

Appendix 7 – Phase 3 Meeting Documents 08162016

EWA Phase 2/3 Effectiveness Studies Meeting

Date | Time | 8/15/2016 9:30 AM |

Location | Ecology Headquarters Office
Lacey, WA, TBD Room Number

Topic | QAPP Template Planning

Conference Line | none

Meeting Handouts:

- 1 - Study Idea List 063016
- 2 - Study Idea Public Briefing
- 3 – S8.B Study Implementation Process
- 4a – Study Proposal vs QAPP Content
- 4b - Permit Section S8.B4-6
- 5a,b - Study Objectives Defined
- 5b – Overview Study Objective & Classification
- 6a,b – Study Objective/Classification & Experiment Requirements
- 7 – Study Type Content vs QAPP Sections

Invited:

- Karen Dinicola, Ecology
- Art Jenkins, City of Spokane Valley
- Jon Morrow, City of Ellensburg
- Jessica Shaw, City of Wenatchee
- Aimee Navickis-Brasch, NBSWE
- Abbey Stockwell, Ecology
- Doug Howie, Ecology
- Brandy Lubliner, Ecology
- Vince McGowan, Ecology

Agenda Items

Topic	Presenter	Time allotted
<input type="checkbox"/> Introductions	All	5 minutes
<input type="checkbox"/> Meeting Goals & Objectives <ul style="list-style-type: none"> • Vision for Stormwater QAPP Templates 	Art	5 minutes
<input type="checkbox"/> Introduction to Effectiveness Studies in EW & Phase 2 (<i>Handouts 1 & 2 & 3</i>)	Art	15 minutes
<input type="checkbox"/> Overview of Next Phases 3a/b & 4	Art	5 minutes
<input type="checkbox"/> Determine <i>Generally</i> , the Detailed Study Proposal Content compared to QAPP Content (<i>Handout 4a & 4b</i>)	Aimee	30 minutes
<input type="checkbox"/> Define Different Types of Study Objectives (<i>Handout 5a & 5b</i>)	Aimee	15 minutes
<i>Break</i>		<i>10 minutes</i>
<input type="checkbox"/> Define Experimental Requirements for Each Study Type (i.e. analysis methods, numbers of samples, study duration) (<i>Handout 6a & 6b</i>)	Aimee	45 minutes
<input type="checkbox"/> Determine <i>Specifically</i> , the Proposal Content for each Study Type with respect to QAPP Content (<i>Handout 7</i>)	Aimee	30 minutes
<input type="checkbox"/> Next Steps: <ul style="list-style-type: none"> • QAPP Template Review and Approval Process • Detailed Study Design Review and Approval Process 	Art/Karen	20 minutes

Notes:

S8.B Study Implementation Process/Path

Completed

June 2015

Phase I

Concepts/Tools

- 100% ECY Grant
- 12-15 Study Ideas (SIs)
- List Ways to Fund SIs
- *Tools to decide how to participate in "regional studies"*

S8.B.1 & Parts of S8.B.2, 3, & 4

What can be done?
How much will it cost?

By June 2016

Phase II

Partnerships

- 100% ECY Grant
- ID lead entities (LE) and Participating Permittees (PPs) for each study idea
- Rank/Submit 12-15 SIs
- ID Funding partnerships
- *EWSG endorses Implementation Plan*

S8.B.2 & 3

What is important?
Who will do it?
How will it be paid?

By June 2017

Phase IIIa Proposals

- Study Teams work on detailed Study Design Proposals (SDPs) w/ consultant(s)
- Submit SDPs for 8-12 SIs by 6/30/2017
- ECY REVIEW

S8.B.4, 5, & 6

How will selected studies be implemented, data collected?

Phase IIIb Design

- w/in 6 months of ECY approval of SDP(s), QAPP's are completed
- ECY review/ approval w/in 90 days

Phase IV Study Work

- Start work on 4 Studies w/in 6 months of ECY approval
- Start work on 4+ studies w/in 15 months of ECY approval
- Interim Reporting
- EIM data entry
- Final Results Reporting and Recommendation

S8.B.7, 8, 9, & 10

What are the results & recommendations?

Outline of QAPP Sections	S8.B4-5 Detailed Study Design Proposal (June 30, 2017)	S8.B6 QAPP (6 months later)
1. Title Page with Approvals	✓	✓
2. Table of Contents and Distribution List	✓	✓
3. Background		
Problem Statement: <i>why does problem needs to be solved</i> Expected modifications to SW Management Program <i>i.e. Use Level Designation & Performance Goals</i>	✓	✓
Description of Study Focus - Permit Required SW Management Program: <i>Structural, Operational, E&O</i>		✓
Overview of previous studies including results		✓
4. Project Description		
Project goals, objectives, & tasks required to collect data	✓	
Information (data) needed to meet objectives	✓	
5. Organization and Schedule		
Key individuals and their responsibilities (i.e. lead entity & participating permittees)	✓	
Project schedule, budget, and funding sources		✓
6. Quality Objectives Precision, bias, sensitivity, representativeness, completeness, comparability		✓
7. Experimental Design	✓	
<i>Study Design Overview</i>	✓	
Target population (E&O)	Preliminary	Final
Monitoring Site or Study Location(s): <i>Maps or diagrams</i>	Preliminary	Final
Description of Practice/Activity: i.e. BMP/Technology Treatment System Sizing, operating procedures, E&O	✓	
Monitoring System Design: <i>including plan sheets</i>	Preliminary	Final
Sample Collection: <i>Define what data will be collected, location for collection, frequency, # samples needed</i>	✓	
8. Sampling Procedures <i>Define how data will be collected</i>	Preliminary	Final
9. Measurement Procedures <i>Define testing methods: i.e. standard testing methods or survey design/interview questions</i>	Preliminary	Final
10. Quality Control		✓
11. Data Management Procedures		✓
12. Audits and Reports		✓
13. Data Verification & Validation		✓
14. Data Quality (Usability) Assessment <i>data analysis methods and presentation (i.e. graphs)</i>	Preliminary	Final

Annual reporting of any monitoring, studies, or analyses conducted as part of S8.B below must follow the requirements specified in the approved Quality Assurance Project Plans (QAPPs).

- B. Stormwater Management Program Effectiveness Studies. Each city and county Permittee listed in S1.D.2.a.i and S1.D.2.a.ii shall collaborate with other Permittees to select, propose, develop, and conduct Ecology-approved studies to assess, on a regional or sub-regional basis, effectiveness of permit-required stormwater management program activities and best management practices. Permittees shall:
1. Review the individual study ideas that were proposed in Permittees' annual reports due March 31, 2010 and add new ideas for collaborative studies of permit-required programmatic, operational, or structural best management practices. For each study idea, discuss: what data are needed to evaluate the effectiveness of the practice; how Permittees' stormwater management programs might be improved based on the findings of a study; and potential partnerships between Permittees whereby data can be collected efficiently and effectively.
 2. Rank the study ideas and compile a final list of twelve to fifteen study ideas for Eastern Washington. For each of these twelve to fifteen study ideas, identify a single Permittee as lead entity and also identify the sub-region or other grouping of Permittees that will participate.
 3. On or before June 30, 2016, submit the ranked list of twelve to fifteen study ideas for Eastern Washington to Ecology. Include a brief summary of the data collection that will be necessary to evaluate the effectiveness of the practice. For each study idea, list the lead entity and the other Permittees that will participate.
 4. Lead entities shall develop detailed study design proposals for a combined total of no fewer than eight and no more than twelve of the top-ranked ideas. For each study, describe the purpose, objectives, design, and methods; list the Permittees that will participate, and their roles and responsibilities; describe anticipated outcomes; identify methods to report the results; and describe expected modifications to the Permittees' stormwater management programs.
 5. On or before June 30, 2017, lead entities shall submit the detailed proposals to Ecology in both electronic and paper form.
 6. Lead entities shall submit a Quality Assurance Project Plan (QAPP) for each study within six months of Ecology's written approval of each detailed proposal. A combined total of no fewer than eight and no more than twelve QAPPs shall be submitted from all lead entities. All QAPPs shall be submitted in both electronic and paper form. If Ecology does not request changes or provide written approval within 90 days of the QAPP submittal, the QAPP is considered approved as submitted.
 7. Lead entities of a minimum of four studies shall begin to implement each study no later than six months following approval of the QAPP. Lead entities for the

remainder of the studies shall begin to implement each study no later than fifteen months following approval of the QAPP.

8. For all studies, lead entities shall describe interim results and status of the study in their annual reports throughout the duration of the study.
 9. For all studies, lead entities and/or participating Permittees shall enter all applicable data collected as part of conducting the study into Ecology's Environmental Information Management (EIM) database before the end of the water year in which it is collected, or within six months of collecting the sample, whichever is later.
 10. All participating Permittees shall report the final results of each study and recommend future actions based on the findings. Reports and recommendations shall be submitted to Ecology no later than six months after completion of the study and by other means and timelines identified in the approved QAPPs.
- C. Each city and county Permittee listed in S1.D.2.a.i and S1.D.2.a.ii shall provide, in each annual report, a description of the Permittee's participation in Eastern Washington Stormwater Management Program Effectiveness Studies planning efforts, and related outcomes.

S9. REPORTING AND RECORDKEEPING

- A. No later than March 31 of each year beginning in 2016, each Permittee shall submit an annual report. The reporting period for the first annual report will be January 1, 2015 through December 31, 2015. The reporting period for all subsequent annual reports will be the previous calendar year unless otherwise specified.

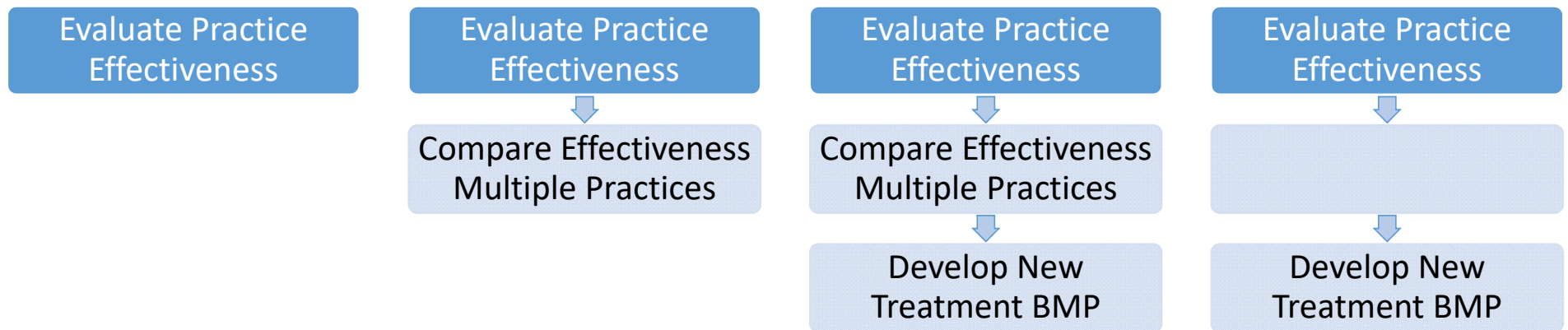
Permittees shall submit annual reports electronically using Ecology's WQWebDMR program available on Ecology's website at <http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html> unless otherwise directed by Ecology.

Permittees unable to submit electronically through Ecology's WQWebDMR must contact Ecology to request a waiver and obtain instructions on how to submit an annual report in an alternative format.

- B. Each Permittee is required to keep all records related to this permit for at least five years.
- C. Each Permittee shall make all records related to this permit and the Permittee's SWMP available to the public at reasonable times during business hours. The Permittee will provide a copy of the most recent annual report to any individual or entity, upon request.
1. A reasonable charge may be assessed by the Permittee for making photocopies of records.
 2. The Permittee may require reasonable advance notice of intent to review records related to this permit.

Stormwater Management Program Effectiveness Study Objectives

(Handout 5)



- Evaluate Practice Effectiveness: study objective is to evaluate the effectiveness of a single practice
- Compare Effectiveness of Multiple Practices: study objective includes comparing the effectiveness of multiple practices (which practice is better)
- Develop New Treatment BMP: for structural treatment BMPs, study objective includes developing new or modified design guidance for a BMP that is approved by Ecology approved for general use

Study Idea Title	Practice/Activity Classification			Study Objective		
	Structural	Operationa I	E&O	Evaluate Practice Effectiveness	Compare Effectiveness of Multiple Practices	Develop New BMP
BMP Inspection and Maintenance Responsibilities			X	X		
Long-term Permeable Pavement Sidewalk Infiltration Performance	X			X		
Stormwater BMP Owner Awareness			X	X		
Determining Pollutant Contributions from Municipal Stormwater in EWA using GIS	X	X	X	X	X	
Seasonal Differences in Street Sweeping Material Removal		X		X	X	
Catch Basin Retrofit Device Placement	X			X	X	
Media Thickness Study and/or Media Component Study	X			X	X	
Street Sweeping and Catch Basin Cleaning Comparison		X		X	X	
Biochar Media Stormwater Treatment Study	X			X	X	
Mobile Contractor Illicit Discharge Education			X	X	X	
Modernizing Education and Outreach Strategies			X	X	X	
Use of Non-vegetative Swale with Native Soils	X			X	X	X
Sand Filter Vault BMP	X			X		X
Sharp Avenue Porous Pavement Study	X			X		X

Study Requirements	Deadlines	Study Objective		
		Evaluate Practice Effectiveness	Compare Practice Effectiveness	Develop New Treatment BMP Emerging Technology
Ranked list of 12-15 EWA study ideas (S8.B2-3) <ul style="list-style-type: none"> Summary of study concept & data collection necessary to evaluate effectiveness Identify lead entity & participating permittees 	30-Jun-16			N/A
8-12 Detailed Study Design Proposals (S8.B4-5) <ul style="list-style-type: none"> Locate Suitable Test Site Define target audience (E&O studies) 	30-Jun-17			N/A
QAPP Development <ul style="list-style-type: none"> Complete QAPP & Submit to Ecology 	Max. 6 months after Ecology approves detailed proposal			
Implement 8-12 Studies	After QAPP approval: minimum 4 studies within 6 months; remaining studies within 15 months			N/A
Type of Data to be Collected				
Number of Samples				
Study Duration (Varies Depending on Study)				
Data Analysis Methods				
Effectiveness Study Reporting (S8.B8-10) <ul style="list-style-type: none"> Annual Report: interim results & study status Enter Data into Ecology EIM database Final Report & Recommendations 	<ul style="list-style-type: none"> Annual report deadline End of water year 6 months after study 			N/A
TAPE Process <ul style="list-style-type: none"> Submit Application Technical Evaluation Report (TER) Ecology Decision 	<ul style="list-style-type: none"> before QAPP 6 after end of study 3 mon. after TER submittal 	N/A	N/A	

Experimental Requirements	Evaluate Practice Effectiveness		
	Operational (street sweeping)	E&O	Structural
Type of Data	<ul style="list-style-type: none"> • precipitation monitoring (depth) • sediment samples: gross solids qualitative estimate; Volumetric/mass measurement & analysis 	<ul style="list-style-type: none"> • <u>Quantitative</u>: Survey target audience (i.e. multiple choice questions) • <u>Qualitative</u>: interview target audience (i.e. open ended questions) 	<ul style="list-style-type: none"> • characterize/define treatment media physiochemical properties (before & after) • water sampling (influent & effluent)^{1,2} • precipitation monitoring (depth) • flow monitoring (runoff flow rate) • infiltration rate
Number of Samples ⁴	minimum 12		minimum 12
Study Duration	1-2 wet seasons		1-2 wet seasons
Methods of Analysis	Basic Statistics: Average & Standard Deviation	<u>Quantitative - Multiple Choice Surveys:</u> <ul style="list-style-type: none"> • convert respondent data to likert scale (agree=1, disagree=-1, neutral=0) • Determine average (central tendency) & standard deviation <u>OR</u> percentage of responses to each answer <u>Qualitative - Open Ended Interview Questions:</u> <ul style="list-style-type: none"> • Ask participants the same open ended interview questions • Analysis: Code interview responses, identify common themes, combine responses with similar themes and determine percentage of responses with similar themes • Verification: 2 independent reviewer verify codes/themes 	<ul style="list-style-type: none"> • Normality Test • Hypothesis Testing - Statistical comparison of influent and effluent concentrations • Pollutant removal efficiency • Average & standard deviation • Statistical evaluation of pollutant removal (confidence interval)

1. Water quality sampling is not applicable for Long-term Permeable Pavement Sidewalk Infiltration Performance
2. Only target pollutants or pollutants for which the BMP treatment level is approved
3. Test for all regulated pollutants a minimum of 3 times during the study

Experimental Requirements	Compare Practice Effectiveness			Develop New Treatment BMP (Emerging Technology - TAPE)
	Operational (street sweeping)	E&O	Structural	Structural Treatment BMP
Type of Data	same as evaluate practice effectiveness			Same as evaluate practice effectiveness EXCEPT for the following modification: <ul style="list-style-type: none"> • water sampling (influent & effluent)^{2,3}
Number of Samples ⁴	minimum 12 each practice		minimum 12 each practice	<ul style="list-style-type: none"> • Statistically comparison of influent and effluent pollutant concentrations, 95% CI & 80% power, minimum 12 samples • Ecology treatment performance criteria is achieved to 95% CI, max 35 samples
Study Duration	same as evaluate practice effectiveness			1.5 maintenance cycles or two wet seasons (for cycles longer than 2 years)
Methods of Analysis	same as evaluate practice effectiveness for structural BMPs	Same as evaluate practice effectiveness, plus: <u>Quantitative - Hypothesis Testing:</u> <ul style="list-style-type: none"> • statistical comparison between practice data sets using nonparametric method such as Mann-Whitney U-test • When comparing between locations with different populations: use a weighted average (i.e. divide the number of responses by the population). 	same as evaluate practice effectiveness	same as evaluate practice effectiveness

QAPP Section	Structural BMPs	Operational BMPs	E&O Studies
1. Title Page with Approvals			
Title, author, organization			
Date prepared or revised			
Signature page includes key individuals, per element 5 below Comments			
2. Table of Contents and Distribution List			
Contents and list			
2.5 Acronyms & Symbols			
Acronyms and Symbols Defined			
3. Background			
Problem Statement: <i>why does problem needs to be solved</i> i.e. Expected modifications to SW Management Program			
Description of Study Focus - Permit Required SW Management Program: <i>Structural, Operational, E&O</i>			
Overview of previous studies including results			
4. Project Description			
Project goals, objectives, & tasks required to collect data			
Information (data) needed to meet objectives			
Information needed and sources			
Study boundaries			
Tasks required			
Practical constraints			
5. Organization and Schedule			
Key individuals and their responsibilities (i.e. project team, stakeholders, lab, etc.)			
Organization chart			
Project schedule including any potential limitations			
Budget and funding sources			
6. Quality Objectives			
Precision			
Bias			
Sensitivity			
Representativeness			
Completeness			
Comparability			

7. Experimental Design			
Study Design Overview			
Target Population (E&O only)	N/A	N/A	
Study Location or Monitoring Site <i>Maps or diagrams, Sampling location and frequency</i>			
Description of Practice/Activity: i.e. BMP/Technology Treatment System Sizing, operating procedures, E&O program			
BMP/Technology Treatment System Sizing			N/A
Description of BMP operations procedures			N/A
Precipitation Monitoring			N/A
Flow Monitoring		N/A	N/A
Water Sampling		N/A	N/A
Sediment Sampling			N/A
Supplemental Laboratory Testing Procedures			N/A
<i>Survey or Interview Questions</i>	N/A	N/A	
<i>Parameters to be determined</i>			
<i>Field measurements</i>			
<i>Assumptions underlying design</i>			
8. Sampling Procedures			
Precipitation Monitoring	✓	✓	
Flow Monitoring	✓	✓	
Water Sampling	✓	✓	
Sediment Sampling	✓	✓	
<i>Procedures for administering and collecting survey responses and interview questions</i>	N/A	N/A	
<i>Field measurement and sampling SOPs</i>			
<i>Measurement and sample collection</i> <i>For E&O, procedures for collecting survey responses and interview questions</i>			
<i>Containers, preservation, holding times</i>			N/A
<i>Equipment decontamination</i>			N/A
<i>Sample or respondent ID</i>			
<i>Chain-of-custody, if required</i>			N/A
<i>E&O: IRB if needed</i>	N/A	N/A	
<i>Field log requirements</i>			N/A
9. Measurement Procedures			
Water Sampling			N/A
Sediment Sampling			N/A
Lab procedures table, including:			N/A
Analyte			N/A
Matrix			N/A
Number of samples			N/A

Expected range of results			N/A
Analytical method			N/A
Sensitivity			N/A
For E&O Describe/justify survey or interview design	N/A	N/A	
Sample preparation method			N/A
Special method requirements			N/A
Field procedures table			N/A
Lab(s) accredited for method(s)			N/A
10. Quality Control			
Table of lab and field QC required			
Laboratory quality control			N/A
Corrective action processes			
11. Data Management Procedures			
Data recording/reporting requirements Lab data package requirements			
Electronic transfer requirements			
Acceptance criteria for existing data			
EIM data upload procedures			
12. Audits and Reports			
Number, frequency, type, and schedule of audits			
Responsible personnel			
Frequency and distribution of reports			
Responsibility for reports			
13. Data Verification & Validation			
Field data verification, requirements, and responsibilities			
Lab data verification			
14. Data Quality (Usability) Assessment			
Process for determining whether project objectives have been met			
Data analysis and presentation methods			
Treatment of non-detects			
Sampling design evaluation			
Documentation of assessment			
15. References			
16. Appendix			
A.			
B.			
C.			
D.			
E.			
F.			
G.			

Appendix 8 – Phase 3 Meeting Documents 09152016

EWSG Meeting

Effectiveness Studies Update

September 15, 2016

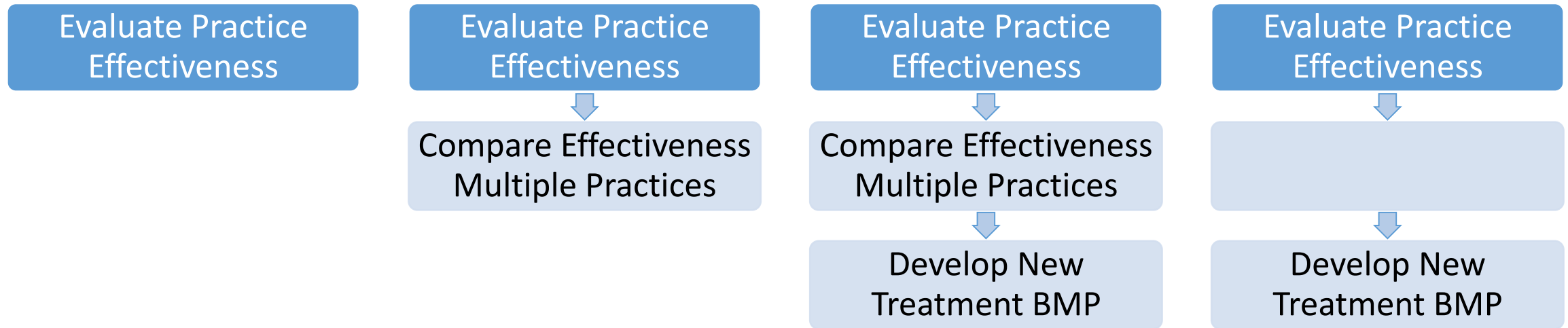
Moses Lake, WA

QAPP Template

Goal: Develop templates for the Detailed Study Design Proposals and QAPP that is specific to the requirements of Stormwater Effectiveness Studies and will provide consistency in the development of these documents

- Defines Content for Detailed Study Design Proposals
 - That aligns with and will be include in the QAPP document
- Defines Content for the QAPP
- Templates are specific to each study classification
 - Structural BMPs, Operational BMPs, and E&O Studies
- Templates consider different study Objectives
 - Evaluate Effectiveness, Compare Effectiveness, and Develop New BMP

Stormwater Management Program Effectiveness Study Objectives



- Evaluate Practice Effectiveness: study objective is to evaluate the effectiveness of a single practice
- Compare Effectiveness of Multiple Practices: study objective includes comparing the effectiveness of multiple practices (which practice is better)
- Develop New Treatment BMP: for structural treatment BMPs, study objective includes developing new or modified design guidance for a BMP that is approved by Ecology approved for general use

Outline of SW Effectiveness QAPP Sections	S8.B4-5 Detailed Study Design Proposal (June 30, 2017)	S8.B6 QAPP (6 months later)
1. Title Page with Approvals	✓	update
2. Table of Contents and Distribution List	✓	update
3. Background		
Introduction to SW Management Activity or Practice; Structural BMP, Operational BMP, E&O Program	✓	
Research Problem Description: why does problem needs to be solved	✓	
Results of Previous Studies		✓
4. Project Description		
Project Goals: Reason for conducting the study including anticipated modification to SW Management Program	✓	
Project Objectives: what the study will accomplish (activities) or how the study will evaluate effectiveness	✓	
Identify Study Location and/or Target Population (E&O): provide short description of location or population include maps	General	Specific
Data Needed to meet objectives:	✓	
Tasks Required to Conduct Study: similar to tasks defined in a statement of work	Preliminary	Finalize
Potential Constraints: describe conditions that may impact the project schedule, budget, or scope	Preliminary	Finalize
5. Organization and Schedule		
Key Team Members: Roles and Responsibilities	Lead entity & participating permittees	All Key Team Members
Project Schedule, Budget, and Funding Sources	Preliminary	Final
6. Quality Objectives		
Defines how study will verify data is scientifically and legally defensible. Quality indicators for data evaluation: precision, bias, sensitivity, representativeness, completeness, comparability		✓
7. Experimental Design		
Study Design Overview: provide an overview of the study design; level of detail similar to executive summary	✓	

Study Location or Target population (E&O): identify and describe selection process	General	Final
Practice/Activity Function: design how it works and the basis for the how (i.e. describe BMP Design Criteria, operating procedures, educational program)	General	Final
Data to be Collected: Define what data will be collected, location for collection, frequency, # samples needed	Preliminary	final
Data Collection Process/Design: Define how data will be collected (i.e. describe the monitoring system design including plan sheets)	Conceptual	Final
8. Sampling Procedures Define specific procedures for collecting data includes standard operating procedures (SOP)		✓
9. Measurement Procedures Define the methods and procedures that will be used during the study to measure data: i.e. standard testing methods or survey design or interview questions		✓
10. Quality Control Define the study procedures for maintaining QA/QC during data collection, i.e. equipment maintenance and calibration, blanks/duplicates		✓
11. Data Management Procedures Describes the procedures for managing and storing data and other documents that contain information collected during the study.		✓
12. Audits Describe what (process/procedures) will be audited, number of audits, schedule, frequency		✓
13. Reports <ul style="list-style-type: none"> Final Report Content – provide outline of final report that identifies information that will be in final report Final Report Dissemination – describe how the report will be distributed and where it will be stored 		✓
14. Data Analysis & Verification Methods Describe methods for: verifying/validating data collected, how data will be analyzed, and presented (i.e. graphs) in the final reports	Preliminary	Final

Study Objective/Classification & Experiment Requirements

Study Idea Title	Practice/Activity Classification			Study Objective		
	Structural	Operational	E&O	Evaluate Practice Effectiveness	Compare Effectiveness of Multiple Practices	Develop New BMP
BMP Inspection and Maintenance Responsibilities			X	X		
Long-term Permeable Pavement Sidewalk Infiltration Performance	X			X		
Stormwater BMP Owner Awareness			X	X		
Determining Pollutant Contributions from Municipal Stormwater in EWA using GIS	X	X	X	X	X	
Seasonal Differences in Street Sweeping Material Removal		X		X	X	
Catch Basin Retrofit Device Placement	X			X	X	
Street Sweeping and Catch Basin Cleaning Comparison		X		X	X	
Biochar Media Stormwater Treatment Study	X			X	X	
Mobile Contractor Illicit Discharge Education			X	X	X	
Modernizing Education and Outreach Strategies			X	X	X	
Media Thickness Study and/or Media Component Study	X			X	X	?
Use of Non-vegetative Swale with Native Soils	X			X	X	X
Sand Filter Vault BMP	X			X		X
Sharp Avenue Porous Pavement Study	X			X		?

