.
Special Construction	▪ lead plates in perimeter walls (radiation control)
	▪ Exhaust
	▪
	▪
	▪
Built In Equipment	▪
	▪
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

R S P ARCHITECTS

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Clinical Imaging

Room Type	Use Category	Room Number
Micro PET		

A. Function Summary:

A medium sized room configured to house the Micro PET imaging scanner.

B. Adjacency:

Located near the RAR and animal physiology labs. This room / equipment will be used primarily with animal test subjects.

C. Number of Occupants: 2

D. Area: 200 sf

E. Architectural Design

Finishes	▪ Floors – Seamless sheet vinyl or epoxy resin
	▪ Wall base – Integral vinyl or epoxy resin
	▪ Walls – paint on gyp. bd.
	▪ Ceilings – ACT tile
Special Construction	▪ A thicker floor slab may be required if the weight of the unit is a factor
	▪ Vibration control in conjunction with floor slab.
	▪ Lead shielding in walls
	▪
Built In Equipment	▪ Lab casework
	▪ Room exhaust
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Control Equipment w/ temperature control	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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RSP ARCHITECTS

UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Clinical Imaging

Room Type	Use Category	Room Number
Radio-pharmacy		

A. Function Summary:

Small work room where dosing of pharmaceuticals occurs.

B. Adjacency:

Located in the clinical imaging area, adjacent to the MR PET and CT PET

C. Number of Occupants:

D. Area:

E. Architectural Design

Finishes	▪ Floors – Seamless Sheet Vinyl
	▪ Wall base – Integral vinyl base
	▪ Walls – paint on gyp. bd.
	▪ Ceilings – Acoustical Ceiling Tile
Special Construction	▪
	▪
	▪
	▪
Built In Equipment	▪ Lab casework
	▪ Work Sinks
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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UofM CMRR Expansion – Preliminary Room Data

U of M Project # 01-180-08-1687

Clinical Imaging

Room Type	Use Category	Room Number
Toilet (hot)		

A. Function Summary:

Private unisex toilet room, dedicated to the clinical imaging area for use by research subjects who are required to wait out a period until radioactivity in their systems decays to a safe level.

B. Adjacency:

Located within the clinical imaging area and close to the patient Cool-Down rooms and both the PET CT and the MR PET scanners.

C. Number of Occupants: 1

D. Area: 50 sf

E. Architectural Design

Finishes	▪ Floors – ceramic tile
	▪ Wall base – ceramic tile
	▪ Walls – ceramic tile
	▪ Ceilings – Acoustical Ceiling Tile or painted gyp. bd.
Special Construction	▪ lead plates in perimeter walls (radiation control)
	▪
	▪
	▪
	▪
Built In Equipment	▪ Plumbing Fixtures
	▪ Vanity
	▪
	▪
	▪

F. Furniture, Fixtures & Equipment

▪ Toilet Room accessories	▪
▪ Grab Bars	▪
▪	▪
▪	▪
▪	▪
▪	▪
▪	▪

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MENT DESCRIPTION	LOCATION	QUANT.	(LxW)	applicable	AMPS	VOLTAGE	PHASE	CONNECTION (yes or no)	Exhaust Air (CFM)	Water (GPM)	Heat load (BTU)	
	Bench	2	36" x 20"	add'l 36" x 22"	?	110	?	no	no	no	?	3 tanks, chart and recorder
	Bench	2 (+4)	43" x 18"	n/a	?	110	?	yes	no	no	?	printer, computer, storage, waste bottl
	Floor	1	36" x 72"	36" x 72"					yes	yes	?	lab gasses
	Floor	1	36" x 48"	36" x 48"				no	no			
	Floor	2	36" x 60"	36" x 48"					yes	yes	?	lab gasses
try) LAB												
	Floor	2 (+2)										with manipulator arms
	Floor	4 (+4)										
		1										
	Floor	2	36" x 72"	36" x 72"					yes	yes	?	lab gasses
PET/ CT	Floor	1										
dality System)												
modality SPECT	Floor	1										
	Floor	1	78"X22"X30"	78"X22"X30"	20.00		1.00	NO	NO	NO	1.7KW	200/208/220/230/240 switchable
ıre)	Floor	1	78"X22"X30"	78"X22"X30"	20.00		1.00	NO	NO	NO	1.7KW	200/208/220/230/240 switchable
	Floor	2	48" x 24" x 30"	48" x 24" x 30"	12.00	208	3.00	no	no	no	2 kw	
	Floor	1	48" x 24" x 30"	48" x 24" x 30"	30.00	120/208	1.00	no	no	no	2.3kw	
	Floor	1	48" x 24" x 30"	48" x 24" x 30"	30.00	120/208	1.00	no	no	no	2.3kw	
ly	Floor	1	63" x 28" x 30"	63" x 28" x 30"	100 - 50		3.00	no	no	no	5.5	200/208/220/230/240 switchable
ıskris WW3 water to water	Floor	1	35" x 46" x 35"	35" x 46" x 35"	20.00	208	1.00	no	no	Yes	17	
150 refrigerated chiller for gradients	Floor	1	30" x 21" x 29"	30" x 21" x 29"	20.00	208	1.00	no	no	no	5	
	Floor	1	64" x 31" x 32"	64" x 31" x 32"	8.00	208	3.00	no	no	no	3	Nitrogen
	Floor	1										
	Bench or Floor	1	3' x 3'		6	120		NO	NO			
	Floor	1										

	Floor	1										

	Floor	1										

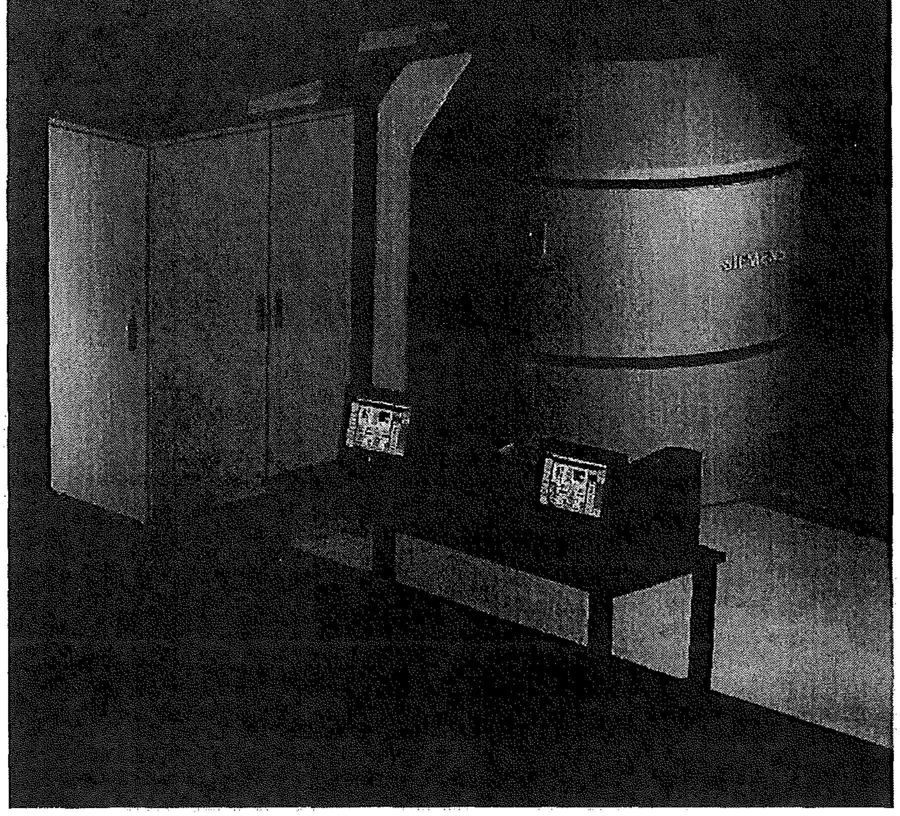
	Floor	1										

SIEMENS

medical

ECLIPSE CYCLOTRON

Site Planning Guide



Siemens Molecular Imaging

10150862-IPI-002-01

6.0 Dimensions and Weights

6.1. Component Weights for the HP Model

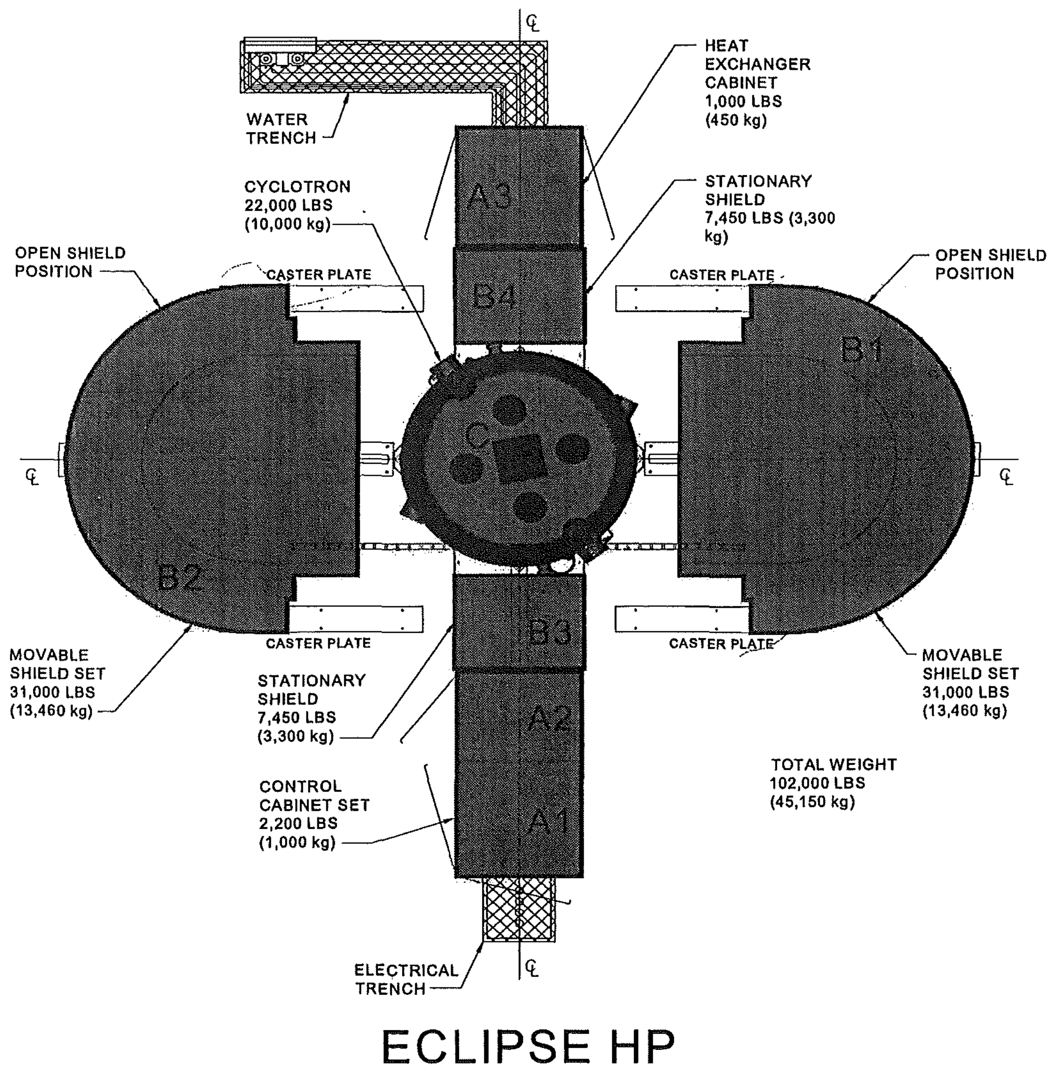


Figure 1 Component Weights for the HP Cyclotron

6.2. Dimensions and Weights of the HP Model

This section breaks down the dimensions and the weight of the HP model cyclotron.

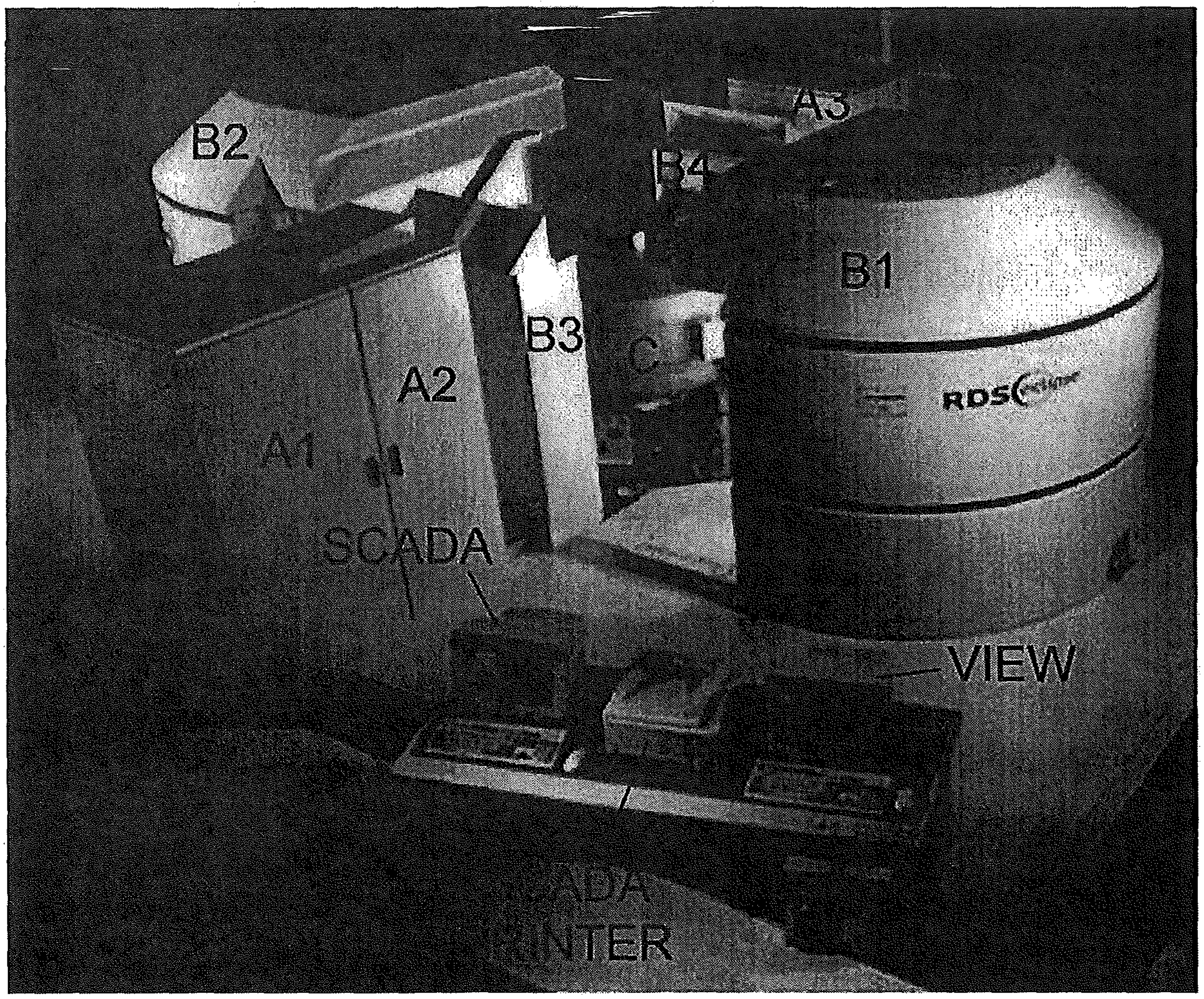


Figure 2 HP Model Cyclotron

Table 2 (Reference Figure 2)

