CORBETT LAND STRATEGIES INC.

VISION • EXPERTISE

# ENERGY AND ENVIRONMENTAL ASSESSMENT REPORT

Upper West Side Urban Boundary Expansion – East, Central and West Areas

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City of Hamilton

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# 1.0 INTRODUCTION

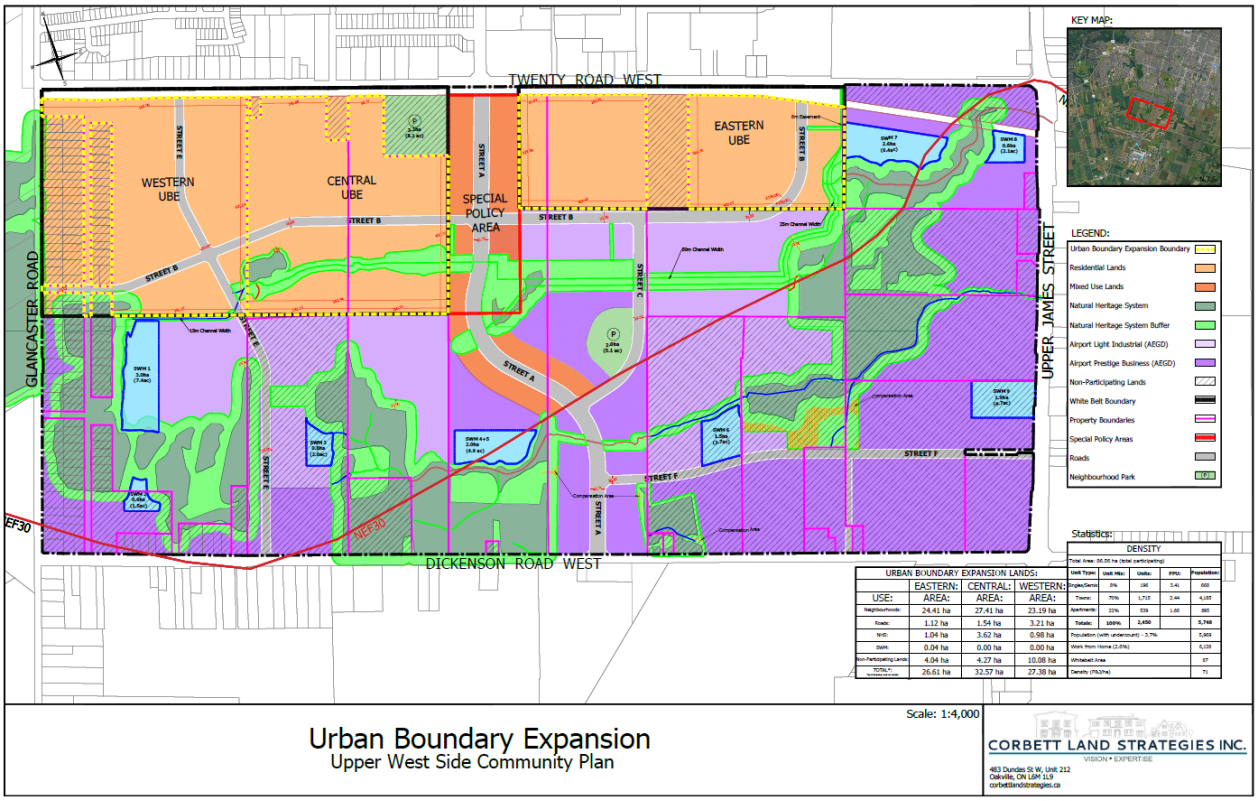
Corbett Land Strategies Inc. (CLS) has been retained by the Upper West Side Landowners Group (UWSLG), formerly the Twenty Road West Landowners Group (TRWLG), the owner of the property (herein referred to as the 'subject lands') to submit an Urban Boundary Expansion (UBE) application for three "white-belt" areas, identified as East, Central and West UBE areas (See Figure 1). These "white-belt" lands are currently identified as rural and are located within the Twenty Road West, Upper James Street, Dickenson Road and Glancaster Road development block. This report has been prepared for all three applications.

The UBE application will help facilitate the development of the subject lands that are considered to be infill and can assist with alleviating the need for immediate housing, a goal set out by the Province and the City. The subject lands are geographically surrounded by the Airport Employment Growth District (AEGD) to the south. The proposed expansion of the urban boundary will act as a buffer between existing sensitive land uses to the north and the planned employment to the south. The UBE applications will also support and coordinate with the Draft Plan of Industrial Subdivision submitted in July 2018, intended to facilitate the extension of Garth Street.

Although the subject lands are located outside of the AEGD, the corresponding guidelines for sustainable development have been applied, to ensure the future development is cognizant with the employment planned for the areas surrounding the John C. Munro Airport. Please note, at the time of preparing this report, no Terms of Reference are available to guide the preparation of this report. Based on latest communication with City staff, the Terms of Reference for Energy and Environmental Assessments reports is anticipated to be completed shortly.

This report has been prepared to be an introduction into the sustainable elements being considered for the subject lands. In addition, the UWSLG has engaged Ecovert to prepare a Sustainable Development Guidelines which can be introduced into future planning policies. It is anticipated that these guidelines will be implemented into the future Secondary Plan and further entrenched during the Draft Plan and Site Plan approval stages.

Figure 1: Upper West Side Community Plan



## 2.0 GUIDELINES

The following Energy and Environmental Assessment report demonstrates the sustainability of the proposed expansion area and responds to the Eco-Industrial Design Guidelines (EIDG). The report is required as per the Urban Hamilton Official Plan (UHOP) and the AEGD Secondary Plan. In the UHOP, Section 3.2.9 states:

> *Proponents of development applications may be required to prepare an Energy and Environmental Assessment Report to indicate how the proposal incorporates environmental and sustainable design features and practices, such as active transportation, energy efficiency through building and site design, and water conservation and is consistent with the principles and policies identified in Section B.3.7 – Energy and Environmental Design and other applicable policies in Chapter E – Urban Systems and Designations.*

In the AEGD Secondary Plan in Section 8.15, the following is stated:

> *Notwithstanding Section F.3.2.9 of Volume 1, the sustainability of development shall be evaluated at the time of development approval for a Plan of Subdivision or Site Plan and an Energy and Environmental Assessment Report demonstrating how the development meets or exceeds the sustainability provisions of the Eco-Industrial Design Guidelines and Urban Design Guidelines shall be required prior to development approval.*

In section 8.15 of the AEGD Secondary Plan, explicit criteria are provided which demonstrates how and which types of sustainable measures are envisioned for the proposed community. The criteria are as follows:

a. Green building materials;
b. Energy efficient building design;
c. Vehicle trip generation, access to public transit;
d. Cycling, and walkability;
e. Water conservation;
f. Diversity of use and availability of community services and public amenities;
g. Waste reduction, reuse and recycling (during construction and during operation);
h. On-site storm water management
i. Grey water reuse
j. Light pollution management
k. “Urban heat island” effect management;
l. On-site renewable energy generation; and,

Alongside this criterion are the nine design principles set out by the EIDG that are also overarching goals of sustainability (see Table 1). In order to achieve complete sustainability, all aspects of sustainability including the economy, environment and social needs to be achieved. Furthermore, the City has defined “sustainability” as an outlook that considers all aspects of a community together (i.e. the social, economic and the environment). In Table 1, the Three Pillars of Sustainability have been used to categorize the nine principles and criteria guidelines as a way to illustrate how the criteria will be defined and measured. Throughout this report, the three pillars will be used as a framework to assist with responding to the requirements, as set out by the City of Hamilton. In addition, the report illustrates that much of the criteria overlaps into other sustainable areas, showcasing that achieving an all-encompassing form of

sustainability starts with good urban design. To this effect, achieving a complete community within the AEGD will help minimize the negative effects of industrial uses and incorporate transitional uses which prevent disruptions to the AEGD.

It is through the EIDG, that the City of Hamilton has set out the objectives to improve the social well-being of individuals and the community as a whole, protect the existing aesthetic features, maintain the natural environmental and reduce the carbon footprint through development and economic efficiency. To respond to the objectives of the Energy and Environmental Assessment Report, several design strategies have been developed through input by qualified professionals. As such, this report has been a collaborative effort, with input from other consultants such as NAK Design Strategies, R.J. Burnside and Associates and Urbantech. Each of the consultants have been retained by the UWSLG to complete technical investigations, submitted under a separate cover. For this report, the listed consultants have incorporated elements and methods from their work to illustrate how the proposed urban expansion area will address the EIDG principles and the AEGD Secondary Plan criteria.

Through the following report, the various aspects of sustainability are explored. This includes demonstrating that the proposed expansion area has the capacity to provide sustainability from social, economic and environmental perspectives. It is believed that the proposed expansion area represents good planning and intends to follow high quality urban design elements that are conducive to both complete communities and functional employment areas.

**Table 1: Three Pillars of Sustainability**

| Sustainability Pillar | Principles | Criteria |
|---|---|---|
| ECONOMIC | Economic Sustainability and Business Synergy | Green building materials |
| | | On-site renewable energy generation |
| | | "Urban heat island" effect management |
| | Water and Wastewater, and Water Conservation/Efficiency | Water conservation |
| | | Grey water reuse |
| | Storm Water Management Guidelines | On-site storm water management |
| | Transportation | Vehicle trip generation, access to public transit |
| | | Cycling, and walkability |
| | Energy & Renewables | Energy efficient building design |
| ENVIRONMENT | | On-site renewable energy generation |
| | | Green building materials |

| | | |
|---|---|---|
| | Air Quality, and Greenhouse Gas Reduction | "Urban heat island" effect management |
| | Materials, Resources, and Solid Waste | Green building materials |
| | | Waste reduction, reuse and recycling (during construction and during operation) |
| | Site Development, Disturbance, Natural Corridors and Greenways | Light pollution management |
| | | Cycling, and walkability |
| **SOCIAL** | Social Sustainability | Light pollution management |
| | | Vehicle trip generation, access to public transit |
| | | Diversity of use and availability of community services and public amenities |
| | | Cycling, and walkability |
| | Food Production and Community Gardening | "Urban heat island" effect management |
| | | Diversity of use and availability of community services and public amenities |

# 3.0 SUBJECT LANDS

## 3.1 Description

The subject lands, approximately 86.56 hectares (213.89 acres) in area are located within the lands bounded by Twenty Road to the north, Upper James to the east, Dickenson Road West to the south, and Glancaster Road to the west (Figure 2 & 3). The plan has been prepared comprehensively to address the holdings of non-participating landowners to ensure the development of a fully integrated and functional community. The imposition of contemporary cost sharing policies at the time of secondary plan approval will ensure that the development of the community will be delivered in an equitable financial manner to both the City and the landowners.

The Subject Lands for the East and Central UBE area are legally described as Part of Lots 2 and 3, 4 – Concession 2, geographic Township of Glanford. The West UBE area is legally described as Part of Lot 117 and all of Lots 118, 119, 120, 121, 122, 123 and 160 and all of lots A, B, C, D, E, F and G of Lot `60. The lands are all located in the southwest precinct of the City of Hamilton (formerly Glanbrook). Due to the Growth Plan allowing the consideration of Urban Boundary Expansion applications for lands no greater than 40 ha, three applications have been prepared to expand the urban boundary for the white-belt areas. The three areas are as follows:

### East

The ‘East’ portion of the subject lands are municipally address as 9285, 9445 and 9511 Twenty Road West. These lands are located generally southeast of the Garth Street and Twenty Road West intersection. The subject lands are approximately 630 metres in width and approximately 330 metres of depth. The subject lands have an approximate area of 26.61 hectares (65.75 acres).

