Technical Memorandum

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Prepared for: Town of Braintree

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Technical Memorandum

Subject: May 2020 Illicit Discharge Detection and Elimination Investigations

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Executive Summary

Stormwater outfall screening and sampling was performed in May 2020 at four outfalls (MQR-002, MQR-003, MQR-005, and CDS-010) previously suspected of having sewage contamination. The results indicate that three of the outfalls (MQR-002, MQR-005, and CDS-010) were not contaminated with sewage at the time of inspection; however, sewage contamination is suspected at outfall MQR-003. Upstream source tracking investigations indicate that the source of contamination for outfall MQR-003 is located between the outfall and the manhole in the intersection of Hancock Street and Frederick Road. Follow-up investigations, such as CCTV inspections, are recommended to locate the source of contamination upstream of MQR-003.

Section 1: Introduction

The Town of Braintree has an active illicit discharge detection and elimination (IDDE) program that seeks to identify and remove illicit discharges to the Town's stormwater system. This program includes dry weather screening and sampling at the Town's stormwater outfalls. Technical Memorandum 1 (Brown and Caldwell, September 24, 2019) provides a summary of previous IDDE investigations.

Technical Memorandum 1 identified four stormwater outfalls that are suspected of sewage contamination:

- CDS-010
- MQR-002
- MQR-003
- MQR-005

All of these outfalls had dry weather discharges with E. Coli concentrations in excess of the state standard (235 cfu/100 ml). In response to the elevated E. Coli concentrations, follow-up investigations were performed in the Spring of 2020. This Technical Memorandum provides a summary of the follow-up IDDE investigations.

Section 2: Investigation Procedures

Dry weather screening and outfall sampling was performed by Brown and Caldwell (BC) and Town employees in accordance with the Town's Outfall Inspection and Dry Weather Sampling SOP (Town of Braintree IDDE Plan, June 2019). Upstream source tracking was immediately initiated at outfalls with evidence of sewage contamination.

In accordance with the dry weather screening and outfall sampling procedures, water quality samples were collected from the outfalls with flow present and sent to the laboratory to be analyzed for E. Coli bacteria. Additionally, concentrations of ammonia, surfactants, and chlorine were measured in the field using field test kits.

The determination of the potential for sewage contamination was initially made in the field based on visual and olfactory observations and field test kit measurements. If an outfall was suspected of contamination, upstream source tracking was immediately initiated.

The criteria for initiating upstream source tracking investigations is shown in Table 1. Bacteria, an important indication of potential sewage contamination, is not shown in the table because the bacteria concentrations cannot be determined in the field – the bacteria samples must be sent to a laboratory and results are typically not available for five to seven days. As a result, the determination of the potential presence of

sewage contamination is initially based on visual/olfactory observations and ammonia, surfactant, and chlorine concentrations.

Table 1. Threshold Criteria for Field Test Kits	
Constituent	Threshold Value (mg/L)
Ammonia	≥ 0.5
Surfactants	≥ 0.25
Total Chlorine	≥ 1.0

The bacteria data is reviewed after it is received from the laboratory to make a final determination as to the likelihood of sewage contamination at the outfall. The reason that upstream source tracking investigations are initiated immediately upon completion of the field test kits rather than waiting for several days to get the bacteria data is that discharges from illicit sources can be episodic and if there is the likelihood that a source is active, it is best to go ahead and perform the source tracking. In some cases, upstream source tracking may be performed only to find out later that it was not needed because bacteria concentrations were below the threshold. However, the burden of performing some upstream source tracking that may be unnecessary is outweighed by the desire to be proactive in locating sources if an illicit source may be active.

Section 3: Results

The investigations were conducted at the four outfalls in May 2020 under dry weather conditions. During this time period, rainfall for the month of May was slightly above average and the groundwater table was elevated as it typically is during the Spring. All investigations were performed with at least four days of no prior rain.

