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## 8 MONITORING

In accordance with the Minister approved *427 Transportation Corridor EA Terms of Reference*, a monitoring strategy was developed for implementation of the Recommended Alternative. The monitoring strategy applies to compliance monitoring (Section 8.1) and environmental effects monitoring (Section 8.2).

The results from carrying out these monitoring strategies during the construction, operation, and maintenance of the undertaking will be retained at MTO's Downsview Office and/or their agent's office so that it is available to the Ministry of the Environment upon request in accordance with their *Code of Practice for Preparing and Reviewing Environmental Assessments in Ontario*, November 2008.

### 8.1 COMPLIANCE MONITORING

The monitoring strategy was developed to reflect how MTO proposed to ensure that the implementation of proposed mitigation measures and key design features are consistent with project commitments outlined in this EA Report and any subsequent documentation.

To do this, Table 8.1 lists all the EA commitments. This table will be expanded during subsequent design and construction phases to include a column explaining how the commitment was addressed in those subsequent stages. As noted above, this tracking table will be retained at MTO's Downsview Office and/or their agent's office so that it is available to the Ministry of the Environment upon request.

These commitments have been grouped by individual discipline (i.e. Hydrogeology, Terrestrial Environment, etc.) or under the heading of "General" because some of the commitments are not specific to a particular discipline.

### 8.2 EFFECTS MONITORING

The monitoring strategy was developed based on the impact assessments carried out for the Recommended Alternative to ensure the following:

- That the predicted net negative effects are not exceeded;
- That the unexplained negative effects are addressed; and
- That the predicted benefits are realized

Table 8-2 summarizes the type and frequency of environment effects monitoring to be carried out in relation to the mitigation and compensation measures that have been developed to address the potential adverse environmental effects described in Chapter 7.

**Table 8-1: EA Commitments and Compliance Monitoring**

ENVIRONMENTAL CONCERN	ISSUE / AGENCIES	PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK
<b>General</b>		
	MTO All Stakeholder	<ul style="list-style-type: none"> <li>• Implement environmental inspection during construction to ensure that protection measures are implemented, maintained and repaired and remedial measures are initiated where warranted..</li> <li>• Carry out ongoing consultation with stakeholders during subsequent design phases and construction.</li> <li>• Obtain any necessary approvals or permits during Detail Design</li> </ul>
<b>Vegetation (Section 7.1.1)</b>		
<p>Intrusion or edge removal of natural vegetation.</p> <p>Release of construction-generated sediment to vegetation areas.</p>	MTO MNR TRCA MOE	<p>General mitigation measures are summarized below and include:</p> <ul style="list-style-type: none"> <li>• Minimize the extent of grading and vegetation removals, wherever feasible. Opportunities to reduce grading limits will be reviewed at Detail Design for all vegetation units.</li> <li>• Ensure a clear delineation of ROW vegetation clearing zones and vegetation retention zones in both the contract documents and in the field to minimize the risk of off-ROW vegetation impacts and avoid incidental impacts as a result of temporary stockpiling, debris disposal and access.</li> <li>• Ensure the use of appropriate vegetation clearing techniques (e.g. trees to be felled away from the retained natural area).</li> <li>• Tree grubbing will be restricted to the required activity zone. Where possible, tree stumps will be cut flush to the ground and grubbing will be avoided to minimize soil disturbance, particularly in erosion prone areas.</li> <li>• Design and install stringent erosion and sediment control measures and maintain throughout construction. This will be particularly important in areas adjacent to wetland communities and watercourses.</li> <li>• Routinely inspect sediment and erosion control structures, including after storms, and repair as required. The structures will be cleaned out when accumulated sediment reaches half the design height.</li> <li>• Re-stabilize and re-vegetate exposed surfaces as soon as possible, using native vegetation seed mixes and plantings in specified areas.</li> <li>• Ensure proper containment and filtering of all construction-generated sediment (whether from dewatering or soil exposure from clearing and grubbing).</li> <li>• Ensure appropriate clearing and disposal of all construction-related debris following construction.</li> <li>• Employ proper handling of potentially toxic construction materials and ensure proper spills management.</li> <li>• Implement environmental inspection during construction to ensure that protection measures are implemented, maintained and repaired and remedial measures are initiated where warranted.</li> <li>• Site specific mitigation measures for vegetation units are recommended, where warranted, as outlined in Table 7 1. The site-specific mitigation measures that are recommended to protect and enhance retained vegetation features include the following:</li> </ul>