### Central

The ‘Central’ portion of the subject lands are municipally addressed as 9625 and 9751 Twenty Road West. These subject lands are located generally southwest of the Garth Street and Twenty Road West intersection. The subject lands are approximately 580 metres in width and approximately 650 metres of depth. The subject lands have an approximate area of 32.57 hectares (80.5 acres).

### West

The ‘West’ portion of the subject lands are municipally addressed as 555 Glancaster Road. These lands are located generally southeast of the Garth Street and Twenty Road West intersection. The subject lands are approximately 450 metres in width and approximately 650 metres of depth. The subject lands have an approximate area of 27.38 hectares (67.66 acres). The west portion of the subject lands contain an abandoned golf course

Surrounding land uses and features to the subject lands include lands which are largely characterized by actively farmed agricultural fields with 3 woodlots, 3 wetlands and 4 ponds of varying size.

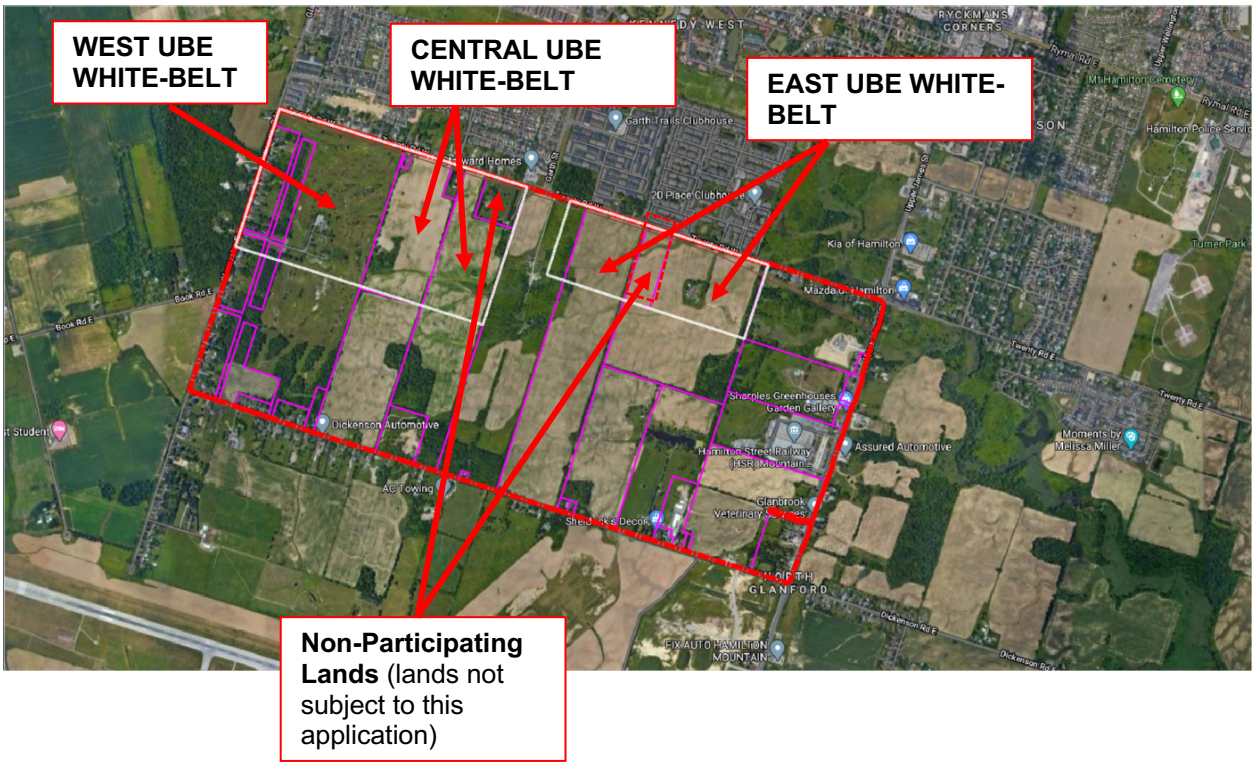
## Surrounding Land Uses

These and much of the surrounding lands have historically been used for the purposes of agriculture and farming. Today, much of the land is currently used for sod farming, landscaping and other cash crops. The subject lands are also located immediately south of an existing residential community. The surrounding land uses are as follows:

| | |
|---|---|
| North: | To the immediate north of the subject lands is a Hydro Corridor and Twenty Road West. The lands beyond are residential uses which include primarily single detached and townhouse dwellings. |
| East: | To the east of the subject lands is Upper James Street. The lands to the east are largely used for residential, agricultural and some commercial purposes. |
| South: | To the immediate south of the subject lands is Dickenson Road West. The lands beyond that include the John C Munroe International Airport as well agricultural, employment and residential uses. |
| West: | To the west of the subject lands include Glancaster Road. Beyond that, the lands to the west are used for agricultural and residential purposes. |

## Figure 2: Context Map


## Figure 3: Location Map



# 4.0 PLANNING POLICY

## 4.1 Rural Hamilton Urban Official Plan

The Rural Hamilton Official Plan (RHOP) came into effect in March 2012. The RHOP is the first planning document for the amalgamated communities of Ancaster, Dundas, Flamborough, Glanbrook, Hamilton and Stoney Creek. According to Schedule D – Rural Land Use Designations, the subject lands are designated as Rural. Within this designation the subject lands are permitted with agricultural permitted uses, resource-based rural uses and institutional uses. A single-family residential dwelling is permitted but not multiples dwellings. The proposed UBE is requesting the subject lands be brought into the urban boundary for the purposes of future residential uses.

## 4.2 Urban Hamilton Official Plan

The Urban Hamilton Official Plan (UHOP) came into effect in August 2013 (except for policies, schedules, maps and appendices still under appeal by the OMB/LPAT). Like the RHOP, the UHOP is the first planning document for the amalgamated communities of Ancaster, Dundas, Flamborough, Glanbrook, Hamilton and Stoney Creek, for the urban area. It also applies over-arching policy found in documents such as *Vision 2020* and the *City's Strategic Plan* (2008) to help advance the City. The UHOP is developed to regulate the use of land including the promotion and maintenance of employment within the City. From this policy direction, the AEGD Secondary Plan was established.

Although the subject lands are not subject to the UHOP, it is the intent of this application that the subject lands be brought into the Urban Boundary for the purpose of residential uses.

## 4.3 Airport Employment Growth District Secondary Plan

As discussed above, although the subject lands are not located within the limits of the AEGD, applicable policies have been applied to ensure conformance between the areas. The AEGD Secondary Plan is one of the primary locations for employment uses in the City and is located in close proximity to the John. C Munro International Airport. The AEGD Secondary Plan provides further direction on employment in this area, further refined from the UHOP, while still maintaining the intent of the UHOP. A secondary function of the AEGD is to facilitate development opportunities which will ultimately aid in the movement of goods.

The AEGD Secondary Plan has been designed to encourage airport related employment uses including industries such as manufacturing, warehousing, knowledge-based jobs and innovation. The AEGD includes several over-arching principles which guide the development of employment opportunities (Section 8.2.7):

a) Provide phasing which guarantees an appropriate supply of land for a diverse range of business;
b) Provide a portion of the AEGD devoted to airport related uses;
c) Provide phased infrastructure and services that cater to a range of employers including innovative, knowledge-based companies;
d) Meet provincial density targets
e) Encourage that future trends in work habits are accounted for (e.g. job sharing, telework, shared workspaces, etc.);

f) Balance high intensity land use with green/ park setting;
g) Develop the employment lands in a manner consistent with municipal and provincial planning policy;
h) Permit a variety of lot sizes and building styles to allow for different types of businesses and for evolution of business needs;
i) Create a prosperous and prestigious employment centre which contributes wealth to the entire region;
j) Leverage the innovative nature of the employment lands to attract progressive and clean industries;
k) Emphasize airport related employment lands to attract progressive and clean industries;
l) Support academic and trades education related to employment in the AEGD.

In accordance with the enclosed Urban Boundary Expansion plan, the subject lands are located immediately adjacent to a site-specific policy which envisions increased commercial and retail opportunities. It is conceived in the AEGD Secondary Plan that this area will act as a gateway into the block and the future employment lands.

The proposed UBE areas will be designed to support such uses and act as land use buffer from the future employment and which can conform to the energy and environmental principles. Further reference to how the proposed expansion area is equipped to respond to the AEGD Secondary Plan principles, can be found in the EIDG checklist, provided in Appendix A.

# 5.0 HAMILTON'S CLIMATE EMERGENCY

Previously, environmental organizations such as Environment Hamilton presented information to the City of Hamilton Mayor and members of the Board of Health regarding Climate Change and the importance of declaring a climate emergency. This is an increasing approach applied by other municipalities to address the pressing issue of climate change. With Hamilton having declared an environmental emergency, this allows all departments to review policies with a climate change lens. This declaration is also considered a symbolic gesture where the City will have additional cooperation among City members and resources to reduce greenhouse gas emissions (GHG) that contribute to climate change. This emergency status will provide the City with the political and financial leverage to increase the City's existing Climate Change plans and initiatives. These plans and initiatives are described below.

## 5.1 Corporate Air Quality & Climate Change Action Plan

The Air Quality and Climate Change Action Plan represents Phase I of the City's plan to address Climate Change. The action plan was released in 2006. This plan outlines the connection between air quality and climate change. Within the action plan, the City has set out steps to address key air pollutants and to reduce GHG emissions. These five action steps are:

1. Research that Informs Policies and Strategies;
2. Response, Engagement & Communication;
3. Adaptation to Smog & Climate Change;
4. Reducing Emissions, Key Pollutants & Greenhouse Gases; and,
5. Delivering Air Quality and Climate Change Programs.

The City addresses these steps as separate programs and policies and are to be addressed by multiple departments. Each category is linked to the other as is climate change to the three pillars.

## 5.2 Corporate Air Quality and Climate Change Strategic Plan

The Air Quality and Climate Change Strategic Plan represents Phase II of the plan and was introduced in 2008. The objectives within this strategy fall in line with the Kyoto Protocol. The goals of this strategy are to reduce to GHG emissions with a "10% reduction of 2005 levels by 2012, followed by a 20% reduction by 2020" (Corporate Air Quality, Phase II, 2008). In this phase, the City also started to take more detailed assessments and inventory of GHG emissions.

## 5.3 Community Climate Change Action Plan

This community program aims to teach Hamiltonians about Climate Change and provide outreach to individuals and organizations to encourage behavioral changes that will ultimately reduce GHG. An interactive website is available to help facilitate community outreach. Tools such as carbon calculators are available to increase public awareness of individual actions and the impact on the environment.