3.1 MQR-005

The first outfall inspected was MQR-005. It is located on the North Bank of the Monatiquoit River near the intersection of Shaw Street and Allen Street. The outfall does not have a headwall. It consists of a steel pipe that sticks out into the river near the bridge on Shaw Street. This outfall is visible from the bridge and is suspected of being influenced by tidal waters only during astronomically high tides. The invert elevation of the pipe is just below the elevation of the underside of the bridge. Figure 1 provides a map of the MQR-005 drainage area. Figure 2 provides a photograph of the outfall on the day of inspection.

The results of the investigations at the outfall are shown in Table 2. Flows were observed at the outfall. There was no visual or olfactory evidence of sewage contamination and the bacteria concentration was 44 colonies/100 mL, well below the threshold. This outfall is not suspected having sewage contamination during the time of inspection.

Since the surfactant concentration of 0.25 mg/L was at the threshold level, upstream investigations were performed, but no sources of contamination were identified. This is to be expected since the bacteria data provides confirmation of no sewage contamination.

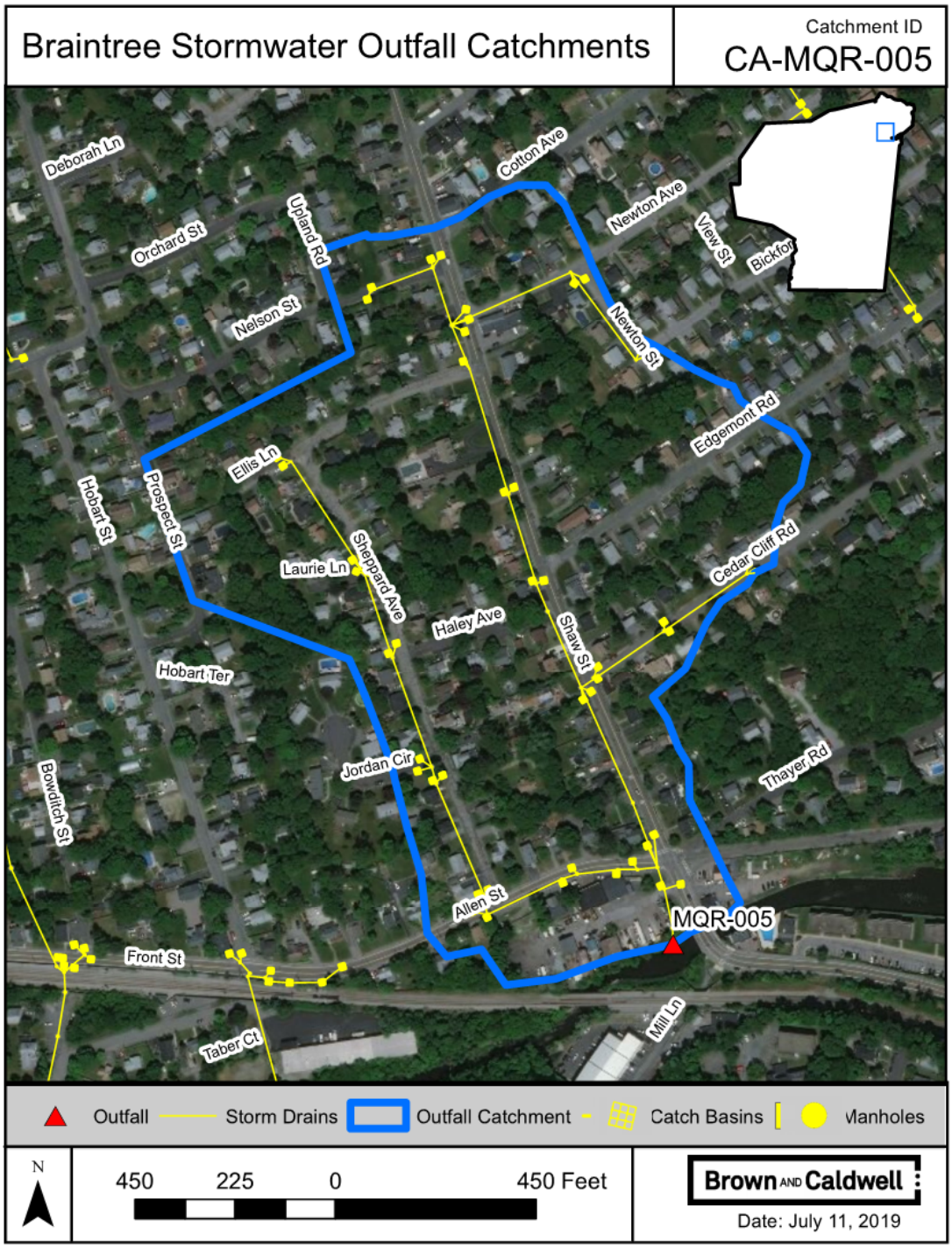

Figure 1. MQR-005 Tributary Area

Figure 2. Photograph of MQR-005 Outfall

Table 2. Outfall Inspection Results							
Outfall ID	Inspection Date	Days Since Last Rainfall	Bacteria *(col / 100 mL)*	Surfactants (mg/L)	Ammonia (mg/L)	Chlorine (mg/L)	Other Evidence of Sewage Contamination (y/n)
