Green Remediation Conference
UMass, Amherst | June 2010

Going Green:
Hill AFB's Basewide Focus on Sustainability

Barbara Hall, PhD
Hill Air Force Base, Utah

Stacey Arens, P.E. LEED AP
Toni Mehraban
Bert Wellens
Hhan Olsen, P.G.
MWH,
Salt Lake City & Chicago

MWH
BUILDING A BETTER WORLD

75th AIR BASE WING


OGDEN
SOUTH OGDEN
WASHINGTON TERRACE
RIVERDALE
SOUTH WEBER
84
ROY
HILL AIR FORCE BASE
SUNSET
CLINTON
LAYTON
15
CLEARFIELD

Sustainability Drivers

Environmental stewardship

Fiscal responsibility

Formal drivers

- Executive Order 13423 and 13514
- AF Infrastructure Energy Strategic Plan 2008
- DoD Memorandum of 10 August 2009 – specific to GSR

Presentation Outline

- Hill AFB Overview
- Sustainability Drivers

- Hill AFB Initiatives
- Restoration Program Initiatives
- Energy Assessment

Use of Landfill Gas – Hill AFB Energy Office

2-mile pipeline	Installed to connect Davis County Landfill to Hill AFB property
Generators	Use landfill gas to generate electricity
9,000,000 kWh/year	Generates enough to power **985 homes**
4,000 tons carbon dioxide/year	Annual reduction is equal to taking **687 cars** off the road
Nov 2004	Completed
$408,000	Actual annual savings
< 10 years	Payback occurs

New Photovoltaic Array – Hill AFB Energy Office

- Largest photovoltaic array in Utah
- Commissioned on 25 June 2009
- Generating 25,000 kWh/month on average
- Saves 135 tons CO_2/year
- Enough energy to support 34 homes
- **Improves Hill AFB's Energy Security**

MWH

Recycling Program (2009)
Hill AFB Environmental Management

Awarded (2008)	Hill AFB with Recycling Coalition of Utah's "Government Recycler of the Year" Award
Resold	• over 380 tons of hazardous waste • over 65,000 gallons of used oil
Diverted	over 650 tons of solid waste from landfills
Generated	$239,000 in recycled scrap metal revenue
Savings for USAF	$490,000

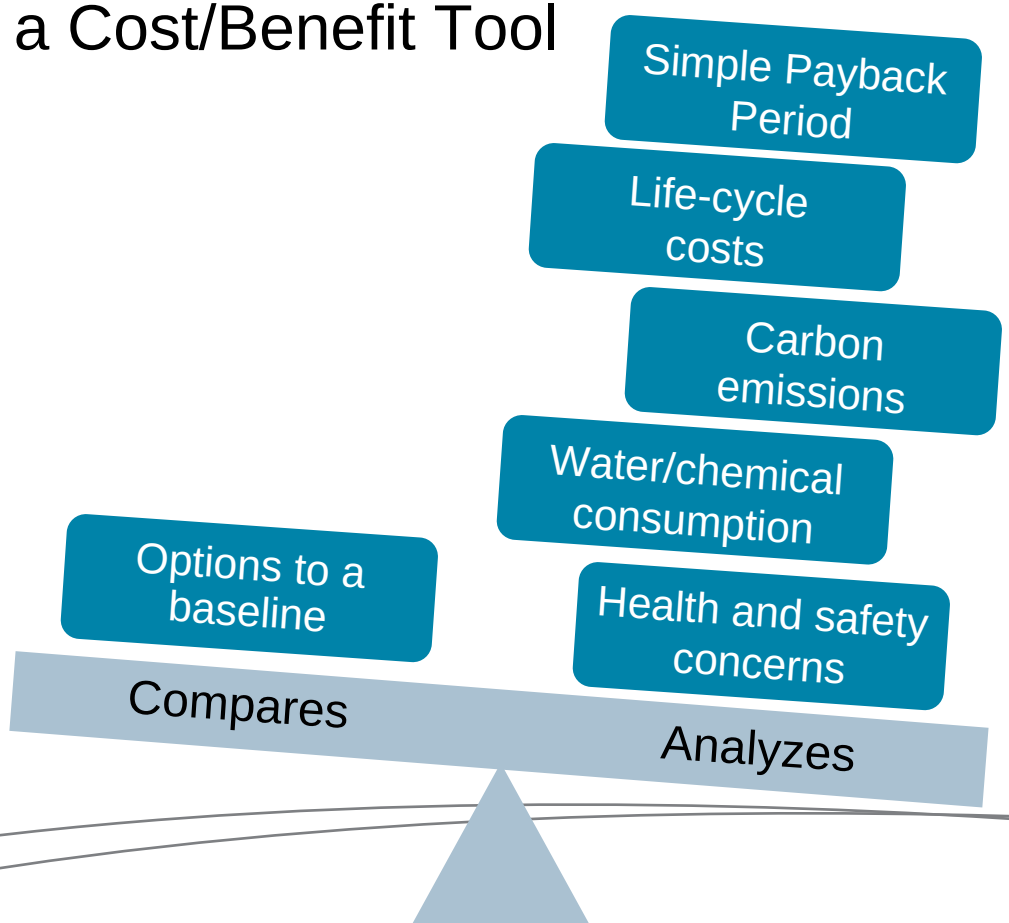
HILL AFB, UTAH
Environmental Management
ENVIRONMENTAL MANAGEMENT

