Document 522
POST-ASSESSMENT REPORT

CHAPTER: The Pennsylvania State University
COUNTRY: Sierra Leone
COMMUNITY: The Covenant Prep. School, Baoma SL
PROJECT: 2-Seater Latrine

PREPARED BY
Andrew Kreider
Beth Milligan
Kyle Palmeter

Submittal Date: 1/18/2012

ENGINEERS WITHOUT BORDERS-USA
www.ewb-usa.org
# Table of Contents

Post-Assessment Report Part 1 – Administrative Information ........................................... 3
  1.0 Contact Information .................................................................................................. 3
  2.0 Travel History ......................................................................................................... 3
  3.0 Travel Team ............................................................................................................ 5
  4.0 Health and Safety .................................................................................................... 5
    4.1 Incident Reports ..................................................................................................... 5
  5.0 Budget ..................................................................................................................... 6
    5.1 Project Budget ....................................................................................................... 6
    5.2 Professional Mentor/Technical Lead Hours .......................................................... 9
  6.0 Project Discipline(s) ............................................................................................... 9
  7.0 Project Location ...................................................................................................... 9

Post-Assessment Report Part 2 – Technical Information ......................................................... 10
  1.0 INTRODUCTION ..................................................................................................... 10
  2.0 PROGRAM BACKGROUND .................................................................................. 10
  3.0 TRIP DESCRIPTION .............................................................................................. 10
  4.0 COMMUNITY INFORMATION ............................................................................... 11
    4.1 Description of Beneficiary .................................................................................. 11
    4.2 Description of Community .................................................................................. 11
    4.3 Community and Partnering Organization/NGO Resources and Constraints ........ 13
    4.4 Community Relations ......................................................................................... 13
    4.5 Community Priorities ......................................................................................... 13
  5.0 DATA COLLECTION AND ANALYSIS .................................................................... 14
    5.1 Summary of Data ............................................................................................... 14
      5.1.1 Design Parameters ....................................................................................... 14
      5.1.2 Materials Costs ......................................................................................... 15
      5.1.3 Construction Method ............................................................................... 17
      5.1.4 Community Surveys ................................................................................. 18
      5.1.5 Detailed Latrine Surveys .......................................................................... 25
      5.1.1 Percolation Tests ...................................................................................... 28
    5.2 Mapping ............................................................................................................... 29
  6.0 MONITORING .......................................................................................................... 31
    6.1 Monitoring plan for current project ...................................................................... 31
    6.2 Monitoring of past-implemented projects ............................................................ 31
    6.3 Project status table ............................................................................................. 31
  7.0 COMMUNITY AGREEMENT/CONTRACT ................................................................. 31
  8.0 PHOTO DOCUMENTATION ...................................................................................... 32
    8.1 School Site Images ............................................................................................ 32
    8.2 Building Materials ............................................................................................. 36
    8.3 Percolation Tests ............................................................................................... 40
    8.4 Concrete Mixing ................................................................................................. Error! Bookmark not defined.
    8.5 Community Discussions ..................................................................................... 41
Post-Assessment Report Part 1 – Administrative Information

1.0 Contact Information

<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
<th>Phone</th>
<th>Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Lead</td>
<td>Beth Milligan</td>
<td><a href="mailto:emm5316@psu.edu">emm5316@psu.edu</a></td>
<td>(412) 266-0570 EWB-PSU</td>
</tr>
<tr>
<td>Project Lead</td>
<td>Kyle Palmeter</td>
<td><a href="mailto:kcpalmeter@gmail.com">kcpalmeter@gmail.com</a></td>
<td>732-668-9186  EWB-PSU</td>
</tr>
<tr>
<td>President</td>
<td>Andrew Kreider</td>
<td>andrewk <a href="mailto:Kreider7@gmail.com">Kreider7@gmail.com</a></td>
<td>(717) 841-2914 EWB-PSU</td>
</tr>
<tr>
<td>Mentor #1</td>
<td>Rich Kercher</td>
<td><a href="mailto:rckercher@gfnet.com">rckercher@gfnet.com</a></td>
<td>(717) 926-0991 EWB-PSU</td>
</tr>
<tr>
<td>Faculty Advisor</td>
<td>John Lamancusa</td>
<td><a href="mailto:jslme@engr.psu.edu">jslme@engr.psu.edu</a></td>
<td>EWB-PSU</td>
</tr>
<tr>
<td>HSO</td>
<td>Andrew Kreider</td>
<td>andrewk <a href="mailto:Kreider7@gmail.com">Kreider7@gmail.com</a></td>
<td>(717) 841-2914 EWB-PSU</td>
</tr>
<tr>
<td>Assistant HSO</td>
<td>Rich Kercher</td>
<td><a href="mailto:rkercher@gfnet.com">rkercher@gfnet.com</a></td>
<td>(717) 926-0991 EWB-PSU</td>
</tr>
<tr>
<td>Education Lead</td>
<td>Beth Milligan</td>
<td><a href="mailto:emm5316@psu.edu">emm5316@psu.edu</a></td>
<td>(412) 266-0570 EWB-PSU</td>
</tr>
<tr>
<td>NGO</td>
<td>Mohamad Khalil</td>
<td><a href="mailto:moselkha@yahoo.com">moselkha@yahoo.com</a></td>
<td>0023276241478 EWB-SL</td>
</tr>
<tr>
<td>NGO</td>
<td>Anthony Nimnhe</td>
<td></td>
<td>(232) 33923911 EWB-SL</td>
</tr>
<tr>
<td>Beneficiary</td>
<td>Martin Simbo</td>
<td><a href="mailto:simbosl@yahoo.com">simbosl@yahoo.com</a></td>
<td>(232)30-858527 Covenant Preparatory School</td>
</tr>
</tbody>
</table>

2.0 Travel History

<table>
<thead>
<tr>
<th>Dates of Travel</th>
<th>Assessment or Implementation</th>
<th>Description of Trip</th>
</tr>
</thead>
</table>
An assessment trip was conducted to determine the feasibility of building a latrine.

<table>
<thead>
<tr>
<th>Date Range</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 17 - 27, 2010</td>
<td>Latrine Assessment</td>
<td></td>
</tr>
<tr>
<td>December 26- January 6, 2012</td>
<td>Combined water assessment and latrine re-assessment</td>
<td>Co-develop a final latrine design. Begin a water project.</td>
</tr>
</tbody>
</table>
3.0 Travel Team

<table>
<thead>
<tr>
<th>Name</th>
<th>E-mail</th>
<th>Phone</th>
<th>Chapter</th>
<th>Student or Professional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kyle Palmeter</td>
<td><a href="mailto:kcpalmeter@gmail.com">kcpalmeter@gmail.com</a></td>
<td>(732) 668-9186</td>
<td>EWB-PSU</td>
<td>Student</td>
</tr>
<tr>
<td>Beth Milligan</td>
<td><a href="mailto:emm5316@psu.edu">emm5316@psu.edu</a></td>
<td>(412) 266-0570</td>
<td>EWB-PSU</td>
<td>Student</td>
</tr>
<tr>
<td>Andrew Kreider</td>
<td><a href="mailto:AndrewKreider7@gmail.com">AndrewKreider7@gmail.com</a></td>
<td>(717)841-2914</td>
<td>EWB-PSU</td>
<td>Student</td>
</tr>
<tr>
<td>John Lamancusa</td>
<td><a href="mailto:jslme@engr.psu.edu">jslme@engr.psu.edu</a></td>
<td></td>
<td>EWB-PSU</td>
<td>Faculty Advisor</td>
</tr>
<tr>
<td>Rich Kercher</td>
<td><a href="mailto:rkercher@gfnet.com">rkercher@gfnet.com</a></td>
<td>(717) 926-0991</td>
<td>EWB-PSU</td>
<td>Professional Mentor</td>
</tr>
</tbody>
</table>

