ENVIRONMENTAL PARTNERS
— An Apex Company —

TECHNICAL MEMORANDUM

November 8, 2024

Hillary Waite, Stormwater Manager
Stormwater Division / Department of Public Works
Town of Braintree
85 Quincy Avenue
Braintree, MA 02184

RE: Town-Wide Culvert Assessment
Town of Braintree, MA

Dear Hillary,
Environmental Partners Group, LLC (EP) is pleased to provide the Town of Braintree (Town) with our Technical Memorandum summarizing the Town-Wide Culvert Assessment project. This memorandum provides a summary of the

- Inventory of Town-, State-, and privately-owned culverts,
- Culvert field assessments,
- Criticality analysis,
- Improvement recommendations, and
- Budgetary costs for improvements.

Initial Inventory and Field Investigations

Desktop Analysis & Culvert Selection

The Town provided EP with a list of 69 potential culvert locations. EP identified an additional 3 culvert sites by using GIS mapping to locate where waterways were crossing Town roadways for a total potential list culvert list of 72. The Town elected not to assess 8 MassDOT-owned culverts, 16 privately owned culverts, 1 inaccessible culvert, and 1 culvert previously scheduled for replacement. Therefore, the final field assessment list included a total of 47 potential culverts.

EP conducted field investigations, visiting the 47 culvert sites in May 2024 and June 2024. Based on initial observations, an additional 20 culverts were excluded from the assessment. Nine (9) were classified as bridges (consisting of abutments, girders/beams, and decks) and 11 were classified as non-stream crossings (drainage system outfalls or inlets, and sites without streams). Altogether, EP provided assessments for 27 culverts.

Culvert Field Assessments

EP assessed each culvert using a standard report format, taking notes, photos, measurements, and site sketches. EP broke up the field assessments into four main criteria listed below that will be used in the criticality analysis:

- **Culvert** – The structural integrity of the culvert, including corrosion, cracking, deformation, and/or loss of material.
- **Slope Stability** – The structural integrity of the culvert's headwalls and wingwalls, and the integrity of the culvert inlet and outlet support, including missing mortar, joint separation, loss of soil material, and signs of culvert outlet and inlet instability.
- **Surface** – The integrity of the surfaces above the culvert, including roadway deformations and sinkholes.
- **Maintenance** – Debris, trash, obstructions, and any unknown pipe connections.

The assessment forms for each culvert, and a summary of all 27 assessed culverts are included in Attachment 1. A GIS shapefile with the culvert locations and all associated field notes, measurements, and criteria scores will be provided to the Town for your use.

Culvert Desktop Assessment

EP assessed the capacity of each culvert by comparing the 100-year 24-hour peak flow rates at the culvert inlet to the discharge capacity of the culvert. The peak flow rates were obtained from StreamStats, an online tool published by the US Geological Survey (USGS) that allows users to determine the flow rates for design storms at a selected point along a stream. In instances where the 100-year 24-hour peak flow rate was not available in StreamStats for a given location, a HydroCAD Hydrologic model was created and run using topographic, land use, and soil information obtained from MassGIS and USDA Soil Survey.

The discharge capacity for each culvert was calculated using Manning's Equation for open channel flow. The equation is a function of pipe slope, channel area, wetted perimeter, and culvert material, which were determined in field assessments. If the culvert's calculated discharge capacity was greater than the 100-year 24-hour stream flow at the culvert inlet, the culvert was determined to be appropriately sized.

Criticality Analysis

EP prepared a criticality analysis for culvert assessment. To complete the assessment, culverts were given a consequence of failure (CoF) rating and a likelihood of failure (LoF) rating. The criticality score is an average of the LoF and CoF. Therefore, not all highly probable events will need the same attention, since they may not have equally high consequence (impact) to the community.

Likelihood of Failure (LoF)

LoF refers to the calculated numerical representation that denotes the probability of failure based upon an asset's physical condition. Each LoF subcategory is given a weight based on EP's experience with culvert failures. Each category was rated from 1 (least amount of LoF) to 5 (most amount of LoF). The LoF categories with their respective weight are as follows:

- **Culvert (30%)** – Each culvert was assessed based on the LoF of the culvert itself. A score of 1 indicated excellent culvert condition: There were no signs of corrosion, cracking, deformation and/or loss of material. A score of 5 indicated the culvert needs immediate repair or replacement: There were signs of severe corrosion, cracking, deformation and/or loss of material.
- **Slope Stability (40%)** – Each culvert was assessed based on the LoF of its inlet and outlet supports, or the lack thereof. A score of 1 indicated excellent condition of the headwalls and wingwalls or other inlet/outlet support: There were no signs of missing mortar, joint separation, loss of soil material, and/or culvert outlet and inlet instability. A score of 5 indicated that the headwalls, wingwalls or other inlet/outlet supports were either non-existent or were showing signs of joint separation, loss of soil material, and/or culvert outlet and inlet instability.
- **Surface (10%)** – Each culvert was assessed based on the LoF of the surface above the culvert. A score of 1 indicated excellent surface condition above the culvert: There were no signs of roadway deformations or sinkholes. A score of 5 indicated an immediate surface concern: There were roadway deformations or sinkholes present.
- **Capacity (20%)** – Each culvert was assessed based on the LoF due to its existing flow capacity. A score of 1 was given if the existing culvert capacity is able to carry a flow greater than the 100-year 24-hour storm flow, a score of 2 was given if the existing culvert capacity is able to carry exactly the 100-year 24-hour flow, and scores 3, 4, and 5 were given if the existing culvert is undersized and unable to carry the 100-year 24-hour flow. A score of 3 was given if two existing culverts would be needed to carry the 100-year 24-hour flow, a score of 4 was given if three existing culverts would be needed to carry the 100-year 24-hour flow, and a score of 5 was given if four or more existing culverts would be needed to carry the 100-year 24-hour flow.

A summary of the LoF ratings are based on Table 1 below and included as Attachment 2. Condition scores are based on EP's Engineering knowledge.

Table 1: LoF Subcategories

	1	2	3	4	5
Culvert (30%)	Excellent Condition	Good Condition	Fair Condition	Poor Condition	Immediate Concern
Slope Stabilization (40%)	Excellent Condition	Good Condition	Fair Condition	Poor Condition	Immediate Concern
Surface (10%)	Excellent Condition	Good Condition	Fair Condition	Poor Condition	Immediate Concern
Capacity (20%)	Existing culvert capacity able to carry greater than 100yr-24hr flow	Existing culvert capacity able to carry 100yr-24hr flow	2 existing culverts required to carry 100yr-24hr flow	3 existing culverts required to carry 100yr-24hr flow	4+ existing culverts required to carry 100yr-24hr flow

Consequence of Failure (CoF)

CoF refers to the calculated numerical representation that denotes the consequence of failure based upon economic, social, and environmental costs. Each CoF subcategory is given a weight based on input from the Town. Each category was rated from 1 (least amount of CoF) to 5 (most amount of CoF). The CoF categories with their respective weight are as follows:

- **Flooding (25%)** – Each culvert was assessed based on the consequences of potential flooding to the surrounding area. A score of 1 was given if there is little to no potential flood damage caused by a culvert failure. A score of 5 was given if there was likely catastrophic (Potential loss of structures or safety concerns) flood damage to the area, neighboring properties, and the stream.
- **Roads (20%)** – Each culvert was assessed based on the consequences of roadway failure. A score of 1 was given to culverts that cross a trail, path, or not heavily trafficked road. A score of 5 was given to culverts that cross a major, very heavily trafficked road.
- **Utilities (20%)** – Each culvert was assessed based on their proximity to utilities. Water and sewer utilities were assessed. A score of 1 was given to culverts that have utilities in the vicinity of the culvert. A score of 3 was given to culverts that have utilities nearby that could be potentially affected by a culvert failure or associated roadway failure. A score of 5 was given to culverts that cross over or under existing utility piping.
- **Historical Areas (5%)** – Each culvert was assessed based on their proximity to historical areas. A score of 1 was given to culverts with no historical areas nearby. A score of 3 was given to culverts with historical areas nearby that could be potentially impacted by a culvert failure. A score of 5 was given to culverts located directly within the same parcel as a known historical area.
- **EJ Communities (10%)** – Each culvert was assessed based on their EJ community status. A score of 1 was given to culverts not located in an EJ Community. A score of 3 was given to culverts within a “Minority” EJ Community. A score of 5 was given to culverts within a “Minority and Income” EJ Community.
- **Government & School Buildings (20%)** – Each culvert was assessed based on their proximity to government and school buildings. This included libraries, fire stations, police stations, colleges, schools, and town hall. A score of 1 was given to culverts with no government and school buildings nearby. A score of 3 was given to culverts with government and school buildings nearby that could be potentially impacted by a culvert failure. A score of 5 was given to culverts located directly within the same parcel as a government or school building.

A summary of these CoF subcategories is presented in Table 2 below and included as Attachment 3.

Table 2: CoF Subcategories

	1	2	3	4	5
Flooding (25%)	No Flood Damage	Minor Flood Damage	Flood Damage	Major Flood Damage	Catastrophic Flood Damage
Road (20%)	Trail/Path or Not Trafficked	Residential/Local Road with Low Traffic	Residential Road with Some Traffic	Major Road, Heavily Trafficked	Major Road, Very Heavily Trafficked
Utilities (20%)	No utilities nearby		Utilities nearby		Utilities crossing culvert
Historical Areas (5%)	No Historical Areas Nearby		Historical Areas Nearby		Within Historical Area
EJ Communities (10%)	Not within an EJ Community		Within a "Minority" EJ Community		Within a "Minority and Income" EJ Community
Gov/School Buildings (20%)	No Government or School Buildings Nearby		Government or School Buildings Nearby		Within Government or School Buildings Parcel

Criticality Analysis Results

A weighted average was used to calculate one LoF score and one CoF score between 1-5 for each culvert. Using these two scores from 1-5, an overall criticality score was determined by averaging the LoF and CoF with equal weighting, as shown in Table 3 and Attachment 4.

Table 3: Criticality Scores

Ranking	Culvert ID	Existing Culvert Size and Material	Street Crossing	LoF	CoF	Criticality Score
1	24	7'x7' Stone	Stetson St	4.60	3.45	4.03
2	7	48" CMP	Pearl St	4.00	3.3	3.65
3	4	18" CMP	Easement / Trail off St. Claire St	5.00	2.15	3.58
4	19	48" CMP	Faulkner Pl	3.90	2.75	3.33
5	2	48" RCP	Liberty St	3.50	3.1	3.30
6	10	(2 Barrel) 24" RCP	Pond St	2.70	3.7	3.20
7	26	(2 Barrel) 7' CMP	Pond Meadow Park Trail	4.20	1.95	3.08
8	27	42" CMP	Pond Meadow Park Trail	4.20	1.85	3.03
9	21	42" RCP	Old Elm St / Elm St	2.80	3.05	2.93
10	14	24" RCP	Chickatawbut Rd	2.90	2.9	2.90
11	15	10.5'x2.5' Concrete	Walnut St	2.70	3.05	2.88
12	3	(2 Barrel) 24" RCP	Old Liberty St	3.30	2.25	2.78
13	22	(2 Barrel) 8" CI	Toland Walkway	3.20	2.1	2.65
14	25	36" RCP	Liberty St	2.10	2.8	2.45
15	6	36" RCP	John Mahar Hwy	2.00	2.85	2.43
16	9	24" RCP	John W Leroy Jr Way	2.30	2.5	2.40
17	1	24" PVC	Wildwood Ave	2.10	2.6	2.35
18	18	4'x3' Concrete	Staten Rd	2.10	2.4	2.25
19	5	48" RCP	Braintree Cemetery Driveway	2.50	1.9	2.20
20	8	24" RCP	John W Leroy Jr Way	1.90	2.5	2.20
21	23	9.5'x7'CMP Arch	Brookside Rd	1.60	2.8	2.20
22	16	11'x3.5' Concrete	Acorn St	1.70	2.65	2.18
23	13	16'x7' Concrete	Lundquist Dr	1.30	3	2.15
24	12	(2 Barrel) 15'x5' Concrete	Pond St	1.40	2.8	2.10
25	11	16'x7.5' Concrete	Granite St	1.00	3.2	2.10
26	20	(2 Barrel) 11'x4' Concrete	Middle St	1.00	2.9	1.95
27	17	5'x3.5' Concrete	Dickerman Ln	1.40	2.4	1.90

Figure 1 below depicts the criticality analysis in graphical form. Culverts towards the top right of the chart are marked as higher priority based on their criticality.

In addition, a color-coded culvert map included in Attachment 5 shows the location of each culvert along with its relative associated criticality score.

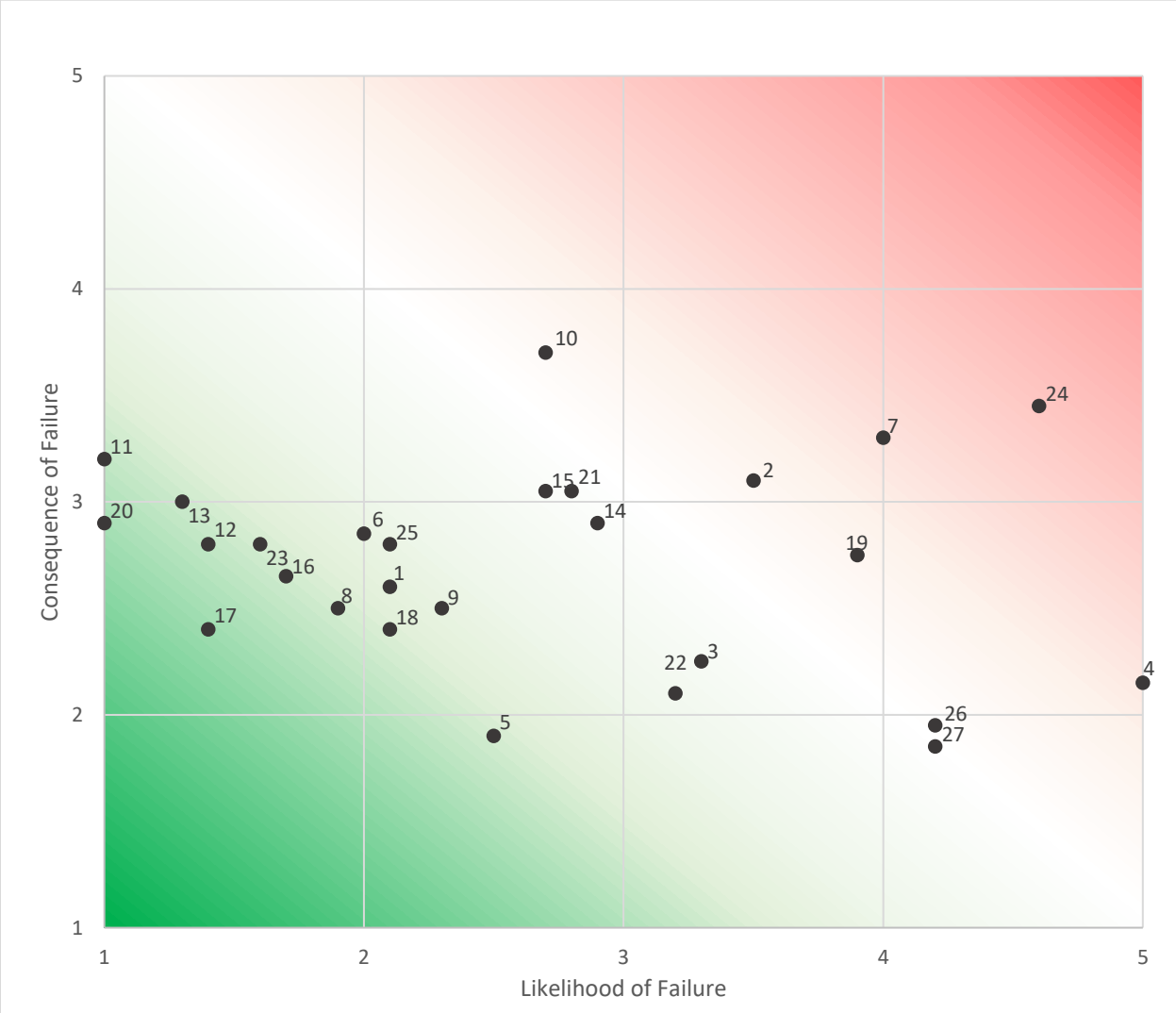


Figure 1: Criticality Analysis

Recommendations

Capital Improvements

EP prepared a priority list for capital improvements based on the criticality analysis above. The list includes suggested capital improvements for culverts that require replacement or repair and is organized by criticality score. Preliminary budgetary costs are included and based on EP's experience with past culvert projects. The costs include an allowance for engineering and a 40% contingency. Additional design analysis will be required to develop actual cost estimates. The list is intended to assist with the prioritization of culvert capital improvement projects, and is intended to be used as a tool, not a set guide. Prioritization of projects can be adjusted as the Town deems necessary depending on changes to existing conditions or budgeting considerations.

Budgetary engineering and construction costs were evaluated for the proposed work at each culvert based on EP's experience with past culvert projects. The costs include the following:

- Engineering costs were based on the size of the project;
    - Construction costs under $500,000 include a 45% engineering cost.
    - Construction costs between $500,000 and $1,500,000 include a 35% engineering cost.
    - Construction costs over $1,500,000 include a 25% engineering cost.
- 40% Engineering and Construction contingency,
- Costs are present day costs with a November 2024 Engineering News Record (ENR) Construction Cost Index of 13632.39.

The top four (4) priorities from our capital improvement list is shown in in Table 5 below and a full capital improvement priority list is provided in Attachment 6.

Table 5: Capital Improvements Priority List

Ranking	Culvert ID	Existing Culvert Size and Material	Criticality Score	Proposed Capital Improvements	Preliminary Budgetary Costs
1	24	7'x7' Stone	4.03	• Replace culvert with 18' x 6' arch culvert with twice the capacity. • Install headwalls and wingwalls. • Replace failing headwall upstream of culvert. • Preliminary design completed June 2020.	$3,310,000.00
2	7	48" CMP	3.65	• Replace the culvert with 5'x3' concrete box culvert meeting stream crossing standards with an adjusted alignment. • Install headwalls and wingwalls. • Regrade stream banks to prevent further erosion.	$1,160,000.00
3	4	18" CMP	3.58	• Demolish culvert and daylight the culvert to existing stream conditions.	$510,000.00
4	19	48" CMP	3.33	• Replace culvert with 8'x4' box culvert meeting stream crossing standards. • Install headwalls and wingwalls.	$1,120,000.00

- **Culvert #24 – 7’x7’ Stone Stetson St Culvert:** The existing 7’x7’ stone culvert is unstable, and sinkholes have formed on the surface above the culvert. EP completed the preliminary design for this culvert in June 2020. We recommended the replacement of the existing culvert with an 18’x6’ arch culvert and the installation of new headwalls and wingwalls.

Figure 2: Culvert #24

- **Culvert #7 – 48" CMP Pearl St Culvert:** The existing 48" CMP culvert is corroded and deformed throughout the length of the culvert. The banks of the stream upstream of the culvert inlet are at risk of erosion and blocking the culvert inlet. We recommend the replacement of the existing culvert with a 5'x3' concrete box culvert and adjustment of the alignment, installation of headwalls and wingwalls, and regrading of the stream banks to prevent further erosion.

Figure 3: Culvert #7 Outlet

- **Culvert #4 – 18" CMP Culvert under Trail/Easement near Claire St:** The existing 18" CMP culvert is severely corroded and missing a bottom. In addition, it is undersized. We recommend demolishing the culvert and daylighting the stream if there are no conflicting utilities present.

Figure 4: Culvert #4 Outlet

- **Culvert #19 – 48" CMP Faulkner Pl Culvert:** The roof of the existing 48" CMP culvert is collapsing, and the culvert is deformed throughout the length of the culvert. The pavement above the culvert is sagging, cracked, and at risk of sinkhole formation. We recommend the replacement of the existing culvert with an 8'x4' concrete box culvert and the installation of headwalls and wingwalls.

Figure 5: Culvert #19

Maintenance Recommendations

EP prepared a list of maintenance recommendations for each culvert based on field assessments. Each culvert was assigned a maintenance score from 1-5. A score of 1 indicates there is no presence of debris, trash, obstructions, and/or any unknown pipe connections. A score of 5 indicates there is presence of one or more of these maintenance issues. These suggestions are solutions that the Town can implement on its own in the near term and/or on a regular basis. Table 4 below shows a summary of the top-priority maintenance recommendations. A full maintenance recommendations list is included in Attachment 7.

Table 4: Maintenance Recommendations List

Culvert ID	Existing Culvert Size and Material	Maintenance Score	Maintenance
ALL CULVERTS	N/A	N/A	• Inspect culvert bi-annually, prior to winter conditions and after spring wet season. Remove leaves, debris and inspect headwall/wingwalls and pipe conditions.
4	18" CMP	5	• Continue to remove vegetative growth near inlets and outlets until culvert can be daylighted or replaced.
21	42" RCP	4	• Remove vegetative growth from inlet. • Clean up garbage on outlet side.
7	48" CMP	4	• CCTV inspect the culvert to confirm the integrity of the entire culvert length and source of unknown pipe connections.
14	24" RCP	4	• Remove branches and debris from inlet side.
15	10.5'x2.5' Concrete	4	• Remove any debris or other flow restrictions near outlet until the downstream channel can be regraded to remove hydraulic restrictions.

Funding Sources

Culvert Replacement Municipal Assistance (CRMA) Grant Program – Division of Ecological Restoration (DER)

The CRMA Grant Program provides support for culvert replacements that cross a natural freshwater, non-tidal river or stream channel. The project must intend to meet the Massachusetts Stream Crossing Standards. Applications are evaluated based on proximity to areas of high ecological value, ability to meet Massachusetts Stream Crossing Standards, demonstration of municipal support, demonstration of an identified pathway for funding, readiness for the proposed phase of work, and ability to provide multiple project benefits. Applications for the grant are typically due in April annually.

Municipal Vulnerability Preparedness (MVP) Action Grant Program – Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA)

The MVP Action Grant Program provides support for MA communities to address climate change impacts resulting from extreme weather, sea level rise, inland and coastal flooding, severe heat, and other climate impacts. Applications are evaluated based on the project's ability to address existing environmental, economic, and social disparities, incorporate nature-based solutions, include collaboration with other municipalities, and utilize climate data to support the project's need. Applications for the grant are due around November annually.

Hazard Mitigation Assistance (HMA) Grants – Federal Emergency Management Agency (FEMA) & Massachusetts Emergency Management Agency (MEMA)

The HMA Grant Programs, such as the Building Resilient Infrastructure and Communities (BRIC) and Hazard Mitigation Grant Program (HMGP) fund projects that reduce or eliminate the flood risk to infrastructure, buildings, roadways, environment and safety. Grants generally become available in Fall of each year.

Coastal Resilience Grant Program – Office of Coastal Zone Management (CZM)

The Coastal Resilience Grant Program funds projects that address coastal flooding, erosion, and sea level rise. This includes risk assessments, public outreach, proactive planning, retrofit and relocation, and shoreline restoration projects. Applications for the grant are typically due in July annually.

Clean Water State Revolving Fund (CWSRF) – Massachusetts Department of Environmental Protection (MassDEP)

The CWSRF Program provides low-cost financing to assist communities to comply with the water-quality standards of the Clean Water Act. This includes drainage system improvements, stormwater management projects, and resiliency projects. The standard subsidy provided is a 2% interest rate loan. Project Evaluation Forms (PEFs) are typically due in July annually.

Congressional Directed Spending (CDS) Requests

Under guidelines issued by the Senate Appropriations Committee, each Senator may request CDS funding for projects in their state for each fiscal year. However, only a small number of these proposals may actually receive federal funding. CDS requests are restricted to a limited number of federal funding streams, and only state and local governments and eligible non-profit entities are permitted to receive CDS funding. Opportunities for CDS typically open in the Spring of each year.

Attachments

1. Field Assessment Forms & Field Assessment Summary
2. Likelihood of Failure (LoF) Subcategories
3. Consequence of Failure (CoF) Subcategories
4. Criticality Scores
5. Culvert Map
6. Capital Improvements Priority List
7. Maintenance List

ATTACHMENT 1

Field Assessment Forms & Field Assessment Summary

Table 1: Field Assessment Summary

	Culvert ID	01	02	03
General Notes	Crossing/Street	Wildwood Ave	Liberty St	Old Liberty St
	Nearest Address	193 Wildwood Ave	1465 Liberty St	1465 Old Liberty St
	Waterway Name	N/A	Cranberry Brook	Cranberry Brook
	Crew Name(s)	Lauren H. & Francesca M.	Lauren H. & Francesca M.	Lauren H. & Francesca M.
	Date	5/14/2024	5/14/2024	5/14/2024
	Time	8:06:00 AM	9:10:00 AM	8:48:00 AM
	Weather	Partly cloudy	Partly cloudy	Partly cloudy
	Temp (F)	56	60	58
Culvert	Material	PVC	Concrete	Concrete
	Shape	Round	Round	Round
	Width/Diameter (in)	24	48	24
	Height (in)	N/A	N/A	N/A
	Length (ft)	57.5	59	32
	No. of Barrels	1	1	2
	Span (ft)	N/A	N/A	5.4 (inlet); 4.9 (outlet)
	Notes	Culvert is smooth with no defects. Culvert allows for clear visibility through to the other side. Perched.	Culvert buried about 1/4 depth (12"). Rebar exposure and some concrete deterioration on either end, just on inlet and outlet edge.	View is clear through to other side, besides a broken pipe joint on Barrel B on outlet side. Slope in Barrel B not consistent due to broken pipe joint. Minor concrete deterioriation on either end of each barrel.
Inlet	Material	Stone masonry/rocks	None	Stone
	Headwall?	Y	N	Y
	Wingwalls?	N	N	N
	Bed Material	Stone/mud	Mud	Mud
	Depth of Water from Invert (in)	0.5	24	3
	Grate?	N	N	N
	Notes	Granite slabs laid on top of culvert at inlet. Stones and granite slabs holding up steep channel slopes on inlet side.	Lack of headwall not an immediate concern, however some erosion and vegetative growth occurring around inlet.	Loose rock around culvert, no footing seen. Headwall is made up of granite slabs, no mortar.
Outlet	Material	Stone masonry	None	Loose stone
	Headwall?	Y	N	N
	Wingwalls?	N	N	N
	Bed Material	Stone/mud	Mud	Mud
	Depth of Water from Invert (in)	0.5	24	1
	Grate?	N	N	N
	Notes	Visible cracking in headwall footing.	Concrete slab/curb next to sidewalk over culvert. 30" and 14" pipes on either side of culvert at outlet side possibly from drainage. Lack of headwall not an immediate concern, however some erosion and vegetative growth occurring around outlet.	"Headwall" above outlet is severely eroded, loose stone. Pipe joint on Barrel B is broken. Root growth, soil and stone in open joint. A lot of vegetation near outlet in general, difficult to access, requires maintentance.
Surface	Surface Type	Paved	Paved	Paved
	Guardrail?	N	N	N
	Notes	No pavement cracking due to culvert.	Pavement looks new.	Pavement looks new.
Overall Ratings	Culvert	2	3	4
	Slope Stability	3	4	4
	Surface	1	2	1
	Maintenance	1	3	3
	Additional Notes	Newer culvert, water flowing correctly, surface looks good, sized correctly.	Culvert showing deterioration and exposed rebar. Pipe half full of stagnat water, seemingly no slope. Sediment level is high. Could use some maintenance of the waterway and surrounding slopes, erosion clearly visible.	Clear sign of erosion around culvert, stones around the inlet side have no mortar and thus subject to shifting. Pipe Joint on Barrel B is broken. Culvert could use repairs and slight cleanup of waterway and surrounding area.

Table 1: Field Assessment Summary

	Culvert ID	04	05	06
General Notes	Crossing/Street	Easement / Trail off St. Claire St.	Braintree Cemetery Driveway	John Mahar Hwy
	Nearest Address	171 St. Claire St.	255 Plain St.	183 Pearl St
	Waterway Name	N/A	N/A	Monatiquot River
	Crew Name(s)	Lauren H. & Francesca M.	Lauren H. & Francesca M.	Lauren H. & Francesca M.
	Date	5/14/2024	5/14/2024	5/14/2024
	Time	9:45:00 AM	10:20:00 AM	11:00:00 AM
	Weather	Mostly sunny	Sunny	Sunny
	Temp (F)	62	64	67
Culvert	Material	CMP	Concrete	Concrete
	Shape	Round	Round	Round
	Width/Diameter (in)	18	48	36
	Height (in)	N/A	N/A	N/A
	Length (ft)	26.5	59	N/A
	No. of Barrels	1	1	1
	Span (ft)	N/A	N/A	N/A
	Notes	Bottom of culvert is missing the entire length of the culvert. Severely corroded. Can see through the culvert, but Town regularly checks this culvert and cleans as needed. Culvert accessed from trail starting at end of St. Claire Circle. Flooding at least a few hundred feet upstream of culvert has been reported, not in immediate area.	Pipe Joint halfway down is slightly separated. No concrete deterioration, looks brand new. Maintenance - cleared a few branches, vegetation in area.	Culvert joints slightly separated in a few places, root growth in joints. There is an orange, oily substance in water at culvert inlet and outlet. Some debris found in culvert channel.
Inlet	Material	None	Concrete & granite slabs	Concrete
	Headwall?	N	Y	N
	Wingwalls?	N	N	N
	Bed Material	Stone	Mud	Stone
	Depth of Water from Invert (in)	9	12	1
	Grate?	N	N	N
	Notes	No headwall, just vegetation and soil. Inlet extremely corroded and fragile. Could be easily broken by stepping on it.	No mortar on headwalls. Minor erosion around granite & stone slabs but mostly intact. There is some settling of stone slabs.	Culvert end at inlet side is flared and clear (length of flared end: 75 in). No headwall but flared end maintaining clear and structurally stable opening.
Outlet	Material	None	Concrete & granite slabs	Concrete
	Headwall?	N	Y	N
	Wingwalls?	N	N	N
	Bed Material	Stone	Mud	Stone
	Depth of Water from Invert (in)	9	30	5
	Grate?	N	N	N
	Notes	No headwall, just vegetation and soil. Outlet extremely corroded and fragile. Could be easily broken by stepping on it.	No mortar on headwalls. Minor erosion around granite & stone slabs but mostly intact. There is some settling of stone slabs.	Culvert end at inlet side is flared and clear (length of flared end: 75 in). No headwall but flared end maintaining clear and structurally stable opening.
Surface	Surface Type	Grass/dirt	Paved	Paved
	Guardrail?	N	N	Y
	Notes	Surface is soil/vegetation. No stone or support around culvert.	No pavement cracking.	No significant defects observed.
Overall Ratings	Culvert	5	2	2
	Slope Stability	5	4	1
	Surface	5	1	2
	Maintenance	5	2	3
	Additional Notes	Culvert accessed from trail starting at end of St. Claire Circle. Culvert itself is almost fully deteriorated and needs to be replaced. Very undersized for how much water would come through in a 100 year storm. Trail and backyards (possibly basements) would be flooded.	Culvert showing only minor wear. The streambed and surrounding basin area leave room for some flooding conditions.	Trash and overgrowth on Inlet and Outlet side. Biological growth in water. Needs a clean up. The streambed and surrounding basin area leave room for some flooding conditions.

	Culvert ID	07	08	09
General Notes	Crossing/Street	Pearl St	John W Leroy Jr Way	John W Leroy Jr Way
	Nearest Address	425 Pearl St	188 Franklin St	188 Franklin St
	Waterway Name	N/A	Sunset Lake	Sunset Lake
	Crew Name(s)	Lauren H. & Francesca M.	Lauren H. & Francesca M.	Lauren H. & Francesca M.
	Date	5/14/2024	5/14/2024	5/14/2024
	Time	11:25:00 AM	12:40:00 PM	1:05:00 PM
	Weather	Sunny	Sunny	Sunny
	Temp (F)	70	73	73
Culvert	Material	CMP	Concrete	Concrete
	Shape	Round	Round	Round
	Width/Diameter (in)	44 (inlet); 48 (outlet)	24	24
	Height (in)	N/A	N/A	N/A
	Length (ft)	N/A	62	63
	No. of Barrels	1	1	1
	Span (ft)	N/A	N/A	N/A
	Notes	CMP is corroded on the bottom, but still largely intact. Highly deformed vertically on the outlet end (48" dia. pipe squished down to 44" height). Deformations occur throughout the length of the pipe. A pipe enters the culvert pipe from the top, it appears to come from a sewer manhole but were not able to verify.	Pipe joint is separated in a few spots. Signs of soil and root growth between joints. However, not much concrete deterioration. Connections from two drain manholes above (see sketch). Culvert is in a marshy area next to Sunset Lake.	Concrete at invert of barrel is worn away a bit, but still intact. Joints appear to be intact. Culvert is in a marshy area next to Sunset Lake.
Inlet	Material	Stone masonry	Concrete	Concrete
	Headwall?	Y	Y	Y
	Wingwalls?	Y	Y	Y
	Bed Material	Stone	Mud	Rock/stone
	Depth of Water from Invert (in)	3	2	2
	Grate?	N	N	N
	Notes	Headwall is loose stone masonry, no mortar. Some vegetation and erosion around the wall. Can see several deformations from the inlet end of the pipe. Upstream of the inlet, there are large cement blocks holding up the stream bank that are leaning and at risk of falling into the stream. If they were to fall, the inlet side of the culvert may be blocked completely.	Solid concrete headwalls and wingwalls in good shape.	Solid concrete headwalls and wingwalls in good shape. Some erosion of concrete occurring on ends.
Outlet	Material	CMP	Concrete	Concrete
	Headwall?	Y	Y	Y
	Wingwalls?	N	Y	Y
	Bed Material	Granite	Mud/sand	Rock/stone
	Depth of Water from Invert (in)	3	2	2
	Grate?	N	N	N
	Notes	Headwall in good shape although the weight of the granite blocks appears to be deforming the pipe.	Solid concrete headwalls and wingwalls in good shape.	Solid concrete headwalls and wingwalls in good shape. Some erosion of concrete occurring on ends.
Surface	Surface Type	Paved	Paved	Paved
	Guardrail?	Y	N	N
	Notes	Guardrail only by outlet side.	Some pavement cracking and repatching but does not appear to be caused by settlement around culvert.	Some pavement cracking and repatching around catch basins which connect into culvert directly. May be due to settlement around culvert.
Overall Ratings	Culvert	5	3	2
	Slope Stability	5	1	2
	Surface	1	2	3
	Maintenance	4	2	2
	Additional Notes	Culvert pipe is in bad condition, incoming pipe penetration needs to be investigated, looks like it's from sewer? Erosion present. Cement blocks near inlet side could block culvert if they slide.	Joints along culvert are separated with roots and soil infiltration. Needs cleanup/maintenance. Sunset lake and basin appear to be able to handle flooding but in a bad storm it could be too much for the size of the culvert.	Soil has settled around the culvert and the roadway is cracking. Road could be repaved. Culvert in fine condition.

Table 1: Field Assessment Summary

	Culvert ID	10	11	12
General Notes	Crossing/Street	Pond St	Granite St	Pond St
	Nearest Address	164 Pond St	2 Campanelli Drive	339 Pond St
	Waterway Name	N/A	Farm River	Farm River
	Crew Name(s)	Lauren H. & Francesca M.	Lauren H. & Mollie C.	Lauren H. & Mollie C.
	Date	5/14/2024	5/23/2024	5/23/2024
	Time	1:35:00 PM	10:50:00 AM	11:45:00 AM
	Weather	Sunny	Cloudy	Cloudy
	Temp (F)	74	73	75
Culvert	Material	Concrete	Concrete	Concrete
	Shape	Round	Box	Box
	Width/Diameter (in)	24	196	179
	Height (in)	N/A	90	59 (inlet); 60 (outlet)
	Length (ft)	N/A	N/A	N/A
	No. of Barrels	2	1	2
	Span (ft)	9.1 (outlet); 9 (inlet)	N/A	370
	Notes	No significant defects observed.	No significant defects observed.	No significant defects observed.
Inlet	Material	Concrete	Concrete	Concrete
	Headwall?	N	Y	Y
	Wingwalls?	Y	Y	Y
	Bed Material	Gravel/rock	Stone	Sand & mud
	Depth of Water from Invert (in)	2	8	4.5
	Grate?	N	N	N
	Notes	Both barrels have flared ends. The surrounding soil/vegetation around the top of the flared ends is eroding.	Bottom of culvert buried, cannot determine depth of sediment. Slight loss of mortar in joint between headwall and wingwall.	GPS point was taken at right side facing inlet. There is no caulk/mortar at joints between headwall and wingwall (some separation).
Outlet	Material	Concrete	Concrete	Concrete
	Headwall?	N	Y	Y
	Wingwalls?	Y	Y	Y
	Bed Material	Sand	Stone	Sand & mud
	Depth of Water from Invert (in)	6	7	6
	Grate?	N	N	N
	Notes	Both barrels have flared ends. Flared ends are 53" across. Flared end of barrel A has a piece broken off. A lot of vegetation around the flared ends on inlet and outlet sides.	Bottom of culvert buried, cannot determine depth of sediment. Slight loss of mortar in joint between headwall and wingwall.	Left side has more sediment fill than right. Dept of water from invert is 6" on right side. Depth of sediment from invert is about 6" on left, 0" on right. GPS point was taken at right side facing outlet. There is no caulk/mortar at joints between headwall and wingwall (some separation).
Surface	Surface Type	Paved	Paved	Paved
	Guardrail?	Y	Y	Y
	Notes	No significant defects observed.	No significant defects observed.	No significant defects observed.
Overall Ratings	Culvert	1	1	1
	Slope Stability	3	1	2
	Surface	2	1	1
	Maintenance	3	1	2
	Additional Notes	Erosion of embankment on inlet side. Both sides a bit overgrown. Flooding possible due to undersized culverts, could flood nearby yards and possibly basements.	Culvert in good conditions and well sized.	There are some branches in stream. Culvert in good condition and well sized.

	Culvert ID	13	14	15
General Notes	Crossing/Street	Lundquist Dr	Chickatawbut Rd	Walnut St
	Nearest Address	825 Lundquist Dr	44 Granite St	162 Walnut St
	Waterway Name	Farm River	N/A	Town Brook
	Crew Name(s)	Lauren H. & Mollie C.	Lauren H. & Francesca M.	Lauren H. & Mollie C.
	Date	5/23/2024	5/14/2024	5/21/2024
	Time	11:20:00 AM	2:30:00 PM	8:12:00 AM
	Weather	Cloudy	Sunny	Sunny
	Temp (F)	74	76	58
Culvert	Material	Concrete	Concrete	Concrete
	Shape	Box	Round	Box
	Width/Diameter (in)	193	24	127
	Height (in)	87	N/A	32 (inlet), 24 (outlet)
	Length (ft)	N/A	N/A	N/A
	No. of Barrels	1	1	1
	Span (ft)	N/A	N/A	N/A
	Notes	Drainage connection halfway down culvert on side (see sketch).	Culvert is about half full with water but is clear. Waterway & Maintenance - Lots of branches and debris in stream on inlet side. Has potential to block flow.	Culvert has some root growth between joints. Generally in good shape. High levels of sediment and muck buildup, especially on outlet side. There are two catch basins tied directly in. Property owner has been cleaning culvert out for 30+ years on outlet side. Waterway banks on outlet side have slowly eroded into the stream (according to homeowner). No slope support. Muck/mud needs to be removed.
Inlet	Material	Concrete	Stone masonry	Concrete
	Headwall?	Y	Y	Y
	Wingwalls?	Y	Y	Y
	Bed Material	Stone	Mud	Sand & stone
	Depth of Water from Invert (in)	21	12	9
	Grate?	N	N	Y
	Notes	Pipe service crossing river at headwall. Some caulk/mortar at joints between headwall and wingwall worn away.	Some minor cracking, and some mortar is chipping. Wingwalls are perpendicualr off of headwalls.	High levels of sediment/muck buildup. Wingwall becomes rockwall, likely the new concrete wingwalls were connected to the old rockwall wingwalls. Concrete has minor wear on headwalls & wingwalls. Raised metal gate on inlet side.
Outlet	Material	Concrete	Stone masonry	Concrete
	Headwall?	Y	Y	Y
	Wingwalls?	Y	Y	Y
	Bed Material	Stone	Mud	Mud
	Depth of Water from Invert (in)	15	12	8
	Grate?	N	N	N
	Notes	Some caulk/mortar at joints between headwall and wingwall worn away.	Large crack on outlet headwall running from top to bottom. Wingwalls are perpendicualr off of headwalls.	Outlet is in good shape, no cracking. High levels of sediment/muck buildup.
Surface	Surface Type	Paved	Paved	Paved/yard
	Guardrail?	Y	N	Y
	Notes	No significant defects observed.	No significant defects observed.	Fences on both headwalls.
Overall Ratings	Culvert	2	2	2
	Slope Stability	1	4	4
	Surface	1	1	1
	Maintenance	2	4	4
	Additional Notes	Culvert in fine condition, some minor wear.	Waterway needs to be cleaned up, culvert has branches in it and culvert is almost full.	Needs maintenance, lots of erosion on outlet side causing a large layer of muck at bottom of waterway. Culvert well sized and in good shape.

	Culvert ID	16	17	18
General Notes	Crossing/Street	Acorn St	Dickerman Ln	Staten Rd
	Nearest Address	62 Acorn St	49 Dickerman Ln	47 Staten Rd
	Waterway Name	Town Brook	N/A	N/A
	Crew Name(s)	Lauren H. & Mollie C.	Lauren H. & Mollie C.	Lauren H. & Mollie C.
	Date	5/21/2024	5/21/2024	5/21/2024
	Time	8:44:00 AM	9:45:00 AM	10:10:00 AM
	Weather	Sunny	Sunny	Sunny
	Temp (F)	60	66	69
Culvert	Material	Concrete	Concrete	Concrete
	Shape	Box	Box	Box
	Width/Diameter (in)	135	60	48
	Height (in)	39.5	42 (inlet), 36 (outlet)	38.5 (inlet), 33 (outlet)
	Length (ft)	N/A	N/A	N/A
	No. of Barrels	1	1	1
	Span (ft)	N/A	N/A	N/A
	Notes	Culvert is filled with muck/mud. Catch basins connect directly into top of culvert. Some peeling of mortar/caulk at joints.	Excellent condition. Very narrow waterway between houses. Concrete walled channel on inlet side. Vegetation and CMP section with its top cut off upstream of inlet side. Requires careful maintenance. Widens up on outlet side to a natural stream with vegetated banks.	Excellent condition. Very narrow channel, banks at risk of eroding down into stream. Several connections to culvert: Two catch basins connect to outfalls at wingwalls, two connections into culvert potentially from drainage system, and one other connection into the culvert, source unknown (see sketch).
Inlet	Material	Concrete	Concrete	Concrete
	Headwall?	Y	Y	Y
	Wingwalls?	Y	Y	Y
	Bed Material	Mud/silt	Rocks	Rocks/sand
	Depth of Water from Invert (in)	6	13	8
	Grate?	Y	N	
	Notes	Concrete headwalls and wingwalls in good shape.	Concrete headwalls and wingwalls in good shape. Concrete walled channel that runs between houses.	Channel banks are eroding from driveway edge. Headwall and wingwalls in excellent condition.
Outlet	Material	Concrete	Concrete	Concrete
	Headwall?	Y	Y	Y
	Wingwalls?	Y	Y	Y
	Bed Material	Mud/silt	Sand/muck/silt	
	Depth of Water from Invert (in)		10	6
	Grate?	N	N	N
	Notes	Concrete headwalls and wingwalls in good shape. Inaccessible due to fence and vegetation. Outlet side is overgrown and needs to be cleared out.	Concrete headwalls and wingwalls in great shape. Outlet opening shorter in height than inlet due to stone/sediment buildup.	Headwall and wingwalls in excellent condition. Outlet opening shorter in height than inlet due to stone/sediment buildup.
Surface	Surface Type	Paved	Paved	Paved
	Guardrail?	Y	Y	Y
	Notes	Fence on inlet and outlet of culvert.	No significant defects observed.	No significant defects observed.
Overall Ratings	Culvert	2	1	2
	Slope Stability	2	2	3
	Surface	1	1	1
	Maintenance	3	3	3
	Additional Notes	Needs maintenance, erosion and overgrowth causing a large layer of muck at bottom of waterway. Culvert well sized and in good shape.	Very narrow waterway between houses. Requires careful maintenance. Culvert properly sized.	Very narrow channel, banks at risk of eroding down into stream. Culvert in good condition and well sized.

	Culvert ID	19	20	21
General Notes	Crossing/Street	Faulkner Pl	Middle St	Old Elm St / Elm St
	Nearest Address	53 Faulkner Pl	275 Elm St	329 Old Elm St
	Waterway Name	N/A	Monatiquot River	N/A
	Crew Name(s)	Lauren H. & Mollie C.	Lauren H. & Mollie C.	Lauren H. & Mollie C.
	Date	5/21/2024	5/21/2024	5/21/2024
	Time	10:30:00 AM	11:10:00 AM	11:45:00 AM
	Weather	Sunny	Sunny	Sunny
	Temp (F)	71	72	74
Culvert	Material	CMP	Concrete	Concrete
	Shape	Round	Box	Round
	Width/Diameter (in)	48	N/A	42 (inlet), 37 (outlet)
	Height (in)	N/A	129	N/A
	Length (ft)	N/A	51	N/A
	No. of Barrels	1	2	1
	Span (ft)	N/A	40' 9"	N/A
	Notes	Roof of culvert is collapsing. Lots of deformation of metal throughout the culvert length. Rocks inside of culvert. Culvert alignment bends halfway down, sagging occurs there. Town recently trimmed back bushes. Requires a lot of maintenance. Very narrow stream channel with banks at risk for erosion into channel.	No blocks, culvert is in good condition. Length and span are approximate measurements (unable to measure length; span was measured from roadway).	Culvert diameter is smaller on outlet end than inlet. Could restrict flow. Otherwise in good condition. Headwalls or wingwalls would help with surrounding ground erosion if added. Garbage in outlet area.
Inlet	Material	Concrete/Stone	Concrete	Concrete
	Headwall?	N	Y	N
	Wingwalls?	Y	Y	N
	Bed Material	Stone	Stone	Stone
	Depth of Water from Invert (in)	7	6	6
	Grate?	N	N	N
	Notes	Wingwalls are damaged (separation from road, cracking).	No significant defects observed.	Highly overgrown with vegetation at inlet. Lack of headwall causing some erosion of soil and vegetation around inlet.
Outlet	Material	N/A	Concrete	Concrete
	Headwall?	N	Y	N
	Wingwalls?	N	Y	N
	Bed Material	Stone	Stone	Stone, sand, silt
	Depth of Water from Invert (in)	4	6	12
	Grate?	N	N	N
	Notes	Highly overgrown vegetation at outlet. Pipe is squished/deformed down at outlet.	No significant defects observed.	Lack of headwall causing erosion of soil around outlet. Almost half full with sediment.
Surface	Surface Type	Paved	Paved	Paved
	Guardrail?	Y	Y	Y
	Notes	Pavement is sagging, cracked, and chunks are missing. Wooden guardrail present.	Fence present as guardrail.	No significant defects observed.
Overall Ratings	Culvert	4	1	3
	Slope Stability	4	1	4
	Surface	5	1	1
	Maintenance	4	1	5
	Additional Notes	Requires a lot of maintenance. Very narrow stream channel with banks at risk for erosion into channel. Culvert pipe in rough shape, roadway in very poor condition.	Culvert in good condition, well sized.	Cleanup maintenance needed, trash on outlet side and inlet side overgrown. Erosion present.

	Culvert ID	22	23	24
General Notes	Crossing/Street	Toland Walkway	Brookside Rd	Stetson St
	Nearest Address	120 Gordon Rd	72 Brookside Rd	139 Stetson St
	Waterway Name	Tributary to Fore River	Smelt Brook	Smelt Brook
	Crew Name(s)	Lauren H. & Mollie C.	Lauren H. & Mollie C.	Lauren H. & Mollie C.
	Date	5/21/2024	5/21/2024	5/21/2024
	Time	2:08:00 PM	2:39:00 PM	3:02:00 PM
	Weather	Sunny	Sunny	Sunny
	Temp (F)	83	83	83
Culvert	Material	Cast iron	CMP	Stone
	Shape	Round	Arch	Box
	Width/Diameter (in)	8	115	83 / 76
	Height (in)	N/A	81	76 / 80
	Length (ft)	19'-3"	N/A	N/A
	No. of Barrels	2	1	1
	Span (ft)	2 (inlet); 1.5 (outlet)	N/A	N/A
	Notes	Metal pipes, some light corrosion, but looks like this culvert has not seen water in a while. Slightly perched.	Lining on CMP is wearing away and metal pipe is corroding. Perched several feet on outlet side.	Culvert is comprised of stone walls with no mortar, granite slabs laid across the top holding up the earth and road above. Large gaps between granite slabs where earth/vegetation can get through and roadway will settle.
Inlet	Material	N/A	Concrete	Stone
	Headwall?	N	Y	Y
	Wingwalls?	N	Y	Y
	Bed Material	Stone	Stone	Rock
	Depth of Water from Invert (in)		5	11
	Grate?	N	N	N
	Notes	Rocks/soil somewhat supporting culvert.	Wingwalls at angle off headwall. Can see light from the outlet, but cannot see the opening on other end of culvert due to a bend in the culvert alignment.	Some mortar present in stone headwall, wearing away a bit. No culvert bottom.
Outlet	Material	N/A	Concrete	Stone
	Headwall?	N	Y	Y
	Wingwalls?	N	Y	Y
	Bed Material	Stone	Stone/sand	Unk
	Depth of Water from Invert (in)		5	17
	Grate?	N	N	N
	Notes	Rocks/soil somewhat supporting culvert.	Wingwalls are perpendicular to headwall. Outlet is inaccessible. Fence with locked gate. Headwall and wingwall material is concrete.	Some mortar present in stone headwall, wearing away a bit. No culvert bottom.
Surface	Surface Type	Gravel trail	Lawn	Paved
	Guardrail?	N	N	Y
	Notes	Gravel trail in good condition.	No significant defects observed.	Roadway in good condition, but there are large sinkholes off the sides of the road.
Overall Ratings	Culvert	3	3	5
	Slope Stability	3	1	5
	Surface	1	1	5
	Maintenance	3	1	3
	Additional Notes	No water in "stream". Completely dry. If there was flow the trail could likely flood but doesn't seem to be any. No headwall, but pipes are so small and only foot traffic on trail.	Culvert pipe is corroding. Otherwise no issues and sized correctly.	Utility pipe going across the culvert width in the culvert on the outlet side. Wood planks surrounding the utility pipe. Culvert showing clear signs of age and should be replaced. Sinkholes present off the edges of the road along the culvert alignment.

	Culvert ID	25	26	27
General Notes	Crossing/Street	Liberty St	Pond Meadow Park Trail	Pond Meadow Park Trail
	Nearest Address	697 Liberty St	Pond Meadow Park	Pond Meadow Park
	Waterway Name	N/A	Smelt Brook	Smelt Brook
	Crew Name(s)	Lauren H. & Mollie C.	Lauren H. & Mollie C.	Lauren H. & Mollie C.
	Date	6/4/2024	6/4/2024	6/4/2024
	Time	8:52:00 AM	9:35:00 AM	10:05:00 AM
	Weather	Sunny	Sunny	Sunny
	Temp (F)	64	66	68
Culvert	Material	Concrete	CMP	CMP
	Shape	Round	Arch	Round
	Width/Diameter (in)	36	86	52
	Height (in)	N/A	N/A	42 (inlet) 32 (outlet)
	Length (ft)	N/A	N/A	N/A
	No. of Barrels	1	2	1
	Span (ft)	N/A	185	N/A
	Notes	Culvert itself is in good shape. Inlet only has an inch or two of water but outlet almost fully submerged. Steep slope or buildup of material in outlet side.	Metal culvert is in poor condition. Arch shape with no bottom. Corrosion along bottom edges of CMP.	Bottom heavily corroded. Deformed by weight of headwalls and trail above, more at outlet side. Inlet flow comes from dam. Some branches in stream we cleared out.
Inlet	Material	Stone masonry	Stone and wire mesh	Stone
	Headwall?	Y	Y	Y
	Wingwalls?	Y	N	N
	Bed Material	Mud	Stone	Stones and muck
	Depth of Water from Invert (in)	1	15	9
	Grate?	N	N	N
	Notes	A lot of organic material and mineral build-up just before inlet. Decent condition of mortar in stone masonry wall.	Metal wire mesh is containing small stones that make up the wall. Sagging in and around culverts, clearly settling over time.	Large boulder/stones loosely laid around inlet for support.
Outlet	Material	Stone masonry	Stone and wire mesh	Stone
	Headwall?	Y	Y	Y
	Wingwalls?	Y	N	N
	Bed Material	Sand	Stone	Stone and muck
	Depth of Water from Invert (in)	10	15	6
	Grate?	N	N	N
	Notes	Root growth in gaps between stone masonry. Lacking mortar in stone masonry wall. There is some erosion around the wall. Outlet pipe almost 2/3 submerged with water/sediment.	Metal wire mesh is containing small stones that make up the wall. Sagging in and around culverts, clearly settling over time.	Large boulder/stones loosely laid around outlet for support.
Surface	Surface Type	Paved	Paved	Paved
	Guardrail?	Y	Y	Y
	Notes	No significant defects observed.	Pavement is sagging in and around culverts. Wooden fence along either side of paved trail is also sagging.	Paved trail in good condtion, no sagging. Some cracking could be due to settlement of headwalls and culvert but difficult to tell. Wooden post fence on either side of trail in good condition.
Overall Ratings	Culvert	2	5	5
	Slope Stability	3	5	5
	Surface	1	5	3
	Maintenance	3	3	2
	Additional Notes	Culvert has branches and dirt built up in the pipe and at the inlet side, needs to be cleaned out.	Pipe corroding and the headwall / pedestrian bridge is a safety concern.	N/A

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 01

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Francesca M.
Job #:	23010598	Date:	5/14/2024
Crossing/Street:	Wildwood Ave	Time:	8:06
Nearest Address:	193 Wildwood Ave	Weather:	Partly cloudy
Waterway Name:	N/A	Temp (F):	56

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	PVC	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Round	Culvert is smooth with no defects. Culvert allows for clear visibility through to the other side. Perched.
Width/Diameter (in):	24	
Height (in):	N/A	
Length (ft):	57.5	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Stone masonry/rocks	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Granite slabs laid on top of culvert at inlet. Stones and granite slabs holding up steep channel slopes on inlet side.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone/mud	
Depth of Water from Invert (in):	1/2	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Stone masonry	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Visible cracking in headwall footing.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone/mud	
Depth of Water from Invert (in):	1/2	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	N	No pavement cracking due to culvert.

Overall Condition Ratings	
Culvert:	2
Slope Stability:	3
Surface:	1
Maintenance:	1

1= Excellent

2=Good

3=Fair

4=Poor

5=Immediate Concern

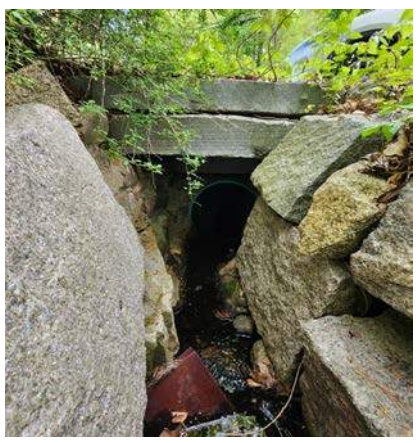
Additional Notes
Newer culvert, water flowing correctly, surface looks good, sized correctly.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 01

Sketch

Photos

Inlet of Culvert



Outlet of Culvert

Inside of culvert from outlet side

Site

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 02

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Francesca M.
Job #:	23010598	Date:	5/14/2024
Crossing/Street:	Liberty St	Time:	9:10
Nearest Address:	1465 Liberty St	Weather:	Partly cloudy
Waterway Name:	Cranberry Brook	Temp (F):	60

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Round	Culvert buried about 1/4 depth (12"). Rebar exposure and some concrete deterioration on either end, just on inlet and outlet edge.
Width/Diameter (in):	48	
Height (in):	N/A	
Length (ft):	59	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	None	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	N	Lack of headwall not an immediate concern, however some erosion and vegetative growth occurring around inlet.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Mud	
Depth of Water from Invert (in):	24	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	None	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	N	Concrete slab/curb next to sidewalk over culvert. 30" and 14" pipes on either side of culvert at outlet side possibly from drainage. Lack of headwall not an immediate concern, however some erosion and vegetative growth occurring around outlet.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Mud	
Depth of Water from Invert (in):	24	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	N	Pavement looks new.

Overall Condition Ratings	
Culvert:	3
Slope Stability:	4
Surface:	2
Maintenance:	3

1= Excellent

2=Good

3=Fair

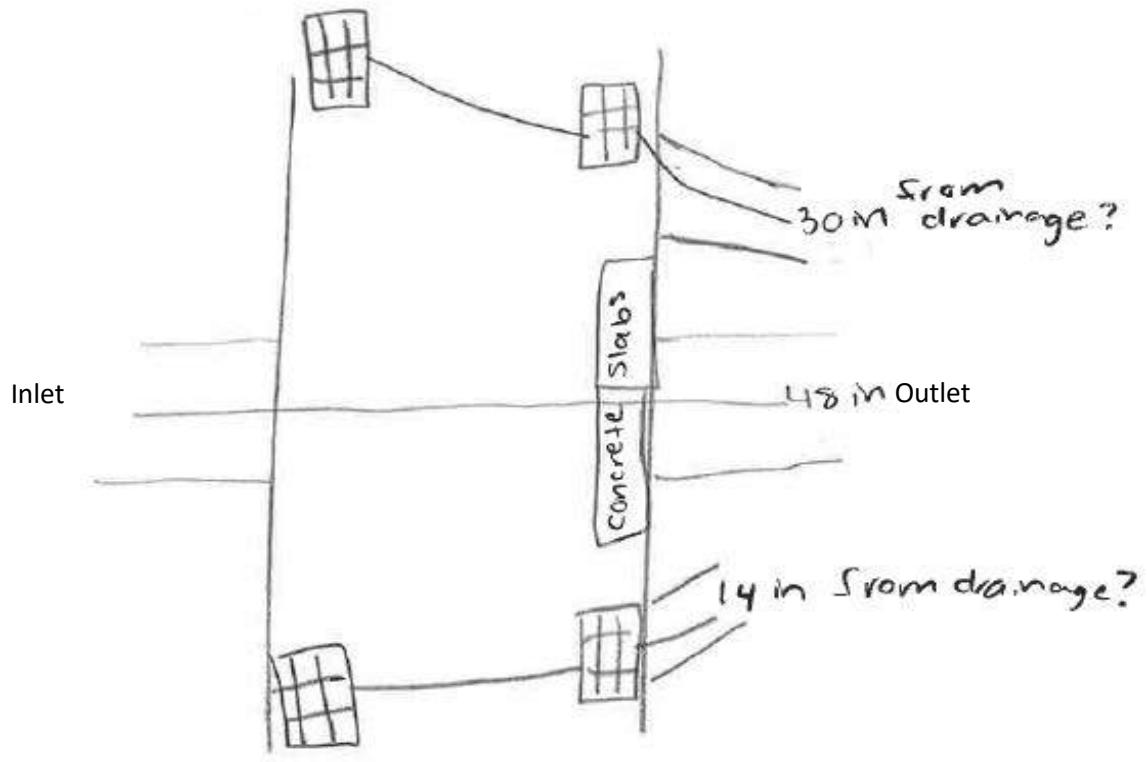
4=Poor

5=Immediate Concern

Additional Notes
Culvert showing deterioration and exposed rebar. Pipe half full of stagnat water, seemingly no slope. Sediment level is high. Could use some maintenance of the waterway and surrounding slopes, erosion clearly visible.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 02

Sketch



Photos

Inside of culvert from inlet side

Inside of culvert from outlet side

Site surface

Culvert and 30" pipe from drainage at outlet

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 03

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Francesca M.
Job #:	23010598	Date:	5/14/2024
Crossing/Street:	Old Liberty St	Time:	8:48
Nearest Address:	1465 Old Liberty St	Weather:	Partly cloudy
Waterway Name:	Cranberry Brook	Temp (F):	58

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.* View is clear through to other side, besides a broken pipe joint on Barrel B on outlet side. Slope in Barrel B not consistent due to broken pipe joint. Minor concrete deterioriation on either end of each barrel.
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Round	
Width/Diameter (in):	24	
Height (in):	N/A	
Length (ft):	32	
Number of Barrels:	2	
Span (ft)	5.4 (inlet); 4.9 (outlet)	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Stone	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.* Loose rock around culvert, no footing seen. Headwall is made up of granite slabs, no mortar.
Headwall? *(Y/N):*	Y	
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Mud	
Depth of Water from Invert (in):	3	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Loose stone	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.* "Headwall" above outlet is severely eroded, loose stone. Pipe joint on Barrel B is broken. Root growth, soil and stone in open joint. A lot of vegetation near outlet in general, difficult to access, requires maintentance.
Headwall? *(Y/N):*	N	
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Mud	
Depth of Water from Invert (in):	1	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.* Pavement looks new.
Guardrail Present? *(Y/N) :*	N	

Overall Condition Ratings	
Culvert:	4
Slope Stability:	4
Surface:	1
Maintenance:	3

1= Excellent

2=Good

3=Fair

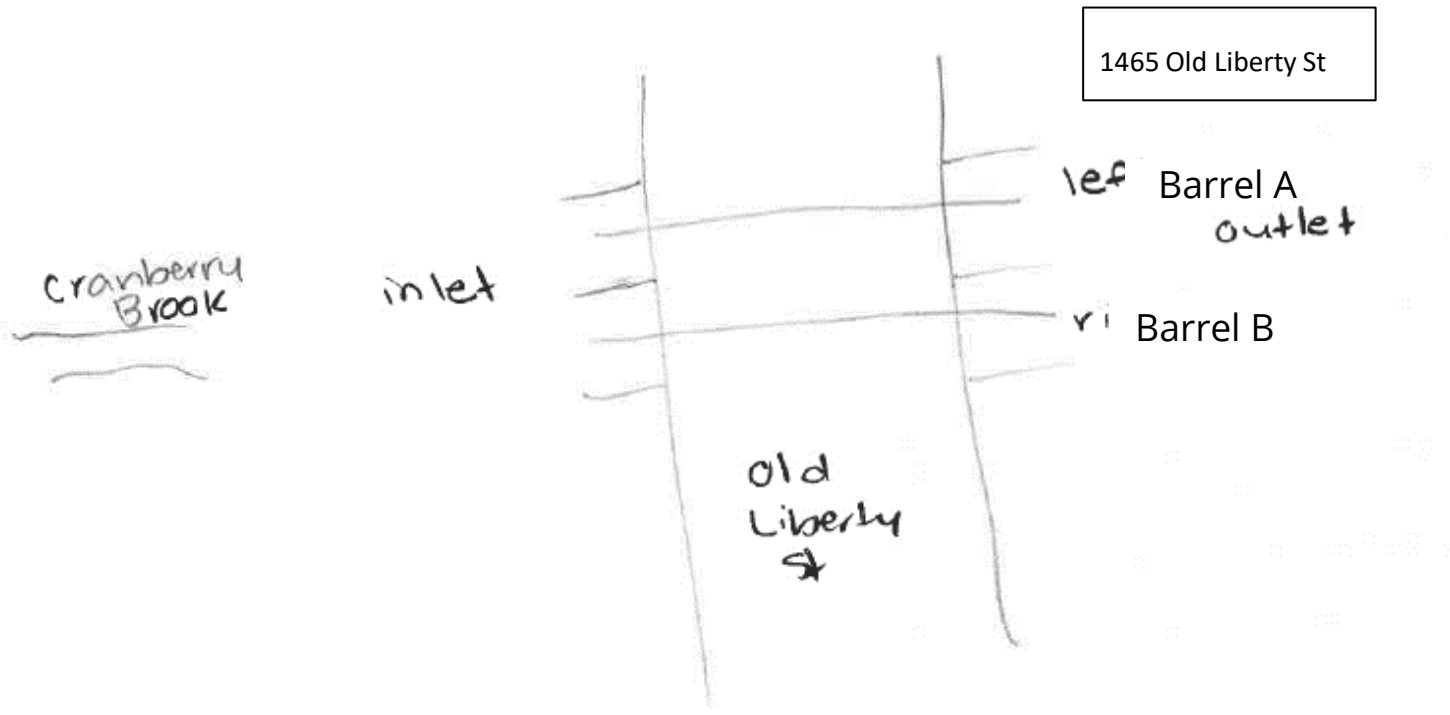
4=Poor

5=Immediate Concern

Additional Notes
Clear sign of erosion around culvert, stones around the inlet side have no mortar and thus subject to shifting. Pipe Joint on Barrel B is broken. Culvert could use repairs and slight cleanup of waterway and surrounding area.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 03

Sketch



Photos

Barrel A at inlet of culvert

Barrel A at outlet of culvert

Barrel B at inlet of culvert

Barrel B at outlet of culvert - pipe joint broken

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 04

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Francesca M.
Job #:	23010598	Date:	5/14/2024
Crossing/Street:	Easement / Trail off St. Claire St.	Time:	9:45
Nearest Address:	171 St. Claire St.	Weather:	Mostly sunny
Waterway Name:	N/A	Temp (F):	62

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	CMP	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Round	Bottom of culvert is missing the entire length of the culvert. Severely corroded. Can see through the culvert, but Town regularly checks this culvert and cleans as needed. Culvert accessed from trail starting at end of St. Claire Circle. Flooding at least a few hundred feet upstream of culvert has been reported, not in immediate area.
Width/Diameter (in):	18	
Height (in):	N/A	
Length (ft):	26.5	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	None	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	N	No headwall, just vegetation and soil. Inlet extremely corroded and fragile. Could be easily broken by stepping on it.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	9	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	None	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	N	No headwall, just vegetation and soil. Outlet extremely corroded and fragile. Could be easily broken by stepping on it.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	9	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Grass/dirt	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	N	Surface is soil/vegetation. No stone or support around culvert.

Overall Condition Ratings	
Culvert:	5
Slope Stability:	5
Surface:	5
Maintenance:	5

1= Excellent

2=Good

3=Fair

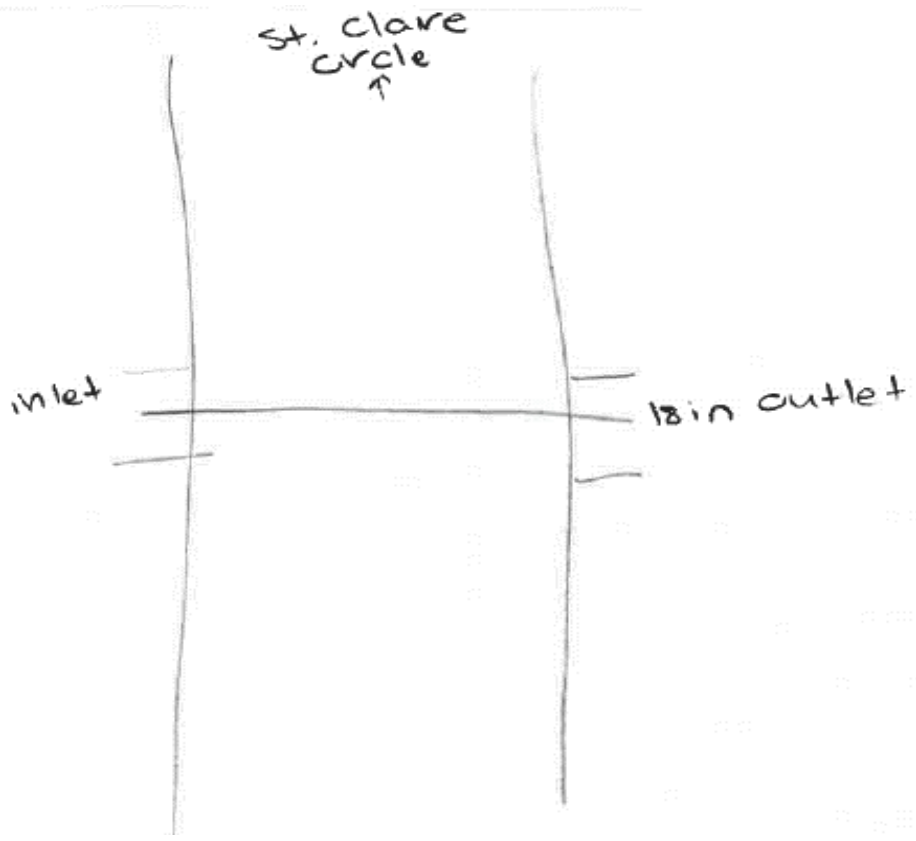
4=Poor

5=Immediate Concern

Additional Notes
Culvert accessed from trail starting at end of St. Claire Circle. Culvert itself is almost fully deteriorated and needs to be replaced. Very undersized for how much water would come through in a 100 year storm. Trail and backyards (possibly basements) would be flooded.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 04

Sketch



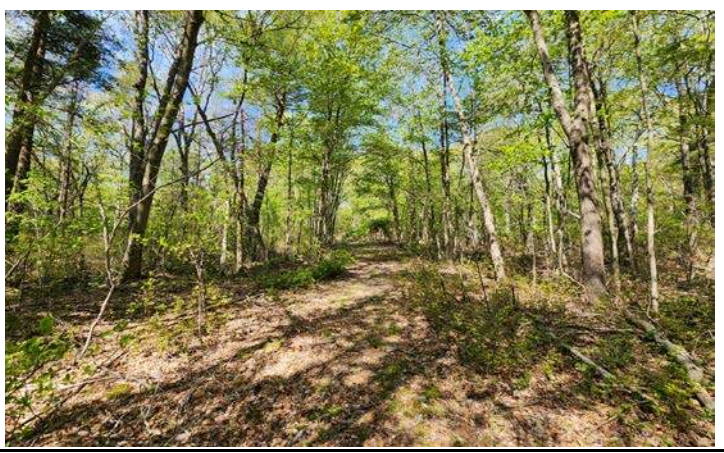
Photos

Inside of culvert at inlet side

Outlet of Culvert

Culvert at inlet

Culvert site



	Signature Lauren K Howe Jannazzi	Page 2

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 05

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Francesca M.
Job #:	23010598	Date:	5/14/2024
Crossing/Street:	Braintree Cemetery Driveway	Time:	10:20
Nearest Address:	255 Plain St.	Weather:	Sunny
Waterway Name:	N/A	Temp (F):	64

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Round	Pipe Joint halfway down is slightly separated. No concrete deterioration, looks brand new. Maintenance - cleared a few branches, vegetation in area.
Width/Diameter (in):	48	
Height (in):	N/A	
Length (ft):	59	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete & granite slabs	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	No mortar on headwalls. Minor erosion around granite & stone slabs but mostly intact. There is some settling of stone slabs.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Mud	
Depth of Water from Invert (in):	12	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete & granite slabs	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	No mortar on headwalls. Minor erosion around granite & stone slabs but mostly intact. There is some settling of stone slabs.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Mud	
Depth of Water from Invert (in):	30	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	N	No pavement cracking.

Overall Condition Ratings	
Culvert:	2
Slope Stability:	4
Surface:	1
Maintenance:	2

1= Excellent

2=Good

3=Fair

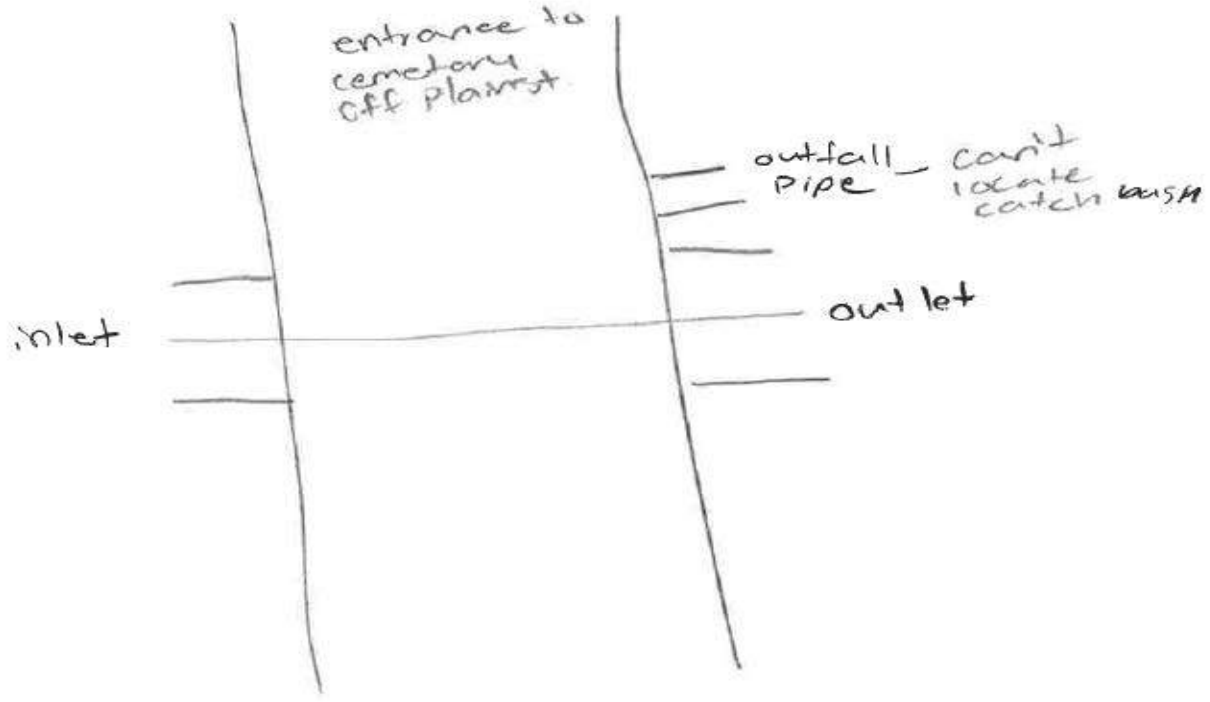
4=Poor

5=Immediate Concern

Additional Notes
Culvert showing only minor wear. The streambed and surrounding basin area leave room for some flooding conditions.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 05

Sketch



Photos

Inside of culvert at inlet side

Outlet of culvert and outfall pipe

Culvert at inlet

Culvert site

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 06

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Francesca M.
Job #:	23010598	Date:	5/14/2024
Crossing/Street:	John Mahar Hwy	Time:	11:00
Nearest Address:	183 Pearl St	Weather:	Sunny
Waterway Name:	Monatiquot River	Temp (F):	67

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Round	Culvert joints slightly separated in a few places, root growth in joints. There is an orange, oily substance in water at culvert inlet and outlet. Some debris found in culvert channel.
Width/Diameter (in):	36	
Height (in):	N/A	
Length (ft):	N/A	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	N	Culvert end at inlet side is flared and clear (length of flared end: 75 in). No headwall but flared end maintaining clear and structurally stable opening.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	1	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	N	Culvert end at inlet side is flared and clear (length of flared end: 75 in). No headwall but flared end maintaining clear and structurally stable opening.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	5	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	Y	No significant defects observed.

Overall Condition Ratings	
Culvert:	2
Slope Stability:	1
Surface:	2
Maintenance:	3

1= Excellent

2=Good

3=Fair

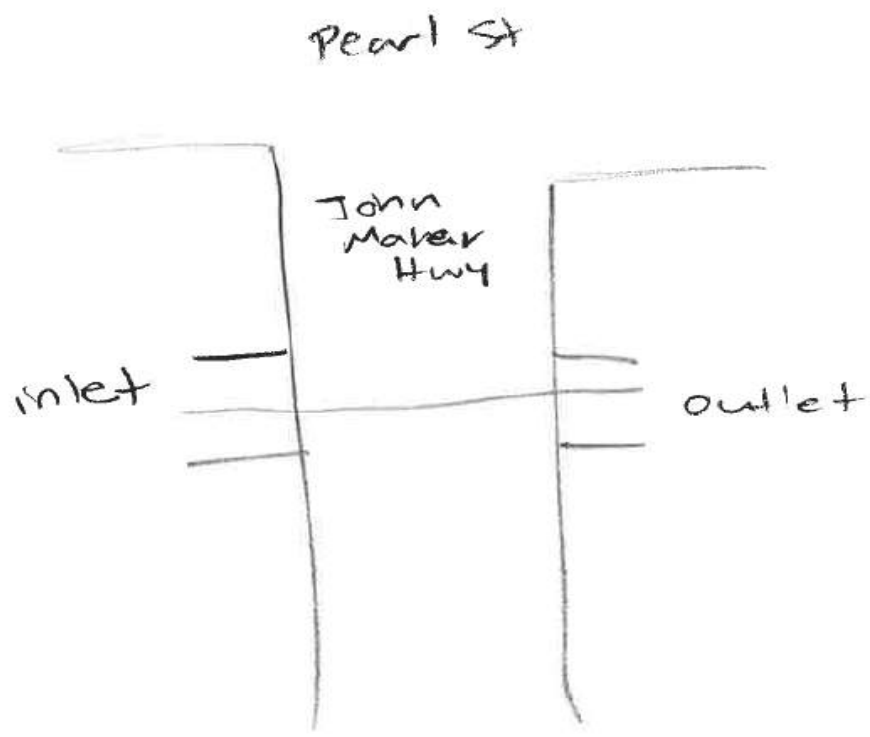
4=Poor

5=Immediate Concern

Additional Notes
Trash and overgrowth on Inlet and Outlet side. Biological growth in water. Needs a clean up. The streambed and surrounding basin area leave room for some flooding conditions.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 06

Sketch



Photos

Inside of culvert at inlet

Culvert at outlet

Culvert at inlet

Surface Site

	Signature Lauren K Howe Jannazzi	Page 2

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 07

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Francesca M.
Job #:	23010598	Date:	5/14/2024
Crossing/Street:	Pearl St	Time:	11:25
Nearest Address:	425 Pearl St	Weather:	Sunny
Waterway Name:	N/A	Temp (F):	70

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	CMP	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Round	CMP is corroded on the bottom, but still largely intact. Highly deformed vertically on the outlet end (48" dia. pipe squished down to 44" height). Deformations occur throughout the length of the pipe. A pipe enters the culvert pipe from the top, it appears to come from a sewer manhole but were not able to verify.
Width/Diameter (in):	44 (inlet); 48 (outlet)	
Height (in):	N/A	
Length (ft):	N/A	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Stone masonry	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Headwall is loose stone masonry, no mortar. Some vegetation and erosion around the wall. Can see several deformations from the inlet end of the pipe. Upstream of the inlet, there are large cement blocks holding up the stream bank that are leaning and at risk of falling into the stream. If they were to fall, the inlet side of the culvert may be blocked completely.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	3	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	CMP	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Headwall in good shape although the weight of the granite blocks appears to be deforming the pipe.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Granite	
Depth of Water from Invert (in):	3	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	Y	Guardrail only by outlet side.

Overall Condition Ratings	
Culvert:	5
Slope Stability:	5
Surface:	1
Maintenance:	4

1= Excellent

2=Good

3=Fair

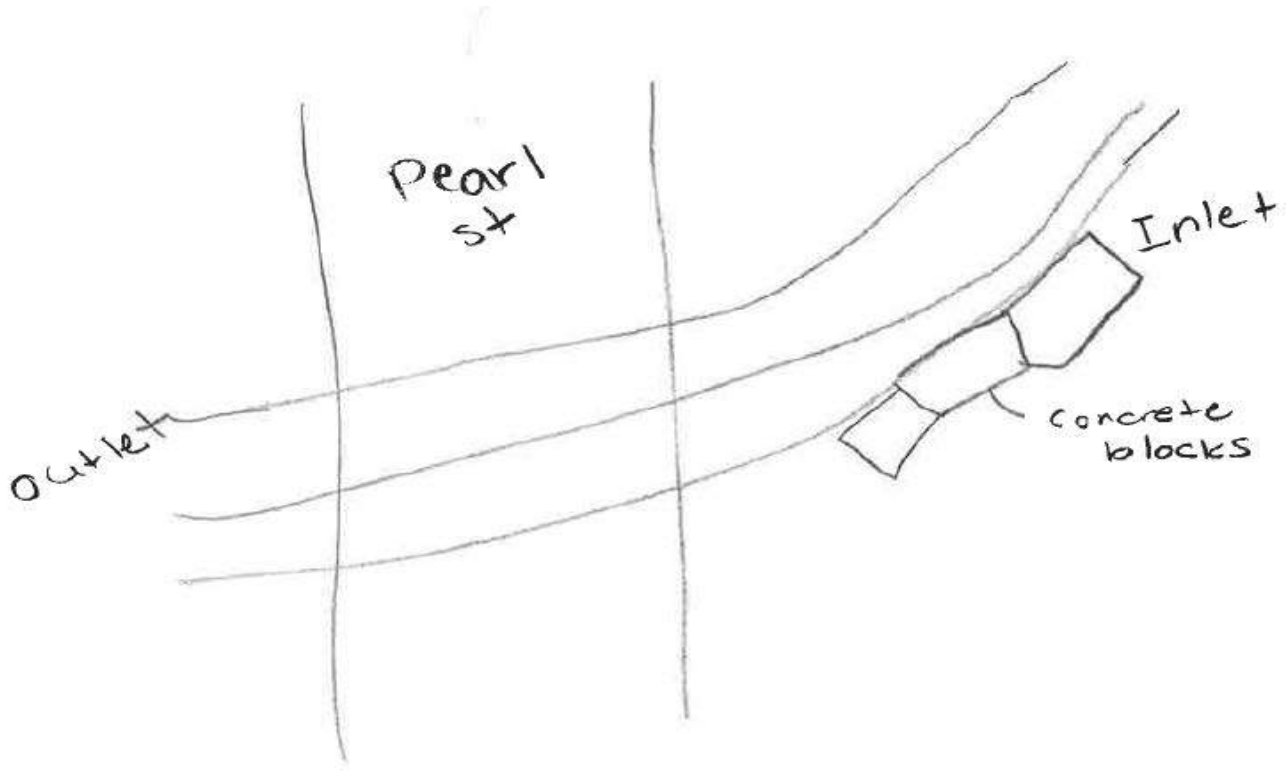
4=Poor

5=Immediate Concern

Additional Notes
Culvert pipe is in bad condition, incoming pipe penetration needs to be investigated, looks like it's from sewer? Erosion present. Cement blocks near inlet side could block culvert if they slide.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 07

Sketch



Photos

Inside of culvert at inlet

Culvert at outlet

Leaning concrete block wall along inlet side

Site facing outlet

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 08

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Francesca M.
Job #:	23010598	Date:	5/14/2024
Crossing/Street:	John W Leroy Jr Way	Time:	12:40
Nearest Address:	188 Franklin St	Weather:	Sunny
Waterway Name:	Sunset Lake	Temp (F):	73

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Round	Pipe joint is separated in a few spots. Signs of soil and root growth between joints. However, not much concrete deterioration. Connections from two drain manholes above (see sketch). Culvert is in a marshy area next to Sunset Lake.
Width/Diameter (in):	24	
Height (in):	N/A	
Length (ft):	62	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Solid concrete headwalls and wingwalls in good shape.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Mud	
Depth of Water from Invert (in):	2	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Solid concrete headwalls and wingwalls in good shape.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Mud/sand	
Depth of Water from Invert (in):	2	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	N	Some pavement cracking and repatching but does not appear to be caused by settlement around culvert.

Overall Condition Ratings	
Culvert:	3
Slope Stability:	1
Surface:	2
Maintenance:	2

1= Excellent

2=Good

3=Fair

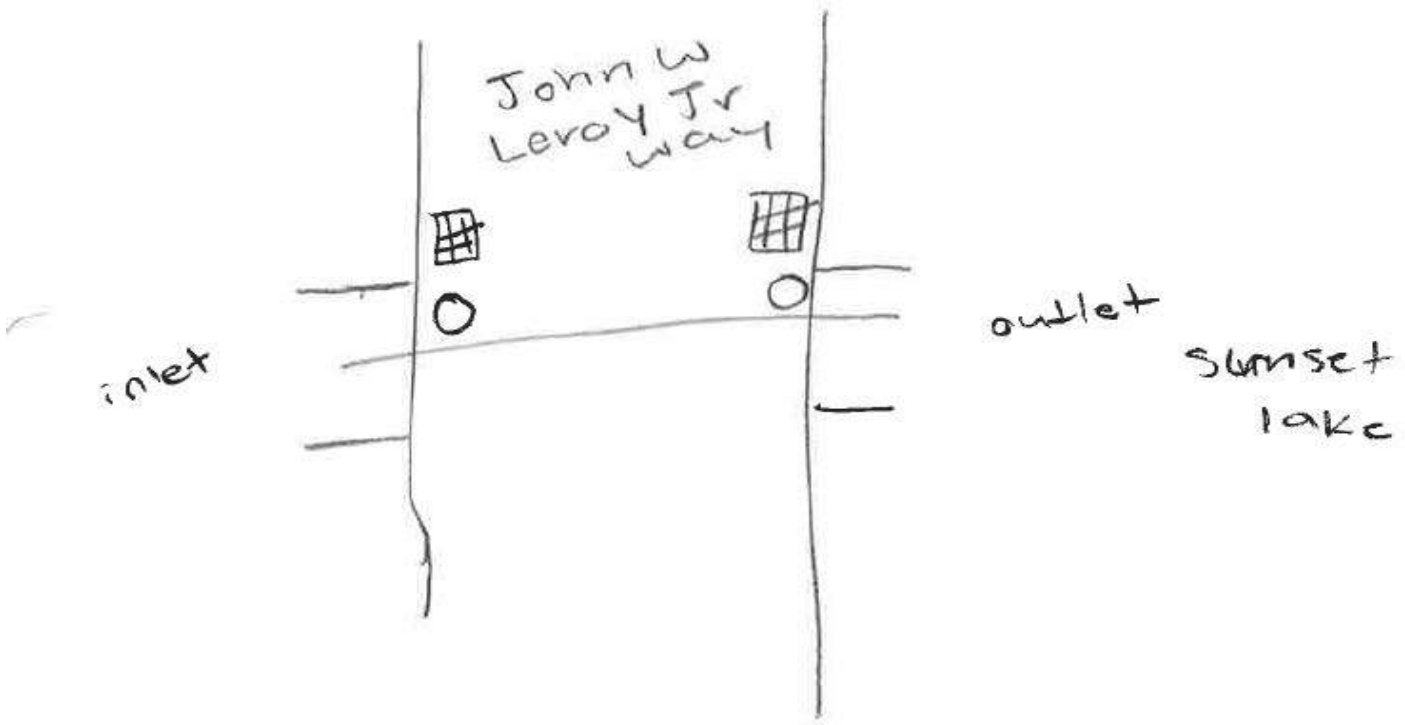
4=Poor

5=Immediate Concern

Additional Notes
Joints along culvert are separated with roots and soil infiltration. Needs cleanup/maintenance. Sunset lake and basin appear to be able to handle flooding but in a bad storm it could be too much for the size of the culvert.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 08

Sketch



Photos

Inside of culvert at inlet

Outlet of culvert

Outlet of culvert

Site surface facing outlet

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 09

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Francesca M.
Job #:	23010598	Date:	5/14/2024
Crossing/Street:	John W Leroy Jr Way	Time:	13:05
Nearest Address:	188 Franklin St	Weather:	Sunny
Waterway Name:	Sunset Lake	Temp (F):	73

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Round	Concrete at invert of barrel is worn away a bit, but still intact. Joints appear to be intact. Culvert is in a marshy area next to Sunset Lake.
Width/Diameter (in):	24	
Height (in):	N/A	
Length (ft):	63	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Solid concrete headwalls and wingwalls in good shape. Some erosion of concrete occurring on ends.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Rock/stone	
Depth of Water from Invert (in):	2	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Solid concrete headwalls and wingwalls in good shape. Some erosion of concrete occurring on ends.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Rock/stone	
Depth of Water from Invert (in):	2	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	N	Some pavement cracking and repatching around catch basins which connect into culvert directly. May be due to settlement around culvert.

Overall Condition Ratings	
Culvert:	2
Slope Stability:	2
Surface:	3
Maintenance:	2

1= Excellent

2=Good

3=Fair

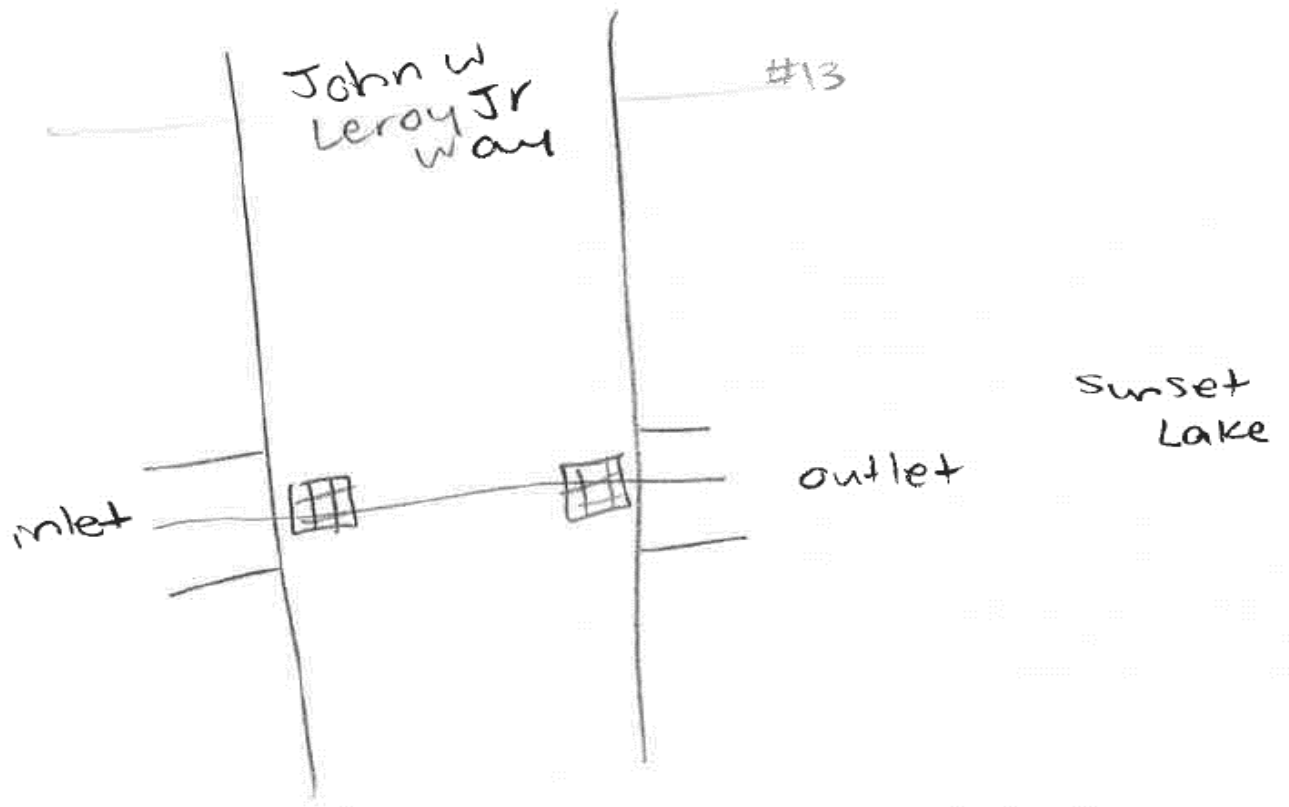
4=Poor

5=Immediate Concern

Additional Notes
Soil has settled around the culvert and the roadway is cracking. Road could be repaved. Culvert in fine condition.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 09

Sketch



Photos

Culvert at inlet

Culvert at outlet

Inside of culvert at outlet

Site surface facing outlet

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 10

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Francesca M.
Job #:	23010598	Date:	5/14/2024
Crossing/Street:	Pond St	Time:	13:35
Nearest Address:	164 Pond St	Weather:	Sunny
Waterway Name:	N/A	Temp (F):	74

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Round	No significant defects observed.
Width/Diameter (in):	24	
Height (in):	N/A	
Length (ft):	N/A	
Number of Barrels:	2	
Span (ft)	9.1 (outlet); 9 (inlet)	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	N	Both barrels have flared ends. The surrounding soil/vegetation around the top of the flared ends is eroding.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Gravel/rock	
Depth of Water from Invert (in):	2	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	N	Both barrels have flared ends. Flared ends are 53" across. Flared end of barrel A has a piece broken off. A lot of vegetation around the flared ends on inlet and outlet sides.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Sand	
Depth of Water from Invert (in):	6	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	Y	No significant defects observed.

Overall Condition Ratings	
Culvert:	1
Slope Stability:	3
Surface:	2
Maintenance:	3

1= Excellent

2=Good

3=Fair

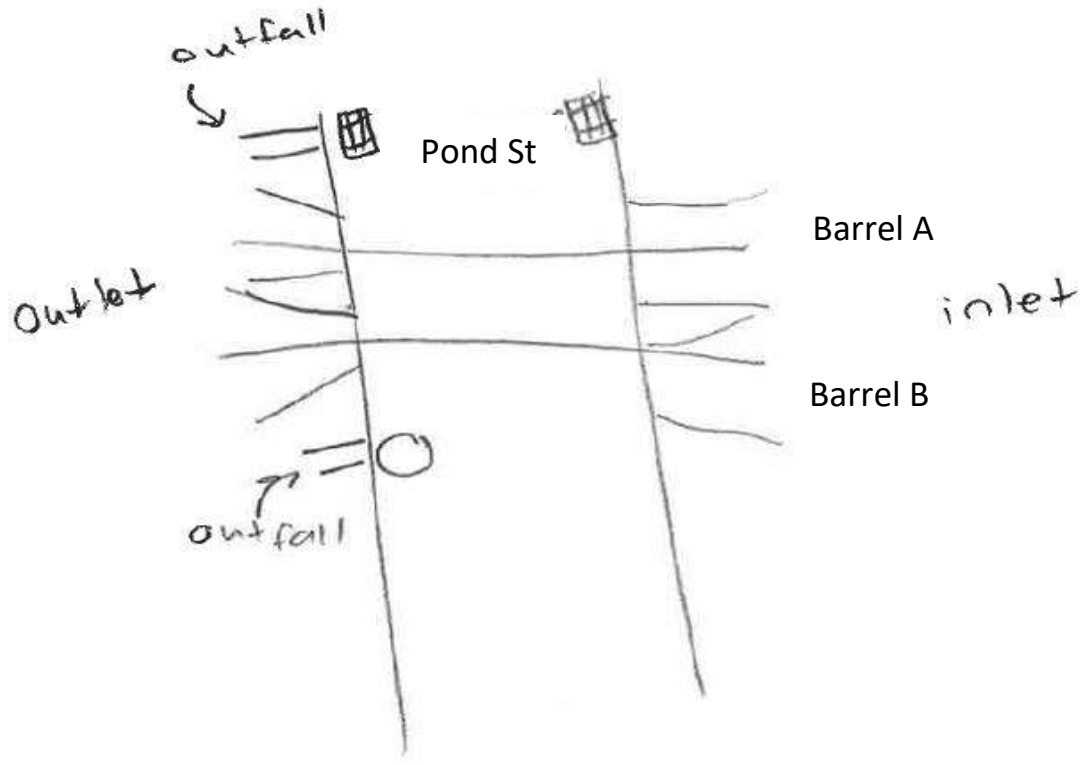
4=Poor

5=Immediate Concern

Additional Notes
Erosion of embankment on inlet side. Both sides a bit overgrown. Flooding possible due to undersized culverts, could flood nearby yards and possibly basements.

ENVIRONMENTAL PARTNERS — An Apex Company	CULVERT ASSESSMENT FORM	Culvert ID: 10

Sketch



Photos

Inside of culvert at inlet (Barrel A-right, Barrel B - Left)

Culvert at outlet

Inside of culvert at outlet (Barrel A-left, Barrel B-right)

Site surface facing inlet

	Signature Lauren K Howe Jannazzi	Page 2

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 11

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Mollie C.
Job #:	23010598	Date:	5/23/2024
Crossing/Street:	Granite St	Time:	10:50
Nearest Address:	2 Campanelli Drive	Weather:	Cloudy
Waterway Name:	Farm River	Temp (F):	73

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Box	No significant defects observed.
Width/Diameter (in):	196	
Height (in):	90	
Length (ft):	N/A	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Bottom of culvert buried, cannot determine depth of sediment. Slight loss of mortar in joint between headwall and wingwall.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	8	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Bottom of culvert buried, cannot determine depth of sediment. Slight loss of mortar in joint between headwall and wingwall.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	7	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	Y	No significant defects observed.

Overall Condition Ratings	
Culvert:	1
Slope Stability:	1
Surface:	1
Maintenance:	1

1= Excellent

2=Good

3=Fair

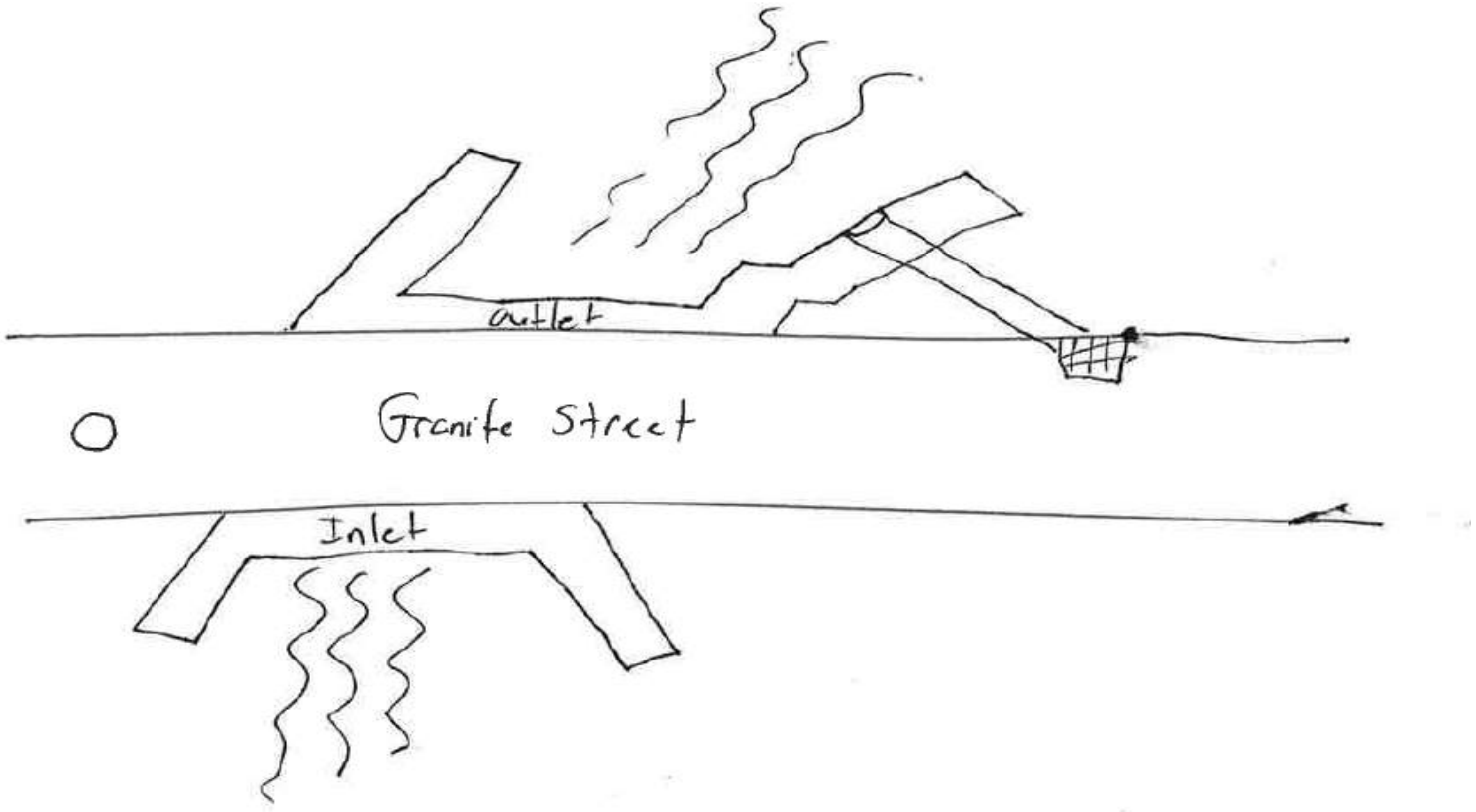
4=Poor

5=Immediate Concern

Additional Notes
Culvert in good conditions and well sized.

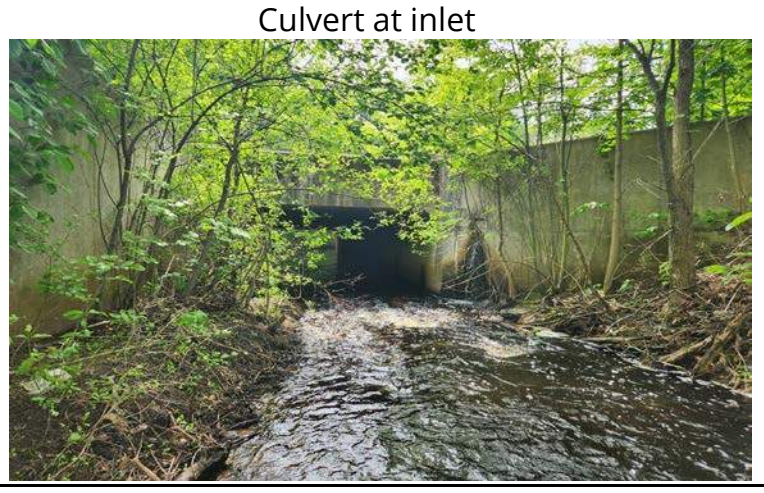
ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 11

Sketch



Photos

Culvert at inlet



Culvert at outlet

Inside of culvert at outlet

Site surface facing inlet

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 12

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Mollie C.
Job #:	23010598	Date:	5/23/2024
Crossing/Street:	Pond St	Time:	11:45
Nearest Address:	339 Pond St	Weather:	Cloudy
Waterway Name:	Farm River	Temp (F):	75

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Box	No significant defects observed.
Width/Diameter (in):	179	
Height (in):	59 (inlet); 60 (outlet)	
Length (ft):	N/A	
Number of Barrels:	2	
Span (ft)	370	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	GPS point was taken at right side facing inlet. There is no caulk/mortar at joints between headwall and wingwall (some separation).
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Sand & mud	
Depth of Water from Invert (in):	4.5	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Left side has more sediment fill than right. Dept of water from invert is 6" on right side. Depth of sediment from invert is about 6" on left, 0" on right. GPS point was taken at right side facing outlet. There is no caulk/mortar at joints between headwall and wingwall (some separation).
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Sand & mud	
Depth of Water from Invert (in):	6	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	Y	No significant defects observed.

Overall Condition Ratings	
Culvert:	1
Slope Stability:	2
Surface:	1
Maintenance:	2

1= Excellent

2=Good

3=Fair

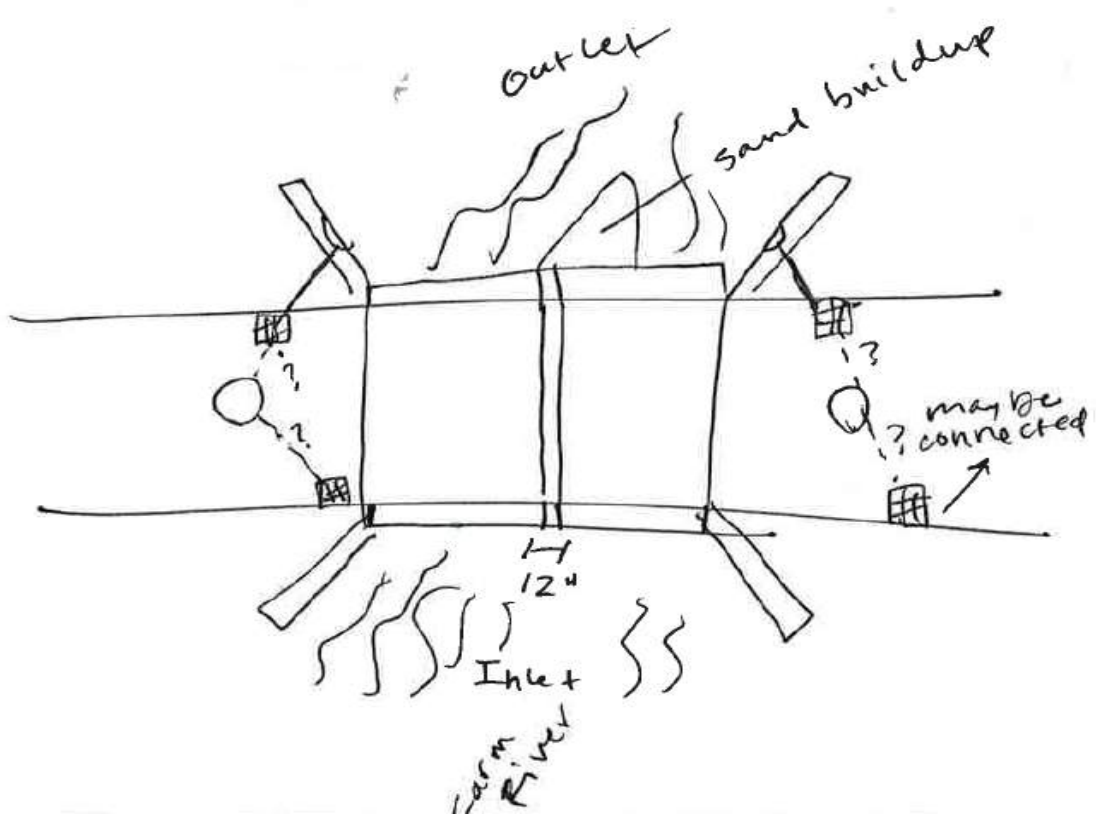
4=Poor

5=Immediate Concern

Additional Notes
There are some branches in stream. Culvert in good condition and well sized.

ENVIRONMENTAL PARTNERS — An Apex Company	CULVERT ASSESSMENT FORM	Culvert ID: 12

Sketch



Photos

Inside of culvert at inlet

Culvert at outlet

Culvert at inlet

Site surface facing outlet

	Signature Lauren K Home Jannizzi	Page 2

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 13

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Mollie C.
Job #:	23010598	Date:	5/23/2024
Crossing/Street:	Lundquist Dr	Time:	11:20
Nearest Address:	825 Lundquist Dr	Weather:	Cloudy
Waterway Name:	Farm River	Temp (F):	74

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Box	Drainage connection halfway down culvert on side (see sketch).
Width/Diameter (in):	193	
Height (in):	87	
Length (ft):	N/A	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Pipe service crossing river at headwall. Some caulk/mortar at joints between headwall and wingwall worn away.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	21	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Some caulk/mortar at joints between headwall and wingwall worn away.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	15	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	Y	No significant defects observed.

Overall Condition Ratings	
Culvert:	2
Slope Stability:	1
Surface:	1
Maintenance:	2

1= Excellent

2=Good

3=Fair

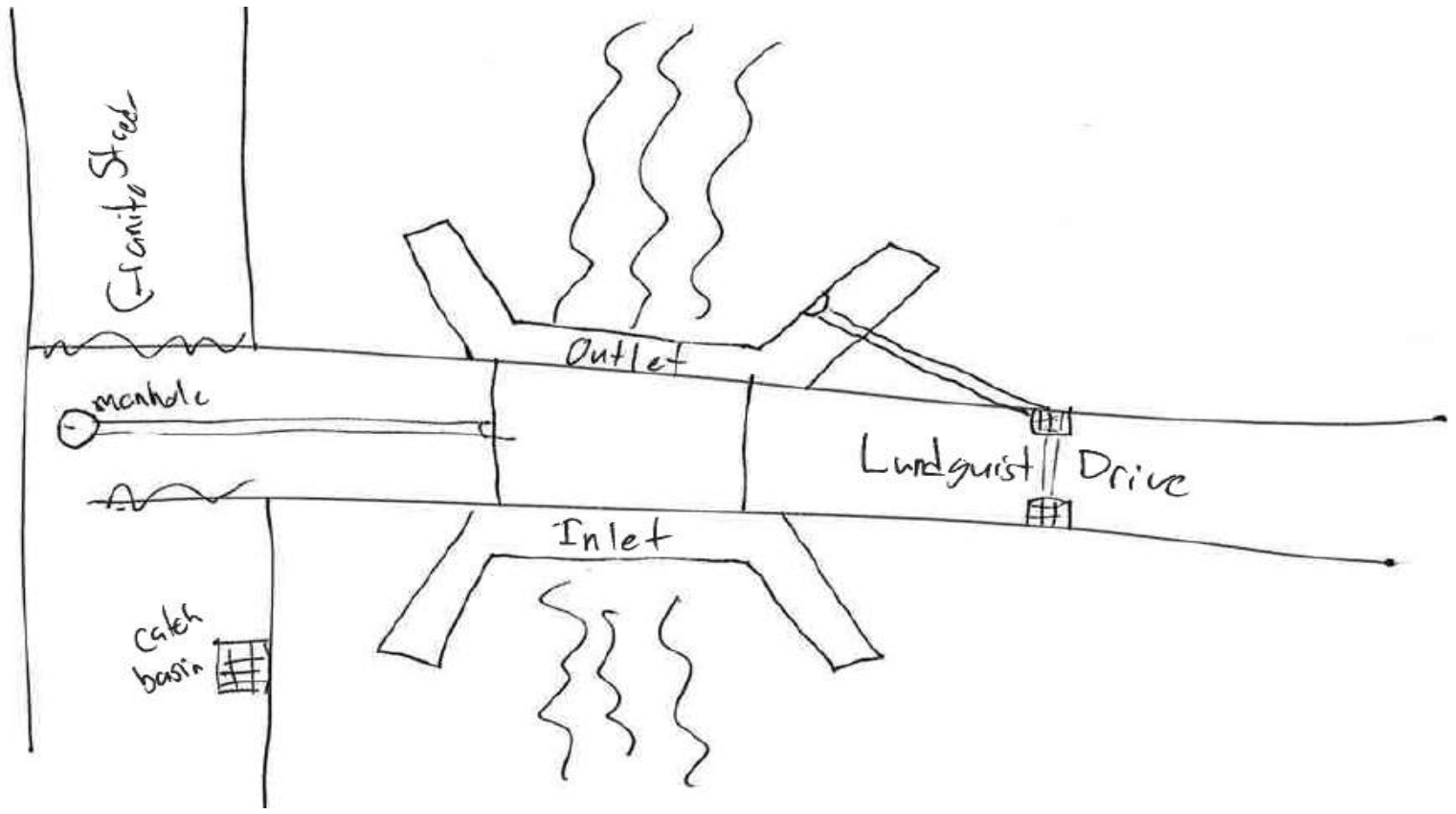
4=Poor

5=Immediate Concern

Additional Notes
Culvert in fine condition, some minor wear.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 13

Sketch



Photos

Culvert at inlet

Inside culvert facing outlet

Culvert at outlet

Site surface facing outlet

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 14

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Francesca M.
Job #:	23010598	Date:	5/14/2024
Crossing/Street:	Chickatawbut Rd	Time:	14:30
Nearest Address:	44 Granite St	Weather:	Sunny
Waterway Name:	N/A	Temp (F):	76

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.* Culvert is about half full with water but is clear. Waterway & Maintenance - Lots of branches and debris in stream on inlet side. Has potential to block flow.
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Round	
Width/Diameter (in):	24	
Height (in):	N/A	
Length (ft):	N/A	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Stone masonry	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.* Some minor cracking, and some mortar is chipping. Wingwalls are perpendicualr off of headwalls.
Headwall? *(Y/N):*	Y	
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Mud	
Depth of Water from Invert (in):	12	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Stone masonry	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.* Large crack on outlet headwall running from top to bottom. Wingwalls are perpendicualr off of headwalls.
Headwall? *(Y/N):*	Y	
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Mud	
Depth of Water from Invert (in):	12	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.* No significant defects observed.
Guardrail Present? *(Y/N) :*	N	

Overall Condition Ratings	
Culvert:	2
Slope Stability:	4
Surface:	1
Maintenance:	4

1= Excellent

2=Good

3=Fair

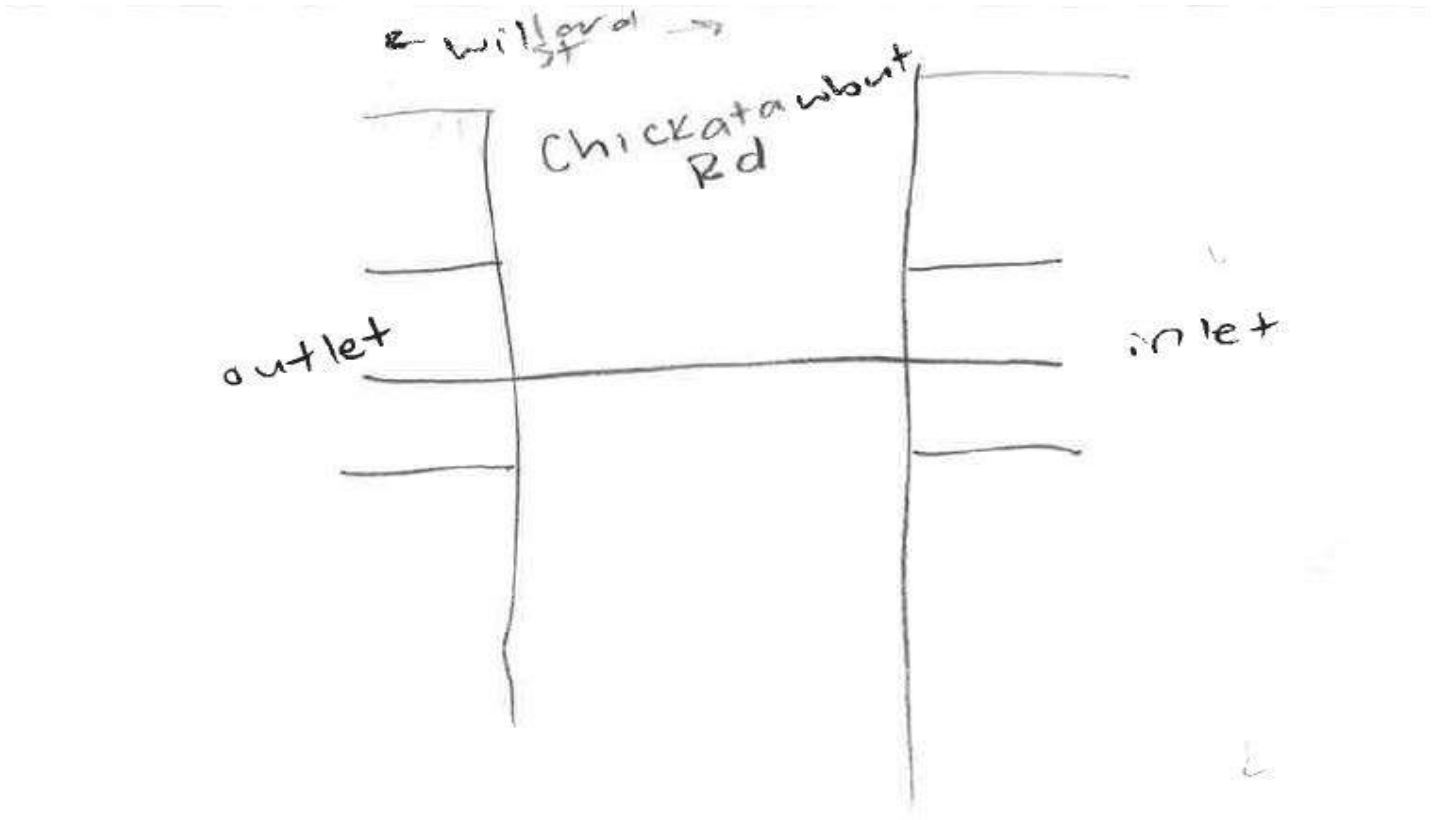
4=Poor

5=Immediate Concern

Additional Notes
Waterway needs to be cleaned up, culvert has branches in it and culvert is almost full.

ENVIRONMENTAL PARTNERS — An Apex Company	CULVERT ASSESSMENT FORM	Culvert ID: 14

Sketch



Photos

Culvert at inlet

Crack in headwall at outlet

Culvert at outlet

Site surface facing outlet

Signature Lauren K Howe Jannazzi

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 15

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Mollie C.
Job #:	23010598	Date:	5/21/2024
Crossing/Street:	Walnut St	Time:	8:12
Nearest Address:	162 Walnut St	Weather:	Sunny
Waterway Name:	Town Brook	Temp (F):	58

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.* Culvert has some root growth between joints. Generally in good shape. High levels of sediment and muck buildup, especially on outlet side. There are two catch basins tied directly in. Property owner has been cleaning culvert out for 30+ years on outlet side. Waterway banks on outlet side have slowly eroded into the stream (according to homeowner). No slope support. Muck/mud needs to be removed.
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Box	
Width/Diameter (in):	127	
Height (in):	32 (inlet), 24 (outlet)	
Length (ft):	N/A	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.* High levels of sediment/muck buildup. Wingwall becomes rockwall, likely the new concrete wingwalls were connected to the old rockwall wingwalls. Concrete has minor wear on headwalls & wingwalls. Raised metal gate on inlet side.
Headwall? *(Y/N):*	Y	
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Sand & stone	
Depth of Water from Invert (in):	9	
Grate? (Y/N):	Y	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.* Outlet is in good shape, no cracking. High levels of sediment/muck buildup.
Headwall? *(Y/N):*	Y	
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Mud	
Depth of Water from Invert (in):	8	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved/yard	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.* Fences on both headwalls.
Guardrail Present? *(Y/N) :*	Y	

Overall Condition Ratings	
Culvert:	2
Slope Stability:	4
Surface:	1
Maintenance:	4

1= Excellent

2=Good

3=Fair

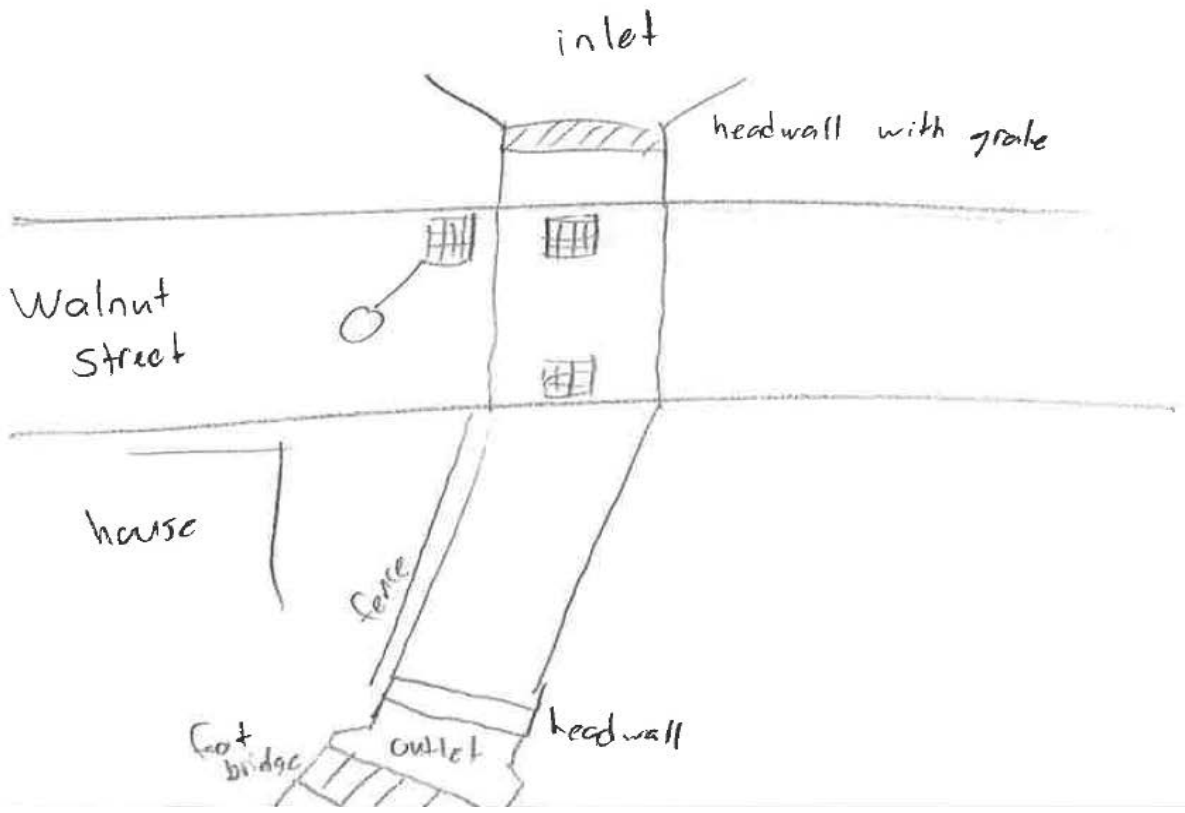
4=Poor

5=Immediate Concern

Additional Notes
Needs maintenance, lots of erosion on outlet side causing a large layer of muck at bottom of waterway. Culvert well sized and in good shape.

ENVIRONMENTAL PARTNERS — An Apex Company	CULVERT ASSESSMENT FORM	Culvert ID: 15

Sketch



Photos

Inside of culvert at inlet

Outlet of culvert

Inlet of culvert

Site facing inlet

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 16

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Mollie C.
Job #:	23010598	Date:	5/21/2024
Crossing/Street:	Acorn St	Time:	8:44
Nearest Address:	62 Acorn St	Weather:	Sunny
Waterway Name:	Town Brook	Temp (F):	60

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Box	Culvert is filled with muck/mud. Catch basins connect directly into top of culvert. Some peeling of mortar/caulk at joints.
Width/Diameter (in):	135	
Height (in):	39.5	
Length (ft):	N/A	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Concrete headwalls and wingwalls in good shape.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Mud/silt	
Depth of Water from Invert (in):	6	
Grate? (Y/N):	Y	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Concrete headwalls and wingwalls in good shape. Inaccessible due to fence and vegetation. Outlet side is overgrown and needs to be cleared out.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Mud/silt	
Depth of Water from Invert (in):	0	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	Y	Fence on inlet and outlet of culvert.

Overall Condition Ratings	
Culvert:	2
Slope Stability:	2
Surface:	1
Maintenance:	3

1= Excellent

2=Good

3=Fair

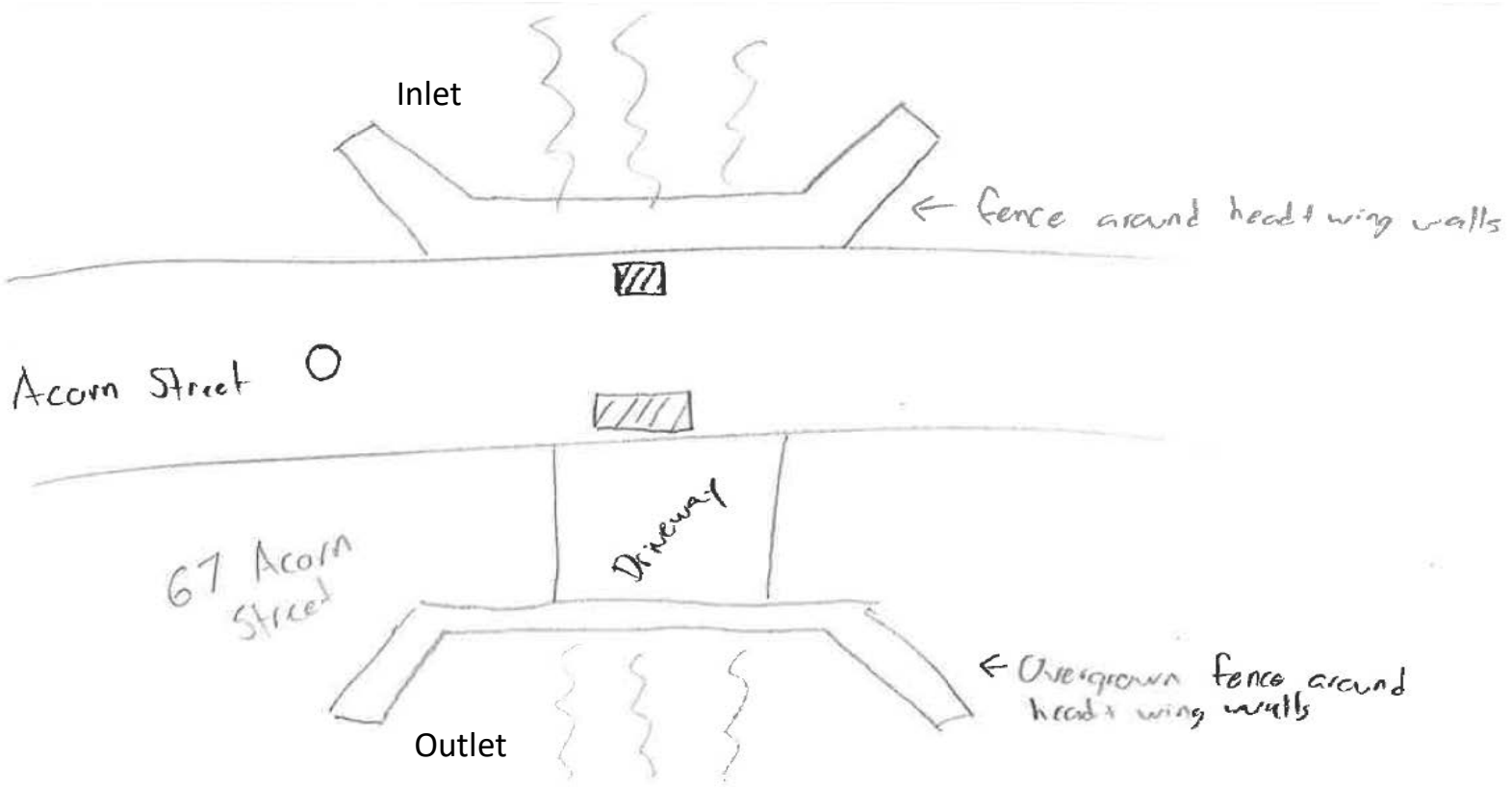
4=Poor

5=Immediate Concern

Additional Notes
Needs maintenance, erosion and overgrowth causing a large layer of muck at bottom of waterway. Culvert well sized and in good shape.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 16

Sketch



Photos

Inside of culvert at inlet

Outlet of culvert

Inlet of culvert

Area around outlet

	Signature Lauren K Home-Jamiggi	Page 2

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 17

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Mollie C.
Job #:	23010598	Date:	5/21/2024
Crossing/Street:	Dickerman Ln	Time:	9:45
Nearest Address:	49 Dickerman Ln	Weather:	Sunny
Waterway Name:	N/A	Temp (F):	66

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Box	Excellent condition. Very narrow waterway between houses. Concrete walled channel on inlet side. Vegetation and CMP section with its top cut off upstream of inlet side. Requires careful maintenance. Widens up on outlet side to a natural stream with vegetated banks.
Width/Diameter (in):	60	
Height (in):	42 (inlet), 36 (outlet)	
Length (ft):	N/A	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Concrete headwalls and wingwalls in good shape. Concrete walled channel that runs between houses.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Rocks	
Depth of Water from Invert (in):	13	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Concrete headwalls and wingwalls in great shape. Outlet opening shorter in height than inlet due to stone/sediment buildup.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Sand/muck/silt	
Depth of Water from Invert (in):	10	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	Y	No significant defects observed.

Overall Condition Ratings	
Culvert:	1
Slope Stability:	2
Surface:	1
Maintenance:	3

1= Excellent

2=Good

3=Fair

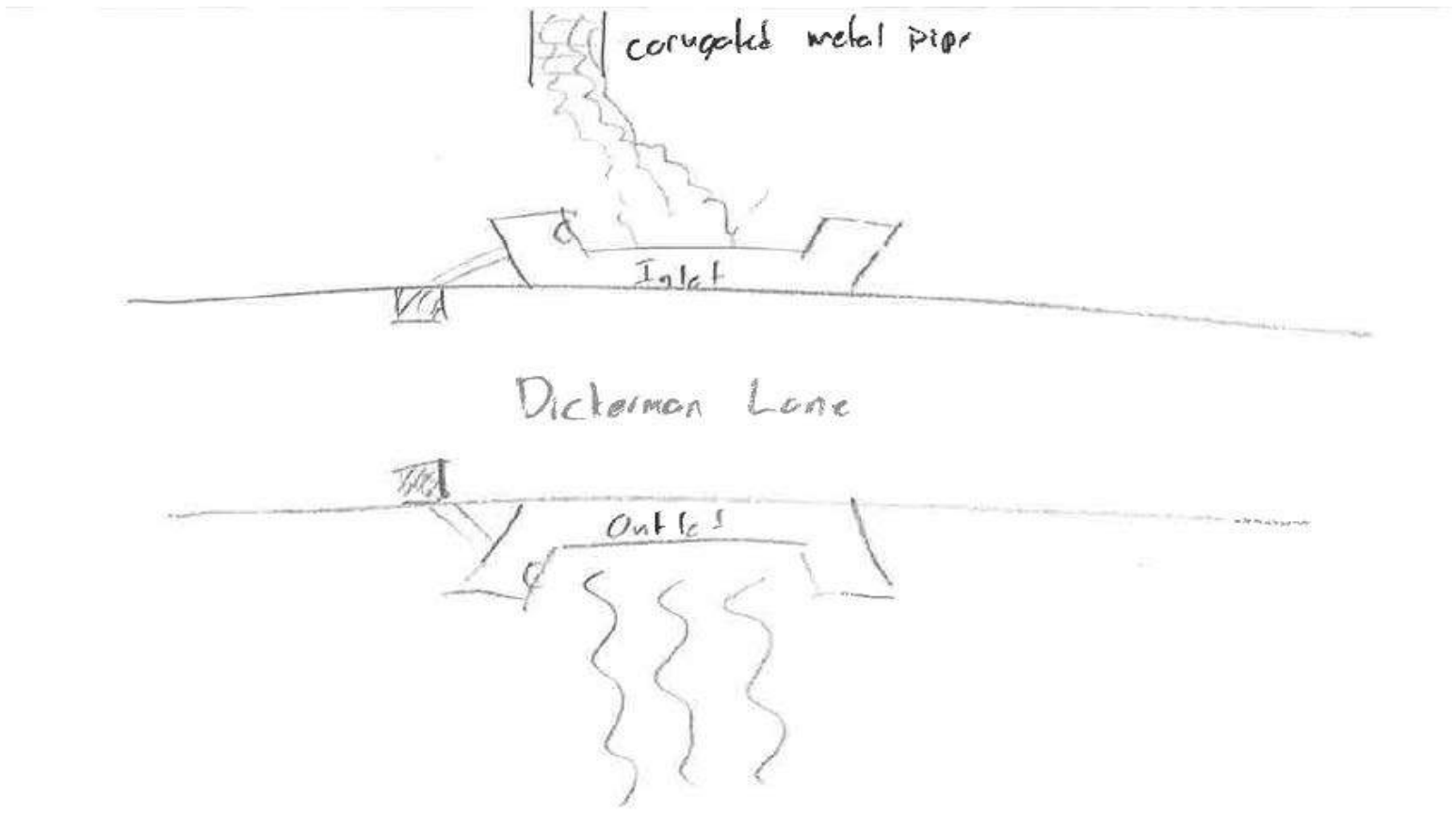
4=Poor

5=Immediate Concern

Additional Notes
Very narrow waterway between houses. Requires careful maintenance. Culvert properly sized.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 17

Sketch



Photos

Inside of culvert at inlet

Inside of culvert at outlet

Corrugated metal pipe by inlet

Culvert at outlet

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 18

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Mollie C.
Job #:	23010598	Date:	5/21/2024
Crossing/Street:	Staten Rd	Time:	10:10
Nearest Address:	47 Staten Rd	Weather:	Sunny
Waterway Name:	N/A	Temp (F):	69

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Box	Excellent condition. Very narrow channel, banks at risk of eroding down into stream. Several connections to culvert: Two catch basins connect to outfalls at wingwalls, two connections into culvert potentially from drainage system, and one other connection into the culvert, source unknown (see sketch).
Width/Diameter (in):	48	
Height (in):	38.5 (inlet), 33 (outle	
Length (ft):	N/A	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Channel banks are eroding from driveway edge. Headwall and wingwalls in excellent condition.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Rocks/sand	
Depth of Water from Invert (in):	8	
Grate? (Y/N):		

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Headwall and wingwalls in excellent condition. Outlet opening shorter in height than inlet due to stone/sediment buildup.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :		
Depth of Water from Invert (in):	6	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	Y	No significant defects observed.

Overall Condition Ratings	
Culvert:	2
Slope Stability:	3
Surface:	1
Maintenance:	3

1= Excellent

2=Good

3=Fair

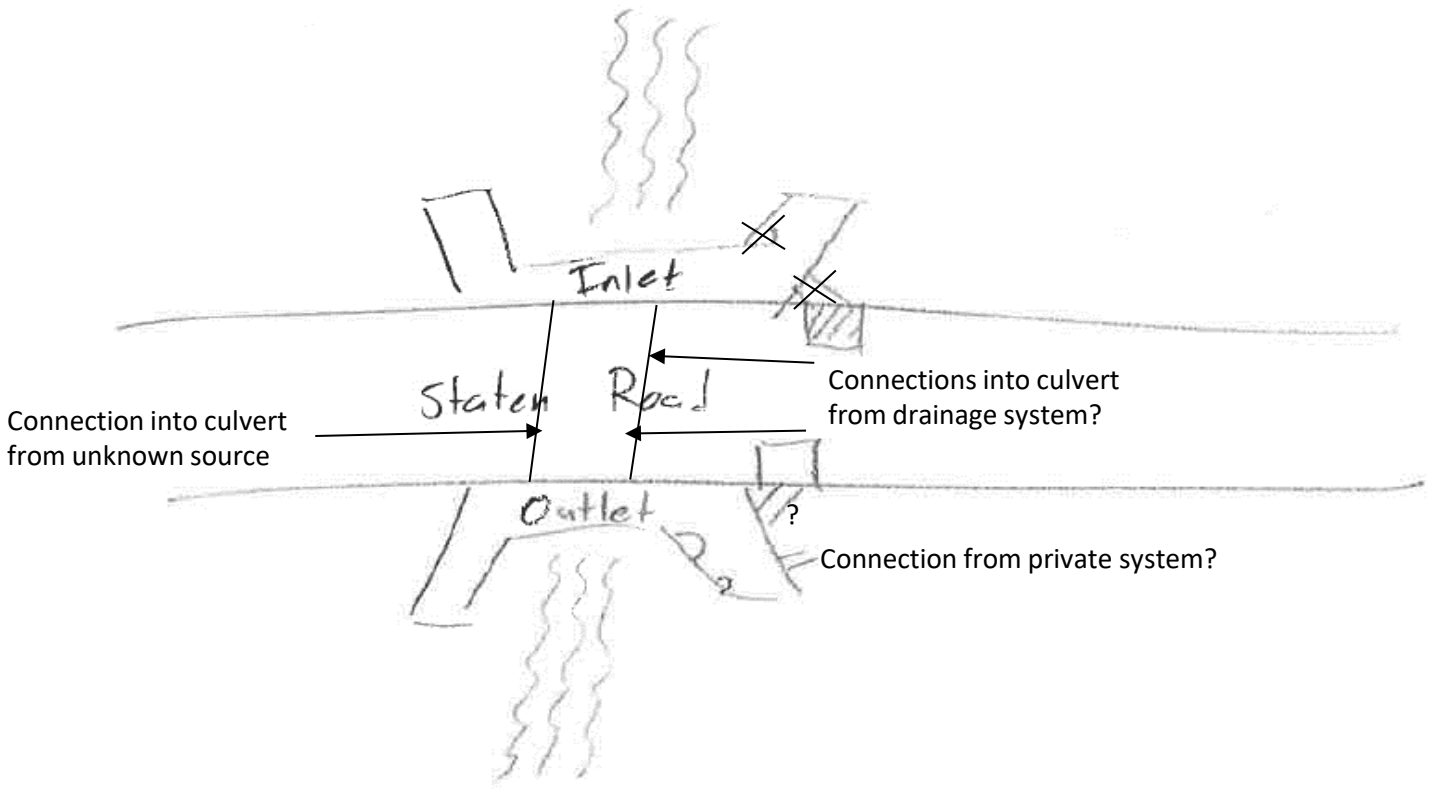
4=Poor

5=Immediate Concern

Additional Notes
Very narrow channel, banks at risk of eroding down into stream. Culvert in good condition and well sized.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 18

Sketch



Photos

Culvert at inlet

Inside of culvert at outlet

Culvert at outlet

Site surface facing inlet

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 19

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Mollie C.
Job #:	23010598	Date:	5/21/2024
Crossing/Street:	Faulkner Pl	Time:	10:30
Nearest Address:	53 Faulkner Pl	Weather:	Sunny
Waterway Name:	N/A	Temp (F):	71

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	CMP	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Round	Roof of culvert is collapsing. Lots of deformation of metal throughout the culvert length. Rocks inside of culvert. Culvert alignment bends halfway down, sagging occurs there. Town recently trimmed back bushes. Requires a lot of maintenance. Very narrow stream channel with banks at risk for erosion into channel.
Width/Diameter (in):	48	
Height (in):	N/A	
Length (ft):	N/A	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete/Stone	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	N	Wingwalls are damaged (separation from road, cracking).
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	7	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	N/A	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	N	Highly overgrown vegetation at outlet. Pipe is squished/deformed down at outlet.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	4	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	Y	Pavement is sagging, cracked, and chunks are missing. Wooden guardrail present.

Overall Condition Ratings	
Culvert:	4
Slope Stability:	4
Surface:	5
Maintenance:	4

1= Excellent

2=Good

3=Fair

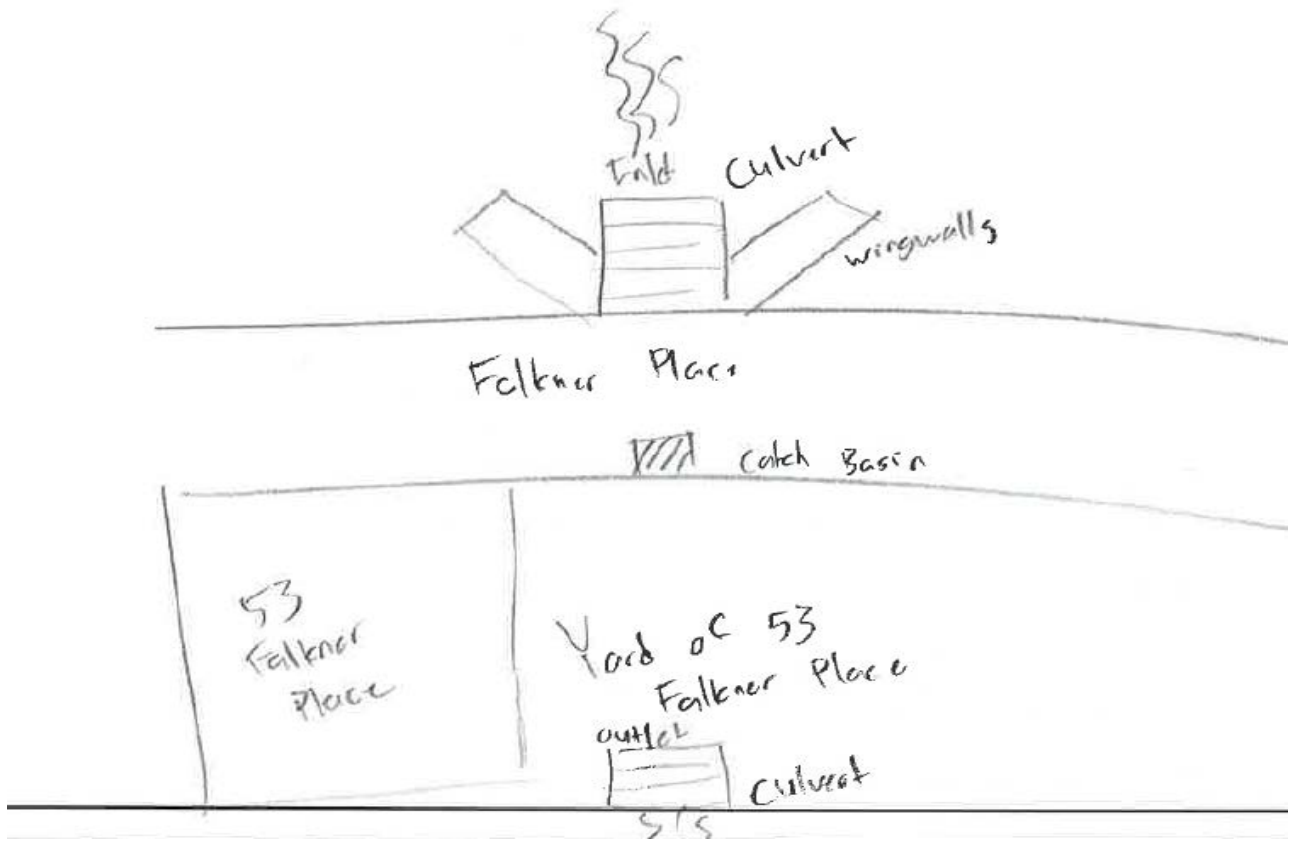
4=Poor

5=Immediate Concern

Additional Notes
Requires a lot of maintenance. Very narrow stream channel with banks at risk for erosion into channel. Culvert pipe in rough shape, roadway in very poor condition.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 19

Sketch



Photos

Inside of culvert at inlet

Culvert at outlet

Culvert at inlet

Site surface facing inlet

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 20

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Mollie C.
Job #:	23010598	Date:	5/21/2024
Crossing/Street:	Middle St	Time:	11:10
Nearest Address:	275 Elm St	Weather:	Sunny
Waterway Name:	Monatiquot River	Temp (F):	72

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Box	No blocks, culvert is in good condition. Length and span are approximate measurements (unable to measure length; span was measured from roadway).
Width/Diameter (in):	N/A	
Height (in):	129	
Length (ft):	51	
Number of Barrels:	2	
Span (ft)	40' 9"	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	No significant defects observed.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	6	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	No significant defects observed.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	6	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	Y	Fence present as guardrail.

Overall Condition Ratings	
Culvert:	1
Slope Stability:	1
Surface:	1
Maintenance:	1

1= Excellent

2=Good

3=Fair

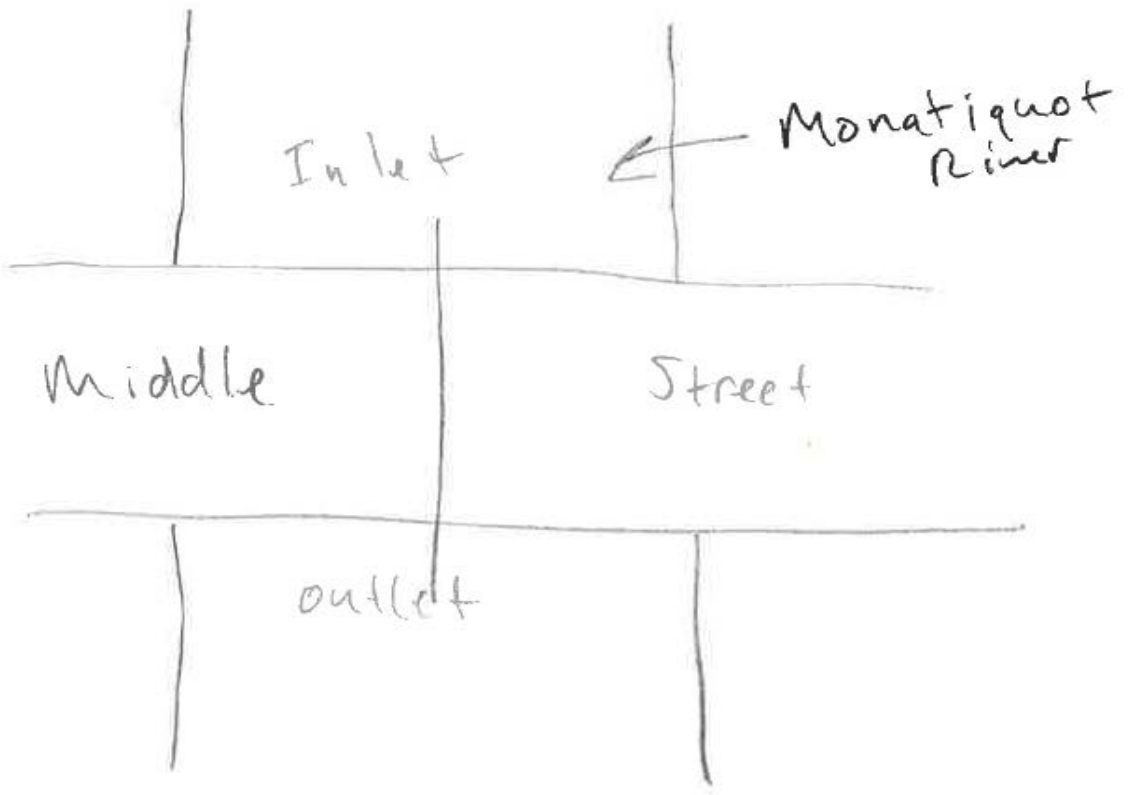
4=Poor

5=Immediate Concern

Additional Notes
Culvert in good condition, well sized.

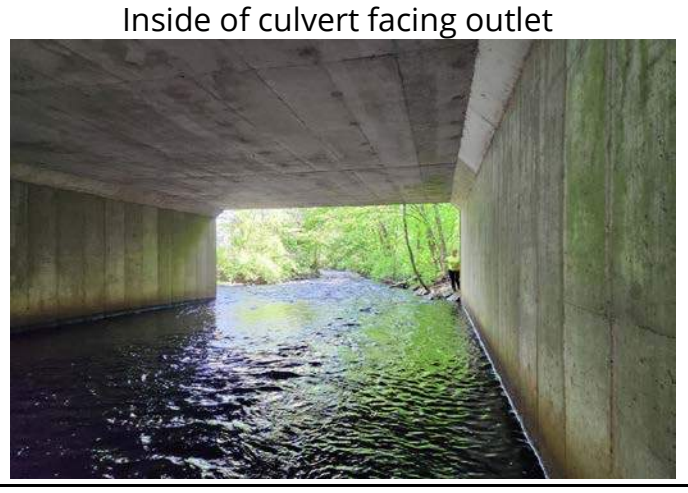
ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 20

Sketch



Photos

Inside of culvert facing outlet



Culvert at outlet

Culvert at inlet

Site surface

	Signature Lauren K Howe Jannazzi	Page 2

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 21

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Mollie C.
Job #:	23010598	Date:	5/21/2024
Crossing/Street:	Old Elm St / Elm St	Time:	11:45
Nearest Address:	329 Old Elm St	Weather:	Sunny
Waterway Name:	N/A	Temp (F):	74

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Round	Culvert diameter is smaller on outlet end than inlet. Could restrict flow. Otherwise in good condition. Headwalls or wingwalls would help with surrounding ground erosion if added. Garbage in outlet area.
Width/Diameter (in):	42 (inlet), 37 (outlet)	
Height (in):	N/A	
Length (ft):	N/A	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	N	Highly overgrown with vegetation at inlet. Lack of headwall causing some erosion of soil and vegetation around inlet.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	6	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	N	Lack of headwall causing erosion of soil around outlet. Almost half full with sediment.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone, sand, silt	
Depth of Water from Invert (in):	12	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	Y	No significant defects observed.

Overall Condition Ratings	
Culvert:	3
Slope Stability:	4
Surface:	1
Maintenance:	5

1= Excellent

2=Good

3=Fair

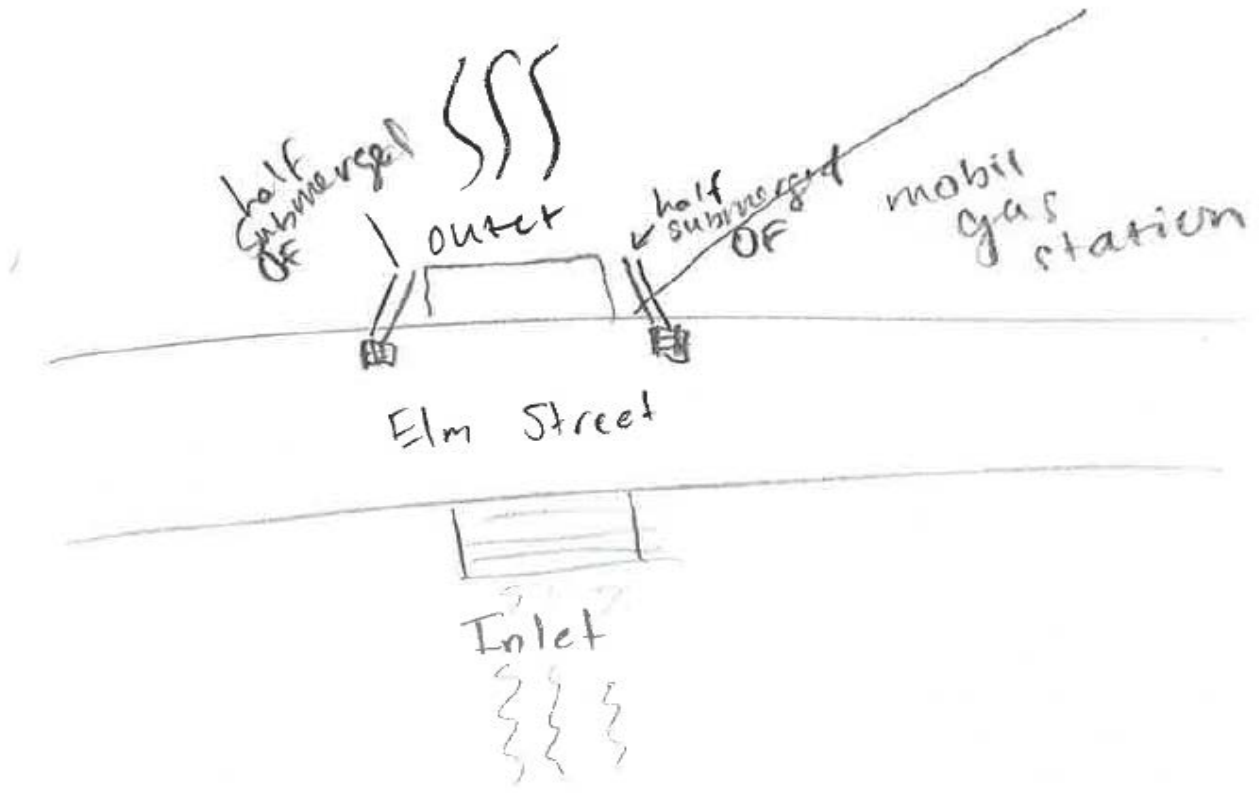
4=Poor

5=Immediate Concern

Additional Notes
Cleanup maintenance needed, trash on outlet side and inlet side overgrown. Erosion present.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 21

Sketch



Photos

Inside of culvert at inlet

Culvert at outlet

Culvert at inlet

Outfall upstream of inlet on Old Elm St

Signature Lauren K Howe Jannazzi

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 22

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Mollie C.
Job #:	23010598	Date:	5/21/2024
Crossing/Street:	Toland Walkway	Time:	14:08
Nearest Address:	120 Gordon Rd	Weather:	Sunny
Waterway Name:	Tributary to Fore River	Temp (F):	83

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Cast iron	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Round	Metal pipes, some light corrosion, but looks like this culvert has not seen water in a while. Slightly perched.
Width/Diameter (in):	8	
Height (in):	N/A	
Length (ft):	19'-3"	
Number of Barrels:	2	
Span (ft)	2 (inlet); 1.5 (outlet)	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	N/A	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	N	Rocks/soil somewhat supporting culvert.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	0	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	N/A	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	N	Rocks/soil somewhat supporting culvert.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	0	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Gravel trail	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	N	Gravel trail in good condition.

Overall Condition Ratings	
Culvert:	3
Slope Stability:	3
Surface:	1
Maintenance:	3

1= Excellent

2=Good

3=Fair

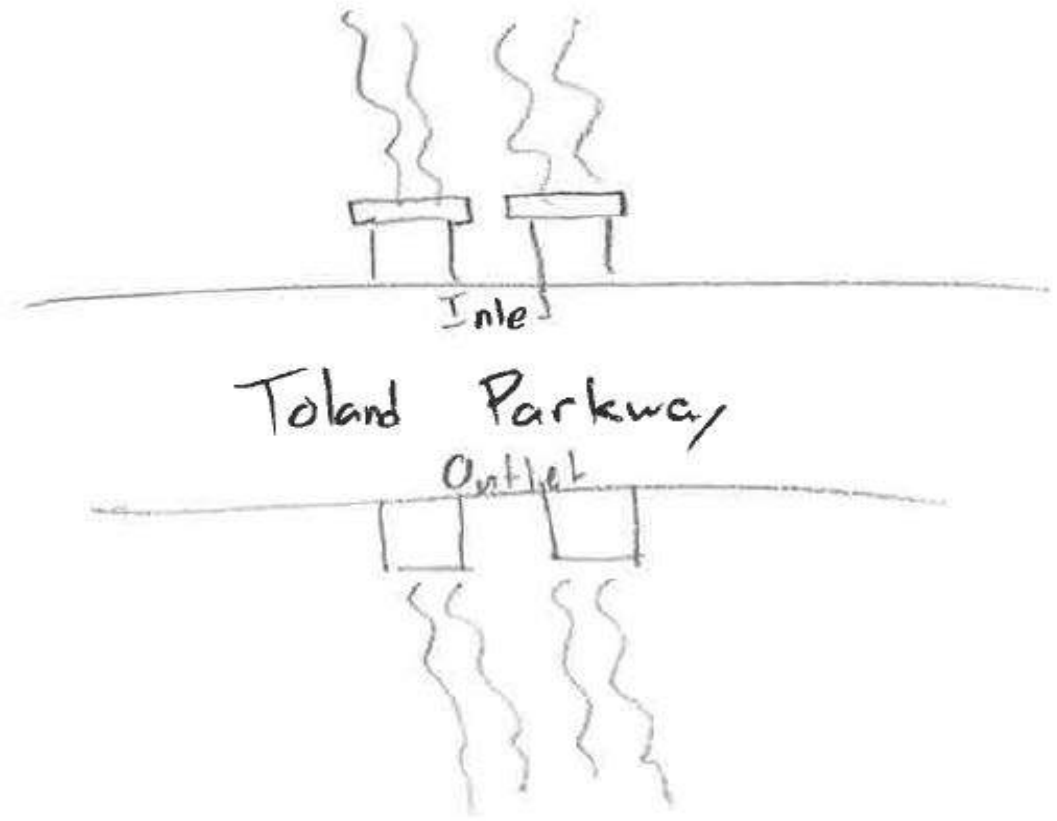
4=Poor

5=Immediate Concern

Additional Notes
No water in "stream". Completely dry. If there was flow the trail could likely flood but doesn't seem to be any. No headwall, but pipes are so small and only foot traffic on trail.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 22

Sketch



Photos

Culvert at inlet

Inside of both culvert barrels at outlet

Culvert at outlet

Site surface (inlet-right, outlet-left)

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 23

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Mollie C.
Job #:	23010598	Date:	5/21/2024
Crossing/Street:	Brookside Rd	Time:	14:39
Nearest Address:	72 Brookside Rd	Weather:	Sunny
Waterway Name:	Smelt Brook	Temp (F):	83

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	CMP	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Arch	Lining on CMP is wearing away and metal pipe is corroding. Perched several feet on outlet side.
Width/Diameter (in):	115	
Height (in):	81	
Length (ft):	N/A	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Wingwalls at angle off headwall. Can see light from the outlet, but cannot see the opening on other end of culvert due to a bend in the culvert alignment.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	5	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Concrete	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Wingwalls are perpendicular to headwall. Outlet is inaccessible. Fence with locked gate. Headwall and wingwall material is concrete.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone/sand	
Depth of Water from Invert (in):	5	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Lawn	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	N	No significant defects observed.

Overall Condition Ratings	
Culvert:	3
Slope Stability:	1
Surface:	1
Maintenance:	1

1= Excellent

2=Good

3=Fair

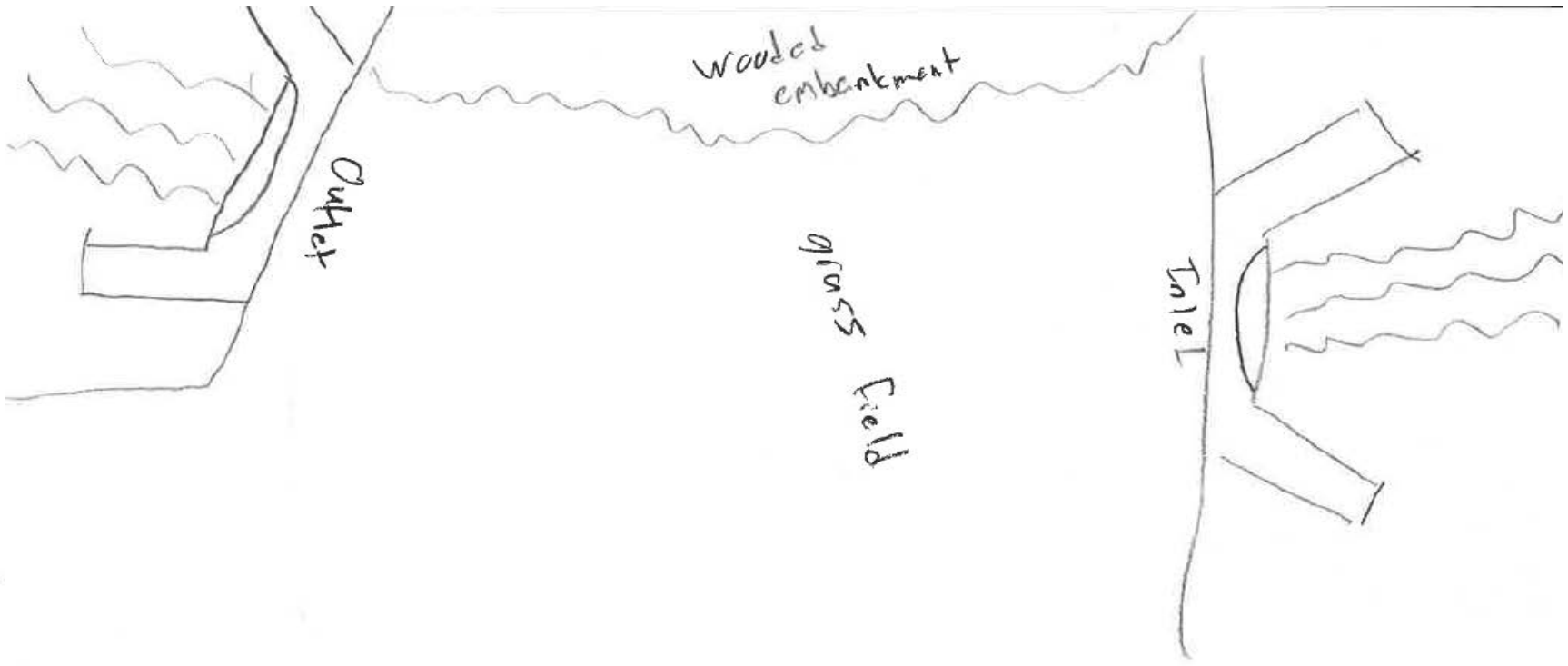
4=Poor

5=Immediate Concern

Additional Notes
Culvert pipe is corroding. Otherwise no issues and sized correctly.

ENVIRONMENTAL PARTNERS — An Apex Company	CULVERT ASSESSMENT FORM	Culvert ID: 23

Sketch



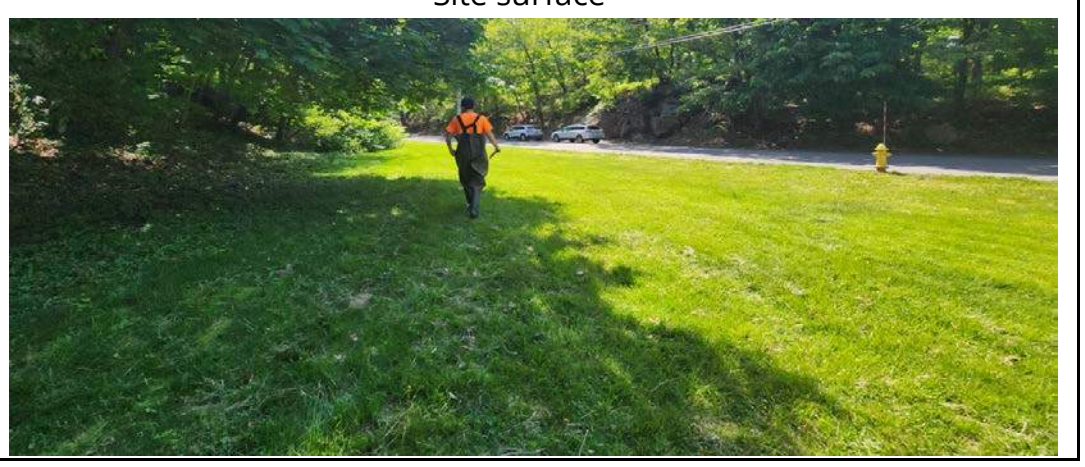
Photos

Inside of culvert at inlet

Culvert at outlet

Culvert at inlet

Site surface



ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 24

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Mollie C.
Job #:	23010598	Date:	5/21/2024
Crossing/Street:	Stetson St	Time:	15:02
Nearest Address:	139 Stetson St	Weather:	Sunny
Waterway Name:	Smelt Brook	Temp (F):	83

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Stone	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Box	Culvert is comprised of stone walls with no mortar, granite slabs laid across the top holding up the earth and road above. Large gaps between granite slabs where earth/vegetation can get through and roadway will settle.
Width/Diameter (in):	83 / 76	
Height (in):	76 / 80	
Length (ft):	N/A	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Stone	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Some mortar present in stone headwall, wearing away a bit. No culvert bottom.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Rock	
Depth of Water from Invert (in):	11	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Stone	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Some mortar present in stone headwall, wearing away a bit. No culvert bottom.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Unk	
Depth of Water from Invert (in):	17	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	Y	Roadway in good condition, but there are large sinkholes off the sides of the road.

Overall Condition Ratings	
Culvert:	5
Slope Stability:	5
Surface:	5
Maintenance:	3

1= Excellent

2=Good

3=Fair

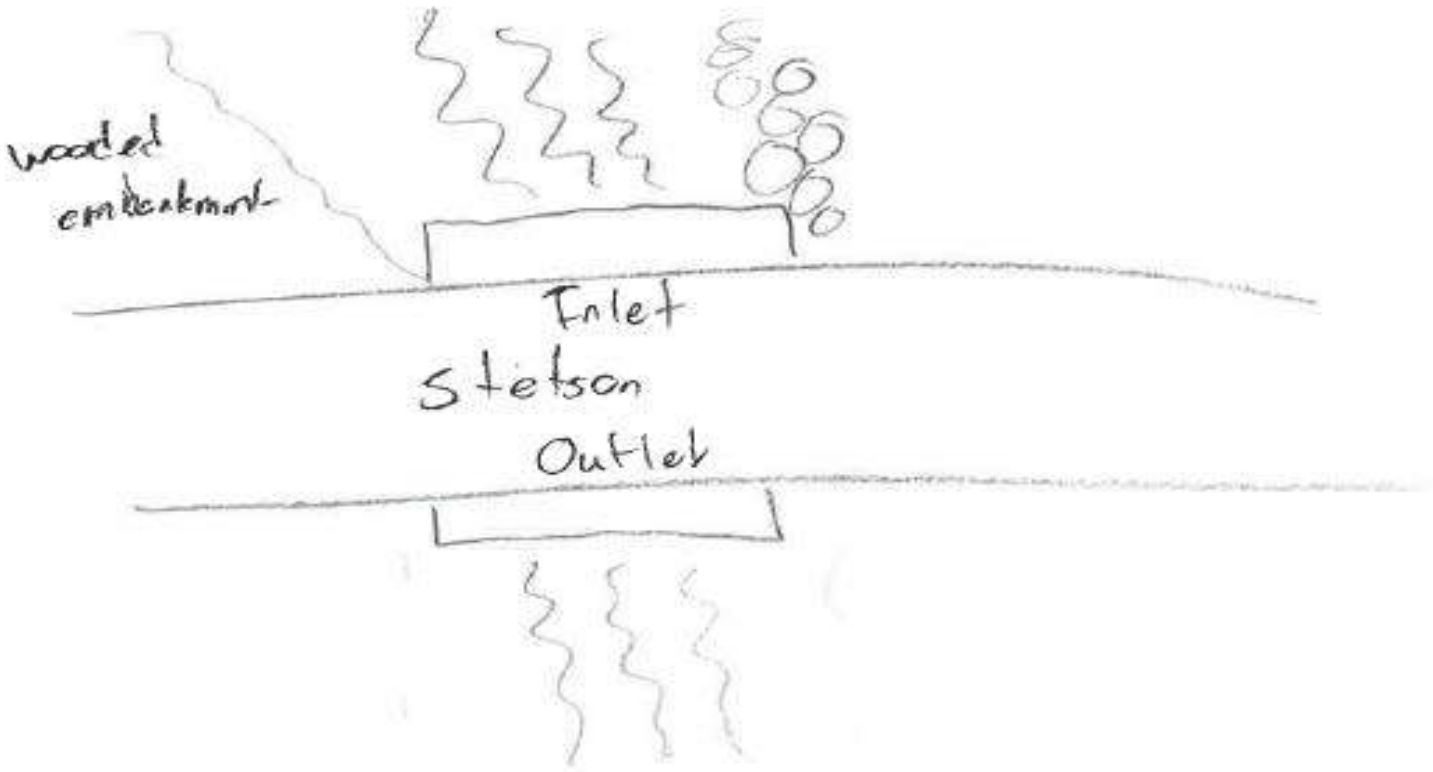
4=Poor

5=Immediate Concern

Additional Notes
Utility pipe going across the culvert width in the culvert on the outlet side. Wood planks surrounding the utility pipe. Culvert showing clear signs of age and should be replaced. Sinkholes present off the edges of the road along the culvert alignment.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 24

Sketch



Photos

Culvert at inlet

Utility pipe on outlet side

Culvert at outlet

Site surface facing outlet

	Signature Lauren K Hone Jannazzi	Page 2

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 25

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Mollie C.
Job #:	23010598	Date:	6/4/2024
Crossing/Street:	Liberty St	Time:	8:52
Nearest Address:	697 Liberty St	Weather:	Sunny
Waterway Name:	N/A	Temp (F):	64

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	Concrete	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Round	Culvert itself is in good shape. Inlet only has an inch or two of water but outlet almost fully submerged. Steep slope or buildup of material in outlet side.
Width/Diameter (in):	36	
Height (in):	N/A	
Length (ft):	N/A	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Stone masonry	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	A lot of organic material and mineral build-up just before inlet. Decent condition of mortar in stone masonry wall.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Mud	
Depth of Water from Invert (in):	1	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Stone masonry	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Root growth in gaps between stone masonry. Lacking mortar in stone masonry wall. There is some erosion around the wall. Outlet pipe almost 2/3 submerged with water/sediment.
Wingwalls? *(Y/N):*	Y	
Bed Material *(Stone, Sand, Mud, etc.)* :	Sand	
Depth of Water from Invert (in):	10	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	Y	No significant defects observed.

Overall Condition Ratings	
Culvert:	2
Slope Stability:	3
Surface:	1
Maintenance:	3

1= Excellent

2=Good

3=Fair

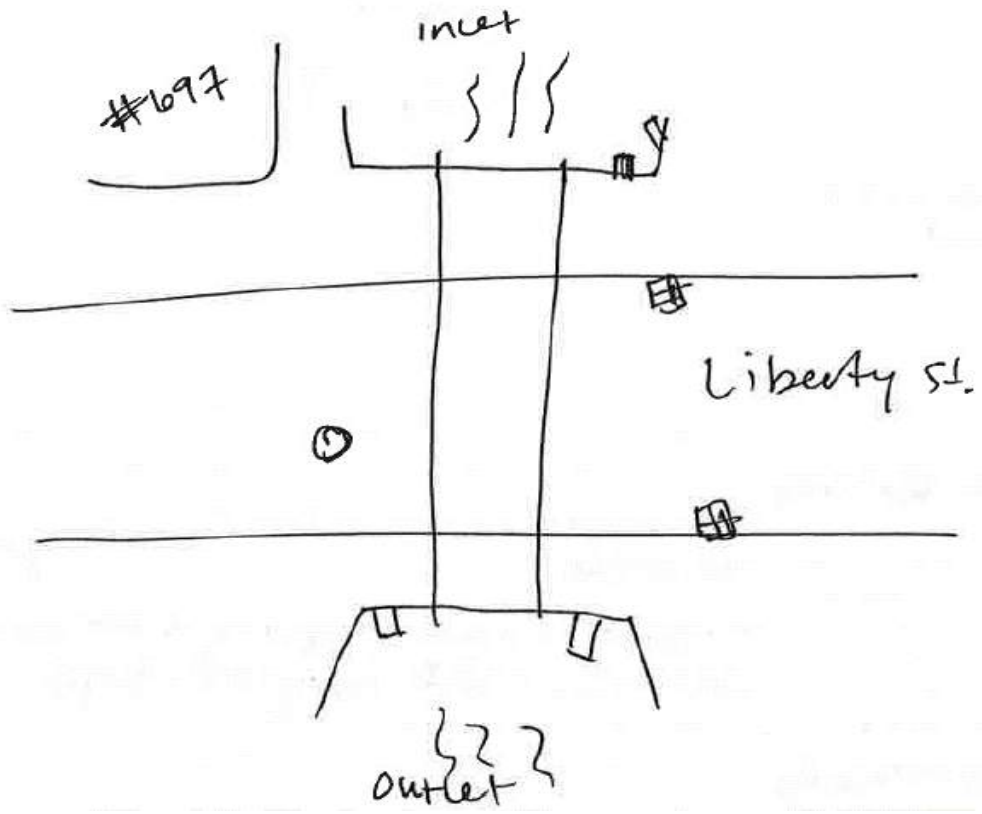
4=Poor

5=Immediate Concern

Additional Notes
Culvert has branches and dirt built up in the pipe and at the inlet side, needs to be cleaned out.

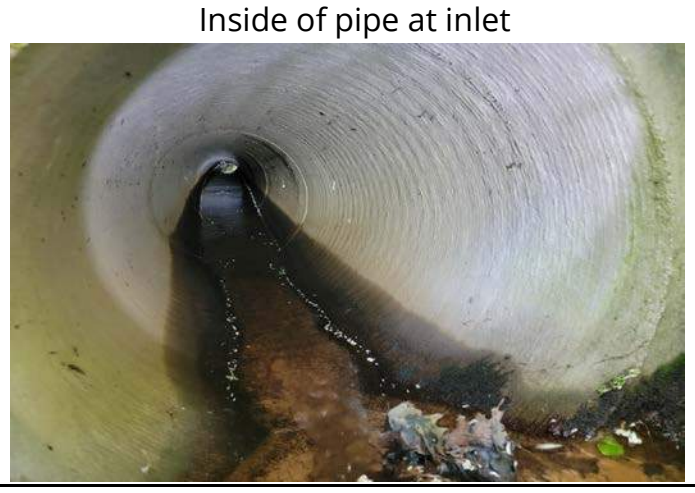
ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 25

Sketch



Photos

Inside of pipe at inlet



Site at inlet

Culvert at inlet

Culvert at outlet

	Signature Lauren K Home Jannazzi	Page 2

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 26

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Mollie C.
Job #:	23010598	Date:	6/4/2024
Crossing/Street:	Pond Meadow Park Trail	Time:	9:35
Nearest Address:	Pond Meadow Park	Weather:	Sunny
Waterway Name:	Smelt Brook	Temp (F):	66

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	CMP	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Arch	Metal culvert is in poor condition. Arch shape with no bottom. Corrosion along bottom edges of CMP.
Width/Diameter (in):	86	
Height (in):	N/A	
Length (ft):	N/A	
Number of Barrels:	2	
Span (ft)	185	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Stone and wire mesh	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Metal wire mesh is containing small stones that make up the wall. Sagging in and around culverts, clearly settling over time.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	15	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Stone and wire mesh	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Metal wire mesh is containing small stones that make up the wall. Sagging in and around culverts, clearly settling over time.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone	
Depth of Water from Invert (in):	15	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	Y	Pavement is sagging in and around culverts. Wooden fence along either side of paved trail is also sagging.

Overall Condition Ratings	
Culvert:	5
Slope Stability:	5
Surface:	5
Maintenance:	3

1= Excellent

2=Good

3=Fair

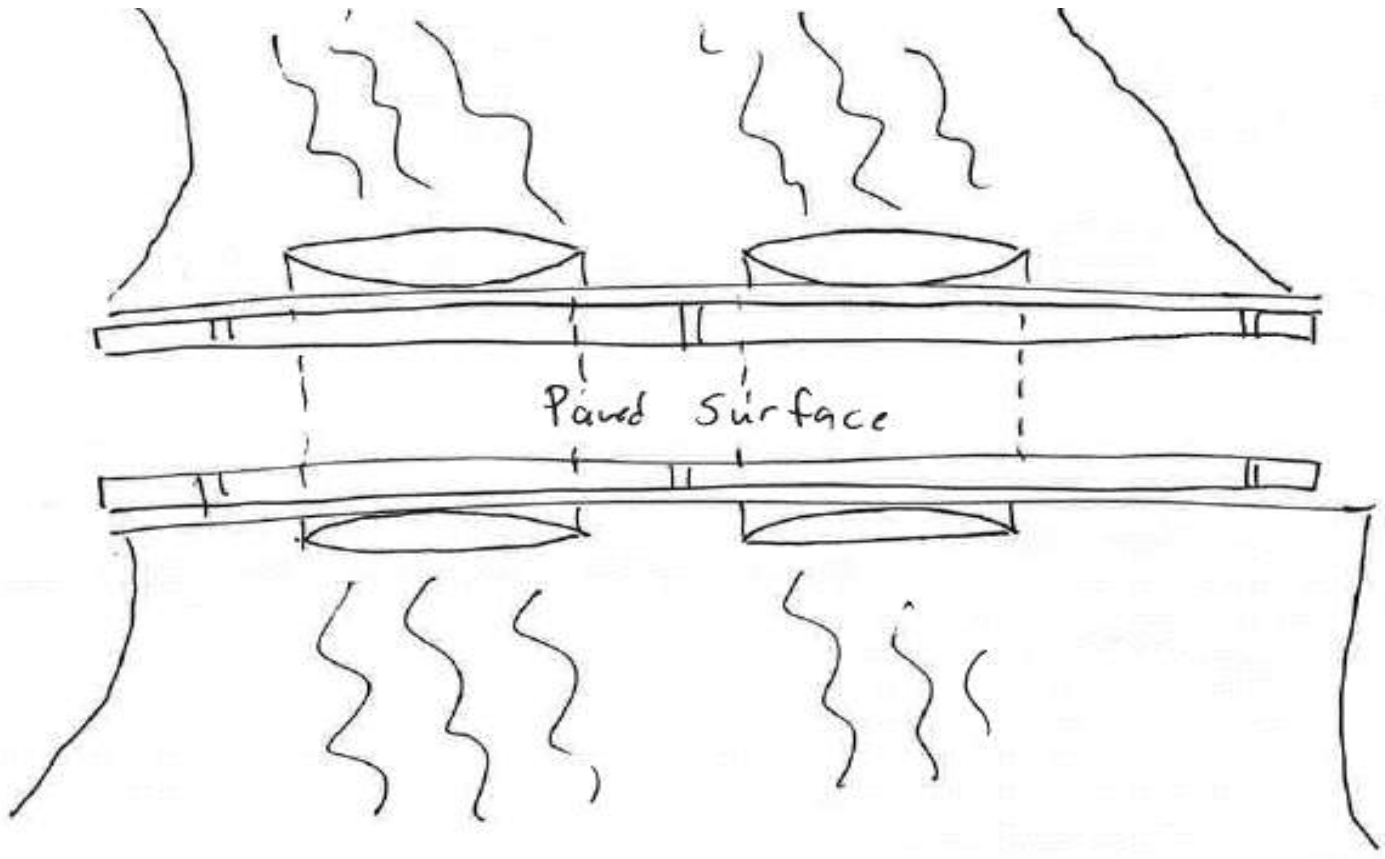
4=Poor

5=Immediate Concern

Additional Notes
Pipe corroding and the headwall / pedestrian bridge is a safety concern.

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 26

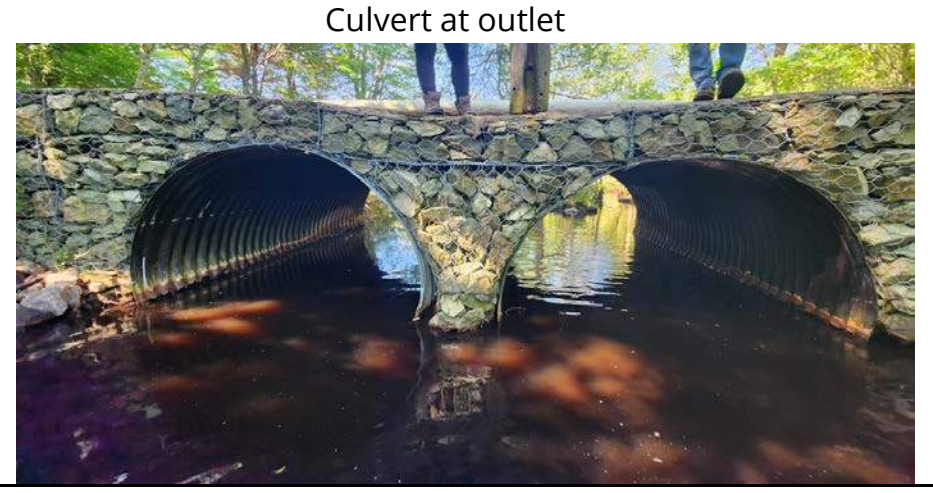
Sketch



Photos

Culvert at inlet

Culvert at outlet



Inside of culvert at inlet

Site surface

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 27

Project Title:	Braintree Culvert Assessment Program	Crew Name(s):	Lauren H. & Mollie C.
Job #:	23010598	Date:	6/4/2024
Crossing/Street:	Pond Meadow Park Trail	Time:	10:05
Nearest Address:	Pond Meadow Park	Weather:	Sunny
Waterway Name:	Smelt Brook	Temp (F):	68

Culvert		Notes
Material *(Concrete, Stone, Brick, Metal, etc.)* :	CMP	*ex: Blockage, Deformation, Cracking, Corrosion, etc.*
Shape *(Round, Elliptical, Box, Arch, etc.)* :	Round	Bottom heavily corroded. Deformed by weight of headwalls and trail above, more at outlet side. Inlet flow comes from dam. Some branches in stream we cleared out.
Width/Diameter (in):	52	
Height (in):	42 (inlet) 32 (outlet)	
Length (ft):	N/A	
Number of Barrels:	1	
Span (ft)	N/A	

Inlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Stone	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Large boulder/stones loosely laid around inlet for support.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stones and muck	
Depth of Water from Invert (in):	9	
Grate? (Y/N):	N	

Outlet		Notes
Material *(Concrete, Stone, Masonry, etc.)* :	Stone	*ex: Cracking, Settlement, Scouring, Evidence of Flooding, etc.*
Headwall? *(Y/N):*	Y	Large boulder/stones loosely laid around outlet for support.
Wingwalls? *(Y/N):*	N	
Bed Material *(Stone, Sand, Mud, etc.)* :	Stone and muck	
Depth of Water from Invert (in):	6	
Grate? (Y/N):	N	

Surface		Notes
Surface Type *(Paved, Gravel, Dirt, etc.)* :	Paved	*ex: Pavement Cracking, Potholes, Sinkholes, Guardrail Damage, etc.*
Guardrail Present? *(Y/N) :*	Y	Paved trail in good condtion, no sagging. Some cracking could be due to settlement of headwalls and culvert but difficult to tell. Wooden post fence on either side of trail in good condition.

Overall Condition Ratings	
Culvert:	5
Slope Stability:	5
Surface:	3
Maintenance:	2

1= Excellent

2=Good

3=Fair

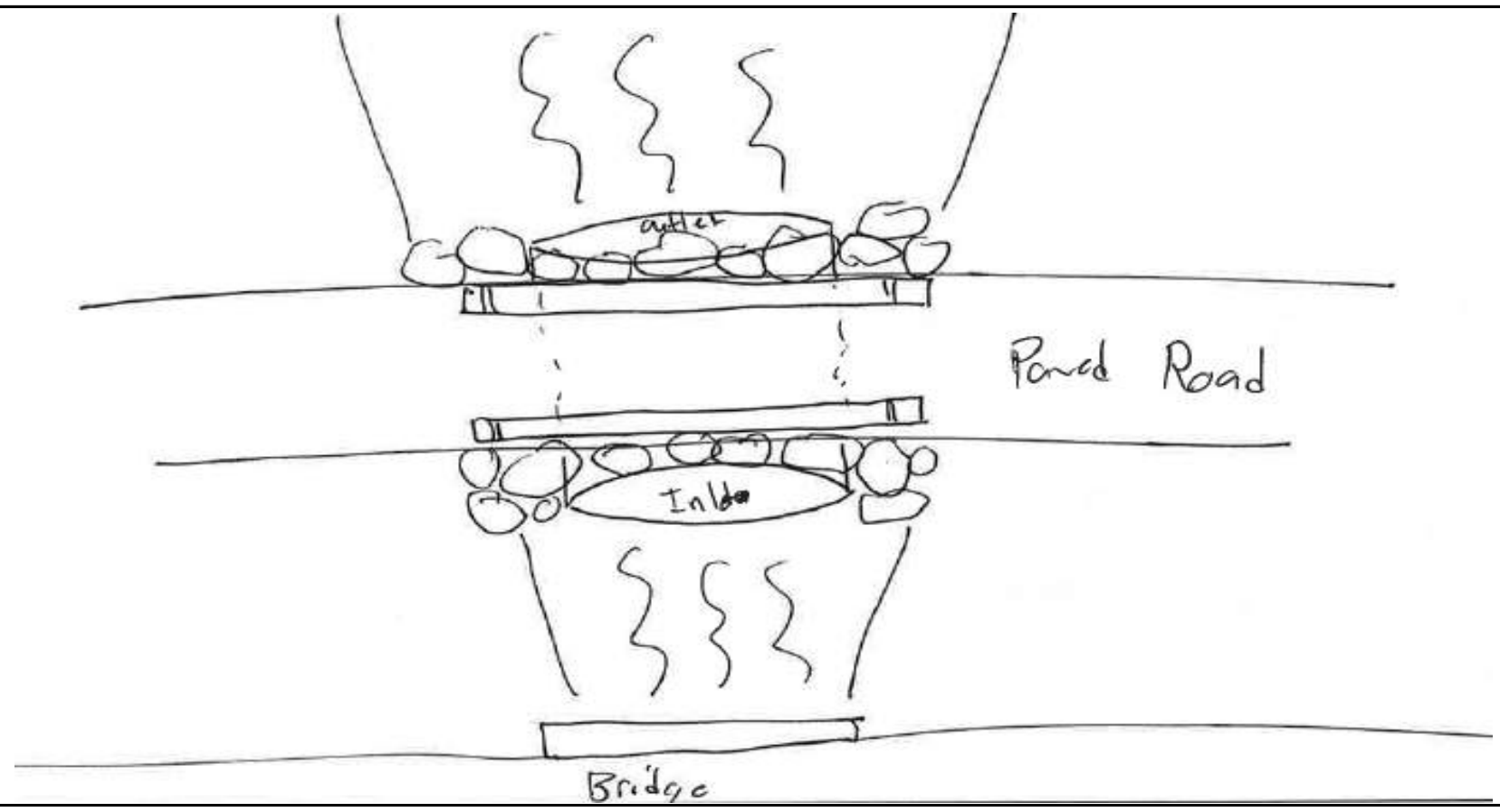
4=Poor

5=Immediate Concern

Additional Notes
N/A

ENVIRONMENTAL PARTNERS — An Apex Company —	CULVERT ASSESSMENT FORM	Culvert ID: 27

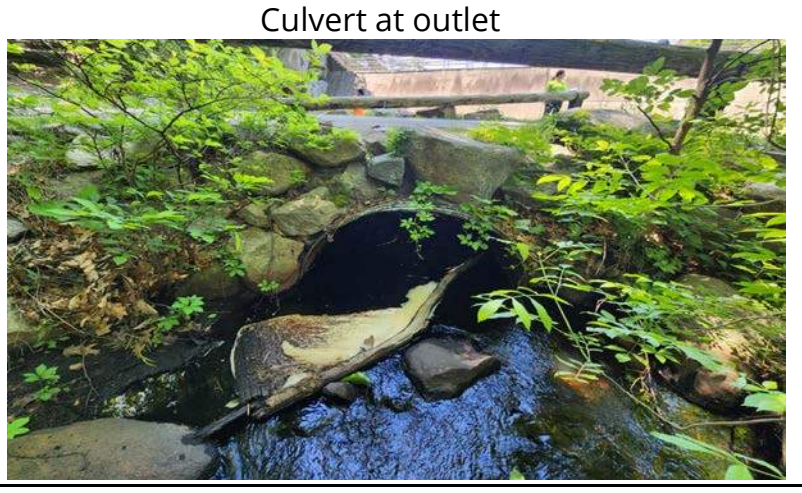
Sketch



Photos

Inside of culvert at inlet

Culvert at outlet



Culvert at inlet

Site surface

	Signature Lauren K Home Jannizzi	Page 2

ATTACHMENT 2

Likelihood of Failure (LoF) Subcategories

	1	2	3	4	5
Culvert (30%)	Excellent Condition	Good Condition	Fair Condition	Poor Condition	Immediate Concern
Slope Stabilization (40%)	Excellent Condition	Good Condition	Fair Condition	Poor Condition	Immediate Concern
Surface (10%)	Excellent Condition	Good Condition	Fair Condition	Poor Condition	Immediate Concern
Capacity (20%)	Existing culvert capacity able to carry greater than 100yr24hr flow	Existing culvert capacity able to carry 100yr24hr flow	2 existing culverts required to carry 100yr24hr flow	3 existing culverts required to carry 100yr24hr flow	4+ existing culverts required to carry 100yr24hr flow

ATTACHMENT 3

Consequence of Failure (CoF) Subcategories

	1	2	3	4	5
Flooding (25%)	No Flood Damage	Minor Flood Damage	Flood Damage	Major Flood Damage	Catastrophic Flood Damage
Road (20%)	Trail/Path or Not Trafficked	Residential/Local Road with Low Traffic	Residential Road with Some Traffic	Major Road, Heavily Trafficked	Major Road, Very Heavily Trafficked
Utilities (20%)	No utilities nearby		Utilities nearby		Utilities crossing culvert
Historical Areas (5%)	No Historical Areas Nearby		Historical Areas Nearby		Within Historical Area
EJ Communities (10%)	Not within an EJ Community		Within a "Minority" EJ Community		Within a "Minority and Income" EJ Community
Gov/School Buildings (20%)	No Government or School Buildings Nearby		Government or School Buildings Nearby		Within Government or School Buildings Parcel

ATTACHMENT 4

Criticality Scores

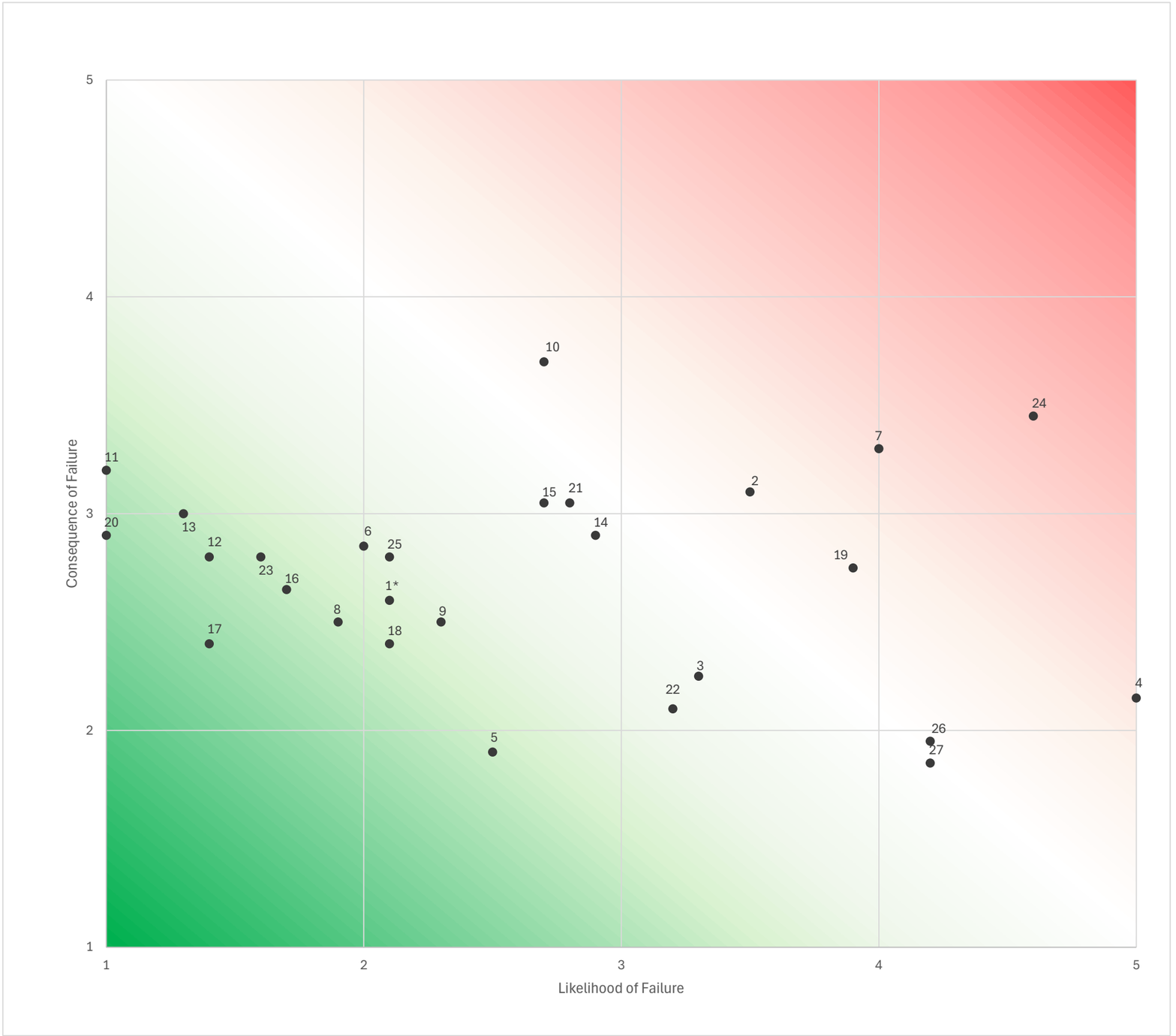
Culvert ID	Existing Culvert Size and Material	Street Crossing	Likelihood of Failure (LoF)					Consequence of Failure (CoF)							Criticality Score
			Culvert (30%)	Slope Stability (40%)	Surface (10%)	Capacity (20%)	LoF	Flooding (25%)	Roads (20%)	Utilities (20%)	Historical Areas (5%)	EJ Communities (10%)	Gov Buildings & Schools (20%)	CoF	
24	7'x7' Stone	Stetson St	5	5	5	3	**4.60**	4	4	5	3	3	1	**3.45**	**4.03**
7	48" CMP	Pearl St	5	5	1	2	**4.00**	3	5	5	1	3	1	**3.3**	**3.65**
4	18" CMP	Easement / Trail off St. Claire St	5	5	5	5	**5.00**	4	1	3	1	1	1	**2.15**	**3.58**
19	48" CMP	Faulkner Pl	4	4	5	3	**3.90**	4	1	5	1	3	1	**2.75**	**3.33**
2	48" RCP	Liberty St	3	4	2	4	**3.50**	3	5	5	1	1	1	**3.1**	**3.30**
10	(2 Barrel) 24" RCP	Pond St	1	3	2	5	**2.70**	3	5	5	1	3	3	**3.7**	**3.20**
26	(2 Barrel) 7' CMP	Pond Meadow Park Trail	5	5	5	1	**4.20**	4	1	1	1	3	1	**1.95**	**3.08**
27	42" CMP	Pond Meadow Park Trail	5	5	3	2	**4.20**	2	1	3	1	3	1	**1.85**	**3.03**
21	42" RCP	Old Elm St / Elm St	3	4	1	1	**2.80**	2	5	3	1	3	3	**3.05**	**2.93**
14	24" RCP	Chickatawbut Rd	2	4	1	3	**2.90**	3	5	3	5	1	1	**2.9**	**2.90**
15	10.5'x2.5' Concrete	Walnut St	2	4	1	2	**2.70**	2	3	5	1	3	3	**3.05**	**2.88**
3	(2 Barrel) 24" RCP	Old Liberty St	4	4	1	2	**3.30**	2	2	5	1	1	1	**2.25**	**2.78**
22	(2 Barrel) 8" CI	Toland Walkway	3	3	1	5	**3.20**	3	1	3	1	3	1	**2.1**	**2.65**
25	36" RCP	Liberty St	2	3	1	1	**2.10**	1	5	5	1	3	1	**2.8**	**2.45**
6	36" RCP	John Mahar Hwy	2	1	2	4	**2.00**	2	5	3	1	5	1	**2.85**	**2.43**
9	24" RCP	John W Leroy Jr Way	2	2	3	3	**2.30**	3	3	1	1	3	3	**2.5**	**2.40**
1*	24" PVC	Wildwood Ave	2	3	1	1	**2.10**	1	3	5	1	1	3	**2.6**	**2.35**
18	4'x3' Concrete	Staten Rd	2	3	1	1	**2.10**	1	3	5	1	3	1	**2.4**	**2.25**
5	48" RCP	Braintree Cemetery Driveway	2	4	1	1	**2.50**	1	2	3	3	3	1	**1.9**	**2.20**
8	24" RCP	John W Leroy Jr Way	3	1	2	2	**1.90**	3	3	1	1	3	3	**2.5**	**2.20**
23	9.5'x7'CMP Arch	Brookside Rd	3	1	1	1	**1.60**	1	4	3	5	3	3	**2.8**	**2.20**
16	11'x3.5' Concrete	Acorn St	2	2	1	1	**1.70**	2	3	5	1	3	1	**2.65**	**2.18**
13	16'x7' Concrete	Lundquist Dr	2	1	1	1	**1.30**	1	4	5	1	3	3	**3**	**2.15**
12	(2 Barrel) 15'x5' Concrete	Pond St	1	2	1	1	**1.40**	1	5	5	1	3	1	**2.8**	**2.10**
11	16'x7.5' Concrete	Granite St	1	1	1	1	**1.00**	1	5	5	1	3	3	**3.2**	**2.10**
20	(2 Barrel) 11'x4' Concrete	Middle St	1	1	1	1	**1.00**	1	5	5	3	3	1	**2.9**	**1.95**
17	5'x3.5' Concrete	Dickerman Ln	1	2	1	1	**1.40**	1	3	5	1	3	1	**2.4**	**1.90**

Legend

1	Very low likelihood of culvert failure and/or very low consequences of culvert failure
2	
3	
4	
5	Very high likelihood of culvert failure and/or high consequences of culvert failure; immediate concern

**Example Calculation:*
Likelihood of Failure: 0.3(2)+0.4(3)+0.1(1)+0.2(1)= 2.10
Consequence of Failure: 0.25(1)+0.2(3)+0.2(5)+0.05(1)+0.1(1)+0.2(3) = 2.60
Criticality Score: 0.5(2.10)+0.5(2.6) = 2.35

Figure 1. Criticality Analysis



ATTACHMENT 5

Culvert Map

QUINCY

RANDOLPH

WEYMOUTH

HOLBROOK

Braintree Town Boundary
Adjacent Town Boundaries
Roads
Braintree Culverts
1.75
3.58
Not Inspected

ENVIRONMENTAL PARTNERS
— An Apex Company —

TOWN OF BRAINTREE · INCORPORATED · 1640 · MASSACHUSETTS

Figure 1

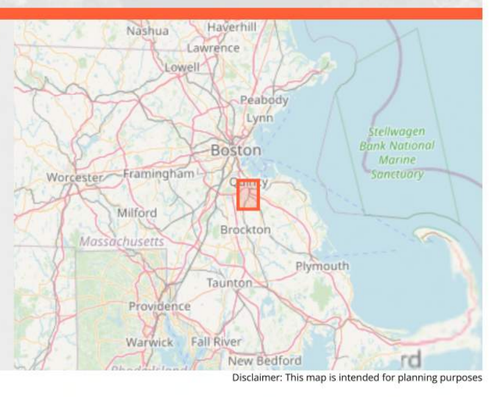
Culverts Map

Braintree, MA

7/22/2024

0 1,200 2,400 4,800

1"=1,200' Feet



I:\Braintree.153\23010598 - Culvert Assessment Program\03 GIS\Maps\Braintree Culvert Map

Disclaimer: This map is intended for planning purposes

ATTACHMENT 6

Capital Improvements Priority List

Priority #	Culvert ID	Criticality Score	Exist. Culvert Size and Mat.	Street Crossing	Proposed Capital Improvements*	Preliminary Budgetary Costs**
1	24	4.03	7'x7' Stone	Stetson St	• Replace culvert with 18' x 6' arch culvert with twice the capacity. • Install headwalls and wingwalls. • Replace failing headwall upstream of culvert. • Preliminary design completed June 2020.	$3,310,000.00
2	7	3.65	48" CMP	Pearl St	• Replace the culvert with 5'x3' concrete box culvert meeting stream crossing standards with an adjusted alignment. • Install headwalls and wingwalls. • Regrade stream banks to prevent further erosion.	$1,160,000.00
3	4	3.58	18" CMP	Easement / Trail off St. Claire St	• Demolish culvert and daylight the culvert to existing stream conditions.	$510,000.00
4	19	3.33	48" CMP	Faulkner Pl	• Replace culvert with 8'x4' box culvert meeting stream crossing standards. • Install headwalls and wingwalls.	$1,120,000.00
5	2	3.30	48" RCP	Liberty St	• Replace culvert with 8'x5' box culvert meeting stream crossing standards. • Install headwalls and wingwalls.	$850,000.00
6	10	3.20	(2 Barrel) 24" RCP	Pond St	• Replace culvert with 8'x4' box culvert meeting stream crossing standards. • Install headwalls and wingwalls.	$960,000.00
7	26	3.08	(2 Barrel) 7' CMP	Pond Meadow Park Trail	• Slipline the 7' CMP culverts with temporary PVC pipe. • Reconstruct the headwall.	$740,000.00
8	27	3.03	42" CMP	Pond Meadow Park Trail	• Line 42" CMP culvert with a cast-in-place liner.	$270,000.00
9	21	2.93	42" RCP	Old Elm St / Elm St	• Install headwalls and wingwalls on either end of existing culvert.	$610,000.00
10	14	2.90	24" RCP	Chickatawbut Rd	• Replace culvert with 3'x2' box culvert meeting stream crossing standards. • Replace headwall/wingwalls.	$650,000.00
11	15	2.88	10.5'x2.5' Concrete	Walnut St	• Provide slope support on downstream end of culvert. • Re-grade downstream channel to remove hydraulic restrictions.	$250,000.00
12	3	2.78	(2 Barrel) 24" RCP	Old Liberty St	• Replace with 5'x3' concrete box culvert meeting stream crossing standards. • Install headwalls and wingwalls.	$570,000.00
13	22	2.65	(2 Barrel) 8" CI	Toland Walkway	• Replace with 3' diameter RCP culvert. • Install headwalls and wingwalls.	$310,000.00
15	6	2.43	36" RCP	John Mahar Hwy	• Replace with 6'x4' concrete box culvert meeting stream crossing standards. • Install headwalls and wingwalls.	$1,130,000.00
17	1	2.35	24" PVC	Wildwood Ave	• Replace stone/granite slabs used for slope stabilization with concrete headwall and wingwalls.	$150,000.00
20	8	2.20	24" RCP	John W Leroy Jr Way	• Line the 24" RCP culvert with a cast-in-place liner if joint separation worsens.	$610,000.00
21	23	2.20	9.5'x7' CMP Arch	Brookside Rd	• Line the 9.5'x7' CMP Arch Culvert with a cast-in-place liner.	$1,910,000.00

*Improvements are based on preliminary hydraulic assessments by Environmental Partners. A Hydrologic-Hydraulic Model, review of MassDEP Stream Crossing Standards, and further review of existing constraints should be completed to size the culvert.
**Costs are budgetary order of magnitude Engineering and Construction costs based on Environmental Partners experience with past culvert projects. Additional design analysis is required to develop actual costs. Costs include a 40% contingency.

ATTACHMENT 7

Maintenance List

Culvert ID	Existing Culvert Size and Mat.	Street Crossing	Maintenance Ranking	Maintenance
ALL CULVERTS	N/A	N/A	N/A	• Inspect culvert bi-annually, prior to winter conditions and after spring wet season. Remove leaves, debris and inspect headwall/wingwalls and pipe conditions.
4	18" CMP	Easement / Trail off St. Claire St	5	• Continue to remove vegetative growth near inlets and outlets until culvert can be daylighted or replaced.
21	42" RCP	Old Elm St / Elm St	5	• Remove vegetative growth from inlet. • Clean up garbage on outlet side.
7	48" CMP	Pearl St	4	• CCTV inspect the culvert to confirm the integrity of the entire culvert length and source of unknown pipe connections.
14	24" RCP	Chickatawbut Rd	4	• Remove branches and debris from inlet side.
15	10.5'x2.5' Concrete	Walnut St	4	• Remove any debris or other flow restrictions near outlet until the downstream channel can be regraded to remove hydraulic restrictions.
19	48" CMP	Faulkner Pl	4	• CCTV inspect the culvert to confirm the integrity of the entire culvert length and to further investigate sources of incoming pipes. • Remove vegetative growth from outlet.
2	48" RCP	Liberty St	3	• Remove vegetative growth near inlets and outlets.
3	(2 Barrel) 24" RCP	Old Liberty St	3	• Remove vegetative growth near inlets and outlets.
6	36" RCP	John Mahar Hwy	3	• Remove trash and debris in upstream and downstream streambeds. • Remove vegetative growth. • Locate source of orange, oily substance.
10	(2 Barrel) 24" RCP	Pond St	3	• Remove vegetative growth near inlets and outlets.
16	11'x3.5' Concrete	Acorn St	3	• Provide an access gate to the fence enclosing the culvert outlet and stream. • Remove vegetative growth from stream, inlets and outlets.
17	5'x3.5' Concrete	Dickerman Ln	3	• Remove vegetative growth near inlet and CMP pipe section just upstream of the culvert. • Remove sediment and stone buildup at outlet side of culvert to remove hydraulic restrictions.
18	4'x3' Concrete	Staten Rd	3	• CCTV inspect the culvert to investigate the source of unknown pipe connections. • Remove sediment and stone buildup at outlet side of culvert to remove hydraulic restrictions.
22	(2 Barrel) 8" CI	Toland Walkway	3	• Remove vegetative growth from outlet.
24	7'x7' Stone	Stetson St	3	• N/A
25	36" RCP	Liberty St	3	• Remove branches and debris from inlet side.
26	(2 Barrel) 7' CMP	Pond Meadow Park Trail	3	• N/A
5	48" RCP	Braintree Cemetery Driveway	2	• N/A
8	24" RCP	John W Leroy Jr Way	2	• N/A
9	24" RCP	John W Leroy Jr Way	2	• N/A
12	(2 Barrel) 15'x5' Concrete	Pond St	2	• N/A
13	16'x7' Concrete	Lundquist Dr	2	• Parge the headwalls and wingwall joints with hydraulic cement.
27	42" CMP	Pond Meadow Park Trail	2	• N/A
1	24" PVC	Wildwood Ave	1	• N/A
11	16'x7.5' Concrete	Granite St	1	• N/A
20	(2 Barrel) 11'x4' Concrete	Middle St	1	• N/A
23	9.5'x7' CMP Arch	Brookside Rd	1	• N/A