QAPP Template Development

Preliminary Process & Timeline

- | | |
|-----------------------|---|
| August 15 | Kickoff Meeting in Lacey <ul style="list-style-type: none"><input checked="" type="checkbox"/> <i>Phase 2 Study Overview & Present/Discuss QAPP Template Concept</i> |
| September 26 | Template Outline Complete (<i>Operational & Structural BMPs</i>) <ul style="list-style-type: none"><input type="checkbox"/> <i>Consultant Submit Template Outline for Ecology Review</i> |
| September 29 | Meeting in Ellensburg <ul style="list-style-type: none"><input type="checkbox"/> <i>Case Study 1 & Template Outline (BMPs) Presentation/Discussion</i> |
| Late October | Complete - Draft Template (BMPs) & Template Outline (E&O) <ul style="list-style-type: none"><input type="checkbox"/> <i>Consultant Submit Templates for Ecology Review</i> |
| Early November | Meeting in Wenatchee (or Lacey) <ul style="list-style-type: none"><input type="checkbox"/> <i>Case Study 2 & Draft Template Outline (E&O) Presentation/Discussion</i> |
| Late November | Complete - QAPP Templates <ul style="list-style-type: none"><input type="checkbox"/> <i>Consultant distributes electronic copies of to EWSG & Ecology</i> |

Next Steps

Detailed Study Design Review & Approval

Define Review Process Detailed Study Design Proposal

→ Define Ecology role in review/approval of Detailed Study Design

Proposed Schedule Development, Review, and Approval Process

→ January 6, 2017 - Consultants start

→ February 1, 2017 - Project Kickoff Meeting

→ Mid-March - 30% Review: Online presentation to Steering Committee & Ecology

→ Mid-April - Public Review

→ Mid-May – 90% Proposal Review – Steering Committee & Ecology

→ June 15, 2017 – Proposal due to Ecology

→ TBD - Ecology Review/Approval Timeline

Appendix 9 – Phase 3 Meeting Documents 09292016

EWA Phase 2/3 Effectiveness Studies Meeting

Date | Time | 9/29/2016 10:00 AM to 2:00 PM *Location* | City of Ellensburg
 501 North Anderson St
 Ellensburg, 98926
 Room Number - TBD

Topic | QAPP Template Development *Conference Line* | none

Meeting Handouts:

- 1 - Agenda
- 2 – Case Study Presentation (distributed at meeting)
- 3 – QAPP Template Draft Outline 09262016
- 4 – QAPP Template Presentation (distributed at meeting)

Invited:

- Karen Dinicola, Ecology
- Art Jenkins, City of Spokane Valley
- Jon Morrow, City of Ellensburg
- Jessica Shaw, City of Wenatchee
- Abbey Stockwell, Ecology
- Doug Howie, Ecology
- Brandy Lubliner, Ecology
- Vince McGowan, Ecology
- Aimee Navickis-Brasch, NBSWE
- Jay Decker, HDR

Agenda Items

Topic	Presenter	Time allotted
<input type="checkbox"/> Introductions	All	5 minutes
<input type="checkbox"/> Case Study Presentation – Operational BMPs <i>Street Sweeping vs Catch Basin Cleaning (Handout 2)</i> <ul style="list-style-type: none"> • Discuss/refine - study design to meet project objectives, goal, & SW Program modifications 	Jon	40 minutes
<input type="checkbox"/> Field Trip – Visit Test-Site and Decant Facility	All	75 minutes
<input type="checkbox"/> QAPP Template Review & Presentation (<i>Handouts 3 & 4</i>) <i>Use Case Study as example/context for QAPP discussion</i> <ul style="list-style-type: none"> • Review/ Discuss/Refine QAPP Template Content: focus on Operational & Structural BMPs • Request Feedback: <ul style="list-style-type: none"> ○ Number of templates (1, 2, or 3)? ○ Structural BMP guidance document (instead of template)? ○ Define effectiveness study report content ○ Identify required elements for effectiveness studies (compared to TAPE and QAPP) • Discuss E&O sections (if time allows) 	Aimee	90 minutes

Topic	Presenter	Time allotted
<input type="checkbox"/> Next Steps <ul style="list-style-type: none">• Select location for October 26th meeting• Define QAPP Template Review and Approval Process• Detailed Study Design Review and Approval Process	Art/Karen	30 minutes

Notes:



STREET SWEEPING AND CATCH BASIN CLEANING COMPARATIVE STUDY

City of Ellensburg

Jon Morrow

September 29, 2016

Case Study #15 Presentation Outline

- ❑ Background
- ❑ Study Goal and Objectives
- ❑ Anticipated Results (outcomes, program modification)
- ❑ Experimental Design Overview (BMP activity, Function, data collected and process)
- ❑ Data Analysis
- ❑ Dissemination of Study Documents

Central Washington Weather

- ❑ Cold Snowy Winters
- ❑ Hot and Dry Summers

A photograph of a weathered wooden barn with a snow-covered roof, set in a snowy landscape with wind turbines in the background.

Background

Summer Condition Precip Avg.

- From April to October Ellensburg precipitation broken down by month
- April .59 inches 61 high 34 low
- May .67 inches 69 high 42 low
- June .59 inches 76 high 49 low
- July .31 inches 84 high 54 low
- August .24 inches 86 high 54 low
- September .43 inches 76 high 43 low

Winter Precip Avg.

- ▣ **From October to March Ellensburg
Precipitation broken down by month**
- ▣ **October .59 (rain) 62 high 32 low**
- ▣ **November 1.22 (3 in. snow) 45 high 27 low**
- ▣ **December 1.57 (8 in. snow) 33 high 19 low**
- ▣ **January 1.18 (7 in. snow) 35 high 20 low**
- ▣ **February .83 (5 in. snow) 41 high 24 low**
- ▣ **March .67 (2 in. snow) 53 high 29 low**

Spring and Summer

- Sweeping and catch basin cleaning season
- March-October
- Conditions, mostly dry, very dry, windy, hot and sporadic/widespread thunderstorms that can deposit one inch of rain in less than 30 minutes.

[Monthly](#)[History](#)[Geo & Map](#)[Weather Forecast](#)

Climate Olympia - Washington

°C | °F

	Jan	Feb	Mar	Apr	May	Jun
Average high in °F:	46	49	54	59	65	71
Average low in °F:	34	33	35	38	43	48
Av. precipitation in inch:	7.83	5.28	5.28	3.54	2.32	1.77
Days with precipitation:	-	-	-	-	-	-
Hours of sunshine:	-	-	-	-	-	-
Average snowfall in inch:	2	5	1	0	0	0

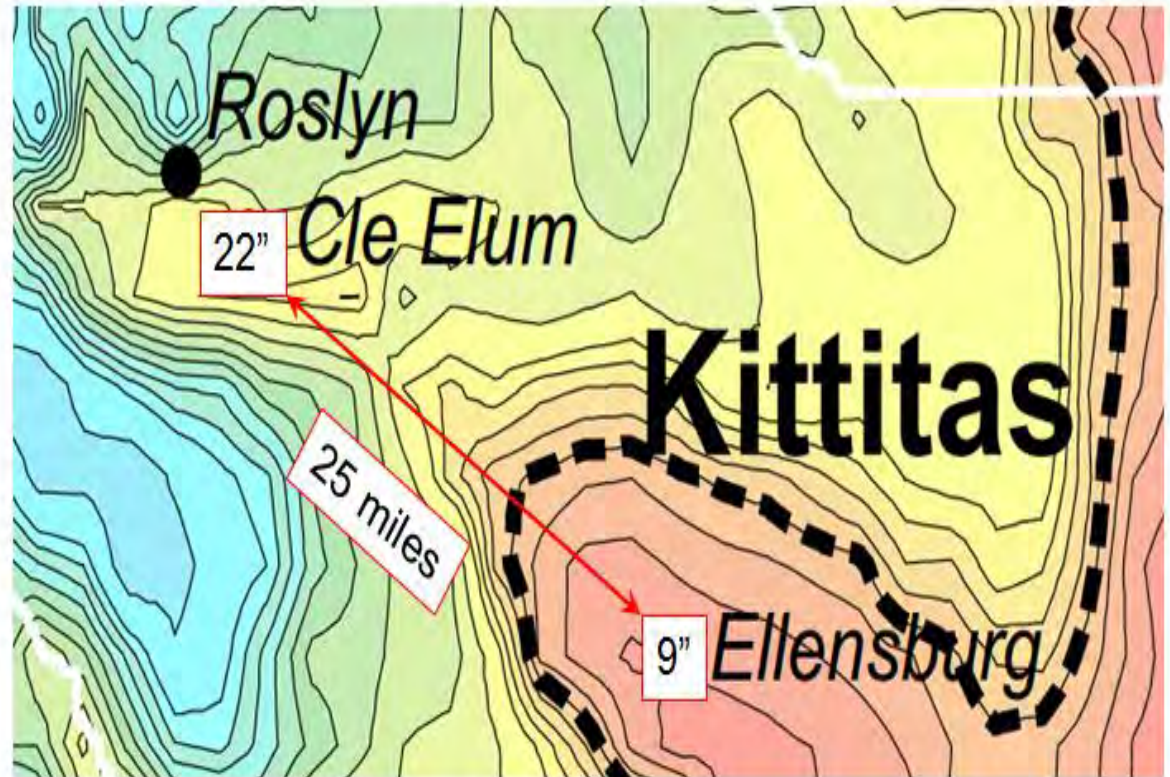
	Jul	Aug	Sep	Oct	Nov	Dec
Average high in °F:	77	78	72	60	50	44
Average low in °F:	51	51	46	40	36	33
Av. precipitation in inch:	0.63	0.94	1.69	4.61	8.62	7.44
Days with precipitation:	-	-	-	-	-	-
Hours of sunshine:	-	-	-	-	-	-
Average snowfall in inch:	0	0	0	0	1	3

Climate data for olympia ap, Longitude: -122.903, Latitude: 46.9733
Average weather Olympia, WA - 98501 - 1981-2010 normals

Jan: January, Feb: February, Mar: March, Apr: April, May: May, Jun: June, Jul: July, Aug: August, Sep: September, Oct: October, Nov: November, Dec: December

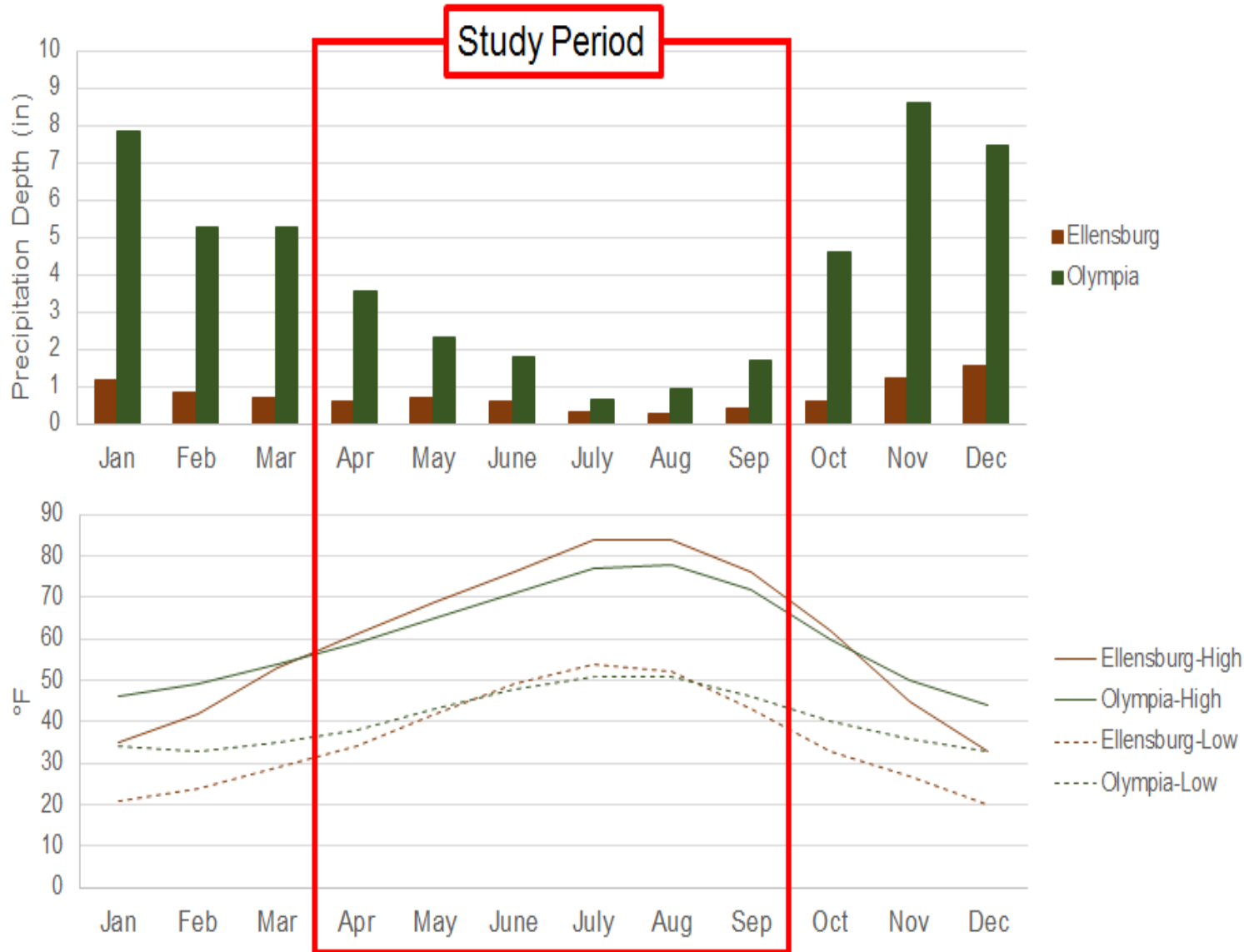
EWA Climate Differences

- Ellensburg to Cle Elum
→ 25 miles
- MAP Increase
→ 0.5-inch/mile



Climate Comparison: Ellensburg vs. Olympia

Source: <http://www.usclimatedata.com>



Ellensburg

MAP = 9"

Snow = 22"

$T_{Ave\ High} = 60^{\circ}F$

$T_{Ave\ Low} = 36^{\circ}F$

Olympia

MAP = 50"

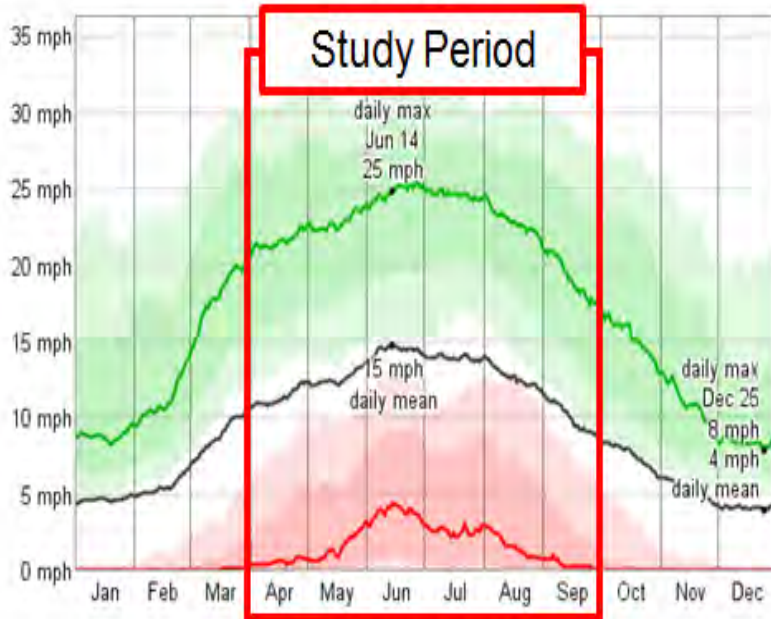
Snow = 12"

$T_{Ave\ High} = 60^{\circ}F$

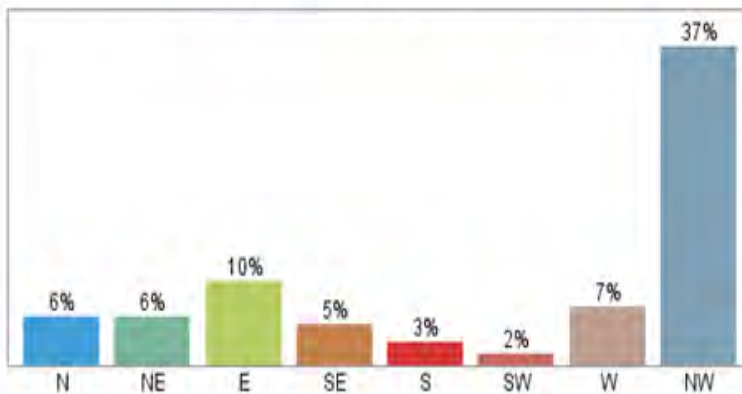
$T_{Ave\ Low} = 41^{\circ}F$

Ellensburg

Wind Speed

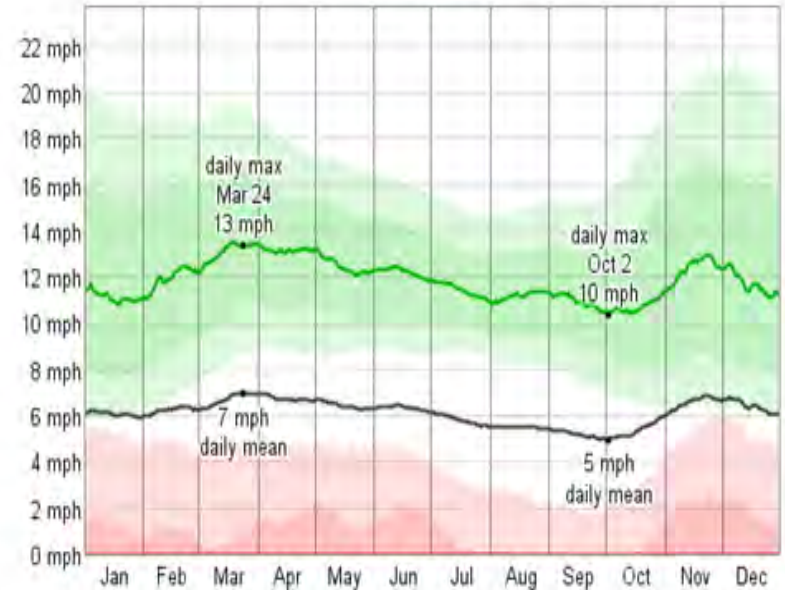


Wind Directions Over the Entire Year

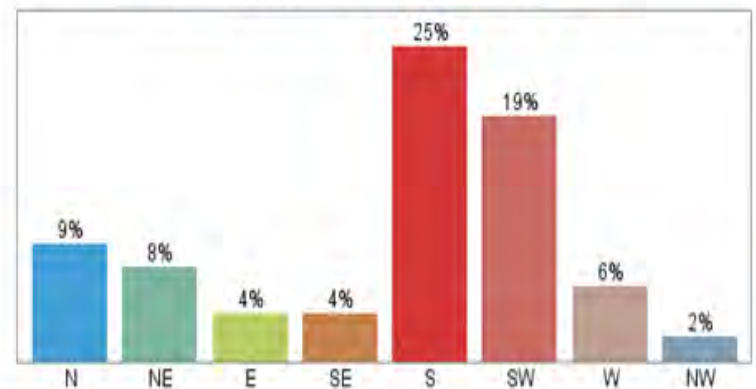


Olympia

Wind Speed



Wind Directions Over the Entire Year



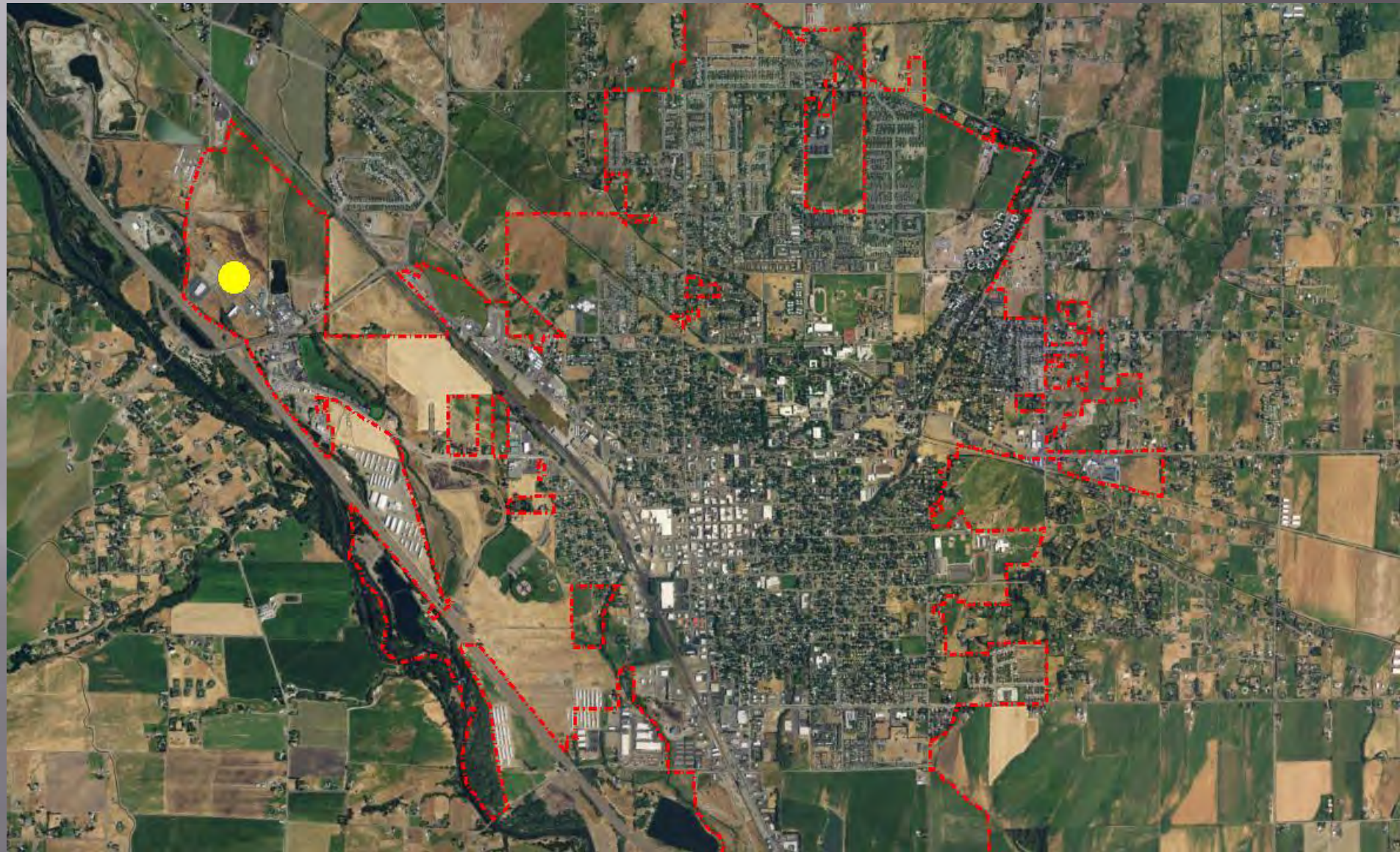
Study Goal and Objectives



Which does a better job ?



