

**Towards Developing a Sustainable West Campus
at the University of Calgary**

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ABSTRACT

In 1995, the Province of Alberta gave the University of Calgary a 74-hectare (184-acre) parcel of land at the western edge of the University's Main Campus. Since then, 44 hectare has been set aside for various uses under different agreements, leaving approximately 30 hectares (75 acres) of developable land for University purposes.

To determine the best use of the annexed land which needs to fall in line with the long term objectives of the University, and other than just to view the site as a holding ground for future expansion, the University initiated a process in 2006 to prepare a master plan for the West Campus. The principal goal is to create a planning framework that is sustainable and which is compatible with the City of Calgary's **imagineCALGARY (see Note 1)** initiative.

The emerging vision of the West Campus development is to create a "University Village" that responds to the growing global recognition that new patterns of living and working and learning will be essential to the social, economic and environmental well-being.

During the planning process, it was identified as crucial to integrate the future West Campus transportation system with the existing surrounding roadway network, and to address connections with nearby developments that included the Main Campus, the University Innovation Park, and adjacent communities. A comprehensive transit strategy that facilitates connections between key University destinations and nearby Light Rail Transit (C-Train) stations was deemed critical. It was further recognized that the long term sustainability of the development hinges heavily on the ability to provide alternative modes of transportation, including biking, walking and transit. Creating a vital safe pedestrian environment with a well connected realm was yet another issue of importance.

This paper describes the planning process in developing a viable and efficient transportation scheme as part of the overall master plan; the data collection and reduction in the study; the analyses; the innovative and context sensitive design (CSD) concepts used; and the final recommendations. It outlines the principles and methodology used and documents the study's results and findings. Analyses of the collected data are provided. Finally conclusions and presentation to the University are given.

Note 1: imagineCALGARY Initiative

To address society's concern on the City's long-term growth, and to achieve a correct balance between the City's "Triple Bottom Line" goal of environmental, social and economic outcomes within the overarching concept of sustainable development, Calgary has initiated a program known as "Plan It Calgary". This program recognizes the close linkage between land-use policy and transportation, and seeks to establish a long-term vision to determine how the City should grow, with focus on land development and mobility issues, and how these policies can be combined to create a more sustainable future. The project is guided by a set of eleven sustainability principles that have been adopted by City Council, and makes use of indicators, targets and benchmarks to different growth scenarios. The project also uses indicators, targets and benchmarks to evaluate various possible growth scenarios for Calgary's future. In summary, the Plan It Calgary project focuses on the guiding principles of urban planning, that land use and

mobility are inextricably linked, and that proper planning can be combined to create a more sustainable future for the City.

1. INTRODUCTION

The University of Calgary (U of C) in Calgary, Alberta is one of the youngest universities in Canada with an enrolment of approximately 28,200 full time students. The University is currently experiencing rapid growth, and has plans to expand its FTE (full time enrolment) by an addition of 7,000 students in the next five years.

Along with the expansion and growth initiative of every institution there is a need for land. As is the case of all fast growing metropolis in north America, land at the heart of the Calgary (City) is at a premium so that carefully planning for its use is crucial for the City's long term growth sustainability. To share the City's vision, U of C has the same goal of prudent land usage. Presently, land surrounding the University for its activities, not all of which are owned by the University, is divided into six main areas, as follows:

- Main Campus (owned by U of C)
- Middle Campus (owned by U of C)
- West Campus (owned by U of C)
- University Innovation Park (UIP, leased to U of C by the City)
- Foothills Medical Centre (owned by the City)
- McMahon Recreation District (owned by the City)

This is illustrated in **Figure 1**.

While land is normally scarce for most entities, a large parcel of land known as the West Campus was recently given to U of C in 1995 by the Province of Alberta. The West Campus is a 74-hectare (184-acre) parcel of land at the western edge of the University's Main Campus. Of this parcel, approximately 13 hectares (32 acres) have since been used to accommodate the new Alberta Children's Hospital and Ronald MacDonald House. Another 20 hectares (50 acres) have been set aside as open space under the terms of a land use agreement with the City of Calgary that governs development of the site, and an additional 10 hectares (24 acres) will be needed for roads and road widening, leaving approximately 30 hectares (75 acres) of developable land for University purposes.

