Study Design
for the
Streets Run Watershed

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1.0   INTRODUCTION

The Streets Run Watershed covers an area of approximately 6,270 acres.   The watershed includes Streets Run, Glass Run and many unnamed tributaries that combine and drain into the Monongahela River near the Sandcastle Water Park in West Homestead, Pennsylvania.   Over the past 50 to 100 years people have continued to spread from the urban centers of the Pittsburgh area to the more rural areas.   Streets Run has suffered from this increase in population and increase in impact.   Today, Streets Run and its tributaries are confined to narrow valleys surrounded by pavement, railroads, floodplain fills, industries and residences.

The problems that plague the Streets Run Watershed are typical of urban watersheds in Western Pennsylvania and include abandoned mine drainage, uncontrolled stormwater of unknown quality and quantity, combined sewer overflows, leaking sewer lines, and flooding.   The boroughs and municipalities that drain into the Streets Run Watershed (Baldwin, Brentwood, West Mifflin, Whitehall, West Homestead, and the City of Pittsburgh) previously had a piece meal approach toward correcting these watershed problems.   In June 2001, they formed the Streets Run Watershed Association (SRWA) to collectively address flooding and watershed degradation.   SRWA is a non-profit organization.

The SRWA has partnered with the Environmental Corps Alliance for Senior Involvement (EASI) to conduct the water monitoring in Streets Run and its tributaries.   EASI is a volunteer program that utilizes retired persons to conduct water monitoring activities.

This Study Design has been prepared to act as a guidance document for volunteers sampling surface waters in the Streets Run Watershed.   This funding to prepare this document was provided through a Growing Greener Grant provided by the Pennsylvania Department of Environmental Protection (PADEP).   This document will cover the goals of the sampling and monitoring program, the purpose of the monitoring, the rationale for what will be monitored and where the monitoring will occur, and quality assurance/quality control.   This document is meant to be a "living" document that will grow and change as the sampling program progresses.

This report has been divided into the following sections: 1.0 Introduction, 2.0 Background, 3.0 Monitoring, 4.0 Data Quality Objectives, 5.0 Monitoring Methods, 6.0 Monitoring Locations and Frequency, 7.0 Quality Assurance/Quality Control, 8.0 Data Analysis, and 9.0 Streets Run Watershed Specific Information.

2.0   BACKGROUND

This section discusses the group's mission, the programs on which the SRWA has been working, the goals of the group, the history of the watershed and its current use, and water quality issues within the watershed.

2.1   Group Mission

The group mission is the mission statement developed by the SRWA, which follows:
"..to promote the restoration and enhancement of the natural resources through flood protection and prevention and stream improvements. This mission will be accomplished by educating the public, promoting the wise use of resources, encouraging the

partnerships necessary to restore and conserve water quality and quantities and by securing the technical and financial resources to meet this challenge."

2.2   Major Programs

SRWA has been working to develop funding so that they may be able to meet their mission statement. As part of this funding drive, SRWA has had the benefit of receiving grants for specific group activities. SRWA's major programs directly result from these grants and are listed below.

- League of Women Voters Water Resources Educational Network Grant – for public information and to increase public awareness
- Pennsylvania Department of Environmental Protection Growing Greener Grant – to conduct a Study Design and a Watershed Assessment and Restoration Plan
- Various Grants from the state - for seed and maintenance of SRWA
- Army Corps of Engineers grant – to evaluate the hydrology of the Streets Run Watershed
- DCED Grant (applied for and implemented by the Boroughs of Baldwin, Whitehall, West Mifflin and Brentwood) for repair and upgrade of the main sanitary sewer interceptor through the Streets Run Watershed.

2.3   Group Goals

A brainstorming session was held on June 5, 2003 to prepare this Study Design. The group goals that were developed include the following:

- To portray an accurate picture of the water quality
- To monitor the water quality, to perform quality testing procedures
- To identify sources of pollution,
- To sample a minimum of two years and be able to extend the sampling period as needed based upon the site
- To provide public awareness by being visible in the stream
- To determine the aquatic life and viability of the stream.