## 5.4 Hamiltonians and Climate Change

Hamilton's Conservation Authority, an environmental management agency, along with other conservation authorities and the City of Hamilton, supports any policies and actions towards mitigating and adapting to Climate Change. The Hamilton Conservation Authority adopted a Climate Change Strategy in 2012. The following principles have been developed for Hamilton's Conservation Authority to follow and guide direction in respect to reducing the effects of Climate Change. These principles are:

- Where possible, climate change actions will address both mitigation and adaptation.
- Collaboration with partners (government agencies, municipalities, academia, the business and agricultural communities, NGOs and the public) will be central to actions on climate change mitigation and adaption.
- Priority will be placed on integrating climate change mitigation and adaptation into core activities.
- Priority will be placed on "no regrets" actions that will improve the resiliency of systems, whatever the eventual climate changes
- Information-based decision making will guide actions
- Adaptive management will allow plans and actions to be guided by information obtained over time through environmental monitoring and other means and adapted as circumstances warrant.

Overall, the goal of the Hamilton Conservation Authority is to "increase the resiliency of our watersheds, systems (natural and man-made) and communities to meet the challenge of climate change" (Climate Change Strategy, 2012).

Areas around Hamilton have experienced Climate Change firsthand. For example, severe flooding started to occur on the Red Hill Valley Parkway in 2009 and increased erosion and drought are occurring in Spencer Creek.

In addition, according Hamilton's Conservation Authority and the IIPCC, residential development or everyday living have contributed to GHGs in 2001. The largest contributing factor is driving (51%), followed by space heating (26.7%), then water heating (11%), appliance & lighting (10.6%) and finally space cooling (0.7%). No matter the type of development or activity, GHGs are produced and Climate Change policies need to be implemented. This report has been prepared with to include mitigation strategies to reduce the effects of Climate Change.

# 6.0 ECO-INDUSTRIAL DESIGN GUIDELINE POLICIES

The intent of the Eco-Industrial Design Guideline (EIDG) policies are to generate development that will achieve a minimal negative impact in terms of place, space and the physical built form. To help achieve a more sustainable development, the EIDG framework includes the following nine key principles:

1. Transportation;
2. Energy, Renewables, Air Quality, and Greenhouse Gas Reduction;
3. Water and Wastewater, and Water Conservation/Efficiency;
4. Storm Water Management Guidelines;
5. Materials, Resources, and Solid Waste;
6. Economic Sustainability and Business Synergy;
7. Social Sustainability;
8. Site Development, Disturbance, Natural Corridors and Greenways; and
9. Food Production and Community Gardening.

As per the above criteria, Figure 1 illustrates how the EIDG principles and the Energy and Environmental Assessment criteria guidelines align and can be defined under the three main sustainability pillars.

## 6.1 Combined EIDG Principles

When analyzing the EIDG principles further, many of these principles can be categorized under more than one of the sustainability pillar. For example, Transportation can be placed under both the Economic and Social pillar. This is because a well-designed transportation network can attract or improve jobs and increase economic activity but can also meet the needs of pedestrians by providing cycling and corridor pathways. Also, as more residents utilize public transit, environmental impacts resulting from congestion and emissions from automobiles can be reduced. With more local residents using public transportation and connecting to the rest of Hamilton in the future, congestion on roads can be reduced.

Renewable energy and GHG emissions can also be categorized under the Economic and Environmental pillars. By reducing the amount of energy used with infrastructure, the City can save on costs by generating, transmitting and distributing less power and can even reduce the use of water. Further, by incorporating LEED certification and other measures, energy performance can be measured, resulting in outcomes such as improved light efficiency and a reduction in pollution. In addition, air quality is improved as less emissions are emitted through low-emitting building materials.

The proposed UBE areas have been designed to accommodate and respond to the EIDG principles. Please see Appendix A for further details.

## 6.2 Residential Urban Design Guidelines

As the subject lands are not located within the AEGD Secondary Plan, additional guidelines regarding residential design and sustainability principles must be applied. CLS has reviewed existing Secondary Plans such as the Binbrook Village Community Core Urban Design Guidelines and the Strathcona Urban Design Guidelines as a reference. These design

guidelines have been combined to produce a list of design principles to follow and provide areas where sustainability measures can be implemented. The accumulated list is provided below.

1. Conserve, enhance and provide greening to the character of the neighbourhood(s);
2. Provide a safe and friendly environment for pedestrians by supporting transit oriented development;
3. Encourage mixed use development and intensification through moderately scaled buildings;
4. Provide appropriate transitions into the existing neighbourhoods;
5. Follow sustainable design principles (i.e. swales, LID, LEED development, efficient building materials etc.); and,
6. Protect and enhance naturalized and environmentally sensitive features.

Like the EIDG principles above, the provided residential urban design principles can be categorized under the three sustainability pillars. By conserving and providing greenery along the streetscapes and providing strong pedestrian accesses (i.e. bike lanes, trails and public transit), and including a mixed of uses in development can enhance the social well-being of a community and improve an individual's quality of life. By supporting intensification and appropriate design transitions between communities as well as supporting LEED development and materials can help meet the density needs for the City and Province meeting the economic pillar as communities will have more housing units available and transition development such as commercial added to the community. Further, more environmentally sustainable materials will be promoted and enhanced for future development. By conserving and protecting naturalized features and implementing sustainable design principles, these principles fall under the environmental pillar.

The proposed development achieves these overarching principles in several respects:

1. The proposed UBE areas are supported by an enhanced natural heritage system which returns the function of several headwaters which were previously removed from the landscape. A combination of mitigation strategies including preservation and channelization have been incorporated for the purposes of improving the ecological function of the natural heritage system. These proposed green networks contribute to the neighbourhood by creating locations for active recreational opportunities as well as linkages for wildlife.
2. The proposed UBE areas have been designed with an arterial and collector road network which will support and encourage the safe navigation of the area for pedestrians and cyclists. In accordance with official plan and secondary plan policies, active transportation and transit routes have been incorporated.
3. The proposed UBE will features opportunities for mixed use development by incorporating residential and live/work housing in close proximity to the envisioned mixed use corridor of Garth Street. The proposed UBE areas will also consist of medium density residential forms such as townhouses, stacked townhouses and low-rise apartments.
4. The proposed UBE areas will allow for a transition of uses from the future employment lands of the AEGD to the existing low-density residential uses, north of Twenty Road West. The medium density and mixed-use uses are uses that can complement both the employment and low-density residential uses.
5. The proposed UBE areas have been designed to incorporate numerous LID measures including outlet swales, minor stormwater management systems (swales, ditches,

natural channels). A Dual Drainage Concept has also been proposed to convey overland flows and channel flows in close proximity.

6. The natural heritage system is proposed to be enhanced through the introduction of new headwater channels which will improve riparian conditions as well as function as linkages for species. In addition, improved buffering has been implemented which ensure woodlots and wetlands are appropriate separated from development.

# 7.0 ECONOMIC SUSTAINABILITY

This section examines the economic sustainability of the proposed UBE areas. The economic sustainability is wide ranging and can affect numerous systems. This includes water and waste water and storm management infrastructure, which if properly designed can produce beneficial impacts to Hamilton's economy and can improve energy efficiency city-wide. Please note, transportation can be examined as a component of economic sustainability, however, due to the social aspects of public transit, further discussion is found in the Social Sustainability section.

One way the City of Hamilton has sought to address economic efficiencies through environmental and design requirements is through the Corporate Energy Policy. In 2014, this was provided to manage and incorporate economic sustainability by working towards energy reduction targets. Currently, the City is working towards a 20% energy reduction and emission reduction offset target. In 2030, Hamilton has an energy reduction target of 45% as well as a target of 60% by 2050. Overall, the City would like to achieve at least 80% in energy and emission reduction.

Aside from emissions, water use is another important activity to measure. Hamilton's Water facilities have calculated that up to 34% of the City's energy use is attributed to water operations alone. Also, within the Corporate Energy Policy, water use operations are described as costly and the City has identified the need to cut down costs by simply participating in water conservation. Methods such as equipment upgrades, operational efficiency, and modifications to facility buildings are a great start to reducing energy and costs, however, by implementing energy reduction goals through new development within Hamilton, the ability to further reduce energy costs in the future is key.

The following sections examine the various components of the proposed UBE areas to identify how future proposed development can be economically sustainable and support the EIDG. This section will also focus on ways to conserve water, reduce waste after and during the construction process and how to reduce energy consumption and emissions.

## 7.1 Water Conservation

The Eco-Industrial Design Guidelines for the Airport Employment Growth District include a number of water conservation measures and provide additional guidelines for more enhanced conservation and efficiency. The EIDG require that proposed developments in the subject lands include water consumption reduction strategies related to employee and business operations; including low-water landscaping, water efficient manufacturing processes, and rainwater capture and reuse. The EIDG also require water efficient fixtures, including low-flow toilets, urinals, showers, appliances, and equipment.

Water consumption reduction strategies related to employee and business operations will largely depend on the businesses occupying future development. However, the landowner may include tenancy agreements that promote water conservation and reuse. Any installations related to water use made during the construction of the Upper West Side development ("East Boundary") will be water-efficient. The "East" Boundary area is anticipated to include water efficient fixtures, appliances, and equipment as per the AEDG Stormwater Master Plan (SWMP) and EIDG. Commercially-available low-flow fixtures can reduce potable water consumption in residential buildings by 45% and in commercial buildings by 28% at no additional cost.

Rainwater harvesting for irrigation of landscaped areas will be considered wherever possible as it can be a cost-effective method of meeting the 30mm capture target set by the City of Hamilton. The proponents will also explore programmable irrigation systems outfitted with moisture sensors and network connections. On-site centralized stormwater storage for firefighting water requirements (underground storage) will also be reviewed in future submissions.

To further reduce both potable water consumption and sanitary loads, rainwater and greywater reuse will be considered at the draft plan and site plan stage. The re-use of greywater (gently used potable water) for landscaping irrigation reduces sanitary loads by redirecting water that would otherwise require municipal wastewater treatment into bio-retention landscaping areas. If current standards allow the required flexibility, greywater and rainwater reuse can provide significant reductions to potable water consumption and sewage conveyance across the AEGD. Rainwater reuse has been shown to offset 100% of toilet-flushing water across similar sites.

It is recommended that water reuse and conservation options including but not limited to those listed above be explored for all proposed land uses on all AEGD lands within the project area. In addition to these water reduction measures, the “East Boundary” area will coordinate with adjacent development to develop innovative means of water use, reuse, and discharge.

Through the completion of a Financial Impact Analysis, the proposed UBE areas will result in beneficial annual revenues from the usage of water and wastewater by residents and businesses. Through the anticipated population and employment, the water and wastewater/storm revenue anticipated to be generated is approximately $11.8 million for employment and $7.5 million for residential. These calculations may even be improved through the application of higher efficiency technologies which can both reduce the cost for installation as well as the costs required for maintenance.

## 7.2 Waste reduction, Reuse and Recycling

According to the United Nations Environment Programme, Building and Construction sectors around the world account for 40% of global energy use, 30% of energy-related Green House Gas (GHG) emissions, 12% of water use, and nearly 40% of global waste. With guidance from the City of Hamilton Eco-Industrial Guidelines, the “East” Boundary area will investigate and implement a wide variety of strategies to reduce waste depending on the proposed future development in terms of construction waste management practices.

Moreover, the reduction, reuse, and recycling of construction waste will be pursued throughout all stages of development, from construction staging to material procurement to construction administration and inspection. Waste reduction strategies for the proposed UBE areas are anticipated to adhered to City standards.