Study Area



State Route 97 Study Area



4 catch basins on each side of street



Closer look





Clean catch basins once a month north side

Sweep south side once a month

Pre project, install scuppers, survey rods, clean both sides of street and catch basins

16" D

8" HDPE

16" D

8" HDPE

8" HDPE

16" D

8" HDPE

16" D

8" HDPE

16" D

8" HDPE

8" HDPE

16" D

8" HDPE

8"

8"

8"

Anticipated Results
Expected Outcomes
Desired Program modification



THE ANTICIPATION IS KILLING ME!

Sweeping removes more solids?

SWEEPING PILE

VACTOR SOLIDS



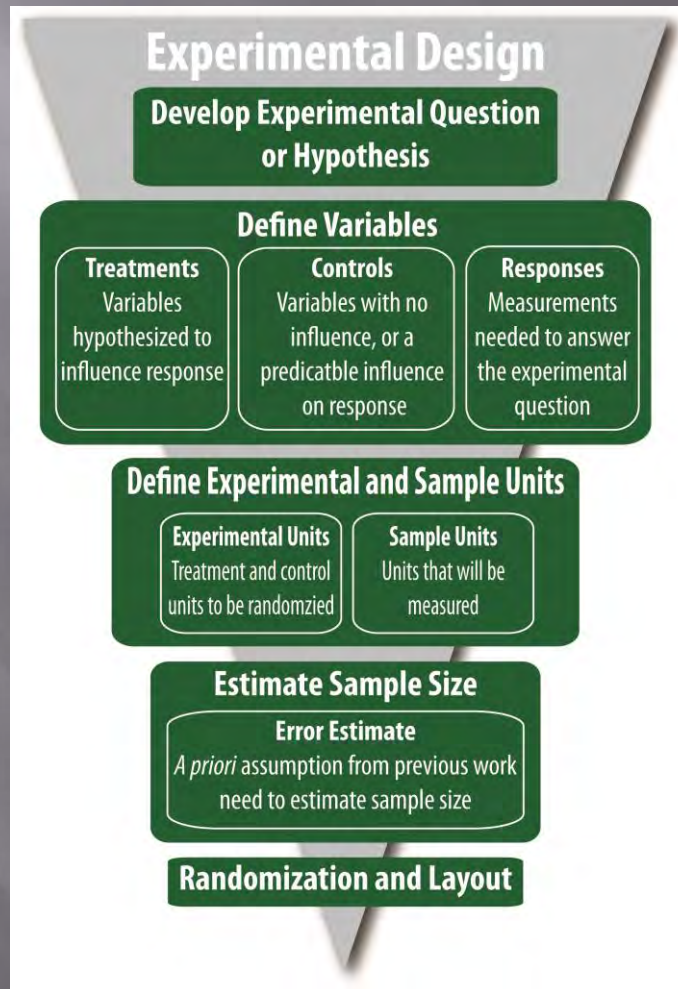
Eastern Washington Phase II Municipal Stormwater Permit

National Pollutant Discharge Elimination System and
State Waste Discharge General Permit for Discharges
from Small Municipal Separate Storm Sewers
in Eastern Washington

State of Washington
Department of Ecology
Olympia, Washington 98504-7600

In compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
and
The Federal Water Pollution Control Act

Experimental Design Overview



Data to Be Collect

Climate

- Wind Speed
- Precipitation

Catch Basins

- Sediment Depth in Catch Basins (bi-monthly)
- Sediment Moisture Content (end of study)
- Sediment Gradation: fine, medium, coarse (end of study)

Swale Inlet

- Sediment Weight in Sock (monthly)
- Sediment Moisture Content (monthly)
- Sediment Gradation: fine, medium, coarse (monthly)

Clean catch basins once a month north side

Sweep south side once a month



◆ Pre project, install scuppers, survey rods, clean both sides of street and catch basins



Catch basin north side SR 97



Outfall cb north side SR 97



Outfall South side SR 97



Outfall south side SR 97



Outfall north side SR 97



Sediment Collection



Sediment sock instead of scupper



Data Collection Process



Data to Be Collect

Climate

- Wind Speed
- Precipitation

Catch Basins

- Sediment Depth in Catch Basins (bi-monthly)
- Sediment Moisture Content (end of study)
- Sediment Gradation: fine, medium, coarse (end of study)

Swale Inlet

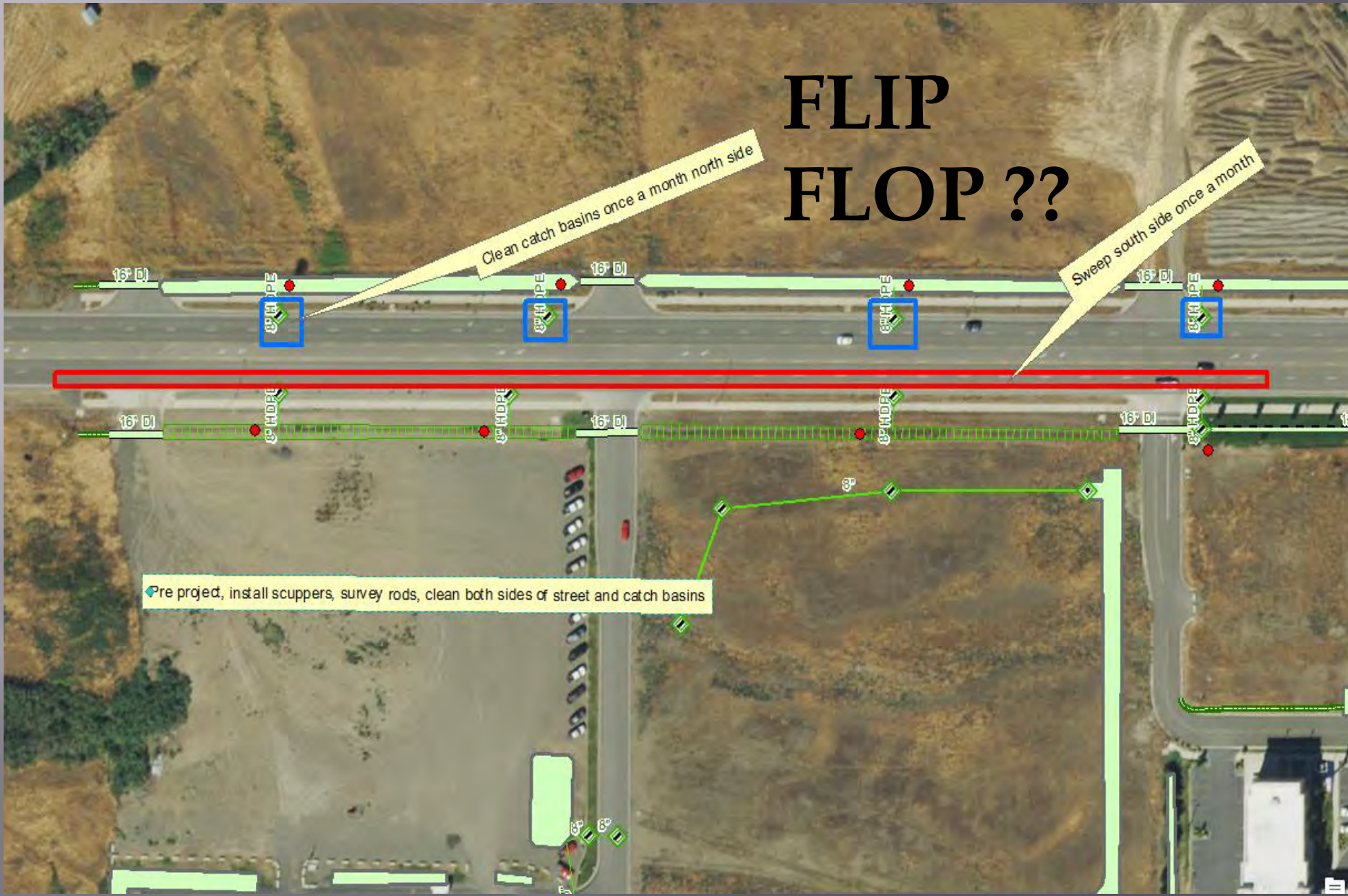
- Sediment Weight in Sock (monthly)
- Sediment Moisture Content (monthly)
- Sediment Gradation: fine, medium, coarse (monthly)

FLIP FLOP ??

Clean catch basins once a month north side

Sweep south side once a month

Pre project, install scuppers, survey rods, clean both sides of street and catch basins



Collect average depth of sediment in catch basin

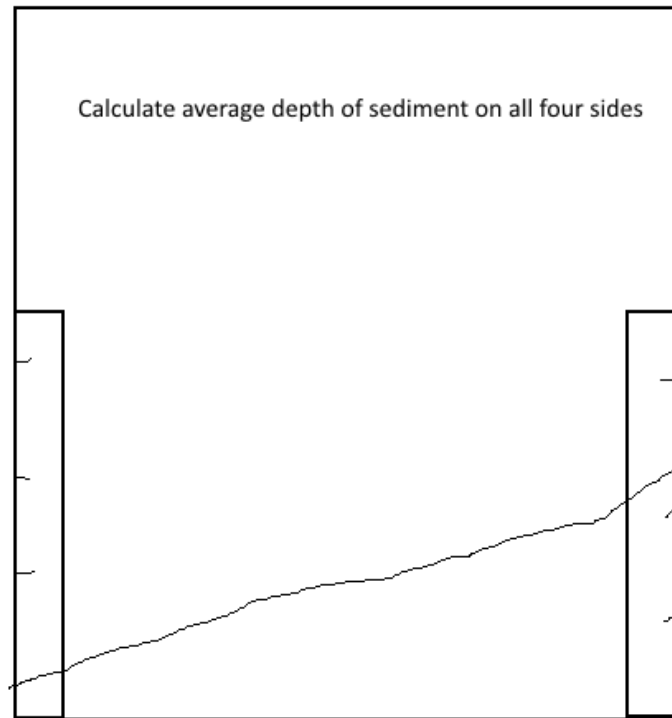
Area = LWH

After measuring volume, calculate density



Calculate average depth of sediment on all four sides

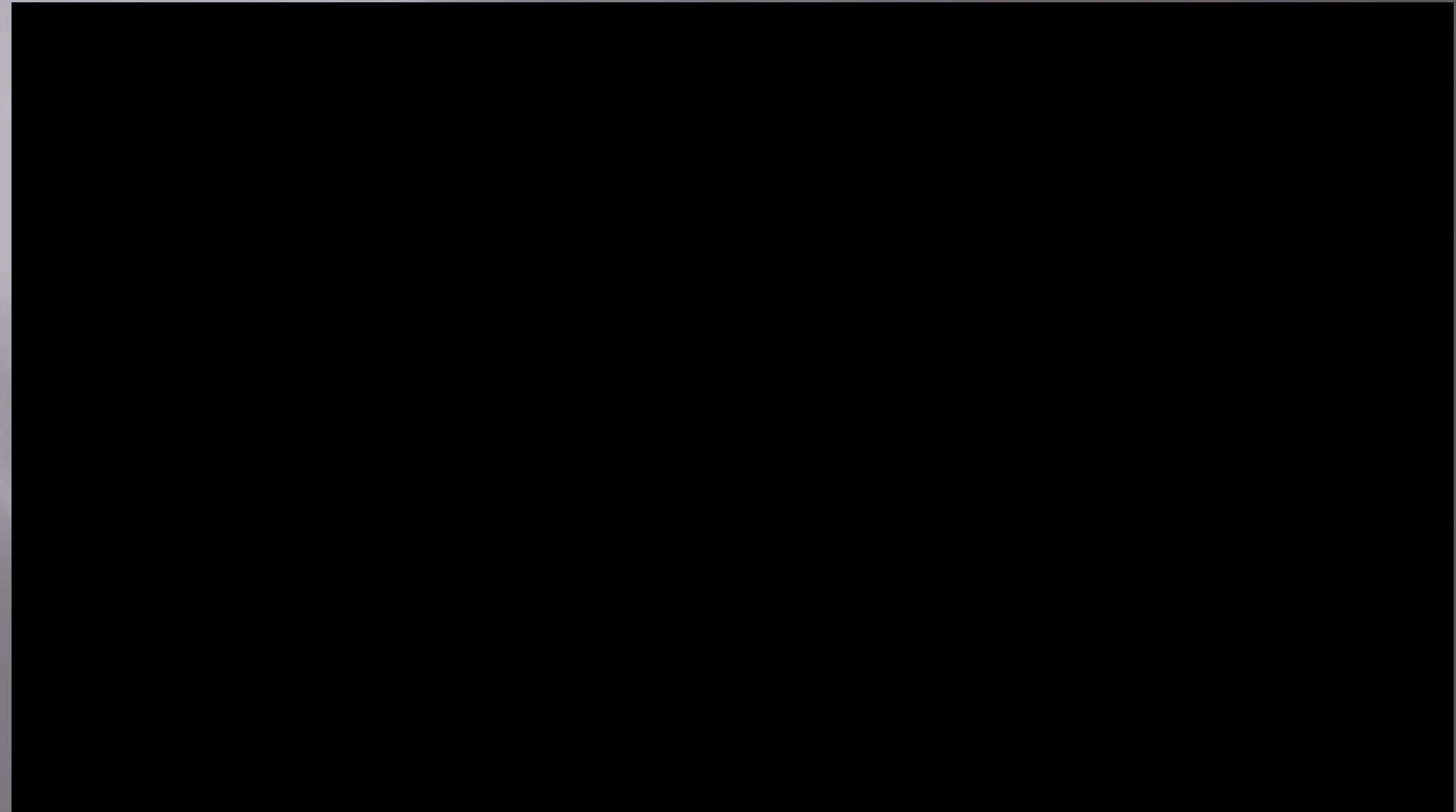
Height



Width

Length

Car Wash Kit



LOONEY TUNES



That's all

Stormwater Effectiveness Studies

Detailed Study Design Proposal & Quality Assurance Project Plan (QAPP) **Template**

Street Sweeping & Catch Basin Cleaning Comparison

Study Classification: Operational

Date: September 29, 2016



Prepared By:
Aimee S. Navickis-Brasch
NBSWE

Prepared For:
City of Ellensburg
On Behalf of the City of Spokane Valley

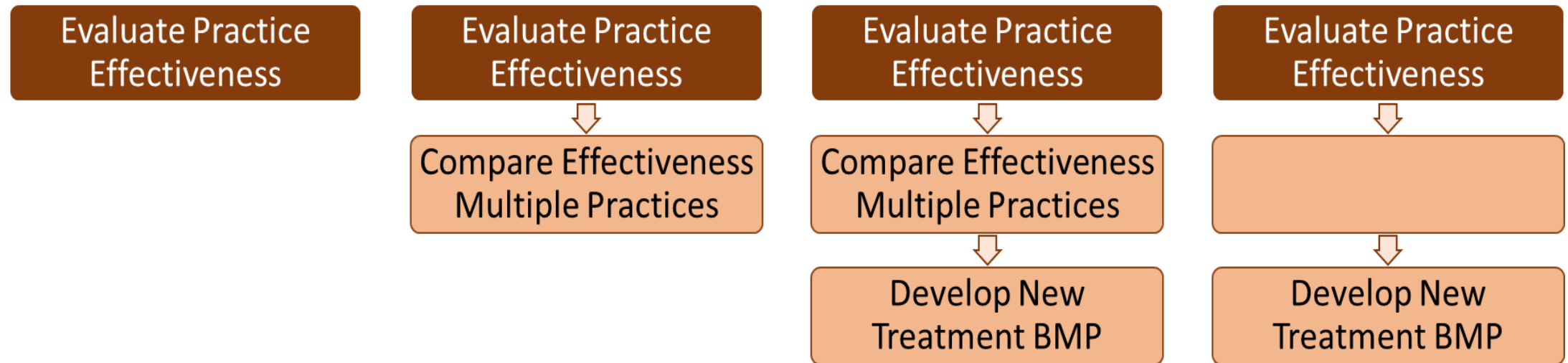
Template Background & Purpose

- Define Content for EWA Effectiveness Studies
 - *Detailed Study Design Proposal & QAPP*
- Provide Specific Guidance for Different Study Classifications
 - *Operational BMP – Template 1*
 - *E&O Programs – Template 2*
 - *Structural BMP – Guidance Document*
- Template developed from:
 - *Ecology QAPP Guidance (2004)*
 - *Ecology TAPE QAPP (2011)*
- Template Instructions
 - *Brown text – instructions → replace with black text or delete*
 - *Text highlighted in yellow – replace with the required information*
 - *Proposal – Content required for proposal*
 - *QAPP – additional content required for QAPP*
 - *Education and Outreach (E&O), Structural BMPs, and Operational BMPs*

EWA Effectiveness Studies Overview

- Study Classifications:

- *Education and Outreach (E&O), Structural BMPs, and Operational BMPs*



EWSG Rank 6/30/2016	Study Idea Title	Practice/Activity Classification			Study Objective		
		Structural	Operational	E&O	Evaluate Practice Effectiveness	Compare Effectiveness of Practices	Develop New BMP
6	BMP Inspection and Maintenance Responsibilities			X	X		
9	Stormwater BMP Owner Awareness			X	X		
14	Long-term Permeable Pavement Sidewalk Infiltration Performance	X			X		
1	Modernizing Education and Outreach Strategies			X	X	X	
4	Mobile Contractor Illicit Discharge Education			X	X	X	
3	Street Sweeping and Catch Basin Cleaning Comparison		X		X	X	
6	Seasonal Differences in Street Sweeping Material Removal		X		X	X	
10	Determining Pollutant Contributions from Municipal Stormwater in EWA using GIS	X	X	X	X	X	
6	Catch Basin Retrofit Device Placement	X			X	X	
12	Biochar Media Stormwater Treatment Study	X			X	X	
2	Use of Non-vegetative Swale with Native Soils	X			X	X	X
11	Media Thickness Study and/or Media Component Study	X			X	X	X
5	Sand Filter Vault BMP	X			X		X
12	Sharp Avenue Porous Pavement Study	X			X		pending results of WSC study

Structural Treatment BMPs Guidance Document

Purpose: Define effectiveness study requirements for Structural Treatment BMPs

➤ *Specifically how effectiveness study requirements differ from TAPE (2011)*

- Effectiveness Studies Objective – Develop New BMP

➤ *Not a NPDES permit requirement*

➤ *Follow TAPE Protocol*

- Effectiveness Studies Objective – Evaluate and/or Compare Effectiveness Only

➤ *Follow Modified TAPE Protocol*

TAPE Requirements	Effectiveness Study - Modified TAPE Protocol	Develop New Treatment BMP - TAPE Protocol
Submit TAPE Application	No application required - Jurisdictions are exempt	Same as Modified TAPE Protocol
BMP - Material Testing	Verify BMP material meets design criteria	Same as Modified TAPE Protocol
Flow Control Testing	?	
Study Duration	2 wet seasons	Same as Modified TAPE Protocol
Pollutants Tested – at Ecology accredited laboratory ²	Test influent & effluent for pollutants the BMP is approved to provide runoff treatment for (see TAPE, Table 8, Required Parameters)	Same as Modified TAPE Protocol, plus: 3 times during the study, test additional parameters (see TAPE, Table 8, Required Screening Parameters)
Number of Rainfall Events Sampled	Min. of 12 rainfall events that meet the qualifying conditions ¹ .	Min. 12 & max. 35 rainfall events that meet the qualifying conditions ¹ . Exact number of samples is based on the following: <ul style="list-style-type: none"> A statically significant difference between influent and effluent pollutant concentrations to a 95% confidence interval and 80% power Ecology treatment performance standards for regulated pollutants are met to the 95% confidence interval. Specifically pollutant removal efficiency: 80% TSS, 60% Zinc, 30% Copper, 50% Total Phosphorus, and < 10mg/L of Total Petroleum Hydrocarbons (TPH).
Data Analysis	<ul style="list-style-type: none"> Determine if difference between influent and effluent pollutant concentrations is statically significant and indicate the confidence interval Determine the pollutant removal efficiency and the associated confidence interval. 	Defined in Number of Rainfall Events Sampled
Technical Evaluation Report (TER)	No TER Required – Effectiveness studies are only required to develop a report that contains elements defined in S8.B10 of the NPDES permit	Same as Modified TAPE Protocol, plus a TER is also required
QAPP & TER Review by Board of External Reviewers	N/A	Jurisdiction convenes BER: 3-5 individuals (2 from Ecology) who provide a peer review of the QAPP and TER.

2.0 Abstract – QAPP Only

An abstract is a paragraph that tells readers what they will find in the document. It should be less than 300 words, and should describe the goals and objectives of the study, and how those objectives will be accomplished.

3.0 Introduction and Background

3.1 Overview of SW Management Practice

- Overview of Operational BMP:
 - Street Sweeping → Elgin Whirlwind Vacuum Sweeper
 - Catch Basin Cleaning → Vector Truck ← Existing
- BMP Operations/Function:
 - Function: Preventing/reducing pollutant runoff from municipal operations
 - Frequency: inspection by 12/2018; every 2 years after; clean → inspection
 - Street Sweeping:
- Pollutants of Concern:
 - Decant from street waste vehicles
 - Road sediments & waste



3.0 Introduction and Background

3.2 Study Problem Description

Reasons why proposed study is needed:

- Effectiveness Study Requirements
- Impact of climatic conditions on practice
 - Another practice maybe more suitable
- Limitations or challenges of practice

Basis for identified problem:

- Empirical observations or interviews:
 - *Jon Morrow's presentation*

3.0 Introduction and Background

3.3 Results of Prior Studies

- Literature search:
 - *Street Sweeping 2x per month = 75% sediment removal (Tetra Tech, 2001)*
 - *Center for Watershed Protection: frequent street sweeping for semi-arid regions (Caraco, 2000)*

3.4 Regulatory Requirements

S5.6 Municipal Operations and Maintenance

→ Catch basin cleaning

?

→ Street Sweeping

4.0 Project Overview

4.1 Study Goal

Study Goal:

The goal of this study is to determine if street sweeping and/or catch basin cleaning is more effective at removal of road solids during the dry season in a semi-arid region.

