

Section 3: Preferred Solution

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3.0 Preferred Solution and Cost Estimate

This section of the Project File provides discussion of the Preferred Solutions that were developed based on refinements made to the Recommended Solutions (that were presented to the Public at the second Public Information Centre and online). A budgetary level Cost Estimate is also presented herein.

3.1 Preferred Solution

The Preferred Solution is based on the Recommended Solutions that were presented at the second Public Information Centre. After reviewing the feedback from all stakeholders and the finalization of the stormwater modeling (using PCSWMM Professional 2D software), the Recommended Solutions were refined to create the Preferred Solution for this project. For more technical details regarding the modeling and methodology used, please refer to the Stormwater Master Plan (SWMP) in Section 8 of the Project File.

In order to evaluate alternative solutions for the study area, a ‘tool box’ of improvements was created. Each type of improvement was evaluated individually based on its application. The advantages and disadvantages were discussed, as well as the associated Municipal Class EA Schedule based on its environmental impact. The evaluation of the potential improvements slide that was presented at the second PIC is attached in the section of the Project File.

This approach was taken based on the size of the study area as well as the project objectives. The goal was to improve stormwater management for the overall system, not to solve individual site drainage issues. As well, the areas of most concern are within developed lands (zoned Business Park). The proposed improvements would consist of retro-fit solutions in some cases.

The Preferred Solution is comprised of many improvements throughout the Study Area, all of which work together to achieve the goal of the study – improving stormwater management. The Preferred Solution figures can be found attached in this section of the Project File.

3.1.1 Proposed Improvements

Below is a summary of the proposed improvements that comprise the Preferred Solution. They have been broken down into the different drainage areas which correspond to the Preferred Solution figures. For detailed discussion on each improvement, refer to the SWMP - 5.2 Proposed Improvements, in Section 8 of the Project File. The SWMP also includes preliminary pipe sizing, pond volumes, typical drain sections and design considerations.

3.1.1.1 Dumouchelle / Halford Area

- Replacement of the Halford Drive storm sewer;
- Establish overland routes to 6th Concession Drain; and,
- Re-alignment of the drainage ditch that converges with the enclosed outlet.

3.1.1.2 County Road 46 / 8th Concession Area

- Replace existing storm sewer;
- Replace existing culverts;
- Cleaning of the open drain sections (Demonte Drain); and,
- Establish overland flow route towards 8th Concession Drain.

3.1.1.3 Blackacre Drive Area

The SWMP has four viable Options as Recommended Solutions. The Preferred Solution Option is to be selected based upon the findings of the ongoing *Turkey Creek Watershed Hydrologic and Hydraulic Study*.

The improvements below apply to all Options unless noted otherwise.

- New Auxiliary Wolfe Drain;
- New Blackacre Pond @ Mun. No. 5400 (excluded in Option 4);
- Enclose Wolfe Drain along Outer Drive;
- Replace/enlarge storm sewer immediately east Walker Road;
- Deepen and widen Collins Drain (excluded in Option 2);
- New Collins Pond @ Mun. No. 5600 (Options 1 & 2 only);
- New storm sewers along Fasan Drive;
- New storm sewers along Blackacre Drive;
- New storm sewer outlets along Moro Drive, Rossi Drive, Olympia Drive and Brendan Lane;

Discussion regarding revisions to the Recommended Solutions

Feedback from the neighbouring municipalities, the Ministry of Transportation and affected land owners have led the Project Team to re-evaluate potential improvement options within the Wolfe Drain watershed. Letters were sent to each of the limited property owners with undeveloped land which could be used for much needed stormwater storage for the overall benefit of the watershed.

Figure 1 herein illustrates the properties that were considered for storage areas. It was necessary for us to designate at least one of these areas (or portions of these areas) for stormwater storage. We aimed to achieve this objective with the least amount of hardship possible. We also wish to clarify that:

- the proposed storage is intended to be a dry pond (i.e., a depressed grass area);
- the dry pond would only provide temporary storage during larger, infrequent events; and,
- the infrequent ponding would be limited to less than 24 hours.

Further to the letter, feedback was received by each of the potentially affected property owners. Correspondence can be found in Section 4 of the Project File, which is briefly summarized as follows:

- The property owners of Mun Nos. 5635 and Mun. No. 5700 were strongly opposed to the potential property acquisitions as they expressed their plans to expand upon their existing development.

- The property owner of Mun. No. 5400 advised of potential future plans to relocate a business to this vacant property.
- The property owner of Mun. No. 5600 advised of potential future plans to expand upon the existing development on the southern side of the Town's right-of-way.
- The property owner of Mun. No. 1360 expressed some interest in having the Town purchase the designated portion of the property.

Through our evaluation of the potential alternative storage locations, Mun. No. 1360 was deemed impractical due to existing topography (i.e., lands too high compared to the proposed Auxiliary Wolfe Drain.

It was also deemed less desirable to acquire lands from properties with existing development (Mun. Nos. 5635 and Mun. No. 5700) as this would deny planned future expansion of lands that have already invested in development on the property. This could also be said for Mun. No. 5600, except that this property is bisected by the Town's right-of-way and thus, it was deemed more reasonable to potentially acquire this land.

The property at Mun. No. 5400 was also deemed to be a reasonable option for property acquisition given that this property is currently vacant; and, it is an ideal location adjacent to the Wolfe Drain to provide storage for flow attenuation and corresponding smaller sewer sizing required to convey flows southerly towards the Collins Drain.

With regards to the proposed 8-metre widening of the Wolfe Drain between Outer Drive and Walker Road, letters were sent to the affected landowners and feedback was received. It was identified that a number of existing septic systems are currently located near the south bank of the drain, which would be disturbed by the proposed widening. Moreover, one property owner expressed concerns of significant impacts to current operations. Based on the foregoing, it was deemed preferable to deepen the proposed Blackacre Pond in lieu of the 8-metre drain widening.

3.1.1.4 Oldcastle Road Area

- New storm sewers on Moynahan Drive and O'Neil Drive;
- New storm sewers along Hennin Street;
- Maintenance to the Hurley Relief Drain to remove sediments and blockages;
- New storm sewers along Del Duca Drive;
- New storm sewers along Ure Street;
- Replace and re-route Hurley Relief Branch Drain;
- New Hurley (Enbridge) Pond;
- New Oldcastle Heights Pond;
- Maintenance to the Washbrook Drain to remove sediments and blockages;
- Replacement of the Washbrook Drain field access culvert;
- Secure overland flow routes between buildings where indicated;
- New 9th Concession Pond.

3.1.1.5 North Talbot Road/ 8th Concession Area

- New storm sewers along Castlewood Court;
- New storm sewers to enclose the Washbrook Drain along North Talbot Road.
- New Washbrook-Downing Pond;
- New Downing Acres Pond

The Recommended Solutions presented at the second Public Information Centre depicted a stormwater pond immediately west of the Downing Drain. Feedback received suggested that we consider fitting the pond to the east of the Downing Drain, within the wedge-shaped portion formed by the drain and the property boundaries. The Recommended Solution has been revised to include a wedge-shaped pond (Washbrook-Downing Pond) as well as a second pond (Downing Acres Pond) to address stormwater management for the 31.2-hectare future development. Alternatively, the Downing Acres Pond could potentially be abandoned whereby stormwater for this development would be addressed off-site via a deeper and larger Washbrook-Downing Pond.

3.1.2 Easements and Property Acquisition

In order for the Town of Tecumseh to implement any of the proposed improvements on privately owned lands, an easement would be required. An easement is a legal right to use another's land for a specific limited purpose. In order to secure the easements required for the proposed improvements, the Town would work with the individual property owners to agree upon fair compensation for use of the land.

Some information regarding easements:

- Property owners still own the land - the Town does not own the land the easement occupies.
- Permanent easements are typically 6 metres wide. Actual width required may be more or less depending on the size and type of stormwater infrastructure being proposed.
- A temporary easement (or working easement) may be required in addition to permanent easements and are strictly to provide additional access during open-cut installation of sewers.
- Easements are typically along property lines within the building setback for most lots.
- Depending on the intended use of the easement, the area may need to be kept clear of all obstructions, such as, structures, parking lots and fences.
- An agreement between the property owner and the Town will detail the intended use and any use restrictions for the easement.

Due to the nature of the Master Planning process, all possible routing for stormwater has been considered during the process of defining the Preferred Solution. Possible routing options for easements were shown in the recommended solutions which were presented at PIC No.2. In many cases, there is only one feasible route to provide outlet for the stormwater. An inventory of the proposed easements to be secured is provided in Appendix M of the SWMP as well as in this section of the Project File for reference.

In the case of the proposed stormwater ponds, the Town will need to acquire the property. The first step would be for the Town to reach out to the land owner to agree upon fair compensation for the purchase of the land. If the land owner and the Town can not agree on the compensation the Town would have to begin a process to expropriate the land.

Due to the impact that the proposed easements and property acquisitions would have to the property owners, the Project Team sent specific correspondence to all potentially affected owners in order to alert them to the potential impact and offer consultation. All of the correspondence sent and received with the potentially affected property owners can be found in Section 4 of the Project File.

3.2 Cost Estimate and Phasing

A preliminary budget cost estimate has been prepared for the Preferred Solution and is presented below.

The total preliminary budget estimate has been set at \$30 Million to \$45 Million. A cost break-down that was prepared as part of the SWMP has been included in this section of the Project File for reference. The costs have been prepared with the following considerations:

- The estimate was prepared based on 2020 dollars;
- No allowance was included for potential easement and land acquisition costs;
- No allowance was included for pump station costs to accommodate stormwater storage facilities;
- The estimate does not include the cost of application or permit fees;
- An allowance of 25% was included for engineering and project administration costs;
- An allowance of 30% was included for contingency;
- No allowance was included for the testing, handling and disposal of impacted soils; and,
- Excludes HST.

A project of this magnitude, that includes many different types of improvements, would not be completed at one time. Therefore, the cost estimate has been broken down two ways; by drainage area and by priority phasing. The improvements have been categorised as short-term, medium-term or long-term based on sequencing and as well as immediate needs.

A list of the proposed projects, schedules and costs is included in this section of the project file for reference. For the full discussion regarding the costs and phasing refer to the SWMP in Section 8 of the Project File.

3.3 Approvals and Next Steps

3.3.1 Schedule A Projects

Proposed improvements in the Preferred Solution that are categorized as Schedule A or A+ are pre-approved under the MECA and can move forward to detailed design and construction at any time. The Schedule A projects proposed in the Master Plan are:

- Improve existing underground sewers within the Town's right-of-way;
- Install new underground sewers with the Town's right-of-way, and;
- Establish overland flow route through existing easements,

All of the proposed drain improvement projects would be completed under the *Drainage Act* and will be subject to the approvals required as per the *Act*. This may include a Species at Risk Assessment and Essex Region Conservation Authority permit.

