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Natural Resource Mapping and Land Protection Prioritization for Greenland, NH

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NATURAL RESOURCE MAPPING AND LAND PROTECTION PRIORITIZATION FOR GREENLAND, NEW HAMPSHIRE

A Final Report to

The New Hampshire Estuaries Project

Submitted by

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NATURAL RESOURCE MAPPING AND LAND PROTECTION PRIORITIZATION FOR GREENLAND, NEW HAMPSHIRE

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Executive Summary

This report describes the development of the project team, mapping criteria, and results of natural resource and co-occurrence mapping of the town of Greenland, New Hampshire. Using Geographic Information Systems mapping and analysis, natural resource characteristics were mapped and land parcels were evaluated to determine conservation priorities within the town. Outreach activities were also carried out and planned to distribute information to town decision makers, landowners and citizens and to share the results of the mapping process.

The purpose of the work was to help the Seacoast Land Trust and the Town of Greenland better identify land protection priorities in its service region and to foster greater involvement with municipalities. The ultimate end in the process is protection of land through conservation easements, conservation land donation or purchase and education of residents about its resources and the efforts being undertaken to protect critical open lands in the area.

NATURAL RESOURCE MAPPING AND LAND PROTECTION PRIORITIZATION FOR GREENLAND, NEW HAMPSHIRE

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NATURAL RESOURCE MAPPING AND LAND PROTECTION PRIORITIZATION FOR GREENLAND, NEW HAMPSHIRE

Introduction

The mission of the Seacoast Land Trust *is to promote the protection and stewardship of open land in the Seacoast area*. A group of citizens concerned about rapid development in the Seacoast and the associated loss of open space and animal and plant habitats formed it in 1998. A map showing the area currently served by the Seacoast Land Trust, watershed boundaries and existing conservation land is included as Figure 1.

In August 2002, the Seacoast Land Trust shared the results of the mapping of Sagamore Creek and Berry's Brook Watershed with the Greenland Conservation Commission and discussed the merits of conducting similar mapping in the Town of Greenland. The Conservation Commission later asked the Seacoast Land Trust to complete a similar mapping program for the town. A grant request was submitted to and accepted by the New Hampshire Estuaries Project. The contract was executed in February 2003.

The Town of Greenland has experienced rapid growth over the last 12 years with much of the farm, forest and shore lands being converted to residential or commercial uses. There is a history of land conservation in town – the Parker Tree Farm, the Weeks Parcel and the Rosamond Hughes property were some early conservation projects. The Packer Bog area is nearly totally protected as well. The Great Bay Resource Protection Partnership has also worked with shore land landowners to put several significant parcels into conservation. The Seacoast Land Trust has been focusing on understanding and working on protection of upper watershed areas to protect the small pockets of wetlands and intermittent streams that provide the source of water for our coastal streams and wetland systems. The mapping has been a considerable help not only in identifying these parcels, but also in illustrating these values for landowners and town decision makers.

Having successfully worked with SPNHF on the mapping of Berry's Brook and Sagamore Creek a baseline resource map and co-occurrence model had already been developed. This model was used as the starting point for customizing the project to better fit the needs of the Town of Greenland.

A steering committee was formed to help guide the project. This committee was made up of representatives from the selectman's board, planning board, conservation commission and from the community as well as the Seacoast Land Trust and SPNHF.

In addition, SLT has worked closely with UNH Cooperative Extension (UNHCE) on the previous mapping project. For the Greenland project, they were helpful in developing the PowerPoint Presentation and will be involved in the citizen/landowner outreach presentation to be completed as part of our follow up work on this project in February 2004.

Project Goals and Objectives

The goals and objectives of this program range from short term to long term. In summary they were:

1. To assist SLT and Town of Greenland in understanding the natural resources of the town.

2. To involve representatives of several Town of Greenland boards in the Seacoast Land Trust activities and the Land Prioritization Process. It was hoped that included local representatives would allow for mapping customization based on local concerns.

3. To develop a set of maps that illustrated the natural resources of the town and that illustrated the "co-occurrence" or overlap of these resource features.

4. Using the co-occurrence results, to rank the land parcels to provide the Town of Greenland and Seacoast Land Trust with a blueprint for land conservation in the area.

5. To develop intriguing visual aids to illustrate threats to natural resources of Greenland and to the potential for protection of remaining resources. In addition, the maps will help to illustrate the efforts and purpose of the Seacoast Land Trust and to educate landowners and residents about their land's resources.

6. To reach out to the landowners and acquaint or remind them of available voluntary land conservation options.

7. To place sensitive open lands in these areas in permanent conservation.

Another outcome that arose as the project proceeded was that the maps could also provide a tool to demonstrate need for and justify potential land conservation funding for local projects.

Methodology

The methodology used to accomplish the goals stated above was generally as follows. Many of these project tasks happened simultaneously and were modified as needed throughout the process.

- Form Project team
- Obtain necessary land parcel data set
- Determine base map content and layout
- Modify ranking system
- Produce draft base maps for review
- Revise ranking system as necessary
- Contact key landowners and provide land protection/estate planning workshops
- Plan and conduct outreach to town boards, citizens and landowners

These are described in more detail below.

Form Project Team

In addition to producing maps, a major goal of the project was to increase the exchange of land conservation ideas and cooperation between representatives of the Town of Greenland and SLT. A committee of these constituents was formed to direct the focus of the mapping efforts. Table 1 displays the final team.

Table 1
Conservation Mapping of Greenland – Steering Committee/Project Team

- Danna Truslow, Seacoast Land Trust (SLT)– executive director and project manager
- Frank Mitchell – UNH Cooperative Extension Service – Land and Water Conservation Specialist
- David McGraw – SPNHF – GIS Specialist
- David McNeill – Greenland Conservation Commission, Chair
- Rick Mauer – Greenland Conservation Commission
- Joe Bricker – Greenland citizen
- Mark Weaver – Greenland Selectman
- Daniel Kern – Greenland Planning Board and Seacoast Land Trust board member.

Three meetings of the large group were convened over the course of the project. Other smaller groups occasionally met or conversed as needed to accomplish the project goals.

Obtain necessary land parcel data set and aerial photograph imagery

The most up to date land parcel data was obtained for the mapping. The tax parcel mapping consultant for the Town worked directly with Dave McGraw of SPNHF to provide that data set. Due to some difficulties with the scaling of the underlying GIS map data and the parcel data; there is not perfect alignment of these lot data. However, it was determined that the amount necessary to fix the problem was not in the budget for the mapping. Therefore the existing tax parcel data set was used.

Determine base map content and layout

As per the scope of work, four natural resource base maps were to be generated for the study. After much discussion and consultation with SPNHF, it was determined that the base maps would include the Aerial Photography (Figure 2), Wildlife Habitat (Figure 3), which also includes wetlands and riparian zones, Water Resources (Figure 4), and Important Soils (Figure 5). The committee reviewed the maps for placenames and road networks and worked with Great Bay Resource Protection Partnership and the Town to determine new conservation properties.

In the final meeting of the Steering Committee, the recently completed color aerial photography of the Seacoast Region was on display. The members of the committee determined that they would like to use the new photo set as the base for the mapping rather than using the existing GRANIT data set. Rockingham Planning Commission provided the new data to SPNHF for this purpose.

Habitat data generated for the Great Bay Resource Protection Partnership (1997) was added to the Wetland/Riparian zone map as the committee deemed this to be an important resource to be illustrated for the general public.

Water Resources map includes all wellhead protection zones, favorable gravel well areas, mapped sand and gravel aquifers and known and potential groundwater contaminant sources.

The Important Soils map includes not only Soil Development Potential, but also Prime Farmland Soils.

Watershed boundaries are also shown on all large maps. The majority of Greenland land area is within the Winnicut River watershed. This includes the Packer Bog/Brook area as this drainage features joints with Winnicut at Great Bay. A small portion of the southeastern portion of Greenland drains to the Berry's Brook watershed and the area to the northwest is within the Great Bay watershed. Pickering Brook drains the northernmost portion of Greenland.

The final scale for the large map set is 1" = 12,000' so that the data could be easily displayed on one map. All data sources are listed on the final maps included as part of this submission. Lot lines are shown on co-occurrence maps only so that natural resource maps would remain uncluttered. A clear overlay at the same scale as the base maps is provided with lot lines and indexed lot numbers. On all maps, existing conservation lands are outlined in green and light yellow. Existing conservation lands are also included on a clear overlay showing lot lines and lot identification numbers.

Modify Co-Occurrence Ranking System

Since a co-occurrence model was previously generated for the Sagamore/Berry's Brook project, this model was used as a basis to customize the Greenland Mapping Project. A copy of the final co-occurrence model is included as Table 2.

The primary changes were adding Prime Farmland Soils, modifying the habitat rankings to include moderate habitat classes, and adding unfragmented land factors. Proximity to Winnicut River and Great Bay were also added to parcel factors. As the final maps were being generated, certain factors and characteristics needed review prior to proceeding to the next step in the mapping process. Project manager, Danna Truslow, GIS specialist Dave McGraw and Steering Committee Member Daniel Kern were in close contact during the final weeks of map completion and made some of the final decisions on weighting and determination of ranked areas.

Table 2

Final Resource Co-Occurrence Model
Town of Greenland NRI

Resource Factor Weightings:

Riparian & Wetland Buffer Zones (200' buffers) 2 points

NWI Wetlands
- Estuarine 2 points
- Palustrine 1 point
- Riverine 1 point

High Value Wildlife Habitat
- Moderate Scoring Areas: [Allsppu] > 38 and < 60 1 point
- High to Very High Scoring Areas: [Allsppu] >= 60 (max value = 88) 2 points

Habitat values were derived from a Great Bay dataset developed by the US Fish & Wildlife Service's (USFWS) Gulf of Maine Program (1/99). This study examined important fish & wildlife habitats in NH's seacoast region and the Gulf of Maine. Each habitat class (derived from Landsat imagery) was identified as important to a range of species. The habitat factor applies value to those areas or habitats that scored above the average town value of 38; [Allsppu] > 38).

Water Resource Features
- Drinking Water Protection Areas (active sources) 1 point
- Potentially Favorable Gravel Well Areas (Tmax >= 1,000 ft2/day) 1 point
- Sanitary Radii (active sources) 1 point
- Aquifer Present (Tmax >= 500 ft2/day) 1 point

Important Soils
- Soil Development Potential: High - Very High - Medium Classes 1 point
- Prime Ag 2 points

Natural Landcover Areas 1 point
- All GRANIT 2001 landcover classes except 100 (Residential, commercial, or industrial), 140 (transportation) and 710 (disturbed).

Intersection of Natural Landcover & High Soil Development Potential 1 point

Unfragmented Lands
- Blocks 250-500 acres 2 points
- Blocks > 500 acres 3 points

Table 2

Final Resource Co-Occurrence Model
Town of Greenland NRI
(Continued)

Parcel Weightings:

By Size

- 5 - 10 acres — 1 point
- 10 - 25 acres — 2 points
- 25 - 50 acres — 3 points
- 50+ acres — 4 points

By Proximity to Conservation Lands *

- Parcel Edge Within 250'(but not linking or abutting) — 1 point
- Abutting Conservation Land — 2 points
- Linking Conservation Land — 3 points

By Proximity to Winnicut River *

- Parcels Abutting Winnicut River (frontage on water) — 1 point

By Proximity to Great Bay *

- Parcels Abutting Great Bay (frontage on water) — 1 point

By Scenic Value * — 1 point

- Parcels having important views. Lands at gateways and along major roads and those that can be seen from the water were chosen as well as other landmark views. * This included all those parcels meeting the above two frontage criteria (frontage on Winnicut River and Great Bay) as well as other designated scenic parcels.

* These factors also had to meet a size criterion of greater than 3 acres.

