THE SERNAS GROUP

MASTER ENVIRONMENTAL

SERVICING PLAN AMENDMENT

SEATON COMMUNITY

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EXECUTIVE SUMMARY

CHAPTER A – INTRODUCTION

In May 2006, the Central Pickering Development Plan (CPDP) was approved by the Province of Ontario under the *Ontario Planning and Development Act, 1994*. The CPDP established a Natural Heritage System (NHS), land use structure, population and employment allocations, an arterial and collector road network, regional level transit framework, policy framework and urban design guidelines for development of the CPDP Planning Area.

The Seaton Master Environmental Servicing Plan (MESP) Study Area is contained within the CPDP Planning Area, which is bounded by the CPR Belleville Line in the south, Sideline 16/ Pickering Ajax boundary in the east, Highway 7 in the north and the York-Durham Town Line in the west. The Planning area is located entirely within the City of Pickering and the Regional Municipality of Durham. The Seaton MESP Study Area comprises those lands within the CPDP Planning area east of the West Duffins Creek. Five subwatersheds drain the MESP Study Area: Brougham Creek, Urfe Creek, Ganatsekiagon Creek, West Duffins Creek and Whitevale Creek. **Figure A2.2** illustrates the extent of each of these subwatersheds in the MESP Study Area.

The CPDP requires the preparation and adoption of Neighbourhood Plans (by amendment to the City of Pickering Official Plan) concurrent with, or prior to, the processing of draft plans of subdivision. As part of Neighbourhood Planning, background studies are required, one of which is this Master Environmental Servicing Plan (MESP).

In August 2008, the Phase 1, Existing Conditions MESP Report (Phase 1 Report), was submitted to the City of Pickering and Toronto & Region Conservation Authority (TRCA). Subsequent to that, the Phase 2 MESP was submitted in July 2010. The Phase 2 MESP Report documented the findings of the MESP analyses of surface water and groundwater assessments, wetland assessments, a stormwater management plan, transportation and servicing concepts, fisheries compensation framework, community facilities recommendations, phasing, monitoring and future study requirements. The Phase 2 MESP Report has now been amended as a result of the review of the document by the various agencies including but not limited to the City of Pickering, TRCA, Region of Durham, Ministry of Environment (MOE), and Ministry of Natural Resources (MNR). Throughout 2011 extensive discussions and technical meetings between the Study Team and the various agencies were undertaken in order to produce this MESP Amendment (MESPA) report. An interim submission of the MESPA was made in August 2011, which included Chapters C through K. Comments from the various agencies have been received on the interim document and have now been incorporated into this complete MESPA report (December 2011). The agency comments and MESPA responses are presented in **Appendix A7**.

The MESPA has been structured to meet the requirements of the CPDP within the framework of the approved MESP Terms of Reference. Details with regard to the Terms of Reference are presented in **Chapter A, Section A3.0**; and, discussions with regard to the goals and policies of the CPDP are included in **Chapter A, Section A4**.0, where a description of the parameters of the Natural Heritage System (NHS) for the CPDP Planning Area also is contained.

The MESPA provides input to other on-going studies, related to land use planning and Regional infrastructure development. It provided the background information for the Seaton Neighbourhood Plan Review Study, undertaken by the City of Pickering, as outlined in **Chapter**

A, Section A8.0. The recommendations of the MESPA will be implemented through the Neighbourhood Plans, Draft Plans of Subdivision and zoning by-laws as and when they are approved, on the basis of further detailed, site specific studies.

Regional infrastructure is being studied and planned under the umbrella of the "Central Pickering Development Plan Regional Services Class EA Study" (CPDP Regional Services Class EA Study). As of the date of submission of this MESPA, the CPDP Regional Services Class EA Study has not proceeded to the point where preferred recommendations for the infrastructure subject to that study (major sewer and water infrastructure and internal and external Regional roads) are available. As a result, the recommendations for the Regional infrastructure that are subject to the CPDP Regional Services Class EA included in this study should be considered as input to the Regional process and may require future amendments depending upon the results of the CPDP Regional Services Class EA Study (i.e. should the location and alignments of the roadway and servicing infrastructure vary significantly from those indicated within this document). With regard to non-Regional roads, this MESPA satisfies the requirements of Phases 1 and 2 of the Class EA process, as described in **Chapter A, Section A9.0**.

This MESPA addresses requirements of the CPDP and the approved Terms of Reference as modified through discussions with agencies. It ensures that the MESP Study Area characteristics are understood in sufficient detail to provide input to the preparation of the Neighbourhood Plans and the draft plans of subdivision and direction related to planning and engineering and further studies to facilitate the development of the MESP Study Area. The following summarizes the major findings and recommendations of this MESPA, with reference to the applicable sections within the report.

CHAPTER B – WATER RESOURCES

1. The designated NHS encompasses natural heritage features, buffers and corridors to link natural features with each other and to those located outside of the MESP Study Area. The NHS as depicted in the CPDP is shown on **Figure A4.2**. It covers approximately 53% of Seaton and 54% of the CPDP Planning Area and includes wetlands, woodlands, the Lake Iroquois shoreline, valley systems to stable top-of-bank, Environmentally Significant Areas, locations of Species at Risk, groundwater seepage/ discharge areas, linkage corridors and buffers.

2. Water resources analyses were completed to assess potential impacts of development in Seaton to the NHS and identify best management practices and mitigative measures to be incorporated into development design. These analyses included:

    - Surface water analyses;
    - Groundwater analyses;
    - Subwatershed water balance analyses;
    - Feature-specific wetland, woodland and headwater drainage features water balance analyses; and,
    - Preparation of a Stormwater Management Plan.

3. The MESPA Land Use Concept used to assess potential implications to the NHS and prepare a Stormwater Management Plan is presented on **Figure A8.1**. This plan reflects the CPDP plan modified based on landowner submitted Neighbourhood Plans and development concept plans where there was no submitted Neighbourhood Plans

with adjustments reflecting recommended roads locations and Major Community Use Facilities identified as part of the Phase 2 MESP process.

Modelling Overview

4. Several models were used to assist in completing the required analyses, comprising:

- **Precipitation-Runoff Modelling System (PRMS) Hydrologic Model** developed for the TRCA Tier 1 Water Budget and Water Quantity Stress Assessment that was refined for compatibility with the updated PRMS code provided with the GSFLOW package. This model was used to evaluate changes in various components of the water balance under existing conditions and future conditions with and without best management/Low Impact Development (LID) practices.

- **Groundwater MODFLOW Model**, an existing steady-state, three-dimensional regional groundwater flow model formed the basis of the groundwater modelling in this study. The model was used to assess groundwater levels and groundwater recharge and discharge under existing conditions and future conditions with and without best management/LID practices.

- **Surface water VISUAL OTTHYMO Model** was used to generate existing conditions and future conditions peak flow rates, with and without best management/LID practices, for the 2 year through 100 year return period storms using the 12 hour AES design storms, as well as for the Regional Storm event (Hurricane Hazel). It was also used to determine sizing criteria for stormwater management facilities to provide post-to-pre control within the MESP Study Area.

- **Surface water QUALHYMO Model** was applied to each MESP subwatershed to evaluate erosion sensitivity of the watercourses for various meteorological conditions. Duration analyses were completed to determine the duration of flows within specified ranges above the critical flow rate for erosion and recommend storage volumes and release rates for stormwater management facility design.

- **Surface water QUALHYMO Model** was also applied to certain wetland, woodland and headwater drainage features subcatchments to identify potential changes in runoff volumes to these features under future development conditions. These models were used to assist in identifying elements of the proposed SWM Plan to manage the quantity of surface runoff to these features.

5. Several SWM alternatives were identified and modelled to assist in the evaluation of erosion, water balance and flood control requirements. **Table B2.1** describes each of the modelled alternatives. Report **Sections B4.0 and B5.0** provide detailed discussion of modelled alternatives. **Section B5.11** addresses other considerations in alternative evaluations including implications to land use, maintenance requirements, etc. **Section B11.0** identifies the preliminary recommended combination of alternatives with the exception that the recommended alternative for Regional Storm controls has not been defined at this time.

6. Several SWM alternatives include low impact development (LID) measures. Through modelling, the MESPA has considered a number of LID measures and assessed their benefit to stormwater management peak flow, groundwater recharge and runoff volume reduction to provide guidance to further LID analyses at the NFSSR stage. An approach

to the review of LID measures at the MESPA stage was identified and discussed with the City of Pickering and TRCA. Discussions addressed the modelling approach and measures to be modelled. The LID measures selected to be modelled were chosen based on the appropriateness of various LID measures given the soil and groundwater conditions in the Seaton Study Area and proposed urban form. Specific LID measures modelled are outlined in **Section B2.3.2**.

Hydrogeological Assessment (Chapter B Section 3)

7. Detailed hydrogeological investigations were completed, the purpose of which was to improve the understanding of existing groundwater and surface water conditions based on field monitoring data, and to complete an assessment of the potential effects of urban land development on the local groundwater and surface water resources.

8. A network of surface water monitoring stations was established during the Phase 1 MESP in four subwatersheds (6 stations in West Duffins Creek, 5 stations in Whitevale Creek, 11 stations in Ganatsekiagon Creek and 5 stations in Urfe Creek). The surface water monitoring stations were established at strategic locations in each subwatershed to record surface water flow conditions across the MESP Study Area and to evaluate potential surface water/groundwater interactions where possible.

9. More than 90 strategically located monitoring wells were drilled and constructed at 77 locations across the study area as part of the Phase I and Phase II MESP studies. Twenty of these locations in the West Duffins Creek subwatershed, 14 are in the Whitevale Creek subwatershed, 35 are in the Ganatsekiagon Creek subwatershed, and 8 are in the Urfe Creek subwatershed. Data from subsequent geotechnical boreholes and monitoring wells completed as part of the Neighbourhood Functional Servicing and Stormwater Studies (NFSSRs) were also used in this MESPA study as they became available.

10. Monthly groundwater monitoring was completed for a one year period from April 2009 until March 2010 and quarterly for 2010. Quarterly monitoring extended into 2011. The monitoring consisted of measuring groundwater levels in each monitoring well and downloading the continuous water level recorders that were installed in select locations.

11. To evaluate the interaction between surface water and groundwater, an inventory of inputs and outputs to the surface water systems over the MESP Study Area was completed through the establishment of 9 upstream monitoring stations along Highway 7; 14 intermediate stream stations along the watercourses and 3 downstream stations south of Taunton Road. In total, 6 stream gauging stations were established in the West Duffins Creek subwatershed, 5 in Whitevale Creek, 11 in Ganatsekiagon Creek and 5 in Urfe Creek. All surface water stations were monitored monthly from September 2008 through December 2009, and the monitoring included stream flow, stream water level and stream bank groundwater level measurements. Dataloggers were installed in select stream stations to record pressure and temperature. Seasonal surface water quality monitoring involved collecting general stream quality data (pH, electrical conductivity, temperature, dissolved oxygen and turbidity).

12. The hydrogeological assessment provided information with regard to stratigraphy, aquifers and aquitards, local soil conditions, groundwater flow directions, and recharge and discharge functions. This information was used as input to inform the wetland assessments and feature-specific water balance calculations, the stormwater

management facilities locations and design, and the LID techniques to be incorporated into the Stormwater Management Plan for the Seaton MESP Study Area.