3.3.2 Schedule B Projects

For the proposed improvements that are categorized as Schedule B projects, the MECA requirements will be completed through this Master Planning process. The Schedule B projects proposed in the Master Plan are:

- New underground storm sewers through private property;
- New overland flow routes along private property;
- New drainage corridors on private property;
- Establishing easements for existing overland flow routes on private property; and
- Storage Ponds.

For the proposed improvements that are categorized as Schedule B projects and would be constructed on newly acquired properties (easement agreement, purchased or expropriated), the following approvals may be required prior to construction:

- Essex Region Conservation Authority permit;
- Ministry of the Environment Conservation and Parks – Species At Risk Assessment;
- Ministry of the Environment and Climate Change;
- Drainage Act Approval;
- County of Essex; and/or,
- Ministry of Transportation.

The following follow up studies may also be required:

- Stage 2 Archaeological Assessment;
- Soil Sampling and Characterization for off-site disposal.

Schedule B projects proposed on existing easements would not be subject to any further environmental approvals prior to construction.





A full list of the proposed projects, schedules and costs is included in this section of the project file for reference.

Do Nothing & Storage Improvements

The following charts present all of the potential proposed improvement that are being considered.

	Proposed Improvements	Description of Improvement	Opportunities	Constraints	Example Images
	Do Nothing	<ul style="list-style-type: none"> No improvements. 	<ul style="list-style-type: none"> No cost to the Town. 	<ul style="list-style-type: none"> Potential building flooding. Roadways will continue to flood. Limited emergency access due to water levels of 0.3m (1ft) or greater in roadways and driveways. 	

Storage is the action of temporarily holding excess stormwater from rainfall events to reduce / control flows being conveyed to the receiving drainage system. Drainage improvements using storage elements, such as stormwater ponds or underground chambers, are used to store stormwater in a safe location to mitigate excessive surface ponding on roadways and private property.

	Proposed Improvements	Description of Improvement	Opportunities	Constraints	EA Project Schedule	Example Image
ST1	Stormwater Pond	<ul style="list-style-type: none"> Construct a stormwater pond to collect and store stormwater to be released downstream at a controlled rate. 	<ul style="list-style-type: none"> Would provide stormwater storage for a large portion of the Study Area. Provides outlet relief for the storm sewers. Proposed in low lying areas within the watershed where ponding tends to occur naturally. Less expensive than underground storage. 	<ul style="list-style-type: none"> Town must secure a piece of property to construct the pond. 	Schedule B	
ST2	Flood Storage on Undeveloped Land	<ul style="list-style-type: none"> Naturally low lying area will be used for flood storage during large storm events. 	<ul style="list-style-type: none"> Cost effective flood water storage solution. Land can still be used when there is no flooding (e.g.: agricultural use, park or soccer fields) 	<ul style="list-style-type: none"> Town must secure a piece of property to use as storage. 	Schedule B	
ST3	Enlarge Existing Stormwater Pond	<ul style="list-style-type: none"> Enlarge an existing pond to accommodate a larger storage volume. 	<ul style="list-style-type: none"> Less expensive to expand on an already existing facility than build new. 	<ul style="list-style-type: none"> Town may need to secure private property to expand the pond. 	Schedule B	
ST4	Underground Storage	<ul style="list-style-type: none"> Install underground storage chambers to store water. 	<ul style="list-style-type: none"> May be installed within the Towns right-of-way. 	<ul style="list-style-type: none"> Town may have to secure land to accommodate the number of chambers required. 	Schedule A (existing easement) or Schedule B (private land)	

Storage Improvements

Stormwater Pond

Stormwater ponds are proposed in areas where large volumes of water need to be stored before being outlet downstream. The ponds can hold a larger volume of water in a smaller area as compared to the option of flood storage on undeveloped lands resulting in lower land acquisition cost and higher construction cost. As well, ponds are typically installed at the downstream end of a drainage area and have weirs to control the release rate to downstream receivers.

The proposed pond locations have been determined based on the existing drainage patterns and features of the lands. The proposed locations are generally low lying areas that tend to flood during large storm events.

Flood Storage on Undeveloped Land

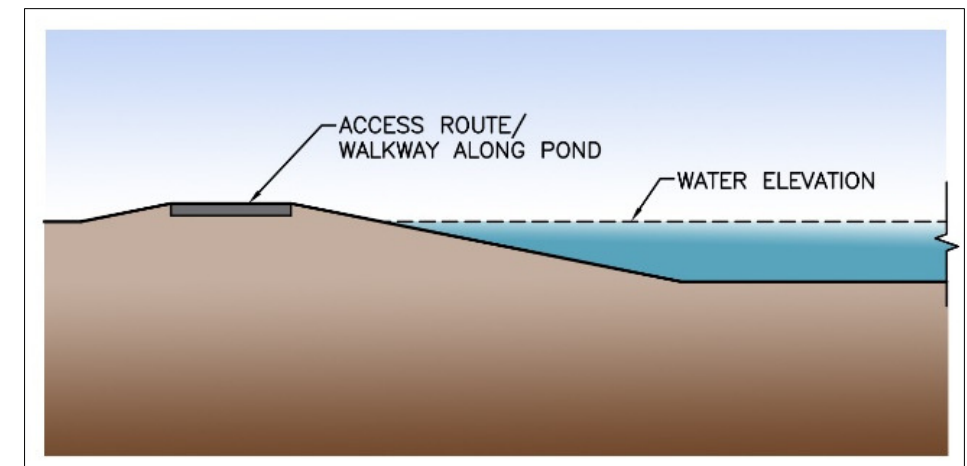
This solution involves allocating areas of land to be flood storage and therefore, undevelopable in the future. The land could be used for agriculture, parkland or soccer pitches, but not for structures or parking. The intent is to allow flood water to accumulate on the lands during large storm events.

The proposed locations are typically low lying lands where water tends to accumulate naturally. Due to the typical depths of water based on existing elevation, the area required would be much larger than the area required for a stormwater pond (larger land acquisition cost, lower construction cost).

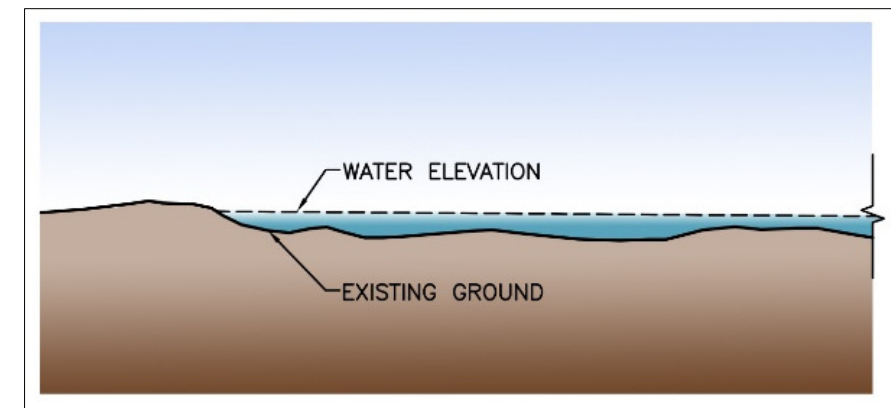
Underground Storage

Underground storage is the most expensive of the storage improvement options. This improvement has been proposed in areas where other storage options are limited by developed properties. Underground storage chambers can be used under the roadways within the Town's right of way and no property acquisition is required.

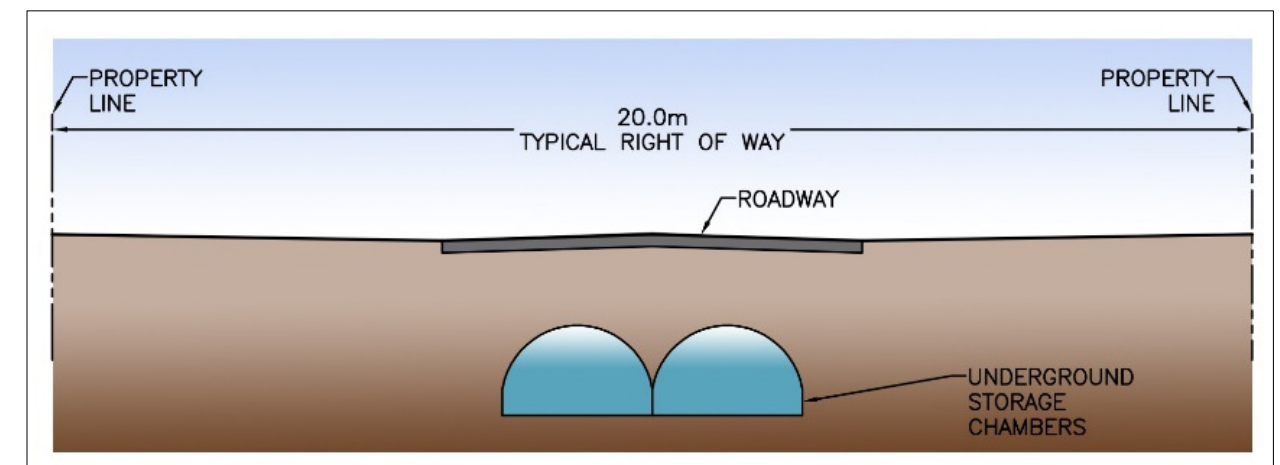
ST1: Typical Stormwater Pond Cross Section



ST2: Typical Flood Storage on Undeveloped Land Cross Section









ST4: Typical Underground Storage Section under a Roadway



Conveyance Improvements

Conveyance is the action of moving stormwater from one place to another. Drainage improvements using conveyance elements such as drains, sewers and surface (overland) flow routes are used to move stormwater more efficiently off the roadway surface and away from buildings.

