

Campus FM Technology Association

Facilities Geospatial Technologies Showcase

**Sustainability Drives the Smart Campus:
GIS is the Platform**

Presented by

Niels la Cour, Senior Physical Planner

Campus Planning, a division of Facilities and Campus Services

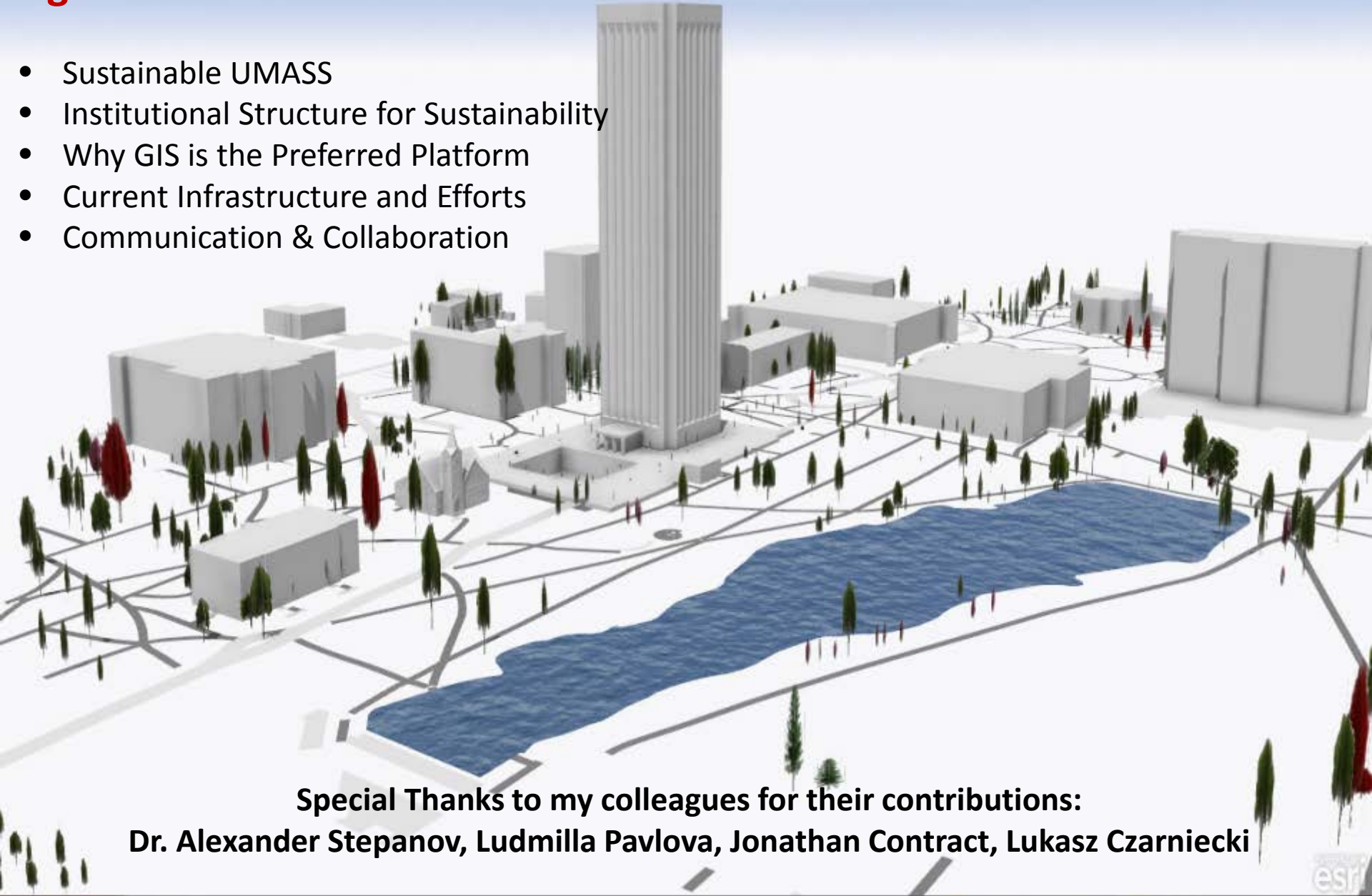
University of Massachusetts Amherst

Umass at a Glance:

- **28,635 Students**
- **1,300 Full Time Faculty**
- **5,000+ Employees**
- **12.5 + Million square feet**
- **200 + Major Buildings (Main Campus)**
- **1,450 Acre Campus**
- **1 FTE GIS Architect in A&F Support Services**
- **Individuals involved from Campus Planning, Design and Construction Management, Physical Plant**

Agenda – Communication and Collaboration

- Sustainable UMASS
- Institutional Structure for Sustainability
- Why GIS is the Preferred Platform
- Current Infrastructure and Efforts
- Communication & Collaboration



Special Thanks to my colleagues for their contributions:

Dr. Alexander Stepanov, Ludmilla Pavlova, Jonathan Contract, Lukasz Czarniecki

ACUPCC, AASHE & STARS, Princeton Review, Sierra Club, Mass Recycle



Sustainability Organization

Chancellor's
Sustainability
Committee

Executive Team

Executive Director,
Residential Life

Eddie Hull

Executive Director, Auxiliary
Enterprises

Ken Toong

Director, Physical Plant

Ray Jackson

Director, Design &
Construction Management

Tom Shaw

Budget Director

Andy Mangels

Dean, College of Natural
Sciences

Steve Goodwin

Rotating Dean Seat

Christine
McCormick

Faculty Senate Rep

Stephen Schreiber

Director, Campus Planning

Dennis Swinford

Sustainability Organization

Chancellor's
Sustainability
Committee

Implementation Sub-Committees

Residential & Community
Programming

Communications

Education & Research

Finance

Food and Dining

Green Building

Master Planning

Transportation

Waste & Recycling

IMPLEMENTATION TEAM

Monica Rochon

*Victoria Rosen &
Elena Sharnoff*

*Craig Nicolson &
Bill Wooldridge*

Lynn McKenna

Rachel Dutton

Patricia O'Flaherty

Ludmilla Pavlova

Glenn Barrington

Terri Wolejko Bechta

Sustainability is Complex:

Multifaceted Problem

Failure to Understand
Systemic Reality

Skills and Capacities

Technology and Design

Time and Money

Knowledge and Attention

Politics and Power

Organizational Limitations

Adapted from Leith Sharp

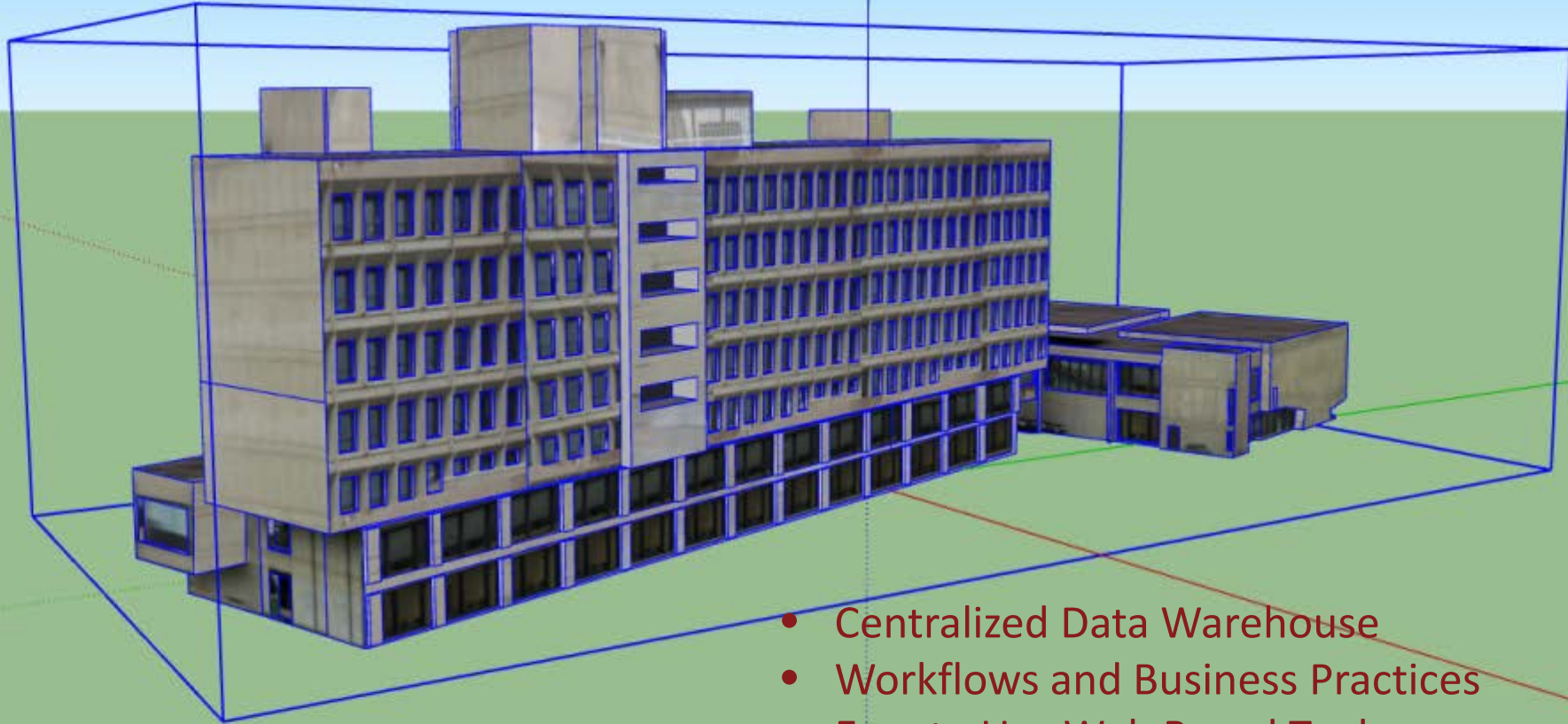
Sustainability Requires Systemic Knowledge & Action

Multifaceted Problem		Multifaceted, Systemic Change
Failure to Understand Systemic Reality	=	Systems Thinking
Skills and Capacities	=	Education and Training
Technology and Design	=	Expertise in green building, energy, transportation, etc.
Time and Money	=	Business Development, Finance and Accounting
Knowledge and Attention	=	Advocacy
Politics and Power	=	Leadership and Organizational Culture
Organizational Limitations	=	Social Marketing Techniques

GIS

Adapted from Leith Sharp

The “Vision” is to create a fully integrated knowledge and information management system that provides decision support for all of the different divisions that make up the enterprise that is the University of Massachusetts.



- Centralized Data Warehouse
- Workflows and Business Practices
- Easy to Use Web Based Tools
- 3D and Visualization Tools
- Right People, Right Access, Right Tools for Decision Support

Campus as Systems

3. Campus as System 📄

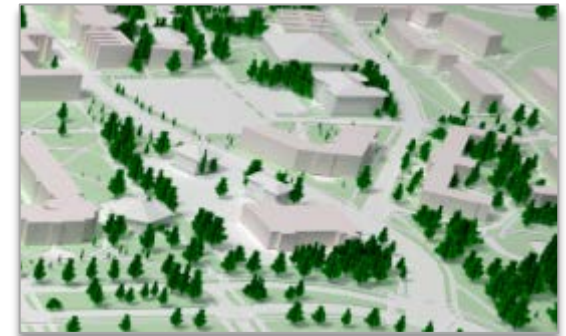
3.1 Buildings +

3.2 Open Space +

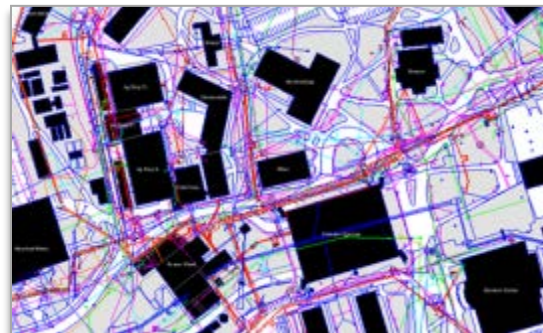
3.3 Transportation/Transit +

3.4 Utilities +

3.5 Infrastructure +



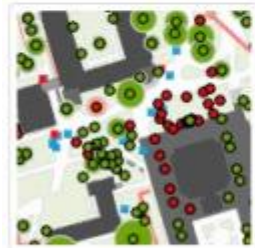
Educational Process
Research
Outreach





GPV Applications

Select an area of UMass campus using a map widget above, then start one of the apps ...



Landscape Management »

This web application provides web-access to spatial layers related to landscape management, such as the tree inventory and open space areas. Certain data layers like the Tree Inventory are searchable.



Utilities Management »

This web application provides easy access to the utilities/infrastructure data, such as steam, water, electric and drainage lines. It also includes information on the past utilities contracts (1947-2000), and surveyors' notes and annotation. All data layers are searchable.



