

Appendix A

Terms of Reference



Terms of Reference for a Master Environmental Servicing Plan (MESP) For York Downs July 2016

Preamble

The following provides an overview of the City of Markham's Submission Requirements for Master Environmental Servicing Plans (MESP's). The MESP is to be prepared in support of Secondary Plans for specific development areas, and is to be completed in conformance with the requirements outlined in the City's Official Plan. These submission requirements are intended to be generic and summarize the information requirements for an MESP completed anywhere within the City of Markham. Nevertheless, it is recognized that the submission requirements may be tailored to be specific to the available information and/or guidance from higher level studies (such as the Subwatershed Study for the City's Future Urban Area).

In circumstances where a Subwatershed Study (for instance) precedes a Secondary Plan and MESP process, some of the data/analyses listed herein may not require new work or it may be appropriate to build upon the technical analyses and assessments conducted in the primary or parent studies, subject to scope concurrence with the City and its partners. References in the table below to the need to refine SWS recommendations are intended to apply to circumstances where refinement may be needed if there are substantive differences in land use assumptions between the MESP and the SWS and/or legislative requirements, policies or engineering standards that have arisen since the completion of the SWS (e.g. Species At Risk [SAR], Climate Change, etc.).

These Terms of Reference summarize only the information and content which is required for an MESP. Further details of the scope of work required for MESP's (i.e. analytical tools and methodology, monitoring, field investigations, mapping and reporting formats and requirements, etc.) are to be defined in the Terms of Reference for each specific MESP. Development proponents are required to consult with the City of Markham and the City's Study Partners (e.g., Toronto and Region Conservation Authority (TRCA), Ministry of Natural Resources and Forestry (MNRF), Regional Municipality of York (Region), adjacent municipalities, as appropriate) to establish and prepare the Terms of Reference for each MESP, prior to initiation.

Task	Required Components
	Executive Summary
1.	The Executive Summary shall include the following:
	• Integrated summary of the work completed and conclusions of the individual sections
	Identification of inter-relationship between the various sections
	• Concise summary of the significance and implications of the findings of the MESP
	Summary of conclusions and recommendations
	Introduction
	The MESP shall include the following, subject to consultation with City and Study Partners:
	• Purpose of the MESP including its relationship to higher level documents and/or other relevant Studies, and its relationship to neighbouring lands in terms of servicing, transportation etc.; Terms of Reference for the MESP should also include a section clearly outlining the study requirements
	• Study area location, attributes, descriptions, figures and boundaries, including rationale for determination of study extent
	• Setting (existing land use, natural features, etc.)
	• Study objectives; the MESP is to:
	 be completed in support of proposed land development within the corresponding Secondary Planning Area
	 be completed to advance detail and be consistent with the recommendations from higher level and/or relevant studies, as applicable
2.	 describe and evaluate opportunities and constraints and conceptual mitigation related to the hierarchy of protection, enhancement, or if required, compensation, for the natural heritage and hydrologic features potentially impacted within the study area; to evaluate these features and their functions in terms of opportunities and constraints for the management of Greenway System in the context of the development, specifically to determine the potential implications to the natural heritage and hydrologic features and valley lands in compliance with the approved policies in the OP (existing 1987 and the partially approved 2014)
	 outline site design or management techniques that may be required to mitigate, enhance or compensate for the potential adverse effects to the natural heritage and hydrologic features and functions
	 provide sufficient level of site investigation, servicing investigation and conceptual design, in recognition of potential access restrictions to some locations, to ensure that significant natural heritage and hydrologic features and their functions are protected and managed in the governing studies, where applicable, as part of the completion of the MESP
	 identify opportunities to reduce servicing and transportation crossings of the Greenway System
	[Note: more detailed investigations will be required in support of individual

