# Watershed Assessment Report

## Appendix C: Sub-watershed Investigation Supporting Materials

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C.1. Withers Basin Delineation: Sub-watershed Field Survey Maps

For ease of viewing for the readership, the sub-watershed field survey maps provided within this appendix illustrate aerial imagery, roadway infrastructure and ownership, and sub-watershed boundaries.
C.1.1. Withers Basin Delineation: Sub-watershed 1
C.1.2. Withers Basin Delineation: Sub-watershed 2
C.1.3. Withers Basin Delineation: Sub-watershed 3
C.1.4. Withers Basin Delineation: Sub-watershed 4
C.1.5. Withers Basin Delineation: Sub-watershed 5
C.1.6. Withers Basin Delineation: Sub-watershed 6
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C.2. USSR Field Survey Forms
### Neighborhood Source Assessment (NSA) Form

**A. NEIGHBORHOOD CHARACTERIZATION**

Neighborhood/Subdivision Name: __________________________

If unknown, address (or streets) surveyed: __________________________

Homeowners Association? □ Y □ N □ Unknown If yes, name and contact information: __________________________

Residential (circle average single family lot size):

□ Single Family Attached (Duplexes, Row Homes) < ¼ acre □ Multifamily (Apts, Townhomes, Condos)

□ Single Family Detached <¼ ½ ¾ 1 acre □ Mobile Home Park

Estimated Age of Neighborhood: _______ years

Percent Homes with Garages: %

With Basements: %

INDEX*

Sewer Service? □ Y □ N

Index of Infill, Redevelopment, and Remodeling □ No Evidence □ <5% of units □ 5-10% □ >10%

---

**B. YARD AND LAWN CONDITIONS**

<table>
<thead>
<tr>
<th>B1. % of lot with impervious cover</th>
<th>Percentage</th>
<th>Comments/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>B2. % of lot with grass cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B3. % of lot with landscaping (e.g., mulched bed areas)</td>
<td></td>
<td></td>
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<tr>
<td>B4. % of lot with bare soil</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: B1 through B4 must total 100%

| B5. % of lot with forest canopy    | Percentage | Comments/Notes |
| B6. Evidence of permanent irrigation or “non-target” irrigation |            |                |

| B7. Proportion of total neighborhood turf lawns with following management status: |
| High:                 |            |                |
| Med:                  |            |                |
| Low:                  |            |                |

B8. Outdoor swimming pools? □ Y □ N □ Can’t Tell Estimated # ______

B9. Junk or trash in yards? □ Y □ N □ Can’t Tell

---

**C. DRIVEWAYS, SIDEWALKS, AND CURBS**

| C1. % of driveways that are impervious | N/A |            |                |
| C2. Driveway Condition □ Clean □ Stained □ Dirty □ Breaking up |            |                |

C3. Are sidewalks present? □ Y □ N If yes, are they on one side of street □ or along both sides □

□ Spotted □ Covered with lawn clippings/leaves □ Receiving ‘non-target’ irrigation

What is the distance between the sidewalk and street? ______ ft.

C4. Is curb and gutter present? □ Y □ N If yes, check all that apply:

□ Clean and Dry □ Flowing or standing water □ Long-term ear parking □ Sediment

□ Organic matter, leaves, lawn clippings □ Trash, litter, or debris □ Overhead tree canopy

* INDEX: □ denotes potential pollution source; ◊ denotes a neighborhood restoration opportunity
### D. ROOFTOPS

| Condition                              | ☐ | ☐ |
---|---|---|
D1. Downspouts are directly connected to storm drains or sanitary sewer |   |   |
D2. Downspouts are directed to impervious surface |   |   |
D3. Downspouts discharge to pervious area |   |   |
D4. Downspouts discharge to a cistern, rain barrel, etc. |   |   |

*Note: C1 through C4 should total 100%*

| Present Downgradient of Leader for Rain Garden? | ☐ | ☐ | N |
---|---|---|---|
D5. Lawn area |   |   |   |

### E. COMMON AREAS

| Condition                              | ☐ | ☐ |
---|---|---|
E1. Storm drain inlets: Yes, are they stenciled? | ☐ | ☐ | N |
| Catch basin inspected? | ☐ | ☐ | N |
| If yes, include Unique Site ID from SSD sheet |   |   |   |
E2. Storm water pond: Is it a wet pond or dry pond? | ☐ | ☐ | N |
| Is it overgrown? | ☐ | ☐ | N |
| What is the estimated pond area? | ☐ | ☐ | N |
| <1 acre | ☐ | ☐ | ☐ |
| about 1 acre | ☐ | ☐ | ☐ |
| >1 acre | ☐ | ☐ | ☐ |
E3. Open Space: Yes, is pet waste present? | ☐ | ☐ | N |
| Is it dumping? | ☐ | ☐ | N |

| Buffers/floodplain present: | ☐ | ☐ | N |
---|---|---|---|
F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOMMENDATIONS

Based on field observations, this neighborhood has significant indicators for the following: (check all that apply)

- Nutrients
- Oil and Grease
- Trash/Litter
- Bacteria
- Sediment
- Other

#### Recommended Actions

| Specific Action                        |   |   |
---|---|---|
- Check retrofit potential? | ☐ | ☐ |
- Better lawn/landscaping practice? | ☐ | ☐ |
- Better management of common spaces? | ☐ | ☐ |
- Pond retrofit? | ☐ | ☐ |
- Multi-family Parking Lot Retrofit? | ☐ | ☐ |
- Other action(s) | ☐ | ☐ |

| Describe Recommended Actions: |   |   |
---|---|---|

#### Initial Assessment

**NSA Pollution Severity Index**

- ☐ Severe (More than 10 circles checked)
- ☐ High (5 to 10 circles checked)
- ☐ Moderate (Fewer than 5 circles checked)
- ☐ None (No circles checked)

**Neighborhood Restoration Opportunity Index**

- ☐ High (More than 3 diamonds checked)
- ☐ Moderate (3-5 diamonds checked)
- ☐ Low (Fewer than 3 diamonds checked)

### NOTES:

Appendix C
### C.2.2. Hotspot Site Investigation (HSI) Form

**Hotspot Site Investigation**

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
</tr>
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<tbody>
<tr>
<td>Date</td>
<td>___ / ___ / ___ (assessed by: ___)</td>
</tr>
<tr>
<td>Watershed</td>
<td>___ / ___ / ___ (camera id: ___)</td>
</tr>
<tr>
<td>Subwatershed</td>
<td>___ / ___ / ___ (pic#: ___)</td>
</tr>
<tr>
<td>Map Grid</td>
<td>LAT ___ ^ ___ &quot; LONG ___ ^ ___ &quot; (lmk#)</td>
</tr>
<tr>
<td>Site data and basic classification</td>
<td>Name and Address: ___ Category: ___ Commercial ___ Industrial ___ Miscellaneous ___ Institutional ___ Municipal ___ Golf Course ___ Transport-Related ___ Marina ___ Animal Facility</td>
</tr>
<tr>
<td>SIC code (if available):</td>
<td>Basic Description of Operation: ___</td>
</tr>
<tr>
<td>NPDES Status</td>
<td>Regulated ___ Unregulated ___ Unknown</td>
</tr>
</tbody>
</table>

**B. Vehicle Operations**

- [ ] Fleet vehicles
- [ ] School buses
- [ ] Other

**B1. Types of vehicles:**

- [ ] Fleets
- [ ] Buses
- [ ] Other

**B2. Approximate number of vehicles:**

- [ ] Fleet
- [ ] Buses
- [ ] Other

**B3. Vehicle activities (circle all that apply):**

- Maintained ___ Repaired ___ Recycled ___ Fueled ___ Washed ___ Stored ___

**B4. Are vehicles stored and/or repaired outside?**

- [ ] Y
- [ ] N
- [x] Can’t Tell

**B5. Is there evidence of spills/leakage from vehicles?**

- [ ] Y
- [ ] N
- [ ] Can’t Tell

**B6. Are uncovered outdoor fueling areas present?**

- [ ] Y
- [ ] N
- [ ] Can’t Tell

**B7. Are fueling areas directly connected to storm drain(s)?**

- [ ] Y
- [ ] N
- [ ] Can’t Tell

**B8. Are vehicles washed outdoors?**

- [ ] Y
- [ ] N
- [ ] Can’t Tell

**C. Outdoor Materials**

- [ ] NA (skip to next page)

**C1. Are loading/unloading operations present?**

- [ ] Y
- [ ] N
- [ ] Can’t Tell

**C2. Are materials stored outside?**

- [ ] Y
- [ ] N
- [ ] Can’t Tell

**C3. Is the storage area directly or indirectly connected to a storm drain (circle one)?**

- [ ] Y
- [ ] N
- [ ] Can’t Tell

**C4. Is staining or discoloration around the area visible?**

- [ ] Y
- [ ] N
- [ ] Can’t Tell

**C5. Does outdoor storage area lack a cover?**

- [ ] Y
- [ ] N
- [ ] Can’t Tell

**C6. Are liquid materials stored without secondary containment?**

- [ ] Y
- [ ] N
- [ ] Can’t Tell

**C7. Are storage containers missing labels or in poor condition (rusting)?**

- [ ] Y
- [ ] N
- [ ] Can’t Tell

**D. Waste Management**

- [ ] NA (skip to next page)

**D1. Type of waste (check all that apply):**

- Garbage ___ Construction materials ___ Hazardous materials ___

**D2. Dumpster condition (check all that apply):**

- No cover/ lid is open ___ Damaged/poor condition ___ Leaking or evidence of leakage (stains on ground) ___ Overflowing ___

**D3. Is the dumpster located near a storm drain inlet?**

- [ ] Y
- [ ] N
- [ ] Can’t Tell

**E. Physical Plant**

- [ ] NA (skip to next page)

**E1. Building:**

- Approximate age: ___ yrs.

**Evidence that maintenance results in discharge to storm drains (staining/discoloration):**

- [ ] Y
- [ ] N
- [ ] Don’t know

---

*Index: [ ] denotes potential pollution source; ___ denotes confirmed polluter (evidence was seen)*
**E2. Parking Lot:** Approximate age ____ yrs. Condition: [ ] Clean [ ] Stained [ ] Dirty [ ] Breaking up

- Surface material: [ ] Paved/Concrete [ ] Gravel [ ] Permeable [ ] Don't know

**E3. Do downsputs discharge to impervious surface?** [ ] Y [ ] N [ ] Don't know [ ] Note visible

- Are downsputs directly connected to storm drain? [ ] Y [ ] N [ ] Don't know

**E4. Evidence of poor cleaning practices for construction activities (stains leading to storm drain)?** [ ] Y [ ] N [ ] Can't Tell

**F. TURF/LANDSCAPING AREAS** [ ] N/A (skip to part G) | Observed Pollution Source?

- F1. % of site with: Forest canopy ____ % Turf grass ____ % Landscaping ____ % Bare Soil ____ %

- F2. Rate turf management status: [ ] High [ ] Medium [ ] Low

- F3. Evidence of permanent irrigation or "non-target" irrigation [ ] Y [ ] N [ ] Can't Tell

- F4. Do landscaped areas drain to the storm drain system? [ ] Y [ ] N [ ] Can't Tell

- F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? [ ] Y [ ] N [ ] Can't Tell

**G. STORM WATER INFRASTRUCTURE** [ ] N/A (skip to part H) | Observed Pollution Source?

- G1. Are storm water treatment practices present? [ ] Y [ ] N [ ] Unknown [ ] If yes, please describe

- G2. Are private storm drains located at the facility? [ ] Y [ ] N [ ] Unknown

  Is trash present in gutters leading to storm drains? If so, complete the index below.

<table>
<thead>
<tr>
<th>Sediment</th>
<th>Organic material</th>
<th>Litter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>2</td>
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<tr>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

**H. INITIAL HOTSPOT STATUS - INDEX RESULTS**

- Not a hotspot (fewer than 5 circles and no boxes checked) [ ] Potential hotspot (5 to 10 circles but no boxes checked) [ ] Confirmed hotspot (10 to 15 circles and/or 1 box checked) [ ] Severe hotspot (>15 circles and/or 2 or more boxes checked)

**Follow-up Action:**

- Refer for immediate enforcement
- Suggest follow-up on-site inspection
- Test for illicit discharge
- Include in future education effort
- Check to see if hotspot is an NPDES non-filer
- Onsite non-residential retrofit
- Pervious area restoration: complete PAA sheet and record
- Unique Site ID here:

**Notes:**
### C.2.3. Pervious Area Assessment (PAA) Form

<table>
<thead>
<tr>
<th>PART I. NATURAL AREA REMNANT</th>
<th>PART II. WETLAND IMPACTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FOREST</strong></td>
<td><strong>WETLAND</strong></td>
</tr>
<tr>
<td>B1. Percent of forest with the following canopy coverage:</td>
<td>B1. % of wetland with following vegetative zones:</td>
</tr>
<tr>
<td>Open %, Partly shaded %, Shaded %</td>
<td>Aquatic:</td>
</tr>
<tr>
<td><em>Note – these should total 100%</em></td>
<td>Emergent:</td>
</tr>
<tr>
<td>B2. Dominant tree species:</td>
<td>Forested:</td>
</tr>
<tr>
<td></td>
<td><em>Note – these should total 100%</em></td>
</tr>
<tr>
<td>B3. Understory species:</td>
<td>B2. Dominant species:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>B4. Are invasive species present?</td>
<td>B3. Are invasive species present?</td>
</tr>
<tr>
<td>☐ Yes ☐ No</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>☐ Unknown</td>
<td>☐ Unknown</td>
</tr>
<tr>
<td>If Yes, % of forest with invasives:</td>
<td>If Yes, % of wetland with invasives:</td>
</tr>
<tr>
<td>Species:</td>
<td>Species:</td>
</tr>
</tbody>
</table>

### D. NOTES

#### E. INITIAL RECOMMENDATION

- ☐ Good candidate for conservation/protective
- ☐ Potential restoration candidate
- ☐ Poor restoration or conservation candidate
### PART II. OPEN PERVIOUS AREAS

#### A. CURRENT VEGETATIVE COVER

A1. Percent of assessed surface with:

- Turf %
- Other Herbaceous %
- None (bare soil) %
- Trees %
- Shrub %
- Other %

(please describe): *Note - these should total 100%*

A2. Turf: Height: inches
- Apparent Slow-growing Frequency: Unknown
- Condition (check all that apply): Thick/Dense
- Thin/Sparse
- Cumpy/Banchy
- Continuous Cover

A3. Thickness of organic matter at surface: inches

A4. Are invasive species present? Y N Unknown
   If yes, % of site with invasives:
   Species:

#### B. IMPACTS

B1. Observed Impacts (check all that apply):
- Soil Compaction
- Erosion
- Trash and Dumping
- Poor Vegetative Health
- Other (describe):

#### C. REFORESTATION CONSTRAINTS

C1. Sun exposure:
- Full sun
- Partial sun
- Shade
- Unknown

C2. Nearby water source:
- Y
- N
- Unknown

C3. Other constraints:
- Overhead wires
- Underground Utilities
- Pavement
- Buildings
- Other (please describe):

#### D. NOTES

#### E. INITIAL RECOMMENDATION

- Good candidate for natural regeneration
- May be reforested with minimal site preparation
- May be reforested with extensive site preparation
- Poor reforestation or regeneration site

---

**PART III. SKETCH**
C.2.4. Streets and Storm Drains (SSD) Form

<table>
<thead>
<tr>
<th>WATERSHED:</th>
<th>SUBWATERSHED:</th>
<th>UNIQUE SITE ID:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>DATE: <em>/__/</em>___</th>
<th>ASSESSED BY:</th>
<th>CAMERA ID:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>MAP GRID</th>
<th>RAIN IN LAST 24 HOURS</th>
<th>PIC #</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Y</em></td>
<td><em>N</em></td>
</tr>
</tbody>
</table>