	Proposed Improvements	Description of Improvement	Opportunities	Constraints	EA Project Schedule	Example Image
CV1	Establish Overland Flow Route	<ul style="list-style-type: none"> Create secured flow paths to direct flows away from structures and reduce ponding and flood risk. Work generally consists of re-grading grassy areas to create swales. 	<ul style="list-style-type: none"> Proposed flow routes are generally where ponding is occurring naturally. More cost effective than underground sewer. 	<ul style="list-style-type: none"> Town must secure easements through private properties. Must respect downstream outlet capacity. 	Schedule A (existing easement) or Schedule B (private land)	
CV2	Improve Existing Underground Sewers	<ul style="list-style-type: none"> Replace / upgrade existing storm sewers to meet acceptable drainage standards. Existing sewers undersized for capacity required. Replace existing culverts. 	<ul style="list-style-type: none"> Cost effective solution to provide flow capacity required for the system. All work completed in the right-of-way (no property acquisition required). Pre-approved work the Town can undertake at any time. 	<ul style="list-style-type: none"> Work is disruptive to adjacent business access and roadways. Must respect downstream outlet capacity. 	Schedule A	
CV3	New Drainage Corridor	<ul style="list-style-type: none"> Construct a drainage corridor to carry flows downstream. Open channel design. 	<ul style="list-style-type: none"> Provides outlet for local sewers. Carries larger flows to downstream outlet. More cost effective than underground sewers. 	<ul style="list-style-type: none"> Town may need to secure land to accommodate the drainage corridor. Must respect downstream outlet capacity. 	Schedule B	
CV4	New Underground Sewers	<ul style="list-style-type: none"> Install new underground storm sewers where required. 	<ul style="list-style-type: none"> For areas where surface features (overland flow routes) cannot be accommodated. 	<ul style="list-style-type: none"> Work is disruptive to adjacent business access and roadways. The Town must secure easements for sewers proposed on private properties. Must respect downstream outlet capacity. 	Schedule A (existing easement) or Schedule B (private land)	
CV5	Improve Existing Drains	<ul style="list-style-type: none"> Includes cleaning and/or widening of existing drain corridors. 	<ul style="list-style-type: none"> Improves conveyance. Work can be completed under the <i>Drainage Act</i> for all Municipal Drains. 	<ul style="list-style-type: none"> May be subject to species at risk timing windows for construction. Must respect downstream outlet capacity. 	Schedule A / Drainage Act	
CV6	Re-Grade Roadway	<ul style="list-style-type: none"> Remove, regrade and replace existing roadway. Adjustment to storm sewer catch basins may be required. 	<ul style="list-style-type: none"> Improves drainage without acquiring land. Pre-approved work the Town can undertake at any time. 	<ul style="list-style-type: none"> Work is disruptive to adjacent business access and roadways. Business driveway entrances will require re-grading as well. More expensive option. 	Schedule A	

Evaluation of Alternatives

Conveyance Improvements

Easements

In order for the Town to implement any of the conveyance improvements on privately owned lands, an easement would be required. An easement is a legal right to use another's land for a specific limited purpose. In order to secure the easements required for the conveyance improvements, the Town would work with the individual property owners to determine fair compensation for use of the land for the intended purpose.

Some information regarding easements:

- Property owners still own the land - the Town does not own the land the easement occupies.
- Easements are typically 6 meters wide.
- Easements are typically along property lines within the building setback for most lots.
- Depending on the intended use of the easement, the area may need to be kept clear of all obstructions, such as, structures, parking lots and fences.
- An agreement between the property owner and the Town will detail the intended use and any use restrictions for the easement.

Overland Flow Route

Overland flow routes have been proposed primarily between properties within the developed areas. The routes would be graded into a swale which will be dry most of the time. The swale will convey water during large storm events. In many cases, the locations where overland flow routes are identified, are routes that the water tends to take naturally but have not been specifically defined as flow routes. In order to incorporate these routes in the overall drainage plan, the routes must be secured by the Town. The flow routes must be maintained to ensure proper function during storm events.

New Underground Sewer

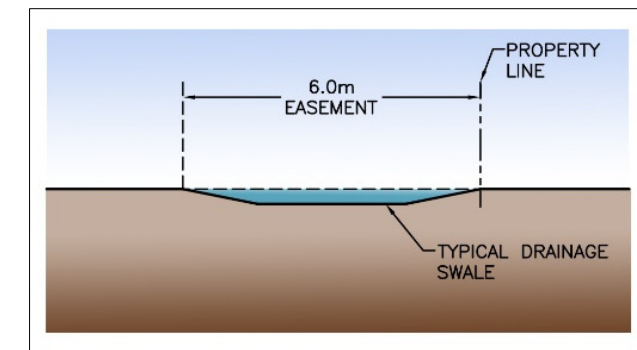
Underground sewers have been proposed where overland flow routes may not be feasible. The Town must secure easements for these sewers for future maintenance and control development over the sewers. If the land is already developed in some cases (parking lots), this option may allow for the parking to remain within the easement.

New Drainage Corridor

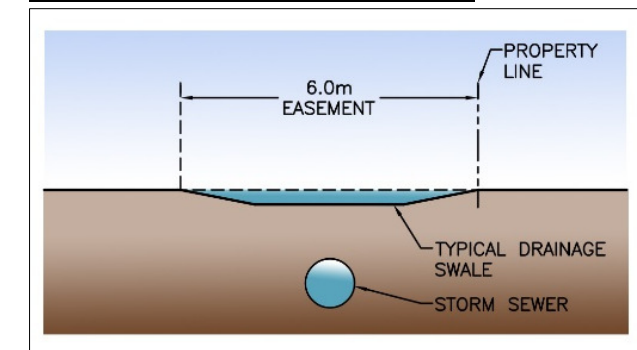
New drainage corridors have been identified in areas where a larger volume of water needs to be accommodated. The proposed new drains typically carry flows to a pond downstream. The Town would have to acquire land or an easement in order to establish the new drain corridors.

Oldcastle Stormwater Master Plan

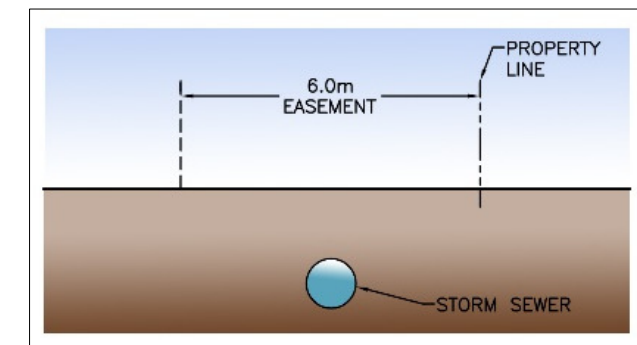
CV1: Typical Overland Flow Route Section



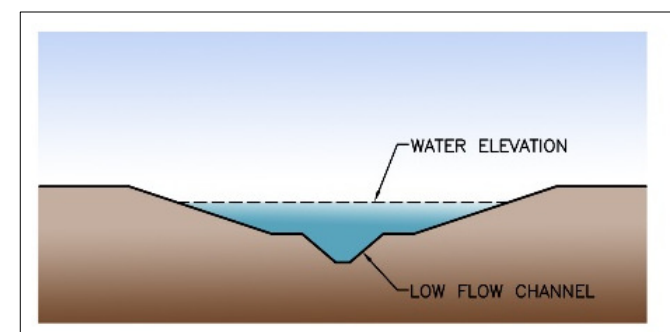
CV1 & CV2: Typical Overland Flow Route with Underground Sewer Section



CV2: Typical Underground Sewer Section



CV3: Typical Drainage Corridor Section



Evaluation of Alternatives

Existing Culvert Assessment

Culvert Assessments

As part of the study, all of the culverts within the Study Area were assessed for condition. The culverts were each given a rating based on the following criteria:

- Good:** 76-100% effective flow area
- Fair:** 51-75% effective flow area
- Poor:** 26-50% effective flow area
- Very Poor:** 0-25% effective flow area

Evaluation of Alternatives

The following alternatives were considered for the culverts:

1. Replace culvert (CV2) – The culverts in poor repair could be replaced to restore effective flow area. This option is not a permanent solution as the culverts could again fill with sediment or become crushed over time.
2. Install new underground storm sewer (CV4) – Installing a storm sewer system within the right of way would replace the need for the culverts. The storm sewers would provide a higher level of service.

Both alternatives are considered pre-approved works under Schedule A Class Environmental Assessment Projects. The Town may proceed with construction and no further EA process is required.

Recommended Solution

The recommended solution is to **install new underground storm sewers** to replace the existing swales and culverts. This solution is intended to alleviate drainage issues associated with problematic culverts. Although this is the more expensive solution, it provides the most effective long-term service.

The locations for these improvements can be found on the Recommended Solutions boards.

Good



Fair



Poor



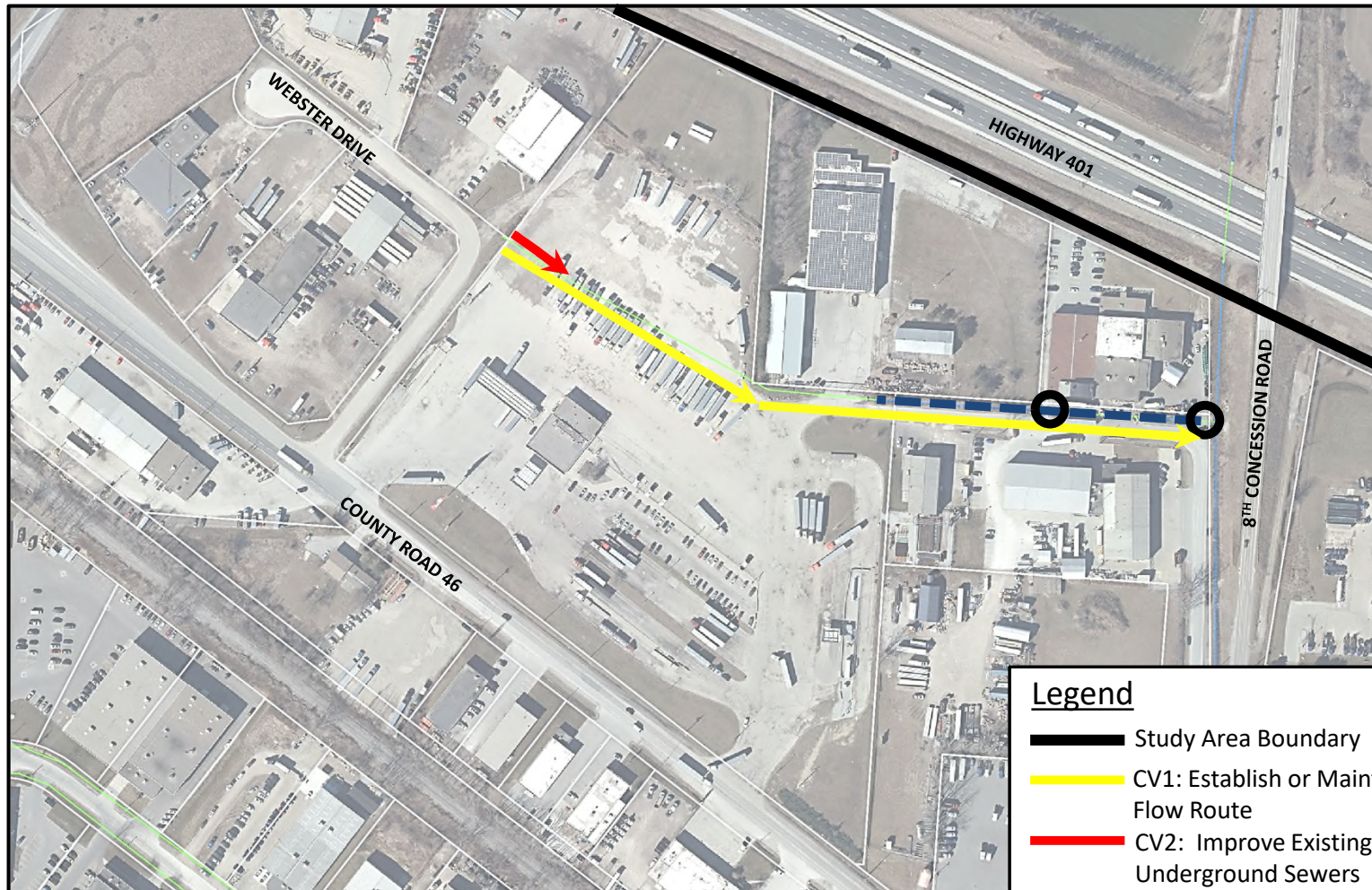
Very Poor



The following slides present the Preferred Solutions for each area. Details of the improvements (such as preliminary pipe sizes, swale side slopes and preliminary pond volumes) can be found in the Stormwater Master Plan in Section 8 of the Project File.