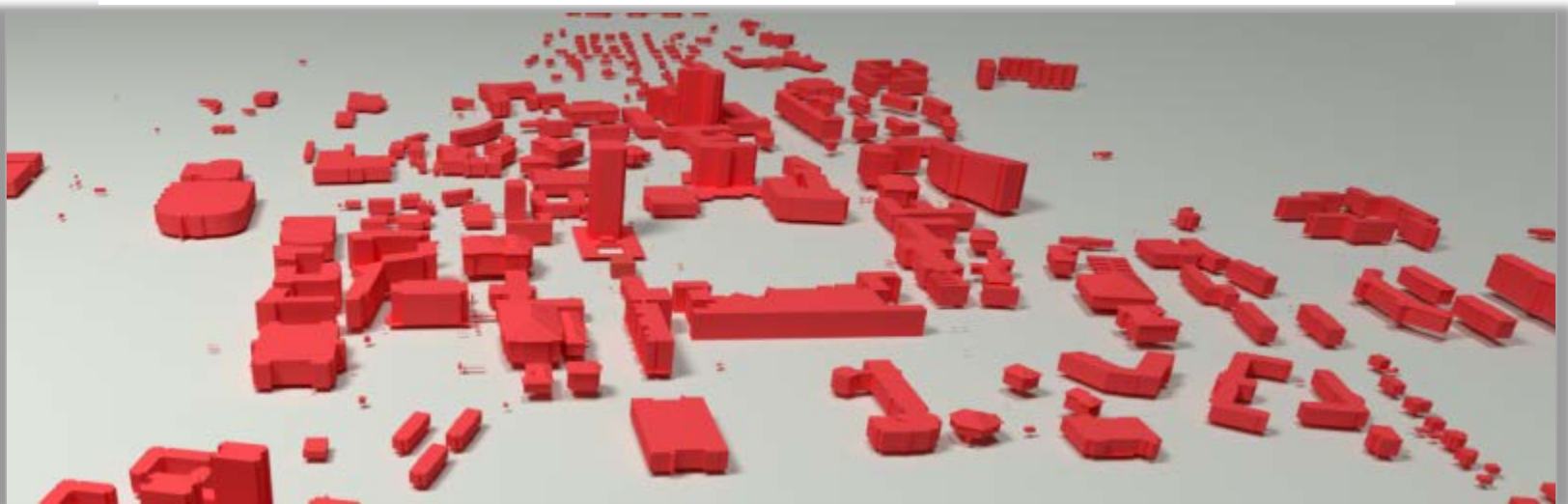
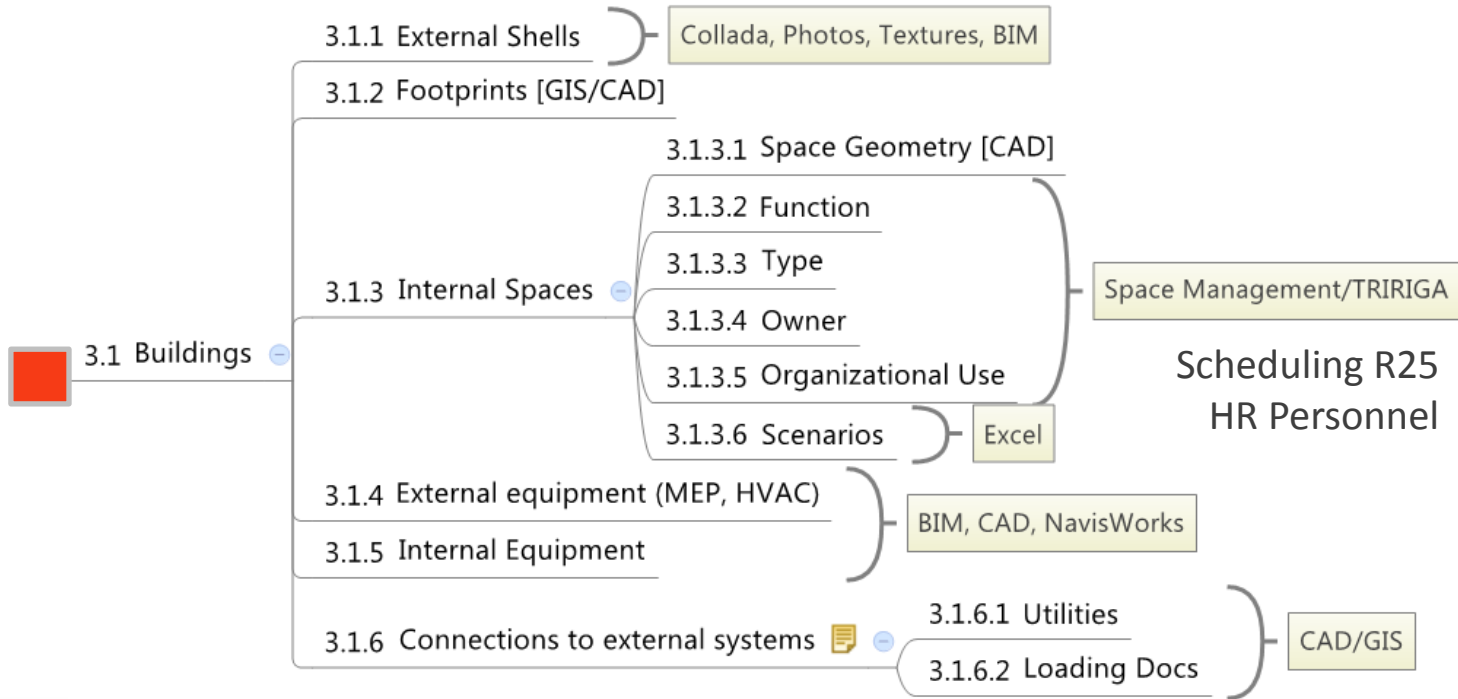
Pavement/Hardscape Management »

Have an idea? Get Involved!



If you have an idea regarding use of GIS on our campus or how specific information or an application (if available) would improve and simplify your everyday operations, please let us know. Contact [Niels La Cour](#) for more information and to share your ideas and suggestions for continuous improvement of these applications or development of new applications.

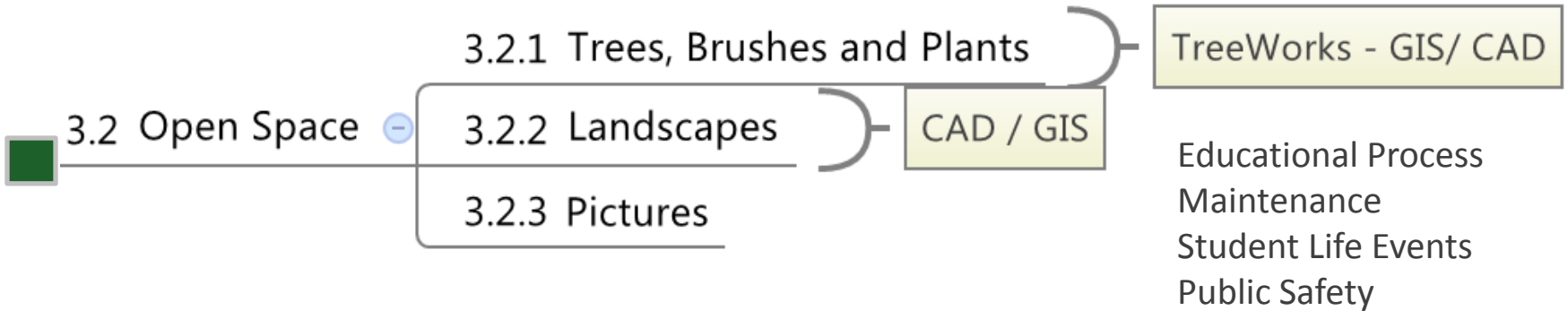
Campus as Systems: Buildings



Campus as Systems: Buildings



Campus as Systems: Open Space



Campus as Systems: Open Space

UMassAmherst

Tree Inventory

Scale 1" = 69' ft

Help Mobile

Search Selection Legend Location Markup

Select Tree and planting S


(show all)

Site ID	Name	Site Type	Planted	Special
589	oak,pin	Tree		0

1 selected To Mailing Labels To Spreadsheet

Tree Info Condition History Photos Print

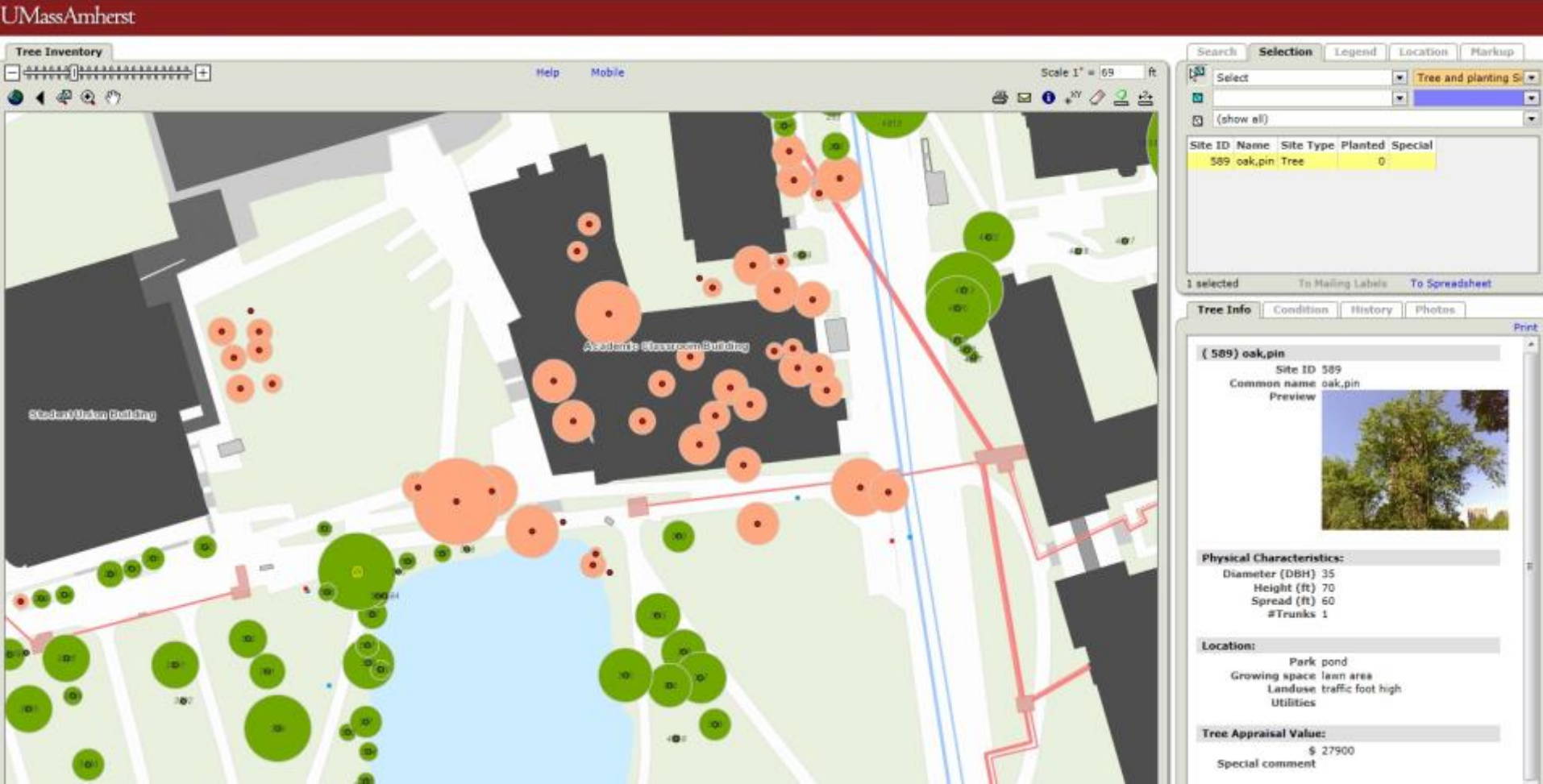
(589) oak,pin

Site ID 589
Common name oak,pin
Preview 

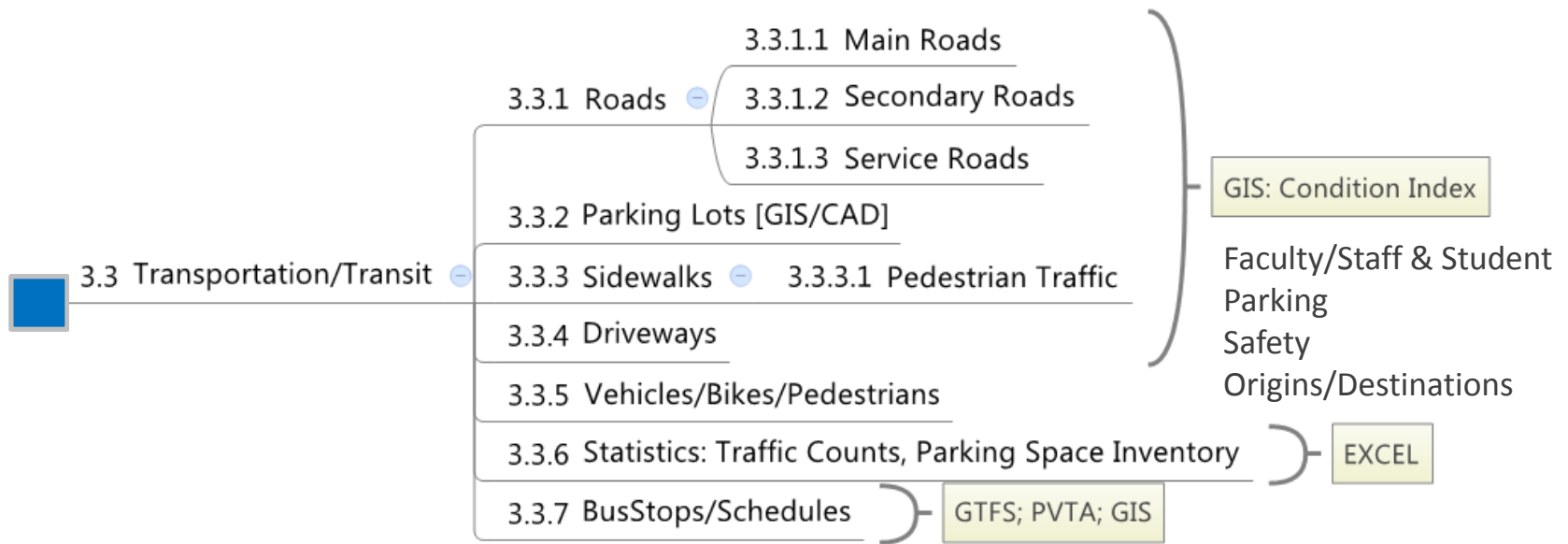
Physical Characteristics:
Diameter (DBH) 35
Height (ft) 70
Spread (ft) 60
#Trunks 1

