



The Pennsylvania Housing Research Center

Project Plan

July 2011 – June 2012

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Table of Contents

HOUSING ACTIVITIES.....	4
PART 1 - Training, Technical Assistance & Outreach:.....	4
A. Program Development.....	4
1. "Training Light" Curriculum	4
2. IRC 2012 Sneak Peek	4
3. Solar Thermal Installation and Inspection.....	5
4. Building with Exterior Rigid Foam	5
5. Exterior Plaster Finish Systems: Code requirements and avoiding failures	5
6. Online training.....	6
7. Train the trainer.....	6
B. PHRC Delivered Workshops	6
1. Advanced Framing: increasing performance and reducing costs.....	6
2. Residential Deck Design Construction and Inspection	6
3. Residential Mechanical Code Compliance Program	7
4. Exterior Plaster Finish Systems: Code requirements and avoiding failures	7
5. Building with Exterior Rigid Foam	7
C. PHRC Training Delivered Through Industry Partnerships.....	7
D. Web-Based Training.....	8
E. Builder Briefs.....	9
F. Technical Assistance, Technology Transfer & Outreach.....	9
PART 2 - Applied Research.....	10
A. Sustainability of residential concrete construction.....	10
B. Concrete quality in residential construction	11
PART 3 - Applied Projects.....	11
A. House depressurization from exhaust systems – Case studies and analysis of risks.....	11
B. Support of Standards	11
PART 4 - Contingency Projects (Housing).....	12
LAND DEVELOPMENT ACTIVITIES.....	14
A Web-Based Training.....	14
B. Technology Transfer & Outreach.....	14
C. Applied Research.....	15
1. Summarize ASCE BMP database as applicable to Pennsylvania	15
2. Land development process flow chart and comparison of permit & approval process in Pennsylvania to other states.....	15
3. Revisiting the Pennsylvania Standards for Residential Site Design.....	16
D.Contingency Projects (Land Development)	16
Projected Budget by Project Categories.....	18

Preface

Each year, the Pennsylvania Housing Research Center (PHRC) seeks to identify and prioritize a series of projects that collectively satisfy the following criteria. Projects should:

- meet the residential construction industry needs and the needs of the housing consumer in Pennsylvania;
- be consistent with the mission and goals of the PHRC;
- be affordable and feasible, given the resources available and the prevailing constraints on time, expertise and facilities; and
- be a balanced program of projects that address both the long- and the short-term needs of all sections of the industry.

This PHRC work plan is the result of input and assistance from numerous groups and individuals. The PHRC Industry Advisory Council (IAC) and the Operations Committee, in particular, have responsibility for the final choice of activities. These housing industry-based bodies consist of manufacturers, suppliers, builders, remodelers, industry associations as well as building code organizations and state agencies. On April 14, 2011 the IAC met to identify and discuss over 40 potential projects for the PHRC to pursue. After a thorough discourse, the members of the IAC voted on projects they felt were the highest priority for the industry. The IAC was also presented with, and approved, a Land Development Project Plan that was based on prioritization decisions made by the IAC Land Development Subcommittee during their inaugural meeting on March 15, 2011. Unless otherwise noted, the projects contained in this plan are anticipated to start July 1, 2011, and be completed on or before June 30, 2012.

The list of projects that follows identifies only those projects that are to receive funds provided to the PHRC by the Commonwealth of Pennsylvania. In most cases, we have attempted to use state funding to leverage outside support; in other cases the work is considered important enough to warrant full state support. It should also be recognized that the PHRC undertakes a wide array of additional projects that do not receive any of these funds and are therefore not listed in this plan.

Please note that with the collection of monies under Act 157 of 2006, there is not an accurate estimate of the exact amounts of funding available during this period. Because of this, this plan only considers funds in-hand. Any remaining funds will be carried over for future projects. We plan to continue with our previous initiatives in the areas of training and education, modular housing, manufactured housing, and applied research.

We plan projects and allocate funds at the start of each year. However, there is a real need for the PHRC to be able to take on special projects during the year. These projects typically fall into two categories: the first includes short term and limited scope projects that are time sensitive, while the second requires the ability to allocate some funds to leverage additional outside funds in response to requests for proposals.