## 7.3 Material Procurement

During the design and construction phases of development there are a number of measures that can be taken by construction contractors and engineers to minimize the GHG emissions and construction material waste associated with development. These measures include and are not limited to the following:

- Minimal temporary servicing lines

- Site grading to match existing conditions
- Construction site orientation to minimize earthworks and ESC loading
- Thorough and comprehensive site maintenance plans
- Consideration of green building materials.

Some of the sustainable design and material procurement decisions that can be made by contractors include using of recyclable and recycled erosion control measures, prioritizing suppliers that minimize packaging waste from construction materials, pursuing sustainable material alternatives, and minimizing the number of material deliveries.

Efforts will be made to procure building materials (based on cost) from within an 800 kilometer radius of the subject lands. Additional targets related to the procurement of recycled and sustainable materials will be set including recycled building material, recycled roadway aggregate, and Forest Stewardship Council certified wood-based products.

## 7.4 Construction Administration

Carefully planned and coordinated construction administration can reduce the production of GHGs, air pollutants, and construction material waste while increasing the use of recyclable materials on-site and encouraging the safe re-use of construction materials.

Throughout the construction process, the best management practices related to soil management outlined by the Ontario MOE will be adopted whenever possible. Soil will be considered an important natural resource to be utilized on-site wherever possible. Using forward thinking soil management, the urban expansion area will maximize the utilization of local fill in order to reduce the quantity of imported soil and the associated GHG emissions.

## 7.5 During Operation

The proposed UBE areas will take active measures to minimize waste production and to facilitate easy integration of the subject lands into the existing municipal waste collection system. Optional measures for waste mitigation included in the EIDG include the incorporation of recycling and composting stations in employee areas, site scale waste diversion initiatives, and on-site composting for yard waste.

Consideration should be given to retaining the assistance of third party experts to oversee and manage waste management effort to ensure efficient site operations, thus allowing construction contractors to focus on site development activities. Alternatively, the contract can be written in such a way that the building contractor must be ISO 14001 certified. This system provides a framework for effective waste handling that can help organizations, if not to significantly decrease their amount of waste, to at least handle it properly and realize cost savings on construction sites.

# 8.0 ENVIRONMENTAL SUSTAINABILITY

The City of Hamilton has established goals of trying to reduce GHGs and mitigate climate change by preserving natural open green spaces and understanding the sources of GHG's. The City has identified GHG sources that are found within Hamilton, including (City of Hamilton):

- *Burning of fossil fuels such as oil, coal and natural gas in energy and consumption; for heating and cooling, lighting and powering electronics; and transportation*
- *Transportation – from cars and trucks, transport trucks and airplanes*
- *Industrial process and manufacturing*
- *Waste Management*
- *Agricultural management and processes.*

In response to these and other GHG sources, the City has prepared *5 steps of action* as a means to reduce GHGs and improve Hamilton's over all air quality. These steps include (City of Hamilton):

1. *Create a greenhouse gas emissions inventory*
2. *Set a greenhouse gas emissions reduction target*
3. *Develop an action plan*
4. *Carry out the action plan*
5. *Monitor progress and report results*

As industrial sectors and residential homes are potential GHG sources, environmental standards are needed to ensure their operations are incompliance with the *5 Steps of Action*. As the proposed UBE areas is to contain a mixture of uses (not yet confirmed) these measures are required. Much of this direction is identified in the AEGD Secondary Plan and the EIDG, which work to ensure the industrial and residential uses include environmental sustainability strategies. It is through this that Hamilton will meet its GHG targets in the future.

The following section outlines the various environmental design elements to be incorporated within the proposed UBE areas such as energy efficient building designs, green building materials and light pollution management. Other areas discussed with include stormwater management, LID planning materials and strategies and how to minimize the effects of 'urban heat island'.

## 8.1 Environmental Urban Design

The AEGD and the EIDG references a set of measures that should be considered when addressing energy efficiency and conservation as it applies to building design and construction. These include considerations for the following:

- Set energy efficiency targets;
- Utilize products that are rated by Energuide for Industry and Energy Star;
- Utilize efficient lighting (LED) and usage programs;
- Consider alternative energy sources (solar);
- Utilize high efficiency HVAC equipment;
- Encourage the adoption of LEED certification or other green building certification.

Notwithstanding the measures and guidelines stipulated in the above referenced document and related certification targets, building design and construction for the Glanbrook Industrial Park lands shall consider a comprehensive strategy with respect to design, materials and lighting applications, including some of the following:

A. Energy Efficient Building Design

- Provide a thorough assessment of the natural surroundings to determine the ideal building orientation that will help achieve cool daylighting throughout the workspaces while reducing the heating and cooling load (passive solar);
- Integrate daylighting design concepts for the configuration of office spaces, such as locating open plan office workstations next to windows to maximize daylight harvesting;
- Understand schedules for occupancy, building use and utility rates to achieve a program that maximizes efficiencies;
- Advanced technologies and practices should be considered with the building process, including renewable energy systems such as photovoltaic systems that replace conventional building materials to generate electricity, solar thermal systems to supplement domestic hot water supply or geothermal heat pump systems to improve HVAC efficiency;
- Shading screens, eaves and overhangs shall be considered to reduce heat absorption through windows;
- Consideration shall be given to integrating a system for collecting and treating grey water (storage cisterns) for use in irrigation and cleaning/maintenance requirements.

B. Green Building Materials

- The use of local materials is encouraged to reduce the distance by which materials are transported from its origins to the construction site;
- Recycled materials should be encouraged throughout the construction process, reducing the demand for new materials and increasing the market for recycling;
- Where lumber materials are used in construction, consider sustainably harvested wood that has been certified by an accredited organization such as the Forest Stewardship Council (FSC);
- Low-e glass and related energy efficient materials (Energy Star certified windows) and installation methods shall be specified;
- Consider bird friendly glazing with an appropriate density pattern spacing or muted reflection to prevent potentially fatal collisions with windows;
- Green roof technologies or reflective, light coloured roofs may be considered for employment, office and institutional buildings in order to reduce solar heat absorption and building energy demand;
- Green roofs are also effective in providing stormwater absorption and quality, reducing urban heat island effects, creating amenity spaces for employee use and enhancing roof aesthetics;
- Utilize roofing materials that are comprised of a relatively high percentage of recycled content;

- Where applicable, consider efficient wall materials such as Insulated Concrete Forms (ICF) that will contribute to the efficiency of the building;
- Consider drywall materials that are comprised of a higher percentage of recycled content;
- Consider material sources that use energy efficient methods and more sustainable energy sources in the manufacturing process;
- Integrate various interior design initiatives including painting interior walls light colours, selecting highly reflective ceiling materials and selecting floor finishes that are not dark to maximize the impact of interior lighting and daylighting.

C. Light Pollution Management

- A balance between safety and security and a reduction in energy consumption shall be achieved;
- Energy efficient luminaires and bulbs (LED) should be utilized to satisfy lighting requirements;
- Lighting poles, luminaires and light levels shall be selected that are appropriate to the site and function to avoid excessive illumination and light pollution;
- Specify Dark Sky compliant fixtures that shield the light source to minimize glare and light trespass and to facilitate better vision at night;
- Ensure there is no light encroachment into natural areas to avoid impacts on wildlife;
- Avoid unnecessary up-lighting from exterior light fixtures onto building facades;
- Opportunities should be considered for renewable energy use, such as solar powered lighting along park paths and natural trails.

In each of the following sections: Energy Efficient Building Design, Green Building Materials and Light Pollution Management, a design form of environmental sustainability with be achieved through the physical built form and will also create an overall aesthetic appearance for employers and the community.

## 8.2 On-Site Stormwater Management

The AEGD SWMP and the EIDG require developments to utilize a suite of LID source and conveyance controls in combination with end-of-pipe dry-ponds as part of a treatment train approach. LID BMP source controls provide treatment of runoff where it falls, allowing rain water to be utilized as a resource instead of processed as waste. LID BMPs are the industry best practice for providing on-site infiltration and source control and will be essential to meeting predevelopment water balance/flow management criteria related to flood control, erosion control, quality control, infiltration, and natural features protection.

LID BMPs provide water quality improvements through a variety of mechanisms. Each LID BMP can be custom designed to provide treatment for specific water quality control parameters and criteria. While each LID BMP may not be able to provide Level 1 Enhanced quality control for the drainage directed towards it, the final water quality of the site discharge can be improved by incorporating the LID BMPs into a treatment train. In traditional stormwater management systems, water is collected and conveyed using a number of features such as gutters, curbs, catch-basins, storm sewers, oil-grit separators, or ponds. In these systems, only the end-of-

pipe SWM components (oil-grit separators, ponds, etc.) provide quality improvements to the site discharge. In an LID BMP treatment train, each component that collects and conveys drainage to the final outlet provides some quality control benefits. In an LID BMP treatment train, the water quality improvements from one LID BMP are compounded by the treatment provided by the next LID BMP in the train by conveying discharge from a source collection feature (i.e. rain barrels, permeable pavement, green roofs) directly into a conveyance feature (i.e. bio-retention, vegetated swales, infiltration trenches) and possibly into a third LID BMP feature or end-of-pipe control (i.e. dry pond, constructed wetland, wet pond, etc.). Development in the AEGD will be required to use dry ponds as end-of-pipe controls to meet the flood control design criteria and may require 250m of stream restoration/outlet modification at each dry pond location.

Further urban design guidelines for the AEGD have road surface for swales and LID bioretention/ infiltration features. The roads will be graded to ensure positive drainage of minor flows to the swales/LID features and positive drainage of major system flows towards the SWM facilities/dry ponds. In general, the major system drainage can be directed overland to the SWM ponds via roadways and swales with the exception of Street A (the Garth Street extension). This road is considered an urban arterial road/emergency route and the depth of major overland flows may not exceed the elevation of the crown of the Road (Section 2.2.1 of the City's document 'Criteria and Guidelines for Stormwater Infrastructure Design' (September 2007).

The proposed stormwater drainage system for the Upper West Side lands incorporate an innovative dual drainage concept (minor and major systems) as recommended in the AEGD SWMP. This involves two distinct storm drainage subsystems:

- the design of a minor system (LID conveyance controls) and
- a major system (overland flow routes, stormwater management dry-ponds, etc.)

## 8.3 Residential On-Site Stormwater Management

The minor system proposed within the East UBE lands will consist of Low Impact Development (LID) conveyance systems designed to remove excess surface runoff from lot level source controls and road right of ways (ROWs) that are produced by more frequent storms, and deliver it to end-of pipe facilities. This will take the form of LID swales within the edges of ROWs that are designed to accommodate flow from the 1:5 year storm without surcharging in accordance with the City's standards and IDF parameters.

The major system proposed within the East UBE lands will consist of the overland flow route in which the runoff flow in excess of the capacity of the minor system/LID swales will be conveyed. The major system is largely portions of roadways but can also include features such swales, ditches, natural channels, drainage easements and end-of-pipe stormwater management facilities.

The subject lands will be graded in such a way to ensure the minor and major systems have adequate conveyance capacity and discharge to a free outlet. It should be noted that major overland flows cannot exceed 0 mm depth above crown of the road for Arterial and Emergency Routes, nor can major overland flows cross an arterial road (i.e. must be captured and conveyed either through a culvert or storm sewer to an approved outlet location) in accordance with City policies.

The Dual Drainage Concept (Minor and Major Systems) approach is consistent with the City of

Hamilton Criteria and Guidelines for Stormwater Infrastructure Design, (Philips Engineering, 2007).