13. The Seaton MESP Study Area is located within two physiographic regions: the South Slope (a vast expanse of glacial till); and the Iroquois Plain (an ancient shore bluff (Iroquois Shoreline) with sand and gravel bars, beach deposits and boulder pavements that developed along much of the northern limit of an ancient lake). In areas north of the Iroquois Shoreline, Peel Pond deposits, consisting of thin strata of well-sorted lake clay, silt and sand, may overlie the local glacial till in the MESP Study Area.

14. The stratigraphy in the MESP Study Area includes a thick layered sequence of overburden deposits. The geologic setting in the MESP Study Area is interpreted to include eight layers representing the overburden and shallow bedrock system, which correlates well with the regional hydrostratigraphic model. These layers include 1) surficial soils, 2) Halton till aquitard, 3) Interstadial deposits aquifer, 4) Newmarket till aquitard, 5) Thorncliffe aquifer complex, 6) Sunnybrook aquitard, 7) Scarborough aquifer and 8) the bedrock.

15. The regional groundwater flow direction in both the shallow and deeper overburden is generally southward toward the lower reaches of the West Duffins Creek and Duffins Creek watersheds, and Lake Ontario. More locally, the groundwater flow patterns in the shallow overburden reflect the ground surface topography, with local shallow groundwater flow moving from topographically higher areas towards the lower-lying valley areas. Groundwater flow in the shallow overburden includes flow in the surficial soils, till and the interstadial deposits. Much of the interaction between groundwater and surface water features in the Study Area occurs in these units at shallow depths. The Thorncliffe aquifer complex is relatively deep in the stratigraphic sequence and there is much less interaction between the various surface watercourses and the groundwater flow system in this unit; however, in some of the deeper valley cuts in the southern portions of the MESP Study Area, particularly along West Duffins Creek, some groundwater discharge may be attributed to this aquifer.

16. The hydrogeologic monitoring has refined the understanding of the recharge-discharge functions that occur in the various reaches of each watercourse. Groundwater recharge areas (areas of downward hydraulic gradients) typically are located in the areas of higher topographic elevation. Groundwater discharge areas (areas of upwards hydraulic gradients) tend to occur in the topographically lower areas. The vertical hydraulic gradients in the shallow subsurface fluctuate both temporally and by location. The monitoring shows the temporal fluctuations in groundwater levels are consistent with both seasonal climate conditions and the effects of precipitation events. As such, the groundwater contribution to surface water features also varies across the Study Area. In some of the valley areas, above-grade water levels (artesian conditions) have been identified along watercourses.

17. In areas where the surficial soil has low hydraulic conductivity (i.e. silts, clays, tills), infiltration is slow and recharge is limited. In areas where the surficial soil is sandy, the hydraulic conductivity is higher and infiltration can be higher, but hydraulic gradients and the thickness of the unsaturated zone in the subsurface are key factors that determine whether the area may be suitable for stormwater infiltration.

Water Balance and Groundwater Modelling (Chapter B Section 4)

18. To comply with the requirements of the CPDP and to simulate pre- and post-development groundwater and surface water conditions, the existing steady-state groundwater (MODFLOW) and hydrologic (Precipitation-Runoff Modelling System: PRMS) models were coupled and locally refined based on area-specific data to simulate pre- and post-development groundwater and surface water conditions. The benefit of building on previously developed models is that the existing models have the advantage of being developed for a broader area than the Seaton area alone, they have been refined and peer-reviewed by numerous professionals prior to this project, and they have been accepted by Toronto & Region Conservation Authority (TRCA). The base models include the Southeast Collector Groundwater Model, which was a part of an extensive Class Environmental Assessment Study for the York-Durham Sewer Study and the PRMS model developed for the TRCA Tier 1 Water Budget and Water Quantity Stress Assessment. The new PRMS better accounts for lateral movement of water in the form of runoff and interflow by allowing it to move to adjacent cells as opposed to contributing directly to the stream channels. This cascading flow mechanism provides for a more-realistic representation of water movement throughout the model area, thus providing a fully-distributed water balance.

19. The baseline hydrologic model was calibrated by adjusting model input values to best match flow statistics for the WSC gauge 02HC049: Duffins Creek at Ajax. The 270 km² catchment that contributes surface water flow to gauge 02HC049 encompasses all of the Seaton MESP Study Area. This gauge was also used as a calibration target for the TRCA regional model (TRCA, 2009). The catchment area of gauge 02HC049 extends northward to the Oak Ridges Moraine: a high-recharge area where many of the Duffins Creek headwater tributaries originate.

20. The groundwater flow model was used to simulate steady-state groundwater flow under current conditions, using long-term average values for model inputs such as recharge and stage in the streams. Calibration targets were the observed water levels in the Interstadial and Thorncliffe aquifer systems, and the estimates of groundwater discharge to streams from site-specific field measurements and Environment Canada data records.

21. The calibrated coupled groundwater and surface water model effectively quantified the potential impacts associated with Seaton development through a series of development scenario simulations. Scenario P1 included an analysis of the current conditions run with the PRMS model was utilized to evaluate the impacts of various combinations of precipitation, climate, and land use on stream flow and groundwater recharge. Current conditions were simulated by calibrating to seasonal flow patterns that are directly influenced by baseflow discharge, which, in turn, is a reflection of seasonal recharge. Baseline groundwater levels and groundwater discharge to streams under current conditions were then simulated with the MODFLOW model using the recharge determined by the PRMS model. This two-step process was repeated for the post-development scenarios to quantify the changes in the water balance components.

22. The PRMS model was applied to quantify the likely changes in runoff and recharge under full build-out with no mitigation. Two versions of this scenario were run: Scenario P2 – Urban development with full build-out and no SWMF with runoff generated on developed areas routed directly to streams; and Scenario P3 – Urban development with full build-out including SWMFs with runoff generated on developed areas routed to unlined SWMFs. All excess runoff above facility capacity was then routed to streams. A

fourth model scenario, Scenario P4, was run to simulate the reduction of development impacts on recharge and runoff under full build-out with SWMF and LID measures implemented. The LID scenario (P4) included rainwater capture on rooftops, downspout connections, infiltration galleries and rural road cross-sections proposed through the NHS. The objective was to predict the effectiveness of LID strategies in minimizing the impact of development on the surface water and groundwater systems.

23. Key findings from the model results include:

- Proposed LID measures as part of the stormwater management plan will mitigate changes in the water balance components. They will reduce runoff volumes by increasing both recharge and losses to evapotranspiration.
- Most of the future development within Seaton is focused on areas of relatively low hydraulic conductivity tills, where the capacity for recharge is already limited under existing conditions. As a result, the relative effect of development on the recharge process will be small. Development over the till-dominated regions will mainly increase runoff by reducing evapotranspiration; therefore, LID measures in these areas should be focused on stormwater management measures that reduce runoff volumes.
- In the vicinity of the Iroquois Plain area, which is characterized by sand and gravel deposits with naturally high rates of recharge, it is predicted that there will be more significant reductions in recharge without SWM as a result of increased imperviousness. Therefore, the construction of LID measures meant to maintain or enhance recharge will be most effective in these areas.
- Additional site-specific work is needed at the draft plan of subdivision stage to confirm LID effectiveness and designs.
- Using unlined SWMFs proved to be the most effective method of mitigating the potential lowering of groundwater levels. The results show that in areas where the groundwater is not used for drinking, unlined SWMFs can be an effective means of mitigating the impacts of development on groundwater levels.
- Simulated groundwater discharge to streams under the full build-out conditions with SWMFs and LID measures indicate that the loss in simulated baseflow to streams and wetlands was approximately 58% of the simulated loss in baseflow without LID measures across the MESP Study Area. There are also apparent improvements in groundwater discharge to wetland features induced through the implementation of LID measures; however, the improvement, relative to the overall water budget of 37 selected wetlands, is insignificant. Groundwater contributions to wetlands never exceeds 5% of the net wetland water budget with the exception of wetland WD2 where the groundwater contributions are modelled to be in the range of 15% to 20%. Groundwater contributions to wetlands are localized along the east bank of Duffins Creek immediately south of Taunton Road and the model suggests that changes to the discharge conditions will not affect the function of the wetlands.
- Modelled drawdown exceeding 3m that was predicted for the area north of Taunton Road (Wetlands G6 and G7) in Scenario P3 are reduced to an acceptable level of less than 1m by the application of LID measures and SWMFs. This modelled potential reduction is substantially within the error of the model and within seasonal fluctuations. Moreover, the two wetlands in this area (Wetlands G6 and G7) will be receiving water augmentation from the development area. No negative impacts to the wetland functions are predicted as a result of the potential modelled drawdown of less than 1m.

- With a few localized exceptions on the east bank of Duffins Creek south of Taunton Road, groundwater discharge to wetlands is negligible compared to surface water contributions (i.e. by 2 orders of magnitude less than the runoff).

***Surface Water Analyses* (Chapter B Section 5)**

24. The hydrologic analyses for this study were completed to provide guidance regarding the requirements for stormwater quantity control and erosion control for the MESP Study Area, as outlined in the MESP approved Terms of Reference. The analyses and conclusions are detailed in **Chapter B, Section 5.0**.

25. The 2002 TRCA Watershed Model forms the base model for use in establishing an updated 2011 MESPA VO2 Model as a tool for use to complete Seaton stormwater management analyses. Revisions to the 2002 Watershed Model included updating drainage area boundaries within Seaton, increasing model discretization within Seaton and reviewing and revising existing land use in the model where needed to establish 2008 as the date of the existing conditions model. Parameterization of the 2011 MESPA VO2 Model followed the approach used in the 2002 Hydrology Update Study. The 2011 MESPA VO2 Model was validated by comparing the simulated return period peak flows to the currently approved values in the 2002 Watershed Model as well as to observed streamflow data. This updating exercise provided an existing conditions model to be used for SWM analyses for the 2 through 100 year storm events.

26. Existing subwatershed hydrological conditions were modelled using Visual OTTHYMO (VO2). The 2011 MESPA VO2 existing conditions model was revised to reflect adjustments to subcatchment boundaries and future Seaton land use conditions. The Neighbourhood Plan (**Figure A8.1**) provided the land use input for the refinement of the 2002 TRCA Watersehd Model for the watershed within the limits of the MESP Study Area. The model was utilized to generate peak flow rates for the 2 year through 100 year return period storms. Simulated flow rates were obtained at the hydraulic structures (i.e. roadway crossings) within the MESP Study Area, at the outlets of the MESP Study Area to the receiving watercourses, and at the confluences with the receiving tributaries downstream of the MESP Study Area. The results indicate that, without stormwater quantity controls, peak flow rates within the MESP Study Area, as well as downstream along the various watercourses, would increase for all events between the 2 year and 100 year event, inclusive. The greatest relative (i.e. percent) increase in peak flow rates would occur within the MESP Study Area, particularly during the more frequent storm events.

27. The 2011 MESPA VO2 Model was further modified to incorporate the proposed stormwater management facilities (SWMF) throughout the MESP Study Area. The objective for SWMF sizing for flood control (2 through 100 year storm events) was based upon the requirement to maintain post-development flows to pre-development levels at key locations within and downstream of the Study Area. Several SWM alternatives were assessed. MESP modelling results show that quantity controls for the 2 year to 100 year storm events throughout all subwatersheds in the MESP Study Area are effective at reducing peak flows compared to future uncontrolled land use conditions; they are effective at controlling post-development peak flows to existing levels locally within the MESP Study Area along all watercourses with the exception of locations along the West Duffins Creek at Taunton Road and at the CPR. At these locations and further downstream on the West Duffins Creek and Lower Duffins Creek, controls within the West Duffins and Whitevale subwatersheds in the MESP Study Area actually increase

flows to higher levels than future uncontrolled flows (approximately 9% for the 50 year and 100 year events). This is due to the shift (i.e. delay) in the release of the peak flow from the MESP Study Area, which coincides more closely with the peak flow rate along the receiving watercourse, thereby resulting in a higher flow rate along the receiving watercourse.