Housing Activities

PART 1 - Training, Technical Assistance & Outreach:

The PHRC has a mandate to transfer knowledge by providing the necessary training and education to the wide variety of groups that make up the housing industry. The projects that are described below are in response to the recommendations that flow out of the PHRC's Industry Advisory Council and reflect the current needs within the housing industry.

A. Program Development

Description: The PHRC will develop or update the following new training programs. These programs will address issues challenging the residential construction industry (builders, remodelers, building code officials, materials suppliers, etc.). During this period the following programs will be developed:

1. "Training Light" Curriculum

Many of the PHRC's existing programs are one- to four-day programs. This can create a barrier to participation as many people are reluctant to spend that much time out of the office or field, or pay the associated travel and/or hotel costs. This project will identify sections of existing PHRC programs that could be presented as standalone, primarily half-day programs. Potential programs include: Deck Construction; Residential Fire Sprinkler Basics; Fireblocking, Clearances to Combustibles, and Combustion Air; and Understanding the Three Energy Code Compliance Paths.

Manager/PI: Turns, Heitzmann

Deliverables: The PHRC will modify existing programs to create four new ½-day to 1-day programs for delivery through industry partners.

2. IRC 2012 Sneak Peek

Since the implementation of the UCC in 2004, many significant changes have occurred in each triennial code cycle. Some examples of major past code changes (several of which have been eliminated legislatively) include anchorage bolt spacing, wall bracing, fire sprinklers, electrical receptacles, and energy requirements. This has kept builders, design professionals and code officials scrambling to keep up.

The 2012 IRC is anticipated to be published in late spring or early summer of 2011. Builders, code officials, municipal officials, state government officials and various organizations will need to be educated about new provisions in the 2012 IRC in order to formulate and present their viewpoints at public hearings of the UCC Review and Advisory council (or other venues). This will also aid stakeholders in preparing for coming code changes if they are adopted.

Manager/PI: Turns, Heitzmann

Deliverables: A presentation, or series of presentations, will be developed and delivered through webinars, speaker service engagements, RAC meetings, and/or training programs.

3. Solar Thermal Installation and Inspection

Consumer demand, helped along by state and federal incentives, has spurred the growth of residential renewable energy systems like solar domestic hot water (SDHW) systems. This one-day program will provide an overview of SDHW systems, including solar collector types, plumbing requirements, roof integration, and structural loading considerations. The Pennsylvania Construction Code Academy currently has a memorandum of understanding with the Pa. Department of Environmental Protection to fund this program with Recovery Act monies. Barring a redirection of that funding, the PHRC will partner with PCCA to develop this program.

Manager/PI: Turns

Deliverables: A one-day training program will be developed, and suitable instructors will be identified. Six to eight of these programs will be delivered across the Commonwealth.

4. Building with Exterior Rigid Foam

The use of foam sheathing achieved a degree of popularity beginning with the oil embargo of the late 1970s. Today, increasing stringency in energy codes along with heightened consumer expectations regarding energy efficiency and comfort are causing more builders and remodelers to consider using exterior rigid foam. While the use of foam sheathing can result in a more efficient building enclosure, it is not without its practical hurdles. Window and door jamb extensions, flashing details, surface burning characteristics, consumer perceptions, siding attachment, wall bracing, and material selection are all potential hurdles to the effective use of exterior rigid foam.

Manager/PI: Turns

Deliverables: The PHRC will develop and offer a 1/2-day to 1-day training program addressing the benefits, drawbacks, and proper installation of exterior rigid foam.

5. Exterior Plaster Finish Systems: Code Requirements and Avoiding Failures

In his 2008 article, *The Perfect Storm*, internationally renowned building scientist, Joseph Lstiburek called eastern Pennsylvania the “stucco failure capital of the United States.” Improper installation of exterior plaster finish systems, like hardcoat stucco and adhered stone veneer, can lead to severe moisture problems and cracking. Many installations do not meet code and result in the need for costly remedial work. This program will cover relevant code requirements, proper flashing and drainage, treatment of joints between dissimilar materials, rainscreen installation, and lath requirements.

Manager/PI: Turns

Deliverables: The PHRC will develop and offer a 1/2-day training program on code compliance and proper installation of exterior plaster finish systems.