2.4   Watershed Background and Current Use

A general background of the Streets Run Watershed was discussed in Section 1.0 of this report. The Streets Run Watershed consists primarily of Streets Run. Approximately eight unnamed tributaries drain into Streets Run. One major tributary, Glass Run, drains into Streets Run near the confluence of Streets Run with the Monongahela River. Currently Streets Run and its tributaries serve as a means of stormwater collection and conveyance to the Monongahela River. The stream is not used for fishing, water sports, water recreation or water supply.

2.5   Water Quality Issues

The primary water quality issues that are of concern for Streets Run are abandoned mine drainage, sanitary sewage, sediment-laden stormwater runoff and contamination from numerous industries that are situated adjacent to Streets Run and its tributaries. Table 2-1 summarizes water quality in the Streets Run Watershed.

3.0 MONITORING

The following subsections describe the monitoring program proposed for the Streets Run Watershed. The purpose of the monitoring, data and sampling frequency and locations will be discussed.

3.1 Purpose of Monitoring

The purpose of monitoring is to establish a baseline of watershed data collected over a 24-month period following EASI protocol. This will help to determine water quality and benthic life, to define the present watershed conditions, and to characterize existing and emerging problems.

3.2 Purpose of Data

It is a consensus that the quality of the water in the Streets Run Watershed has degraded over the past 50 years. To date, no water quality data has been collected on Streets Run or its tributaries. The data to be collected will be used to provide information to develop baseline water quality data, to develop clean up strategies, and to reduce and control pollution problems. The data will be provided to PADEP and other interested government agencies, private industry, and concerned citizens to reveal trends in the watershed quality.

3.3 What Will be Monitored

The surface water and macro-invertebrate life in Streets Run and its tributaries will be monitored under this Study Design. Both watershed ecosystem indicators and public health indicators will be reviewed. Surface water will be collected and analyzed on a monthly basis. Benthos will be evaluated two times per year. Figure 1 shows the Streets Run Watershed and the proposed sampling locations.

4.0 DATA QUALITY OBJECTIVES

Data quality objectives are the quantitative (numerical) and qualitative (narrative) terms used to describe how good the data needs to be in order to be useful. For this study, data quality will be discussed for sampling and for analysis.

Data quality objectives for sampling are described in terms of completeness, representativeness and comparability. Completeness is the percentage of the total number of samples that you must actually collect in order to consider your data set "complete". If there are too many "holes" in the data, analysis of your results will be difficult. Representativeness is the extent to which the samples collected reflect the true environmental condition or population you are monitoring. This relates to the location of where the sample is taken from in the stream. It may also relate to the number of samples taken. It may be narrative or numerical. Comparability is the extent to which data from the study can be compared with the past data from the same study or a similar one. For easy access, the data quality objectives for sampling have been summarized on Table 4-1.

Data quality objectives for analysis are discussed in terms of accuracy, precision and detection limits. Accuracy is how close an analytical result is to the expected value. Precision is the degree of agreement between repeated measurements of the same analysis. The detection limit is the lowest possible concentration that your analysis can detect or accurately report.

It should be noted that the data quality objectives established in this Study Design might not accurately represent the field sampling and analysis program over time. This Study Design is a living document that can be modified, as required, throughout the water sampling program. These data quality objectives should be periodically reviewed by the sampling teams to verify their accuracy.

5.0 MONITORING METHODS

The monitoring methods to be used are discussed in the following subsections.

5.1 Surface Water Sampling

The monthly surface water samples will be analyzed for the following items:
- Temperature
- pH
- Conductivity
- Sulfate
- Nitrate
- Alkalinity
- Dissolved oxygen
- Total phosphate

Complete descriptions of the sampling and analyses procedures can be found in the Pennsylvania Volunteer Water Quality Monitoring Field Manual. Table 5-1 summarizes the water sampling program.

5.2 Benthic Macroinvertebrate Sampling

Benthic macroinvertebrates will be sampled two times per year, in the spring and in the fall. The sampling protocol will follow the Pennsylvania Volunteer Water Quality Monitoring Field Manual section titled "Biosurvey."