Co-Occurrence Values for Lands in Greenland

The final co-occurrence values for the GIS evaluation are displayed in a variety of formats and using a variety of criteria. The co-occurrence maps, Figures 6 and 7, display a range of shading to represent values of co-occurrence. The dark brown represents the largest values of co-occurrence gradating to lighter colors, which represent low co-occurrence.

Two co-occurrence maps were generated for this project. The Organic Co-Occurrence map includes all those features listed as Resource Factor Weightings in Table 2. This map allows the viewer to see where high value resources occur regardless of parcel size. This analysis can be valuable in finding smaller parcels embedded in larger areas that can be crucial to conservation efforts. It also allows those parcels that are not close to existing conservation land but still have intrinsic resource values to be emphasized.

This evaluation shows that land along the Great Bay and in the southwest and south central portions of Greenland to have the highest resource co-occurrence. In these areas, high value wetland, stream, habitat and groundwater resources co-occur making these areas particularly valuable from a resource perspective.

The second Co-Occurrence map represents co-occurrence of all factors Total Co-Occurrence Map. While similar to the organic co-occurrence, the parcel factors add significant value for those lands adjacent to or joining conservation lands, shore land, especially large parcels and those with important views. The areas with the greatest values occur in the southwest portion of Greenland as well as along the Great Bay waterfront in the northwest portion of town. Significant values also are illustrated in the southeast near Breakfast Hill Road and along Newington Road in the northeastern portion of Greenland.

In addition to the overall co-occurrence maps, two smaller maps representing scores by parcel were also developed by SPNHF. In order to generate these maps, the co-occurrence value was integrated over each parcel. The average parcel value was calculated and every parcel above the average value was ranked by parcel totals. This evaluation will further help the town and Seacoast Land Trust to identify key conservation areas. The map and lot number of each of these high value parcels is included on the maps. Like the larger maps, one of these parcel specific maps represents Organic Co-Occurrence and one represents Total Co-Occurrence.

Spreadsheet tables were also developed showing the criteria and ranking for each parcel in the watershed (Appendix A). These tables form the basis of our landowner and land use research and outreach efforts. These spreadsheets show rankings of each parcel by resource and parcel factors and show the combined score. They also include lot identification numbers. This table has been modified for internal use to include landowner/use information. They are in Excel spreadsheet form and can be easily sorted and modified.

A full set of all reports, maps, tables and background materials is being provided to the Town of Greenland and a full set will be kept at the Seacoast Land Trust.

Contact key landowners

At the initiation of the project, SLT updated and modified the landowner database for Greenland to allow for easy landowner contact. During the course of the project, two estate-planning seminars were offered by SLT in May and again in September, as part of our ongoing outreach efforts at SLT. Seacoast landowners (including those in Greenland) as well as SLT members and town boards were invited to attend these workshops. Each was free and open to the public. A copy of the agendas for each of these workshops is included in Appendix B.

SLT followed up with Greenland landowners with additional information and phone calls.

Research current landowner and land use status

Throughout the process, our Greenland landowner database was updated and land use/protection status was tracked. This information is included in SLT files for the project, but not included in the tables included in this report out of respect for landowner privacy.

Plan and conduct outreach to target audiences

A copy of the Outreach Plan is included in Appendix B. The Steering Committee represented a good cross-section of Greenland town government and the materials developed to date have been made available to committee members at all meetings. A PowerPoint presentation was developed for these meetings and is included in Appendix B. Now that the maps are complete, the following outreach has been or will be conducted:

Press release to local and state media announcing completion of mapping project (Appendix B).

Presentation to Conservation Commission, January 2004.

Presentation to technical work session of planning board in February 2004.

Presentation for public meeting February 2004.

House meeting presentation, March 2004.

As with the mapping for Sagamore Creek and Berry's Brook, these presentations will go beyond those planned above. They are a valuable presentation tool and one that has been successfully used to complete multiple conservation projects for the Seacoast Land Trust. The maps are also used with private meetings with landowners to illustrate conservation priorities and values as part of land protection work.

Results and Discussion

One complete set of large format maps for each watershed is included with the final report in an accompanying map tube. Smaller maps are included with the bound report.

The overall project results as illustrated in the final maps has provided the Seacoast Land Trust with a justification for developing land protection priorities as well as a valuable visual tool for illustrating the importance of land protection. Following are some of the modifications made as the process evolved and following that is a discussion of target areas.

As mentioned earlier in the text, the map presentation and co-occurrence criteria were modified based on the priorities expressed in the Steering Committee meetings. In particular, there were modifications to emphasize habitat, prime farmland soils, unfragmented lands, and important views.

Finally, even though the most recent data set of conservation land was used, some already conserved land that did not appear in the GRANIT database. After meeting with municipal representatives, some of our rankings were modified and annotated based on these changes.

The ranking system is fairly heavily weighted towards large parcels. However, the working group felt this was justified due to the fact that habitat would likely be least disturbed in large undeveloped parcels. The manually derived land use information was used to weed out large parcels that were already developed. These landowners will be contacted to discuss stewardship of remaining open land in future outreach efforts. The contrast in rankings is made clear when comparing ranking by parcel factors, ranking by resource factors and ranking by combined totals.

Conversations are already underway with several of the landowners in the Greenland area. SLT will work closely with the Town of Greenland on conservation efforts and assist them in any way possible to assist with landowner contact, transactions, and funding.

Conclusion and Evaluation

SLT is using these maps to broaden land protection efforts and provide valuable tools to the Town of Greenland as well as other land protection organizations. We can illustrate the value of land protection to municipalities and landowners and promote this as a planning and future funding tool. These illustrations go beyond words to show interested parties the tangible value of our ever-shrinking open lands here in the Seacoast.

The process of land protection is a slow one. Many factors need to be weighed by landowners and conservation organizations before final agreements can be reached. Seacoast Land Trust looks forward to facilitating land protection in these areas with the assistance of these working maps.

- Did the project increase the knowledge of the Conservation Commission and other Town Boards about the natural resources in their community?
  Yes, the project illustrated natural resource distributions vividly and compactly. Not only have those involved in the process seen them, but the presentation, posting in Town Hall and the Library will also broaden awareness.
- Did the project increase the awareness of these same boards on conservation options and the benefits to landowners within their town as well as the community at large?
  Yes, several of these board members have attended previous conservation option/estate planning workshops and will continue to be invited to upcoming outreach efforts.
- Did the work produce the results that GCC was expecting? How does the ranking compare with internal land protection priorities?
  It has similar priorities, but several key SW parcels were not yet identified and the resources had not been quantified as they were in this study.
- Did the process foster a positive working relationship between SLT and Greenland Conservation Commission? Will this cooperative relationship continue?
  It was a great way to work with the Conservation Commission as well as representatives from planning and select board and definitely fostered a positive working relationship.
- Did the outreach programs provide citizens and landowners with valuable information about natural resources and their conservation options?
  The Estate planning workshops in May and September provided conservation option information and workshops in February and thereafter will continue to provide this information.
- Did any landowners approach SLT or GCC about conservation of their land?
  Yes, we have had several inquiries and are working on several projects already.
- Will the town initiate land conservation at a municipal level?
  Greenland nearly passed a $2 million dollar bond issue last year and is committed to putting the bond on the ballot this year as well.
- Did it increase the visibility of SLT and the awareness of the service that they provide?
  Yes, we have gotten to know several key decision makers as well as opening conversations with many landowners and citizens in Greenland.

Recommendations

Ever since our first mapping project, it was clear that this was a good means of not only understanding the land, but also connecting with local decision makers and landowners to get to common ground. As land use is changing rapidly in the Seacoast, keeping these maps up to date will be an ongoing effort. SLT has received a grant from NH Coastal Program to complete this mapping process for the remainder of the service area then coalesce all the mapping work into one "greenbelts" map for our service area. In retrospect, mapping all of the area at once may have been advantageous, but it would not have allowed us to really learn and understand each of these areas in detail as we have.

We recommend that Greenland work with abutting municipalities to work on protection projects that cross boundaries and to study and understand these maps and use them in the planning and future planning for the town.

Seacoast Land Trust will continue to reach out to landowners to acquaint them with land protection options and to assist the town where possible with land protection projects. Since complete protection of parcels is not always attainable or desirable, SLT also promotes the responsible development of land and protection of the most sensitive lands. The results of this mapping process may also suggest to Greenland to study alternatives to traditional subdivision planning to protect key resources.

Appendix A

Land Protection Priority Ranking Spreadsheets

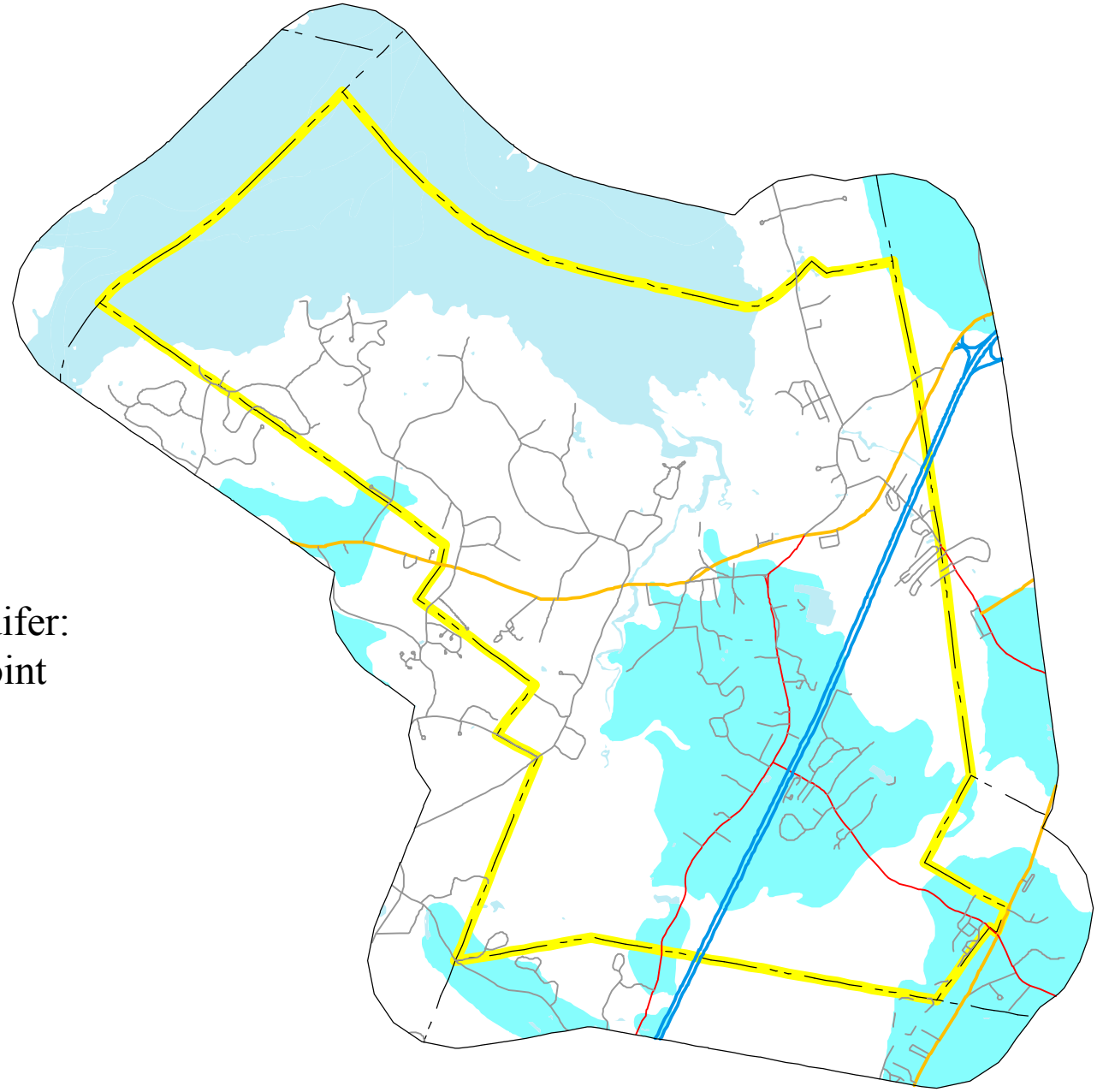
Appendix B

Outreach Plan and Estate Planning Agendas

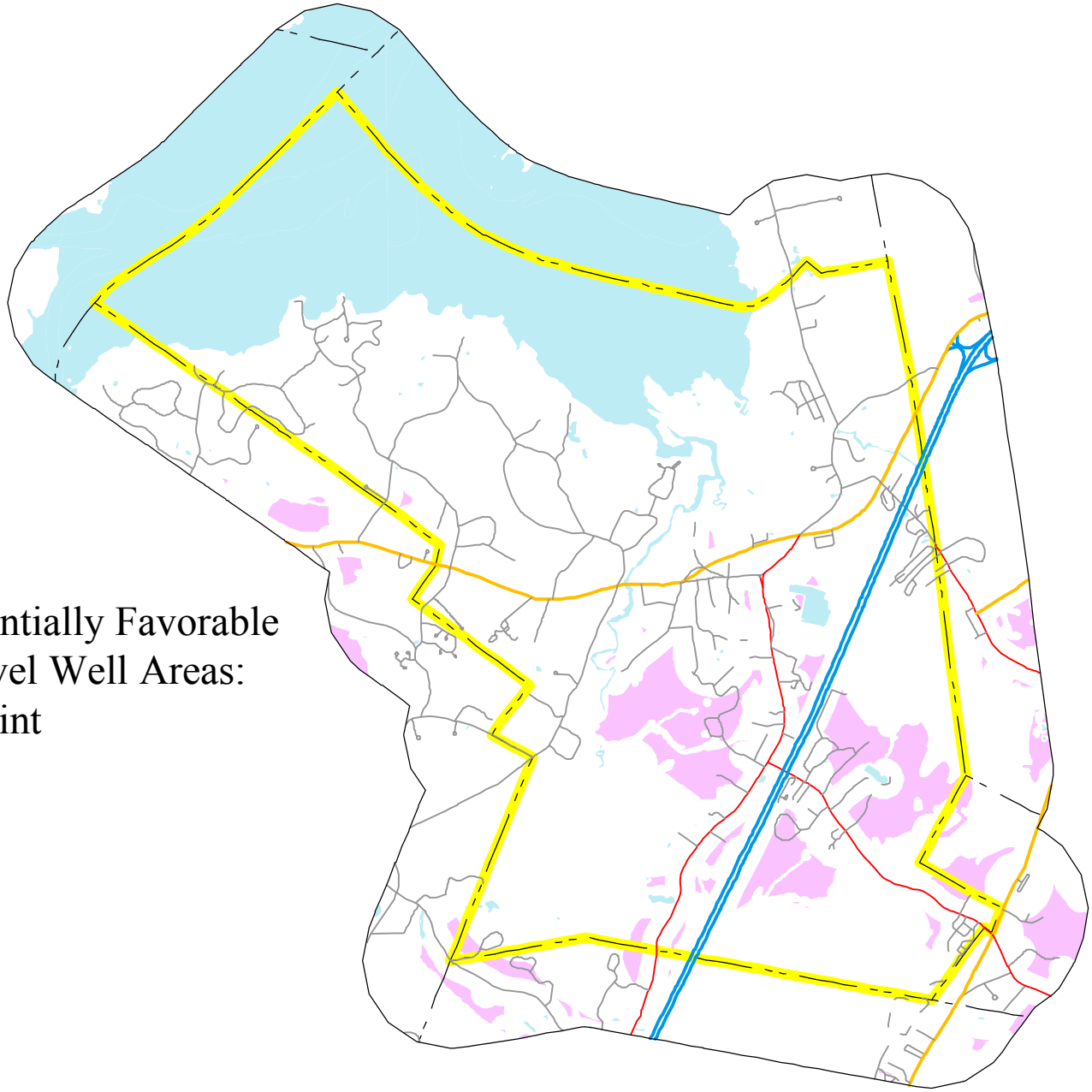
Appendix C

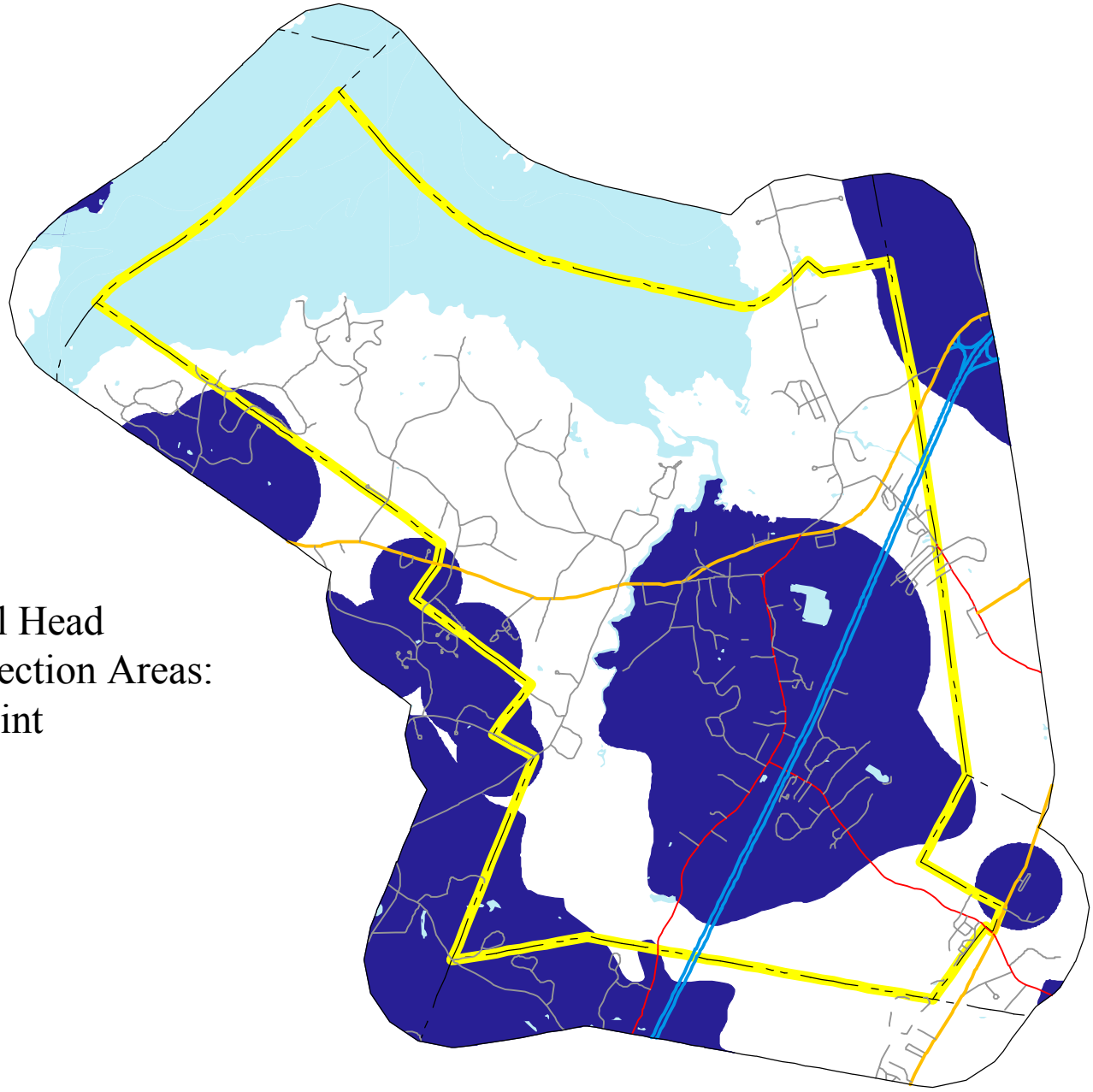
Maps

Aquifer:
1 point



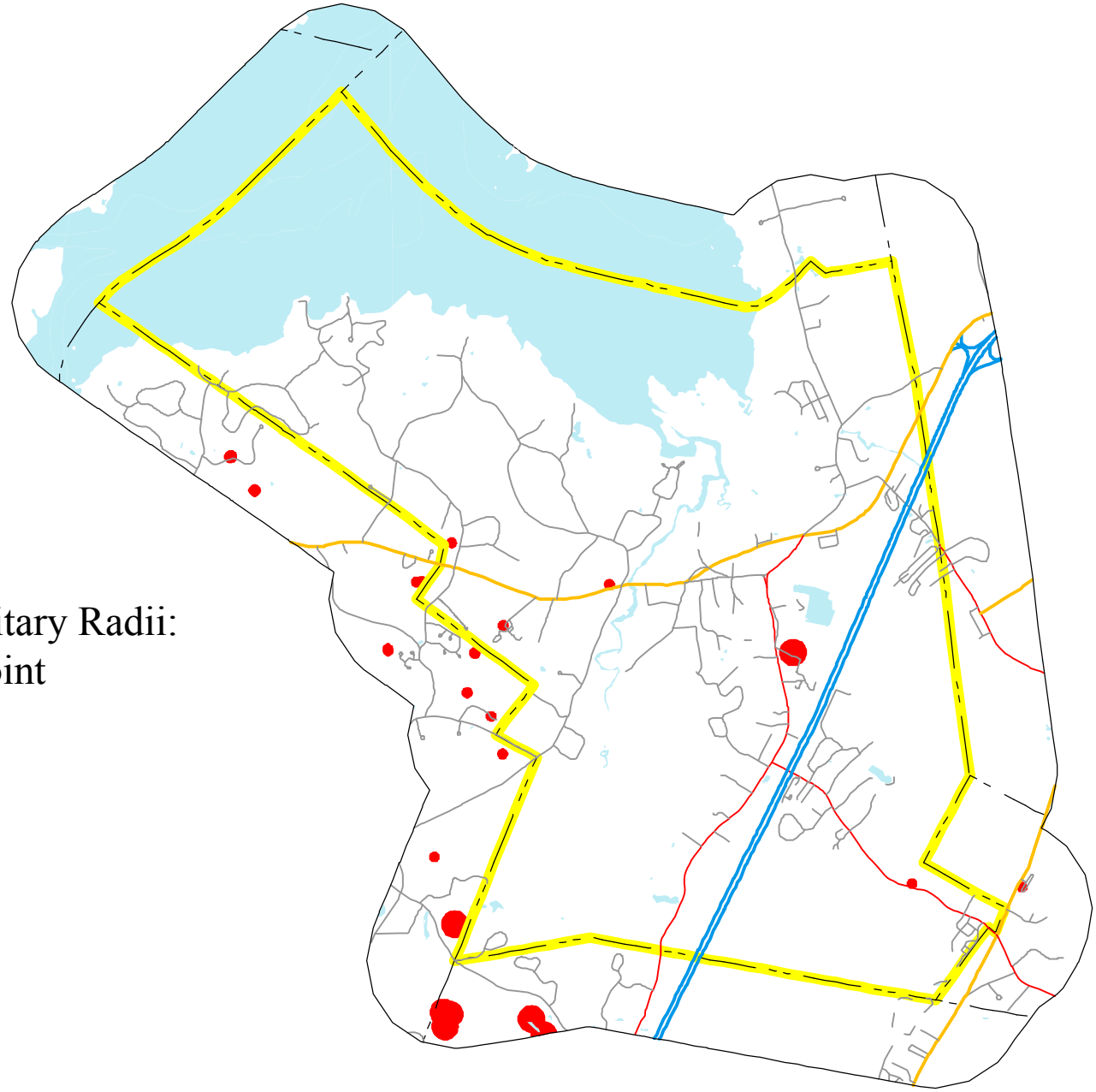
Potentially Favorable
Gravel Well Areas:
1 point

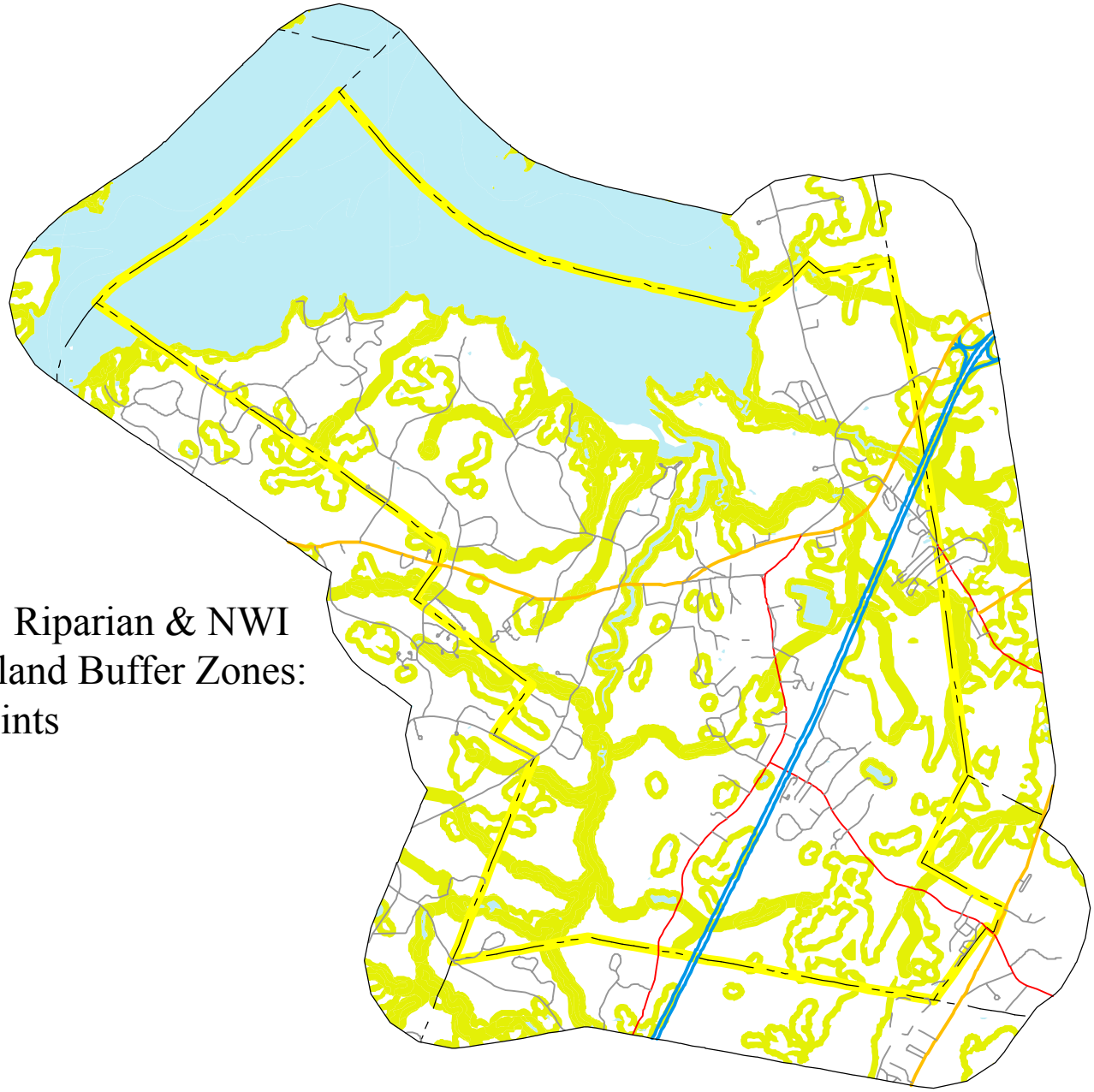




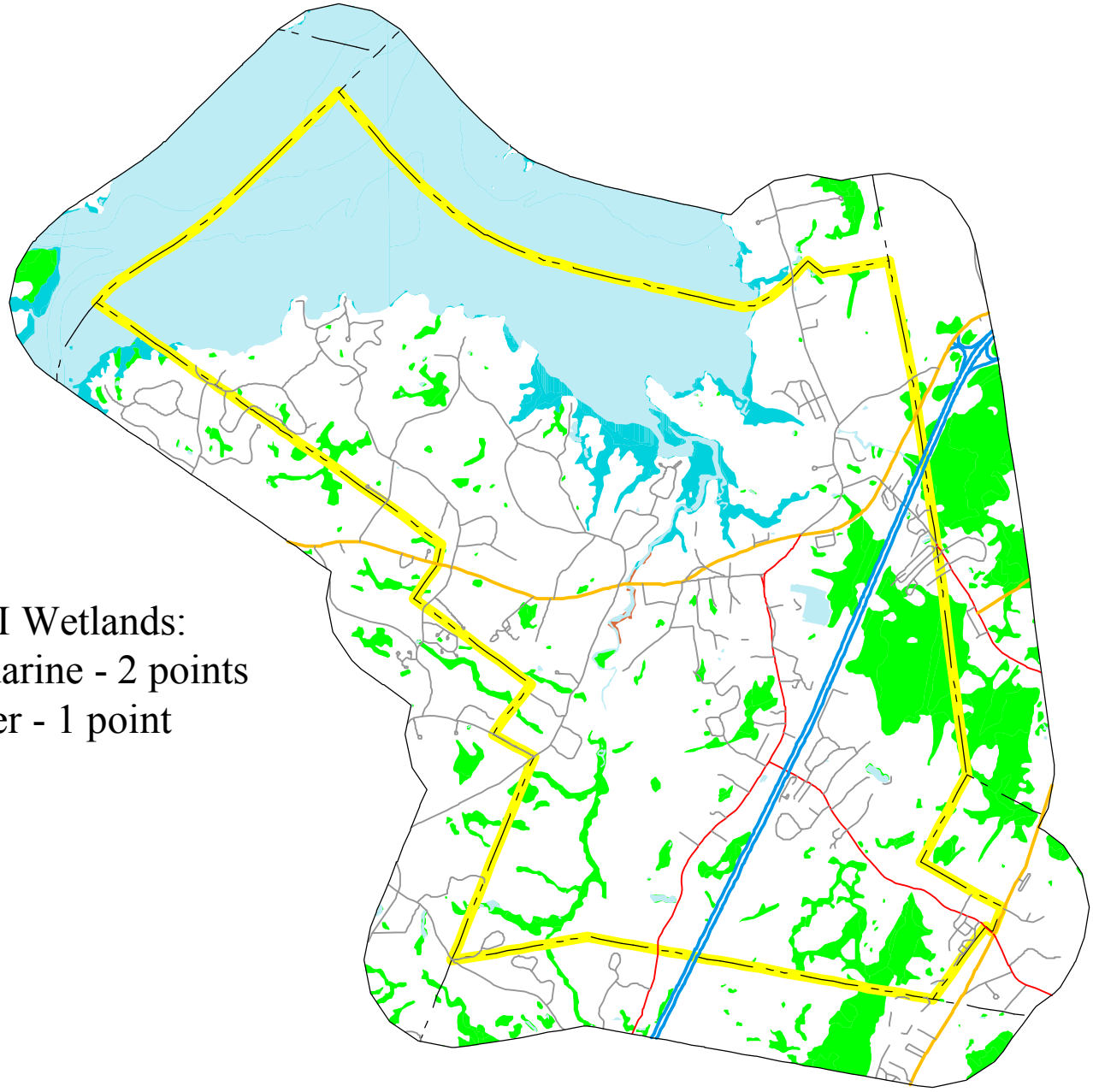
Well Head
Protection Areas:
1 point

Sanitary Radii:
1 point

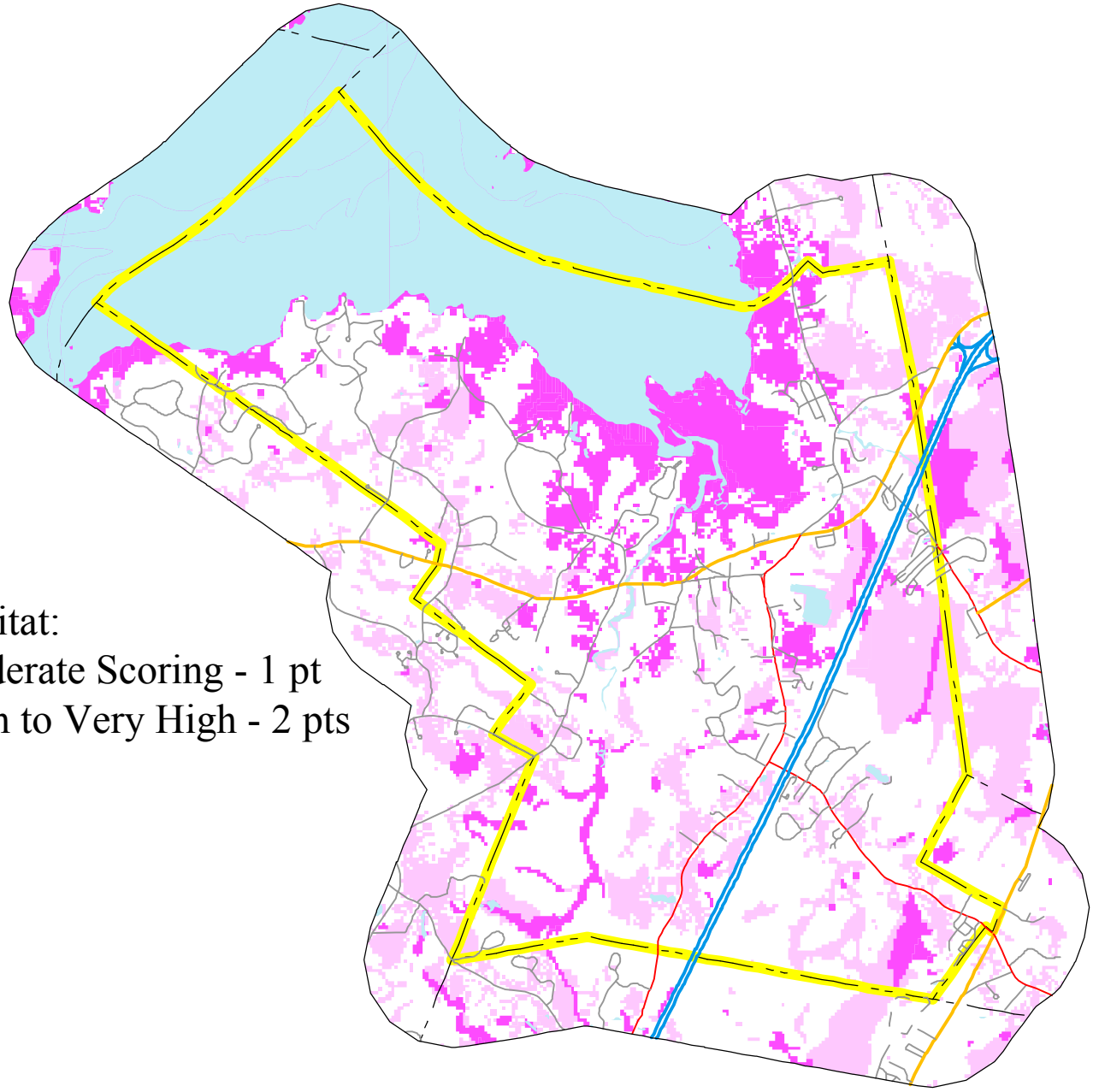




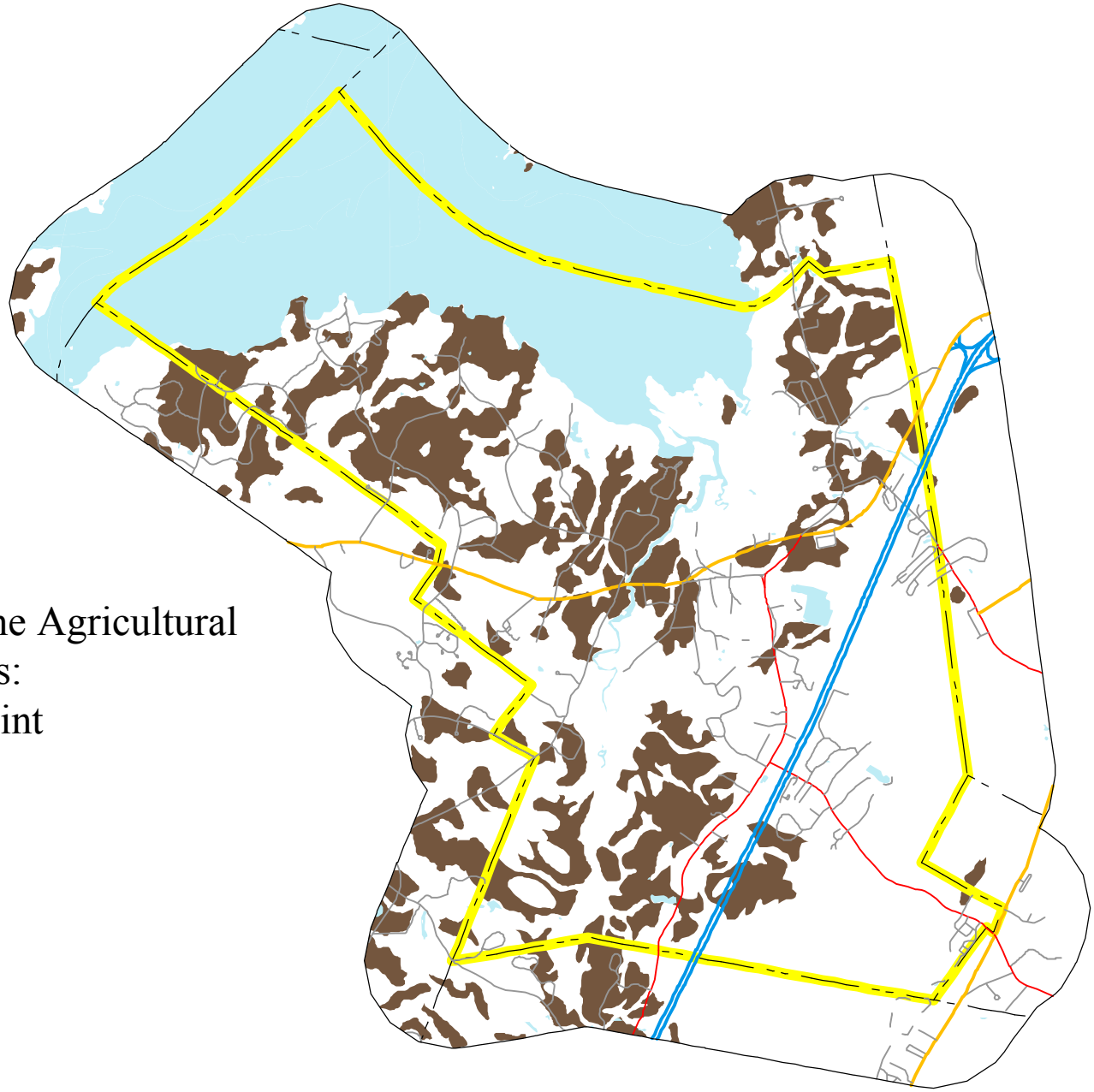
200’ Riparian & NWI
Wetland Buffer Zones:
2 points



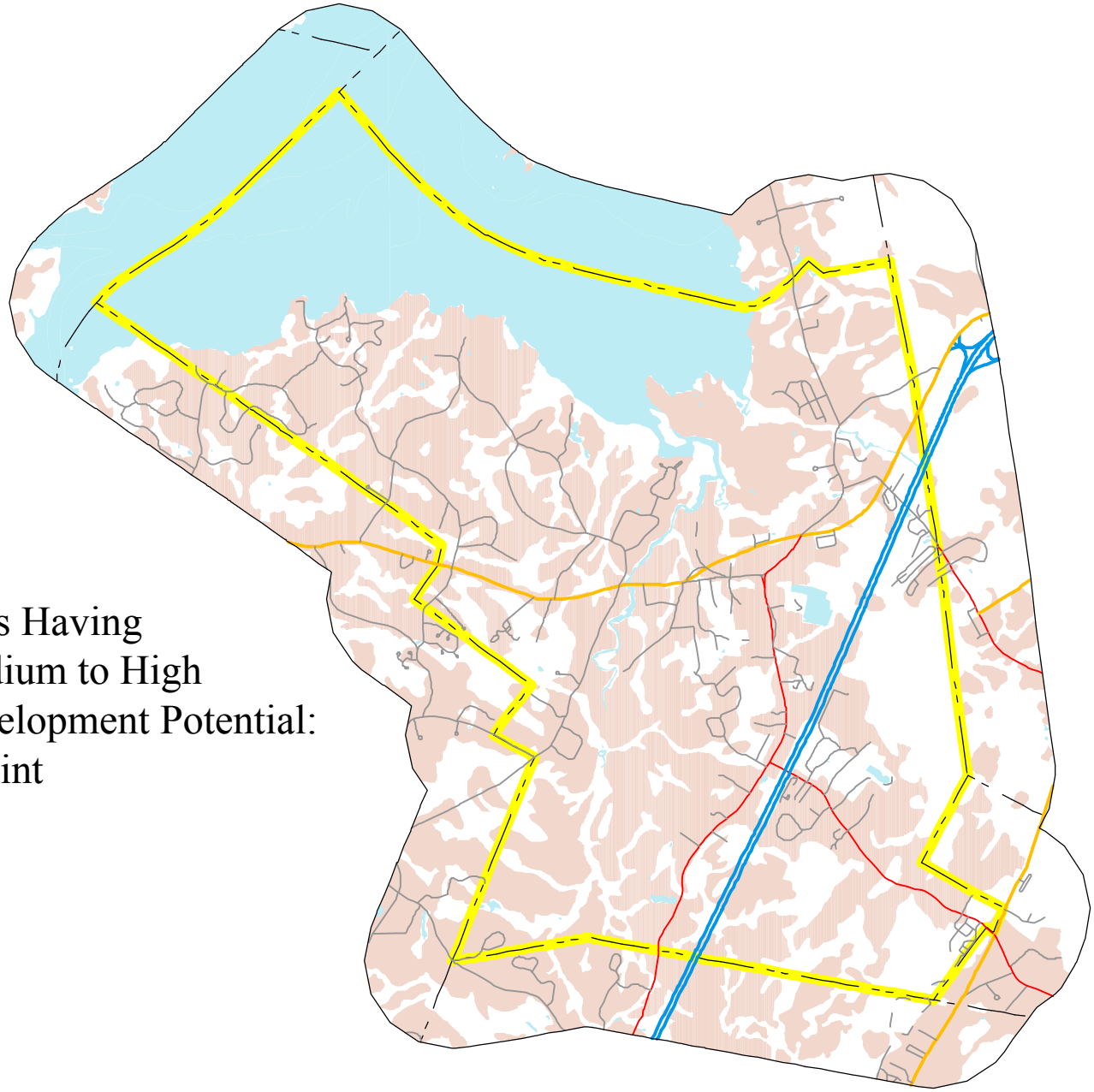
NWI Wetlands:
Estuarine - 2 points
Other - 1 point



Habitat:
Moderate Scoring - 1 pt
High to Very High - 2 pts

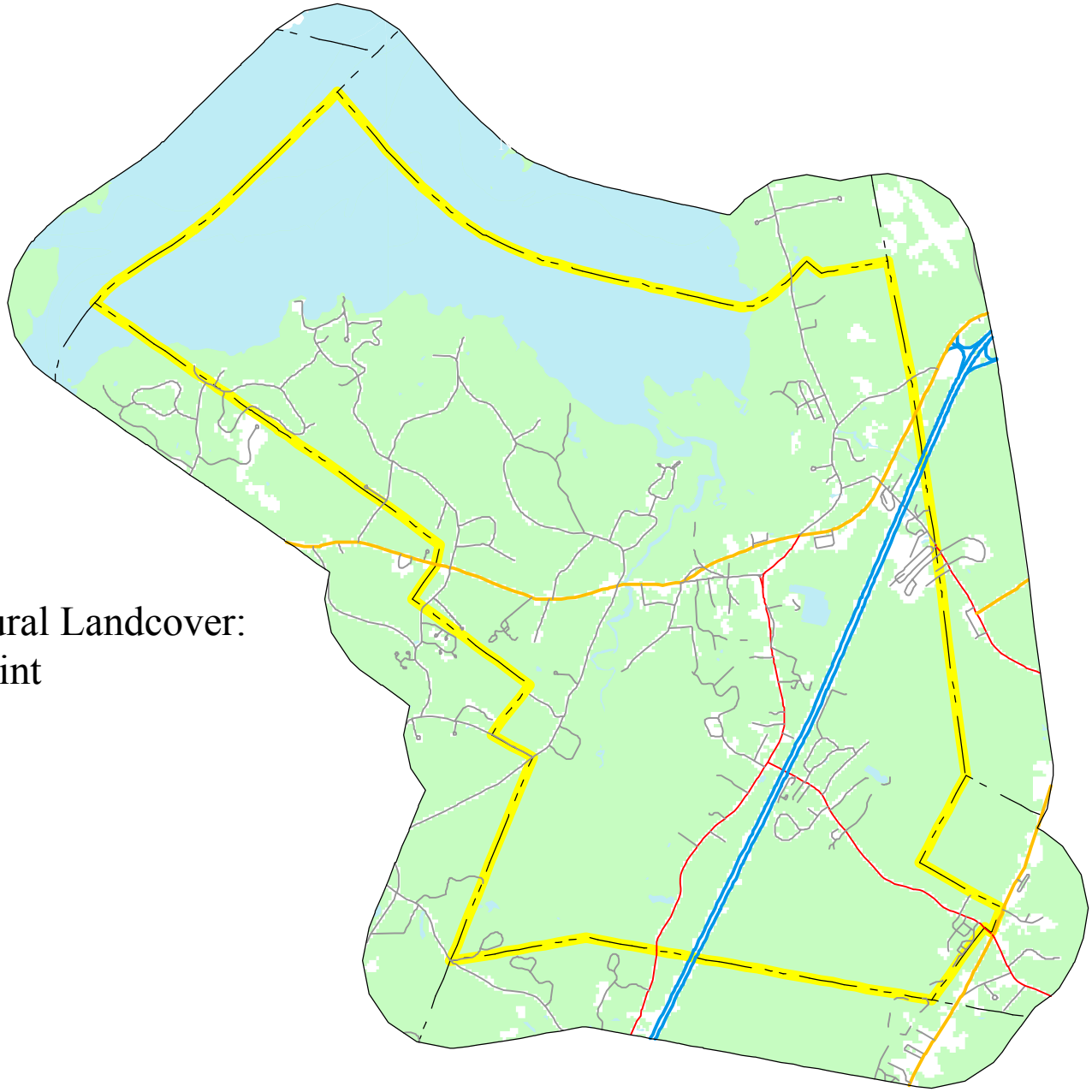


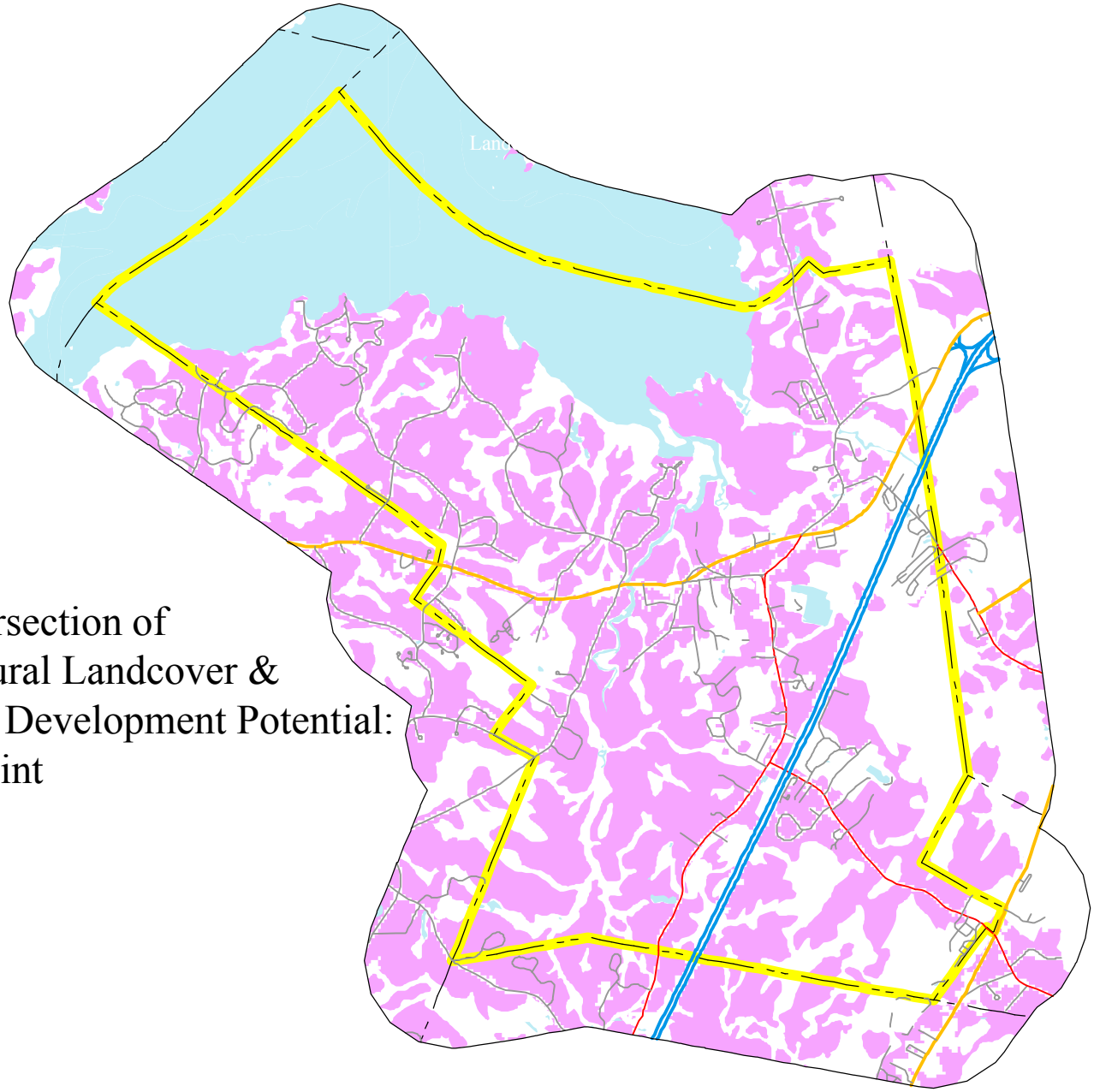
Prime Agricultural
Soils:
1 point



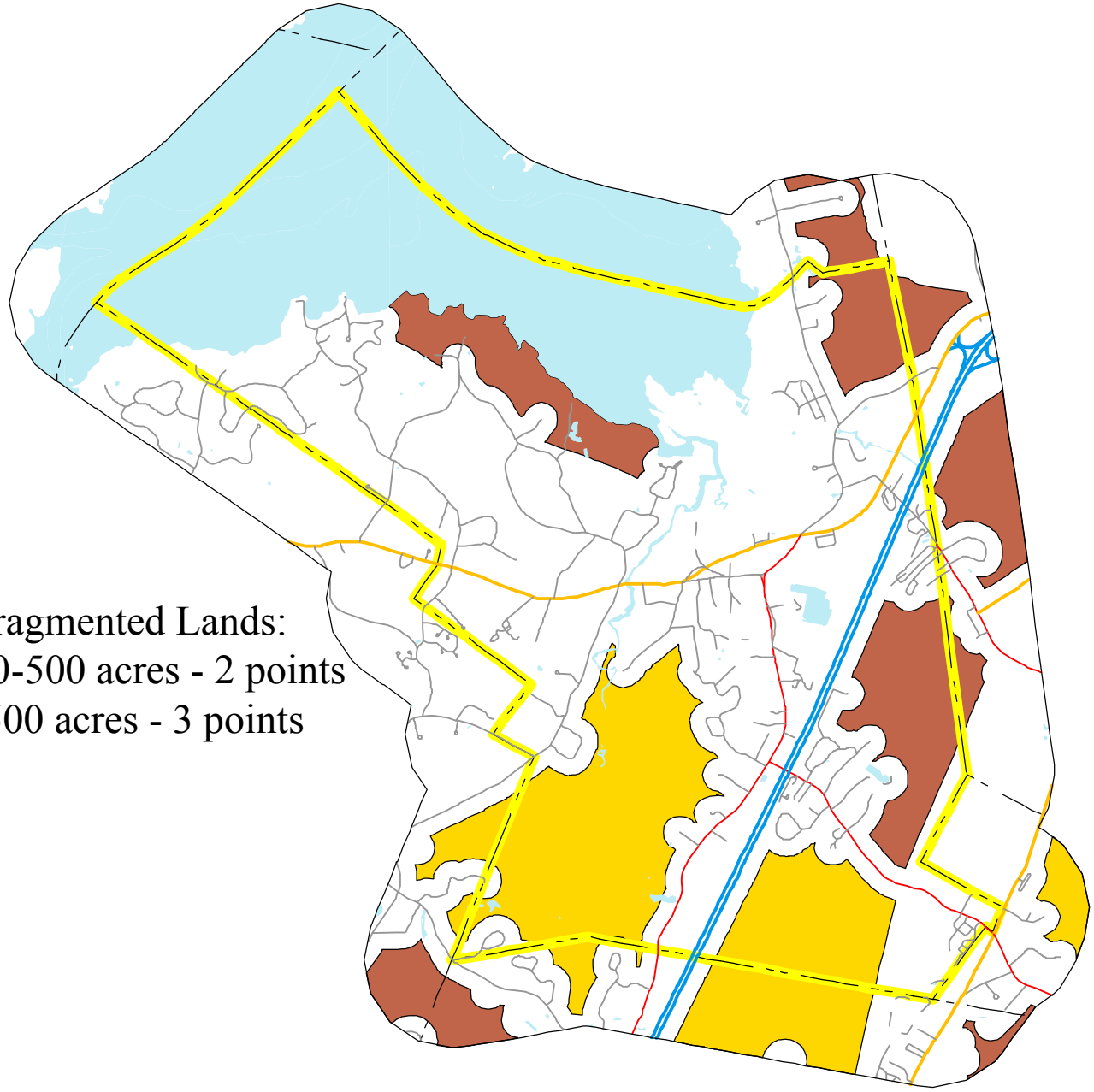
Soils Having
Medium to High
Development Potential:
1 point

Natural Landcover:
1 point

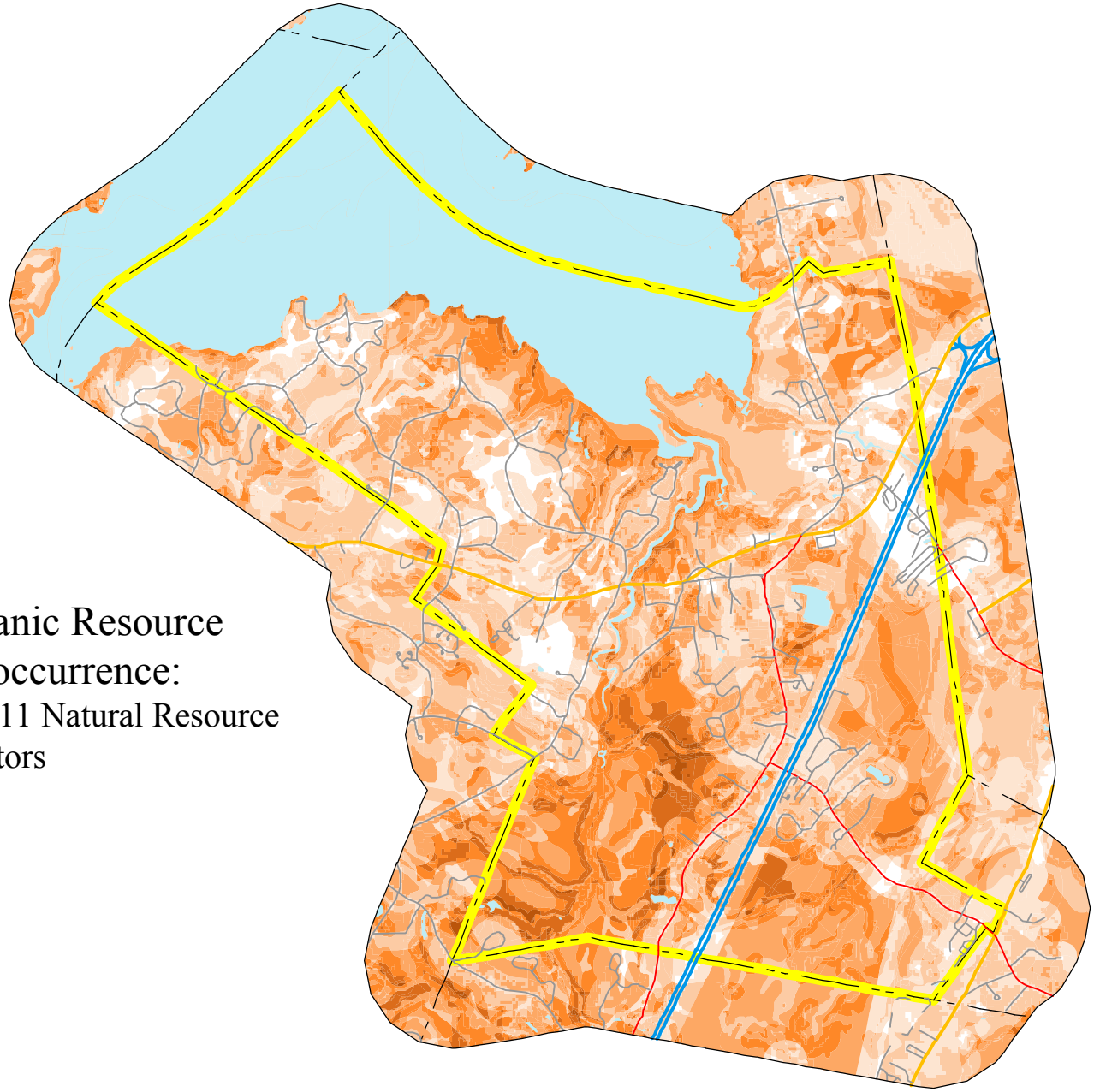




Intersection of
Natural Landcover &
Soil Development Potential:
1 point

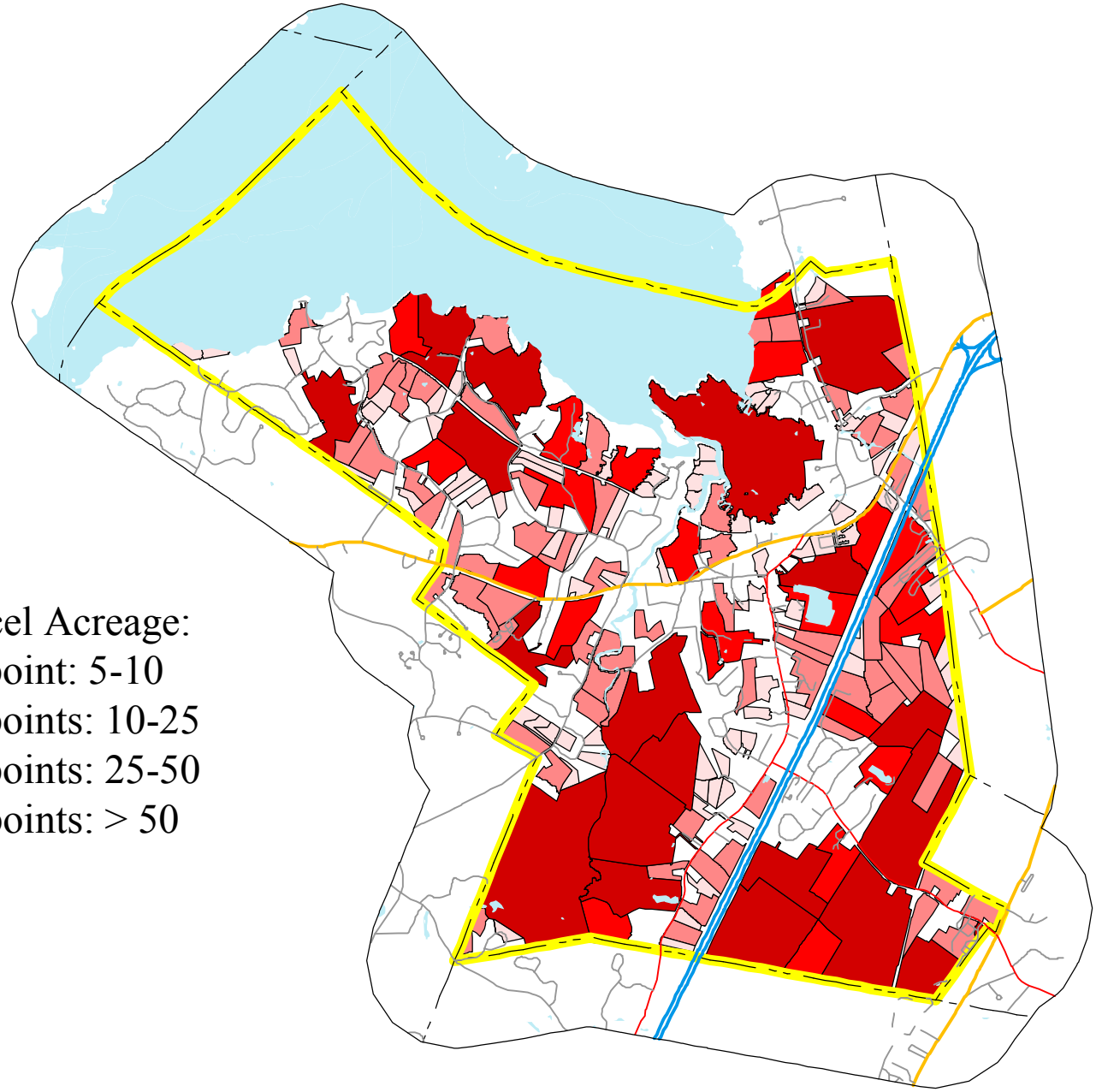


Unfragmented Lands:
250-500 acres - 2 points
> 500 acres - 3 points

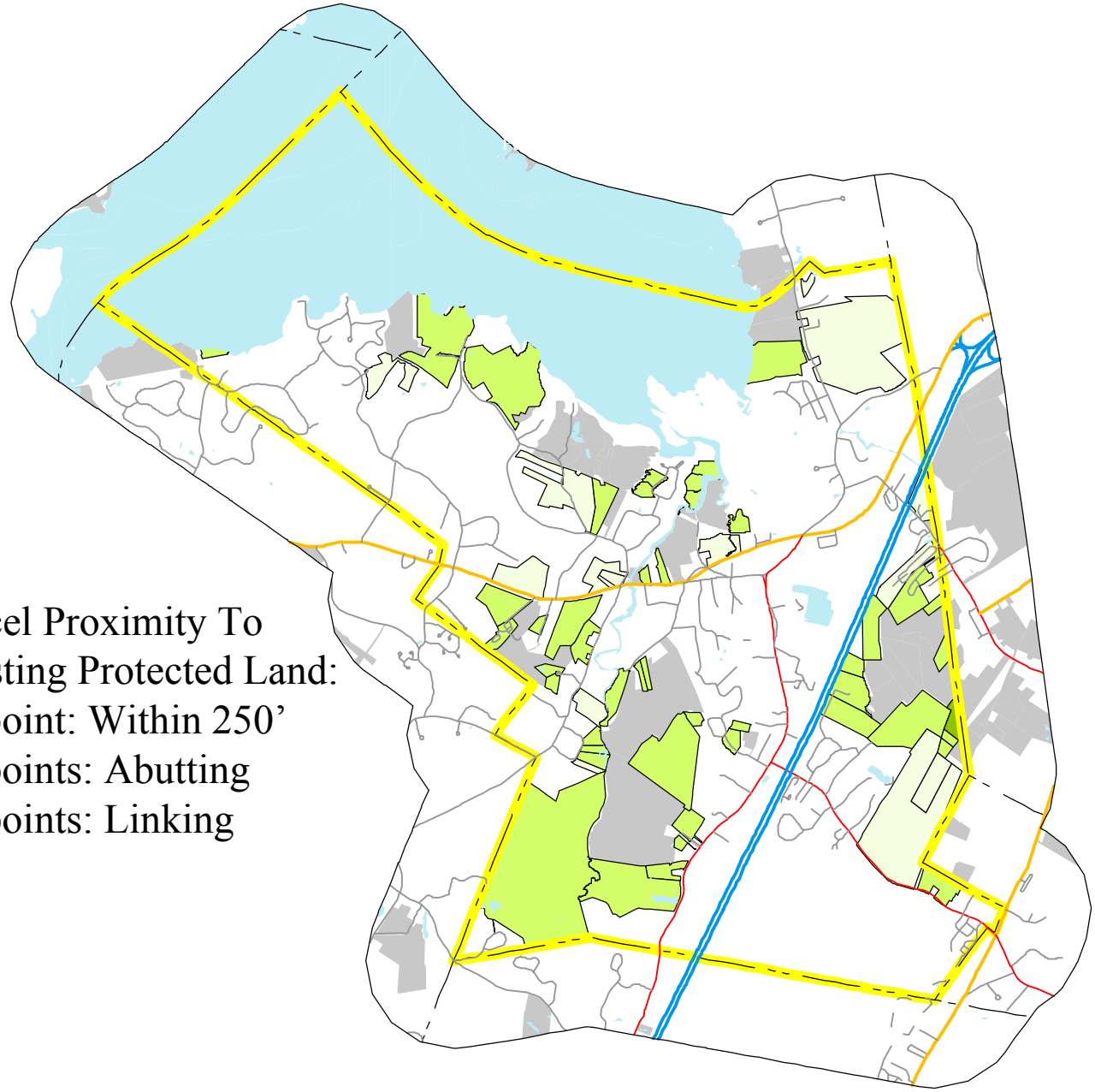


Organic Resource Co-occurrence:

All 11 Natural Resource Factors



Parcel Acreage:
1 point: 5-10
2 points: 10-25
3 points: 25-50
4 points: > 50



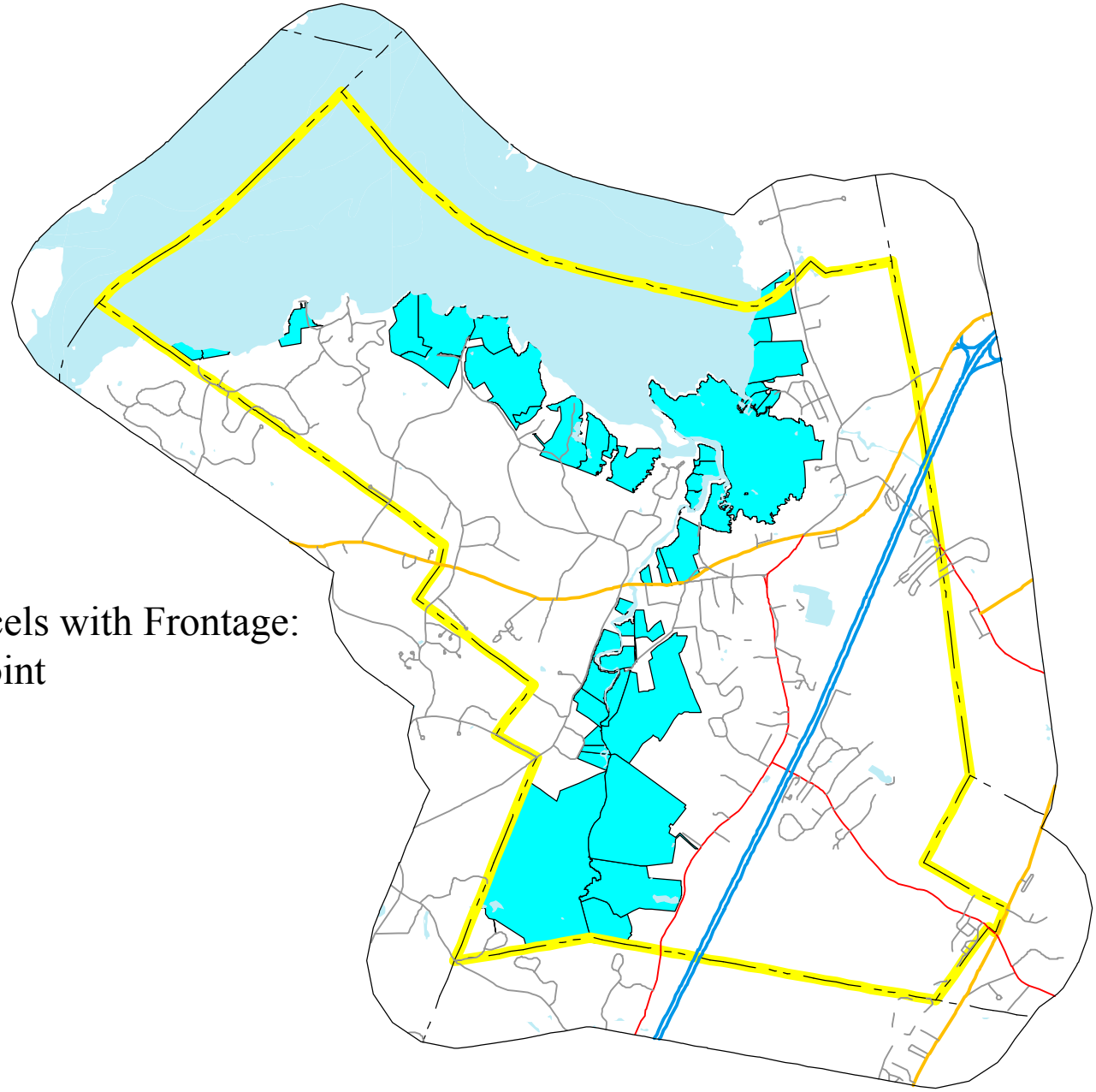
Parcel Proximity To
Existing Protected Land:

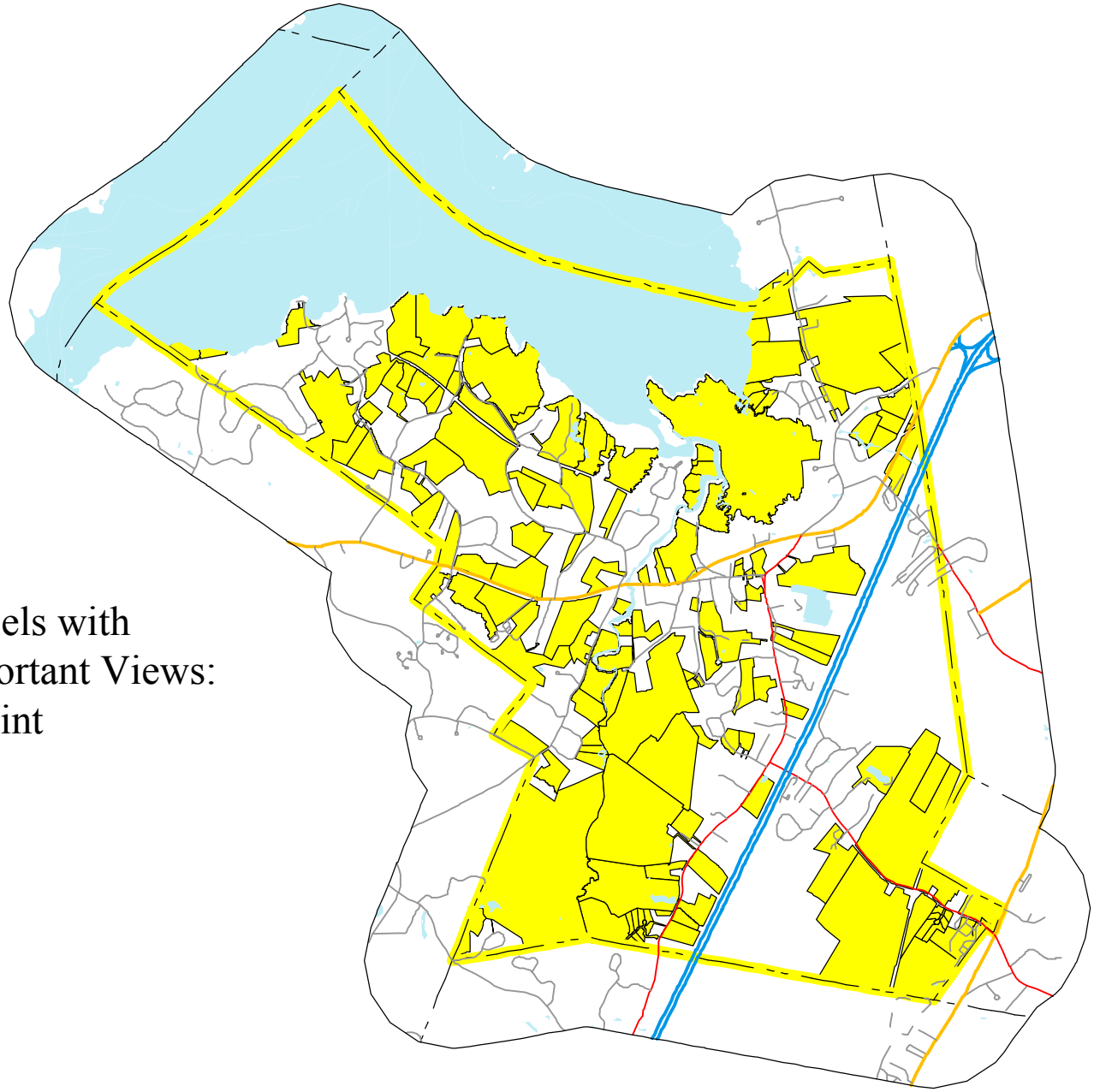
1 point: Within 250’

2 points: Abutting

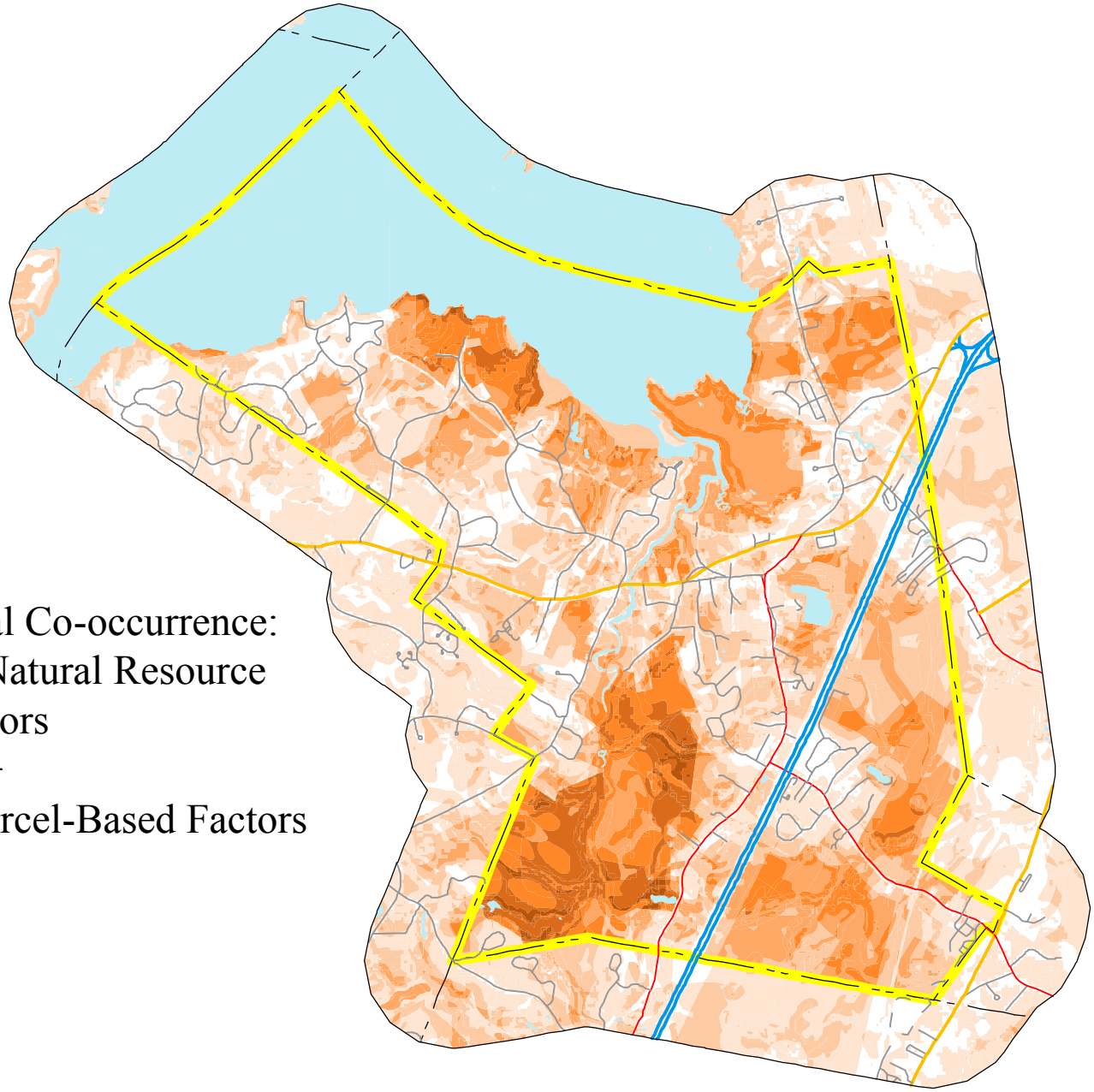
3 points: Linking

Parcels with Frontage:
1 point

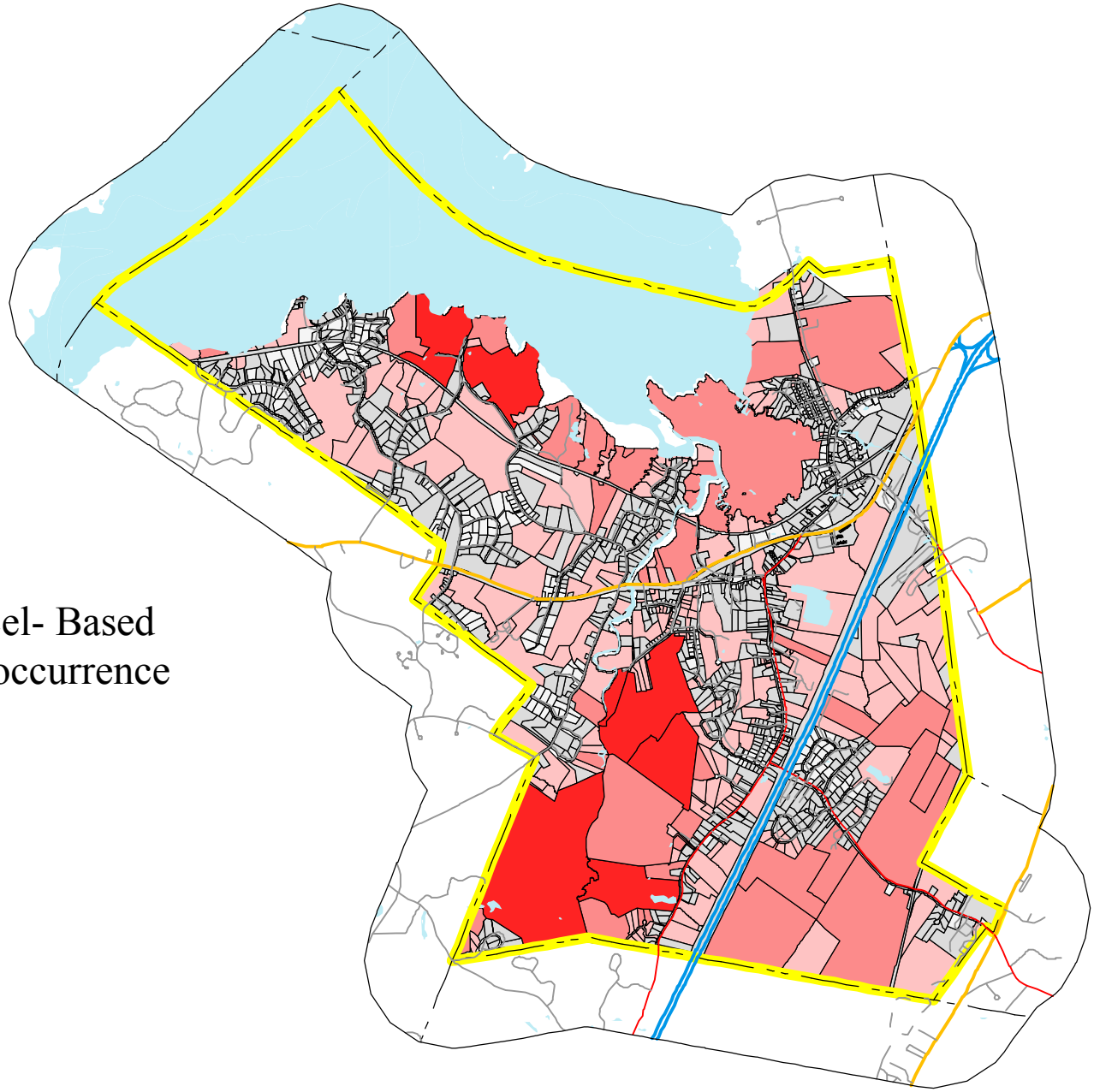




Parcels with
Important Views:
1 point



Total Co-occurrence:
11 Natural Resource Factors
+
4 Parcel-Based Factors



Parcel- Based
Co-occurrence