ENVIRONMENTAL CONCERN	ISSUE / AGENCIES	PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK
		<ul style="list-style-type: none"> <li>Review details of West Robinson Creek valley crossing and grading at Unit FO-11 to specifically determine if large Bur Oak trees within the ROW can be protected.</li> <li>Install vegetation protection fencing to protect retained vegetation. This is recommended where vegetation removals will occur within forested communities (i.e. FO-7, FO-15, FO-19 and FO-21).</li> <li>Review edge management opportunities at Detail Design for the following units: FO-7, FO-15, FO-19 and FO-21. Consideration will be given to incorporating narrow 'no-grubbing' zones (in order to stimulate suckering and edge creation) and edge plantings to help buffer exposed forest interiors from wind, sun and salt spray.</li> <li>Develop specific valley restoration (Rainbow Creek, Robinson Creek, West Robinson Creek) and enhancement plans during Detail Design, integrating opportunities to remove invasive species, improve cover and enhance diversity.</li> <li>Review locations of L-ranked and regionally rare flora at Detail Design to determine if protection is feasible (i.e. species is located beyond the grading limits). This is recommended wherever L-ranked flora has been noted (i.e. within Units FO-7, FO-12, FO-15, FO-17b, FO 21).</li> <li>Review hedgerows at Detail Design to determine the required removals of hedgerow trees.</li> <li>The stormwater management facilities were located to avoid or minimize encroachment into vegetation features and specifically the valleys. These areas will be reviewed at Detail Design and their outfalls, particularly those into the main valleys, will be sited and designed during Detail Design in consultation with the ecologists to further minimize effects, and ensure the outfalls are stable (avoid potential erosion and sedimentation effects) and that all areas disturbed during their construction are restored and naturalized.</li> <li>There are a few cases where site-specific mitigation is not warranted since the majority of the unit will be removed, and/or the units are anthropogenic in origin. For example, there are two small vegetation units that will be completely removed (Units MA-10 and FO-17b). No site-specific mitigation measures are recommended for these features, however opportunities to re-create small seasonal marsh depressions (similar to MA-10) will be explored during Detail Design. In addition, no site-specific mitigation measures are warranted for the cultural meadows affected due to their cultural origin, generally transient persistence, and/or minor natural heritage function.</li> </ul>
<b>Wildlife Habitat (Section 7.1.1)</b>		
<p>Localized impacts due to removal of and edge encroachment into common vegetation / habitat.</p> <p>Localized potential impact to migratory birds and their nests.</p> <p>Protection of wildlife during construction.</p> <p>Maintaining wildlife movement opportunities.</p>	<p>MTO MNR TRCA MOE</p>	<ul style="list-style-type: none"> <li>The mitigation measures outlined above to minimize effects to vegetation and protect adjacent vegetation areas will in turn protect the associated wildlife habitat functions.</li> <li>In order to protect nesting migratory birds, the contractor will: <ul style="list-style-type: none"> <li>Ensure that no active nests will be removed or disturbed in accordance with the <i>Migratory Birds Convention Act</i>.</li> <li>Apply timing constraints to avoid vegetation clearing (including grubbing) during the breeding bird season (May 1 to July 31).</li> <li>If vegetation clearing cannot be scheduled outside the breeding bird season, then an avian biologist will be employed to conduct a nest survey in the area to be cleared. If active nests of migratory birds are located then a mitigation plan will be developed and approved by Environment Canada prior to clearing. This may involve delays to allow for fledging.</li> <li>Inspect the two large culverts (Langstaff Road and Major Mackenzie Drive) that are proposed for</li> </ul> </li> </ul>

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<p>The breeding habitat for the Western Chorus Frog (and other L-ranked amphibians) potentially exists in the general Study Area.</p>		<p>removal for nesting activity during the Detail Design phase. If there is any evidence of or potential for their use for nesting of migratory birds, their removal will be scheduled outside of the migratory bird nesting period.</p> <ul style="list-style-type: none"> <li>• If the structures cannot be removed outside the identified nesting season, ensure that bird nesting preventative measures (such as wire screens or tarps) will be implemented to prevent new nesting prior to May 1 and maintained until July 31 of the calendar year in which they were installed. At a minimum, the preventative measures will be installed at structures where evidence of past nesting was observed. These measures will be periodically checked, and maintained as required, so as not to entrap birds, and will be removed following construction.</li> <li>• Any wildlife incidentally encountered during construction will not be knowingly harmed.</li> <li>• In the event that wildlife encountered during construction does not move from the construction zone, the Contract Administrator will be notified.</li> <li>• Wildlife movement was a specific consideration in the structure design at the two main valley crossings. Specifically, design criteria for the bridges included maintenance of a minimum height of 3 m and a minimum Openness Ratio (OR) of 0.6 to facilitate movement of the full range of animals using this landscape, including large mammals (e.g. White-tailed Deer). The ultimate design heights and ORs based on the Preliminary Designs for the bridges meet or exceed these minimum criteria (all bridges meet the 3 m minimum height and provide ORs &gt; 3 for the ultimate 10 lane scenario).</li> <li>• For the smaller watercourse crossings (Rain-1, Rain-2, Rain-4 and Rob-7), a minimum target OR of 0.05 will be implemented in order to facilitate movement of small and medium sized mammals. While preliminary culvert sizing has been developed at some of these crossings, generally the designs will not be finalized until Detail Design and therefore final ORs have not calculated at this time.</li> <li>• The valley crossing designs will be further developed at Detail Design, with specific consideration of wildlife movement and habitat opportunities. Other specific design aspects that will be integrated into the Detail Design of the bridges to enhance their function as eco-passages and make them more 'wildlife-friendly' include: <ul style="list-style-type: none"> <li>• Avoid use of sharp rock protection and ensure areas on both sides of the watercourse will provide substrate materials conducive to animal movement and footing of ungulates.</li> <li>• Incorporate cover elements (e.g., woody cover/masses, brush piles, boulders, vegetation etc.) to provide a natural transition with habitat features on either side of the bridge and provide cover under the bridge.</li> <li>• Restore adjacent vegetation areas disturbed for construction access using native species, to replace and enhance the existing vegetation to cover along the valleys.</li> <li>• Assess the need for fencing to 'funnel' animals to the bridges will be assessed during Detail Design.</li> </ul> </li> <li>• At Detail Design, review specific locations of Western Chorus Frog breeding habitat (as well as breeding habitats for Gray Treefrog and Spring Peeper) relative to the highway alignment (e.g. associated with units FO-11, FO-15, FO-17b) and further assess their representation generally. This information will allow a refinement of the impact assessment and will determine whether protection is possible (i.e. habitat is located beyond the grading limits, with consideration of indirect effects of noise). If breeding habitat is directly affected, consider reviewing opportunities for re-creation of habitat features at an adjacent location, if feasible and if surplus property is available.</li> </ul>