Anticipated SW Management Program modification:

The results will be used to refine/modify O&M procedures for reducing/preventing sediments build up in catch basins. for catch basins

4.0 Project Overview

4.2 Study Description & Objectives

Study Description:

- *For 8 months: street sweep only on one side of road, measure sediment depth in catch basins and weight sediment in sock at swale inlet pipe (both sides of road)*
- *Repeat study on other side of road*
- *Measured Effectiveness: change in sediment weights & depths; compare*

Objectives:

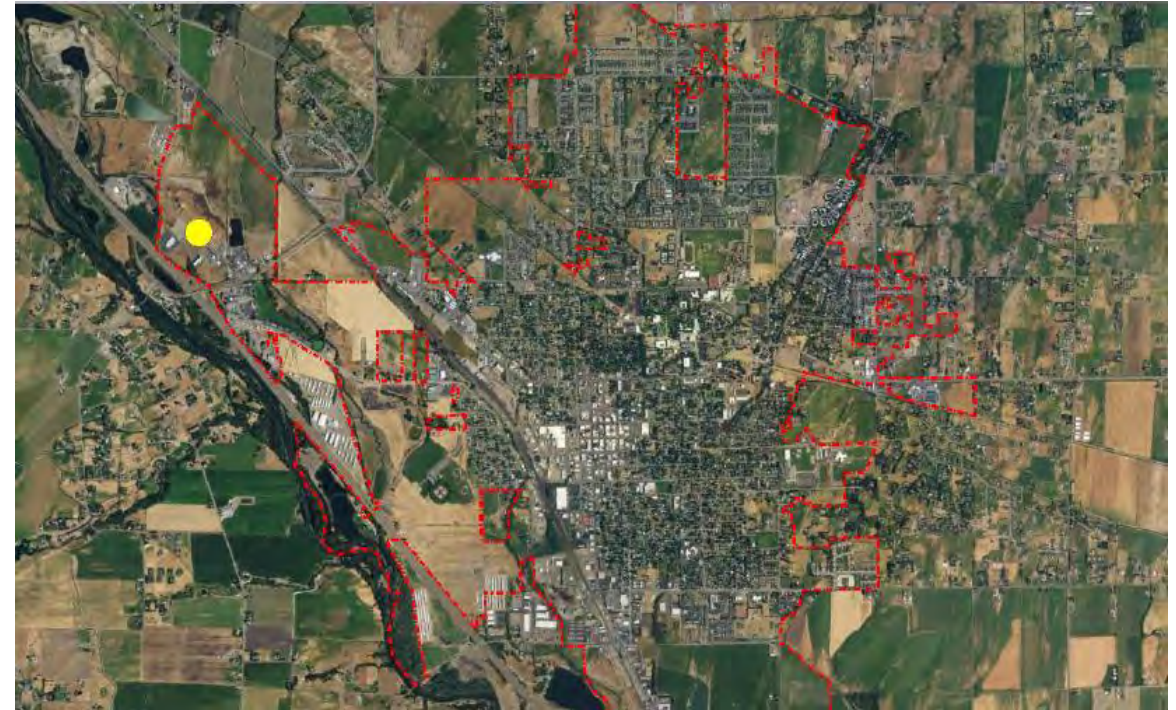
- Determine change in sediments depths & weights: in catch basins & swale inlet pipe
- Prepare recommendations for O&M: catch basin cleaning & street sweeping practices

4.0 Project Overview

4.3 Study Location

Provide overview of test-site location

- Land use, land cover
- Major truck route
- ADT
- One test site
- Climate: Low MAP, extended dry period, high winds



4.0 Project Overview

4.4 Data Needed to Meet Objectives

Climate

Wind Speed

Precipitation

Catch Basins

Sediment Depth in Catch Basins

Sediment Moisture Content

Sediment Gradation: fine, medium, coarse

Swale Inlet

Sediment Weight in Sock

Sediment Moisture Content

Sediment Gradation: fine, medium, coarse

4.0 Project Overview

4.5 Tasks Required to Conduct Study

Proposal – Primary Tasks

Task Number & Name	Task Overview
Task 1: Project Management	
Task 2: Design Study	Develop Detailed Study Design Proposal & QAPP, Ecology Review/Approval
Task 3: Implement Study	Order/assemble parts, clean catch basins, install measurement rods, collect data
Task 4: Summarize Study Findings	Analyze Data and Develop Final Report(s), Ecology Review/Approval
Task 5: Disseminate Study Findings	Enter data into EIM database; Post Final Report and fact sheet/video on web site

QAPP – Add Subtasks

4.0 Project Overview

4.6 Potential Constraints

Ellensburg Weather

- Above average Mean Annual Precipitation (MAP)

WSDOT Maintenance

- Accidently street sweeps at study location

Spills

- Oil Truck Spill at test site → oil enters catch basins

Vandalism

- Vandals remove socks attached to swale inlet pipe

Funding Source

- City of Ellensburg budget cuts

5.0 Organization & Schedule

5.1 Project Schedule

Proposal – Lead Entities and Participating Entities Only

QAPP – Add other Key Project Team Members

Key Team Members	Role	Responsibility
Lead Entity, Name Organization Phone Number Email	Lead Entity	Define
Participating Entity, Name Organization Phone Number Email	Participating Entity	Define
Participating Entity, Name Organization Phone Number Email	Participating Entity	Define
Key Team Member, Name Organization Phone Number Email	Project Role Title	Define

5.0 Organization & Schedule

5.2 Project Schedule

TASK	DUE	DURATION
Effectiveness Study Design (S8.B4-5)		
Detailed Study Design Proposal - Development	June 2017	
Proposal - Ecology Review Period		Not defined
QAPP (S8.B6)		
QAPP - Development	Submit to Ecology max. 6 months after Detailed Study Proposal Approval	
QAPP - Ecology Review		3 months
Implementation - Data Collection (S8.B7)		
Phase 1: minimum 4 Studies	<u>Start</u> : max 6 months after QAPP approval	
Reporting & Data Analysis (S8.B8-10)		
<u>Annual Report</u> – describe study status & interim results throughout study duration	Annual Report Deadline	
<u>EIM Database</u> – enter collected data	End of water year or 6 months after data collection	
<u>Final Report</u> – study results & recommend future action	6 months after study completion	

5.0 Organization & Schedule

5.3 Budget & Funding Sources

Provide Budget for study & describe how project will be funded

- Proposal:
 - budget breakdown by primary tasks
 - Indicate approximate duration for each task & approximate time for study
 - Identify potential funding sources or indicate plans for obtaining funding
- QAPP:
 - Budget breakdown by primary tasks & subtasks
 - Expected start-end dates, durations, deadlines for deliverables, and total time for study
 - Identify funding sources; indicate if additional resources are needed to complete study

6.0 Quality Objectives – QAPP Only

This section defines how the stud will verify data is scientifically and legally defensible. Quality indicators for data evaluation include:

6.1 *Decision Quality Objectives (DQOs)*

6.2 *Measurement Quality Objectives*

6.3 *Targets for Precision, Bias, and Sensitivity*

- *Precision*
- *Bias*
- *Sensitivity*

Targets for Comparability, Representativeness, and Completeness

- *Comparability*
- *Representativeness*
- *Completeness*

7.0 Experimental Design

The purpose of this section is to define the experimental design (how the practice effectiveness will be evaluated and/or compared) and provides the basis for why the experimental design was selected (may include a literature search)

7.1 Study Design Overview

Provide an overview of the study design (level of detail similar to executive summary). The purpose of this section is to introduce the reader to the study design and the primary elements of the study.

7.0 Experimental Design

7.2 *Selection Process: Study Location*

The purpose of this section is to describe the process for selecting the location of the test-site.

The City will choose one street that has the same surfacing, no parking, same number of catch basins, same traffic counts, tree canopy and same road profile to study which method removes more solids from the storm system. On the same day each month, one side of the street will be swept and the other, only catch basins cleaned for a period of eight months. The street chosen receives the same environmental conditions such as rain, wind and snow.

7.0 Experimental Design

7.3 *Stormwater Practice Operation & Function*

This section describes how the practices operates and functions

Operational BMP procedures description:

- Frequency of the practice: 2x per month
- related inspections: 2x per month
- Seasons: dry season – April - September
- Provide a project test site sketch/diagram.

Describe the type of equipment

- what the equipment is designed to do;
- indicate the operational performance relevant to the study (i.e. size of sediment particles the sweeper can pick up, efficiency for removing sediments, ect.)

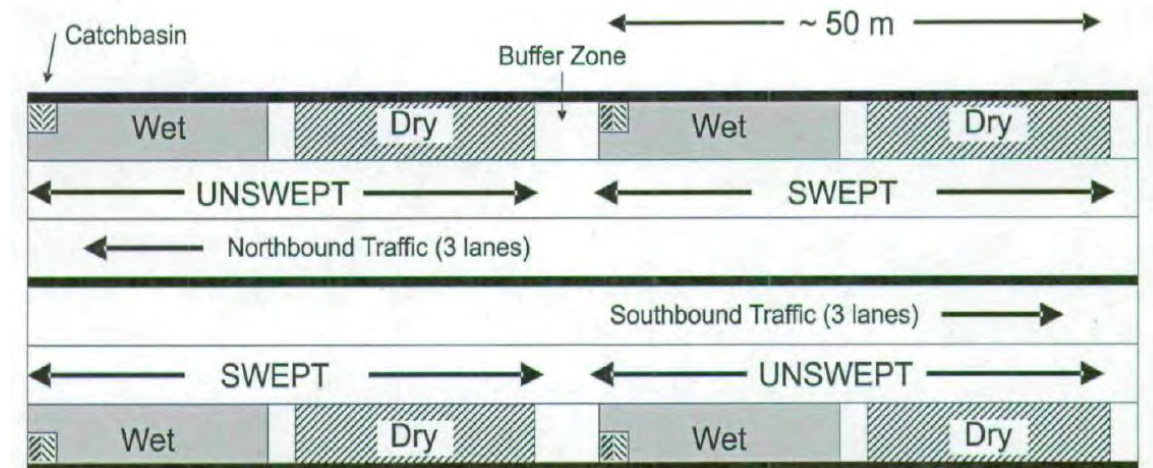


Fig. 1. Diagram of field site sampling locations.

7.0 Experimental Design

7.4 *Data to be Collected*

Climate

Wind Speed (daily)

Precipitation (daily)

Catch Basins

Sediment Depth in Catch Basins (bi-monthly)

Sediment Moisture Content (end of study)

Sediment Gradation: fine, medium, coarse (end of study)

Swale Inlet

Sediment Weight in Sock (monthly)

Sediment Moisture Content (monthly)

Sediment Gradation: fine, medium, coarse (monthly)

7.0 Experimental Design

7.5 *Data Collection Design*

This section describes the system or process design developed to collect data. Applicable to studies that include a system (automated or manually operated) designed (prior to or for the study) for collecting samples.

***Operational BMPs** – describe any modifications to the drainage system existing system and provide pictures (i.e. installing graduated rods in the existing catch basins for measuring sediment depth); instruction for installing equipment or parts*

8.0 Sampling Procedures – QAPP Only

This section defines the sampling methodology and procedures for collecting data, including defining the standard operating procedures (SOP) for sample collection.

8.1 Standard Operation Procedures (SOP) for Sample Collection

- *Triggers for sample collection (i.e. SOP for storm selection and tracking criteria)*
- *Sample Collection and Processing (i.e. water quality, sediments, etc)*
- *Cleaning catch basins*
- *Post Storm Procedures for Equipment Cleaning*
- *Visual Inspection of the for damage*
- *Visual Inspection of the test-site or monitoring equipment for sediment build-up on roads, etc. (SOPs include qualitative methods for assessment)*
- *References to applicable standard methods for sample collection*

8.0 Sampling Procedures – QAPP Only

8.2 *Containers, Preservation Methods, Holding times*

Applicable to studies that collection water quality or sediment samples

8.3 *Equipment Decontamination*

Applicable to studies that collection water quality or sediment samples

8.4 *Sample Identification*

Define a protocol for sample identification: identification numbers, location, date, time, sampler initials, parameters, etc.

8.5 *Chain of Custody*

Provide chain of custody procedures if the collected samples will leave the possession of the sample collector prior to measuring the sample (i.e. transferring to a lab for analytical analysis).

8.6 *Field Log Requirements*

This section should define the field information that will be collected and logged during the data collection phase of the study.

9.0 Measurement Procedures – QAPP Only

This section describes the methods and procedures for measuring the collection data. Standard operational procedures (SOPs) or standard testing methods preferred. 9.1

9.1 Procedures for Data Analysis

Define the data that will be analyzed. For BMP effectiveness studies, this may include:

- *Water quality analysis parameters*
- *Measuring sediment depths in catch basins and sediment sample weights*
- *Visual Inspection of sediment build-up on roads (qualitative methods for assessment)*
- *Material characterization; gradation; moisture content; CEC*

Include the following information, if applicable: number of samples, expected range of results; standard testing methods or SOPs; method detection limit; sample preparation methods; lab accreditation methods.

Analyte	Testing Methods	Reporting Limit	Sample Size & Container	Preservative	Holding Time	Laboratory	Ecology Certified
Temperature	SM 2250 B	0.1°C	HPDE	none	15 minutes	Gonzaga	No
pH	EPA 150.2 or SM4500H+B	0.2 units	HPDE	none	15 minutes	Gonzaga	No
Total Suspended Solids (TSS)	SM 2540 D-97	1.0 mg/L	1 L HDPE	Refrigerate <6°C	7 days	RPWRF	Yes
Total Recoverable & Dissolved Metals ² <ul style="list-style-type: none"> Copper (Cu) Zinc (Zn) Lead (Pb) Calcium (Ca) Magnesium (Mg) 	EPA 200.8 EPA 200.7 ⁶	Cu: 0.1/0.1µg/L ¹ Zn: 5.0/1.0µg/L ¹ Pb: 0.1/0.1µg/L ¹ Ca: 0.04/0.04mg/L ¹ Mg: 0.2/0.2 mg/L ¹	500mL HDPE	Dissolved: filter (0.45µm), 1% HNO ₃ , Refrigerate <6°C Total: 1% HNO ₃ Refrigerate <6°C	6 months	Eurofins ⁴ SVL ⁵	Yes
Hardness ² as CaCO ₃	SM 2340 B97	1.0 mg/L	500mL HDPE	ICP: 1% HNO ₃ Titration: H ₂ SO ₄ Refrigerate <6°C	28 days	Eurofins ⁴ SVL ⁵	Yes
Total & Dissolved ^{3,5} Phosphorus (P)	SM 4500 P E	0.01 mg/L	1 L HDPE	H ₂ SO ₄ Refrigerate <6°C	28 days	RPWRF	Yes
Total Kjeldahl Nitrogen ³ (TKN)	EPA 351.2	0.5 mg/L	1 L HDPE	H ₂ SO ₄ Refrigerate <6°C	28 days	SVL	Yes

10.0 Quality Control – QAPP Only

This section defines the procedures for maintaining QA/QC during the data collection phase of the study both in the lab and out of the field. Includes steps to ensure representativeness, comparability, quality of samples. Common QC procedures include:

- *Quality Control of samples (i.e. water quality, sediment, survey data)*
- *Equipment maintenance and calibration*
- *Sample preservation and handling*
- *Record keeping*
- *Laboratory QC procedures: method blanks, duplicates,*

10.2 Corrective Action

This section defines the corrective action plan and procedures if the QC results indicate problems with data during the project.

11.0 Data Management Procedures – QAPP Only

This section describes the procedures for managing and storing data and other documents that contain information collected during the study which includes:

- Describe procedures for recording and reporting data acquired in the field
- Describe requirements for the data package from the lab
 - Detailed case narrative: problems w/ analysis, corrective action plans, deviations for analytical methods, QC results, complete definition list for each qualifier used
- List requirements for electronic transfer of data protocol: from field/lab to your database
 - % of data that will undergo QC review, describe corrective procedures
- Describe procedures for obtaining data from existing databases and literature files
- Describe where and how data will be stored

12.0 Audits & Reports

12.1 Audits – QAPP Only

Describe what will be audited: process, procedures, number of audits, schedule, frequency, responsibility

Types of Audits:

- Technical System Audit – qualitative; verify conformance to QA Project Plan
- Proficiency Testing – quantitative determination of analyte in blind standard to evaluate proficiency of the lab

Question: are audits required for effectiveness studies? Develop New BMP - TAPE?

12.0 Audits & Reports

12.2 Final Report – QAPP Only

Final Report Content	Effectiveness Studies	TER ²
1. Cover Letter	✓	✓
2. Executive Summary	✓	✓
3. Introduction	See Note 1	✓
4. Technology Description	See Note 1	✓
5. Sampling Procedures	See Note 1	✓
6. Data Summaries and Analysis	✓	✓
7. Operation & Maintenance Info	✓	✓
8. Discussion	✓	✓
9. Conclusions	✓	✓
10. Future Action Recommendations	✓	

12.3 Dissemination

- Describe how project document will be made available to public (i.e. website locations)
- Project Documents: QAPP, final report, fact sheet, videos

13.0 Data Analysis & Verification Methods

13.1 Data Verification & Validation

This section describes methods for verifying & validating data collected is consistent, correct, and complete

- How QC results will be examined to determine if MQOs are met (Section 6.0)?

Operational BMPs - verify sample collection procedures were followed; assess equipment calibration checks (i.e. scale for weighing sediment) with respect to data values recorded; verify consistency of street sweeping and/or catch basin cleaning procedures; assess equipment maintenance records

Structural Treatment BMPs – Review relevant sections in TAPE document; review precipitation data for gaps and describe how the gaps will be filled (if possible); assess equipment calibration checks with respect to data values recorded; verify sample collection procedures were followed; review lab data for flags (include data qualifiers, definitions, and criteria for use)

13.0 Data Analysis & Verification Methods

13.2 Data Analysis Methods

Describe how data collected will be analyzed

- Define hypothesis testing methods → statistical significance between measured data
- Indicate parametric or non-parametric methods
- Specify confidence interval

Operational BMPs

Data Analysis Process: Difference/Percent change, Average, Standard Deviation (between measurements); Normality testing; Hypothesis Testing (statistical significance compare between practices)

Data Analysis Methods – Ryan-Joiner or Shapiro-Wilk test; Two-Sample T-Test (normal data) and Wilcoxon Single-Ranked test (non-parametric); ; define alpha levels

Data Presentation Methods - Operational BMPs

Line graphs to illustrate differences between measurements of same practice and identify any rainfall events; box and whisker plots for comparing differences between practices

Appendix 10 – Phase 3 Meeting Documents 12052016

EWA Phase 2/3 Effectiveness Studies Meeting

Date | Time | 12/5/2016 10:00 AM to 2:00 PM

Location | City of Ellensburg, 501 N. Anderson St,
Public Works Conference Room

Topic | QAPP E&O Template Development *Conference Line* | none

Meeting Handouts:

- 1 - Agenda
- 2 - Introduction to CBSM: *(to be distributed at meeting)*
- 3 - Case Study Presentation #1: *(to be distributed at meeting)*
- 4 - Case Study Presentation #2: *(to be distributed at meeting)*
- 5 - QAPP E&O Template Presentation *(to be distributed at meeting)*
- 6 - QAPP E&O Template Draft Document 12052016
(to be emailed on 11/30/2016)
- 7 - QAPP Template Introduction 12052016
(to be emailed on 11/30/2016)

Invited:

- Karen Dinicola, Ecology
- Abbey Stockwell, Ecology
- Doug Howie, Ecology
- Brandy Lubliner, Ecology
- Vince McGowan, Ecology
- Art Jenkins, City of Spokane Valley
- Jon Morrow, City of Ellensburg
- Jessica Shaw, City of Wenatchee
- Martin Nelson, City of Kennewick
- Aimee Navickis-Brasch, NBSWE

Agenda Items

	Topic	Presenter	Time allotted
<input type="checkbox"/>	Introduction to Community Based Social Marketing (CBSM) <i>(Handout 2)</i>	Jessica	20 minutes
	<ul style="list-style-type: none"> ➤ Overview of CBSM ➤ example of process/criteria for selecting target behaviors 		
<input type="checkbox"/>	Case Study Presentation #1 – E&O Study <i>Mobile Contractor Illicit Discharge Education (Handout 3)</i>	Jessica	20 minutes
	<ul style="list-style-type: none"> ➤ Background, Goals/Objectives, Experimental Design, Anticipated Results, Dissemination of Documents 		
<input type="checkbox"/>	Case Study Presentation #2 – E&O Study <i>Modernizing Education & Outreach Strategies (Handout 4)</i>	Martin	20 minutes
	<ul style="list-style-type: none"> ➤ Background, Goals/Objectives, Experimental Design, Anticipated Results, Dissemination of Documents 		
<input type="checkbox"/>	QAPP Template: E&O Section Review & Presentation: <i>Case Studies as example/context for discussion (Handouts 5 & 6)</i>	Aimee/All	120 minutes
	<ul style="list-style-type: none"> ➤ QAPP E&O Template Presentation ➤ Review/ Discuss/Refine QAPP E&O Template Content ➤ Request Feedback: QAPP Template Introduction 		
<input type="checkbox"/>	Lunch Break	All	30 minutes
<input type="checkbox"/>	Discuss Next Steps:	Art/Karen	30 minutes
	<ul style="list-style-type: none"> • Templates Complete by NBSWE: December 15, 2016 • Define QAPP Template Review and Approval Process • Detailed Study Design Review and Approval Process 		

Notes:



Fostering Sustainable Behaviour

An Introduction to Community-Based Social Marketing

November 4, 2011

Information- Intensive

- ☞ Radio
- ☞ Television
- ☞ Internet
- ☞ Newsprint





Information-Intensive

- ↳ Attitude-Behaviour
- ↳ Economic Self-Interest

Attitude- Behaviour

☞ Attitudes = Behaviour

☞ Little Connection



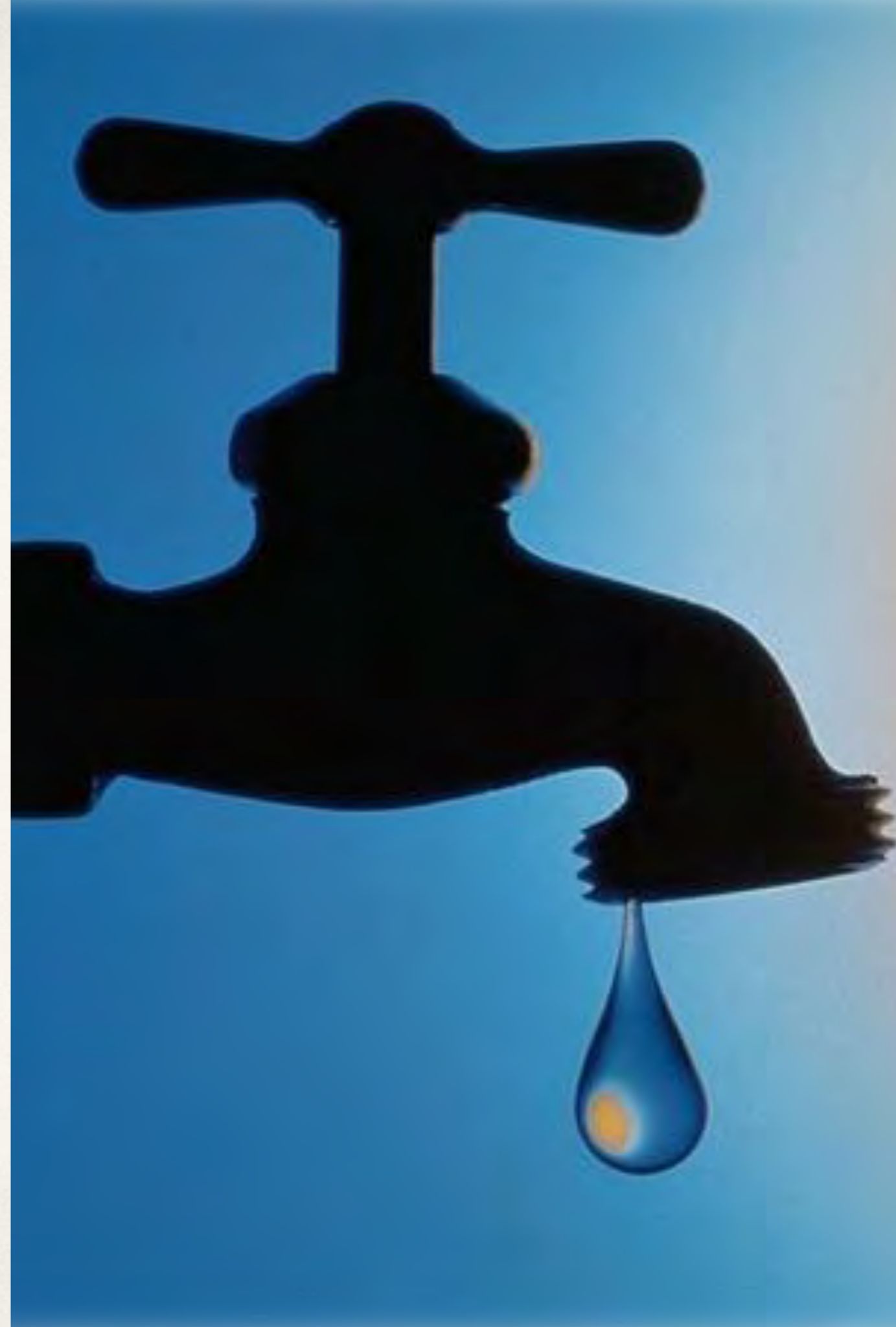


Attitude- Behaviour

- ☞ Energy Efficiency Workshop
- ☞ Attitudes and Knowledge
- ☞ Evaluation
 - ☞ 1 of 40 Lowered HHW
 - ☞ 2 of 40 Installed Wrap
 - ☞ 8 of 40 Installed Showerhead

Attitude- Behaviour

- ☞ Water-Use Handbook
 - ☞ Described Wasteful Water Use
 - ☞ Water Energy Relationship
 - ☞ Detailed Conservation Methods
- ☞ No Reduction in Water Use





Economic Self-Interest

- ☞ Systematically Evaluate
- ☞ Act in Self-Interest
- ☞ Enlightenment = Change

Economic Self-Interest

- ↳ Residential Cons. Service
- ↳ Gas & Electric Utilities
 - ↳ Audits, Loans, Contractors
- ↳ Evaluation
 - ↳ 6% Requested Audit
 - ↳ 50% Acted, Savings 2-3%
 - ↳ 30% Waiting List Control





Economic Self-Interest

- ☞ California: \$200 Million a Year
- ☞ Encourage 1-Time/ Repetitive
- ☞ Frequently Little Impact

Why Prevalent?