Location:
Park pond
Growing space: lawn area
Landuse: traffic foot high
Utilities

Tree Appraisal Value:
\$ 27900
Special comment



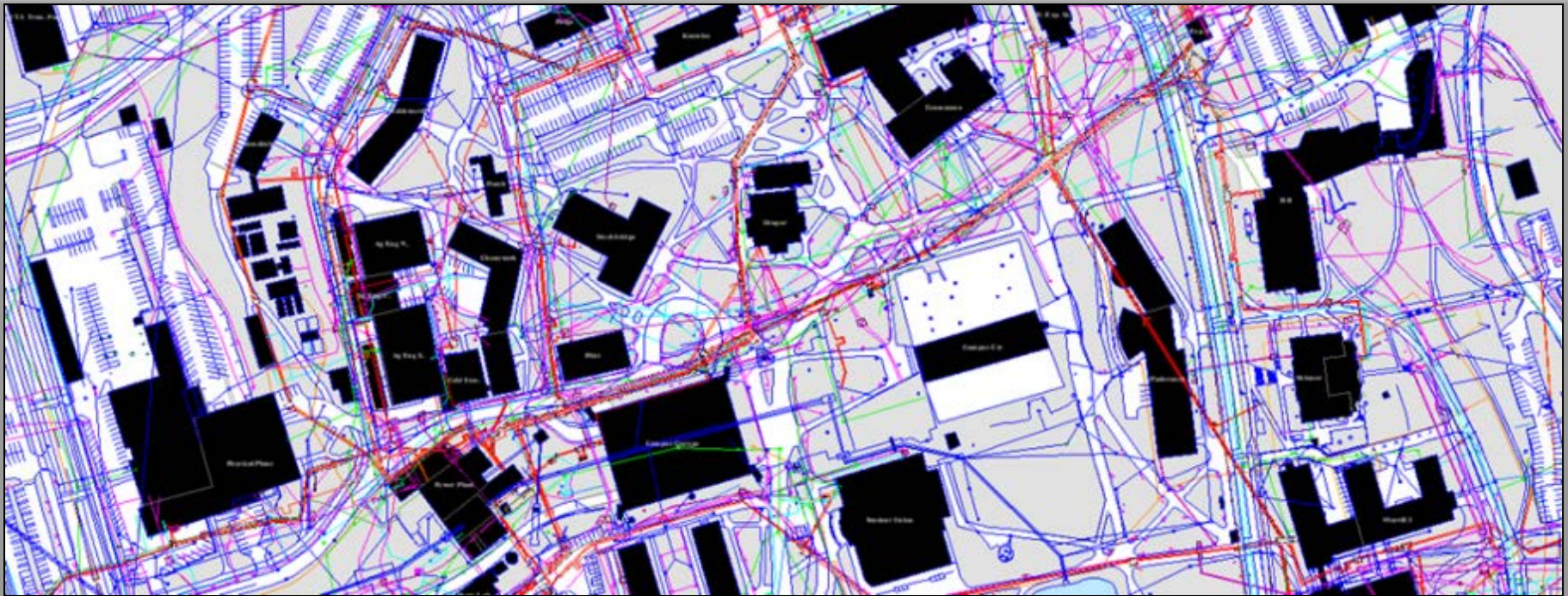
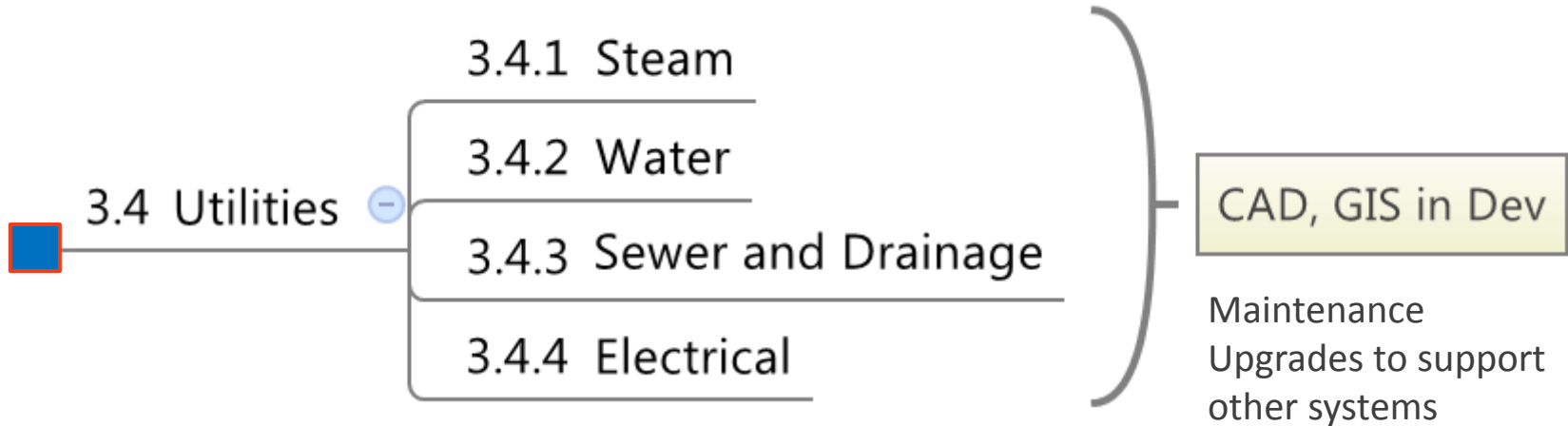
Campus as Systems: Transportation/Transit



Campus as Systems: Transportation/Transit



Campus as Systems: Utilities



Campus as Systems: Utilities

UMassAmherst

Utilities and Infrastructure Condition: Steam Utilities

Scale 1" = 139 ft

Help Mobile

Life Sciences Laboratories

Academic Classroom Building

Student Union Building

Infrared Survey

Infrared Survey 2014

Search Selection Legend Location Markup

Select Steam Infrared Surveys

(show steam-leaking areas)

OBJECTID	LocationID	Name	Comments	SurveyYear
12	Steam10			

1 selected To Mailing Labels To Spreadsheet


Steam Infrared Surveys Print

Steam Infrared Survey Area:

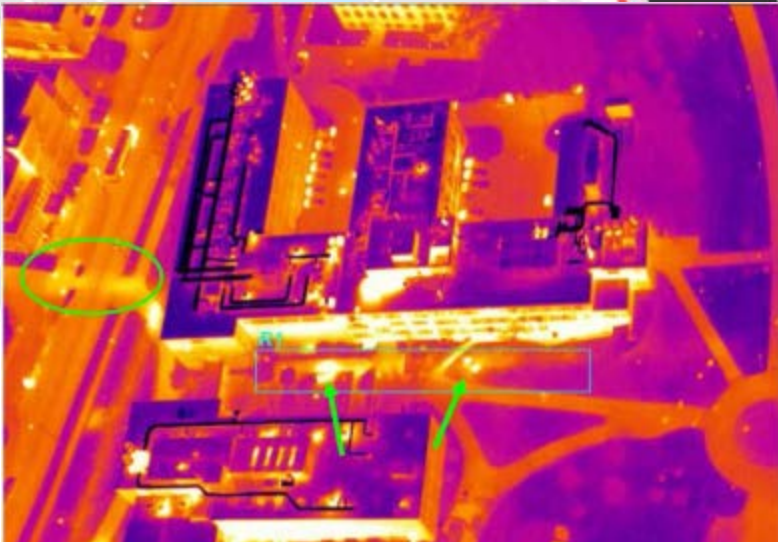
- LocationID: Steam10
- DocName: Steam10.pdf
- DocType: PDF
- IrYear: 2013
- StudyName: Infrared Survey

Survey Report Excerpt:

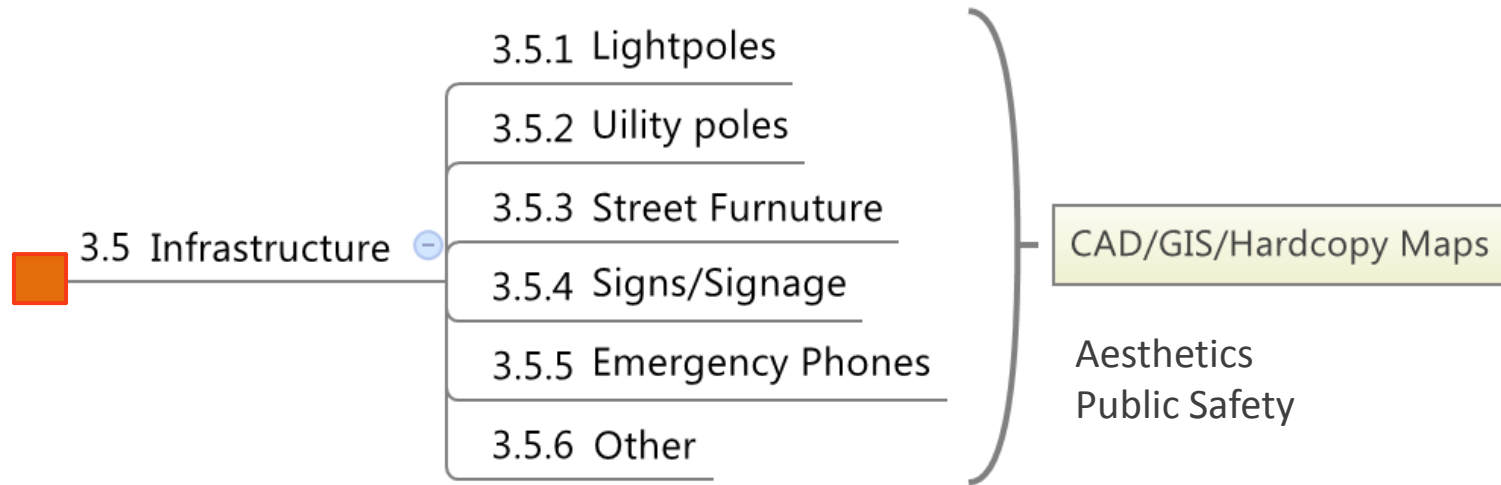
Click to view



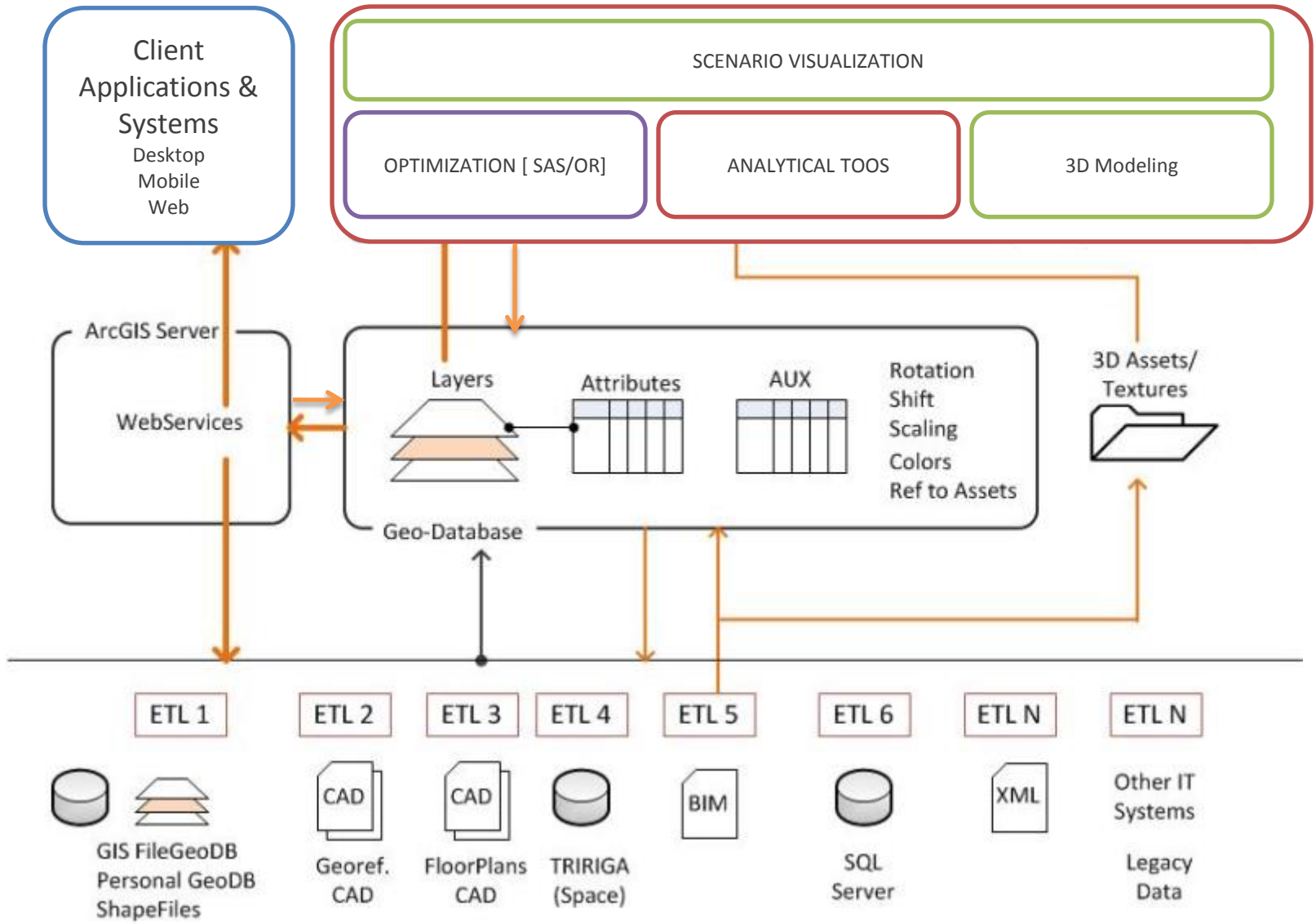
DocURL



Campus as Systems: Infrastructure

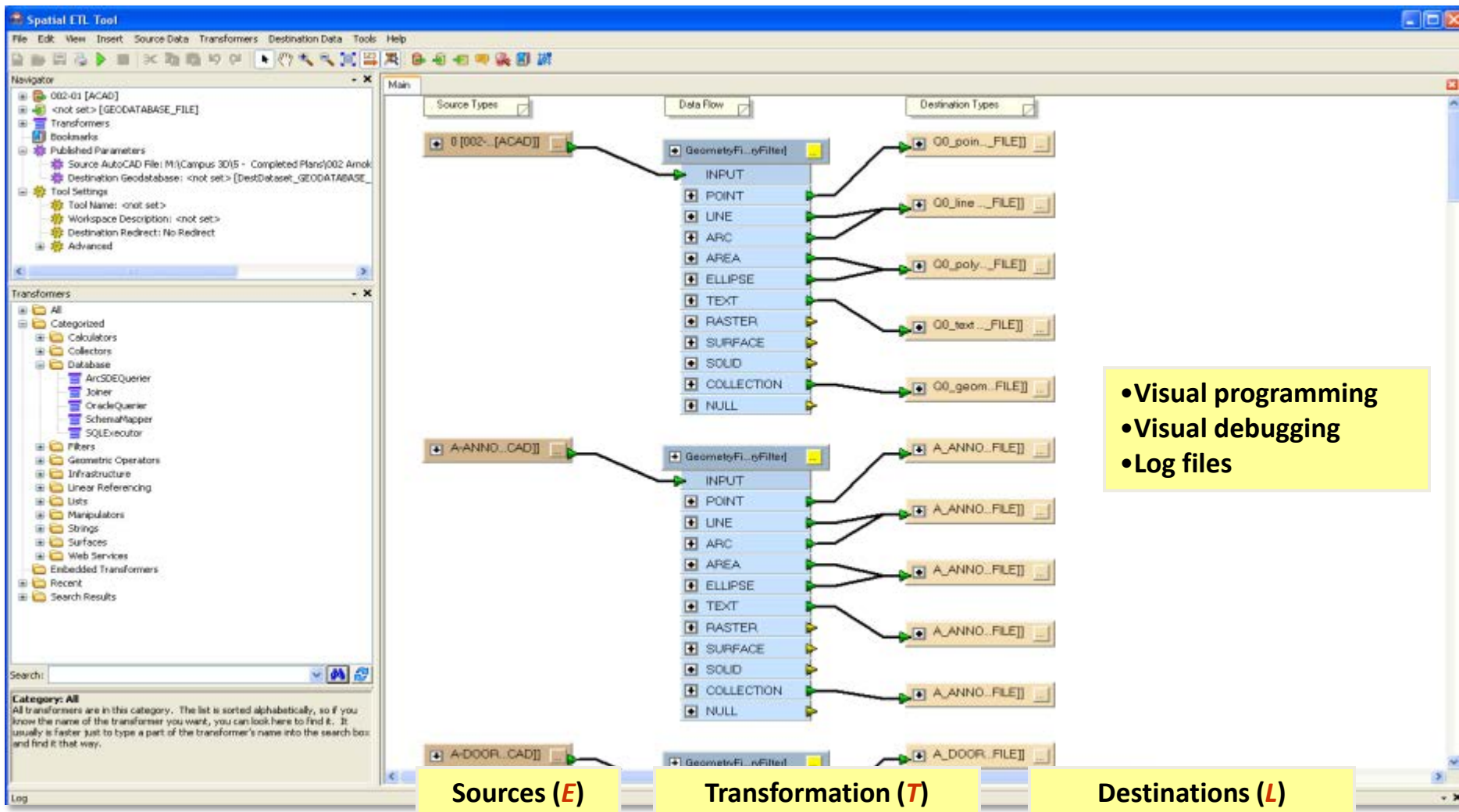


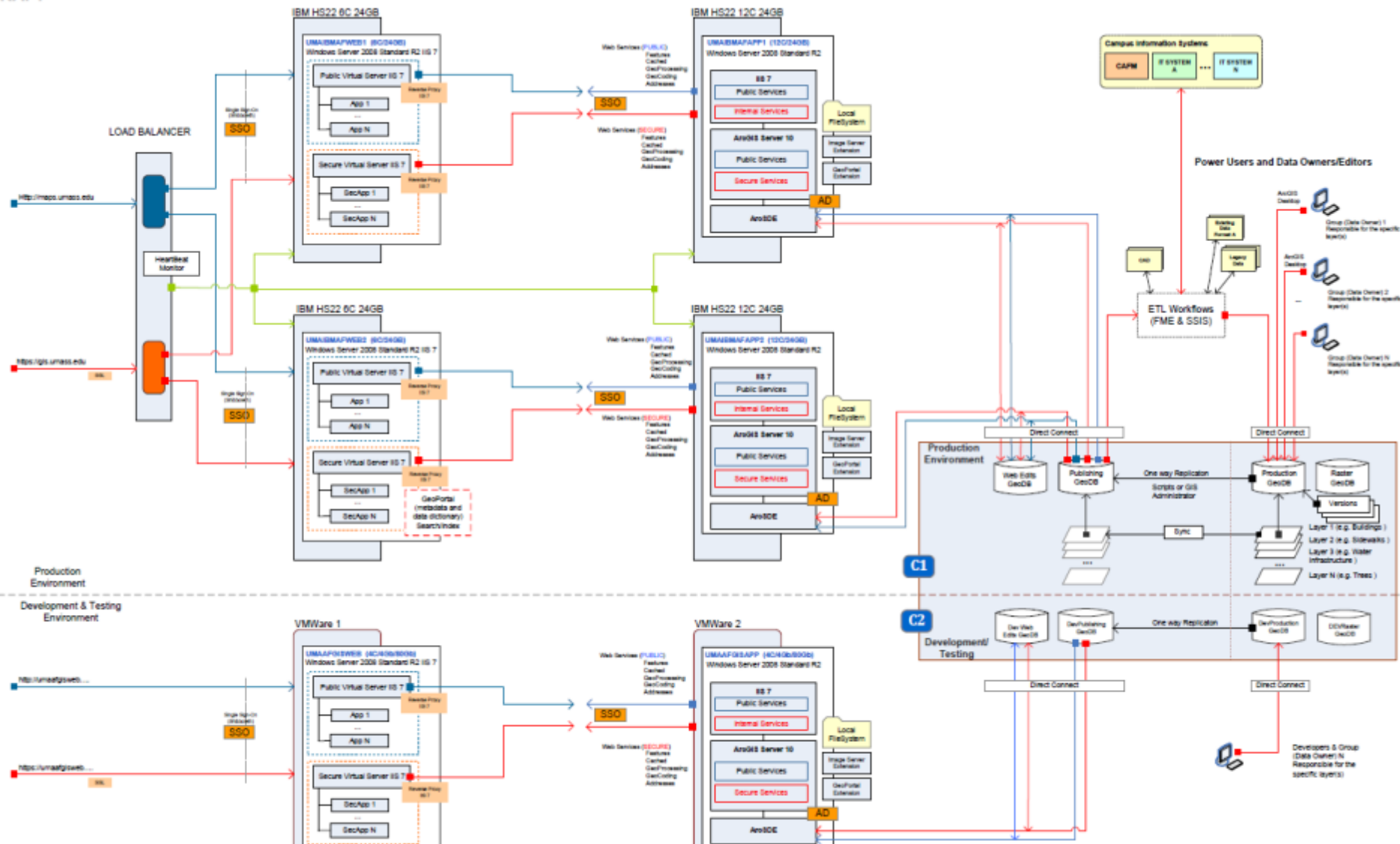
Data & Analytical Workflows (WF)



Data InterOperability WorkBench

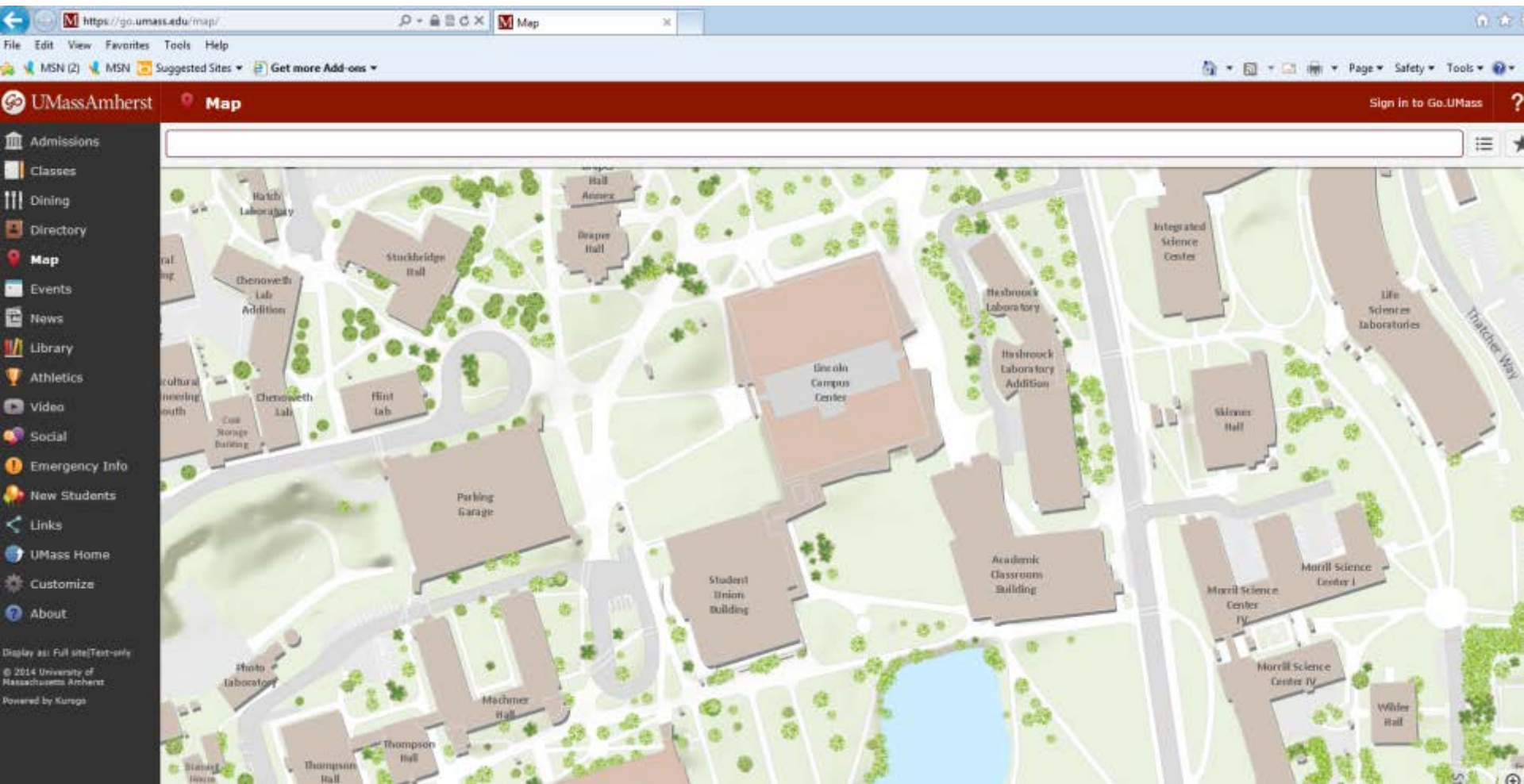
Support for more than 300 data formats





GIS Architecture (Version 0.4) DRAFT
 September 19, 2011
 Web editing database was added to the repository

Student Portal Web Map



Staff GIS Viewer

Facilities Planning & Campus Planning

UMass Campus | Aerial Photos | Topography | Utilities | Space | Historic Architecture Survey

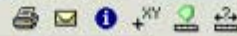
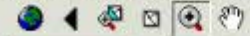
Size



Help

Floors 2

Scale 1" = 10 ft



Selection | Legend | Location | Markup

Select Survey Photos

(show all)

Project	Comment
BAKER BUTTERFIELD FIRE UPGRADE	
BAKER BUTTERFIELD FIRE UPGRADE	
BAKER BUTTERFIELD FIRE UPGRADE	
BAKER BUTTERFIELD FIRE UPGRADE	
BAKER BUTTERFIELD FIRE UPGRADE	
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BAKER BUTTERFIELD FIRE UPGRADE	
BAKER BUTTERFIELD FIRE UPGRADE	
BAKER BUTTERFIELD FIRE UPGRADE	

