Delineation and Function Rating of Jurisdictional Wetlands on Potentially Developable City-owned Parcels In Juneau, Alaska

by

Koren Bosworth
Bosworth Botanical Consulting
Juneau, AK
bosworth@alaska.com

and

Paul Adamus, Ph.D.
Adamus Resource Assessment, Inc.
Corvallis, OR
adamus7@comcast.net

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1.0 Background

Due to the major constraints imposed by Juneau's geographic position, buildable land is extremely important to the City's continued growth. A proportion of City-owned undeveloped land might be buildable, but the exact acreage and location has been uncertain because jurisdictional wetlands on these undeveloped parcels have not been delineated comprehensively using protocols acceptable to wetland regulatory staff of the US Army Corps of Engineers. Moreover, the management categories of wetlands on these parcels (as based on their levels of functions) have not been determined. The proposed project attempted to fill these needs, and dovetails with the City's updating of its Comprehensive Plan that must be completed during 2007.

2.0 Methods

2.1 Preparatory Tasks

The study area encompasses the Urban Service Area Boundary (USAB) and areas near the USAB where municipal water and sewer service can be extended within the next 15 years. Prior to start-up of this study, all City-owned land within that area was screened for suitability for new development by staff of the Community Development Department (CDD) using data from the City's GIS system. For example, City lands mapped as having protected stream corridors or other protected open space, mass wasting or avalanche hazards, or slopes mostly greater than 18% were excluded from further consideration. This screening process identified 20 candidate parcel units, each consisting of multiple parcels in close proximity, before considering whether any contained legally-protected wetlands. A second round of screening by CDD staff reduced this number to 10 parcel units, still without accounting for the possible presence of wetlands. Aerial photographs (false color infrared from 2001) of these 10 parcel units were then inspected by Koren Bosworth as a prelude to field work.

2.2 Wetland Delineations

Depending on parcel unit size, we spent 2-6 hours walking each parcel unit, focusing particularly on (a) any parts that had been mapped previously as wetland (ARA 1987- see Lit.Cited), (b) areas of low slope, and (c) areas that appeared from aerial photographs or soil maps to possibly be wetlands. We did not walk the exact and complete perimeter of each parcel unit, but rather focused on areas where there was a credible probability of wetland occurrence. The parcel units were visited during the period from October 2 through 25, 2006. This is near the end of the approximate growing season (the Corps of Engineers official growing season for northern Southeast Alaska is April 29 to Sept. 28). Although some species were beginning to senesce, we do not believe any resulting differences in cover values were significant in terms of overall delineation of boundaries of the wetlands we assessed.

Wetlands were identified and delineated using procedures in the official manuals of the U.S. Army Corps of Engineers (1987, 2006). Specifically:

- Vegetation criteria for wetlands were assessed using the prevalence index based on plant species indicator status (Reed 1988, as updated) and as listed in the Interim Regional Supplement.
- Hydrologic criteria for wetlands were assessed by noting the presence of water directly at this time of year on either the soil surface, or free water or saturated conditions within 30 cm of the soil surface.

- Soil criteria for wetlands were assessed by digging a pit to a depth of at least 30 cm, and assessing soil texture as well as hue, chroma, and value using a Munsell color chart. The soil indicators of hydric conditions, as defined in the Interim Regional Supplement, were used.

Our original intent was to used a cartographic-level GPS to delineate the boundaries of all wetlands within 50 feet or less. However, within all the wetlands we visited, despite repeated attempts at various times of the day, we were unable to get sufficient satellite signals to enable the GPS at more than a few points, due mainly to extensive tree canopy. Therefore, the hand-drawn delineations shown in the accompanying spatial data layer were based on a judgmental combination of the following:

1. Interpretation of digitized orthorectified aerial photographs, under magnification
2. Detailed LiDAR-derived maps of slope, topography, and streams
3. Field plots whose locations we estimated using the above sources and (when available) GPS points.
4. Field notes made as we walked through the parcel units, in some cases along defined transects, with location of our path estimated from the above sources or, in the case of some transects, by measuring distance and compass direction in the field from a point with known (GPS-determined) coordinates.

Given these limitations, it is possible a limited number of very small (<0.5 acre) closed-canopy wetlands might have been missed, and that the precision of our wetland boundaries may in a few cases be no finer than about 100 feet. In most cases, we estimate a precision of about 20 feet. The resulting boundaries should be considered sufficient for the types of planning-level decisions for which they were intended to be used. However, if plans to develop a particular parcel reach a more advanced stage, we recommend a final jurisdictional wetland delineation be done around the "footprint" of the proposed development.

2.3 Assessment of Functions; Assignment to Protection Categories

The CDD requested that the "Adamus Methodology" for assessing functions of wetlands in Southeast Alaska be used, because that was the supporting document for the Juneau Wetlands Management Plan (1997 Revision). The "Adamus Methodology" is a series of standardized criteria used to assign a qualitative rating to each of 12 wetland functions or values. Those functions are defined in ARA (1987)(see Literature Cited). It is important to recognize that the Methodology by itself does not assign a wetland to a management category (A, B, C, D, EP). Rather, its ratings are used in the initial step of assigning the wetland to a category, with most of the categorization process occurring after taking into account various weights pre-assigned to the functions, as well as availability of practicable alternatives (other buildable sites) and public preferences. The standardized procedures and weighting factors that must be used to convert function ratings to final management categories are detailed in the Juneau Wetlands Management Plan (CDD 1997).

For this study, the "Adamus Methodology" as comprised of the function criteria in the Juneau Wetlands report (ARA, 1987) (see Literature Cited) was not used verbatim, because using that fully would have required equipment and time not available for this effort. For example, to use the Methodology to its fullest extent would have required chemical analysis of water samples, installation of groundwater monitoring devices in all the parcel units, and polling of the public about their preferences and recreational use of wetlands. Therefore, for each wetland function, only the parts of the Methodology that could be applied rapidly were used. In addition, it became apparent that scientific knowledge of wetlands – and specifically, an understanding of which wetland characteristics are most indicative of levels of each function – had advanced considerably in the 20 years since the

original study was done. This growth of knowledge has not invalidated any of the criteria originally used, but rather suggested a need for their refinement and expansion. Accordingly, some additions and minor adjustments of the criteria were made, their extent being limited mainly by this study's schedule, and these are detailed in Table 1. These criteria are mostly supported by peer-reviewed literature in professional journals but it was not feasible within the constraints of this project to cite the supporting documents. We retained from the original wetland study the number of function categories available for each function (e.g., 3 levels for functions assigned either a High, Moderate, or Low; some functions potentially have 4 or 5 levels).

Although the CDD (1997) had assigned scores for Public Perception and Practicable Alternatives to each wetland assessed in 1987, the Public Perception score had been based on polling of the public through a formal questionnaire, and the Practicable Alternatives score had been assigned through CDD judgments unrelated to wetland science. Thus, it was not possible to compute those characteristics for the 36 "new" wetlands. Instead we used the scores assigned to the nearest wetland that had been assessed in 1987, realizing in doing so that public perceptions of particular wetlands and availability of buildable alternative sites may have changed greatly across location and time. Similarly, ratings for the Recreation-Actual value had been assigned in 1987 through use of public polling, and because it was not possible to implement that again, we used the rating for the nearest wetland.

To define wetland categories, the Juneau Wetlands Management Plan had taken the "weighted summed function scores" for all wetlands covered by that Plan and divided them into 5 ranked groups, called quintiles, with an equal number of wetlands in each group (Figure 5 in CDD 1997). In other words, the 20% of the wetlands with the highest scores were placed in the highest category, the 20% with the lowest scores were placed in the lowest category, and so forth for the intermediate categories. See the Plan for details, and the first column below for the score ranges that defined the categories. However, because we added new wetlands to the statistical population of Juneau wetlands, the numeric boundaries of the quintiles had to be recalculated for this study and results are shown in the second column.

	CDD 1997	This Study
Quintile 5 category	55-67	55-80
Quintile 4 category	68-82	81-99
Quintile 3 category	83-96	100-108
Quintile 2 category	97-122	109-116
Quintile 1 category	123-148	117-148

We recommend that at some future time, consideration be given to supporting a more comprehensive review and refinement of the technical criteria and scoring system to bring them into compliance with best available science. After review and testing by resource agencies, those refinements should then be applied to all wetlands rated in the original Juneau wetlands study, including those that can be accessed with permission on private lands, and new management categories assigned where so indicated.

Data required to assess the levels of the 12 functions were collected by Dr. Adamus while visiting all parcel units concurrently with Ms. Bosworth, who was primarily responsible for the delineations. In addition, existing maps and aerial photographs were used to assess some features important to particular wetland functions, such as proximity to roads, general soil type, intersections with streams, and surrounding land cover.

Figure 1 - "Adamus Methodology" criteria used for assessing relative level of each function

Ratings in column 2 are VH (very high, 7), H (high, 6), MH (moderately high, 5), M (moderate, 4), ML (moderately low, 3), L (low, 2), or VL (very low). C1, C5, etc. refer to cell addresses in the accompanying spreadsheet where the data can be found (see Appendix A for data categories). The weight shown for each function is the one recommended by the CDD (1997) report.
Important Note: When scoring each function, begin with its top row and then proceed downward row by row only if the criteria in the row being examined are not met. Only one rating (the highest applicable one) should be assigned per function per wetland.

Function	Rating	Criteria
Groundwater Discharge	H (6) if	1) Wetland is non-tidal (C9=0) AND 2) either is at the toe of a steep slope (C5= TS) or is on a slope of greater than 15% (C6= H) or in an alluvial fan or avalanche chute (C4= AC) or is intersected by a perennial stream or is within 50 ft of one (C11= PI).
	L if	Wetland is tidal (C9= Y) and is not intersected by a perennial stream or within 50 ft of one (C11= not PI & not P50) and is not at toe of a steep slope (C5= not TS) and not in alluvial fan (C4= not AF) and is on a slope of less than 7% (C6= L)
	M if	not H and not L
Sediment/ Toxicant Retention (weight= 6)	H (6) if	1) Wetland is at toe of a steep slope or on a flat (C5= TS or F) and has a slope of less than 15% (C6= M or L) and its soil is predominantly peat (C7= Y), OR 2) Wetland is not intersected by a perennial or ephemeral stream (C11= not PI & not Ei) and is on a slope of less than 7% (C6= L)
	MH (5) if	Wetland is not intersected by a perennial or ephemeral stream (C11= not PI & not Ei) and its gradient is less than 15% (C6= not H) and its soil is predominantly peat (C7=Y)
	L (2) if	Wetland gradient is greater than 15% (C6= H) and pit-mound topographic variation is not extensive or great (C17= 0 or T1L)
	ML (3) if	not H and not MH and not L

Function	Rating	Criteria
Nutrient Export (weight= 7)	H (6) if	1) Wetland is tidal (C9= Y) OR
		2) Wetland is intersected by a perennial stream (C11= PI) AND ANY of 2a, 2b, or 2c
		2a) its surface water levels experience large fluctuation (C13= H) or
		2b) its area covered only seasonally by surface water is extensive (C15= H)
		2c) it is dominated by trees (C18= T50) or deciduous shrubs (C19= D50)
	L (2) if	1) There is no perennial stream within 200 ft of the wetland and not intersected by ephemeral stream (C11= not PI & not P50 & not P200 & not Ei), and any of the following:
		2a) is mostly covered by wetland moss (C21= M50) or
		2b) the wetland's surface water levels experience little or no fluctuation (C13= L) or
		2c) the area covered only seasonally by surface water is very limited (C15= S)
	M (4) if	not H and not L
Riparian Support (weight= 10)	H (6) if	1) Wetland is intersected by a perennial stream (C11= PI) or is within an annual floodplain (C12= FP) AND EITHER
		1a) alder shrub covers at least half of the wetland's vegetated area or stream bank (C19= A50 or A90), or
		1b) deciduous shrubs/trees cover more than 90% of the wetland's vegetated area or stream bank (C20= D90).
		OR
		2) Wetland is intersected by an ephemeral stream (C11= Ei) and
		2a) alder shrub covers more than 90% of the wetland's vegetated area or stream bank (C19= A90) or
		2b) deciduous shrubs/trees cover more than 50% of the wetland's vegetated area or stream bank (C20= D50).
	MH (5) if	1) Wetland is intersected by a perennial stream (C11= PI) or is within its annual floodplain (C12= FP) AND EITHER
		1a) alder shrub covers at least 1% of the wetland's vegetated area or stream bank (C19= A1), or
		1b) deciduous shrubs/trees cover more than 50% of the wetland's vegetated area or stream bank (C20= D50).
		OR
		2) Wetland is intersected by an ephemeral stream (C11= Ei) or is within 50 ft of a perennial stream (C11= PI) AND
		2a) alder shrub covers more than 50% of the wetland's vegetated area or stream bank (C19= A50) or
		2b) deciduous shrubs/trees cover more than 1% of the wetland's vegetated area or stream bank (C20= D1).
	L (2) if	There is no perennial or ephemeral stream within 50 ft of the wetland (C11= not PI & not Ei & not P50 & not Ei), and the wetland contains less than 1% deciduous shrubs/trees (C20= 0)
	ML (3) if	not H and not L and not MH

Function	Rating	Criteria
Salmonid Habitat (weight= 11)	VH (7) if	1) Wetland is tidal (C9= Y), OR
		2) salmonid fish can access part of the wetland year-round (C10=P) and habitat quality (pools, undercut banks, wood, etc.) is good (C14= H)
	H (6) if	Salmonid fish can access part of the wetland year-round (C10= P) and habitat quality is moderate (C14=H)
	MH(5) if	Salmonid fish can access part of the wetland year-round (C10= P) and habitat quality is low (C14= M or L).
	ML (3) if	Salmonid fish can access part of the wetland seasonally (C10= S) and habitat quality is moderate or high (C14= M or H).
	L (2) if	Salmonid fish can access part of the wetland seasonally (C10= S) and habitat quality is low (C14=L).
	VL (1) if	Salmonid fish cannot access the wetland at any time (C10= 0)
Erosion Sensitivity (weight= 7)	H (6) if	Wetland is on a slope of greater than 15% (C6= H) and its predominant soil is peat (C7= Y)
	MH(5) if	Wetland is on a slope of greater than 15% (C6= H) and its predominant soil is not peat (C7= 0)
	ML (3) if	Wetland is on a slope of greater than 7% (C6= M or H) and its predominant soil is peat (C7= Y)
	L (2) if	Not H and not ML and not MH
Groundwater Recharge (weight= 7)	H (6) if	Wetland is not in an alluvial fan or avalanche chute (C4= not AF & not AC) or tidal area (C9= 0) AND
		Wetland is not intersected by a perennial stream or within 50 ft of one (C11= not PI & not P50) and is either on a plateau (C5= P) or has a slope of mostly less than 7% (C6= L)
	L (2) if	Wetland is tidal (C9= Y) or is intersected by a perennial stream (C11= PI)
	M (4) if	Not H and not L

Function	Rating	Criteria
Hydrologic Control (weight= 9)	H (6) if	1) Wetland non-tidal (C9= 0) and is on a slope of less than 7% (C6= L) and is not intersected by a stream (either perennial or ephemeral) (C11= not PI & not Ei) OR
		2) Wetland is not in a mid-slope or toe-slope position (C5= not TS & not MS) and is in a floodplain (C12= FP) or has extensive seasonal ponding of surface water (C15= H) or has extensive and large pit-mound topography (C17= T25H)
	MH(5) if	Wetland is non-tidal (C9= 0) and has moderate-extensive seasonal ponding of surface water (C15= M) or moderate water level fluctuations (C13= M) or extensive but mild pit-mound topography (C17= T25L)
	L (2) if	Wetland is tidal (C9= Y)
	ML (3) if	Not H and not MH and not L
Detention Value* (weight= 9)	H (6) if L(2) if	Wetland is non-tidal (C9= 0) and uphill areas have peat soils (C8= Y) and relatively extensive development (C26= H)
		Wetland is tidal (C9= Y) and uphill areas have little or no development (C26= L)
	M (4) if	Not H and not L
Recreational Use Potential (weight= 5)	H (6) if	Developed hiking trails go to or near (within 100 ft of) wetland and wetland is within 0.5 mile of trailhead (C30= H) and wetland is on public land (C31= C)
	MH (5) if	Developed hiking trails go to or near the wetland but wetland is farther than 0.5 mile from trailhead (C30= M) and wetland is on public land (C31= C)
	L (2) if	No hiking trails go to or near the wetland and wetland is more than 0.5 mile from road (C30= 0) and wetland is on private land (C31= P)
	ML (3) if	No trails are within 100 ft of wetland but the wetland is within 0.5 mile of a road (C30= L) and wetland is on public land (C31= C)
Recreational Use Actual (weight= 6)	H (6) if	Results of a 1987 recreational survey indicated relatively high use of this wetland or the closest one (C32= H)
	MH (5) if	Results of a 1987 recreational survey indicated moderately high use of this wetland or the closest one (C32= MH)
	L (2) if	Results of a 1987 recreational survey indicated relatively low use of this wetland or the closest one (C32= L)
	ML (3) if	Results of a 1987 recreational survey indicated relatively moderately low use of this wetland or the closest one (C32= ML)

Function	Rating	Criteria
Wildlife Support* (weight= 11.5)	H (6) if	1) Wetland is tidal (C9= Y) or contains or adjoins at least 1 acre of perennially ponded non-tidal water (C16= PW) OR
		2) Wetland is contiguous to a large forested tract and not separated from it by roads (C25= C) and has little or no uphill development (C26= L), and has not been altered by nearby ditches or roads (C28= 0), and has less than 10% cover of non-native plants (C29= 0), and 2a or 2b:
		2a) creates a gap in the canopy of an extensive surrounding forest (C23= CC) and is not primarily wetland moss (C21= 0 or M1) and is (2a1) distant from the nearest residence (C27= F) or (2a2) has many vegetation structural forms (C22= H), OR
		2b) does not create such a gap (C25= 0) and is not within 100 ft of a residence (C27= M or F), and has more than 90% total tree cover (C18=T90) or more than 50% deciduous tree/shrub cover (C20= D50), or has salmonid access (C10= S or P), or at least one large-diameter tree (C24= BT), or extensive pit-mound topography (C17= T25L or T25H), or many vegetation forms (C22= H)
	MH (5) if	Wetland is contiguous to a large forested tract and not separated from it by roads (C25= C) and has less than 10% cover of non-native plants (C29= 0), and EITHER
		a) creates a gap in the canopy of an extensive surrounding forest (C23= CC) and is not within 100 ft of a residence (C27= M or F) and has some diversity of vegetation structural forms (C22= not L) OR
		b) has more than 50% deciduous tree/shrub cover (C18= T50 or C20= D50) or is intersected by or within 50 ft of a perennial stream (C11= PI or P50) or is more than 0.5 mile from a road and lacks developed trails (C30= 0)
	L (2) if	1) Wetland does not create a gap in the canopy of an extensive surrounding forest (C23= 0), and is not tidal (C9= 0), and is not within 500 ft of perennially ponded non-tidal water (C16= 0), and does not have salmonid access (C10= 0), and has no large-diameter trees (C24= not BT & not MT), and has little or no pit-mound topography (C17= 0 or T1L), and has 1a or 1b:
		1a) >90% moss cover (C21= M90) or more than 10% cover of non-native plants (C29= Y) or only a few vegetation structural forms (C22= L), OR
		1b) is not contiguous to a large forested tract (C25= 0) and has any of the following: extensive development in uphill areas (C26= H) or is close to a residence (C27= N) or has been altered by nearby ditches or roads (C28= Y) or has developed trails and a trailhead nearby (C30= H).
	ML (3) if	Not H and not ML and not L

* Detention Value was termed “Downslope Beneficiary Sites” in the ARA (1987) and CDD (1997) reports. Wildlife Support is the merger of “Disturbance-sensitive Wildlife” and “Regional Ecological Diversity” in those reports; their respective weights were averaged.

Figure 2 - Scores for 12 functions in each of the 36 delineated wetlands, and resulting management category based on formulas described in CDD (1997).

Scores: 7= very high, 6= high, 5= moderate high, 4= moderate, 3= moderate low, 2= low, 1= very low. Not all functions can have the full range of scores (1 to 7).

Parcel unit	Wetland	Ground water Discharge	Sediment/ Toxicant Retention	Nutrient Export	Riparian Support	Salmonid Habitat	Erosion Sensi-tivity	Ground water Recharge	Hydro-logic Control	Detention Value	Recrea-tion Potential	Recrea-tion Actual	Wildlife Habitat	Mange-ment Category
1	28	6	6	6	5	6	2	2	5	4	6	3	6	**B**
1	30	2	6	4	3	1	2	6	6	4	6	6	5	**B**
1	31	6	6	4	6	1	2	4	6	4	6	6	5	**B**
1	48	6	6	4	5	3	2	4	5	4	3	3	3	**C**
1	49	6	6	4	5	3	2	4	5	4	3	3	3	**C**
2	7	6	6	4	5	1	3	4	3	4	3	3	5	**B**
2	23	6	6	4	5	1	3	4	3	4	3	2	5	**B**
2	24	4	5	2	3	1	3	4	3	4	3	2	5	**B**
2	26	2	5	2	3	1	3	6	3	4	3	2	5	**B**
2	27	2	5	2	3	1	3	6	3	4	3	2	5	**B**
3	15	6	6	4	5	1	3	4	3	4	3	5	5	**B**
3	32	6	6	4	5	1	3	4	3	4	3	5	5	**B**
3	33	6	3	2	3	1	6	4	3	4	3	5	5	**B**
3	34	6	3	4	5	1	6	4	3	4	3	5	5	**B**
3	35	6	5	4	5	1	3	4	3	4	3	5	5	**B**
3	36	6	6	4	5	1	3	4	3	4	3	5	5	**B**
3	38	4	3	4	5	1	3	4	3	4	3	5	5	**B**
3	39	4	3	4	5	1	3	4	3	4	3	5	5	**B**
3	40	6	6	4	5	1	3	4	3	4	3	5	5	**B**
4	5	2	5	2	3	1	3	6	3	4	3	2	5	**B**
4	6	2	5	2	3	1	3	6	3	4	3	2	5	**B**
4	14	6	6	2	3	1	3	4	3	4	3	2	5	**B**
5	58	6	6	4	6	3	2	4	5	4	6	6	5	**A**
5	59	6	6	4	6	3	2	4	5	4	6	6	5	**A**
6	10	6	3	4	5	1	6	4	3	4	3	5	5	**B**
6	11	6	3	4	5	1	6	4	3	4	3	5	5	**B**
6	12	6	3	4	5	1	6	4	3	4	3	5	5	**B**

Parcel unit	Wetland	Ground water Discharge	Sediment/ Toxicant Retention	Nutrient Export	Riparian Support	Salmonid Habitat	Erosion Sensi-tivity	Ground water Recharge	Hydro-logic Control	Detention Value	Recrea-tion Potential	Recrea-tion Actual	Wildlife Habitat	Mange-ment Category
6	13	6	3	4	5	1	6	4	3	4	3	5	5	**B**

Parcel unit	#	Ground water Discharge	Sediment/ Toxicant Retention	Nutrient Export	Riparian Support	Salmonid Habitat	Erosion Sensi-tivity	Ground water Recharge	Hydro-logic Control	Detention Value	Recrea-tion Potential	Recrea-tion Actual	Wildlife Habitat	**Mange-ment Category**
7	1	6	6	2	3	3	3	4	3	4	3	3	6	**A**
7	3	6	6	4	5	3	3	4	3	4	3	3	5	**B**
8	29	4	5	2	3	1	3	4	3	4	3	2	6	**B**
8	56	6	6	2	3	1	3	4	3	4	3	2	6	**B**
8	57	4	5	2	3	1	3	4	3	4	3	2	6	**B**
9	16	6	2	2	3	1	6	4	3	4	3	5	5	**B**
9	17	6	2	2	3	1	6	4	3	4	6	5	6	**A**
9	22	6	6	2	3	1	3	4	3	4	6	5	6	**A**
11	8	6	3	4	5	6	2	2	3	4	6	5	6	**B**

* parenthesized codes are for the nearest 1987 wetland. unparenthesized codes indicate partial spatial overlap with 1987 wetland

3.0 Findings

Jurisdictional wetlands were found in nearly all parcel units visited. In most cases they occupied only a small portion of the parcel unit. Management categories and ratings for individual functions are shown in Table 2. Of the 36 wetland polygons that we delineated, 4 met the criteria for management category A, 30 for category B, and 2 for category C. None of the wetlands were found to contain any non-native plant species.

Parcel units 10 and 12 were eliminated from the project because of avalanche and slope issues. Parcel 13 was folded into parcel 2 north with which it is contiguous (along the NW edge of #2 north). Parcel 13 had no wetlands on it. Parcel 14 was folded into parcel 7 with which it is contiguous along it's NE edge.

Digital maps showing the delineated wetlands with topography, slope, aerial photos, anadromous streams, preliminarily modeled streams and drainages and roads, as well as ground-level photographs of many of the wetlands, have been included in this findings section and provided digitally to and by the CDD separately. Likewise, the spreadsheet containing all data and showing each step in the calculation of the management category of each wetland is provided separately in electronic format. Narrative descriptions of individual wetlands within parcel units, along with photographs, and the field forms documenting their delineation, are provided in the following sections. Following is a brief description of the electronic map layers used to produce the maps in the following part of the Findings section.

Figure 3 - Brief description of electronic map layers used

Brief description of electronic map layers used:

Buildable Sites for CBJ's Comprehensive Plan Update 2006. General site locations of city held parcels considered in this portion of the comprehensive plan update. Parcel boundaries, where indicated or implied, are approximately located, and are not based on certified land surveys.

Road system (road centerlines). Acquired by GPS by the Alaska Department of Transportation in 2002, with several subsequent updates by the CBJ.

CBJ Designated Wetlands (1987). Official CBJ wetland study based on 1984 photography, subsequently delineated by the Army Corps of Engineers, classified by Paul Adamus, and adopted as designated wetlands by the CBJ in 1987. Because the specific ground control for the aerial photography and the methodology used by the Corps for the delineation of wetlands are undocumented, the accuracy of the map layer is unknown, and the locations of designated wetlands must be considered approximate.

CBJ Designated Wetlands (1987) Area of Study. The area of coverage of the 1987 wetland study is limited to the Mendenhall Valley and parts of North Douglas Island.

CBJ Delineated Wetlands (2006). Wetland delineation and classification done for CBJ's Comprehensive Plan Update 2006. Delineations were done from CBJ aerial photography (2001) and CBJ topographic mapping (2002), both of which were based on known ground control. To the extent that wetlands can be delineated from these data sources, the accuracies of wetlands locations can be determined. Classifications of the wetlands in this map layer are based on Adamus methodology. The project included site visits and field verification of classifications throughout the study area.

CBJ Delineated Wetlands (2006) - Area of Field Work. Indicates areas of the CBJ which were included in on-site visits, and where classifications of wetlands were confirmed with field checks.

CBJ Anadromous Waters and Streams (1997). Approximate location of stream courses and water bodies in the CBJ. Not all streams in this map layers contain anadromous fish throughout their full extent.

CBJ Anadromous Waters and Streams (1997) - 200 foot buffers. 200 foot buffers on both sides of each stream course.

Alaska Department of Fish and Game Anadromous Waters Catalog (2006). Approximate location of stream courses containing anadromous fish within the CBJ. Documentation for this dataset indicates that the purpose of the Anadromous Waters Catalog is to specify anadromous waters in the state, but that the accuracy of features in the electronic map is not always known.

Alaska Department of Fish and Game Anadromous Waters Catalog (2006) - 200 foot buffers. 200 foot buffers on both sides of the stream courses in the state's AWC.

Topographic contours - 10 and 100 foot intervals. Developed from topographic spot elevations acquired by LIDAR in 2002.