6. Online Training

With tight budgets and near record-high gasoline prices, the need for web-based training is greater than ever. This project will identify an online service that would serve as the delivery mechanism for online training programs. Next, a pilot program will be developed out of existing PHRC workshop material, and adapted to fit the online format.

Manager/PI: Turns

Deliverables: A self-paced, online training program will be developed, advertized, and the number of participants tracked.

7. Train the Trainer

This item does not involve the development of a new training program, but an effort to increase the PHRC training program presenter infrastructure with a focus on grooming presenters with real world construction or construction management experience. This will involve soliciting interested people, selecting those who are qualified, and teaching them PHRC workshop material. The intent of this effort is to reduce travel distances and costs for participants and presenters of PHRC workshops.

Manager/PI: Turns

Deliverables: The PHRC will identify two to three new training program instructors, train them on PHRC workshop materials, and include them in the training schedule.

B. PHRC Delivered Workshops

Description: Every year the PHRC provides workshops for builders, remodelers, design professionals, educators, trade contractors and building code officials. These programs will be administered directly by the PHRC. Some of the topics that are being considered for this year's programs include the following:

1. Advanced Framing: Increasing Performance and Reducing Costs

With increased competition between builders and a green building movement that is here to stay, advanced framing provides a means to cut costs while improving energy efficiency and reducing waste. This half-day program provides an overview of advanced framing techniques while discussing the potential benefits to builders and homeowners, as well as things to watch out for. Relevant code issues are also discussed.

2. Residential Deck Design Construction and Inspection

Decks are considered simple structures, yet deck-related failures are responsible for a substantial number of injuries and deaths each year. This program will discuss the root causes of these problems and offer real world solutions.

This one-day program will provide an overview of IRC code requirements for residential decks and a detailed review of the proper installation of commonly used connectors, fasteners and some commonly used proprietary products. The afternoon will focus on hands-on examples, including

designing a simple residential deck, performing a detailed deck plan review to check for code compliance, and a virtual inspection of a residential deck.

This course is designed for builders, remodelers, deck contractors, building code officials (plan reviewers and inspectors), design professionals, home inspectors, and manufacturers and suppliers of deck-related construction materials.

3. Residential Mechanical Code Compliance Program

This program focuses on mechanical installers and job supervisors, as well as new building code officials to provide a more in-depth knowledge of mechanical systems, since many of them come into code enforcement from other areas of the construction industry and are not familiar with mechanical requirements and proper installation issues. This program will provide new and experienced building code officials, mechanical installers, and job supervisors the background they need to effectively administer and enforce the mechanical requirements in the IRC.

4. Exterior Plaster Finish Systems: Code Requirements and Avoiding Failures

In his 2008 article, *The Perfect Storm*, internationally renowned building scientist, Joseph Lstiburek called eastern Pennsylvania the “stucco failure capital of the United States.” Improper installation of exterior plaster finish systems, like hardcoat stucco and adhered stone veneer, can lead to severe moisture problems and cracking. Many installations do not meet code and result in the need for costly remedial work. This program will cover relevant code requirements, proper flashing and drainage, treatment of joints between dissimilar materials, rainscreen installation, and lath requirements.

5. Building with Exterior Rigid Foam

The use of foam sheathing achieved a degree of popularity beginning with the oil embargo of the late 1970s. Today, increasing stringency in energy codes along with heightened consumer expectations regarding energy efficiency and comfort are causing more builders and remodelers to consider using exterior rigid foam. While the use of foam sheathing can result in a more efficient building enclosure, it is not without its practical hurdles. Window and door jamb extensions, flashing details, surface burning characteristics, consumer perceptions, siding attachment, wall bracing, and material selection are all potential hurdles to the effective use of exterior rigid foam.

Manager/PI: Turns

Deliverable: The PHRC will administer and deliver at least four technical workshops to be held at various locations across the state.

C. PHRC Training Delivered Through Industry Partnerships

Description: The PHRC has developed and maintains a wide array of training for all sectors of the construction industry with a focus on residential construction. These programs are intended to address technical issues facing the industry. Additionally, the PHRC will customize programs to better meet the needs of an industry partner. Each program is developed with a particular audience,

which may include builders, remodelers, trade contractors, design professionals, teachers, building code officials, etc.