An early projection of land needs, as identified by a 2001 master plan study, revealed that the University has about 50 additional years of expansion capacity on its present Main Campus, to support a final growth to approximately 40,000 FTE students by the year 2025. Conclusions of the earlier study indicated that the West Campus lands will not be necessary to accommodate projected growth in traditional campus academic functions, and as a result opened the possibility of using the West Campus lands for some visionary and innovative usage. The vision for development of the West Campus lands which subsequently emerged responds to the growing global recognition that new patterns of living and working and learning will be essential to a community's social, economic and environmental well being, if not for its survival. In recognition of this, the University is assuming its obligation to Canada's future by attempting to develop an exemplary community that is environmentally sound, socially responsible, financially solid, and transportation-wise viable in the long term.

Building on this vision, the University initiated a process in the summer of 2006 to prepare a master plan for the West Campus. The principal goal set for the plan was to translate the initial vision into a framework plan to guide the long term development in the area. A multi-disciplinary consultant team that was made up of transportation and infrastructure professionals, market and financial analysts, community outreach and public partnership specialists, local planning and regulatory review personnel, led by an architectural firm based in Massachusetts, was selected to prepare the plan in the Fall of 2006.

For this assignment, the consultant team was directed to perform the following tasks:

- Prepare an overarching urban design framework for the West Campus site
- Analyze transportation and infrastructure conditions and recommend any necessary improvements

This paper describes the planning process for the transportation component of the study. It describes the planning process in developing a viable and efficient transportation scheme as part of the overall master plan; the data collection and reduction in the study; the analyses; the innovative and context sensitive design (CSD) concepts used; and the final recommendations. It outlines the principles and methodology used and documents the study's results and findings. Analyses of the collected data are provided. Finally conclusions and presentation to the University are given.

2. KEY ISSUES

To seek an early “buy-in” of the final recommended master plan by all key stakeholders and interested parties, a vigorous public outreach and stakeholder participation program was launched to invite comments and ideas. Through the initial analysis of campus conditions and this stakeholder consultation process, including the holding of several open houses, some important key issues on transportation were identified. The following is a summary:

- **Transportation Sustainability**

Transportation sustainability was identified as a top priority by University stakeholders and community residents. The goals of the master plan will also need to be consistent with the goals outlined in the City of Calgary's **imagineCalgary** (see **Note 1 under Abstract**) initiative, which has extensive and comprehensive transportation objectives to promote public transit usage.

- **Linking of the West Campus with Other Campus Planning Initiatives**

There is a need to coordinate the West Campus study to the other major initiatives including the Campus Community Plan for the University's Main Campus, the University Innovation Park master plan, the South Campus medical district, the McMahon recreation district, and other University landholdings. Land use relationships, and open space and transportation connections between these areas are of particular importance.

- **Integration with Neighbouring Communities**

Community residents were concerned about density, and the impact of the West Campus development on opportunities for University expansion, green space, traffic, parking, and noise; and its integration and enhancement with their mode of living.

- **Traffic and Transportation**

There is obviously a need to integrate the West Campus transportation system with the surrounding road network, and to address connections with the Main Campus, UIP, and adjacent communities. A comprehensive transit strategy that facilitates connections between key University destinations and nearby Light Rail Transit (LRT) train stations is required. Traffic and transportation was a major concern for area residents, who voiced strong support for alternative modes of transportation, including biking, walking, and transit. Improved pedestrian across the major thoroughfare of 32nd Avenue NW was another critical issue.

Other issues not directly related to transportation but nevertheless bear importance to the study included:

- **Design Vision**

The plan needs to create a destination at the West Campus with a distinct sense of place that is accessible to the University community, as well as residents of surrounding communities.

- **Land Use Mix and Density**

The development potential of the site needs to respond to the surrounding urban context and adjacent land uses. Potential revenue generation is another important consideration.

- **Campus Town**

It was noted that the Main Campus lacks vitality after hours, which wants to be changed.

- **Housing**

The plan is to create an opportunity for affordable housing in Calgary, particularly for University faculty, staff and students.

- **Community Concerns**

Specific comments provided related to five principle areas of: transportation; density and integration with adjacent communities; accommodating long-term University needs; sustainability and open space; and housing.

3. FRAMEWORK FOR TRANSPORTATION PLANNING

The West Campus master plan is developed based on the goals that were defined during the visionary phase that preceded the master planning effort. The key governing parameters include:

- Encouraging a flexible mixture of use on the site
- Responding to the broader environmental and economic concerns
- Housing a significant number of University employees, as well as more students
- Making a positive impact on carbon emissions by eliminating worker and student commutes, while reducing the potential neighbourhood traffic impact.