	development applications; however, those study requirements will be appropriately scoped as a result of this investigation.]
	Scope Outline
	• Study team that include an inter-disciplinary team with expertise including but not limited to environmental, hydrogeological/geotechnical, engineering, planning, landscape architects and public consultation and transportation.
	• Maps depicting land ownership and participation in the study
	Report structure outline
	• Summary of pre-consultation activities with City, TRCA, MNRF, Region, and others as required
	• Background review of existing relevant studies (e.g. transportation studies, approved watershed, subwatershed, drainage studies, fisheries management plans, best management practices guides, natural heritage systems planning guides, flood and stormwater management studies, etc.)
	Planning and Environmental Policy Context
3.	• Identify and define applicable Federal, Provincial, Regional, TRCA and Municipal planning and environmental policies including existing 1987 City of Markham Official Plan and the applicable sections of the partially approved City of Markham 2014 Official Plan which supersede it . This includes policy review of the applicable Official Plan policies
	• Reference existing relevant studies (e.g. approved watershed, subwatershed, drainage studies, fisheries management plans, best management practices guides, natural heritage systems planning guides, flood and stormwater management studies, urban design studies, transportation studies, trail studies, etc.) which represent the parent studies and governing documents for the MESP. Identify, list and summarize applicable sections of each document as they relate to the MESP
	• Define requirements for compliance with any relevant Subwatershed and other applicable studies
	• Identify Greenway System including natural heritage and hydrologic features identified for protection in the applicable Official Plan policies.
	Characterization of <u>Existing</u> Conditions: Constraints and Opportunities
	The MESP will include assessment/identification (as applicable) of constraints and opportunities to the Greenway System related to:
	Monitoring
4.	 Pre-development monitoring of adequate duration established consultatively with City and TRCA staff
	Physical Setting
	• Physiography - – characterization of physiographic setting and landform;
	 Topography – topographic survey of the study area and boundary, including all on- site structures, watercourses, drainage routes, culverts and general location of treed

	areas, etc.; and
0	Geology – surficial geology description and mapping, bedrock geology and stratigraphic interpretation of the subsurface sediments
• S	urface Water Resources
0	Surface water hydrology and hydraulics including:
	 Existing land use drainage conditions (boundaries and patterns)
	 Existing land use hydrologic modeling
0	The Regional Storm assessment for existing and post development will be conducted using the watershed model prepared by TRCA. The consultant will conduct the modeling using the current VO2 model, but with the understanding that further assessment of the Regional impacts using the updated PCSWMM model will be required to confirm or adjust previous findings. Updates will be submitted to the City and the TRCA as amendments to the MESP
0	Water budget for existing conditions, based upon water balance for surface water with input from the groundwater component
0	In consultation with the city and TRCA, identify headwater drainage features and establish management scenarios as per the TRCA Evaluation Classification and Management of Headwater Drainage Features Guidelines (2014)
0	Update existing TRCA's floodline mapping based on current site topographic survey.
0	Surface water quality including:
	 Documentation of water quality monitoring findings for area watercourses
	 Outline of recommendations from Stormwater Management Retrofit Study/Plan including specifically any retrofit and restoration opportunities
• V	Vater Budget/ Water Balance
0	Establish water budget for existing conditions, based upon water balance for groundwater with input from the surface water component. This would include (but not limited to):
	 calculation of annual infiltration with input from field tests related to soil's hydraulic conductivity and infiltration rates
	• establish targets for overall water balance including local groundwater recharge as necessary based on the extent of guidance provided by this MESP and any other relevant higher level studies (to ensure the sustainability of wetlands, woodlands, etc. and to manage runoff)
0	Feature based water balance - identify natural features within the study area and based on monitoring results provide information how each feature is sustained within their catchment areas (groundwater/surface water), hydroperiod, and expected timing to return to "normal" conditions
0	Prepare stage/storage/discharge information for storage based features using survey and monitoring data

• Prepare and calibrate hydrologic/hydrogeologic modeling or calculations using monitoring data

• Groundwater Resources

A hydrogeological assessment to assess the existing soil and groundwater conditions at York Downs will characterize the physiography, topography and drainage, surface water flow conditions and describe the surficial and bedrock geology, hydrostratigraphy, local aquifers, groundwater use and water quality, and the interpreted groundwater flow systems. Water balance calculations for pre-development, post-development and post-development with mitigation will also be provided.