Topographic contour – approximate mean high water tide line (15.4 feet). Developed from topographic spot elevations acquired by LIDAR in 2002.

Terrain Slopes – 18% or Greater. Developed from modeled topographic slopes based on spot elevations acquired by LIDAR in 2002. According to CBJ building code, a slope of 18% or greater requires special engineering for steep slopes.

Terrain Slopes. Color map layer of terrain slopes, derived from topographic spot elevations acquired by LIDAR in 2002. Blue is essential flat terrain, greens are up to 15% slope, yellow is 15%-18% slope, browns to reds are 18% to 35 degrees, and reds are greater than 35 degrees of slope.

Modeled streams. Computer generated model of stream courses, based on topographic spot elevations acquired by LIDAR in 2002.

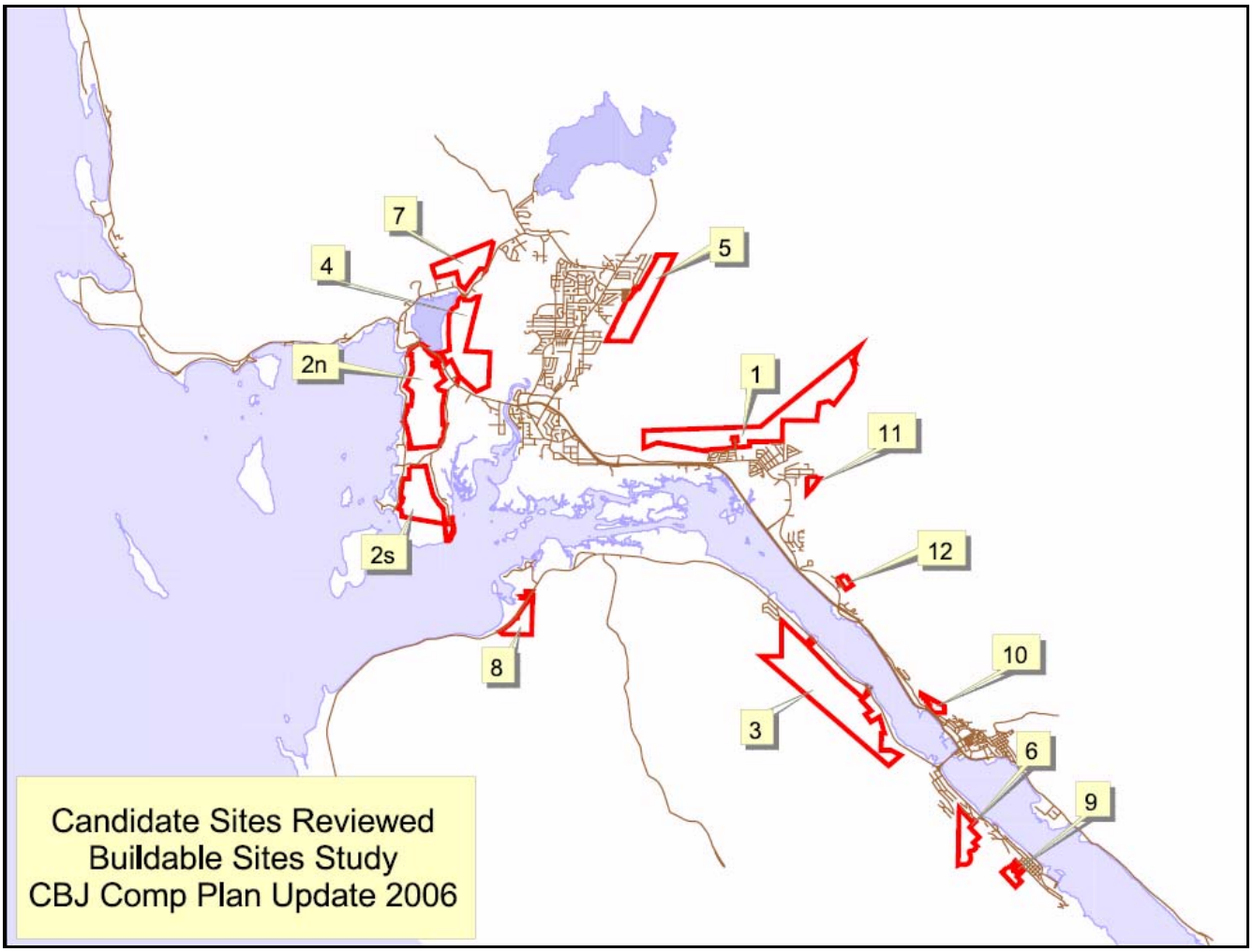

Figure 4 - Parcel unit locations and labels

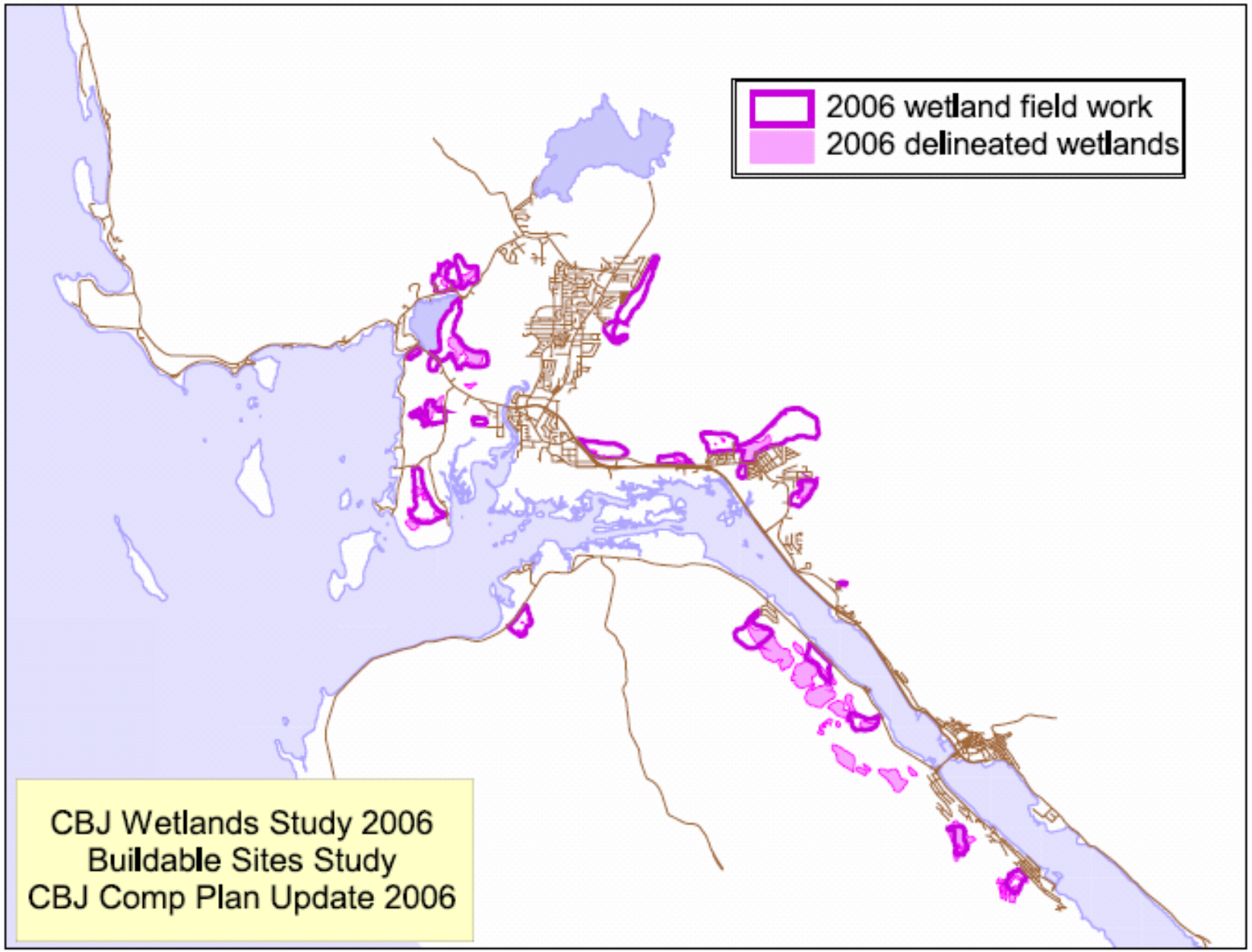

Figure 5 - Field survey map

3.1 Parcel Unit #1

This parcel unit is in the general area of Switzer Creek and contains at least 5 distinct wetlands, 3 assigned to category B and 2 to category C. The west end of the original unit is very steep and was not surveyed for wetlands during this field season. The east end of the original unit was outside the urban service area and part of it is being developed as a materials source by the city and so was not surveyed as part of this project (BBC did survey it for the city as part of the materials source project). The exact areas visited are shown on the field survey map (Fig. 2).

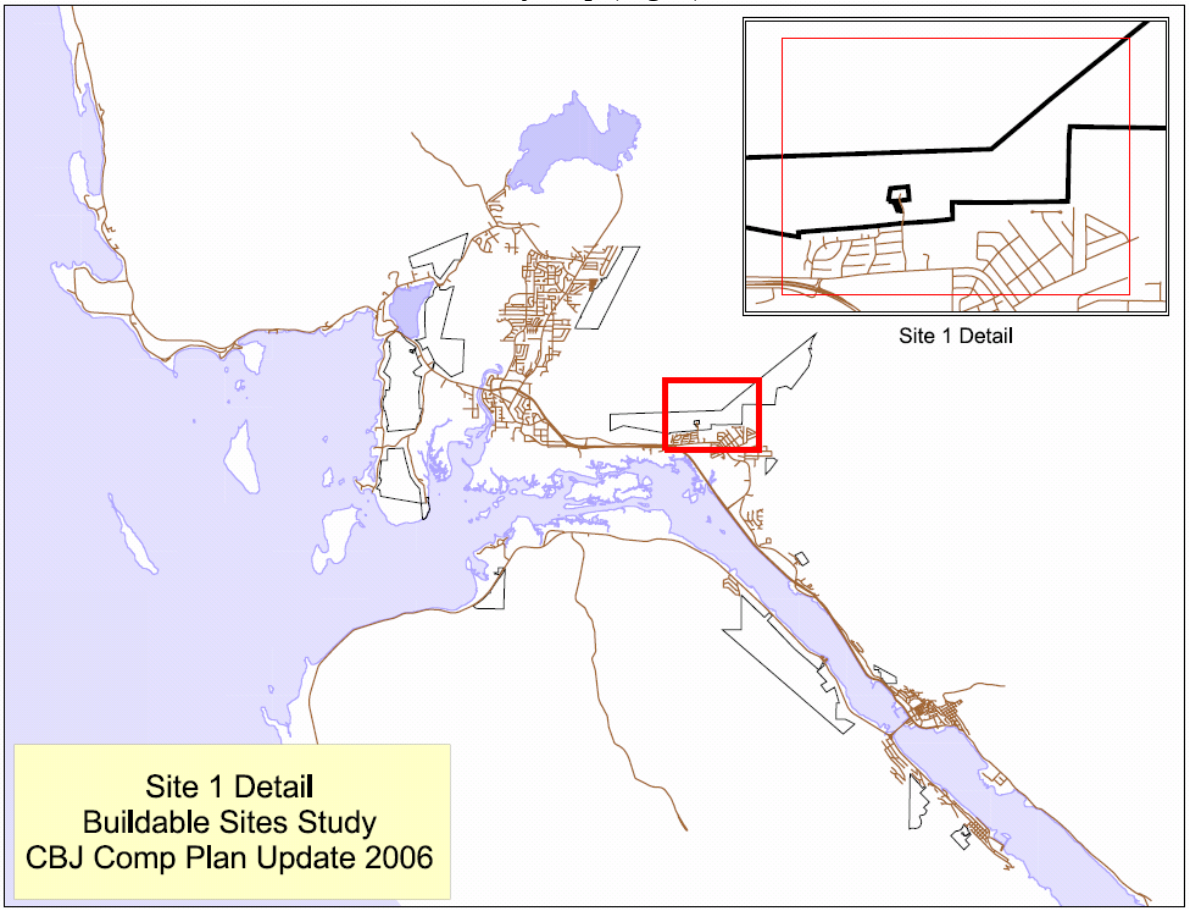

Figure 6 - Site 1 detail map

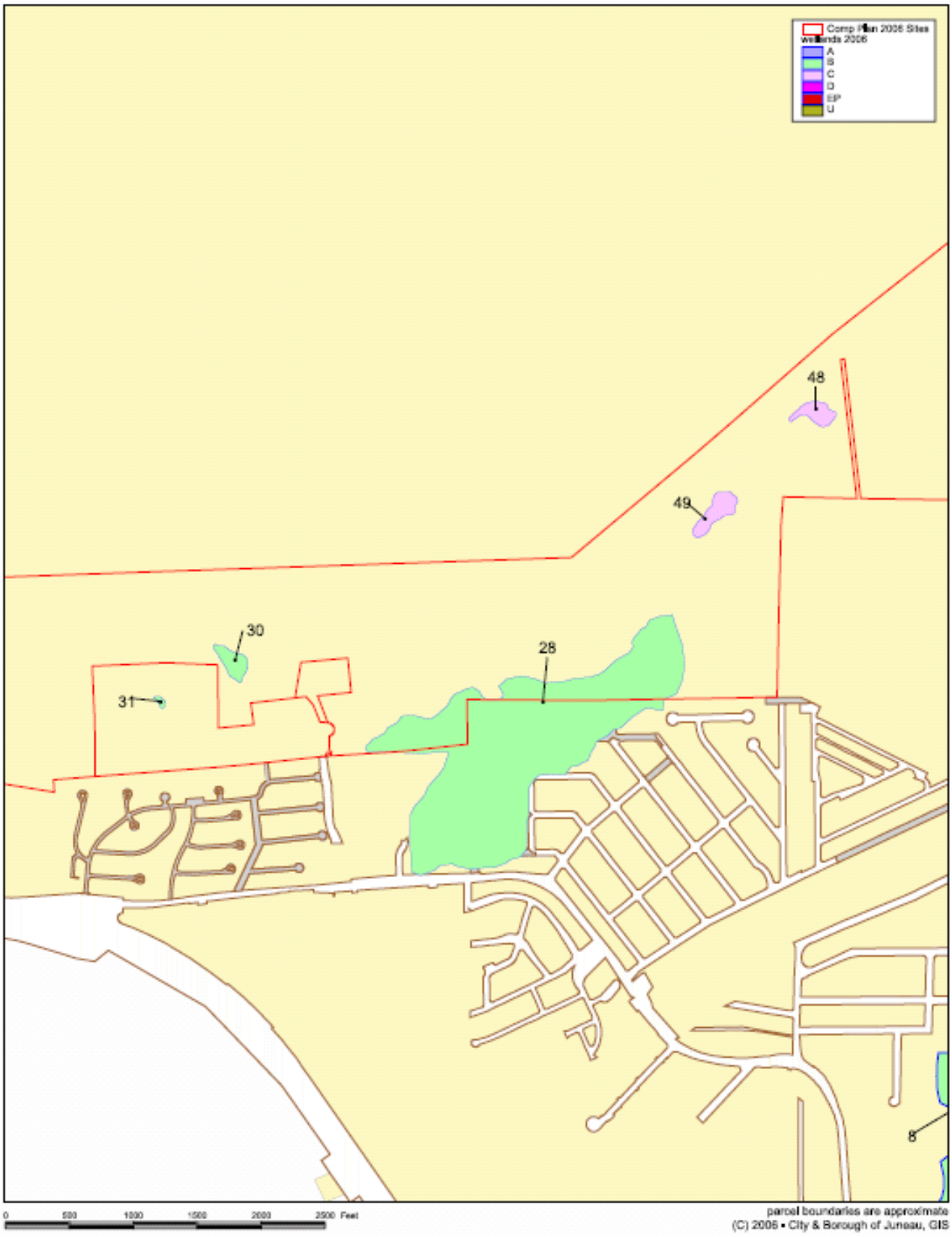

Figure 7 – Site 1 - 2006 wetland polygon labels

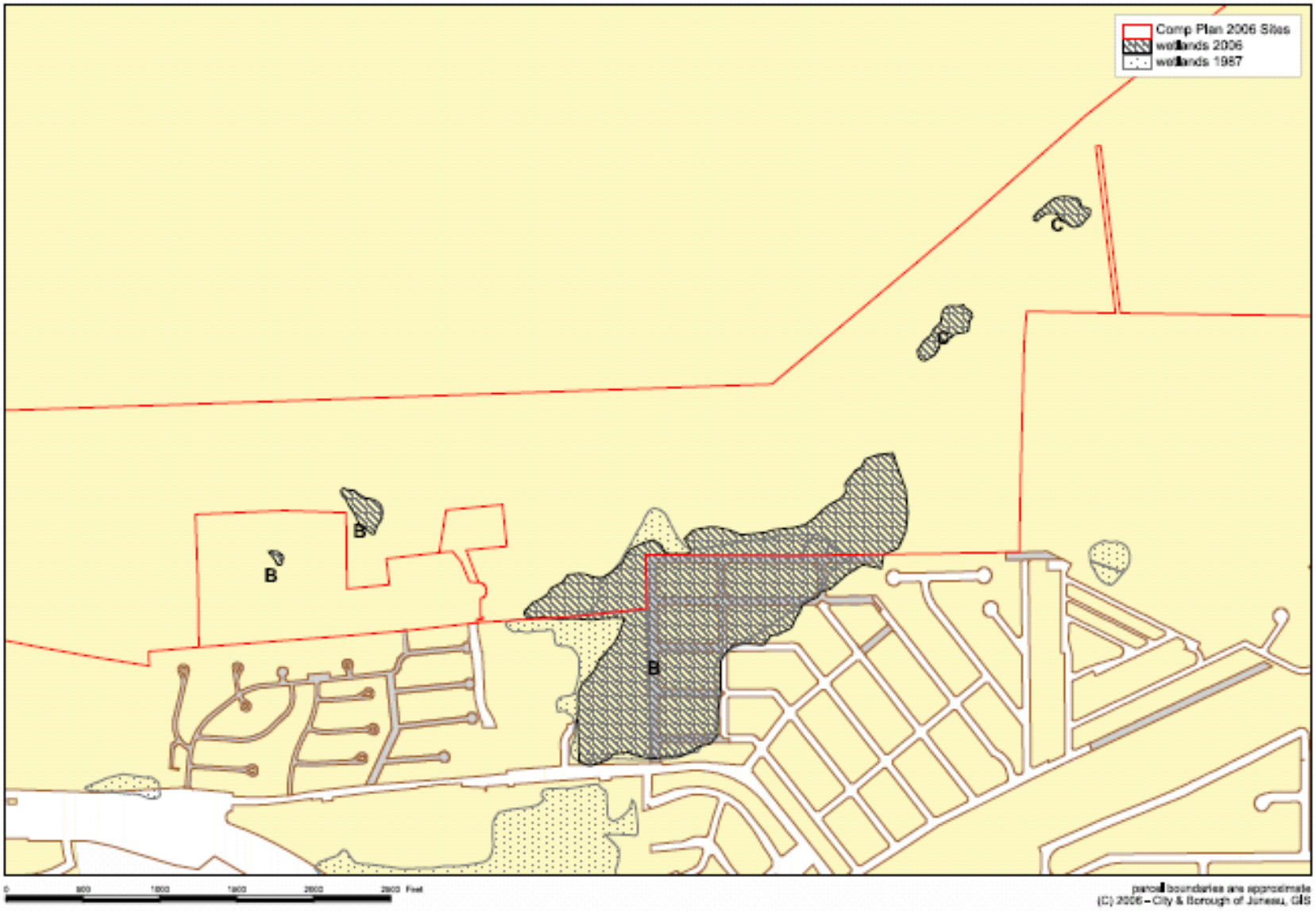

Figure 8 - Site 1 - 1987/2006 Wetlands w/wetland ratings

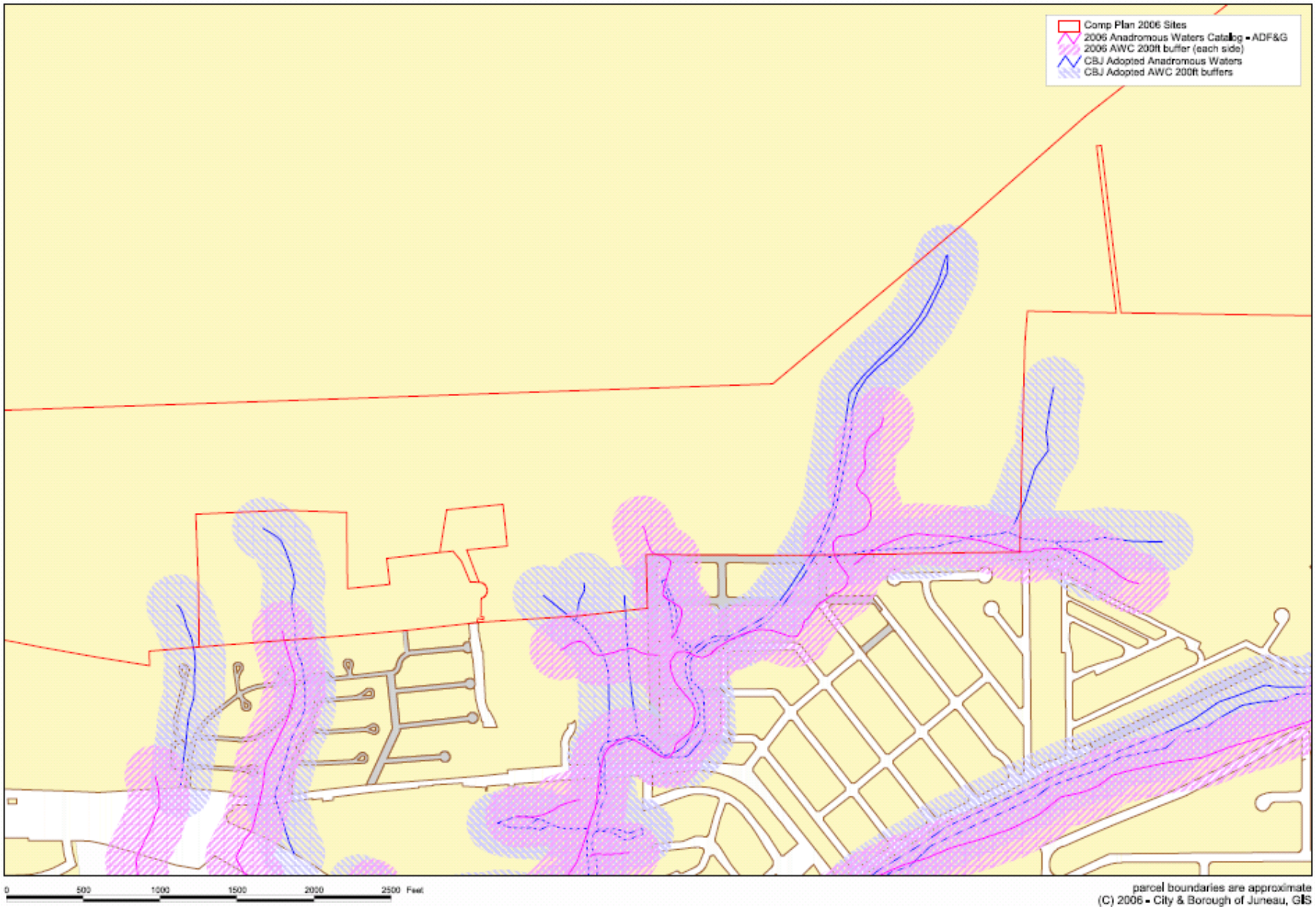

Figure 9 - Site 1 - Anadromous streams and buffers

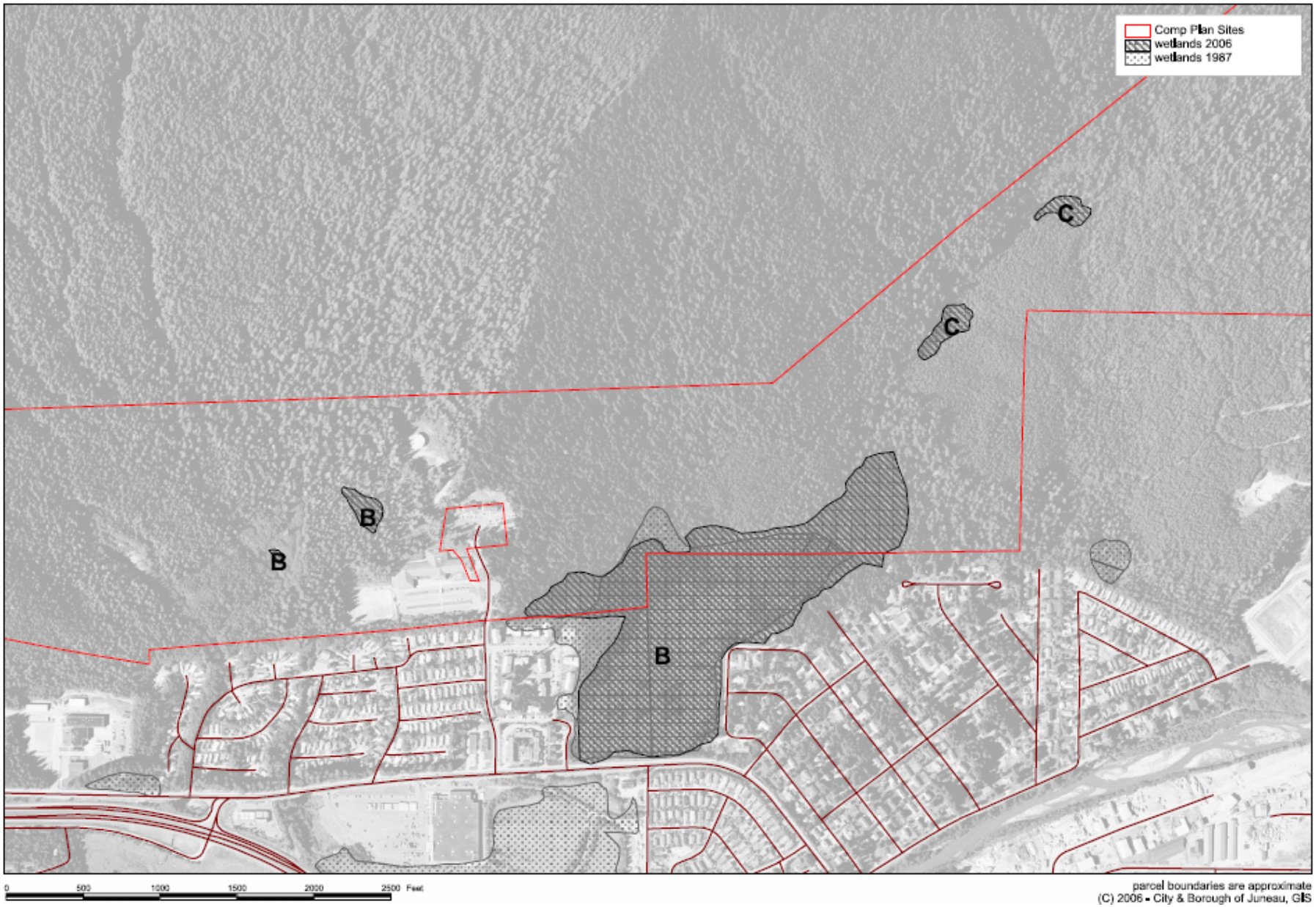

Figure 10 - Site 1 - 2001 Aerial photo with 1987/2006 wetlands

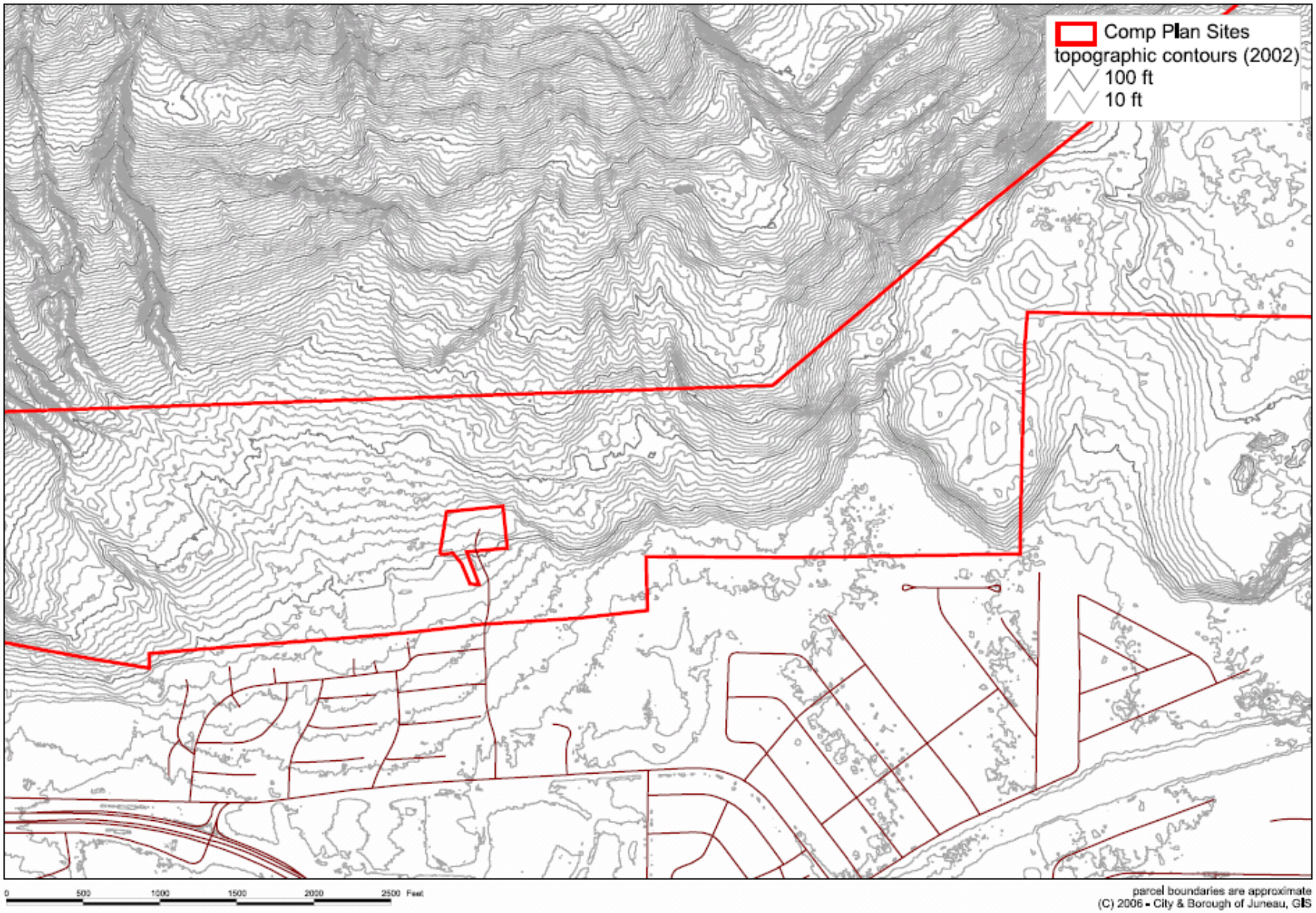

Figure 11 - Site 1 – Topographic contours map

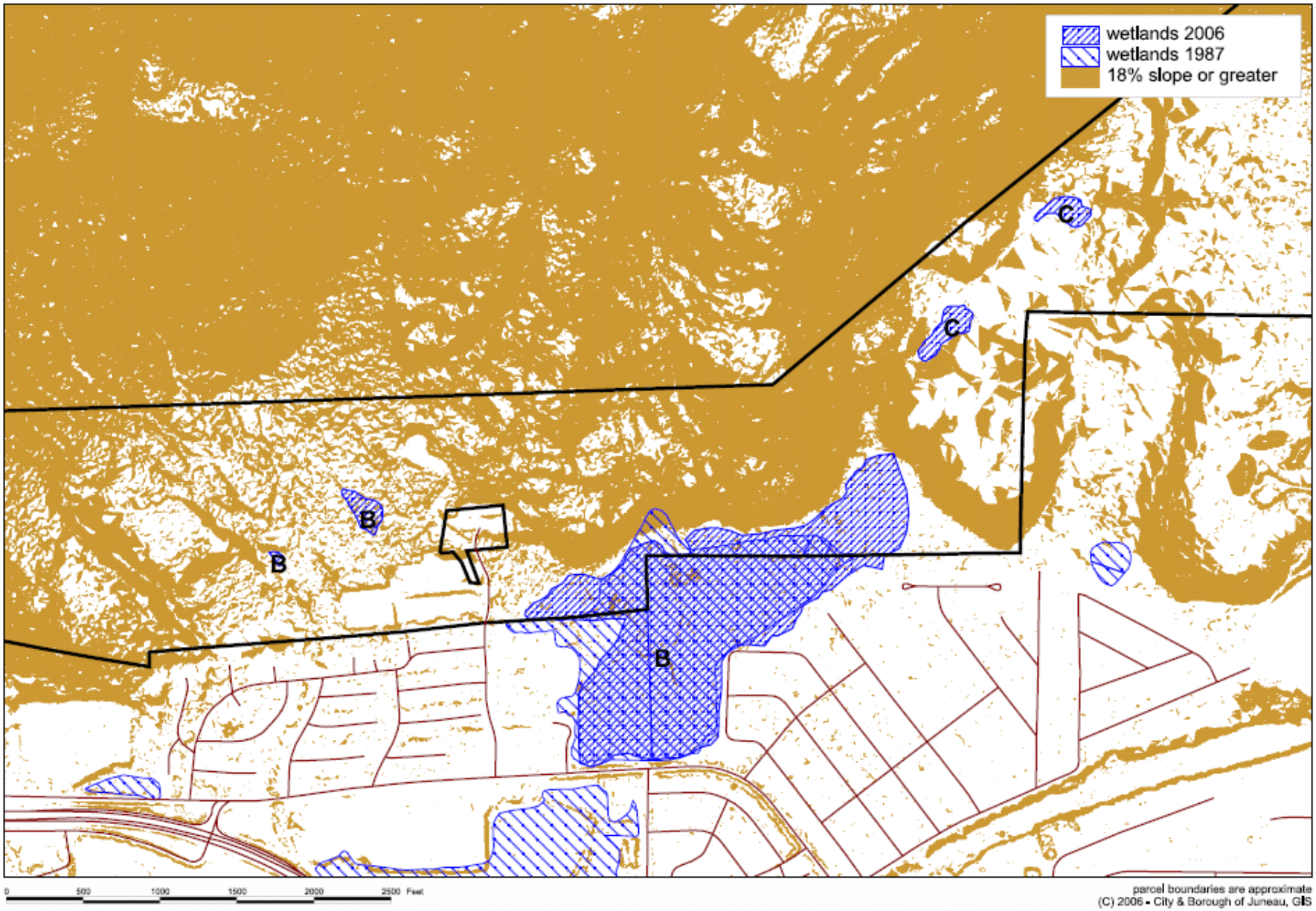

Figure 12 - Site 1 - 18% slope or greater

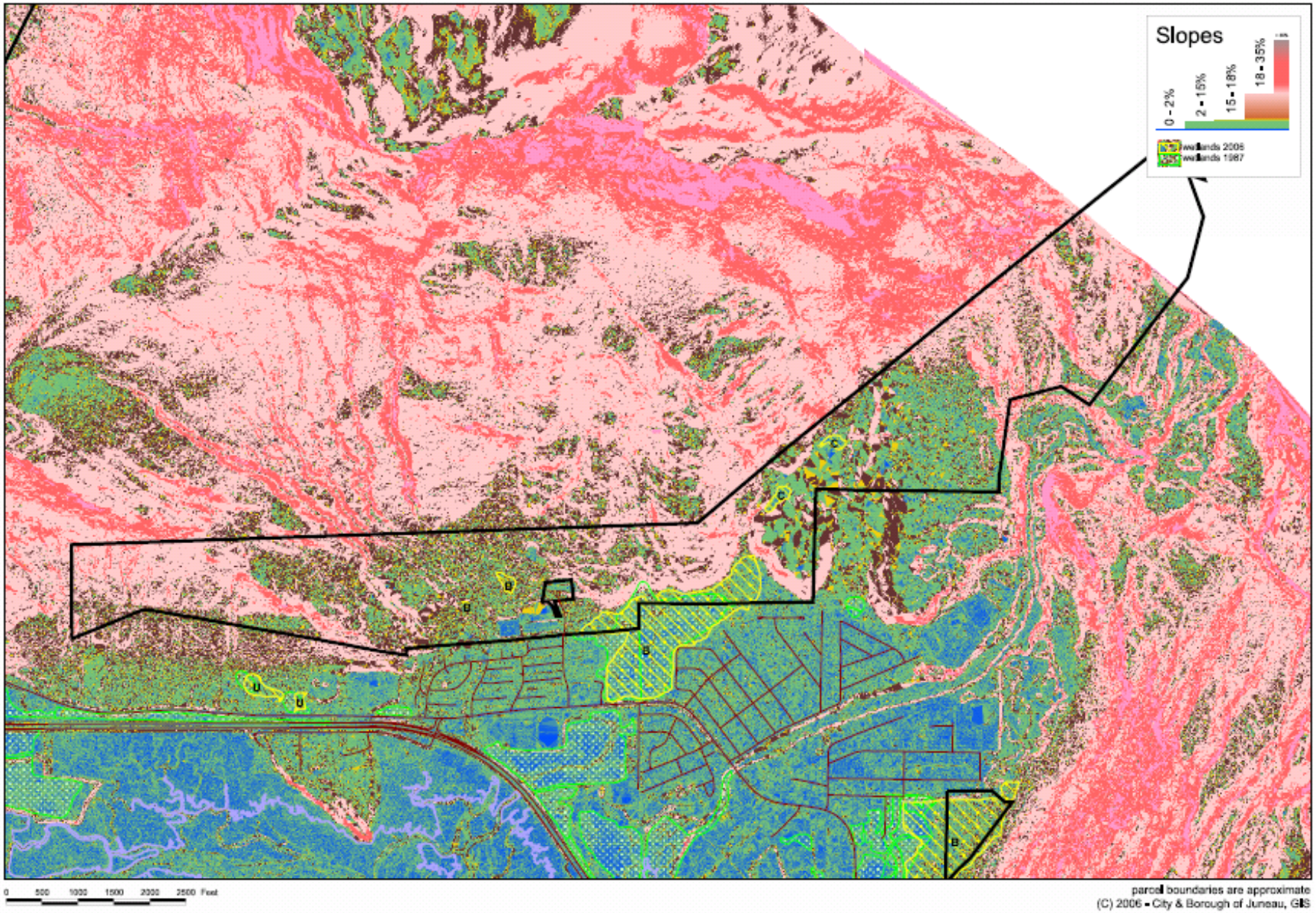

Figure 13 - Site 1 -slope map w/wetlands

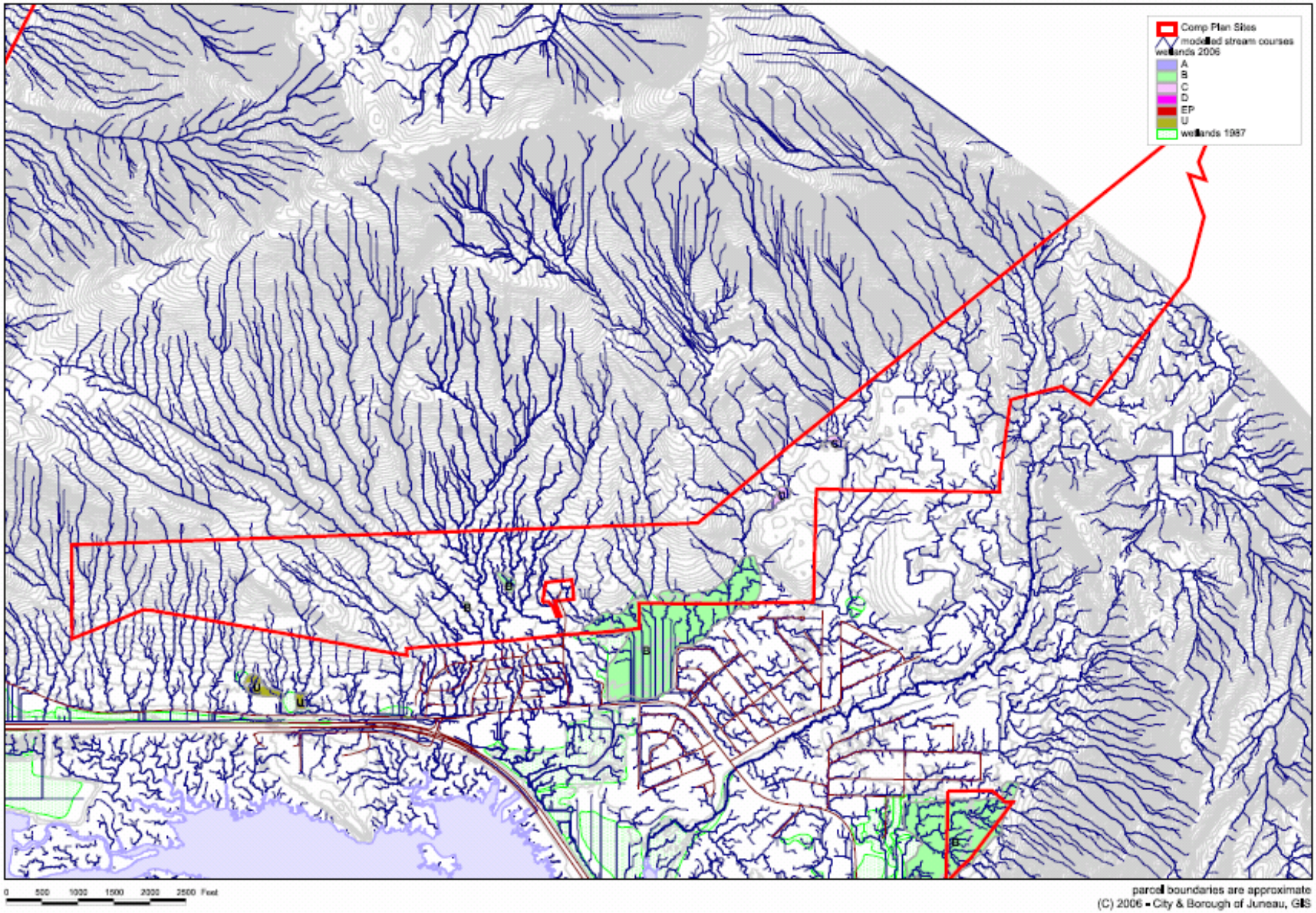

Figure 14 - Site 1 -Preliminary modeled streams and drainages

3.1.1 Wetland #28

Figure 15 – Site 1 - Wetland #28

Portions of this large wetland are intercepted by upper Switzer Creek. It was assigned to category B based partly on relatively high ratings for Groundwater Discharge, Sediment/Toxicant Retention, Nutrient Export, Salmonid Habitat, Wildlife Habitat, and Recreational Use Potential (Table 2). Ratings were relatively low for Groundwater Recharge and Erosion Sensitivity. This wetland was not assigned to category A partly because of its relatively high PP (lower public preference) and PA (more numerous practicable alternatives) scores based on 1987 information for the closest wetland (L15) assessed at that time. This wetland is a complex of marshy uplifted beach meadow and bog in the southern part (mostly outside the study unit) and scrub-shrub and forested wetland in the northern part. The forested wetland overstory is dominated by large spruce with an understory of young hemlock. The wetter swales were dominated by skunk cabbage, devils club and liverworts and the drier hummocks by spiny wood fern. The scrub-shrub community is dominated by Sitka alder, Sitka willow and high bush cranberry with an understory of skunk cabbage and Sitka sedge. Soils in both communities have been mapped as hydric soils – mostly mucky peats of the Kena and Maybeso Series, and during the time of visit were saturated throughout all of the wetland (except on scattered hummocks).

3.1.2 Wetland #30

This wetland is just west of the DZ school. It was assigned to category B due partly to relatively high ratings for Groundwater Recharge, Sediment/Toxicant Retention, Hydrologic Control, and Recreational Use (Table 2). Fish cannot access any part of this wetland. This wetland was not assigned to category A partly because of its relatively high PP (lower public preference) and PA (more numerous practicable alternatives) scores based on 1987 information for the closest wetland (L15) assessed at that time. The wetland is mostly forested with stunted spruce and hemlock, with a small open bog in its southern portion. The soil has been mapped as a hydric soil of the Wadleigh Series, and during the time of visit was saturated throughout all of the wetland (except on scattered hummocks).

3.1.3 Wetland #31

Figure 16 – Site 1 - Wetland #31

This wetland is west of the DZ school and west of wetland #30. It was assigned to category B based partly on relatively high ratings for Groundwater Discharge, Sediment/Toxicant Retention, Riparian Support, Hydrologic Control, and Recreational Use (Table 2). Fish cannot access any part of this wetland, but East Creek flows along the western edge. This wetland was not assigned to category A partly because of its relatively high PP (lower public preference) and PA (more numerous practicable alternatives) scores based on 1987 information for the closest wetland (L15) assessed at that time. This wetland site was formerly a pond created by a small catchment dam on East Creek. The water table is perched in the wetland area by the bedrock that outcrops there. The wetland has an unusual gramimoid understory with a somewhat open overstory of red alder and Sitka willow. Young fast-growing spruce saplings are coming up under the red alder overstory. The soil was a saturated, gleyed soil.

3.1.4 Wetland #49

Figure 17 - Site 1 - Wetland #49

This small sedge marsh is upstream from wetland #28, and is intercepted by an ephemeral tributary to Switzer Creek. It was assigned to category C based partly on a relatively low rating for Erosion Sensitivity and moderate ratings for Salmonid Habitat, Recreational use, and Wildlife Habitat (Table 2). A few of the characteristics that contributed to the low ratings for these functions include its relatively flat slope and lack of structurally diverse vegetation. This wetland was not assigned to category B partly because of its relatively high PP (lower public preference) and PA (more numerous practicable alternatives) scores based on 1987 information for the closest wetland (L15) assessed at that time. The wetland is dominated by Sitka sedge and skunk cabbage. The water table over most of the wetland at the time of the visit was 9-10 inches above the surface (i.e, the wetland was flooded) and the soil was a sedge peat of the Kina Series.

3.1.5 Wetland #48

Figure 18 - Site 1 - Wetland #48

This wetland was upstream from wetland #48 and is identical to it with regard to all its functional ratings and hydrologic regime. It also was flooded by an ephemeral tributary of Switzer Creek during the time of visit. This wetland was larger than the upper marsh and the upper part was dominated by small-flowered bulrush and Sitka sedge. The lower part of the wetland had *Equisetum*-dominated open water, rimmed with Sitka willow. The water table was 10-15 inches above the soil surface over most of the wetland and the soil was a sedge peat of the Kina Series except in the upper part, where the flooding stream was washing sediment into the wetland.

3.2 Parcel Unit #2

This parcel unit is on highlands within the Mendenhall peninsula and contains at least 5 distinct wetlands, all assigned to category B. This unit is divided into two portions by Engineers Cutoff road and the FAA airport towers clearing. The steep areas in the northern and western parts of this unit were not visited. The exact areas visited are shown on the field survey map (Fig. 2).