11 selected To Mailing Labels To Spreadsheet

Photo Info

BAKER BUTTERFIELD FIRE UPGRADE Print

ID 595A6AAA69A9AAC01D54D4FE3500068B

Comment

Source

Go to [EDMS](#) [Click Here](#)

FileName BakerButterfieldFireUpgrade_f-12.jpg

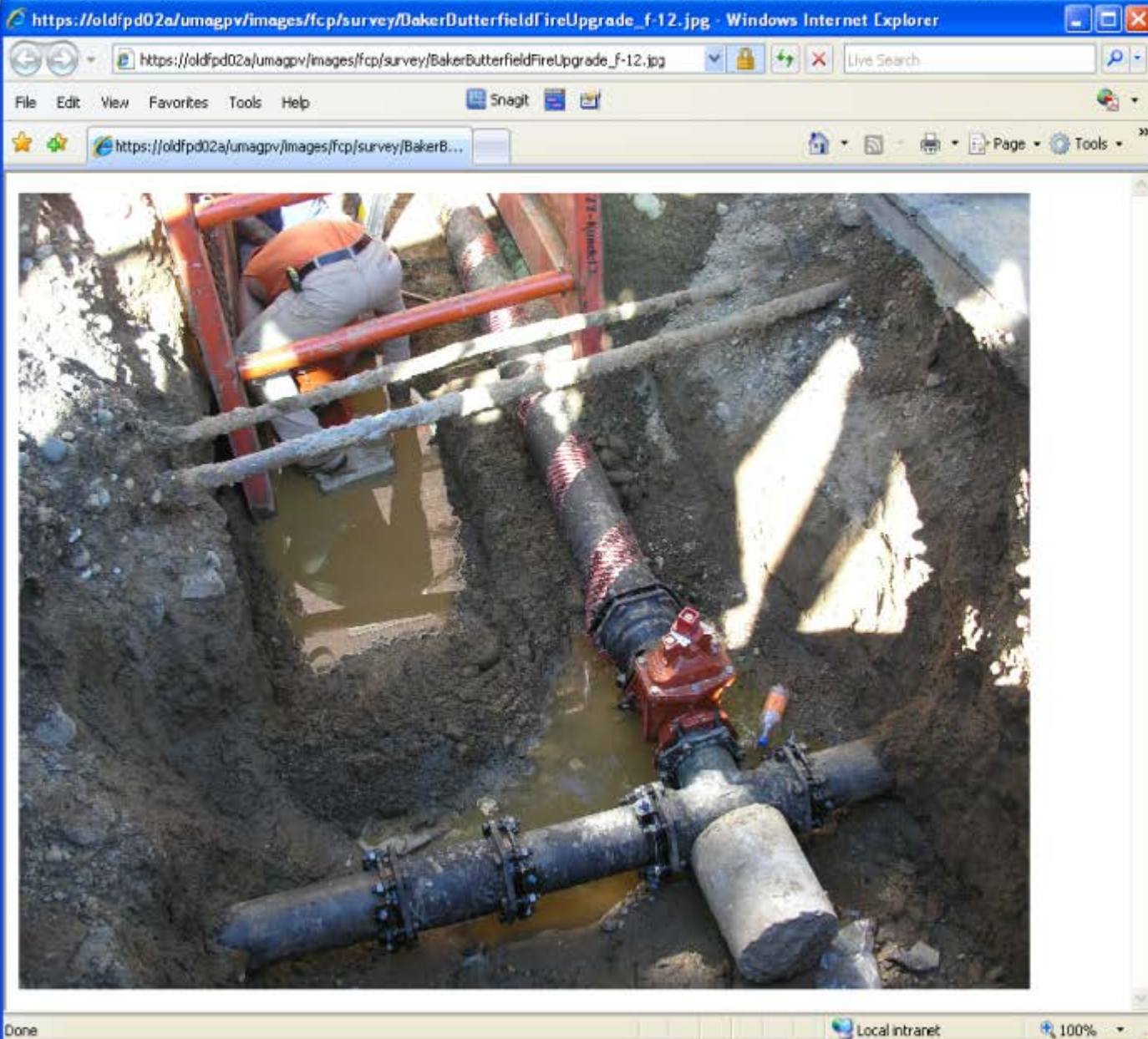
Preview



FP&CP SharePoint Go

AppGee

Save Map as Image



action Legend Location Markup

Select Survey Photos

(show all)

Object	Comment
ER BUTTERFIELD FIRE UPGRADE	
ER BUTTERFIELD FIRE UPGRADE	
ER BUTTERFIELD FIRE UPGRADE	
ER BUTTERFIELD FIRE UPGRADE	
ER BUTTERFIELD FIRE UPGRADE	
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Selected To Mailing Labels To Spreadsheet

Photo Info Print

BAKER BUTTERFIELD FIRE UPGRADE

ID 595A6AAA69A9AAC01D54D4FE350068B

Comment

Source

Go to [Click Here](#)

EDMS

FileName Baker ButterfieldFireUpgrade_f-12.jpg

Preview

Done Local intranet 100%

UMass Campus Aerial Photos Topography **Utilities** Space Historic Architecture Survey

Size

Floors Sub-Ba: Scale 1" = 47 ft

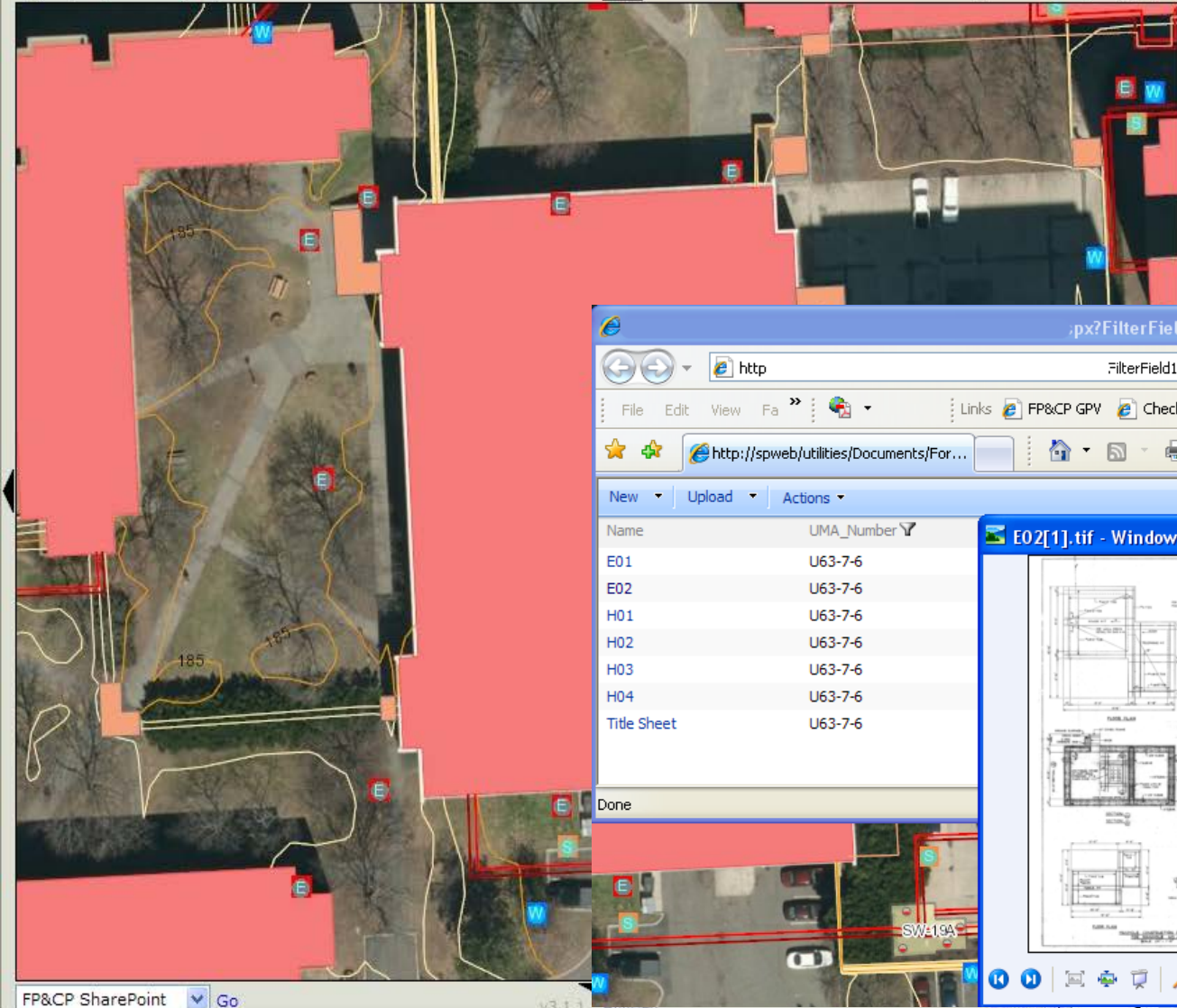
Help Print Mail Info XY Layers Layers

Selection Legend Location Markup

Select Utility Contracts

(show all)

U63-7-6	1965	Electric and Telecom	Additions to St
U63-7-6	1965	Electric and Telecom	C Additions to
U63-7-6	1965	Steam	Additions to St
U63-7-6	1965	Steam	C Additions to
U63-7-6	1965	Steam	Additions to St
U63-7-6	1965	Steam	C Additions to
U63-7-6	1965	Steam	Additions to St
U63-7-6	1965	Steam	C Additions to
U63-7-7	1965	Water	
U63-7-7	1965	Water	
U63-7-7	1965	Water	



http FilterField1=UMA_... FilterValue1=...

http://spweb/utilities/Documents/For...

Name	UMA_Number
E01	U63-7-6
E02	U63-7-6
H01	U63-7-6
H02	U63-7-6
H03	U63-7-6
H04	U63-7-6
Title Sheet	U63-7-6

Done

E02[1].tif - Windows Picture and Fax Viewer

1

Staff Viewer: Mark-up Tools

UMassAmherst

Utilities and Infrastructure Condition: Steam Utilities

Help Mobile Scale 1" = 139' ft

The screenshot displays a GIS application window. The main map area shows a campus layout with black building footprints, white roads, and red utility lines. A prominent red polygon is labeled "IDB Project Area". A yellow dashed box labeled "Ground Survey 2014" is also visible. The interface includes a top navigation bar with "Help" and "Mobile" links, and a scale indicator of "1 inch = 139 feet".

Search Selection Legend Location Markup

Your Name: Niels La Cour (CP)

Category: Utilities Management

Markup Group: [New](#) [Zoom To](#) [Delete](#) [To KML](#)

Title: [untitled] Lock

Text: IDB Project Area Glow

Created By	Title
02/27/15 Niels La Cour (CP)	[unbidd]
02/27/15 Niels La Cour (CP)	IDB Project Area

Staff Viewer: Mark-up Tools

The screenshot displays a GIS application interface with three main components:

- Map Window:** Titled "Utilities and Infrastructure" with a sub-tab "Condition: Steam Utilities". It shows a map with a red boundary and a yellow callout box labeled "Infrared Survey 2014". The scale is 1" = 139'.
- Markup Panel:** Located on the right, it includes a "Search" tab and a "Markup" section. The "Markup" section shows:
 - Your Name: Nels La Cour (CP)
 - Category: Utilities Management
 - Markup Group: New Zoom To Delete To HTML
 - Title: [untitled]
 - Lock:
 - Text: IDB Project Area
 - Glow:
- Message Window:** Titled "Map - Message (HTML)", it shows an email composition interface with the following details:
 - To: Raymond Jackson
 - Subject: Map
 - Body: "Hi Ray, here is the project <https://gis.umass.edu/apps/gpv/viewer.aspx?state=253104261695> Ctrl-Click to follow link"
 - Body: <https://gis.umass.edu/apps/gpv/Viewer.aspx?state=253104261695>

Staff Viewer: Mark-up Tools

UMassAmherst

Utilities and Infrastructure Condition: Steam Utilities

Help Mobile Scale 1" = 139' ft

The screenshot displays a GIS application interface. The main map area shows a campus layout with black building footprints and red utility lines. A prominent red polygon is labeled "IDB Project Area". A yellow dashed box on the map is labeled "Ground Survey 2014". The interface includes a search bar at the top right, a legend, and a markup panel on the right side. The markup panel shows the user's name as "Niels La Cour (CP)", the category as "Utilities Management", and the markup group as "New". The title of the markup is "[untitled]". The markup is a text annotation "IDB Project Area" with a glow effect. The markup panel also shows a table of created markups:

Created By	Title
02/27/15 Niels La Cour (CP)	[unbidd]
02/27/15 Niels La Cour (CP)	IDB Project Area

Campus Planning Web Page

Web site was developed as permanent platform for web based participation process, communication and planning resources.

Over 3,500 Visits

UMASS AMHERST *campus planning*
a division of facilities & campus services

[home](#) • [master planning](#) • [maps and information](#) • [related links](#) • [about us](#) • [contact us](#)

THE PLAN IN PROCESS

the long view
Understand the issues in campus development and how we're creating "a culture of planning."

INFORMATION YOU CAN USE

more than maps
Sure, we have maps, but you can also find reports, meeting schedules, GIS links and more.

GET INVOLVED

it's your campus
Contribute to our blog, come to a meeting, or send us email. Tell us what you like, or don't, about your campus.