- ☞ Underestimate Difficulty
- ☞ Expediency
- ☞ Ineffective Models
- ☞ Relative Ease
- ☞ Lack of Evaluations



Community-Based Social Marketing



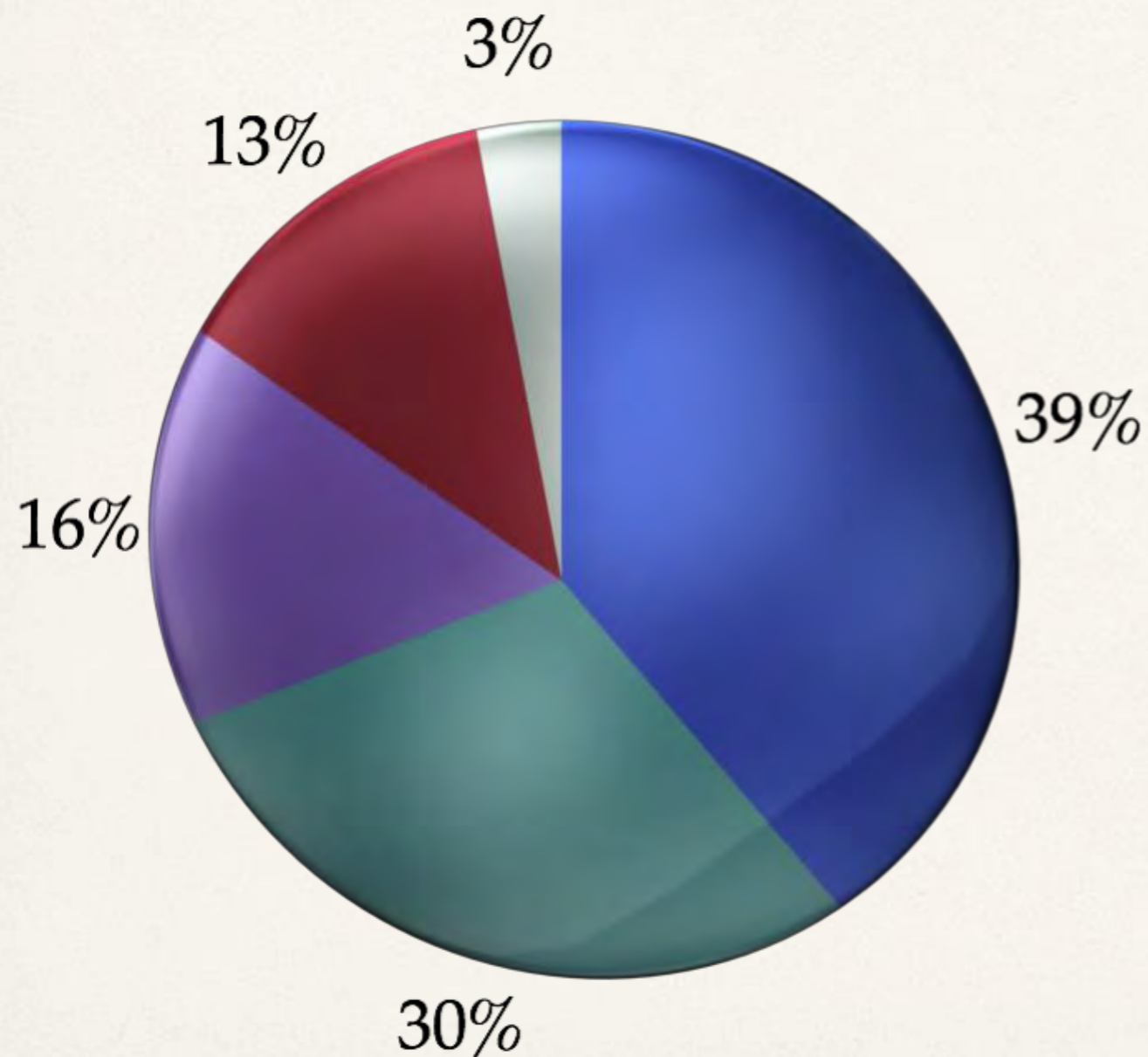
Community-Based Social Marketing



Community-Based Social Marketing



Selecting Behaviours

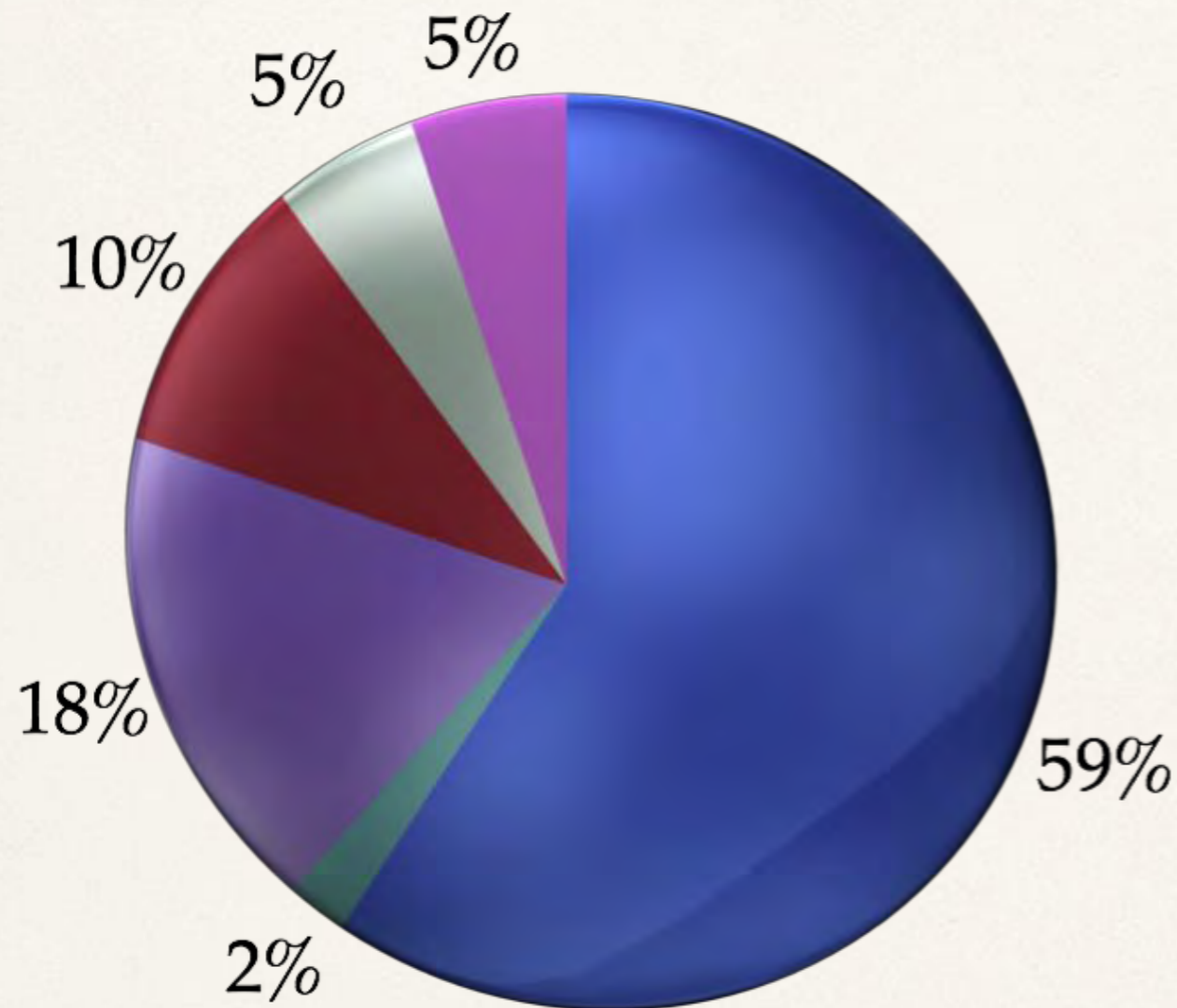


Energy Use by Sector (2006)¹

- Industrial
- Transportation
- Residential
- Commercial/ Institutional
- Agriculture

¹Source: Natural Resources Canada

Selecting Behaviours

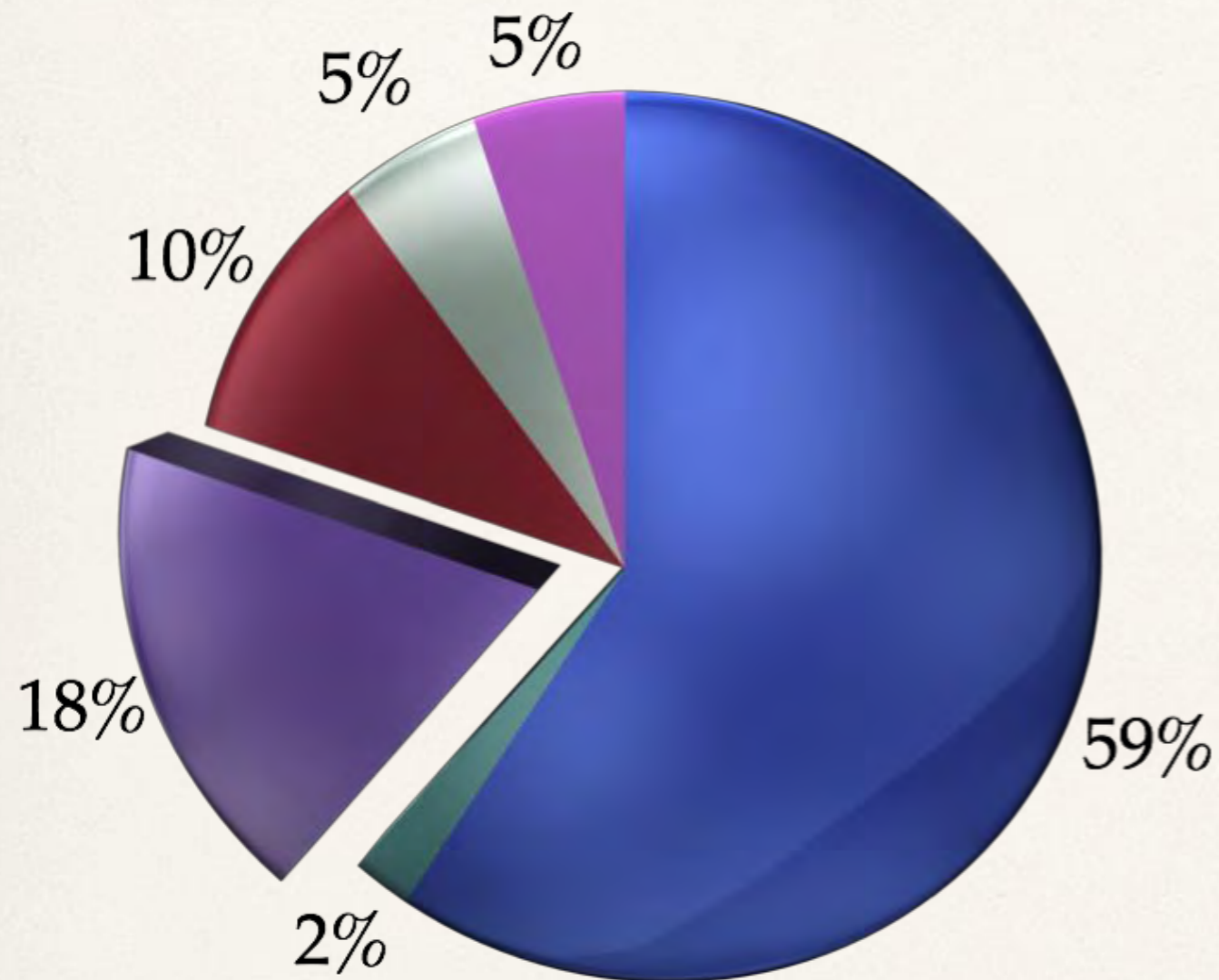


Household Energy Use 2006¹

- Space Heating
- Space Cooling
- Water Heating
- Appliances Major
- Appliances Minor
- Lighting

¹Natural Resources Canada

Selecting Behaviours



HWH Related Behaviours

- ☞ Install Low Flow Showerheads
- ☞ Turn Down HWH Thermostat
- ☞ Install Blanket
- ☞ Install On-Demand System
- ☞ Shorter Showers

Selecting Behaviours

- ⌘ Non-Divisible
- ⌘ End-State
- ⌘ No Strategies



Selecting Behaviours

✧ Rigorous

- ✧ Technical Review (Impact)
- ✧ Review Cases (Probability)
- ✧ Inspections (Penetration)

✧ Less Rigorous

- ✧ Survey Experts (Impact)
- ✧ Survey Audience (Probability)
- ✧ Survey Audience (Penetration)



Rank	Behaviour	GHG (kg/ph/y)	Probability (0 - 4)	Penetration (0 -100%)	Weight
1	Purchase Green Power	8700	2.15	3%	18143
3	Cold Water Wash	450	3.09	38%	862
4	Increase Use of Clothes Line	200	3.07	8%	564
2	Install 10 CFLs	700	3.03	23%	1633
5	Install LF Showerhead	215	2.5	61%	209

Community-Based Social Marketing



Uncovering Barriers & Benefits



Literature
Search



Observations



Focus Groups



Surveys



Fostering Sustainable Behavior

COMMUNITY-BASED SOCIAL MARKETING

HOME BOOK ARTICLES CASES STRATEGIES FORUMS MY ACCOUNT TRAINING CONTACT

Site Resources

This site consists of five resources for those working to foster sustainable behaviors, such as those involved in conservation, energy efficiency, transportation, waste reduction, and water efficiency. The site includes the complete contents of the book, *Fostering Sustainable Behavior*, as well as searchable databases of **articles**, **case studies**, and turnkey **strategies**. Further, it includes, **discussion forums** for sharing information and asking questions of others. If you take a moment to complete the free registration for this site resources added since your last visit, will be highlighted, in the table below and you will be able to post to the discussion forums and receive the daily discussion forum digest by email.

Please note: To gain the full functionality of this site please login or create an account



Agriculture & Conservation

Articles	0	34
Cases	0	6
Strategies	0	0
Forums	0	100



Energy

Articles	0	237
Cases	0	18
Strategies	0	0
Forums	0	264



Transportation

Articles	0	91
Cases	0	9
Strategies	0	0
Forums	0	142



Waste & Pollution

Articles	0	315
Cases	0	46
Strategies	0	0
Forums	0	313



Water

Articles	0	62
Cases	0	11
Strategies	0	0
Forums	0	156

Note

Place your cursor over the above icons to reveal which behaviors have been **assigned to each category**. Clicking on a behavior will **display all of the content** on this site related to that behavior. Enjoy!

Welcome, Guest

- [Login](#)
- [Create Account](#)
- [Help & Terms of Use](#)

Search the Site

[Advanced Search](#)

Learn How to Encourage...



children to **walk to school**

[PREV](#) [SHOW ALL](#) [NEXT](#)

Email a Link

Please note: You must log-in to send links to people.



Announcements

Currently, we have some 15 papers under development or review dealing with behaviors as diverse as carpooling, installing low-flow showerheads and reducing residential fertilizer use. We expect the first of these articles to appear September of 2009. For further information contact jfsb@cbsm.com. [Download the call for papers here](#)



Agriculture & Conservation

0 New | 100 Total ↗

0 – No Threads Today, Start a New Thread ↗



Waste & Pollution

0 New | 313 Total ↗

0 – No Threads Today, Start a New Thread ↗



Energy

2 New | 263 Total ↗

1 – Low Cost/No Cost Household Energy Saving ↓

1 – Energy Use Reporting/Computer Management ↓



Water

1 New | 156 Total ↗

1 – Capture of Rain Water and Gray Water ↓



Transportation

0 New | 142 Total ↗

0 – No Threads Today, Start a New Thread ↗



Announcements & General Disc.

3 New | 627 Total ↗

1 – Multiplier Effect of Education ↓

1 – Mobile Education Unit ↓


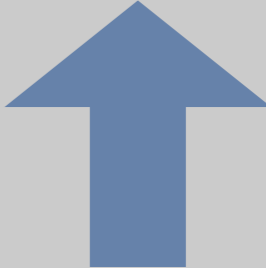




Energy

Community-Based Social Marketing



Develop Strategy

Specific Behaviour	Barriers	Benefits
Encourage		
Discourage		

Community-Based Social Marketing



Select
Behaviours

Uncover
Barriers
&
Benefits

Develop
Strategy

Pilot
Strategy

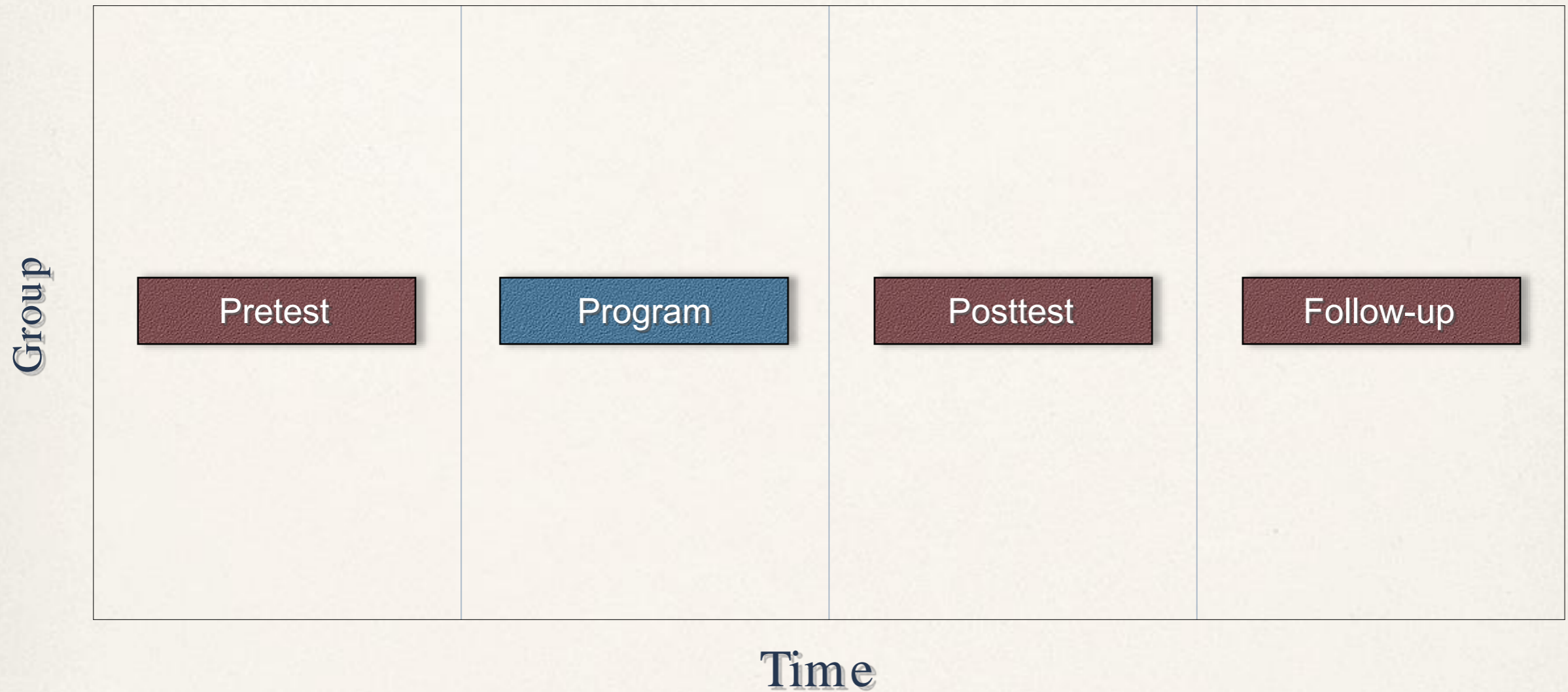
5

A close-up photograph of a wet, golden-brown leaf with numerous water droplets on its surface. The leaf is the central focus, with a blurred green background of other foliage. The lighting is bright, highlighting the texture of the leaf and the clarity of the water droplets.

Piloting

- ☞ Random Selection
- ☞ Random Assignment
- ☞ Measurement
 - ☞ Behaviour Change
 - ☞ Resource Use
 - ☞ Resource Quality

Pilot Strategy



Pilot Strategy





Turn it Off

- ❧ Barrier Research
- ❧ Barrier-Based Strategy
- ❧ Tested with Schools & TTC

**TURN YOUR
ENGINE OFF**



For Our Health

Toronto Atmospheric Fund



For the air
we breathe.

*An official truck of the Province of Ontario (with permission)

Canada

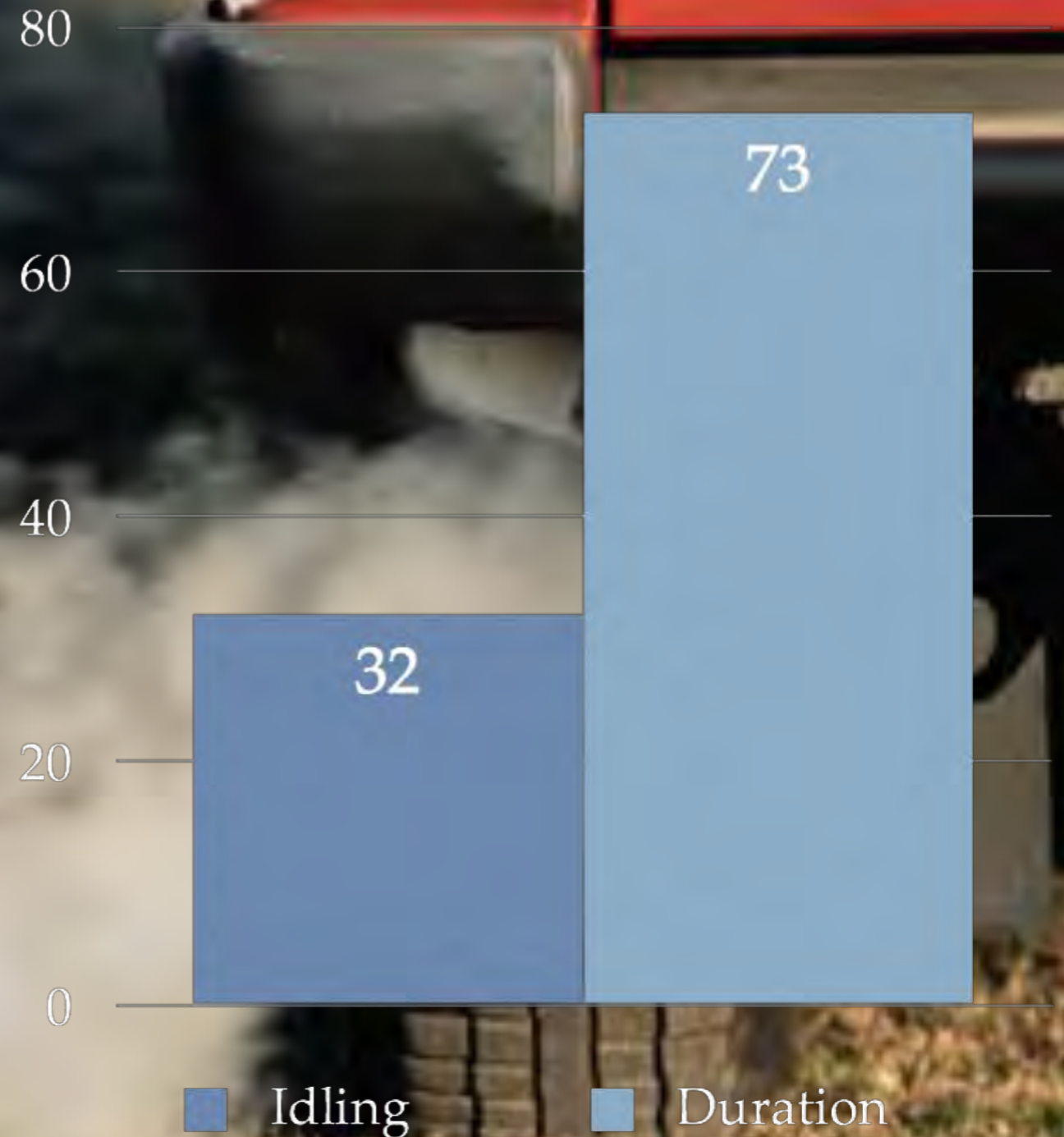
For Our Air



**I Turn My Engine Off
When Parked**

Turn it Off

- 🔗 NRCan Turnkey Toolkit
- 🔗 200 Canadian Communities
- 🔗 50 Municipalities Idle Free
- 🔗 Used Internationally