3.1 Transportation Considerations

The evolution of the final transportation component has been continuously reshaped in the course of the study to reflect the University's visionary goals, which is to build an exemplary, sustainable, vibrant and lovable neighbourhood place around its surrounding communities, with minimal vehicular dependence and traffic impact to the adjacent neighbourhood. The following are the guiding principles in the study of the transportation network system:

- **Provide Leadership in Sustainability**

The University plays an important role as an educator on all stages, and has the opportunity to demonstrate leadership in its actions. Development of the Master Plan Area has been used to serve as a model for all dimensions of sustainability, including its approach to transportation planning.

- **Create a Vital Pedestrian Environment**

To support the vision for the Master Plan Area, new development should contribute to the creation of a vital pedestrian environment that is well connected with the Main Campus and adjacent neighbourhoods.

- **Improved Connections**

The Master Plan Area is located within a diverse urban setting that includes the University's Main Campus, UIP, other institutions, and residential neighbourhoods. Development of the site creates the opportunity to strengthen the surrounding urban environment through improved land use relationships, an integrated open space system, an efficient transportation system, and a connected pedestrian realm.

- **Convenient and Efficient Transportation**

The transportation system serving the Master Plan Area must support the large residential population that will live there, and the people that will be drawn around the city by the dynamic mix of uses that are planned for site. Vehicular access and transit service should be convenient and efficient, with priority given to transportation options that reduce vehicle trips.

- **Sustainability Strategy – Transportation and Mobility**

To fulfil its vision as a community leader in sustainable development, the University has taken a strong position on sustainability, and has set very aggressive targets for all new major capital projects, with LEEDS Platinum being the desired goal where possible. On

transportation there is a great potential to achieve measurable reductions in greenhouse gas emissions through strategies that reduce vehicle trip generation. New developments on Master Plan Area should be high density, mixed-use, and compact to reduce the need for vehicle trips, and to support transit, cycling and walking. Faculty, staff and student housing should be accommodated to facilitate walking to the Main Campus, UIP and other University facilities. Efficient transit connections, including possibly a low-energy shuttle, should be planned to link the Master Plan Area with nearby the LRT (C-Train) stations. A community-wide transportation plan should be adopted, which could include incentives for fuel-efficient vehicles, maximum parking restrictions, and other restrictions.

3.2 Non-transportation Considerations

Aside from what was described in Section 3.1, the following “non-transportation” objectives were formulated to guide the West Campus development.

- Master planning goals
 - In harmony with the University’s Academic Plan
 - Establish a revenue stream to support the University’s purposes
 - Support city-wide development
 - Mix learning and research with commercial functions
- Planning and design principles
 - Define a strong West Campus Identity, creating an exciting new urban district in NW Calgary
 - Create appropriate transitions in land uses, built form, density, height, scale, massing and landscape
 - Preserve views
- Integrate plan with other University planning initiatives
 - Campus Community Plan
 - University Innovation Park
 - Urban Campus
- Sustainable strategies
 - Ethics and social responsibility
 - Health and wellness
 - Major and minor capital projects
 - Water management
 - Energy management
 - Waste management
 - Procurement
 - Maintenance and operations
 - Economics
- Real estate market assessment
 - Local economy
 - Office market

- Retail market
- Residential market
- West campus market attributes

4. FINAL DEVELOPMENT PLAN

4.1 Master Plan Area Development Program

The final development program for the Master Plan evolved from the study comprises over approximately 825,000 gsm (8.9 million gsf) of mixed-used development, of which 45 percent is residential and 55 percent is non-residential, on a site area of 76.9 hectares (190 acres). The development program consists of the following elements:

Non-Residential Development (444,593 gsm, 4.78 million gsf)

- University Research (109,385 gsm, 1.1 million gsf)
- Retail/Restaurant (33,348 gsm, 258,821 gsf)
- Civic/Cultural (11,573 gsm, 124,524 gsf)
- Private Research/Office (258,997 gsm, 2.7 million gsf)
- Conference/Hotel (31,290 gsm, 336,680 gsf)

Residential (380,054 gsm, 4.09 million gsf)

- High Density Housing (180,251 gsm, 1.9 million gsf)
- Medium Density Housing (97,870 gsm, 1.0 million gsf)
- University Housing (101,932 gsm, 1.0 million gsf)

4.2 Formulation Principles

Formulation of the overall program and the range of mix of uses was shaped by several factors, including the:

- Creation of a mixed-use urban district as a new destination in NW Calgary
- Opportunities to advance the University's goals of sustainability and the reduction of vehicle trips through higher densities, compact urban form, and pedestrian and transit-orientated development
- Relationship of the Master Plan Area to surrounding land uses and neighbourhoods
- Capability of transportation and utility infrastructure systems to support new development
- Prohibition of certain incompatible uses such as big box retailers
- Viability of various long-term uses in the Calgary market

4.3 Implementation Phasing

Given the significant scale of the project, it is anticipated that the development will occur in phases over a 25-year time horizon. A total of five development phases are proposed for the Master Plan Area as follows. Key components featured in each phases is also given:

Phase 1 210,000 gsm (2.26 million gsf)

Phase 1 is to leverage proximity to the Main Campus to serve as an effective connector to future phases further west. Development will be in two stages of five (5) years each, executed sequentially. Stage 1 will focus on building a University place known as the **Civic Plaza**, the centre of which features a clock or bell tower. It will also contain the 37th Street Park and a large residential component. Stage 2 will involve the ongoing development of mixed use building around an extension of the plaza.