CDS-010	May 21, 2020	5	8.6	NS	NS	NS	No
MQR-002	May 13, 2020	4	2.0	0.25	0	0	No
MQR-003	May 14, 2020	5	4,000	0.25	0.6	0	Yes
MQR-005	May 13, 2020	4	44	0.25	0	0	No

NS: Not sampled. Discoloration of the water rendered the field test kits unusable.

3.2 MQR-002

The second outfall inspected was MQR-002. It is located on the North Bank of the Monatiquoit River in the bridge abutment of Quincy Avenue (Route 53). The outfall is located in the side of the bridge and flows down into a small pool that drains into the Monatiquoit River. This outfall is visible from the bridge and is suspected to only being influenced by tidal waters during astronomically high tides. The invert elevation of the pipe is just below the elevation of the underside of the bridge. Figure 3 provides a map of the tributary area to the outfall. Figure 4 provides a photograph of the outfall on the day of the inspection.

Flows were observed at the outfall. The results of the investigations at the outfall are shown in Table 2. There was no visual or olfactory evidence of sewage contamination and the bacteria concentration was 2 colonies/100 mL, well below the threshold. This outfall is not suspected having sewage contamination during the time of inspection.

Since the surfactant concentration of 0.25 mg/L was at the threshold level, upstream investigations were performed, but no sources of contamination were identified. This is to be expected since the bacteria data provides confirmation of no sewage contamination.

