Mapping Infectious Disease Across the Maine – New Brunswick Border

First Quarter Report (May-July 2006)

Submitted by the New Brunswick Lung Association and

American Lung Association of Maine

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Introduction

The New Brunswick Lung Association and the American Lung Association of Maine have successfully completed the first quarter of the cross border project, entitled: "Mapping Infectious Disease Across the Maine – New Brunswick Border." After the Orientation Meeting, the proponents engaged all key partners in a series of conference calls, and initiated related sub-contracts. The project is progressing as planned and on schedule. Please find attached our financial summary and statements. This report is for the period May 1st to July 31st, 2006

Work Summary

Committees: This project is delivered by 4 key committees, and a Management Team. The four committees held conference calls to initiate sub-contracts and to facilitate cross-border collaboration between partners. See Annex for minutes and action items that were compiled. The four committees, their participants, and the frequency of calls, are:

User Needs Analysis Committee (2 calls) • Barb MacKinnon, NBLA • David Harris, USM • Rosemary Mosher, USM • Eddie Oldfield, NBLA • Xiaolun Yi, NBLA • Chantale Caron, CARIS • Dave Coleman, UNB • Jianfeng Zhao, UNB • Bernd Kurz, UNB • Kyle Hubbard, UNB • *Health End-Users were consulted*	**Legal Advisory Committee (3 calls)** • Chris DeLong, Cox-Hanson Law Firm • Patrick Fitzgerald, Cox Hanson • Rita Heimes, USM • Dave Townsend, UNB • Kenneth Maybee, New Brunswick Lung Association (NBLA) • Eddie Oldfield, NBLA
Data Model Design Committee (4 calls) • Darka Mioc, UNB • Francois Anton, UNB • David Harris, USM • Rosemary Mosher, USM • Chris Gianios, USM • Chantale Caron, CARIS • Constantino, CARIS • Kevin Wilson, CARIS • Xiaolun Yi, NBLA • Maurice Lanteigne, NBLA • Eddie Oldfield, NBLA	**Simulation Coordination Committee (1 call)** • Kenneth Maybee, New Brunswick Lung Association • Barb MacKinnon, NBLA • Eddie Oldfield, NBLA • Xiaolun Yi, NBLA • Maurice Lanteigne, NBLA • David Harris, University of Southern Maine • Cathy Belmore, Emergency Measures Organization • Alex Miller, EMO • Malcolm McCabe, EMO • Ian Becking, Public Safety and Emergency Preparedness Canada • Louise Boily, Public Health Agency of Canada • Philip Abdelmalik, Public Health Agency of Canada • Claude Robichaud, NB Department of Health • Valorie Storey, NB Department of Health • Alex Bubar, NB Department of Health • Dr. Grlica Bolesnikov, NB Department of Health • Anne R. Sites, Maine Health Authority • Kevin Wilson, CARIS Ltd • Denis Poliquin, GeoConnections Canada • Ernest MacGillivray, EMO • Norm Anderson, American Lung Association of Maine • Holy Akwar, NB Department of Health • Nina Wesch, GeoConnections Canada • Steven Kempton, Public Health Agency of Canada

User Needs Analysis

In order to design an application that could support multiple decision-making needs, we conducted a user-needs review and analysis. It consisted of a literature review, including WHO protocols for pandemic preparedness, and the Canadian and American pandemic preparedness plans. We also conducted a survey of end-users on both sides of the border. This survey produced a variety of inputs and use-case scenarios. The user needs analysis provided our development team with specifications for features, functionality, accessibility, data and map visualization. Our User Needs Synopsis is available upon request, but a user needs summary is provided here for your convenience:

- Outbreak monitoring for spatial illustration (scalable time-series maps)
- Spatial / Thematic illustration of baseline influenza prevalence (incidence)
- Identification of WHO threat level (either side of the border)
- Identification of new cases & contact tracing & clusters
- Identification of quarantines, isolation wards, school closures, etc
- Identification of hospitals, beds, hospital and ambulatory resources
- Planning of anti-viral / prophylaxis treatment
- Identification of secondary impacts (e.g. interruptions to public transport, energy supply, distribution of food, etc)
- Dissemination of key maps to health authorities / chief medical officer
- Collaboration between health & safety authorities (local, regional, provincial, national, international) in disease surveillance and control
- Public education – fundamental to the New Brunswick Lung Association and American Lung Association of Maine, as 'end-users' of application, in addition to our goals of: epidemiological research, monitoring of environmental determinants of health, policy guidance, and public dissemination.
- Epidemiological Analysis – to be explored in the context of a pandemic influenza outbreak. More extensive health requirements can be explored in future projects (e.g. asthma, COPD, and other infectious diseases).
- Visualization requirements: respect medical and standard cartography rules, provide overlay and analysis capabilities, provide classification selection, provide thematic choice, provide user-defined variable selection, provide illustration of influenza data (at various scales, using various statistical methods, using cluster methods, at various time scales), overlay graphs, and create graphs from data tables (although raw attribute data will not be distributed).
- Support multiple concurrent users (satellite operations, assuming social distancing and travel restrictions in effect + participation of multiple health authorities on both sides of border during exercise).
- Enable multiple users to contribute information about ongoing (on the ground) events and decisions (e.g. first aid personnel), in a way that decision makers can accumulate 'population-based' data, and discern among reliable and unreliable sources. For example some events may be recorded by the public (e.g. someone reporting signs of illness), doctors (reporting case-numbers), laboratories (confirming disease strains of reported case-numbers), local officials or first responders, while others may be recorded by key military, health, safety, and other officials.
- Enable private users to track ongoing events using group-discussion forum, and provide the ability to search through historical records (e.g. what is it now, what was it like before)
- Privacy, security, integrity and currency of data
- Enable high-speed, high-volume, access to robust application
- Provide wireless access to 'controlled user network' – for gathering data and disseminating information about events, and facilitate disease surveillance and control (e.g. for coordination of front line health/safety workers with central headquarters). In future projects wireless applications may be used to support sensor technology for collecting field data (e.g. air quality, human health and behavior observation,
- Use interoperable standards and technology

Legal Documentation

The Legal Advisory Committee reviewed the New Brunswick Lung Association's privacy policy to make recommendations for liability insurance for a web-mapping application using health data. In addition, they produce Non-Disclosure Agreements, data privacy assessment in the United States and Canada, and have begun work on privacy disclaimers, terms-of-use statements / liability disclaimer, and Memorandums of Understanding. Legal documentation and files are kept by the President and CEO of the New Brunswick Lung Association.

Data Dictionaries

Our Data Model Design Committee prepared a series of tasks to create a database that met this project's requirement of mapping influenza data across the international border, while providing key spatial and feature data to enable decision making in response to pandemic influenza. To begin data model development, the University of Southern Maine and the New Brunswick Lung Association completed data dictionaries – including data set definitions, and data table feature description. This was useful for knowing the complete data holdings for this project. In this process we were also able to identify errors/omissions in data sets – and correct them. Data dictionaries are kept in Microsoft Excel spreadsheet files and Access tables, a project binder, and are available upon request. Data and metadata will be converted into the XML metadata standard. Metadata creation is in progress – data dictionaries will enable the creation of metadata, to be published alongside our WMS services (e.g. in the CGDI and to health and safety partners across the North East, in Canada and the USA). We will use ESRI **ArcCatalog** (Ver. 9.1), which has a Metadata Editor compliant with FGDC standards up to 2005. Other tools are also available.

Data privacy is maintained at all times. This project will result in a successful demonstration of the design/concept, but public access will remain limited to html dissemination of preset aggregate maps and limited portal access (no access to influenza data or other disease records). Access to the advanced CARIS SFE web-map application during this project will be limited to exercise participants, technology providers, academic partners, and our fund providers. Our WMS services are being shared through the CGDI to health and safety authorities. We provide additional services to health & safety authorities: online mapping, collaboration tools, wireless, and data entry capability.

Data Comparison & Selection

Once the data dictionaries were complete, we compared data holdings across the border, to identify gaps, discrepancies, and good matches. This was especially important for thematic layers (e.g. influenza admissions data), framework data (e.g. road network), infrastructure (i.e. other spatial features), and our spatial hierarchy (i.e. geocodes/postal codes, census areas, health regions etc). Based on data comparison, we could make a selection of data that could be mapped seamlessly across the border, while satisfying the project's goal of helping decision-makers to respond to pandemic influenza. Our data comparison is available upon request.

Data Model Design

Following the data dictionaries, comparison, and selection, the University of New Brunswick's Department of Geodesy and Geomatics Engineering began developing an Entity Relationship (ER) / UML Diagram. The ER diagram considers the spatial hierarchy for both sides of the border, identifies 'keys' in various data tables, and also considers temporal data through consistent date fields (time stamps). This data model design is essential to meet visualization requirements, spatial analysis, and to support decision-making on pandemic influenza.

Following review and approval of the ER diagram, early in 2nd Quarter, we will be able to create data tables and implement a database that is built upon the conceptual / ER model. The Model will be used by CARIS to ensure integration of the CARIS SFE query functionality / parameter-passing with our spatial-temporal database. Furthermore, the ER diagram takes into consideration the decision-making requirements of end-users, and serves to enhance user experience in obtaining data across various data tables i.e. dynamic data querying through multiple table selection. While multiple table selection is

available via Query tools, it is not available in map feature selection in CARIS SFE, however single-table attribute and spatial data will be queryable from map feature selections. Both require a multi-dimensional (spatial-temporal) database. We are currently aligning spatial data sets for both sides of the border, to create a spatial hierarchy tree. Our 2nd Quarter report will include a spatial hierarchy diagram.