County Road 46 / 8th Concession Area

The Preferred Solution for this area is to maintain the existing overland flow route, replace the pipe where shown, improve the existing drain and replace the existing culverts within the drain.

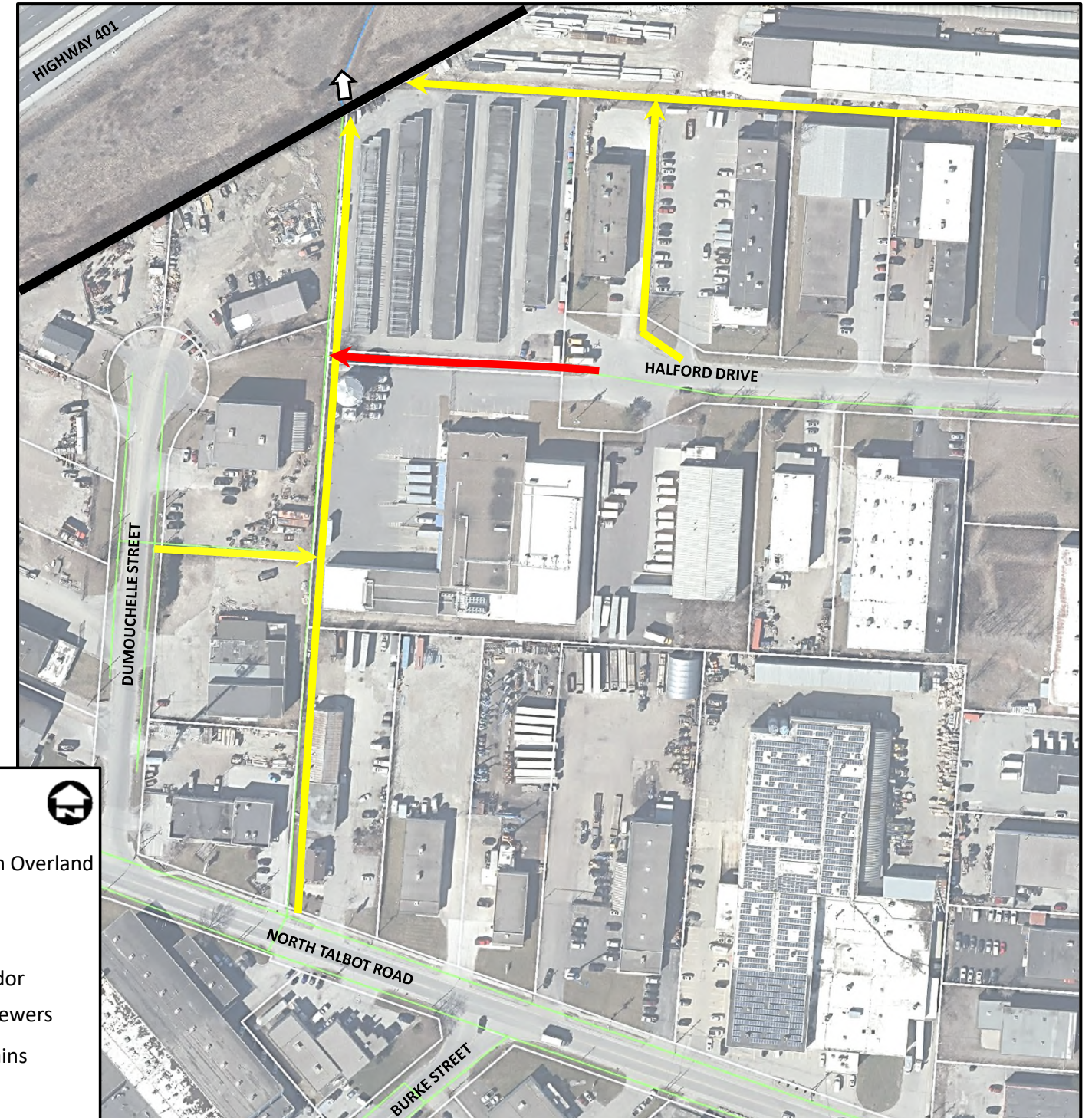


Legend

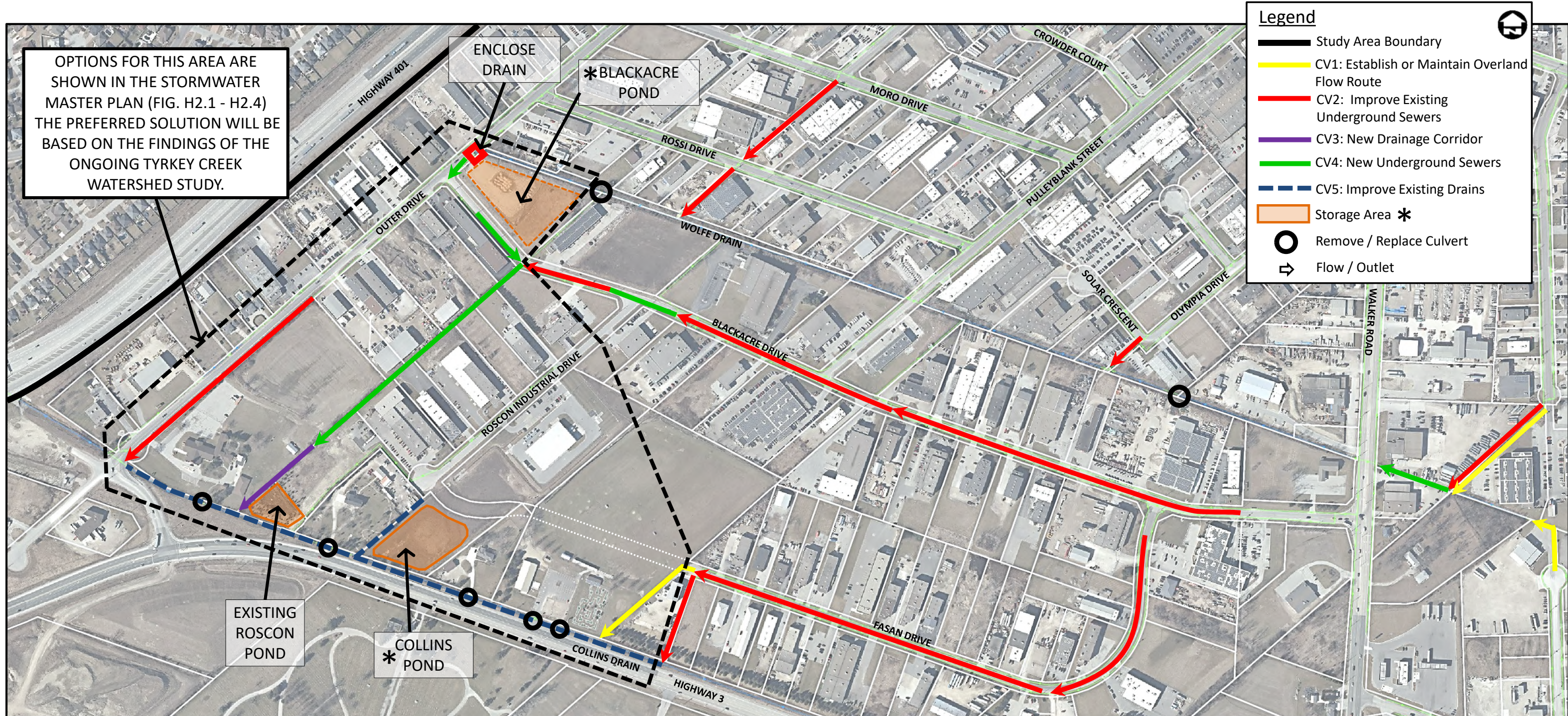
- Study Area Boundary
- CV1: Establish or Maintain Overland Flow Route
- CV2: Improve Existing Underground Sewers
- CV3: New Drainage Corridor
- CV4: New Underground Sewers
- CV5: Improve Existing Drains
- Storage Area *
- Remove / Replace Culvert
- Flow / Outlet

Dumouchelle / Halford Area

The Preferred Solution for the Dumouchelle / Halford Area is to secure easements in order to establish or maintain the existing overland flow routes as shown below. As well, the underground sewer at Halford Drive should be improved.













Blackacre Drive Area The Preferred Solutions for the Blackacre Drive area includes improvements to the existing storm sewers and addition of new storm sewers as shown below. Two ponds have been proposed - Collins Pond, along the Collins Drain and Blackacre Pond along the Wolfe Drain. The Collins Drain will require improvement in order to provide relief for Fasan Drive as shown (improved underground sewer and proposed overland flow route). Finding of the ongoing Turkey Creek Watershed Study will determine the improvements required within the dashed boundary shown below.