These programs are intended to be offered through our industry partners, which may include trade associations such as the Pennsylvania Builders Association or their 42 local associations, professional associations, building code associations, as well as the Pennsylvania Construction Code Academy (PCCA).

General Audience Programs

1. International Residential Code Essentials	2 day
2. Residential Energy Essentials	2 day
3. IRC Plumbing Essentials	2 day
4. IRC Mechanical Essentials	2 day
5. Residential Mechanical Compliance	1 day
6. International Energy Conservation Code Essentials (Commercial)	2 day
7. International Residential Code Inspection Essentials	2 day
8. Two-family-dwellings and Townhouses	1 day
9. IRC 2012 Sneak Peek	½ day
10. Residential Deck Design, Construction & Inspection	1 day
11. Blueprint Reading	1 day
12. Advanced Framing – increasing performance and reducing costs.	½ day
13. Residential Fire Sprinklers	1 day/2 day

Available Only through the Pennsylvania Construction Codes Academy

1. International Residential Codes Academy	4 day
2. IRC Plumbing Academy	4 day
3. IRC Mechanical Academy	4 day
4. Electrical Essentials Academy	4 day
5. Photovoltaic Inspections/Installation Training	1 day

Manager/PI: Turns, Heitzmann

Deliverable: The PHRC will deliver at least 15 workshops to be held through various industry partners across the Commonwealth. The PHRC will also deliver custom programs upon request.

D. Web-Based Training

Description: The PHRC's Industry Advisory Council has requested the development and deployment of web-based training. There is a need for technical programs with a lower-cost delivery mechanism than a formal classroom setting. This initiative will seek to develop interactive web-based training that can be available both live and archived for future viewing. Proposed topics are listed below. For webinars related to land development, see Part 4 of this plan.

Housing Webinar Series	
Month	Proposed Title/Topic
August	Fire protection for lightweight floor systems
September	Spray foam – thermal barriers, ignition barriers, and specific approvals
October	Solar energy economics in Pennsylvania
November	Manufactured stone veneer: avoiding moisture-related failures
December	Building with exterior rigid foam
January	Site preparation: visualizing the finished product
March	Radiant barriers: Do they make sense in Pennsylvania?
April	How to properly insulate a slab
May	Makeup air and large kitchen exhaust systems

Programs are subject to change and additional programs may be added to address industry demands and emerging issues.

Manager/PI: Turns, Heitzmann

Deliverable: The PHRC will develop and deliver at least nine housing webinars. Additional programs may be added to address emerging issues as they arise.

E. Builder Briefs

Description: Continuation of the series of short technical documents that address specific issues that have been identified by builders or remodelers. These documents are intended to be quick to read with a lot of the information presented graphically or pictorially. Potential topics include:

1. Building with exterior rigid foam
2. Makeup air and large kitchen exhaust systems
3. Radiant barriers
4. Sustainability of concrete in residential construction
5. Concrete quality

Manager/PI: Turns, Scanlon, Heitzmann

Deliverable: At least two Builder Briefs will be researched, written, printed and distributed.

F. Technical Assistance, Technology Transfer & Outreach

Description: Continuation or expansion of activities to get information and publications to builders, remodelers, design professionals, building code officials and others involved in the residential construction industry.

Manager/PI: Turns, Blansett, Heitzmann

Deliverables: The PHRC will work with the PBA and other industry and trade organizations by means of the following activities:

1. **Support of the UCC Review and Advisory Council (RAC):** The PHRC will take a more proactive role in supporting the RAC than during the last code cycle. The primary role of the PHRC will be to research differences between the 2009 International Residential Code (IRC) and the 2012 IRC, and potentially other UCC codes, to provide the RAC with an overview of

the most significant code changes. The significance of code changes will be evaluated based on the likely benefits versus drawbacks, the degree of change in typical practice, technical feasibility, cost, and other factors as applicable.

2. **Annual Pennsylvania Housing and Land Development Conference:** For 19 years this conference has been the premier technical conference for housing and land development issues in Pennsylvania. This two-day conference provides the latest information on emerging technologies and how to resolve problems facing the housing industry. The conference is intended for all sections of the housing industry including builders, remodelers, code officials, educators, design professionals and modular and HUD-code builders. One day of the conference focuses primarily on the house itself, while the other serves as an annual forum that addresses emerging planning, design, and regulatory issues affecting the land development industry in Pennsylvania. This day is intended for anyone involved in land development activities including builders, developers, design professionals, planners and regulatory officials.
3. **PCCA Symposium:** The PHRC will work with the PCCA to develop and deliver a one-day program that will be drawn from the content of the Pennsylvania Housing and Land Development Conference. This annual event is intended to address technical issues being faced by building code officials.
4. **Speaker Service:** The PHRC will hold and/or participate in talks and seminars directed at the housing and land development industries. This may include trade and professional association functions and regional meetings, local association meetings, or state or national conferences.
5. **General Outreach Activities:** This includes activities to let builders know about the PHRC and the services and publications it provides. These activities may include the PHRC newsletters, mailings, promotional pamphlets, advertisements in trade journals, phone calls, and the PHRC's Web site.
6. **Fall Newsletter** – This letter will be sent to PHRC members to keep them up-to-date on recent PHRC activities, and promote upcoming events including the PA Housing and Land Development conferences.

PART 2 - Applied Research

A very important function of the PHRC is to undertake or stimulate research and development on materials, products, procedures, etc. These efforts may have a longer-term and/or a more fundamental focus than other projects. The projects that are listed below foster partnerships and draw on the expertise and strengths of the persons, groups and facilities available at both the Pennsylvania State University and the Pennsylvania College of Technology.

A. Sustainability of Residential Concrete Construction

Description: Concrete is extensively used in residential construction for basements, slabs on grade, above grade construction, driveways, parking areas, and sidewalks. Sustainability is a high priority issue within institutions such as the American Concrete Institute (ACI). Current research topics include replacement of Portland cement with waste products such as fly ash etc., recycling

waste products such as glass as for aggregates, and other means to reduce the carbon footprint associated with concrete construction. Use of pervious concrete in residential construction will also be investigated.

Manager/PI: Scanlon

Deliverables: A research report documenting findings, and/or a Builder Brief.

B. Concrete Quality in Residential Construction

Description: This project will examine optimization of concrete mix design, production and placement to improve the quality of concrete construction, control cracking, and improve performance of concrete in general. Because concrete work in residential construction is usually not as closely monitored as concrete work in commercial construction, home builders need guidance on how to ensure quality in concrete construction. Use of concrete for above grade construction will also be investigated to identify benefits such as longevity, durability, fire resistance, and resistance to extreme events such as hurricanes and tornados. Construction with concrete masonry will also be included in the study.

Manager/PI: Scanlon

Deliverable: A research report documenting findings, and/or a Builder Brief.

PART 3 - Applied Projects

These groups of projects are application oriented and have a direct need by the residential construction industry. This includes the development and support of standards, and longer term initiatives.

A. House Depressurization from Exhaust Systems – Case Studies and Analysis of Risks

Description: The 2009 IRC requires makeup air for range hoods with flow rates in excess of 400 cfm, and house depressurization can result in the dangerous backdrafting of atmospherically drafted combustion appliances and non-direct-vent fireplaces. This project would measure the actual amounts of house depressurization in several new homes to determine the risk of backdrafting if open combustion appliances were installed. Blower door tests will also be performed to measure building envelope tightness, which is a key aspect in whether dangerous house depressurization will occur.

Manager/PI: Turns

Deliverable: This project will result in a short research report, or a Builder Brief.

B. Support of Standards

Description: The PHRC has developed three standards to respond to industry demand. These include Pennsylvania's Alternative Residential Energy Provisions, Pennsylvania Standards for Residential Site Development Standards and Foundation Systems for Relocated Manufactured Housing. Each of these standards requires training and timely technical assistance for local governments, builders/developers, design professionals, and contractors. All of these standards are available electronically for free and hard copies are available for a fee.

Manager/PI: Turns

Deliverable:

1. Pennsylvania's Alternative Residential Energy Provisions - 2009: Education will be provided through various building code training programs and technical assistance will be provided through telephone and email support by the PHRC.
2. Pennsylvania Standards for Residential Site Development Standards: Please see the Land Development section.
3. Foundation Systems for Relocated Manufactured Housing: The PHRC will provide technical assistance through telephone and email support.
4. Deck lateral load guidelines – The PHRC will provide speaker service engagement, as well as technical support to builders and code officials.