Item	Description	Width in (cm)	Depth in (cm)	Height in (cm)	Weight lb (kg)
C	Cyclotron	58.8 (150)	58.8 (150)	68 (173)	22000 (10000)
A1 + A2	Control Cabinets	56 (142)	31.5 (80)	82.5 (210)	2200 (1000)
A3	Heat Exchanger Cabinet	32 (81)	31.5 (80)	82.5 (210)	1000 (450)

Shielding (Composite Blocks):

B1	Movable				
	Top	94.5 (240)	72.5 (184)	21 (54)	7810 (3545)
	Shell	94.5 (240)	55 (140)	38.5 (98)	7560 (3430)
	High-Z Insert	65 (165)	30.5 (78)	47.5 (121)	9690 (4395)
	Base	94.5 (240)	55 (140)	30.5 (78)	6780 (3075)
B2	Movable				
	Top	94.5 (240)	72.5 (184)	21 (54)	7810 (3545)
	Shell	94.5 (240)	55 (140)	38.5 (98)	7560 (3430)
	High-Z Insert	65 (165)	30.5 (78)	47.5 (121)	9690 (4395)
	Base	94.5 (240)	55 (140)	30.5 (78)	6780 (3075)
B3	Stationary	26 (66)	32.5 (83)	91 (231)	7450 (3380)
B4	Stationary	26 (66)	32.5 (83)	91 (231)	7450 (3380)
			Approximate Total		**104,000 (47100)**

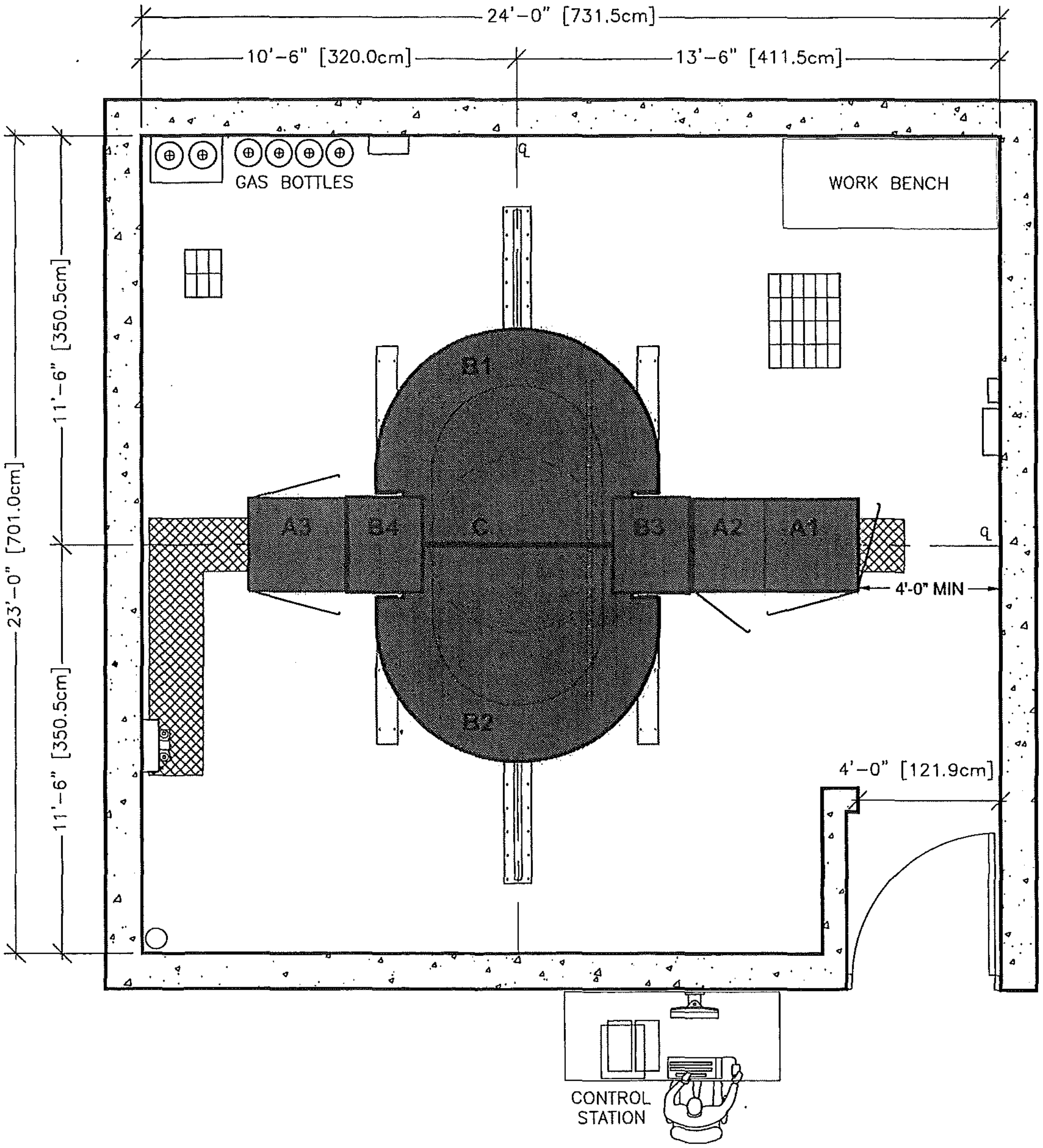
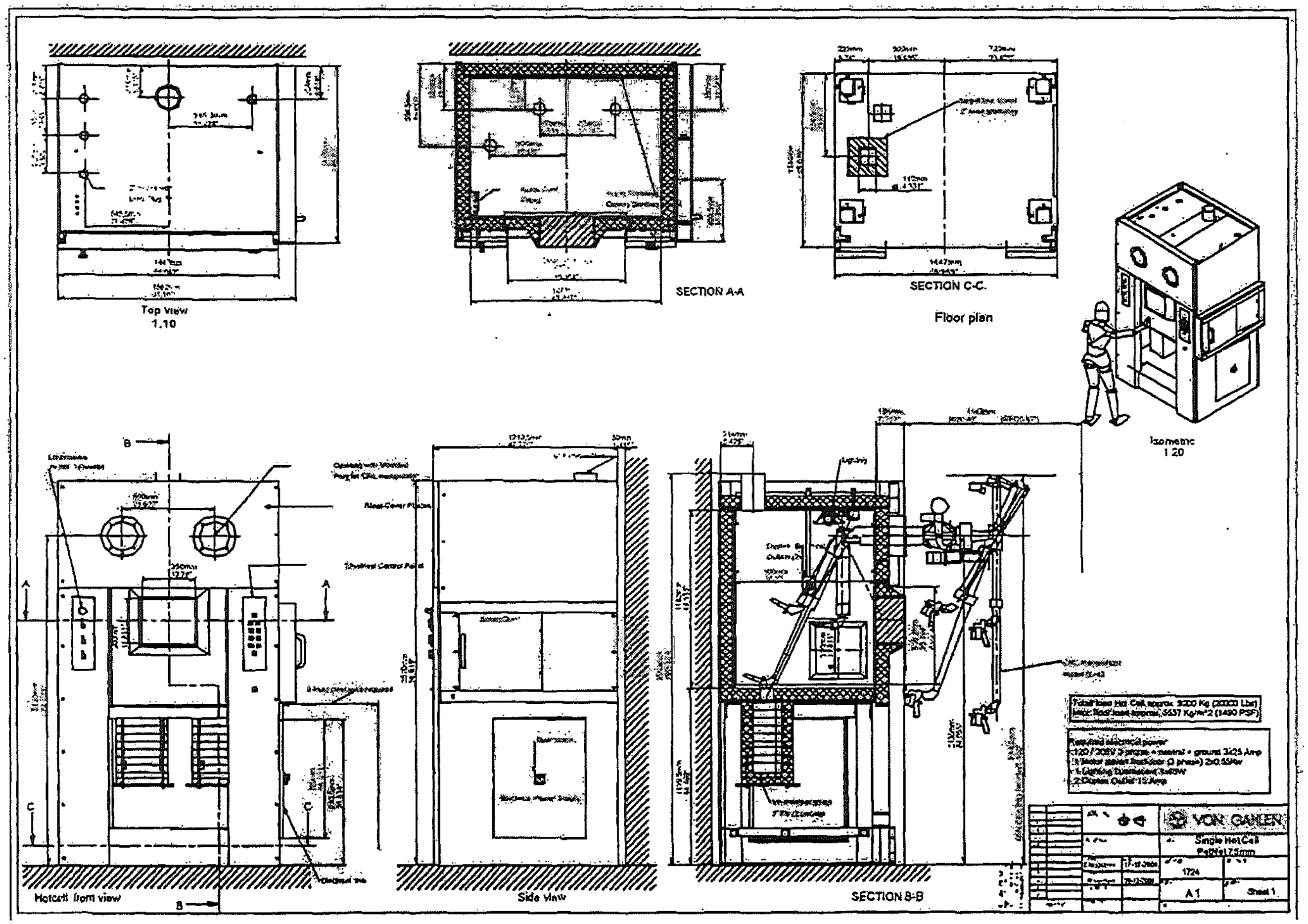


Figure 6 Cyclotron Room Layout - Cyclotron Component Placement

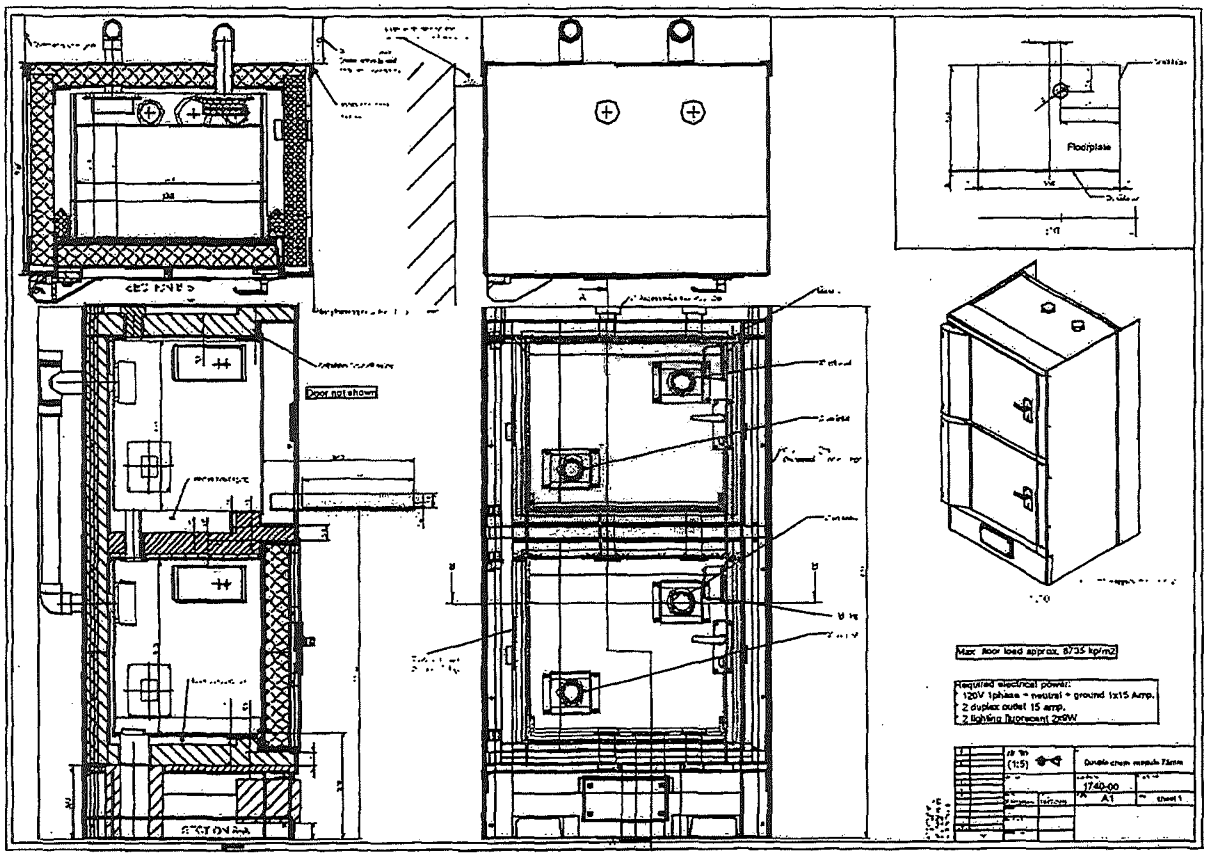
This illustration shows the ECLIPSE installed in the room. Room size is based around standard minimum room size dimensions.