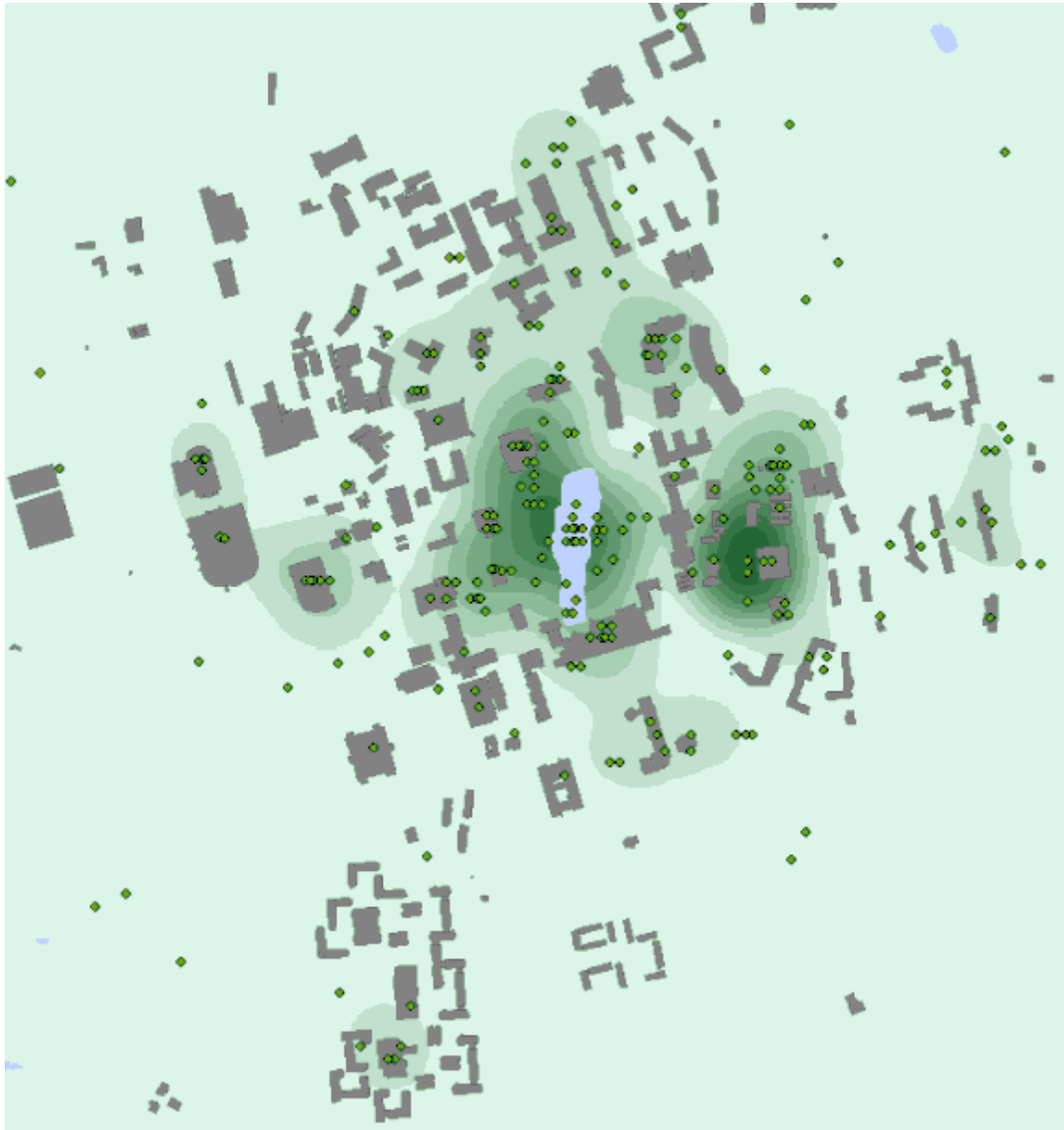
[home](#) • [master planning](#) • [maps and information](#) • [related links](#) • [about us](#) • [contact us](#)

This page is maintained by UMass Amherst Campus Planning

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UMASS AMHERST *campus planning*
a division of facilities and campus services

Web Based Survey “Likes”



People like good outdoor spaces with nice plantings and views.

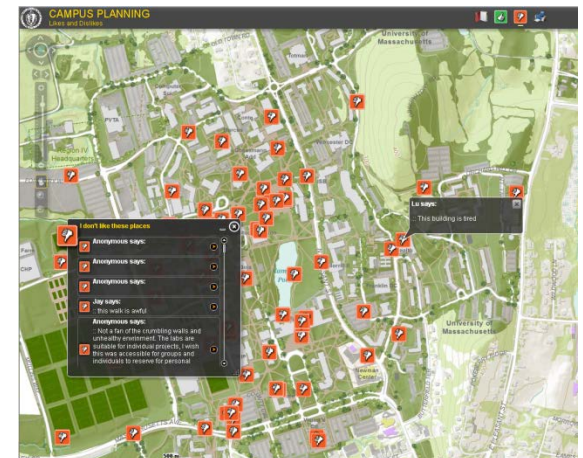
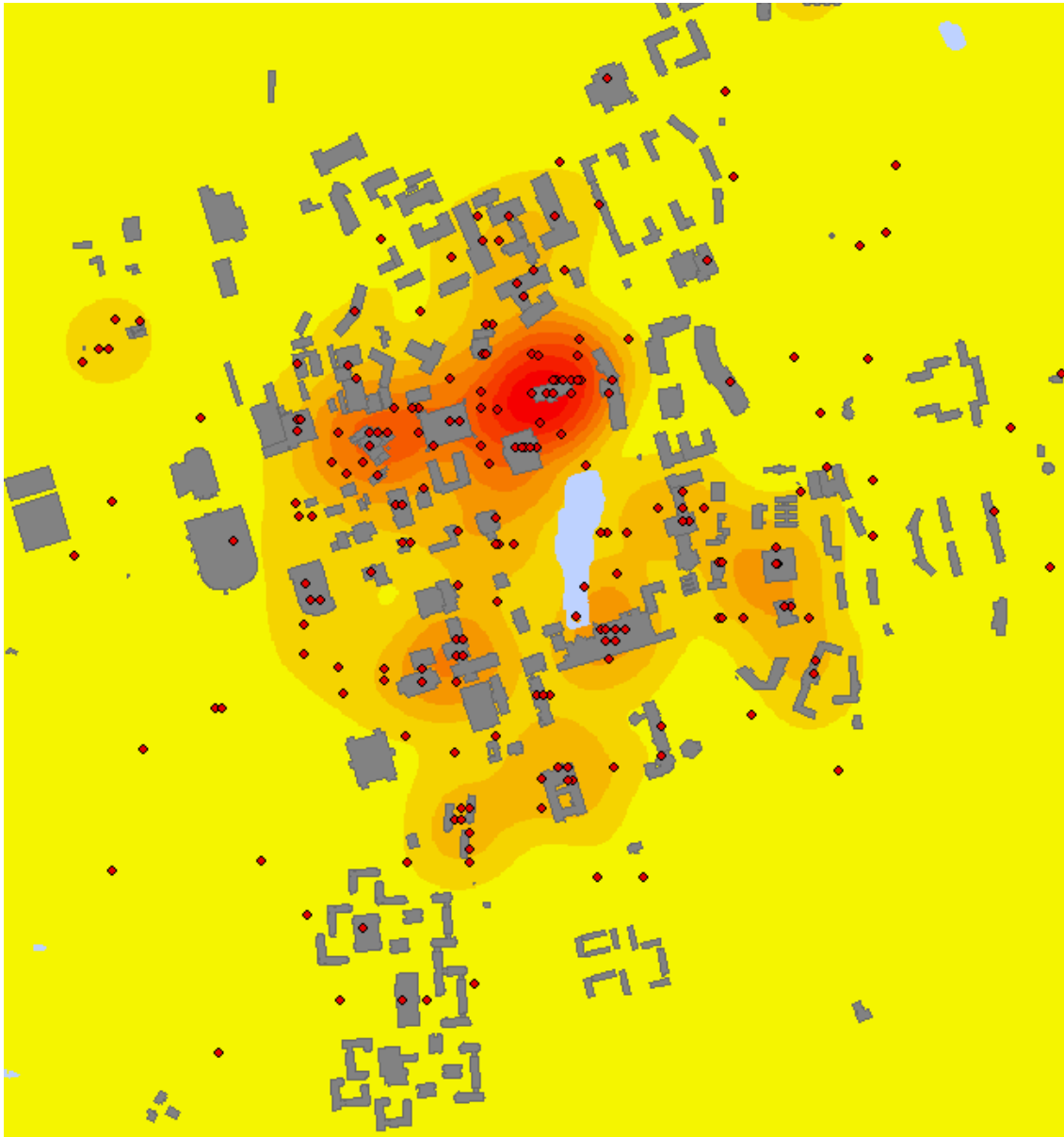
People like the views from the campus core.



Web Based Survey “Dislikes”

People comment on tired old buildings that need to be demolished and replaced.

People don't like cars where only pedestrians should be and there are complaints about dangerous crosswalks and intersections.





Master Plan Explorer: Introduction

campus planning , a division of facilities and campus services



The University of Massachusetts
Campus Master Plan

Why is it important?

Having a strategic plan of long-term growth and development is crucial for any successful organization.

The Master Plan outlines major phases of long term development of our Campus, which will sustain and support the University's mission.



Slide group:

- Creating a culture of planning
- Commenting on the Plan's Ideas
- Navigation and Control
- Start the Master Plan Explorer App

Download:



Complete Report
48 Mb
(as November 17, 2011)

Share and Contact:

- [Contact Campus Planning](#)
- [Facebook](#)
- [Twitter](#)



Master Plan Explorer

campus planning , a division of facilities and campus services

Find building:



Master Plan



Future Options



Phase One



Campus 2011



Transparency



Filter by Type:

All Types

Legend:

- Proposed buildings
- Existing buildings



East Campus Pond Lawn



SubTitle: Protect and Enhance Open Space

Phase: 2

SiteDesc: The East Campus Pond Lawn is one of the largest and most visible of the Campus green spaces. It is also one of the most historic landscapes on campus, together with the west lawn, remnants of the "Central Park" or "Campus Green" shown in historic plans. The

Tags:

Details

Additional Info

Comments



Master Plan



Future Options



Phase One

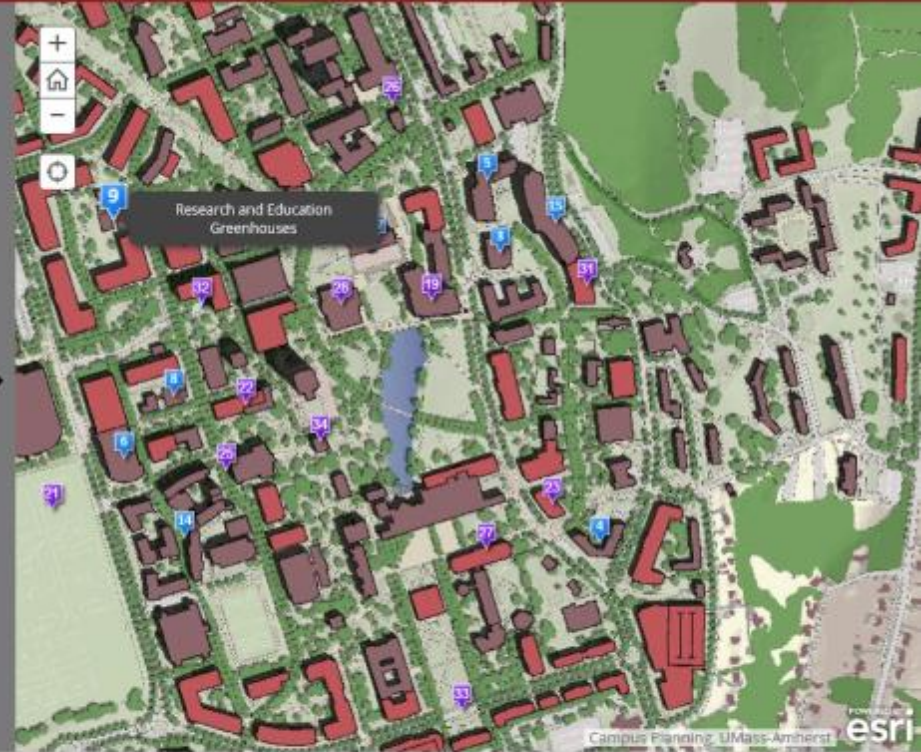


Campus 2011



Transparency

Master Plan Story Map



UMass has over 300 Sustainability Related Courses



- **New Faculty Fellows program launched:**
 - 11 Fellows for 2013/14
 - Partners: E&R + CFT + Library
- **Research: \$31M Annually**
 - Almost \$1 in every \$4 of total research expenditures.