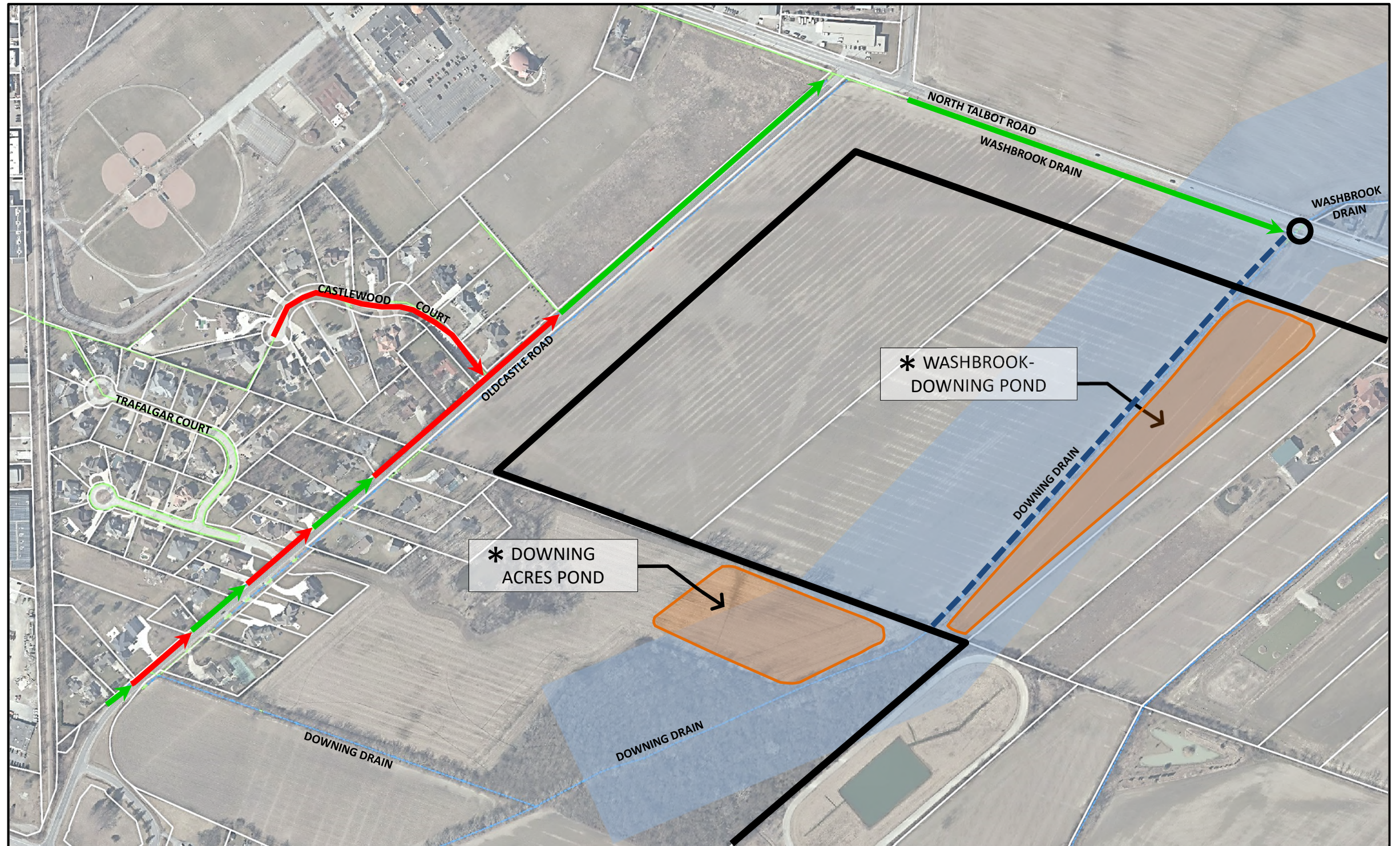


* The storage areas depicted in this slide are conceptual representations of the approximate area required based on functional level evaluations of storage requirements. Actual storage area and associated land requirements may vary in shape and size.

Oldcastle Road Area The Preferred Solution for this area includes the improvement and addition of new underground storm sewers along Castlewood Court, Oldcastle Road and North Talbot Road. It also includes the addition of 2 new ponds along the Downing Drain and replacement of the culvert under North Talbot Road.

Legend

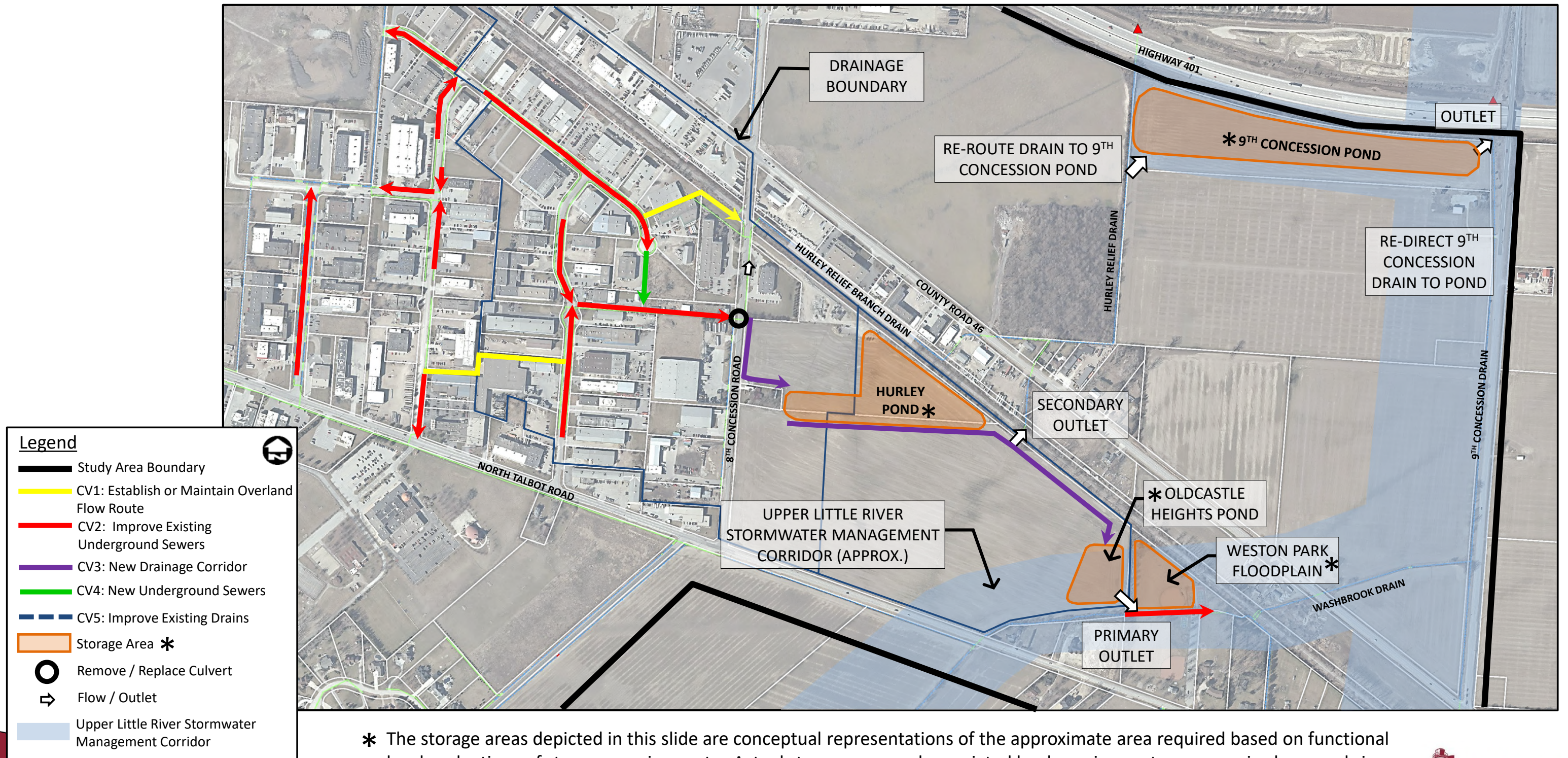
-  Study Area Boundary
-  CV1: Establish or Maintain Overland Flow Route
-  CV2: Improve Existing Underground Sewers
-  CV3: New Drainage Corridor
-  CV4: New Underground Sewers
-  CV5: Improve Existing Drains
-  Storage Area *
-  Remove / Replace Culvert
-  Flow / Outlet
-  Upper Little River Stormwater Management Corridor



* The storage areas depicted in this slide are conceptual representations of the approximate area required based on functional level evaluations of storage requirements. Actual storage area and associated land requirements may vary in shape and size.

North Talbot Road / 8th Concession Area

The Preferred Solution includes the improvement of existing underground storm sewers and the establishment of overland flow routes west of 8th Concession Road. Three ponds have been proposed in this area, the Hurley Pond, the Oldcastle Heights Pond and the 9th Concession Pond. As well, new drainage corridors have been proposed to route flows to the proposed ponds.



* The storage areas depicted in this slide are conceptual representations of the approximate area required based on functional level evaluations of storage requirements. Actual storage area and associated land requirements may vary in shape and size.




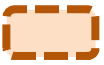


WOLFE DRAIN WATERSHED IMPROVEMENT OPTIONS

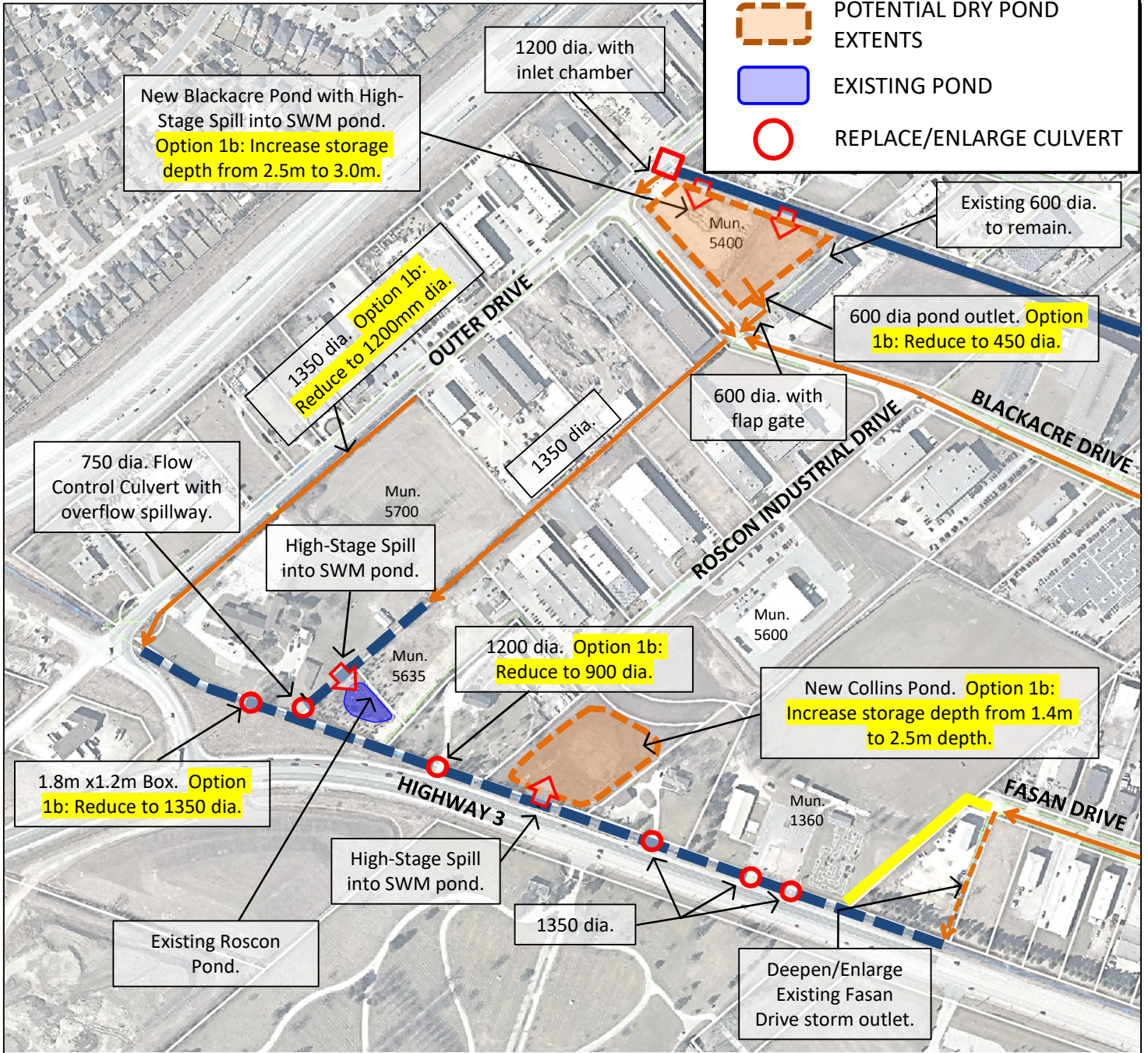
OPTION	Re-route Fasan Drive storm sewer to new Collins Pond	Deepen/Enlarge Collins Drain	New Blackacre Pond (2.5m Deep Storage)	New Blackacre Pond (3.0m Deep Storage)	New Collins Pond (1.5m Deep Storage)	New Collins Pond (2.5m Deep Storage)	Flow Control on proposed new Auxiliary Wolfe Drain	1:100 Year Peak Flow to City (m ³ /s) ¹
1a		x	x		x		x	7.55
1b		x		x		x	x	6.63
2	x		x		x		x	7.59
3*		x	x				x	8.92
4*		x						12.54

Note 1: Existing 1:100 Year Peak Flow to City is 7.7 m³/s. Parkway Design Flow is 6.1 m³/s. See Figure J4 of Appendix J for flow reference location and flow hydrographs.

* Option is only valid if the ongoing Turkey Creek Study findings determine that the downstream receivers can safely convey the peak flow rate.

LEGEND

-  NEW/IMPROVED DRAIN
-  NEW UNDERGROUND SEWER
-  OVERLAND FLOW ROUTE
-  POTENTIAL DRY POND EXTENTS
-  EXISTING POND
-  REPLACE/ENLARGE CULVERT



WOLFE DRAIN 1:100 YEAR PEAK FLOW DOWNSTREAM OF HIGHWAY 401 CROSSING:

- Option 1a = 7.55 m³/s.
- Option 1b = 6.63 m³/s.



Title	WOLFE DRAIN IMPROVEMENTS – OPTIONS 1A & 1B	
	Project	OLDCASTLE STORMWATER MASTER PLAN

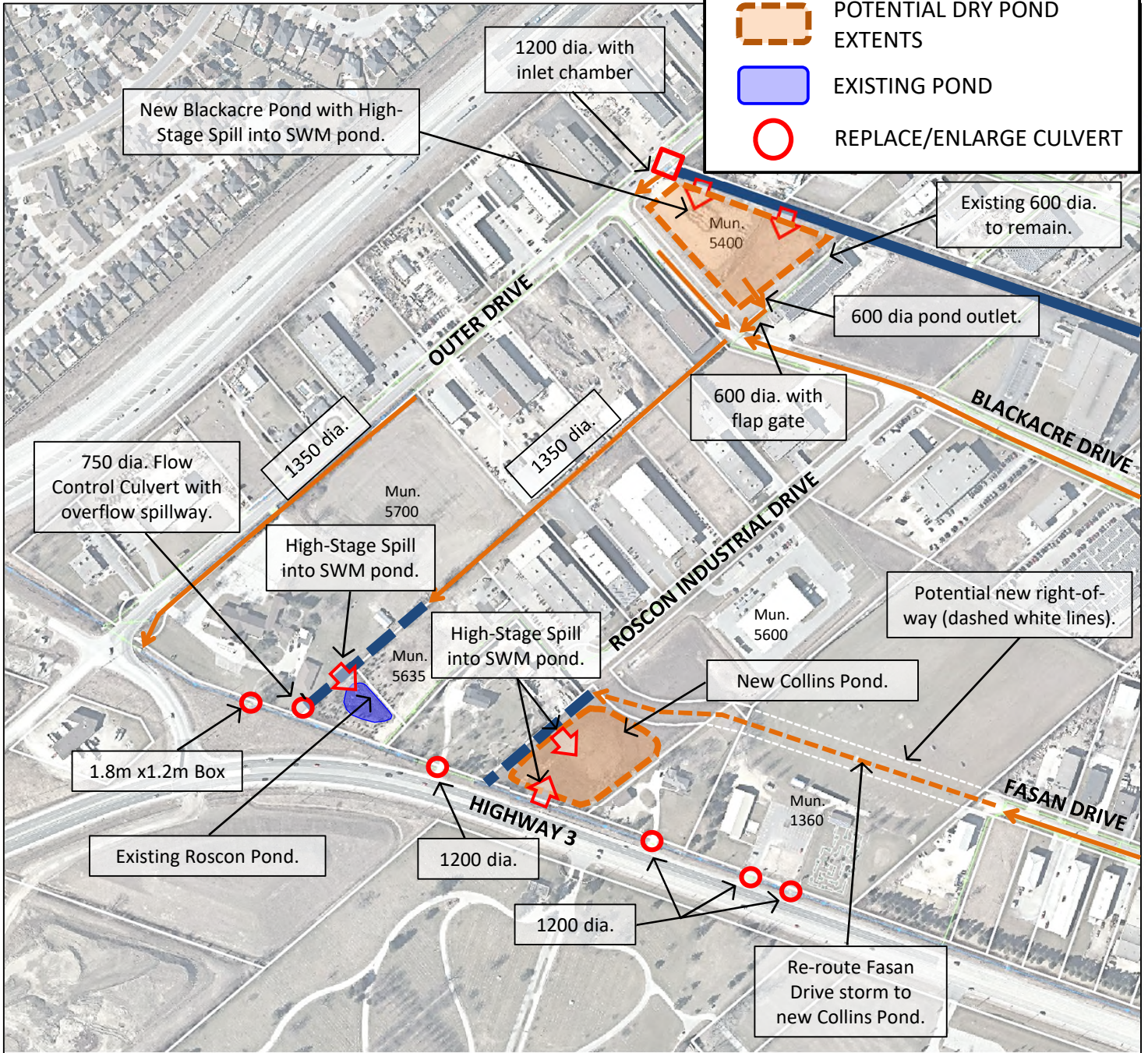
Date	JAN 2022
Scale	NTS
Project No.	19-010

**FIGURE
H2.1**

LEGEND



- NEW/IMPROVED DRAIN
- ← NEW UNDERGROUND SEWER
- OVERLAND FLOW ROUTE
- POTENTIAL DRY POND EXTENTS
- EXISTING POND
- REPLACE/ENLARGE CULVERT

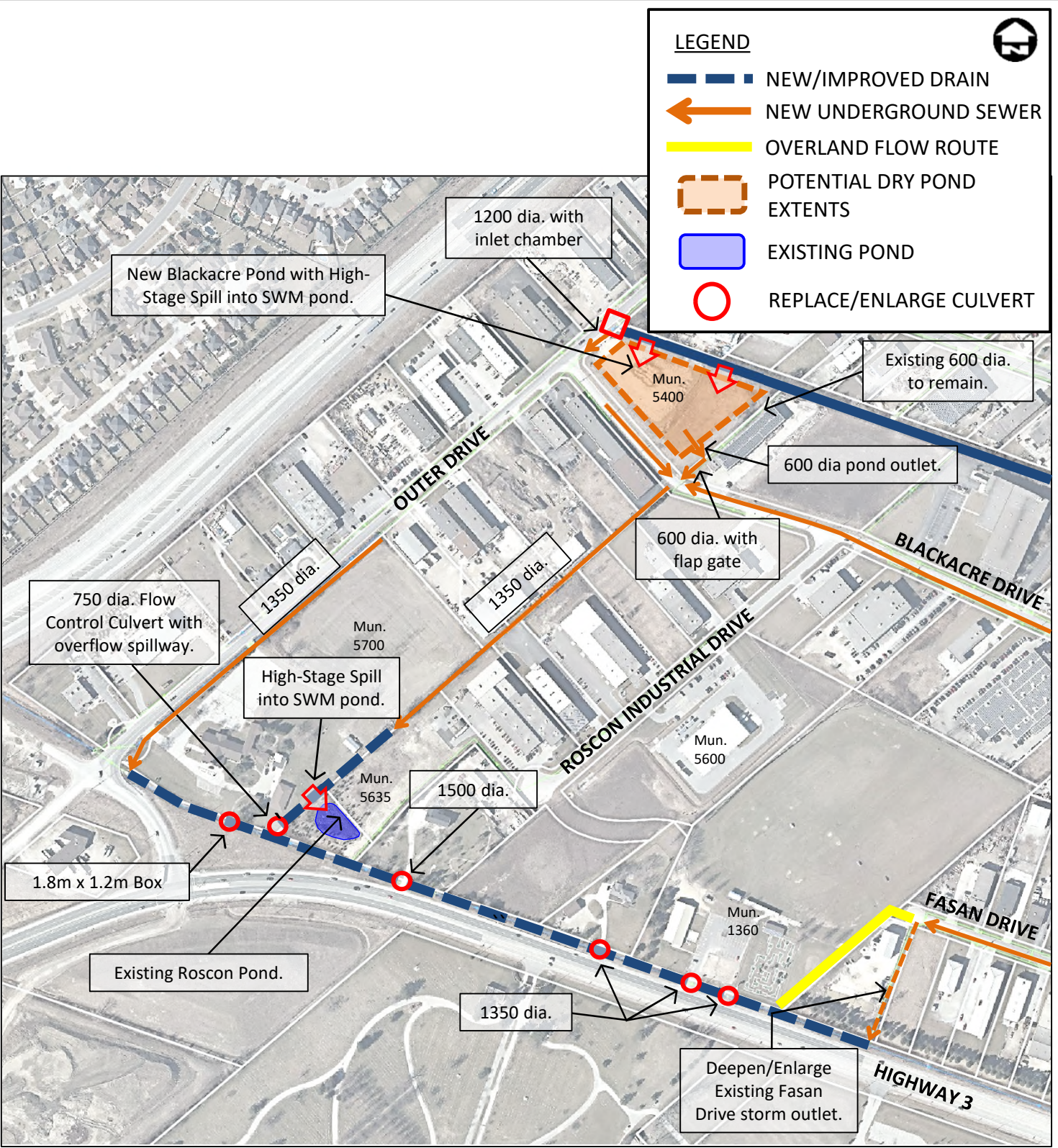


WOLFE DRAIN 1:100 YEAR PEAK FLOW DOWNSTREAM OF HIGHWAY 401 CROSSING = 7.59 m³/s.



Title	WOLFE DRAIN IMPROVEMENTS – OPTION 2	
	Project	
OLDCASTLE STORMWATER MASTER PLAN		Date
		JAN 2022
		Scale
		NTS
		Project No.
		19-010

**FIGURE
H2.2**





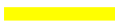



WOLFE DRAIN 1:100 YEAR PEAK FLOW DOWNSTREAM OF HIGHWAY 401 CROSSING = 8.92 m³/s.

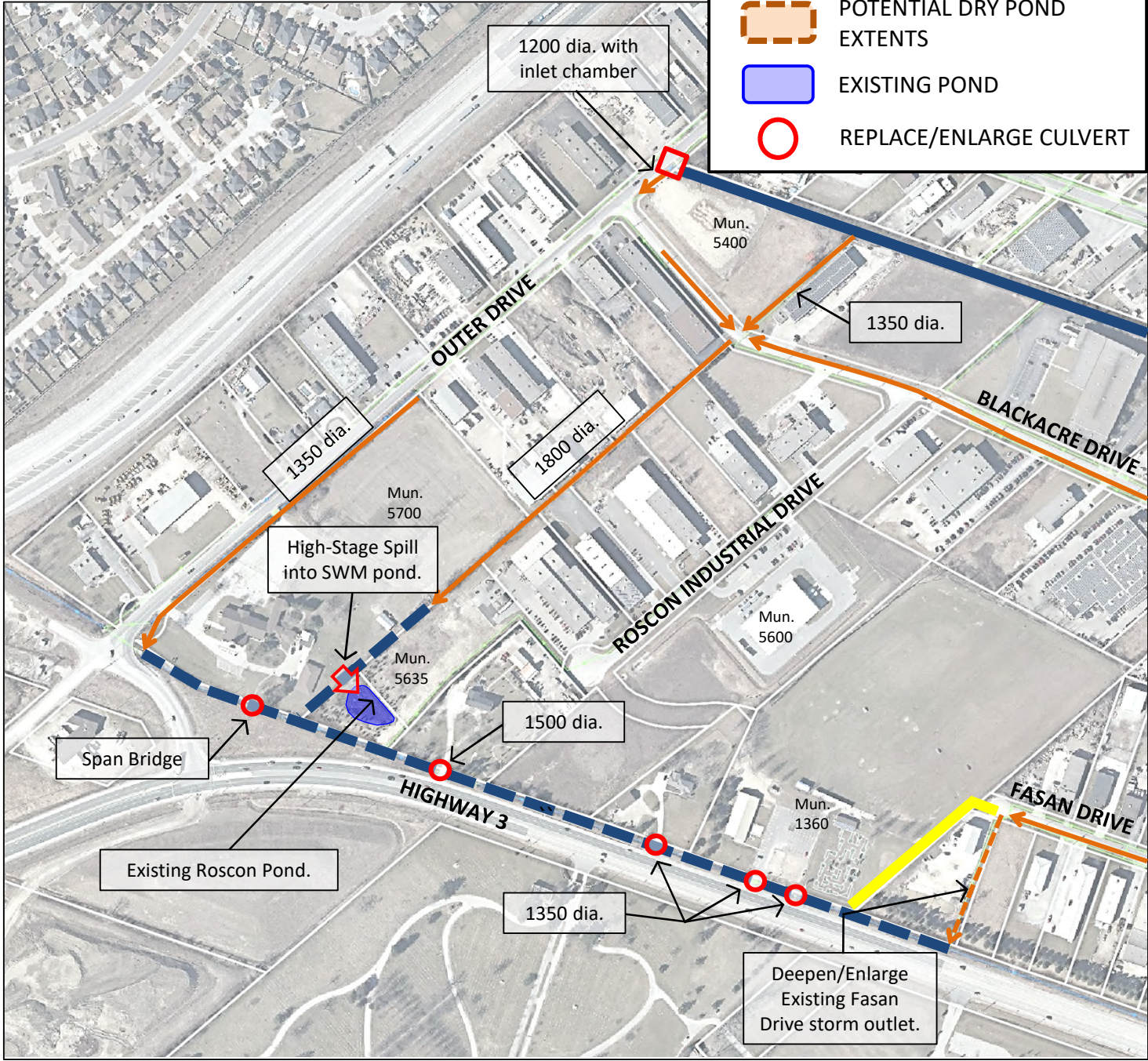


* Option 3 is only valid if the ongoing Turkey Creek Study findings determine that the downstream receivers can safely convey the peak flow rate of 8.92 m³/s.

Title WOLFE DRAIN IMPROVEMENTS – OPTION 3*	Date	JAN 2022	FIGURE H2.3
	Scale	NTS	
	Project No.	19-010	
Project OLDCASTLE STORMWATER MASTER PLAN			

LEGEND

-  NEW/IMPROVED DRAIN
-  NEW UNDERGROUND SEWER
-  OVERLAND FLOW ROUTE
-  POTENTIAL DRY POND EXTENTS
-  EXISTING POND
-  REPLACE/ENLARGE CULVERT



WOLFE DRAIN 1:100 YEAR PEAK FLOW DOWNSTREAM OF HIGHWAY 401 CROSSING = 12.54 m³/s.



* Option 4 is only valid if the ongoing Turkey Creek Study findings determine that the downstream receivers can safely convey the peak flow rate of 12.54 m³/s.

Title WOLFE DRAIN IMPROVEMENTS – OPTION 4*	Date	JAN 2022	FIGURE H2.4
	Scale	NTS	
	Project No.	19-010	
Project OLDCASTLE STORMWATER MASTER PLAN			

Cost and Implementation

Oldcastle Stormwater Master Plan

Project ID	Project Description	Planning and Approval Process	Watershed	Subwatershed	Easement / Property Acquisitions	Timeframe ¹	Preliminary Budget Cost Estimate ²
W.1	Wolfe Drain Improvements	Drainage Act	Turkey Creek	Wolfe Drain	E8, E9, E14 and PA1	Short-Term	\$3,550,000
8C.1	Demonte Drain Improvements	Drainage Act	Little River	9th Conc. Drain	E15	Short-Term	\$100,000
H.1	Hurley Relief Branch Drain Improvements	Drainage Act	Little River	Hurley Drain	-	Short-Term	\$50,000
H.2	New Storm Sewer along Del Duca Drive	Schedule B	Little River	Hurley Drain	E16 and E17	Short-Term	\$1,000,000
H.3	New Storm Sewer along Ure Street	Schedule B	Little River	Hurley Drain	E19	Short-Term	\$450,000
9C.1	Washbrook Drain Improvements	Drainage Act	Little River	9th Conc. Drain	-	Short-Term	\$620,000
W.2	Collins Drain Improvements	Drainage Act	Turkey Creek	Wolfe Drain	E10 and PA2	Medium-Term	\$1,130,000
W.3	New Storm Sewer along Fasan Drive	Schedule B	Turkey Creek	Wolfe Drain	E11	Medium-Term	\$1,340,000
W.4	New Storm Sewer along Blackacre Drive	Schedule A	Turkey Creek	Wolfe Drain	-	Medium-Term	\$1,870,000
W.5	Replace Storm Outlets to Wolfe Drain	Schedule B	Turkey Creek	Wolfe Drain	E6, E7, E12 and E13	Medium-Term	\$1,080,000
6C.1	Replace Halford Drive Storm Outlet	Schedule B	Little River	6th Conc. Drain	E1 to E5	Medium-Term	\$60,000
7C.1	New Storm Sewers along O'Neil Dr. & Moyhanan St.	Schedule A	Little River	7th Conc. Drain	-	Medium-Term	\$230,000
H.4	Enlarge & Re-route Hurley Drain to New Hurley Pond	Schedule B	Little River	Hurley Drain	E19, E20 and PA4	Medium-Term	\$3,320,000
9C.2	New Washbrook-Downing Pond	Schedule B	Little River	9th Conc. Drain	PA3	Medium-Term	\$2,200,000
7C.2	New Storm Sewer along Hennin Street	Schedule A	Little River	7th Conc. Drain	-	Long-Term	\$370,000
9C.3	New Storm Sewer along Oldcastle Road, Castlewood Court and O'Neil Drive	Schedule A	Little River	9th Conc. Drain	-	Long-Term	\$1,880,000
9C.4	Extension of Washbrook Drain Enclosure	Drainage Act	Little River	9th Conc. Drain	-	Long-Term	\$4,170,000
9C.5	Oldcastle Heights Pond	Schedule B	Little River	9th Conc. Drain	-	-	\$1,310,000
9C.6	Downing Acres Pond	Schedule B	Little River	9th Conc. Drain	-	-	\$1,630,000
9C.7	9th Concession Pond	Schedule B	Little River	9th Conc. Drain	PA5	-	\$5,660,000