VON GAHLEN



DRAWING #1724

VON GAHLEN



DRAWING #1740

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SPECIFICATIONS FOR A 75mm (3") HOT CELL

1. Inside Dimensions: 49"W x 36"D x 46 ½"H
2. Outside Dimensions: 56 ¾"W x 48"D x 98 13/16" H
3. 75mm (3") of Lead Shielding in Walls, Roof and Floor
4. Vertically Motor Driven Door with Safety Interlocks. Door Opening 30"W x 24"H
5. Lead Glass Window with Clear View of 13 ¾"W x 11 13/16"H
6. Stainless Steel lining with Optional Cup Sink
7. Sliding Door with Opening of 12" x 12" on Right Hand Side
8. Lighting Fixture – Bulb is replaceable Externally from the Hot Cell
9. Exhaust Connection Pipe – 6" in Diameter
10. 2 Duplex Electrical Outlets, Individually Fused and Switched
11. Steel Support Stand with Epoxy Coating
12. Low Voltage Control Panel with Water Proof Switches
13. Electrical Cabinet on Right Hand Side
14. Exterior Finish Epoxy Coated for Ease of Cleaning.
15. Quick Connect Fittings with Values for Utilities, Four Supplied
16. Opening in the Floor of Hot Cell for Dose Calibrator (with Shield Support Bracket)
17. 4 Each – 2" Openings in Roof for Target Lines with Plugs
18. Ring Shields for Ion Chambers (2 each)
19. Opening in Floor for Supply Lines from Cyclotron (2" Conduit)
20. Shielding from Laboratory Floor to the Floor of the Hot Cell on the left hand side.
21. Transfer Port Between Hot Cells and Chemical Modules as needed.

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SPECIFICATIONS FOR A
75mm (3") DUAL CHEMISTRY MODULE

1. Modules to be installed one on top of the other.
2. 75mm (3") of lead shielding in walls, roof and floor.
3. Inside dimensions of each module: 27" wide x 20" deep x 24" high.
4. Outside dimensions of each module: 39 1/4" wide x 25-1/2" deep x 29-1/2" high.
5. Low profile fluorescent light fixture.
6. Switched electrical duplex outlet.
7. Electrical control box mounted on the lower front side of the module.
8. Stainless steel liner.
9. Slide out stainless steel pan (22" wide x 19" deep) with 1" lip to contain spills or leaks.
10. Hinged front door, door opening 27" wide x 24" high.
11. 2" diameter ventilation duct.
12. Steel support stand with epoxy coating.
13. Opening for 2" conduit for gases from the cyclotron.
14. Shielding for 2" conduit from the room floor to the bottom of the enclosure.
15. Accessory opening with stepped lead plugs. Four per unit.
16. Cable ways to allow each of the modules to be connected to the hot cell.
17. Optional transfer port between hot cell and chemical modules.

SIEMENS

Biograph TruePoint PET•CT

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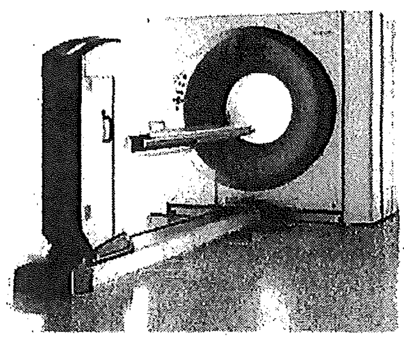
Biograph TruePoint PET•CT

Biograph TruePoint

For an **interactive demo** of the Biograph please click here.

The advanced building blocks of PET and CT technology that make TruePoint possible, work together with Siemens syngo applications to offer you the finest multimodality imaging.



HD•PET providing a new level of PET performance
LSO crystals for faster scans
HI-REZ offering unsurpassed resolution
TrueX providing uniform PET resolution and 2x improvement in signal-to-noise ratio
TrueV providing the longest axial field of view
TrueC offering model-based scatter correction calculated independently for every patient and bed position
UFC detectors providing stunning CT image quality
SureView ensuring maximum image quality and any scan speed
CARE Dose4D for real-time dose modulation
z-Sharp for the highest spatial resolution available

Documents
Biograph TruPoint Brochure[753 KB]
TruePoint PET•CT Technology Brochure[2.27 MB]
HD•PET Clinical Image Book[1.49 MB]

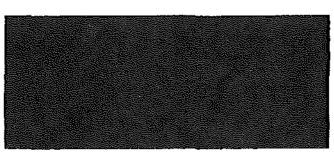
MI Clinical Engines

MI Clinical Engines are a unique combination of Siemens' innovative molecular imaging technology and *syngo* the easy-to-use intuitive application platform, integrated into our clinical solutions in PET•CT

MI Cardiology PET•CT Engines
MI Neurology PET•CT Engines
MI Oncology PET•CT Engines

Clinical Image Gallery

PET•CT Images[3 KB]



Education

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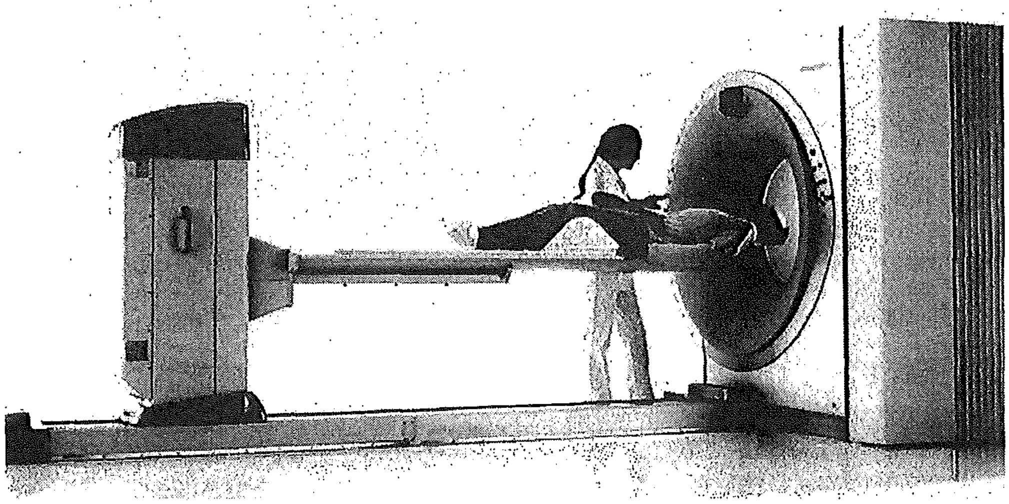
It's time to think big. True volumetric PET•CT with TrueV, a revolutionary technology from Siemens, increases the PET field of view by an eye-opening 33% in the axial dimension. It's the largest PET•CT field of view in the industry. Proven to increase count rate performance by an amazing 78%, TrueV provides you with the most functional information possible per PET bed position and reveals the clearest, most breathtaking PET images you've ever seen.

But that's not the complete TruePoint story. The combination of the incredible metabolic detail of our PET technology with true volumetric CT provides unsurpassed hybrid clinical image quality. It's the surest way to see exactly what activity is taking place in the body and exactly where to localize it.

Clarity and detail you have to see to believe.

Find it all in the details

Data courtesy of Cancer Imaging and Tracer Development Program, University of Tennessee, Dr. David Townsend



True Clarity

Closer Attention to Detail Reveals the Bigger Picture

TruePoint PET•CT completely integrates the functional sensitivity of PET with the rich anatomical detail of diagnostic multislice CT. Exclusive technologies, such as the award winning Patient Handling System (PHS), HI-REZ, LSO, Pico-3D, True C, and SureView, offer superb image quality for improved diagnostic confidence. With Biograph's leading-edge technology, you can be more confident in your ability to detect changes in molecular activity even before anatomical changes become visible.

TruePoint PET•CT helps you to reveal primary tumors, detect metastases, quantify uptake, and reduce false positives. Whether you're working in oncology, cardiology, or neurology, you need the most complete set of information possible in order to make a truly accurate diagnosis. Only TruePoint PET•CT reveals the tiniest abnormalities in the clearest detail.

See what you've been missing.

Installation for Biograph 40/Biograph 64

Featuring a compact footprint and low system weight, the Biograph 40 and Biograph 64 slice are designed to meet stringent siting requirements and make best use of vital floor space. The operating efficiency of the Biograph is further enhanced by its low power requirements. A quiet system environment provides maximum patient comfort.

Scanner Room

The scanner room accommodates the Biograph gantry and Patient Handling System.

Minimum interior size	4.6 m (15 ft) x 7.3 m (24 ft)
Recommended interior size	5.0 m (16.5 ft) x 7.9 m (26 ft)

Operator's Room

The operator's room houses the *syngo* Acquisition Workplace, *syngo* MI Workplace, PET acquisition system (ACS III), PET Reconstruction System (PRS) control box, monitors, and other computer equipment as necessary.

Typical room size	3.2 m (10.5 ft) x 4 m (13 ft)

Equipment Room

The equipment room houses the Power Distribution Cabinet (PDC), Image Reconstruction System (IRS), CT Cooling System Cabinet and any auxiliary equipment for power and cooling (for example, facility water supply, electrical panels, etc.)

Minimum room size	3.2 m (10.5 ft) by 2.1 m (7 ft)

Gantry Weight

The Biograph gantry weighs approximately 3973 kg (8750 lb).

Floor Requirements

The Biograph is a precision aligned system that requires a rigid, level concrete floor for proper support. See the *Biograph TruePoint PET•CT Planning Guide* for further details.

Climate and Cooling Requirements

Scanner room climate control must be provided 24 hours per day, 7 days per week. Heat dissipation into scan room for the Biograph 40/64 is 4.4 kW (16650 BTU/hr).

The scanner room temperature should be maintained between 20° to 24° C (68° to 75° F) and should not vary more than ± 1.5° C (2.7° F) per hour. The air pressure needs to be maintained between 750 and 1060 mbar. The relative humidity is 15% to 75% without condensation, and the recommended range is 30% to 70%.

The constant temperature is maintained by both integrated and external chiller systems. Either air/water chillers or water/water chillers are available. A two-stage temperature monitor must be installed to shut off the system in the event of excessive heat buildup in the utility room and scanner room. The scanner room must be equipped with four shut-off valves close to the scanner to be able to interrupt the water flow between the water chillers and the scanner.

Power Supply and Consumption

PET	200 – 240 or 400 VAC single phase, 3.8 kVA 50, 60 Hz
CT	380 – 480 V, 3 phase, 50, 60 Hz, 111 kVA with air chiller, 104 kVA with water to water chiller

An emergency power-off switch must be installed to disconnect the power in the event of an emergency.

System Specifications

PET System Specifications

Patented PET Detector Assembly	Biograph 6, 40, 64
Detector material	Lutetium Oxyorthosilicate (LSO)
Crystal dimensions	4.0 x 4.0 x 20 mm
Crystals per detector block	169
Number of detector blocks	144 (192 with TrueV option)
Photomultiplier tubes (PMTs)	4 per block
Detector ring diameter	842 mm
Detectors per ring	624
Number of detector rings	39 (52 with TrueV option)
Total number of detectors	24336 (32448 with TrueV option)
Transaxial FOV	605 mm
Axial FOV	162 mm (216 with TrueV option)
Number of image planes	81 (109 with TrueV option)
Plane spacing	2 mm

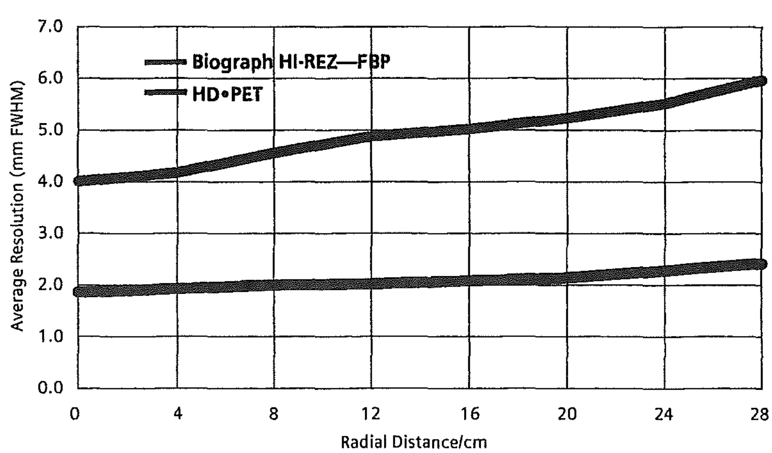
PET Data Acquisition/Processing	Biograph 6, 40, 64
Coincidence time resolution	500 psec
Coincidence window	4.5 nsec
Acquisition mode	Static, multibed (dynamic, gated optional)
Scatter fraction	<36% @425 keV LLD
Scatter correction	TrueC Single scatter simulation

PET Performance[1]	Biograph 6, 40, 64
Count rate peak NECR	96 kcps@35 kBq/cc (165 kcps@32 kBq/cc with TrueV option)
Sensitivity	4.4 cps/kBq @425 keV (7.9 with TrueV option)
Energy resolution	<14%
Uniformity	≤5% variation

PET Resolution Specifications[1]	Biograph 6, 40, 64	HI-REZ Option
Transaxial resolution (NEMA 2001)		
FWHM @ 1 cm	5.9 mm	4.2 mm
FWHM @ 10 cm	6.0 mm	4.8 mm
Axial resolution (NEMA 2001)		
FWHM @ 1 cm	5.5 mm	4.7 mm
FWHM @ 10 cm	6.0 mm	5.7 mm

HD•PET Option[2]	
Average resolution	
FWHM @ 1 cm	2.0 mm
FWHM @ 10 cm	2.0 mm
FWHM @ 20 cm	2.1 mm
FWHM @ 28 cm	2.4 mm

HD•PET Option — Resolution with TrueX[2]



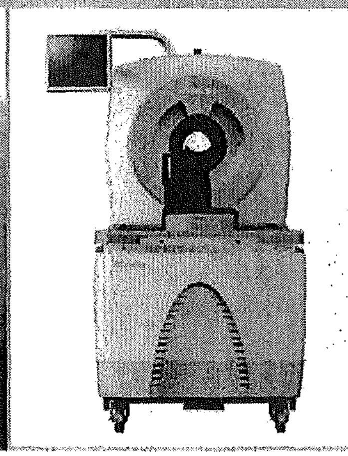
1) Performance specifications represent average values measured following the methodology of NEMA standard publication NU 2 2001, Performance Measurements of Positron Emission Tomographs, except where noted. Sensitivity and uniformity were measured with ^{68}Ge sources.

