Final Project Report:
Otter Creek Watershed Improvement Project #9029-015

Project Summary:

The City of West Union was selected by Iowa Department of Economic Development as a Green Pilot Community in 2008. The community determined that a major green project would be the reconstruction of the public infrastructure in the downtown business district. Sustainability, innovation and the ability to replicate anywhere would be the guiding principles for the project. A key component of the project was the replacement of the impermeable street and sidewalk surfacing with a porous paver system. This system, along with bio-retention cells along the sidewalk/streets and at the intersection bumpouts, filters, then cleanses and cools stormwater prior to a very slow discharge into Otter Creek. The project was designed to reduce the peak discharge rate for a 100 year storm by 95% and reduce the runoff volume by 20%. West Union is located within the Otter Creek watershed, and Otter Creek itself is a designated cold water trout stream that runs just south of the city's center knoll. Fayette County Soil and Water Conservation District and the IDNR consider improvement of the water quality of Otter Creek to be very important. The reconstruction of downtown West Union in this sustainable manner is the first step in an overall Otter Creek watershed improvement project.

Financial Accountability

Table 1: Watershed Improvement Funding

WIRB Funded Items	Total Funds Approved ($)	Total Funds Approved—Amended ($)	Total Funds Expended ($)	Available Funds ($)
Permeable Pavement	$450,000	$424,745	$403,557	$21,188
Bio-Retention Cells	$50,000	$75,255	$72,659	$2,596
Totals	$500,000	$500,000	$476,216	$23,784
Difference			**($23,784)**	

The porous paver system and the bio-retention system were two elements of a comprehensive "Green Pilot" project that also included water and sewer replacement, a geothermal system, energy efficient lighting and many placemaking elements and amenities. As a "pilot" project, assumptions were made as to what the costs of materials and time would be given what was known about the separate costs of each element of the project, which resulted in a conservative estimate. From the point that the original WIRB application was submitted to the time of project completion, both funding sources and costs have changed. Additional funding sources were identified who were eager to participate in the pilot project. The total project cost was lower than estimated as the project benefitted from cost reductions in some materials and the cost savings realized through the completion of multiple projects with just one dig.

Table 2: Total Project Funding

Funding Source	Cash		In-Kind Contributions		Total	
	Approved Application Budget ($)	Actual ($)	Approved Application Budget ($)	Actual ($)	Approved Application Budget ($)	Actual ($)
WIRB	$500,000	$476,216			$500,000	$476,216
West Union	$903,300	$333,158			$903,300	$333,158
IDALS-I-Jobs	$500,000	$500,000			$500,000	$500,000
IDNR-I-Jobs	$100,000	$60,453			$100,000	$60,453
IDOT RISE	$843,036	$996,524			$843,036	$996,524
Iowa Great Places	$160,000	$160,000			$160,000	$160,000
FC SWCD		$0	$5,000	$0	$5,000	$0
IEDA (IDED)	$198,000	$198,000			$198,000	$198,000
MSWU	$10,000	$0	$5,000	$5,000	$15,000	$5,000
Extra I-Jobs	$0	$400,156			$0	$400,156
Totals		$3,124,508	$10,000	$5,000	$3,224,336	$3,129,507

Watershed Improvement Fund contribution: Approved application budget: 15 %
Actual: 15 %

As previously mentioned, the project as a whole came in under expectations and additional funders joined the project to fund varying elements. The timing and availability of I-Jobs stimulus money was ideal for this project, and its shovel-ready nature and pilot project importance helped the City submit successful applications for these funds. The largest discrepancies in the originally submitted project budget and the reasons for such include:

- The City of West Union. As new funders with more restrictive funding parameters came into the process, the city's money was flexible enough to be used in any element of the project, some of which that were not eligible for any other funding. In the WIRB budget, a special I-Jobs award was made to the city (after the original WIRB application was made) which could be used for the porous paver system and the bioretention system, freeing some of the city's money for other elements.
- IDNR-I-Jobs. The entire $100,000 was spent on the project, but in elements that were not included in the originally submitted budget, so the full amount is not reflected in the reporting documents.
- Fayette County SWCD. The $5,000 in-kind work was surely completed given the participation by SWCD staff, however, official documentation could not be obtained at the time of this report.
- Main Street West Union. The Main Street Program contributed $5,000 in cash toward the additional costs of the grant writer, rather than to this piece of the project. The additional $5,000 could not be documented for this report, but it is believed to have been spent directly to support the project educational efforts and some amenities.
- Extra I-Jobs. After the initial application submission for WIRB funding, the City was awarded additional I-Jobs funding which could be used for the porous paver system and the bio-retention system, among other elements.