Phase 2 115,000 gsm (1.23 million gsf)

Phase 2 development builds on the completed Phase 1 area, extending west to the edges of the Master Plan Area. It is mainly residential.

Phase 3 133,000 gsm (1.43 million gsf)

Phase 3 is located almost entirely on the Main Campus in the area to the east of the Children’s Hospital. The development program will comprise largely of the private research or office component, possibly related to the Hospital.

Phase 4 126,000 gsm (1.35 million gsf)

Phase 4 is to the south of the Children’s Hospital. It will include a new “**eco-hotel and conference centre**”, with other office and support uses. There will be some residential development with higher densities.

Phase 5 241,000 gsm (2.50 million gsf)

Phase 5 development area extends north from Phase 1 area, east to the developed edge of the Main Campus. The program consists of University research buildings.

Phases 1 through 5 development boundaries are illustrated in **Figure 2**.

5. TRAFFIC ANALYSIS

Based on the proposed development program described in Section 4, a conventional traffic analysis based on the traditional 4-step planning process of trip generation, distribution, assignment and modal split was carried out. The number of vehicle trips that will be generated by the West Campus Lands development using trip rates published in the 7th edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual are as follows:

Land Use	Area or Units	Peak Hour Trips
Academic/Research	109,385 m ²	707
Retail/Restaurant	33,348 m ²	1,309

Private/Research	258,997 m ²	988
Civil/Cultural/Hotel	42,863 m ²	1,164
Residential	380,054 m ² (5,064 units)	<u>2,025</u>
Total		6,193

The newly generated trips from the West Campus development will greatly impact the existing roadway network system. In addition, the future UIP to the northeast of the site will create another 2,270 vehicle trips during the peak hour of travel when it is fully constructed. This is on top of an expected background growth of traffic to the planning year of 2025.

5.1 The Problem

On examination of these calculated figures, it quickly became apparent that such large addition of vehicle traffic is unsupportable by the existing roadway infrastructure, without significant modification and upgrade. The implementation of the West Campus Lands development will thus require the large scale widening of existing highways to boulevards and the creation of grade-separated interchanges in a predominantly urban setting, which is unfortunately unsustainable and against the University's principles of development. As well, the high level of traffic generated does not comply with the Land Use Agreement between the University and the City of Calgary in response to community concerns

5.2 Mitigation of Traffic

To contain the growth of traffic and hence creating minimal impact to the neighbouring areas; yet meeting the expansion goals of the University at the West Campus, the development process and its strategies formulated will need to drastically reduce the final number of new trips generated. To achieve this, both inter and intra campus transport was examined. For external trips to the site originated from and destined to locations outside of the University, besides strengthening the use of public transit (bus and Calgary's light rail transit LRT known as the C-train) as a convenient and attractive mode of transportation; as well, a vigorous transportation demand management policy (such as transit subsidy, shared rides, parking management, increasing vehicle occupancy, discount coupons, implementing flexible work hours, and promoting distance learning, etc.) will be enforced. For internal or intra-campus trips within the site, the use of non-motorized form of transport (walking or biking), and highly energy efficient carriers (including large capacity campus shuttle busses, trolley cars, and people mover systems) will be favoured, by strictly limiting and controlling the number of available parking within the different campuses. All these will be made possible by the introduction of a well planned, comprehensive and viable transportation network.

In the planning process, discussions were held and overall cooperation has been sought from key public agencies including Calgary Transit, Alberta Children Hospital, the Foothills Hospital, and the UIP Development Agency. Calgary Transit welcomes the opportunity to plan for long term transit sustainability with the University. The other agencies are institutional partners with common interests in reducing auto dependence and parking demands. These agencies are capable of promoting transportation demand management collectively and on an individual basis; and great economies are possible through cooperation.