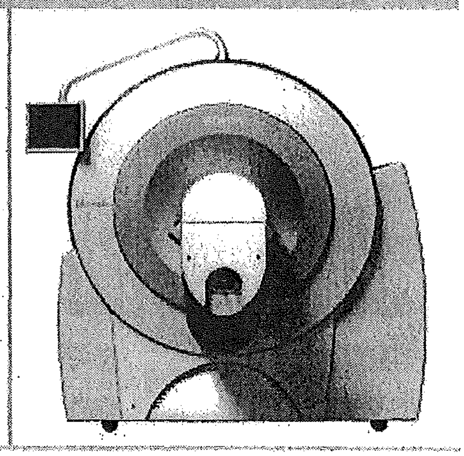
2) Measurements were taken with a line source suspended in air at radial positions from the center to 28 centimeters in 4 centimeter steps. The data were reconstructed with a standard filtered backprojection algorithm using FORE rebinning and with the TrueX algorithm using six iterations and 14 subsets.

Patient Handling	Biograph 6	Biograph 40	Biograph 64
Width	42 cm (16.5 in)	42 cm (16.5 in)	42 cm (16.5 in)
Length	379 cm (149 in)	379 cm (149 in)	379 cm (149 in)
Weight	726 kg (1600 lb)	726 kg (1600 lb)	726 kg (1600 lb)
Maximum patient weight	204 kg (450 lb)	204 kg (450 lb)	204 kg (450 lb)
PET•CT horizontal co-scan range	190 cm (74.8 in)	190 cm (74.8 in)	190 cm (74.8 in)
Horizontal bed travel	264 cm (104 in)	264 cm (104 in)	264 cm (104 in)
Vertical bed travel	53 – 101 cm (21 – 40 in)	53 – 101 cm (20 – 40 in)	53 – 101 cm (20 – 40 in)

Gantry	Biograph 6	Biograph 40	Biograph 64
Height	202 cm (79.5 in)	202 cm (79.5 in)	202 cm (79.5 in)
Width	239 cm (94 in)	239 cm (94 in)	239 cm (94 in)
Depth	156 cm (61.5 in)	156 cm (61.5 in)	156 cm (61.5 in)
Patient port diameter (continuous)/aperture	70 cm (27.5 in)	70 cm (27.5 in)	70 cm (27.5 in)
Gantry weight	3212 kg (7079 lb)	3973 kg (8750 lb)	3973 kg (8750 lb)

Data





Inveon
No Limits on Discovery

SIEMENS
medical

Inveon is a revolutionary preclinical imaging platform, providing integrated small animal PET, SPECT and CT imaging and analysis. A brilliant combination of cutting-edge technologies with multiple configuration options to fit your research needs, Inveon becomes an invaluable part of your research workflow. Inveon is available as a fully integrated or dockable system with single or multimodality configurations.

No Limits on Performance

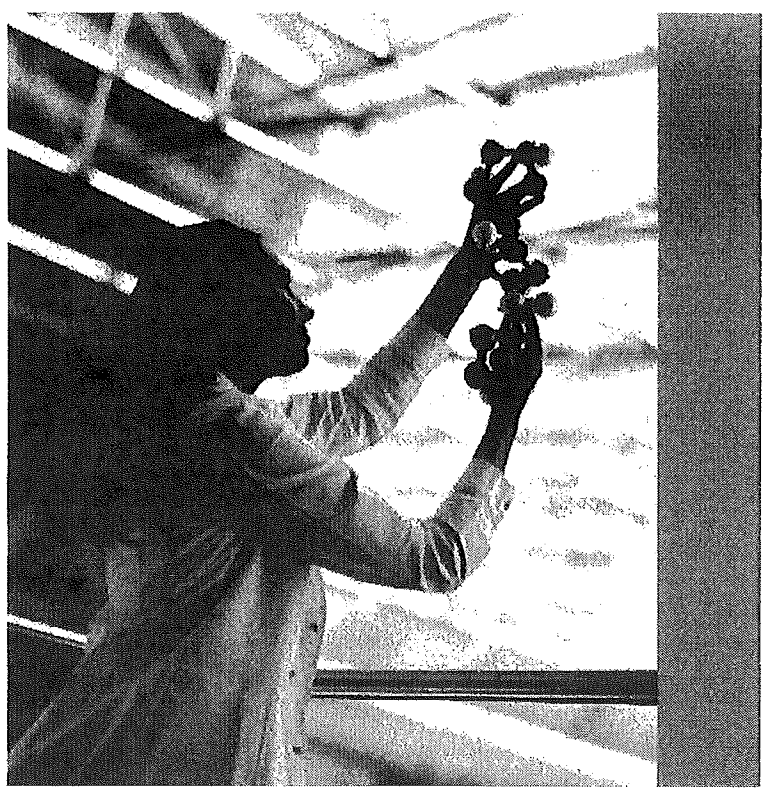
Inveon's exceptional performance is based on true system integration for fast, quantitative analysis with increased sensitivity and resolution. Inveon is built on an innovative new acquisition architecture which unifies data collection from multiple modalities (PET, CT, and SPECT). By providing true system integration and improved system performance, Inveon takes molecular imaging to a new level.

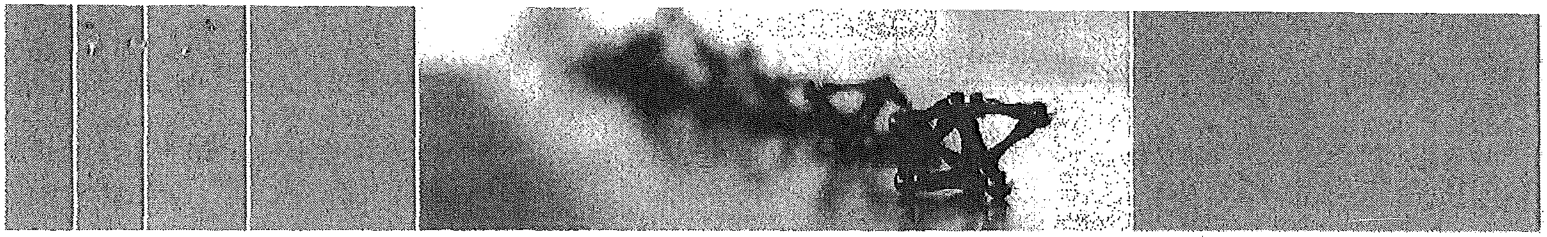
- Versatile multimodality platform
- Unified control of PET, SPECT, and CT data acquisition
- Unmatched PET detector technology for the industry's highest resolution and sensitivity
- Groundbreaking new PET and SPECT acquisition and processing technology for improved count rate performance
- Unique PET transmission method for faster and more accurate attenuation correction
- Advanced multi-pinhole SPECT collimators for improved sensitivity and spatial resolution
- Novel CT automated zoom control for optimized field of view (FOV) and resolution

No Limits on Versatility

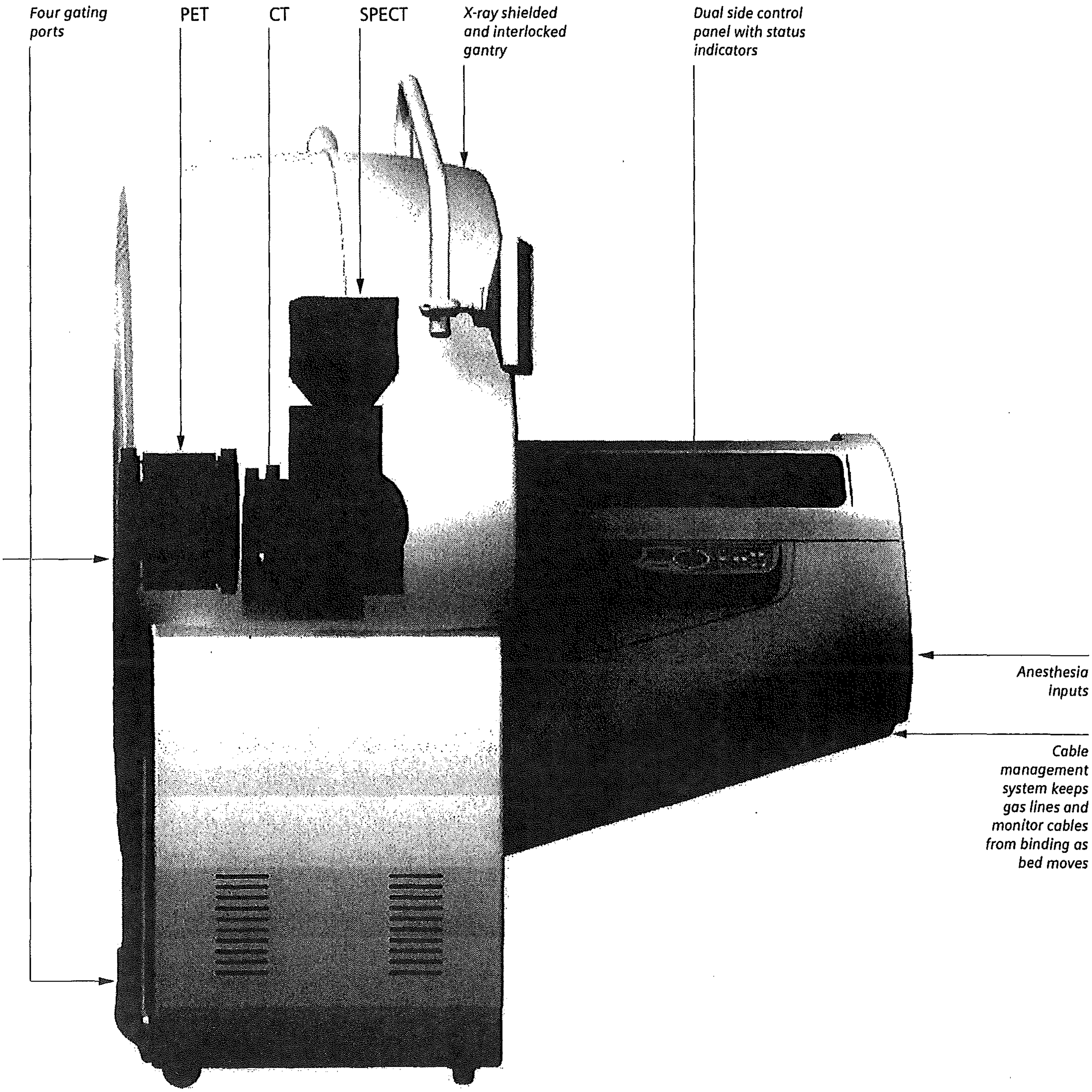
Inveon's integrated multimodality platform delivers best-in-class PET, SPECT, and CT in a single system. Designed for adaptability, Inveon is field upgradeable to grow with your research program. Start with CT or SPECT and build versatility by adding additional modules to configure multimodality systems such as PET·CT, SPECT·CT, or PET·CT·SPECT. All components are fully integrated and optimized for outstanding performance.

Our novel approach to dedicated PET delivers an additional dimension of versatility: it's dockable. The dedicated PET system docks with the multimodality system, providing the convenience of a single multimodality platform with the throughput and utilization of two independent scanners. You can simply connect and calibrate the gantries to turn your systems into one multimodality unit. When in the docked configuration, both systems can operate independently or as a single unit under the control of a single workstation.

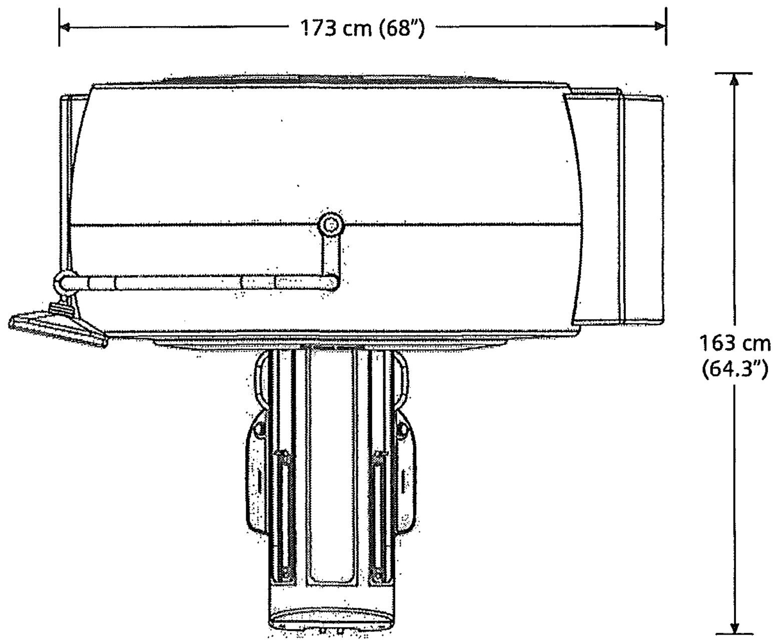


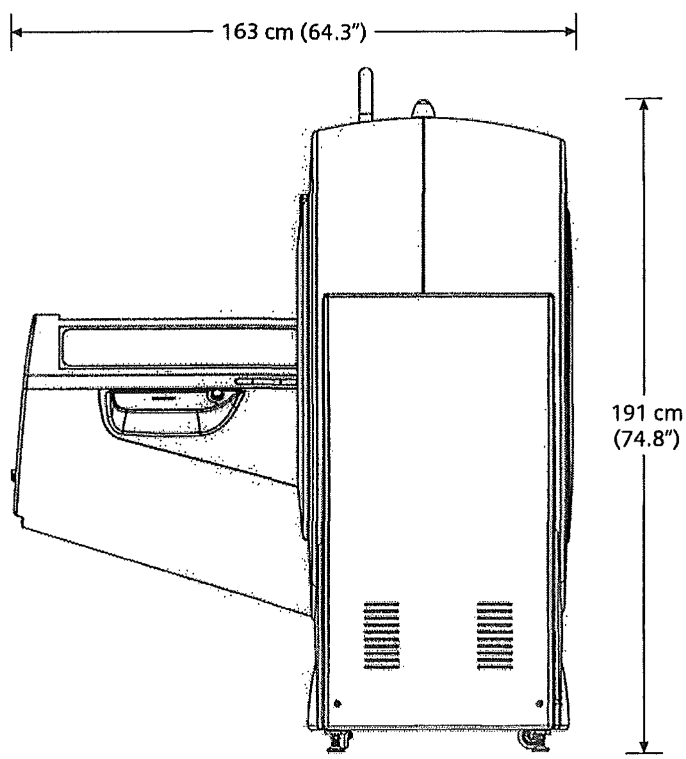


Multimodality System

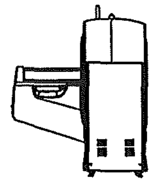


Multimodality System Drawings





Multimodality CT System Specifications



CT Engineering Specifications	
Unit weight	909 kg (2,004 lbs)
Unit height	191 cm (74.8 in.)
Unit width	173 cm (68 in.)
Unit depth	163 cm (64.3 in.)
Operating room temperature	45–75 °F (7–24 °C)
Operating humidity	30–70% non-condensing
Maximum heat generation	6500 Btu/hr
Power requirements	18 A @ 110 V 9 A @ 220 V