4.0 Health and Safety

4.1 Incident Reports
Did any safety incidents occur during this trip? ___Yes _X_No

If “Yes,” please submit your completed Incident Report as a separate attachment with this report. If your HSO has not yet filled out the Incident Report, a blank form can be found on the EWB-USA website – Member Pages – Project Process – Health and Safety Program.
5.0 Budget

5.1 Project Budget

<table>
<thead>
<tr>
<th>Direct Costs</th>
<th>Project Budget</th>
<th>Total Budget</th>
<th>Actual Expenses</th>
<th>Variance</th>
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<tr>
<td><strong>Travel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Airfare (8 persons)</td>
<td>$9000</td>
<td>$0</td>
<td>$15,186</td>
<td>$6186</td>
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<tr>
<td>Gas</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Rental Vehicle</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Taxis/Drivers</td>
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<td>$0</td>
<td>$67</td>
<td>$0</td>
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<tr>
<td>Misc.</td>
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<td><strong>Sub-Total</strong></td>
<td>$0</td>
<td>$0</td>
<td><strong>$15,709</strong></td>
<td>$0</td>
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<tr>
<td><strong>Travel Logistics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exit Fees/Visas</td>
<td>$0</td>
<td>$0</td>
<td>$1200</td>
<td>$0</td>
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<tr>
<td>Inoculations</td>
<td>$0</td>
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<td>$2000</td>
<td>$0</td>
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<tr>
<td>Insurance</td>
<td>$0</td>
<td>$0</td>
<td>$88</td>
<td>$0</td>
</tr>
<tr>
<td>Licenses &amp; Fees</td>
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<td>$0</td>
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<td>$0</td>
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<tr>
<td>Medical Exams</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td>Passport Issuance</td>
<td>$0</td>
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<td>$0</td>
<td>$0</td>
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<tr>
<td>Misc.</td>
<td>$0</td>
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<tr>
<td><strong>Sub-Total</strong></td>
<td>$0</td>
<td>$0</td>
<td><strong>$3288</strong></td>
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<tr>
<td><strong>Food &amp; Lodging</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Lodging</td>
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<tr>
<td>Food &amp; Beverage (Non-alcoholic)</td>
<td>$0</td>
<td>$850</td>
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<td>$0</td>
<td><strong>$2717</strong></td>
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<tr>
<td><strong>Labor</strong></td>
<td></td>
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## In-Country logistical support

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<tr>
<th>Item</th>
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<th>Non-Cost</th>
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<tbody>
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<td>Local Skilled labor</td>
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<td>$0</td>
</tr>
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<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Sub-Total</strong></td>
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<td>$0</td>
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## EWB-USA

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Non-Cost</th>
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<tbody>
<tr>
<td>Program QA/QC(1)</td>
<td>$0</td>
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<td><strong>Sub-Total</strong></td>
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<td>$0</td>
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## Project Materials & Equipment (details needed)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Non-Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement</td>
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<td>$0</td>
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<tr>
<td>Headpan</td>
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<td>$0</td>
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<tr>
<td>Headpan</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Rebar &amp; Lumber for site survey</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Sub-Total</strong></td>
<td>$0</td>
<td>$0</td>
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</table>

## Misc. (details needed)

<table>
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<th>Non-Cost</th>
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<tbody>
<tr>
<td>Report Preparation</td>
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<tr>
<td>Advertising &amp; Marketing</td>
<td>$0</td>
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<tr>
<td>Postage &amp; Delivery</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td>Misc.</td>
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<td>$0</td>
</tr>
<tr>
<td><strong>Sub-Total</strong></td>
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<td>$0</td>
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<tr>
<td><strong>TOTAL</strong></td>
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<td>$0</td>
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</table>

## EWB-USA National office use:

<table>
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<th>Indirect Costs</th>
<th>Cost</th>
<th>Non-Cost</th>
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<td>EWB-USA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program Infrastructure(1)</td>
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<tr>
<td><strong>Sub-Total</strong></td>
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<td>$0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>$0</td>
<td>$0</td>
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</table>

**Note (1):** These rows are calculated automatically based on type of trip.

## Non-Budget Items:

### Additional Contributions to Project Costs

<table>
<thead>
<tr>
<th>Community</th>
<th>Cost</th>
<th>Non-Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Materials</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td>Logistics</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>--------------</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Cash</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Other</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Sub-Total</strong></td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>EWB-USA Professional Service In-Kind</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional Service Hours</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Hours converted to $$(1)</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Sub-Total</strong></td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>GRAND TOTAL (Project cost)</strong></td>
<td>$0</td>
<td>$0</td>
</tr>
</tbody>
</table>

**Funds Raised for Project by Source**

### Source and Amount (Expand as Needed)

<table>
<thead>
<tr>
<th>Source and Amount</th>
<th>Actual Raised to Date</th>
<th>Actual Raised Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Societies</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Corporations</td>
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<tr>
<td>University</td>
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<td>$0</td>
</tr>
<tr>
<td>Rotary</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Grants - Government</td>
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<td>$0</td>
</tr>
<tr>
<td>Grants - Foundation/Trusts</td>
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<tr>
<td>Grants - EWB-USA program</td>
<td>$0</td>
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<td>Other Nonprofits</td>
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<td>$0</td>
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<tr>
<td>Individuals</td>
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<td>$0</td>
</tr>
<tr>
<td>Special Events</td>
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<td>$0</td>
</tr>
<tr>
<td>Misc.</td>
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<td>$0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$0</td>
<td>$0</td>
</tr>
</tbody>
</table>

*The $456 for Misc. Travel was a $40 water taxi from airport, and a $17 return ferry, both multiplied by 8 people.
5.2 Professional Mentor/Technical Lead Hours

<table>
<thead>
<tr>
<th>Name(s) of Professional Mentor(s) (student chapters)</th>
<th>Pre-trip hours</th>
<th>During trip hours</th>
<th>Post-trip hours</th>
<th>Total Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rich Kercher</td>
<td>20</td>
<td>56 (7 work days, 8 hrs per day)</td>
<td>8</td>
<td>84</td>
</tr>
</tbody>
</table>

6.0 Project Discipline(s):
Check the specific project discipline(s) addressed in this report. Check all that apply.

**Water Supply**
- ___ Source Development
- ___ Water Storage
- ___ Water Distribution
- ___ Water Treatment
- ___ Water Pump

**Sanitation**
- ___ Gray Water System
- ___ Black Water System
- ___ Latrine

**Structures**
- ___ Bridge
- ___ Building

**Civil Works**
- ___ Roads
- ___ Drainage
- ___ Dams

**Energy**
- ___ Fuel
- ___ Electricity

**Agriculture**
- ___ Irrigation Pump
- ___ Irrigation Line
- ___ Water Storage
- ___ Soil Improvement
- ___ Fish Farm
- ___ Crop Processing Equipment

7.0 Project Location

Longitude: 8.425224
Latitude: -13.266375
Post-Assessment Report Part 2 – Technical Information

1.0 INTRODUCTION

This document’s purpose is to record all data from the trip. Technical data as well as social data was taken over seven days in Baoma, Sierra Leone.