An extensive groundwater and surface water monitoring network has been established on the property including 28 monitoring wells, 16 drive point piezometers and 6 staff gauges. Monthly monitoring began in March 2016 and is on-going. In addition to this data, historical groundwater and surface water monitoring data previously subject to PTTW monitoring requirements are also considered.

- Hydrogeological investigations including:
 - Existing groundwater levels, flow direction and gradients
 - Aquifer locations and vul**n**erability
 - Groundwater recharge and discharge zones
 - Baseflow contribution to wetlands and watercourses
- Major groundwater resources and groundwater users in the area from MOECC water well and water taking permits and other relevant information
- Refine/define targets for overall water balance as necessary based upon scale of assessment and extent of guidance provided by higher level studies
- Source Water Protection Plan including:
 - Wellhead Protection Area Quantity
 - Wellhead Protection Areas A, B, C, and D
 - \circ Groundwater Vulnerability 8 and 10
 - Significant Groundwater Recharge Areas
 - Ecologically Significant Groundwater Recharge Areas
 - Surface Water Intake Protection Zones
- Fluvial Geomorphology
 - Existing land use fluvial geomorphologic conditions including:
 - Reach delineation
 - Rapid assessments

 Detailed geomorphic field assessment
 Meander belt width assessments for major tributaries throughout the study area, using MNRF and TRCA approved assessment protocols in support of erosion hazard delineation
•
 Meander belt width delineation in support of Redside Dace habitat limits, where present in consultation with MNRF
• Erosion threshold assessment including consideration of downstream areas
Aquatic Resources
 Aquatic community description including:
 Physical conditions including channel form, in-stream cover, spawning habitat, refuge habitat, riparian cover, etc.
 Fisheries community composition and significant/sensitive species including aquatic species or communities that have designations under the Endangered Species Act or the Species At Risk Act
• Hydrologically sensitive features and key hydrologic features
 Natural features' dependencies on surface water and/or groundwater based upon hydrogeological investigations.
 Identification and delineate (including staking) of all wetland features (provincially and locally significant wetlands and unevaluated wetlands) in consultation with the Ministry of Natural Resources and Forestry (as required), TRCA and the City.
 Identification and delineation of valleyland features and buffers
Terrestrial Resources
• Vegetation community description and floral inventories including:
 Ecosystem context
 Community description using MNRF ELC standards
 Identification of Areas of Natural and Scientific Interest (ANSI)
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 Identification of vegetative communities and significant/sensitive species including species or communities that have designations under the Endangered Species Act or the Species At Risk Act
 Identification and delineation (including staking) of woodlands. Any proposals for removal of woodlands will require completion of woodland assessment using the City's established Terms of Reference for Woodland Evaluation. This work can be completed separately (prior to impact assessment) or as part of this MESP.
 Habitat conditions and species. Acceptable methods should be clarified for birds, amphibians/reptiles and mammals and approved by City and TRCA staff.