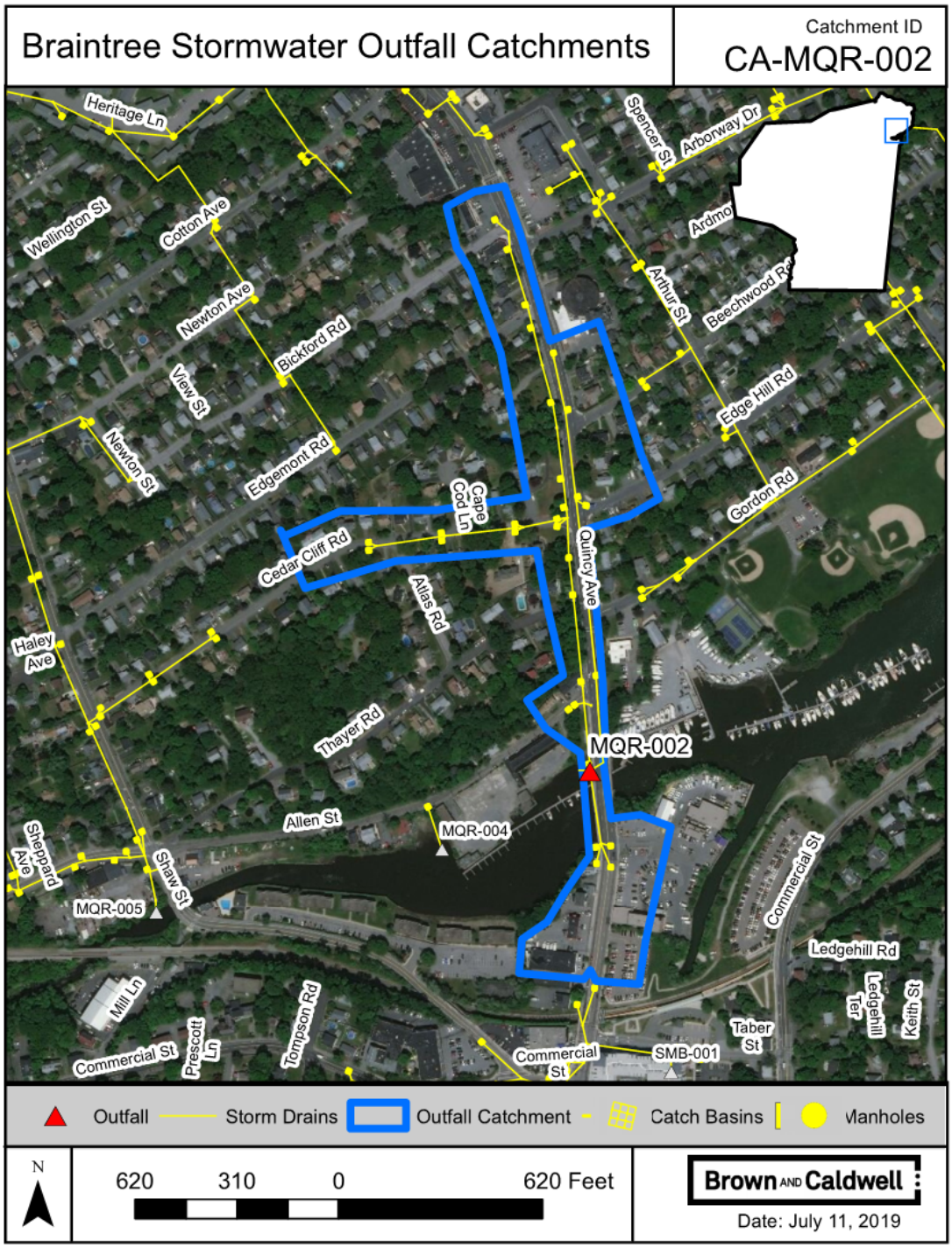

Figure 3. MQR-002 Tributary Area

Figure 4. Photograph of MQR-002 Outfall

3.3 MQR-003

The third outfall inspected was MQR-003. It is located on back side of the former industrial site that abuts Ames Pond and is in-between two active MBTA rail lines. The outfall is a stone square culvert that passes under the northern MBTA tail line and discharges to the Monatiquoit River downstream of Ames Pond. The outfall is in a remote area and access is via a steeply graded hill side. This outfall is only visible from the

heavily wooded area behind the Ames Pond property. Figure 5 provides a map of the tributary area. Figure 6 provides a photograph of the outfall at the time of the inspection.

