Troutbrooke Slope Stabilization Project

Toronto and Region Conservation Authority

Project Plan

April 15, 2011

5 Shoreham Drive, Downsview, Ontario M3N 1S4

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1.0 INTRODUCTION

In May 2009, Toronto and Region Conservation Authority (TRCA) staff completed an inspection of the rear property located at 45 Troutbrooke Drive after being notified of a severe slope failure affecting a valley wall of the Black Creek floodplain, southwest of the Jane Street and Sheppard Avenue West intersection. A follow-up inspection by TRCA on May 12, 2009 confirmed that the failure area extended from Nos. 35 to 51 Troutbrooke Drive. There were nine (9) residential properties affected, although the failure appeared to be most severe at 45 Troutbrooke Drive where the failure scarp had exposed the foundation wall.

In July 2009, TRCA retained a professional engineering firm, Terraprobe Inc., to complete a geotechnical and slope stability assessment for 35 to 51 Troutbrooke Drive. The objective of the assessment was to determine the cause(s), effects, hazards and extent of the slope failure based on existing and acquired geotechnical and topographic data. Specifically, the long-term stable slope crest position was established in relation to the residential properties in the study area to determine whether any of the existing dwellings were at risk.

TRCA received Terraprobe's final report on October 8, 2010, which identified a significant risk of additional slope slides along the slope crest and adjacent to the residential structures in the near future. As the existing slope was considered adequately safe and stable against deep seated failures, it was reasonable to assume that the existing structures were not threatened by potential slope failures. The slope instability did however, pose considerable safety concerns and threaten further damage to structures in the rear yards of all nine properties, including sheds, patios, retaining structures, gardens and landscaping. Terraprobe recommended major slope restoration and stabilization works to mitigate the risk of additional slope failures.

Based on these findings TRCA staff identified the Troutbrooke Drive erosion site as a priority for remedial works and recommended at Authority Meeting #8 held on October 29, 2010 that a Class Environmental Assessment (Class EA) be undertaken. The Class EA would facilitate the planning and design stage to allow a slope stabilization project to proceed to implementation under TRCA's Erosion Control Monitoring and Maintenance Program in the summer of 2011 (pending the approval of funding from City of Toronto).

The area of concern is located in a ravine section of Black Creek that runs through Donwsview Dells Park adjacent Troutbrooke Drive, where the upper slope instability is creating a risk to private property. A map of the study area is presented in **Figure 1** and **Figure 2**.

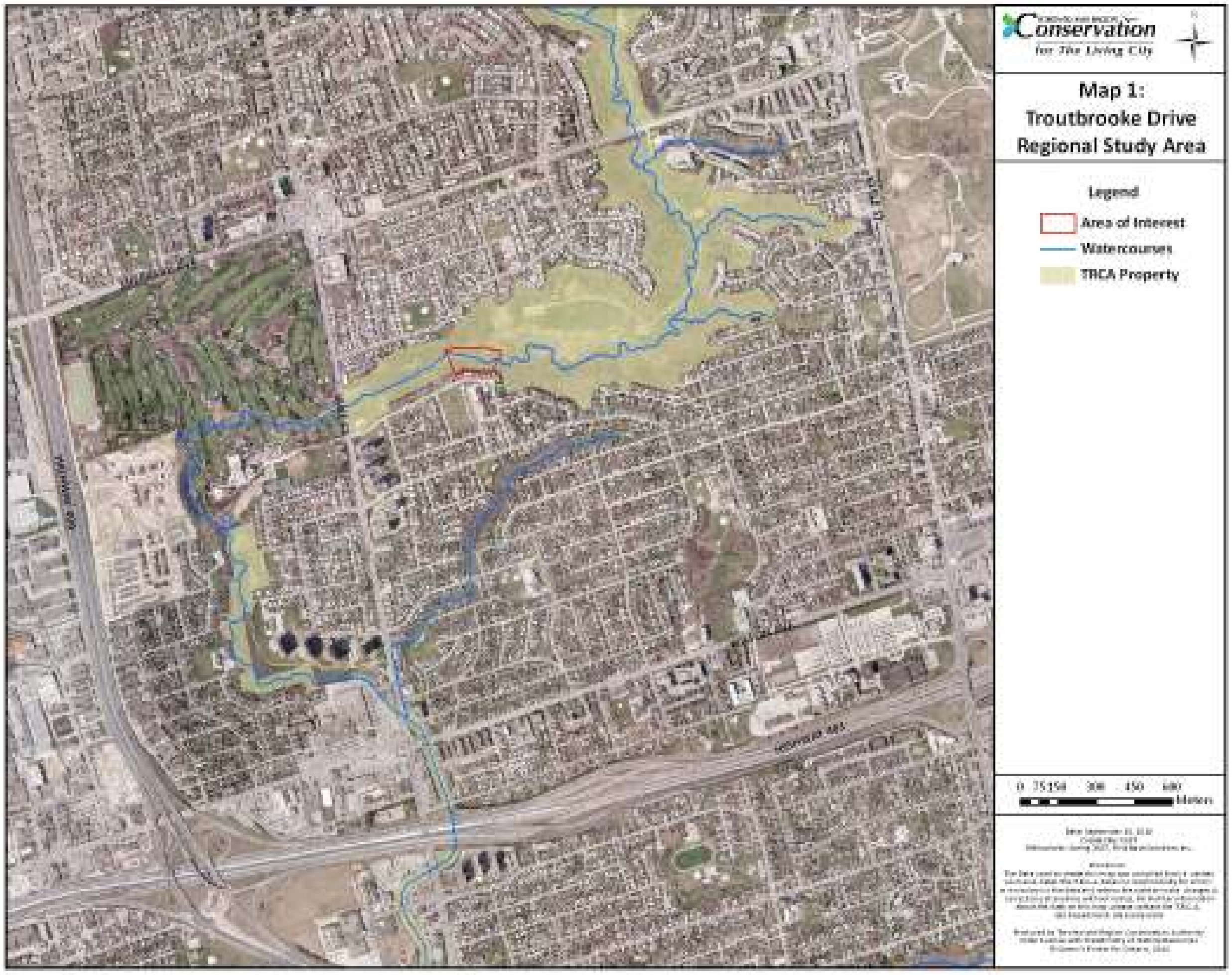

Figure 1. The project site is located east of Jane Street and south of Sheppard Ave on Black Creek.
Source: TRCA, 2010.

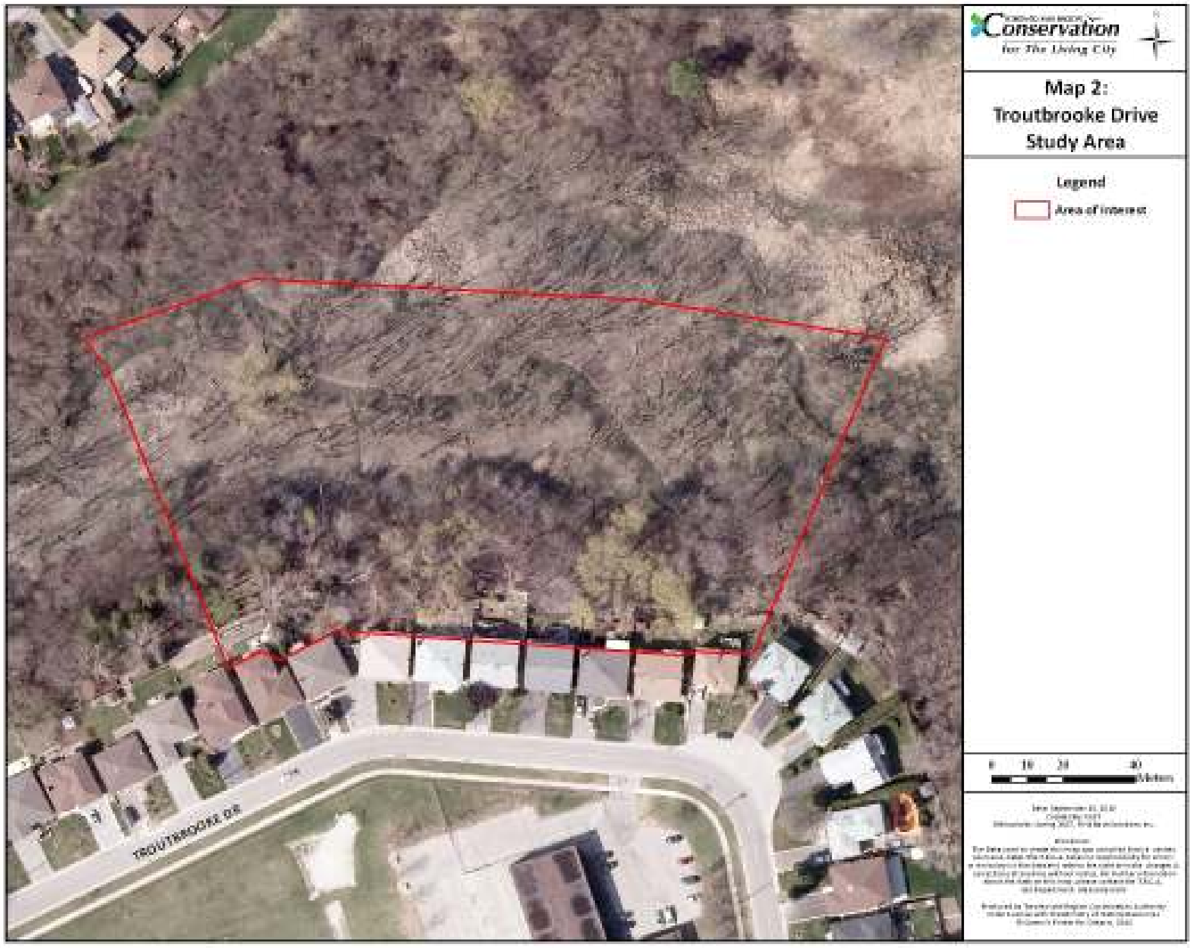

Figure 2. The study limits encompass the rear yard of nine properties on Troutbrooke Drive, Toronto. *Source: TRCA, 2010.*

1.1 Relationship of Undertaking to the Environmental Assessment Act

TRCA is defined as a public body in Section 3 of Regulation 334/90 in the Environmental Assessment Act (R.S.O.) 1990, and as such, must conduct its remedial flood and erosion control projects in accordance with said Act.

Recognizing that common elements exist in addressing flood and erosion problems, a coordinated approach to environmental assessments was developed by Conservation Ontario for all Conservation Authorities (CAs) known as the Class Environmental Assessment for Remedial and Erosion Control Projects (Class EA). According to the Class EA document,

> *"Remedial Flood and Erosion Control Projects refer to those projects undertaken by Conservation Authorities, which are required to protect human life and property, in previously developed areas, from an impending flood or erosion problem. Such projects do not include works which facilitate or anticipate development. Major flood and erosion control undertakings which do not suit this definition, such as multipurpose projects, lie outside the limits of this Class require an Individual Environmental Assessment"* (Conservation Ontario, 2002).

Almost twenty years of experience have demonstrated that using the Class EA approach for dealing with flood and erosion control projects is an effective way of complying with the Act requirements. Approval of the Class EA allows CAs to carry out these types of projects without applying for formal approval under the Act, on the condition that all other necessary federal and provincial approvals are obtained. A chart illustrating the key steps of the Class EA planning and design process is shown in **Figure 3.**

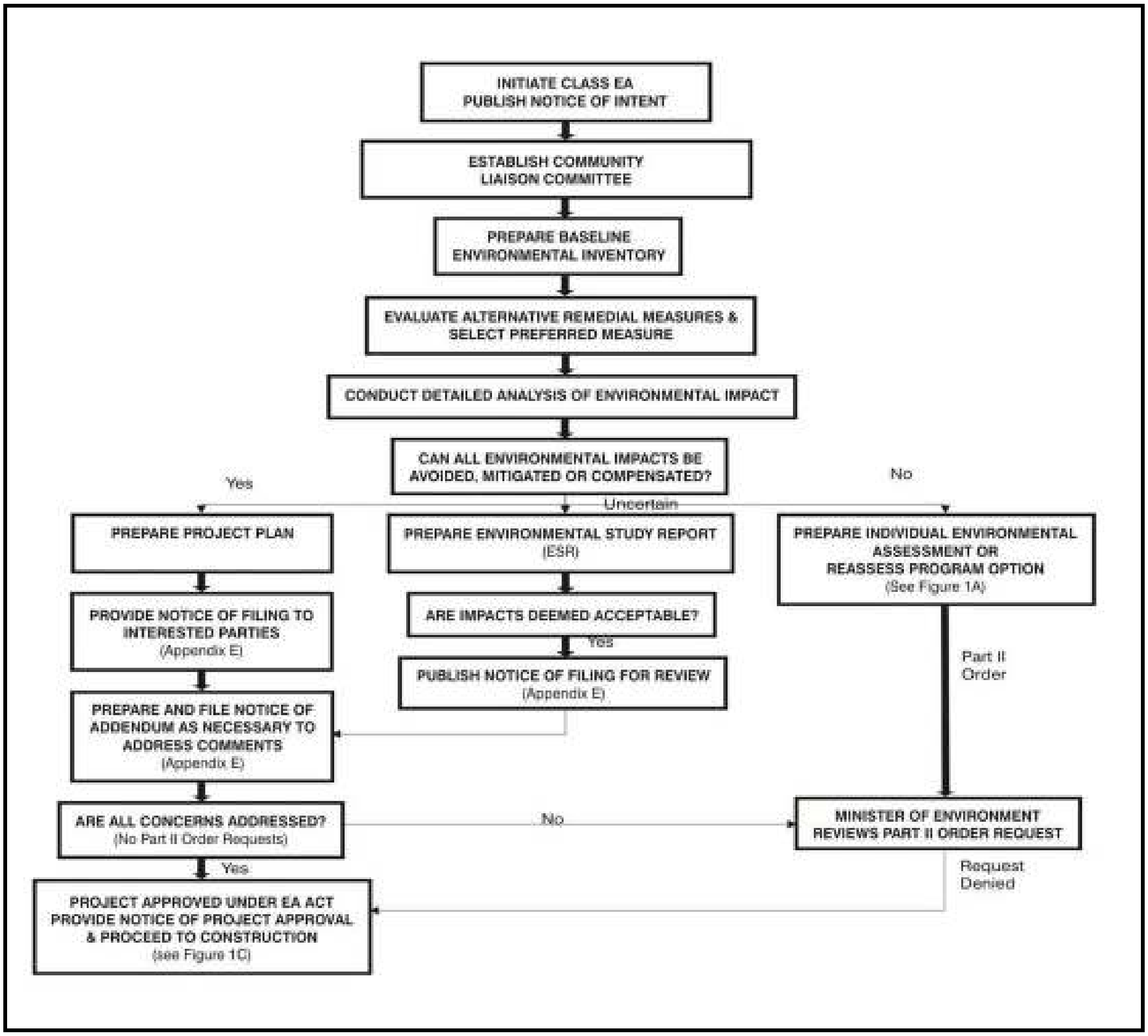

Figure 3. Class Environmental Assessment Planning and Design Process.
Source: Conservation Ontario, 2002.

1.2 Purpose of the Undertaking

The purpose of the Troutbrooke Slope Stabilization Project (the Project) is to provide long-term, low maintenance protection against erosion and slope instability that will prevent future property damage, reduce the risk to public safety, and which is compatible with the surrounding physical, biological, social and cultural environment.

The proposed undertaking will be carried out in accordance with TRCA's *Criteria & Implementation Procedure for Valley & Stream Corridor Regeneration and Remedial Works Projects* (Design Criteria), which seeks to reduce and eliminate existing flood, erosion and slope instability hazards and to rehabilitate valley and stream corridors on private and public lands (**Appendix A**).

1.3 Description of Study Area

The study area is located on a tributary of the Humber River, known as Black Creek, in North York, a suburb of Toronto. At the project site, nine (9) single-family residential structures back onto the crest of the slope on a ravine section of Black Creek which forms part of Downsview Dells Park. The residences are located at varying distances from the slope crest ranging from 2 m to 10 m behind the existing residential structures. The residences have walkouts to landscaped rear yards with lawns, gardens, trees, shrubs and structures such as patios, decks, fences and sheds. Those homeowners located at the western extent of the project site have lost some of the landscaped portion of their yard associated due to erosion.

The valley wall at the project site is approximately 18 metres (m) high, with an average upper slope inclination of 1.4 : 1 (horizontal : vertical or h : v) (Terraprobe, 2010). Where failure scarps are present the slope inclination is near vertical. The residential property lines extend part way down the slope, between 12 and 18 m. Numerous make-shift retaining structures have been constructed on the upper slope using a variety of materials such as railroad ties, sheeting, timber and concrete block. Inspection of these structures has revealed evidence of instability such as bulges, cracks and rotation.

The lower slope is largely well vegetated with trees of varying maturity. In some where large trees are present there is less slope vegetation. Landscaping debris and garbage prevents slope vegetation in other areas, particularly along the western extent of the project site. Two very minor gullies with minimal erosion extend along the entirety of the slope face. There are also isolated minor scarps ranging from 0.3 to 0.6 m.

The slope toe is adjacent to the floodplain and a meander of Black Creek. The soils are saturated, silty clay and support healthy vegetation cover. There is no evidence of active toe erosion, with the exception of the area where Black Creek is directly adjacent to the slope at the eastern end of the project site.

Figure 4. Active erosion exposed foundation at No. 45 Troutbrooke Drive.
Source: TRCA, 2009.

Figure 5. Active erosion exposing foundation at No. 47 Troutbrooke Drive.
Source: TRCA, 2009.

Figure 6. Failed retaining walls in the rear yard at No. 51 Troutbrooke Drive.
Source: TRCA, 2009.

Figure 7. Active erosion in the rear yard at No. 43 Troutbrooke Drive.
Source: TRCA, 2010.

1.4 General Description of the Undertaking

There are four situations in which remedial flood and erosion control projects may be undertaken within the Class EA:

i) Riverine flooding
ii) Riverine and valley slope erosion
iii) Shoreline flooding
iv) Shoreline erosion

The primary objective of the project is to provide long-term protection against valley slope erosion. Alternative remedial measures to address this problem situation include:

- Soil bioengineering with the use of vegetation to stabilize soil, slow runoff, and dissipate erosive energy
- Improvements to internal drainage through the use of French drains, interceptor drains, or tile drains
- Improvements to surface drainage by redirecting water away from the slope, or by providing swales
- Regrading of the slope to provide a long-term stable angle of repose

Secondary objectives include the protection of existing land uses, improved aesthetics, and improved terrestrial habitat. As such, the project examines a number of other alternatives to achieve the primary and secondary objectives outlined in the Class EA document.