	 Significant wildlife species and habitat conditions
	 Conduct breeding bird and amphibian surveys, as requested by TRCA and/or MNRF as required
	 Significant species including local, Regional, Provincial significant species, communities of conservation concern as per TRCA rankings, and species or communities that have designations under the Endangered Species Act or the Species At Risk Act
	 Identification of wildlife linkage passages and connectivity opportunities
	 Confirmation of the Greenway System
	- Integrated characterization (Task 4) of how the existing Greenway System is interconnected, including natural heritage and hydrologic features and their functions. This would include:
	- Identify natural linkages and ecological corridor functions
	- Identification of vegetation protection zones (i.e. buffers)
	- Identification of complementary land uses and potential enhancement lands
	 Establish opportunities and constraints mapping and define developable areas, undevelopable areas and any areas requiring further stud
	 Clearly define the circumstances in which infrastructure is permitted within vegetation protection zones. LID, trails, etc
	Proposed Development Plan and Municipal Servicing
	Note: The timing of this section of the MESP coincides with the timing of the Community Design Plan and Sustainability Framework development.
	The MESP will include:
	• Summary description of development, including proposed development areas, types of development, and maps
	Study area ownership
	Stormwater Management (SWM) servicing including:
5.	• Functional stormwater and environmental management plan and associated hydrologic modelling (pre and post development) complete with boundaries as required
	• Updated hydrologic analysis and verification that stormwater management plan addresses criteria and requirements of Subwatershed Study and other parent documents as appropriate
	• Post development water budget to inform stormwater management plan for water quality, quantity, infiltration, groundwater and erosion control
	• Refine infiltration targets (for each landowner to meet) based on post development infiltration deficit (particularly in potentially significant recharge areas) based upon refined land uses and other technical information

	land uses and other technical information
0	Hydraulic analysis – major infrastructure (floodplain, culverts, other crossings etc.)
	If applicable, apply fluvial geomorphology recommendations for the design of open watercourses including: meander belt, erosion thresholds etc.
0	Outline best management practices/stormwater management recommendations/alternatives
0	Size and site general footpint of proposed stormwater management facilities and outfalls; where required, complete site visits with relevant agencies to review stormwater management facility/outfall locations
0	Delineate future land use catchment area boundaries
0	Delineate major and minor drainage systems
0	Preliminary grading plans/facility design elements, including preliminary storage- discharge relationships for stormwater management facilities
о О	Screening and assessment of long list of low impact development (LID) techniques to be considered at detailed design stage including assessment of function and feasibility based upon proposed conditions. LID targets (infiltration, evapotranspiration, runoff) shall be established at the MESP stage based on the pre/post water balance assessment. The MESP should clearly state that LID measures will be implemented at the site specific stage consistent with the recommendations of the MESP, applicable City's OP policies and the City and TRCA LID guidelines and directions
0	Complete review of alternatives for Regulatory Event management and recommend preferred management strategy
0	Compare pre to post development stormwater conditions up to the Regional flows and water levels within downstream receiving watercourses including SPAs.
0	Integrate stormwater management plan requirements with future specific water budget analysis to identify appropriate mitigation measures to manage runoff volumes to specific features
0	Analysis and comparison of pre-development and post-development (controlled) flow conditions for modelled storm events relative to the erosion threshold (variation within +/- 5% will be allowed)
0	Consultation summary with MNRF to address implications on aquatic SAR (i.g. Redside Dace)
• W	ater supply servicing including:
0	Existing infrastructure
0	Availability of external services
0	Expected population and demands
0	Future Population (Ultimate Scenario) within the catchment area in accordance with the current Official Plan (OP)
0	Identification of proposed/permitted connection points to existing water supply systems

• Pressure districts
• Design criteria (average, daily, hourly, fire demand, pressure, and pipe roughness)
• Proposed infrastructure and servicing plan
• Water distribution modelling and pressures during maximum day, peak hour, minimum hour and maximum day plus fire conditions
 Servicing constraints (Regional and Municipal scale), expansion, and upgrade requirements to support the proposed development Internal servicing constraints
Wastewater/sanitary servicing including:
• Existing infrastructure
 Identification of proposed/permitted connection points to existing wastewater servicing systems
• Existing service areas and flows
• Design criteria (generation rates and infiltration contribution) for growth
• Proposed infrastructure and servicing plan
• Expected population and wastewater generation
• Future Population (Ultimate Scenario) within the catchment area in accordance with the current OP
• Expected sanitary flow from the proposed and future developments within the area
• Prepare and implement monitoring plan at key locations as required
• Wastewater servicing model inclusive of existing and proposed service areas
 Servicing constraints (Regional and Municipal scale), expansion, and upgrade requirements to support the proposed development
Preliminary site grading including:
 Existing grading including existing topography and general grading/sloping direction(s) of site, location of high and low areas
 Grading criteria including consideration of positive drainage of sewers and overland flow by gravity to receiving systems; ensure acceptable grading of site and roads
 Proposed grading including proposed preliminary grading concept plan, location of future high and low areas, grading constraints in relation to existing and proposed servicing infrastructure and environmental/ecological features, potential requirements for cut/fill, consideration of existing and future grades of surrounding areas outside of TRCA buffers, interface with natural heritage and hydrological features
• High level recommendations and principles to be applied for site management and phasing, related to minimizing erosion and sediment discharge to receiving watercourses during construction, consistent with City Engineering Standards

	 Considerations of reduction in cut/fill and integration of the natural topography in post development landscaping and road design
•	• Conceptual natural channel design (if required) for relocated watercourses including:
	• Base mapping
	• Design criteria (hydrology, hydraulics, channel dimensions, terrestrial and aquatic habitat)
	 Geomorphic field assessment
	• Design constraints
	 Corridor requirements (flood conveyance, erosion hazard limits, aquatic habitat, terrestrial habitat, existing City/Region trail systems)
	• Fish habitat impacts and mitigation, enhancement or if appropriate, compensation opportunities
	• Design concepts (plan view, profile, typical sections, etc.)
	• Barrier removal opportunities
	 Consultation summary with MNRF where Redside Dace (and/or other species at risk) habitats may be affected
	 Road crossing, cycling and pedestrian bridge crossing, and trail system conceptual designs Based on recommendations from relevant studies (where available), complete conceptual design of road crossings, cycling and pedestrian bridge crossing, and trail system including consideration of requirements related to hydraulics, fluvial geomorphology and wildlife passage
Trar	nsportation
The	MESP at minimum will include:
•	 Introduction Study assumptions Rationale and location of crossings as related to the Greenway System Intersection operation methodology Verification of crossing role and function Transportation Association of Canada crossing vehicle capacity
•	 Existing Conditions Site and area description Study area road network (including transit, bike and pedestrian) Transit service Existing traffic volumes Existing traffic intersection operations
•	 Future background traffic conditions Planned network improvements Traffic growth Other area developments

	 Background traffic volumes
	 Background traffic intersection operations
	Proposed development Development statistics
	 Development statistics Vehicular trip generation
	 Vehicular trip generation Non-auto trip generation
	 Trip distribution and assignment
	o The distribution and assignment
	• Total traffic conditions
	• Total traffic volumes
	• Assessment, comparison and evaluation of alternative road networks
	 Mobility connectivity – internal and external
	• Total traffic intersection operations
	• Transportation demand management
	 Recommended transportation network
	 Road classification
	 Non-auto facilities (Including transit, bike and pedestrian)
	 Future transit service
	• Right of way
	 Cross sections
	Dhosing
	Phasing
	The MESP will include:
	• Development and construction phasing and staging (Phase 1 has been identified as per
	Figure 1 . Remaining phases will be identified at a later stage and will be included in
7	the MESP as updates or amendments)
	Mobility connectivity - internal and external
	• Requirements for interim stormwater and environmental management and servicing,
	and associated recommendations
	Detential Development Imports and Decreased Mitigation/Enhancements
	Potential Development Impacts and Proposed Mitigation/Enhancements
	An impact assessment shall be conducted after the characterization of the Environment and
	once a Conceptual Plan has been developed.
	The impact approach should include the application of the Mitigation Hispanshy. The
	The impact assessment should include the application of the Mitigation Hierarchy. The Mitigation Hierarchy will be actablished in consultation with the City and TRCA staff and
	Mitigation Hierarchy will be established in consultation with the City and TRCA staff and will prioritize the determination of avoidance, minimization and mitigation to alleviate
0	environmental harm and the removal of natural heritage and hydrologic features. Requests for
8	consideration of natural heritage compensation are always treated as a last resort outcome.
	The MESP will include:
	Assessment of impacts on surface and groundwater resources Development footprint and site grading
	• Development footprint and site grading
	 Assessment of the impacts of the development on the surface water and groundwater systems and any mitigation measures required prior to construction