Course	Title and description	Credits	Meeting Days	Term
ARCH-DES 497A	ST-Sustainable Building Systems Students will engage in a process of research and analysis of sustainable, energy efficient, and...	3 cr	TU	Fall 2013
ARCH-DES 497B	ST-Sustainable Design This course provides an introduction to the principles of sustainable design, exploring emerging...	3 cr	TU	Fall 2013
ARCH-DES 520	Building Physics I Studio and lecture. Energy conservation in contemporary residential construction. Emphasis on:...	3 cr	TU TH	Fall 2013
BCT 150	The Built Environment We will explore the issues of sustainability from the perspective of the built environment, our...	4 cr	M W	Fall 2013
BCT 211	Energy Efficient Housing Energy conservation in contemporary residential construction. Emphasis on: energy efficient...	3 cr	TU TH	Fall 2013
CE-ENGIN 462	Water Resources Engineering and Sustainability Methods for sustaining natural hydrologic conditions and controlling flooding in land development...	3 cr	TU TH	Fall 2013
CE-ENGIN 509	Transportation System Analysis Introduction to transportation systems analysis and modeling as applied to the urban transportation...	3 cr	TU TH	Fall 2013
ECO 691A	S-Current Research in Environmental Conservation Provides graduate students with a broad sampling of new and cutting-edge research related to...	1 cr	F	Fall 2013
ECO 697PS	S-Perspectives on Sustainability Description not available at this time	3 cr	F	Fall 2013
ECON 308	Political Economy of the Environment Application of the theories of political economy to environmental problems and issues. Topics...	3 cr	TU TH	Fall 2013

LEARN



NSF Project Will Support Undergraduates Research in Offshore Wind Energy

NSF Project Will Support 10 Undergraduates Per Summer for UMass Amherst Research in Offshore...

[Read more »](#)

LIVE



New E-Waste Recycling Bin in the SGA office!

A new electronic waste collection bin has been installed in the SGA office located in room 420...

[Read more »](#)

LEAD



NSF Grant Funds Sustainable Agriculture, Clean Energy Partnership

The NSF has awarded an \$810,000 grant to create collaborative programs combining clean energy...

[Read more »](#)

IN THE SPOTLIGHT



Jordan Chan
Fellow & Secretary of Sustainability

UPCOMING EVENTS

Apr 09 Strengthening Ties for Collective...
UMass Amherst Campus

[Read More](#)

Apr 10 Strengthening Ties for Collective...
UMass Amherst Campus

[Read More](#)

[Show all events »](#)

ENGAGE



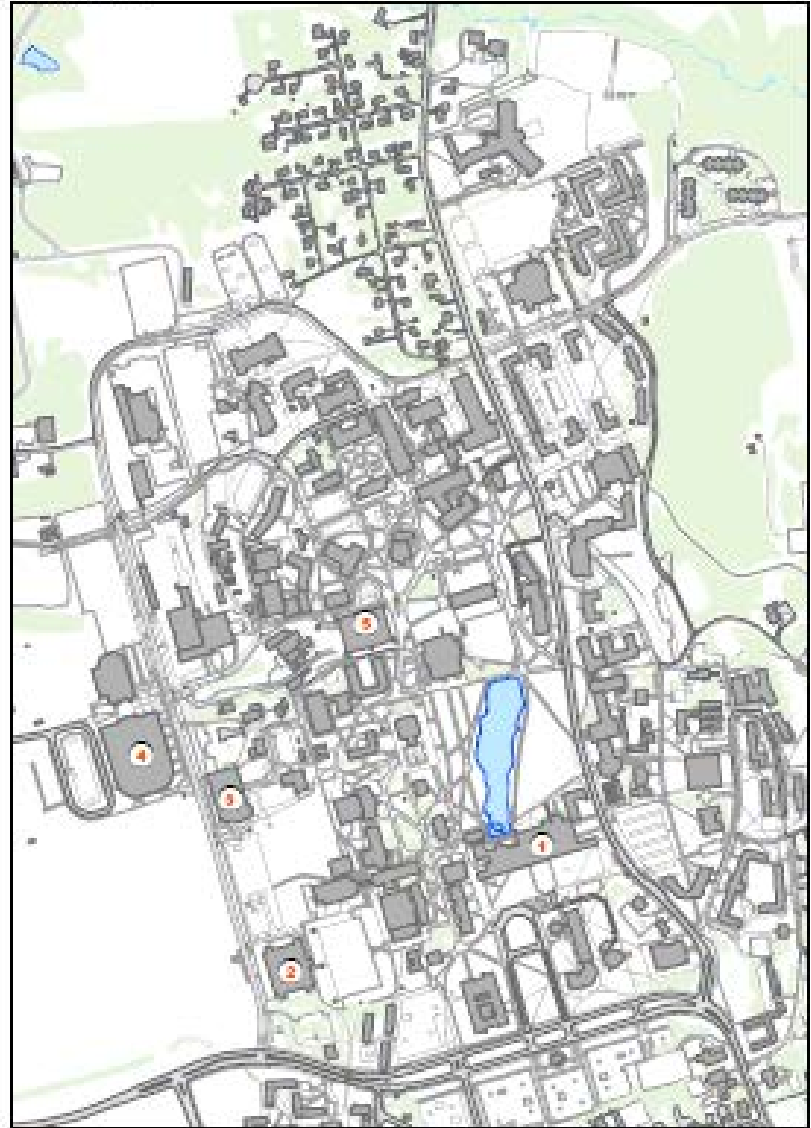
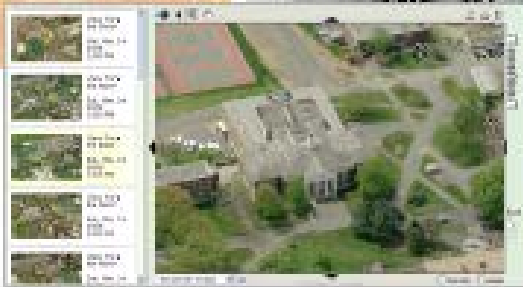
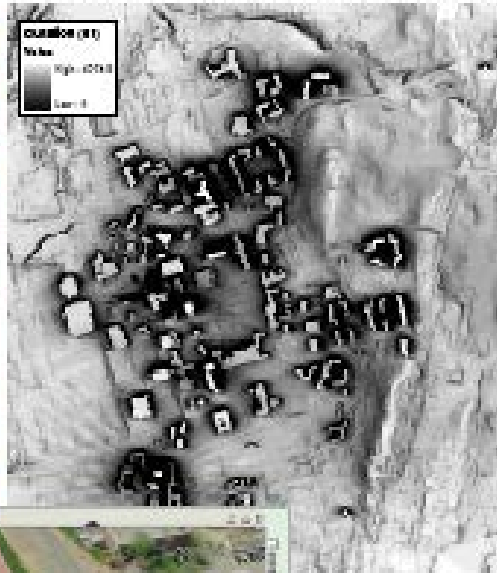
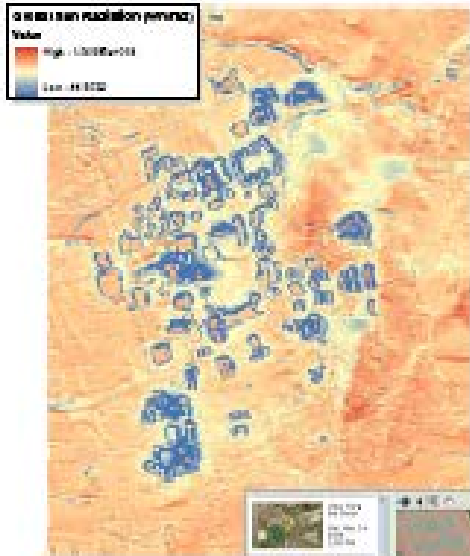
Sustainability Explorer

Campus Sustainability Explorer



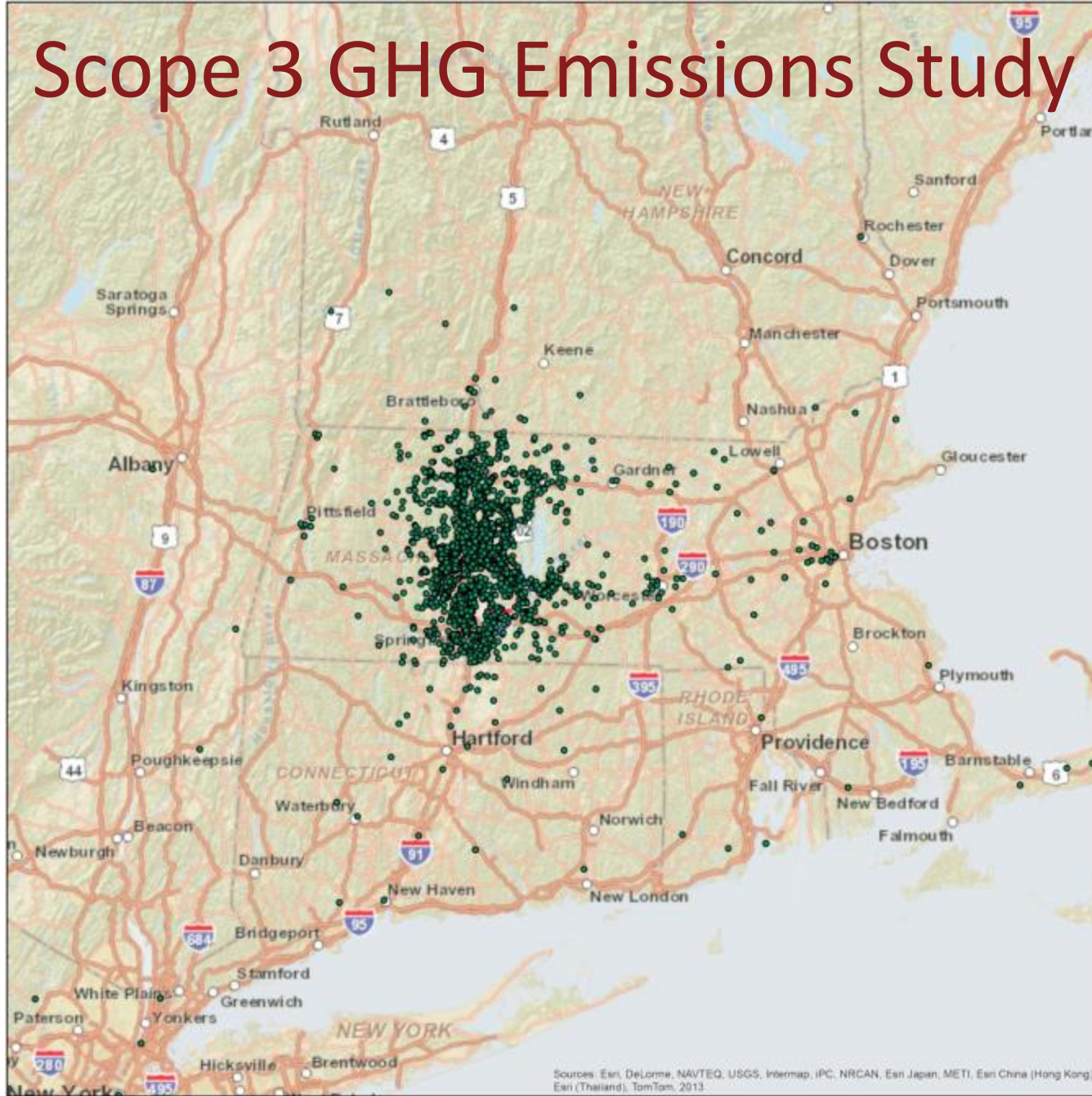
Solar Panel Siting Study

Finding Potential Sites for Solar Panel Locations



Building	Area (sq ft)	Roof Type	Orientation	Shading	Estimated Potential (kWh/yr)	Estimated Potential (\$/yr)	Notes
001 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
002 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
003 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
004 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
005 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
006 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
007 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
008 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
009 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
010 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
011 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
012 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
013 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
014 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
015 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
016 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
017 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
018 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
019 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
020 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
021 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
022 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
023 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
024 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
025 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
026 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
027 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
028 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
029 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
030 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
031 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
032 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
033 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
034 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
035 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
036 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
037 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
038 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
039 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
040 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
041 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	
042 Student Center	1,111,000	Flat	South	Low	1,000,000	\$1,000,000	

Scope 3 GHG Emissions Study



Waugh Arboretum Viewer

The Waugh Arboretum
Created by Todd Beals & Sasha Stipanov
UMass Campus Trees Website

Search for Trees

Click one of the following task items to execute query.

- Botanical Name: Genus or Genus species >
- Common Name: Pine or Pine, White >
- Building >
- Commemorative Trees >
- Champion Trees >
- Class Trees >
- Historic Trees >
- Sesquicentennial Planting 2014 >
- Labeled Trees >
- Appraised Value > \$20,000 >
- Site ID Number >

Map labels include: Knowles Engineering Building, Goessmann Laboratory Addition, Goessmann Laboratory, Draper Hall Annex, Draper Hall, Stockbridge Hall, and various tree species names like oak, maple, beech, and dogwood.

