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TO: RI Environmental Monitoring Collaborative

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DATE: 13 July 2005

RE: Imagery and Land Cover Mapping in RI

As instructed by the RIEMC in its 17 May 2005 meeting, a subgroup of RIEMC members and knowledgeable partners met on 13 July 2005 to discuss technical specifications of imagery for Rhode Island that could serve as a basis for as many statewide mapping projects of general interest as possible. The questions we set out to answer were:

1. What is universe of planned or proposed imaging and large geospatial data development projects?
2. Is it possible to combine imaging and mapping missions?
3. Is it possible to pool funding to support imaging and mapping missions?
4. What would be a schedule/cycle time for future image acquisition and derivative mapping updates?

We had an excellent turnout of mapping leaders in the state and it was a very productive meeting (see the FROM list on this memorandum). We offer the following observations and recommendations to the RI Environmental Monitoring Collaborative.

1. ***What is universe of planned or proposed imaging and large geospatial data development projects?*** -- There are many imaging projects underway or under discussion for the State. The attached table summarizes the major imaging projects we identified. It does not include extremely large scale (6 inch pixel size) town-specific digital orthophotography missions planned or underway for some RI communities (e.g., South Kingstown).

2. Is it possible to combine imaging and mapping missions? -- We should establish a coalition of partners led by the RIEMC and RIGIS to develop the following image products in the spring of 2006 or 2007.

- a) *Digital orthophotography, statewide extent, 1 foot pixel size, true color image, spring leaf off, NAD83, State Plane Coordinates, positional accuracy meeting national Map Accuracy Standards for 1:2,500 mapping (90% of the features shall be within 6.9 feet of their true location) , and*
- b) *1:12,000 (or perhaps 1:24,000) scale color infrared transparencies created from 1:24,000 photography, spring leaf off condition, obtained at the same time as above, and*
- c) *LIDAR ground elevations for land at 1-2 foot pixel size.*

These data would be the primary information resource that would be used to develop a large number of mission-critical derivative datasets (e.g., wetlands, land cover, natural habitats, riparian buffers, sprawl, flood zones, etc.) that are used by every sector of the land, water, and Bay management communities, as well as business, economic development, emergency response, and homeland security.

Once the technical specifications for this general use image base have been established, it will be possible to develop cost estimates for creating updated land cover and wetlands data using this digital orthophoto and hardcopy (1:12,000 IR transparencies) imagery. The RIEMC and RIGIS will require staff support to lead the finalization of the image base, develop cost estimates of its acquisition, seek financial commitments from partners, and establish data development protocols and cost estimates for land cover and wetland data derived from the imagery. These tasks will require the technical support and input of a large number of people and institutions, many are authors of this memo. Coordinating this effort will be a significant commitment.

3. Is it possible to pool funding to support imaging and mapping missions? -- Institutional partners who might be able or interested in contributing to funding or managing elements of the project include: The USGS, the National Geospatial-Intelligence Agency, RI Office Statewide Planning, RIGIS, RI National Guard, State Wildlife Grant program (SWG), The Nature Conservancy, DEM Wetlands Division, US Forest Service, RI DOT, RI CRMC, USDA, NRCS, and RIEMA.

4. What would be a schedule/cycle time for future image acquisition and derivative mapping updates? -- The imagery described in 2a above should be obtained every 5 years and would be the basis for land use GIS data updates

and many other critical applications by the public, private, and NGO institutions in the State.

In off-years (years 2, 3, 4, and 5) we should use the USDA Farm Service Agency true color leaf on digital orthophotography at 1 m pixel size. This ortho imagery can be obtained for approximately \$6,000 if we partner with the USDA FSA and USDA NRCS. This imagery is already scheduled to be obtained on an annual basis. This would result in a update cycle as follows:

- 2006 1 foot pixel color and IR imagery as in "a," "b," and "c" above. Use imagery to update wetlands GIS data, then landuse GIS data.
- 2007 USDA FSA 1 m leaf on color ortho imagery.
- 2008 USDA FSA 1 m leaf on color ortho imagery.
- 2009 USDA FSA 1 m leaf on color ortho imagery.
- 2010 USDA FSA 1 m leaf on color ortho imagery.
- 2011 1 foot pixel color orthos as in "a" above, update land use to this imagery. CIR transparencies and LIDAR terrain data do not need to be collected again.

A number of caveats were noted for these recommendations

- a) A 5 year cycle time and off-year imagery would not need serve all the imagery needs for DEM Wetlands Division. They have unique aerial photography needs not met by the products listed here.
- b) These data do not serve all the mapping needs of coastal geologists and resource managers interested in shoreline change or submerged features.
- c) We should study the viability and utility of adding radar backscatter data acquisition as a supplement to the LIDAR elevation data.

Table 1. Major Image Acquisition and Derivative Database Development Initiatives Underway or in Discussion in Rhode Island

| Possible Future Imagery | Possible Derivative Data |
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| ❖ 2003/2004, spring true color leaf-off orthos, 2 foot pixel, hopefully delivery sometime in Fall 2005, DOT | ❖ RIGIS LULC update from 2003/2004 orthos, carry over historical wetlands, 0.5 acre MMU, DOA Statewide Planning |
| ❖ NGA (National Geospatial-Intelligence Agency, ex-NIMA, ex- | ❖ NLCD 2001 update, 30 m pixel, 21 classes |

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| <p>DMA), urban imagery every 3 years for urban areas (60% of RI), < 1 meter resolution, \$100,000 for partnering</p> <ul style="list-style-type: none"> ❖ USDA Farm Service Agency (FSA) National Agricultural Imagery Program (NAIP), true color summer leaf-on orthos, 1 or 2 m pixel, annual (1 m scheduled for RI in 2008, CT for 2006) ❖ USDA Farm Service Agency (FSA) National Agricultural Imagery Program (NAIP), true color spring leaf-off orthos, 1 m pixel, custom order, approx \$23,400 ❖ 2005 summer eelgrass mapping imagery, CRMC, NOAA NERR. NBP, et al. ❖ Wetland remapping imagery, color-IR, spring leaf off, 9"x9", 1:12,000 scale, stereo transparencies ❖ Panchromatic (black and white) 1:12,000 9"x9" statewide imagery, DEM Wetlands and DAM Safety (1999, 2002) ❖ RI National Guard Facility and Training imaging, 2 year cycle, spring leaf-off condition, color orthos, <=2 foot pixel size ❖ RIEMA/E911 Pictometry, oblique, very large scale true color imagery, massively overlapping for 360 degree viewing (five prototype RI communities in progress) ❖ 2005 ACOE LIDAR shoreline (1.5 km onshore, 0.5 km offshore) mission, In Progress | <ul style="list-style-type: none"> ❖ NOAA CCAP 2005 LULC change update based on TM imagery, 22 classes. ❖ Remapping RI wetlands, 0.25 acre MMU? ❖ Riparian buffer mapping (DEM/URI) ❖ RI Natural Communities Mapping ? ❖ Coastal erosion mapping, 1:2,000 Boothroyd/CRMC ❖ RI Natural Heritage Database of Element Occurrences (species and communities). |
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| <ul style="list-style-type: none">❖ DOT road right of way image database, 800,000 images ❖ Scituate Reservoir watershed, LIDAR and true color orthos, spring 2006 leaf-off, 2 foot pixel, DEM Water Programs ❖ 2005 statewide orthoimages, 1:12,000, 1m pixel, panchromatic, spring leaf off, NRCS, arriving summer/fall ❖ Brown U radar backscatter elevation for RI ❖ 2005 Summer Narragansett Bay Eelgrass Mapping, true color positives (transparencies) @ 1:12,000 w/ 60/30% o/s; 9"x 9" prints; digital orthos w/ 0.5 m pixel resolution. Imagery according to NOAA C-CAP protocol; Partners: STB, NBEP, URI-GSO, CRMC. | |
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