Community-Based Social Marketing



Recommendations

- ☞ Tier Behaviours
- ☞ Identify Barriers & Benefits
- ☞ Pilot Strategies
- ☞ Develop Turnkey Resources
- ☞ Overarching Vision



Questions and Comments

Mobile Contractor Illicit Discharge Education Effectiveness Study

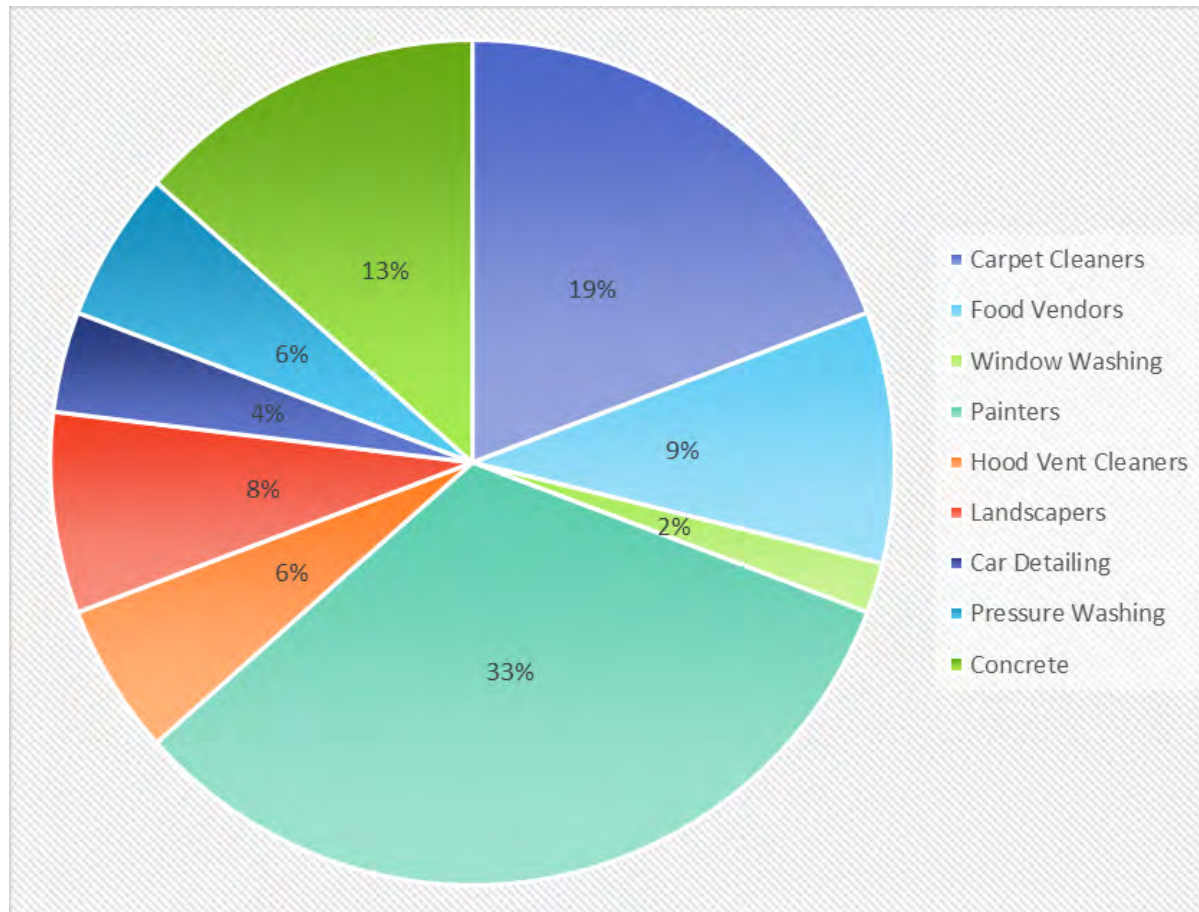
Jessica Shaw, City of Wenatchee

November 16, 2016



Mobile Contractors of Concern

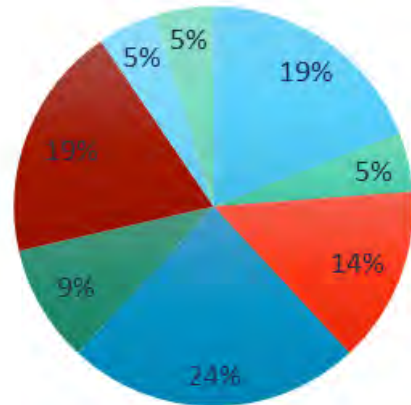
Mobile contractors cover a variety of trades and often provided services in multiple jurisdictions.



Confirmed illicit discharges in 7 jurisdictions from 2011-2016.

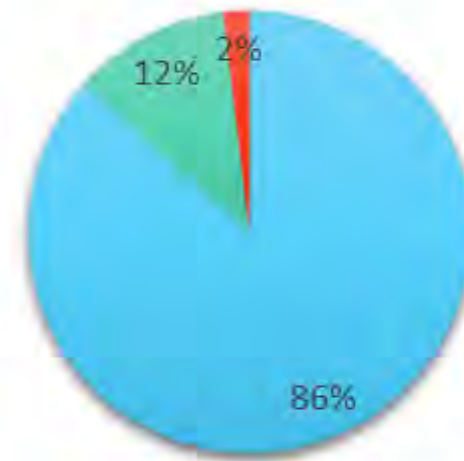
Issues vary by Jurisdiction

MS4 No. 1



- Food Vendors
- Landscapers
- Car Detailing
- Carpet Cleaners
- Window Washing
- Painters
- Hood Vent Cleaners
- Pressure Washing

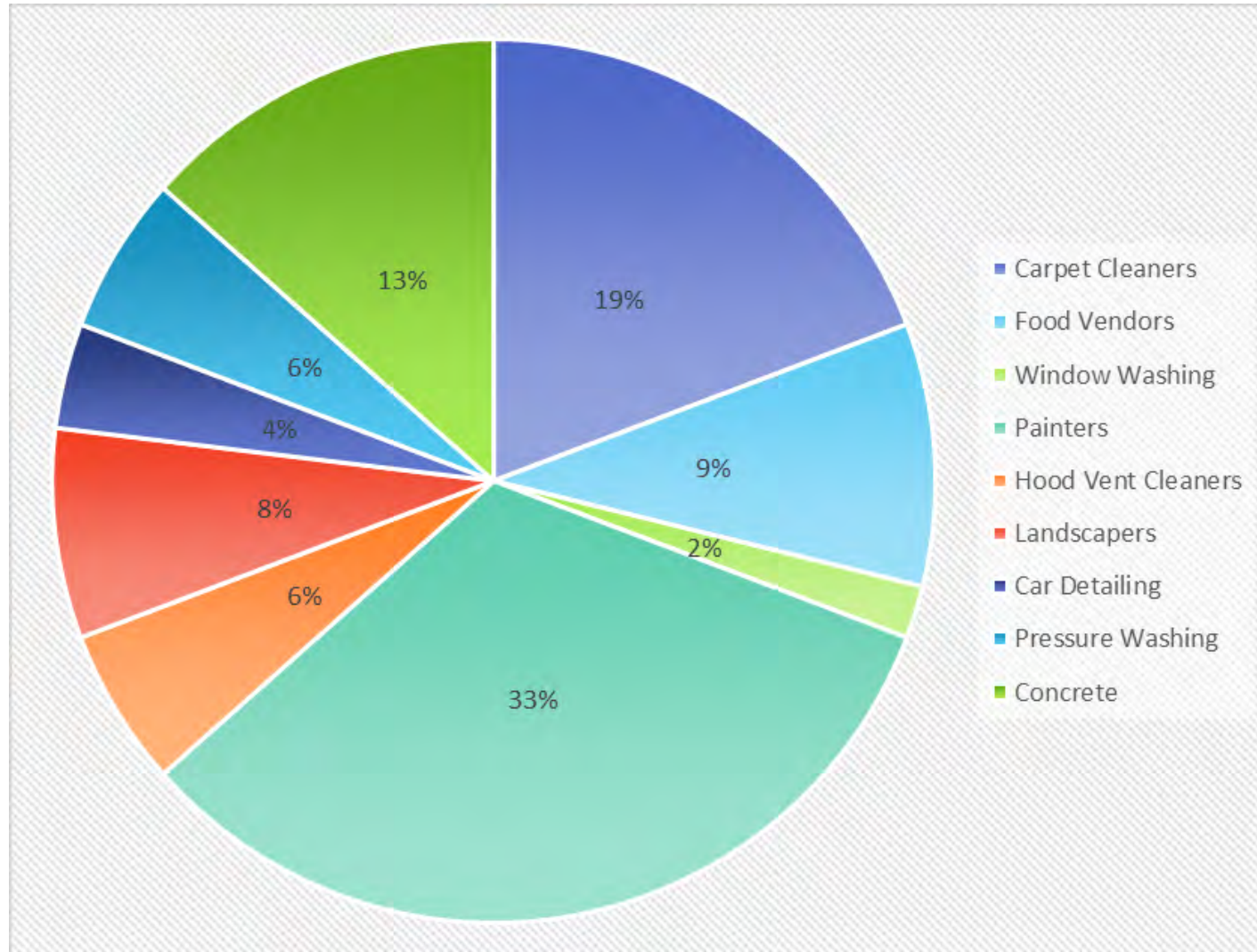
MS4 No. 2



- Food Vendors
- Landscapers
- Car Detailing

Mobile Contractors of Concern

Mobile contractors cover a variety of trades and often provided services in multiple jurisdictions.



- Based on 52 confirmed illicit discharges in 7 jurisdictions from Jan 2011 to Jul 2016.
- 5.7% of the complaints were regarding mobile contractors.

Why worry about mobile contractors?

- 5.7% is believed to be the tip of the iceberg. Mobile contractor discharges are often difficult to identify and track.
- Strength and quantities of illicit discharges from mobile contractors can cause water quality violations and public health issues.
- Many are run as home businesses which makes it difficult to verify that they are using proper discharge practices for wastewater.
- Other reasons?



#4 - Mobile Contractor Illicit Discharge Education

Lead Entity: City of Wenatchee

Study Classification: Education and Outreach



Study Goal: Evaluate the effectiveness of the education and outreach program for mobile contractors.

Conceptual Study Approach Options:

- A. Evaluate effectiveness of the Dump Smart pilot program.
- B. Evaluate impact, probability and penetration to select the mobile business behavior that would be most effective to change.

Data Collection: Information regarding mobile contractors will be collected through surveys and/or interviews and from partner jurisdictions. For Plan B additional literature research would be needed.

Study Goal and Objectives

Goal: Determine the effectiveness of mobile business education and outreach.

➤ *A5.B.1.a, page 12*

All Permittees shall continue to implement a public education and outreach program designed to achieve improvements in the target audience's understanding of the problem and what they can do to solve it. The program shall, at a minimum, including the following based on the land uses and target audiences found within the community:

➤ *S5.B.1.a.ii, page 12*

Information for businesses and the general public about: preventing illicit discharges, including what constitutes illicit discharges, the impacts of illicit discharges, and promoting proper management and disposal of waste.

Objectives:

Plan A – Evaluate whether the Dump Smart pilot program was effective in changing mobile contractor wastewater disposal practices.

Plan B – Evaluate the most effective behavior and target audience to focus future mobile business discharge education and outreach.

Plan A: Evaluate Dump Smart Pilot Program

- Funded by Ecology through the Municipal Stormwater Grants of Regional or Statewide Significance program in 2010. Lead agency: Snohomish County.
- Included a survey of experts from Eastern and Western WA and focus groups to assess barriers and benefits for carpet cleaners, pressure washers, painters, and hood cleaners in Puget Sound and Spokane.
- Target behavior: Discharge mobile contractor wastewater to sewer.
- Outreach strategies included a website, a pledge, a window cling and free ad in the local paper.
- Dump Smart pilot program was launched in the following E. WA communities: Moses Lake, Spokane, Spokane Valley, Wenatchee, East Wenatchee, Douglas County, and Chelan County.
- No follow-up was done on the pilot program.

www.wastormwatercenter.org/dump-smart



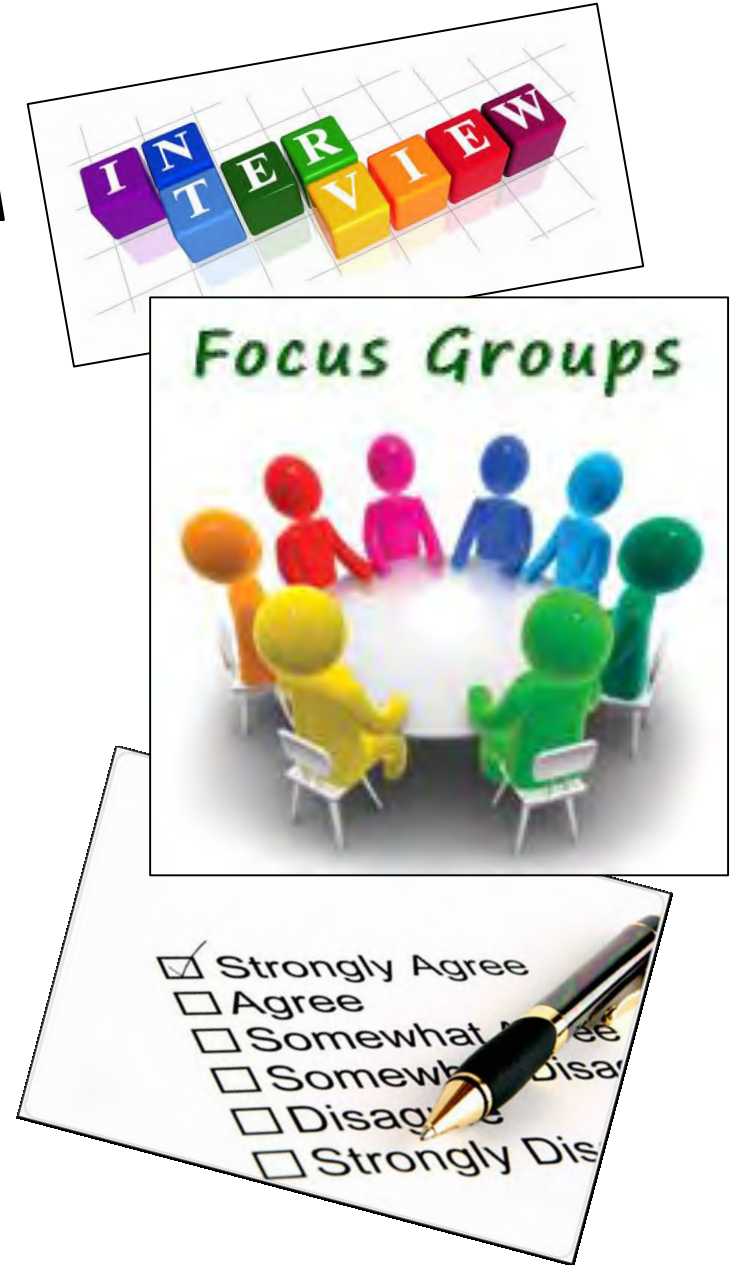
Experimental Design Overview

Overview of Study Approach for Plan A

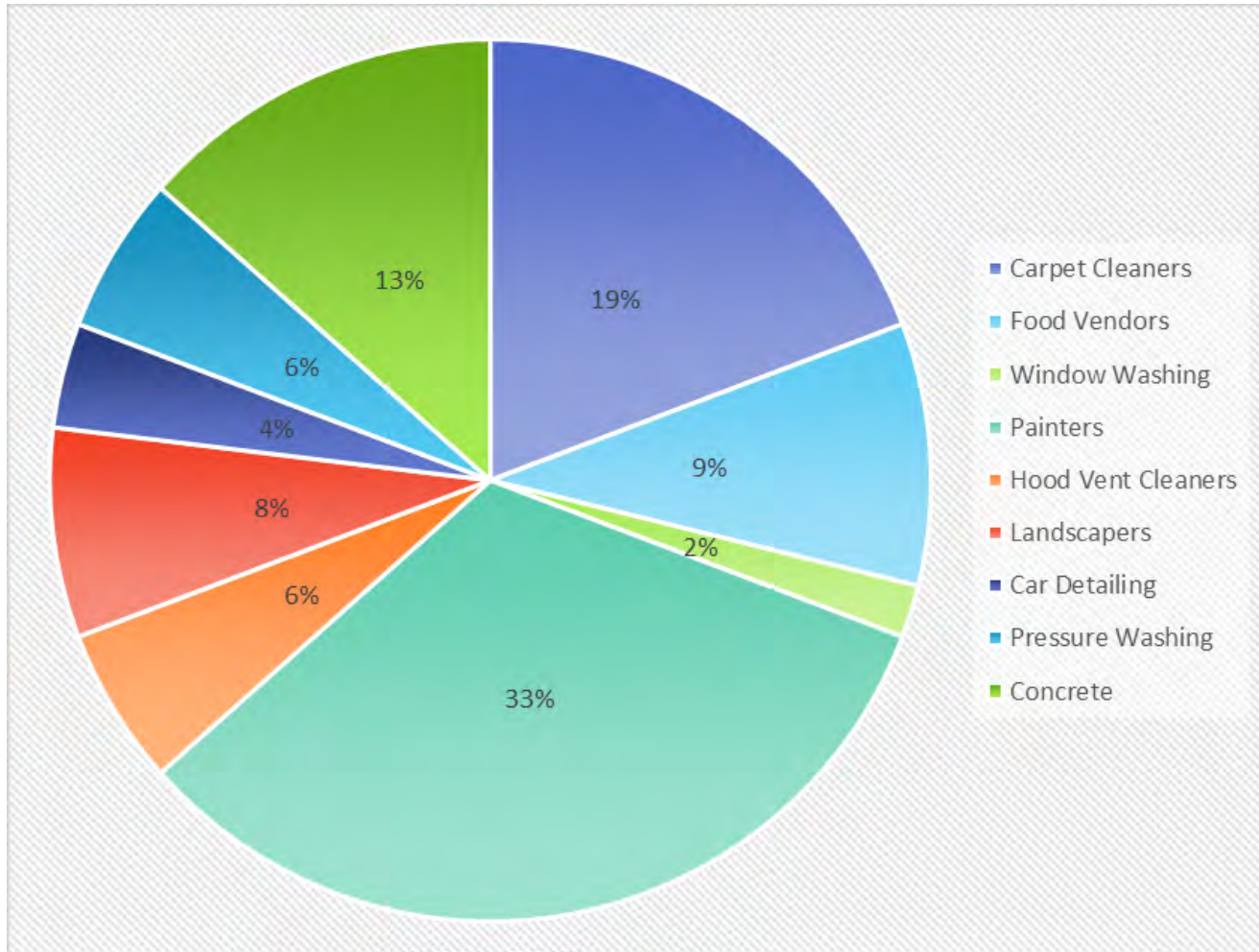
- Survey one of the mobile contractor groups:
 - Evaluate whether the target audience understands the target behavior and what they can do to solve it.
 - Verify the barriers and benefits to best management practice implementation from the focus groups.
- Collect illicit discharge data and program implementation information from participating permittees.

Estimated Study Duration: 24 months

Note: The most effective survey for the mobile contractors would be the phone survey. The phone survey has been shown to provide a higher response rate than a mailed or online survey.



Plan B: Evaluate impact, probability and penetration to select the mobile business behavior that would be most effective to change.



- Who is most likely to discharge to surface water?
- Who has the most hazardous products and wastes?
- Who has the potential to discharge the largest volume?
- How many contractors are there in a specific group?
- How many complaints were confirmed?
- What are the known water quality issues?

Examples of target behaviors to evaluate...

- Discharge wastewater to sewer.
- Clean up spilled chemicals and wastewater.
- Stockpile material at the work site to prevent discharge to storm.
- Other behaviors?...

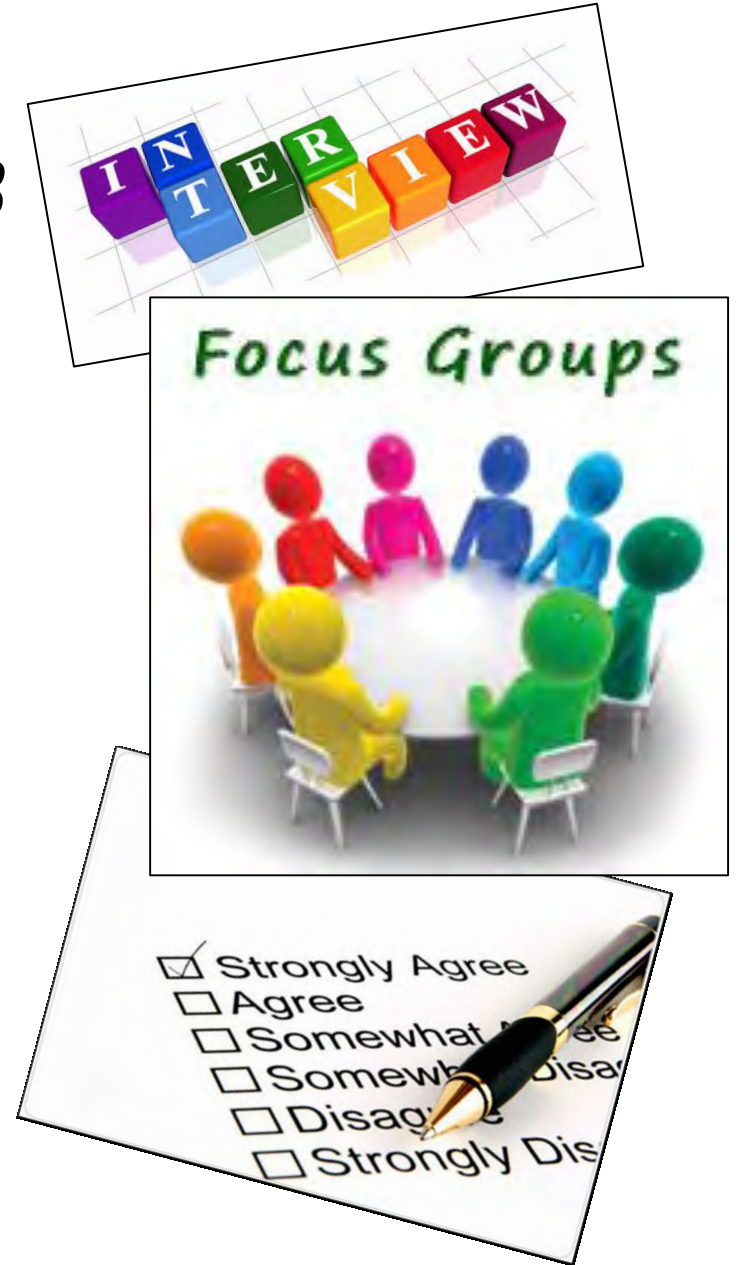


Experimental Design Overview

Overview of Study Approach for Plan B

- Survey permittees to determine target behaviors and pollution from mobile businesses.
- Gather applicable water quality data for Eastern Washington.
- Collect Illicit discharge data and program implementation information from participating permittees.
- Survey specific mobile contractor group(s) to confirm or refute observations and pollutant data:
 - Evaluate whether the target audience understands the target behavior and what they can do to solve it.
 - Gather information on pollutants and estimated concentrations.

Estimated Study Duration: 36 months



Experimental Design Overview

Study Location & Target Population

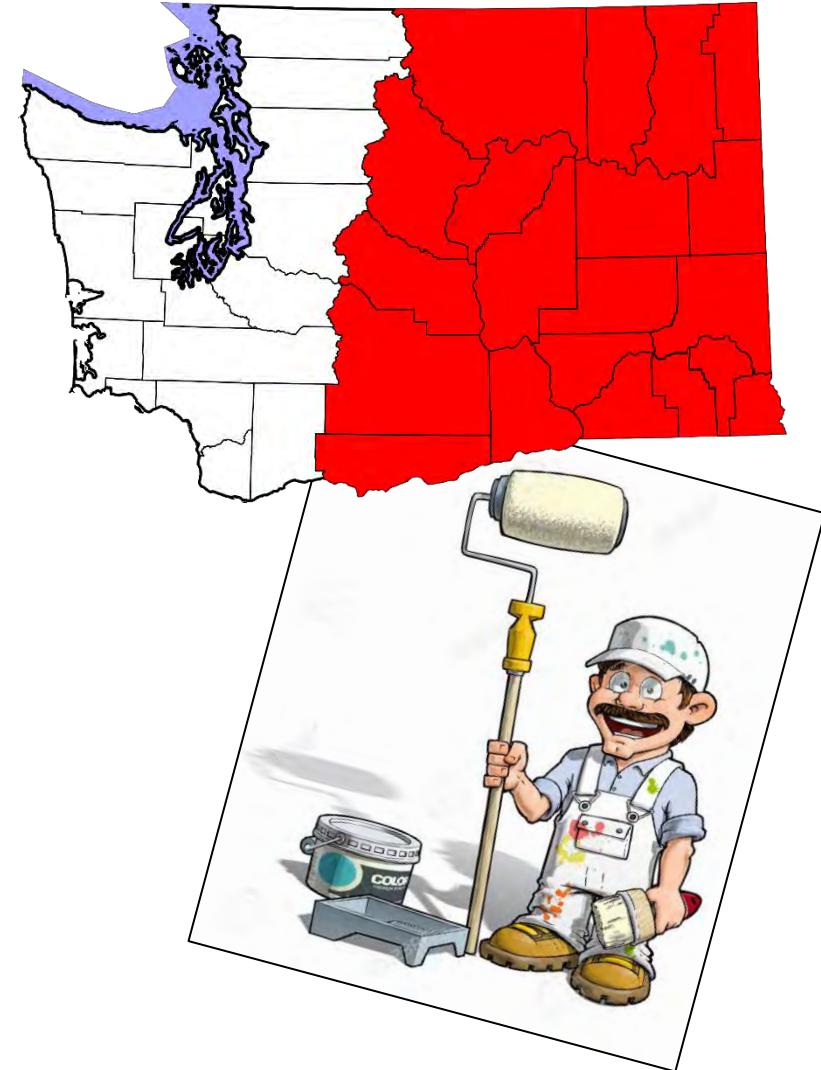
Study Location Selection

1. Communities that implemented a program for the target audience/behavior.
2. Communities that did not implement a program for the target audience/behavior.

