



Newsletter



“Passing the Torch”

Volume 7, Number 1

June 2003

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I write this shortly after attending my last Task Force meeting, as it is time for me to pass the torch. It was 8 years ago when I offered to serve on what was then the BDS task force with the hope of contributing to the development of a state-of-the-art, user-oriented bridge design software product. Since that time, both Opis and Virtis were born and have evolved from conceptual ideas into reality.

During my tenure I observed first hand the exemplary efforts, dedication and teamwork of the Task Force members, Contractor team, TAGs and User Group, all who have been key to bringing effective products to the bridge community. The consistent commitment to success and forward thinking of the participants have kept the products ‘fresh’ and well positioned for sustained future improvements. My involvement as a part of this team effort has been personally rewarding.

The future presents many challenges and opportunities. Full implementation of

LRFD, including LRFR, are key challenges where Virtis and Opis must be positioned to play a major role. I will continue to have a personal interest in Virtis truss module, Opis substructure, and other possible new analysis capabilities, and offer my continued input and ongoing support to these present and future development efforts.

I am very pleased that Brian McCaffrey from New York State DOT will be taking my place on the Task Force. I have the fullest confidence that Brian will build on significant contributions he has already made to Virtis/Opis through his participation with the user group and TAGs as well as from the vital role he plays in New York’s Virtis implementation initiative.

My most sincere thanks to AASHTO, the Task Force Chairs and members and to the BridgeWare community.

Many Thanks...

...to George Christian for his eight years of service on the Virtis/Opis Task Force. His bridge wisdom, leadership and professionalism will be truly missed. We wish George the best as he continues his “other job” as the State Bridge Engineer for NYSDOT. George assures us that he passes his torch to the capable hands of Brian McCaffrey, also from NYSDOT.

— Ken Hurst

— George A. Christian
Virtis/Opis Task Force Member

Virtis/Opis 5.0 Released April 4th

By Ken Hurst, Task Force Chairman

Version 5.0 of Virtis and Opis superstructure products introduces many new features. The following summarizes these new features:

- Floor system superstructures comprised of girders, floorbeams and stringers are supported. Both the line and system approach of entering data are available. Three types of floor system superstructures are available: Girder-Floorbeam-Stringer, Girder-Floorbeam and Floorbeam-Stringer superstructures. These superstructures can have concrete decks and steel members.
- Timber deck rating is available.
- Timber decks on steel beams are supported.
- Reinforced concrete decks on timber beams are supported.
- A new deck type, named "Generic", has been added to provide dead load computations for deck types other than concrete or timber.

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Web-Based Support Center

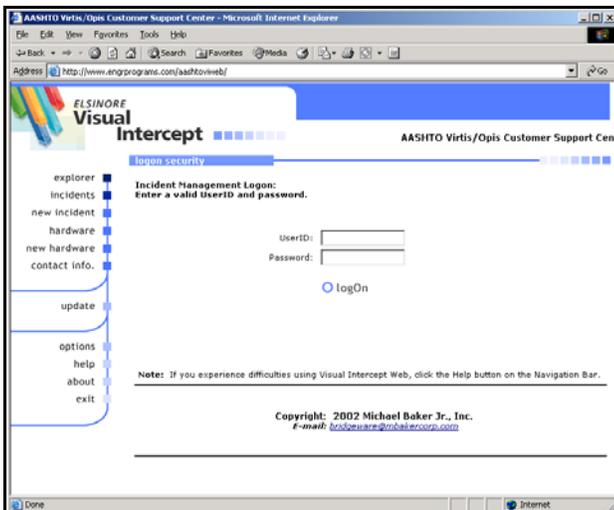
By Joe Ihnat

One of the tools used every day by the Virtis/Opus development team is Visual Intercept. Alpha and Beta testers use Visual Intercept to report problems discovered during the testing phase. It's also one of the ways we communicate with our customers.

A DOT or consultant normally chooses a contact person, then registers that person with us by returning the Technical Support registration form. Then we provide the contact person with a user id and password for our Visual Intercept incident database.

An incident can be a bug report, a technical question, or an enhancement request that the user may have. The contact person can access Visual Intercept by clicking on the Support Center link on the Virtis/Opus Technical Support home page. After logging on, a user can enter new incidents, check on the status of previous incidents, and even examine incidents entered by other users. You may find that your problem or question has already been addressed.

When entering a new incident it's helpful for the contact person to provide as much information as possible. After an incident has been entered, it is assigned to a developer. The status of the incident is usually changed to "Assigned" while it is being worked on. Occasionally, more information about the incident will be required from the user, in which case the developer will change the status to "Information Needed". When the developer believes he or she has fixed the bug or answered the question, the status will be changed to "Resolved". The contact person then has the opportunity to "Accept" the resolution or can "Resubmit" the incident. The contact person should check back often for changes in incident status.



Developers also enter their own incidents to track issues that need to be addressed during the development process. These development incidents are not available through the Support Center. Together with the incidents entered by users, these form a

rudimentary "to do" list for each developer. The Visual Intercept database contains all of the incidents entered since before version 2.0 was released!

Our customers may also submit questions via email. However, oftentimes an incident will be created on the user's behalf using the text of the email.

Virtis/Opus Technical Support home page: <http://aashto.engrprograms.com/virtis/>
 Virtis/Opus Technical Support email address: Bridgeware@mbakercorp.com

Visual Intercept is a product of Elsinore Technologies.

communication tools

User Group Meeting

The annual meeting of the Virtis/Opus and BRASS User Groups is scheduled from August 21st through 23rd at Gulf Shores, Alabama. Robert Fulton of the Alabama Department of Transportation will host the meeting.

The User Group meeting will be preceded by a one-day training session on August 20th. There will be several different training sessions to choose from: Fundamentals training for new users; advanced training in the latest Virtis/Opus features; Virtis/Opus API for Third Party developers and BRASS training. Those planning to attend any of the training sessions are asked to bring their laptop computer with the latest version of the software installed.

The 2½ day meeting will feature product updates, work plan overviews, discussions with the Virtis-Opus Task Force and plenty of discussion concerning future plans and prioritization of enhancement requests. Contact Robert Fulton at 334-242-6281 or fultonr@dot.state.al.us for more information.

Virtis/Opis Database Migration Wizard

By Mehrdad Ordoobadi

Since the consistency of database structure and data is a key element for Virtis/Opis software to function properly, the migration of the database is one of the most important, complicated and sensitive tasks as new versions of the software are released.

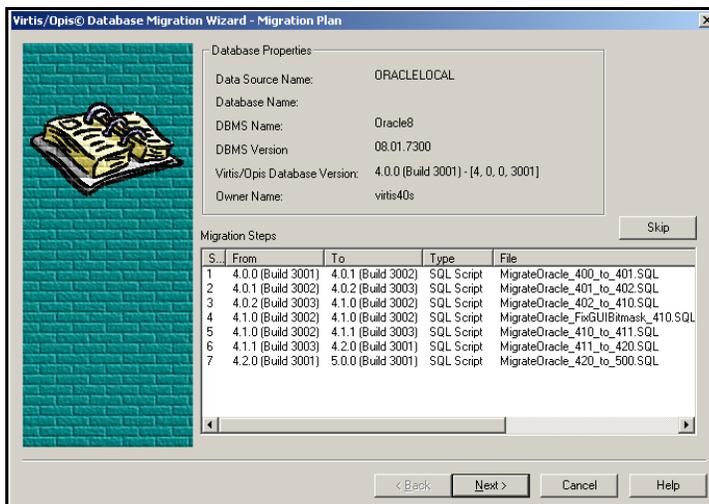
Issues that make the migration process complicated are identified below:

- The user is not familiar with the database software.
- The user does not know how to backup and recover a database.
- The user does not know who owns database schema and migrates the database while connected to the database as another database user.
- The user runs the wrong migration scripts against the database.
- The user runs the migration scripts more than once.
- The migration process takes a long time and it appears to hang.
- The SQL utilities for Oracle and SQL Server/MSDE do not notify the user if an error takes place during the migration. The user needs to examine the spool file in order to make sure that no errors were reported after the migration is completed. In case of error, the user needs to redo the entire migration process.

“...the Database Migration Wizard...makes the migration process easier, faster and more reliable....”

The Virtis/Opis team is developing the *Database Migration Wizard*, a software that makes the migration process easier, faster and more reliable for end-users and also database administrators. This new product offers the following features:

- Supported database types: Oracle, SQL Server/MSDE and Sybase SQL Anywhere.
- Speedy migration process. The amount of time used to migrate Virtis/Opis databases is significantly reduced with this tool.
- Ease of use.
- Allows migration of an old database (as old as version 4.0.0) to a more recent version.
- Database structure is validated before the migration starts. This prevents partially migrated databases to be migrated again. It also ensures the consistency of the migrated database.
- Makes a backup copy of SQL Server/MSDE or Sybase SQL Anywhere database before migration.
- Recovers the database from backup if there were errors.
- Migration Log File with detailed information about the database and the migration process. The log file also contains SQL Server/MSDE and Sybase SQL Anywhere database recovery instructions.
- If the program runs into an error during the migration, it gives the user various recovery options.



The Database Migration Wizard will be ready for distribution with the next release of Virtis/Opis.

Opis Substructure Update

By Krishna Kennelly

The Opis substructure project was started in July 2001. Sixteen states have committed funding focused on providing LRFD capabilities for pier design. The overall objective is to provide capabilities for users to design the common pier types — primarily frame, column bents and wall piers. This new addition to Opis will allow the engineer to design piers in conjunction with Opis existing superstructure capabilities or as a stand-alone tool for substructure design using a different superstructure package.

Work is now focusing on the first deliverable scheduled for early 2005. This version will include description, analysis, load generation, load combinations and overall structural analysis results for the basic pier types. Specification checking and automated design tools and wizards will be added in later releases.

A Technical Advisory Group (TAG) for substructures was formed in December 2001. The TAG is chaired by Kevin Western, a Task Force member from Minnesota. The TAG is comprised of the following volunteers:

- Mitch Hiles, Tennessee
- Tom Kurtenbach, Illinois
- Gregg Freeby, Texas
- Tom Koch, North Carolina.

A load management document that describes the procedures Opis will use to compute the pier

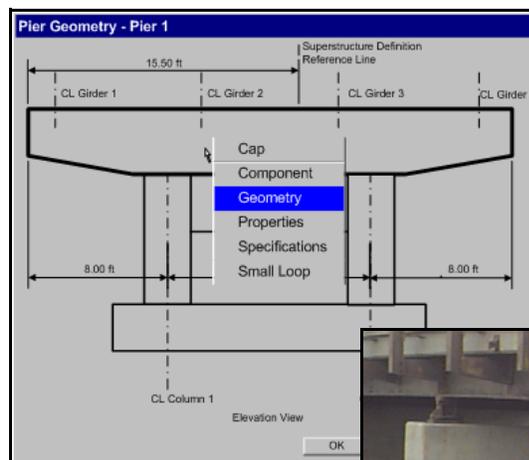
loads has been developed. This document details the step-by-step procedures involved in computing the pier loads and applying them to the pier. Aspects of the load calculations that should be agency-

expanding capabilities

configurable have been identified and are being incorporated into the overall system framework. One such aspect is the distribution of longitudinal loads to the piers in a structure. It is anticipated that the method of load distribution will vary between agencies. As such, the Opis substructure framework will allow for agencies to tailor the computations to their needs. The TAG is currently reviewing the load management document and providing guidance on the proposed load computations.

Design of the graphical user interface is well underway. Mockups of the windows in the system have been developed and are being reviewed by the TAG. The next system design task is the database design, which will be underway soon.

Development for the first release (with the exception of the finite element analysis engine, which is nearly completed) will start this summer and conclude in July 2004. This will be followed by approximately five months of testing.

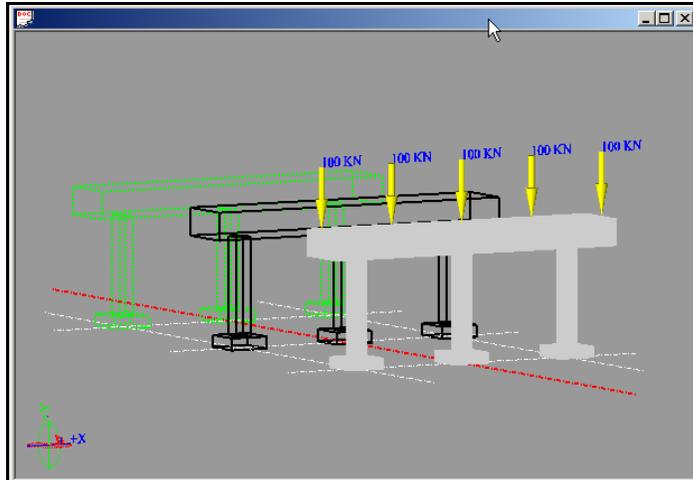


New Three-Dimensional Graphics Engine Considered for Opis

By Girish Bhanushali

A new graphics engine is being prototyped for Opis Substructure. The engine is based on OpenGL, which is a low-level graphics language included with Windows 2000 and XP capable of producing very sophisticated three-dimensional graphics. The prototyping involves exploring the capabilities of the language and determining how it can effectively be used to produce three-dimensional graphics of substructure units such as piers.

The major responsibility of the new graphics engine is to provide three-dimensional graphics capabilities for the design engineer to view the pier model. This includes definition of the geometry of the substructure unit including dimensions, assignment of material properties and reinforcement. With the current capabilities of the prototype, a user can generate the three-dimensional model of a pier with a few clicks of a mouse button. The engine can also be used to generate graphics for viewing the loads to be applied to the model. It is capable of displaying the finite element model



showing elements and nodes and for viewing actions such as shear force, bending moment and displacements resulting from the finite element analysis. Objects in the model can be selected to navigate to windows for viewing detailed information about the object or editing the properties of the object.

“An important objective during the prototyping was to evaluate the effort required to develop these capabilities in a cost-effective manner for use in Opis Substructure.”

OpenGL is based on scenes and each scene is composed of individual objects. Each object (e.g. text, line, sphere, point, 2D face, footing, pier, cap, etc.)

identifies itself with a unique ID and can be selected, rotated, translated, scaled and modified individually. The user can zoom, pan and rotate the model with mouse movements or keyboard actions. Separate orthographic, perspective, top, side or elevation views in different windows or the same window can be displayed.

The prototyping was driven by the above engineering requirements as well as software aspects such as reusability and future extensibility of the code. An important objective during the prototyping was to evaluate the effort required to develop these capabilities in a cost-effective manner for use in Opis Substructure. This requires a carefully designed framework of software classes that encapsulate the OpenGL programming interface. Such a framework allows for efficient software development.

Integrated BRIDGEWare Capabilities Under Development

By Paul D. Thompson

The past year has seen significant progress in building linkages between Virtis/Opis and Pontis. It is now possible to store data for all three products in the same physical database, to run all three on the same computer, and to send Virtis rating results to Pontis. An integrated Startup Guide incorporates the experiences of several agencies with installing and integrating the product suite. Now, work is continuing on several new, shared capabilities. These include:

- Report writer. Reports generated from Virtis will be able to include Pontis data about the bridge, roadways, inspections, and structure units, along with the associated customizable agency tables.
- Document management. Virtis/Opis will take advantage of the document management features

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“5.0 Released...” *Continued from Page 1*

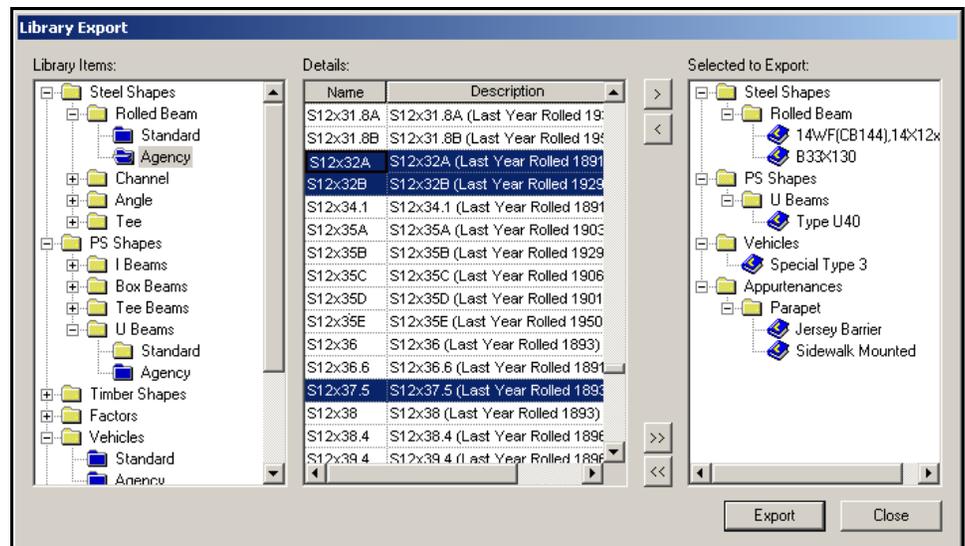
- The following additional prestressed beam shape templates are supported:
 - Precast I-beams with a top flange that acts as the deck
 - Precast I-beams with no top flange
 - Precast Tee-beams (single and multiple stems)
 - Precast Tee-beams (single and multiple stems) with a top flange that acts as the deck
 - Precast U-beams
- A Library Import/Export feature provides the capability of exchanging library data between BridgeWare databases.
- An XML file, named "old rolled shapes.xml", containing 1558 historical steel rolled shapes is provided with this release. It is compiled from "Historical Record, Dimensions and Properties: Rolled Shapes, Steel and Wrought Iron Beams & Columns, as rolled in U. S. A., Period 1873 to 1952," with sources as noted/compiled and edited by Herbert W. Ferris, and published by the American Institute of Steel Construction. The Library Import feature can be used to import these steel rolled shapes into the BridgeWare database.
- The Bridge Exchange feature provides the capability of exchanging bridges between repository (typically a state DOT) databases and consultant databases while maintaining a history of events and analysis results. In conjunction with this new feature, the BridgeWare Admin program provides the ability to specify a database as repository or consultant.
- The Report Tool can now produce a report from the Bridge Explorer.
- The Report Tool can now produce a report that includes analysis results. Selections for analysis event groups and attributes have been added to member alternatives in the Report Tool window.

Library Data Exchange

By Herman Lee

With the release of version 5.0, a new capability has been added to the Library Explorer to exchange library items between BRIDGEWare databases. This feature allows users to export selected library items to an XML file that can be imported into another BRIDGEWare database. The ability to exchange library data enforces the requirements of modeling with the same components or performing rating with the same customized vehicle. This also eliminates the risk of manually creating the same library item in different BRIDGEWare databases. The export and import features are available to users that have the correct access privileges granted in Libraries and Library Import. Without

the correct privileges, the Export and Import items in the File menu will be disabled. For export, users need to have Read privilege for the Libraries. For import, users need to have Write and Create privileges in both Libraries and Library Import. Both the export and import windows allow the user to pick and choose the available library items. To safeguard the existing library data, the import will check for duplicates to prevent overwriting customized data. All imported library items will be located in their respective Agency folders.



Meet the Project Team

This issue of the *Virtis-Opis Newsletter* features articles written by our development team. Several members have been part of the team since 1997, and each serves a key role in delivering the professional bridge design and load rating software available. We are extremely proud of their contributions, and anticipate their continued success in enhancing the software in the years to come. The Team:



Mehrdad Ordoobadi – Mehrdad’s primary role is lead developer and administrator of the Virtis-Opis database. He has a Masters degree in Structural Engineering from Shiraz University and a Masters degree in Computer-Aided Engineering from Carnegie Mellon University. Mehrdad has been an integral part of the Virtis/Opis team since 1997.

Krishna Kennelly – Krishna is a senior bridge engineer with 14 years of experience in bridge design and computer software engineering. A graduate of the University of Pittsburgh with an M.S.C. E., Krishna leads the design and engineering development of the system and is a primary architect of the graphical user interface design for much of the system.



Joe Ihnat – Joe is a graduate of the University of Pittsburgh with a B.S. in Applied Mathematics. Joe has several key roles on the project, primarily as developer of the Graphical User Interface. He also takes care of much of the User support through maintenance of the Visual Intercept customer support center.

Herman Lee – Herman is a registered professional engineer and a graduate of the Colorado State University with a Masters degree in Civil Engineering. Herman is the Jack-of-all-trades regarding Virtis since he gets involved in many different parts of the system including Windows development, engineering development, maintenance and testing.



Girish Bhanushali – A graduate of the University of Florida with a Masters degree in Civil Engineering and Computer Information Science, Girish is the newest member the project team. Girish has worked primarily on the Opis substructure project prototyping a new navigational and data display approach using the 3D graphics engine Open GL.

Brian Goodrich – Brian is employed by BridgeTech, Inc. and is a graduate of the University of Wyoming with a Masters degree in Civil Engineering. Part of the project team since 1997, Brian’s primary role has been to develop the interface software between the Virtis/Opis systems and the BRASS analytical and specification checking systems.