PART 4 - Contingency Projects (Housing)

The PHRC may take on high priority, short-term projects mid-cycle as opportunities arise. Some issues and project ideas arise after the spring Industry Advisory Council (IAC) planning meeting, yet are important topics to address. Other project ideas were brought to the IAC, but lacked sufficient outside financial support at the time this plan was issued. Below are several projects that may be undertaken contingent upon receiving additional funding.

1. **Flood Preparedness of Pennsylvania's Housing Stock:** Pennsylvania has more miles of waterways than any other state and is one of the most flood-prone states. This project will review the current state-of-the-art for flood resistive construction and proper procedures for flood recovery. This project will also identify key areas for future efforts to help Pennsylvania prepare for the recovery of future floods. This project will include involvement from FEMA, PEMA, and others involved in emergency response in the Commonwealth.

Deliverable: The PHRC will deliver a brief report highlighting the existing resources available within the Commonwealth and suggestions for improvements in the recovery.

2. **Voluntary Standards for Relocated Manufactured Housing:** Frequently the manufacturer's installation instructions are not present when a manufactured home is relocated. This puts installers, code officials, and sometimes the homeowners in a quandary with regard to how the home should be installed. Often this is a barrier to relocating a manufactured home either to an outright lack of code acceptance, or because homes are held to code requirements that make reinstallation of the home economically infeasible. This project would summarize which codes and standards are applicable to various types and vintages of manufactured homes, along with providing basic standards to ensure the health and safety of the occupants. The PHRC will work closely with the Pennsylvania Department of Community and Economic Development's Housing Standards Division, and the Pennsylvania Manufactured Housing Association. Funding will likely be solicited from the Center for Rural Pennsylvania.

Deliverable: The PHRC will develop and publish a standard that could be followed by installers of relocated manufactured housing, and accepted by code officials.

3. **Prototype Architectural Light Therapy System:** The goal of the project is to develop a working prototype of a residential living environment outfitted with a novel architectural lighting system designed to promote health by stimulating the human circadian system while maintaining

standards for visual quality. The space will be instrumented with measurement devices to verify light exposure performance and will serve as a model for future clinical trials and larger-scale residential installations. While not voted on as a high priority, this project fosters the research/industry partnership that was a founding goal of the center. The PHRC wishes to encourage the relationship between Penn State faculty and its industry partners in order to stay on the cutting edge of housing-related research. The PHRC has offered to provide some of the seed money requested, provided matching funds can be secured by the researchers.

Deliverables:

1. A fully equipped and calibrated prototype *Architectural Light Therapy System* will be designed and constructed on the Penn State University Park campus.
2. A journal-quality research paper describing the design and calibration of the *Architectural Light Therapy System* will be written and submitted for peer review.
3. A major research proposal will be written and submitted to an external funding agency (e.g., National Science Foundation, National Institutes of Health, etc.) to perform a large-scale clinical trial of the effectiveness of the space in maintaining and promoting senior health.

Land Development Activities

The land development process is a key component of providing affordable homes; however, there is no single group looking at land development practices in Pennsylvania. These initiatives are part of the PHRC's long-term effort to provide technical input and guidance and leadership to these issues. Selection of the projects listed below was based on input and assistance from the Industry Advisory Council (IAC) Land Development Subcommittee. This Subcommittee consists of builders, developers, engineers, planners, local government and the Pennsylvania DEP. On March 15, 2011 the IAC Land Development Subcommittee met to identify and discuss over 35 potential projects for the PHRC to pursue. After a thorough discourse, the members of the Subcommittee voted on projects they felt were the highest priority for the industry.

The highest priority project as voted on by the Subcommittee is listed here as a contingency project because it will be contingent on securing funds for data collection equipment and is not a project that can be completed in a single year. Although the project itself is contingent, seeking funds to complete the project will be considered a high priority.

A. Web-Based Training

Description: There is a need for technical programs with a lower-cost delivery mechanism than a formal classroom setting. This initiative will develop interactive web-based training that can be available both live and archived for future viewing.

Land Development Webinar Series	
Month	Proposed Title/Topic
TBD	PA Standards for Residential Site Design
TBD	Chapter 102 for Contractors: Erosion & Sediment Pollution Control Updates and Working with the Licensed Professional
TBD	How to Get More Non-Structural BMP Credits
TBD	Modeling Stormwater Runoff in Karst Areas

It should be noted that the programs are subject to change and additional programs may be added to address industry demands.

Manager/PI: Blansett

Deliverable: Interactive web-based training programs that will be delivered and then archived on the PHRC website for future viewing.

B. Technology Transfer & Outreach

Description: Continuation or expansion of activities to get information and publications to builders, developers, design professionals, and others involved in the land development industry.

Manager/PI: Turns, Blansett

Deliverables: The PHRC will work with the PBA and other industry and trade organizations by means of the following activities:

1. **Annual Pennsylvania Housing and Land Development Conference:** See Part 1F above.
2. **Speaker Service:** See Part 1F above.
3. **General Outreach Activities:** In addition to activities as described in Part 1F above, this involves attending relevant Pennsylvania DEP meetings, participating in technical committees such as the Pennsylvania Stormwater Technical Workgroup and serving as a technical resource to legislative committees as needed

C. Applied Research

A very important function of the PHRC is to undertake or stimulate research and development on materials, products, and procedure. These efforts may have a longer-term and/or a more fundamental focus than other projects. Applied research projects foster partnerships and draw on the expertise and strengths of the persons, groups and facilities available at the Pennsylvania State University. The Stormwater Best Management Practices (BMPs) in Real Residential Developments project is listed under Part D as a Contingency Project, but when funding is secured it will be transferred to a high priority Applied Research project.

This group of projects deals with topics of practical and relatively immediate needs of the land development industry.

1. Summarize ASCE BMP Database as Applicable to Pennsylvania

Description: American Society of Civil Engineers (ASCE) Environmental Water Resources Institute (EWRI) maintains the International Stormwater BMP Database which is a repository of pollutant removal data from over 400 BMP studies. This database is cumbersome to use and it is difficult to determine what data or BMPs apply in PA. This project will sort through the data and develop an easy-to-access summary report of the data that is applicable in PA.

Manager/PI: Blansett

Deliverable: A public report detailing BMP effectiveness data as applicable in Pennsylvania organized by type of BMP commonly used in residential land development projects. When the data are available, BMP application in the different soil types in Pennsylvania will be discussed.

2. Land Development Process Flow Chart and Comparison of Permit & Approval Process in Pennsylvania to Other States

Description: Permitting and approval agencies don't always know the whole process of developing a piece of land, and are not always aware of the other permits or approvals that are needed to complete a project. Acquiring all of the necessary permits and approvals for a land development project in Pennsylvania often takes a year to 18 months, or longer, while the process can be significantly shorter in other states. The goal of this project is to develop a flow chart that integrates the federal and state requirements and provides a template for the local requirements. The flowchart will also include a typical timeline for the various steps based on agency review periods which will allow for easy comparison of the process in Pennsylvania to other states. Through comparing processes and timelines, an attempt will be made to identify ways to facilitate the process in Pennsylvania.

Manager/PI: Blansett

Deliverables:

1. A public report with a detailed graphic outlining the land development process in Pennsylvania with a typical timeline.
2. A public report describing the land development process in Pennsylvania and comparing it to the process in several other states highlighting differences and steps that might be less time or resource intensive.

3. Revisiting the Pennsylvania Standards for Residential Site Design

Description: The Pennsylvania Standards for Residential Site Design were finalized in April 2007. This set of consensus standards allows for up-to-date design innovations, and provides flexibility needed for sustainable land development. Since the document was released it has not been as widely accepted by municipalities as was hoped.

This initiative will solicit more local government input on the Standards and utilize the Subdivision and Land Development Ordinance (SALDO) and Land Use committees within PSATS, along with other local government resources for input and experience. The project as originally proposed and voted on by the Land Development Subcommittee includes an analysis of long-term or lifetime costs maintenance costs of adopting the Standard; however, the PHRC does not have the resources or time to obtain the type of data needed for a life-time cost analysis. The project will attempt to gather information from municipalities about the long-term costs of maintenance and compare existing SALDO requirements with those proposed by the Standards. A stakeholder committee will be formed to review comments and determine how to address changes.