Target Population Selection:

- Dump Smart Program: pressure washers, carpet cleaners & painters.
- Target population selected by behavior.

Sample size will vary based on the target population.



Anticipated Results & Program Modifications

The study will provide data on the effectiveness of the education and outreach program.

A. Based on the evaluation of the Dump Smart program, the program may be modified based on the information from the study. A second pilot program would be implemented.

B. Information from the study will be used to develop and implement a new pilot program focused on the selected behavior and mobile contractor group.

Dissemination of Study Documents

The Wenatchee Valley Stormwater Technical Advisory Committee webpage will be used to post final study documents.

www.wenatcheewa.gov/WVSTAC

- Detailed Study Design
- QAPP
- Final Report
- Fact sheet (short summary of study and study findings)

Partner Agencies

Cities: East Wenatchee, Ellensburg, Kennewick, Pasco, Pullman, Selah, Spokane Valley, Sunnyside, Union Gap, Walla Walla, Wenatchee, and Yakima.

Counties: Chelan, Douglas, and Yakima.

- Participation expectations:
 - Review study & provide input
 - Provide IDDE data & local program information
 - Assist with gathering information on local contractors
- Interagency agreement for funding between Wenatchee Valley jurisdictions.
- Memorandum of Understanding for all other partner agencies.





Future Effectiveness Studies

- Evaluate effectiveness of Dump Smart pilot program for one of the other mobile contractors.
- Implement a revised Dump Smart pilot program for a specific mobile business contractor and conduct a follow-up survey.
- Conduct a study on barriers and benefits for selected behavior from Plan B.
- Implement and evaluate a pilot program based on barrier and benefits research for Plan B behavior.
- Select another new behavior...

ANY
QUESTIONS

??

..


Modernizing Education and Outreach Strategies

City of Kennewick

Martin Nelson

October 26, 2016

Protege Nuestros Ríos de Contaminación en Desagüe Pluviales




El agua de lluvia que no se filtra llega a nuestros riachuelos, ríos y océanos. Las superficies tales como las calles, estacionamientos y entradas no permiten que la lluvia sea absorbida por la tierra, así que el agua corre a las alcantarillas sin el beneficio de ser filtrado. Usted puede hacer su parte y ayudar a proteger nuestros riachuelos, ríos y océanos al seguir unas cuantas pautas:

- 1) Las alcantarillas para agua de lluvia no son botes de basura. ¡Recoge y tire toda su basura en un bote de basura o recíclalo! Esto incluye excremento de perros y otros animales.
- 2) Lave su carro en su césped o en un lavadero de coches comercial.
- 3) Reduzca la cantidad de fertilizante, productos para césped y pesticida que aplique a su césped y jardín. Si se derrama en la banqueta o en su entrada, ¡bárrelo! ¡No lo mande a las alcantarillas!
- 4) NUNCA debes echar aceite de motor usado, pintura u otros químicos domésticos en las alcantarillas. Contacte al operador de residuos sólidos de su condado para información sobre cómo desechaarlo apropiadamente.

Acuérdese de decirles a sus vecinos y familia que no hay que tirar NADA en las alcantarillas.

Protect Our Rivers From Stormwater Pollution



Stormwater runoff is unfiltered water that reaches our streams, rivers and oceans. Surfaces such as streets, parking lots and driveways do not allow rain to soak into the soil, therefore it runs off into storm drains without the benefit of filtration. You can do your part to help protect our streams, rivers and oceans by following a few guidelines.

- 1) Storm drains are not garbage cans. Pick up and dispose of all litter into a garbage can or recycle it! This includes dog/animal waste.
- 2) Wash your car on the lawn or at a commercial car wash.
- 3) Reduce fertilizer, turf builder and pesticide use on your lawn and garden. If any spills over onto the sidewalk or driveway, sweep them up! Don't wash them down!
- 4) NEVER pour used motor oil, paint or other household chemicals down a storm drain. Contact your county Solid Waste provider for information on proper disposal.

Remember to tell your neighbors and family not to dump ANYTHING down the storm drains.

Only Rain Down the Drain!

Do Your Part to Help Protect Our Rivers

Presentation Outline

- Background
- Study Goal and Objectives
- Experimental Design Overview
 - Overview of Study Approach
 - Introduction to E&O Program
 - Study Location & Target Population
 - Data
- Anticipated Results
- Dissemination of Study Documents



Background (Problem Statement)

- **People receive and process information in different ways.**
- **How do we reach them best.**
- **Improve our program stratagem and communication method (Improving our communication method)**
- **We don't know how well we are reaching our citizens**



Background

- While some of our community has avoided computers and smart phones, many have adopted computing and mobile media as a way of doing business and staying current.
- As technology becomes the main stay for much of the population, we must evaluate our forms of engagement in order to stay relevant.
- We must look for ways to best reach our Citizens
- leverage old and new messaging techniques
- Need to find efficiencies
- Need to take advantage of opportunities to learn about our customers while we share our message.



Benton Franklin Fair Booth

Handouts



Home and Garden Show Booth

Study Goal and Objectives

Phase 1 Goal: We would like to understand how effective our current messaging techniques are working in our effort to reach the general public.

- *This goal is oriented on meeting Eastern Washington NPDES Phase II permit Section S5B1*

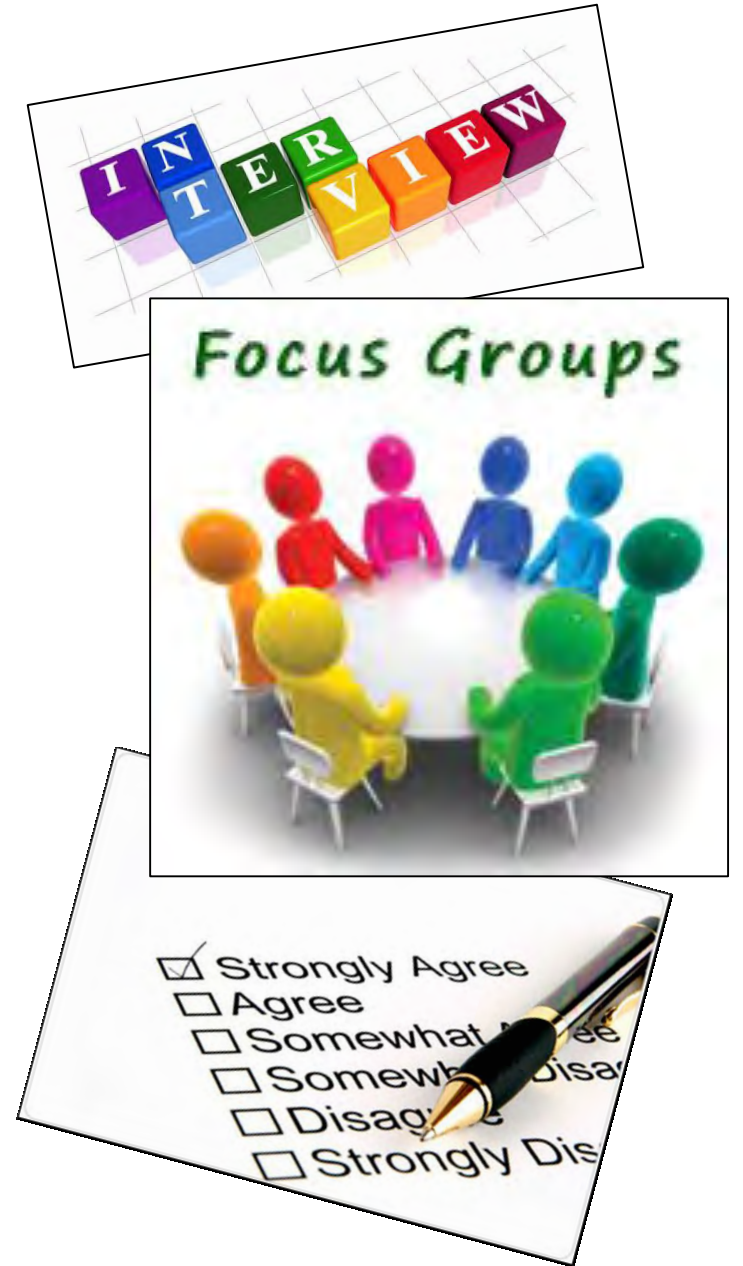
Phase 1 Objectives:

1. Identify the current methods for conveying information to the public
2. Clearly define the current educational program
3. Implement the evaluation of the current program

Experimental Design Overview

Overview of Study Approach

- Multi phased study:
 - Phase 1 – assessing our current program and outreach techniques.
 - Phase 2 – I identify revisions to programs message and identifying new tools
 - Phase 3 – Reassess the program for growth and revise as needed
- Phase 1 study duration: The study will run through 1 to 3 iterations. Each iteration will last 2 weeks from start to finish
- A preliminary calibration survey will be conducted with a small sample size using only a few questions to verify that our survey format or formats are valid. Once revised, the surveys will be conducted in as small an area as the City of Kennewick and potentially in many other Eastern Washington permit areas.



Experimental Design Overview

Introduction to E&O Program

- The Education and Outreach program in the City is a collection of action items that have been assembled and launched as opportunities have presented themselves. The first portion of this project will frame the components of the current E & O components into a clear program.
- The current E & O program provides outreach through public events and through messaging at the curb, and through municipal web sites in our to primary languages.
- The materials include informational flyers, fridge magnets, dog bag dispensers, shopping bags, water conservation kits, and other handouts.
- The messages are a mixture of the standard do's and don'ts of protecting our storm system and water quality in general.
- Many of the handouts containing websites and spill response phone numbers of our area

Experimental Design Overview

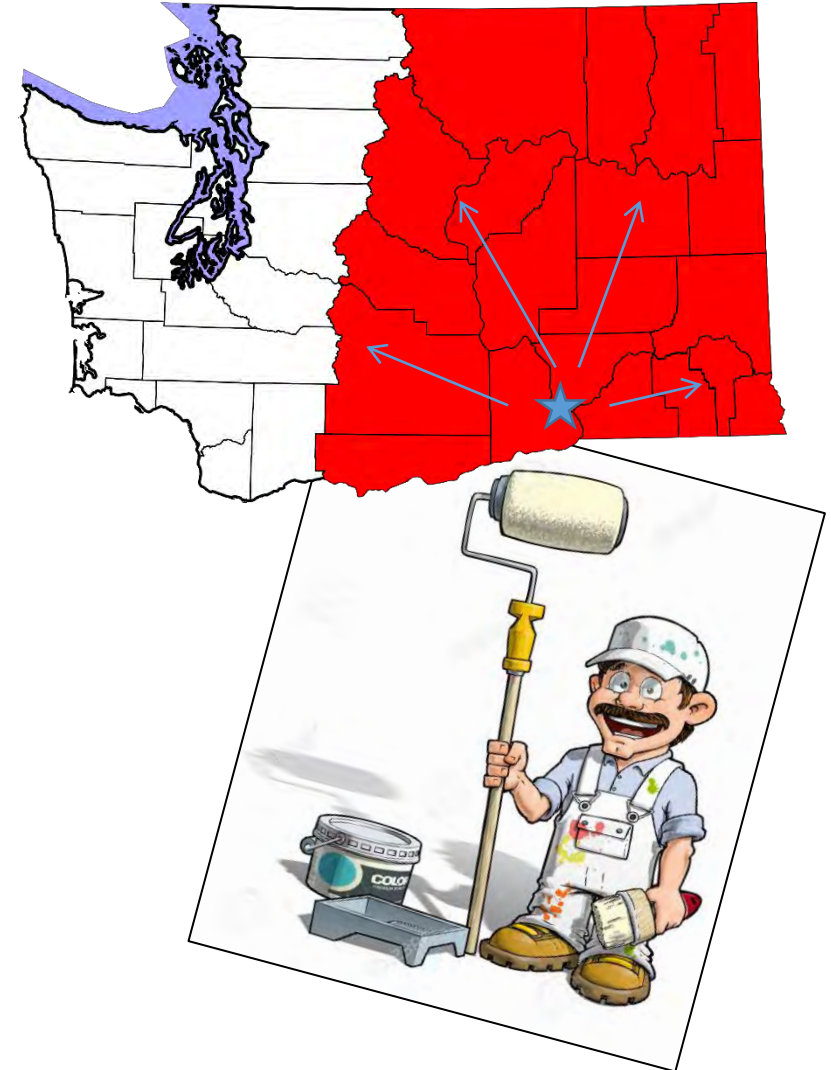
Study Location & Target Population

Study Location

- The study will be designed to be replicated in any jurisdiction, through the initial launch through partnerships in Eastern Washington.

Target Population:

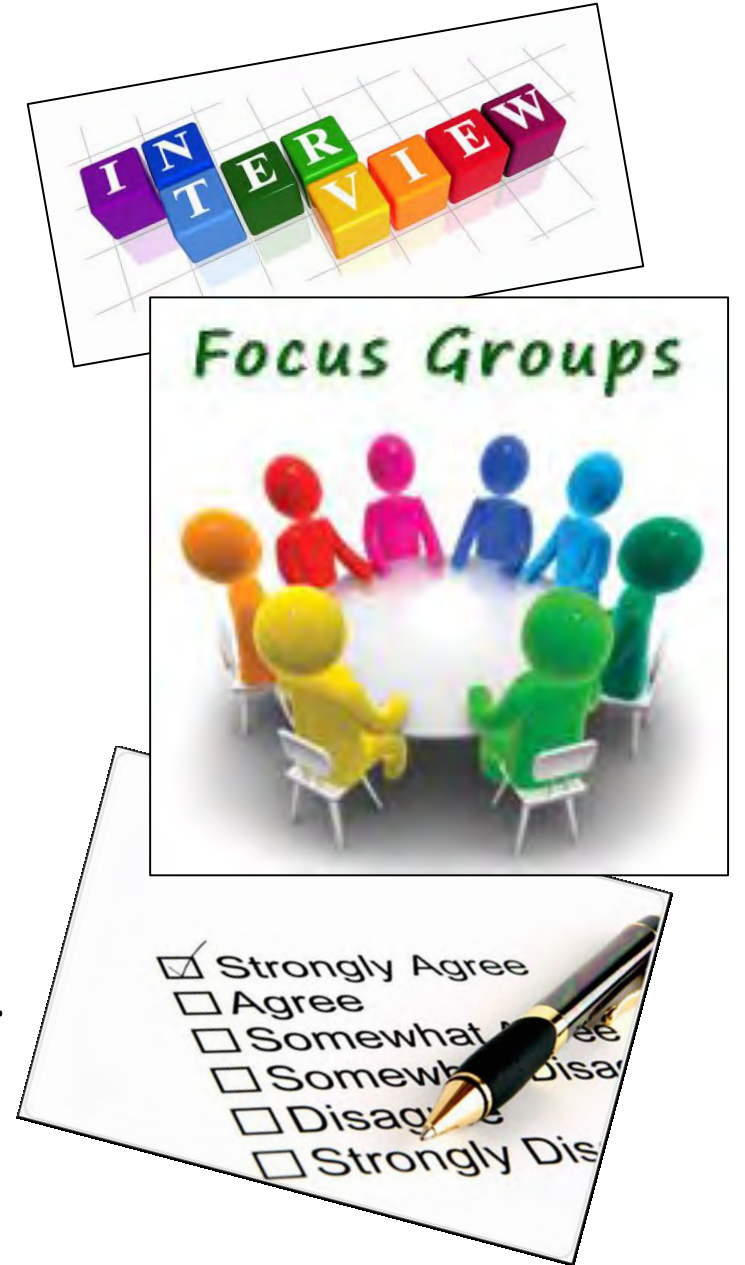
- The General Public is a mix of parents, employees, and business owners. Reaching them with simple messages sets a good based for water quality protection in general and a launch in point for other more specific groups.



Experimental Design Overview

Data

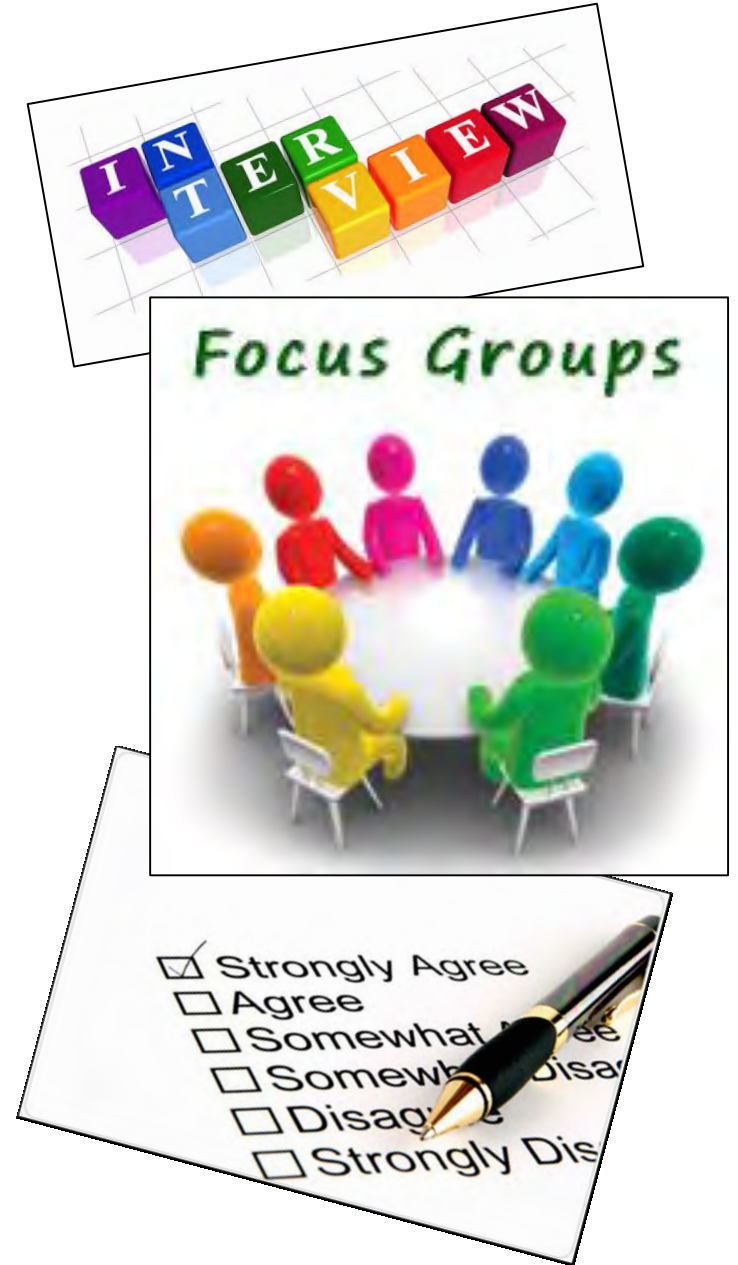
- Data collection process
 - We have not yet settled on a specific framework, but the following ideas have floated to the top.
 - Surveys in the utility bill
 - Website posting and City Facebook links to surveys
 - Interviews at public events
 - Discussions with local focus groups
- Data collection duration
 - This will likely only take a few months to set up and collect the data we are looking for.
 - My initial thoughts are to start in mid summer and in late fall. This will cover both the summer events we conduct outreach at as well as a portion of the school year.



Experimental Design Overview

Data

- Data to be collected
 - Again, we have not settled on the specific questions, but the following ideas have floated to the top
 - We can show some of the materials we have provided to the public and ask if they have seen or received one, then ask, did they read it or find it useful.
 - We can ask if they have called or needed to call the spill response phone number, were they successful in finding the number and making the call.
 - I would like to have a question or two asking if they know what stormwater is and whether they think there is anything to stop what is put in the system from getting in to the ground or the river.
 - As we step through the calibration survey and into the full local or regional survey, we will look to refine the questions and format as needed to try to increase its effectiveness
 - One concept is to ask for responses to just 3 questions (very short survey) followed by an additional 3 or more questions the following month (another very short survey). Associated with each of these short surveys would be an opportunity for them to answer additional questions if they had the time
 - after the submittal of the 3 responses, a thank you and more questions become available.



Anticipated Results

Anticipated Outcomes: We expect to gain an understating of what is and isn't working in our current program and where we need to modify the message and messaging tools to better reach our audience.

Desired Stormwater Program Modification: A refined and more accessible message and reaches more of the public providing better connection with the water quality message. Once we find out how to get one set of messages better connects with our audience, we will be more successful with follow on message with new topics.

Dissemination of Study Documents

The study documents listed below will be distributed and made available to the public by posting to the City, Ecology, or Storm Center website with links for access.

- Detailed Study Design – City/ Ecology Web Posting
- QAPP
- Final Report
- Fact sheet or video (short summary of study and study findings)

#1 - Modernizing Education and Outreach Strategies

Lead Entity: City of Kennewick

Study Classification: Education & Outreach



- Study Goal: determine the effectiveness of various new communication technologies (NCT) to convey messages that protect stormwater
- Conceptual Study Approach:
 - assess effectiveness of different methods for communicating information (existing & NCT)
 - define message
 - deploy message through various NCT
 - evaluate reception of message
- Data Collection: Data will be collected through surveys (multiple choice and yes/no questions) disseminated using mailers, websites, social media, apps, etc.

ANY
QUESTIONS

??

..

Stormwater Effectiveness Studies

Detailed Study Design Proposal & Quality Assurance Project Plan (QAPP) **Template**

Study Classification: (select one)

- Structural BMP Operational BMP Education & Outreach

Study Objective(s): (indicate all that apply)

- Evaluate Effectiveness Compare Effectiveness



Date: December 5, 2016

Prepared By:
Aimee S. Navickis-Brasch
NBSWE

Prepared For:
City of Spokane Valley
Art Jenkins

E&O QAPP Template Presentation Agenda

Overview: Review E&O QAPP Template using Case Study Presentations as an example

- Sections that mostly repeat between QAPP Templates (Sections 1.0-5.0)
 - Third Priority: Briefly review content and ask for section comments
- **New/Different from traditional QAPPs (Section 6.0-8.0)**
 - **Top Priority: Presentation/Discussion/Comment on these sections**
- Sections that are mostly similar between QAPP Templates (Section 9.0 to end)
 - Second Priority: Presentation/Discussion/Comment on these sections
- Next Steps
 - Define: Template Completion date; Ecology Review/Comment Process for Templates

Template Instructions

- **Brown text** - instructions & guidance for developing the section
 - Delete from final document
- **Text highlighted in yellow** - replace with the information relevant to a specific study
- For Sections that do not apply to a study
 - Enter “**Not applicable**” along with an explanation
- Information expected in the Proposal and QAPP documents is identified in boxes

Proposal – indicates the information expected in the Proposal. However, users are encouraged to provide as much information and detail as known at the time the Proposal is developed.

QAPP – indicates the additional information expected in the QAPP

2.0 Executive Summary (was Abstract)

Repeat Section - QAPP Only

The executive summary is a brief (300-500 word) and non-technical summary of the project that is typically written for a more general audience and includes the “key” elements of the study.

- Description of the E&O program that is the focus of the study
- Study goals and objectives
- How those objectives will be accomplished
- Brief description: instruments and how data will be collected and used
- The study area, target population, and estimated duration of the study
- Anticipated study outcome & modifications permittee expects to make using the findings

3.0 Background

Repeat Section

3.1 The Stormwater Education and Outreach (E&O) Program

- **Subsection Purpose:** describe the existing SW E&O program(s) that is the focus of this study or if the study focus is to collect baseline data with the intent of developing a new E&O program, describe the proposed E&O program and how the data will be used to develop the program.

3.2 Problem Description

- **Subsection Purpose:** Explain the reason(s) why the proposed effectiveness study is needed and provide a basis for the identified problem.

3.3 Results of Prior Studies – QAPP Only

- **Subsection Purpose:** Describe findings from previous studies that support the need for the study and/or the potential success of the study. Include references the information or data sources.