**A. LOCATION**

- Street names or neighborhood surveyed: 
- Adjacent land use: _Residential_ _Commercial_ _Industrial_ _Institutional_ _Municipal_ _Transport-Related_ 
- Corresponding HSI or NSA field sheet? If so, circle HSI or NSA and record its Unique Site ID here

**B. STREET CONDITIONS**

- Road Type: _Arterial_ _Collector_ _Local_ _Alley_ _Other:________
- Condition of Pavement: _New_ _Good_ _Cracked_ _Broken_
- Is on-street parking permitted? _Y_ _N_ If yes, approximate number of cars per block:
- Are large cul-de-sacs present? _Y_ _N_

<table>
<thead>
<tr>
<th>Index Rating for Accumulation in Gutters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean</td>
</tr>
<tr>
<td>Sediment</td>
</tr>
<tr>
<td>Organic Material</td>
</tr>
<tr>
<td>Litter</td>
</tr>
</tbody>
</table>

**C. STORM DRAIN INLETS AND CATCH BASINS**

- Type of storm drain conveyance: _open_ _enclosed_ _mixed_ _N/A_
- Percentage of inlets with catch basin storage: |
- Sample 1-2 catch basins per NSA/HSI |
- C3. Catch basin #1 |
- C4. Catch basin #2 |

<table>
<thead>
<tr>
<th>Latitude</th>
<th>Longitude</th>
</tr>
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<tbody>
<tr>
<td><em>°</em> <em>'</em></td>
<td><em>°</em> <em>'</em></td>
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<thead>
<tr>
<th>LMK #</th>
<th>Picture #</th>
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</thead>
</table>

- Current Condition: _Wet_ _Dry_
- Condition of Inlet: _Clear_ _Obstructed_ 
- Litter Accumulation: _Y_ _N_ 
- Organics Accumulation: _Y_ _N_ 
- Sediment Accumulation: _Y_ _N_ 
- Sediment Depth (in feet): _ft._ 
- Water Depth: _ft._ 
- Evidence of oil and grease: _Y_ _N_ 
- Sulfur smell: _Y_ _N_ 
- Accessible to vacuum truck: _Y_ _N_

**D. NON-RESIDENTIAL PARKING LOT (>2 acres)**

- Approximate size: _acres_
- Lot Utilization: _Full_ _About half full_ _Empty_
- Overall condition of Pavement: _Smooth (no cracks)_ _Medium (few cracks)_ _Rough (many cracks)_ _Very Rough (numerous cracks and depressions)_
- Is lot served by a storm water treatment practice? _Y_ _N_ If yes, describe:
- On-site retrofit potential: _Excellent_ _Good_ _Poor_
### E. Municipal Pollutant Reduction Strategies

<table>
<thead>
<tr>
<th>E1. Degree of pollutant accumulation in the system:</th>
<th>□ High □ Medium □ Low □ None</th>
</tr>
</thead>
<tbody>
<tr>
<td>E2. Rate the feasibility of the following pollution prevention strategies:</td>
<td></td>
</tr>
<tr>
<td>Street Sweeping:</td>
<td>□ High □ Moderate □ Low</td>
</tr>
<tr>
<td>Storm Drain Stenciling:</td>
<td>□ High □ Moderate □ Low</td>
</tr>
<tr>
<td>Catch Basin Clean-outs:</td>
<td>□ High □ Moderate □ Low</td>
</tr>
<tr>
<td>Parking Lot Retrofit Potential:</td>
<td>□ High □ Moderate □ Low</td>
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### Catch Basin Sketches

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<tr>
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Notes:
C.3. Sub-watershed Investigation: Discussion of Non-bacterial Field Observations

The comprehensive investigative approach taken by SMS4 personnel during the USSR field reconnaissance effort led to the generation of this supplemental document of the WAR to inform the readership of additional observations made within Withers Basin watershed. Table C.3 summarizes the non-FIB observations within each watershed and each category of non-FIB is briefly discussed.

Table C.3: Semi-quantitative evaluation of non-FIB sources by sub-watershed.