## 8.4 Quality Control

The stormwater management criteria listed in the Airport Employment Growth District (AEGD) Subwatershed Study and Stormwater Master Plan (SWMP) states that all lands in the AEGD require Enhanced Level 1 MOECC quality control. The AEDG SWMP also states that a minimum of 10mm of rainfall must be infiltrated on-site for water quality control and that it is expected that the "best achievable" infiltration volume should be pursued using any available LID BMPs.

While the subject lands are not located within the AEGD, the MOECC's updated LID Stormwater Management Guidance Manual targets have been applied. These targets are expected to require capture and control of the 90th percentile event (28mm to 29mm) along with Level 1 Enhanced quality control.

Regardless of existing soil infiltration rates, efforts will be made to incorporate infiltration throughout the subject lands with the aim of meeting the pending MOECC Low Impact Development RVCt standard of controlling the 90$^{th}$ percentile event, which is estimated to be from 28mm to 29mm.

The Quality Control targets listed in the 2017 SWMP Implementation Plan are included below (see Figure 4).

The proposed UBE area will prioritize well-distributed source controls in order to provide treatment of rainfall wherever it lands. LID BMP source controls will be allocated as site conditions allow. The following suite of LID source control measures from the AEGD SWMP will be evaluated for site feasibility.

- Rainwater Harvesting
- Green Rooftops
- Downspout Disconnection
- Soakaway Pits
- Bioretention and Special Bioretention
- Soil Compost Amendments
- Tree Clusters
- Filter Strips
- Permeable Pavement

LID BMP conveyance features, such as bio-filters, bio-retention swales, grassed channels, and subsurface perforated pipe systems, will provide quality and infiltration improvements to runoff across the site before it is discharged into the proposed end-of-pipe facilities. LID BMP conveyance features will be designed to function as the minor system for the AEGD wherever possible.

**Figure 4: SWMP Implementation Plan – Surface Water Quality**

| Category | Generalized Control Target | AEGD Minimum Targets | Amendments and/or Pending Amendments since 2011 |
|---|---|---|---|
| Surface Water Quality | Control pollutant loadings in accordance with current MOE guidelines. Enhanced level 1 protection as defined in the 2003 Stormwater Management Planning & Design manual – reduce the average long term annual load of suspended sediment by 80% or better | Current MOE requirement for end-of pipe infiltration@ 70% TIMP =3.5mm<br><br>Minimum water quality target for the AEGD is the infiltration of 10mm for water quality.<br><br>It is expected the practitioners will strive for a "best achievable" results which include LID practices that utilize filtration, evaporation, transpiration and retention in order to control greater than 10mm target | • Low Impact Development Stormwater Management Guidance Manual (Pending 2017) will superseded the 2011 Plan. Minimum on-site volume control targets will be required. 90th percentile event which, will achieve Level 1 control, is anticipated to range from 28mm to 29mm and will superseded the minimum water quality target.<br><br>• Stormwater Source Control Policy for Industrial, Commercial and Instructional (ICI) Land Uses (February, 2014) – See **Section 2.9.4** |

## 8.5 Erosion Control

Development must comply with the generalized control targets from the MOECC . The MOECC erosion control criteria include capture of the 25mm event and release over a 24-hour period. Alternatively, the MOECC allows for controlling the frequency and duration of site outflows such that the in-stream index of erosion potential is not increased.

The AEGD Minimum Erosion Control targets can be referenced due to their proximity but which consider how hydromodification, or modifications to natural channel hydraulics and watershed hydrology, can lead to watercourse destabilization and aquatic habitat destruction. To minimize hydromodification, the AEGD SWMP requires matching pre-development water balance under post-development conditions. This requires the same rates of runoff, infiltration, and evapotranspiration under post-development conditions as there are under existing conditions. Wherever this is not possible, the AEGD SWMP states that erosion control must be integrated into the end-of-pipe facility.

Pre-development water balances for all sub-catchments in the AEGD study area have already been established. The pre-development infiltration rates provide the capture targets for the LID BMP systems used under post-development conditions within each AEGD subwatershed.

Evapo-transpiration rates will be met by incorporating enhanced tree pits and bio-retention into the ROW swales and site plan areas in addition to tree clusters as part of general site landscaping requirements. If feasible, green roofs should be considered in order to further increase post-development evapotranspiration and reduce building HVAC costs. The LID

Facility Control Targets for infiltration included in the AEGD SWMP state the required post-development infiltration volume for different land use areas within the site area.

The Erosion Control targets listed in the 2017 SWMP Implementation Plan are included below (see Figure 5).

**Figure 5: SWMP Implementation Plan – Watercourse Erosion Control**

| Category | Generalized Control Target | AEGD Minimum Targets | Amendments and/or Pending Amendments since 2011 |
|---|---|---|---|
| Watercourse Erosion Control | 1. In accordance with current MOE guidelines: capture the Runoff volume generated by a 25mm event, and release it to the outlet over 24 hrs<br>Or<br>2. Control the frequency and duration of site outflows such that in-stream index of erosion potential (e.g. multi-year erosive impulse) is not increased. | Match pre-development water balance (See AEGD Subwatershed and Stormwater Master Plan- Sections 4.1.5.2 – 4.1.5.4)<br><br>Where matching pre-development water balance is not possible, integrate erosion control within end-of-pipe facility. | • Low Impact Development Stormwater Management Guidance Manual (Pending 2017) is anticipated support the 2011 Plan. Minimum on-site volume control targets will be required as will a requirement for the maintenance of the pre-development water balance.<br>• Stormwater Source Control Policy for Industrial, Commercial and Instructional (ICI) Land Uses (February, 2014) – See **Section 2.9.4**. |
| • Proponent to contact the respective Conservation Authority for watercourse specific guidance and to confirm the need to complete an erosion analysis to determine if any proposed infrastructure will impact erosion within and downstream of the study area. It should be noted that this hazard information may affect development setbacks beyond the 15m-30m natural heritage/fisheries buffers as detailed within this report. | | | |

## 8.6 Stormwater Management Planning

The UBE areas will protect and, where necessary, enhance stream corridors through the application of stream buffer requirements listed in the Sub-watershed Master Plan, riparian plantings to achieve cover requirements, and stream/outlet modification at each dry pond location. At the detailed design stage, a maintenance program for stormwater management features will be included.

Further, the internal road design will adhere to the City of Hamilton concepts presented in the AEGD Stormwater Master Plan and Urban Design Guidelines. Given the unique and progressive stormwater management and LID concepts presented for the ROW areas, these alterative standards will need to be discussed with City staff. The proposed ROW widths are noted on the submitted Draft Plan. The proposed layout of the collector roads generally conforms to the road layout concepts presented in the AEGD Transportation Master Plan with some minor differences. The road layout will be refined through the completion of the Integrated EA, future submissions and in consultation with the City of Hamilton and the consultant team. The proposed ROW will enhance the streetscape of residential subdivisions and provide sustainable solutions to SWM regarding registered lots.

## 8.7 LID Planning

The 2017 Aquafor Beech Implementation Plan cites LID facility capture targets for specific land uses and hydrologic soil types. These targets represent the infiltration volume that LIDs in specific areas should be able to capture given the underlying soil conditions and an assumed percentage of imperviousness. These targets are listed below (see Figure 6).

**Figure 6: Capture Targets – Land Use and Hydrologic Soil Types**

| Scenario | LID Facility Design Capture Target | | Assumed % Imp. |
|---|---|---|---|
| | (mm) | (m3/ha) | |
| Road over AB Soils | 9 | 90 | 70 |
| Road over BC Soils | 8 | 80 | 70 |
| Road over BC Soils | 7 | 70 | 70 |
| Prestige Business Park/Airport Related Businesses (AB Soils) | 10 | 100 | 70 |
| Prestige Business Park/Airport Related Businesses (BC Soils) | 8 | 80 | 70 |
| Prestige Business Park/Airport Related Businesses (CD Soils) | 6 | 60 | 70 |
| Airside Industrial/Light Industrial (AB Soils) | 13 | 130 | 80 |
| Airside Industrial/Light Industrial (BC Soils) | 11 | 110 | 80 |
| Airside Industrial/Light Industrial (CD Soils) | 8 | 80 | 80 |

These criteria only take into account the runoff generated from rainfall on that particular land use area and not runoff that is directed overland into the ROW from site plan areas. The Implementation Plan LID Facility Design Capture Targets for the AEGD are unique for different land uses. Drainage from site plan areas will need to meet quality control and infiltration targets prior to discharging onto the ROW. Site plan drainage that is directed onto the proposed ROW will only consist of major system drainage that does not require quality control or infiltration.

Moreover, the existing drainage systems along Twenty Road West, Upper James Street and Dickenson Road West provide outlets for the future Upper West Side SWM facilities and corresponding catchment areas. While diversion of flows is proposed for the north portion of the site (to T-29/Pond 8), the minor headwater reaches along the Upper West Side will be maintained

to continue to provide surface conveyance and riparian rights (although with reduced contributing drainage areas) to the adjacent landowners. With the development of the East UBE lands, the majority of drainage to the outlets and watercourse/wetland features can generally be maintained similar to existing conditions.

## 8.8 Right-Of-Way LID BMP Planning

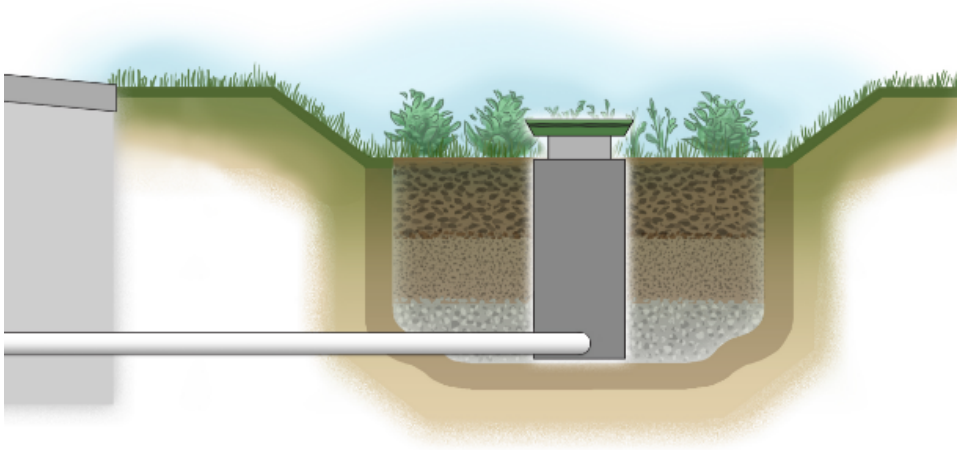
Preliminary road cross-sections are provided in the AEGD Stormwater Master Plan and were designed in accordance with the EIDG and the City of Hamilton Innovative Stormwater Source Control Policy. These cross-sections include the following:

- a 45.72m ROW for a 6-lane arterial road
- a 33m ROW for a 4-lane collector road and
- a 26m ROW for a 2-lane collector road.

Each of these cross-sections includes two 3m swales on either side of the roadway to accommodate guidelines from the EIDG and the City of Hamilton Innovative Stormwater Source Control Policy stating that developments within the AEGD should prioritize minor and major system conveyance using LID BMPs and surface conveyance only (i.e. no storm sewers).