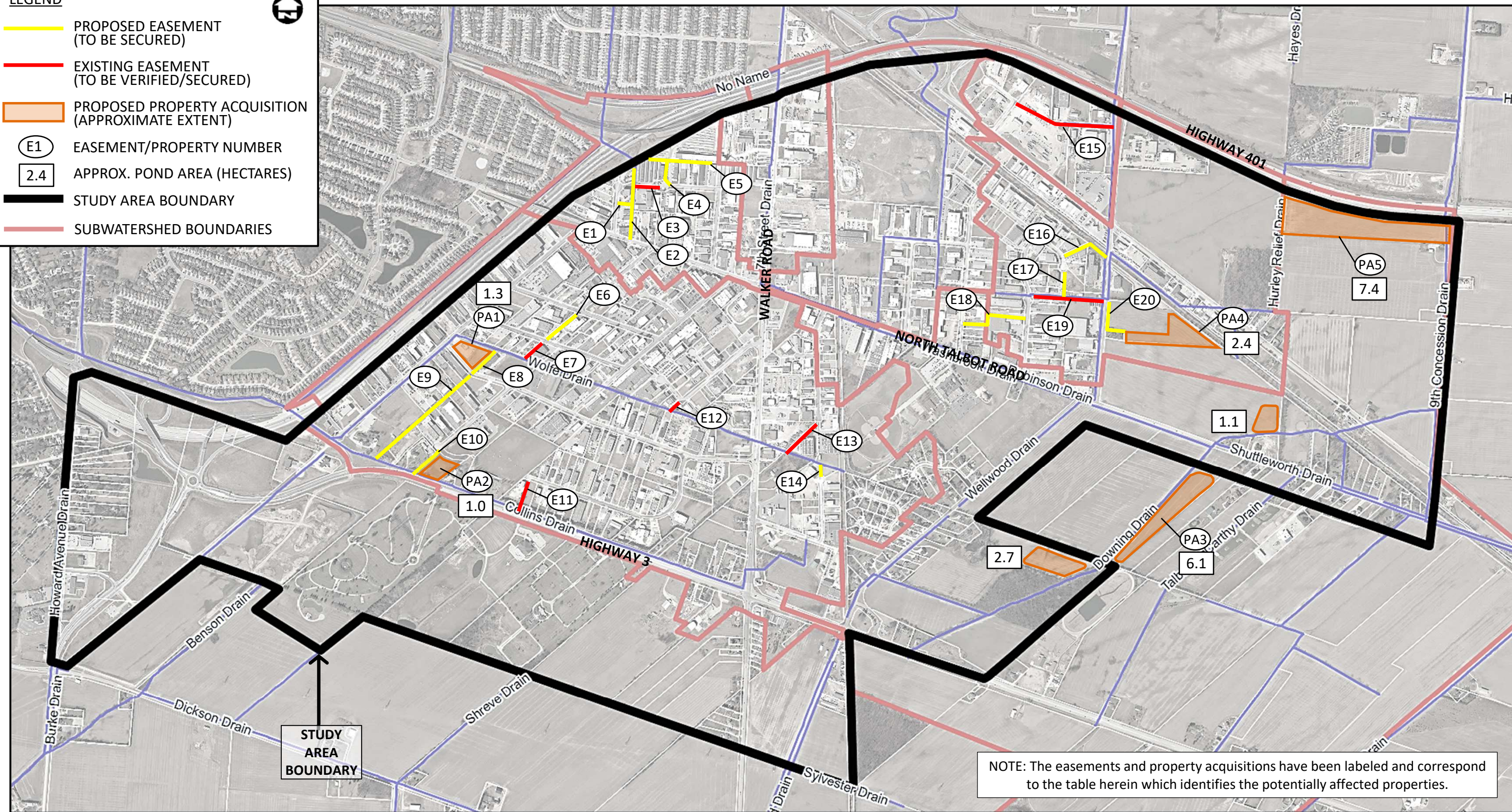
¹ Recommended Timeframe: Short-Term = 1-2 years; Medium-Term = within 10 years; Long-Term = within 20 years.

² Preliminary Budget Costs for Section W: Wolfe Drain Subwatershed Improvement Costs are based on Option 1b.

Short-Term Improvements = \$5.8 Million
 Medium-Term Improvements = \$11.2 Million
 Long-Term Improvements = \$6.4 Million
 Development-Driven SWM = \$8.6 Million
TOTAL = \$32.0 Million

LEGEND

- PROPOSED EASEMENT (TO BE SECURED)
- EXISTING EASEMENT (TO BE VERIFIED/SECURED)
- PROPOSED PROPERTY ACQUISITION (APPROXIMATE EXTENT)
- E1 EASEMENT/PROPERTY NUMBER
- 2.4 APPROX. POND AREA (HECTARES)
- STUDY AREA BOUNDARY
- SUBWATERSHED BOUNDARIES



NOTE: The easements and property acquisitions have been labeled and correspond to the table herein which identifies the potentially affected properties.



Title EASEMENTS AND PROPERTY ACQUISITION MAP	Date JAN. 2022	FIGURE M1
	Scale NTS	
Project OLDCASTLE STORMWATER MASTER PLAN	Project No. 19-010	

EASEMENT#	EASEMENT ADDRESS	OWNER(S)	MAILING ADDRESS
E1	5160 DUMOUCHELLE ST	FACCHINATO HOLDINGS LTD	[REDACTED]
	5180 DUMOUCHELLE ST	FACCHINATO HOLDINGS LTD	
E2	5140 DUMOUCHELLE ST	NASCI TRUCKING LIMITED	[REDACTED]
	5160 DUMOUCHELLE ST	FACCHINATO HOLDINGS LTD	
	5180 DUMOUCHELLE ST	FACCHINATO HOLDINGS LTD	
	1780 N TALBOT RD	957474 ONTARIO LIMITED	
	1840 N TALBOT RD	BAHCELI, KEMAL & SUAT	
	1920 HALFORD RD	363148 ONTARIO LIMITED	
	1925 HALFORD RD	2693316 ONTARIO LIMITED	
E3	HALFORD RD	TECUMSEH TOWN	[REDACTED]
E4	1920 HALFORD RD	363148 ONTARIO LIMITED	[REDACTED]
	1960 HALFORD RD	1352192 ONTARIO LTD	
E5	1920 HALFORD RD	363148 ONTARIO LIMITED	[REDACTED]
	1960 HALFORD RD	1352192 ONTARION LTD	
	1950 HALFORD RD	1787954 ONTARIO LTD	
	2020 HALFORD RD	OFFERFAIR INC	
	2030 HALFORD RD	CROATIA MACHINE TOOL OF CANADA	
	2050 HALFORD RD	SCWI ENTERPRISES INC	

EASEMENT#	EASEMENT ADDRESS	OWNER(S)	MAILING ADDRESS
E6	1525 MORO DR	DDS SOFTWARE SOLUTIONS INC	[REDACTED]
	1580 ROSSI DR	ACENZIA INC	[REDACTED]
	1620 ROSSI DR	388456 ONTARIO LIMITED	[REDACTED]
E7	1615 ROSSI DR	BRICASA INC	[REDACTED]
	1625 ROSSI DR	1277032 ONTARIO INC	[REDACTED]
E8	5400 OUTER DR	470698 ONTARIO LTD TRUSTEE	[REDACTED]
	1840 BLACKACRE DR	CARLESIMO HOLDINGS INC	[REDACTED]
E9	5420 OUTER DR	OLIVIA ENTERPRISES INC	[REDACTED]
	5450 OUTER DR	520589 ONTARIO INC	[REDACTED]
	5500 OUTER DR	DALLA, BONA MARIO	[REDACTED]
	5540 OUTER DR	470698 ONTARIO LTD	[REDACTED]
	5600 OUTER DR	470698 ONTARIO LTD	[REDACTED]
	5700 OUTER DR	CONGREGATION OF THE ORDER ANTONIN MARONITE IN ONTARIO	[REDACTED]
	5425 ROSCON INDUSTRIAL	813978 ONTARIO LTD	[REDACTED]
	5455 ROSCON INDUSTRIAL	2443176 ONTARIO LTD	[REDACTED]
	5485 ROSCON INDUSTRIAL	ROSATI DEVELOPMENT CORP	[REDACTED]
	5515 ROSCON INDUSTR DR	1808250 ONTARIO LIMITED	[REDACTED]
5575 ROSCON INDUSTRIAL	MARONTATE ENTERPRISES INC	[REDACTED]	

EASEMENT#	EASEMENT ADDRESS	OWNER(S)	MAILING ADDRESS
E9	5605 ROSCON INDUSTRIAL	1382229 ONTARIO LIMITED	[REDACTED]
	5635 ROSCON INDUSTRIAL	1382229 ONTARIO LIMITED	[REDACTED]
	1100 HIGHWAY 3	DESMARAIS, JOSEPH PAUL VICTOR	[REDACTED]
E10	1100 HIGHWAY 3	DESMARAIS, JOSEPH PAUL VICTOR	[REDACTED]
E11	2005 FASAN DR	1432351 ONTARIO INC	[REDACTED]
	2015 FASAN DR	DIXON, ALLAN & SUSAN	[REDACTED]
E12	2175 SOLAR CRES	EL-HY CO LIMITED	[REDACTED]
	2340 OLYMPIA DR	MICHAEL TOOL & MOLD (WINDSOR) LIMITED	[REDACTED]
E13	5385 BRENDAN LANE	990077 ONTARIO LIMITED	[REDACTED]
	5400 WALKER RD	GORSKI BULK TRANSPORT INC	[REDACTED]
E14	5405 DI COCCO CRT	MOVIN' FREIGHT HOLDINGS LTD	[REDACTED]
	5410 DI COCCO CRT	166050 CANADA INC	[REDACTED]
E15	2800 TRAFALGAR CRT	DOCHERTY, THOMAS JOSEPH KASCHAK, DEBORAH KATHERINE	[REDACTED]
	2820 TRAFALGAR CRT	BERTRAM, DANE & JENNIFER	[REDACTED]
E16	4040 COUNTY RD 46	Husky Oil Ltd	[REDACTED]
	5015 8TH CONCESSION RD	R J CYR CO INC	[REDACTED]
	4965 8th CONCESSION RD	LAVAL TOOL & MOULD LTD	[REDACTED]
	4975 8TH CONCESSION RD	679637 ONTARIO LTD	[REDACTED]

EASEMENT#	EASEMENT ADDRESS	OWNER(S)	MAILING ADDRESS
E17	5041 8TH CONCESSION RD	PRODART ENTERPRISES INC	[REDACTED]
	4150 DELDUCA DR	360 MANUFACTURING	[REDACTED]
	4200 DELDUCA DR	FILIPPO LIBURDI CONSTRUCTION LIMITED	[REDACTED]
E18	4201 DELDUCA DR	EAGLE HEATING & COOLING INC	[REDACTED]
	4300 DELDUCA DR	2030185 ONTARIO LTD	[REDACTED]
E19	5145 URE ST	2391472 ONTARIO LTD	[REDACTED]
	5155 URE ST	WEST INDUSTRIES INC	[REDACTED]
	N/A O'NEIL DR	WEST INDUSTRIES INC	[REDACTED]
	5170 O'NEIL DR	EAGLE PRESS & EQUIPMENT CO	[REDACTED]
E20	5105 8TH CONCESSION RD	DELICATA, GIUSEPPE	[REDACTED]
	5175 8TH CONCESSION RD	WEST INDUSTRIES INC	[REDACTED]
	5100 URE ST	ROM-EX INVESTMENT LTD NEWENG INVESTMENT LTD	[REDACTED]
	5130 URE ST	N TALBOT HOLDINGS LTD	[REDACTED]
E21	5100 8TH CONCESSION RD	UNION GAS LIMITED	[REDACTED]
PA1	5400 OUTER DR	470698 ONTARIO LTD TRUSTEE	[REDACTED]
PA2	TALBOT RD	WESTCO WINDSOR INC.	[REDACTED]
PA3	N TALBOT RD	838073ONTARIO INC.	[REDACTED]
PA4	5100 8TH CONCESSION RD	UNION GAS LIMITED	[REDACTED]
PA5	9TH CONCESSION RD	HAYES, JORDAN AND JUSTIN	[REDACTED]