Project Management and Technical Advisory Team – Our oversight and planning team consists of Technical Manager Jim Duray, Project Manager Jeff Campbell of Michael Baker Jr., Inc. and Technical Advisors Jay Puckett of BridgeTech, Inc. and Paul D. Thompson.

“Integrated...”

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recently added to Pontis, to associate photos, graphics, reports, etc. with Virtis/Opis bridges.

- Import/export. A functional requirements document is under development for a new import/export facility that might be shared among the BRIDGEWare products. This facility will use the new standardized ASCII file format known as XML. Among other

things, the facility will be able to transfer data from earlier versions of the products to later ones.

In addition, AASHTO is investigating the use of license management software that could be shared among any or all of the AASHTOWare products, to enable it to provide more licensing flexibility.

In the BRIDGEWare Strategic Plan, the integration of these products is seen as a springboard for many valuable future enhancements, such as the incorporation of life cycle cost information in bridge design; the ability to perform seismic and scour analysis for bridge management; support of research on the costs and effectiveness of preservation activities; and integration with the business processes of oversize/overweight permits, and asset management.

Export Challenges

By Brian Goodrich

The export process translates the Virtis®/Opis® *general* description of the bridge to a mathematical model targeted to a specific engine, such as BRASS™. In many cases, the general description can be directly applied to an engine. However, challenges are faced when the general description must be modified to conform to the format required by an engine.

Virtis®/Opis® permits describing steel girders using cross sections and ranges or schedules of beam shapes or plates. The BRASS™ engines only support the cross section method, so the shape and plate schedules are automatically converted to cross sections during the export process.

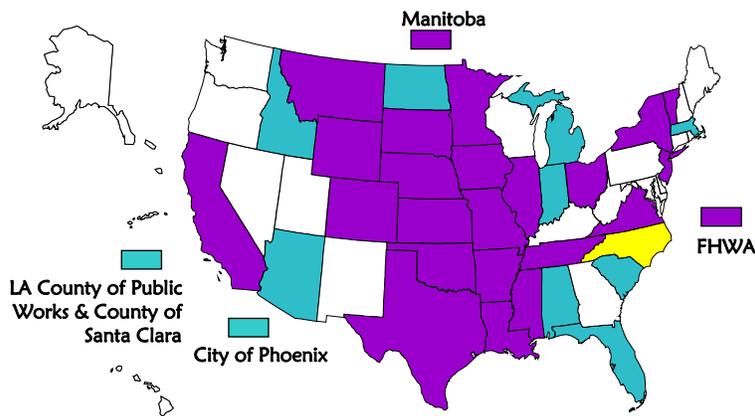
Another challenging aspect of the export process is generating schedules of cross

bracing, transverse stiffeners, and stirrups to the BRASS™ engines. In Virtis®/Opis®, the location of each of these elements is specified. Because the BRASS™ engines are point-of-interest based, they require defining a range and then the spacing of the element (say stirrups) within that range.

Translating the various loads to the BRASS™ engines also requires some creative effort. BRASS™ supports a fixed number of concentrated loads, distributed loads, and load cases. Wherever possible, the export process merges concentrated loads at the same location, distributed loads that extend over all spans, and load cases with common stages of construction. If this merging process was not performed, some Virtis®/Opis® bridges could not be analyzed by BRASS™. Currently there are two export processes in Virtis to support the BRASS-STD and the Madero engine and one for Opis to support the BRASS-LRFD engine.

Challenges will be faced during the implementation of *any* engine due to its internal assumptions, ranges of applicability, and limitations. The export process plays a vital role in Virtis®/Opis® to address each of these challenges.

Current Licensees



39 Agency Participants
57 Consultant licenses and 9 Academic licenses

- Virtis and Opis
- Virtis Only
- Opis Only
- Non-participants

Contractor for Virtis/Opis Development:

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100 Airside Drive
Moon Township, Pennsylvania 15108
Contact: Jeffrey J. Campbell, P.E.
Phone: 412-269-6300
Email: Bridgeware@mbakercorp.com

Subcontractors:
BridgeTech, Inc., Laramie, WY
Paul D. Thompson, Castle Rock, CO

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- | | |
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