In accordance with the Class EA planning process, a full range of alternatives must be developed, including both traditional and innovative approaches. The type and range of alternatives developed, such as the ones listed above, will vary by project as they are based on the nature, cause and extent of the problem, and must be tailored to the individual characteristics of each site.

In determining the preferred measure to remediate the erosion and slope instability problem, two major factors were considered: risk to structure(s); and the cause of the hazard. According to TRCA's Design Criteria, potential risk to existing structures is deemed to be the most important factor and accordingly is given more weight than the physical and geological condition associated with the cause of erosion and/or instability.

In all cases, the design of erosion control and slope stabilization works must provide protection compatible with TRCA's Design Criteria, which includes improvements to or enhancements of terrestrial habitat conditions through natural designs.

The decision-making process used in selecting the preferred remedial action is documented in detail in *Section 5.0* of this report. The proposed undertaking meets all TRCA planning and policy objectives, and satisfies the needs and concerns of the affected property owners and general public.

1.5 Rationale for the Undertaking

In the spring of 2009 a slope failure occurred adjacent to five properties on Troutbrooke Drive (Nos. 51 to 43). The primary failure scarp located near the slope crest was 80 m in length, 1.2 to 2 m high and was bare and oversteepended. Within the associated slumping failure area landscaping and retaining walls located in the rear yards of the affected properties were damaged or destroyed and the foundation wall of one home was exposed. Secondary failure scarps, north of the primary failure also occurred, ranging from 0.3 to 1 m in height. A tension crack in the pavement between 47 and 49 Troutbrooke Drive was also found following the slope failure.

In July 2009, TRCA retained a professional engineering firm, Terraprobe Inc., to complete a geotechnical and slope stability assessment for 35 to 51 Troutbrooke Drive. The objective of the assessment was to determine the cause(s), effects, hazards and extent of the slope failure based on existing and acquired geotechnical and topographic data. TRCA received Terraprobe's final report on October 8, 2010, which identified a significant risk of additional slope slides along the slope crest and adjacent to the residential structures in the near future. Due to the considerable safety concerns and potential for further damage to structures in the rear yards of all nine properties, including sheds, patios, retaining structures, gardens and landscaping, TRCA made the determination to proceed with a Class Environmental Assessment for Remedial and Erosion Control Projects.

2.0 BACKGROUND

This section provides factual information as to the causes, effects, extent and associated hazards in the connection with erosion and instability at the project site. Findings and recommendations of studies carried out within the study are presented herein, providing justification for TRCA involvement.

2.1 History of the Problem

Based on the interpretation of available aerial imagery, construction of the housing development at Troutbrooke Drive took place between 1962 and 1968. TRCA has been monitoring issues relating to slope instability along the stretch of Black Creek adjacent to Troutbrooke Drive since 1968. A slope failure was recorded along the valley wall behind Nos. 59 to 73 Troutbrooke Drive in 1966. TRCA completed remedial works at the rear of properties 61 to 73 in 1968 (59 Troutbrooke declined participation).

On March 19, 1971, TRCA ordered an investigation of land slippage at the rear of properties at 35 – 47 Troutbrooke Dr. Erosion was noted at Nos. 35 – 39. Subsequent site inspections of the slope behind 35 – 39 Troutbrooke Drive were completed by TRCA every spring between1977 and 1984. Records from these inspections note evidence of unauthorized filling activities, erosion, and some movement of retaining walls.

Following a slope failure in April 1991, Terraprobe Inc was retained to complete a geotechnical assessment at Nos. 49 and 51 Troutbrooke Drive. The report resulting from this investigation identified that, 'the position of the original slope crest, prior to 1962, was estimated to be about 10 to 15 m south of its position in 1991'. Therefore, it was concluded that filling was carried out over the slope crest and face to create a flat and level area to facilitate construction of the dwellings with level rear yard space. The failure was described as having taken place through the earth fill previously dumped over the natural slope face. The results of the slope stability analysis concluded that the failure was triggered by a combination of wet weather, unstable fill and unstable retaining walls. Follow up monitoring was undertaken by Terraprobe in 1992 and 1995 which noted further evidence of movement of retaining structures and subsidence of the earth fill material.

In the spring of 2009, TRCA staff completed an inspection of the rear property located at 45 Troutbrooke Drive after being notified of a severe slope failure affecting the valley wall. A follow-up inspection by TRCA on May 12, 2009 confirmed that the failure area extended from Nos. 35 to 51 Troutbrooke Drive. TRCA retained Terraprobe to conduct a geotechnical investigation and slope stability assessment.

Terraprobe's analysis of the slope and contributing factors to the failure again pointed to a combination of weather, unengineered fill material and retaining structures. Terraprobe reported that during the months that preceded the slope failure, Toronto received almost double the average snowfall in January, followed by more than double the average rainfall in February and greater than average rainfall in April. The large snow melt and rainfall events that ensued, coupled with freezing temperatures between events are believed to have contributed to a build up of ground water within the earth fill at this site.

2.2 Identification of Previous Studies

2.2.1 Geotechnical Reports

Terraprpobe Inc (1991) - Geotechnical Investigation Slope Failure
In 1991, Terraprobe Inc was retained by Metropolitan Toronto and Region Conservation Authority (MTRCA) to complete a geotechnical assessment at Nos. 49 and 51 Troutbrooke Drive. The slope failure occurred on April 25, 1991 after a period of wet weather, directly behind the existing dwellings at Nos. 49 and 51 Troutbrooke Drive and resulted in the former slope crest dropping in elevation from 0.5 to 1 m, as evidenced by a crack or scarp on the rear slope. The investigation found that the slope failure had taken place through earth fill which had been previously (1962 to 1991) dumped over the natural slope face. Numerous make-shift retaining walls had been erected to contain the fill materials.

The results of the slope stability analyses concluded that slope failure was triggered by a combination of wet weather, unstable fill, and unstable retaining walls. Further, the analyses indicated that stability of the existing dwellings had not been affected by the slope failure, and that the houses were safe from further slope instability. Two potential remedial solutions were suggested which included supporting the rear-yard fill with a retaining wall and removing some of the fill on the slope and improving drainage. Slope inclinometer casing were installed in boreholes on the slope crest behind Nos. 49 and 51 Troutbrooke Drive to facilitate monitoring of possible ground movements.

Terraprobe Inc (1992) – Slope Movements and Stability Study
Terraprobe was retained to complete an inspection on No. 51 Troutbrooke, after the property owner noticed minor cracking in an interior wall of the residence. The existing inclinometer casings and residence were both inspected by Terraprobe. It was reported that a timber retaining wall in the rear yard of the property had shifted approximately 10 to 30 millimeters (mm) away from the residence, since the previous inspection in July 1991. However, the monitoring of the inclinometer casing located immediately adjacent to the residence indicated there had been no movement since the previous inspection in July 1991. Terraprobe reported that the minor cracking was not caused by the recent ground movement.

Terraprpobe Inc (1995) – Slope Monitoring and Stability Study
As a result of the geotechnical investigation completed by Terraprobe in 1991, a recommendation was to undertake a monitoring program. The site inspection took place January 23, 1995 at Nos. 49 and 51 Troutbrooke Drive. To characterize any changes in slope, a survey of elevation of previous benchmarks, inclinometer monitoring, examination of the exterior brick cladding and at No. 51 Troutbrooke Drive the examination of the interior drywall was undertaken. The results of the investigation indicated that the ground along the patio slabs in the rear yard (filled ground) appeared to be slightly lower in elevation in January 1995 than in April 1992, July 1991, by 3 to 4 centimeters (cm). Also, the inclinometer monitoring showed that there had been no significant movement of the ground adjacent to the houses since the monitoring began 46 months ago. Finally, the isolated minor hairline cracking on the interior drywall of house No. 51 were reported to be related to high humidity in the bedroom ensuite (not vented), and not caused by recent ground movements around the house.

Terraprpobe Inc (2010) – Geotechnical and Slope Stability Assessment
Terraprobe was retained in 2009 to investigate a slope failure that occurred behind Nos. 43 to 51 Troutbrooke Drive. The slope failure and resulting scarp was approximately 80 metres (m) in length. The scarp varied in height from about 0.3 to 2 m. In addition, to the scarp from the 2009 failure exposed a section of the foundation walls at 45 Troutbrooke Drive and 47 Troutbrooke Drive was reported. The field investigation of the site consisted of slope mapping and the advancement of an additional 13 boreholes, as well as the installation of additional standpipe piezometers and slope inclinometer casing. The 2009 study recommended that stabilization of the existing upper slope conditions be accomplished by removing the fill material and re-grading the valley wall to a more stable, flatter inclination with improved drainage. Alternative stabilization measures offered included constructing a reinforced soil slope structure along the rear of the dwellings, to create a safe, flat and level rear yard.

Terraprpobe Inc (2010 & 2011) – Erosion Monitoring Program
Terraprobe was retained by TRCA in 2010 to carry out a monthly erosion monitoring program for the erosion and slope failure affecting 51 to 35 Troutbrooke Drive. As part of the original assessment, standpipe piezometers to measure the static groundwater table and slope inclinometer casings to measure slope movement were installed. The data recorded indicates that no significant horizontal movements of the subsurface at the monitored locations have occurred, since November 2010. Further slumping and erosion of the soil near the failure scarp have been reported. Terraprobe reports that the north east foundation wall of #47 is now exposed and further movement of the slope crest between #45 and #47, as well as between #47 and #49 has occurred.

2.2.2 Planning Documents

The study area has received extensive scrutiny by all levels of government as part of the Toronto Watershed planning process. In developing the range of alternatives for evaluation under the Class EA guidelines, TRCA utilized and incorporated many of the planning recommendations from the municipal, provincial and federal governments.

Erosion Control Monitoring and Maintenance Program (1981)
Toronto and Region Conservation Authority's Erosion Control Monitoring and Maintenance Program was developed to minimize risk to life and property as a result of the erosion of riverbanks, valley walls and shorelines, while protecting and enhancing the natural attributes of the streams, valley corridors and Lake Ontario shoreline within TRCA's jurisdiction. The Province of Ontario and regional municipal governments of the Greater Toronto Area (City of Toronto, and Regions of Peel, York and Durham) provide funding on an annual basis to TRCA to protect public infrastructure, parklands, recreational trails, and residential dwellings threatened by erosion and slope instability issues arising typically from historic planning and development decisions.

In 1981, TRCA developed a funding policy for works carried out on private lands, whereby benefiting landowners be required to contribute to the cost of the project, either financially, or through the transfer of lands. The original Authority Resolution (#71/81), was amended at Authority Meeting #4/98 on May 29, 1998 (Resolution #A91/98) and most recently at Authority Meeting #7/09 on September 25, 2009 (Resolution #A159/09).

Greenspace Strategy (1989)
Toronto and Region Conservation Authority completed the *Greenspace Strategy* for the Greater Toronto Region, a strategic planning exercise to establish long-term management goals. This provided direction for the conservation of the Lake Ontario waterfront, the river valleys, and the Oak Ridges Moraine, and identified the need for greater cooperation to achieve more integrated natural resource planning and management. It proposed that the TRCA establish planning task forces for each major watershed within TRCA's jurisdiction.

A watershed is the total area of land drained by a watercourse and its tributaries. Watershed management strategies are developed to provide direction to natural systems protection, restoration, public education, recreation, and cultural and heritage planning activities within a watershed. To date, the TRCA has established planning task forces and completed watershed management strategies for three of the nine watersheds within its jurisdiction. In 1990, the TRCA adopted the Comprehensive Basin Management Strategy for the Rouge River Watershed, the first watershed management strategy. The second watershed management strategy, Forty Steps to a New Don, was published by the Don Watershed Task Force in 1994. In 1997, Legacy: A Strategy for a Healthy Humber and A Call To Action was published as an integrated watershed management strategy for the Humber River (TRCA 1999).

Valley and Stream Corridor Management Program (1994)
The *Valley and Stream Corridor Management Program* is a guideline document developed by TRCA to direct land use activities and development within valley and stream corridors. This Program acknowledges the need for risk management related to flooding, erosion, and slope instability, while ensuring that future environmental degradation is prevented, and natural areas are restored. This Program includes policies and criteria that govern any change to existing resource-based uses of valley and stream corridors. The Program also offers recommendations for the rehabilitation of valley and stream corridors that will help direct short and long-term resource planning activities.

Toronto and Region Remedial Action Plan (1994)
The *Toronto and Region Remedial Action Plan* (RAP) was developed by all levels of government and multi-stakeholders. The plan encompasses 2000 km^2 of Toronto and Region areas of concern including the waterfront and all the watersheds from Etobicoke Creek in the west to Rouge River in the east. The Toronto RAP Team consists of Environment Canada, Ontario Ministry of Natural Resources and TRCA, who implement the RAP throughout the Toronto area. The remedial action plan works towards the following goals:

- Clean waters
- Healthy Habitats
- Science and Monitoring
- Sustainability
- Education and Involvement

Towards a Living City Region (2000)
Toronto and Region Conservation is committed to community partnerships with all sectors of society, to encourage environmental stewardship and build on innovative thinking about environmental health, social responsibility, and sustainable economies.

TRCA's vision of a Living City Region has four objectives:

- Healthy Rivers and Shorelines - To restore the integrity and health of the region's rivers and waters from the headwaters in the Oak Ridges Moraine, throughout each of the nine watersheds in TRCA's jurisdiction, to the Toronto waterfront on Lake Ontario;
- Regional Biodiversity - To protect and restore a regional system of natural areas that provide habitat for plant and animal species, improve air quality and provide opportunities for the enjoyment of nature;
- Sustainable Communities - To facilitate broad community understanding, dialogue and action toward integrated approaches to sustainable living and city building that improve the quality of life for residents, businesses and nature; and
- Business Excellence - To produce continuous improvement in the development and delivery of all programs through creative partnerships, diverse funding sources, and careful auditing of outcomes and effectiveness.

City of Toronto By-Law Ravine and Natural Feature Protection (2002)
The New Ravine Protection By-City of Toronto, *Ravine and Natural Feature Protection By-Law Chapter 658-10,* was passed by City Council on October 03, 2002 to protect features (trees and landform) and functions (ecology and hydrology) of the ravine system encouraging environmentally responsible management. Regarding the restoration of a disturbed site, the City by-law stipulates that;

> "*A person who injures or destroys a tree or places or dumps fill or refuse, or alters the grade of land in a protected area without a permit or in contravention of a condition of a permit, shall replace the tree and remove the fill, or refuse, regrade the area and take any other steps required to restore the site to its original condition to the satisfaction of the General Manager.*"

Terrestrial Natural Heritage System Strategy (2006)
Toronto and Region Conservation's *Terrestrial Natural Heritage System Strategy* (TNHSS) was designed to enhance biodiversity and the quality of life for residents by seeking to increase the amount of forest and wetland habitats. It uses a science-based analytical tool, based on ecological criteria to identify an expanded and targeted land base for inclusion in a terrestrial natural heritage system. The Strategy was designed for the entire TRCA jurisdiction as terrestrial systems and their interactions span watershed boundaries. The target system relates to the terrestrial component of the natural heritage system. Although increases in natural cover benefits many other system components, such as promoting natural water budget, the target terrestrial natural heritage system was designed using terrestrial ecological criteria. The Strategy contains a number of strategic directions including proposed land use planning policies, land management, stewardship and education opportunities, and long-term monitoring.

2.2.3 Aquatic and Terrestrial Habitat Reports

In the past twenty years, management plans have been developed to preserve and improve the aquatic and terrestrial conditions along the Black Creek watershed. Black Creek is a tributary of the Humber River, which is the largest watershed in the Toronto region, as such it is pertinent to sustain this rare environment of aquatic and terrestrial habitats for future generations.

This Class EA incorporates a number of studies compiled over the last thirty years in order to provide a broad understanding of the environmental conditions within the Black Creek watershed. The following sources of information are only several of the resources that were used to define the aquatic and terrestrial conditions for the study area:

- CFN# 21743: Troutbrooke Drive Nos. 49 and 51 Troutbrooke Drive, TRCA Corporate Records.
- CFN# 42381: Troutbrooke Drive Slope Stability Assessment, TRCA Corporate Records.
- Environment Canada, Ministry of the Environment, Ministry of Natural Resources, Toronto and Region Conservation Authority. 1989. Metro Toronto and Region Remedial Action Plan. Stage 1. Environmental Conditions and Problem Definition.
- Toronto and Region Conservation Authority (TRCA). 1982. *Environmentally Significant Areas Study*.
- Ontario Ministry of Natural Resources (OMNR). 2008. Natural Heritage Information Centre, Rouge River Watershed. (nhic.mnr.gov.on.ca/nhic_old.cfm).
- Government of Canada. Committee on the Status of Endangered Wildlife in Canada (COSWIC). (www.cosewic.gc.ca).

Terrestrial and aquatic data was obtained by TRCA. Data from these inventories are referenced in this report where applicable.

2.2.4 Socioeconomic and Cultural Heritage Studies

The following sources of information are only several of the resources that were used to define the socioeconomic conditions and cultural heritage resources for the study area:

- Toronto and Region Conservation Authority. 2010. Archaeology Department.
- City of Toronto website. 2001 and 2006. *Downsview-Roding-CFB Neighbourhood Profile*. (http://www.toronto.ca/demographics/cns_profiles/cns26.htm).
- Toronto Neighbourhoods website. 2010. *Downsview* (http://www.toronto neighbourhoodguide.com/)
- Toronto Transit Commission (TTC) website. 2010. *Bus Routes, 35 Jane Street*. (www.ttc.on.ca).