For most of the ROW sections in the proposed expansion area, the 3-meter LID BMP swales allocated on either side of the roadway will provide sufficient conveyance for minor and major system flows. The only area that will require additional measures for meeting major system conveyance requirements is the ‘downstream’ end of Street B. The swales in this ROW section will be underlain by perforated pipes. Drainage from the ROW swales will be directed into the perforated pipes using swale overflow devices such as the Swale Gard Bioretention Overflow Filter shown schematically below (see Figure 7).

**Figure 7: Swale Gard Bioretention Overflow Filter**



More detailed site-wide infiltration data will be needed in future submissions to refine the infiltration rates for specific segments of the proposed right-of-way’s, however preliminary results show that incorporating intermittent bioretention facilities into the ROW swales will

provide sufficient quality control, and infiltration for a majority of the site. The remainder of the site will receive additional quality control and infiltration through the use of infiltration galleries and bio-retention facilities among other LID BMPs. Efforts will be made to locate infiltration LID BMPs on any pockets of higher permeability soil found throughout the site.

An example of the LID BMP conveyance swales described in this section is shown below (see Figure 8).

**Figure 8: LID BMP Conveyance Swale**

## 8.9 LID Planning for Site Plan Areas

LID BMPs for the site plan areas were screened for potential feasibility based on the proposed land uses, site design, grading, and budgetary constraints. Drainage from each block will receive as much quality treatment as possible from LID BMPs within the block before being discharged into the rights-of-way. The following categories of LID BMPs will be considered for the UBE areas.

- Rainwater Harvesting
- Green Roofs
- Downspout Disconnection
- Soakaway Pits
- Bioretention and Special Bioretention
- Soil Compost Amendments
- Tree Clusters
- Filter Strips

- Permeable Pavement

Each of these categories represents a range of possible technologies that fits a particular purpose. Bio-Retention facilities collect drainage in depressions and use vegetation to filter out particulates and hydrocarbons before discharging the drainage into the storm sewer system or to another LID BMP. Bio-Swales also provide vegetative filtration by conveying drainage through swales constructed from an engineered vegetative media. Permeable pavements attenuate peak runoff flows by absorbing and infiltrating surface runoff from the overlying and surrounding areas. Green Roofs can consist of a variety of vegetative options that can provide benefits including stormwater controls, heat dissipation, and air quality improvements.

Aside from Green Roofs, each LID BMP is heavily dependent on detailed site grading, which dictates how much drainage is directed to the LID BMP. Different LID BMP categories have specific ratios of LID BMP footprint to contributing drainage area that the LID BMPs can provide full treatment for. In order to optimize the effectiveness of the LID BMPs allocated for the site, each block will have to be graded such that the correct amount of site drainage reaches each LID BMP feature. While preliminary grades have been produced, this finer level of detail will be achieved at the detailed design stage. Care will be taken during detailed design to orient the LID BMPs such that major overland flows will bypass the LID BMP in order to mitigate erosion of the feature.

## 8.10 LID BMPs for Quality Control

Two LID BMP systems are proposed to control the flows from rooftop areas within the site. Smaller rooftop flows may be directed to rain barrels through gutter systems. Rooftop drainage from larger buildings may be directed through internal conveyance systems to cisterns incorporated into the building foundations. Drainage collected by these LID BMPs may be re-used for irrigation purposes. Proposed rainwater harvesting LID BMPs will ensure that rooftop flows, which do not need quality control, are not directed onto roadways where they would require treatment. The retention of rooftop drainage reduces the contributing drainage area to the LID BMPs that provide quality control to the site areas and the right-of-way areas.

## 8.11 Grey Water Re-use

Grey water re-use refers to a variety of stormwater management systems that send gently used water from kitchens, bathroom sinks, laundry machines and showers into landscaped areas designed to infiltrate the grey water and provide significant quality improvements to the resulting site runoff. Grey water re-use can significantly reduce a community's impact on municipal water and wastewater infrastructure. Grey water re-use reduces a community's water consumption by reducing the need for landscaping irrigation and reduces the volume of wastewater sent to municipal wastewater treatment facilities. Re-using grey water can be a significant step towards achieving LEED certification.

Grey water systems are best utilized in conjunction with Bioretention LID BMPs. Bioretention areas can be custom designed to provide treatment for a variety of household and municipal pollutants. The EIDG requires drought-resistant landscaping for at least 50% of publicly landscaped areas to minimize irrigation needs and require developments to reduce potable water consumption for irrigation by 50% over conventional means. It is recommended that Grey Water reuse options be explored for all proposed land uses on all AEGD lands within the project area.

## 8.12 "Urban heat island" effect management

The Urban Heat Island effect refers to measured temperature increases in urban areas above the surrounding ex-urban area. These temperature increases are measured anywhere that has high concentrations of thermally absorptive materials such as concrete, asphalt, and steel. These materials retain thermal energy that radiates and/or dissipates into the surrounding air leading to higher measured temperatures in urban areas that are associated with increased mortality across urban areas.

The Urban Heat Island effect can be mitigated by reducing the concentration of thermally absorptive material in urban areas and by urban design that promotes the propagation of prevailing winds. Urban Heat Island effect management should be managed in collaboration with the urban stormwater management LID BMP systems that break up thermally absorptive areas and provide pathways for air circulation. Green roofs are one LID BMP that can provide significant reductions in the accumulation of rooftop thermal energy. This can reduce the air conditioning needs of the building and the temperature of the surrounding air.

The absorption of heat in urban areas can also be reduced through the application of thermally reflective coatings and lighter colored paints. The AEGD Urban Design Guidelines highlight several options to minimizing the impacts of heat island effect through Guideline 07 of the Built Form Guidelines:

*Guideline 07: Vegetated Surfaces*
*Building design should reduce the heat island effect. Facilities should implement green roofs, planted walls and terraces to reinforce the visual connection to the surrounding landscape, provide habitat for wildlife and encourage storm water run-off diversion and capture for irrigation.*

The referenced measures are recommended for all portions of the subject lands within the project area and early and frequent collaboration and consultation between engineers, planners, architects and landscape architects is recommended to ensure successful design and implementation.

## 8.13 On-Site renewable energy generation

The most common form of renewable energy generation are the well-known solar photovoltaic panels seen on rooftops and in large rural arrays. Solar photovoltaic panels are an excellent source of reliable and affordable on-site power that does not suffer from the power loss associated with long-distance transmission lines. The Ontario Power Authority's FIT (Feed-In Tariff) and MicroFIT programs allow solar systems to be connected to municipal electrical systems and provide compensation for any power that a system contributes to the municipal grid.

While solar photovoltaic panels are the most common form of solar power generation in Ontario they are not the only form of thermal power generation. Solar assisted heat pumps use a thermal solar panel to transfer heat to the evaporator of a heat pump, increasing the COP of the heat pump in order to generate power more efficiently. While solar photovoltaic systems are more common than solar assisted heat pumps, the cost of these systems on a $/kWh basis is comparable.

Solar thermal panels can also be used in conjunction with district power systems by providing energy to the district power system media. In order to reduce energy needs with the AEDG, the EIDG states that building orientation should be designed to take advantage of passive solar heating, natural lighting, ventilation and shading. The EIDG also states that 10% of building energy needs should be sourced by renewable sources of power and that 50% of energy needs should be provided by grid-sourced renewable energy. It is recommended that onsite renewable energy generation be explored for all proposed land uses on all AEGD lands within the project area.

The proposed development will look to incorporate design strategies which allow future buildings to be easily converted to incorporate renewable energy sources. It is the intention of the proposed development to allow buildings to be renewable energy ready.

## 8.14 Natural Corridors and Greenways

In addition, preserving and enhancing natural heritage systems is key to help achieve environmental sustainability. The UBE areas has identified numerous natural heritage features that will be enhanced. The natural heritage systems will incorporate vegetative protection zones which provide for improved setbacks from wetlands and woodlots. As well, the proposed development seeks to achieve a natural landscape that will introduce native species to the environment and will minimize the need to alter or remove any natural features. Likewise, the UBE area has been designed to feature natural walkways and a path system for pedestrians in close proximity to proposed headwater channel. It is believed that through these endeavors, the appreciation and need for green space will be improved, ultimately leading into the last pillar of sustainability to be met – Social Sustainability.

# 9.0 SOCIAL SUSTAINABILITY

Social sustainability tries to achieve a balanced well-being of an individual and of the community in which the individual belongs. Social sustainability can include community engagement and participation, healthy and safe communities, a strong presence of culture and diversity and equal access to public transit and green spaces. Through the 2015-2016 Strategic Plan, the City of Hamilton has incorporated various elements of social sustainability into planning policies like the EIDG.

The promotion of social sustainability in places of employment is particularly important. One way to achieve this is through the provision of an equitable transportation system. A strong transportation system will support employees reaching their places of employment as well as residents connecting to other neighbourhoods. It is also important that a balanced transportation system feature multiple forms. In particular, forms such as public transit and cycling are most equitable as they can be inexpensive, allow for the movement of greater numbers and are more environmentally friendly. As well, public transit systems can also allow increased social interactions, stronger connections to the physical environment, mental health and an enriched physical well-being.

## 9.1 Transportation

The proposed UBE areas will incorporate transit, pedestrian and cyclist friendly design elements to discourage dependency on the single-occupancy vehicle. This compliments the City's overall transportation vision to achieve a greater sustainable transportation system by promoting and encouraging alternative modes of travel, including walking, cycling and transit.

The Upper West Side area has commenced an Integrated Municipal Class Environmental Assessment to determine the arterial and collector road network within and surrounding the proposed development area. This study will confirm the function and connections to pedestrian, cycling and transit networks.

The proposed has been subject to a Transportation Study by R.J. Burnside & Associates, who has analyzed the trip generation impact and deemed the proposed development to have a similar impact upon the local road network as the uses assessed through the 2011 TMP. As well the external road network identified in the 2016 TMP is capable of supporting the UBE area.

Additionally, R.J.Burnside has determined that the proposed UBE area will support transit along Twenty Road, that the pedestrian and cycling trail system can be achieved to support City objectives and that there would be minor impacts on the proposed transit system (all of which can be addressed through future accommodations).

## 9.2 Public Transit Amenities

The Airport Employment Growth District Transportation Master Plan Report (AEGD TMP) has identified potential routes servicing the areas abutting the proposed UBE area. However, the timing of this network and how the proposed development functions in connection with this network will be subject to future studies. However, it is recommended that future transit stops be planned to be accommodated at:

- Twenty Road and Garth Street intersection.
- Along Garth Street Extension, at a location(s) that meets current standard transit coverage guidelines of a 400m walking distance.
- Garth Street Extension and Dickenson Road West.

The location of the proposed transit stops should be within walking distance to and from the development taking into account a 400m walking distance. Other transit encouraging features are also recommended and include the following:

- Pedestrian connections between the transit stop and building entrances.
- Provide illumination along the pedestrian pathway to the stop.
- Weather-protected waiting shelters.
- Benches in the waiting area.
- Bicycle racks to be located at or near transit stops.
- Display transit information including timetables at the stops.