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<b>Fisheries and Aquatic Habitat (Section 7.1.2)</b>		
<p>Potential impact on fish habitat</p> <p>One fish species of conservation concern (Redside Dace) has been recorded downstream of the general Study Area.</p>	<p>MTO MNR TRCA DFO</p>	<ul style="list-style-type: none"> <li>• Section 7.1.2.3 outline specific mitigation proposed at each watercourse.</li> <li>• The four bridge crossings proposed over Rainbow Creek and West Robinson Creek have been designed to avoid direct encroachment into the bankfull channels and to minimize potential indirect effects to the watercourses by maintaining fluvial geomorphic and hydrotechnical functioning of the channels, which will in turn, maintain fish movement and protect the underlying physical habitat features.</li> <li>• Construction related mitigation including: <ul style="list-style-type: none"> <li>• All instream or near stream works will be conducted during the appropriate in-water timing window. For the four main crossings (Rain-3, Rain-5, Rob-5, Rob-6) this window will be finalized in further consultation with MNR during Detail Design in relation to the 'potential' presence of Redside Dace. Specifically, the draft mapping provided by MNR (MNR 2008) showing reaches falling under a Redside Dace timing window (July 1-September 15) encompasses the reaches of Rainbow Creek (Langstaff Road crossing), West Robinson Creek at the mainline and Major Mackenzie Drive crossings, and East Robinson Creek at the mainline crossing. However, as is outlined in Section 7.1.2.2, it is unlikely that this species currently resides in any of these watercourse reaches. The only in-water works proposed at these crossings pertain to removal of the existing culverts at Langstaff Road and Major Mackenzie Drive and re-instatement of the open channel sections; the new bridges will fully span the watercourses. Alternatively, and with agreement from the MNR, a warmwater construction timing (from July 1 to March 31) would be applied to protect the resident warmwater fish communities present at these crossings.</li> <li>• A warmwater construction timing window (from July 1 to March 31) will also be applied for installation of the culverts and associated works at the minor watercourses supporting seasonal fish use or draining to a downstream fishery (Creek-1, Rain-1, Rain-3, Rain-4, Rain-5, Rob-6, Rob-7).</li> <li>• Sediment and erosion control measures will be implemented during all phases of construction, clean-up and restoration to prevent sediment laden runoff from entering any of the watercourses directly from the construction zone. At a minimum, the plan will address the following aspects: <ul style="list-style-type: none"> <li>• Perimeter silt fence will be installed between the work areas and all reaches of those watercourses where works are required, including ditch and drainage works that drain to watercourses that support fish habitat.</li> <li>• The fencing will be properly installed and regularly inspected and maintained. It will be left in place and maintained until all surfaces contributing drainage to these watercourses are fully stabilized.</li> <li>• All exposed and newly constructed surfaces will be stabilized using appropriate means in accordance with the characteristics of the soil material and slope conditions.</li> <li>• These surfaces will be fully stabilized and re-vegetated as quickly as possible (and at a maximum within 45 days) following completion of the works.</li> </ul> </li> <li>• All near-water construction zones will be isolated using standard perimeter silt fencing of the general construction zone up and downstream. The silt fencing will be heavy duty/re-enforced fencing for all disturbed areas of the embankments that drain to the streams. Silt fencing will be regularly inspected and maintained as required.</li> <li>• Only clean materials free of fine particulate matter will be placed in the water for temporary</li> </ul> </li> </ul>

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		<p>construction measures (e.g. temporary flow management dams will be constructed of 'pea gravel' bags, geotextile fabric or other clean material, temporary barge access pad, if required, will be constructed or clean rock fill) or permanent works (e.g. culvert and channel substrates, cobble/boulder material).</p> <ul style="list-style-type: none"> <li>• If any temporary dewatering of the near or instream construction zones is required in order to construct the new culverts or pier footings or remove culverts, appropriate energy dissipation and settling/filtration measures will be used for discharge to ensure no erosion or sediment release occurs in the watercourses. No dewatering discharge will be released directly to the watercourses. If temporary dewatering of the near stream construction zone is required, dewatering will be discharged through a filter bag/splash pad located at least 30 m from the watercourses.</li> <li>• All culvert removal and channel restoration works to be completed 'in the dry' using an appropriate temporary flow bypass system to maintain clean flow around the construction zone. To minimize potential for impacts and facilitate restoration where fish use was identified it is recommended that culvert works on the minor crossings be conducted during low flow periods when these features support no or very small flows. This may be beneficial at West Robinson Creek in particular (i.e. instream works at Major Mackenzie Drive crossing) as this watercourse supports low flows throughout the summer months.</li> <li>• Temporary flow bypass plans for the removal of the existing culverts and natural channel reinstatement works at the Langstaff Road and Major Mackenzie Drive crossings of Rain-4 and Rob-6 will be developed prior to construction. It is anticipated that flows will be diverted through a pipe or flume system. The staging will be planned so that diversion period is minimal. Standard 'dam and pump' techniques will be used at the majority of the new culvert installations and at remainder of the culvert removals (Huntington Road, Major Mackenzie Drive culverts), since flows during the summer should be small, and durations will be relatively short. The withdrawal points will be properly sited and designed to prevent intake of silt or bed materials, and the discharge points sited and designed to prevent erosion and any sediment release.</li> <li>• Where there is no flow on watercourses/drainage features requiring instream works, contingency temporary flow bypass measures will be in place to manage any flow in the event of a storm and associated runoff.</li> <li>• The reinstated channel sections at the Langstaff Road and Major Mackenzie Drive crossings of Rain-4 and Rob-6 will be constructed 'in the dry', and then opened to flow and transitioned with the up and downstream channel sections. As noted above, construction of the new channel sections, and particularly the flow transition, is recommended during the summer during low flow periods. The new channels will be fully stabilized prior to opening. The transition zones will be carefully constructed to ensure a 'seamless transition' with the upstream channel section.</li> <li>• A Scientific Collectors Permit will be obtained in order to conduct a fish salvage prior to any works being conducted for the culvert removals (Rain-4, Rob-6, East Robinson Creek Huntington Road and Major Mackenzie Drive culverts) as well as culvert installations (at Rob-7) using appropriate techniques to capture and transfer unharmed any stranded fish as specified in the permit.</li> <li>• All dredged, salvaged or stockpiled materials will be located a safe distance from the watercourses edges and stabilized to prevent migration of any sediment or other material to the watercourse.</li> <li>• All work areas or other disturbed surfaces draining to the watercourses and/or in the floodplain will</li> </ul>