<table>
<thead>
<tr>
<th>Sub-watershed</th>
<th>Dumpster Management</th>
<th>Debris Accumulation</th>
<th>Automotive/ Hydrocarbon</th>
<th>Material Storage/ Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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Ratings: Blank = no evidence, L = Low input, H = Heavy Input

C.3.1. Dumpster Management

Not unlike management of household solid waste within residential areas, almost every business generates solid waste and temporarily stores it on-site. Many businesses have dumpsters, compactors, or refuse bins and these containers are typically kept behind buildings or in alleys, where they are often out of sight and out of mind. Residential and commercial refuse containers can be a contributing source to stormwater pollution if they are not properly operated and maintained. In addition to increasing the chance of wind-blown debris from leaving a site, open dumpsters and refuse bins can collect rain water which mixes with any wastes that may be located within the container and when emptied, the polluted water inevitably spills or leaks. Rainwater can also naturally wash leaking materials, spills, and trash from solid waste collection containers into local stormwater facilities. Wash water from cleaning refuse bins and loading docks at commercial locations is another source of stormwater pollution, as this runoff may contain grease, trash, bacteria, and even chemicals. Figures C.3.1-1 and C.3.1-2 illustrate dumpster management observations made during the field reconnaissance effort.
Figure C.3.1-1: Open dumpsters (sub-watershed 11).

Figure C.3.1-2: Examples of an open dumpster (sub-watershed 5) and material storage within a dumpster enclosure at a commercial location (sub-watershed 8)
C.3.2. Debris Accumulation

One contributing factor to urban debris accumulation within stormwater facilities is wind-blown or stormwater transported trash/debris from improper solid waste management; however, improper disposal or cleanup practices from human-influenced activities such as discarding food and beverage packaging, cigarette butts, yard debris, construction materials, and even miscellaneous items such as old apparel, televisions, bicycles, shopping carts, and even debris-fabricated structures for pedestrian crossing of open drainage channels are also contributive sources. Municipalities employ best management practices such as street sweeping, municipal drainage system preventive and corrective maintenance activities, and special engineered devices such as trash racks and filter screens to capture and hold debris for removal. Preventive maintenance of both the open channel and underground pipeline municipal drainage network is crucial, as not only is the debris accumulation aesthetically unattractive, it may cause blockages and lead to unintended localized flooding conditions. Figures C.3.2-1 through C.3.2-7 illustrate debris accumulation observations made during the field reconnaissance effort.
Figure C.3.2-1: Staging of construction materials (and a vehicle) within close proximity to an open drainage channel (top-right and bottom-center) located within a residential area and discarded construction and yard debris accumulation (top-left) within an open drainage channel located within a residential area (sub-watershed 4).
Figure C.3.2-2. Yard debris discarded (left) within a roadside drainage channel (sub-watershed 4), (middle) staged within close proximity to a roadside drainage channel (sub-watershed 5), and (right) staged near a drainage catch basin (sub-watershed 6).

Figure C.3.2-3: Debris accumulation of food and beverage containers within a municipal drop inlet located within a residential area (sub-watershed 6).
Figure C.3.2-4: Debris and vegetative overgrowth within a privately-maintained (left) open drainage channel (sub-watershed 7) and (right) stormwater pond (sub-watershed 8).

Figure C.3.2-5: Debris-fabricated structures utilized for open drainage channel pedestrian crossing activities within residential areas causing (left) embankment erosion (sub-watershed 8) and (right) blockage of drainage channel (sub-watershed 10).
Figure C.3.2-6: Granular sand material (left) discarded within a public drainage facility and (right) on-street parking inhibiting street sweeping within a residential area (sub-watershed 9).

Figure C.3.2-7: Paint discarded (left) alongside open drainage channel within a commercial location (sub-watershed 10), (middle) stained catch basin grate within a commercial location (sub-watershed 11), and (right) charcoal ashes discarded within an open drainage channel within a residential area (sub-watershed 8).
C.3.3. Hydrocarbons/Automotive:

Automotive and mechanical equipment maintenance facilities, by the very nature of their services offered to the public, are potential sources of stormwater pollution by introduction of hydrocarbons, trace metals, or other contaminants into the urban landscape. Wastes generated at automobile/mechanical maintenance facilities include: solvents (paints and paint thinners), antifreeze, brake fluid and brake lining, batteries, motor oils, fuels (gasoline, diesel, and kerosene) and lubricating grease. When possible, a majority of commercial automotive/mechanical repair work is performed by onsite technicians/mechanics under designated covered areas and within repair bays or areas that provide access to the necessary waste material storage containment devices and chemical cleanup kits. Even with these preventive and corrective measures in place, maintenance and repair facilities may suffer from space and time constraints that make indoor repair work impractical, and employees may have no control over containing spills from vehicles or equipment brought onsite by customers after hours. Understanding that just like vehicular car washing, automotive or mechanical equipment repair work is preferred to be performed at a commercial location with adequate stormwater protective measures in place; however, many residents, as an obvious cost saving measure, desire to perform their own repair activities. Figures C.3.3-1 through C.3.3-6 illustrate hydrocarbon/automotive observations made during the field reconnaissance effort.

Figure C.3.3-1: Staining of parking surfaces (left and middle) with automotive fluids (sub-watersheds 5 and 8) staining of parking lot gravel (right) within commercial location (sub-watershed 7).
Figure C.3.3-2: Automotive staining of street due to on-street parking within a residential area (sub-watershed 6).

Figure C.3.3-3. Repair activity occurring within numerous multi-family development parking areas (sub-watersheds 5 and 8) and residential yards (sub-watershed 4).
Figure C.3.3-4: Automotive fluid staining of pavement adjacent to automotive repair locations (sub-watershed 11).

Figure C.3.3-5: Automotive fluid staining of parking surfaces within commercial areas (sub-watershed 11).
Figure C.3.3-6: Automotive maintenance bay (left) uphill from street - potential for discharge event and (right) vehicular parking overtop privately-maintained drainage facility (sub-watershed 11).
C.3.4. Material Storage/Other

Improper material storage and handling is a common source of urban stormwater pollution and one whose solution may more easily be aligned with public outreach and education campaigns. Many individuals are unaware of proper material and chemical storage practices, such as stockpile management, stormwater inlet protection, storing chemicals off the ground on pallets, use of secondary containment for liquid products, etc. **Figures C.3.4-1 thru C.3.4-4** illustrate the material and chemical storage observations made during the field reconnaissance effort, whereas **Figures C.3.4-5 thru C.3.4-10** illustrate observations relative to agricultural practices, disposal of household cooking grease, drainage system access and maintenance, sediment accumulation within parking areas and runoff from unstable soils on vacant parcels, and aquatic vegetative growth within stormwater ponds.

![Figure C.3.4-1](image1.jpg)

**Figure C.3.4-1:** Sand stockpile enclosure (left) at an industrial location in close proximity to a stormwater facility (sub-watershed 2) and a fueling station (right) within an uncovered area (sub-watershed 11).
Figure C.3.4-2: Staging of chemicals within close proximity to an open drainage channels in a residential area (sub-watershed 4).

Figure C.3.4-3: Improper storage of chemicals and materials at commercial locations (sub-watershed 11).
Figure C.3.4-4: Improper chemical storage and cleaning practices at a commercial location (sub-watershed 9).

Figure C.3.4-5: Cleaning of a commercial vehicle (left) within a residential area (sub-watershed 3) and overuse or misdirection of irrigation water (right) within a multi-family development (sub-watershed 1)
Figure C.3.4-6: Garden rows graded to discharge into an open drainage channel within a residential area (sub-watershed 4).

Figure C.3.4-7: Observation of a stained drainage facility with an oily substance (left) within a multi-family development (sub-watershed 6) and improper cooking grease disposal (right) within a residential area along an open drainage channel (sub-watershed 9).
Figure C.3.4-8: Sediment accumulation (left) within a commercial parking area (sub-watershed 7) and a vacant lot with unsatisfactory soil stabilization (right) to prevent sediment transport (sub-watershed 11).

Figure C.3.4-9: Residential fencing (left) hindering private maintenance of a bioretention swale (sub-watershed 9) and missing drainage facility grate (right) within a commercial location (sub-watershed 10).
Figure C.3.4-10: Growth of aquatic vegetation within a regional stormwater pond (sub-watershed 9).