28. Additional analyses were completed in order to evaluate the effectiveness of stormwater management quantity controls throughout the MESP Study Area with the exception of the Whitevale Creek and West Duffins Creek Subwatershed south of Highway 407. The results of this assessment indicated that quantity controls for the 2 year to 100 year storm events are effective at controlling post-development peak flows to existing levels locally within the MESP Study Area along all watercourses with the exception of Whitevale Creek. Increases in future flows are simulated for all return period events along the Whitevale Creek since portions of this subcatchment would have no quantity controls. Downstream of the MESP Study Area, flows would remain less than or equal to existing flows with the exception of negligible increases in frequent flows at Lake Ontario.

29. A subsequent review of impacts of uncontrolled flows in Whitevale Creek was undertaken (refer to **Sections B5.8.2.2** and **B5.9.3.4**). This review concluded that culvert improvements at two Whitevale Creek road crossings at Whitevale Road and relocation of a driveway to a house owned by Infrastructure Ontario would be required to accommodate increased flows without increasing flood risk.

30. Erosion thresholds were assessed by identifying the most sensitive reaches along the network of channels that could potentially be impacted. From these reaches, target critical velocities or critical shear stresses for the bed or bank materials were defined. Once the critical shear stress or velocity was known, the equivalent discharge was determined from detailed measurements of the watercourse geometry.

31. The erosion thresholds were used in the erosion analyses to determine SWMF sizing for erosion control purposes. The erosion analysis was completed using the spreadsheet methodology which was previously applied for the Duffins Heights Community Erosion Analysis Report (Sernas, April 2010). The methodology utilizes the results of the continuous simulation as input to spreadsheets in order to complete the erosion analyses at each location on the basis of Stream Power, Erosion Index, and Hours of Exceedance.

32. Erosion analyses were completed for the existing land use scenario at the following five locations that were identified as the most sensitive erosion threshold sites within each subwatershed encompassing the MESP Study Area:

    Site W6 located along Whitevale Creek in Seaton
    Site D4 located along West Duffins Creek in Seaton South of Taunton Road
    Site G10 located along Ganatsekiagon Creek in Duffin Heights
    Site U6 located along Urfe Creek in Seaton
    Site ED2 located along Duffins Creek downstream of Rossland Road

33. Continuous simulation was completed using the QUALHYMO hydrologic model for the existing land use conditions, for the period of record from 1998 to 2003 (inclusive) as it contains both representative wet and dry years. It is considered to provide a sufficient

basis for the evaluation of erosion sensitivity of the watercourses for the various meteorological conditions.

34. Erosion analyses were then completed for future land use conditions (QUALHYMO hydrologic model revised), to assess erosion impacts in the absence of erosion controls. The assessment identified that, in the absence of stormwater management practices, the erosion potential at each of the critical locations is anticipated to increase under the future development condition. Increases in hours of exceedance are small; larger increases are modelled in effective stream power and erosion index.

35. The QUALHYMO model for erosion was further modified to include erosion control within end-of-pipe facilities in all subwatersheds, LID measures, and combinations of the two. Erosion control requirements within the end-of-pipe facilities were established utilizing pond stage-storage-discharge relationships based extended detention of runoff from the 25 mm rainfall event for a maximum 120 hours. Volume reductions resulting from the application of LID measures have been simulated by reducing the impervious areas proportionate to the volume reduction simulated in the water balance modelling.

36. The results of the analysis indicate that the application of LID measures only or SWM facilities only reduces erosion potential to varying degrees; however, the greatest reduction to erosion potential, based upon effective stream power and erosion index criteria, would be achieved through the application of LID measures and extended detention storage within end-of-pipe facilities throughout the Seaton Study Area.

37. **Section B5.11** discusses the findings of each of the modelled alternatives considering their effectiveness to achieve SWM objectives, implications to land use and the NHS, maintenance requirements, and costs. Based on these considerations, the preferred SWM Plan consists of a number of SWM elements including:

- Post to Pre quantity control for the 2 through 100 year storm events in end-of-pipe SWMFs in all Seaton subwatersheds except for all West Duffins Creek subcatchments and Whitevale Creek subcatchments south of Hwy 407;
- Erosion control (extended detention of the 25mm rainfall event for 120 hours) and water quality control (“Enhanced” level) end-of-pipe SWMFs in all Seaton subwatersheds;
- LID measures on a variety of land uses in Seaton including:
    a. Roof downspout disconnection (i.e. roof runoff to lawn) and increased topsoil depths (additional 30 cm) applied to recreational complexes, schools, and medium and low density residential lands.
    b. Capture of the first 5mm of rainfall in employment areas assuming runoff is either retained using techniques that promote evapotranspiration such as a green roof or is routed to a storage element.
    c. Infiltration from Taunton Road Mixed Use Corridor land uses.
    d. Rural road cross-sections through the Natural Heritage System.
- Culvert improvements at two Whitevale Creek road crossings at Whitevale Road and relocation of a driveway to a house owned by Infrastructure Ontario.

38. The stormwater management unit release rates and storage requirements that are to be applied to any future development within the MESP Study Area to ensure that the quantity and erosion criteria are achieved are:

STORMWATER MANAGEMENT UNIT
RELEASE RATES AND STORAGE REQUIREMENTS

Subwatershed/Return Period	Unitary Storage (m^3/impervious ha)	Unitary Discharge (L/s/ha)
Urfe Creek Subwatershed		
Erosion	250	0.6
5 Year[1]	650	2.7
100 Year[1]	1125	7.4
Ganatsekiagon Creek Subwatershed		
Erosion	250	0.6
5 Year[1]	600	5.4
100 Year[1]	1025	12.0
Whitevale and West Duffins Subcatchments north of Hwy 407		
Erosion	250	0.6
5 Year[1]	650	3.8
100 Year[1]	1125	9.0
West Duffins and Whitevale Subcatchments south of Hwy 407		
Erosion	250	0.6
5 Year[1]	No quantity controls required	
100 Year[1]	No quantity controls required	

NOTE: [1]Volumes represent cumulative volumes at key operating stages within the facility for flood control, and do not include any extended detention or permanent pool volume requirements.

39. Preliminary model results for the Regional Storm Event are currently being reviewed by the MESP Team based on the 2002 and 2011 updated hydrology models and are being discussed with the TRCA and City of Pickering. Further discussions with the TRCA and the City of Pickering on the Regional Storm hydrology model and alternative management strategies are being pursued.

Stormwater Management Facility Location Analysis (Chapter B Section 6)

40. The Seaton MESP Terms of Reference require that a stormwater strategy be identified including the general location, type and discharge targets for all stormwater management facilities. Thus, stormwater management alternatives were evaluated to address the water management criteria and sustainability. The recommended MESPA SWM Plan includes the implementation of end-of-pipe stormwater management facilities (SWMF), use of low impact development (LID) measures, and on-site controls in certain focused areas.

41. Mapping of proposed SWMF locations is provided along with commentary on facility locations relative to NHS boundary, top-of-bank, meander belt, geologic/hydrogeologic conditions, erosion and flooding hazards, wetlands and woodlands, contributing drainage areas, facility size and general outlet locations.

42. The recommended SWMF locations were the result of extensive interactive work by the various MESP disciplines to address site specific issues including terrestrial and aquatic ecology, fluvial geomorphology, hydrology, geology, hydrogeology, stormwater management and grading within the SWMF block. This assessment was integrated fully with the hydrologic modelling, water balance modelling and feature based assessment work (wetlands, woodlands and headwater drainage features) completed as part of this MESPA.

43. A one page SWM matrix of considerations affecting the location and design of each of the 60 proposed SWMFs was prepared. Each matrix includes a plan view of the subcatchment within which the SWMF is located, showing the following:

- Proposed facility locations and footprints;
- Existing and proposed CPDP infrastructure and servicing corridors;
- Adjacent natural features and hazards and their associated set-back limits;
- 'MESPA Feature Based Assessment and Water Balance' nomenclature (wetland, woodland and headwater drainage feature identification numbering);
- Ecological Land Classification (ELC) labels for applicable habitat units in the immediate vicinity;
- Adjacent stream reach numbers; and,
- The location of pertinent hydrogeologic information, including:
  - the Iroquois Shoreline, as mapped in the CPDP
  - monitoring and test wells included in the groundwater monitoring program.

44. The SWMF matrices also include written commentary on the range of considerations and criteria affecting SWMF location and design including:

- Subwatershed location, contributing drainage area, pond block area, outlet location;
- Relationship to floodlines, top-of-bank, stable slope line, meander belt, erosion hazard, fisheries habitat, and the NHS;
- Geologic and hydrogeologic conditions at/near the proposed SWMF location;
- Implications to wetlands, woodlands, and fisheries;
- Implications to terrestrial corridors, trails;
- Roads and cultural heritage; and,
- Requirements for additional study needs specific to each SWMF matrix. These requirements are in addition to the listing of 'standard' work to be completed to finalize SWMF locations at the draft plan of subdivision stage outlined in **Chapter B Section B6.4**.

45. Eleven (11) SWMFs are located entirely within the NHS, 19 SWMFs are located partially within the NHS; and 30 SWMFs are located outside of the NHS entirely within development limits. SWMFs are recommended in or partially in the NHS where the following criteria were met:

- The NHS vegetation habitat types were agricultural lands or meadows or young successional communities (ELC units CUM), or isolated planted (landscape) trees sometimes mapped as CUS or CUP;
- Created linkage areas between natural features (i.e. across agricultural land) and along stream corridors were unaffected by the facility for at least half of the width of the linkage (as established for Duffin Heights). With the exception of seven SWMFs, all other SWMFs located in linkages only extend into the linkage by 25% or less; three of these extend into the linkage only slightly greater than 25% or are greater than 25% for only a short distance;
- Setbacks from environmental features outlined in **Section B6.2** were maintained; and,
- Existing linkage functions through the NHS were maintained.

46. If post-development drainage area was less than 5 hectares, the area was identified as an On-site Control Area (OSCA). There are 21 OSCAs that are too small to support end-of-pipe SWMFs.

Natural Feature Assessments and Water Balance (Chapter B Section 7)

47. The Seaton NHS contains numerous wetlands, woodlands and headwater drainage features (HDF). The MESP TOR specifically includes requirements to assess implications of development on wetlands and woodlands, and on watercourses.

48. The general approach to the natural features assessments is the same for all three types of features, although the methodology varies slightly and thus the assessments are presented in individual chapter sections for the three types of features.

49. The purpose of the water balance analyses is to identify potential changes in runoff volumes to the identified natural heritage features and identify mitigative measures where warranted. The identification of potential changes to runoff volumes was based upon two considerations: future development within the contributing surface drainage areas to the features and, the proposed Stormwater Management Plan that identifies SWM facility locations throughout the community.