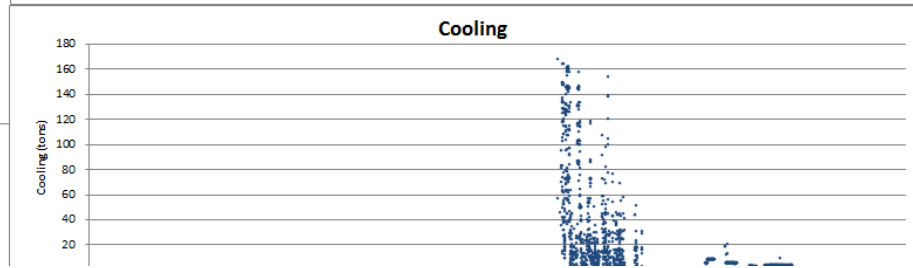
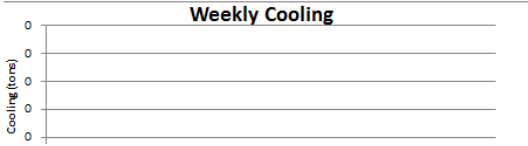
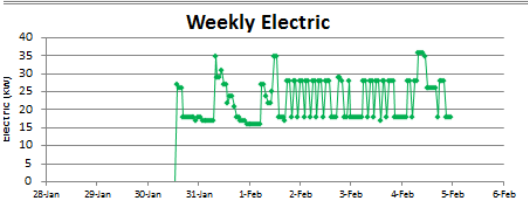
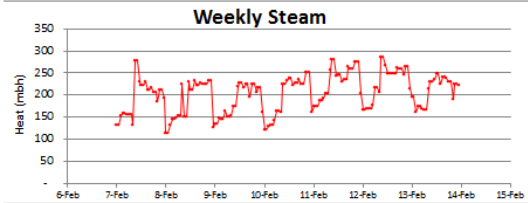
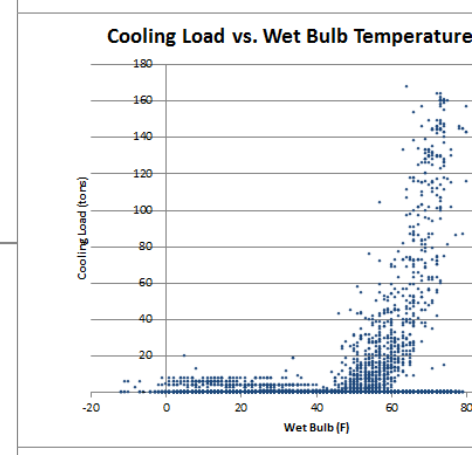
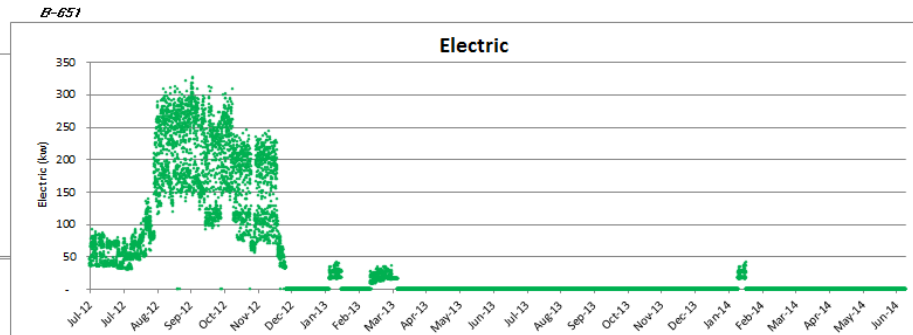
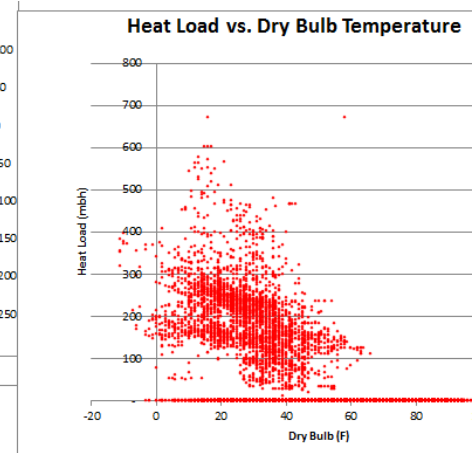
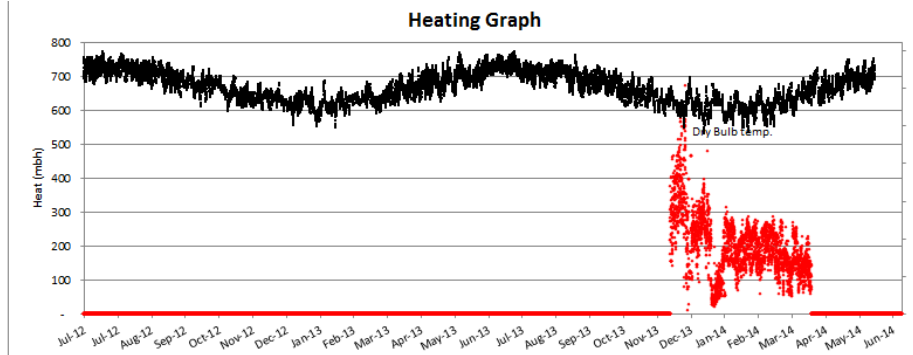
Building Energy Data

B-357 HAMPSHIRE DINING HALL

Area 47,311 gsf Energy Intensity Rank
 FY2013 - - Elect. FY2013 327kw 6.9 w/gsf
 FY2014 672 mbh 14 B/h/sf Elect. FY2014 411kw 0.9 w/gsf
 ak Chw 168 tons 282 sf/ton

	Heat			Elect		
	2013	2014	Diff.	2013	2014	Diff.
Jul	-	-	-	39,887	-	(39,887)
Aug	-	-	-	65,296	-	(65,296)
Sep	-	-	-	162,545	-	(162,545)
Oct	-	-	-	146,916	-	(146,916)
Nov	-	-	-	113,822	-	(113,822)
Dec	-	186,202	186,202	64,098	-	(64,098)
Jan	-	134,425	134,425	719	719	-
Feb	-	127,535	127,535	5,494	3,138	(2,356)
Mar	-	126,658	126,658	10,462	-	(10,462)
Apr	-	27,635	27,635	160	-	(160)
May	-	-	-	-	-	-
Jun	-	-	-	-	-	-
Total	-	602,455	602,455	609,419	3,857	(605,562)
Factor	No Meter	10%				
EFLH	No Meter	897				

Weekly Graphs Steam Electric CHW
 Start Day 02/07/14 01/29/13 08/01/13



Campus Energy Benchmarking Explorer

QuickTime Player File Edit View Window Help

Campus Energy Benchmarking Explorer

https://umass-amherst.maps.arcgis.com/home/webmap/viewer.html?useExisting=1#

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Save Share Print Directions Measure Bookmarks Find address or place

About Content Legend

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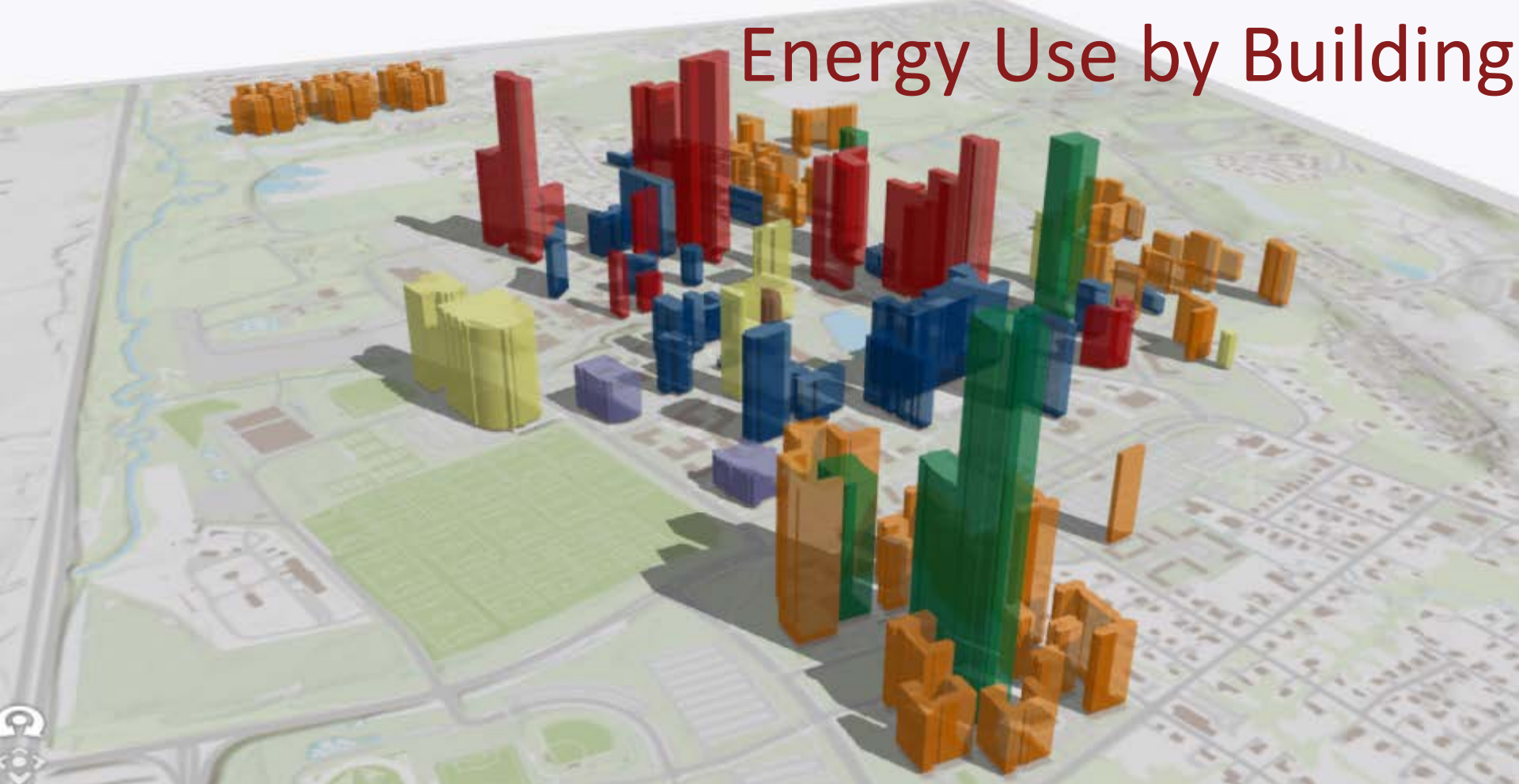
- Residential
- Recreation
- Library
- Health
- Dining
- Administration
- Laboratory
- Academic
- Energy Consumption FY13
- Energy Consumption FY-12
- Energy Consumption FY11
- Energy Consumption FY10
- BNC Sustainability Energy Explorer - UMass Building Shadow
- Topographic

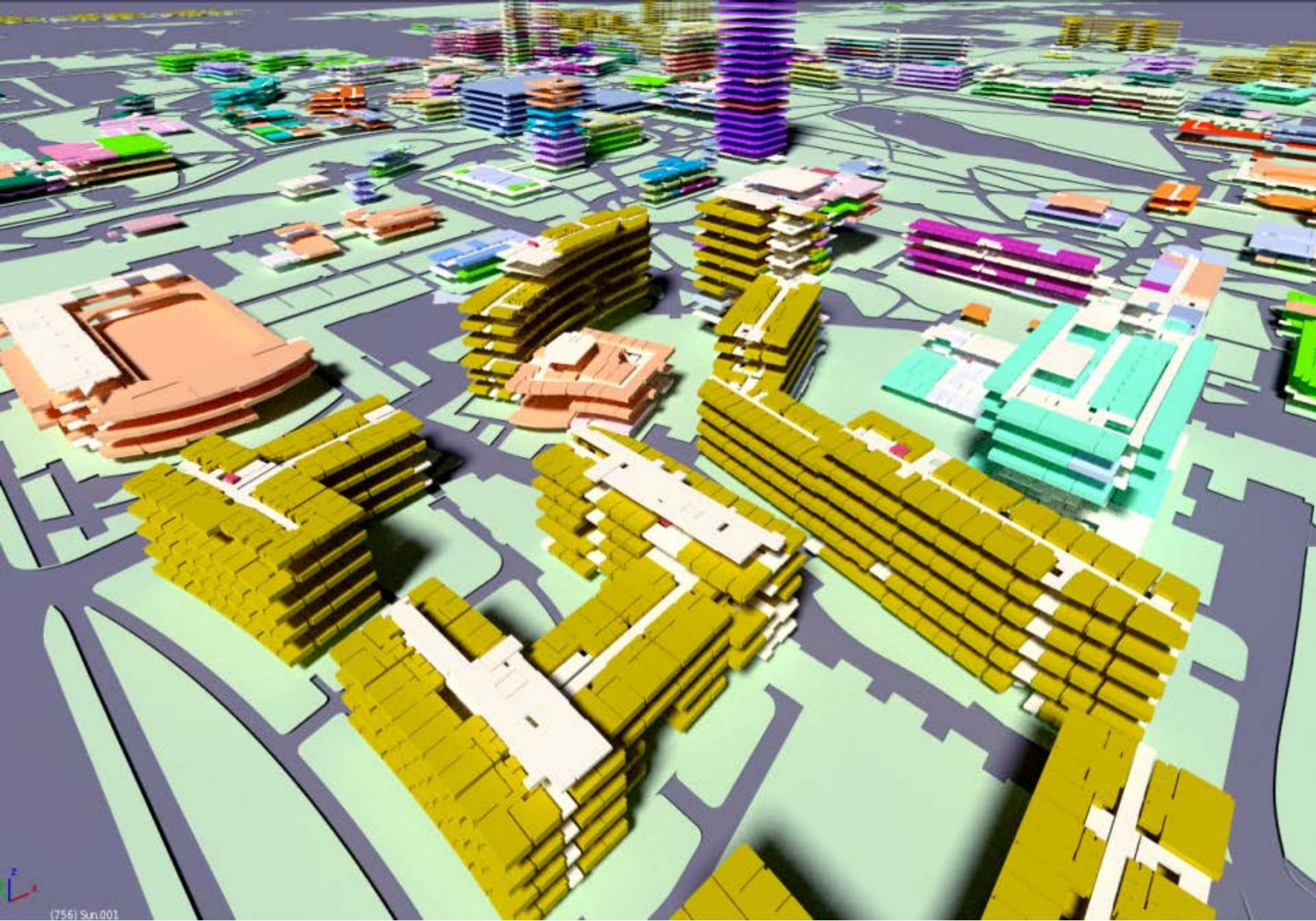
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Energy Use by Building





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