The Data Model being developed will be robust and transferable, for example, to health authorities in NB and other jurisdictions interested in disease surveillance and control. Our ER diagram will be available early in the 2nd Quarter. We incorporated user requirements in the design of our Data Model, despite the fact that some data is unavailable (e.g. the National Emergency Stockpile System, or individual cases of pandemic influenza). Our data holdings currently include substantial health records data for influenza (5 years matching ICD coded Hospital Discharge Data, of fine resolution) and health infrastructure, as well as population census data, road topology, spatial framework data, and more – for both sides of the border.

During the Simulation Committee conference call, July 26 2006, participants suggested that additional data sets may add value to the exercise and for disease control. We are currently in negotiation with the Public Health Agency of Canada and the New Brunswick Department of Health, as well as the Maine Health Authority, to explore the possibility of obtaining additional data sets pertinent to this project and for the simulation / exercise (including via WMS). Through the CGDI and NSDI, other background data can be integrated. We can fill any gaps with 'dummy data' for the simulation/exercise, to demonstrate the effectiveness of our data model design to support decision-making on pandemic influenza. Furthermore, exercise participants will use the CARIS SFE (POI feature) and Data Entry Module to add information and data, to maps. The Data Entry Module stores data in tables for future querying and map illustration.

We will use PIDs (property layer) for the Province of New Brunswick to simulate a pandemic outbreak with capability to illustrate individual cases, disease clusters, laboratory confirmation of tests / strain, mortality rate, time-series maps for outbreak waves, and to identify quarantine areas. We are at liberty to use the PID layer, but based on the License with Service New Brunswick, not allowed to illustrate the PID layer, except at very local-area scale and if exercise-relevant data/information has been added to the PID/property layer.

CARIS SFE currently supports English, French, and Spanish. But metadata is in ***language of origin – and not translated. Data display variables are also in language of origin.***

Dummy Data Sets

For this project, we need to create a 'dummy data set' for simulating a pandemic influenza outbreak. Dummy data sets for the following may be required:

- Pandemic outbreak (initial cases to full outbreak). Maurice Lanteigne, New Brunswick Lung Association, will prepare a time-series model of pandemic outbreak cluster maps, James Watmough (UNB) is providing the pandemic outbreak 'dummy' data set. Geo-statistical methods will be tested on 5 years of historical influenza data, which will result in the production of baseline influenza time-series maps, a deliverable in this project. Geo-statistical methods will then be applied to 'dummy' data set.
- Impacts on: health care resources, schools, transportation/borders, grocery stores / food distribution, energy supply and essential services.
- Simulated Response Activities could include: anti-viral treatment, quarantines, threat level alerting, pandemic response (physicians, local authorities, provincial government / public alerts, etc), Health facilities management, Human resources planning and coordination, and more.

Statistical Methods / Computational Algorithms

In order to analyze spatially referenced health data, a number of simple and advanced geostatistical methods must be embedded in the system. These allow for illustrating aggregate data on small and large scale maps, accounting for confounding factors (such as seasonal variation, age, false count / low count, lag and progress (time-series). This is particularly useful for illustrating baseline prevalence of influenza over several years, or to determine mortalities attributable to outbreak (or heat wave). A dummy data set simulating a pandemic outbreak in the population, will be represented in a series of time-scale maps. This will help guide planning and prevention efforts (e.g. targeted anti-viral prophylaxis treatment and quarantine), and will be built into the scenario.

A spatial hierarchy tree is being developed for both sides of the border. Once the spatial trees are defined, we can compare the resolution matches for influenza and population demographic data. The spatial tree will also enable the correlation of data across various data tables, to spatial definitions (dissemination areas, census areas, federal electoral districts, health regions, zipcode / postal code, property, international boundaries, etc). A spatial tree will be defined early in the 2nd Quarter by our Data Model Design Team.

A web-site diagram was developed, to create a blank web-site portal, to support a community of practice. The portal also enables public education, and dissemination of time-series WMS maps in *html* windows, to epidemiologists. Therefore, we need to build statistical procedures that create the time-series models, for illustration on the web, based tightly on epidemiological requirements or user needs. These procedures are hard-wired WMS layers, but new ones can always be added. A review of this model will be undertaken by Philip Abdelmalik, of the Public Health Agency of Canada, in the 2nd Quarter.

Statistical methods can be run on both sides of the border together (integrated) or individually (i.e. seperately). The procedures embedded in the Data Model will be useful in future projects, if the application is used by other health jurisdictions, or for analyzing population health data and for disease surveillance and control.

A statistical package is being developed by the New Brunswick Lung Association. The package contains database procedures to be embedded in our database, SQL scripts, geo-statistical procedures that can be called up by the user, to visualize health data in response to different questions or ***user needs (user selected variables for classification, thematic style, statistical method, time/duration, and scale of health and population data),*** in the map portal. A full list of procedures and their purpose, will be provided in the 2nd quarter. The statistical procedures that will be adopted for this project, will be decided based on time constraints. Here is a preliminary table developed for reference only.

Univariate Analysis
Purpose: To provide summary statistics by age-group, gender, geographic layers and temporal layers; in conjunction with graphs, charts, histograms, scatter plots, etc.

- Frequency
- Mean
- Median
- Standard deviation
- Coefficient of Variance
- Skewness
- Ex. Kurtosis
- Quatriles (25th percentiles)
- Quintiles (20th percentiles)
- Percentiles (0-100 percentiles)
- Median (50th percentile)
- Minimum (0 percentile)
- Maximum (100th percentile)

Univariate Detection Models
Purpose: To provide predictive modeling capability during disease surveillance scenarios.

- Seasonal Auto-Regressive Integrated Moving Average
- Time-Weighted Averaging Model
- Autoregressive Integrated Moving Average
- Change-Point Identifier
- Contingency Table Analysis
- Cumulative Sums Model
- Exponentially-Weighted Moving Averages
- False Discovery Rate Analysis
- Kalman Filter
- Neural Network Model
- Randomization Tests
- Recursive Least Squares Model

Regression Analysis
Scalar Outlier Detection
Serfling Model
Support Vector Machine
Univariate Hidden Markov Model
Wavelet Analysis

Multivariate Detection (Cluster) Models
Purpose: To provide analytical resolution for the identification of potential at-risk population groups in three-dimensional geographic / temporal layers.

Bernoulli model
Poisson model
Space-Time Permutation model
Ordinal model
Exponential model
Nearest-Neighbor model

Classification Methods
Purpose: To provide a standardized legend (pattern / colour) encoding capacity for data representation across temporal and spatial geographic layers.

Quatriles
Quintiles
Percentiles
Sigma Coefficients
Standardized Mortality Rates (SMR)
Standardized Incidence Rates (SIR)
Age Standardized Mortality Rates (ASMR)
Age Standardized Incidence Rates (ASIR)

Other Direct Outcomes:

Database Algorithms and Statistical Procedures
Data Table Creation (based on ER Diagram)
Time-Series Map Creation and WMS services
Graph Creation
Classification of Map Layers
Variable Selection (i.e. user driven)
Exportable geostatistically driven WMS services

See the report entitled: "Assessing Gaps and Opportunities: Advancing the CGDI in Public Health", section on Statistical Methods for detailed discussion of limitations and application of statistical methods to health data. This report is available upon request, from the New Brunswick Lung Association.

CARIS Detailed Specifications Review

CARIS is following an ISO software development process, which means CARIS provides the proponents with detailed design specifications every quarter. This ensures timely decision-making on development of features, and delivery of milestone objectives (including testing, implementation, and exercise using CARIS SFE). Detailed specifications for the first chunk of development work by CARIS, are available upon request.

A license for CARIS SFE has been provided to the University of Southern Maine, to allow for server configuration and WMS testing with the New Brunswick Lung Association in the 2nd Quarter. Our existing WMS URL was given to key stakeholders for additional CGDI-based leveraging of data and services. When the new CARIS SFE is implemented in this project, our WMS services will be updated.

Upon completion of the user needs assessment, CARIS was provided refined specifications for some features, to begin development. One SOW deliverable was primarily affected. Based on user needs analysis, we changed the real-time map collaboration (transactional WFS) to a PPGIS ***Forum***, which

enables multiple concurrent users to collaborate and to share custom WMS maps. The PPGIS functions fell outside of the CARIS SOW scope, adding about 40 days beyond capacity. Therefore UNB has provided a demonstration of PPGIS Forum concepts, reviewed by EMO and the New Brunswick Lung Association. The PPGIS forum is now being developed in this project by the New Brunswick Lung Association in conjunction with the Department of Geodesy and Geomatics Engineering. CARIS will provide the software/interface protocols for integrating the PPGIS Forum with the CARIS SFE mapping portal (i.e. to standard WMS map tools, map sharing tools, classification tools, query tools, and Points of Interest).

ESRI Canada has provided ArcView software, as an in-kind sponsorship, in our production environment. This enables us to produce Shapefiles which can be ingested by CARIS SFE for dissemination over the web as WMS layers. Due to ESRI's contribution of software, the New Brunswick Lung Association can prepare maps, classifications, Points-of-Interest data, and chart/graph creation, essential for the success of our exercise and demonstration of this project's goal of seamless integration of thematic and framework data. Some examples of the tasks facilitated through ArcView:

- Scale Matching and Spatial Hierarchy Design

- Cluster Map Creation:
    - using Satscan for spatial attribute generation (geostatistical analyst)
    - using ESRI to plot 3-dimensional disease clusters / hotspots, and spatial distribution / range
    - publishing as Shapefile into a time-series WMS layer group (by day, week, month, year).

- Other thematic map generation

PPGIS / User Collaboration Tools

As part of our project proposal, we indicated that our community-of-practice required collaboration tools. The design team thought it would be useful to link these tools within our mapping portal. Therefore, we engaged the University of New Brunswick's Department of Geodesy and Geomatics Engineering to demonstrate a functioning PPGIS prototype using ESRI as the map interface, and to develop a conceptual design (available upon request) for implementing PPGIS with our CARIS SFE application. A number of end-users provided feedback by survey method, and participated in live demonstrations and meetings to identify user requirements. User needs in this area helped us to develop a conceptual model for a system that is capable of supporting multiple users, in groups, to track events / decisions, tied to spatial features, map views, and other data. Technical specifications have also been developed. This system will enable collaboration between distributed users over the Internet. Therefore, the simulation / exercise will be greatly facilitated through our PPGIS prototype, by enabling participants to make decisions about real-time events and information. In future projects, this system will allow multiple researchers to collaborate online for health-related research and analysis. Public participation forum & points of interest will be developed as part of our PPGIS prototype.

Although we initially proposed for CARIS to develop the Map Collaboration Window, the additional features of PPGIS (as confirmed by our survey of health and safety end-users) required development outside of the scope and deliverables of CARIS SOW (adding about 40 days). Therefore, we decided it would be feasible and cost-effective to work with UNB to take an existing PPGIS prototype and match it to CARIS SFE and WMS protocols, and to integrate forum and data management tools. This change (see Changes) will result in a fully functional collaboration interface, with non-transactional map portal, capable of handling POIs and attach data/information to map features, and for users to save and share maps which can be read by group members (including metadata layer cards). Group permissions are managed within the PPGIS third-party software, to be developed by the New Brunswick Lung Association (Xiaolun Yi) and University of New Brunswick (Jianfeng Zhao). Group discussions will remain private and role-defined. Some roles are private and assigned by the administrator to user groups (e.g. health and safety emergency management coordinators). Each role has permissions for access to data, map layers, and functionality. Separate portals can be created to maintain separation of public from private users on the web.

Wireless Prototype Implementation

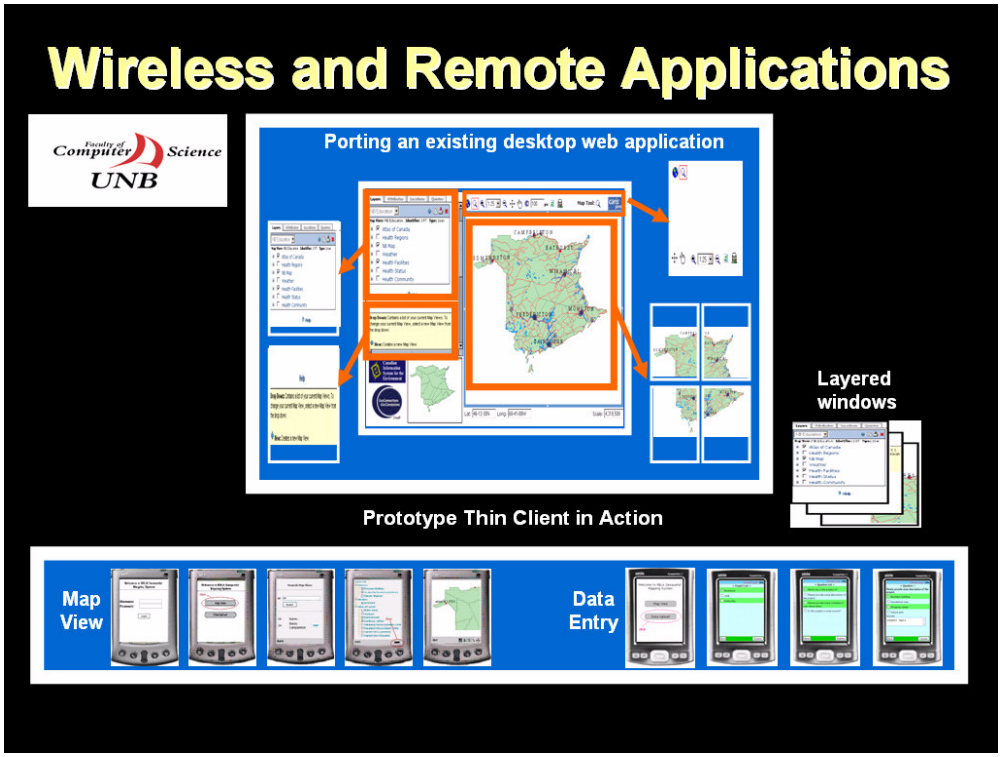
The University of New Brunswick Computer Science Faculty developed two wireless application modules that are linked with the CARIS SFE WMS service and Lung Association database. The wireless application includes a data-entry module, and a map retrieval module. Due to bandwidth and other limitations, the wireless application is not able to support points-of-interest (dynamic map interaction). It does support layer selection, pan, zoom, save. The data-entry module compensates by enabling users to provide front-line health data to the database for illustration in CARIS SFE – e.g. to the Health Emergency Management Coordinator, or Chief Medical Officer, and Provincial Emergency Action Committee. The wireless application will be available to all participants of the simulation / exercise.

The wireless application works on several PDA types, and we have investigated the possibility of supporting BlackBerry. An end-user survey concluded that Blackberry is the most commonly used handheld PDA. The application uses WMS services, but is recognized by the server as a PDA – therefore the maps are split into four quadrants for display on the PDA. The user then has the ability to scroll among the quadrants and select layers for display.

The wireless application will be integrated into the Lung Association's services in 2nd quarter for testing. The data entry module will be exported into the CARIS SFE application itself – allowing desktop users to enter data into the database for future querying/illustration. Points-of-Interest, can be added by users to maps for sharing, but do not get saved in a database and therefore cannot be queried. Furthermore, Points of Interest are not available in the wireless application. The data-entry module overcomes this barrier, and also provides a standardized data format for data collection (e.g. new cases, quarantine addresses/location, supplies / stockpile information, Provincial/State pandemic threat indicators). In future projects, this system may also be used to collect observation data for a number of health-related initiatives, including: monitoring air quality impacts on human health, community level planning (e.g. active transportation), disease prevention, policy and more.

The wireless application is currently supported by:

(1) HP iPaq with MobileOS,
(2) Treo600 with Palm 5 OS,
(3) Palm TX, Palm Lifedrive, and others with Palm OS5 and Blazer web browser,
(4) Other: this includes laptop, desktop.
(5) Blackberry is being investigated



Simulation Coordination / Scenario Writing

The Simulation Coordination Committee held their first teleconference on July 26, to get agreements from key health and safety authorities to participate in our exercise / simulation, scheduled for March. The committee reviewed progress to date, were given an online presentation, and were asked to provide input for the development of a scenario for pandemic influenza preparedness. Discussion included:

- Maps and Data Modeling for influenza
- Development of Simulation Outline
- Identifying Exercise Director (Ernest MacGillivray, EMO)
- Identifying Scenario Writer (Alex Miller, Co-Director of exercise)
- Identifying Special Advisors (Kenneth Maybee and others)
- Identifying Scenario Participants (records to be compiled)
- Confirmed PEAC / EMO leadership and participation
- Confirmed NB Health and Maine Health participation
- Identifying Scenario Scope (TBD)
- Identifying Exercise Location (NB Emergency Operations Center, in Fredericton)
- Identifying Exercise Satellite Operations (TBD)
- Confirmed seamless integration and visualization of health/population data across distributed access network (end-users and data providers)
- Identifying Training Location/Time (TBD)
- Next conference call is scheduled for September 13

Evaluation

Exercise participants, EMO, and the New Brunswick Lung Association, will conduct a comprehensive evaluation of application, database, functionality, and effectiveness (for decision making support during pandemic exercise).

All application and database testing procedures will be developed by CARIS, New Brunswick Lung Association, University of New Brunswick, University of Southern Maine, with guidance from Emergency Measures Organization, and health authorities.

Presentations

GeoTec – Eddie Oldfield, Project Director, made two presentations at this year's GeoTec conference, held in Ottawa, as part of the cross-border partnership session held by the USGS and GeoConnections.

Geomatics Atlantic – Eddie Oldfield made a presentation of opportunities for expanding the CGDI and GIS applications in public health, including disease surveillance and pandemic preparedness.

NB Department of Health – a presentation was given to the Health Emergency Coordinator and staff, about the cross-border project, GIS application, and partnership for conducting an exercise on pandemic preparedness. Discussions are ongoing with the Minister, Deputy Minister, and senior staff, for the participation of NB Health in future activities. The New Brunswick Lung Association assisted the department in assessing the early stage requirements for consideration of GIS applications within the Department.

The NorthEast Border Health Initiative and Disease Surveillance and Control Committee (funded by CDC) is holding a teleconference on August 1st. The New Brunswick Lung Association and American Lung Association of Maine will participate based on invitation by NB Department of Health to inform the committee of this project's goals, objectives, timeline, and exercise. *(See Simulation Minutes attached, for Breaking News of August 1st conference call positive outcomes).*

The **National Pandemic Preparedness Committee** was informed about this project via Louise Boily of the Center for Emergency Preparedness and Response, of the Public Health Agency of Canada, and discussions are ongoing. Interest has elevated to the Director General level at the Public Health Agency of Canada, Dr. Ron St-John.

Workshops

CGDI Developers Network – we participated in a national meeting held by the CGDI Developer's Network, to discuss opportunities for advancing the CGDI in public health and safety, especially with respect to facilitating disease surveillance and population health.

F/P/T Pandemic Preparedness Workshop – Eddie Oldfield participated in the Federal, Provincial, Territorial Pandemic Preparedness Workshop, held jointly by the Public Health Agency of Canada and Public Safety and Emergency Preparedness Canada. Speakers included the National Association of Grocers, Ernest MacGillivray (NB EMO) and experts in virology and pandemic surveillance. Several presenters called on the need for more effective decision-support technologies and better planning and preparedness by health and safety authorities, along with others (e.g. Canadian Food Inspection Agency).

NCAR – 2006 Colloquium – Modeling Infectious Disease – NASA, NSF, UCAR, NCAR, and the CDC sponsored a one-week training seminar / colloquium for 20 individuals from around the globe, with over 25 key experts in disease epidemiology, GIS and statistics, climate/atmospheric modeling, and infectious disease control. Eddie Oldfield had the unique opportunity to participate and assess this project's methodologies with the assistance of participating scientists and technology experts. The visit to Boulder, Colorado (sponsored by NASA and CDC among others), included a tour of the NCAR Foothills visualization laboratory with several Petra bytes of data for 3D simulation of earth's climate, weather, atmospheric and land based phenomenon (e.g. pollution, forest fires, temperature and precipitation anomalies, particle distribution, pollution / plume dispersion models, and more). The colloquium included hands on training in climate models (SRES models used by the IPCC climate simulations and GHG reduction pathways), as well as manipulation of health, satellite, vegetation and meteorological data, in ESRI ArcView. Finally, presentations were given on the various challenges, research, and solutions for epidemiological modeling of infectious diseases, alongside climate indicators and environmental determinants of health. This requirement was recognized by the United Nations Climate Change Convention, and is being developed by the Adaptation groups concerned with public health (including WHO, and UN member states). By all indications, this project is built upon sound methodologies and will result in a successful demonstration of web-based GIS in the public health domain that would be beneficial to stakeholders for future projects across domains. Moreover, CARIS SFE will become part of international GIS arsenal for health, safety and the environment.

Through participation in the **New Brunswick Multidisciplinary Geomatics Review Committee**, we helped to prepare a report, presentation, and consultations on building a sustainable New Brunswick GIS infrastructure and basemap data dissemination, in support of multiple department needs, research, and current health and safety priorities. To garner the vision statement, architecture model, goals and objectives, one may contact David Finley, of Service New Brunswick. A meeting will be arranged with David Cowperthwaite, Director of IT and e-Health, NB Department of Health. Meetings with the Minister, Deputy Minister, senior staff, and key health personnel, have already strengthened our partnership with NB Department of Health. This NGO-Government partnership is also true of the American Lung Association of Maine and the Maine Health Authority.

Problems

To keep track and counter any problems that arise, our Management Team meets daily and acts promptly. In addition, we have compiled 4 binders (3-5 inches thick) to organize our activities, project documentation, reporting, etc.

Oracle Database License – In order to support our multi-dimensional database, we must select a database that is supported by CARIS SFE. While CARIS does not fully support MySQL spatial (a free-ware database), they do support Oracle Spatial. Since the Lung Association does not yet have an account with Oracle, we have been seeking a license via several avenues including:

- Oracle Corporation
- University of New Brunswick
- Emergency Measures Organization
- NB Department of Health

- Pharmaceutical sponsors
- CDC, PHAC, and PSEPC
- National Research Council, Institute for Information Technology

The New Brunswick Lung Association will continue to maintain a MySQL database server & database, and transfer data to an Oracle Database server once implemented. The University of New Brunswick will develop a data model and create the data tables in an Oracle Database, on their own license of Oracle. The National Research Council has offered to investigate the possibility of hosting our database in Oracle, on a Research License, involving 25 named users – and to provide multiple facilities, technology, video-conferencing, and notification services for the exercise. The NRC owns an Oracle license, and it is currently not utilized. They also have server racks and high-speed connectivity through fiber. The Emergency Measures Organization, the NB Department of Health, and the University of New Brunswick are all connected to the NRC through secure networks for shared applications in public safety. EMO can provide the server technology to support the Oracle DB. We are working with our partners to finalize a solution for hosting the Oracle Database, expected in the 2nd Quarter. We have clarified that our ***license requirement*** is:

- **Oracle 9i, <u>with</u> Spatial component. An Enterprise License is valued at $60,000.**
- **We need ONE Processor License.**

We have identified multiple and distributed benefits to health and safety authorities, for future exercises and projects, utilizing our infrastructure (database and application combined). It meets several strategic and policy objectives of partners in health and safety for the North East (including New England States and Eastern Canadian Provinces' Health and Disease Control Authorities). We could implement our database model on a simple database, such as MySQL, but we would lose certain functionality provided in the multi-dimensional database conceptual design. This would be a last resort – but we would still be able to seamlessly integrate thematic and framework data for visualization purposes (pre-production of WMS maps, and hardwired queries).

Other avenues we are pursuing for an Oracle License: We have a teleconference scheduled with Director of Marketing and Promotion, of ORACLE Canada, regarding discounts that are available. Naturally, we see great benefit in hosting our own Oracle database. CARIS has also offered to investigate the possibility of hosting our DB in Oracle, for testing, training, and exercise. An Oracle-certified DB technician at CARIS is working with us on Data Model development and integration with CARIS SFE. We also are seeking CDC funds (since GeoConnections will not support software purchases), through the North East Border Health Initiative. The Public Health Agency of Canada, Public Safety and Emergency Preparedness Canada, and the Joint Emergency Preparedness Program will be solicited for contributions of software. Discussions may be held at senior levels of government, to further enable this project.

Recommendation: In view of the number of projects that GeoConnections will be involved with over the next number of years, and the demand for standardization, we recommend that GeoConnections investigate the possibility of hosting an Oracle Enterprise License, that can provide services to multiple users (i.e. project developers awarded funds from GeoConnections programs).

Fiber Connectivity – For this project, we need to establish a high-speed fiber connection. A meeting will be held on August 2nd, with Greg Sprague of the National Research Council, Institute for Information Technology, headquartered in Fredericton. Mr. Sprague manages the CANARIE / New Brunswick Fiber Network, who works closely with the E-nnovations fiber network in Fredericton (i.e. physical high-speed fiber network linking government, industry, and academia). For the exercise, this fiber network may be used. The New Brunswick Lung Association already implemented a 500 foot fiber cable within the Victoria Health Center, to EMO, the Operations Center and Situation Room. Ernest MacGillivray, Director of EMO, will provide the high-speed service, pending some final configurations. We will have fiber connectivity in the 2nd quarter. EMO needs to implement a converter for switching to class-5 / class-6 fiber, and assign us a different IP / gateway address from their internal/security networks.

Other

The New Brunswick Lung Association and American Lung Association of Maine have approached several pharmaceutical companies (e.g. Roche Canada) on the basis of providing a demonstration of disease tracking technology research and public education, and coordination with health authorities' needs: stockpile management and distribution of medication, quarantine management, supply management, laboratory strain identification and records, contact tracing, disease geography and spread, epidemiological analysis, public alerting, and targeted anti-viral / prophylaxis treatment. The infrastructure needed to support such a system would need to be developed over the course of future projects, with partners, and be sensitive to various strains of influenza / disease.

The New Brunswick Lung Association and the University of Southern Maine will continue to support an application that provides the conduit for participation of key decision-makers in evaluating concepts for developing regional infrastructure and public participation tools in both official languages. This has been identified as very valuable by and for the North East Border Health Initiative, the CDC, and the Public Health Agency of Canada.

Changes

Upon review of time constraints and relevance of 'Pervasive Network', it has been decided that existing funds for Dr. Mihaela Ulieru will be re-allocated for developing the PPGIS Forum, wireless application, and exercise preparation. The Lung Association and Management Team decided it was necessary to negotiate a change in scope for the University of New Brunswick's Computer Science Faculty. A meeting was held with Dr. Mihaela Ulieru who agreed to rescind funds to advance other objectives within this project, that are to be carried out by the Computer Science Faculty and other partners

Instead of preparing a prototype Intelligent Agent / Pervasive Network, UNB will assist in the development of the Collaboration Interface (PPGIS), augmenting wireless applications and data entry modules – each of which require additional development time and resources than first anticipated. The additional work still meets our milestone objectives, and is completely feasible within this project's scope and timeline.

The Emergency Measures Organization and National Research Council will provide notification and pervasive networking capabilities using their own technology, and UNB's Dr. Mihaela Ulieru will participate in the exercise.

Notwithstanding, the New Brunswick Lung Association will support multiple / distributed health users through the PPGIS Collaboration tools to allow incident tracking, data collection, and map sharing – essential to this project.

As per Clause 11.1 in the Contribution Agreement, a new workplan will be developed to reflect a quarterly milestone reporting process. A template will be provided to us by GeoConnections as soon as possible. No other changes to workplan / timeline.