6.0 MONITORING LOCATIONS AND FREQUENCY

The frequency of the sampling and analyses for surface water quality will be once a month for at least 24 months. Benthos will be sampled and evaluated two times per year, in the spring and fall. As previously stated, the sampling locations are shown on Figure 1. Table 6-1 summarizes the sampling locations.

7.0 QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance/quality control (QA/QC) is a system that is initiated as a part of a sampling program to guarantee that the sampling teams produce the most accurate and reliable results. The first step in producing quality results is to implement a training

reliable results. The first step in producing quality results is to implement a training program. All volunteers participating in the Streets Run monitoring program must complete the EASI training. In the future, training in the use of a colorimeter may be available. Other methods, such as field blanks, field duplicates and mandatory equipment calibration are necessary to produce "good" data. Table 7-1 summarizes the QA/QC measures to be implemented while conducting surface water and benthic sampling in Streets Run.

Should analytical results show that there are QA/QC problems, the following corrective measures may be enacted:
- Field and analytical audits by EASI trainers or other sampling team members
- Additional training
- Delete flawed data
- Modify collection, analytical or data recording procedures

8.0 DATA ANALYSES

All sampling and analyses information will be recorded on data sheets. The sampling teams in the Streets Run Watershed will be using data sheets from the <u>Pennsylvania Volunteer Water Quality Monitoring Field Manual.</u> At a minimum, field data sheets will contain the following information:
- Location of sampling point
- Sampling date and time
- Monitors' name
- Surface water conditions
- Any additional descriptive comments
- Current weather conditions
- Unique identification sample number
- Depth of sample
- Type of sample collected
- Any field measurements taken
- Signature of individual responsible for site work

A designated sampling team member will incorporate the collected data into spreadsheets. This will allow all the data to be searched to look for trends or patterns. Statistics, including averages, means, medians and ranges can then be calculated and a representation of the Streets Run Watershed will be documented.

9.0 STREETS RUN WATERSHED SPECIFIC INFORMATION

Tables 9-1 and 9-2 identify the sampling team members and the technical committee, respectively. This section will also be used to document information specific to the Streets Run Watershed as the sampling progresses (i.e., sample point inaccessible during the months of January and February, or big load of garbage dumped at sample point, etc.) Team and Technical Committee members may contact the preparer of this report to incorporate updates or changes to the sampling program.

SCALE: 1" = 2000'