MWH

Restoration Program Sustainability Initiatives

Quantifying Savings

- How should we quantify and document savings to both our budget and our environment?
- Developed a Cost/Benefit Tool



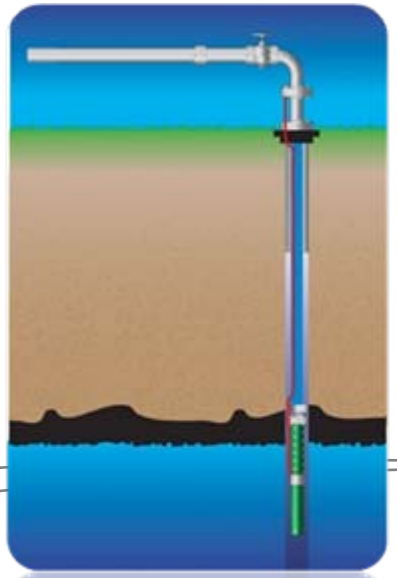
Transition to Wellmaster® Tubing

Example 1

Installed flexible tubing
5 Operable Units

Replaced rigid PVC piping in extraction wells with flexible tubing

- Life cycle of PVC = 5 years
- Life cycle of Wellmaster = 20 years
- 1 to 8 inch diameter tube size available



Wellmaster Cost/Benefit

Example 1

Cost/Benefit Analysis for	**Transition to Wellmaster Piping from Rigid PVC/SS Piping for Pump Removal and Well Rehabilitation**
Date of Evaluation	**2/4/2010**
Operable Unit and System	**OU1; OU6 On-Base; OU8 1,2-DCA; OU8 BBHCS; OU 12 BBHCS**

Parameter	Baseline	Alternative 1
Equipment/Method/Procedure	Extraction Well Discharge Rigid PVC/SS Piping	Extraction Well Discharge Wellmaster Piping
Total Carbon Savings per Year (lbs CO2 emitted/year)	0	**318,776**
Total Water Conservation per Year (gal/year)	0	0
Total Chemical Savings per Year (lbs/year)	0	0
Simple Payback Period (yrs)	-	**3.04**
Anticipated 20 year Life-Cycle Costs	$ 1,445,626	$ 544,600
Anticipated 20 year Life-Cycle Cost Savings	$ -	**$ 901,026**

Groundwater Sampling Program

Example 2

10 groundwater OUs sampled for VOCs

- ~1,500 samples collected per year
- Standard Purge used at 3 OUs; Low-Flow at 7 OUs
- Goal: Transition all?/ most? to passive method in 2010

Evaluate data comparability between Standard Purge (SP) and HydraSleeve™ (HS) to determine if passive sampling provides an **acceptable, cost effective, and energy-efficient alternative** for use at Hill AFB

MWH

Passive Sampling

Example 2

Cost-benefit and footprint analysis

Footprint Components	Estimated Footprint Reduction
Mileage	**58%** reduction in CO_2
Idle time and fuel use	**99.8%** reduction in waste water
Compressor/ generator fuel use	**49%** reduction in sampling days
Sampling time/ samples per day	
Average volume water	

