

Quality Assurance Project Plan Addendum

Apple Creek Site Selection and Sediment Sampling for Urban Sources

Project ID: GL000E02288_GBF1701_AppleCreek

Addendum to

Sediment Budget and Sediment Source Apportionment Study for Plum Creek

(Project Number: GL00E02024_GBF1603_PlumCreek)

Prepared for:

Wisconsin Department of Natural Resources

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SECTION A – PROJECT MANAGEMENT

A.1 Title of Plan and Approval

Quality Assurance Project Plan Addendum Sediment Budget and Sediment Source Apportionment Study for Apple Creek

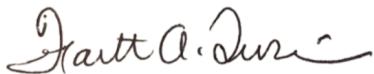
Site Selection and Urban Sampling Procedures

Project ID: GL000E02288_GBF1701_AppleCreek

February 8, 2018

**Prepared by:
U.S. Geological Survey**

This quality document is an addendum to the approved quality assurance project plan for prepared for Sediment Budget and Sediment Source Apportionment Study for Plum Creek, project id GL00E02024_GBF1603_PlumCreek. This addendum describes the site selection approach, number of samples and sampling protocol for addressing urban sources within the Apple Creek watershed that has been funded through a separate GLRI grant.



Date: 2/19/18

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Sediment Source Apportionment Study
Apple Creek Site Selection and Sediment Sampling for Urban Sources
Standard Operating Procedure (SOP)
February 8, 2018

This amendment covers additional site selection and sediment sampling in urban areas included in the 2018-19 Apple Creek sediment budget and sediment source apportionment study. These methods are an amendment to the standard operating procedures (SOP) for site selection and sediment sampling included in the Quality Assurance Project Plan for the Plum Creek sediment budget and sediment source apportionment study (Fitzpatrick and Kammel, 2017). This amendment also gives more details for general site selection and sediment sampling sediment from urban areas, which were beyond the scope of Gellis et al. (2016). Additional guidance for urban areas was gathered previous studies that sampled road or pavement related sediment by Carter et al. (2003) for the River Aire, Popleto et al. (2009) for a small urban watershed in southern Brazil, and various street and parking lot sampling for contaminants in sediment (Pitt, 1979; Selbig and Bannerman, 2007; Van Metre et al., 2008; Mahler et al., 2010). Sampling apparatus for these studies included a plastic hand trowel, plastic hand broom and dustpan, or vacuum. Sediment is generally swept off of roadways, gutters along curbs, or gravel shoulders.

Urban Source Site Selection

The Apple Creek watershed has more urban land and less natural/background (forested/grassland) than Plum Creek which required additional procedures for selecting and sampling regulated and non-regulated urban areas. The comparison of land uses between the two creeks are shown in table 1. Urban areas in the Apple Creek watershed include Appleton and Little Chute. Urban areas included in the Plum Creek TMDL were Buchanan and Kaukauna (Cadmus, 2012) which are downstream or outside of the immediate watershed upstream of the U.S. Geological Survey gaging station. Urban area associated with the town of Holland, occupy only about 1.5 mi² within the upper watershed of Plum Creek and were not specifically sampled as a source area.

Table 1. Watershed land use comparison for Apple Creek and Plum Creek (Cadmus, Inc., 2012).

Land Use	Apple Creek % of Total	Plum Creek % of Total
Agriculture	60.2	76.2
Urban (non-regulated)	15.7	10.8
Urban-MS4	16.5	0.3
Construction	0.7	0.2
Natural background	6.8	12.4

In the Apple Creek watershed over 30 percent of the land cover is urban, with 16 percent nonregulated and 16 percent regulated MS4 (Cadmus Inc., 2012). The TMDL for Apple Creek contains reductions of total phosphorus (TP) and total suspended solids (TSS) loads for urban (regulated) as well as agriculture (Cadmus, 2012). Construction sites have a reduction for TSS only. The coverage of urban areas in Apple Creek's sampling design was adjusted to include regulated and nonregulated urban areas as well as construction sites (table 2, fig. 1). Sites with urban land cover will be selected randomly to include both regulated and nonregulated. Municipal boundaries will be used to distinguish urban regulated areas. Active construction sites change quickly and final site selection will be identified by reconnaissance before sampling.

Natural background (forested/grassland) areas were not sampled as a separate source area in Apple Creek because they made up less than 7% of the total watershed area (table 1). Much of the natural background area was located along the Apple Creek riparian corridor where there is potential for eroding gullies/ravines (fig. 1). The eroding gullies/ravines along the Apple Creek main stem made up an additional potential source area and sites were selected from those previously inventoried by Outagamie County. Because these gullies/ravines require different management techniques than eroding stream banks, similar to Plum Creek both potential sources were separately sampled.

Table 2. Type and number of sites and sediment samples for the Apple Creek sediment source apportionment study, 2018-19.

Type of source area	# sites	# QA samples	# total samples
Source			
Cropland	15	1	16
Urban (nonregulated)	15	1	16
Urban (regulated)	15	1	16
Construction sites	10	1	11
Gullies	15	1	16
Eroding banks	15	1	16
Target			
In situ suspended sediment-watershed outlet	10	1	11
In situ suspended sediment- ag/urban mix	9	1	10
In situ suspended sediment-upstream urban	9	1	10
Soft fine-grained streambed sediment	13	1	14
Total # of samples:			136

Similar to Plum Creek's SOP, 15 samples will be collected from each source area, except for 10 samples at the construction sites (fig. 1). For sediment targets, three in situ suspended sediment samplers will be installed in March/April 2018. One sampler will be at the watershed outlet. A second sampler will be located mid-watershed where the stream is influenced by both urban regulated and agricultural land. A third sampler will be located in the watershed headwaters with almost all urban land. Streambed soft sediment samples will be collected at all 30 rapid geomorphic assessment sites (if present). A subset of

13 soft sediment samples will be submitted for analyses, with likely two or three samples from stormwater ponds. A tentative list of sampling sites and their locational information is shown in table 2.