The latrine project location had moved since previous assessment trip due to purchase of private property for the school & church. The new site was assessed for possible implementation of a latrine to establish sanitation at the primary school.

EWB-PSU also conducted a water assessment concurrently. The club clearly distinguished between the two projects; the latrine beneficiary is the Covenant Preparatory School that serves 80 children in the community, and the water beneficiary will be the community as a whole.

2.0 PROGRAM BACKGROUND

The community of Baoma lacks a reliable water source and sanitation facilities. The majority of the village’s drinking water comes from an unprotected spring with significant amounts of fecal coliforms present. The community would like to improve human health and environmental conditions by diverting human waste in latrines, namely in the Covenant Preparatory School. The immediate benefit of building a latrine is waste diverted; the long-term benefit lies in emphasizing the importance of sanitation to future community leaders.

3.0 TRIP DESCRIPTION

The trip EWB took on 12/28/2011 – 1/6/2012 consisted of two assessment trips, as previously described. Rich Kercher served as the latrine mentor with Kyle Palmeter, Beth Milligan, and Andrew Kreider. Mark Ralston served as the water mentor with Mary Beth Paskewicz and Jill Morris. This document, as should be clear by now, references aspects of the trip as they are relevant to the latrine project.

On this most recent trip, the latrine team surveyed the new land and performed multiple percolation tests. Most importantly, the major design decisions were worked out with the owner of the land, the results of which are outlined later in this document (5.1.1). All parties involved (EWB-PSU, EWB-SL, and Covenant Prep School) have given significant input on the project, and are satisfied with their contribution to the project. EWB-PSU spent one morning conducting surveys with a cross section of the Baoma population regarding water, food, health, and living conditions. A second morning was spent conducting surveys specifically on latrines, going from house to house asking about details of their latrines.
One morning was spent with the children of the school doing two lessons. The first was to use plastic straws to build a tall structure, dividing the children into six groups. The second lesson was a demonstration on how to build a ‘tippy-tap’ stand outside.

Over the course of the week, three community meetings took place where EWB-PSU and the leaders of Baoma discussed what the community would like to see happen, and important local considerations for any sort of implementation.

4.0 COMMUNITY INFORMATION

4.1 Description of Beneficiary

The Covenant Preparatory School is the primary beneficiary. The founder and headmaster Martin Simbo is our source of contact in the school. He currently rents the land that the school and his personal home is built on. Martin Simbo personally purchased land very near to the current school location to build a new school, as well as a new home. Very recently, on December 26, 2011, Martin received a notice that his current rent will be significantly raised for the coming year. If he chooses to move out, he must be moved out by the end of June.

Martin Simbo contact info: simbosl@yahoo.com, covenantfamilyssl@yahoo.com, www.covenantfamilyministriessl.org, (+232)30-858527, 76-105230, 33-967133

4.2 Description of Community

The community of Baoma is governed by an overall chief, queen, and head-man. The chief is John Coker, queen is Mammy Matu, and the head-man is S.K Gbomer. The head-man is an elected position, and does the vast majority of the governing work. By-laws are effective and respected. Below this trio of authority is a set of sub-chiefs that govern smaller locales within the community; the sub-chief in charge of the area we are planning on working is named James Sesay. A rough estimate of the population is 600 people.

This community does not have an electricity grid. Homeowners who want electricity must buy a generator and gasoline to provide it for themselves.
Running water is present for those who can afford to run a hose from an uphill spring to their own tank. The majority of the community does not have running water and collects what they need every day with buckets. All of the roads are dirt, and are best traveled by an SUV.

The first of two community meetings held during the trip was comprised of a ‘cross-section’ of the community, and discussed the needs and problems of the community. The issues raised were poor trash management, a general lack of understanding the cause and effect of personal actions on health, need of a health center, water being infected with bacteria, distance to haul water, waste of water a huge issue, a lack of training on how to efficiently use water, and the growing number of people depending on the same source. Water was the predominant topic of conversation. Many of the water sources are privately owned, with private arrangements being worked out to pay for water from them. S.K. (head-man) and others expressed an interest in making the current sources public, however some dissent on respecting privately owned land made the issue of how ownership should look in the future a bit unclear. Public sources are free, but infected; private sources are cleaner but cost money. The consensus of the community was that well owners would be receptive to selling their sources to the community, possibly on the condition that they are given a seat on the water board.

Also at this meeting we learned that those who can afford to purchase water for drinking, do. However, the majority of the community cannot afford to buy water. The cost of a 20-pack of 250mL bags of water is 3,000Le ($0.68). This lasts a family of 8 for a day.

S.K. summarized the importance of water by saying, “without water, life can go nowhere.” The current situation of water is summarized by the man who moved to Baoma because it was the only place he could find land by saying, “if you are drowning and someone holds out a knife, you grab that knife.” (EWB-PSU’s Interpretation: This community has many things wrong with it but for some people it’s the only place they can call home (you take what you can get). In this case the community is the knife.)

While on the topic of land, it is worth noting the dreadful process of buying it. According to Martin’s conversation with Andrew, buying from the government is far and away the best option. The government does not sell land outright, choosing instead to lease indefinitely in case valuable resources are found on the property. Should the government decide it necessary to reclaim the land, they pay a fair price for the property as well as any development done on the land. Buying privately, however, is a very risky undertaking as there is little or no regulation on proper process. A seller of land can collect money from multiple buyers and tell each of them that they own the land, leaving the fight for who gets to use it up to the ‘buyers.’ Sometimes ‘sellers’ really do not own the land at all, leaving it up to the ‘owners’ to duke it out for rights to the land. All of these private fights over land are carried out in the court, and the outcome is more dependent on who has more money, power, and influence than who properly owns land.

Martin has a government lease on the land and has developed it, which makes him well beyond any possible conflict of ownership.
4.3 Community and Partnering Organization/NGO Resources and Constraints

The community is very limited in resources. They will be providing some labor and materials for the project. EWB-PSU will be providing the technical design and roughly half of the financing for the project. In the signed MOU, the Covenant Preparatory School has committed to 40% of total cost through in-kind contributions and 10% cash. EWB-Sierra Leone will help us locate materials and any additional labor needed. The community is close to the capital city of Freetown so transportation of construction materials and equipment will not be a constraint. The language barrier is not an issue because the community speaks English. However, their accents may make communication challenging. In these few cases, Mr. Khalil and EWB-Sierra Leone have enabled us to communicate.

4.4 Community Relations

We have remained in contact with Mohamed Khalil of EWB-Sierra Leone, who is familiar with the area, and who also submitted the original project proposal to EWB. Mr. Khalil has been able to give us details about the community as well as help us determine the logistics of the trip. He has also introduced us to the local church who is responsible for the school and who we will be working closely with on this project.

EWB-PSU has also been in contact with Martin Simbo, the headmaster of the beneficiary school with regard to the design decisions (5.1.1) throughout the fall of 2011.

4.5 Community Priorities

During the first community meeting, a ‘cross-section of members’ outlined a number of problems and priorities.

Needs/Problems (as outlined by Baoma community members):
- Much water is wasted due to spilling, broken hoses, and general carelessness
- Education (Baoma-ans were fond of saying “sensitization,” meaning “educate”) of community to the benefits of being frugal
- Many people do not realize the impact on their health caused by their own actions
- The community’s expanding population only puts more stress on existing resources
- Having technical information is one necessary part to getting government help on water
- Trash management is non-existent (People burn trash or litter it)
5.0 DATA COLLECTION AND ANALYSIS

5.1 Summary of Data

5.1.1 Design Parameters

Firm Parameters:
- May 2012 Implementation
  - A latrine solution must be found by then because the school is moving in June. If we do not implement in May, we should resign this project.
- Latrine location on the downhill side of the school
  - no other feasible locations
- 2-seater
  - 3+ seater would require immense excavation, may not fit at all
- Hand-washing must be outside
  - No extra indoor space, due to location
- Excavation, concrete retaining walls must be completed before EWB-PSU arrives in May
- All slabs must be cast in-place
  - …as compared to cast, dry, and move over land to location
- Plaster all four walls of pit
  - Leakage should be prevented, as residents live nearby and downhill

Parameters requiring further analysis:
- Block vs. Wood superstructure
  - Block is the preferable construction material in Sierra Leone. Wood is cheaper, and weathers acceptably, though not as well as block. Block also gives a building better status in the public eye.
- Sealed vs. Open-floor pit
  - On 1/12/2012, Andrew Kreider consulted with Dr. Rachel Brennan, Environmental Engineering, regarding this parameter. For the following reasons, Dr. Brennan strongly recommended a completely sealed pit to avoid spread of pathogens:
    - There is a water source uphill within 300ft of latrine.
    - Groundwater depth is unknown at this location, and may be contaminated if latrine waste is allowed to drain. (rhyolite rock could not be drilled into)
    - Neighbors live downhill within 150ft.
    - A storm-water chasm is a mere 20ft downhill from the latrine.
- VIP (Ventilated Improved Pit / composting) vs. Pour-flush
  - The vast majority in the community have pour-flushes. See Table 5.1.5 for Detailed Latrine Survey information.
5.1.2 Materials Costs

*Following prices were found nearby in Goderich at Freetown Building Materials.

<table>
<thead>
<tr>
<th>Item</th>
<th>Price, Le</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imported Cement, 50kg</td>
<td>41,000</td>
</tr>
<tr>
<td>Local Cement, 50kg</td>
<td>40,000</td>
</tr>
<tr>
<td>Headpan, good quality</td>
<td>40,000</td>
</tr>
<tr>
<td>Headpan, low quality</td>
<td>25,000</td>
</tr>
<tr>
<td>Corrugated Zinc, 20-pack of 34gage 2’x6’</td>
<td>260,000</td>
</tr>
<tr>
<td>Corrugated Zinc, 20-pack of 28gage, 2’x8’</td>
<td>750,000</td>
</tr>
<tr>
<td>Corrugated Aluminum, 20-pack of 32gage, 2’x8’</td>
<td>800,000</td>
</tr>
<tr>
<td>Rebar, ½ inch (12mm), ~38’</td>
<td>52,000</td>
</tr>
<tr>
<td>Roofing felt, 40” wide, price per yard</td>
<td>6,000</td>
</tr>
<tr>
<td>Roofing nails, galvanized, 2.5”, 2500/box</td>
<td>25,000</td>
</tr>
<tr>
<td>Nails, 3” (all weights are same price; thicker nail = fewer total/box)</td>
<td>220,000</td>
</tr>
<tr>
<td>Squat toilet, no trap</td>
<td>220,000</td>
</tr>
<tr>
<td>Flexible trap</td>
<td>30,000</td>
</tr>
<tr>
<td>Toilet seat, both lid &amp; seat</td>
<td>110,000</td>
</tr>
<tr>
<td>Toilet w/ tank, “closed couple”</td>
<td>400,000</td>
</tr>
<tr>
<td>Sink, small, white in photo, incl. trap</td>
<td>95,000</td>
</tr>
<tr>
<td>Milla Tank, water, hi-density plastic, 1000L</td>
<td>1,400,000</td>
</tr>
<tr>
<td>Milla Tank, water, hi-density plastic, 2000L</td>
<td>2,300,000</td>
</tr>
<tr>
<td><em><strong>All pipes are sold by 18’ length</strong></em></td>
<td></td>
</tr>
<tr>
<td>PVC, ¾”</td>
<td>30,000</td>
</tr>
<tr>
<td>PE Pipe, ¾”, 1 roll</td>
<td>175,000</td>
</tr>
<tr>
<td>PVC, 1”</td>
<td>42,000</td>
</tr>
<tr>
<td>PE Pipe, 1”, 1 roll</td>
<td>200,000</td>
</tr>
<tr>
<td>PVC, 1 ½”</td>
<td>65,000</td>
</tr>
<tr>
<td>PVC, 1 ¼”</td>
<td>60,000</td>
</tr>
</tbody>
</table>
The Pennsylvania State University
The Covenant Prep. School, Baoma SL
2-Seater Latrine

PVC, 4” pipe 65,000
PVC, elbow, ⅜” 2,000
PVC, elbow, 1 ¼” 4,000
PVC, elbow, 1 ½” 6,000
PVC, elbow, 1 ¾” 5,000
PVC, elbow, 3” 10,000
PVC, elbow, 4” 15,000
PVC, coupling (size not specified) 15,000

Lumber Yard (Mohamed Khalil knows its name)

Lumber, White, 1” x 12” x 14’ 38,000
Lumber, White, 2” x 12” x 14’ 75,000
Lumber, White, 2” x 2” x 14’ 10,000
Lumber, White, 2” x 3” x 14’ 15,000
Lumber, White, 2” x 4” x 14’ 20,000
Lumber, White, 2” x 6” x 14’ 37,500

*White wood must be of Bergie- other woods are poor quality, rip-offs

Lumber, Red, 1” x 12” x 14’ 48,000
Lumber, Red, 2” x 12” x 14’ 85,000
Lumber, Red, 2” x 2” x 14’ 15,000
Lumber, Red, 2” x 3” x 14’ 17,500
Lumber, Red, 2” x 4” x 14’ 20,000
Lumber, Red, 2” x 6” x 14’ 42,500

*Red wood must be of Mahogany or Yawui- other woods are poor quality, rip-offs

Miscellaneous Materials

(1) Brick 5,000
(1) Bag of Charcoal 18,000

* 2 bags per month are necessary to heat water for Martin’s family of 4

(1) 20-pack of 250mL bagged water 3,000

* A family of 8 consumes AT LEAST one of these 20-packs per day
5.1.3 Construction Method

Note: 1 bag of cement = 2 head-pan cement  (*Headpan picture in 8.4)

**Bricks:**
- 1 bag cement : 12 head-pan of sand (ratio for latrine, as well as sample)
- 1 bag cement : 10 head-pan of sand (for load-bearing walls)
- 1 bag cement : 15 head-pan of sand (for general walls)
- 1 bag cement : 20 head-pan of sand (for shady contractors)

**Concrete:**
- 1 bag cement : 3 head-pan sand : 6 head-pan stone
  *by volume 2:3:6
  *stones should be 0.5” (12mm)

**Samples:**
- **Cylinder #1: Block** (or mortar mix) 1:6 (cement : sand, volume ratio)
- **Cylinder #2: Concrete** 2:3:6 (cement : sand : stone, volume ratio)
  *Way too wet, stones proper size
- **Cylinder #3: Concrete** 2:3:6 (cement : sand : stone, volume ratio)
  *Proper water content, stones a bit large
5.1.4 Community Surveys

Site #1
Date/Time: 1/2/12 @ 9:37am
Interviewee: Haragetu Jalloh (Mother), Age 29, Female, has been in community for 3 years
Interviewers: Kyle Palmeter, Rich Kercher, and Pastor Martin Simbo

Household:
- 2 wives
- 10 children (5 boys and 5 girls)
- 2 kids in college, 2 in primary and 2 in secondary
- Main income comes from a one room shop that sells drinks, food, toiletries, pencils, soap, cigarettes, etc.

Food:
- Tea and bread in morning
- Cassava and potato leaves
- Muslim so they don’t eat pork
- Main food is rice and stew w/ fish, beef or chicken
- Fish is normally eaten because it is the cheapest
- Beef and chicken are more expensive and only eaten on special occasions

Needs:
- Water (they do not have running water)
- Electricity (specifically said she needs “light”)

Water:
- Gets water from Garden Spring (usually a long wait) and sometimes from the Queen’s tap
- Family uses about 10 buckets (5 gal) a day for general purpose and another 5 for cooking
- Uses chlorine solution (also had ammonia smell) to purify water. She got a small bottle from a friend who deals with water treatment about 5 months ago and is still using same bottle. She squirts a small amount from a syringe into her drinking water bucket every time she adds more water to it.
- Uses ½ cc for 5 gallon bucket

Latrine:
- House has a roughed in toilet inside that will be finished once they can get running water
- Until then, there is a pour-flush latrine structure in backyard unattached from house
- Offset pit that is about 9’ x 8’ x ?
- Block w/ metal roof
  **More info in detailed latrine survey section**

Health:
1 child/month is sick with upset stomach/fever (she thinks it is malaria)
1 child is “always sick” (special health problem)
Takes children to an outside health clinic. Goes to the emergency hospital (run by an Italian NGO) but they only take certain cases. If turned away she will take them to a private clinic in Freetown.
Children get sick more often when the seasons change
No recent deaths

**Site #2**
**Date/Time:** 1/2/12 @ 10:26 am
**Interviewee:** Mohamed Kai, Age 52, Male
**Interviewers:** Kyle Palmeter, Rich Kercher, and Pastor Martin Simbo

**Household:**
- 5 unrelated families live on property (previously a chicken farm)
- There are 4 apartments and 1 separate house that are all rented from a landlord that doesn’t live in the village
- 11 children, all that are old enough to be in school are
- Income comes from making African soap (powder from charcoal, soda and palm oil) and small bags of snacks and selling them in village. Martin refers to this as “petty trading”

**Food:**
- Usually have one meal a day that consists of rice and fish stew
- If low on money they will eat their inventory
- If business is bad, they can go 3 days without eating

**Needs:**
- Clean Water
- Latrines
- Schools
- A Market
- A Health Center

**Water:**
- They take water from the dam (spring box) because the street tap is broken
- They know the water isn’t pure but they drink it anyway because they have no choice
- They help to clean the spring box when called to do so by the elders
- If the dam runs dry, they will go to the garden spring
- Usually have to wait to get water
- One family (2 adults, 3-5 kids) will use about 10 buckets (5 gals) a day
Latrine:
- 1 pour-flush commode for all 5 families
- Offset Pit that is about 6’ x 5’
- Unknown depth
- Has been there for possibly 20 years and hasn’t been pumped
- Pit is about to fill up. They don’t know what they will do when it fills because they don’t have enough $300,000-400,000 Le to pump out
- 150,000-1 million Le to dig new pit
** More info in detailed latrine assessment section

Health:
- About 3 children are sick each month
- When kids get sick they take them to the emergency hospital (only accepts children)
- Adults will usually self-treat themselves with meds sold in the village
- Why do you think the children get sick?: environment is not hygienic, sleep with their animals
- Diarrhea and stomach pain is very normal
- Have mosquito nets but still believe they get malaria
- 1 child always has trouble breathing, chest burns (special case)
- How would improve health?: community-wide hygiene education because some ppl don’t know how to take care of themselves
- No recent deaths

Site #3

Date/Time: 1/2/12 @ 11:13am
Interviewee: Kumba Lebbis, Age 28, Female
Interviewers: Kyle Palmeter, Rich Kercher, and Pastor Martin Simbo

Household:
- 7 children (6 girls and 1 boy)
- 5 are in school, 2 are too young
- Income comes from cooking food and her husband breaks rocks
- Lives in house owned by brother who lives in England. He owns several homes in community. This family is moving into a better home after her brother fixes it up
- She has a cell phone (got a call while we were interviewing her)

Food:
- Rice, cassava dough, herring fish
- While we were interviewing her, she was scaling and gutting fish and boiling water to make a stew

Needs:
The Pennsylvania State University
The Covenant Prep. School, Baoma SL
2-Seater Latrine

-Clean water for drinking
-Better education
-Health center

**Water:**
- Gets water from a well close to the main dam that is under a tree? (she lived close to spring box)
- Always have to wait for water
- They are very careful about their water usage
- Use about 5 buckets (5 gal) a day, 2 for cooking and 3 for washing
- Don’t treat they’re water, they drink it as they get it

**Latrine:**
- They don’t have a toilet they just go in the bush

**Health:**
- Children get sick 3-4 times a month
- Get malaria and get sick from “environment” because it is not hygienic
- Goes to “emergency” but they don’t accept all cases so sometimes has to go to a private center
- One child was taken to the hospital, entered into coma, fed through tube, and recovered
- How would you improve health?: educate children on proper hygiene, having a local health center

**Site #4**
**Date/Time:** 1/2/12 @ 9:25am
**Interviewee:** Saidu Timbo, Male
*leftmost in picture
**Interviewers:** Andrew Kreider, Mark Ralston, Anthony Nimneh (EWB-SL)

**Household:**
- 30 occupants
- 20 Children
- 5 are in school
- School dropout, earns a living doing petty jobs
- **Observation** Small house, under 500 sq. ft. tin siding, wood trunk frame, chickens running about
- Caretakers: Do not own, do not pay rent on property. However, they can be kicked off whenever the owners return
- Wood fire under a roof, lots of smoke

**Food:**
- Rice

**Water:**
- No problems with the water. “It is cool and good for me.”
2-Seater Latrine

-Collects 5 buckets (5 gal each) per day
  -3 buckets for cooking
  -2 buckets for bathing

Latrine:
-They do not have a latrine, presumably go in the bush

Site #5
Date/Time: 1/2/12 @ 9:45am
Interviewee: Francis Kandeh, Male
*middle in picture
Interviewers: Andrew Kreider, Mark Ralston, Anthony Nimneh (EWB-SL)

Household:
-7 occupants
-5 Children, ages 13-18
-2 are in school
-very solid home, concrete walls, clean & new metal doors & locks, relatively large

Food:
-rice
-sauce made from palm oil, veggies, beans
-Garden outside includes: cassava leaves, coco leaves

Needs:
a medical center would greatly improve people’s health

Water:
-collects from garden spring
-1 drum (60gal) per day, used for cooking and cleaning
-1 20-pack of bagged water per day

Latrine:
-Flushing toilet in house, vault outside

Health:
-Wife gets sick sometimes
-children get smallpox
-causes of general sickness is dust, environment
-malaria common

Figure 5.1.4.5
Site #6
Date/Time: 1/2/12 @ 9:57am
Interviewee: Michael (red shirt), Kini (green/white polo) – Sons of James Cicil, regional village chief. Kini is caretaker of Garden Spring
Interviewers: Andrew Kreider, Mark Ralston, Anthony Nimneh (EWB-SL)

Household:
-6 people total
-4 sons, all in school
-Kini & Michael are both studying accounting

Needs:
-malaria medicine
-more treatment for water

Water:
-10+ buckets per day
-2 for drinking
-8 for cooking & cleaning
-carried from Garden Spring, 5 min away.