50. Two types of water balance analyses were completed:

    a. Water balance modelling of some individual features was completed using the QUALHYMO model in continuous simulation mode to determine the change in runoff volumes between pre and post-development conditions for each of the features. The results of the modelling were used to determine the optimum location for SWMF outfall and the need for further mitigative measures.
    b. Where it was determined that a SWMF could not outlet to a feature, alternative water sources to the feature were identified. A water augmentation feasibility analyses (WAFA) was completed, the purpose of which was to determine the volume of water required to achieve a water balance when a certain percentage of a feature drainage area will be diverted away from the feature due to tableland development, pond locations and servicing constraints.

51. The information and resulting analyses were used to determine potential impacts to natural heritage features (wetlands, woodlands, HDFs) and to identify mitigative measures (i.e. SWM pond outlet locations, either into or downstream of the features, and source, type and location of any water augmentation requirements, etc).

52. The results and requirements of the water balance analyses and mitigation measures are to be confirmed at the NFSSR stage through confirmation of the modelling assumptions.

Wetland Assessment and Water Balance (Chapter B Section 8)

53. The Seaton NHS contains numerous wetlands as identified by the MNR and TRCA as part of the CPDP study process. A detailed scope of work to assess implications to these wetlands was not included in the Seaton MESP TOR. The study entitled, *Wetlands Water Balance Evaluation, Seaton Lands of the North Pickering Area* (Morrison Environmental Limited, North-South Environmental Inc. and Philips Engineering Limited; March 2008) was underway at the time of preparation of the

Seaton MESP TOR and was expected to provide further direction to stormwater management planning in Seaton.

54. The *Wetlands Water Balance Evaluation* provides findings for the 8 wetlands studied but provides little input to specific tableland development and stormwater management directions for the management of the 132 wetlands that exist in the Seaton NHS. Therefore, a scope of work for the evaluation of wetlands in this MESP was prepared and endorsed by the TRCA and the City in the fall of 2008. The method includes wetland monitoring, evaluation of wetland drainage conditions, categorization of wetland types, water balance analyses where warranted, and identification of stormwater management practices as needed to minimize impacts of development on wetland features and functions.

55. A network of wetland monitoring stations was established; 8 wetland stations were established in the Ganatsekiagon Creek watershed and 9 in the West Duffins Creek watershed. The wetland monitoring stations included piezometers to measure shallow groundwater levels to evaluate potential groundwater and surface water interactions in the wetlands. Monthly monitoring consisted of measuring water levels in the wetlands, in dedicated stilling well stations; and, measuring water levels in piezometers located at the edges of the wetlands (wetland bank). Wetland bed depths were measured to determine the total depth of the water column. Dataloggers were installed at all wetland stations to record water levels and temperature.

    The wetland monitoring provided information with regard to the flow gradients to and from wetlands (surface water and groundwater levels) and the primary source of moisture contributions to the wetlands, and was used to inform the feature-specific water balance assessments.

56. The majority of the wetlands across the uplands portions of the MESP Study Area depend predominantly on surface water contributions. Groundwater contributions predominate for wetlands in the valley of the main West Duffins Creek, in locations along Ganatsekiagon Creek and Urfe Creek where significant elevation differences occur along the channel, for instance just south of Whitevale Road. Other wetlands, such as those located upstream near the rim of the east bank of lower West Duffins Creek, exhibit dependence on both surface and groundwater contributions.

57. The surface drainage area to each wetland was mapped and each was screened to determine which would require individual detailed water balance analyses or other analytical approaches to address development implications to wetland functions. The screening exercise categorized all Seaton wetlands into four categories, related to the need for water balance analyses. All the wetlands are categorized as A, B, C, or D, as indicated on **Figure B8.3**.

RECOMMENDED ANALYSES OF SEATON WETLAND CATEGORIES

A.	Riparian 'online' wetlands with relatively large contributing drainage areas within and/or outside of the Seaton Community and no or little changes to the existing contributing drainage area	→	No individual wetland water balance analyses required if surface drainage areas to wetland are not substantially altered; commentary on expected changes to runoff volumes to be provided from results from overall hydrology analyses
B.	Wetlands with no proposed development within their surface drainage catchments	→	No water balance analyses required
C.	Wetlands with contributing drainage areas on Federal lands north of Highway 7, Whitevale community or Whitevale Golf Course	→	No water balance required as part of the Seaton MESP; MESP will identify potential need for future water balance analyses as part of future airport development
D.	Wetlands with proposed development in their surface water catchments that are not categorized as "A", "B" or "C" category wetlands; and those wetlands that are Category "A" wetlands and will experience substantial change in contributing drainage area	→	Complete hydrological modelling to determine expected degree of change in runoff volumes and identify how future development will maintain existing runoff volumes if needed

58. The results of the categorization are as follows:

- 53 wetlands or 39% of all wetlands are Category A wetlands; these distributed fairly uniformly across Whitevale Creek, Ganatsekiagon Creek and Urfe Creek subwatersheds, with fewer occurring in the West Duffins Creek subwatershed;
- 40 wetlands or 29% of all wetlands are Category B wetlands; more of these wetlands lie in the West Duffins and Urfe Creeks subwatersheds, but also do occur in the Ganatsekiagon and Whitevale Creeks subwatersheds;
- 5 wetlands or 4% of all wetlands are Category C wetlands; these wetlands are located in the West Duffins, Ganatsekiagon and Whitevale Creeks subwatersheds with none in the Urfe Creek subwatershed; and,
- 38 wetlands or 28% of all wetlands are Category D wetlands where urban development will be located within their drainage area.

59. A comparison of the wetland types of the *Wetlands Water Balance Evaluation* (Morrison Environmental et al, March 2008) and the MESP wetland assessments categories was undertaken. Findings of the *Wetlands Water Balance Evaluation* (March 2008) are similar to that documented in this study.

60. There are 5 Category A wetlands for which it was deemed necessary to undertake a more detailed examination of the implications of development within their subcatchment through a water balance needs assessment. These riparian wetlands were therefore treated and analyzed as Category D wetlands.

61. An assessment of all 38 Category D wetlands and the 5 Category A wetlands (i.e. 43 wetlands) was undertaken to determine the need to complete water balance calculations for these wetlands. This assessment considered land uses in contributing drainage areas and wetland characterization including topography, outlet conditions, soils, monitoring data, habitat attributes, surface water and groundwater conditions. Where changes to runoff volumes to wetlands are expected, the need to complete hydrologic analyses was identified. This wetland water balance needs assessment is detailed in

Chapter B Table B8.9. The results indicate that individual water balance analyses are required for 32 wetlands, summarized in **Table B8.10**.

The water balance analyses were undertaken to identify potential changes in runoff volumes to wetlands based upon future development within the immediate tableland contributing drainage area and the proposed stormwater management plan that identifies SWM pond locations throughout the community. This information was input to the determination of potential impacts to wetlands and the identification of mitigative measures (i.e. SWM pond outlet locations either into or downstream of wetlands, direction of roof drainage to wetlands, etc).

Two types of water balance analyses were completed. Results were used to determine the optimum location for SWMF outfall, either up or downstream of the wetland and the need for further mitigative measures. Where it was determined that a SWMF could not outlet to a wetland, whether for grading reasons or because runoff volumes would increase substantially, alternative water sources to the wetland were identified in the form of roof water and/or rear yard drainage.

Woodland Assessment and Water Balance (Chapter B Section 9)

62. The woodlands within the NHS, based on ELC habitat types (comprising forests, cultural woodlands and plantations) were delineated and identified with an 'F'.

63. The majority of the woodlands are located in the stream corridors, especially associated with West Duffins and Urfe Creeks, and the southern portions of Whitevale and Ganatsekiagon Creeks. Additional woodlands, many remnant farmland woodlots, have been included in the east-west NHS linkages south of Hwy 407 and midway between Whitevale and Taunton Roads. Woodland areas are poorly represented immediately north of Whitevale Road, and are almost completely absent north of Hwy 407.

64. The woodland habitats comprise mono-species coniferous plantations and cultural woodlots, and diverse dry-fresh and fresh-moist deciduous, coniferous and mixed forest types, with age classes ranging from young-mature to mature, and the presence of regenerating thicket areas indicating that successional expansion of the woodland areas is occurring already.

65. The majority of the woodlands across the MESP Study Area depend predominantly on precipitation and surface water inputs with the important frequent storm contributions typically from catchment areas close to the woodland limit. Groundwater contributions may be greater in valley areas along stream corridors where the water table is closer to ground surface and the root zone of the various woodland species. These high water table conditions occur primarily along the main branch of West Duffins Creek and on the sandy soils along and below the Iroquois Shoreline.

66. The surface drainage area to each woodland was mapped and each woodland was screened to ascertain whether development is proposed within its surface catchment, to determine which woodlands require individual detailed water balance analyses or other analytical approaches to address development implications to the woodland. All woodlands were categorized A, B, or C, as indicated on **Figure B9.1**.

RECOMMENDED ANALYSES OF SEATON WOODLAND CATEGORIES

Category	Description	Required Analyses
A	Upland woodland with surface flow from it directed toward a development area.	→ No water balance analyses required.
B	Woodlands with no proposed development within the surface drainage catchments, or only passive parkland development.	→ No water balance analyses required
C	Woodlands with development proposed in their surface drainage catchments.	→ Complete hydrological modelling to determine expected degree of change in runoff volumes and identify how future development will maintain existing runoff volumes if needed

67. The results of the categorization are as follows:

- 71 NHS valley and tableland woodlands were categorized;
- 5 woodlands or 7% of the identified woodlands are Category A; 3 of these are located in the Ganatsekiagon Creek subwatershed and there is one each in the West Duffins and Urfe Creeks subwatersheds;
- 28 woodlands or 39% of the identified woodlands are Category B; these are fairly evenly distributed across the subwatersheds; and
- 38 woodlands or 54% of the woodlands are Category C wetlands where urban development will be located within their drainage area; about two-thirds are located in the West Duffins and Ganatsekiagon Creeks subwatersheds and about one-third in the Whitevale and Urfe Creeks subwatersheds, with one located in the Brougham Creek subwatershed.

68. An assessment of the 38 Category C woodlands was undertaken to determine the need to complete water balance calculations for these woodlands. Nine (9) woodlands were determined to require water balance analyses. As SWMFs will not discharge directly to woodlands, the purpose of the water balance assessment is only to determine the water augmentation requirements, not the SWMF outlet location.

69. The 9 woodlands requiring water augmentation are FC3, FC4, FC6a, FC6B, FC17, FC18, FC20, FC21 and FC31, as summarized in **Table B9.8**. For those woodlands requiring augmentation of flows to achieve a water balance, LID measures are recommended to convey and distribute clean water to the woodland. The source and delivery route of the clean water will be confirmed and finalized through the NFSSRs.

Headwater Drainage Features Assessment and Water Balance (Chapter B Section 10)

70. Detailed hydrological and hydrogeological analyses of the watercourses have been undertaken in accordance with the requirements of the MESP TOR. The critical values for discharge, velocity and depth of flow for the most sensitive reaches for receiving streams have been ascertained, and used in concert with design storm values to provide direction with regard to stormwater management options and requirements to ensure that the post-development impact will not negatively affect the function of the stream systems. However, the work completed does not directly address the functions of the

small, typically ephemeral upstream ends of the watercourses. Thus, a headwater drainage feature (HDF) assessment was undertaken.

71. A detailed scope of work to explicitly assess implications to HDFs was not included in the Seaton MESP TOR. The categorization, evaluation and assessment method that has been used is similar to the method used for wetlands and woodlands. The HDF assessment is directed explicitly at the headwater reaches and not the entire stream system, which is addressed through the erosion assessment and SWM design. This scope of effort for the HDF assessment was presented and reviewed with TRCA and the City. The method includes evaluation of the existing and post-development drainage conditions of the HDF, determination of the natural heritage character and function of the HDF, water balance analyses where warranted, and identification of stormwater management practices as needed to minimize impacts of development on the HDF and associated natural heritage features and functions.

72. For the HDF assessment, the headwater reach is defined as the reach at the most upstream end of a channel. The headwater reaches frequently are located in close proximity to the limits of the natural heritage features of the NHS.

73. All HDFs within the NHS were identified. The surface drainage area to each HDF was mapped and each was screened to ascertain whether development is proposed within its surface catchment, to determine which HDFs require individual detailed water balance analyses or other analytical approaches to address development implications. This screening was undertaken since some HDFs, depending upon their location and type, will not experience changes to surface water conditions as a result of development of the Seaton lands and hence do not need a water balance analysis. All HDFs are categorized A, B, or C, as indicated on **Figure B10.1**.

RECOMMENDED ANALYSES OF SEATON HEADWATER DRAINAGE FEATURE CATEGORIES

Category	Description	Required Analyses
A	Drainage area entirely within the NHS or no change to drainage and/or no development or only passive uses proposed in its surface drainage catchment.	→ No water balance analyses required.
B	Water balance addressed through wetlands or woodlands water balance.	→ No additional water balance analyses required.
C	Development in the catchment, or change in drainage area and/or drainage patterns are proposed.	→ Water Balance Needs Assessment required.

74. Seventy (70) HDFs were identified for assessment. There are five reaches that may at first glance appear to be HDFs: Reaches DD4, UB11, B4, BA3, and BA4. The headwater reaches of these channels are located north of Seaton and have not been assessed as part of this MESPA.

75. The results of the categorization are as follows:

- 21 HDFs or 30% of the HDFs are Category A; the majority of these are located in the Urfe Creek subwatershed with others located in the Ganatsekiagon and Whitevale Creeks subwatersheds;
- 11 HDFs or 16% of the HDFs are Category B; the majority of these are located in the West Duffins and Ganatsekiagon Creeks subwatersheds with one each in Whitevale and Urfe Creeks subwatersheds;
- 38 HDFs or 54% of the HDFs are Category C wetlands where urban development will be located within their drainage area; about 84% are distributed fairly equally in the West Duffins, Whitevale and Ganatsekiagon Creeks subwatersheds with the remainder in the Urfe Creek subwatershed; and
- There are no HDFs located in the Brougham Creek subwatershed.

76. An assessment of the 38 Category C HDFs was undertaken to determine the need to complete water balance calculations for these HDFs. Sixteen (16) HDFs were determined to require water balance analyses (see **Table B10.7**). As SWMFs will not discharge directly to these HDFs, the purpose of the water balance assessment was only to determine the water augmentation requirements, not the SWMF outlet location.

77. For those HDFs requiring augmentation of flows to achieve a water balance, LID measures are recommended to convey and distribute clean water to the HDF. The source and delivery route of the clean water will be confirmed and finalized through the NFSSRs.

Stormwater Management Plan (Chapter B Section 11)

78. The proposed stormwater management plan (SWMP) is structured to meet the objectives of the CPDP, the requirements of the MESP Terms of Reference, and to address the recommendations of the Watershed Plan for Duffins Creek and Carruthers Creek (TRCA, 2003). Investigations and analyses were undertaken in an iterative, integrated manner by the multi-disciplinary MESP Study Team to ensure that inter-relationships that exist between surface water, groundwater, receiving wetlands, woodlands, watercourses, aquifers and other NHS features were identified and appropriate mitigative measures were recommended.

79. In reviewing the options for inclusion in the proposed SWMP, alternative best management practices (BMPs) and low impact development (LID) measures were evaluated on the basis of capabilities, limitations and physical constraints associated with their implementation. The evaluation of alternative BMPs and LIDs made use of guidelines in the *MOE Stormwater Management Planning and Design Manual, March 2003, (MOE SWMP Design Manual)* and considered the practicality of implementing alternative LID techniques set out in the *TRCA/CVC Low Impact Development Manual, 2010*.

80. A suite of end-of-pipe and LID measures are proposed for the Seaton development. End-of-pipe SWM facilities are proposed to provide the required Enhanced Level of water quality control, erosion control and flood control storage volume requirements.

81. There are conflicting ‘demands’ for roof water for various LID measures (for wetland, woodland and headwater drainage feature augmentation or runoff volume reduction);

thus, the following management priorities were set based on the findings of the recharge, groundwater, erosion and feature based water balance analyses:

- As the first priority, roof water should be directed to wetlands, as identified by the features (wetlands, woodlands and headwater drainage feature) water balance assessments. Water fed to these wetlands through a LID measure will aid in runoff volume reduction by increased evapotranspiration and increased recharge that occurs in some feature areas.
- As a second priority, roof water should be directed to other LID measures to reduce runoff volumes and/or promote recharge where feasible.

82. The recommended SWM Plan for Seaton includes:

- **SIXTY (60) END-OF-PIPE SWMF** to provide water quality, erosion control and flood control. Criteria for the design of these facilities include:

  - *Water Quality* - Enhanced (Level 1) protection (minimum 80% total suspended solids removal) based on the *MOE SWM Manual* (2003).
  - *Erosion Control* – Provide extended detention of the 25 mm rainfall event for a minimum of 120 hours.
  - *Quantity Control* - Control post-development release rates for the 2 year through 100 year design storm events to the unit release rates provided below for Urfe and Ganatsekiagon subwatersheds and in the Whitevale Creek subwatershed north of Hwy 7. No 2 year to 100 year controls are required in West Duffins Creek subwatershed or in Whitevale Creek subwatershed south of Hwy 407, however, culvert improvements to two road crossings of Whitevale Road over Whitevale Creek are needed to accommodate 100 year future flows without overtopping the road and one driveway access to a building located in the NHS should be relocated; see **Section B5.8.2**.

- **LOW IMPACT DEVELOPMENT (LID) MEASURES** are recommended in areas of sand and gravel surficial soils for infiltration purposes (where groundwater levels are compatible with the use of infiltration measures) and in areas of till soils to reduce runoff volumes and provide water quality benefits. The following LID measures are recommended.

  - Roof downspout disconnection (i.e. roof runoff to lawn) and increased topsoil depths (total 30 cm) applied to recreational complexes, schools, and medium and low density residential lands. See **Section 4.7.4** for roof areas and runoff assumed for each land use.
  - Capture of the first 5mm of rainfall from 50% of impervious area in employment lands assuming runoff is either retained using techniques that promote evapotranspiration such as a green roof or is routed to a storage element or similar measure with 5mm capacity.
  - Infiltration from Taunton Road Mixed Use Corridor land uses.
  - Rural road cross-sections through the Natural Heritage System.

  Consideration of additional LID measures should be addressed at the draft plan or site plan stage through NFSSR analyses.

- **TWENTY-ONE (21) ON-SITE CONTROL AREAS** where a variety of on-site control measures may be proposed for implementation at the draft plan of subdivision stage.

- **FORTY-SIX (46) THIRD PIPE SYSTEMS TO DIRECT ROOF RUNOFF** to nineteen (19) wetlands, nine (9) woodlands and fourteen (14) headwater drainage features to maintain clean water sources to these features in Seaton.

- **DISCHARGE OF SWMF FLOWS TO FOUR (4) WETLANDS** to direct treated runoff to wetlands to provide water source to wetlands.

- **DESIGN OF RURAL ROAD CROSS-SECTIONS THROUGH THE NHS** to promote infiltration, provide water quality benefits and reduce runoff volumes reaching watercourses.

83. Further analyses will be required to finalize the SWMF design and locations as part of the Neighbourhood Functional Servicing and Stormwater Reports. Prior to draft plan or site plan approvals, additional study of each facility should be completed to finalize its location, configuration and size, and design elements. Further analyses of the potential for use of LID measures also should be completed at the draft plan of subdivision stage.

CHAPTER C – TRANSPORTATION

84. The various modes of transportation for the MESP Study Area were analyzed and documented. Recommendations with regard to planned routes and modes of travel were provided where appropriate.

85. The road improvements planned for the Seaton Area are:

- Highway 407 EAST extension and realignment of Brock Road with Highway 407 interchange scheduled for opening 2015;
- Highway 7 widening from 2 lanes to 4 lanes currently underway between Brock Road and Highway 12 and also future widening between Brock Road and the Markham Bypass;
- Realigned Whitevale Road from Whitevale Road at Sideline Road 22 into York Region to protect the Hamlet of Whitevale from extraneous traffic;
- Whites Road extension northerly along the Sideline Road 26 right-of way into the Federal Lands with a new interchange at Highway 407 as well as widening south of Taunton Road to Finch Avenue with a new crossing of West Duffins Creek;
- Rossland Road Extension northerly from 3rd Concession Road along the Sideline Road 22 right-of-way with a new interchange at Highway 407; and
- The MESPA confirms that the initial interchange with Highway 407 should be constructed at Whites Road.

86. Several transit initiatives are planned by GO Transit, Durham Region Transit (DRT), Metrolinx, and Toronto that are within the Seaton area or are relevant to the Seaton area, specifically:

- Existing GO Transit bus service along Highway 407 will continue (in mixed traffic) on the Highway 407 EAST Extension. A Transitway along the south side of Highway 407 is protected for future separation of bus traffic.

- The CPDP proposed a GO station on the south side of Taunton Road west of Brock Road and requires an EA study. The station area is restricted by surrounding NHS and by insufficient frontage along the railway to accommodate appropriate platform length. Based on the analysis in **Chapter C, Section C7.2**, it is recommended that consideration be given to relocating this potential station to the south side of Taunton Road just east of Brock Road.
- Durham Region Transit envisions in the Long Term Transit Strategy Final Report (March 2010) a bus rapid transit (BRT) line along the proposed Whites Road (Sideline Road 26) right-of-way, as well as along Brock Road.
- Metrolinx and Region of Durham propose a higher-order bus service along the Steeles-Taunton corridor.
- Metrolinx identified potential use of the CPR Belleville Subdivision and CNR Havelock Subdivision both passing near the Seaton Community to connect with stations in Toronto with GO Rail service.
- The City of Toronto proposes LTR lines throughout the City. Of interest to the Seaton area are the following:
  - the Eglinton Crosstown LRT;
  - the replacement of the Scarborough RT.

87. Recommendations in this MESPA related to transit include:

- Service frequency and potential alternative routing plan that confirm bus service transit coverage within a 5-minute walking distance, in **Chapter C, Section 7.1** and **Appendix C7**;
- Relocating a potential GO station to the south side of Taunton Road just east of Brock Road, and providing a GO station at Whites Road;
- In addition to relocating a potential GO station to the south side of Taunton Road just east of Brock Road, locating a GO station at Whites Road would provide parking so that development density can be increased at Brock Road as required by the CPDP (**Chapter C, Section 7.2**);
- Indicating that the CPR Belleville Subdivision could provide rail connection to Toronto's Union Station including new intermediate stations in Scarborough; and
- The provision of transit connections to Toronto initiatives including the Eglinton Cross-town Line, the Sheppard LRT and the Scarborough RT replacement.