### 9.3 Pedestrian and Cyclist Infrastructure

Pedestrian access will most likely take the form of sidewalks and is recommended on both sides of all collector and arterial subdivision roads to facilitate the flow of pedestrians throughout the proposed UBE areas. Sidewalks should be provided on one side of local roads as a minimum. The sidewalks should connect seamlessly with the existing road network, building entrances and proposed transit stops. The AEGD TMP and the City's Cycling Master Plan indicate that bike lanes will be implemented on Twenty Road, Dickenson Road, and Garth Street extension. Although the timeline for bike lanes has not been confirmed as part of the City's capital programming schedule, the Garth Street extension has been designed with cycling facilities in mind as part of this application to provide cyclist and pedestrian links to both Dickenson Road and Twenty Road. This design inclusion will encourage and meet the active transportation initiatives of the City. All roadways will have lighting and proper landscape buffer.

Cyclists can access the site through Twenty Road and Dickenson Road at Garth Street Extension. Short term bicycle storage such as bicycle racks should be provided for residents and employees in well-lit areas of building entrances. Bicycle racks should be provided at and near transit stops.

### 9.4 Parking and Logistic Facilities

As the proposed UBE area is intended to feature largely medium density residential area, how parking is incorporated must be contemplated. Some of the Eco-Industrial design elements that should be considered include:

- Providing minimum number of parking spaces.
- Possible implementation of paid parking for employees.
- Parking to be located at the interior lots or rear side of the building.
- Parking garages for most residential development.

- Designated carpool spaces located near the main entrances.
- Designated alternative fuel or hybrid vehicles spaces located near the main entrances.
- Loading docks and service area to be located in areas of low visibility.
- Provide travel planning resources for employees including trip planning tools, active transportation maps and transit information.
- Develop ride-sharing programs and initiatives.
- Encourage variable working hours and shift requirements.
- Offer membership in a Transportation Management Association for employees.

The proposed development will be subject to further design modifications, as well as future planning approval processes. It will be through these that parking facilities will be fully developed.

## 9.5 Food Production and Community Gardening

The City of Hamilton is promoting the use of community gardens as way to ensure food safety for residents that are experiencing poverty. The City also advocates that community gardens can be a way to promote wellness and provide a sense of community. There may be community garden opportunities within the proposed UBE areas.

One of these opportunities can occur within the existing hydro corridor. A recent partnership between Hydron One and the City of Toronto has brought about a parks plan called The Meadow way. This proposed park system will serve to contact numerous community and will provide numerous benefits including community gardens. Similar functions can occur within the adjacent Hydro Corridor and could benefit the employees working in the area as well as the adjacent residential communities.

As well, the proposed UBE areas are seeking to protect numerous natural heritage features. In addition, considerable land will be devoted to the pedestrian navigation and active recreational purposes. These parks and open spaces will also be optimal locations for community gardens which could provide numerous benefits including wellness and bird and insect habitats.

## 9.6 Diversity of Use

In accordance with the EIGD criteria guidelines, the need for diversity of use and availability of community services and public amenities is identified. Diversity of use refers to having different land use types within the proposed development and how they can support the community by providing public amenities. This includes a variety of residential forms and types which in turn offers opportunities for residents and families of different ages, sizes and income type to live and grow in the same neighbourhood. Additionally, the proposed variability of residential uses will be conducive to the employment envisioned for the AEGD which will serve as possible housing for the employees anticipated to work in this area.

## 10.0 CONCLUSION

The UHOP and AEGD Secondary Plan go to great lengths to promote sustainable design. This is a result of the belief that these features will also improve the City's economy, environment and social infrastructure. Both documents seek to achieve this through the preparation and submission of an Energy and Environmental Assessment Report. The requirement for this report is designed to ensure development proposals, located within, and outside, of the AEGD, demonstrate how they are sustainable. The criteria and principles to be followed are located in the AEGD Secondary Plan as well the EIDG, and have been responded to in Appendix A. Please note, the proposed urban boundary expansion area is not located within the AEGD, however, the applicable guidelines and policies have relevance due to their proximity.

Further work is being completed which will result in the completion of a Sustainable Development Guidelines which will be integrated within the Secondary Plan and Draft Plans. These guidelines are being prepared by Ecovert and are currently in their infancy but illustrate the groups commitment to ensure the development is sustainable.

Appendix A demonstrates that the proposed development is cognizant of the criteria and principles from the UHOP, AEGD and EIDG. Numerous areas have been discussed such as transportation, energy efficiency, wastewater and water conservation, green urban design and social impacts. For example, public transportation will be facilitated by the plan as well as pedestrian networks in the green space areas. Also, users will be directed to conserve water by using green building materials and to reduced GHG emissions. These are just some examples that have been illustrated throughout this report and which has outlined that the proposed development will maintain a high level of sustainable design.

In accordance with the applicable guidelines, the proposed development can be sustainable and will help foster a community that can thrive. Further, the proposed development meets the EIDG and can be an example of development which promotes sustainability.

## APPENDIX A - Eco-Industrial Guidelines Checklist

| ECO-INDUSTRIAL DESIGN PRINCIPLE/ RATIONALE | CHECK-LIST | UBE RESPONSE |
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| **Pedestrian and Cycling Infrastructure:**<br>Inclusion of pedestrian and cycling networks expands transportation options and reduces reliance on automobiles.<br><br>Sidewalks have an important role for those working along main routes. Well designed sidewalks encourage walking and provide safety for pedestrians of all ages. The addition of walkways and trails enhances the network and provides additional connectivity. Pedestrian comfort and security should also be considered when designing employment areas.<br><br>The creation of a cycling network using on and off-road cycling facilities offers people a viable alternative to automobiles travel and promotes a healthy lifestyle. | ✓<br><br>✓<br><br>✓<br><br>✓<br><br>✓ | • The UBE areas will develop a system of year-round connected pedestrian and bicycle networks composed of trails, walkways, cycling lanes and sidewalks.<br>• The UBE areas will look to accommodate streetscape amenities that encourage pedestrian movement, such as: benches, street trees, waste receptacles, pedestrian-scaled street lighting<br>• The UBE areas will incorporate curb cuts for accessibility.<br>• The UBE areas will seek opportunities for bike lanes and/ or off-road cycling and/ or multi-use trails<br>• Integration of cycling facilities with the City's trail system will be pursued, where feasible.<br>• The UBE areas will seek opportunities for secure, weather-protected bike storage and changing/ shower facilities, where feasible. |
| **Parking:**<br>Reduction of parking requirements promotes more efficient land use, compact form, reduction of stormwater run-off and heat island effect.<br><br>In addition, reduction of surface parking areas creates enhanced walkable streetscapes. Parking located at interior of built areas helps to mitigate the detrimental effect of parking on streetscapes and promotes more walkable streets. | ✓<br><br>✓<br><br>✓<br><br>✓ | • The UBE areas will try to minimize the size of parking areas.<br>• The UBE areas will seek opportunities to include options for preferred parking for carpools, vanpools and other automobile sharing options.<br>• The UBE areas will encourage the development of parking at locations to the interior, rear or side of built areas to minimize impacts to the streetscape and locate front doors near transit facilities.<br>• The UBE areas will encourage preferred parking locations for high-efficiency hybrid or alternative fuel vehicles. |
| **Logistics Facilities:**<br>Loading docks, outside storage, and service area should be located in areas of low visibility and screened from public view. Shared driveways between two properties and consolidated logistic facilities should be provided to minimize the development footprint and minimize disruption of the public sidewalks. | N/A | • The UBE areas are not proposing employment uses. |
| **Energy Conservation and Efficient Buildings:**<br>Energy efficiency and conservation reduces the needs of costly generation, transmission and distribution of power as well as reduces the development's carbon footprint. Energy reduction also generate savings to businesses and municipalities. | ✓ | • The UBE areas will try to encourage users to feature high-efficiency products and to participate in Natural Resources Canada voluntary programs, such as EnerGuide for Industry and ENERGY STAR. |

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| | ✓<br><br><br>✓<br><br><br>✓<br><br><br>✓ | • Future Buildings will be directed to achieve a certain level of efficiency improvement.<br>• The UBE areas will encourage users to utilize LED lighting or other alternatives which are energy efficient in all public lighting settings.<br>• The UBE areas will recommend the use of energy efficient fixtures and/ or alternative energy sources (e.g. solar power) for outdoor lighting.<br>• The UBE areas will try to advise future users to incorporate the use of high-efficient heating, ventilation and air conditioning equipment.<br>• The UBE areas will look to ways to achieve LEED accreditation or other green building certification. |
| **Renewable Power Generation:**<br>On-site renewable power generation and local energy production have many benefits for the environment as they increase the flexibility of the electrical grid; increase user's awareness of where their power comes from and reduce carbon emissions.<br><br>Use of on-site renewable energy generation can also result in savings for the user, principally if the generation coincides with high peak demand. Grid-sources renewable energy are those that meet the Environment Canada Environmental Choice program's EcoLogo requirements for green power supplies. | ✓ | • The UBE areas will contemplate the inclusion of on-site renewable resources of power generation (wind, solar, biomass) to meet certain levels of energy needs of buildings, outdoor features and commonly owned infrastructure in the project. |
| **Building Orientation:**<br>Passive Solar gain reduces the heating and lighting requirements for buildings at no cost to the developer or owner. Solar gains can be obtained through street and building orientation, fenestration and building height/ separation. The level of benefit will relate to the number of lots and facades fronting on east-west road versus the number fronting on a north-south road. Orienting buildings south will bring benefits from the highest winter heat gains. During the summer, this strategy will provide more natural light while rejecting heat. | ✓ | • The UBE areas will recommend the orientation and design of buildings and infrastructure to take advantage of passive solar heating, natural lighting, ventilation and shading for cooling. |
| **Air Quality:**<br>Jurisdiction for ensuring healthy air quality lies primarily with the Provincial government. Nevertheless, municipalities and developers can contribute significantly to ensure healthy air quality during construction and building operation. A healthy indoor air quality decreases health risks associated with respiratory diseases, asthmas and allergies, increases productivity and increases resale value of the building. | ✓<br><br>✓<br><br>✓ | • The UBE areas will establish minimum air and dust emissions during construction and demolition.<br>• The UBE areas will recommend users and builders incorporate low-emitting building materials.<br>• The UBE areas will seek to have buildings designed with indoor carbon dioxide ($CO_2$) monitoring systems. |