<u>Environmental Accountability</u>

Summary of water quality:
As noted in Table 3, turbidity, suspended solids, total phosphorus levels and fecal coliform counts in Otter Creek were lower in 2013. This occurred despite the fact that most of the samples were taken following significant rain events. The low turbidity and suspended solids results are particularly remarkable. This suggests that progress has been made in reducing the amount of sediment and manure that is washing into Otter Creek. Total nitrogen levels were higher in 2013, probably a result of the extreme climate patterns experienced by northeast Iowa over the last two years.

Table 3: Monitoring Results from Selected Sites, 2009 - 2013

Monitor Location:	Otter Creek @ Linden Street				Otter Creek @ Pine Street			
Parameter:	2009	2010	2011	2013	2009	2010	2011	2013
Temperature (°C)	NA	14.3/14.5	15.2/14.4	12.8/13.7	NA	15.2/16.2	15.8/16.2	13.4/14.2
pH	NA	7.9/7.9	7.5/7.5	7.5/7.5	NA	8.0/8.0	7.9/7.7	7.7/7.7
Conductivity (microSiemens/cm)	NA	398/390	480/537	496/520	NA	349/381	481/495	498/520
Dissolved Oxygen (mg/L)	NA	9.4/9.1	8.8/8.8	9.0/8.8	NA	9.7/9.4	9.3/8.8	9.5/9.9
Turbidity (NTU)	NA	56/20	129/20	17/5	NA	63/42	249/158	24/5
Suspended Solids (mg/L)	NA	49.33/ 21.84	72.28/ 34.54	31.9/5.4	NA	50.23/ 30.63	180.9/ 137.5	33.1/5.3
Phosphorus (mg/L)	.94/.40	1.14/1.04	1.04/.7	1.05/.36	1.14/.71	.99/.83	1.19/1.04	.84/.29
Nitrogen (mg/L)	9.7/9.7	12.0/11.9	9.5/9.6	13.7/14.7	8.3/8.7	9.5/9.0	7.6/7.4	12.7/13.3
Chloride (range of mg/L)	<27 - 27	<27	<27 - 27	<33	<27 - 40	<27 - 27	<27 - 79	<33 - 33
Fecal Coliform (colonies/100ml)	42,713/ 11,000	126,176/ 114,350	165,551/ 41,500	736/504	31,251/ 9,400	151,904/ 8,800	38,151/ 30,500	1,151/236

Monitor Location:	Otter Creek @ Echo Valley Park				Glovers Creek, just before it empties into Otter			
Parameter:	2009	2010	2011	2013	2009	2010	2011	2013
Temperature (°C)	NA	15.6/16.4	16.5/16.9	16.8/16.4	NA	15.1/15.7	14.2/12.4	14.5/14.2
pH	NA	8.3/8.0	8.1/8.0	7.9/7.9	NA	8.3/8.3	8.1/8.1	8/8.1
Conductivity (microSiemens/cm)	NA	396/358	565/601	609/591	NA	413/364	534/615	583/603
Dissolved Oxygen (mg/L)	NA	10.9/9.7	9.4/9.2	5.0/5.0	NA	10.3/9.9	9.9/10.2	9.8/9.4
Turbidity (NTU)	NA	92/44	393/173	5.4/4	NA	143/69	349/36	6.0/6.0
Suspended Solids (mg/L)	NA	55.18/ 34.75	333.45/ 111.16	33.1/5.3	NA	98.77/ 75.34	261.19/58	5.1/5.6
Phosphorus (mg/L)	1.62/.92	1.61/1.48	3.08/2.55	.53/.53	2.38/2.03	1.49/1.44	2.0/.57	.34/.3
Nitrogen (mg/L)	8.8/9	9.3/9.4	9.7/9.0	15/14.4	9.4/9.8	10.0/10.5	10.2/9.9	10.1/10
Chloride (range of mg/L)	<27 - 55	<27 - 40	<27 - 64	<33 - 55	<27 - 33	<27 - 27	<27	<33 - 33
Fecal Coliform (colonies/100ml)	77,771/ 7,940	86,403/ 10,800	387,438/ 47,500	300/201	148,744/ 16,400	81,876/ 8,750	105,650/ 59,000	251/210

Source: Rick Klann, Upper Iowa University

Runoff from West Union following the downtown renovation was also studied and it appears that the project has been successful in allowing water to percolate into the ground, greatly slowing down the rate of runoff into Otter Creek. This also helped to eliminate the temperature shock that would have occurred had warm water just run off the impermeable surfaces, flowing directly into Otter Creek, as verified by the temperature reductions at Linden and Pine Streets in the monitoring data. While the turbidity and chloride levels in the runoff was slightly higher than that in Otter Creek, the flow was so low that this amount of sediment and chloride transport is negligible. Nitrogen levels in the runoff were also negligible. The runoff from downtown West Union did contain phosphorus and fecal coliform bacteria,

possibly due to contamination from old septic tanks or leakage from sewer lines, or it could be a remnant from the impact of downtown construction on sewer lines. (Klann, 2013)

Monitoring is expected to continue for the next two to three years through the SWCD as part of a larger watershed project.