APROXIMATE LIMITS OF WATERSHED

BALDWIN

BRENTWOOD

PITTSBURGH

STREETS RUN WATERSHED

AIRPORT
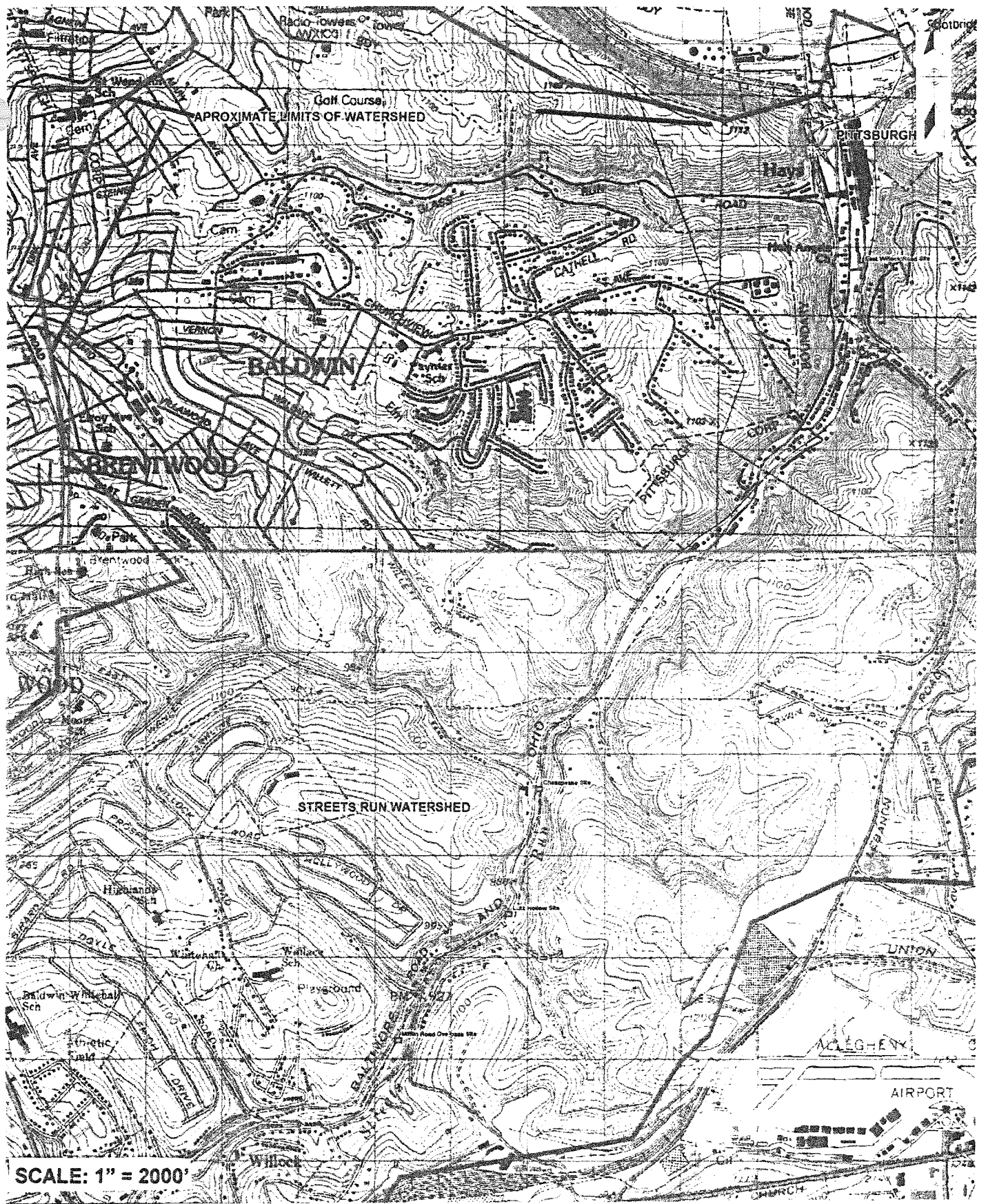
Collective Efforts, LLC
Civil and Environmental Engineers

Streets Run Watershed Association

Site Location Map

Drawn By: CMC	Chkd By:	Date: 07/01/03	FIGURE 1
		Project No. 01-2901	

TABLE 2-1
CURRENT STATUS OF WATERSHED

Streams of Interest	Water Uses Protected	Actual Uses and Values	Uses Supported (Yes or No?)	Source of Impairment	Cause of Impairment	Known Problems, Conflicts or Threats	Known Efforts to Address Problems
Streets Run	WWF, PWS	Stormwater collection, not potable water supply	Yes			Floodway filling over the last 100 years, mining, dumping, urban encroachment	
Glass Run	WWF, PWS	Stormwater collection, not potable water supply	Yes			Mining, dumping	
Unnamed Tributaries	WWF, PWS	Stormwater collection, not potable water supply	Yes			Urban encroachment	

Notes:
WWF = warm water fisheries
PWS = public water supply

TABLE 4-1
DATA QUALITY OBJECTIVES FOR SAMPLING

Parameter	Method/ Measurement Range	Units	Practical Quantitation Limits	Precision	Accuracy	Completeness
Temperature	Armored Thermometer/ 0 - 100	°C	0	+/- 20%	+/- 0.5 °C	80 %
Dissolved Oxygen	Winkler Titration/ 0.2 - 4 1 - 20	mg/l	0.2	+/- 20% RPD*	75 – 125 % recovery**	80 %
pH	pH meter/ 1 - 14	pH units	1.0	+/- 20% RPD*	90 – 110 % recovery**	80 %
Conductivity	Conductivity Meter/ 10 - 1990	μ mhos/cm	10	+/- 20% RPD*	+/- 10 μ mhos/cm	80 %
Nitrate	Cadmium Reduction/ 0.044 - 4.4 0.044 - 44	mg/l	0.044	+/- 20% RPD*	75 – 125 % recovery**	80 %
Total Phosphate	Acid Persulfate Digestion-Ascorbic Acid Test/ 0.02 – 1 0.02 – 5 0.02 – 50	mg/l	0.02	+/- 20% RPD*	75 – 125 % recovery**	80 %
Alkalinity	End Point Titration/ 5 – 100 20 – 400	mg/l	5 20	+/- 20% RPD*	75 – 125 % recovery**	80 %
Sulfate	Turbidi-Metric 50 - 200	mg/l	50	+/- 20% RPD*	75 – 125 % recovery**	80 %