• Define impacts of buried services and roads
• List mitigation and enhancement techniques to achieve subwatershed study recommendations (as available)
• Recommend list of acceptable LID techniques to maintain water budget, based upon long list of general mitigation techniques previously advanced (see Section 5); final LID and Best Management Practices (BMPs) to be established at the detailed design stage. Provide target information values for landowners.
• Apply and advance the recommendations from the Subwatershed Study (as available) related to headwater drainage features completed as part of the subwatershed studies or related studies as available. The MESP shall recommend management scenarios for each feature based on established protocols and management scenarios in the subwatershed studies (as available)
• Characterization of groundwater quality where potential exists for development to alter conditions (e.g., individual septic systems)
• Assess impacts on aquatic and aquatic habitats and recommend suitable mitigation, enhancement, and compensation measures where applicable including consultation summary with MNRF to address implications on aquatic SAR (e.g. Redside Dace)
• Assess impacts on vegetation and vegetative communities and recommend suitable mitigation measures, enhancements and compensation where applicable
• Assess impacts on woodlands and recommend suitable mitigation measures, enhancements and compensation where applicable
• Assess impacts on wildlife and wildlife habitat and recommend suitable mitigation, enhancement, and compensation measures where applicable
• Update the PCSWMM model established by AMEC for the upstream Future Urban Area (FUA) with the post development hydrologic conditions for the site for the Regional Storm event. Modeling to be completed once PCSWMM is available.
• Use the FUA PCSWMM model to complete a Regional Storm event impact assessment for the downstream receiving system including SPAs. Provide mitigation measures (if required) to address any increases in water levels in the SPAs that result from the proposed development of the York Downs lands.
• Apply and advance the recommendations from the subwatershed study (as available) related to channel protection, buffers and/or setback delineation in accordance with criteria established in the applicable Official Plan and related Official Plan Amendments (OPAs)
• Identify enhancement and compensation requirements based on recommendations from higher level studies
• Effects on connectivity, and fragmentation and isolation of habitat
• Complete a feature specific water budget analysis and identify mitigation, enhancement and potential compensation measures as applicable
• Assess impacts to, and identify protection, enhancement and potential compensation approaches as applicable for the management of species at risk based on the federal Species At Risk Act (SARA) and/or the Provincial Endangered Species Act (ESA)

	• Description of how the recommended watercourse and stormwater management strategy and Greenway System address requirements of higher level studies
	• Integrated assessment of impacts to interconnection between the existing Greenway System with groundwater, surface water, wetlands, woodlands, and other natural heritage features
	• Summarize impacts on the natural environment and natural processes to protect, enhance or if appropriate, compensate, the natural environment and natural processes from the impacts of development
	General and Public Consultation
	The MESP will:
10	• Outline how all consultation requirements have been met for the Planning Act and the Municipal Class EA for the first two phases in the Planning and Design Process of the Class EA for all major road, water and wastewater projects at a minimum, where applicable
	• Include appropriate consultation within the context of the Planning Process
	Monitoring
	Monitoring requirements must be included in the MESP in accordance with findings of the MESP and any relevant environmental studies or other higher level documentations where applicable. The following requirements must be satisfied in this MESP for all phases (see Figure 1) in this study:
	• Phase 1 – minimum two (2) years monitoring
	• Remaining Phases - minimum three (3) years monitoring
11	Terrestrial and aquatic system
	Valleylands and Creek system
	Surface and Groundwater systems
	• Water balance/ water budget for all feature based natural systems
	During construction and post-construction monitoring activities
	• Other monitoring requirements (e.g. MNRF, Region)
	Future Study Requirements (Draft plan stage, detailed design stage, etc.)
12	Native soil preservation
13	Conclusions/Recommendations