*Assumes 1,500 samples
750 using SP
750 using Low-flow

Cost-benefit:
Converting from conventional methods to a passive sampling method (HydraSleeve™) could save up to $9 million over a 20-year period

MWH

Energy Assessment Overview

Example 3

- Groundwater plumes have projected site closure dates of 2035 and beyond
- “Remedies in Place” between 1994 and 2007
- Goals:
  - Minimize long-term recurrent costs associated with O&M activities
  - Identify and implement “easy wins”
  - Identify longer-term efforts
  - Strategically plan funding to support longer-term efforts

MWH

Project Description

- Completed a baseline **Energy, Carbon, and Cost Evaluation** for the 12 Active Remediation Systems at Hill AFB
- Analyzed system data
- Performed field assessments
- Identified potential improvements (actions)
- Assessed savings (energy, carbon, and O&M)
- Estimated costs for implementation
- Calculated a payback period
- Ranked the improvements by payback period

Energy Assessments - **METHOD**

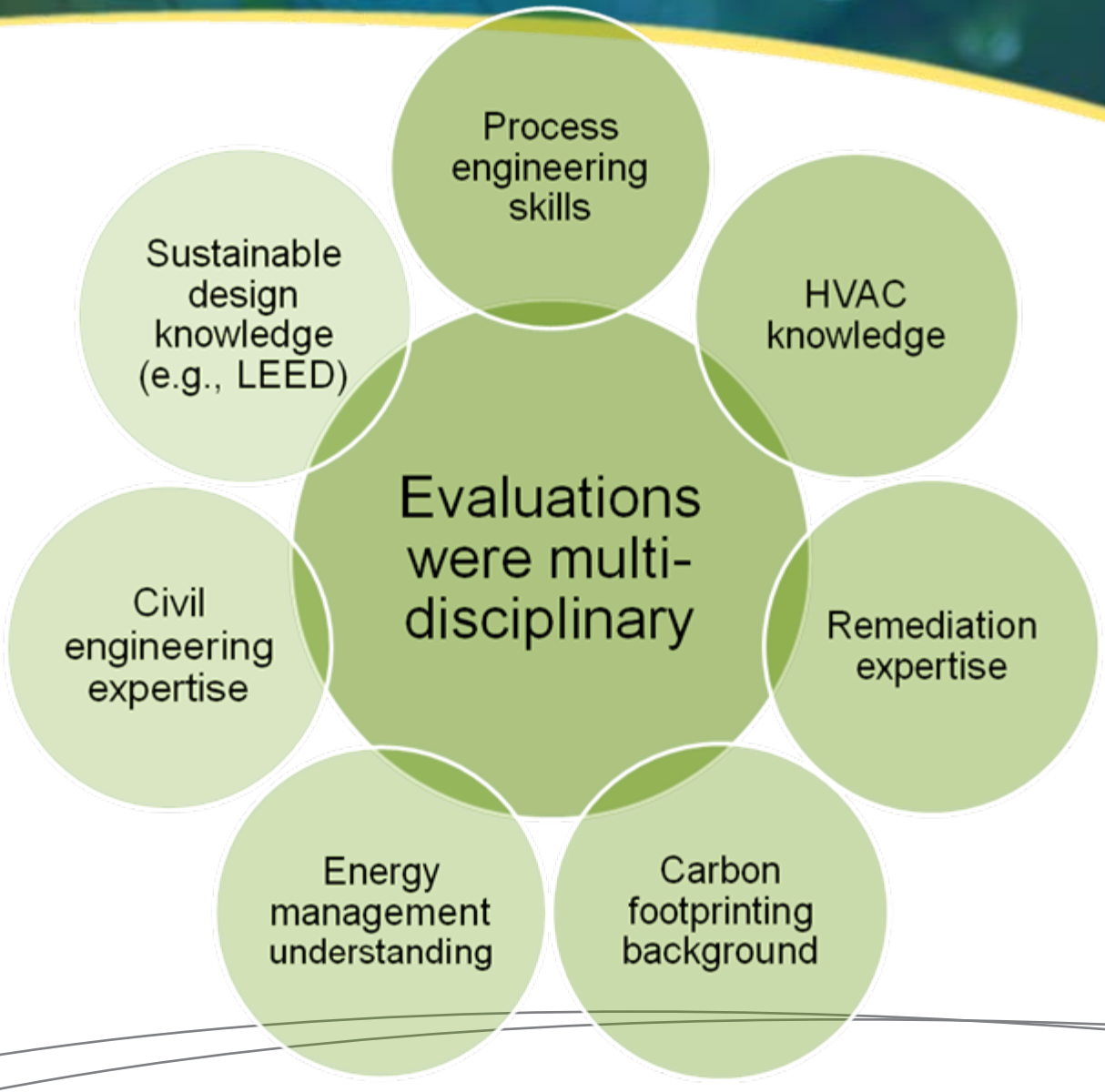
- Data mining
  - Monthly/annual reports
  - O&M manuals
  - Site manager/O&M contractor correspondence
- Developed a baseline
  - Energy, carbon, and cost
  - Critical step in understanding existing conditions
  - For comparison after implementing improvements
  - Included
    - Electricity and natural gas usage
    - Travel of O&M contractors to and from the site
    - Utility demand from secondary treatment at a POTW
- Evaluated data to focus energy assessments

Energy Assessments - **METHOD**

- Performed Field System Assessments
  - Site managers and O&M contractors were present
  - Addressed questions from data mining exercise and field conditions
  - Recorded equipment and HVAC sizes
- Compiled and Evaluated Potential Improvements
  - Estimated savings (energy, CO_2 emissions, water, O&M)
  - Estimated investment costs to implement ($\pm$ 25%)
  - Calculated a payback period

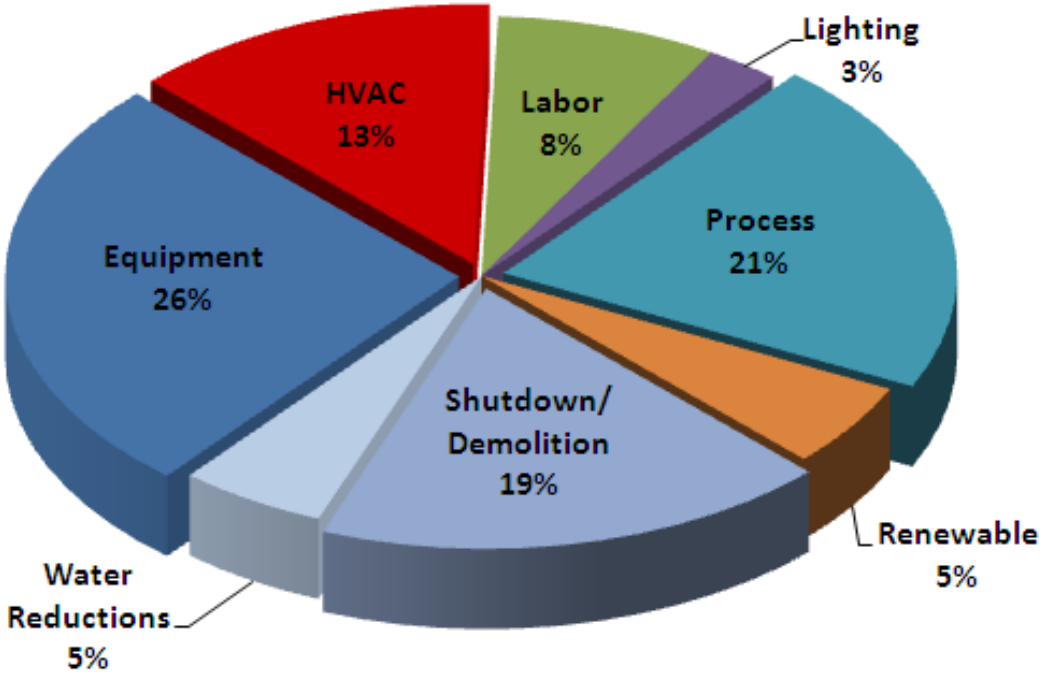
MWH

Energy Assessments - **METHOD**



Energy Assessments - **RESULTS**

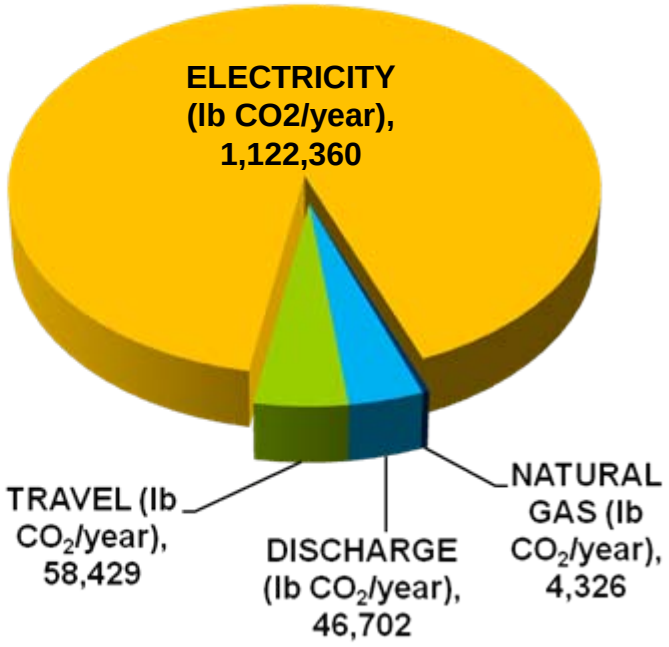
- Identified 35 site-specific and 3 basewide recommendations for cost-effective implementation of Green and Sustainable Remediation practices
- 29 recommendations evaluated for implementation
- 9 recommendations not evaluated for payback period
  - No payback (electric meter)
  - Small payback
  - Should be evaluated after site conditions change



MWH

Energy Assessment Baseline (OY 2008*)

Category	Total of 12 Active Remediation Systems
Operating Cost	$1,623,414
Mass of Contaminants Removed	832 pounds
Volume of Groundwater Extracted/Treated	183,400,000 gallons
Electricity Consumed	1,122,000 kWh
Remediation Carbon Footprint	1,232,000 pounds CO_2



* Operating Year 2008 = Apr 2008 thru Mar 2009

MWH

Energy Assessments - **RESULTS**

	Energy Savings (kWh/yr)	CO_2 Emissions Reductions (lbs/yr)	O&M Savings ($/yr)	Estimated Investment ($)	Overall Payback Period (yr)
Recommendations with Payback < 5 years (14 ea.)	215,000 (19%)	194,000 (16%)	$247,000 (15%)	$319,000	1.3
Payback 5-10 years (4 ea.)	113,000 (10%)	101,000 (8%)	$4,500 (0%)	$33,000	7.3
Payback > 10 years (11 ea.)	67,000 (6%)	63,000 (5%)	$17,000 (1%)	$300,000	17.6
Total Savings	395,000 (35%)	358,000 (29%)	$268,500 (17%)	$652,000	2.4

MWH

“WOW, maybe it IS easy being GREEN!”

Summary

- Good environmental stewards!
- Reducing carbon footprint results in measurable and significant cost savings
- Application can be on a Basewide or equipment level
- Evaluations with energy reduction in mind, in addition to a system performance perspective, yield more optimization opportunities
- A lot of “quick wins” for Hill AFB without significant upfront costs
- Greener remediation helps meet DoD energy and carbon reduction goals (EO)

Discussion

Barbara Hall: 801-777-0493
Barbara.Hall@hill.af.mil

Stacey Arens: 801-617-3219
Stacey.Arens@mwhglobal.com


Hill Air Force Base

Energy Assessments – **EXAMPLE**

- Switch pneumatic to electric pumps at 3 sumps
  - Air compressor typically loses 80-90% of energy demand in the form of heat
  - Efficiency further reduced by air leaks in line
  - Energy costs will be 5-10 times the compressor's purchase cost
  - Overall, the electricity usage of a pneumatic is a factor of 5 higher than a non-throttled electric pump
- Estimated savings
  - 56,000 kWh/year
  - 50,000 lbs CO_2/year
  - $1,515/year in utilities
- Investment - $4,000
- Payback - 2.6 years

Take Home Message:
Use electric pumps where possible

MWH