88. The Seaton Natural Heritage System Management Plan and Master Trails Plan, October 2008 (NHS/Trails Plan) included dedicated 3m asphalt paths within the rights-of-way of the Arterials roads, on-road 1.5m bike lanes along the Collector roads as well as a network of 3m paths through the NHS in Seaton. Primary connections to the trails within the NHS have been identified in the NHS/Trails Plan. There also will be potential for numerous secondary connections of local streets within the neighbourhoods to the NHS trail system via parks, SWMF, schools and major community facilities, as identified in **Figure C8.1**.

89. Policies and recommendations to reduce the public's dependence on the car and use alternate modes of transportation (transit, carpooling, walking, cycling, active transportation) are termed Travel Demand Management (TDM). TDM measures are outlined in **Chapter C, Section C9.0**, with recommendations to implement some or all of the measures to reduce auto dependency.

90. Thirty-eight locations were identified where new roads would be required to cross the NHS or where existing roads that crossed the NHS would require upgrades in support of future development. **Figure C6.1**, in **Chapter C** indicates the general location of these crossings. The natural heritage conditions of these crossing locations were investigated in the field and recommendations were made related to alignment modifications, as detailed in **Table 1** in **Appendix C6-A**.

91. As a result of investigations, the MESPA has recommended minor changes to the alignments of roads shown in the CPDP to minimize the effects to sensitive natural and cultural heritage areas, and to respond to public input. The nine recommended modifications to the CPDP roads are summarized in **Table C6.12** and **Figure C6.3** shows the recommended alignments.

92. The evaluation of these alignment changes is provided in **Tables C6.1 to C6.11** and forms part of the Class EA component of this MESPA.

93. The MESPA recommends that the East-West Type C Arterial between North Road and Rossland Road Extension be designated as a Special Type C Arterial and the road designation between Rossland Road Extension and Whitevale Road be downgraded to a Collector Road to reflect the abutting land uses and characteristics of the Neighbourhood Plans.

94. The MESPA recommends the elimination from the CPDP of the 3rd Concession Road from the Rossland Road Extension over the West Duffins Creek to Whites Road.

95. The factors that should be considered in the design of road crossings of the NHS are detailed in **Chapter C, Section C6.4.2, Table C6.13,** and include the following: hydraulics, fluvial geomorphology, stormwater management, fisheries, geotechnical and hydrogeology, wildlife passage, vegetation management, species at risk, road design, and trails. The design requirements for each crossing, regardless of whether it includes a watercourse or a terrestrial natural heritage feature, will be addressed, on a site specific basis, at the detailed design stage through the NFSSRs.

.*CHAPTER D – MUNICIPAL SERVICING*

96. The review and evaluation of the municipal servicing requirements has been undertaken to reflect Phases 1 and 2 of the Municipal Engineers Association Municipal Class Environmental Assessment (MEA Class EA) requirements and to provide recommendations and input to the CPDP Regional Services Class EA Study.

97. This MESPA assessed and confirmed, in coordination with the ongoing CPDP Regional Services Class EA Study, the needs, sizing and assumed locations of Regional infrastructure, comprising the trunk sanitary sewerage collection system and the water distribution system. Recognizing the approvals for this infrastructure are dependent on the approval of the CPDP Regional Services Class EA Study, the proposed designs and figures/drawings presented herein reflect a conceptual system that confirms the feasibility of servicing Seaton and may have to be amended once the CPDP Regional Services Class EA Study has been finalized if recommended alignments and locations of the servicing infrastructure differ significantly from those indicated within this MESPA. At the time of submission of this MESPA, given discussions with the CPDP Regional Services EA Consulting Team, such an occurrence is considered unlikely.

98. The determination of the requirements for the extensions of the Regional trunk and sub-trunk sewers, and trunk water feedermains to provide services to each of the Neighbourhoods are based on an analysis of sizing and topography, systems needs and the submitted Neighbourhood Plans where available, and in coordination with the Regional Class EA as mentioned above.

99. The proposed trunk sewer system required to service Seaton and the identified external lands is shown on **Figure D3.1** of **Chapter D**. Pipe diameters ranges from 300mm at the upper reaches to 1200mm, specifically south of Rossland Road where the individual branch flows converge.

100. The locations shown on **Figure D3.1** reflect efforts to minimize the interaction and thus impacts to the NHS system. In this regard, the majority of the service crossings of the NHS are aligned with road crossings of the NHS. However, there are seven locations where it will be necessary to construct the sanitary services through the NHS not along road rights-of-way. Specific installation requirements with respect to the NHS for each of these seven locations are discussed in **Chapter D, Section 3.1**.

101. All crossings of watercourses, major roads (Highways 407 and 7, Taunton Road), CP Rail, Trans-Northern Pipelines and the Natural Heritage System (NHS) areas where diverse natural heritage features are present (i.e. excluding agricultural lands) are proposed to be constructed using appropriate trenchless technology. The exact type of construction would be determined during the detailed design phase considering sub-surface ground conditions, natural heritage conditions, and development requirements and will be further detailed in the Neighbourhood Functional Servicing and Stormwater Reports (NFSSRs) that will be prepared subsequent to the submission of this MESPA.

102. With the exception of the sanitary sewage pumping station required to service Whitevale and Green River, the entire sewer system was developed to avoid the need for sewage pumping stations. The CPDP Regional Services Class EA Study and Neighbourhood Functional Servicing and Stormwater Reports will analyze options for servicing of the development in the vicinity of Mulberry Lane by either gravity or by the construction of a sewage pumping station and forcemain system.

The proposed trunk water system is presented on **Figure D3.5**. It consists of reservoirs, booster pumping stations and trunk feedermains. The feedermains are generally aligned with proposed collector/arterial roads. The system may also service existing hamlets of Whitevale and Green River as well as the Federal (Airport) Lands.

103. The source of water for Seaton is the Region's Pickering water system. The design and size requirements for reservoirs and pumping stations for the three water pressure zones (III to V) and the trunk feedermains have been confirmed in coordination with the CPDP Regional Services Class EA Study. The water system design is summarized in **Table D3.3**. To service the Seaton area, a 900mm diameter trunk feedermain is required from the Zone I reservoir to the Zone IV Reservoir.

104. The recommended stormwater management and road infrastructure systems are included within **Chapters B and C,** respectively.

105. Non-municipal utilities, comprising electrical transmission, gas, telephone and cable TV are discussed in **Chapter D, Section 4.**

106. Veridian Connections, who is responsible for electrical distribution, has confirmed it will require a transformer station in order to increase capacity to accommodate the demands for new growth. Veridian has initiated an EA to determine the preferred location. However, this MESP has investigated the viability of co-locating the transformer station and stormwater management facility adjacent to the Regional Pressure Zone I Reservoir, as shown on **Figure D4.1** (south of Taunton Road, east of Neighbourhood 11).

107. It is the intent to encourage the utilities to co-locate their underground facilities wherever possible, on common trench or conduit facilities and to locate any required above ground plants in locations that can be screened with landscaping or intervening structures when possible.

108. Cost estimates associated with the infrastructure have been prepared, and are presented in **Chapter D, Section D5.0**:

- The sanitary service estimates are presented in **Table D5.1**; and,
- The water feedermain, pumping station, and reservoir estimates are in **Table D5.2.**

CHAPTER E – ENDANGERED SPECIES

109. Five species at risk have been identified within Seaton and include Redside Dace (*Clinostomus elongatus*), Atlantic Salmon (*Salmo salar*), Bobolink (*Dolichonyx oryzivorus*), Least Bittern (*Ixobrychus exilis*) and Butternut (*Juglans cinerea*). The presence of these species requires consideration of current federal and provincial species at risk legislation.

110. The federal *Species at Risk Act, 2002* (SARA) establishes an official list of wildlife species that are considered at risk in Canada. The official list, referred to as 'Schedule 1' represents those species that were assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as of 1999, when the legislation was being drafted. Of the species at risk within Seaton, Least Bittern (threatened) and Butternut (endangered) are currently listed in Schedule 1 of the Act. However, the policies of SARA apply to only Least Bittern. SARA does not apply to Butternut on private (non-federal) lands, such as Seaton, as the Province of Ontario protects this species under the provincial *Endangered Species Act (*ESA, 2007).

111. At a provincial level, species at risk and their habitats are afforded protection under the *Endangered Species Act* (ESA*)*. Listing of species at risk is led by the Committee on the Status of Species at Risk in Ontario (COSSARO). The Act protects individuals of species that are listed as extirpated, endangered, or threatened and habitat of a species that is listed as endangered or threatened. Therefore, Redside Dace (endangered), Bobolink (threatened), Least Bittern (threatened) and Butternut (endangered) are protected under the ESA. Neither Atlantic Salmon nor its habitat is protected under the ESA as it is classified as extinct.

112. There are two types of habitat protection: 'general' (Clause 2 (1) (b) of the Act) and 'regulated' (Clause 2 (1) (a) of the Act), which requires a regulation to be made under Clause 55(1) (a) of the Act. The definition of 'general' habitat applies to areas on which a species currently depends. These areas may include dens and nests, wetlands, forests and other areas essential for breeding, rearing, feeding, hibernation and

migration. This protection remains in place until a species-specific habitat regulation is created.

113. Section 29.1 of Ont. Reg. 293/11 under the ESA, which amended Ont. Reg. 242/08, describes specific habitat requirements of Redside Dace and therefore constitutes the habitat regulation for this species. This new regulation also provides for a number of exemptions to the prohibition to damage and destroy habitat and the requirement to obtain permits from MNR with regard to Redside Dace. The exemptions apply to developments that have certain approval status under the Planning Act or Condominium Act and to undertakings that have certain approval status under the Environmental Protection Act. To date, there has not been a determination of the extent to which these exemptions may apply to developments and undertakings within Seaton. However, the extent to which these exemptions apply will be reflected in the Overall Benefit Plans and/or Mitigation Plans to be refined during the NFSSR and detailed design stages and through ongoing consultation with MNR.

114. Section 5 of Ont. Reg. 242/08 states that species protection of a Butternut tree that *"...is affected by Butternut canker to such a degree that retaining the trees at their location would not support the protection or recovery of butternut"* (Section 5 (4) of the Reg.). Further, Section 5 (5) of Ont. Reg. 242/08 provides the opportunity to kill, harm or take no more than 10 Butternut trees identified in a Butternut health assessor's report as trees that are not affected by Butternut canker or that are affected to a degree that is less than would permit the tree to be killed, harmed or taken as per Section 5 (4) (see further discussion in **Section E5.0**).

115. Although the primary focus of the ESA is habitat protection, allowances are made for projects where it can be demonstrated that an overall benefit to the species and its habitat will be achieved. A successful overall benefit proposal has measurable positive improvements and is linked to addressing threats identified for the species.

116. As part of the MESPA, reasonable alternatives were considered in the planning of major infrastructure, and efforts were made to limit potential impact to valued components of the natural heritage system (NHS), including species at risk habitat. In cases where interference with habitat for species at risk is unavoidable, the MNR has confirmed that an Overall Benefit Permit will be required as development plans proceed unless exemptions outlined in Ont. Reg. 293/11 are deemed to apply for Redside Dace.

117. Correspondence and meetings with the MNR have occurred to determine the implications of the ESA to development in Seaton and have also been attended by personnel from the TRCA, the City of Pickering, the Region of Durham, and the Region of Durham consultants working on the "Central Pickering Development Plan Class Environmental Assessment for Regional Services in the City of Pickering". The discussions regarding ESA permitting clarified the process, but additional discussions are required through subsequent stages of the development process.

118. Species-specific habitat requirements for each species at risk in Seaton are summarized in **Section E3.0**. **Figure E3.1** illustrates reaches within Seaton that have been identified as Redside Dace habitat, along with Redside Dace occurrences collected from the Natural Heritage Information Centre and provided by the MNR. Redside Dace habitat was identified in Ganatsekiagon Creek, Urfe Creek and Brougham Creek.

119. Overall benefit plans are outlined in detail for Redside Dace (**Section 3.6.2**, **Figure E3.2** and **Table E3.1**), Bobolink (**Section 4.1** and **Figure E4.1**) and Butternut (**Section 5.1**). There was one Least Bittern occurrence noted in Seaton and was within the protected NHS. However, the location of this occurrence did not contain suitable habitat conditions for Least Bittern when investigated by the MESPA team. Other suitable habitat locations were noted within the protected NHS and therefore there will not be any impact to the species. No further work or protection measures are required in Seaton with regard to Least Bittern.

120. The MESPA has addressed the known endangered and threatened species, but as development proceeds in the future, due diligence by development proponents is required to ensure that the ESA and its regulations are not contravened with respect to additional SARO listed species.

CHAPTER F - FISHERIES AND AQUATIC HABITAT

121. The MNR in cooperation with TRCA identified natural heritage features, corridors, and appropriate buffers required to protect the overall ecological function of the Seaton area. All known watercourses were included as part of the NHS. This serves to minimize the type and scope of impacts that cannot be avoided.

122. The Phase 1 MESP documents the extent and quality of all existing aquatic habitat within the MESP Study Area. The results of the field assessment and habitat mapping were used to evaluate potential impacts from proposed development-related infrastructure, such as stormwater management and transportation facilities. Given that the watercourses are afforded protection from development through inclusion in the NHS, potential impacts to aquatic habitat impact primarily arise from stormwater management inputs and watercourse crossings related to the transportation network.

123. Fish habitat is protected under the federal *Fisheries Act*, which is administered by the Department of Fisheries and Oceans (DFO). DFO's *Policy for the Management of Fish Habitat (1986)* provides direction on the agency's goals, objectives and strategies for fish habitat management in Canada. DFO's "*Habitat Conservation and Protection Guidelines"* (1988) further refines the direction given in the original policy statement. When applying the Fish Habitat Conservation goal, DFO applies the "No Net Loss" principle to balance unavoidable habitat losses with habitat replacement on a project-by-project basis.

CHAPTER G – MAJOR COMMUNITY FACILITIES

124. The CPDP policies require the MESP to identify the number, size and general location of Major Community Facilities required to serve the Seaton Community based on a population of up to 70,000 persons.

125. The facilities that were originally identified are:

- Two Public and one Catholic High Schools
- One District Park and three Community Parks
- Two recreation centres, one or both of which would include a library
- A police services station
- Two stand alone fire stations

- An emergency medical services (EMS) station
- Region of Durham works depot, waste transfer site and transit depot
- City of Pickering works depot, fire headquarters and animal shelter

126. The Phase 2 MESP (July 2010) provided recommendations for the location of a number of these facilities as well as a recommendation that locations of the remaining facilities need not be identified in the MESPA.

127. Subsequent to these recommendations, the City of Pickering completed a comprehensive Neighbourhood Planning process for all of Seaton. Through this process, the location of the following Major Community Facilities have been endorsed by Council and agreed to by the landowners:

1. Two Public and one Catholic High Schools
2. One District Park and three Community Parks
3. Two recreation centres
4. Two fire stations

The locations for these facilities are shown on **Figure G5.1**.

128. The proposed locations take into the account the co-location of various facilities such as groupings of high schools, recreation complexes, community parks and libraries where appropriate. It is also proposed that the EMS station be co-located with one of the fire stations.

129. Based on the land use designations and community facilities identified through the City's Neighbourhood Planning process, the MESPA is recommending that a number of the previously identified Regional and City works facilities, and the police station do not need to be specifically located in the MESPA. Instead, they can be located in land use designations appropriate for the use wherever the responsible agency deems suitable. For some other facilities, such as an animal shelter and City work's depot sites, outside of Seaton may also be appropriate as they will service a much wider area than Seaton itself.

CHAPTER H – PUBLIC CONSULTATION

130. Consultation with the public and review agencies throughout all planning and design phases of a project is a key component of the Class EA process. In **Chapter A, Section 9.0** the mandatory consultation requirements of the Class EA process are outlined.

131. At the initiation of the project, a stakeholder list was compiled, representing all parties that could have an interest or regulatory authority over some portion of the project. The full contact list is provided as **Appendix H1**. As well, a Notice of Study Commencement was circulated to all stakeholders to initiate the consultation process. A copy of the Notice is included in **Appendix H2**.

132. An additional process of consultation occurred with First Nations. Fourteen First Nations were identified as potentially having interest in the Seaton Study Area. These groups are listed in **Chapter H, Section 2.0**.

133. Archaeological assessments were conducted during the preparation of the CPDP, as discussed in **Chapter H, Section 3.1**. Additional archaeological investigations were

undertaken concurrent with the MESP, on private and provincially-owned developable lands, and the NHS. The results of these investigations are summarized in **Chapter H, Section 3.1**. The full reports will be provided under separate cover, upon request, as the information is sensitive and should remain confidential to authorities.

134. Three public information centre (PIC) meetings were held, notices for which were sent out in advance, as shown in **Appendices H3, H4** and **H5**. At each PIC, information display panels were available and Project Team members were available for one-on-one discussions. The displays for these PICs and summaries of questions and answers are provided in **Appendices H3, H4** and **H5**.

- PIC #1 - City of Pickering Council Chambers on June 27, 2007
  - The purpose was to introduce the study, explain the Municipal Class EA process, and receive feedback.
- PIC #2 - City at the Pickering Council Chambers on January 10, 2008
  - The purpose was to review the planning process to date, present information pertaining to existing environmental conditions, and discuss the next steps for the project.
- PIC #3 - Herongate Barn Theatre (2885 Altona Road, Pickering) on Tuesday, April 13, 2010
  - This PIC was held after compilation and evaluation of existing conditions pertaining to the impact of the proposed transportation and transit systems, stormwater management strategy, municipal servicing extension and required community facilities within the Study Area. Its purpose was to communicate details of the proposed solutions and receive feedback prior to selection of preferred solutions and completion of the study.

135. As required by the Terms of Reference, there was an Oversight Committee of agency and organization representatives. The Committee met five times, as detailed in **Chapter H, Section 1.7**. Copies of the meeting reports and listing of Oversight Committee members are included in **Appendix H6.**

136. In addition to the PICs and the Oversight Committee meetings, additional meetings were held with agencies. A summary of the dates, purpose and attendees of these meetings is presented in **Chapter H, Section 1.8**, with formal meeting minutes included in **Appendix H6.**

137. Following the submission of this MESPA document, a Notice of Opportunity to Comment will be made. The Notice will be mailed directly to all parties on file as having an interest in this MESP and through appropriate public notices in local newspapers.

CHAPTER I – PHASING/IMPLEMENTATION

138. The Region of Durham and the City of Pickering have requested that some the employment lands along Highway 407 be serviced concurrently with the initial phases of development of the residential neighbourhoods in Seaton. To accommodate this, the Province will seek development approval of approximately 80 ha (200 acres) of employment lands along Highway 407, generally in the area between the two new interchanges.

139. This will require extensions of the Regional services northerly through much of Seaton to provide for the servicing of these first phases of the employment lands. The servicing of these lands is included within **Chapter D** and will be determined as part of the CPDP Regional Services Class EA Study process.

140. An agreement between the Province and the four private landowners in Seaton has been executed to provide the up-front funding necessary to extend Regional spine services to the first phase of employment lands.

141. As part of the City of Pickering Seaton Conformity OPA, a Staged Servicing and Implementation Strategy (SSIS) has been prepared which proposed a four (4) phase approach for both the living area and employment lands. The phasing shown in the MESPA reflects the phasing shown in the SSIS.

142. It is anticipated that implementation of the services and roads will require a Front Funding agreement with the Region. Discussions with the Region have commenced on the principles to be incorporated into the agreement; however, the format and final conditions had not been finalized as of the date of submission of this MESPA.

CHAPTER J – FUTURE STUDY REQUIREMENTS

143. Although the MESPA provides a framework setting out directions and recommendations for a range of environmental and servicing requirements, addressing roads and transit, water and wastewater servicing, stormwater management, utilities, community facilities, phasing and monitoring at the MESP level of detail, further study and design are required to provide additional detail in support of development applications. This additional information will be included in Neighbourhood Functional Servicing and Stormwater Reports (NFSSRs) and Environmental Study Reports prepared to comply with the Municipal Class EA process.

144. The purpose of the NFSSRs will be to provide more detailed information and confirm the servicing routes, environmental constraints, and stormwater management facility (SWMF) locations, sizes and outfall locations presented in this MESPA. An annotated Table of Contents was developed to establish the scope of work required for the preparation of the NFSSRs and is included in **Appendix J2**.

145. As noted in **Table J3.1**, three City of Pickering roads are subject to Schedule C of the Class EA. These roads are Road I - North-South Type C Arterial (Sideline 24), Road IV - East-West Special Type C Arterial and Road VI - East-West Employment Collector. The MESPA addressed Phases 1 and 2 of the Municipal Class EA planning process. As Neighbourhood Plans and plans of subdivision for Seaton are completed and reviewed, the Seaton Landowners Group, in consultation with the City of Pickering, will address Phases 3 and 4 Class EA requirements for these roads. Results of the assessment will be subject to public and agency review and will be documented in publicly available Environmental Study Reports. The roads will only be constructed subject to satisfactorily completing the Class EA thirty (30) day public review process.

CHAPTER K – MONITORING

146. The MESP Terms of Reference requires that a monitoring program be established to assess the effectiveness of recommended measures and provide potential recommendations for adjustments to the systems proposed for Seaton, if required.

147. The recommended monitoring program for Seaton has two components:

- A Watershed System Monitoring and Management Program to be undertaken by the TRCA; and,
- A Mitigation Measures and Best Management Practices Monitoring Program for the development to be undertaken by each individual developer on a development parcel basis as conditions of development approval.

148. The Watershed System Monitoring and Management Program is based on an agreement with TRCA that a single monitoring program would be prepared for the complete Duffins Creek Watershed by TRCA, in consultation with the City of Pickering and the Town of Ajax, and developed from input from various environmental servicing plans that will be undertaken for each development community. It is proposed that a specific program for Seaton be developed by TRCA, in consultation with the City of Pickering and the landowner group after submission of this MESPA.

149. An adaptive environmental management framework, which is a flexible system through which potential and possibly unanticipated impacts can be identified and mitigated, will comprise a component of the Watershed System Monitoring and Management Program. In this regard, it is recommended that a contribution of $310,000 be provided to a "Duffins Watershed Adaptive Management Fund", to be maintained by the City and to be used in consultation with TRCA, through appropriate conditions of development approval.

150. The recommended Mitigation Measures and Best Management Practices Monitoring Program requires the preparation of two reports, which would be required by and defined in conditions of subdivision or site plan approval on a development parcel basis. These reports are:

- Hydrogeological Conditions Monitoring Report; and
- Surface Water Discharge/Water Quality Monitoring Report.

151. The purpose of the Hydrogeological Conditions Monitoring Report would be to determine the effect of impacts of development on the subsurface groundwater levels within the aquifer(s) supplying potable water and baseflow to the existing community. The recommended scope of the study is detailed in **Chapter G, Section 2.2.1**. The period of monitoring would be bi-annually for 6 years commencing the year following the initiation of underground servicing of the development plan for each phase.

152. The purpose of the Surface Water Discharge/Water Quality Monitoring Report would be to determine the effectiveness of the SWM Best Management Practices (BMP) and Low Impact Development (LIDS) Measures incorporated into the stormwater management works on the quality and quantity of the stormwater discharges into West Duffins, Whitevale, Ganatsekiagon, Urfe Creek and Brougham Creeks. The recommended scope of the study is detailed in **Chapter G, Section 2.2.2**. The period of monitoring would be bi-annually for 6 years commencing the year following the initiation of underground servicing of the development plan for each phase.

CONSIDERATION OF THE DUFFINS WATERSHED PLAN, 2003

153. The Watershed Plan for Duffins Creek identifies issues to be addressed and the opportunities that exist for protection and enhancement within the subwatersheds of Duffins Creek that are within the MESP Study Area. Recognizing that the watershed ecosystem is a complex network of related features and functions, the authors of the Watershed Plan worked within an identified set of component systems, namely:

- surface water quantity and quality;
- groundwater quantity and quality;
- aquatic habitat and species;
- human heritage;
- public use – outdoor recreation; and
- sustainable communities.

154. The table below presents a summary of the above noted components, reiterates the objectives as set out in the Watershed Plan, provides in bullet form how the objectives of the Plan have been or will be addressed within the context of the Seaton MESPA, and provides references to the MESPA text for further detail.

TOPIC	OBJECTIVES	PHASE 2 MESPA SECTION AND OTHER REPORTS
Surface Water Quantity	Maintain the existing water balance within the watershed	
	• Precipitation-Runoff Modelling System (PRMS) Hydrologic Model was used to evaluate changes in various components of the water balance (i.e. runoff, infiltration, recharge and evapotranspiration) under existing conditions and future conditions, both with and without best management practices and LID measures. • The modelling was also used in conjunction with the monitoring and MODFLOW groundwater model results to develop a LID strategy to develop LIDs to address the overall water balance in the watershed.	**Phase 2, Chapter B, Sections B3.2, B4.5, B4.6 and B4.7**
	Maintain or enhance baseflows	
	• Monitoring of existing conditions stream flow was done at representative locations. These results, in conjunction with the geological mapping and hydrogeological modelling have been used to evaluate potential impacts to base flow conditions and to recommend LID and stormwater management measures that will serve to maintain or enhance baseflow.	**Phase 2, Chapter B Sections B3.2, B4.5, B4.6, B4.7 and B5.0**
	Minimize or reduce risks to human life and property due to flooding	
	• Sixty stormwater management facilities are proposed within the Seaton Study Area. Within the Urfe and Ganatsekiagon Creek subwatersheds, quantity control of post-development stormwater flows to pre-development levels for the 2 year through 100 year design storm events is recommended. No 2 year through 100 year quantity controls are recommended for West Duffins or Whitevale Creeks south of Highway 407.	**Phase 2, Chapter B, Section B5.0**

TOPIC	OBJECTIVES	PHASE 2 MESPA SECTION AND OTHER REPORTS
	Maintain or restore natural stream channel stability	
	• Development of appropriate erosion thresholds and integration within the overall stormwater management plan. • Sixty stormwater management facilities proposed for within the Seaton Study Area will provide extended detention of stormwater flows during frequent rainfall events. The extended detention times will mitigate potential erosion impacts, therefore maintaining channel stability. • A series of LID measures is recommended to reduce runoff volumes and encourage infiltration.	**Phase 2, Chapter B, Sections B5.0 and B6.0**
	Manage the quality and quantity of runoff from rural and urban areas to maintain in-stream uses	
	• Forty-eight stormwater management facilities are proposed within the Seaton Study Area which will provide quantity control of post-development stormwater flows to pre-development levels for the 2 through 100 year design storm events. (There are twelve SWM facilities on West Duffins and Whitevale Creek that will provide quality control only). • A series of LID measures is recommended to reduce runoff volumes and encourage infiltration. • Twenty-one On-Site Control Drainage Areas (OSCA) are proposed within the MESP Study Area which will be required to provide quantity control of post-development stormwater flows to pre-development levels for the 2 through 100 year design storm events. • On-site quality control in the form of best management practices and LID measures are proposed for the twenty-one OSCAs. • Erosion threshold approach to pond sizing was used to address in-stream erosion potential.	**Phase 2, Chapter B, Section B6.0** **Phase 2, Chapter B, Section 5**
	Minimize in-stream sediment associated with construction activity	
	• Sediment and erosion control practices during construction will be in accordance with the Greater Golden Horseshoe Conservation Authorities Erosion and Sediment Control Guideline for Urban Construction. • Long-term in-stream monitoring program based on an adaptive management approach to identify and address concerns in a timely manner.	**-** **Phase 2, Chapter K**
Groundwater Quality and Quantity	Maintain or enhance groundwater levels and discharge for watershed functions	
	• The PRMS and MODFLOW groundwater flow simulations were completed for existing conditions, post-development without mitigation and post-development conditions with LIDs to simulate the effectiveness for maintaining functions within the watershed areas.	**Phase 2, Chapter B, Sections 4.5, 4.6, and 4.7**

TOPIC	OBJECTIVES	PHASE 2 MESPA SECTION AND OTHER REPORTS
	Protect groundwater quality to ensure provision of safe water supplies and ecological functions	
	• Lake Ontario is the major source of fresh drinking water for virtually all communities that border its north shore. Lake Ontario will continue to be the primary source of drinking water for future development in Seaton. There are no known municipal, industrial or commercial water takings from any of the streams that flow through or from Seaton. • Considerable effort was taken to characterize the wetland, woodland and headwater drainage features and understand the relationships between the shallow groundwater systems and the surface water systems. Management measures recommended in this study for recharge and infiltration enhancement considered the protection of both surface water and groundwater quality.	**Phase 2, Sections B7.0 through B10.0**
	Ensure sustainable rates of groundwater use	
	• Existing groundwater use was considered in the modelling; there are no municipal water supply wells in the MESP Study Area and groundwater use is not proposed for development. Changes in the amount of infiltration were considered in context with current groundwater use. The results showed that the proposed development will not adversely affect groundwater levels in the deeper aquifers beyond the MESP Study Area.	**Phase 2, Sections B3.0 and B4.0**
Aquatic Habitat and Species	Protect and restore native aquatic species and communities	
	• All existing and potential fish habitats were identified and protected with appropriate buffers and setbacks through CPDP. • Protection of endangered species including Redside Dace is addressed in **Chapter E.** • Existing fish habitat documented through Phase 1 MESP Report. • Opportunities for habitat improvements, restoration and removal of barriers are identified.	**CPDP;** **MESP Phase 1, App B and C; Phase 2 Chapter E, Phase 2 Chapter F Section F2 .0**
	Protect and restore the riparian zone and associated functions	
	• The riparian zones of the identified watercourses are protected through the CPDP NHS designation. • Opportunities for riparian enhancement are identified.	**CPDP; Phase 2 Chapter B, Section B6.0; Phase 2 Chapter F; Seaton NHS Management Plan**
Terrestrial Habitat and Species	Increase the percent of natural cover to a quantity that provides targeted biodiversity and supports recreational uses	
	• The CPDP identified numerous locations where the NHS incorporated agricultural land. The natural cover within the Seaton MESP Study Area will increase over time as development proceeds.	**CPDP;** **Seaton NHS Management Plan**

TOPIC	OBJECTIVES	PHASE 2 MESPA SECTION AND OTHER REPORTS
	Protect the natural system quality and function from the influence of surrounding land uses	
	• The highest quality natural areas (West Duffins, Ganatsekiagon and Urfe Creek valleys; west-central tableland forest) are protected from development by inclusion in the NHS and buffered. • SWMF analyses, including water balance, undertaken to ensure retention of NHS features and functions. • Alignment modifications of roads and infrastructure undertaken to minimize potential impacts.	**CPDP;** **Phase 2 Chapter B, Section 6;** **Phase 2 Chapter C, Section 6 and Chapter D, Section 3**
	Protect and restore all native vegetation community types and species to targeted levels	
	• NHS captures diverse mix of native vegetation community types. SWMF analyses, including water balance, undertaken to ensure retention of NHS features and functions.	**CPDP;** **MESP Chapter B, Sections B7.0 through B10.0**
Public Use – Recreation	Create continuous watershed trails in the greenspace system linking Lake Ontario and the Oak Ridges Moraine	
	• The Seaton Natural Heritage System Management Plan and Master Trails Plan**, October 2008** (NHS/Trails Plan) provides for the major trail system through the NHS in Seaton. The MESP identifies numerous potential connections from the neighbourhood to the MTS.	**Seaton Natural Heritage System Management Plan and Master Trails Plan, October 2008;** **Phase 2 Chapter G, Section G5.2**
	Manage the green space system for sustainable uses and public enjoyment	
	• Most of the green space is in public ownership and will remain so. • Recommendations are provided for uses which can be incorporated into the NHS without impairing natural heritage features and functions. This frees up land outside the NHS for development which, in itself, is a sustainable practice. Large areas of NHS remain for trails and other passive public recreational use.	**CPDP;** **Phase 2 Chapter G**
	Improve green space accessibility while ensuring compatibility between social benefits and ecological health	
	• The potential connections to the NHS and MTS identified in the MESP will be further reviewed and finalized in the Seaton Neighborhood Plan Review Study.	**Seaton Natural Heritage System Management Plan and Master Trails Plan, October 2008 (NHS/Trails Plan);** **Phase 2 Chapter G, Section G3.0**
Human Heritage	Identify and document human heritage resources for protection	
	• Stage 1-2 Archaeological Assessments are being conducted where infrastructure is proposed through previously unstudied areas. • The areas being assessed are predominantly within the Natural Heritage System (NHS).	**Phase 2 Chapter H Section H3.0**

TOPIC	OBJECTIVES	PHASE 2 MESPA SECTION AND OTHER REPORTS
	• Stage 3 Archeological Assessments are being conducted to confirm the limits of new and previously identified sites and to provide input on limits for Heritage Easements where appropriate.	
	Increase awareness and appreciation of the inherent value of human heritage resources	
	• The results from the Stage 1-2 and Stage 3 Archaeological Assessments will be used to evaluate potential impacts to archaeological resources and to recommend measures that will serve to maintain significant archaeological resources in situ where feasible and practical. • The Archaeological Assessments are being carried out in consultation with First Nations and with the presence of a First Nations Monitor. • Documented heritage resources will be taken into account in the planning and construction of trails and infrastructure.	**Phase 2 Chapter H Section H3.0** **Phase 2 Chapter H Section H2.0**
Sustainable Communities	Increase awareness of watershed issues and use of available watershed knowledge in decision making to foster sustainability and sustainable lifestyle practices	
	• Decision making process of MESPA has been based on sustainability principles.	**-**
	Use sustainable urban design approaches to guide urban growth and development	
	• The City of Pickering Council endorsed an Amendment to the Pickering Official Plan (the Conformity OPA) which addresses sustainability in several of the policies presented therein. Neighbourhood Plans (NP) and Sustainable Placemaking Guidelines for all of the urban area will also be prepared to comply with the Conformity OPA. • Sustainable urban design is a separate initiative of the City. The MESPA recommendations set the stage for sustainable urban design.	**-**