* RPD (Relative Percent Difference) = $\dfrac{X_s - X_d}{[(X_s + X_d)/2]} \times (100)$

Where: X_s = result for the sample and
X_d = results for the duplicate sample

** Percent (%) Recovery = Measured Value/Calibration Standard Value x 100

TABLE 5-1
SAMPLE COLLECTION METHODS

Indicator	What will be sampled	Containers /preservation	Quantity to be Collected	No. of samples per site	Methods Reference
Temperature	Water	In-stream	---	1	(a)
pH	Water	In-stream	---	1	(a)
Conductivity	Water	In-stream	---	1	(a)
Sulfate	Water	HACH kit	25 to 50 mL	1	(a)
Total phosphate	Water	HACH kit	20 mL	1	(a)
DO	Water	HACH kit	Tube/ DO bottle	1	(a)
Alkalinity	Water	HACH kit	23 mL	1	(a)
Nitrate	Water	HACH kit	5 mL	1	(a)
Benthic Macroinvertebrates	Benthic life	White dishpan	---	3	(a)

(a) Pennsylvania Volunteer Water Quality Monitoring Field Manual

Notes:

DO = dissolved oxygen
ML = milliliter

TABLE 6-1
SAMPLING LOCATIONS

Site Number	Brief Description of Location	How and Where will the Site be Sampled	Type of Site	Indicators
1 # 1047	East Willock Rd.	Sampling over 10 meter section of stream.	Flat easily accessible stream bed. Stream bottom is cobble, gravel & sand. Water is clear and well populated.	General water chemistry 12/year, benthic 2/year
2 # 1104	Chesapeake Site.	Sampling over 10 meter section of stream.	Flat easily accessible stream bed. Stream bottom is cobble, gravel, sand & silt. Water is slightly milky and lightly populated.	General water chemistry 12/year, benthic 2/year
3 # 1083	Mifflin Rd overpass.			
4 # 1084	Lutz Hollow			

TABLE 7-1
QUALITY CONTROL MEASURES

INTERNAL CHECKS	T	PH	C	ALK	DO	NITRATE	SULFATE	PHOS	BENTHIC
Field Blank			✔						
Field Duplicate	✔	✔	✔	✔	✔	✔	✔	✔	✔
Equipment Calibration	✔	✔	✔						

One field duplicate should be conducted at every sampling station (i.e., one analysis [not one of each analysis] for either alkalinity, DO, nitrate, sulfate, total phosphate or benthics should be duplicated at each sampling station).

Notes:

T= temperature
C=conductivity
ALK=alkalinity
DO=dissolved oxygen
PHOS=total phosphate

TABLE 9-1
PROJECT TASKS AND PERSONNEL

Major Project Tasks	Who Will Perform	Address, Phone No., e-mail
Testing – Sample collection	Robert Reitmeyer (team leader)	412-885-0852 allrs@stargate.net
Testing – Sample collection	Robert Lutz	412-881-4758 lutzf@stargate.duq.edu
Testing – Sample collection	Pat Bondi	412-884-3554 PBondi715@aol.com
Testing – Sample collection	Jack Yerman	412-881-4743 jacky@libcom.com
Testing – Data Recorder	Regina Reitmeyer	412-885-0852 allrs@stargate.net

TABLE 9-2
TECHNICAL COMMITTEE

Member Name	Area of Expertise	Address, Phone No., e-mail
Coreen Casadei	Engineering, ecology	462 Perry Highway, PGH, PA 15229, 412-459-0114, ccasadei@collectiveefforts.com
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Patrick J. Bondi		Pbondi715@aol.com
Harold Berkoben		