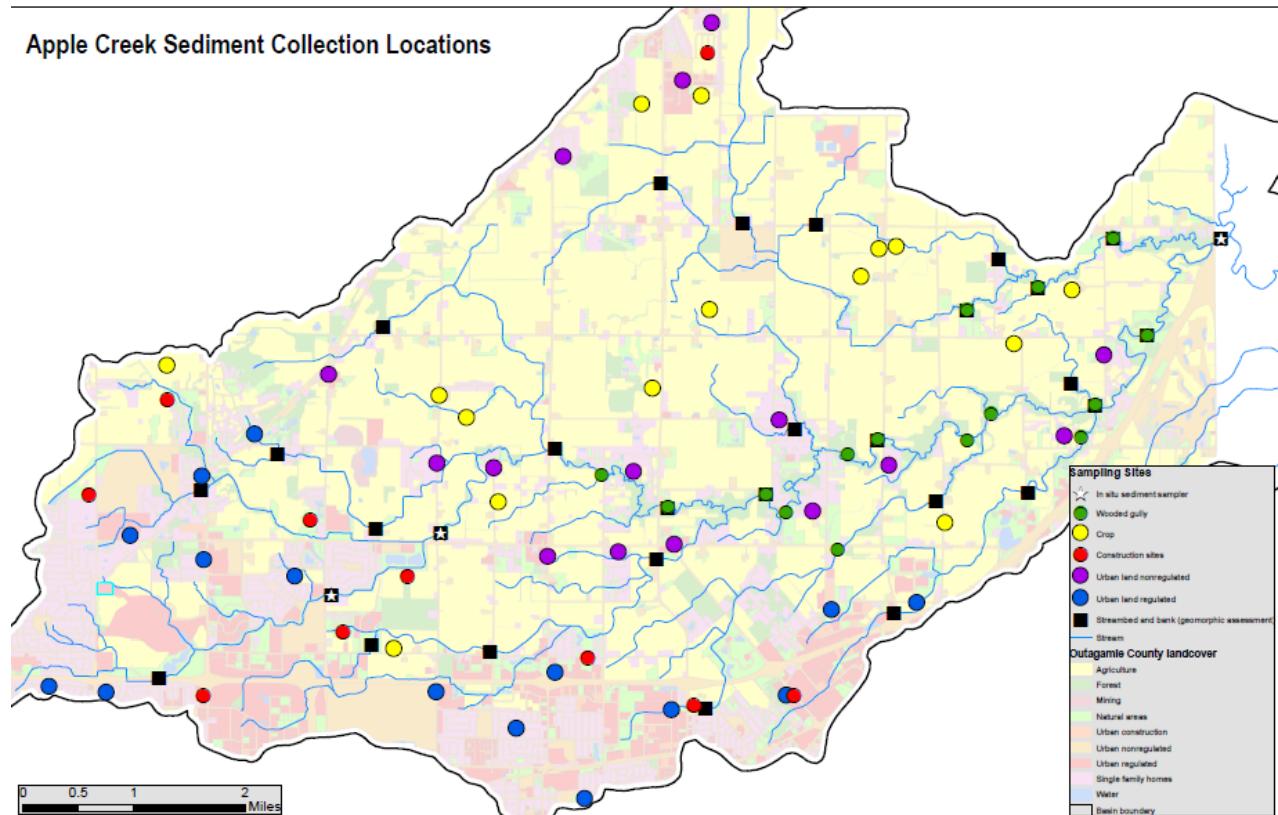


Figure 1. Location map of tentative sampling sites for Apple Creek.

Table 3. Apple Creek sampling sites, type of site, and location.



Sampling Sediment from Urban Areas

Source samples from urban regulated and unregulated areas will be collected from roadside curb and gutter or gravel shoulders (fig. 2). Similar to other source samples, samples will be collected using a plastic trowel or plastic hand broom and dust pan, or possibly a high volume small surface sampler (HSV3) vacuum (CS₃, Inc.). Optimally a HSV3 will be used which has EPA approval for sampling households and environmental settings for lead-laden dust. If broom and dustpan are used, a paint-free long handled version will be used to minimize fatigue and sampling time. For roadside gravel, the top 2cm or less will be collected using the equipment that is easiest to get a representative sample of what would most likely be transported into the ditches or swales during the next runoff event.

For each urban source site, a composite sample will be collected that consists of 15 subsamples from each side of a road, spaced 10 m apart along 150 m transects for a total of 30 subsamples per site composite. The recorded location of the site will be the center of the road, at the midpoint of the transect (fig. 2). At each of the 30 subsampling locations, a 30x30 cm area will be sampled. This area can be expanded or shrunk to obtain the optimum amount of total composite sample, which is approximately 250 to 500 ml. Gutters near storm sewer inlets are preferred, with sediment that will likely enter the stream system during the next rainfall event. However, large piles of sediment, leaves, and brush should be avoided. Sampling should be done in approximately May so that it represents a mix of sediment from winter sanding and stormwater runoff from snowmelt and rainfall. Samples will be composited into double plastic zip-topped bags or plastic jars with plastic lids. The sampling equipment will be washed with phosphate free detergent and rinsed with deionized water between sites. The sampling equipment will be stored in plastic bags during transport.

During sampling, a traffic control plan will be followed and traffic will not be blocked. Temporary traffic control procedures will be followed for work on shoulders with no encroachment using required cones, signage, personal reflective high visibility vests, and vehicle flashers, similar to what is done for streamflow measurements (USGS, 2014).