CT Performance Specifications	
125 mm X-ray Detector	
Number of detector pixels	2048 x 3072
Detector element size	32 µm
Maximum Field of View (FOV)	5.5 cm x 8.4 cm
Magnification range	1.2–3.3
165 mm X-ray Detector	
Number of detector pixels	4064 x 4064
Detector element size	32 µm
Maximum FOV	≥ 10 cm x 10 cm
Magnification range	1.2–3.3
Standard X-ray Source	
Maximum power	80 W
Focal spot size	50 µm
Voltage range	35–80 kVp
Maximum anode current	1000 µA
Maximum spatial resolution	30 µm
Variable Focus X-ray Source	
Maximum power	65 W
Focal spot size	≤ 6 µm @ 8 W; ≤ 60 µm @ 65 W
Voltage range	20–130 kVp*
Maximum anode current	500 µA
Maximum spatial resolution	15 µm
Minimum scan time	
Continuous rotation	≤ 1 min
180 step scan	≤ 3 min
360 step scan	≤ 6 min
Reconstruction	
Algorithm	Modified Feldkamp algorithm
Speed with real time reconstruction	512^3 volume reconstructed during scan time

* 20–80 kVp with standard scanner shielding
20–130 kVp with user provided external shielding

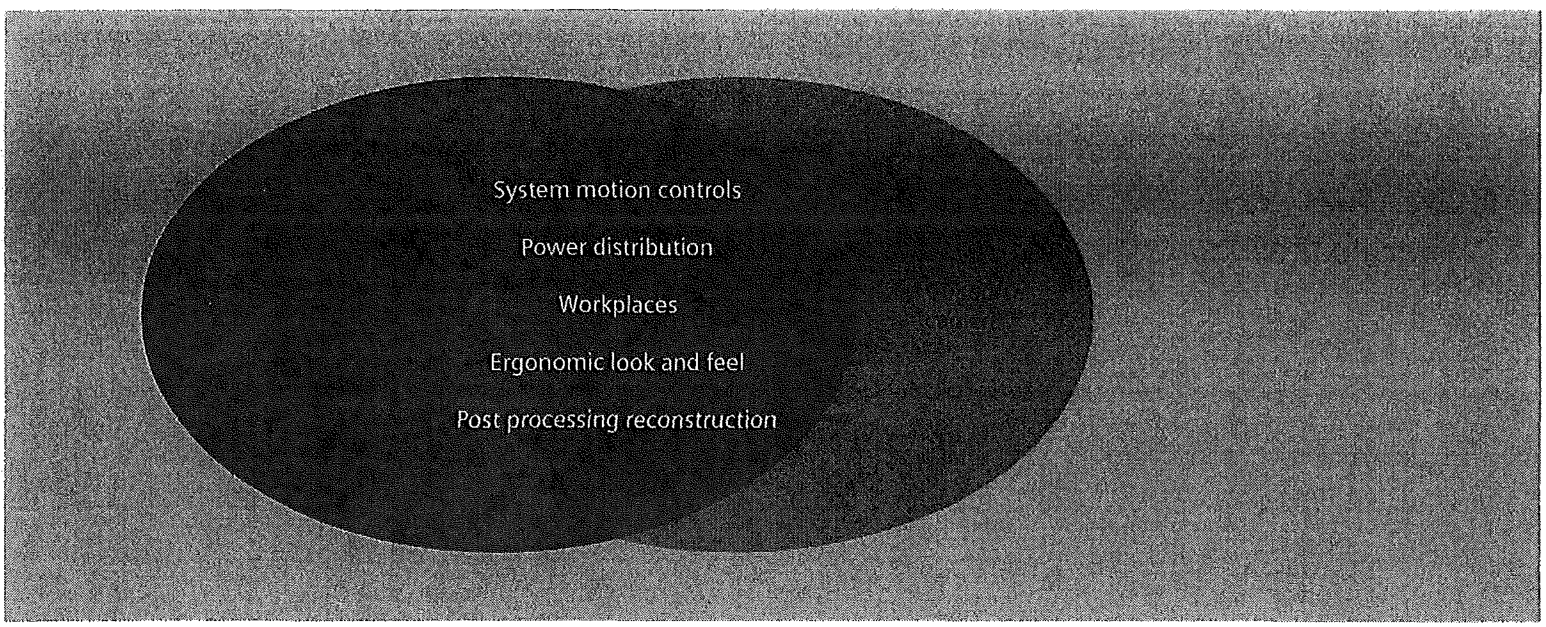
Multimodality Integration

Integrated Acquisition System

Inveon's versatile data acquisition system provides optimal PET, SPECT, and CT performance on a platform designed as a true multimodality system. Networked computers embedded in the gantries coordinate PET, SPECT, and CT data acquisition, and an innovative new nuclear pulse processing system acquires high resolution PET and SPECT data.

Integrated Motion Control

Historically, preclinical multimodality solutions have consisted of two independent systems, often with separate workstations, loosely packaged in a single gantry. Inveon changes the paradigm. An integrated CAN bus network precisely controls the position of up to twelve stages, coordinating beds, SPECT detector positioning, CT source and detector positioning and transmission sources, tightly integrating the command and control of each modality.



PROVISONAL SPECIFICATION FOR
MAGNEX 7.0 TESLA 900mm
ACTIVELY SHIELDED
SUPERCONDUCTING MAGNET SYSTEM

Prepared by:-
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Document Ref : TS1617B

Date : November 2008

CONTENTS

1. DESCRIPTION OF THE SYSTEM

The MRBR 7.0/900/ASR system is a complete superconducting magnet system intended primarily for enabling NMR Imaging (MRI), NMR Spectroscopy (MRS) and Functional Imaging (*f*MRI) research studies.

The system consists of an actively shielded highly homogeneous superconducting magnet (7.0 Tesla) housed in a 900 mm horizontal room temperature bore, low-loss helium cryostat. Field shimming is primarily accomplished using superconducting shim coils. Final shimming is performed with a small number of passive shims.

The system is supplied with a helium level monitor and an emergency quench heater control unit. A two-stage 4.2 K cryo refrigerator cooling system is employed, consisting of two independent cryocooler systems that eliminate the static cryogenic consumption.

i) Regulatory Compliance

The following components are coded to the requirements below:

7.0 T 900 mm AS system assembly including cryocooler and compressors
E5083Helium monitor
E7007 Emergency Discharge Unit (EDU)
E7101 EDU monitoring unit

Domestic (USA) Requirements:

The vendor shall design and manufacture the item to be compliant with UL 60601-1 (Medical Electrical Equipment Part 1: General Requirements for Safety). The vendor shall obtain ETL (or UL or CSA $_{NRTL}$)* Component Recognition for the item to UL 60601-1. The vendor shall maintain the ETL (or UL or CSA $_{NRTL}$) Component Recognition by subscribing to ITS (or UL or CSA) follow-up services, and shall apply ETL (or UL or CSA $_{NRTL}$) labels to the item in accordance with ITS (or UL or CSA) requirements.

Canadian Requirements:

The vendor shall design and manufacture the item to be compliant with CSA C22.2 No. 601.1 (Medical Electrical Equipment Part 1: General Requirements for Safety). The vendor shall obtain c-ETL (or c-UL or CSA)* Component Recognition/Certification for the item to CSA C22.2 No. 601.1. The vendor shall maintain the c-ETL (or c-UL or CSA) Component Recognition/Certification by subscribing to ITS (or UL or CSA) follow-up services, and shall apply c-ETL (or c-UL or CSA)* labels to the item in accordance with ITS (or UL or CSA) requirements..

International and European Requirements:

The vendor shall design and manufacture the item to be compliant with IEC 60601-1/EN 60601-1 (Medical Electrical Equipment Part 1: General Requirements for Safety). The vendor shall obtain an IEC Informative Report (or European Compliance Report or CB Certificate) from ITS (UL or CSA)* for the item to IEC 60601-1/EN60601-1.

Additional specific compliances

The 7.0T 900 mm Cryostat Assembly only

This assembly shall be designed and manufactured to meet Pressure Equipment directive 97/23/EC. It is the responsibility of the vendor to assure that the assembly is tested, certified, and labeled as such at the point of manufacture. This assembly must be CE marked for the Pressure Equipment directive and labeled as such.

E5083 Helium monitor, E7007 Emergency Discharge Unit (EDU),
E7101 EDU monitoring unit, and Compressors, only

The above items shall be designed and manufactured to meet the EMC directive 89/336/EEC and Low Voltage directive 72/23/EEC. It is the responsibility of the vendor to assure that each assembly is tested, certified, and labeled as such at the point of manufacture. These assemblies must be CE marked for the EMC directive, Low Voltage directive and labeled as such.

2. THE SUPERCONDUCTING MAGNET

i) General Description

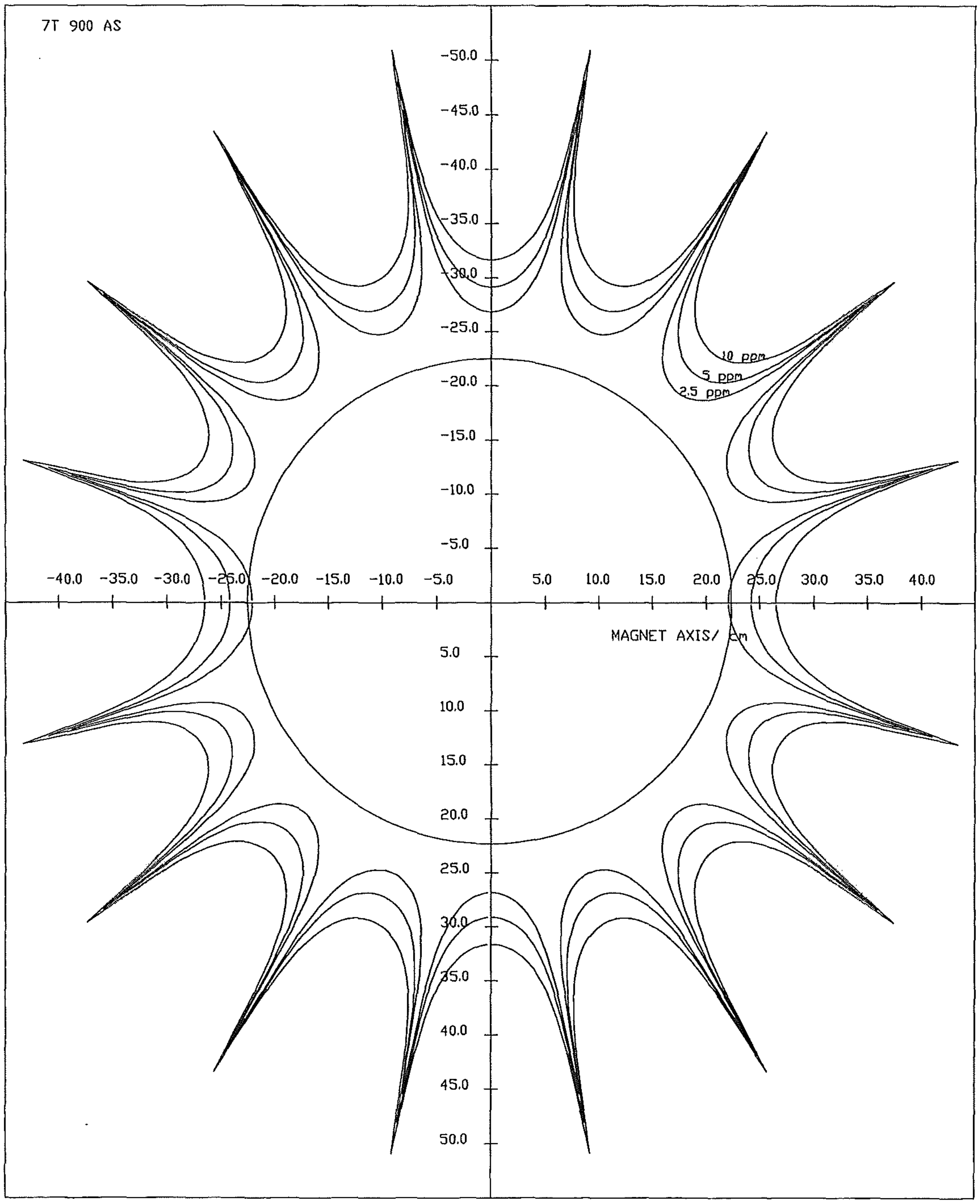
The magnet is wound from multi-filamentary NbTi conductor with a high percentage of copper to superconductor. The windings are placed on a precision-machined aluminium alloy former and fully vacuum impregnated for robustness and long term reliability.

The field homogeneity is defined over a 45 cm diameter spherical volume. Theoretical field profiles are shown in figure 1. Inevitably winding tolerances and small amounts of environmental influence will distort the central field. Corrections for these distortions are made in the first instance by superconducting shim coils located on a former surrounding the main coil. High order corrections are made by a minimal number of passive shims placed in the bore of the system. It is anticipated that the gradient coils (not supplied) will have provision for passive shims.

The magnet coils are fully protected from accidental damage during a quench by a resistor and diode network located within the helium reservoir. In the event of the need to activate an emergency discharge of the magnet, a quench heater circuit is incorporated within the windings. The protection circuit is designed to minimise field bloom in the event of a quench

The magnet is designed to conservative levels of stress and mechanical stability to ensure reliable and stable operation. In addition the use of high quality superconducting wire ensures that a highly stable magnet system is achieved

Figure 1 Theoretical Field Profile



ii) ***Specifications***

Magnet type	: Multi-coil superconducting wound on suitable aluminium alloy formers
Central field	: 7.00000 Tesla -140μT / +280μT
Magnet maximum over-field	: 7.005 T
Operating current	: Less than 300 amps
Typical magnet ramping rates	: 36 hours

Note: Elapsed time to ramp magnet is usually greater than the quoted ramp time. Elapsed time depends upon the installation process (Number of working hours per day ramping, breaks for helium fills, magnet rest periods, access periods to the site etc.)

No. of ramp cycles	: No practical limit but training may occur
Guaranteed ultimate field stability Measured over 72 hour period up to 14 days after persistence	: Less than 0.05 ppm/hour
Predicted ultimate field stability	: Less than 0.015 ppm/hour
Calculated screening Factor	: Greater than 10
Run down to less than 0.02 T following activation of emergency quench	: Expected less than 400 Seconds
Protection circuit	: Protected against multiple quenches by a resistor and diode network located within the helium reservoir.
Stray field (0.0005T) on green field site	: 4.0 m radial x 7.2 m axial
Bloom Field (0.0005T)	: Less than 4.6 m radial x 7.8 m axial

Field homogeneity values

Factory shimmed
(superconducting shimmed) : Less than 15 ppm over 45 cm dsv

Final site shimmed**
(superconducting and passive shims) : Less than 5 ppm over 45 cm dsv

For acceptance the fully shimmed values will use a passive shim projection by Magnex Scientific.

Calculated full width half maximum : <0.1 ppm***
(FWHM)(over 22 cm DSV)

Projected homogeneity on other volumes will be provided in factory acceptance for information only.

* Defined as the peak to peak variations of points plotted over a twelve plane, twelve angle plot on the surface of the stated spherical volume
**Only installed in the Magnex Scientific approved passive shielding or magnetically clean rooms
***This is predicted using Magnex Scientific software, MS^3 . The spherical harmonic expansion used for the calculations are the 3rd order and higher harmonics derived from the final field plot.

iii) Superconducting Shim Coils

The use of superconducting shim coils ensures that excellent long term field homogeneity from the magnet is achieved. These coils are positioned on a suitable former surrounding the main coil in the helium reservoir. As determined by Magnex to provide form, fit and function equivalence and to ensure continuity of supply, the shim former may be one of two possible constructions as listed below. Each coil set is fitted with a super-conducting switch for persistent mode operation. If the magnet has to be ramped down for any reason it is expected the superconducting shims will need to be reset, target time for this operation to be one day.

Shim former construction:	a) All GRP or b) GRP with 304 stainless steel inner layer
Coil details:-	
Shims provided	: Z1, Z2, Z3, X, Y, ZX, ZY, X2-Y2 XY, Z2X, Z2Y, Z(X2-Y2), ZXY
Maximum recommended current	: 25 amps (nominal)
Shim strength	: The shim strengths shall be capable of eliminating the expected gradients..
Coupling	: All shims are designed to be de-coupled from main coil
Decay of superconducting shims	: Homogeneity remains in specification over 1 year.

3. THE CRYOSTAT

i) General Description

The cryostat is of zero boil-off design, consisting of a central all-welded stainless steel helium vessel which is surrounded by an aluminium cryo-cooled radiation shield. The complete assembly is contained in a stainless steel outer vacuum vessel with an angled service turret located centrally on top of the cryostat (see customer interface). The turret provides access to the helium reservoir for the demountable magnet leads, helium level probe, and helium transfer siphon. The room-temperature bore-tube is constructed from stainless steel.

The cryostat is supplied with a support stand that consists of load-spreading plates which have provision for fixing to the floor of the installation room. The helium reservoir contains in total approximately 3000 litres of liquid helium of which approximately 500 litres volume is above the upper recommended working level of the system. Details of refill intervals are given below.

Cryogen level probes are incorporated into the liquid helium reservoir and the associated electronics provide liquid level display and a low-level alarm. Back-up liquid helium level probes are included for use in the event of failure of the primary probes.

The system is equipped with 2 independent 2-stage 4.2 K cryo refrigerators with compressor units. The first stage of the cryocoolers cool the radiation shield, the second stages recondense evaporated helium gas enabling the cryostat to be zero boil off in the static configuration.

In the event of a quench, cold fluids must not drop onto the service turret or the pump out port. Both of these are shown in the customer interface drawing. The quench line (also known as the quench/vent tube) inside the magnet room should be thermally insulated in a manner appropriate for cryogenic pipe work.

ii) Specifications

Dimensions:-

Overall length of cryostat	: 3366 mm ± 10 mm

Note: Service end to be marked/labelled with actual distance from magnet isocentre to service end plate.

Overall height for standard system	: 3200 mm ± 10 mm (excludes quench duct)
Cryostat width	: 2900 mm ± 5 mm
Room temperature clear bore (without shims)	: 900 mm ±3 mm
Room temperature bore-tube material	: 304 Stainless steel 5 mm thick.
Regarding location of weld line:	± TBD degrees about top-dead-centre and ±55 degrees about bottom-dead-centre are 'keep-out' zones. The weld line may be located anywhere outside of these keep-out zones. Location of weld line to be indicated on the 2-D interface drawings.

Max loading weight of equipment in:

Magnet bore	: 2000 kg as a distributed load. All components are to be mounted so as to limit static pressure to 50 psi.
Centre of field to base of stand	: 1400mm ± 10 mm
Cryostat end flange to centre of field	: 1683 mm ± 5 mm from patient end
Minimum ceiling height for insertion of ancillaries into/out of the service turret; for either angled or vertical cold heads	: Less than 3700 mm
Weight of cryostat excluding cryogens	: 38 tonnes

Note: the above weight does not include MR system components such as gradient coil, etc.

Cold/Radiation Shield bore tube construction

Material	: 6 mm thick SIC-1200 Aluminium
radiation shield ID	: 940 mm ±1.5 mm
Cryocooler type	: Configuration of Sumitomo RDK415 cold heads and Sumitomo F-70 compressors (Number to be determined)

Chiller	: Customer to provide chiller unit for compressors.
Vacuum leak rate	: Better than 1x 10^{-7} mBar L/s
Maximum rate of temperature change (Magnet/cryostat system)	: ± 5 Deg C in 10 minutes
Ambient temperature range	: 20-24 Deg C for the MR scanner room
Relative humidity	: 40-60% non condensing
Atmospheric pressure	: 700 to 1060 mbar.

Liquid nitrogen cryogen details

Volume for initial installation from warm: (includes cooling the magnet from room temperature to 77K)	17,000 litres

Liquid helium cryogen details:-

Volume for initial installation from warm: (includes cooling the magnet from 77K to 4.2K, volume required to completely fill helium reservoir and to top up helium reservoir after magnet energisation).	17,000 litres

This is to be supplied in dewer sizes of 500 litres minimum during cool down.

Typically an additional 8000 litres of helium will be required for each training quench (if any occur)

Ramping losses (0T to 7T or 7T to 0T; for a full ramp cycle multiply the indicated value by two) Excluding transfer losses	: 1500 litres (nominal)
LHe evaporation rate	: 0 litres/hour in steady state (nominal)

Note:
Cryogen usage rates assume no gradient pulsing or other system activities, i.e., quiescent.

Safe minimum operation level	: 500 litres from full (nominal)
System service interval approximately	: Annually (by Magnex Certified Engineer at field)

Note External events such as cryocooler down time gradient pulsing etc will result in additional cryogen consumption that may require additional service visits to replenish the cryogens.

Bursting disc complies with	: BS 2915 of 1990 and EC directive 97/23/EC.

iii) ***Transport***

Transport method	: Cold Ship, by Air ride truck and Sea freight only.
Minimum shipping height	: 3200 mm by removal of coldheads and associated cryogenic hardware (TBC)
Shock Loads	: 3g vertical, 2.5g horizontal on Magnex supplied pallet

iiii) Magnet Sensors

: system temperatures to be defined

4. SYSTEM COMPONENTS

1. MRBR 7.0T/900AS magnet with integral superconducting shim coils.

2. Helium transfer siphon: P222000068

3. Sumitomo RDK408 2 stage cold head or equivalent (Number TBD) .

4. Sumitomo F-70 compressor or equivalent (Number TBD)

5.Gas lines
20 meter flexible gas lines: (4 off)

6. E7007 Emergency Discharge Unit, E7101 EDU monitoring unit and E5083 helium monitor mounted in 19" sub racks (equipment room)

7. Set of cables consisting of : TBD

8. Spares kit

9. Magnet system manual, safety manual and log book A hard copy of the manual will be shipped with each magnet and left on site with the magnet system.

Optional Ancillaries

1. Remote monitoring system
Note: This is normally installed during Magnex Scientific warranty period and/or as part of Magnex service contract if applicable. All components supplied as part of the remote monitoring system remain the property of Magnex Scientific Ltd

SPECIFICATION

FOR A 10.5 TESLA 820 mm

SUPERCONDUCTING MAGNET SYSTEM

Prepared by:-
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www : magnex.com

Document Ref : TS1668E

Date : January 2009

CONTENTS

1. DESCRIPTION OF THE SYSTEM

The MRBR 10.5/820 system is a pumped superconducting magnet system intended primarily for Research Studies on the Biological applications of NMR Imaging (MRI), NMR Spectroscopy (MRS) and Functional Imaging (*f*MRI).

The system consists of a highly homogeneous superconducting magnet (10.5 Tesla) housed in a 820mm horizontal room temperature bore, low-loss helium cryostat. Field shimming is primarily accomplished using superconducting shim coils. Final shimming is performed with a small number of passive shims located in gradient coil (not supplied).

The system is supplied with a pumping station to maintain reduced temperature operation, a helium level monitor and an emergency quench heater control unit. A two-stage cryo refrigerator cooling system is employed, consisting of three independent cryocooler systems. These minimise the cryogen consumption and eliminate the necessity for a liquid nitrogen reservoir.

2. THE SUPERCONDUCTING MAGNET

i) General Description

The magnet is wound from multi-filamentary NbTi conductor with a high percentage of copper to superconductor. The windings are placed on a precision-machined aluminium alloy former and fully vacuum impregnated for robustness and long term reliability.

The field homogeneity is defined over a 40cm diameter spherical volume. Theoretical field profiles are shown in figure 1. Inevitably winding tolerances and small amounts of environmental influence will distort the central field. Corrections for these distortions are made in the first instance by superconducting shim coils located on a former surrounding the main coil. High order corrections are made by a minimal number of passive shims placed in the bore of the system.

The magnet coils are fully protected from accidental damage due to a quench by a resistor and diode network located within the helium reservoir. In the event of the need to activate an emergency discharge of the magnet a quench heater circuit is incorporated within the windings.

The magnet is designed to conservative levels of stress and mechanical stability to ensure reliable and stable operation. In addition the use of high quality superconducting wire ensures that a highly stable magnet system is achieved.

Figure 1 Theoretical Field Profile

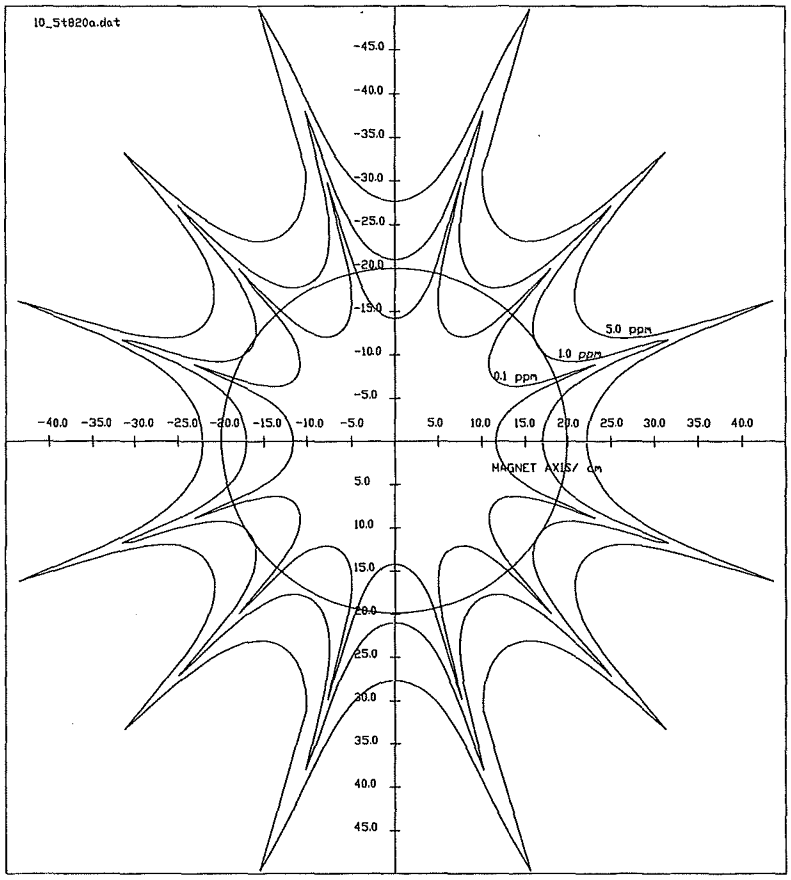
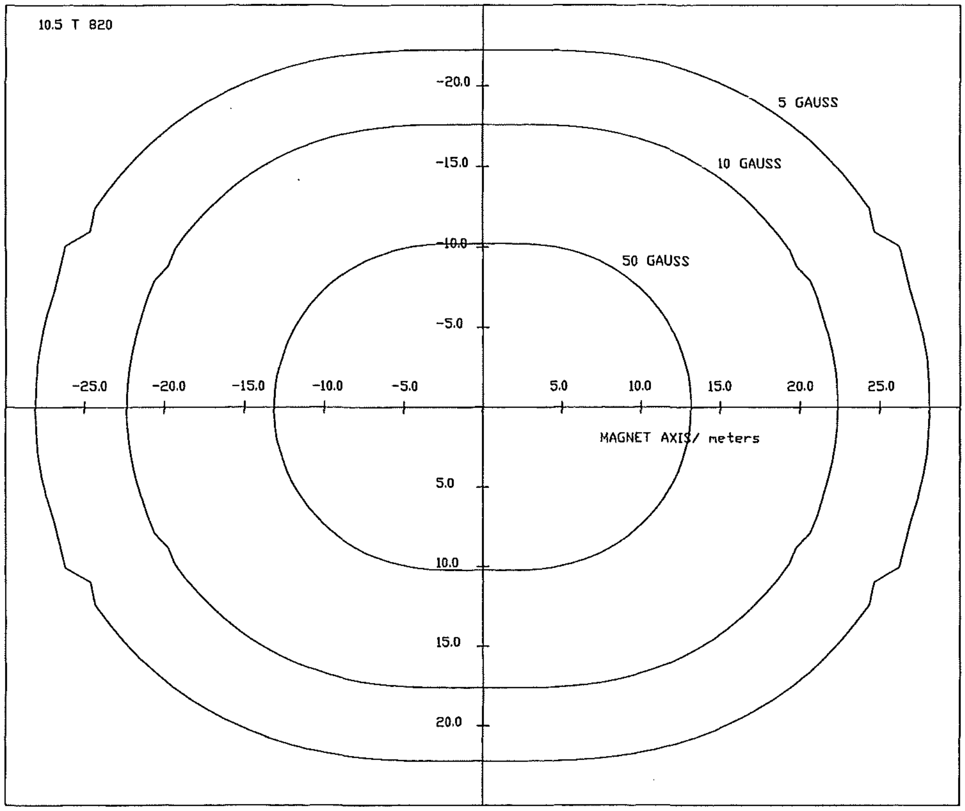


Figure 2 Stray field (unshielded)


10.5 T 820
5 GAUSS
10 GAUSS
50 GAUSS
-20.0
-15.0
-10.0
-5.0
-25.0
-20.0
-15.0
-10.0
-5.0
5.0
10.0
15.0
20.0
25.0
MAGNET AXIS/ meters
5.0
10.0
15.0
20.0

ii) Specifications

Magnet type	: Multi-coil superconducting
Central field	: 10.5 Tesla (10.0 T guaranteed)
Guaranteed ultimate field stability Measured over 72 hour period	: Less than 0.05 ppm/hour
Operating current	: 240 amps (nominal)
Field homogeneity values (see Figure 1)	
Superconducting shims only	: Less than 20 ppm pk to pk over 40 cm dsv*
Fully shimmed (SC + passive shims)	: Less than 5 ppm pk to pk over 40 cm dsv*
	: Less than 1 ppm pk to pk (or 0.1 ppm vrms) projected over 25 cm dsv**

* Defined as the peak to peak variations of points plotted over a twelve plane, twelve angle plot on the surface of the stated volume

** Projected from 40 cm dsv plot assuming 1st and 2nd order shims are set optimally.

Fringe field	: See Figure 2
Position of 5 gauss contour	
Axially from magnet centre line	: 28.2 metres
Radially from magnet centre line	: 22.3 metres

iii) Superconducting Shim Coils

The use of high purity superconducting shim coils ensure that excellent long term field homogeneity from the magnet is achieved. These coils are positioned on a non-conducting former surrounding the main coil in the helium reservoir. Each coil set is fitted with a super-conducting switch for persistent mode operation.

Coil details:-

Shims provided	: Z1, Z2, Z3, X, Y, ZX, ZY, X2-Y2 XY Z2X Z2Y Z(X2-Y2) ZXY
Maximum recommended current	: 25 amps (nominal)
Coupling	: All shims are designed to be de-coupled from main coil

3. THE CRYOSTAT

i) General Description

The cryostat is of conventional design, consisting of a central all-welded stainless steel helium vessel that is surrounded by three aluminium cryocooled radiation shields. The complete assembly is contained in a stainless-steel outer vacuum vessel with a vertical service turret located centrally on top of the cryostat. The turret provides access to the helium reservoir for the demountable magnet leads, helium level probe, and helium transfer siphon.

The outer vessel has flat end-flange closures constructed from aluminium that are sealed to the main body and bore-tube by compressed rubber 'O' ring seals. The room-temperature bore tube is constructed from stainless steel.

The cryostat is supplied with a support stand that consists of load-spreading plates which have provision for fixing to the floor of the installation room. Cryogen level probes are incorporated into the liquid helium reservoir and the associated electronics provide liquid level display and a low-level alarm. Back-up liquid helium level probes are included for use in the event of failure of the primary probes. The probes will monitor helium levels continuously from empty to full conditions.

The system is equipped with 3 off 2-stage cryo refrigerators with compressor units to minimise the heat load on the helium can so that helium hold time exceeds six months.

In order to reach the enhanced field of 10.5 T it is necessary to reduce the temperature of the magnet to below 3 K by the use of a rotary pump system.

The reduced temperature operation is maintained via the pumping station. A rotary pump reduces the pressure in the helium bath and thus lowers the boiling point of the helium to below 3 K. In this mode of operation helium transfers are done though a split semi-permanent siphon that incorporates a control valve to prevent air being sucked into the helium vessel.

ii) Pumping Station

The pumping station consists of two pumps. In normal operation, only one pump is in use at any one time with the second in stand-by mode. A controller automatically switches between the two pumps. An electro-pneumatic valve (held open in normal use) allows for servicing and designed to close in the event of a quench to protect the down-stream vacuum components. The pumps, manometer controller and electro-pneumatic valve all interface with the electronic monitoring/control system.

The monitoring section of the electronics system measures and records the following parameters:

1. Three temperature sensors located within the magnet
2. Pumping station parameters of control valve position and cryostat pressure

3. Liquid helium level
4. Radiation shield temperatures

ii) Specifications

The cryostat is generally as shown in Figure 3.

Full specifications for the system are as follows:-

Dimensions:-

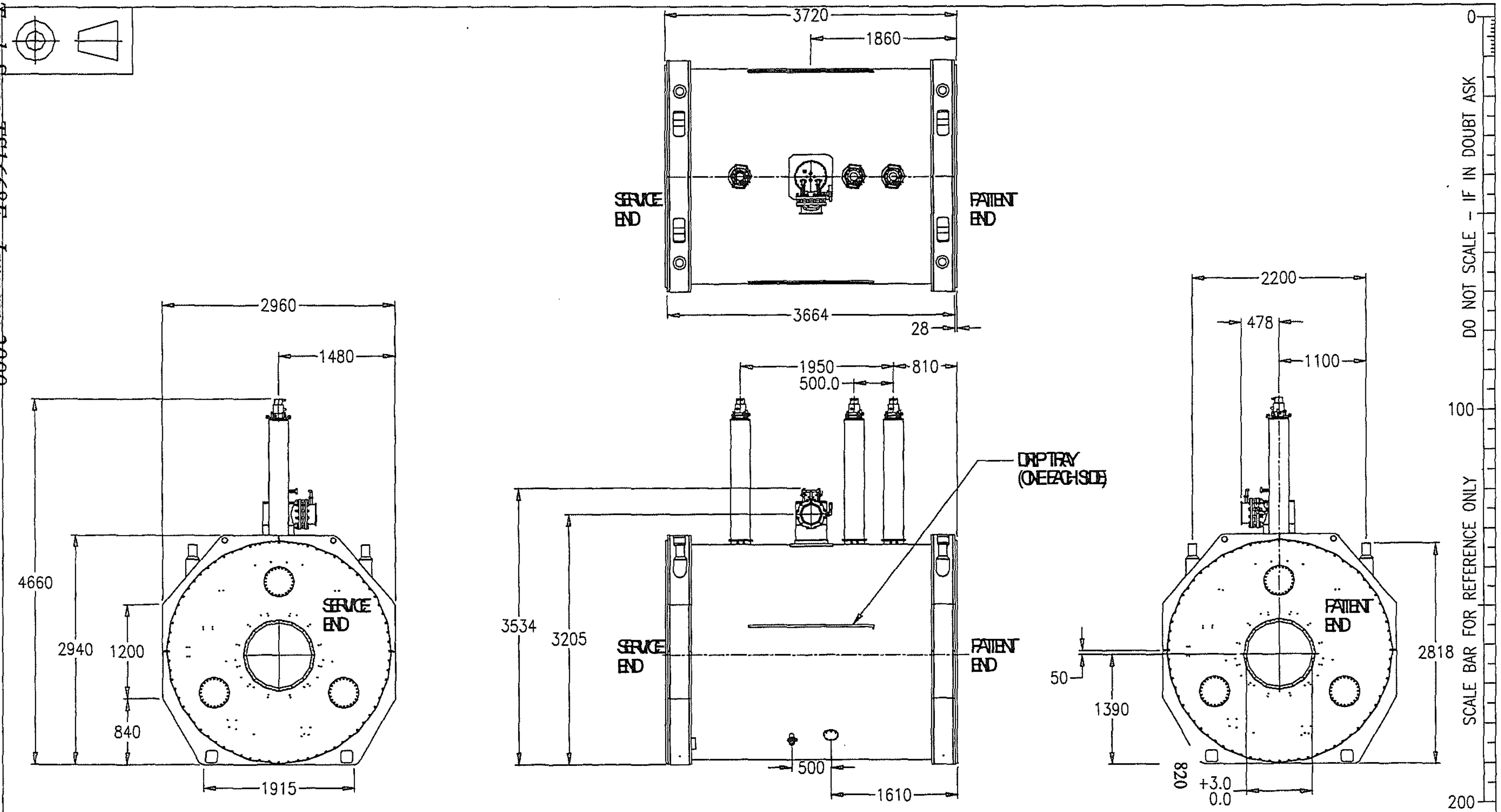
Overall length of cryostat	: 3720 mm
Overall height with support frame	: 4660 mm
Room temperature clear bore (without shims)	: 820 mm
Room temperature bore-tube material	: Stainless steel
Centre of field to base of stand	: 1390 mm (nominal)
Cryostat end flange to centre of field	: 1860 mm (nominal)
Width of cryostat	: 2960 mm
Minimum transport height	: 3534 mm
Weight of cryostat excluding cryogens	: 60 000 kg approx.
Cryocooler type	: Sumitomo CH210 (2 off) and RDK408 cold heads
Compressor type	: Sumitomo F-70 (3 off)
Chiller	: Customer to provide chiller unit for compressors.
Manufacturing code	: CE (complying to current Euopean directives) Built to the European/Medical Device Directive EN60601-1
Transport method	: Warm fully transitted.
Quench Duct Flange Interface	: ISO 250

Cryogen requirements:-

Volume of liquid nitrogen for initial installation to cool the magnet from room temperature to 77 K.	: 20000 Litres (Nominal)
Volume of liquid helium for initial installation to cool the magnet from 77K to 3 K, volume and to completely fill helium reservoir after energisation.	: 30000 Litres (Nominal)
Recommended refill volume during normal operation	: 900 litres (Nominal)
LHe evaporation rate	: 0.2 litres/hour
Liquid helium refill interval	: 6 months

iii) Transport

Transport method	: Warm fully transitted by Air ride truck and Sea freight.
Shock Loads	: 3g vertical, 3g horizontal on Magnex supplied pallet (to be confirmed).



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--	--	A	20.01.09	N/A	1ST ISSUE

magnex scientific

DIMENSIONS IN MM UNLESS STATED
REMOVE ALL SHARP EDGES & BURRS

DRAWN BY:-	PJ
CHECKED BY:-	
APPROVED BY:-	
DATE:-	20.01.09

ALL WEIGHTS AND DIMENSIONS ARE APPROXIMATE AND CAN CHANGE WITHOUT NOTICE.

TITLE:- 10.5T 830 CUSTOMER INTERFACE

OUT TRAY

DRAWING NUMBER: AHZ342323A SHEET 1

MATERIAL: --

FINISH: -- ID No: 42323

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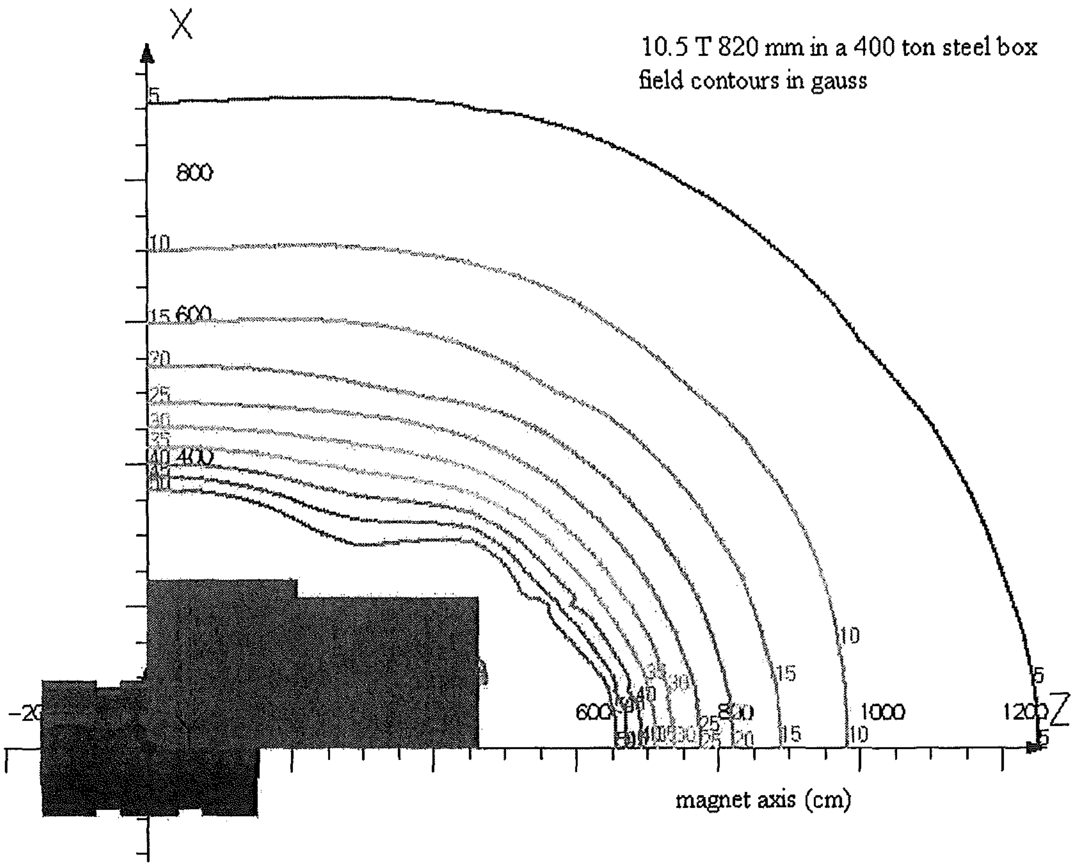
4. SYSTEM COMPONENTS

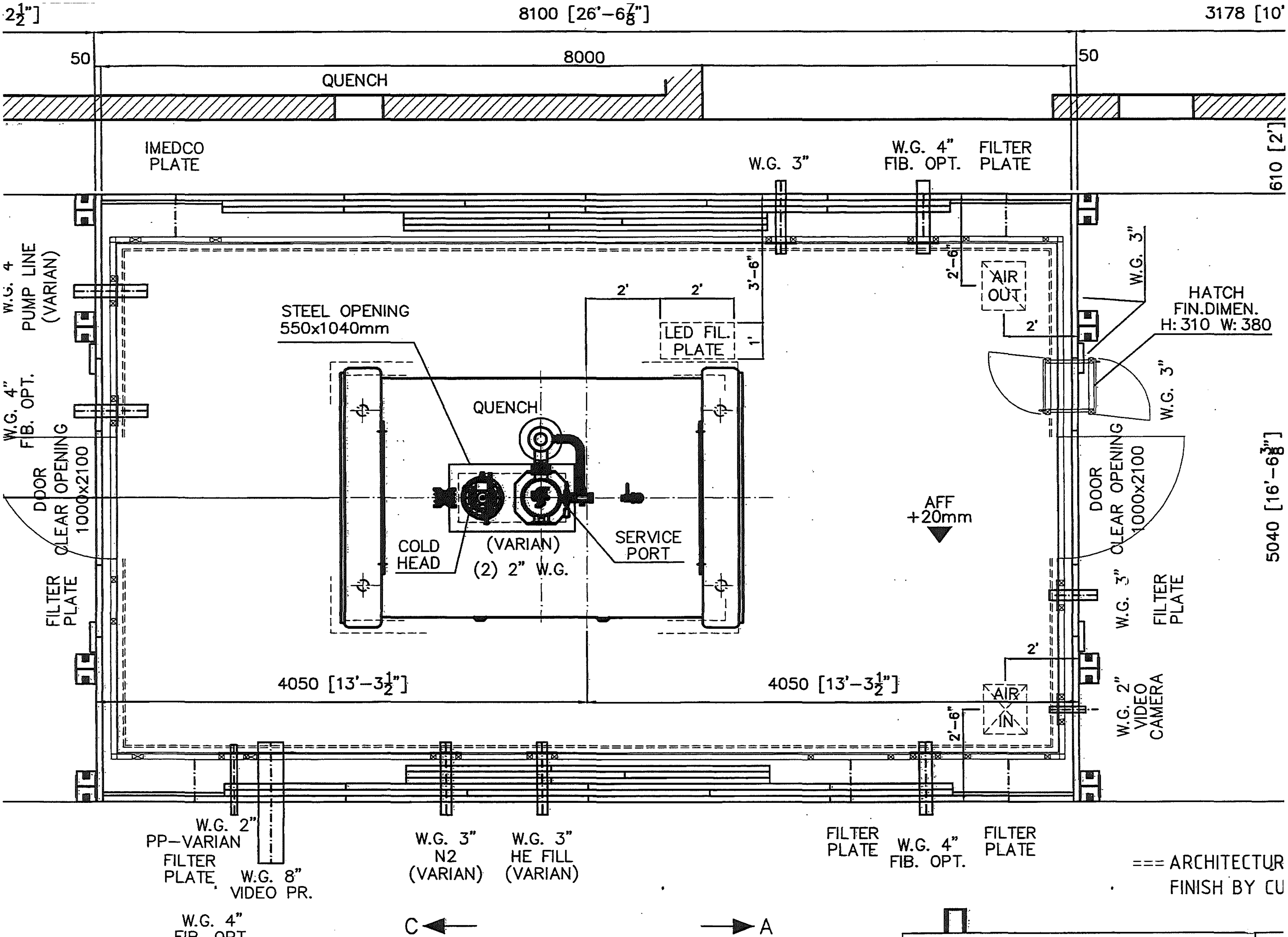
1. MRBR 10.5T/820 magnet with integral superconducting shim coils.
2. Magnet pumping station with redundant pump
3. Helium transfer siphon (compatible with iron shield)
4. Sumitomo CH-210 2 stage cold heads or equivalent (2 off)
5. Sumitomo RDK408
6. Sumitomo F-70 compressors or equivalent (3 off)
7. 18 metre semi flexible gas lines (3 pairs)
8. E7007 Emergency Discharge Unit
9. E5011 helium monitor
10. Magnet monitoring system
11. Full set of cables
12. Main current lead
13. Shim lead
14. System manual
15. Spares kit

Appendix A

Stray field plot in a 400 ton steel room.

Please note the steel room is not in the scope of supply.





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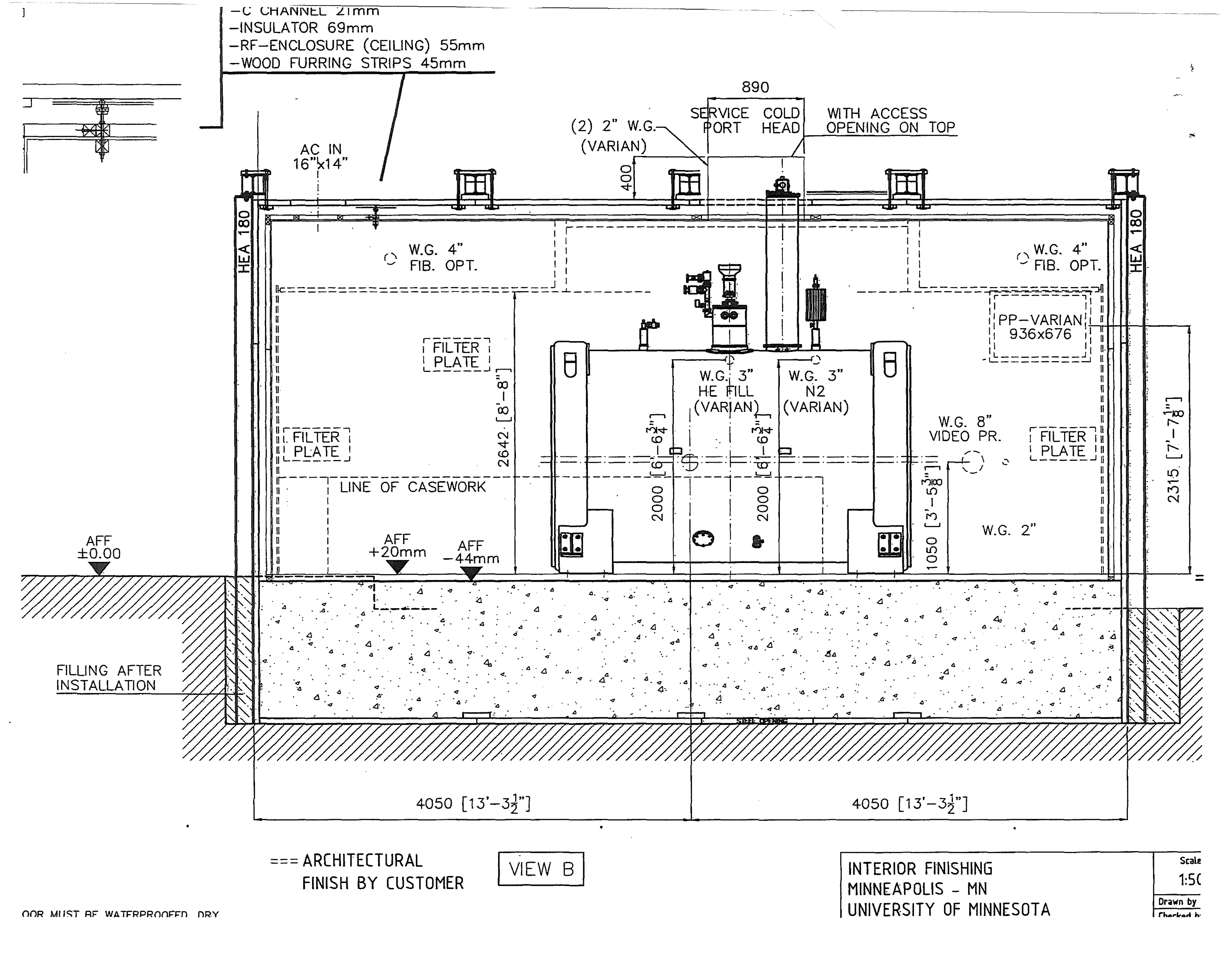
POSITION MAGNET
MINNEAPOLIS - MN

HVAC WAVEGUIDE:

HVAC SUPPLY + RETURN 16"x12"


-C CHANNEL 21mm
-INSULATOR 69mm
-RF-ENCLOSURE (CEILING) 55mm
-WOOD FURRING STRIPS 45mm
890
SERVICE PORT
COLD HEAD
WITH ACCESS OPENING ON TOP
(2) 2" W.G. (VARIAN)
AC IN 16"x14"
400
HEA 180
HEA 180
W.G. 4" FIB. OPT.
W.G. 4" FIB. OPT.
PP-VARIAN 936x676
FILTER PLATE
FILTER PLATE
FILTER PLATE
2642 [8'-8"]
W.G. 3" HE FILL (VARIAN)
W.G. 3" N2 (VARIAN)
W.G. 8" VIDEO PR.
2000 [6'-6$\frac{3}{4}$"]
2000 [6'-6$\frac{3}{4}$"]
1050 [3'-5$\frac{3}{8}$"]
2315 [7'-7$\frac{1}{8}$"]
LINE OF CASEWORK
W.G. 2"
AFF ±0.00
AFF +20mm
AFF -44mm
FILLING AFTER INSTALLATION
STEEL OPENING
4050 [13'-3$\frac{1}{2}$"]
4050 [13'-3$\frac{1}{2}$"]
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VIEW B
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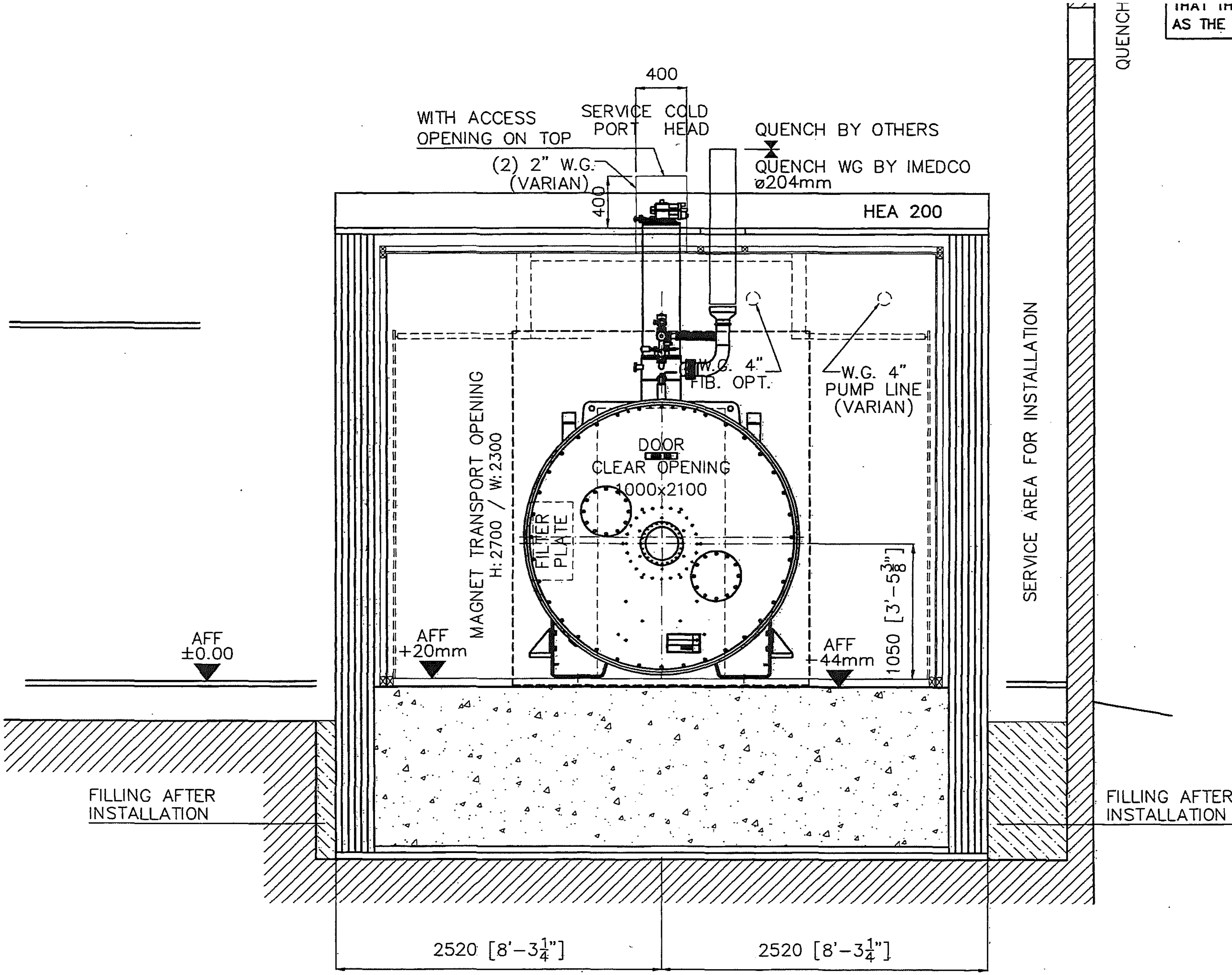
OOR MUST BE WATERPROOFED, DRY

THAT THE LOCAL SAFETY
AS THE MRI SUPPLIER'S S



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