ENVIRONMENTAL CONCERN	ISSUE / AGENCIES	PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK
		<p>be stabilized and re-vegetated with appropriate native, non-invasive species as soon as feasible following construction.</p> <ul style="list-style-type: none"> <li>• The erosion and sediment control measures will be left in place, monitored and maintained in proper working order until all disturbed areas draining to the watercourses are fully stabilized, including establishment of vegetative cover.</li> <li>• No equipment shall cross or otherwise enter the other watercourses except to construct the specified works.</li> <li>• All activity will be controlled so as to prevent entry of any petroleum products, debris or other potential contaminants/deleterious substances, in addition to sediment as outlined above, to the watercourses. Storage, maintenance or refueling or maintenance of equipment will be conducted at least 30 m away from the watercourses. The Contractor will have an appropriate spills management/response plan in place throughout construction, including spill control and absorbent materials, instructions regarding their use and notification procedures.</li> <li>• Every effort will be made to retain as much of the natural vegetation as reasonably possible to help ensure bank stability and control erosion, and to expedite the re-colonization of native plant species.</li> <li>• All riparian vegetation removed to construct the highway works will be replaced with a mix of appropriate native species. Additional riparian plantings may be incorporated to enhance existing conditions along the right-of-way (ROW), and along the re-alignment and pool areas as outlined in the site specific mitigation measures section above. Only native shrub and tree species, compatible with the site conditions will be used.</li> <li>• A qualified environmental inspector will be on-site as required throughout construction, responsible for ensuring the sediment and erosion control measures are functioning and all of the mitigation measures are being implemented.</li> </ul>
<p><b>Restoration and Enhancement Opportunities (Sections 7.1.1 and 7.1.2)</b></p>		
<p>Permanent loss of vegetation and associated wildlife habitat.</p>	<p>MTO MNR TRCA DFO</p>	<p>MTO does not have a mandate to secure and manage lands for the purposes of terrestrial habitat restoration/creation/enhancement. MTO's mandate focuses on avoidance and mitigation of impacts to natural features. This objective has been effectively achieved through the process of selecting and refining the technically preferred route.</p> <p>MTO recognizes the value of identifying and integrating opportunities for replacement or enhancement of the existing local features where these efforts can reasonably be expected to persist and provide long term ecological benefit. Given the functions associated with the valley systems, particularly within the transitioning land use patterns, it is logical that these areas be targeted to identify opportunities. This can be considered on lands owned by MTO within or adjacent to the ROW that is surplus to transportation needs, or in some cases, where there are adjacent publicly owned properties.</p> <p><u>Specific Opportunities</u> Although the valley systems are re-naturalizing over time, opportunities to enhance this process are evident. For example, opportunities exist generally to remove or control invasive species, improve and diversify cover with native tree and shrub plantings, infill vegetation gaps, enhance slope and bank stability and other riparian functions, enhance botanical diversity with seeding of native riparian grasses and herbs and generally</p>

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		<p>enhance connectivity at the valley crossing areas and on other ROW areas that abut the valleys.</p> <p>As highlighted in Section 7.1.1.3, enhancement opportunities have been incorporated into the Preliminary Design of the replacement structures at the Major Mackenzie Drive and Langstaff Road crossings of the main valleys. Specifically, the existing structures at these road crossings are culverts, which provide only limited opportunities for animal movement. These structures will be replaced with bridges that will meet the same minimum design criteria to pass the full range of wildlife as the two new bridges. The opened valley sections through the new bridges will be rehabilitated, re-instating the valley linkages and significantly improving wildlife movement and habitat opportunities relative to the existing conditions at the culvert crossings.</p> <p>Specific areas where restoration and enhancement opportunities can be explored, on lands owned by MTO within or adjacent to the ROW that is surplus to transportation needs, or in some cases, where there are adjacent publicly owned properties, include:</p> <ul style="list-style-type: none"> <li>• The highway crossing of West Robinson Creek where the landscape is currently pastured and very open. This area would benefit substantially from the restriction of cattle access to the creek and riparian and floodplain areas, and subsequent planting/naturalization to improve cover and habitat opportunities, and enhance diversity and connectivity.</li> <li>• The floodplain and riparian areas on the downstream side of the Major Mackenzie Drive crossing of West Robinson Creek and on the upstream side of the Langstaff Road crossing of Rainbow Creek (north side) are also currently quite open and would benefit from additional tree and shrub plantings to improve cover and enhance diversity and connectivity.</li> <li>• There is a heavy concentration of invasive species noted (including Black Swallow-wort and Buckthorn) at the proposed crossing of Rainbow Creek (in Vegetation Unit FO 21). This area could be enhanced through an invasive species management program targeting these two species and the subsequent planting of native shrubs and seeding of riparian herbs and grasses. Discussions with TRCA in regards to invasive species management will continue during Detail Design.</li> <li>• Opportunities to create small floodplain depressions or enhance existing depressions or abandoned channel areas to provide amphibian breeding habitat that could be used by Western Chorus Frog among other species can be integrated in the enhancement design.</li> <li>• Opportunities to replace vegetation cover exist at the stormwater management facilities. All of the stormwater management facilities are located in primarily agricultural field areas abutting the valleys. The outfalls into the valleys will be sited in disturbed areas or sited to otherwise minimize impacts to existing vegetation. The areas set aside for the stormwater management facilities have been sized conservatively. Therefore, in addition to general naturalization of the stormwater management facilities (recognizing limitations on attracting wildlife to these features), buffer areas and any 'surplus' land areas around the margins that are not required specifically for the facility itself can be planted and naturalized. Where feasible the active pond areas can be sited optimally to maximize the area abutting the valleys available for planting. The outfall areas into the valleys will also be restored and naturalized, incorporating opportunities to enhance existing conditions where these outfalls are located in disturbed and open portions of the valleys.</li> <li>• Other general planting and naturalization opportunities include interchange areas and portions of the highway embankments (provided they do not interfere with visibility and safety requirements). While</li> </ul>

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		<p>these plantings may not necessarily contribute directly to natural areas depending on their locations, general functions associated with increased vegetation cover in these headwater areas will accrue.</p> <p><u>Commitments to Future Work</u> MTO's first objective has been and will continue to be to minimize impact to vegetation and associated habitat. This objective will be carried through the Detail Design stage, as the highway plans are refined and finalized. These efforts will focus on reducing the clearing footprint within the ROW and restoring disturbed areas to replace vegetation following construction, where feasible and where this vegetation can be retained in the long term.</p> <p>As well, opportunities for replacement of vegetation will also be identified on lands that MTO own or will own that is surplus to transportation needs. Once the EA is approved and MTO completes the property acquisition process, surplus portions of other properties will be assessed to identify other opportunities for restoration and replacement of vegetation cover. Land areas abutting or close to the valleys will be specifically targeted. Where the adjacent portions of the valleys at the crossings or abutting the ROW are publicly owned, MTO will explore opportunities to extend the vegetation and habitat restoration plans during Detail Design, in consultation with the agencies.</p> <p>These opportunities will be explored and developed further during Detail Design once MTO land ownership and project requirements are finalized. Efforts will target the valley and immediately adjacent lands, focusing on mitigation and restoration, with integration of opportunities to restore and enhance vegetation and habitat conditions that have been generally disturbed through agricultural and other cultural activities. The mitigation, restoration and enhancement plans will be developed in consultation with the agencies. The plans will be incorporated in the Contract Documents.</p>
<b>Drainage and Stormwater Management (Sections 6.2.7 and 7.1.3)</b>		
<p>Additional pavement area has the potential to increase the quantity of water into receiving waters and decrease the quality of water</p>	<p>MTO MOE MNR TRCA DFO</p>	<p>Section 7.1. 3 outlines proposed mitigation and commitments to future work proposed. This includes:</p> <ul style="list-style-type: none"> <li>• Nine stormwater management ponds will be constructed to provide treatment for the increase in pavement. Full detail designs of all stormwater management facilities will be conducted during subsequent design phases using TRCA modeling, watershed reports, and unit release rates, where available;</li> <li>• Areas where stormwater management ponds are not feasible, Low-Impact Developments, such as flat-bottom grass-lined swales, will be utilized. Low-Impact Development within the TRCA jurisdiction will be designed using the document "Low Impact Development Stormwater Management Manual", dated November 2008;</li> <li>• All stormwater management facility designs will incorporate discharge practices in order to mitigate potential negative thermal impacts to receiving watercourses;</li> <li>• The outlet structure for the 25mm erosion storm for all stormwater management ponds will utilize a "bottom draw" system, which allows the water discharged from the pond to be taken from the lower (cooler) levels of the pond;</li> <li>• For the receiving coldwater watercourses, techniques for providing thermal mitigations to discharged stormwater management pond flows will be provided. Thermal practices include, but not limited to:</li> </ul>

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		<p>deepening the permanent pool to a minimum of 3 metres to facilitate the discharge of cooler water; discharging low flows to an infiltration basin; or providing vegetated shade to outlet channels;</p> <ul style="list-style-type: none"> <li>• Outlet structures discharging to a watercourse with sensitive fish habitat or environmental area will be sited during subsequent design phases through a site visit with staff from MTO, MOE, MNR, and the TRCA;</li> <li>• Stormwater management facilities will not be located within sensitive environmental features or regulated floodline areas;</li> <li>• Stormwater management facilities will not discharge to intermittent watercourses that are primarily groundwater fed, as the discharge from the facility may have a negative erosive impact on the receiving watercourse;</li> <li>• Erosion and sediment control measures and contract specifications are to be developed during subsequent design phases. These documents will be reviewed with the TRCA, MTO, MNR, and MOE prior to construction.</li> <li>• Maintenance schedule for the stormwater facilities will be developed during detail design and provided to MOE.</li> </ul> <p>For further information on the proposed mitigation, proposed commitments to future work and recommendations, please refer to Chapter 6 and Appendix J (particularly Sections 9.0, 10.0 and 11.0).</p> <p>In addition, it is noteworthy that MTO employs and recognizes the importance of best salt management practices. MTO follows best management practices for road salt management, which are consistent with the best practices in North America. Best management practices include advanced weather forecasting, electronic spreader equipment, the use of brines in pre-wetted salt, and varying application rates of road maintenance materials to match weather conditions.</p> <p>MTO partners with stakeholders using the latest technology, tools and methods to keep roads safe for winter driving and to minimize salt usage. For example, MTO is a member of a national Road Salt Management working group assigned by the Council of Deputy Ministers responsible for transportation and highway safety. Consisting of both Canadian road maintenance agencies and Environment Canada, this group ensures state-of-the-art salt management practices are identified. MTO will continue to investigate ways to control and reduce salt usage while ensuring highway safety. MTO will continue to explore new and emerging technologies to further enhance road salt management practices.</p>
<b>Groundwater Resources (Section 7.1.4)</b>		
Potential for affecting groundwater quantity and quality	MTO MOE TRCA Property Owner	<p>A groundwater monitoring program will be carried out to document the effects of the proposed construction of Highway 427 Extension on local groundwater resources. The recommended framework for the monitoring program includes the following:</p> <p><u>For Construction</u></p> <ul style="list-style-type: none"> <li>• Prior to the commencement of construction activities, a door to door well survey will be carried out to determine the status of groundwater users within 300 m of the edges of the proposed highway alignment. Based on the survey results, the appropriate site specific individual well monitoring program can be</li> </ul>

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		<p>established where a potential interference risk is considered credible.</p> <ul style="list-style-type: none"> <li>• Installation of one monitoring well (screened in the shallow overburden) near each temporary or permanent groundwater dewatering works.</li> <li>• The monitoring for elevation will include:               <ul style="list-style-type: none"> <li>• Pre-construction: weekly 1 month before start of construction.</li> <li>• During construction: dependant upon length of construction; with a minimum frequency of once per month.</li> <li>• Post-construction: weekly for 2 weeks after end of construction.</li> </ul> </li> <li>• If there are impacts to the quality and quantity of individual wells, MTO will provide temporary water supply until dewatering operations have been completed and/or replace or restore the water supply by drilling private wells deeper into underlying overburden soils.</li> <li>• The groundwater quality monitoring is as follows: once prior to, once during and once following construction unless contamination is encountered at which point the monitoring will be continued and assessed by a professional geoscientist or engineer. Groundwater quality analysis should include general water chemistry (ions, metals and inorganics), VOCs and polycyclic aromatic hydrocarbons (PAHs).</li> <li>• A spill response program will be developed to minimize the potential for groundwater contamination along the alignment and near the surface water crossings in particular. This will include a procedure for timely notification of the spill, and established procedures for spill contaminant and cleanup.</li> <li>• For the segments that require a roadway cut (i.e. in the vicinity of Langstaff Road), geotechnical drilling will be conducted during future design phases to determine the subsurface soil and groundwater conditions within the cut section and the degree / extent of potential water table lowering.</li> </ul> <p><u>For Highway Operation</u></p> <ul style="list-style-type: none"> <li>• Given the low hydraulic conductivity of the overburden soils the potential for long term impacts to groundwater quality is low. These impacts can be further minimized with the application of best management practices for road salting and an appropriate spills response program. MTO employs and recognizes the importance of best salt management practices. MTO follows best management practices for road salt management, which are consistent with the best practices in North America. Best management practices include advanced weather forecasting, electronic spreader equipment, the use of brines in pre-wetted salt, and varying application rates of road maintenance materials to match weather conditions.</li> </ul> <p>MTO partners with stakeholders using the latest technology, tools and methods to keep roads safe for winter driving and to minimize salt usage. For example, MTO is a member of a national Road Salt Management working group assigned by the Council of Deputy Ministers responsible for transportation and highway safety. Consisting of both Canadian road maintenance agencies and Environment Canada, this group ensures state-of-the-art salt management practices are identified. MTO will continue to investigate ways to control and reduce salt usage while ensuring highway safety. MTO will continue to explore new and emerging technologies to further enhance road salt management practices</p>
<p><b>Air Quality (Section 7.1.5)</b></p>		

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<ul style="list-style-type: none"> <li>MTO carried out an air quality study and has determined that significant effects are not anticipated during operations.</li> <li>Some minor impacts (construction equipment emissions and dust) are anticipated during construction.</li> </ul>	<p>MTO MOE</p>	<ul style="list-style-type: none"> <li>Construction activities such as the operation of heavy equipment, topsoil removal, excavation and grading will generate dust and exhaust emissions which have the potential to result in temporary decreases in air quality. These activities are therefore anticipated to result in some short-term, localized effects to air quality around the project site. These effects will be controlled by good construction practice, local legislation and manufacturing design.</li> <li>To mitigate potential effects associated with emissions from construction equipment, the Contractor will be required to keep equipment in good operating conditions and will be asked to avoid unnecessary idling of equipment. The use of well-maintained equipment will ensure that combustion emissions are kept to a minimum.</li> <li>To mitigate potential air quality effects resulting from the creation of dust during construction, dust suppressant measures, as identified in Ontario Provincial Standard Specification (OPSS) 506, will be used during construction. OPSS 506 outlines the requirements for dust suppressants and their application. In addition, any disturbed lands will be vegetated (e.g. seeded) as appropriate to reduce the potential for dust to develop from exposed soil.</li> </ul>
<p><b>Management of Excess Material and Property Contamination (Section 7.1.6)</b></p>		
<ul style="list-style-type: none"> <li>Surplus materials will be generated during construction and require proper management / disposal.</li> <li>An area was identified as having potential for site contamination within the recommended alignment of the Highway 427 extension between Highway 7 and Major Mackenzie Drive.</li> </ul>	<p>MTO MOE</p>	<ul style="list-style-type: none"> <li>Excess materials generated during construction will be managed in accordance with OPSS 180.</li> <li>Opportunities to minimize excess material generation through salvage and reuse (such as earth material for slope flattening) will be identified during the subsequent detail design phase.</li> <li>Phase I and II Environmental Site Assessment will be undertaken for those sites identified in Section 7.1.6.</li> </ul>
<p><b>Individual Properties and Access (Section 7.2.1)</b></p>		
<ul style="list-style-type: none"> <li>Impacts on property.</li> <li>Impacts to access</li> </ul>	<p>MTO Property Owner</p>	<ul style="list-style-type: none"> <li>Standard mitigation/compensation measures for property impacts are addressed on an individual property/land owner basis. Mitigation and compensation measures for those properties with direct impacts will include, but are not limited to property acquisition at fair market value in accordance with Ministry policy and directives; and relocation of access. In cases where only part of the property is required, the effect this may have on the balance of the property will be taken into consideration.</li> </ul>

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<b>Noise (Section 7.2.3)</b>		
<ul style="list-style-type: none"> <li>The future absolute noise levels are less than 65 dBA for all receiver locations</li> <li>Eight (8) receiver locations (R1, R5, R7, R9, R10, R11, R12 and R14) are predicted to experience an increase in future noise levels &gt; 5 dBA with the proposed Highway 427 Extension.</li> <li>Construction noise issues.</li> </ul>	MTO MOE	<ul style="list-style-type: none"> <li>Noise mitigation was reviewed for the locations with an increase in sound greater than 5 dBA. It was determined that noise mitigation is not considered to be technically and/or economically feasible at these locations.</li> <li>Further examination will be carried out during the detail design phase if it is determined there are significant changes to the horizontal and vertical profile and/or changes to the traffic projections that warrant additional noise analysis at the existing NSAs.</li> <li>The NSAs in the study area are likely to be displaced in the future due to the anticipated land development adjacent to the future Highway 427 extension. Further examination will be carried out in the subsequent detail design phase to confirm the status of the existing NSAs within the study area.</li> <li>During construction of the proposed improvements, the contractor will be required to abide by the Contract Operational Constraints and municipal noise control by-laws (including any exemptions).</li> <li>The Contractor will be required to keep idling of construction equipment to a minimum and to maintain equipment in good working order to reduce noise from construction activities.</li> <li>Noise emissions from construction equipment will also be subjected to the limits set out in the MOE Publication NPC-115 and the Noise Control Guideline for Class Environmental Assessment of Undertakings.</li> <li>Construction may occur outside of normal working hours and on weekends for certain activities along the Highway 427 extension. Such work will be carried out in compliance with local noise by-laws and any noise by-law exemptions that may be granted.</li> <li>If complaints regarding construction noise arise from construction, they will be investigated according to the provisions of the MTO Noise Guide (October 2006).</li> </ul>
<b>Archaeological Resources (Section 7.3.1)</b>		
<ul style="list-style-type: none"> <li>Stage 2 Archaeological Assessments were undertaken for all properties where permission to enter was provided. The remaining Archaeological Assessments will be completed once an access agreement can be reached or MTO owns the property.</li> </ul>	MTO MCL	<ul style="list-style-type: none"> <li>The Preliminary Design has been modified to avoid direct impacts to the James Moody site, AkGv-294, located on property 32 on the north side of Major Mackenzie Drive. However, since the corridor lies within the 10 metre buffer zone around the site limits established by the Stage 3 CSP, a Stage 3 test unit excavation within the corridor limits is required. This will involve the excavation of one metre square units placed at five metre intervals across the buffer zone within corridor limits prior to construction. During construction, the James Moody site will be protected to ensure that no construction activities including storage/stockpiling impact the archaeologically sensitive area. This shall include:             <ul style="list-style-type: none"> <li>Erect a temporary barrier around the area to be avoided.</li> <li>Issue "no go" instructions to all on site construction crews, engineers, architects or others involved in day-to-day decisions during construction.</li> <li>Show the location of the area to be avoided on all contract drawings, when applicable.</li> <li>Before grading and other soil disturbing activities, inspect to confirm that the placement of barriers conforms to the location and extent of the area to be avoided.</li> <li>During grading and other soil disturbing activities, inspect and monitor the area to be avoided to verify the effectiveness of avoidance strategies. If alteration of the archaeological site is observed at any time during construction, notify the ministry immediately.</li> <li>After completion of the grading and other soil disturbing activities, inspect and report to he</li> </ul> </li> </ul>

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		<p>Ministry of Culture on the effectiveness of the strategy in ensuring that the area to be avoided remains intact.</p> <ul style="list-style-type: none"> <li>• The Preliminary Design has been modified to minimize impacts to the Coleraine Burying Grounds located on property 34B on the south side of Major Mackenzie Drive. However, in order to ensure no unmarked grave shafts remain between the current Burying Grounds property limits and roadside ditching, Stage 2 monitoring of the mechanical removal of topsoil will be completed within the undisturbed corridor limits. During construction, the Burying Grounds will be protected to ensure that no construction activities including storage/stockpiling impact this archaeologically sensitive area (see above protection standards).</li> <li>• The Preliminary Design has been modified to avoid impacts to the Coleraine Schoolhouse located on property 34B on the south side of Major Mackenzie Drive. During construction, the site will be protected to ensure that no construction activities including storage/stockpiling impact the archaeologically sensitive area (see above protection standards). If impacts cannot be avoided, a Stage 3 Archaeological Assessment and possibly Stage 4 excavation will be required.</li> <li>• Stage 2 Archaeological Assessment is required for properties as depicted in Exhibit 7-6. This will be conducted prior to construction. The Stage 2 Reports will be filed with the Ministry of Culture. Construction cannot occur at those sites until the Ministry of Culture has concurred that no further Archaeological Assessment work is required prior to construction.</li> <li>• No further archaeological work is required for the 15 isolated, pre-contact findspots including: AkGv-54 (MPA 1989); FS 3 (AMICK 2009) and findspots 1 to 13 including AkGv-297, AkGv-298, AkGv-299, AkGv-300, AkGv-301 and AkGv-302 (NDA 2009).</li> <li>• No further archaeological work is required for the remainder of the project based on negative survey results.</li> <li>• If human remains are discovered the police or coroner and the Register of Cemeteries, Ministry of Government Services will be notified immediately in accordance with the <i>Cemeteries Act</i>.</li> <li>• Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the <i>Ontario Heritage Act</i>. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the <i>Ontario Heritage Act</i>. Further investigation and notifications will be conducted in accordance with the MTO/MCR "Protocol for Dealing with Archaeological Concerns on Ministry of Transportation Undertakings".</li> <li>• MTO is committed to sharing the results of future archaeological investigations and continuing discussions with First Nations as appropriate throughout the design and construction process to discuss appropriate mitigation when details are known.</li> </ul>

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<b>Heritage Resources (Section 7.3.2)</b>		
<ul style="list-style-type: none"> <li>There are four (4) direct effects, i.e. displacement or removal, and twelve (12) indirect impacts, i.e. disruption effects, associated with the technically preferred alternative.</li> </ul>	<p>MTO MCL</p>	<ul style="list-style-type: none"> <li>Complete the site specific mitigate measures outlined in Table 7-9</li> </ul>
<b>Utilities (Section 7.4.1)</b>		
<ul style="list-style-type: none"> <li>Utility relocations including existing 230kV towers north of Langstaff Road</li> <li>The existing profiles of Zenway Blvd and Langstaff Road will be raised significantly impacting municipal services.</li> <li>York Region is currently constructing a new watermain connection along Huntington Road from Rutherford Road to Nashville Road.</li> </ul>	<p>MTO HYDRO ONE YORK REGION</p>	<ul style="list-style-type: none"> <li>MTO will further consult with Hydro One during the detail design phase of this study regarding the relocation of the Hydro One 230kV towers. It is recommended that Hydro One use a monopole tower for the relocated 230kV tower in the transitway in order to reduce footprint.</li> <li>Municipal services (watermains, storm sewers, sanitary sewers, hydro) may need to be relocated due to the high fills and bridge abutments being proposed. Details of the relocation will be discussed with the municipalities during Detail Design.</li> <li>Preliminary Highway 427 Extension plans have been provided to the Region of York for the purpose of reinforcing the Huntington Road watermain design to accommodate the freeway.</li> </ul>
<b>Construction Staging (Section 6.2.13 and 7.4.2)</b>		
<ul style="list-style-type: none"> <li>Motorists may experience delays and disruption during construction.</li> </ul>	<p>MTO YORK REGION CITY OF VAUGHAN CPR</p>	<ul style="list-style-type: none"> <li>All the portions of the recommended alternative can be constructed without impacting existing travel routes except at the Region's 427 Interim Arterial Extension (Regional Road 99) area. The details regarding construction staging and timetable will be provided during detail design. In addition, MTO will work with the municipalities in the development of the construction staging during detail design.</li> <li>A traffic staging plan will be developed in the subsequent design phases. Where the existing arterial crossing roads need to be reconstructed, a temporary detour roadway will also be constructed to maintain traffic.</li> <li>The 427 Interim Arterial Extension has been built as a short term measure to temporarily relieve the terminus of Highway 427 at Highway 7. During construction of the Highway 427 extension to the north from Highway 7, it is not possible to maintain traffic of the 427 Interim Arterial Extension at all times, MTO will work to mitigate traffic impacts by minimizing the duration of the closure. In addition, the reconstruction of Zenway Boulevard will require a temporary closure of Zenway Boulevard in the vicinity of the intersection with 427 Interim Arterial Extension. Properties on Zenway Boulevard will be accessed from either the east via Highway 27 / Vaughan Valley Boulevard or the west via Highway 50 / Huntington Road. The details regarding construction staging and timetable will be provided during detail design.</li> <li>Consultation with CP Rail will continue in subsequent design phases to minimize impact to the rail operations in the construction of the CPR overpass.</li> <li>York Region Emergency Services Branch will be provided with details regarding access routes, egress routes, duration of impediments, and any possible operational impacts resulting from construction.</li> <li>The Peel District School Board will continue to be notified of the project details and provided with</li> </ul>

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		information regarding how the proposed works may impact school bus service.
<b>Transportation (Section 6.2)</b>		
<ul style="list-style-type: none"> <li>The project will impact existing road crossings, which will require future grade separations or closures.</li> </ul>	<p>MTO Municipalities</p>	<ul style="list-style-type: none"> <li>There are 5 crossing roads within the study area limits (Zenway Boulevard, Langstaff Road, Rutherford Road, McGillivray Road and Major Mackenzie Drive). Interchanges are proposed at 3 locations (Langstaff Road, Rutherford Road and Major Mackenzie Drive). The proposed cross-sections include:               <ul style="list-style-type: none"> <li>a 4-lane cross-section at Langstaff Road and Zenway Boulevard. In addition, the proposed right-of-way provided for McGillivray Road can accommodate a future widening of 4 lanes and 1.5 m sidewalk on both sides of the road</li> <li>a 6-lane cross-section at Rutherford Road and Major Mackenzie Drive. The 6-lane cross sections include provisions for a Transit/HOV lane.</li> <li>All cross-sections protect for a 1.5 m sidewalk on both sides.</li> <li>Langstaff Road, Rutherford Road and Major Mackenzie Drive cross-sections protect for a 1.5 m bike lane on either side of the roadway.</li> </ul> </li> <li>The structures of the crossing roads have been designed to accommodate sidewalks, as well as bike lanes on Langstaff Road, Rutherford Road and Major Mackenzie Drive. Details of the bike lane routes in the vicinity of the ramp area will be determined in consultation with the municipality during detail design.</li> <li>The design of the cross-sections for the crossing roads were per the local and regional municipal requirements. The cost sharing for all elements of these roadways will be discussed with the municipalities during detail design.</li> <li>Local road realignments / connections are required. A brief description of each road realignment / connection is provided below.               <ul style="list-style-type: none"> <li>Major Mackenzie Drive will be realigned northerly for a 1.5 km section in the vicinity of the proposed Major Mackenzie Drive Interchange. This realignment allows for the development of the interchange and also eliminates Major Mackenzie Drive's existing intersection with Huntington Road.</li> <li>Huntington Road will be removed from McGillivray Road northerly to just north of the realigned Major Mackenzie Drive. Huntington Road north will be realigned to connect to Major Mackenzie Drive between Highway 427 and the CPR rail line as discussed in Section 6.1. Huntington Road south will connect to McGillivray Road. A roadway will connect McGillivray Road and Major Mackenzie Drive. This roadway, which was identified in the approved Huntington Road Class EA Study from Major Mackenzie Drive to McGillivray Road (May 2004) conducted by City of Vaughan and CPR, is located approximately 650 m east of existing Huntington Road. The roadway intersection with McGillivray Road is located close to the existing CPR spur line. As identified in the Huntington Road EA Study, when traffic (road and rail) warrants in the future, the City of Vaughan will determine a long term solution if necessary as part of a future EA study.</li> <li>McGillivray Road will be realigned for a 800 m section approaching Rutherford Road to achieve proper intersection spacing to the Rutherford Road Interchange. Based on a review of sight distance requirements, it is feasible to locate the intersection of the realigned McGillivray Road between the future Robinson Creek Bridge and future Rutherford Road/CPR rail grade-separation. Final alignment, including location of the intersection with Rutherford Road, will be determined in consultation with the City of Vaughan and York Region. The existing McGillivray Road in this section will not be abandoned but will end in a cul-du-sac to maintain access to existing properties.</li> </ul> </li> </ul>

**Table 8-2: Summary of Monitoring Requirements Associated with Recommended Alternative**

<b>Net Effects</b>	<b>Monitoring Requirements</b>
<b>GROUNDWATER</b>	
The temporary decrease in groundwater levels due to dewatering would be minimized through deep foundations and baseflow maintenance	<ul style="list-style-type: none"> <li>• Monitor stream flow conditions based upon the requirements of Permit To Take Water.</li> </ul>
The temporary changes to groundwater quantity and quality affecting private wells would be compensated through the provision of a temporary or permanent water supply.	<ul style="list-style-type: none"> <li>• Monitor nearby private wells prior to, during, and following construction for both groundwater quality and quantity.</li> </ul>
<b>TERRESTRIAL</b>	
Vegetation will be replanted as part of general landscaping requirements and if enhancement opportunities are found.	<ul style="list-style-type: none"> <li>• Monitor the success of planting as per MTO contract standards.</li> </ul>
<b>AQUATIC</b>	
The indirect loss of aquatic habitat would be minimized.	<ul style="list-style-type: none"> <li>• Monitoring during construction will be conducted by a Qualified Environmental Inspector at all locations</li> </ul>
The direct loss of aquatic habitat due to channel realignments would be minimized.	<ul style="list-style-type: none"> <li>• Monitoring during construction will be conducted by a Qualified Environmental Inspector at all locations</li> </ul>
<b>AIR QUALITY</b>	
No specific monitoring requirements identified.	
<b>NOISE</b>	
No specific monitoring requirements identified.	

<b>Net Effects</b>	<b>Monitoring Requirements</b>
<b><i>SOCIO-ECONOMIC</i></b>	
	No specific monitoring requirements identified.
<b><i>WASTE MANAGEMENT AND CONTAMINATION</i></b>	
	No specific monitoring requirements identified.
<b><i>ACHAEOLOGY</i></b>	
	No specific monitoring requirements identified.
<b><i>BUILT HERITAGE</i></b>	
	No specific monitoring requirements identified.