3.4 Regulatory Requirements

- **Subsection Purpose:** Specify the specific SW Management Program conditions or other conditions in the EWA NPDES Phase II Municipal Stormwater permit that the study will address. Include the specific permit section (S5.1 Public Education and Outreach) and subsections.

4.0 Project Overview

Repeat Section

4.1 Study Goal

- **Subsection Purpose:** Define all the study goal(s) (i.e. the reason(s) the study is being conducted): compare and/or evaluate the effectiveness of E&O program(s); potential decisions made as a results of study; how study could advance regional understanding of E&O programs

4.2 Study Description and Objectives

- **Subsection Purpose:** Describe how the study goal(s) will be accomplished: short description of study; indicated if study has multiple phases; list study objectives

4.3 Study Location and/or Target Population

- **Subsection Purpose:** Identify and provide an overview of the location where the study will be conducted (test and control sites) and the population the E&O program targets.

Proposal: The target population and test-site may not be selected. Describe the general characteristics of the proposed population and test-area, the estimated sample size, number of test-sites.

4.0 Project Overview

Repeat Section

4.4 Data Needed to meet Objectives

- **Subsection Purpose:** Describe: the types of data that will be collected during the study, the types of instruments that will be used to collect data, the sources of data, how data will meet objectives

4.5 Tasks Required to Conduct Study (table format)

- **Subsection Purpose:** Define the tasks and subtasks needed to complete the study; brief description of the work associated with each task; the objective the task achieves; anticipated deliverables.

Proposal: It is only necessary to provide the relevant information for the primary tasks

4.6 Potential Constraints

- **Subsection Purpose:** Describe conditions that may impact the project schedule, budget, or scope and the steps that will be taken to reduce the impact of these conditions.

Proposal: Provide a description based on the information known about the study

5.0 Organization & Schedule

Repeat Section

Section Purpose: Describe who is responsible for completing the tasks, when the tasks will be completed, how much each task will cost, and how the study will be funded.

5.1 Key Project Team Members: Roles and Responsibilities (table format)

Proposal – the Lead Entity, Participating Entities, Partner Entities, & the Ecology Reviewer

QAPP – add other key members such as project team, project managers, decision makers, stake holders, lab contacts, field personnel, third party reviewers, etc.

5.2 Project Schedule (table format)

Proposal – task duration, permit deadlines, and estimated time to complete the study

QAPP – add sub-tasks, expected start-end dates, deliverables, and deadlines for deliverables

5.3 Budget and Funding Sources (table format; broken down by tasks & subtask)

Proposal – estimated budget for primary tasks; identify potential funding sources and/or needs

QAPP – add sub-tasks and provide more detailed budget; identify funding source and/or indicate if additional funding is needed to complete the study

6.0 Quality Objectives

QAPP Only

Section Purpose: provide a roadmap of the QA/QC plan will be employed during the project: provide a brief written description that addresses how QA/QC is addressed throughout the QAPP.

Section 6.0 Power Point Presentation:

- DQIs and MPCs Definition
- Suggested Section Layout
- Seven Principle DQIs for E&O Studies
- Considerations & Suggestions for Sample Size Determination

6.0 Quality Objectives

DQI and MPC Definition

- QA/QC plan is embedded throughout the QAPP
- QAPP emphasizes how the data quality indicators (DQIs) and respective measurement performance criteria (MPCs) will be applied to a project
- DQIs - qualitative & quantitative measures that to characterize the aspects of quality data
- DQIs - goals for quality data that guide development of experimental design as well as the process of creating and analyzing data
- DQIs - establish the trustworthiness of the data and focus on minimizing error and improving the accuracy
- MPCs – acceptance criteria for the DQIs; specify how good data must be to meet project objectives

6.0 Quality Objectives

Suggested Section Layout (QA/QC Road Map)

- ✓ Identify and describe the various types of data that will be created during this study and the intended purpose of each type of data
- ✓ For each type of data briefly describe the process that will be used to measure the data including the type of instrument that will be used
- ✓ Evaluate the data using the applicable DQI and describe the steps that will be taken to reduce error and improve the quality of the data
- ✓ For each applicable DQI, specify the MPCs that will be used to determine if the data is usable for meeting for project objectives
- ✓ Indicate the QC procedures that will be followed to verify the data created during this study is acceptable and reference applicable section(s) that define the QC procedures
- ✓ Indicate the audits that will be performed to verify conformance to the QAPP and reference applicable sections that define the audit procedures
- ✓ Describe the process that the study will employ to verify the quality of the data and assess the usability of the data

6.0 Quality Objectives

Seven Principal DQIs for E&O Studies

1. Validity
2. Reliability
3. Objectivity
4. Completeness
5. Credibility
6. Transferability
7. Integrity



6.0 Quality Objectives

Seven Principal DQIs for E&O Studies

1. **Validity** (bias) - Closeness between the measured value and the true value. An instrument is considered valid when it measures what it is purported to measure.
 - Develop new instrument using acceptable methods
 - Use established instruments that have been validated
 - Questions written in language that is accessible to audience
 - Peer review of instruments by panel of experts
 - Field test/validate instrument (pilot test) before broad application



6.0 Quality Objectives

Seven Principal DQIs for E&O Studies

2. **Reliability (precision)** - The degree to which an instrument produces stable and consistent results on repeated measurements

- SOPs for data collection are defined and followed
- Use multiple instruments to collect data
- Pilot test instruments
- Use larger sample size
- Interrater reliability



6.0 Quality Objectives

Seven Principal DQIs for E&O Studies

3. **Objectivity** - Attempt to diminish or eliminate the investigators bias. An objective investigator is neutral and open all sides of the argument without imposing their own bias, motivations, interested or perspectives.

- Remove investigator from direct contact with subjects
- Investigator avoids the use of prompts during interviews
- Use data analysis procedures and methods that are appropriate for the types of data collected
- Provide evidence that conclusions are based on findings
- SOPs are defined and consistently followed
- SOPs are appropriate for the study



6.0 Quality Objectives

Seven Principal DQIs for E&O Studies

4. **Completeness** - The amount of valid data needed to be obtained from the measurement system. Data is considered complete when: the sample size is representative of the target population.
- Sound justification is provided for sample size selected
 - Define procedures for handling missing data
 - Use appropriate coding for missing data
 - Report missing data with the results
 - Results should include consideration for how missing data could limit the transferability of the data set



6.0 Quality Objectives

Seven Principal DQIs for E&O Studies

5. **Credibility** – often referred to as social desirability bias: describes a type of response bias where survey respondents answer questions in a manner they believe will be viewed favorably by others. It can take the form of over-reporting "good behavior" or under-reporting "bad", or undesirable behavior.
- Ask the same question with response categories in reverse order
 - Careful consideration of social desirability bias in the selection of instruments; how research is introduced; and how questions are worded
 - Use multiple types of instruments and sources to collect and cross check data can assist the investigator in understanding and interpretation the response.
 - Appropriate use of priming respondent (i.e. let them know it is okay to admit behavior)



6.0 Quality Objectives

Seven Principal DQIs for E&O Studies

6. **Transferability** – The extent to which sample data can be transferred from a sample to a population. Datasets are considered transferable if the instruments, data sources, data collection procedures, sample selection procedures, and reporting are equivalent.

- Define the process and provide justification for selecting the: target audience, study area, and sample size (representative of population)
- Define and justify the process applied to for compare datasets between populations and/or study areas
- Use sound sampling procedures that yield a sample representative of the population on key variables
- Use statistical comparisons to generalize study findings
- Provide follow up procedures for non-respondents



6.0 Quality Objectives

Seven Principal DQIs for E&O Studies

7. **Integrity** - Integrity is concerned with minimizing errors through the process of collecting, recording, and analyzing data.
 - Develop and consistently follow: data collection SOPs; data recording and reporting procedures; use standard forms; verify data has been properly recorded and logged
 - Properly train those involved in data collection
 - Provide assurances for maintaining respondent confidentiality
 - Use data analysis procedures/methods appropriate for data types
 - Verify (through audits) that all procedures are followed
 - Describe process for minimizing errors that could limit the transferability



6.0 Quality Objectives

Sample Size Determination

Four Primary Considerations (hypothesis testing):

1. Criteria for Statistical Significance
2. Level of Statistical Power
3. Statistical Analysis Strategy
4. Effect Size (judged to be meaningful)



6.0 Quality Objectives

Sample Size Determination

Criteria for Statistical Significance

- Probability of rejecting null hypothesis (H_0), given that H_0 is true
 - Type I error – due to sampling errors
 - α = Chance of making Type 1 error
 - $\alpha = 0.05$ (common in social sciences)
- Probability of rejecting null hypothesis (H_0), given that H_0 is false
 - Confidence Interval (CI) or risk level
 - If $\alpha = 0.05$ then CI = 95%

Sample size is inversely related to significance level (α)

6.0 Quality Objectives

Sample Size Determination

Level of Statistical Power

- **Statistical Power** - Probability of **NOT** rejecting H_0 , given that H_0 is false
 - Type II Error
 - Less of a concern, but cannot ignore
 - Typical Statistical Power values: 0.70 to 0.85 (TAPE uses 0.80)
- **Statistical Power** - Chance of making Type II error depends upon:
 - Sample Size
 - Actual Value of Parameter

Reduce chance of Type II Error → take larger sample size

(Statistical Power increases as sample size increases)

6.0 Quality Objectives

Sample Size Determination

Statistical Analysis Strategy (*Data analysis procedures*)

- Data analysis procedure for testing hypothesis depend upon:
 - Research Design (i.e. Case Studies)
 - Research question of interest
 - Nature or type of variables studied
- Analysis strategies that consider more information about subjects, require fewer subjects
 - Quantitative Independent variables require fewer subjects compared to qualitative
 - Studies with data collected pre and post require fewer subjects compared to post alone
 - 12 samples are the minimum number for most statistical analysis methods

The more independent variables, the more subjects needed

6.0 Quality Objectives

Sample Size Determination

Effect Size

- Degree to which the null hypothesis is false (degree of variability)
- When comparing two population means:
 - Difference is large → smaller sample size
 - Difference is small → larger sample size
 - The more heterogeneous a population → larger sample size needed
 - The more homogeneous a population → smaller sample size needed
- Effect size in relation to assessment tool or instrument
 - New tools – more difficult to detect effect size
 - Use established tools or pilot test tools

6.0 Quality Objectives

Sample Size Determination - Strategies

1. Using a Census for Small Populations

- **Approach:** Sample the entire population
- Best for small populations, provides highest level of reliability (precision)

2. Using a Sample Size of a Similar Study

- **Approach:** Use the same or typical sample size as similar studies (literature search)
- Must carefully review procedures to avoid repeating errors made in other studies



6.0 Quality Objectives – QAPP Only

Sample Size Determination - Strategies

3. Use Published Tables

- **Approach:** Rely on published tables to provide sample size based on a given set of criteria
- **Typical Criteria:** Statistical Significance, Statistical Power, Degree of Variability

4. Use Formulas to Calculate Sample Size

- **Approach:** Calculate sample size using appropriate methods
- Use when combinations of different criteria's are needed to select sample size
- Online Calculators

<https://www.checkmarket.com/sample-size-calculator/>

Table 2. Sample size for $\pm 5\%$, $\pm 7\%$ and $\pm 10\%$ Precision Levels Where Confidence Level is 95% and $P=.5$.

Size of Population	Sample Size (n) for Precision (e) of:		
	$\pm 5\%$	$\pm 7\%$	$\pm 10\%$
100	81	67	51
125	96	78	56
150	110	86	61
175	122	94	64
200	134	101	67
225	144	107	70
250	154	112	72
275	163	117	74
300	172	121	76
325	180	125	77
350	187	129	78
375	194	132	80
400	201	135	81
425	207	138	82
450	212	140	82

6.0 Quality Objectives

Sample Size Determination - Strategies

- Minimum sample size: 100
 - If population is less than 100; need to survey the entire population
- Maximum sample size: 10% of population
 - Not to exceed 1000
- Chose Minimum when:
 - time and money are limited
 - Only rough estimate is needed (relate to CI and power)
 - You don't plan to divide sample into different groups during the analysis or you plan to use a few large subgroups (i.e. males/females)
- Chose Maximum when:
 - time and money are available
 - Accurate results are important (relate to CI and power)
 - You plan to divide sample into different groups during data analysis (i.e. age groups, etc)

Reference: <http://www.tools4dev.org/resources/how-to-choose-a-sample-size/>

7.0 Experimental Design

Section Purpose & 7.1 Study Design

Section Purpose: Describe the experimental design that will be used to evaluate (and/or compare) the E&O program(s) effectiveness and/or develop an E&O program (i.e. collecting baseline data). Section provides the basis for why the experimental design was selected; may include a literature search.

7.1 Study Design

- ***Subsection Purpose:** Describe the approach the study will follow to meet the specified objectives and provide a basis for the selected approach*
- *Discussion how E&O program will be evaluated to determine if the learning objectives are achieved*
- *Identify and generally describe the types of instruments that will be used to measure the data, how the instruments will be administered, and the focus of the questions that will be asked*
- *Identify the types of data that will be collected and briefly describe how the data will be collected*
- *Indicate whether multiple methods will be used*

7.0 Experimental Design

7.2 Process for Selecting Test-Site & Target Population

Subsection Purpose: Provide a detailed description of the test-site (study area) and the target population along with justification for selection. Include maps, photos, and/or drawings; examples of the tools/methods used for selection. Suggestions for this section include:

- Identify the site locations and populations and provide a justification for selection
- Provide a detailed description of the process and criteria for selecting the target population, test-site(s), and if applicable the control-sites and control population.
- Define the variables that will influence selection and summarize the variables in tables. Variables will vary depending on specific study goals. Examples include:
 - ✓ Geographical area and land use classification
 - ✓ Demographics and accessibility
 - ✓ Primary employment industries and types businesses

Proposal – describe the proposed selection process and criteria. If the sites and/or populations have been selected, provide information about the actual process and criteria.

7.0 Experimental Design

7.4 Data to be Collected

Subsection Purpose: Identify the various types of data that will be collected and what the intended purpose is for each with respect to meeting the project objectives.

For each data type identify:

- ✓ The location for its collection
- ✓ The anticipated frequency of collection
- ✓ The number of samples expected to be collected
- ✓ Recommend using Tables to keep the section brief



7.0 Experimental Design

7.4 & 7.5

7.4 Execution of E&O Program During Study

This section only applies if the E&O program will be executed during the study and is part of the experimental design.

- **Subsection Purpose:** Explain how the E&O program will be executed during the study, specifically explain if there are any differences from what was described in Section 3.1.

7.5 Other E&O Programs

Proposal - Subsection 7.5 not included in Proposal; delete section before submitting.

- Describe any other E&O programs in the study or control area that may influence the target populations' responses. Include details regarding the process to determine if there are other E&O programs.

8.0 Instrument Design & Development

QAPP Only

Section Purpose: Describe the instrument(s) that will be used during the study along with the process used to develop and validate the instruments. **If the instruments will be developed after the QAPP is complete**, this section should define the process that will be followed to develop the instruments, the types of instruments proposed, and the focus of the questions that will be included.



8.0 Instrument Design & Development

8.1 Instrument Design

Subsection Purpose: Describe how the instruments were designed and developed. This may include:

- ✓ Identify the instruments (surveys, interview questions, etc.) proposed to measure or compare effectiveness for an E&O program and/or assess the target population's perceptions/knowledge/attitudes/behaviors (i.e. collect baseline data)
- ✓ Describe how/why the instruments were designed to collect data from the target population and provide a basis for the selected design (may include a summary of literature)
- ✓ Include a copy of the instrument with the survey and/or interview questions (attachment)

8.0 Instrument Design & Development

8.2 Procedures for Collecting Data

Subsection Purpose: Define the procedures for collecting the various types of data created during the study. Standard operating procedures (SOPs) are the procedures that define specifically how to conduct an activity. **If the SOPs will be developed after the QAPP is complete**, this section should describe the general approach for collecting data and indicate when they will be developed (i.e. specify the relevant task and schedule). SOPs for E&O studies may include:

- ✓ Instructions that will be provided to the participant before they take the survey
- ✓ How the instruments will be disseminated to the target population (i.e. mailer, email, web based polls, social media, listserve, one-on-one or group interview, etc.)
- ✓ How interviews will be conducted including instructions provided to the participant before starting an interview; how to address the participant's questions during the interview; and how to address prompting and/or priming participants
- ✓ What data will be recorded (see section 10.0 Data Recording and Management Procedures)

8.0 Instrument Design & Development

8.3 *Instrument Validation*

Subsection Purpose: After the instrument(s) have been developed, the next step is to validate the instrument. Validation is the process to verify the instrument measures what it was intended to measure and produces stable results. This subsection should describe the process that will be employed to validate the instruments. This Section may include:

- ✓ The use of established instruments from similar studies that have already been validated
- ✓ Field testing of instruments before broad implementation (i.e. focus groups, pilot testing, etc.)
- ✓ Asking the same question with response categories read in reverse order (quantitative data)
- ✓ Using peer debriefing: independent reviewers who verify codes/themes for a portion of the responses; then the reviewers compare, discuss, and modify their codes/themes until they mutually agree (qualitative).
- ✓ Defining acceptable interrater reliability ratings (for MPCs)
- ✓ Using multiple methods
- ✓ Peer review of instrument/questionnaire by panel of experts

9.0 Quality Control

QAPP Only

Section Purpose: Describe the QC procedures that will be employed during the study to minimizing errors and support the integrity of the data through the process of collecting, recording, and analyzing data. Recommended using tables to keep the section brief.

9.2 Corrective Action

- **Subsection Purpose:** For all the data that will be created during this study, explain how QC will be addressed to minimize errors. This may include:
 - ✓ Properly training those involved in data collection
 - ✓ Develop and consistently follow SOPs during data collection (section 8.0)
 - ✓ Develop and consistently follow data recording and reporting procedures (section 10.0)
 - ✓ Develop and consistently use standard forms for data collection (section 10.0)
 - ✓ Conduct Audits using third party (section 11.0)

9.2 Corrective Action

- **Subsection Purpose:** Define the corrective action plan and procedures if the QC results indicate problems during the course of the project. Include in your project plan any additional procedures to be followed to correct or compensate for QC problems if they occur.

10.0 Data Management Plan Procedures

QAPP Only

Section Purpose: Define the data management plan, specifically describe how the data and other important project documents will be managed, stored, and archived during the study. The reason data management plans are developed is to reduce the potential for errors during the data collection and analysis phases of the project.

10.1 Data Identification

- **Subsection Purpose:** Define the protocol for identifying data collected during the study. This may include:
 - ✓ identification numbers
 - ✓ location, date & time
 - ✓ sampler initials
 - ✓ blind coding data to respect respondent's confidentiality, etc.

10.0 Data Management Plan Procedures

QAPP Only

10.2 Data Recording & Reporting Requirements

- **Subsection Purpose:** describe the procedures for recording data in the field and compiling the data collected (transferring the data to an electronic format). This may include:
 - ✓ Developing a data collection template (i.e. standard form) that specifies the data to be collected for each instrument (include a copy of any data collection templates in the appendix). Items that may be on the template include:
 - *date and time, data collectors name(s), sample identification, specific instrument measures (i.e. questions), and a space for adding comments about issues that may influence the quality of the data*
 - ✓ Identify potential sources of error that may occur during data reporting and provide procedures for detecting and correcting these errors.
 - ✓ Indicate the software programs or databases that will be used to store the data.
 - ✓ Specify the duration and responsible party for archiving the data.

10.0 Data Management Plan Procedures

QAPP Only

10.3 Procedures for Missing Data

- **Subsection Purpose:** Define the project procedures for addressing missing data. This may include:
 - ✓ Define procedures for handling missing data
 - ✓ Use appropriate coding for missing data
 - ✓ Report missing data with the results

10.4 Acceptance Criteria for Existing Data

Subsection only applies to projects that to use existing data (i.e. data not collected during this study).

- **Subsection Purpose:** Define the acceptance criteria that will be used to determine if a dataset can be compared and/or combined for the decisions to be made during this study.

10.5 Environmental Information Management (EIM) Data Upload Procedures

- **Subsection Purpose:** Per section S8.B-9 of the permit, enter data into Ecology's EIM system before the end of the water year in which it is collected or within 6 months of collecting the data, whichever is later.

12.0 Audit

QAPP Only

Section Purpose: Describe what will be audited; the process and procedures; number of audits; audit schedule and frequency; audit responsibility (who will audit)

Type of Audit: Technical System Audit – qualitative; verify conformance to Quality Assurance Project Plan. This may include:

- ✓ Verify the field staff have been trained and are following the SOPs for sample collection
- ✓ Verify the data management procedures are followed including recording the data in the field
- ✓ Confirm instrument validation procedures are followed
- ✓ Verify the process defined for selecting test-sites and target population was followed.



12.0 Data Verification & Usability Assessment

Section Purpose & 12.1 Data Verification

Section Purpose: define the process that the project will employ to verify ~~the instruments, evaluate~~ the quality of the data, and evaluate the usability of the data for meeting the project objectives.

Proposal – Identify the data that will be verified

12.1 Data Verification

- **Subsection Purpose:** Describe the process that will be employed to evaluate the quality of the data created during the study and identify responsible party for verifying the data. Ideally, data verification is performed by a person other than the one generating the data. The data verification process may include:
 - ✓ Review data records: ensure they are consistent, correct/complete, with no errors or omissions
 - ✓ Review the results from the QC section
 - ✓ Review the results from the audit section
 - ✓ Examine data to determine if MPC's were met

12.0 Data Verification & Usability Assessment

12.2 Data Usability Assessment

12.2 Data Usability Assessment

- **Subsection Purpose:** Describe the process and procedures that will be used to establish the usability of the data for meeting the project objectives. This will include:
 - ✓ Results from the data verification
 - ✓ Whether the MPCs for the project have been met. Generally, if the MPCs have been met, then data should be of sufficient quality to be usable for meeting project objectives. If the MPCs have not been met for data, the user will need to decide if the data is still usable or reject the data.

13.0 Data Analysis Methods

Section Purpose & 13.1 Hypothesis Testing

Section Purpose: define the methods the project will use to analyze the data and address the study goals outlined in Section 4.1

Proposal – Define what data will be analyzed and the process for analyzing the data (i.e. normality testing, removal efficiency, etc.)

13.1 Hypothesis Testing

- **Subsection Purpose:** For datasets that will be compared, either between the test-site and control-site or between baseline and post responses, describe how the datasets will be analyzed to determine if there is a statistically significant difference. This could include:
 - ✓ Summary of hypothesis testing process and methods that will be used to analyze the data.
 - ✓ Definition of the null and alternative hypothesis that will be evaluated
 - ✓ Definition of the methods and describe how/why the methods are appropriate for the types and quantity of data. This is particularly important for non-normally distributed data and ordinal data

13.0 Data Analysis Methods

13.2 Quantitative & 13.3 Qualitative Analysis Methods

13.2 Quantitative Data Analysis Methods

- **Subsection Purpose:** Define the quantitative data analysis process and methods. This could include:
 - ✓ Summary of methods that will be used to analyze the data
 - ✓ Summary of methods that will be used to compare data sets
 - ✓ A description regarding how multiple choice surveys will be coded with a Likert scale

13.2 Qualitative Data Analysis Methods

- **Subsection Purpose:** Describe the technique that will be used to analyze qualitative data. This includes:
 - ✓ Organizing and categorizing the data into themes and codes
 - ✓ Connecting the data to show how one concept may influence another
 - ✓ Using a peer debriefing to validate the codes and themes by having other researchers review the codes, evaluating alternative explanations, disconfirming evidence, and searching for negative cases
 - ✓ Summary of methods that will be used to determine the number of similar or dissimilar responses

13.0 Data Analysis Methods

13.4 Data Presentation Methods

- **Subsection Purpose:** Describe how the data will be presented (i.e. tables, charts, and/or graphs) in the final reports to illustrate trends, relationships, and anomalies.



14.0 Reports (new Section)

14.1 Final Report – QAPP Only

- Annual Report
- Final Report
- Fact Sheet

14.2 Dissemination of Project Findings

- *Proposal* – Identify proposed location & process
- *QAPP* - Describe how project document will be made available to public and identify location (i.e. website)

Final Report Content	Effectiveness Studies
1. Cover Letter	✓
2. Executive Summary	✓
3. Introduction	See QAPP
4. Technology Description	See QAPP
5. Sampling Procedures	See QAPP
6. Data Summaries and Analysis	✓
7. Operation & Maintenance Info	✓
8. Discussion	✓
9. Conclusions	✓
10. Future Action Recommendations	✓

15.0 Appendices & 16.0 References

- Comments?
- Additions?
- Revisions?

Next Steps

- QAPP Templates Complete: Goal is December 15th
 - Operational and Structural BMP Template to Ecology this week for review
- QAPP Template Ecology Review, Comment/Approval Process
 - Define process and dates
- Detailed Study Design Review/Comment/Approval Process
 - Define process and dates