Latrine:
-use a pour-flush toiled, with outside vault

Health:
-Kini gets sick about twice a year, during the season-changes
- Michael “never” gets sick

Site #7
Date/Time: 1/2/12 @ 10:30am
Interviewee: Mariatu Bangura, Momodu Kamara
Interviewers: Andrew Kreider, Mark Ralston, Anthony Nimneh (EWB-SL)

Household:
-10 Occupants
-6 children, age 9-15
-3 in school
-main sources of income are brick, breaking stone, selling rice, making stew
-can sell a plate of rice for 2,000 Le
-sometimes have to get rice on loan
-residing as a caretaker since 2002 (9 years)

**Food:**
- rice
-sometimes she cannot afford to eat anything for 2 or 3 days straight
*Anthony comments later that many people in this community live in poverty like this

**Needs:**
- Medical facility
*A free emergency room is available in Goderich, run and paid for by Italians. They only take emergency cases; they feed patients, wash clothes, give meds, and deliver babies.

**Water:**
-source: Garden Spring
-children carry water
-10 buckets (5gal buckets)
-2 buckets for drinking
-rest for washing, cooking

**Latrine:**
-Use bush
*At one point, another man chimed in saying that people can use public restrooms in Freetown for 200Le. Anthony claimed he never knew of any bathrooms other than the one at his bank.

**Health:**
- children often get sick with colds, coughs, malaria
-sickness is caused by sleeping on cold ground

**Food:**
- rice

**Needs:**
- hospital treatment

**Water:**
-Source: Dam past Kamara
-children carry water approximately 1 mile
-sometimes pay for drinking water
-20 buckets per day
-15 buckets for drinking
-5 for cooking, washing

**Latrine:**
-use bush for bathroom

**Health:**
-Sometimes children get sick from malaria, stomach illness
-causes: Water not pure, food spoiled, mosquitos

---

**Site #8**
**Date/Time:** 1/2/12 @ 11:10am
**Interviewee:** Kai Lans (fluent English)
**Interviewers:** Andrew Kreider, Mark Ralston, Anthony Nimneh (EWB-SL)

**Household:**
-15 occupants
-5 children, all in school
-unemployed, odd jobs, sells cell phone credits
-2 houses on property, fairly large
5.1.5 Detailed Latrine Surveys

In addition to conducting general community surveys, we also conducted more detailed latrine surveys on some families in the community who we identified to have latrines. It is worth noting that all of the families had reported using water for anal cleansing. The following table summarizes our results.

<table>
<thead>
<tr>
<th>Type</th>
<th>Tank or Pit Size (l x w x h)</th>
<th>Superstructure Size</th>
<th>Construction</th>
<th>Comments</th>
<th>Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pour-Flush 8 x 9 x ? *</td>
<td>8’ x 6’6” x 6’</td>
<td>-Block walls -Corrugated metal roof -Wood door-frame and doors -Pre-fabricated swat plate w/ water trap -Windows</td>
<td>-Structure had 1 latrine stall (3 x 6’6” x 6”) and 1 stall for bathing -No running water, flushed with bucket</td>
<td><img src="image1.png" alt="Picture 1" /></td>
</tr>
<tr>
<td>2</td>
<td>Pour-Flush 6 x 5 x ? *</td>
<td>Indoor latrine</td>
<td>-Block walls -Corrugated metal roof -Tarp curtain as a door -Toilet bowl</td>
<td>-Attached to a 4 unit building -5 families share this one latrine (approx. 25 people) -Flush with bucket (1-5gal) -Pit is almost full; they’re not sure what they’re going to do when it fills. They cannot afford to pump it for 400,000 Le.</td>
<td><img src="image2.png" alt="Picture 2" /></td>
</tr>
</tbody>
</table>
### 3. Pour-Flush Latrine

- **Dimensions:** 7'9" x 7' x 20"
- **Materials:**
  - Block walls
  - Tile floor
  - Wood doors
  - Toilet bowls
  - 2' x 2' windows
- **Notes:**
  - This latrine belonged to the village Queen
  - 2 latrine stalls
  - Cost 3 million Le (~$700) for pit and structure
  - Only children 5 or older could use latrine because the bowl was too high
  - Use 1 gal bucket to flush

### 4. Pit Latrine

- **Dimensions:** 7'3" x 6'2" x ?
- **Materials:**
  - Block walls
  - Corrugated metal roof
  - Wood door
- **Other:**
  - Odor was present
  - Used by 8 people
  - Squat hole
  - Water from a bathing area also entered pit

### 5. Pour Flush Latrine

- **Dimensions:** 112”x58”
- **Materials:**
  - Indoor toilet
  - Block walls
  - Tile floor
  - Toilet bowl
  - Sink
- **Other:**
  - 3 people live in the house, but more people use the latrine
  - Latrine is indoor with a tank and vent pipe outside the house
  - (g) gallons used per flush
#### 2-Seater Latrine

| 6 | Pour flush | -indoor toilet | -5-7 years old  
- latrine inside house with slab outside  
- 5 people use the latrine  
- 1-2 gallons of water used for each flush  
The bottom is a open pit  
Tank is (dimensions) |

*Some users were unsure of original construction details

**Nearly all the latrines in Baoma are pour-flush. We only found one exception, described in Row 4 of the above chart.
5.1.1 Percolation Tests

Perc. Test were conducted three days in a row. The first two test where done with pits that were not completely saturated. The test conducted on the third day was with a completely saturated pit (at least 24 hours). The following chart summarizes the data from the 3 tests. The graph below is for the third test.

Table 5.1.1.1

<table>
<thead>
<tr>
<th>Test #1 1/1/12</th>
<th>Time (min)</th>
<th>Height (in.)</th>
<th>Test #2 1/2/12</th>
<th>Time (min)</th>
<th>Height (in.)</th>
<th>Test #3 1/3/12</th>
<th>Time (min)</th>
<th>Height (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5½</td>
<td></td>
<td>0</td>
<td>12</td>
<td></td>
<td>0</td>
<td>11 ¾</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td></td>
<td>5</td>
<td>12</td>
<td></td>
<td>5</td>
<td>12 ½</td>
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</tr>
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<td>10</td>
<td>8 ¼</td>
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<tr>
<td>20</td>
<td>9 ½</td>
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</table>

Figure 5.1.1.2
A rate of 1 in/hr is considered very fast. The rate we observed is even faster, suggesting the land is unsuitable for an open-floor pit, as wastewater will drain out before sufficient remediation.
5.2 Mapping

The scanned field book page above shows the necessary surveying data for the site. A, B, & D are the property boundaries. The school that is currently under construction is from E to the retaining wall, and the dots that form a rectangle with one wall along the A-B line.