Manager/PI: Blansett

Deliverable: This project will result in a public report summarizing research findings and addressing concerns expressed by local government representatives. An addendum may be issued to address additional comments and new stormwater management regulations. A webinar on the Standards will be developed and presentations will be made to land development design professionals and local government groups. These efforts will be coordinated with PSATS, Local chapters of the American Society of Civil Engineers and the American Planning Association, PBA's Developers Council, and other professional associations. A proposal to present the Standards at the 2012 PSATS Conference will be submitted. The Standards will be presented at the National Low Impact Development Symposium in Philadelphia September 25-28, 2011.

D. Contingency Projects (Land Development)

Projects in this group have a high level of interest, but because of limited resources (financial, staff, etc.) the PHRC is not able to undertake them during this period. Although the project itself is a contingency project, seeking funding to support the project is a high priority. State funds will be leveraged to seek matching grant monies for equipment and water quality sample lab analysis.

1. Stormwater BMP Effectiveness in Real Residential Developments

This project involves the installation of flow monitoring and sample collection equipment in residential developments to collect data on the characteristics of stormwater runoff from these sites and the effectiveness of BMPs in a typical development. Data will be collected from sites that are 20 to 50 acres in size and from different types of land use to compare single family developments, townhouse developments, farm fields, and natural forests. Because nitrogen, phosphorus and

sediment are water quality parameters of interest to the DEP in BMP design and the targets of the EPA TMDL, flow and water quality (nitrogen, phosphorus, sediment) data upstream and downstream of BMPs will be collected. Flow data along with the constituent concentrations can be used to determine the total load (g) and event mean concentration (EMC, mg/L), or a flow weighted average, which is a parameter commonly used to model water quality (see Appendix A of the Pennsylvania Stormwater BMP Manual). Data will be collected from different types of events (for example, spring rains versus summer thunderstorms versus winter rain on snow) over several years.

The goals of this project are to:

- Define the pollutant load from residential developments
- Define the effectiveness of different BMPs and treatment trains (BMPs in series)
- Compare different types of development
 - Compare development to undeveloped areas and the modeling assumption of considering 20% of existing area to be meadow in good condition

The outcomes of this project would include peer-reviewed journal publications and technical conference presentations of the study findings and a public summary report of the data. Webinars and other presentations can be developed to disseminate the findings.

While field data is being collected at several development sites, some other information could be collected from the same sites to expand the impact of this study. These projects area:

a. Long-Term Operation and Maintenance (O&M) Issues for Stormwater BMPs

This part of the project would include a literature review of existing data sources on O&M needs of stormwater BMPs. While flow & water quality data are being collected at different developments, site inspections will be conducted to determine the type and frequency of maintenance needed. The literature material will be combined with site observations to develop recommendations that can be used address O&M needs of new and existing stormwater BMPs.

b. Homeowner Acceptance of On-Lot Stormwater BMPs

Stormwater regulations are pushing more BMPs to be located on individual properties rather than a single basin for a whole development. At the development sites where BMPs are being monitored, homeowners can be periodically surveyed to find out information such as what they know about their on-lot BMP, how they feel about them, have they been provided with maintenance information and what are they doing to maintain the BMP. This information can be used to provide information about the long-term operations and maintenance of BMPs and the likeliness of them being maintained by homeowners. The data collected could lead to the development of homeowner training programs and provide local governments and the Pennsylvania DEP information about the effectiveness of regulations putting responsibility of stormwater management on to the homeowner.

Projected Budget by Project Categories

Project	Act 157 Funds	Outside^{1,2}	PSU Support	Total
Training, Technical Assistance and Outreach	\$187,582	\$279,722	\$91,915	\$559,220
Applied Research	\$78,658	\$21,440	\$38,543	\$138,641
Land Development	\$124,386	--	\$60,949	\$185,334
Applied Projects	\$29,406	--	\$14,409	\$43,815
Total	\$420,032	\$301,162	\$205,816	\$927,010

Notes:

- 1 Outside funding is received from a variety of sources including fees for services, in-kind contributions, industry contributions, grants and contracts.
- 2 These funds are contingent upon industry commitments.