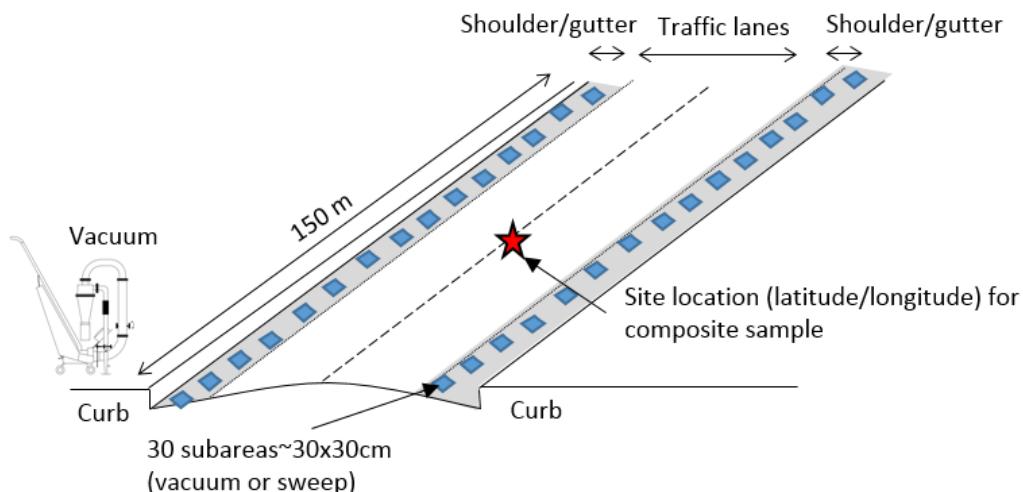


Figure 2. Sampling design for collection of street dust and dirt (modified from Pitt, 1979).

References

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U.S. Geological Survey Illinois Water Science Center, 2014, Traffic control plan: Unpublished report, USGS, Urbana, IL, 18 p.

Table 3. Apple Creek sampling sites, type of site, and location.

Site identification number	Site Type	Latitude (decimal degrees)	Longitude (decimal degrees)
CO-1	Construction	44.31913	-88.35628
CO-2	Construction	44.29604	-88.37578
CO-3	Construction	44.31171	-88.33859
CO-4	Construction	44.32242	-88.39657
CO-5	Construction	44.30100	-88.30579
CO-6	Construction	44.29602	-88.26837
CO-7	Construction	44.30441	-88.35037
CO-8	Construction	44.29472	-88.28650
CO-9	Construction	44.33473	-88.38225
CO-10	Construction	44.37996	-88.28369
URG-1	Urban Regulated	44.29600	-88.26973
URG-2	Urban Regulated	44.29414	-88.29062
URG-3	Urban Regulated	44.30715	-88.26144
URG-4	Urban Regulated	44.30804	-88.24593
URG-5	Urban Regulated	44.28255	-88.30644
URG-6	Urban Regulated	44.29176	-88.31886
URG-7	Urban Regulated	44.31168	-88.35906
URG-8	Urban Regulated	44.29908	-88.31175
URG-9	Urban Regulated	44.29655	-88.33341
URG-10	Urban Regulated	44.31386	-88.37562
URG-11	Urban Regulated	44.31706	-88.38902
URG-12	Urban Regulated	44.33027	-88.36635
URG-13	Urban Regulated	44.29655	-88.39342
URG-14	Urban Regulated	44.29732	-88.40380
URG-15	Urban Regulated	44.32481	-88.37600
UNR-1	Urban Non-Regulated	44.38394	-88.28295
UNR-2	Urban Non-Regulated	44.37640	-88.28831
UNR-3	Urban Non-Regulated	44.33806	-88.35289
UNR-4	Urban Non-Regulated	44.32642	-88.33320
UNR-5	Urban Non-Regulated	44.32581	-88.32284
UNR-6	Urban Non-Regulated	44.33196	-88.27085
UNR-7	Urban Non-Regulated	44.34034	-88.21168
UNR-8	Urban Non-Regulated	44.31478	-88.30020
UNR-9	Urban Non-Regulated	44.32579	-88.25034

SLH Sample Digestion Details – SOP ESS INO IOP550.0

Digestions are tailored to the matrix and project objectives. Specific digestion conditions including sample size and acid cocktail are reported with each set of sample results. For both the Plum Creek and Apple Creek source apportionment study, conditions are specified below:

Digestion	SLH – Microwave (550.0)
Sample size (approx..)	0.1 gram
Acid mix	9 mL 16M HNO ₃ 3 mL 12M HCl 2 mL HF 1 mL H ₂ O
Digestion condition	Up to 280°C 200 bar pressure