The proposed latrine design is centered at point L.
### 2-Seater Latrine

<table>
<thead>
<tr>
<th>Station</th>
<th>Ground Distance, ft</th>
<th>Angle</th>
<th>Vertical Distance, ft</th>
<th>Elevation</th>
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<tbody>
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<td>31.5</td>
</tr>
<tr>
<td>A - D</td>
<td>101</td>
<td>10</td>
<td>16.0</td>
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<tr>
<td>D - B</td>
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<td>10</td>
<td>21.5</td>
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<td>L - A</td>
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<tr>
<td>E - L</td>
<td>22</td>
<td>10</td>
<td>17.0</td>
<td>6.7</td>
</tr>
</tbody>
</table>
6.0 MONITORING

6.1 Monitoring plan for current project

(1) We plan to keep track of the number of children who use the latrine per day.
(2) We will observe how full the pit is at certain intervals over time.
(3) The school will maintain the structure, adding grout where necessary and cleaning sanitary slab

All of these monitoring activities can be done by EWB-Sierra Leone.

6.2 Monitoring of past-implemented projects

EWB-PSU currently has no past-implemented projects.

During the first assessment trip, EWB-PSU taught the children of Covenant Preparatory school hand-washing. They gave demonstrations on how quickly germs spread and the importance of washing your hands after going to the bathroom and before eating and handling food. To ensure that the wash their hands long enough, they wash their hands as long as it takes to sing the ‘Happy” song, approximately 30 seconds.

On this assessment trip, we expanded on those lessons; we, with the aid of the children and school teachers, built a tippy tap, a small, simple hand washing station for the school. The children remembered the lessons learned on the previous assessment trip an incorporated them with the new tippy tap.

6.3 Project status table

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Project Discipline(s)</th>
<th>Date of Completion (m/d/y)</th>
<th>Functionality (enter one range per project)</th>
<th>Periodic Maintenance (yes or no)</th>
<th>Demonstration of Knowledge Transfer (yes or no)</th>
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</thead>
<tbody>
<tr>
<td>N/A</td>
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</table>

7.0 COMMUNITY AGREEMENT/CONTRACT

After the last failed submission for the latrine project, we felt it was necessary to clear up and uncertain details and agree on appropriate contributions by each party. We explained the importance of project ownership and sustainability. These discussions were outlined in our Memorandum of Understanding. On this trip, we were able to meet with our project partners many times to discuss the Memorandum of Understanding. By the conclusion of our trip, we had developed an MOU that satisfied all three parties involved and left Sierra Leone with a signed copy. This can be found in Section 13.1.
8.0 PHOTO DOCUMENTATION

8.1 School Site Images

This is a picture of the new school site taken from the south end of the property. As can be seen, this site was carved out of the side of a hill and leveled off. A lot of work still remains on this new school structure. A little more site excavation remains to be done and the walls and roof structure need to be constructed. Pastor Martin hopes to have this completed by June 2012.
In this picture, the proposed location of the 2-seater latrine can be seen. We staked the dimensions out with poles and surveyor’s line. This location was chosen after much discussion between EWB-PSU, Pastor Martin and the contractor working on the school structure.
This picture shows the block work of the school foundation. This type of block work is by far the most common building practice in the village. In fact, it was such a common and widely-accepted building method that we determined our latrine superstructure must be constructed this way.
Here, a gap in the wall can be seen. These gaps were present all around the structure and will later be filled in with concrete to create a concrete, rebar-reinforced support column. This again is a construction method that was present throughout the community where a second floor was being constructed.
8.2 Building Materials

This is the local lumber yard. They have 1x12’s and 2x12’s in both ‘red wood’ and ‘white wood.’ They have similar strength properties, but ‘red’ is used for furniture and aesthetic things. These boards can be cut to any size we want (2x4, 2x6, etc.). The boards were straight but not perfect like American lumber. Their straightness could be improved with additional planning, but for general building purposes, these boards were fine as they were.

The local hardware store, one branch of a large chain based in Freetown. Dr. Lamancusa can be seen (grey shirt) looking up prices of various materials. The list of material prices is found in Section 5.1.2. EWB-PSU purchased a head-pan here, the kind widely used for measuring sand, concrete, and stones.
Aluminum (32BWG) is also available in red, green & blue. This will supposedly be longer-lasting than even 28BWG zinc.
This is a roofing nail found at the local building supply store. These nails are what is typically used for attaching corrugated metal to lumber supports. Also in this picture is a small piece of tar paper that is used to seal the nail to the roof. The heat of the sun will melt the tar to create a seal.
This was a very common site throughout the community. These men are making block out of cement and sand. The mix is so dry that they are able to mold the bricks and immediately remove the mold. They would then let the blocks sit on the ground to dry/cure. Although these men are making blocks to sell, it is also common practice to make blocks yourself at your construction site. Below, the blocks can be seen curing on the ground.
8.3 Percolation Tests

We performed percolation tests in a hole that was 2 feet below ground level.
8.4 Concrete Mixing

To make concrete samples, we had EWB-SL demonstrate their concrete mixing practices. The unit of measurement is one head-pan, pictured above. The mixture in this picture is not a full head-pan, rather it is a small amount of mixed concrete for samples. Typically sand and stone is measured in a headpan, while concrete is measured by each 25kg bag.

The ratios of the samples are as follows:

**Cylinder #1: Block** (or mortar mix)  1:6 (cement : sand, volume ratio)
**Cylinder #2: Concrete** 2:3:6 (cement : sand : stone, volume ratio)
  *Way too wet, stones proper size
**Cylinder #3: Concrete** 2:3:6 (cement : sand : stone, volume ratio)
  *Proper water content, stones a bit large

Figure 8.4.1
8.5 Community Discussions

Top: Community meeting on the final day, after discussing both parties’ plans of action.
Bottom: On-site with Martin (yellow) working out location and design of latrine.
PROJECT FEASIBILITY

Pastor Martin, headmaster of the school, recently purchased new land, and is currently building a new school and church on his own private property. This will make building a latrine for the school much more feasible, permanent, and a long term solution. We surveyed the new school site extensively, and have found a good location for a future latrine. While in country, we were able to see firsthand local construction methods for making mortar blacks, pouring concrete, and took inventory of available construction materials in the city. This information will allow us to design and build a latrine using locally accepted construction methods and materials.

During the assessment trip, we were also able to visit a decent amount of existing latrines within the community (Detailed descriptions of these latrines are seen in section 5.13). Latrines are fairly common among more financially stable families; however it is an accepted and encouraged practice throughout the community. Unfortunately, many cannot afford latrines, so open defecation is still very prevalent. We feel confident that our understanding of locally established construction methods, site knowledge, and implementing a design similar to existing latrines will make a latrine for the Covenant Preparatory school a very feasible and a sustainable solution.

9.0 LESSONS LEARNED

PRE-TRIP PLANNING: EWB trip planning materials were useful. Brainstorming during pre-trip meetings was also useful.

TRAVEL: Coordination with PSU travel personnel was useful to identify baggage limitations for air travel.

HEALTH and SAFETY: We used first aid kits for minor cuts and scrapes. The time spent in preparing for health and safety issues before the trip was useful in sensitizing team members to health & safety issues such as personal hygiene, food safety, daily medications.

COMMUNITY INVOLVEMENT: This project involves a community with complex community issues. We spent quite a bit of time in discussing issues with community members, and the time spent on community involvement was definitely worthwhile.

FLEXIBILITY: In spite of our pre-trip planning, local conditions were not completely as expected. We found that it was helpful to be flexible with the assessment trip work plan in order to address changing conditions.
10.0 PROJECT STATUS

The assessment trip was very beneficial and we acquired a great deal of information with regards to the latrine project. We did extensive site and community surveying, as recommended by the TAC last March. The results are compiled in section 5.1.5.

Our designed has been narrowed to a vip/pour flush based on accepted practices within the community. We feel we have more than sufficient information to proceed with this project. The latrine project for the Coventry Preparatory School is currently in the design phase with hopes of building and implementing the latrine in Summer 2012.

11.0 PROFESSIONAL MENTOR/TECHNICAL LEAD ASSESSMENT

11.1 Professional Mentor/Technical Lead Name (who provided the assessment)

Richard Kercher, P.E.

11.2 Professional Mentor/Technical Lead Assessment

This second assessment trip allowed the latrine project team to focus specifically on the task of collecting data on the new site for the Covenant Preparatory School and to further survey community members on latrine usage and existing latrine facilities as suggested by the TAC. We found several examples of pour-flush latrines in the community but also found that other community members continue to urinate and defecate in the open. The school proprietor, Pastor Martin Simbo, believes that providing proper facilities at the school will help to educate the children in the importance of using a latrine. We were pleased when the children remembered our hand-washing demonstration and exercise from the first implementation trip, including singing a school song twice (I am H-A-P-P-Y) to ensure they washed their hands for at least thirty seconds. We followed up on hygiene with the school staff building a tippy-tap. Each student then took turns using the tippy-tap.

The new school is currently under construction on property purchased by Pastor Martin. He is planning to finish the first floor slab and relocate within the next six months. The existing school is located on leased property. Recently the property owner has asked for an additional lump sum fee from Pastor Martin or the property owner will have the option to find a new tenant after six months (July 2012). We are encouraged that the EWB-PSU project will be built on property owned by the school and church and that it will not be built on a leased property.

As shown on the sketch of the school property the foundation of the school spans from one property corner on the north to the property corner on the south. The open property located uphill to the west corner of the property is steep and rocky terrain. The remaining location for
the latrine within the property boundaries is downhill from the school towards the east corner. Pastor Martin also prefers to use this area to build the latrine. During the assessment trip, we came to an agreement with the Pastor as documented in the Memorandum of Understanding that a two-seater latrine will be considered in design. While the size and topography property leased by Pastor Martin would have accommodated a preferred four-seater latrine, the constraints of the new site cannot accommodate the space required for a larger latrine facility.

Lastly, this second assessment trip allowed us to witness local construction techniques and practices. We witnessed and talk to several builders that were forming concrete blocks, which are the preferred building material in Sierra Leone. We were also able to speak with the contractor who is constructing the new school and to see formwork and rebar in the retaining wall. Several building supply stores were visited in the town of Goderich located next to the community of Baoma. The proximity to Freetown, the well-organized school organization, and support of the community should all contribute to a first successful project for the EWB-PSU student chapter.

11.3 Professional Mentor/Technical Lead Affirmation

I affirm that I was involved in the trip preparation and take responsibility for continuing the design of the Covenant Preparatory School latrine project in Baoma, Sierra Leone.
12.0 APPENDIX

12.1 Memorandum of Understanding

Memorandum of Understanding:
Covenant Preparatory School Latrine Implementation

This contract is between the officials of the covenant preparatory school, Engineers Without Borders - Sierra Leone (NGO Mohamed Khalil) and the Pennsylvania State University student chapter of Engineers Without Borders-USA for the purpose of setting guidelines for the 2-Seater Latrine Project.

1. The officials of Covenant Preparatory School agree to the following:

   1. The officials of the Covenant Preparatory School agree to allow The Pennsylvania State University Chapter of EWB-USA to design and construct the 2-Seater Latrine for the Covenant Preparatory School on the property owned by Pastor Martin Simbo.
   2. The Covenant Preparatory School agrees to pay 10% cash and a 40% “in-kind” (materials, labor, etc.) contribution for the latrine project in order to ensure project ownership and sustainability.
   3. The school officials of the Covenant School agree to maintain the latrine for the students on a routine basis.
   4. The school officials agree to identify and repair basic malfunctions of the latrine, and if not easily repaired, they are responsible to contact Engineers Without Borders - Sierra Leone for assistance.
   5. The school officials agree to arrange the excavation and lining of the pit to be completed prior to the arrival of EWB-PSU.
   6. The school officials agree to only allow students and faculty to use the latrine, and secure the latrine during non-school hours. The latrine may also be used by the parishioners on Sundays during church services.
   7. The school officials agree to dedicate themselves to being educated on the benefits and process of operating and maintaining their latrine. They also agree to pass on this knowledge to others in the event that they leave the school.
   8. Since one of the goals of this latrine is to instill in the students the benefits of proper sanitation practices, the school officials agree to properly educate their students on these benefits.
   9. Upon the filling of the latrine pit, the school officials agree to have the pit emptied appropriately and in an environmentally sound manner approved by EWB-SL.
   10. The school officials will establish a single point of contact within each party and will copy all parties on all project-related emails.

Memorandum of Understanding, version 1
Covenant Preparatory School Latrine Implementation

January 4, 2012
II. Engineers Without Borders - Sierra Leone (EWB-SL) agrees to the following:

1. EWB-SL will work with Covenant Preparatory School and EWB-PSU to facilitate communication.
2. EWB-SL will provide contacts for ongoing maintenance, if the community is unable to repair the latrine.
3. EWB-SL will provide or aid in acquiring transportation for the travel members of the EWB-PSU chapter during implementation and monitoring visits.
4. EWB-SL will provide translators and trainers for the EWB-PSU chapter.
5. EWB-SL will provide or help to acquire the necessary resources for the completion of the project (Labor, Vehicles, Materials etc.).
6. EWB-SL will check EWB-PSU’s plans to make sure that they abide by local Sierra Leone laws and codes.
7. EWB-SL will provide regular (monthly) status updates of latrine usage and conditions.
8. EWB-SL will oversee all construction that is undertaken prior to EWB-PSU’s arrival and will ensure that it meets EWB-PSU’s drawings and specifications.
9. EWB-SL will establish a single point of contact within each party and will copy all parties on all project-related emails.

III. The Pennsylvania State University Student Chapter of EWB-USA (EWB-PSU) agrees to the following:

1. EWB-PSU will work with the Covenant Preparatory School and EWB-SL to design and build a suitable latrine.
2. EWB-PSU will provide materials and labor not obtained by the school officials for construction of the project.
3. EWB-PSU will teach the school officials how to maintain their latrine.
4. EWB-PSU will provide as-built drawings to the school officials after project completion.
5. EWB-PSU agrees to educate the school officials on correct sanitation practices and will provide them with example lesson plans for the students.
6. EWB-PSU agrees to provide ongoing technical support for the operation and maintenance of the latrine on future monitoring and water supply assessment trips.
7. EWB-PSU will establish a single point of contact within each party and will copy all parties on all project-related emails.
On behalf of, and acting with the authority of the Covenant Preparatory School, Engineers Without Borders - Sierra Leone and The Pennsylvania State University Student Chapter of EWB-USA, the undersigned agree to abide by the above conditions.

| Headmaster of the Covenant Preparatory School  
(Pastor Martin Simbo) | EWB-SL: Founder  
(Mohamed Khalili) |
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</table>
| EWB-PSU: Professional Mentor  
(Rich Kercher) | EWB-PSU: Faculty Advisor  
(Dr. John Lamancusa) |
|                        |                  |
| EWB-PSU: Project Lead  
(Beth Milligan) | EWB-PSU: Project Lead  
(Kyle Palmeter) |

Memorandum of Understanding, version 1  
Covenant Preparatory School Latrine Implementation  
January 4, 2012  
Page 3 of 3