Based on the above assumptions, and on information obtained from research on several similar research/university campuses in the United States, including the North Carolina State University (study of a trolley loop), the Piedmont Triad Research Park North Carolina (study of a central pedestrian spine), the Bio-Square Discovery & Innovation Park, Boston (study of an underground pedestrian corridor), and the Duke University in Durham (study of personal rapid transit), the modal split figure of auto/transit has been greatly revised in favour of transit. The final reduced additional trips generated from the West Campus site are approximately 1,863, which is at a much lower level than the original estimate based on traditional analysis of 6,193. At this level, infrastructure improvement requirements that are needed to ensure an acceptable level of service for the roadways in the vicinity of the West Campus Lands are considered as minimal, and involve no more than the signalization or modification of existing signals at some key intersections within the site, adding travel lanes, and increasing the storage length of some turning lanes. No high speed corridors and complex grade-separated urban interchanges are envisaged.

6. FINAL TRANSPORTATION NETWORK

In the course of the study, a transportation study was prepared as part of the master planning effort to test the ability of the proposed transportation system to support planned development on the Master Plan Area. The study confirmed that the road network will support anticipated levels of development, and that key intersections will function at reasonable levels of service, subject to certain improvements.

The final recommended West Campus master plan defines a comprehensive transportation network that facilitates alternative transportation opportunities, provides connectivity through the new communities created, and is integrated with the surrounding road system. A primary goal of the proposed transportation network is to support the master plan vision for a new, transit and pedestrian oriented urban district. Another goal is to facilitate connections among area institutions – the Main Campus, UIP, the Foothills medical district and the McMahan sports district – and to the local C-train stations (McMahan Station, University Station and Brentwood Station). The following is a description of the proposed transportation network and is illustrated in **Figure 3**.

6.1 Highways and Arterial Roadways

Road access to the Master Plan Area will occur via the existing highway and arterial road network, including Crowchild Trail, Shaganappi Trail, 32nd Avenue and 16th Avenue. No additional highways will be created, nor are there any major widening on these arterials envisioned.

6.2 Gateways and Primary Road Network

The Master Plan Area road network will be framed around an urban street grid with multiple intersections with the highway and arterial road system in order to provide permeability and connectivity. A few key intersections will serve as ‘gateways’ to the Master Plan Area,

including 32nd Avenue at 37th Street and an improved Collegiate Boulevard; 24th Avenue at West Campus Drive; and 16th Avenue at West Campus Way. The gateways will lead to a primary road network, which will consist of a new east-west road along the civic plaza, a re-aligned West Campus Drive, 24th Avenue, and West Campus Drive.

6.3 Secondary Roads

The secondary road network will consist of a grid of local roads that will define internal blocks and development parcels. Secondary roads will connect with primary and arterial roads at regular intervals to disperse traffic, and facilitate pedestrian movement.

6.4 Bicycle Paths

The master plan accommodates a comprehensive bicycle path system that connects with existing and planned pathways on the Main Campus, the surrounding urban street grid and the regional recreational trail network. The system is intended to support alternative transportation options, as well as recreational.

6.5 Transit Routes and Shuttle System

The primary road network is designed to support efficient transit service, and eventually a shuttle system, through the Master Plan Area and the surrounding areas. Two continuous, overlapping bus loops are proposed. The “inner route” will connect the Main and West Campuses to the University C-train station via the new civic plaza, West Campus Drive and 24th Avenue. The “outer route” will connect the University Station with the Foothills medical district and the McMahan C-Train Station via the civic plaza, West Campus Drive, West Campus Way, and through the medical district and the McMahan recreation district. A University operated shuttle system could reinforce transit service along these routes, providing more frequent service, and direct connections to University destinations. The shuttle system, if warranted by volume, could take the form of a people mover system, such as an above grade mono-rail system, at grade vehicles on track, or trolley cars on rubber wheels.

7. CONCLUSIONS

Completion of the West Campus master plan represents the first step in a complex planning and development process. To advance the development of the Master Plan Area, U of C need to initiate Area Planning for Phase 1, conduct a market research to validate the feasibility of potential Phase 1 uses, form an entity that is legally authorized to move ahead with the planning, seek approvals from government agencies having jurisdiction over the Master Plan Area, and launch a sales and marketing plan. The overall order of magnitude development cost is estimated at approximately \$3,732 million in 2007 dollars, of which transportation cost (including structured parking, local utilities, lighting and drainage) is \$137 million, a mere 3.7 percent. The low proportion of transportation infrastructure is possible based on a low capital investment on building new roads, and is only realizable if the neighbourhood community development concept is strictly followed.

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Figure 1: Location & Detailed Map



Figure 2: Phase Development



Figure 3: Proposed Transportation Network