Summary of practices installed and activities completed:
The completed project features over 193,000 SF of porous paving system. Bio-retention areas cover 26,858 SF of the project area in 78 separate cells. The six block project also addressed the downtown's aging water and sanitary sewer infrastructure. The project showcases additional innovative sustainability strategies such as energy efficient lighting and a district-wide geothermal heating and cooling system.

The nature of the project attracts interest regionally, state and nationwide. During the WIRB Grant period, visitors were common at the project site and community stakeholders were featured speakers at many conferences. The project was also featured on television, both through Iowa programming and on nationally syndicated programs. An entire documentary about the project is nearly complete and will tell the story of the project and its environmental benefits from pre-construction meetings to the post-construction celebration. Tours, conference presentations, workshops and dignitary visits are detailed further in Table 5.

Table 4: Summary: Practices and Activities

Practice or Activity	Unit	Approved Application Goal	Accomplishments	Percent Completion
Permeable Pavement	SF	160,000 SF	193,000 SF	100%
Bio-retention Cells	SF	26,873 SF	26,858 SF	100%
Site Group Tours	Ea.		14	Continuous
Workshops	Ea.		3	Continuous
Conference Presentations	Ea.		9	Continuous
Dignitary Visits	Ea.		6	Continuous
Other Media	Ea.		3	Continuous

Table 5: Activity Details

Tours:
• Univ. of Iowa Faculty and Staff
• IDALS Urban Conservationists
• Upper Iowa Conservation Management Students
• RC&D Scenic Byways Tour
• Leadership Iowa Conference
• Land Improvement Contractors of America
• Decorah High School
• NF 7th Graders (4 tours)
• South Winneshiek Middle School Students
• IEDA Staff

• West Union and Oelwein Rotary Clubs
• Street Grand Opening
• Community Efficient and Renewable Energy Workshop
Conferences:
• National Conference of the American Association of Architects (Boston)
• Iowa Water Conference (Ames)
• Dubuque Sustainability Conference
• Flood Center of Iowa Flood Seminar (Elkader)
• Univ. of Iowa Water Resources Class
• NE Iowa Land Surveyors
• Turkey River Watershed Management Authority
• Smart Growth Conference (Charlotte, NC)
• NE Iowa League of Cities
• EPA Climate Showcase (Seattle)
Workshops:
• IEDA Stormwater Training
• Turkey River Watershed Public Meeting
• Community Efficient and Renewable Energy Workshop
Special Visitors:
• Congressman Bruce Braley
• City of Lansing, IA Contingent
• Debbie Durham, Director, Iowa Economic Development Authority
• Bill Menner, USDA Iowa Director
• Staff of Senator Grassley
• City of Mt. Morris, IL Contingent
• Watershed Improvement Board
• Several Guest Speakers from the Grand Opening: Jim Collins, Alliant Energy; Patty Petersen, Trees Forever; Vicki Rowland, Fayette County Supervisors; Rachelle Howe, Upper Explorerland RPC; David Yocca, Conservation Design Forum; Robert Ballou, WIRB; Tim Waddell, IEDA
Other:
• KCRG's Our Town Feature
• In View with Larry King Feature
• Project Webcam – IEDA Website
• Film Documentary – funded by Iowa Energy Center

Program Accountability

The comprehensive nature of the entire project attracted a significant amount of external attention, expanding the educational opportunities about the practices incorporated into the project beyond initial expectations. The media coverage, locally, regionally and nationwide, allowed for a much broader audience. The environmental impacts of the project will continue to be apparent over time as the system is tested by significant storms and time itself. In a project this size, challenges were experienced daily, but perseverance on the part of the city, engineers, designers and other stakeholders ensured the successful completion of the project.

Many lessons were learned as a result of the project's implementation. A key element of all issues was communication. Communication with and among city leadership, community organizations, funding and technical assistance providers, and overall, city residents is vital to ensuring that all efforts support and lead to the same outcome. The project was developed as a pilot project with a specific emphasis on its replicability. The cost of completing such a comprehensive project can be limiting for communities, however the varying elements of the project can be replicated to any scale in any community. The City looks forward to many years of tours and presentations, with notable impacts to Otter Creek as the projects features are fully operational.

Before:

After: