City of Cambridge, Massachusetts
Department of Public Works
147 Hampshire Street • Cambridge, MA 02139

APPENDIX B
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Common Pollutants

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Report Prepared By:

Cambridge Department of Public Works and

Malcolm Pirnie, Inc.
601 Edgewater Drive
Suite 360
Wakefield, MA 01880
781-224-4488

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B. COMMON POLLUTANTS

Sediment (Suspended Solids) Eroded soils are a common component of urban stormwater and are a pollutant in their own right. Excessive sediment can be detrimental to aquatic life by interfering with photosynthesis, respiration, growth and reproduction. Sediment particles transport other pollutants that are attached to their surfaces including nutrients, trace metals and hydrocarbons. High turbidity due to sediment decreases the value of surface waters for recreational use and can decrease light penetration for submerged aquatic plants. Sediments also fill streams and storm drainpipes causing flooding and property damage. It can also reduce the capacity of the waterway blocking navigation. Erosion from construction sites, exposed soils, street runoff, poor maintenance of drainage systems and stream bank erosion are the primary sources of sediment in urban runoff. In addition, the energy from light reflecting off of suspended sediment can increase water temperatures (Kundell and Rasmussen, 1995).

Nutrients Runoff from developed land often has elevated concentrations of both phosphorus and nitrogen, which can enrich streams, lakes, reservoirs and estuaries. This process is known as eutrophication. Significant sources of nitrogen and phosphorus include fertilizer, atmospheric deposition, animal waste, organic matter, sewer overflows and leaks, detergents, and the dry and wet fallout of materials in the atmosphere. Excessive nutrients also promote alga growth, which can reduce light penetration to submerged vegetation thus depleting oxygen from bottom waters. In addition nitrification of ammonia by microorganisms cans consume dissolved oxygen.

Organic Carbon/Organic Enrichment Organic matter, washed from impervious surfaces during storms, can present a problem in slower moving downstream waters. Some sources include organic material blown onto the street surface, and attached to sediment from stream banks, or from bare soil. In addition, organic carbon is formed indirectly from algal growth within systems with high nutrient loads. As organic matter decomposes, it can deplete dissolved oxygen in waters. Declining levels of oxygen in the water can have an adverse impact on aquatic life.

Bacteria/Pathogens Pathogens are waterborne disease causing organisms and include a broad range of bacteria and viruses that are difficult to identify. Pathogens enter surface waters from a variety of sources including sanitary and combined sewer overflows, wastewater, illicit connections to the storm drain system, pet waste and warm blooded wildlife. Indicator bacteria such as coliform (E. coli) and fecal streptococci (Enterococci) are used as indicators of potential pathogens.

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Hydrocarbons Vehicles leak oil and grease that contain a wide array of hydrocarbon compounds, some of which can be toxic to aquatic life at relatively low concentrations. Sources are automotive (primarily due to leaking engines), and some areas that produce runoff with high runoff concentrations include gas stations, commuter parking lots, convenience stores, residential parking areas, and streets (Schueler, 1994). Other sources include illegal disposal of motor oil in storm drains and illegal disposal of grease from restaurant grease traps to storm drains.

Trace Metals Cadmium, copper, lead and zinc are routinely found in stormwater runoff. Many of the sources are from automotive vehicles. For example, one study suggests that 50% of the copper in Santa Clara, CA comes from brake pads (Woodward-Clyde, 1992). Other sources of metals include paints, road salts, and galvanized pipes. These metals can be toxic to aquatic life at certain concentrations, and can also accumulate in the bottom sediments of waterways. Other sources include industrial and commercial sites, rooftops and painted areas, improperly disposed household chemicals, landfills, hazardous waste sites and atmospheric deposition.

Pesticides A modest number of currently used and recently banned insecticides and herbicides have been detected in urban and suburban streamflow at concentrations that approach or exceed toxicity thresholds for aquatic life. Key sources of pesticides include application to lawns and highway median and shoulder areas.

Chlorides Salts that are applied to roads and parking lots in the winter months appear in stormwater runoff and meltwater at much higher concentrations than many freshwater organisms can tolerate. One study of four Adirondack streams found severe impacts to macroinvertebrate species attributed to chlorides (Demers and Sage, 1990).

Thermal Impacts Runoff from impervious surfaces may increase temperature in receiving waters, adversely impacting aquatic organisms that require cool water conditions (e.g., alewife). Data suggest that increasing development can increase stream temperatures by between five and twelve degrees Fahrenheit, and that the increase is related to the level of impervious cover in the drainage area (Galli, 1991). Since warm water can hold less dissolved oxygen than cold water, this thermal pollution further reduces oxygen levels in depleted urban streams.

Trash and Debris (Objectionable sediments/solids) Considerable quantities of trash and debris are washed through the storm drain networks and from Combined Sewer Overflows (CSO) into streams. The trash and debris accumulate in streams and lakes and detract from their natural beauty. Depending on the type of trash, this material may also lead to increased organic matter or toxic contaminants in water bodies.

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Snowmelt Concentrations The snow pack can store hydrocarbons, oil and grease, chlorides, sediment, and nutrients. In cold regions, the pollutant load during snowmelt can be significant, and chemical traits of snowmelt change over the course of the melt event. Oberts (1994) and others have reported that 90% of the hydrocarbon load from snowmelt occurs during the last 10% of the event. From a practical standpoint, the high hydrocarbon loads experienced toward the end of the season suggest that stormwater management practices should be designed to capture as much of the snowmelt event as possible.

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