2.3 Justification of Conservation Authority Involvement

TRCA has a mandate to carry out remedial erosion control works as set out in Section 20 of the Conservation Authorities Act (R.S.O. 1990):

> "*The objects of an authority are to establish and undertake, in the area which it has jurisdiction, a program designed to further the conservation, restoration, development and management of natural resources other than gas, oil, coal and minerals (R.S.O. 1990, C.27, s.20).*"

As part of this broad mandate, CAs are considered to have prime responsibility over water management in terms of water quantity and related hazards through administrative and regulatory powers. In the 1980 Watershed Plan, TRCA developed and implemented its Erosion and Sediment Control Program (ESCP) with two major directions:

> *"To minimize the aggravation or creation of erosion or sediment problems as a result of new development, and to rectify existing problems through protective works" (TRCA, 1980).*

These directions are categorized as either preventative, or protective, respectively. The project falls under the protection component of the ESCP, which is designed to protect lives and minimize loss of property through the construction of suitable remedial works. Through annual capital funding from the City of Toronto, TRCA is able to implement a program or major remedial works for shoreline protection and slope stabilization throughout the watersheds within the City of Toronto. The goal of TRCA through this project is to prevent, eliminate or reduce the risk of hazard to life and property, and to protect and enhance the natural attributes along the Metropolitan, Lake Ontario shoreline and the primary river valleys within Metropolitan Toronto.

The results of the geotechnical assessment carried out by Terraprobe (2010) as described in *Section 2.2* indicate that erosion and slope instability will likely continue at the site, and will eventually affect the residential dwellings located on Troutbrooke Drive if remedial action is not taken.

The extent to which the slope is expected to recede is identified by the long-term stable slope line, which illustrates the required inclination of a given slope to be considered stable. The current projected stable slope is illustrated in **Figure 11**.

3.0 BASELINE INVENTORY

Once the determination has been made that remedial works are warranted at a given site, a baseline inventory is prepared. The baseline inventory provides the information needed to evaluate the alternative options developed through the Class EA process, and a baseline from which to monitor the types and level of environmental impacts that may result from implementing the preferred alternative.

TRCA has developed the following baseline inventory of the existing conditions of the Black Creek valley wall and surrounding environments. The baseline environmental inventory provides the information required to evaluate the alternative methods, and the forms of the baseline from which the preferred alternative will be compared to determine its effectiveness, and environmental impact.

The inventory involves the examination and documentation of:

- the erosion problem
- existing site conditions, including physical, biological, cultural and socioeconomic characteristics
- engineering/technical aspects to be considered
- previous protective measures that have been implemented within the study area

This baseline environmental inventory takes into consideration the directly and indirectly affected environment. The indirect area affected by the project includes Downview Dells and the Black Creek corridor. This indirect area is referred to as the regional study area. The area directly affected by the project is referred to as the study area or project site.

Baseline environmental data was collected from the following organizations due to their specific expertise relevant to the regional and local study area:

- Environment Canada
- Ontario Ministry of Natural Resources
- Ontario Ministry of the Environment
- Toronto Field Naturalists
- Toronto Ornithological Club
- Toronto and Region Conservation Authority

To assist with the review and expansion of the baseline inventory, as well as the design of the preferred alternative, TRCA retained the services of the geotechnical engineering firm Terraprobe Limited in 2010.

Several groups were contacted for their input into the inventory process. This included local landowners, Oakdale Golf and Country Club, Black Creek Conservation Project, and City Councillor, Maria Augimeri.

3.1 Existing Site Conditions

In accordance with the Class EA process, the broad definition of 'environment', as provided in the **Environmental Assessment Act**, is applied to this section. The prepared environmental description is *"an inventory of elements for which a given project is likely to* *have an impact"* (Conservation Ontario, 1993). The inventory includes an evaluation of the presence and extent of physical, biological, cultural, social, economic, and technical engineering elements applicable to the study area.

A drawing of the existing site conditions for the project area is included as **Appendix B**.

3.1.1 Physical Environment

The study area includes tableland, valley wall and floodplain area of Black Creek. The valley wall is approximately 18 m high, with an average upper slope inclination of 1.4 : 1 h : v. The upper slope has been filled and it is estimated that the slope crest is 10 to 15 m further north of it natural position. The results of the geotechnical investigation indicate that approximately 8,000 m^3 of earth fill and rubble overlies the upper natural slope face. Borehole samples indicate that fill extends beyond the dwellings to depths of 1.1 to 7.6 m.

The underlying native soils consist of very stiff silty clay to clayey silt glacial till, which is overlying a deposit of sand and silt found at depths of 4.9 and 2.3 m below grade (elevation 155.9 and 156.3 m Geodetic datum). Within this sand and silt deposit groundwater is found at around elevation 154.7 and 155.6 m (Geodetic datum). The ground water level fluctuates depending on the amount of precipitation and snow melt runoff.

The slope toe is adjacent to the floodplain and a meander of Black Creek. The level of Black Creek at the toe of the slope is measured at plus or minus elevation 142 m (Geodetic datum). Here the saturated, silty clay supports healthy vegetation cover. The only small area of active toe erosion, is located in an area where Black Creek is directly adjacent to the slope at the eastern end of the project site.

Approximately 130 m west of the study area, is an existing rock fill dam referred to as the Black Creek Retardation Dam. This dam was constructed by TRCA in 1961 to mitigate the impact of heavy storm events that result in flash floods in the urbanized area downstream. The concrete channel downstream was designed in concert with the dam. There is no correlation between this flooding and the slope failure that has occurred along the upper slope. Capillary rise of water up the valley wall is restricted as the toe of slope consists of a saturated layer of silt and clay with an overlying layer of sand and silts which are not subject to capillary rise. Furthermore, if capillary rise had led to slope instability failure of the slope would have occurred near the toe of the slope.

Air Quality
The study area is located to the northeast of Toronto's downtown core. The project area experiences similar air quality conditions found throughout the Toronto region as a result of urbanization and industrial development in Southern Ontario. Atmospheric pollutants that are sampled on an hourly basis in the Toronto area include carbon monoxide (CO), nitrogen dioxide (NO2), ground level ozone (O3), sulphur dioxide (SO2), and suspended particulates and total reduced sulphur compounds. Typically, most air pollutants have decreased in concentration or remained relatively stable since the late 1960's (TRCA, 2004).

The Air Quality Index (AQI) is an indicator of air quality, based on hourly pollutant measurements of some or all of the six most common air pollutants listed above and is used to inform Toronto residents of the existing air quality and to provide health advisories when the combined levels of the pollutants exceed certain levels of the index (MOE, 2009). If the air quality value is below 32, the air quality is considered relatively good. If the AQI value is in the range of 32 to 49 (moderate category), there may be some adverse effects on very sensitive people. An index value in the 50 to 99 range (poor category), may have some short-term adverse effects on the human or animal populations, or may cause significant damage to vegetation and property. An AQI value of 100 or more (very poor category) may cause adverse effects on a large proportion of those exposed (MOE, 2009).

Elevated air temperatures during the summer are related to increased air quality index advisories and warnings may be issued for up to several weeks at a time depending on weather conditions. Overall, air quality in Toronto is below National Ambient Air Quality Objectives (MOE, 2010). Below are two examples of testing during spring and summer months. The AQI ratings in July are much lower than the ratings in August and are typical to what is found during these months.

Table 1. Air Quality Readings for North Toronto (August 20, 2010)

Air Quality for TORONTO North			
Date	**Time**	**AQI**	**Cause**
20-Aug-10	12:00 AM	19	Fine Particulate Matter (PM2.5)
21-Aug-10	1:00 AM	26	Fine Particulate Matter (PM2.5)
22-Aug-10	2:00 AM	32	Fine Particulate Matter (PM2.5)
23-Aug-10	3:00 AM	34	Fine Particulate Matter (PM2.5)
24-Aug-10	4:00 AM	35	Fine Particulate Matter (PM2.5)
25-Aug-10	5:00 AM	35	Fine Particulate Matter (PM2.5)
26-Aug-10	6:00 AM	34	Fine Particulate Matter (PM2.5)
27-Aug-10	7:00 AM	30	Fine Particulate Matter (PM2.5)
28-Aug-10	8:00 AM	24	Fine Particulate Matter (PM2.5)
29-Aug-10	9:00 AM	20	Fine Particulate Matter (PM2.5)
30-Aug-10	10:00 AM	20	Ozone (O3)
31-Aug-10	11:00 AM	22	Ozone (O3)
1-Sep-10	12:00 PM	28	Ozone (O3)

Source: MOE, 2010.

Table 2. Air Quality Readings for North Toronto (MOE, 2010)

Air Quality for TORONTO North			
Date	**Time**	**AQI**	**Cause**
20-Oct-10	12:00 AM	13	Fine Particulate Matter (PM2.5)
21-Oct-10	1:00 AM	11	Fine Particulate Matter (PM2.5)
22-Oct-10	2:00 AM	9	Fine Particulate Matter (PM2.5)
23-Oct-10	3:00 AM	8	Fine Particulate Matter (PM2.5)
24-Oct-10	4:00 AM	8	Fine Particulate Matter (PM2.5)
25-Oct-10	5:00 AM	9	Fine Particulate Matter (PM2.5)
26-Oct-10	6:00 AM	9	Fine Particulate Matter (PM2.5)
27-Oct-10	7:00 AM	9	Fine Particulate Matter (PM2.5)
28-Oct-10	8:00 AM	7	Fine Particulate Matter (PM2.5)
29-Oct-10	9:00 AM	8	Ozone (O3)

30-Oct-10	10:00 AM	12	Ozone (O3)
31-Oct-10	11:00 AM	14	Ozone (O3)
1-Nov-10	12:00 PM	13	Ozone (O3)

Surface Drains
Several homes have down-spouts that are routed to the back of the house or drain underground with possible connection to drains into the ravine or into the City storm sewer system. This overland drainage contributes to surface erosion and the formation of gullies along slope face.

Black Creek
Black Creek is a tributary of the Humber River, a designated Canadian Heritage River. The Black Creek subwatershed is highly urbanized and covers an area of approximately 68 Km^2. Black Creek is considered a third order intermediate warm water stream, where over half of the streams have been designated as third order due to a the loss of length of many historic first and second order tributaries (TRCA, 2005). The reach of stream located north of Troutbrooke Drive has a slope percent ranging between 0.0-0.3%. Currently, 38% of Black Creek has riparian cover and sixteen in-stream barriers to fish passage have been identified throughout the Creek.

The hydrology of the Humber River is driven by overland flow and groundwater inputs. A number of factors including soil type, topography, land use, soil moisture and precipitation intensity and duration dictate the amount of overland flow. Groundwater discharge to a stream forms baseflow that provides a source of water throughout the year. Within the Black Creek subwatershed, only one location between Finch and Sheppard Avenues is thought to contribute significant groundwater discharge (TRCA, 2005). The estimated baseflow ratio for Black Creek is approximately 15%. Due to the high intensity of development and lack of baseflow, Black Creek is unable to support a self-sustaining cold water fish community. However, due to some localized groundwater inputs, the creek may be able to support an introduced coldwater species such as brown trout (*Salmo trutta*). The Black Creek flow regime under a number of storm return periods is outlined in **Table 3**.

Table 3. Black Creek Flow Data (TRCA, 2011)

Event	Peak Flow (cms)	W.S. Elev (m)	Velocity (m/s)
Regional	379.1	146.29	0.33
100 Year	200.6	145.21	0.21
50 Year	174.3	145.01	0.19
25 Year	148.6	144.81	0.17
10 Year	114.7	144.52	0.13
5 Year	89	144.28	0.11
2 Year	55.7	143.88	0.07

Soil/Fill Quality
In general, the subsurface soil conditions encountered in the boreholes that have been advanced across the project site consisted of earth fill and rubble that extends to depths of 1.1 to 7.6 m near the residential structures, to no fill material at the mid-way point of slope. The underlying native soils consist of very stiff or dense glacial till deposits overlaying a stiff to hard deposit of clay and silt (Terraprobe, 2010).

In October 2010, soil sampling was conducted by TRCA. The samples were sent to a certified laboratory, AGAT Laboratories, for soil analysis. The soil samples were analyzed for the following parameters:

- Metals & Inorganics
- Volatile Organic Compounds
- Petroleum Hydrocarbons F1 – F4
- Polycyclic Aromatic Hydrocarbons

All soil samples were within the Provincial Soil Quality Guidelines for residential/parklands. A copy of the Certificate of Analysis is included as **Appendix E**.

Water Quality
Escherichia coliform (E.coli) is the form of coliform bacteria used in Ontario to indicate the presence of harmful bacteria in surface waters. The Provincial Water Quality Objective (PWQO) for E.coli is 100 CFU/100 mL for swimming areas. Near the outlet of the Black Creek subwatershed recent TRCA records indicate levels of E.coli at 1444 CFU/100 mL. TRCA also has records of other conventional pollutants and trace metals sampled at the mouth of Black Creek between 2002 and 2004. The percent of time these pollutants were found to be within provincial and Canadian guidelines are shown in **Tables 4 and 5**.

Road salts have come under increased scrutiny since they were deemed to be a toxic substance as defined in Section 64 of the Canadian Environmental Protection Act (Environment Canada and Health Canada, 2001). The five year risk assessment leading to the designation of road salts as 'toxic' suggested a limit for chloride (a major constituent of road salt) of approximately 250 mg/L for the protection of sensitive aquatic organisms. Chloride concentrations at the mouth of the Black Creek subwatershed are extremely high with only 38% of samples collected below the 250 mg/L limit.

Table 4. Percent of Time Selected Conventional Pollutants Met Guidelines at the Mouth of Black Creek Monitoring Station (TRCA, 2002 - 2004)

Total Suspended Solids	Chloride	Total Phosphorus	Nitrate	Un-ionized Ammonia	Dissolved Oxygen
95	38	38	24/90	100	100

Table 5. Percent of Samples that Met Guidelines for Selected Trace Metals at the Mouth of Black Creek Monitoring Station (TRCA, 2002 - 2004)

Lead	Copper	Zinc	Cadmium	Chromium	Iron	Nickel
94	81	63	100	94	50	94

3.1.2 Biological Environment

The forested areas and grasslands within the Downsview Dells parklands, adjacent to the study area provide a continuous corridor of habitat for mammal, bird and reptile species.

TRCA monitoring of flora and fauna are reported by their local significance. A local significance "L-Rank" has been created by TRCA and it is applied to species, or communities to provide a measure of their biological significance, or abundance in a Greater Toronto Regional context. L-Ranks represent a scale of significance that ranges from L1 to L5. L1 or a low L-score represents a high significance, and high L-score represents low significance. Also included is L+, which indicates a non-native species or community which is not ranked in the range.

Table 6. Typical L - Rank Description (TRCA, 2006)

Status	Description
L1	Extremely significant in TRCA Region due to rarity, stringent habitat needs, and/or threat to habitat
L2	Highly significant: occurs in high-quality natural areas and is probably declining in the Toronto area, often already rare
L3	Locally significant: generally occurs in natural rather than cultural areas; may be vulnerable to decline
L4	Generally secure; may be a conservation concern in a few specific situations
L5	Dependent on degraded, often urban habitats; not a conservation concern
L+	Non-native species or community which generally requires management unless special conservation concern exists

The mid-slope can subdivided into two ecological land classification units. Of the two units, the Fresh-Moist Sugar Maple-White Elm Deciduous Forest (0.24 ha) is the dominant terrestrial community followed the Dry-Fresh Sugar Maple Deciduous Forest (0.22 ha). The Black Creek floodplain consists of a Willow Mineral Deciduous Swamp (4.57 ha) community. Although, observed outside of the Troutbrooke Drive study area the following locally rare plants were noted nearby: spinulose wood fern (*Dryopteris Carthusiana)* L5, northern lady fern (*Athyrium filix-femina var. angustum)* L5, mountain maple (*Acer spicatum)* L4 and foam flower (*Tiarella cordifolia) L4*. Both mountain maple and foam flower are listed on the Natural Heritage Information Centre as rare species of interest (MNR 2006).

TRCA staff identified a willow mineral deciduous swamp with stagnant water at the base of the valley wall. This type of willow community grows on peat or muck soils in a moist environment. Typically, these swamps are flooded seasonally, potentially with a variety of wetland trees and shrubs. There are several terrestrial exotic/alien and invasive flora species found within this area. These species include: Common reed (*Phragmites australis*), and Manitoba maple (*Acer negundo*). These species reproduce prolifically and tend to out-compete many desirable plant species.

TRCA has similarly categorized and ranked the fauna species depending on the level of concern, known as "L-Ranks" found within the vicinity of the project area. The study area is located within an important migratory zone, which encompasses both the Atlantic and Mississippi flyways. Songbirds rely on the vegetated system of ravines and valleys found throughout Toronto when in need of rest, food, or shelter from adverse weather conditions during migration. This habitat serves as an important staging area for these birds when they are most vulnerable. Waterfowl, shorebirds, and birds of prey are also common migrants.

Table 7. Fauna Species of Concern (TRCA, 2010)

Common Name	Scientific Name	L Rank
American crow	*Corvus brachyrhynchos*	L5
Black-capped chickadee	*Poecile atricapillus*	L5
Blue jay	*Cyanocitta cristata*	L5
Downy woodpecker	*Picoides pubescens*	L5
Northern cardinal	*Cardinalis cardinalis*	L5
Great crested flycatcher	*Myiarcyhus crinitus*	L4
Northern flicker	*Colaptes auratus*	L4

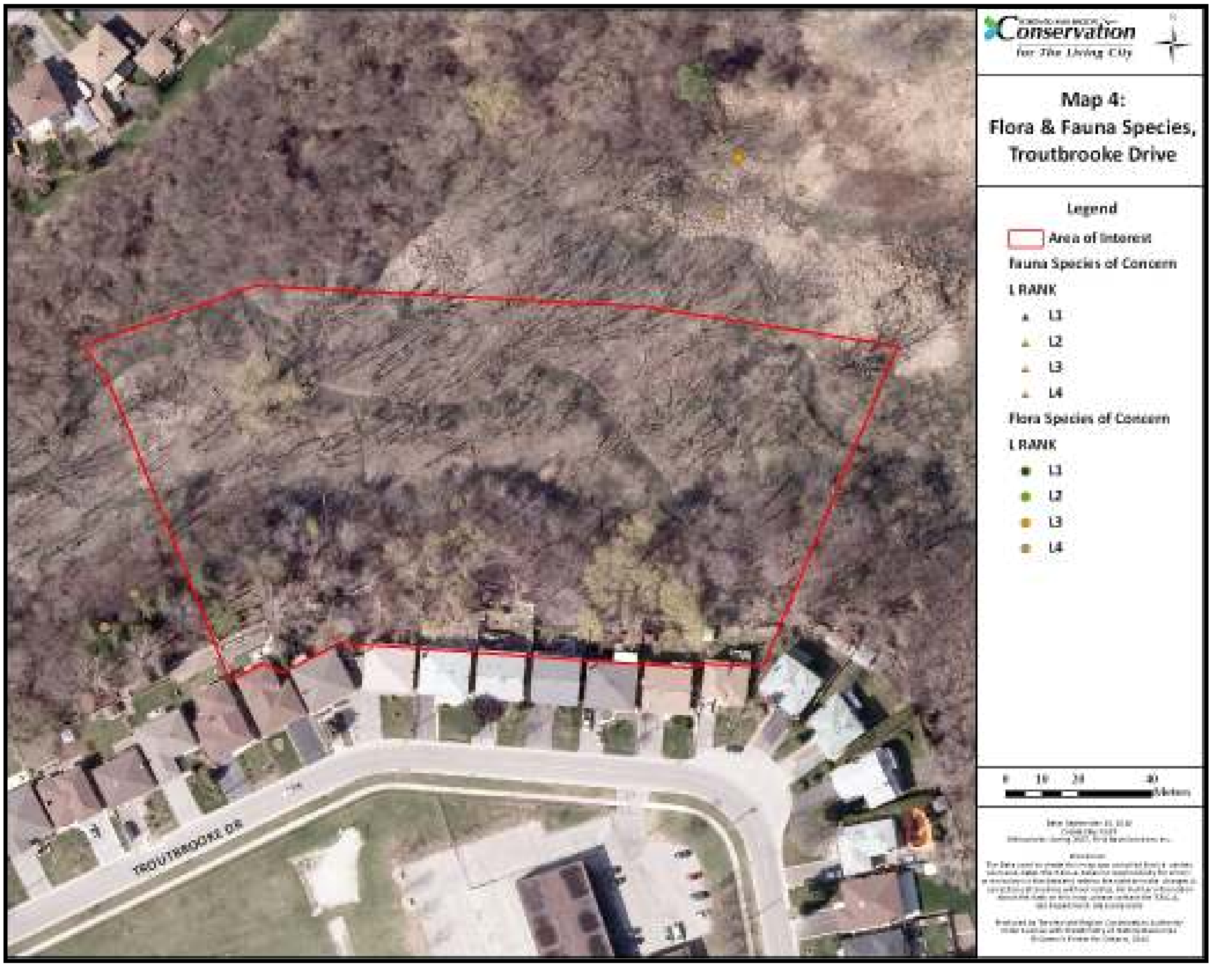

Figure 8. General location of the “L” rating of flora and fauna species within the vicinity of study area. *Source: TRCA, 2010.*

Fish Habitat

Black Creek supports a warm water fish community. A TRCA monitoring station (HUFMP13) is located North East of the intersection of Jane Street and Troutbrooke Drive. This station is used to collect data under the Ontario Stream Assessment Protocol (OSAP). Water quality is assessed through the collection and analysis of macroinvertebrates that are present at the site. In 2004, results indicate a Hilsenhoff reading of 5.65. These results indicate that there is likely fairly substantial organic pollution present.

Historically a total of 18 species were in the Black Creek subwatershed, 16 of which are native. In 2001 an Index of Biotic Integrity (IBI) was used to measure fish community associations to identify the general health of the broader stream ecosystem. The median score for Black Creek falls into the "poor" stream quality range. A 2004, fisheries survey discovered one blacknose dace (*Rhinichthys atratulus*) in this reach of Black Creek. The recommendations made in the Fisheries Management Plan suggest that restoration efforts target the rehabilitation of Darter Species.

3.1.3 Cultural Environment

The study area is located in a low-density residential area within the “Downsview” neighborhood in the former City of North York. The majority of the properties located within the study area are owned by private landowners, more specifically there are nine (9) residential properties that back directly onto the valley wall of Downsview Dells Park. The valley wall is owned by the private landowners and Downsview Dells parklands are owned by TRCA and managed by the City of Toronto. It should be noted that the majority of the proposed work area is on private lands; however some lands may be transferred to TRCA prior to any remedial works taking place.

In accordance with the Class EA process and TRCA’s policy, lands subject to be impacted by Authority projects are subject to a variety of investigations prior to the commencement of construction. As a component of this practice, TRCA conducts archaeological investigations to determine whether or not the study area contains cultural heritage resources that might be impacted by the land-use modifications.

A Stage 1 and 2 Archaeological Assessment was completed by TRCA’s Archaeology Resource Management Services in November 2010. This assessment encompassed the designated construction area and proposed access route, on Lot 14 Concession IV West, in the City of Toronto. A copy of the assessment is included as **Appendix E**.

The following are the results of this archaeological assessment:

- No cultural material was encountered during the archaeological assessment.
- The portions of the project area assessed for the storage and stockpiling area in Downsview Dells Park as well as the access route from the park through the valley lands to the rear of the construction area north of the houses at 35 to 51 Troutbrooke Drive be considered free from archaeological concern.
- The backyards and slope where the erosion control measures are to be implemented has been assessed as excessive slope and was avoided during the Stage 2 assessment. It is recommended that this area be considered free of archeological concern for removal of fill and existing retaining structures that overlie the natural grade.

The following recommendations were proposed:

- In the event that construction methods are altered to remove fill below the natural grade then further Stage 2 assessment or Stage 2 monitoring will be required to assess for deeply buried resources.

- The remainder of the project area be cleared of any further archaeological concerns.
- In the event the project area is altered or expanded beyond the current boundaries that further Stage 2 assessment be completed.

3.1.4 Socioeconomic Environment

Downsview is one of the largest neighbourhoods in the City of Toronto. The Downsview community is located from Allen Road in the east to Highway 400 in the west and Sheppard Avenue in the north to Lawrence Avenue West in the south. It should be noted that Downsview community is within a larger community referred to as the Downsview-Roding-CFB Community, a map illustrating both boundaries of the Downsview and Downsview-Roding-CFB community are shown in **Figure 9** and **Figure 10.**

The neighbourhood is made up of diverse ethnic groups, primarily Italian, Spanish, Vietnamese and Chinese among other groups. Based on 2006 census data, the community is primarily made up of working age adults (54%), followed by children (18%), seniors (16%) and youth (12%). Based on 2006 census data, the average cost of a dwelling in this neighbourhood is $376,124.

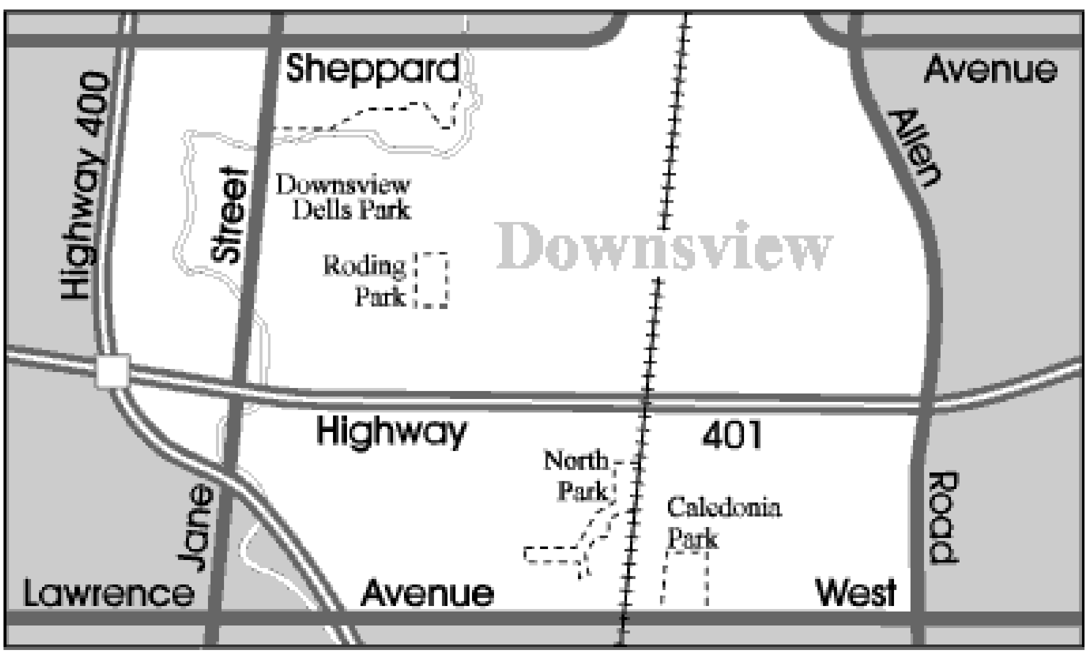

Figure 9. Boundaries of Downsview Community.
Source: Toronto Neighbourhoods, 2010.

Figure 10. Boundaries of Downsview-Roding-CFB Community.
Source: City of Toronto, 2006.

For many years Downsview was predominately an agricultural community with a church, general store, school and post office. In the 1920's a famous aircraft company decided to develop in the community, followed by a military base in World War Two. After the war the community underwent a significant development boom until the early 1970's. Recent investment in this community includes construction of the Humber River Regional Hospital (opening 2014) acute care facility and Forensic Services and Coroner's Complex at the intersection of Keele St and Wilson Ave.

Existing Transportation Routes
The main transportation routes surrounding the study area are Jane Street to the west and Sheppard Avenue to the north. The closest main transportation route is Sheppard Avenue East which is located west of the project site.

The major artery road that services the study area is Jane Street with a regulatory speed limit of 60 km/h and a daily two way traffic flow of approximately 17,500 vehicles per day. Traffic control signals are located approximately 280 metres to the south at Exbury Road and 315 metres to the north at Giltspur Drive. The affected properties are located on Troutbrooke Drive a two lane local roadway with a regulatory speed limit of 50 km/h. The Toronto Transit Commission (TTC) has public transit buses through North York via Jane St. (e.g. Bus 35 Jane Street) with various routes and times (TTC, 2010).

There is no access road at the base of the slope within the Black Creek valley in the vicinity of the project area. However, there is a maintenance access road from the parkette, located at the northeast corner of the Jane Street and Troutbrooke Drive intersection, to the Black Creek Dam. The proposed construction access route for this project is to extend the maintenance access road to the base of the slope to the affected properties.

Surrounding Land Uses
The Downsview Dells parklands (i.e., floodplain) are owned by TRCA and managed by the City of Toronto. These parklands are utilized by area residents for recreational pursuits such as walking and cycling.

Oakdale Golf and Country Club is located at 2388 Jane Street due west of the study area. It should be noted in 2007 a water main was installed from Black Creek to the golf course to upgrade the sprinkler system. With the installation of the water main the golf course was granted an easement on TRCA lands. More specifically, the easement travels from the parkette, located at the northeast corner of the Jane Street and Troutbrooke Drive intersection, along the south side of Black Creek and crosses the creek just east of the Black Creek Dam. TRCA requires permission from the golf course to access the easement as it is located in a portion of the proposed construction access route. The location of the easement is shown in **Appendix E**.

3.1.5 Engineering/Technical Environment

Rate of Erosion in Ecosystem
Based on Terraprobe's geotechnical investigation and slope stability analysis the slope will experience various recession rates depending on the current location and condition of the slope. If there is no remedial work performed on the slope it is expected that there will be property loss at each of the residential properties from Nos. 35 to 51 Troutbrooke Drive with a loss of approximately 4 to 11 m of tableland in an unknown timeframe.

The slope toe is adjacent to the floodplain and a meander of Black Creek. There evidence of only one small area of active toe erosion, where Black Creek is directly adjacent to the slope at the eastern end of the project site. At the rear of property Nos. 35 and 37 there is erosion of the creek bank exposing 0.3 m of soil and tree roots. As such Terraprobe recommends a setback of 5 m to allow for future toe erosion.

Sediment Deposition Zones in Ecosystem
Black Creek is located approximately 50 m north of the study area. Between the creek and valley wall is the floodplain with a willow mineral deciduous swamp. The sediment supply travels downstream, and the majority of the sediment settles immediately upstream of the rock fill dam, known as the Black Creek Dam, located approximately 150 m northwest of the study area. The need for sediment removal and other maintenance of the dam structure is assessed by TRCA on an annual basis. This monitoring has identified the need for sediment removal upstream of the dam to maintain flood storage capacity within the floodplain to prevent downstream flooding. This maintenance will be undertaken by TRCA in the near future but will not have any impact on planned slope remediation works.

Flood Risk in Ecosystem
During high flow storm events the waters of Black Creek, water levels in the creek rise and over top the banks, spilling out into the floodplain. Seasonal peaks and major storm events can cause water levels in the creek to rise to over a metre, with elevations of 143.88 m to 144.81 (based on predicted 2 and 25 year storm events respectively). These events have little impact on the upper slope stability due to slope heights of upwards of 18 m found within the study area.

Slope Stability
Slope instability at the study area is considered to be the result of a significant volume of fill material placed over the natural slope crest, and construction of make-shift retaining structures on the residential properties located at Nos. 35 to 51 Troutbrooke Drive. Overland flow and groundwater discharge across the slope face are identified as triggering these events, particularly when freeze and thaw events occur in the spring. The spring 2009 failure has created oversteepened slope conditions which continue to erode and self stabilize.

All detailed geotechnical slope stability analyses require the selection of a design minimum Factor of Safety; the values for which are used to determine the long-term stable slope inclination. According to the Ministry of Natural Resources (MNR) Policy Guidelines a minimum Factor of Safety for active land use, which would include residential properties such as Nos. 35 to 51 Troutbrooke Drive, typically are between 1.3 to 1.5 (MNR, 1994). The following table has further details on the MNR Policy Guidelines.

Table 8. MNR Recommended Minimum Design Factors of Safety.

Type	Land – Uses	Design Minimum Factor of Safety
A	PASSIVE: no buildings near slope; farm field, bush, forest, timberland, woods, wastelands, badlands, tundra	1.1
B	LIGHT: no habitable structures near slope; recreational parks, golf courses, buried small utilities, tile beds, barns, garages, swimming pools, shed, satellite dishes, dog houses	1.2 to 1.3
C	ACTIVE: habitable or occupied structures near slopes; residential, commercial, and industrial buildings, retaining walls, storage/warehousing of non-hazardous substances	1.3 to 1.5
D	INFRASTRUCTURE and PUBLIC USE: public use structures and buildings (i.e. hospitals, school, stadiums), cemeteries, bridges, high voltage power transmission lines, towers, storage/warehousing of hazardous materials, waste management areas	1.4 to 1.5

Source: MNR, 1994.

Based on the ten (10) selected cross-sections, one cross section per property with the exception of 45 Troutbrooke Drive (e.g., 35, 37, 39, 41, 43, 45a, 45b, 47, 49, and 51) and the representative soils the following table outlines the minimum Factor of Safety for potential slope slides at each of the affected properties.

Table 9. Analysis of Existing Slope Conditions

Section (House No.)	Slope Inclination	Approx. Slope Height (m)	Minimum Factor of Safety for Potential Slope Slides
			Overall Slope Existing Conditions
35	1.3 H : 1 V (upper) 2.0 H : 1 V (lower)	19	1.3
37	1.3 H : 1 V (upper) 2.1 H : 1 V (lower)	19	1.3
39	1.2 H : 1 V (upper) 2.0 H : 1 V (lower)	19	1.4
41	1.6 H : 1 V (upper) 1.8 H : 1 V (lower)	18	1.5

43	1.7 H : 1 V (upper) 2.5 H : 1 V (lower)	18	1.8
45a	1.6 H : 1 V (upper) 1.7 H : 1 V (lower)	19	1.6
45b	1.6 H : 1 V (upper) 2.0 H : 1 V (lower)	18	1.6
47	1.0 H : 1 V (upper) 2.6 H : 1 V (lower)	18	1.6
49	1.0 H : 1 V (upper) 1.7 H : 1 V (lower)	18	1.5
51	1.8 H : 1 V (upper) 2.1 H : 1 V (lower)	19	1.6

Source: Terraprobe, 2010.

Based on the slope stability analysis results, the areas most susceptible to slope instability or erosion are at the residential properties located at 43, 45 and 51 Troutbrooke Drive.

Hazardous Lands/Hazardous Sites

Hazard lands within the Regional Study Area include all of the floodplain which is susceptible to flooding or which have unstable slopes or soils. TRCA administers Ontario Regulation 166/06: Development, Inference with Wetlands and Alterations to Shorelines and Watercourses. Through this regulation TRCA has the ability to prohibit, regulate or require permission for development where the control of erosion may be affected. TRCA has delineated a Regulation Limit which identifies TRCA's area of interest based on hazards associated with the position of the crest slope of the ravine including the 100 year flood level and predicted the LTSCC of the valley wall. All residential properties located on a ravine lot within the study area are within this Regulation Limit.

4.0 DESCRIPTION OF PRELIMINARY ALTERNATIVE CONCEPTS

The information obtained in completing the baseline inventory is used in the evaluation of alternative options, giving specific consideration to the advantages and disadvantages of each method.

4.1 Description of Preliminary Concepts

In September 2010, TRCA retained Terraprobe Inc. to examine the causes and effects of the on-going erosion and to design appropriate remedial alternative options to eliminate erosion within the project area. The following four (4) preliminary site appropriate remedial options were developed:

- Preliminary Concept 1 – "Do Nothing" Alternative
- Preliminary Concept 2 – Remove Fill and Replace with Compacted Fill Slope
- Preliminary Concept 3 – Remove Fill and Replace with an Engineered Structure
- Preliminary Concept 4 – Greenspace Acquisition

It should be noted that for each preliminary concept with the exception of the "Do Nothing" and Concept 4, the upper decks located at Nos. 39 and 49 Troutbrooke Drive are required to be disassembled, removed and replaced during construction, as the existing footings are grounded in the existing fill material.

4.1.1 "Do Nothing" Alternative

The "Do Nothing" option is a mandatory alternative that must be considered in the Class EA process, as it helps to justify the need to undertake a remedial flood or erosion control project. Should the "Do Nothing" option, or other Conservation Authority programs such as land acquisition be deemed to be a more acceptable solution, then there is no further consideration for remedial action and the Class EA process terminates.

Under the "Do Nothing" alternative the slope will continue to recede until the slope reaches a stable inclination. As the slope erodes a significant portion of tableland will be within the erosion hazard limit, including the residential structures and associated infrastructure from Nos. 37 to 51Troutbrooke Drive. Terraprobe (2010) determined that if no remedial work was undertaken it would be expected that there would be crest loss across the entire site to the long-term stable slope crest (LTSSC), which would vary depending on the condition of the slope. In general, the residential properties are anticipated to lose approximately 4 to 11 m of tableland in an unknown timeframe.

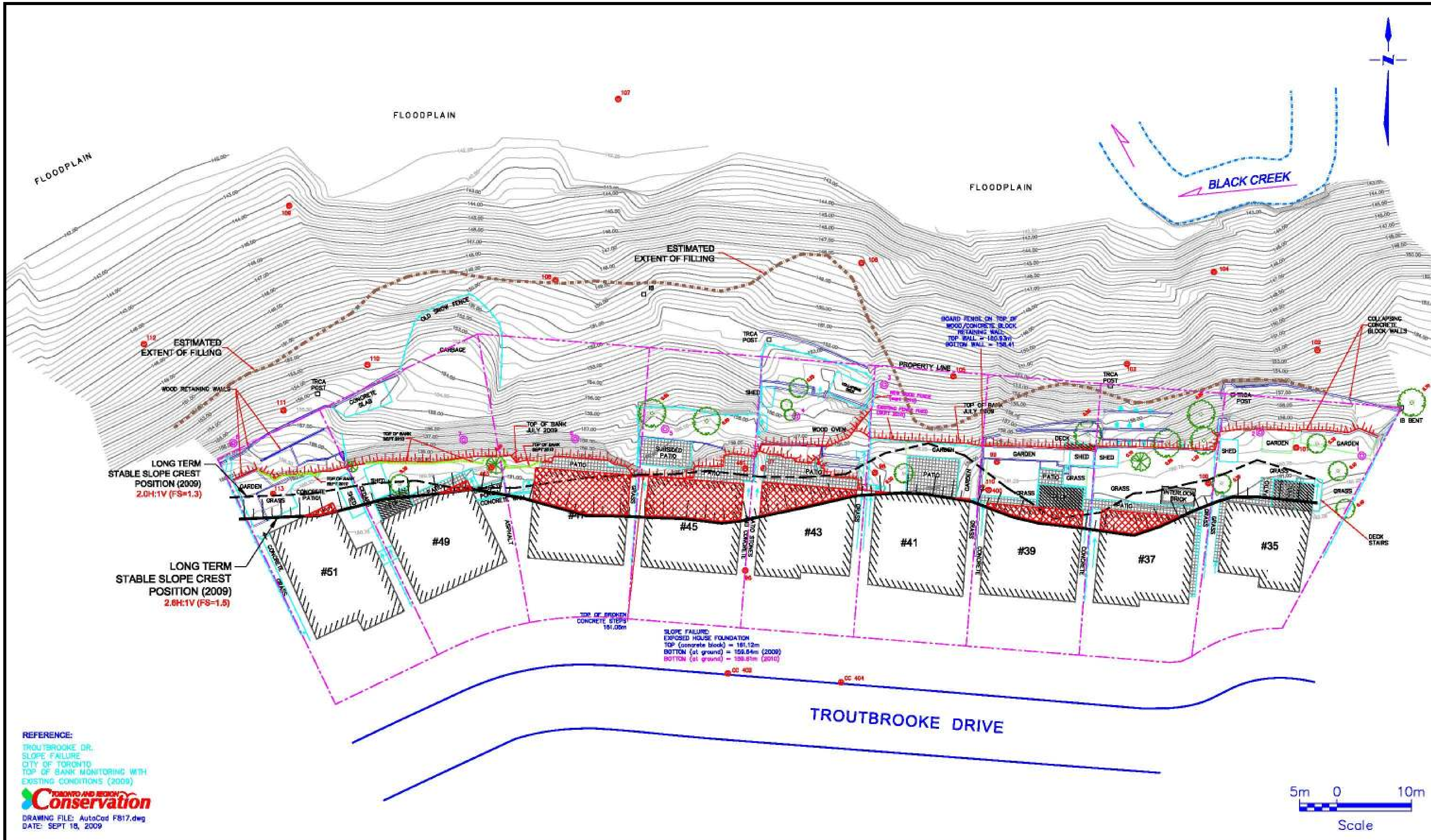

Figure 11. Long-term stable slope crest line (LTSSC) without any remedial protection.
Source: *Terraprobe, 2011.*

4.1.2 Preliminary Concept 2 – Remove Fill and Replace with Compacted Fill Slope

In order to achieve stable slopes in the rear yards of the dwellings, this option proposes removal of the existing unengineered fill material at the approximate edge of the existing dwellings and replacing with good quality fill, compacted to a stable slope inclination. Utilizing different potential fill materials the slope inclinations can range from 2.5 H : 1 V, 2.0 H : 1 V, or 1.5 H : 1 V. Utilizing the 2.5 H :1 V slope option at this site would also require construction of a 1-2 m high, free draining berm at the toe to contain the fill. A perforated seepage collector pipe at the bottom of the slope between the fill and native soil is also required to move groundwater through the slope face. Vegetation on the slope face would also be part of this option to control surface erosion.

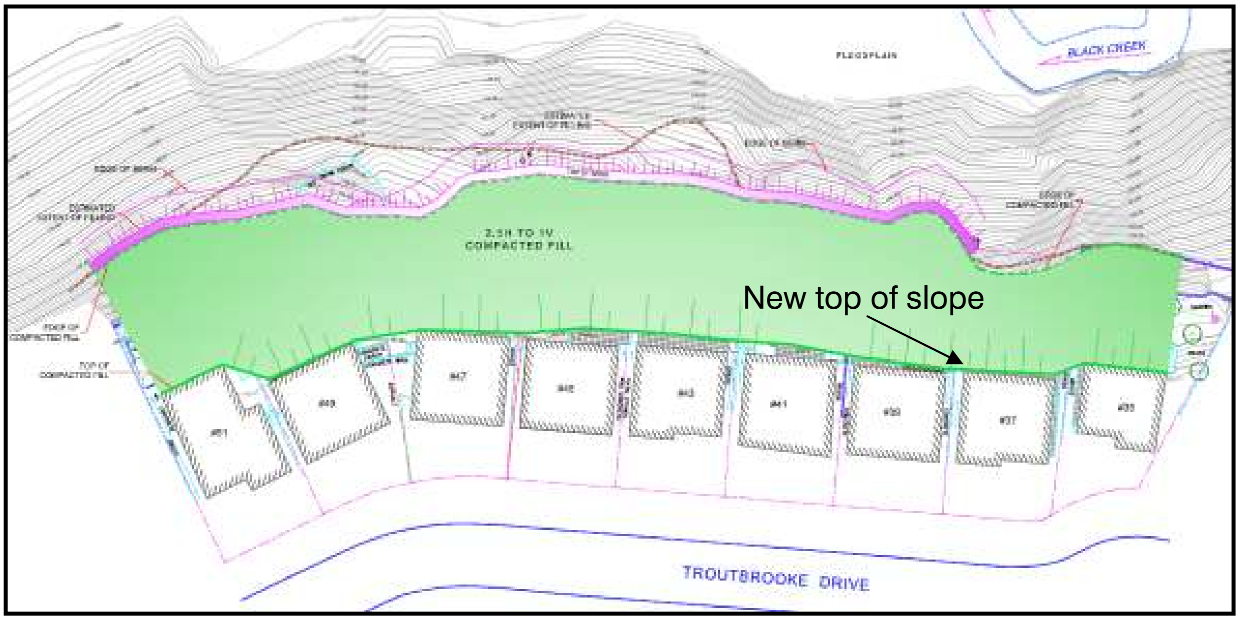

Figure 12. Preliminary Concept 2 – Remove Fill and Replace with Compacted Fill Slope
Source: Terraprobe, 2010.

4.1.3 Preliminary Concept 3 – Remove Existing Fill & Replace with an Engineered Mechanically Stabilized Earth Wall

In order to achieve stable slopes in the rear yards of the dwellings, this option utilizes a vegetated retaining wall with a face angle of 1 H : 1 V. Prior to construction the existing fill would be removed from the back of the dwellings to an inclination of 1 H : 1 V and replaced with a compacted geogrid mechanically reinforced wall. The height of the wall would range from 7 to 11 m. The facing system would be comprised of either SierraScape or Envirolok, which support creation of a vegetated slope face.

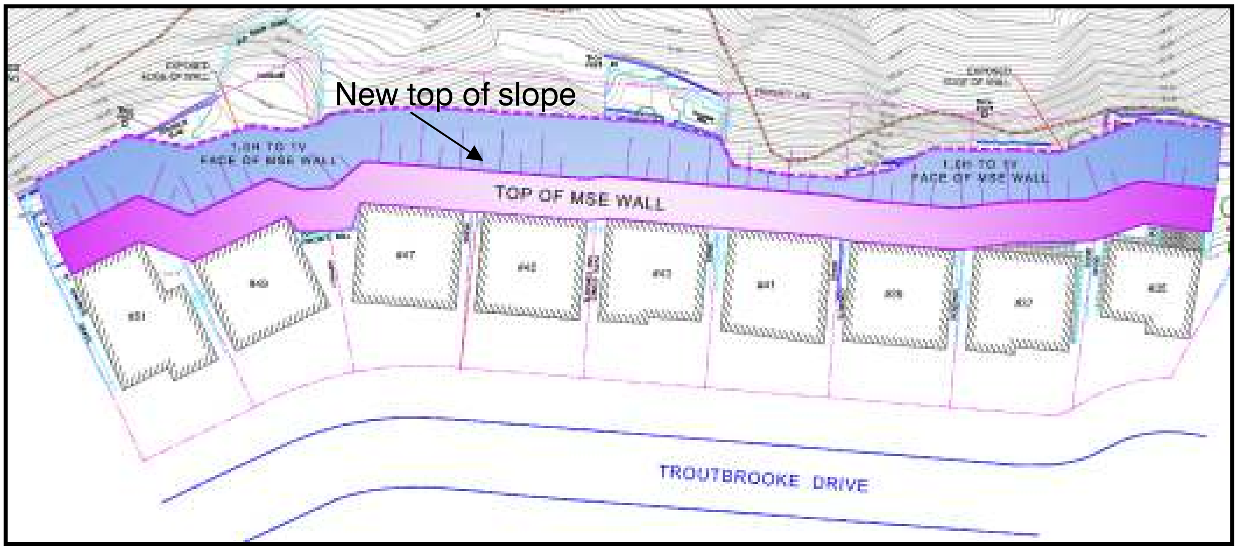

Figure 13. Preliminary Concept 3 – Remove Existing Fill & Replace with an Engineered MSE Wall.
Source: Terraprobe, 2010.

4.1.4 Preliminary Concept 4 – Greenspace Acquisition

This preliminary concept removes the risk to the public by the demolition of the residential structures and regrading the slope to a more stable inclination. These properties would become a greenspace for the use of the local community. With this concept it is anticipated that there will be minimal long-term impact to the existing tableland. A conceptual plan view of this option is shown in **Figure 14.**

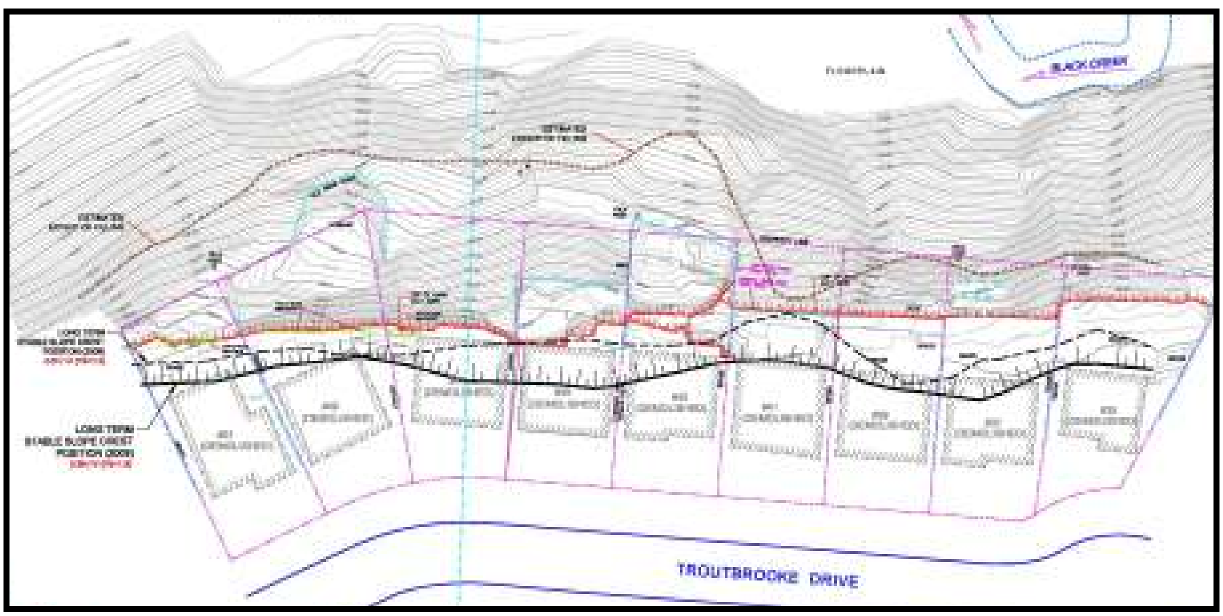

Figure 14. Preliminary Concept 4 – Greenspace Acquisition.
Source: Terraprobe, 2011.

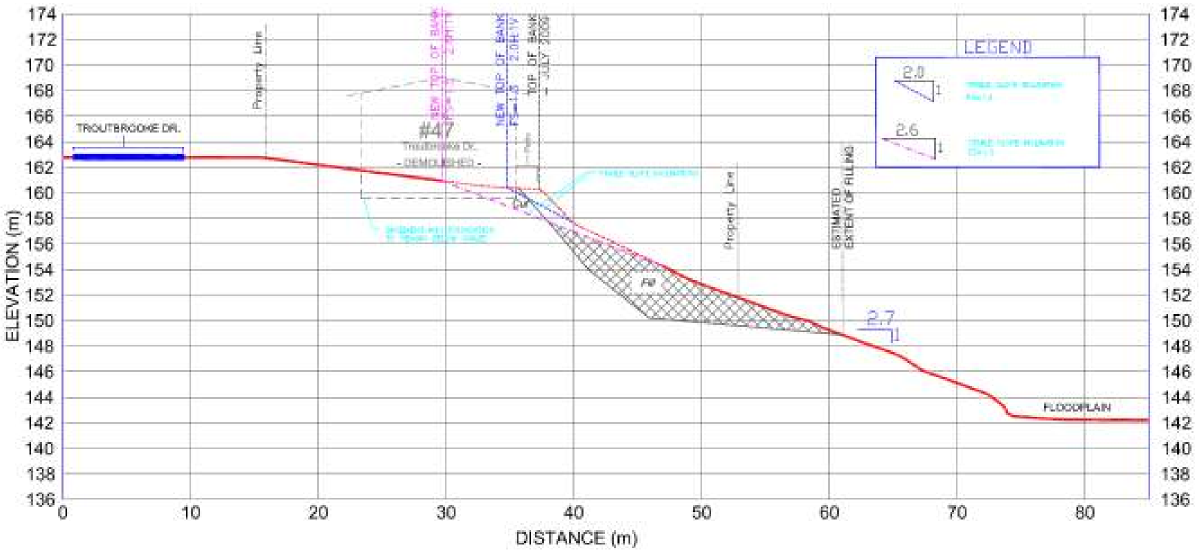

Figure 15. Preliminary Concept 4 residential structures will be demolished and the slope re-graded. *Source: Terraprobe, 2011.*

Costs for Preliminary Concept 4 were estimated using unit prices from recently tendered projects in 2010. These cost estimates include planning, legal fees, acquisition, demolition, restoration, and contingency allowance, but are still only concept level cost estimates. Based on these assumptions this alternative is valued at $5.9 million.

5.0 EVALUATION OF PRELIMINARY ALTERNATIVE CONCEPTS

The baseline information was used to evaluate the alternative design concepts giving specific consideration to the positive and negative impacts on the existing physical, biological, socioeconomic, and cultural environments, as well as technical and engineering concerns. The results of the evaluation are outlined under the respective evaluation criteria categories below.

5.1 Evaluation Criteria

To ensure that the proposed solution best meets the project objectives, TRCA, Terraprobe Inc., and CLC members had several discussions to determine the most essential evaluation criteria in relation to the physical, natural, cultural, socio-economic, technical engineering and feasibility and costs elements. Each of the preliminary concepts were evaluated with the criteria outlined in **Section 5.1.1** to **5.1.3** as summarized in **Table 10.**

5.1.1 Physical and Biological Criteria

To achieve the project objective of preserving or enhancing the ecological conditions of the slope, the following four physical and biological evaluation criteria were considered as part of the evaluation of the alternatives:

- Consider construction related impacts such as noise, dust, vibration
- Ensure no negative impact to Black Creek
- Protect or enhance existing native vegetation
- Consider potential impact on nesting birds

5.1.2 Cultural and Socioeconomic Criteria

To achieve the project objective to ensure there was minimal impact to the community during and after construction, the following six cultural and socioeconomic considerations were considered as part of the evaluation of alternatives:

- Consider impact on Downsview Dells Park
- Ensure no negative impacts to existing infrastructure
- Prevent future property damage
- Prevent or minimize property loss of public and private land
- Reduce risk to public safety
- Consider compatibility with existing land use

5.1.3 Technical and Engineering Criteria

To achieve the project objective of creating a stable slope that will not jeopardize the safety of life, the following technical and engineering considerations were considered as part of the evaluation alternatives:

- Eliminate or reduce slope hazard
- Protect against future erosion and slope instability
- Consider site access requirements
- Consider feasibility of construction and costs

The advantages and disadvantages of each of the preliminary concepts have been considered against the evaluation criteria developed by TRCA, Terraprobe Inc. and the CLC members. The results of this evaluation are summarized in **Table 10**.

Table 10. Results of Evaluation of Preliminary Concepts

Evaluation Criteria	Alternative	Advantage	Disadvantage	Effect on Environment
PHYSICAL AND BIOLOGICAL				
Consider impact of construction on noise, dust, vibration	Do Nothing	•		No construction related impacts.
	Concept 2		•	Potential for noise, dust and vibration impacts during construction.
	Concept 3		•	Potential for noise dust and vibration impacts during construction.
	Concept 4		•	Potential for noise dust and vibration impacts during demolition.
Ensure no negative impact to Black Creek	Do Nothing	•		No impact to Black Creek.
	Concept 2		•	Potential for sediment entering Black Creek.
	Concept 3		•	Potential for sediment entering Black Creek.
	Concept 4	•		Construction access will be from the top of slope, no impact to Black Creek.
Preserve or enhance existing native vegetation	Do Nothing		•	Some trees on the valley wall will be lost to erosion.
	Concept 2		•	Trees on valley wall require removal to facilitate construction.
	Concept 3	•		Trees on valley wall require removal to facilitate construction.
	Concept 4	•		Allows vegetation to be restored on tableland.
Consider potential impact on nesting birds	Do Nothing	•		No impact.
	Concept 2	•		Potential for construction related disturbance during Nesting Bird Window - May 1 to July 23.
	Concept 3	•		Potential for construction related disturbance during Nesting Bird Window.
	Concept 4	•		Potential for construction related disturbance during Nesting Bird Window.
CULTURAL AND SOCIOECONOMIC				
Consider impact on Downsview Dells Park	Do Nothing	•		Minimal impact to adjacent parkland.
	Concept 2		•	Impact to parkland as valley wall would be regraded and mature vegetation removed.
	Concept 3	•		Impact to parkland as valley wall would be regarded to an inclination of 1 H: 1 V.
	Concept 4	•		Increases amount of parkland.
Ensure no negative impact to existing infrastructure	Do Nothing	•		No anticipated impacts.
	Concept 2		•	Access and construction activities have potential for negative impacts.
	Concept 3		•	Access and construction activities have potential for negative impacts.
	Concept 4		•	Residential structures and associated infrastructure would be removed.
Prevent future property damage	Do Nothing		•	High risk of future property damage and loss of tableland.
	Concept 2	•		Prevents future property damage.

	Concept 3	•		Prevents future property damage.
	Concept 4	•		Prevents future property loss.
Reduce risk to public safety	Do Nothing		•	Ongoing concern for public safety.
	Concept 2	•		Minimal risk to public.
	Concept 3	•		Minimal risk to public.
	Concept 4	•		No risk, TRCA would purchase all nine (9) properties and establish stable slope.
Consider compatibility with existing land use	Do Nothing		•	Property owners would have limited or no use of rear yards.
	Concept 2		•	Provides limited to no tableland for useable rear yards.
	Concept 3	•		Provides tableland for useable rear yards.
	Concept 4		•	Residential use will be changed to parkland use.
TECHNICAL AND ENGINEERING				
Eliminate or reduce slope hazard	Do Nothing		•	Will not stabilize slope or reduce hazard.
	Concept 2	•		Potential to stabilize slope and protect properties at risk.
	Concept 3	•		Potential to stabilize slope and protect properties at risk.
	Concept 4	•		Potential to stabilize slope and protect properties at risk.
Protect against future erosion and slope instability	Do Nothing		•	Slope instability and erosion is not addressed.
	Concept 2	•		Addresses slope instability and erosion.
	Concept 3	•		Addresses slope instability and erosion.
	Concept 4	•		Addresses slope instability and erosion.
Consider site access requirements	Do Nothing		•	Difficult to access the slope for maintenance as crest position recedes.
	Concept 2		•	Site access via Downsview Dells parkland to the base of valley wall.
	Concept 3		•	Site access via Downsview Dells parkland to the base of valley wall.
	Concept 4	•		Site access will be from the top of slope on Troutbrooke Drive.
Consider feasibility of construction and costs	Do Nothing		•	Property values will decrease and the cost of maintenance for the property owners have the potential to be significant.
	Concept 2		•	Costs to implement will be medium to high.
	Concept 3		•	Costs to implement will be high.
	Concept 4		•	Costs to implement will be high.

Source: TRCA, 2011.

6.0 REFINED ALTERNATIVE CONCEPTS

Based on the results of the evaluation of the preliminary alternatives, Concepts 2 and 3 were modified to ensure the affected properties do not lose any useable tableland with the implementation of the remedial works. The existing tableland in each of the nine (9) affected properties varies in size; generally the west side of the site has minimal rear yards, while the east side has approximately 6 – 8 m of useable tableland. Modifications to preliminary alternatives resulted in making provision for a minimum of 5 m of usable yard space based on a measurement of the average amount of yard space currently found on the street.

6.1 Concept 2 – Remove Fill and Replace with Compacted Fill Slope

This concept proposes to create stable slopes at the site with no impact to the existing residential structures. The estimated 7 m of un-engineered fill material would be removed and replaced with compacted good quality fill, at a stable inclination. A conceptual plan view of this option is shown in **Figure 16**.

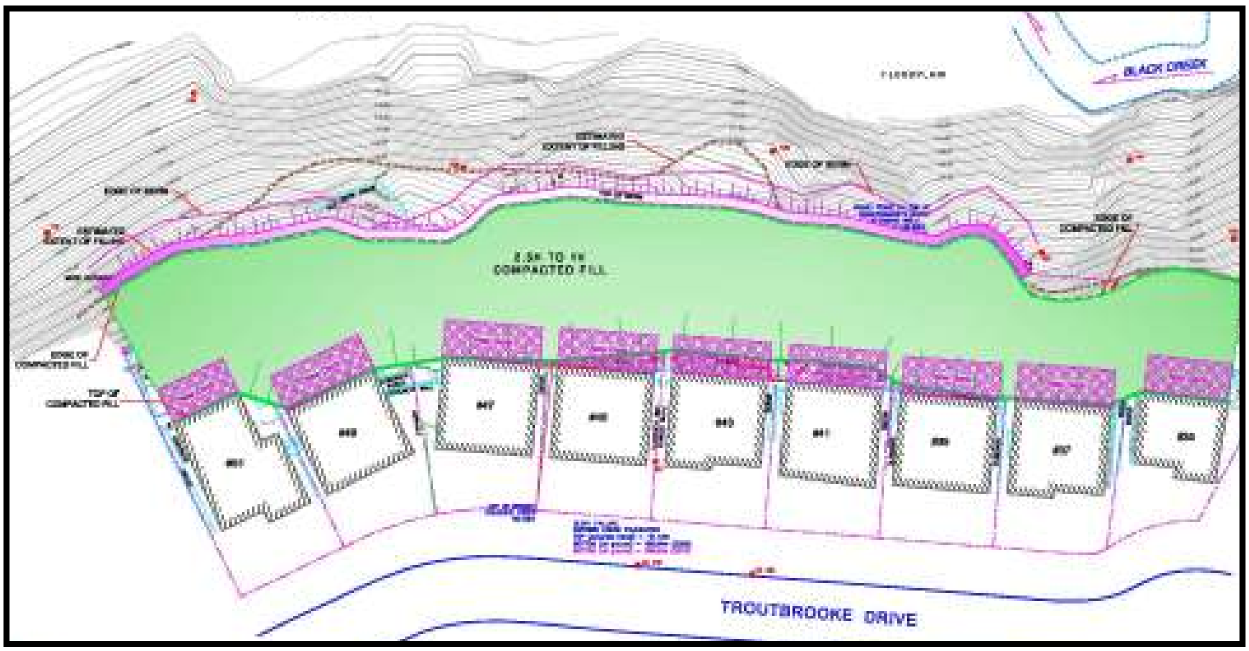

Figure 16. Concept 2 – Remove Fill and Replace with Compacted Fill Slope.
Source: Terraprobe, 2011.

There are three (3) variations of this concept for removing fill and replacing with compacted fill as illustrated in **Figures 17** through **19**:

- **Concept 2a** – Remove existing fill, sort through the existing fill into stockpiles of reusable and not-reusable fill, then compact reusable fill along with new fill (2.5 H:1 V). A deck measuring the full width of the house and extending 5 m north of dwelling is included to provide usable yard space.

- **Concept 2b** – Remove existing fill, dispose of the excavated fill, replace with compacted Granular "B" fill (2.0 H: 1V). A deck measuring the full width of the house and extending 5 m north of dwelling is included to provide usable yard space.

- **Concept 2c** – Remove the existing fill, dispose of the excavated fill, replace with compacted Granular "B" fill that is reinforced with geogrid (1.5 H: 1 V). The reinforced slope is positioned to create a minimum of 5 m of tableland or the identified 2009 Top of Bank.

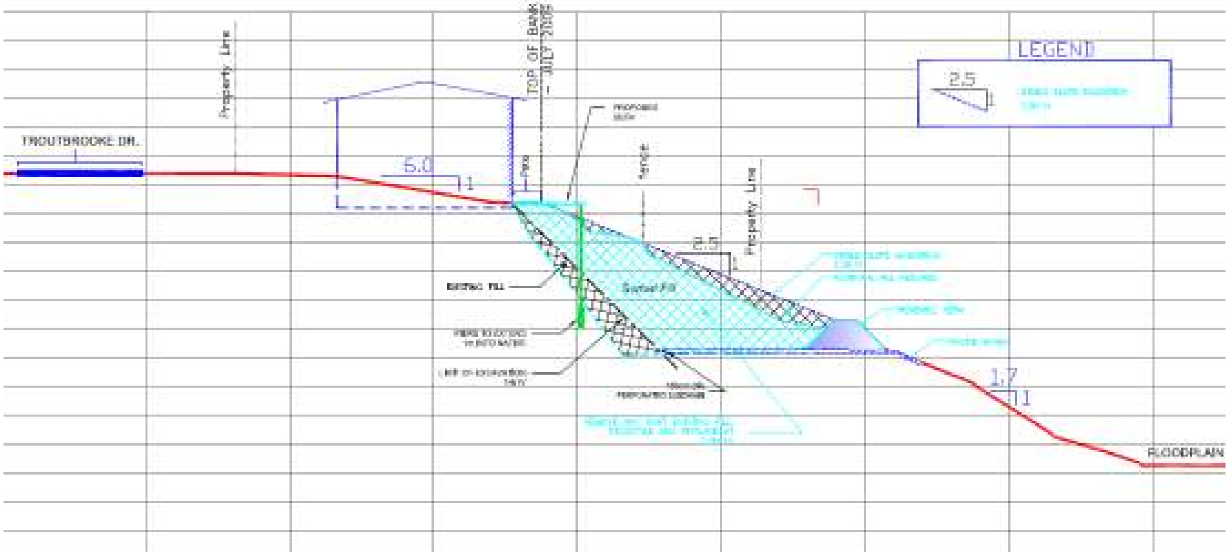

Figure 17. Concept 2A remove existing fill, sort, compact reusable fill along with new fill (2.5 H:1 V)
Source: Terraprobe, 2011.

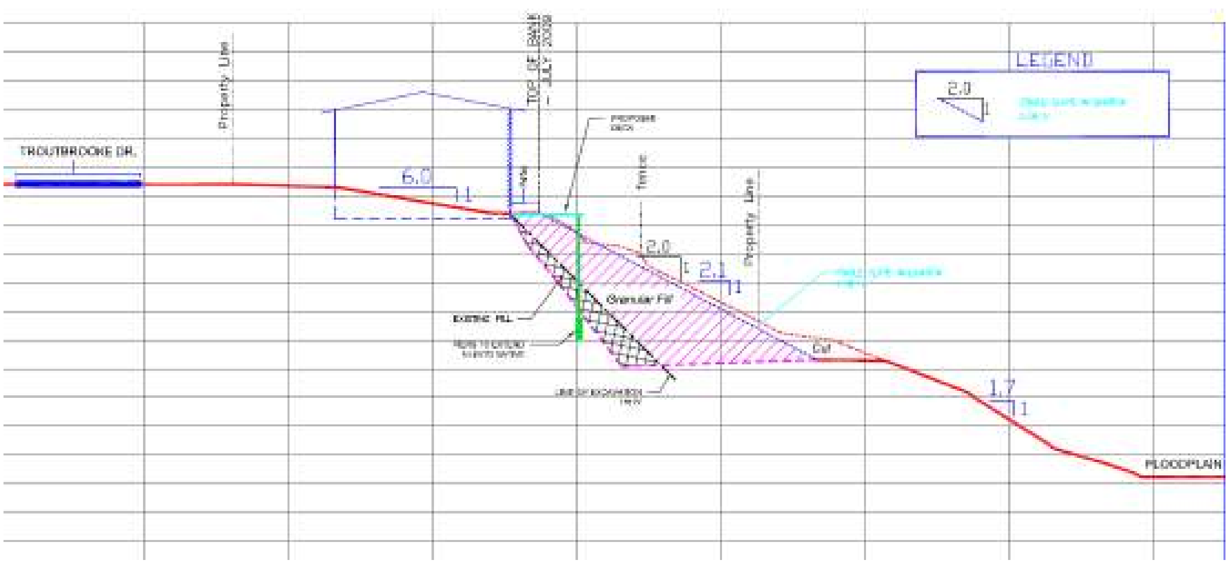

Figure 18. Concept 2B remove/dispose existing fill, replace with compacted Granular "B" fill (2 H: 1V)
Source: Terraprobe, 2011.

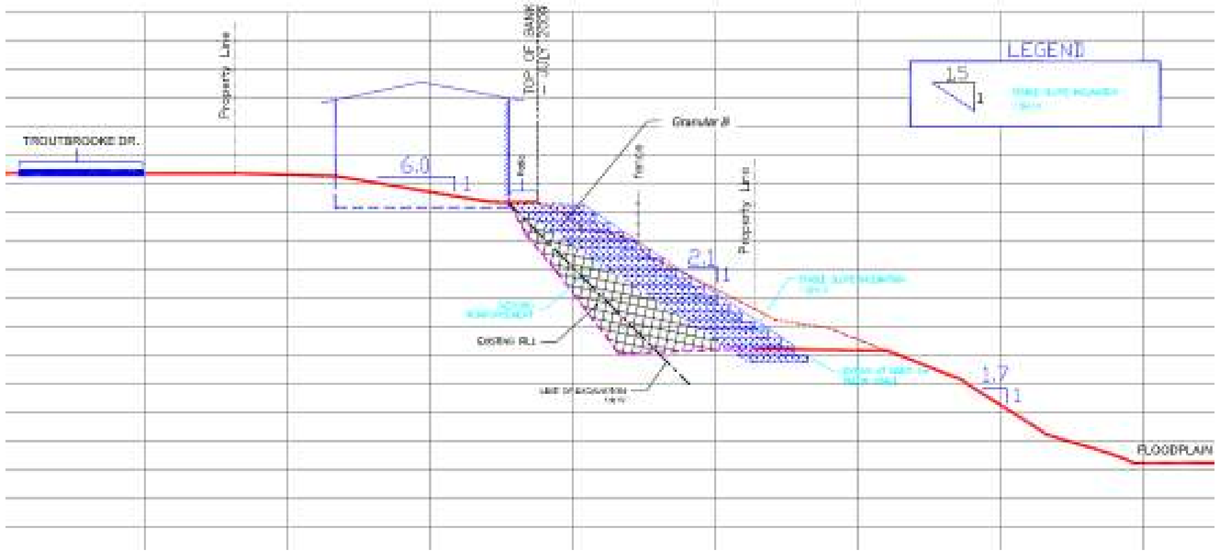

Figure 19. Concept 2C remove existing fill, dispose excavated fill, replace with compacted Granular "B" fill that is reinforced with geogrid (1.5 H: 1 V).
Source: Terraprobe, 2011.

Each of the three variations of this concept are proposed at various inclinations, consequently, the volume of fill material to be removed and replaced is dependent on the variation. It should be noted that due to the inclination of Concept 2a (2.5 H: 1V), a berm will be required at the toe of the valley wall.

Table 11. Volume of fill material to be removed and replaced for each variation of Concept 2.

Approximate Fill Volumes (m3)	Concept 2a	Concept 2b	Concept 2c
Existing fill to be removed	7,500	7,500	5,000
Fill to be replaced	8,000	5,500	7,500
Berm	1,500	-	-

Source: Terraprobe, 2011.

Construction costs for each variation of Concept 2 were estimated using unit prices from recently tendered projects in 2010. These cost estimates include the planning, legal fees, restoration and contingency allowance, but are still only concept level cost estimates. Based on these assumptions the following table summarizes the estimated construction costs for each variation of this concept.

Table 12. Estimated costs of the three variations of Concept 2.

Preliminary Concept	***Cost***
2A	$ 1.3 Million
2B	$ 1.8 Million
2C	$ 2.0 Million

Source: TRCA, 2011.

6.2 Concept 3 – Remove Fill and Replace with an Engineered Structure

Concept 3 will allow a steeper slope to be constructed with an engineered mechanically stabilized earth (MSE) wall, also known as a retaining wall, with a face angle of 1 H: 1 V. The steeper slope will reduce the volumes of imported fill material. More specifically, there would be 7,000 m^3 of fill material removed and replaced with 7,500 m^3 of new imported fill material. Furthermore, the face of the MSE wall will be planted to enhance the vegetation coverage and stability of the wall. A conceptual plan view of this option is shown in **Figure 20**.

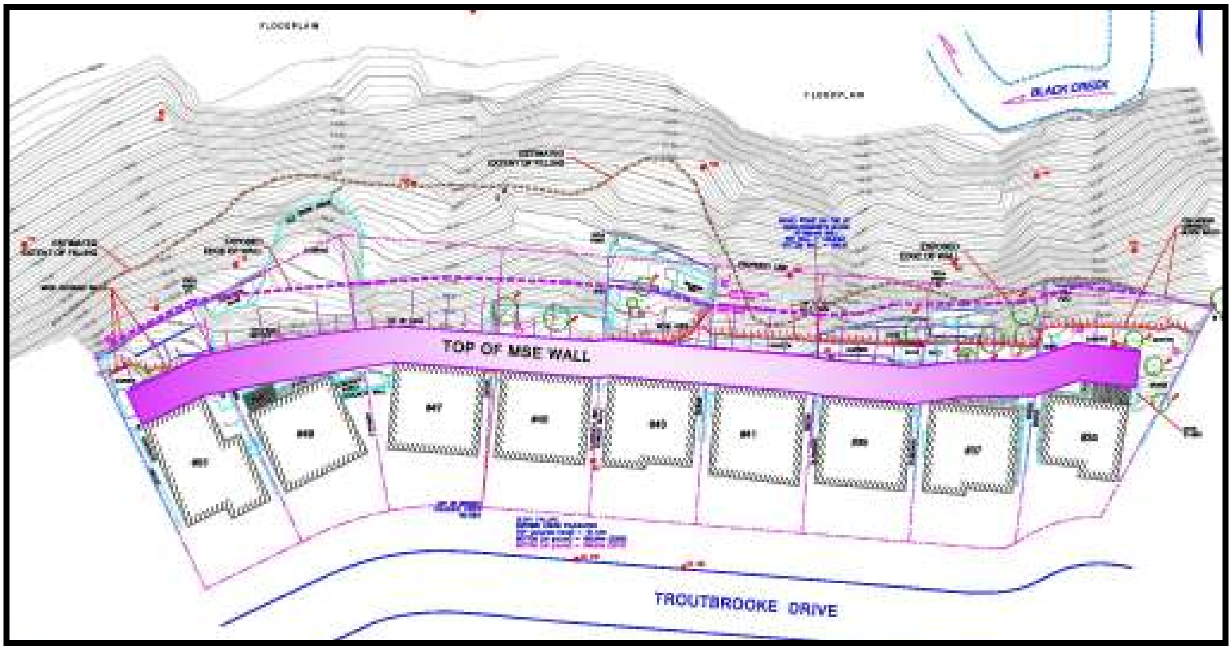

Figure 20. Concept 3 – Remove Fill and Replace with an Engineered Structure.
Source: Terraprobe, 2011.

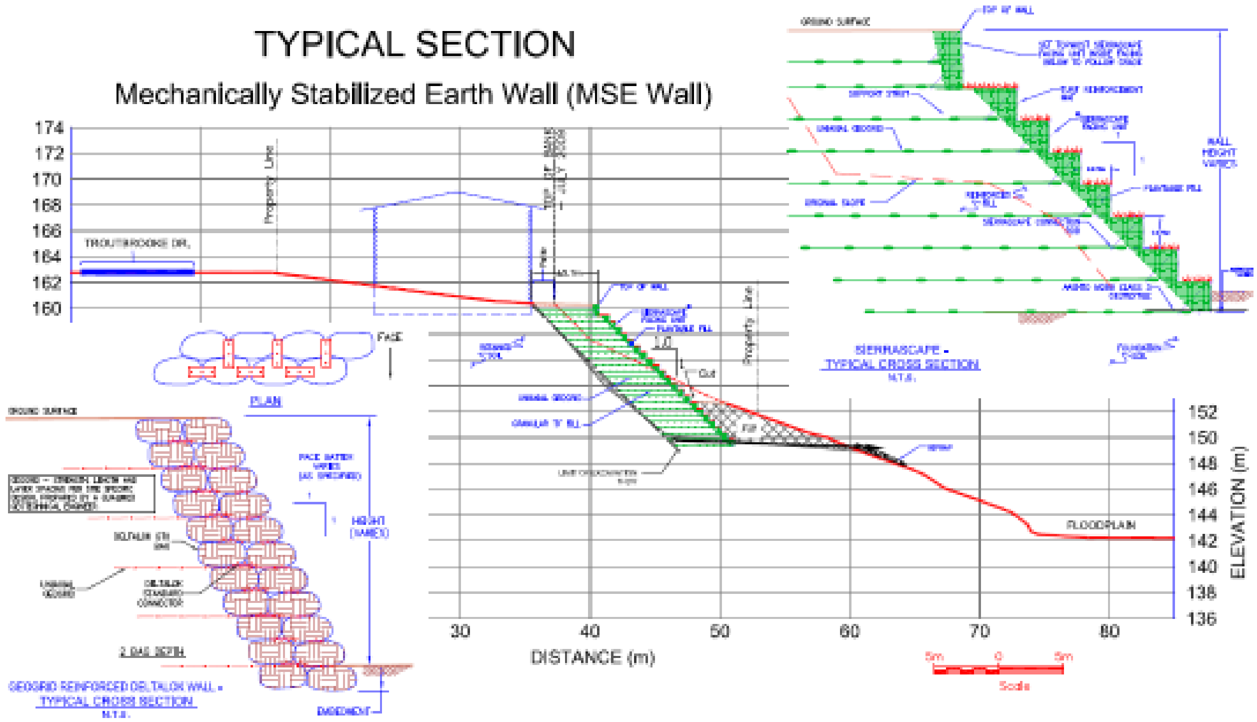

Figure 21. Concept 3 creates a minimum of 5 m of tableland or the identified 2009 Top of Bank.
Source: Terraprobe, 2011.

Construction costs for Concept 3 were estimated using unit prices from recently tendered projects in 2010. These cost estimates include planning, legal fees, restoration plan and contingency allowance, but are still only concept level cost estimates. Based on these assumptions this alternative is valued at $1.9 million.

7.0 EVALUATION OF ALTERNATIVE CONCEPTS

An extensive examination of the types and extents of impacts, both positive and negative, that each alternative method would have, including but not limited to:

- The significance of the expected environmental effects
- The degree of the effectiveness of the method
- The extent of the technical feasibility
- The magnitude of costs

An evaluation of the preliminary alternatives follows.

7.1 The "Do Nothing" Alternative

The environmental effects of a "Do Nothing" approach relates to the potential long-term effects of erosion on the terrestrial and cultural environment. These predicted problems are largely associated with the ongoing loss of tableland. Under the "Do Nothing" alternative the slope will continue to be unstable, with the potential of further slope failures along the upper slope.

If left unprotected the crest of the slope is anticipated to recede by approximately 4 to 11 m, within an unknown timeframe. This loss of tableland would place approximately nine (9) residential structures in immediate risk. The supporting infrastructure (i.e., gas mains, sewer and water connections, electrical servicing) may also be affected by the predicted erosion.

Although the "Do Nothing" alternative would not require any financing up front, ongoing costs may be required to relocate servicing, and replace municipal infrastructure. Additional costs would be borne by the residents due to loss of property value and property damage. Therefore, this alternative is not considered technically feasible due to the risk to public infrastructure and property.

7.2 Concept 2a – Sort Existing Fill and Re-compact at 2.5 H : 1V

Concept 2a requires that all existing fill material be removed, sorting the reusable from non-reusable fill material, then filling and re-grading the slope with reusable and new fill material. Terraprobe has estimated an approximate 7,500 m^3 of existing fill material would be removed, and approximately 8,000 m^3 of new fill material would be imported. The cost of this concept is the most economical at an estimated 1.3 million. However, at this time the volume of fill material that would be reusable is unknown. Therefore, the cost of implementation may vary, pending on the quantity of reusable fill, which will only be known once the material has been excavated and sorted. Furthermore, if Concept 2A would be implemented all of the nine (9) properties would have no usable tableland in the rear yards. TRCA recommended a deck structure as a modification to this concept, as there will be less than five (5) m of tableland. These deck structures would be supported on piles extended to bear within the native soils, which would be the width of the residential structures, and extend approximately five (5) m.

This concept would not remediate the nine (9) affected properties with any useable tableland. It would not be compatible with the existing land use, as many of the affected properties on the west side of the study area have 6 to 8 m of useable tableland. Therefore, this alternative is not considered a viable option due to the significant impacts to useable space in the rear yards.

7.3 Concept 2b – Remove Existing fill and Import Granular Fill at 2.0 H : 1 V

This preliminary alternative is similar to Concept 2a, however this design will not reuse any of the existing fill, instead it will be replaced with new granular fill, which will allow the slope to be constructed at a slightly steeper inclination of 2.0 H : 1 V. A deck structure has also been recommended as a modification to ensure there would be useable space in the rear yard. These deck structures would be supported on piles extended to bear within the native soils, which would be the width of the residential structures, and extend approximately five (5) m.

Again similar to Concept 2a, this concept would not remediate the nine (9) affected properties with any useable tableland. It would not be compatible with the existing land use, as many of the affected properties on the west side of the study area have 6 to 8 m of useable tableland. Therefore, this alternative is not considered a viable option due to the significant impacts of useable space in the rear yards.

7.4 Concept 2c – Remove Existing Fill and Replace with Geogrid Reinforced Granular Fill at 1.5 H : 1V

This concept will utilize a geogrid reinforcement to construct a stable slope at a slightly steeper slope than Concept 2a and 2b. The steeper slope and reinforcement will allow for less fill material to be removed at an estimated 5,000 m^3. However, this concept would not allow the slope crest to be remediated to the position in 2009 without any further encroachment into and impact to the valley wall and floodplain. Therefore, this alternative is not considered a viable option due to the significant impacts on the environment.

7.5 Concept 3 – Remove Existing Fill and Replace with an Engineered Mechanically Stabilized Earth Wall at 1 H : 1V

This concept will allow the slope crest to be remediated to either 5 m or the position of the slope crest in 2009. More importantly, this concept would provide the highest level of stabilization. The MSE wall would be constructed across the rear yards of the nine (9) affected properties and vary in height, from 5 to 12 m. This alternative is designed to protect the valley wall from future erosion and to provide for a long-term stable slope.

This solution is particularly desirable because it would provide the highest level of stabilization with minimal impact to the properties, as all of the properties would be able to be remediated to either 5 m or the slope crest position in 2009. Moreover, this alternative is the most technically feasible with the least impacts to the natural, cultural and socioeconomic environments.

7.6 Concept 4 - Greenspace Acquisition

This preliminary concept would require TRCA to purchase each of the nine (9) affected properties, demolish the residential structures, and stabilize the valley wall.

This solution is not viable as the majority of affected property owners have not expressed interest in the sale of their properties. More importantly, TRCA does not have the funds within the existing budget to implement this concept as it is the most expensive and would require the purchase of all nine (9) of the affected properties.

8.0 SELECTION OF THE PREFERRED ALTERNATIVE

The results of the evaluation of alternatives led to the preliminary identification of Concept 3, Remove Existing Fill and Replace with an Engineered Mechanically Stabilized Earth Wall, as the Preferred Alternative. Selection of this option as the Preferred Alternative was based primarily on the following reasons:

- Provides adequate long-term stability of the valley wall and protection of public safety
- Compatible with, and minimizes impacts on, the surrounding environments
- Provides terrestrial enhancements to the greatest extent possible
- Most cost effective
- Consideration of public opinion

The detailed design will include the removal of some of the existing fill, and replacement with a Mechanically Stabilized Earth (MSE) wall with a face angle of about 1 H to 1 V. TRCA is currently investigating the most appropriate type of reinforcement system (i.e., Delalok, or SierreScape), however at this time SierraScape has been recommended as the best application for this site.

The MSE wall is a flexible structure that has been recommended to be constructed using a SierraScape face (galvanized baskets) with Tensar uniaxial geogrid as the tensile reinforcement. The layers of geogrid will be spaced every 0.45 m (height), which is dictated by the SierraScape basket system. Preliminary calculations indicate that a minimum geogrid length is 5 m. The geogrid will likely consist of Tensar UX1100 MSE. The reinforced soil shall be 19 millimeters (mm) clear crushed stone in the lower 3 m of the wall. Above that, the reinforced soil will consist of Granular ‘B’ type II compacted to not less than 98% Standard Protor Maximum Dry Density (SPMDD). A fence or metal railing must be provided at the top of the wall as per the Ontario Building Code. The fence or metal railing should be set back a minimum of 0.5 m from the face. The design does not allow for any loads on the top of the wall in excess of 4 kPa. Therefore, there should be no above ground pools, nor hot tubs, nor any storage of any materials in excess of 4kPa.

Design drawings of the preferred alternatives are contained in **Appendix C**.

9.0 ENVIRONMENTAL SCREENING

9.1 Detailed Environmental Analysis of the Preferred Alternatives

To complete the detailed environmental analysis of the preferred alternatives, the information collected for the baseline inventory is examined in greater detail to confirm potential impacts, refine methods of mitigation, and to identify any unforeseen impacts. The evaluation of impacts includes both temporary impacts during construction of the undertaking, and permanent impacts due to operation and maintenance of the works after construction. **Table 13** screens the potential negative and positive effects of the proposed undertaking on the environment during construction and maintenance phases. It includes the consideration of the magnitude, geographic extent, duration, frequency, permanence or reversibility and ecological context of the effects, as well as proposed mitigation measures and any residual effects.

Environmental components that have been identified as potentially having an effect on the environment, both positive and negative, are discussed herein. Those that have been determined as not applicable (n/a) as identified in **Table 13**, have been omitted from further discussion.

Table 13. Table of Detailed Environmental Analysis of the Preferred Alternative.

Screening Criteria	Rating of Potential Effects								
	-H	-M	-L	NIL	+L	+M	+H	NA	Comments
Physical									
Unique Landforms								•	
Existing Mineral/Aggregate Resources Extraction Industries								•	
Earth Science - Areas of Natural and Scientific Interest								•	
Specialty Crop Areas								•	
Agricultural Lands or Production								•	
Niagara Escarpment								•	
Oak Ridges Moraine								•	
Environmentally Sensitive/Significant Areas (physical)								•	
Air Quality				•					Mitigative measures will be taken to minimize impacts of equipment use during construction and operation.
Agricultural Tile or Surface Drains								•	
Noise Levels and Vibration				•					Mitigative measures will be taken to minimize impacts of equipment use during construction and operation.
High/Storm Water Flow Regime								•	
Low/Base Water Flow Regime								•	
Existing Surface Drainage and Groundwater Seepage				•					Proposed remedial work will improve drainage system along the valley wall.
Groundwater Recharge/Discharge Zones								•	
Littoral Drift								•	
Other Coastal Processes (Wave Climate)								•	
Water Quality								•	
Soil/Fill Quality				•					Only clean aggregates and/or rubble will be used in construction.
Contaminated Soils/Sediment/Seeps (Sediment Quality)				•					Soil sampling was conducted in October 2010, results show fill material is within the Canadian Soil Quality Guidelines for residential/parklands.
Existing Transportation Routes				•					
Constructed Crossings (e.g. bridges, culverts)								•	
Geomorphology								•	
Other								•	
Biological									
Wildlife Habitat					•				Proposed remedial work will improve terrestrial habitat that is currently threatened by erosion.
Habitat Linkages or Corridors					•				Proposed remedial work will help with the re-establishment of vegetation on the valley wall.
Significant Vegetation Communities				•					Sensitive vegetation will be avoided or replaced during restoration.
Environmentally Sensitive/ Significant Areas (biological)								•	
Fish Habitat				•					Sediment and erosion control measures will prevent sediment entry into Black Creek.
Species of Concern				•					Species of concern (Mountain Maple and Foam Flower) will be protected during construction.
Exotic/Alien and Invasive Species				•					Restoration plan will include only native vegetation.
Wildlife/Bird Migration Patterns					•				Temporary disruption only; long-term positive effect through increased vegetation cover.
Wildlife Population				•					Short-term disruption only.
Wetlands				•					Mitigative measures will be taken to protect the willow mineral deciduous swamp from any impact of equipment use during construction and operation.
Microclimate								•	
Unique Habitats				•					Mitigative measures will be taken to protect the willow mineral deciduous swamp from any impact of equipment use during construction and operation.
Life Science - Areas of Natural and Scientific Interest								•	
Other								•	
Cultural									
Traditional Land Uses								•	
Aboriginal Reserve or Community								•	
Outstanding Native Land Claim								•	
Transboundary Water Management Issues								•	
Riparian Uses								•	
Recreational/Tourist Uses of Water Body and/or Adjacent Land								•	Proposed Construction access route is through the from at the northwest corner
Recreational/Tourist Uses of Existing Shoreline Access								•	
Aesthetic or Scenic Landscapes or Views					•				In the long-term the view of the valley wall will improve with the increase in vegetation growth.
Culturally Significant Resources				•					Archaeological investigation was completed, however if any cultural heritage resources are discovered during construction all work will be stopped and a TRCA archaeologist would be called on-site to document.

Historic Canals								•	
Federal Property								•	
Heritage River System				•					
Other								•	
Socioeconomic									
Surrounding Neighbourhood or Community				•					Temporary disruption only.
Surrounding Land Uses or Growth Pressure				•					
Existing Infrastructure, Support Services, Facilities							•		Protects existing infrastructure and services.
Pedestrian Traffic Routes					•				TRCA will evaluate the potential for future trail connection.
Property Values or Ownership							•		Proposed work will reduce or eliminate further loss of property and protect property values from Nos 35 to 51 Troutbrooke Drive.
Existing Tourism Operations								•	
Property/Farm Accessibility								•	
Other								•	
Engineering/Technical									
Rate of Erosion in Ecosystem							•		Proposed work will stop erosion along the crest of the valley wall.
Sediment Deposition Zones in Ecosystem				•					
Flood Risk in Ecosystem								•	
Slope Stability							•		Proposed works will minimize loss of existing tableland.
Existing Structures							•		Provides protection for existing residential and associated infrastructure in the long term.
Hazardous Lands/Hazardous Sites						•			Slope instability will be reduced.
Other Engineering Projects at this Location								•	

Note. Screening of potential effects as negative (-), neutral (NIL) or positive (+) and rating them as relatively high (H), medium (M), low (L) or not applicable (NA). From Conservation Ontario, *Class Environmental Assessment for Remedial Flood and Erosion Control Projects, 2002, p23, Table 3.*

9.1.1 Physical Environment

Air Quality
At a local scale, no significant sources of air pollution exist within the immediate and surrounding study area. No component of this project is anticipated to degrade air quality or be influenced by local or regional sources of air pollution. Any impacts from machinery and/or vehicles used as part of the construction phase will be temporary and minimal, and are therefore not deemed to be significant.

Noise and Vibration
Implementation of the proposed undertaking will result in a limited and temporary increase in noise and vibration levels from the presence of construction equipment and vehicles. The effects of noise and vibration will be minimized by limiting work hours between 7:00 am – 5:00 pm, Monday to Friday. Pre and post construction assessments of the affected homes will be conducted to ensure no damages are caused as a results of the construction.

Existing Surface Drainage and Groundwater Seepage
The proposed works will install a perforated seepage collector pipe at the lowest elevation of the wall interface between the native and MSE wall structure. Additional pipes will collect ground water and will outlet at the face of the slope, onto a rip rap apron to reduce surficial erosion. Furthermore, low-permeability soil cap will be installed on the MSE wall to minimize infiltration of precipitation and runoff into the reinforced soil zone.

Soil/Fill Quality
The existing soils are highly susceptible to erosion; the vegetated MSE wall will effectively replace the poor soil quality with site appropriate fill material to prevent oversteepening of the upper slope. Only clean fill materials will be utilized during construction.

Existing Transportation Routes
There is no access from the top of the valley wall to complete construction, as there is minimal space between each of the residential structures. Therefore, the most beneficial route to access the project area would be from the base of the valley wall. There is an existing maintenance access road from the parkette, located on the northeast corner of Jane Street and Troutbrooke Drive, eastward to Black Creek Dam. The proposed construction access route is to utilize the existing road to the dam, and extend the route along the base of the valley wall to the project area. The proposed staging and storing area for the construction is in the parkette adjacent to the parking lot.

It should be noted that there is an easement in sections of the proposed construction access route. The easement is for a private water main owned by the Oakdale Golf and Country Club. This water main runs from the golf course, under Jane Street, through the parkette, along the existing access road and crosses Black Creek just east of the dam. TRCA has met with the Oakdale Golf and Country Club to discuss the proposed construction access route, and they agree in principle to allow TRCA to utilize this route to access the project area.

9.1.2 Biological Environment

Wildlife Habitat

Temporary disruption of wildlife habitat will occur during construction due to clearing required for the access route. Through conscientious design for the surrounding environment, all attempts will be made to minimize the area required for access and to select areas which require the least loss of vegetation. All disturbed areas will be restored using appropriate native species; therefore there is no long-term negative impact on wildlife habitat.

Natural vegetation cover at the project site will be achieved through implementation of a restoration plan will likely result in an overall net positive effect on wildlife habitat.

Significant Vegetation Communities

With respect to unique landforms in the project area, the only conservation concern is the protection of the willow mineral deciduous swamp at the base of the valley wall. To prevent damage to or loss of this significant community, the area will be staked off before construction begins, and will be avoided during construction. Furthermore, to prevent any disruption of sediment to the swamp, silt fencing will act as a barrier.

Species of interest identified at this site include Level 4 (L4) and Level 5 (L5) ranked species, which are identified as species able to withstand minor to moderate disturbance. There were no species identified within the study area that were not able to withstand minor disturbances, and all practical measures will be taken to ensure that site disruption is minimized, therefore no significant adverse impacts are expected.

Species of Concern – Flora and Fauna

With respect to the flora species of interest in the project area, the conservation concern is the protection of the Mountain Maple (*Acer spicatum)* and Foam Flower (*Tiarella cordifolia)*. These two species are listed on the Natural Heritage Information Centre as rare species of interest (MNR 2006). To prevent damage to or loss of these significant communities, the population will be staked off before construction begins, and will be avoided during construction.

The fauna species of interest will be temporary disrupted during the construction period. TRCA expects the wildlife habitat will improve as vegetation growth increase on the valley wall.

Exotic/Alien and Invasive Species

The impacts to the existing vegetation will be minimized, and only native materials are being used. No new exotic or invasive species will be introduced to the project area as the result of the restoration plan. During construction, any invasive species located along the construction access route or at the project site will be scooped up and discarded, with the bare soil then being prepared for planting with native species.

Wildlife Population

Impacts to existing wildlife populations within the project limits are likely to occur as the result of implementing the proposed undertaking due to the increase in noise and vibration levels from construction vehicles and equipment. Any displacement of wildlife populations is anticipated to be short-term, and when weighed against the overall increased vegetative cover and improved quality of wildlife habitat by using native species, this temporary impact is deemed acceptable. Construction activities are expected to temporarily displace wildlife during site preparation and slope stabilization. Tree removals and construction will be scheduled to take place in late summer and fall to prevent and any impacts on breeding birds and nesting.

9.1.3 Cultural Environment

Recreational or Tourist Use of Water Body and/or Adjacent Lands
TRCA is aware that many members of the community along Jane Street utilize the parking lot, parkette, and the maintenance access road to gain access to Downsview Dells Park. TRCA must restrict public access during the construction period. However, the parkland will be accessible from the pedestrian trails along the north side of Black Creek.

Aesthetic or Scenic Landscapes or Views
The preservation of the tableland and increase of vegetative cover at the project site, particularly on the eroding valley wall, is generally perceived as improving the aesthetic landscape.

Archaeological Resources, Built Heritage Resources and Cultural Heritage Landscapes
An archaeological investigation was completed by TRCA's Archaeology Management Resource Services in the Fall of 2010. At this time, the study area has been cleared of any cultural heritage resources, however if any cultural heritage resources are discovered during construction, the construction staff will stop work until the resource and site has been inspected by an Archaeologist from TRCA's Archaeology Management Resource Services.

9.1.4 Socioeconomic Environment

Surrounding Neighbourhood or Community
The surrounding neighbourhood will be temporary disrupted during construction, as the construction vehicles will be traveling along the base of the slope, immediately adjacent to a residential subdivision. TRCA will implement precautions to minimize and mitigate any potential negative impacts to the surrounding neighbourhood during construction.

Surrounding Land Uses
The study area is located along the Black Creek valley wall immediately behind the residential properties from Nos. 35 to 51 Troutbrooke Drive. The study area has been proposed to be accessed from the base of the slope through the Downsview Dells parklands. As previously noted, a portion of the proposed construction access route has an easement for a water main owner by the Oakdale Golf and Country Club; as such TRCA must acquire permission from the golf course with proposed accessibility prior to any commencement of remedial works.

Existing Infrastructure, Support Services, Facilities
The proposed works will reduce the current rate of erosion that is occurring in this area and will aid in the protection of the residential structures from Nos 35 to 51 Troutbrooke Drive. The proposed works will require the removal and replacement of the existing fill material.

TRCA will ensure the residential structures are monitored to ensure there are no significant impacts with the removal of the fill material. Furthermore, the upper decks located at Nos. 39 and 49 Troutbrooke Drive are required to be disassembled, removed and replaced, as the existing footings are grounded in the existing fill material which will be removed during construction.

Property Values or Ownership
The proposed undertaking is not likely to have an adverse effect on the property values for the property owners on Troutbrooke Drive. Conversely, the long-term protection of the affected valley wall is expected to protect property values at the subject site.

9.1.5 Engineering/Technical Environment

Rate of Erosion in Ecosystem
The final design is expected to effectively stabilize the slope against further erosion.

Sediment Deposition Zones in Ecosystem
With respect to sediment deposition in the project area, the only conservation concern is the protection of the willow mineral deciduous swamp at the base of the valley wall. To prevent any disruption of sediment to the swamp, silt fencing will act as a barrier.

Slope Stability
The slope will be stabilized in accordance with the proposed remedial option. All disturbed areas will be re-vegetated with appropriate native species of trees, shrubs, grasses, and wildflowers.

Existing Structures
The proposed works will provide long-term protection for the existing residential structures on Troutbrooke Drive. All construction equipment will enter the site from the proposed construction access route. TRCA will implement precautions to minimize and mitigate any potential negative impacts to structures on the tableland resulting from construction.

Hazardous Lands/Hazardous Sites
The preferred alternative will decrease the angle of repose of the valley wall thus reduce slope instability.

10.0 SUMMARY OF PUBLIC CONSULTATION

This section of the Project Plan provides a summary of comments received during the planning and design phases of the project, a discussion of how these concerns have been addressed, and an outline of the monitoring program which will be implemented both during construction and once the project is completed.

10.1 Role of the Community Liaison Committee

The following information is provided from Conservation Ontario's *Class Environmental Assessment for Remedial Flood and Erosion Control Projects (January 2002).*

> *"In an effort to facilitate more on-going public involvement at the project level, the Conservation Authority shall, based on its contact group mailing lists and expressions of interest from the local landowners, members of the general public, interest groups, or agencies, establish a Community Liaison Committee (CLC) to assist the Authority by obtaining additional public input concerning the planning and design process of an individual flood and/or erosion control project, and to review information and provide input to the Conservation Authority throughout the process. The Conservation Authority shall strive to ensure that the membership of the CLC is representative of all views respecting a proposed remedial and erosion control project. (Conservation Ontario, 2002)."*
>
> *"As the name implies, the function of the CLC, in the Class EA process, will be to assist the Conservation Authority to reach out and maintain contact with community residents, groups, associations and organizations. The CLC will provide direct input into the process. At the end of the process, the entire committee will have been exposed to the entire process, will have understood how decisions have been reached and will have had their questions answered during the process.*
>
> *To fulfill its function, the CLC will:*
>
> - *Identify items of public concern with regard to the impact and design of proposed erosion control alternatives;*
> - *Provide direct input on these concerns to the Conservation Authority to be utilized throughout the planning and design process;*
> - *Co-host, with Authority Staff, meetings organized by the Authority to facilitate the resolution of concerns relating to a proposed remedial work;*
> - *Review any Part II Order Requests made by members of the public and attempt to resolve the issues of concern between the Part II*

Order requesters and the Conservation Authority before the request gets referred to the Minister of the Environment for a decision; and

- *Where appropriate, submit an assessment to the Conservation Authority, upon project completion, commenting on the effectiveness of the Class EA process for meeting public concerns for the specific project, and where relevant, identify possible improvements (pp.36-37) (Conservation Ontario, 2002)."*

More information regarding the CLC is described in the following section.

10.2 Public Notifications and Consultation

The following is a summary of comments received during the consultation process for the Troutbrooke Slope Stabilization Project. Documents related to public outreach component of this project; including all published notices, meeting materials and minutes, and comment forms are included in **Appendix D**.

Comment forms were distributed by TRCA following each public consultation session to ensure that an understanding of the project objectives and direction was maintained throughout the planning process. The forms also provided a means of soliciting input into the planning and design phases of the project, and were utilized in the development of the alternative options considered and in the selection and refinement of the preferred alternative. Written comments ensured that ideas and concerns were investigated and addressed at meetings, facilitating open dialogue between staff and the general public.

10.2.1 Project Initiation

On October 29th, 2009, TRCA received permission from the TRCA's Board of Directors to proceed with the Troutbrooke Slope Stabilization Project.

TRCA staff hand-delivered an information package to the affected property owners to inform them on the findings of the geotechnical and slope stability assessment completed by Terraprobe Inc. on the residential properties located at Nos. 35 to 51 Troutbrooke Drive.

In the package, TRCA notified the residents that a Class EA for Remedial Erosion and Flood Control Protection would need to be conducted to develop and evaluate alternative options to determine the most ideal preferred alternative to stabilize the valley wall, and that staff would like the affected property owners to participate on the Community Liaison Committee (CLC). TRCA recommended that the owners restrict the access to their rear yards and any deck structures be inspected by a structural engineer to confirm the safety of the structure and assess potential risk of damage to the residential structure in the event of failure.

It should be noted that TRCA informed the City of Toronto Building Department that the foundation of the residential structure located at 45 Troutbrooke Drive was exposed. A building inspector completed an assessment of the structure, and reviewed the report "Geotechnical and Slope Stability Assessment, 35 to 51 Troutbrooke Drive, Toronto, Ontario" by Terraprobe Inc. in October 2010. TRCA held a meeting with staff from the City of Toronto Building Department, and Terraprobe to discuss the slope instability in relation to the stability of the residential structure. The City was informed that the slope would be monitored monthly until the commencement of construction, and if there were any slope failures TRCA would contact for a further assessment of the residential structures.

10.2.2 Notice of Intent

In accordance with the Class EA process, the first point of public contact occurred when the Notice of Intent was published in the *North York Mirror* on Friday November 5th, 2010. The Notice of Intent was also delivered to the following:

- Residents of Nos. 35 to 51 Troutbrooke Drive
- TRCA staff with an interest in the project
- City of Toronto staff with an interest in the project
- Councillor Augimeri, Ward 9 – York Centre
- Monte Kwinter, M.P.P., York Centre
- Honourable Art Eggleton, M.P., York Centre
- Ministry of the Environment
- Conservation Ontario
- Black Creek Conservation Project of Toronto (BCCP)
- Oakdale Country and Golf Club

A Community Liaison Committee (CLC) was subsequently formed, which included the affected landowners or representatives, TRCA staff, Terraprobe Ltd., Councillor Augemeri's Assistant, and a staff member from BBCP. The Oakdale Golf and Country Club staff and other interested individuals who expressed an interest in the project did not attend the meetings.

10.2.3 Community Liaison Committee Meeting #1

The first CLC meeting, held on November 24, 2010 at Beverley Heights Middle School, 26 Troutbrooke Drive, Toronto, Ontario was attended by several staff from TRCA, Terraprobe staff, Councillor Augimeri's Assistant, a BCCP staff member, and the majority of the affected property owners or representatives.

Three alternative techniques and variations utilized in slope stabilization projects with similar conditions to those found along valley walls were presented to the attendees. The three techniques presented were:

1. Remove Fill and Replace with Compacted Fill Slope
2. Remove Fill and Replace with an Engineered Structure
3. Greenspace Acquisition

Additionally, the "Do Nothing" option was discussed. Examining this option is a required step of the Class EA process, and is used as a tool to demonstrated the results of not undertaking remedial works. Through the examination of the Do Nothing option it was illustrated that the long-term, stable slope crest for this unstable slope would place numerous residential structures and other public infrastructure at risk.

At the conclusion of the meeting, a workbook was distributed to the participants asking for input into the next steps of the planning process for the project.

It should be noted that minimal workbooks were returned, however during the meeting it was noted that the affected property owners would like to maximize the amount of useable space in the rear yard. Therefore, a strong preference for the engineered structure was identified by TRCA during discussions with the homeowners.

The documentation of this meeting is contained in **Appendix D**.

10.2.4 Community Liaison Committee Meeting #2

A CLC meeting was held on February 16, 2011 at Beverley Heights Middle School, 26 Troutbrooke Drive, and was attended by several staff from TRCA, staff from Terraprobe Inc, Councillor Augimeri's Assistant, the affected property owners and representatives of the affected property owners. Terraprobe presented the six (6) concepts including several modifications that TRCA had recommended to address the concerns of the CLC members from CLC meeting #1. Furthermore, TRCA provided rough cost estimates for each of the proposed modified alternatives.

A workbook was distributed to the CLC members to provide feedback on the modifications and costs presented, to select the preferred design concept, and to assess the importance of the evaluation criteria for each of the concepts presented. TRCA only received one completed workbook.

Furthermore, TRCA staff scheduled private meetings with the affected property owners or representatives to discuss the preferred alternative and ensure all the concerns of the owners were discussed.

The documentation of this meeting is contained in **Appendix D**.

10.2.5 Meetings with the Affected Property Owners

In March 2011, TRCA staff (Project Manager, Project Coordinator, and Manager Acquisitions and Sales) proceeded to conduct private meetings with the affected property owners or representatives to discuss the preferred alternative. The majority of the property owners or representatives took the opportunity to attend these meetings. Those attending unanimously selected Concept 3, as the preferred alternative, with the exception of 51 Troutbrooke Drive. TRCA and representatives of 51 Troutbrooke Drive are currently investigating a solution to resolve their remaining concerns through potential land acquisition or refinement to the preferred alternative that will be achieved during detailed design.

Meeting minutes from each of the meetings are in contained in **Appendix D**.

10.2.6 Community Liaison Committee Meeting #3

A CLC meeting was held on April 6, 2011 at Beverley Heights Middle School, 26 Troutbrooke Drive, and was attended by several staff from TRCA, staff from Terraprobe Inc, staff member from BCCP, the affected property owners and representatives of the affected property owners. Terraprobe presented the preferred alternative, and a detailed description of the MSE wall (i.e., SierraScape system). Furthermore, TRCA reviewed the details of construction.

A workbook was distributed to the CLC members to provide feedback on the preferred alternative, the project and the Class EA process. TRCA did not receive any workbooks.

The documentation of this meeting is contained in **Appendix D**.

10.2.7 Notice of Filing

The second public notification will occur when the Project Plan is filed on April 15, 2011. As per the requirements of Section 4.2 of the Class EA document, a Notice of Filing shall be published in the same newspaper as the Notice of Intent, in this case the April 15, 2011 issue of the *North York Mirror*, and shall be sent to all parties contacted in the first notification process who expressed an interest in the remedial work, Conservation Ontario and Ministry of the Environment. Copies of the report will be provided to the local Councillor's office, the Jane and Sheppard Public Library, and at the TRCA Head Office for public review during the 30 day review period.

10.2.8 Notice of Project Approval

In the interest of good project management, a Notice of Approval and a Notice of Project Completion shall be sent to all parties who expressed an interest in the project and to Conservation Ontario.

10.3 Monitoring Program

Since the completion of the geotechnical and slope stability assessment, Terraprobe has been retained by TRCA to continue monthly monitoring of the slope movement to ensure that the residential structures are not at risk. Since commencing the monitoring program, Terraprobe has reported further slumping and erosion of soils near the original area of failure. Visual observations indicate that in addition to No. 45 Troutbrooke Drive, the foundation wall of No. 47 Troutbrooke Drive is also now exposed. This monitoring will continue until the commencement of construction planned in September 2011.

A program to monitor the performance of the slope stabilization works will consist of frequent visual inspections and formal surveys, with comparisons being made to expected performance. Furthermore, TRCA will retain a professional engineering firm to complete an inspection of any structures (i.e., residences, decks, etc.) prior to construction and monitor these structures throughout construction to ensure there is no significant impact with the implementation of the stabilization works. For example, survey pins will be installed to the north west and north east corners of each of the residential structures from Nos. 35 to 51 Troutbrooke Drive. The purpose of the survey pins is to monitor if there is any change in position of the back wall of the residential structures during construction.

Immediately following construction, the visual inspection of the stabilization works will be completed after each major storm event for the period of 1 year. Surveys will be conducted annually until a period of 5 years has passed, after which time inspection will be adjusted to an appropriate frequency depending on structure condition.

If a significant deviation from expected performance is noted during a visual inspection, additional surveys will be undertaken immediately. If a survey detects a significant deviation from expected performance, then remediation construction will be planned and implemented immediately such that the stabilized slope meets design performance criteria at all times.

11.0 REFERENCES

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