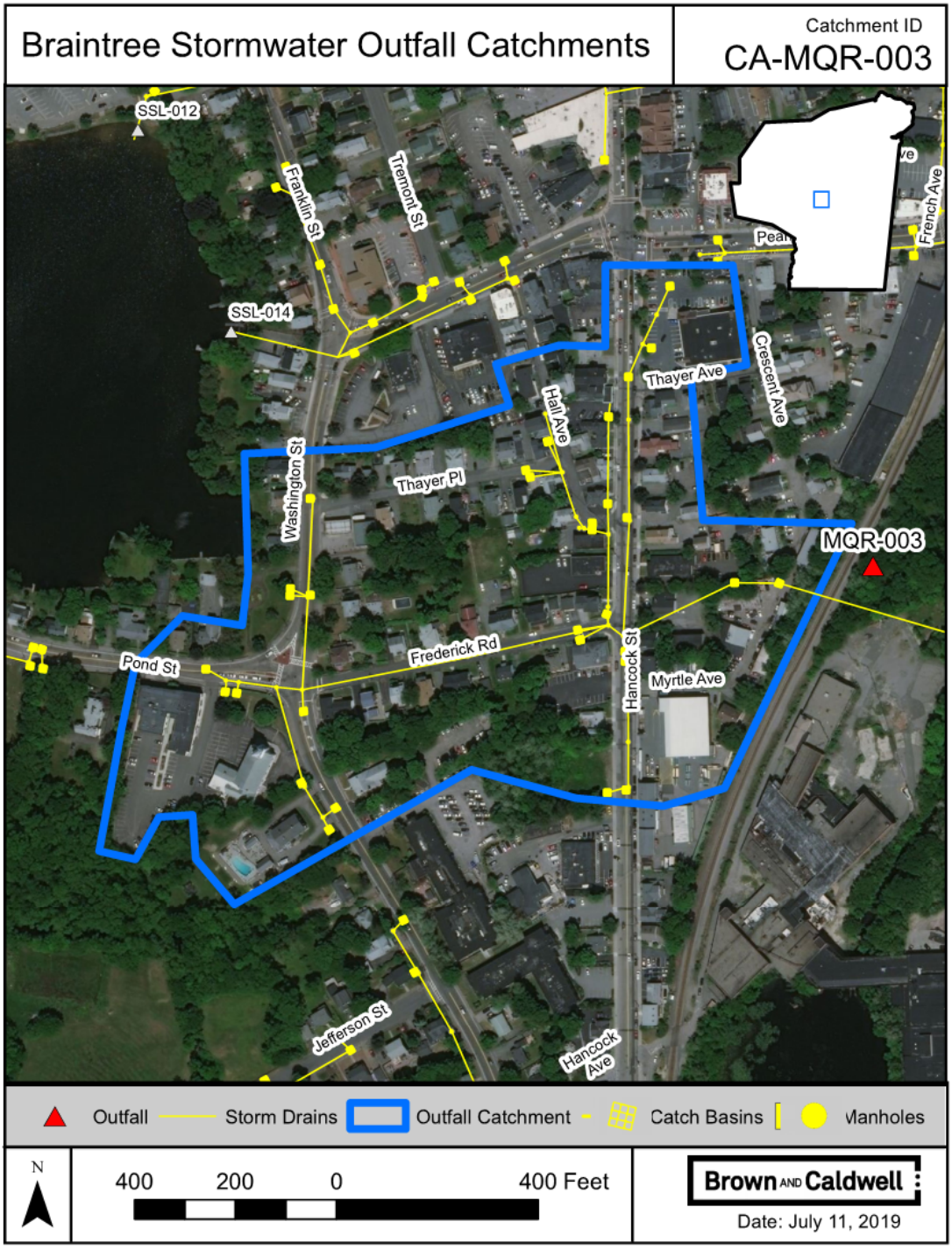

Figure 5. MQR-003 Tributary Area

Figure 6. Photograph of MQR-003 Outfall

The results of the investigations at the outfall are shown in Table 2. At the outfall, the discharge waters were opaque and cloudy. There was a slight odor of raw sewage as well. These characteristics are possible indicators of sewage contamination. The bacteria concentration was 4,000 colonies/100 mL. This

concentration exceeds the threshold. The ammonia and surfactant concentrations also exceeded the thresholds, with an ammonia concentration of 0.6 mg/L being well above the threshold of 0.25 mg/L. These results indicate that MQR-003 may have illicit contamination.

Source tracking was performed upstream of MQR-003. During previous inspections (see Technical Memorandum 1, Brown and Caldwell, September 24, 2019), this outfall was suspected of having sewage contamination from a privately-owned surcharging sanitary manhole on Crescent Avenue, just upstream from the outfall. The Town had previously contacted the property owner to resolve the contamination. Those efforts appear to be successful as the inspection found no signs of sewage contamination from the sanitary manhole to the storm drain catch basin.

Source tracking found stormwater flow in the manhole in the intersection of Hancock Street and Frederick Road. In addition to the field test kit measurements, bacteria samples were collected at this manhole. A sample was collected from the pipe inlet to the north (storm drain Hancock Street) and from the west (Frederick Road). The Hancock Street pipe E. Coli concentration was 3.0 colonies/100 mL, and the Frederick Road pipe E. Coli concentration was 23 colonies/100 mL. Both of these concentrations are well below the concentration of 4,000 colonies/100 mL measured at the outfall. This indicates that the illicit source is located somewhere between the manhole at Hancock Street/Frederick Road and the stormwater outfall.

3.4 CDS-010

The fourth and final outfall inspected was CDS-010. It is located behind the house number at 32 Linda Road. The outfall is accessed via a right-of-way adjacent to the house at 30 Alida Road. The outfall is partially submerged and has significant sediment deposits in the scour pool. The outfall discharges to a low-lying wetland area behind the residences. This outfall is only visible from the heavily wooded area behind Linda Road and Alida Road. Figure 7 provides a map of the outfall's tributary area. Figure 8 provides a photograph of the outfall at the time of inspection.

Since CDS-010 was submerged, the water quality sampling was performed at an upstream manhole. The results of the investigations are shown in Table 2. There was no visual or olfactory evidence of sewage contamination. The bacteria concentration was 8.6 colonies/100 mL, below the threshold. Field test kits were not performed at this outfall because discoloration of the water made it difficult to interpret the field test kit results. CDS-010 is not suspected of having sewage contamination at the time the inspection was performed.

Even though the field test kits could not be performed at the manhole upstream of the outfall, upstream source tracking was initiated based on past evidence of sewage contamination at this outfall. Fortunately, the team was able to perform the field test kits at the upstream manholes which were unimpacted by the discoloration issues near the outfall. No conclusive evidence of sewage contamination was observed during the upstream source tracking which is consistent with the low bacteria concentration measured upstream of the outfall.