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| **Water Conservation and Efficiency:**<br>Efficient and wise use of water can help reduce businesses water and energy bills while helping to preserve Hamilton's local water. Resources and helping to reduce business's carbon footprint. It may also help to reduce run-off pollution through grey water use and can potentially defer infrastructure costs.<br><br>Through the use of gutters and downspouts, businesses can catch rainwater and channel it to landscape elements or store it in a rain barrel to use during dry periods.<br><br>Low water use landscaping requires the selection of native, drought-resistant species that require little to no watering, minimal planting practices and only basic maintenance.<br><br>Efficient equipment and fixtures can help reduce water consumption. | ✓<br><br>✓<br><br>✓<br><br>✓ | • The UBE areas will seek ways in which water consumption reduction strategies can be implemented for residential uses.<br>• The UBE areas will seek opportunities to incorporate water efficient fixtures, including low-flow toilets, urinals, faucets and showers.<br>• The UBE areas will recommend to users the usage of rain and/or moisture sensors with irrigation systems, where feasible.<br>• The UBE areas recommend the incorporation of grey water technologies and systems into future infrastructure in future business and developments. |
| **Waste Water Management:**<br>Greywater reuse reduces the loading on infrastructure (both potable water systems and storm sewers) and generates savings for businesses and municipalities. Greywater from sinks, showers and other sources can be used to flush toilets and urinals. Some wastewater flows that are not discharged to the sanitary or combined sewer system can be used by the business' processes or products. | ✓ | • The UBE areas will be designed to support a system of greywater recovery for use in businesses process, flushing, irrigation, cooling and car washing. This can be encouraged through the implementation of Swale Gard Bioretention Overflow Filters and LID BMP Conveyance Swales. |
| **Low-Water Landscaping:**<br>Water efficient or xeriscape landscaping requires little to no irrigation, minimal planting practices and basic maintenance. Also, adding organic material to the soil help to retain water, decreases soil compaction and water runoff.<br><br>Use of rainwater collection for irrigation and high-efficiency irrigation technology can reduce the need for potable water and consequently reduce water costs. | ✓<br><br>✓ | • The UBE areas are to pursue methods of low-maintenance landscaping for some of the publicly landscaped area.<br>• The UBE areas will recommend to users to employ high-efficiency irrigation technologies and/or other techniques to reduce potable water consumption for irrigation. |
| **Stormwater Management:**<br>Use of stormwater management measures ensures ground infiltration, minimizes run-off and diverts water from the building. By slowing the flow of water and allowing settling, filtration and percolation, water quality and quantity can be regulated.<br><br>Low Impact Development (LID) source and conveyance controls provide aquatic habitat protection, water quality, erosion, and water balance control, while dry ponds provide flood | ✓<br><br>✓<br><br>✓ | • The UBE areas will incorporate measures which take advantage of LID stormwater management measures to allow for improved settling, filtration and percolation of water.<br>• The UBE areas may seek ways to encourage the uses of a Treatment Train Approach to managing Stormwater,<br>• The UBE areas will incorporate a number of LID measures to meet the predevelopment water balance criteria including LID source controls land use as per the stormwater master plan) and LID conveyance control measures. |

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| protection and allow for multipurpose use of dedicated lands. Stream restoration provides the additional benefits of improved stream corridor functions, moderating stream temperatures and improving aquatic and terrestrial habitat conditions. | ✓<br>✓<br>✓ | • The UBE areas are to incorporate dry ponds stormwater methods where feasible.<br>• The UBE areas will seek ways to optimize Stream Corridors to protect species habitat by ensuring appropriate buffers and flood conveyance requirements.<br>• The UBE areas are to be supported by a maintenance program for the stormwater management. |
| **Materials and Resources:**<br>Construction materials require an extensive network of extraction, processing and transportation; as such, the use of green materials generates fewer impacts on the environment than the use of regular construction materials. Repairing, reusing and remanufacturing building materials extend the life of all materials. One step further is to design buildings that can be easily converted, repaired or disassembled and their parts reused.<br><br>Using salvaged materials can reduce the need for new materials and save on construction costs. Materials with recycled content reuse waste products that otherwise would have been disposed in landfills. Use of local materials reduces the impacts of transportation and supports the regional economy.<br><br>Paper and wood products certified by the Forest Stewardship Council (FSC) are guaranteed that come from an environmentally and socially responsible source. | ✓<br>✓<br>✓<br>✓<br>✓<br>✓ | • The UBE areas will recommend the construction of buildings and infrastructure to use green building materials.<br>• The UBE areas are to recommend the preferred use of local building materials<br>• The UBE areas will seek opportunities for the use of materials which are recycled, salvaged, refurbished or reused.<br>• The UBE areas will incorporate building materials and techniques which enhance building durability.<br>• The UBE areas are to encourage the use of recycled aggregate materials for roadways, surface parking lots, sidewalks and curbs.<br>• The UBE areas will recommend to users the benefits of wood-based materials and products. |
| **Construction Waste Management:**<br>Reducing construction waste results in lowered costs from landfill tipping fees and reduces the need for landfill space. Construction waste can be a resource for some industries; as such, increasingly private operations are collecting and recycling construction and demolition waste. Recycling of construction waste and use of recycled materials reduces the demand for virgin materials and the environmental impacts associated with extraction, processing and transportation of resources. | ✓<br>✓<br>✓ | • The UBE areas will develop a waste management plan which reduces construction waste during construction and demolition.<br>• The UBE areas will encourage users to recycle nonhazardous construction and demolition debris, where feasible.<br>• The UBE areas will incorporate non-hazardous construction waste material for the construction of roadways, parking lots, sidewalks, and curbs, whenever possible. |
| **Comprehensive Waste Management:**<br>Waste management is the process of collecting, processing and disposing of waste. There are many economic, environmental and social benefits from diverting waste away from landfills or incinerators, through reuse, recycling or composting. | ✓<br>✓<br>✓ | • The UBE areas will provide opportunities of recycling and composting in employee and public areas.<br>• The UBE areas will recommend to users the positives of waste diversion initiatives.<br>• The UBE areas will allow the use of on-site composting system which do not interfere with the airport operations. |

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| Among the economic benefits are the revenues generated from selling waste, savings from additional landfill creation and operations, and savings from reduced transportation of waste.<br><br>There are also important environmental benefits: recycled materials use less energy than producing with virgin materials; recycling reduces greenhouse gases emitted by landfill and incinerators; and, conserves resources.<br><br>Social benefits can also be achieved through recycling and reusing waste, such as the reduction of pollutants and improvement of health, and the promotion and encouragement of an environmentally sustainable behaviour. | | |
| **Economic Stability and Business Synergy:**<br>Organizations that work together to create business synergies and make use of by-products and/or energy can obtain numerous benefits, such as: reduction in the use of virgin materials as resource input; increase energy efficiency and reduced energy use; reduction in volume of waste products; increase in the amount and types of process outputs that have market value; and, reduction in pollution. | ✓<br><br>✓<br><br>✓ | • The UBE areas will recommend to users the benefits of identifying synergies between waste producers and waste users, whenever possible.<br>• The UBE areas will allow opportunities for users to share system requirements and facilities, where feasible.<br>• The UBE areas will seek ways in which design opportunities may merge the locations logistics/truck delivery facilities and/or combining parking, public transportation and car-pooling facilities, if feasible. |
| **Access to Amenities:**<br>Proximity to amenities (e.g. convenience commercial and health/fitness clubs) promotes walking, reduces dependency on the automobile, increases employee satisfaction and contributes to good workplace relationships. The creation of well-connected community can help to foster a strong sense of community, improve road network efficiency and safety.<br><br>Parks, plazas and other public and private open spaces are meeting and gathering places that increase the sense of place, offer opportunities for recreation, and contributes to employees' wellbeing. | ✓<br><br>✓<br><br>✓<br><br>✓<br><br>✓ | • The UBE areas will be designed to bring local amenities in close proximity to residents.<br>• The UBE areas will be designed to provide future pedestrian infrastructure.<br>• The UBE areas has been designed with blocks devoted to open spaces, parks and other public infrastructure<br>• The UBE areas are to incorporate public spaces which ensure a high level of comfort for residents.<br>• The UBE areas has been designed with increased protections of the natural heritage system which will enable optimal views from places of employment. |
| **Site Development:**<br>Incorporating innovative design and approaches in sustainability can reduce the carbon footprint of businesses, increase energy and other efficiencies, create more comfortable and healthy places to work, and generate long term savings for businesses, employees and municipalities. Sustainable design strategies are constantly evolving, and new technologies are introduced to the market in a regular basis. | ✓<br><br>✓<br><br>✓ | • The UBE areas has been designed to protect and enhance the local natural heritage system.<br>• The UBE areas can be designed with a block structure which can support higher employment densities and a compact form.<br>• The UBE areas has will be designed to incorporate opportunities for innovative design and approaches in sustainability, smart growth, or creative development ideas. |

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| Higher development densities make a better use of the land, create compact communities, create opportunities for transit use, reduce dependence on automobile and reduce the impact on the environment, among other benefits. | | |
| **Site Disturbance & Natural Environment:**<br>The ecological value of the site should be respected because many Canadian ecosystems are fragile and lack the biodiversity of more southerly eco-types. Undisturbed slopes greater than 15% must be left undeveloped as these lands often represent areas of significant landform features such as ravines and ridges. | ✓<br>✓<br>✓<br>✓<br>✓<br>✓<br>✓<br>✓<br>✓ | • The UBE areas will be designed with contemplation of monitored erosion and a sediment control program.<br>• The UBE areas will encourage the creation of edge management plans for areas adjacent to natural heritage features.<br>• The UBE areas will implement appropriate building setbacks for development adjacent to the boundary of natural features in accordance with provincial, municipal and Conservation Authority regulations.<br>• The UBE areas will recommend the incorporation of native species in stormwater facilities planting.<br>• The UBE areas will seek to ensure construction work staging to minimize the time soil is exposed and unstabilized.<br>• The UBE areas will seek opportunities for landscaping designs which increase shading and cooling locations.<br>• The UBE areas will recommend the use of native species and the avoidance of invasive species in landscaping designs.<br>• The UBE areas will seek to maximize the tree canopy by incorporate species which are native and will contribute to the long term of growth of the forested areas.<br>• The UBE areas will enhance and protect the natural heritage system by incorporating appropriate buffers which include naturalized features, as per Provincial, Municipal and Conservation Authority regulations.<br>• The UBE areas to support opportunities for the integration of passive land uses within open spaces and natural heritage features.<br>• The UBE areas will seek to include signage illustrating the locations of natural heritage features. |

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| **Natural Corridors and Greenways:**<br>Green spaces serve as recreational areas for employees. Linked space systems have numerous benefits including encouraging healthy habits, habitat continuity, aesthetic improvement and encouraging non-auto modes of travel.<br><br>When the green spaces are linked to natural areas, they also provide wildlife habitats and migration pathways for a diversity of species. | ✓<br><br>✓<br><br>✓ | • The UBE areas can be designed to enhance connections to natural heritage areas.<br>• The UBE areas can be designed to protect and enhance stream corridors through the completion of EIS studies.<br>• The UBE areas can provide road networks which seek to promote and avoids disruption of naturalized areas and green corridors. |
| **Heat Island Reduction:**<br>Use of dark, nonreflective surfaces for roofs, parking areas and walkways contribute to heat island effect by absorbing more solar radiation and emitting it back to surrounding areas as heat, raising ambient temperatures and increasing building cooling loads. Light coloured, reflective surfaces mitigate this effect. Using highly reflective and emissive materials or installing green roofs can also reduce heat island effects. | ✓ | • The UBE areas will seek opportunities to reduce the heat island effect by facilitating the incorporation of numerous features. |
| **Food Production and Community Gardening:**<br>The AEGD is located nearby extensive agricultural areas, most of it inside the Greenbelt Natural Heritage area, which make them permanently protected from urban development. Employers and employees can take advantage of the proximity of these agricultural operations and incorporate their products into the business operations and for consumption in the local cafes and restaurants.<br><br>Proximity to community gardens provides access to open space and increases food self-sufficiency.<br><br>Community gardens also help to reduce the carbon footprint of the development, providing food products to be used at employees' cafés and restaurants, as well as reducing the heat island effects in developed areas. Community gardens also allow individuals to have access to traditional produce or nutritionally rich foods close to their workplace. They offer opportunities for exercising, interactions and stress relief. | ✓<br><br>✓ | • The UBE areas will be designed to utilize features such as open spaces and the hydro corridor to encourage community gardening and enhance food production.<br>• The UBE areas will seek to promote local food production through the future businesses which may occupy the lands. |