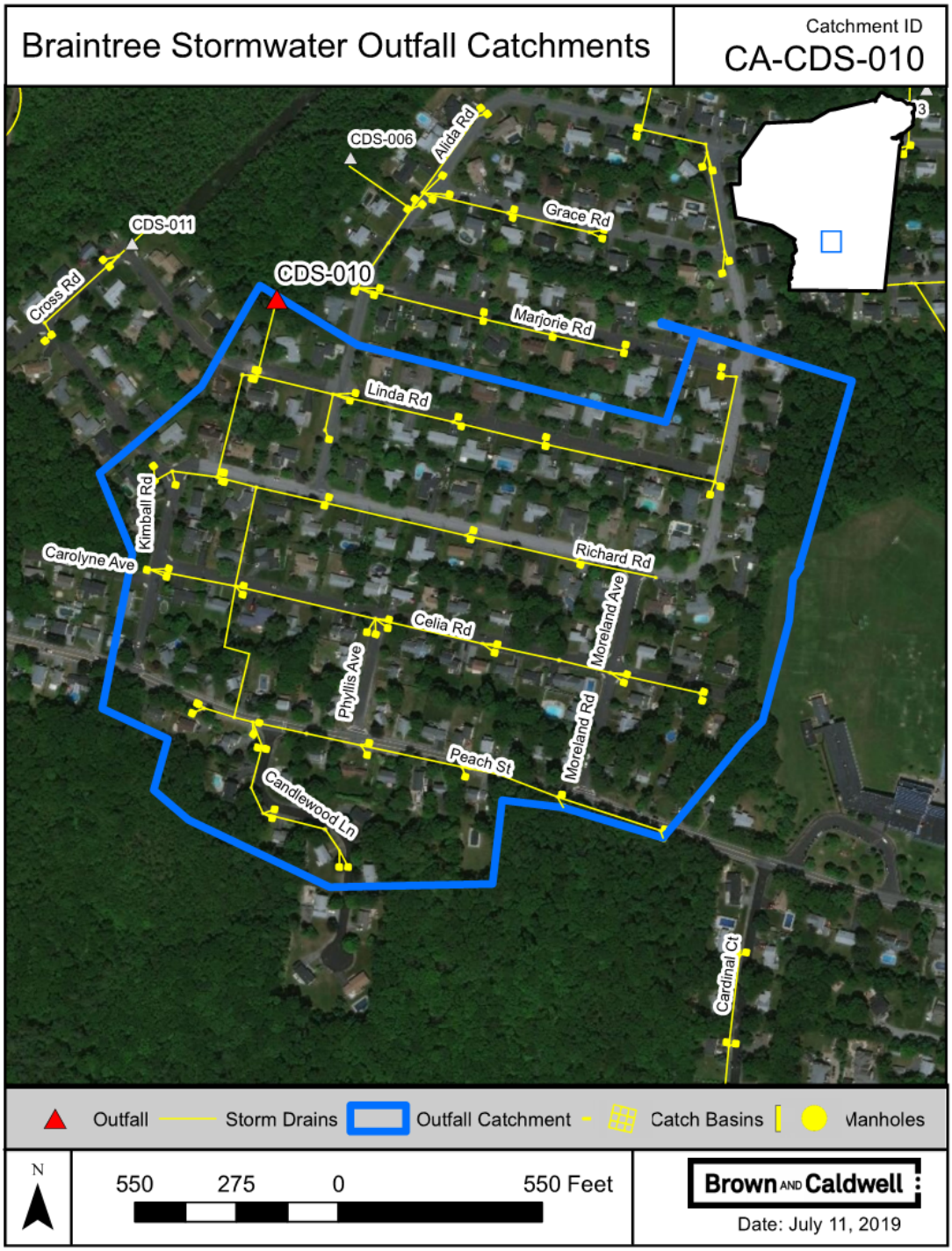

Figure 7. CDS-010 Tributary Area

Figure 8. Photograph of CDS-010 Outfall

Section 4: Conclusions

Stormwater outfall screening and sampling was performed in May 2020 at four outfalls (MQR-002, MQR-003, MQR-005, and CDS-010) that were previously suspected of sewage contamination. The results indicate that three of the outfalls (MQR-002, MQR-005, and CDS-010) were not contaminated with sewage at the time of inspection. The presence of sewage contamination was suspected at outfall MQR-003. Upstream source tracking investigations indicate that source of contamination for outfall MQR-003 is located between the outfall and the intersection of Hancock Street and Frederick Road.

Section 5: Recommendations

The following steps are recommended:

- Follow-up investigations at outfalls not suspected of sewage contamination (MQR-002, MQR-005, CDS-010) – Keep these as 'high priority' outfalls. Continue to perform dry weather sampling at these

outfalls at six-month intervals. If evidence of sewage contamination is identified, perform upstream flow tracking to isolate the source. If evidence of sewage contamination is not found on three consecutive investigations, change the status of the outfall to 'medium priority' and reduce the sampling frequency accordingly.

- MQR-003 - Perform CCTV inspections of the storm drains between the outfall and the intersection of Frederick Road and Hancock Street to identify connections to the storm drain and potential sources of contamination. If the CCTV inspections do not identify a likely illicit source, consider other investigations techniques such as dye testing of building connections. Once the illicit source is identified, take actions to remove it from the stormwater system. After the illicit connection has been removed, perform dry weather screen and sampling to confirm removal of the source.