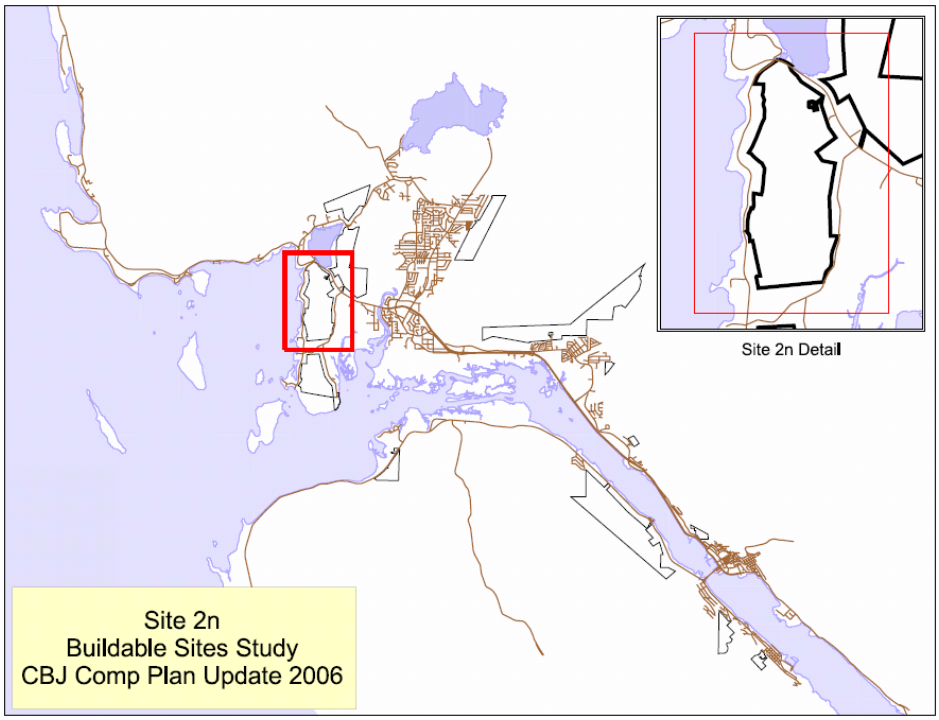

Figure 19 - Site 2 north – detail

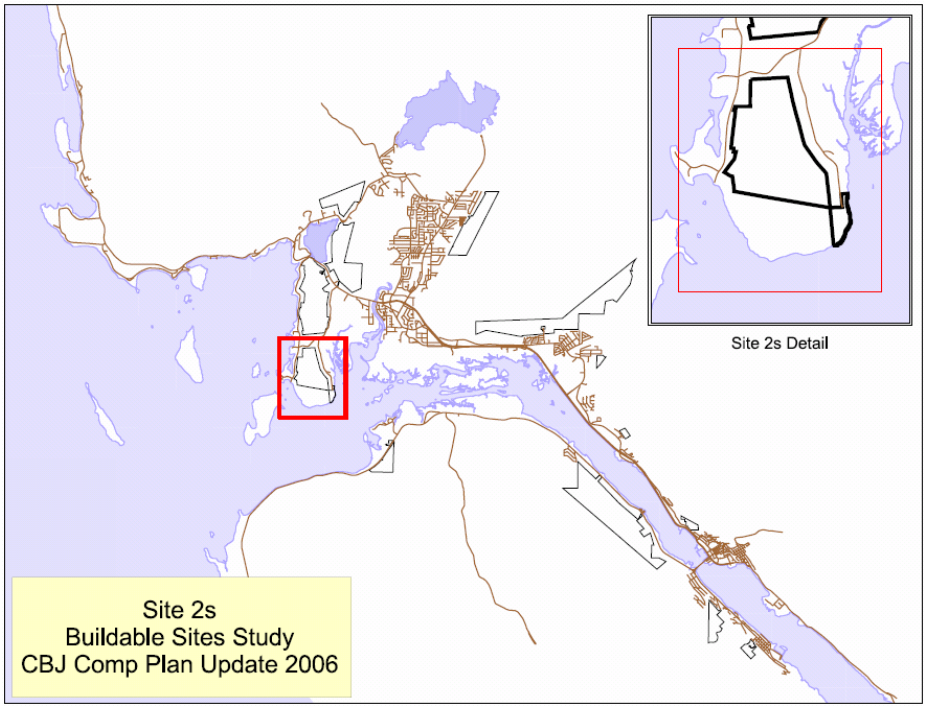

Figure 20 - Site 2 south detail map

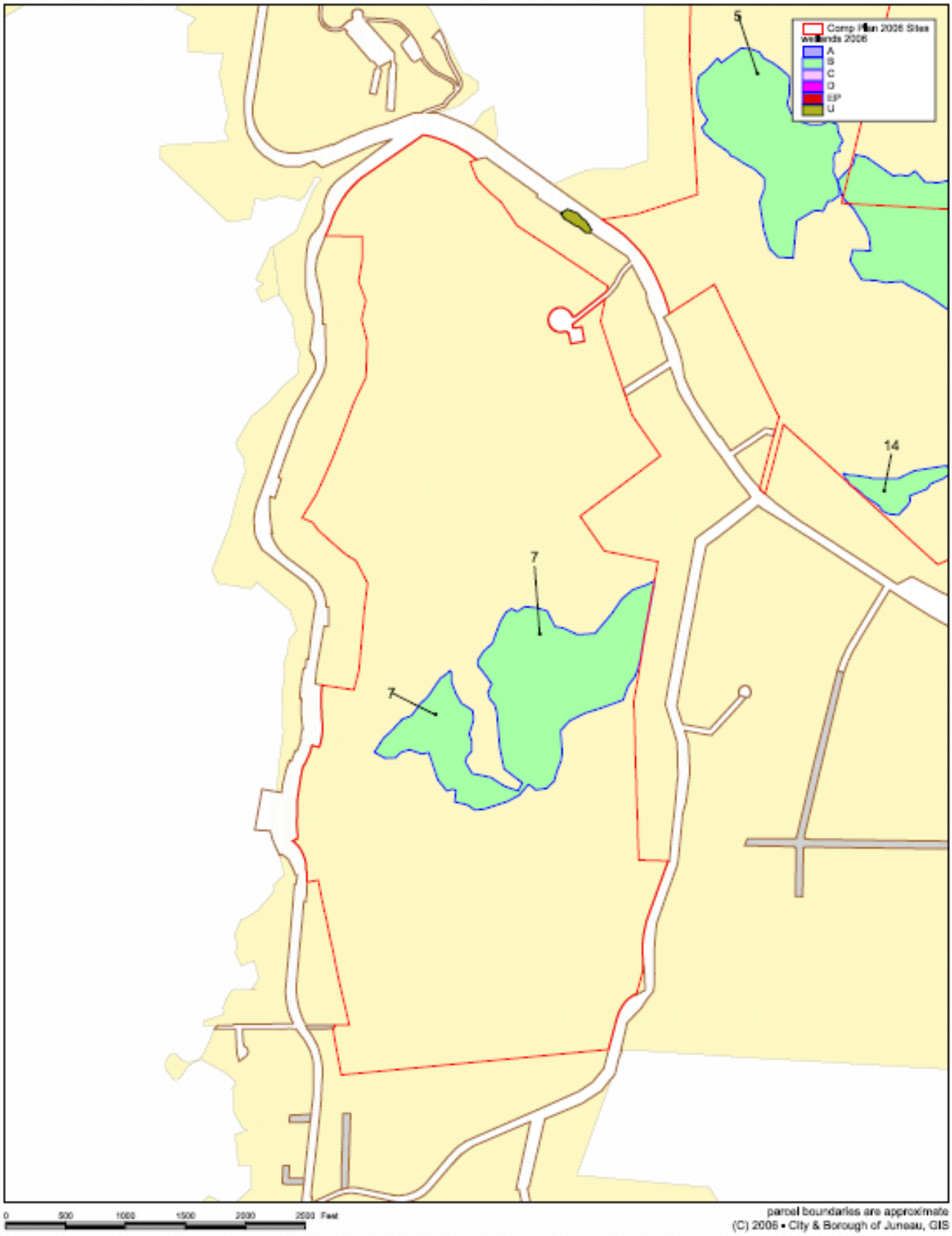

Figure 21 – Site 2 north -Wetland polygon labels

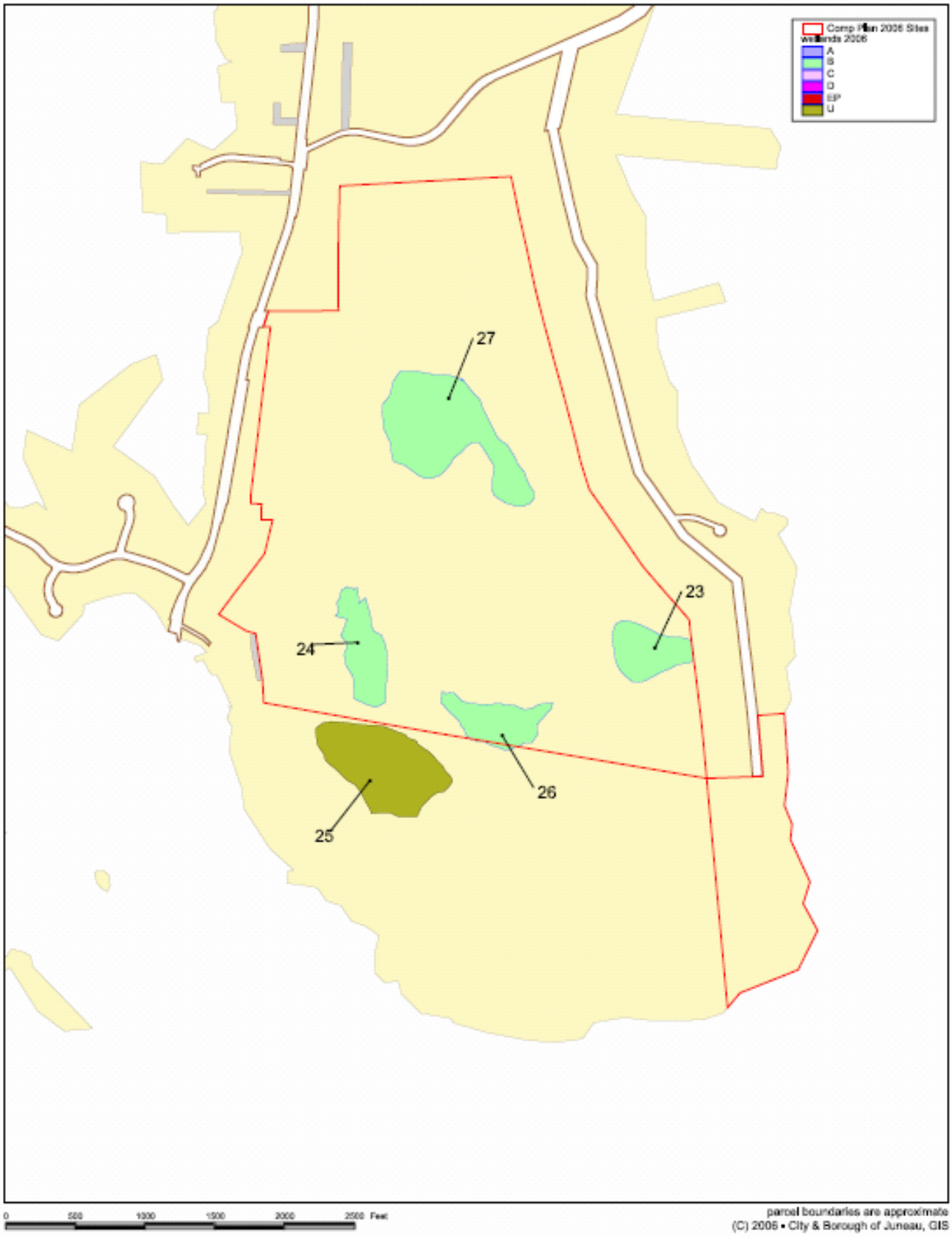

Figure 22 – Site 2 south - Wetland polygon labels

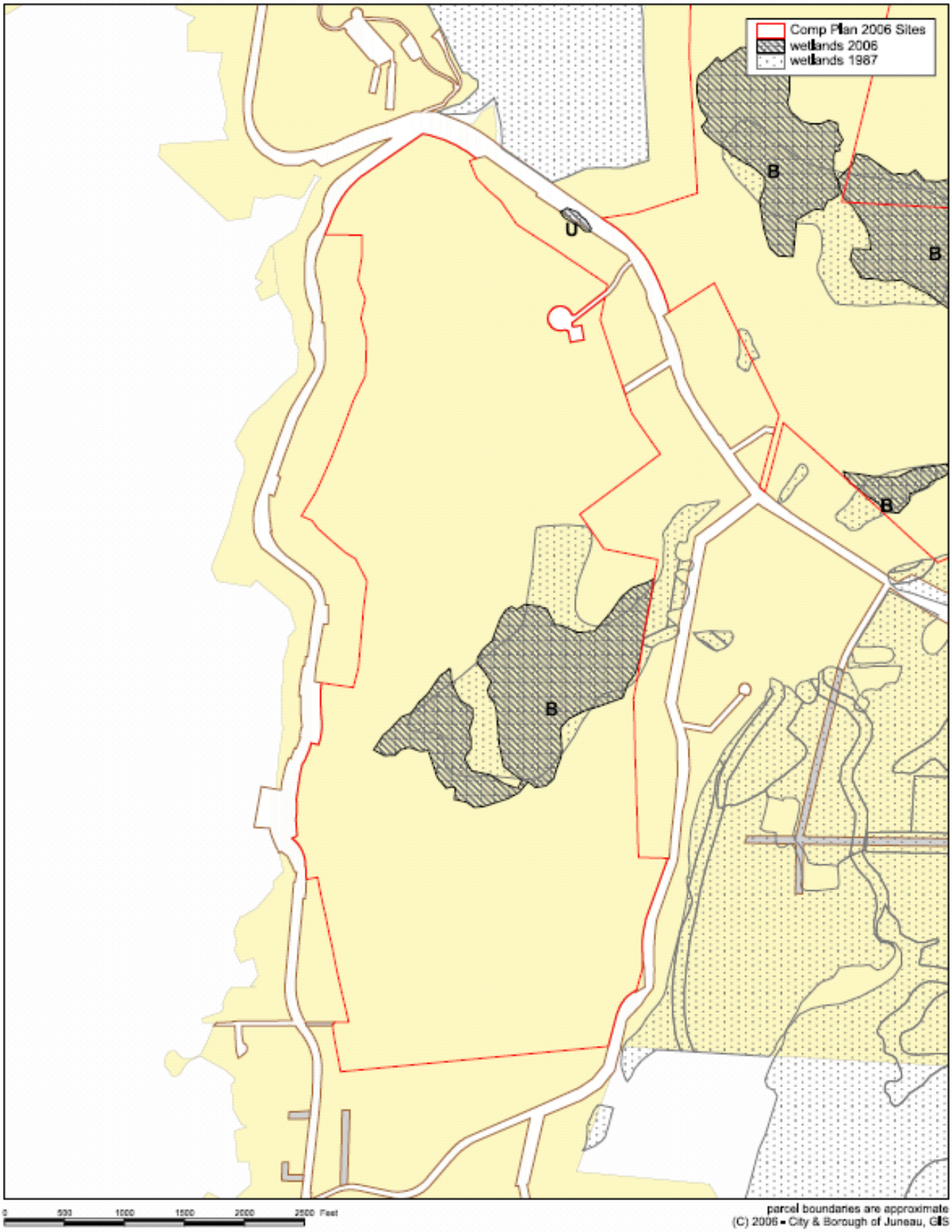

Figure 23 - Site 2 north - 1987/2006 wetlands w/wetland ratings

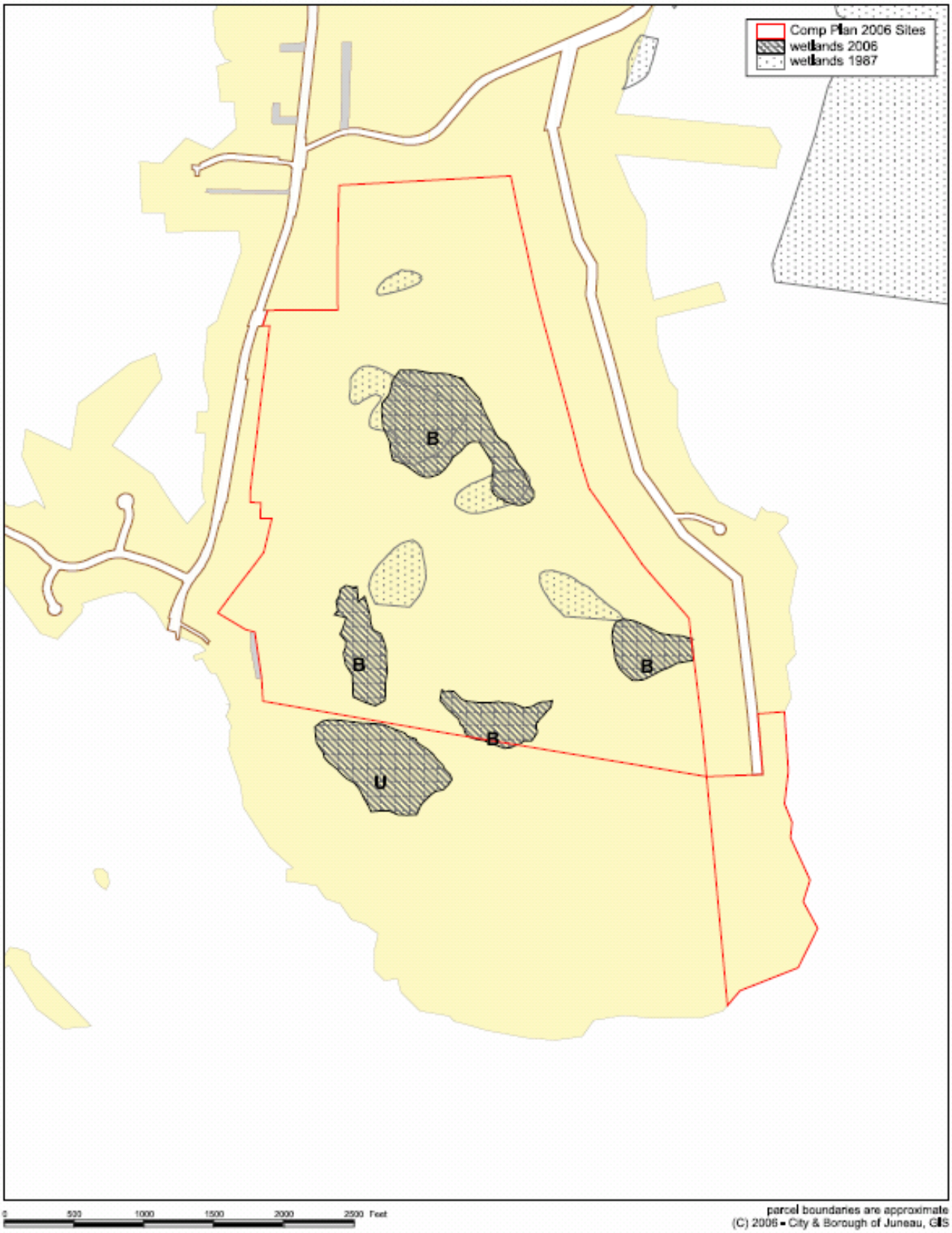

Figure 24 - Site 2 south - 1987/2006 wetland map w/wetland ratings

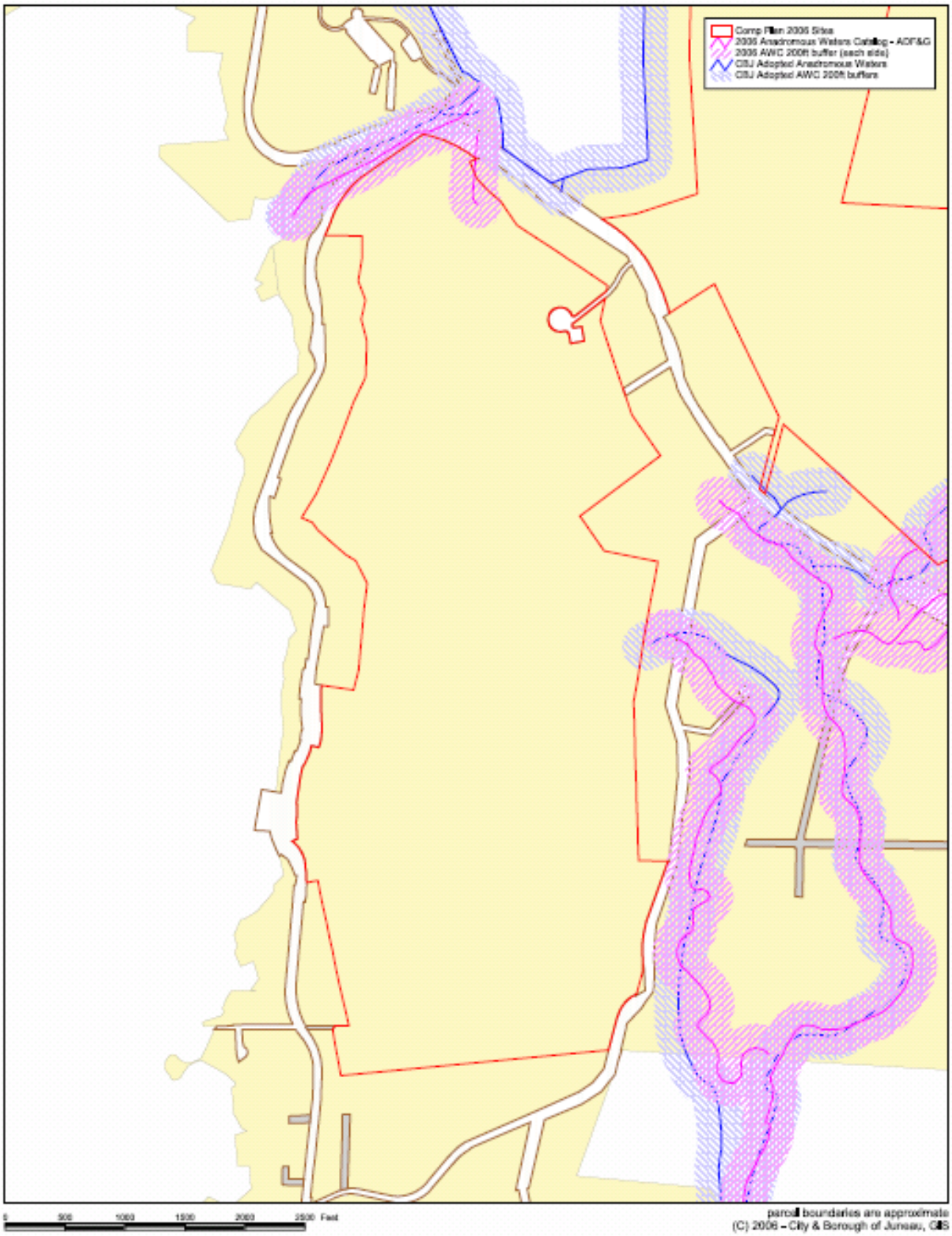

Figure 25 - Site 2 north - Anadromous stream map

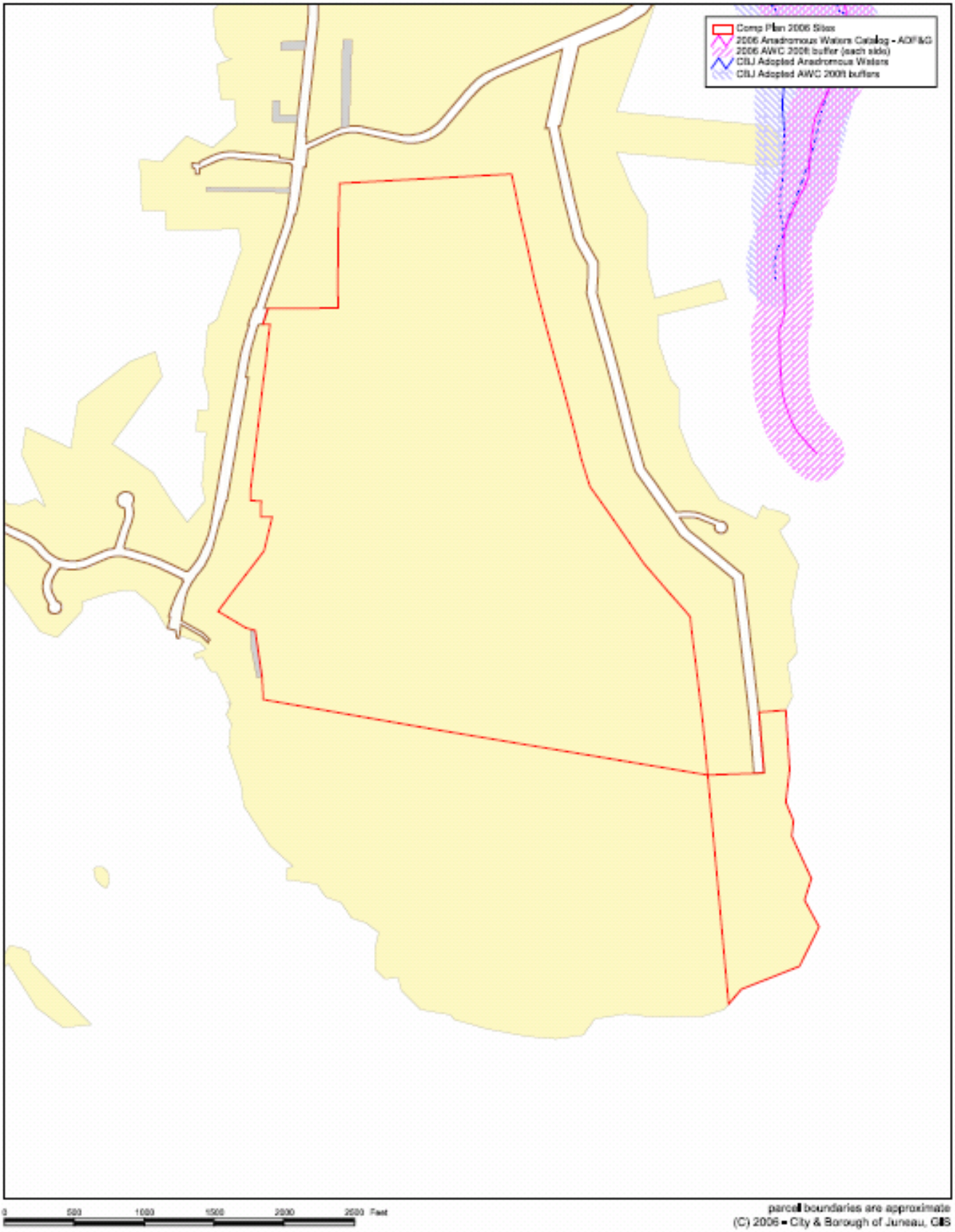

Figure 26 - Site 2 south - Anadromous stream map

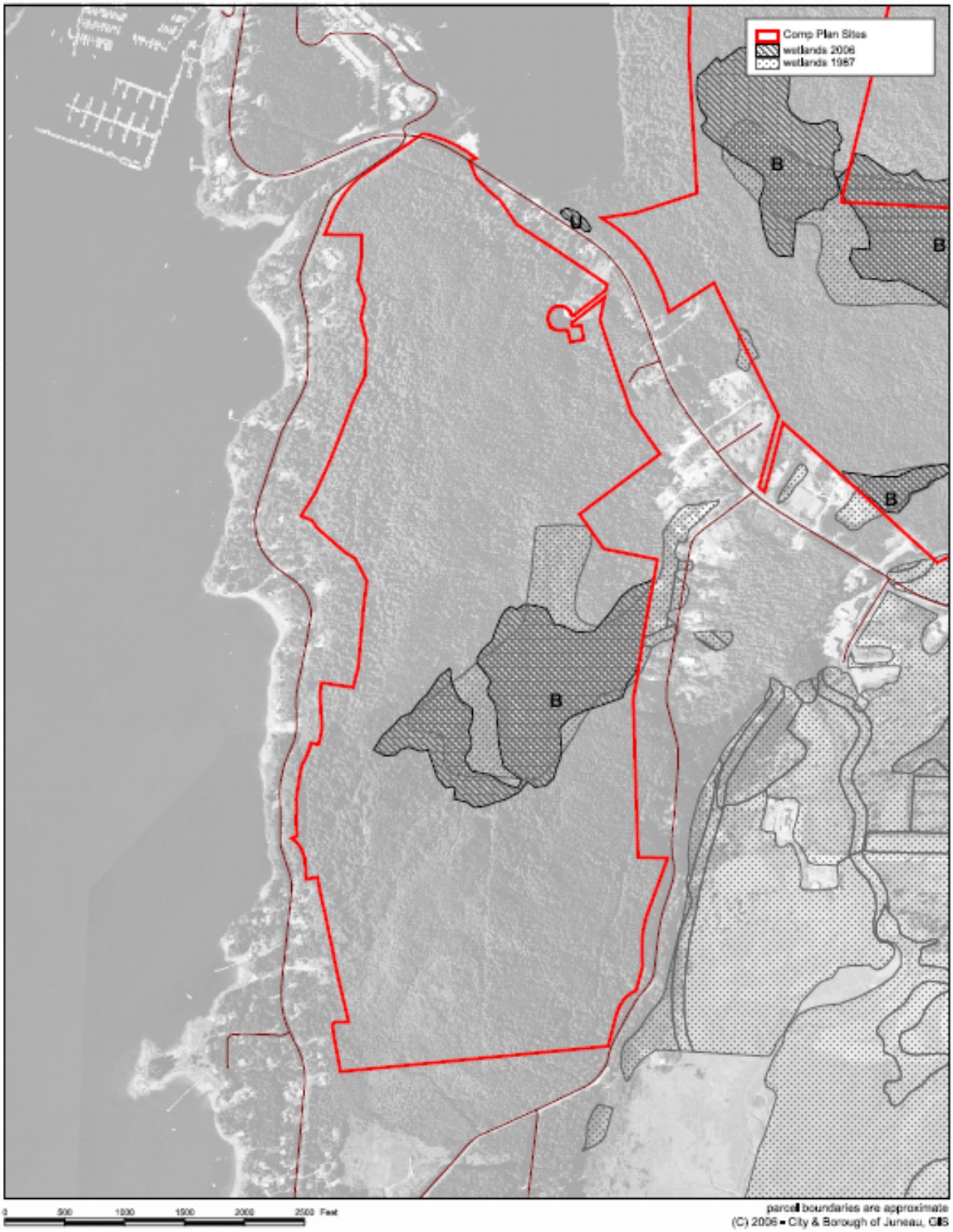

Figure 27 - Site 2 north - 2001 aerial photo w/ 1987/2006 wetlands

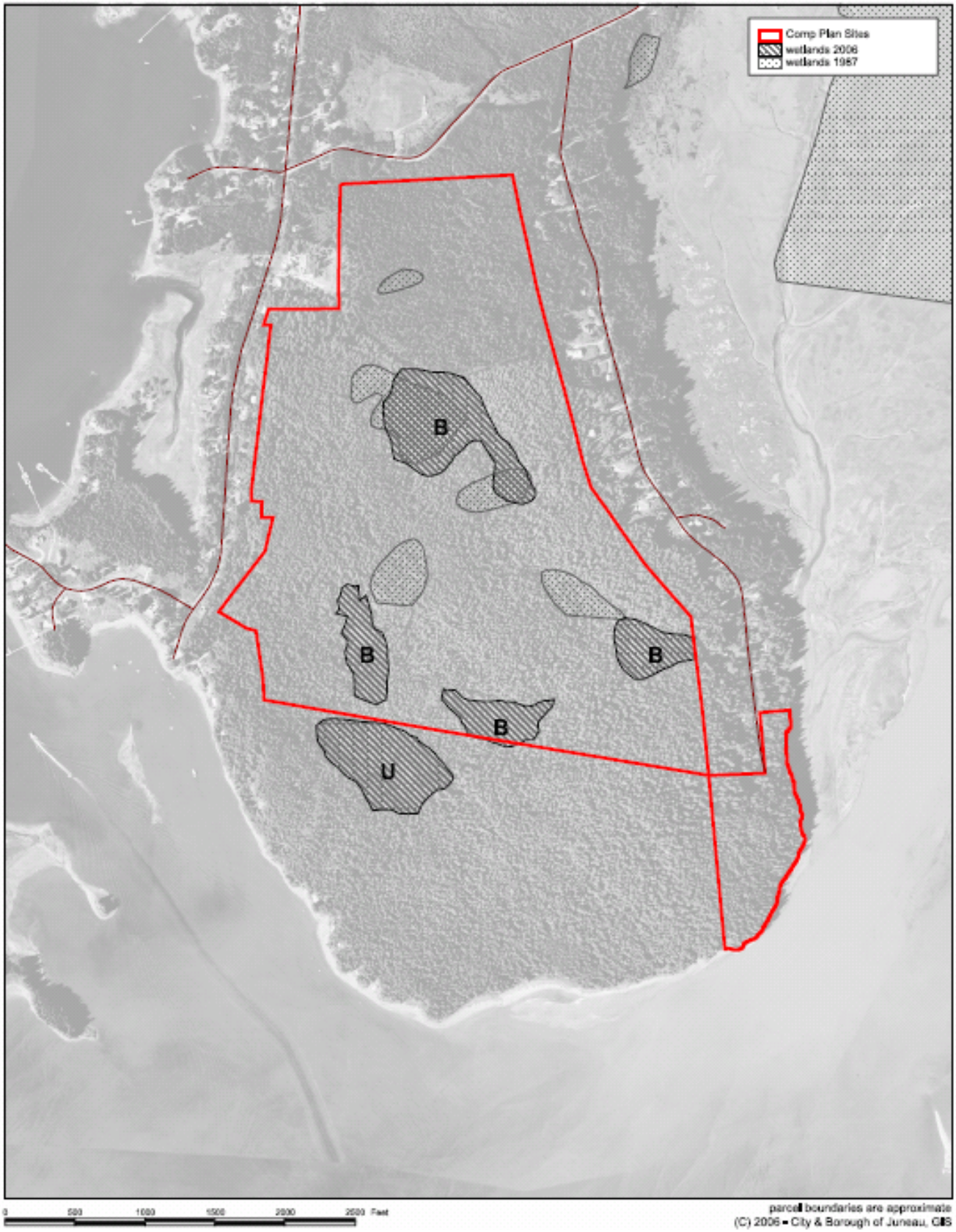

Figure 28 - Site 2 south - 2001 aerial photo w/ 1987/2006 wetlands

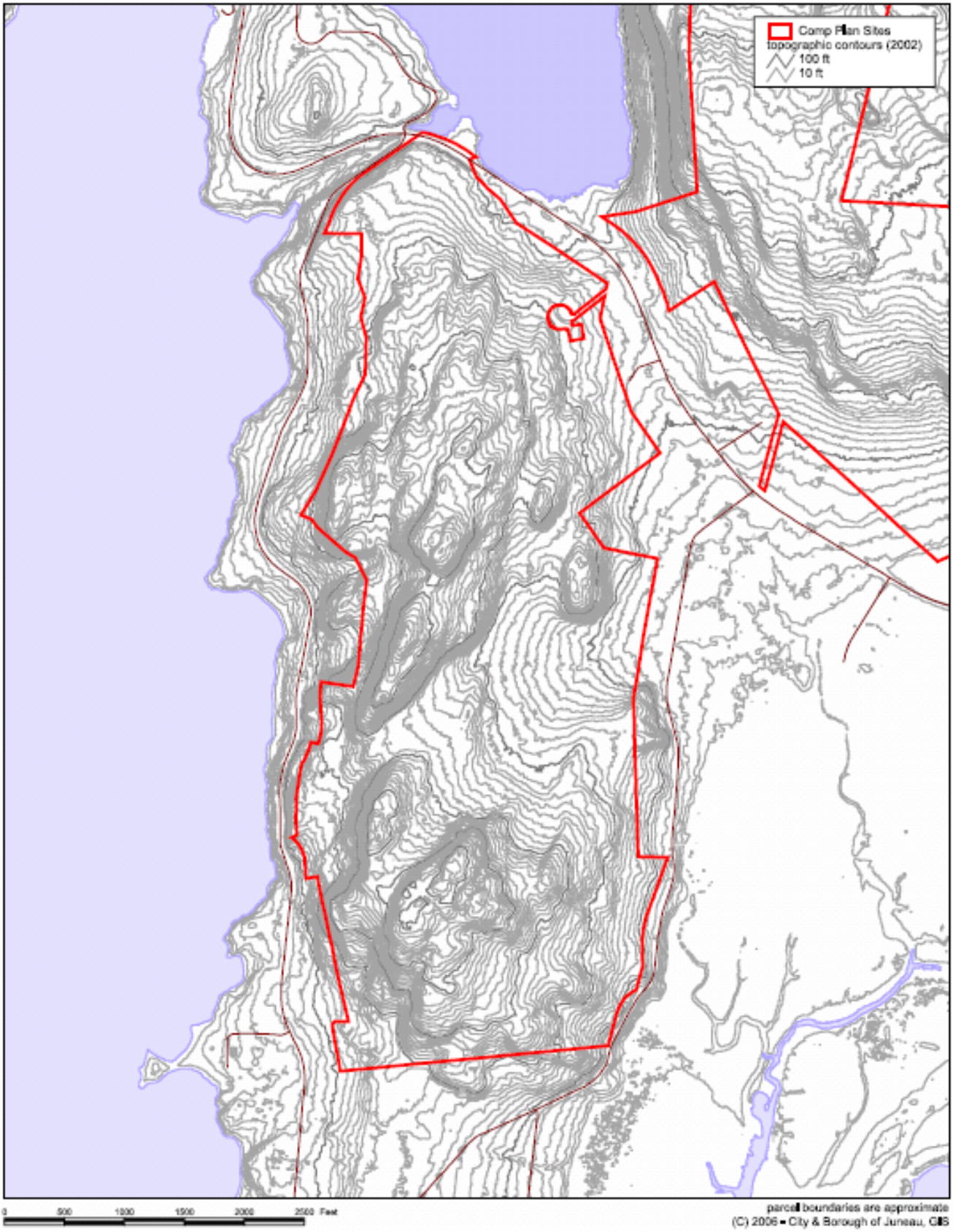

Figure 29 - Site 2 north topographic contour map

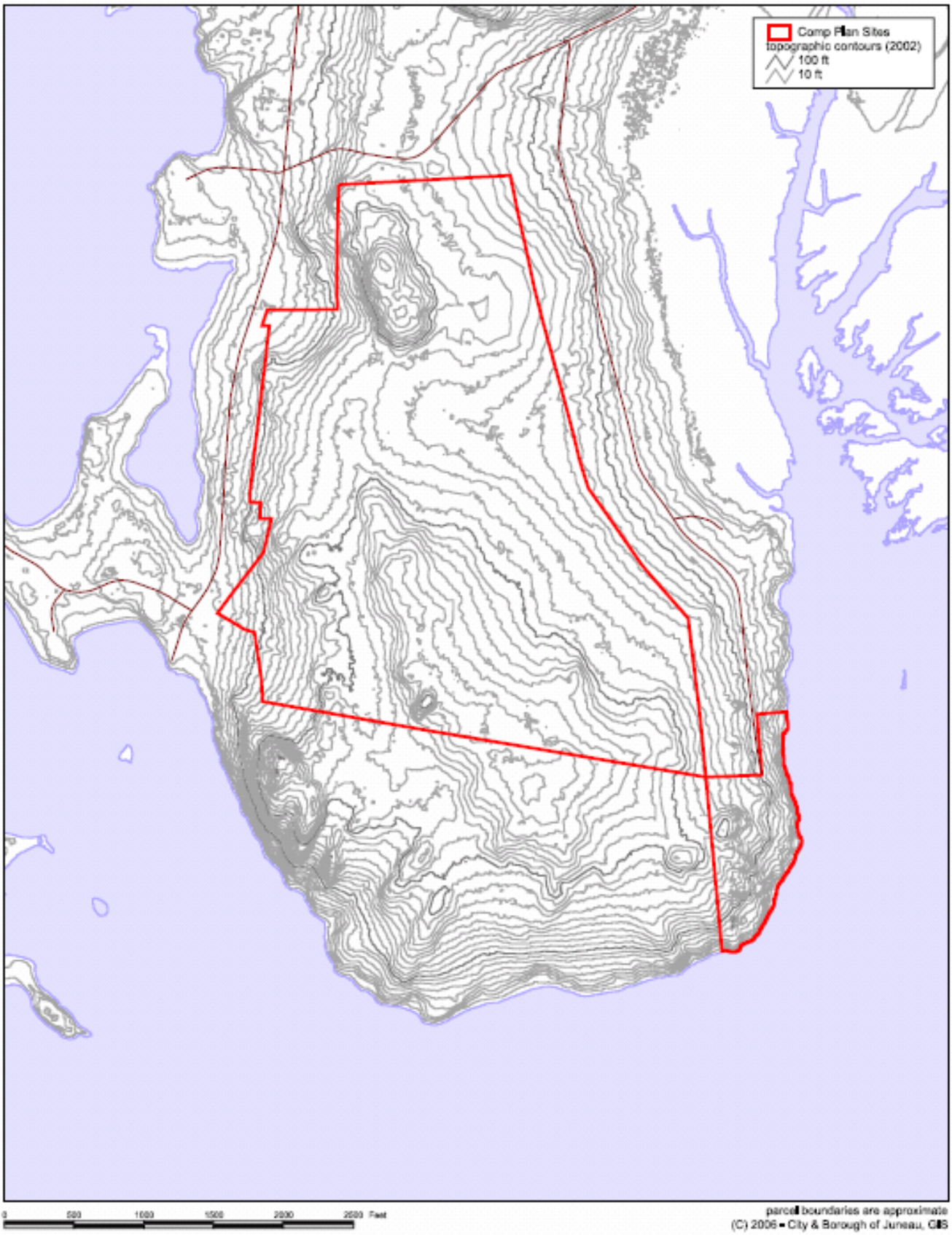

Figure 30 - Site 2 south topographic contour map

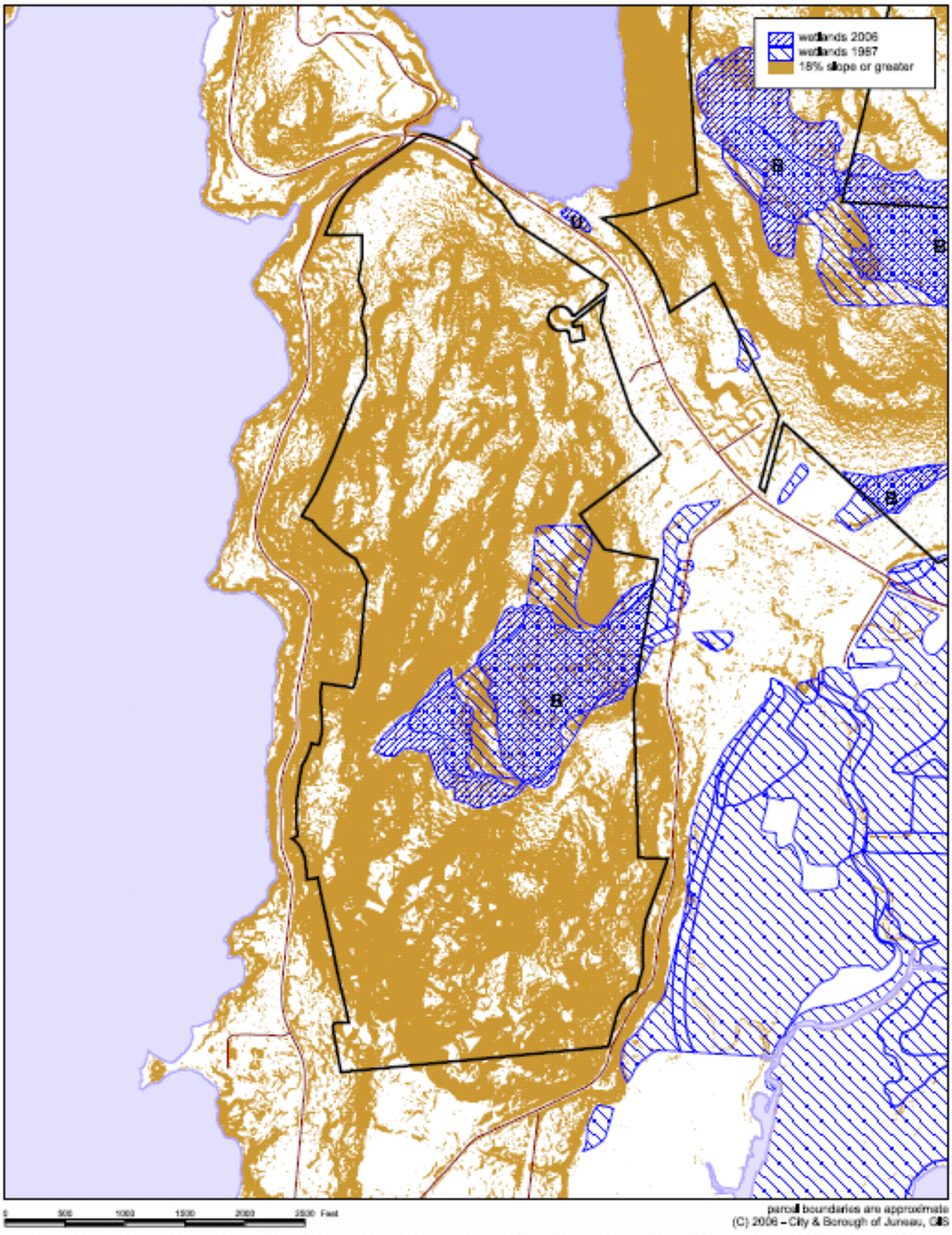

Figure 31 - Site 2 north topography - 18% slope or greater

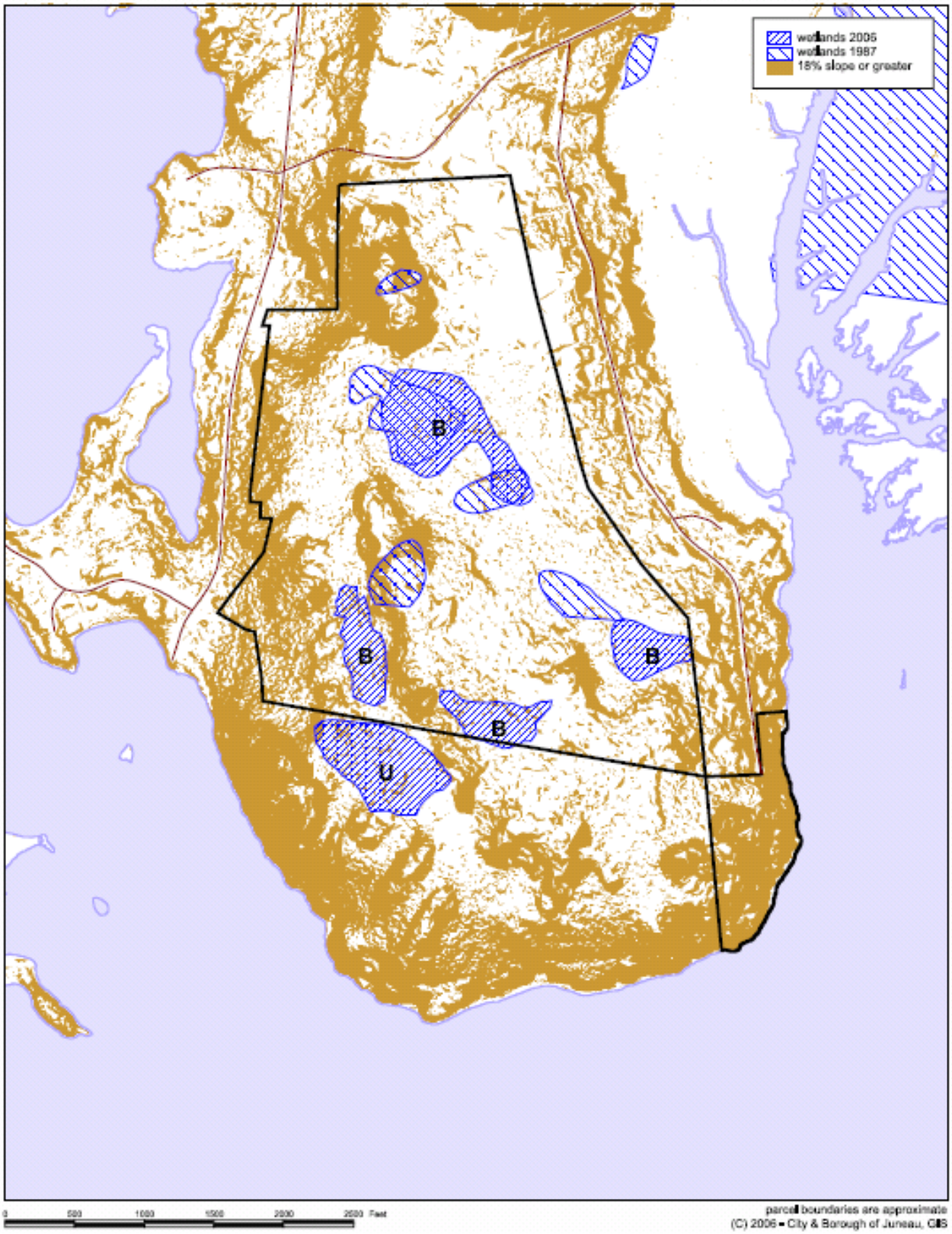

Figure 32 - Site 2 south topography - 18% slope or greater

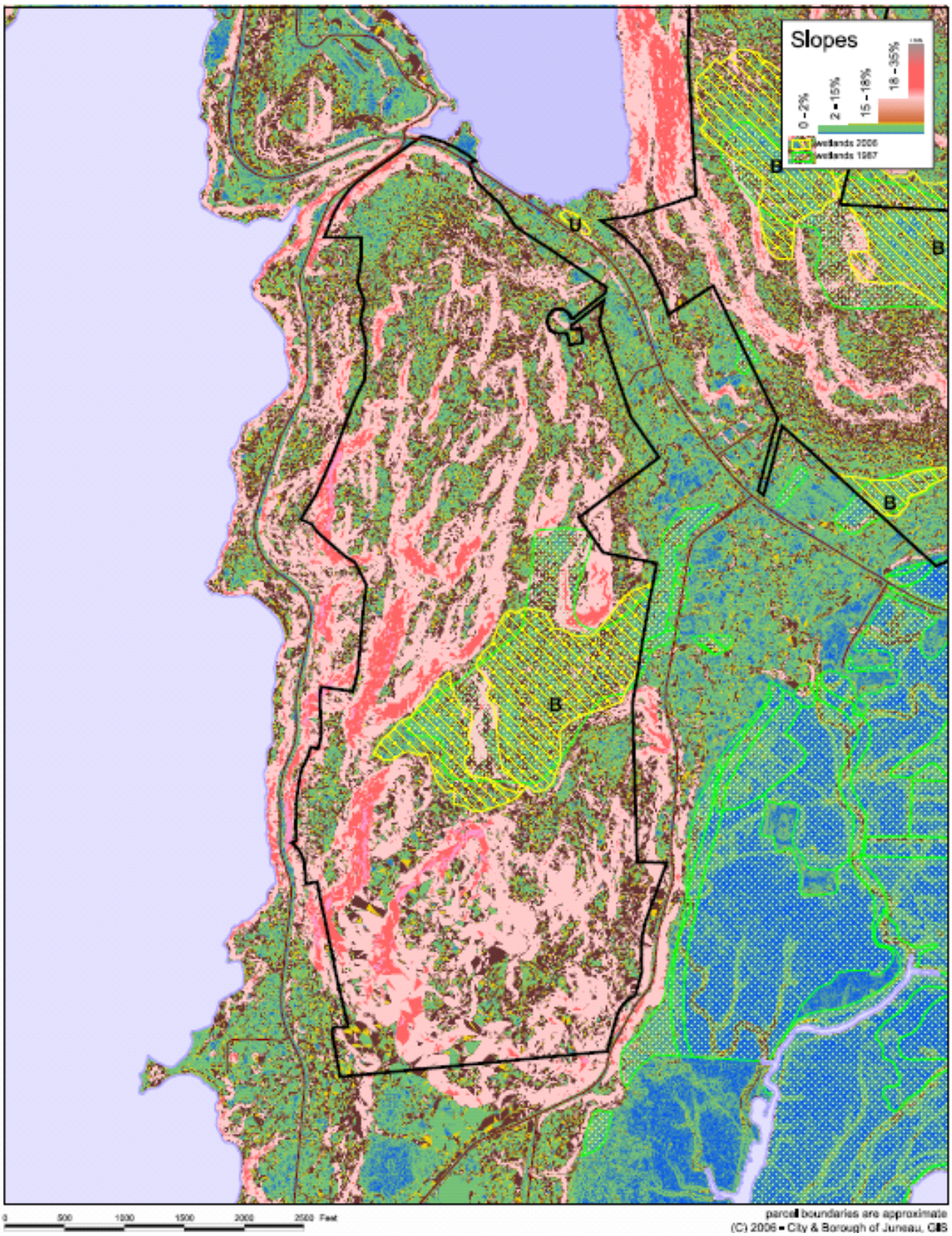

Figure 33 - Site 2 north - slope map w/wetlands

Figure 34 - Site 2 south - slope map w/wetlands

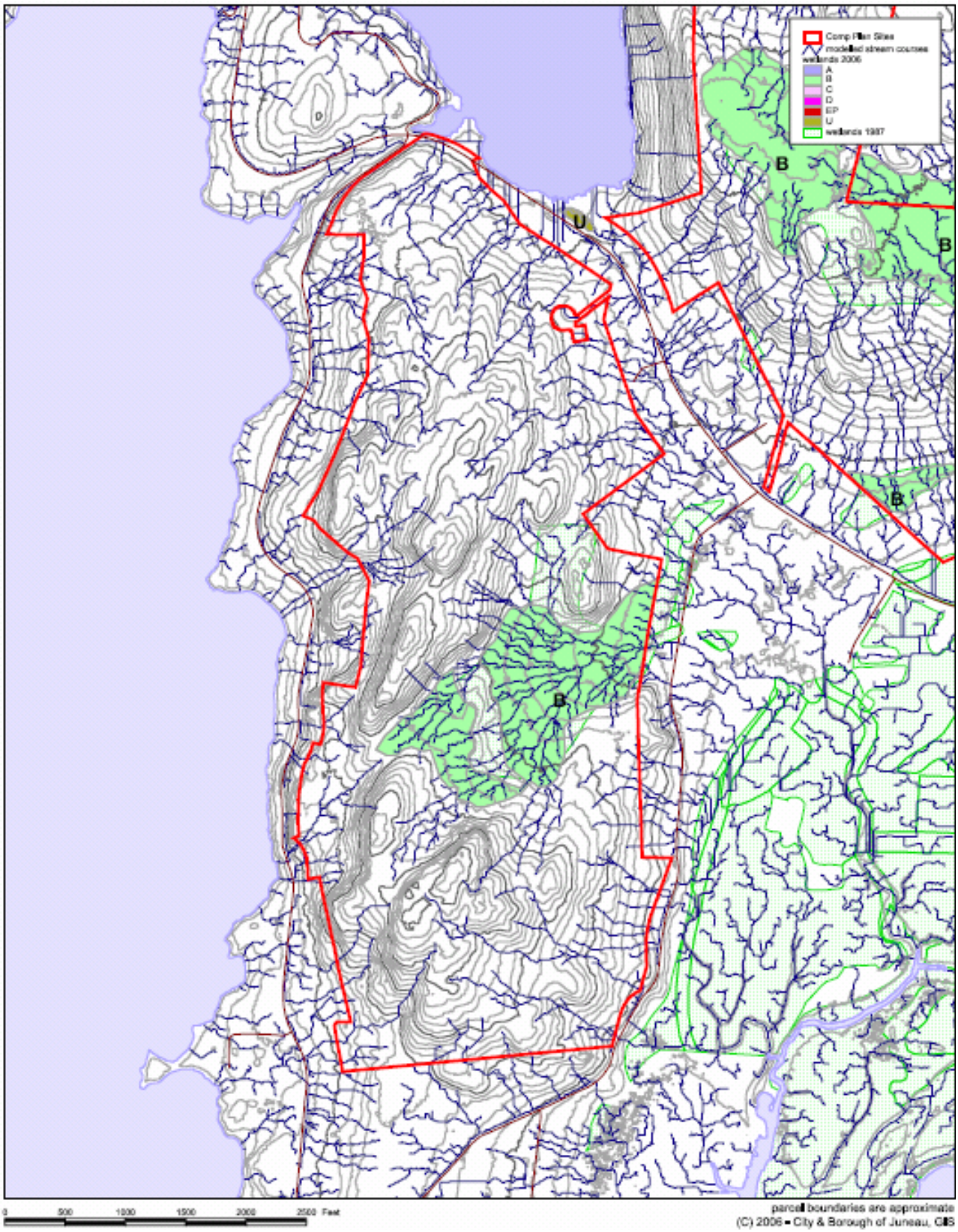

Figure 35 - Site 2 north - Preliminary modeled streams and drainages

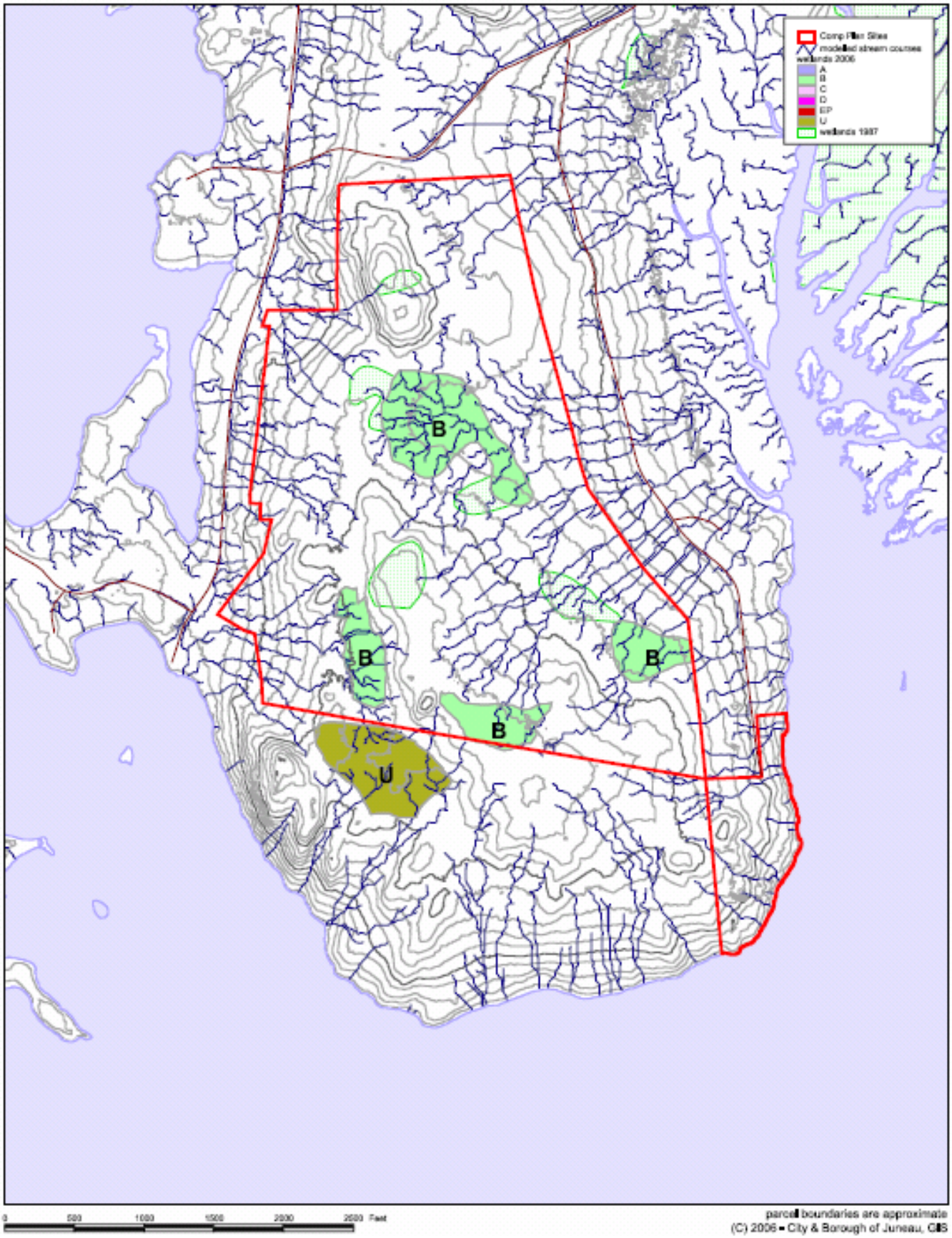

Figure 36 - Site 2 south - Preliminary modeled streams and drainages

3.2.1 Wetland #7

Figure 37 – Site 2 north - Wetland #7 - forested wetland

Figure 38 - Site 2 north - Wetland #7 - ericaceous wetland

This wetland is in the northern part of the peninsula. It was assigned to category B based partly on relatively high ratings for Groundwater Discharge and Sediment/Toxicant Retention (Table 2). Small, probably ephemeral, streams flow along the northern and southern edges of this wetland but fish probably cannot access any part of the wetland itself. Part of this wetland overlaps a wetland labeled as MW11 in the 1997 Juneau Wetlands Management Plan, and the Plan also assigned that part to category B. The wetland is a complex of forested wetland and alder fen on the slopes, and sedge fen and ericaceous bog on the flatter benches. The forested wetland is dominated by scrubby hemlock and skunk cabbage and the alder fens by Sitka alder and crabapple. The sedge fen is dominated by Sitka sedge and the ericaceous bog by Labrador tea, stunted shore pine, mountain hemlock, and *Sphagnum* moss. The soils were all hydric and during the time of visit soils in most of the wetland were fully saturated, except on scattered hummocks.

3.2.2 Wetland #23

Figure 39 – Site 2 south - Wetland #23

This wetland is in the southern part of the peninsula. It was assigned to category B based partly on relatively high ratings for Groundwater Discharge and Sediment/Toxicant Retention (Table 2). Part of this wetland overlaps a wetland labeled as MW16 in the 1997 Juneau Wetlands Management Plan, and the Plan assigned that part to category C. Fish cannot access any part of this wetland. This wetland is a poor fen/rich bog complex on a narrow bench with a small drainage flowing through it. The wetland is dominated by Sitka alder and Sitka sedge in the fen portions with strong groundwater influence, and Labrador tea, stunted shore pine, mountain hemlock and *Sphagnum* moss on the boggy parts. The soils are all hydric soils, mostly sedge and *Sphagnum* peats of the Kina and Wadleigh series and during the time of visit the water table was at or above the surface of the soil.

3.2.3 Wetland #24

This wetland is in the southern part of the peninsula. It was assigned to category B based partly on moderate to high ratings for Sediment/Toxicant Retention and Wildlife Habitat (Table 2). Part of this wetland overlaps a wetland labeled as MW15 in the 1997 Juneau Wetlands Management Plan, and the Plan assigned that part to category C. Fish cannot access any part of this wetland. This wetland is a poor fen/rich bog complex on a flat area at the top of the ridge that runs north-south down the peninsula. The wetland is dominated by Sitka alder and Sitka sedge in the fen portions with strong groundwater influence, and Labrador tea, stunted shore pine, mountain hemlock and *Sphagnum* moss on the boggy parts. The soils are all hydric soils, mostly sedge and *Sphagnum* peats of the Kina and Wadleigh series, and during the time of visit the water table was at or above the surface of the soil.

3.2.4 Wetland #26

This wetland is in the southern part of the peninsula. It was assigned to category B based partly on moderate to high ratings for Sediment/Toxicant Retention, Wildlife Habitat, and Groundwater Recharge (Table 2). Part of this wetland overlaps wetlands labeled as MW12, MW13, and MW 14 in the 1997 Juneau Wetlands Management Plan, and the Plan assigned those to category C. Fish cannot access any part of this wetland. This wetland is a poor fen/rich bog complex on a bench on the east edge of the ridge that runs down the peninsula. The wetland is dominated by Sitka alder and Sitka sedge in the fen portions with strong groundwater influence, and Labrador tea, stunted shore pine, mountain hemlock and *Sphagnum* moss on the boggy parts. The soils are all hydric soils, mostly sedge and *Sphagnum* peats of the Kina and Wadleigh series, and during the time of visit the water table was at or above the surface of the soil.

3.2.5 Wetland #27

Figure 40 – Site 2 south - Wetland #27

This wetland is in the southern part of the peninsula. It was assigned to category B based partly on moderate to high ratings for Sediment/Toxicant Retention, Wildlife Habitat, and Groundwater Recharge (Table 2). Part of this wetland overlaps wetlands labeled as MW12, MW13, and MW 14 in the 1997 Juneau Wetlands Management Plan, and the Plan assigned those to category C. Fish cannot access any part of this wetland. This wetland is a poor fen/rich bog complex on a flat divide along the the ridge that runs north-south down the peninsula. The wetland is dominated by Sitka alder and Sitka sedge in the fen portions with strong groundwater influence, and Labrador tea, stunted shore pine, mountain hemlock and *Sphagnum* moss on the boggy parts. The soils are all hydric soils, mostly sedge and *Sphagnum* peats, of the Kina and Maybeso Series, and during the time of visit the water table was at or above the surface of the soil.

3.3 Parcel Unit #3

This parcel unit includes a wide geomorphic upper bench, a slope, and then a narrow lower bench on Douglas Island just northwest of the bridge. It contains 8 distinct wetlands, all assigned to category B. However, the geographically closest wetlands to this parcel unit in the 1997 Juneau Wetlands Management Plan are labeled DE3 and the Plan assigned them to category A. Representative portions of this unit were field checked during the mapping period. The exact areas visited are shown on the field survey map (Fig.2)

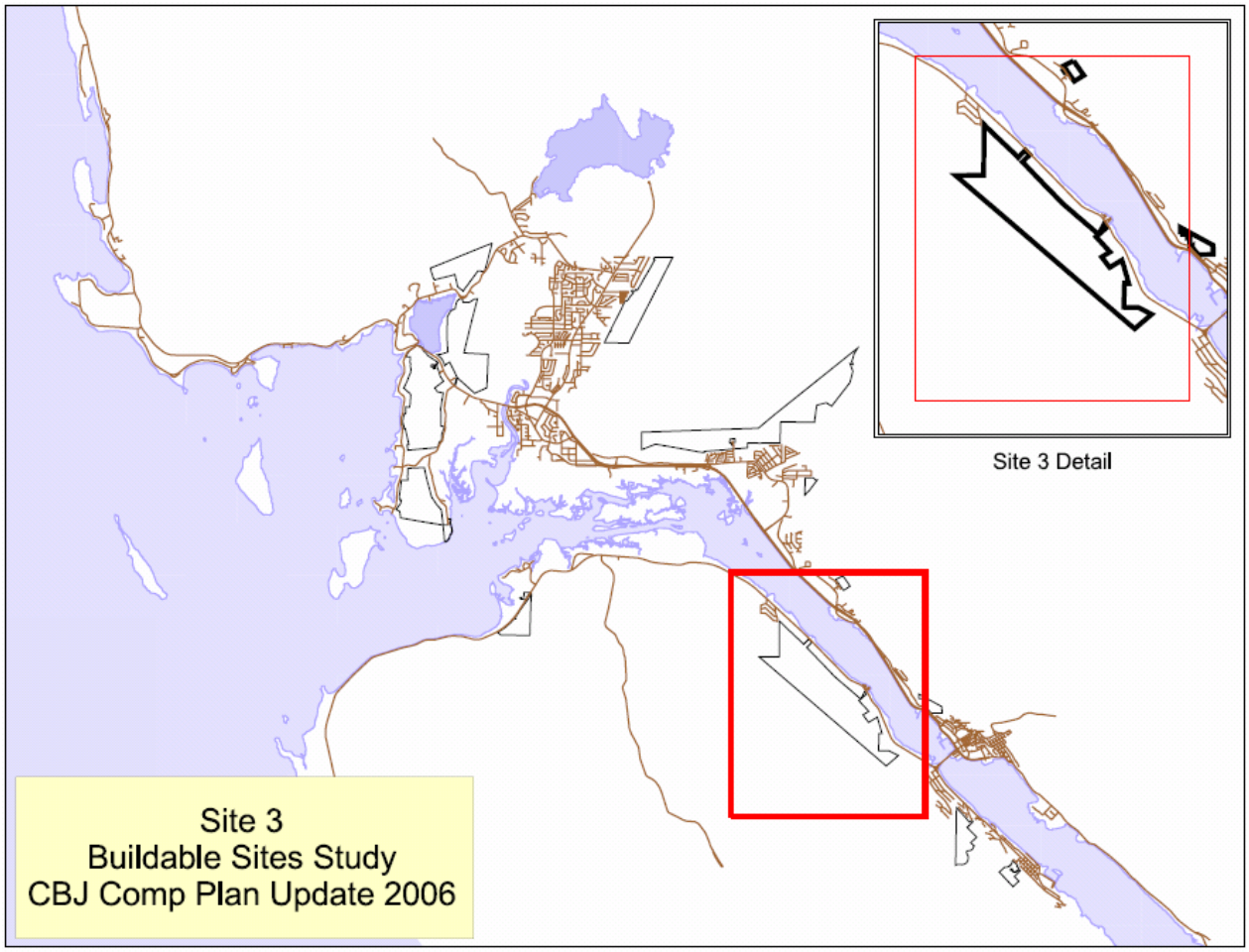

Figure 41 - Site 3 - detail map

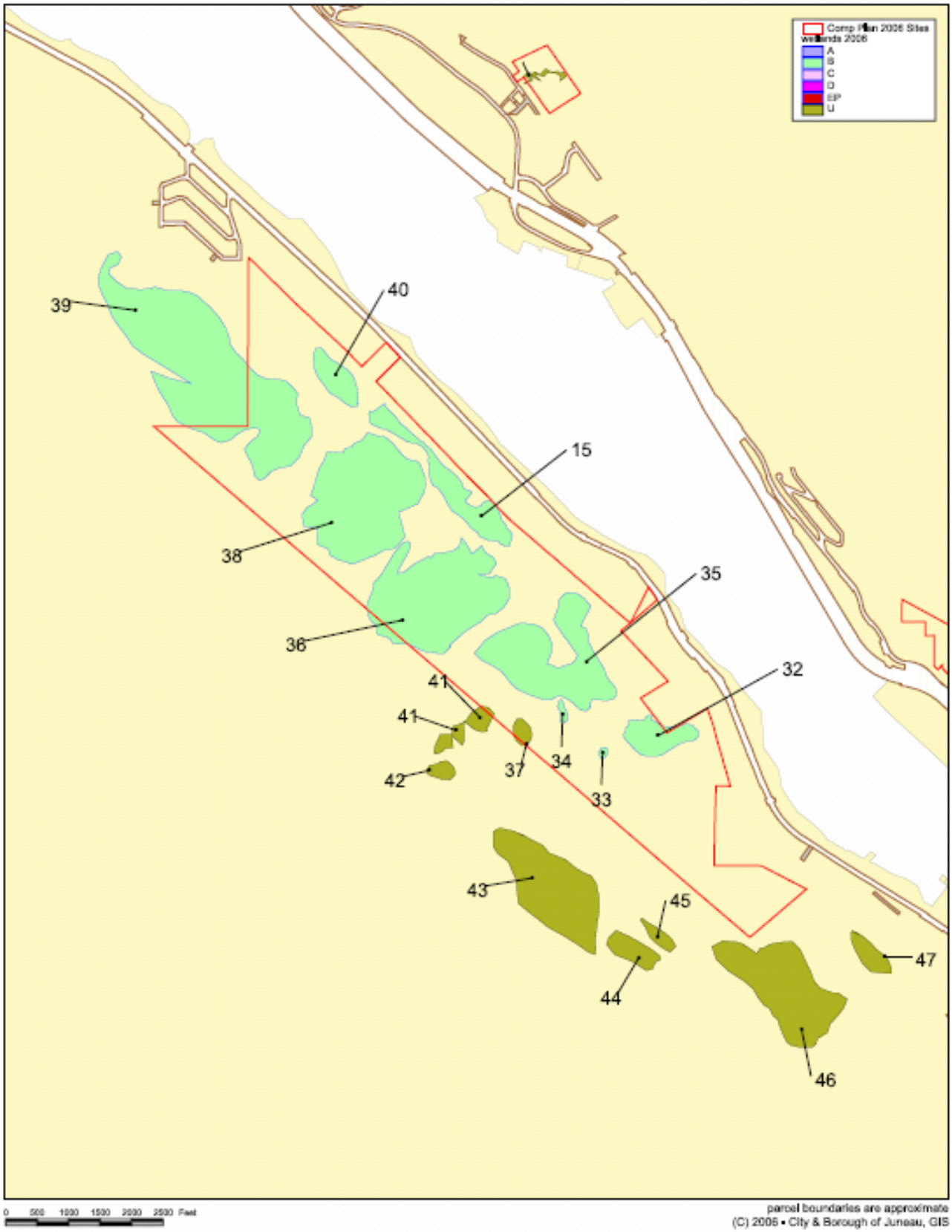

Figure 42 – Site 3 - wetland polygon labels

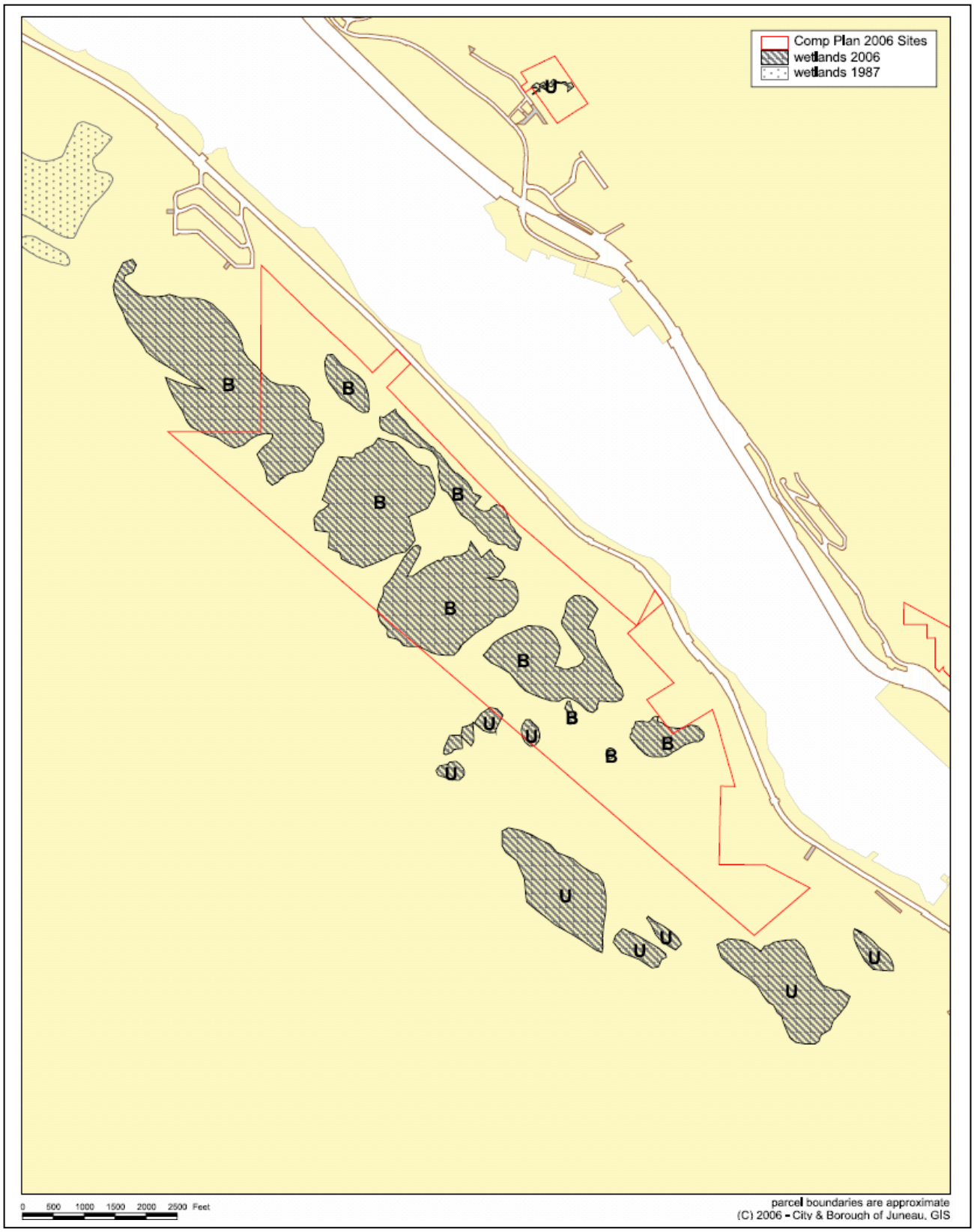

Figure 43 - Site 3 wetland map

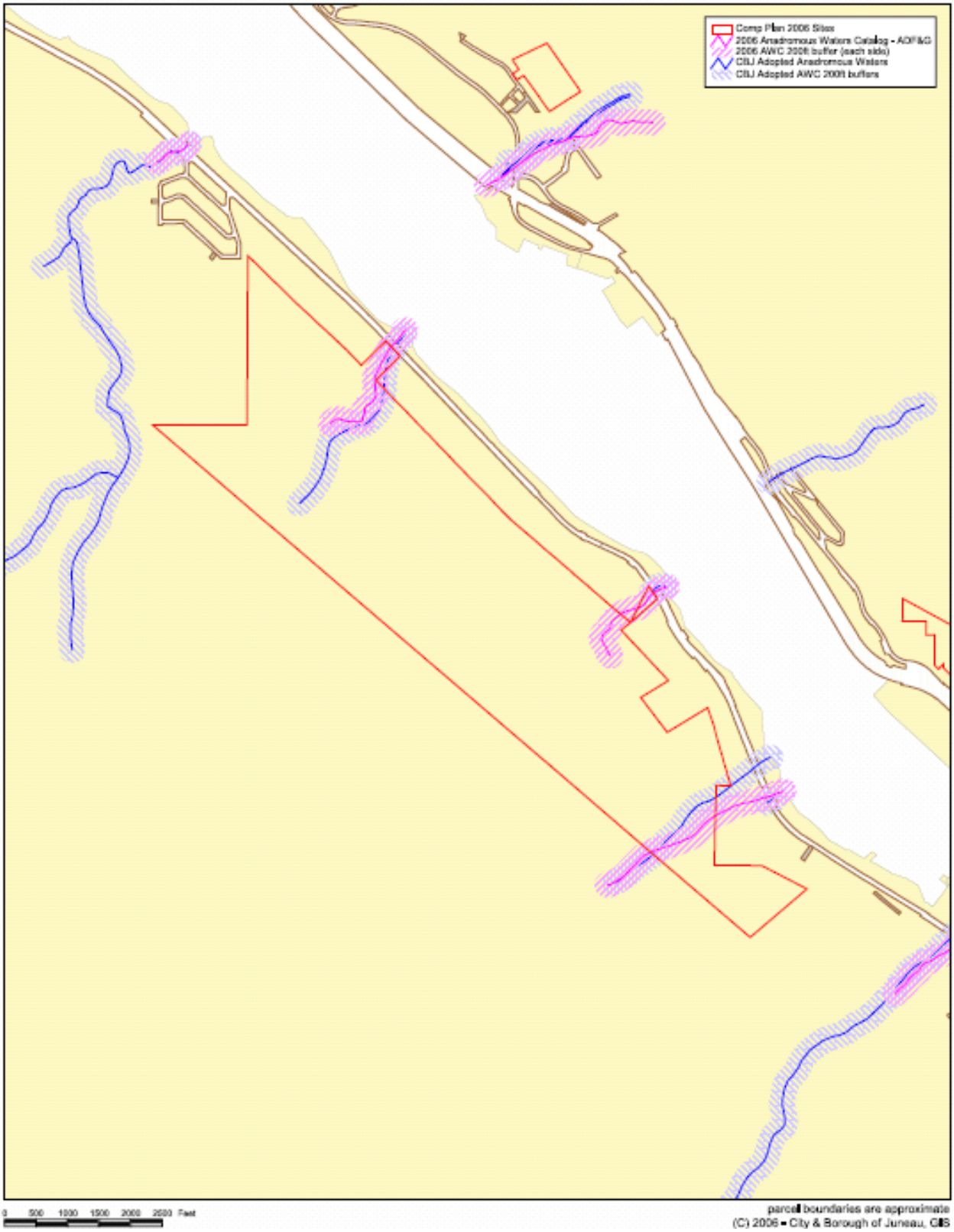

Figure 44 - Site 3 - Anadromous waters map

Figure 45 - Site 3 - 2001 Aerial photo w/wetlands

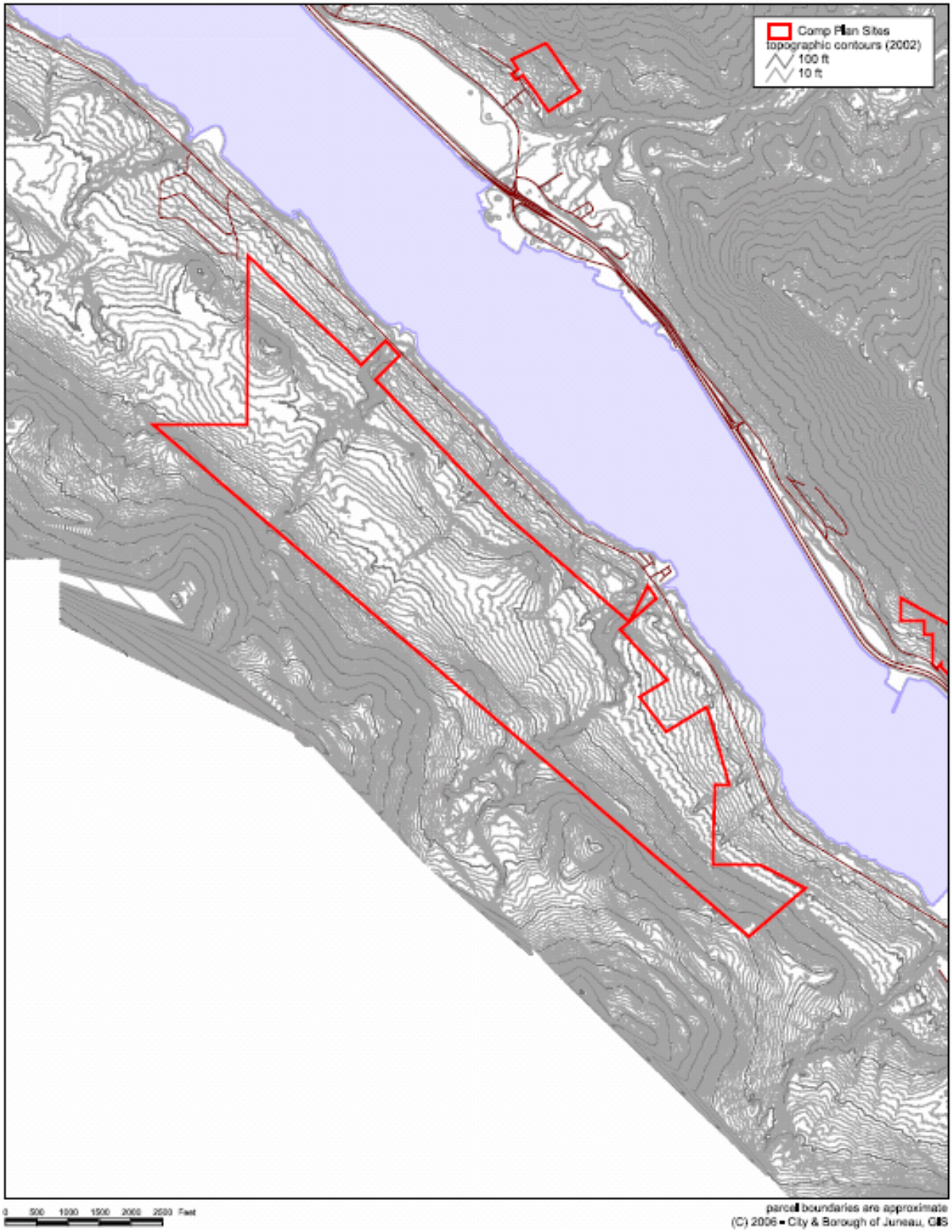

Figure 46 - Site 3 - topographic contours

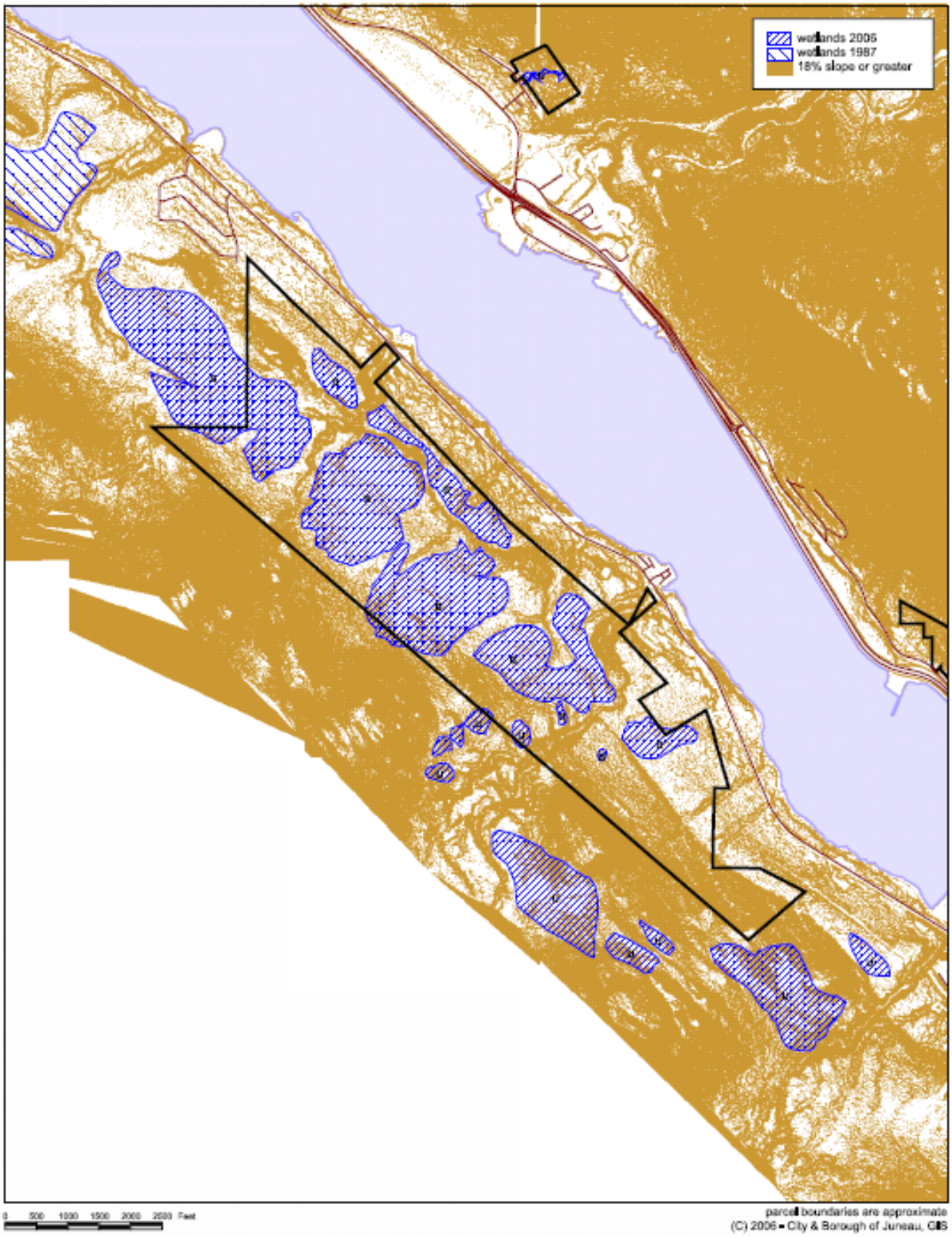

Figure 47 - Site 3 topography - 18% slope or greater w/wetlands

Figure 48 - Site 3 slope map w/wetlands

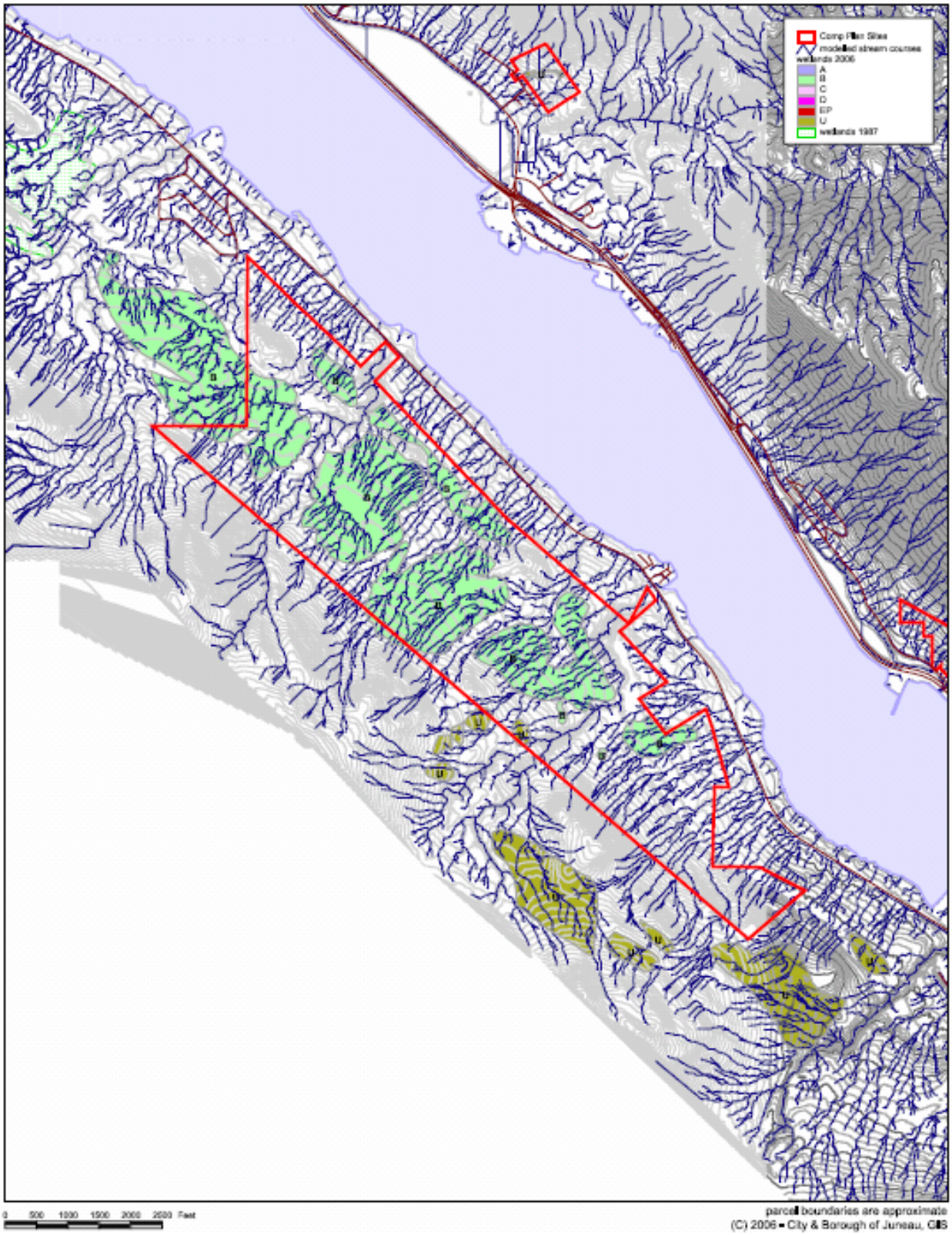

Figure 49 - Site 3 - Preliminary modeled streams and drainages

3.3.1 Wetland #15

Figure 50 – Site 3 - Wetland #15 - sloping sedge fen

This wetland is on the lower, narrow bench in the northeastern part of the parcel unit. It was assigned to category B based partly on high ratings for Groundwater Discharge and Sediment/Toxicant Retention (Table 2). Fish cannot access any part of this wetland. The northern end of this wetland is a sloping sedge fen dominated by *Trichophorum* and livid sedge with a more ericaceous bog around the edges. The soils are hydric, mostly of the Kina Series. The rest of the wetland is forested wetland dominated by Sitka spruce, western hemlock , blueberries, and skunk cabbage. Those soils are mostly hydric, with mucky peats of the Maybeso Series in the swales and non-hydric soils on the hummocks. At the time of the study the water table was at or near the surface over most of the wetland.

3.3.2 Wetland #32

Figure 51 – Site 3 - Wetland #32 - edge of forested wetland/alder fen

Figure 52 – Site 3 - Wetland #32 - edge of ericaceous bog and alder fen

This wetland is in the eastern part of the parcel unit. It was assigned to category B based partly on high ratings for Groundwater Discharge and Sediment/Toxicant Retention (Table 2). Fish cannot access any part of this wetland. This wetland is a complex of forested wetland - alder fen – ericaceous bog. The forested wetland is dominated by scrubby hemlock and skunk cabbage, and the alder fens by Sitka alder and crabapple. The alder fen is dominated by Sitka alder and various graminoids and the ericaceous bog by Labrador tea, stunted pine, Sitka spruce, hemlock and *Sphagnum* moss. The soils are all hydric, mostly of the Kina and Maybeso Series. The water table was at or near the surface over all the wetland except for scattered hummocks.

3.3.3 Wetland #33

This is a tiny wetland in the eastern part of the parcel unit. It was assigned to category B based partly on high ratings for Groundwater Discharge and Erosion Sensitivity (Table 2). Fish cannot access any part of this wetland. This is an ericaceous bog, dominated by small sedges and *Sphagnum* moss. The soils are hydric and were saturated at the time of visit.

3.3.4 Wetland #34

This is a small wetland near the center of the parcel unit. It was assigned to category B based partly on high ratings for Groundwater Discharge and Erosion Sensitivity (Table 2). Fish cannot access any part of this wetland. This is an ericaceous bog, dominated by small sedges and *Sphagnum* moss. The soils are hydric and were saturated at the time of visit.

3.3.5 Wetland #35

This wetland is somewhat large and near the center of the parcel unit. It was assigned to category B based partly on high ratings for Groundwater Discharge and Erosion Sensitivity (Table 2). Fish cannot access any part of this wetland. This wetland is a complex of forested wetland-alder fen – ericaceous bog. The forested wetland is dominated by scrubby hemlock and skunk cabbage, and the alder fens by Sitka alder and crabapple. The ericaceous bog is dominated by Labrador tea, stunted pine, spruce, hemlock and *Sphagnum* moss. The soils are all hydric and the water table was at or near the surface over all the wetland except for scattered hummocks.

3.3.6 Wetland #36

This wetland is similar to wetland #35 but is farther from streams. It was assigned to category B based partly on high ratings for Groundwater Discharge and Erosion Sensitivity (Table 2). Fish cannot access any part of this wetland. This is an ericaceous bog, dominated by small sedges and *Sphagnum* moss. The soils are hydric and saturated.

3.3.7 Wetland #38

This wetland is relatively large and is near the center of the parcel unit. It was assigned to category B based partly on moderate to high ratings for Riparian Support, Recreational Use, and Wildlife Habitat, but in general this wetland scored lower than wetlands 35 and 36 (Table 2). Fish cannot access any part of this wetland. This wetland is a complex of forested wetland - alder fen – ericaceous bog. The forested wetland is dominated by scrubby hemlock and skunk cabbage, and the alder fens by Sitka alder and crabapple. The ericaceous bog is dominated by Labrador tea, stunted pine, spruce, hemlock and *Sphagnum* moss The soils are all hydric, of the Kina and Maybeso Series, and the water table was at or near the surface over all the wetland except for scattered hummocks.

3.3.8 Wetland #39

Figure 53 – Site 3 - Wetland #39 - ericaceous bog

This wetland is relatively large and extends beyond the western end of this parcel unit. It was assigned to category B based partly on moderate to high ratings for Riparian Support, Recreational Use, and Wildlife Habitat, but in general this wetland scored lower than wetlands 35 and 36 (Table 2). Fish cannot access any part of this wetland. This wetland is a complex of forested wetland - alder fen – ericaceous bog. The forested wetland is dominated by scrubby hemlock and skunk cabbage and the alder fens by Sitka alder and crabapple. The ericaceous bog is dominated by Labrador tea, stunted pine, spruce, hemlock and *Sphagnum* moss. The soils are all hydric, of the Kina and Maybeso Series, and the water table was at or near the surface over all the wetland except for scattered hummocks.

3.3.9 Wetland #40

This is a somewhat small wetland located on the narrower bench downslope from wetland 39. It was assigned to category B based partly on high ratings for Groundwater Discharge and Erosion Sensitivity (Table 2). Fish cannot access any part of this wetland. This wetland is a complex of forested wetland - alder fen – ericaceous bog. The forested wetland is dominated by scrubby hemlock and skunk cabbage and the alder fens by Sitka alder and crabapple. The ericaceous bog is dominated by Labrador tea, stunted pine, spruce, hemlock and *Sphagnum* moss. The soils are all hydric, of the Kina and Maybeso Series, and the water table was at or near the surface over all the wetland except for scattered hummocks.

3.4 Parcel Unit #4

This parcel unit is mostly on a hilltop ("Hill 560") just east of Auke Lake. It contains 3 distinct wetlands, all assigned to category B. All of this unit was visited except for the upper part of wetland #14. The exact areas visited are shown on the field survey map (Fig. 2).

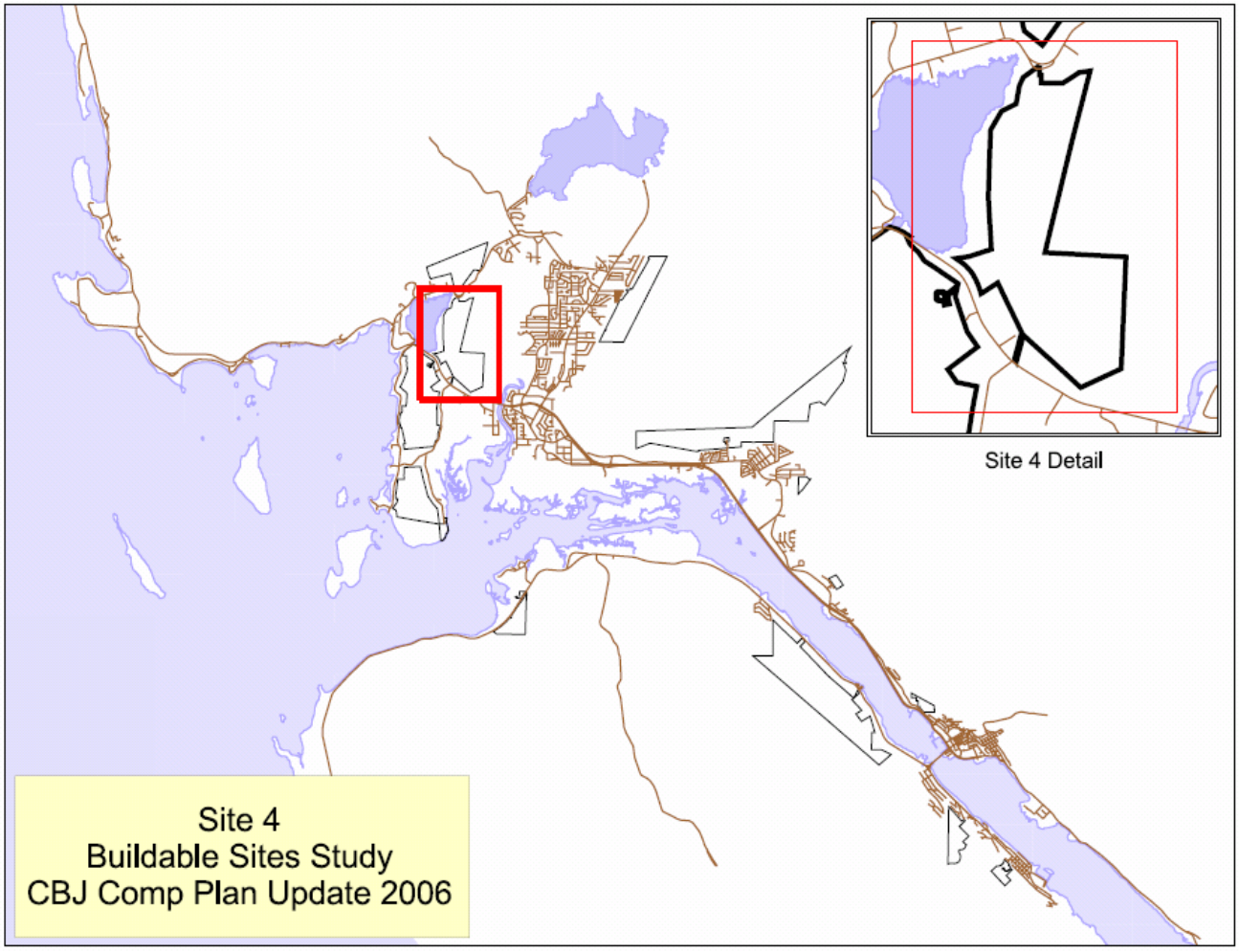

Figure 54 - Site 4 - detail map

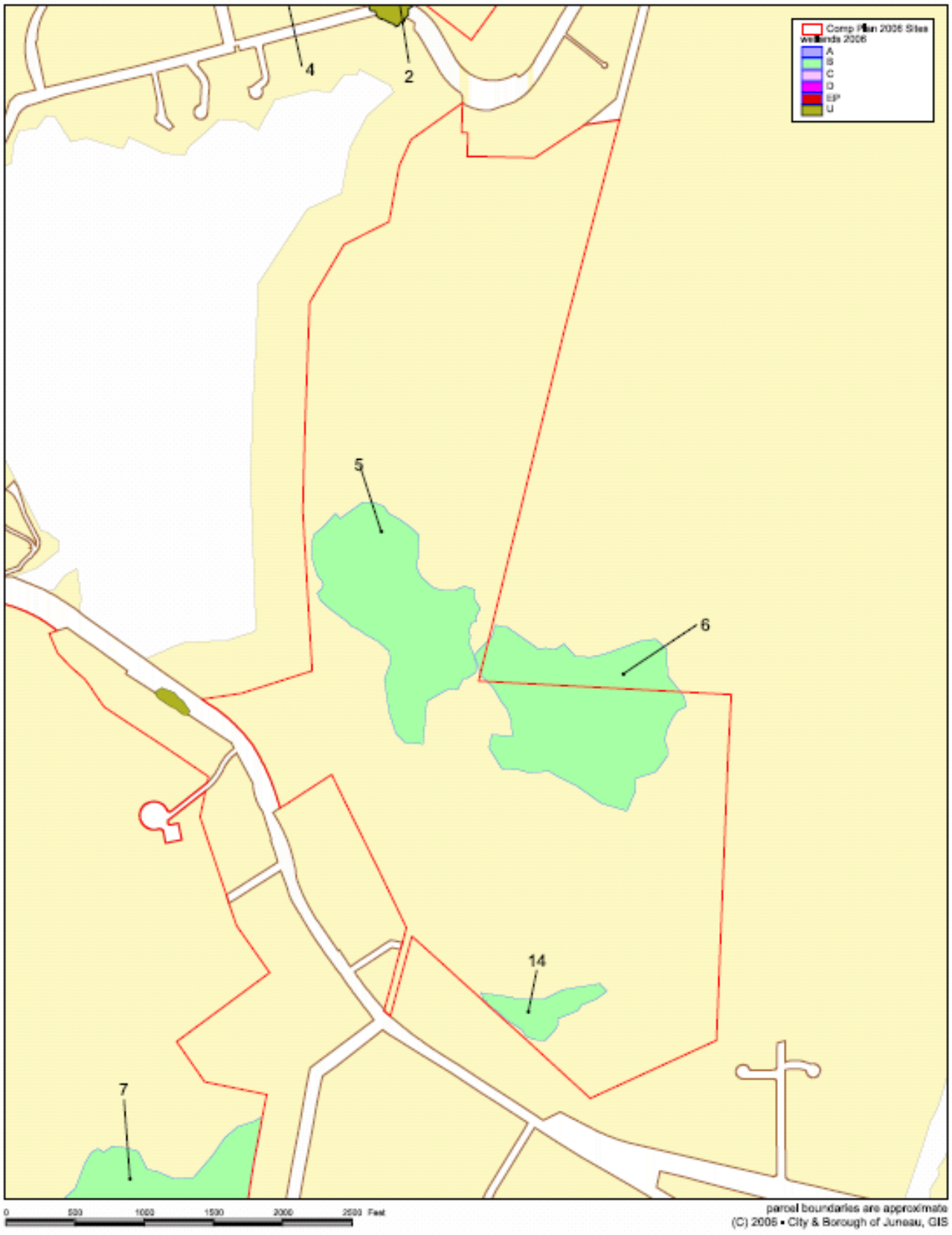

Figure 55 – Site 4 - Wetland polygon labels

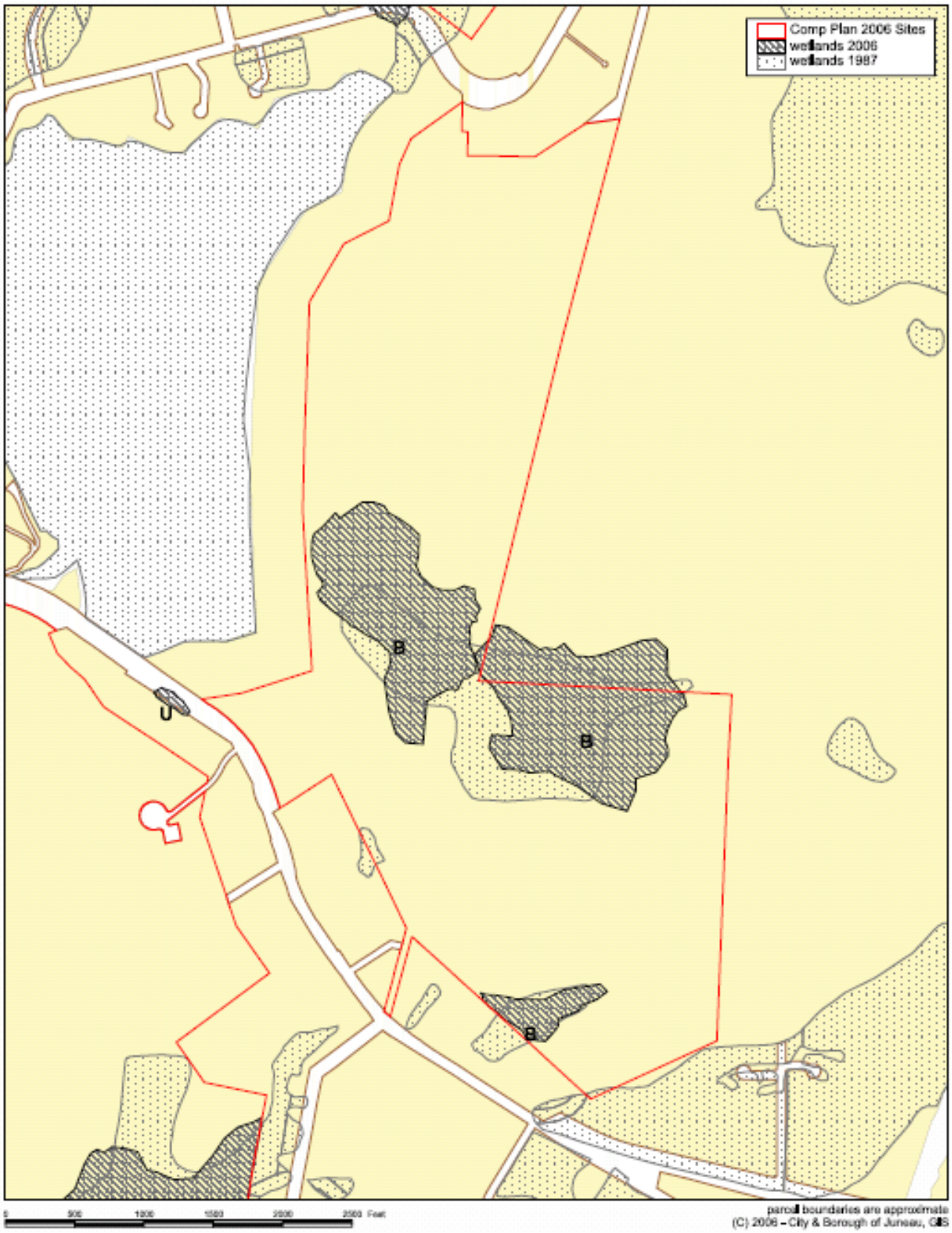

Figure 56 - Site 4 - 1987/2006 wetland maps

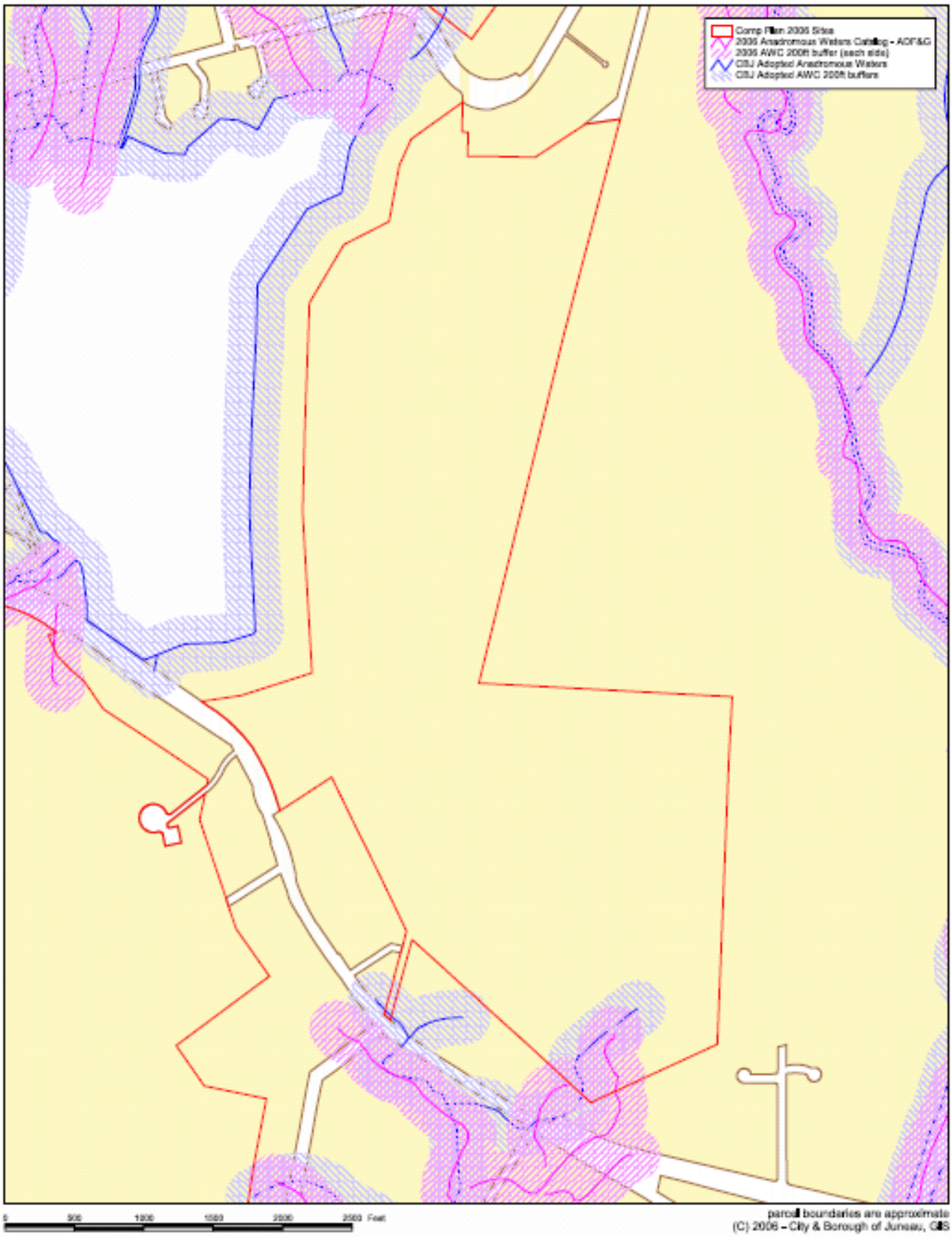

Figure 57 - Site 4 Anadromous waters map

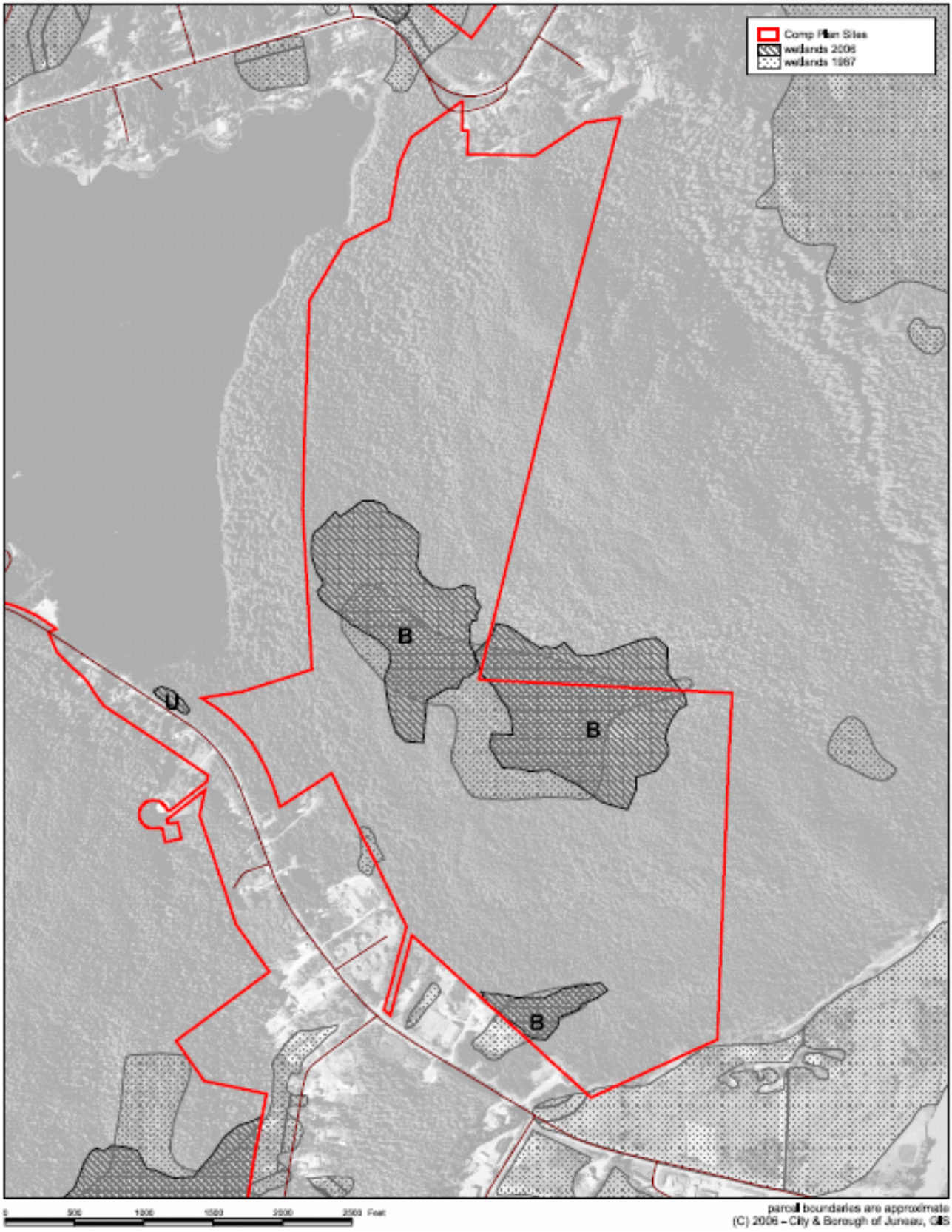

Figure 58 - Site 4 2001 Aerial photo with wetlands

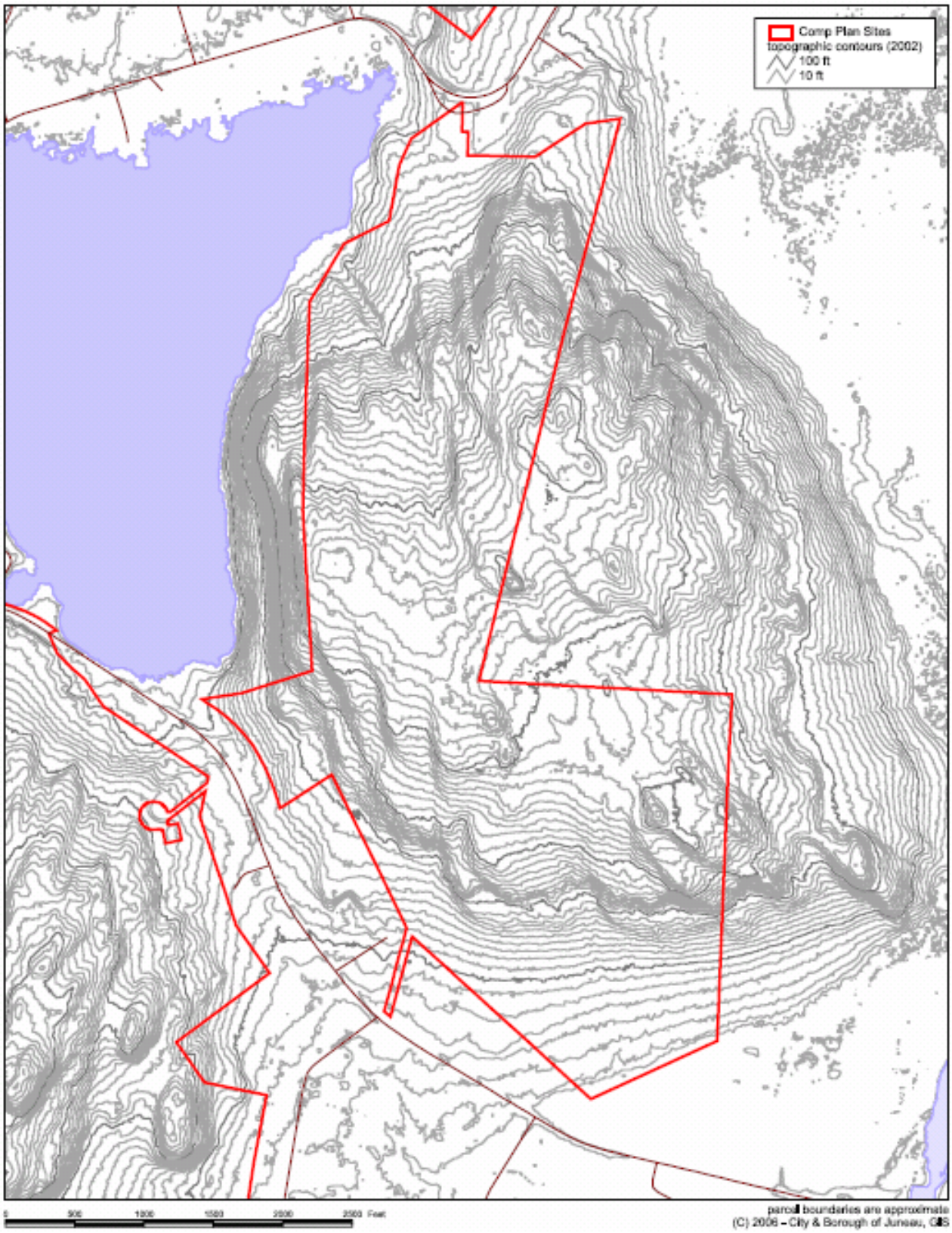

Figure 59 - Site 4 Topographic contours map

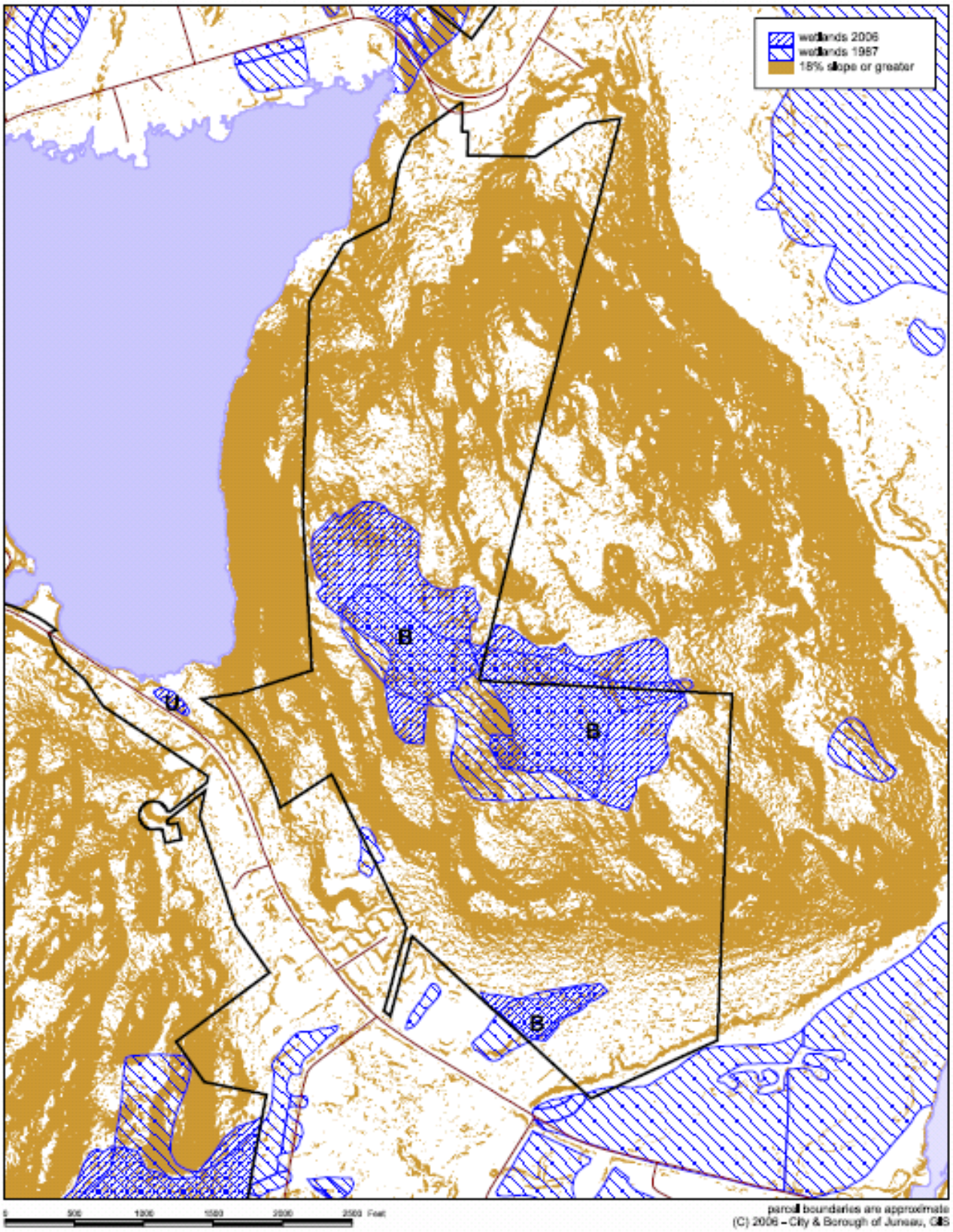

Figure 60 - Site 4 - 18% slope or greater

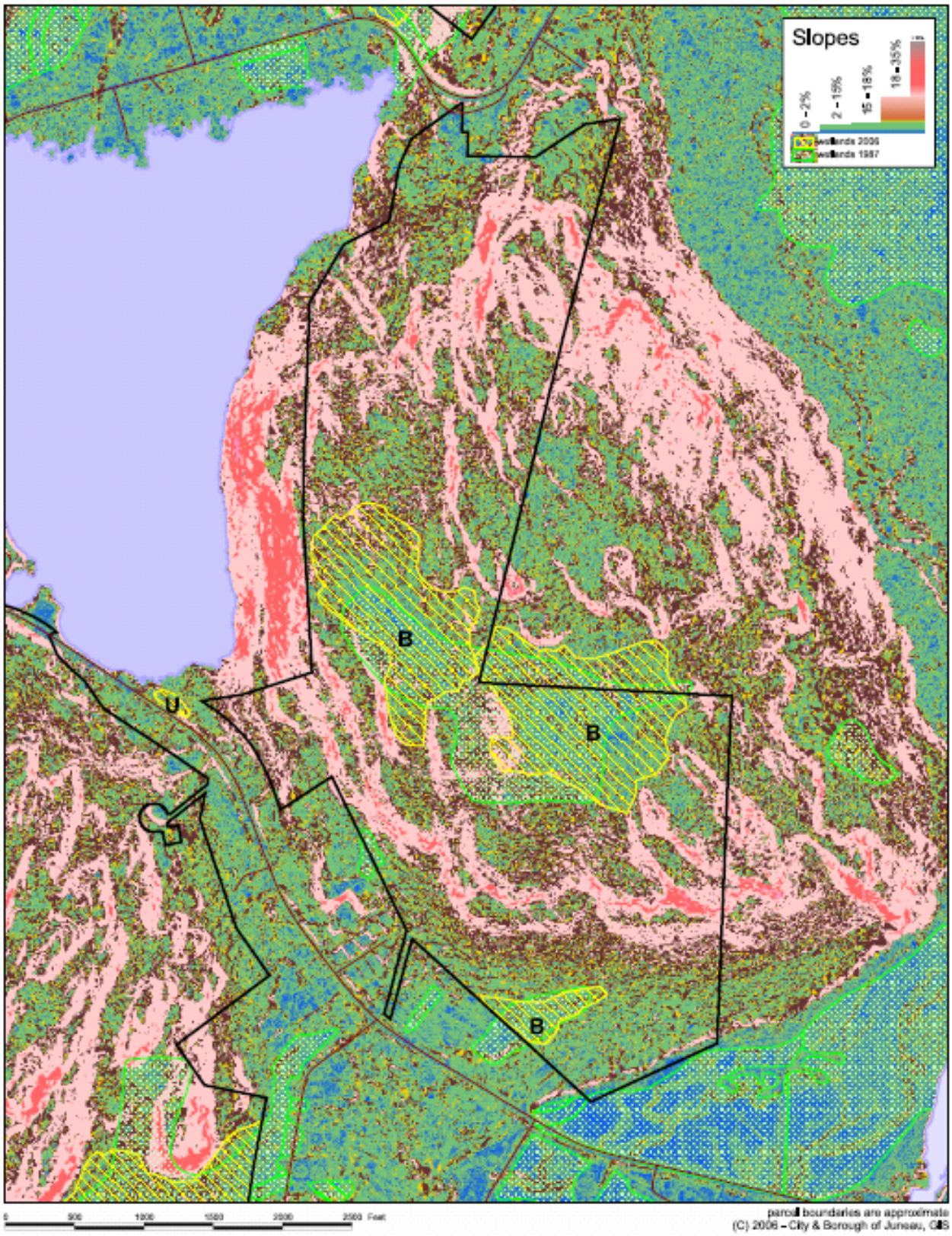

Figure 61 - Site 4 - slope map w/wetlands

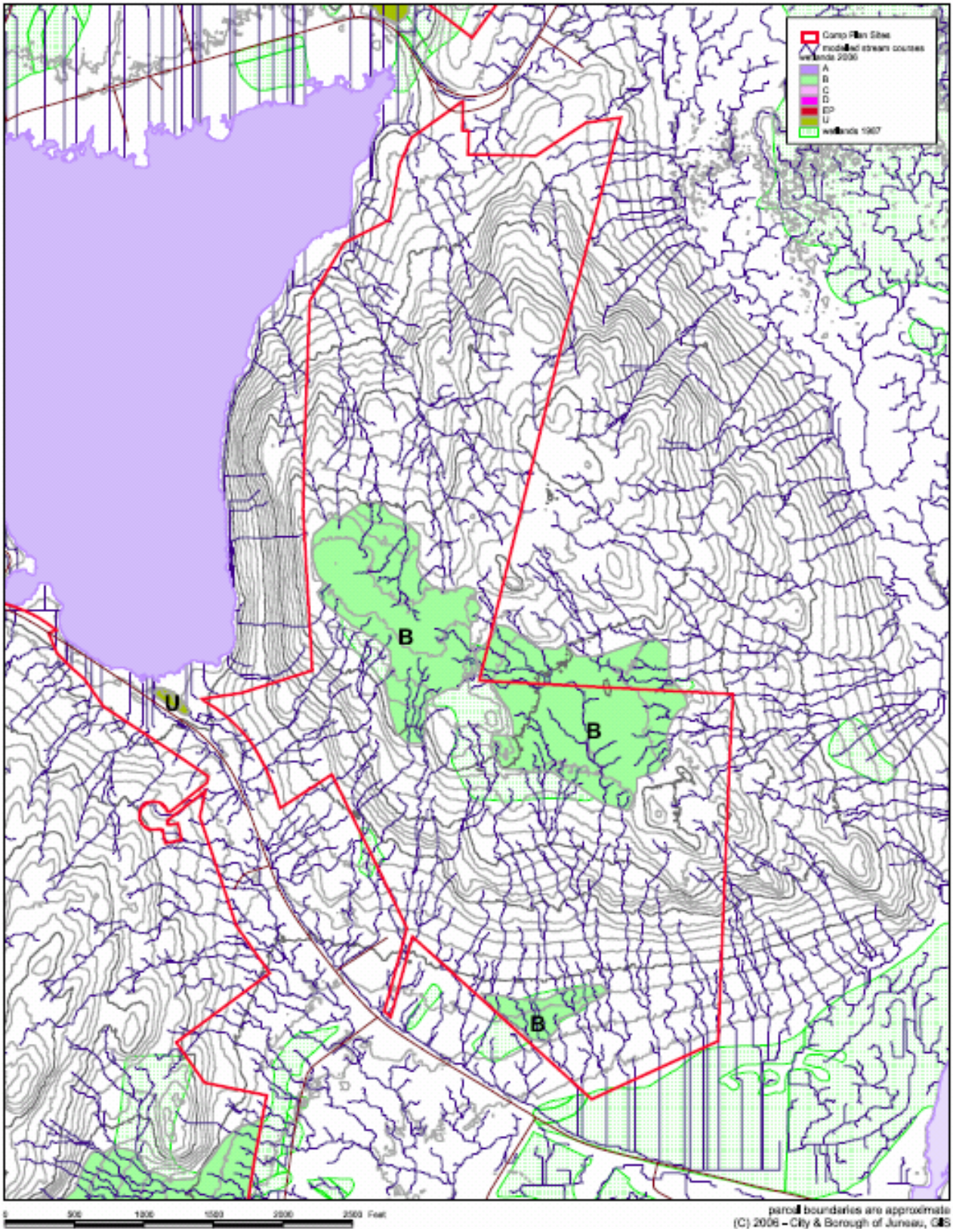

Figure 62 - Site 4 - Preliminary modeled streams and drainages

3.4.1 Wetland #5

Figure 63 – Site 4 - Wetland #5 - bog with ponds

Figure 64 – Site 4 - wetland #5 - ericaceous parkland

This very large hilltop wetland is on the western side of the parcel unit. It was assigned to category B based partly on a high rating for Groundwater Recharge and moderate to high ratings for Sediment/Toxicant Retention and Wildlife Habitat (Table 2). Part of this wetland overlaps a wetland labeled as A1 in the 1997 Juneau Wetlands Management Plan, and the Plan assigned that part to category C. Fish cannot access any part of this wetland. The flatter central part of this wetland is an ombrogenous bog with many small ponds. This wetland is dominated by *Sphagnum* moss and stunted shore pine. The more rolling edges of this wetland are parklands dominated by shore pine and ericaceous subshrubs. The spur off the southern end of the wetland is a forested wetland dominated by western hemlock and skunk cabbage. The soils are all hydric, mostly of the Kogish and Wadleigh Series, and the water table was at or within 12 inches of the surface during the study.

3.4.2 Wetland #6

Figure 65 – Site 4 - Wetland #6 - bog with ponds

Figure 66 – Site 4 - Wetland #6 - groundcover detail

This very large hilltop wetland is on the eastern side of the parcel unit and is almost contiguous to wetland #5. It was assigned to category B based partly on a high rating for Groundwater Recharge and moderate to high ratings for Sediment/Toxicant Retention and Wildlife Habitat (Table 2). Part of this wetland overlaps a wetland labeled as A1 in the 1997 Juneau Wetlands Management Plan, and the Plan assigned that part to category C. Fish cannot access any part of this wetland. The flatter central part of this wetland is an ombrogenous bog, dominated by *Sphagnum* moss and stunted shore pine. The more rolling edges of this wetland are parklands, dominated by shore pine and ericaceous subshrubs. The soils are all hydric, mostly of the Kogish and Wadleigh Series, and the water table was at or within 12 inches of the surface during the study.

3.4.3 Wetland #14

This small wetland is downslope from wetland #6 on the eastern side of the parcel unit. It was assigned to category B based partly on a high rating for Groundwater Discharge and Sediment/Toxicant Retention (Table 2). Part of this wetland overlaps an area labeled as MW19 in the 1997 Juneau Wetlands Management Plan, and the Plan assigned that part to category D. Fish cannot access any part of this wetland. The wetland is a complex of forested wetland, dominated by western hemlock, blueberries and skunk cabbage; alder fen and sedge fen dominated by Sitka sedge and *Trichophorum*. The soils are all hydric, of the Kina and Maybeso Series, and the water table was at or near the surface over all the wetland except for scattered hummocks.

3.5 Parcel Unit #5, Wetlands #58 &59

This parcel unit is at the bottom of Thunder Mountain in the Jordan Creek area. Because of discrepancies between the wetlands mapped in the 1987 study and those mapped during this study, our survey of this unit was particularly detailed. We covered the whole unit except for the steep avalanche slopes on the eastern edge of the unit. This wetland is within an area labeled as J2 in the 1997 Juneau Wetlands Management Plan, and the Plan also assigned that to category A. The parcel unit was found to currently contain only 2 small wetlands that are very close and similar. This area is flooded seasonally by Jordan Creek, probably allowing fish access at that time. The wetlands were assigned to category A based partly on a high rating for Groundwater Discharge, Sediment/Toxicant Retention, Riparian Support, and Recreational Use (Table 2). The wetland is dominated by Sitka willow, lady fern and forget-me-nots. The soils were a hydric mineral soil of unknown series, possibly the Chilkoot Series and the water table was 2-4 inches above the surface at the time of the study.

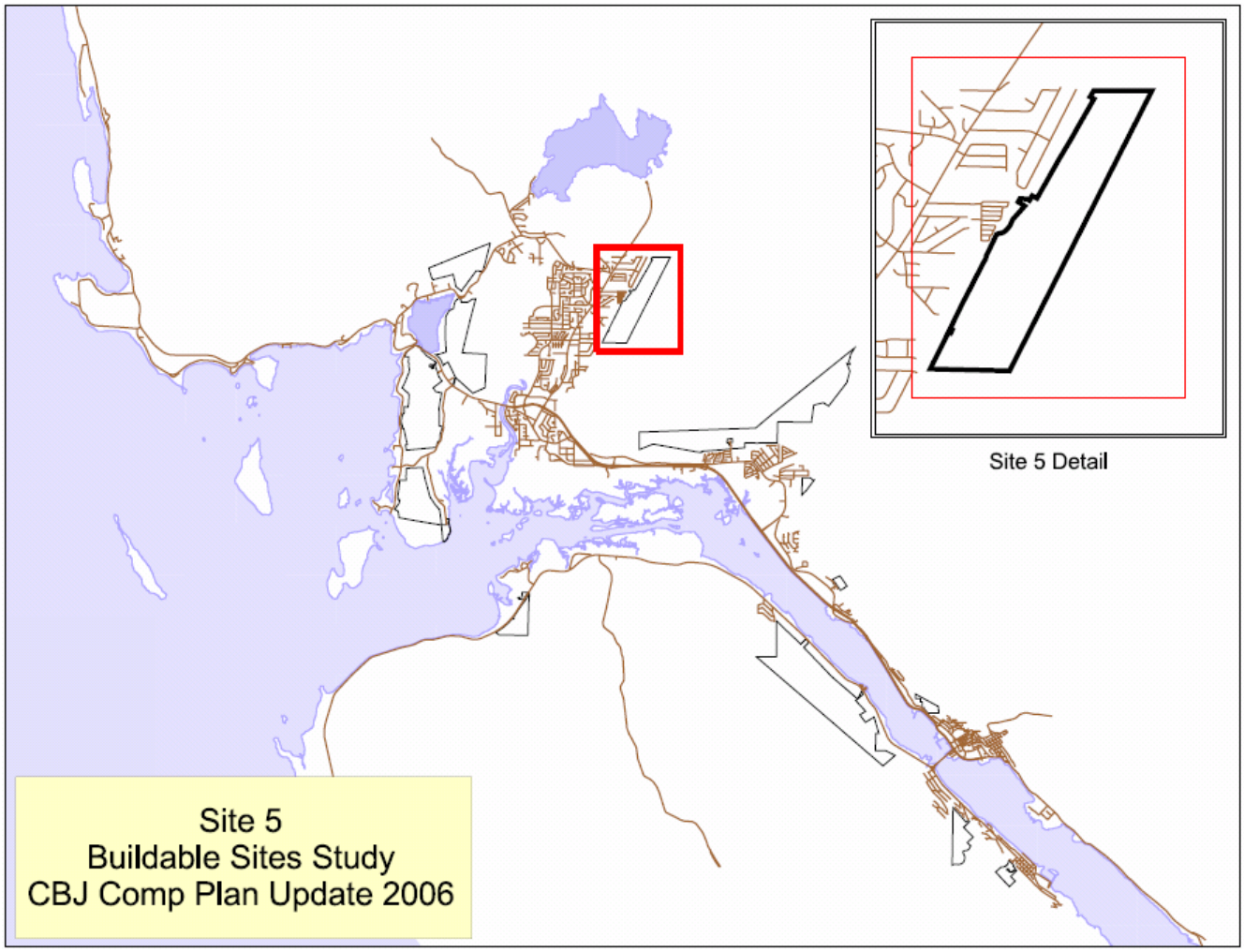

Figure 67 - Site 5 detail map

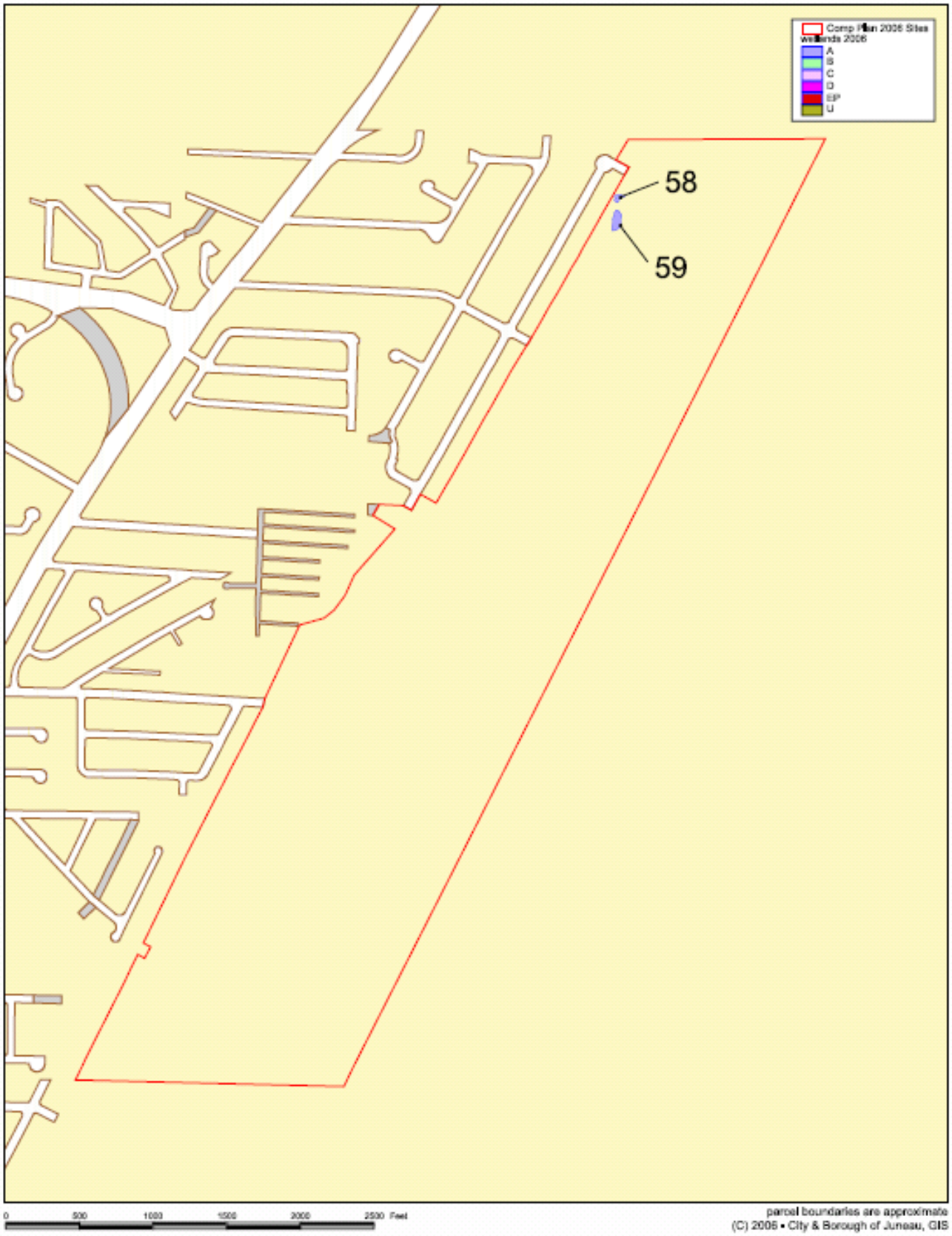

Figure 68 - Site 5 - Wetland polygon labels

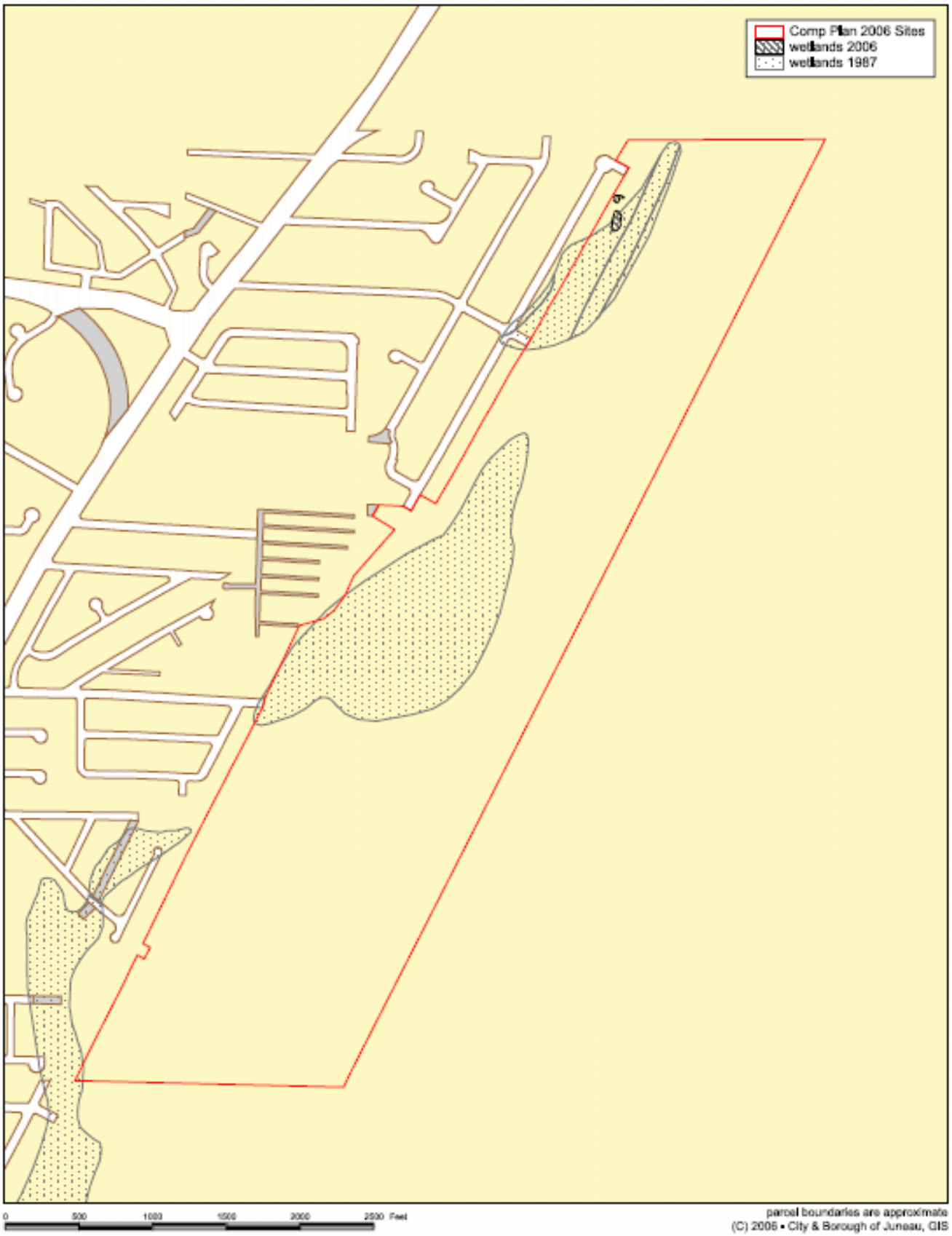

Figure 69 - Site 5 1987/ 2006 wetland map w/wetland ratings

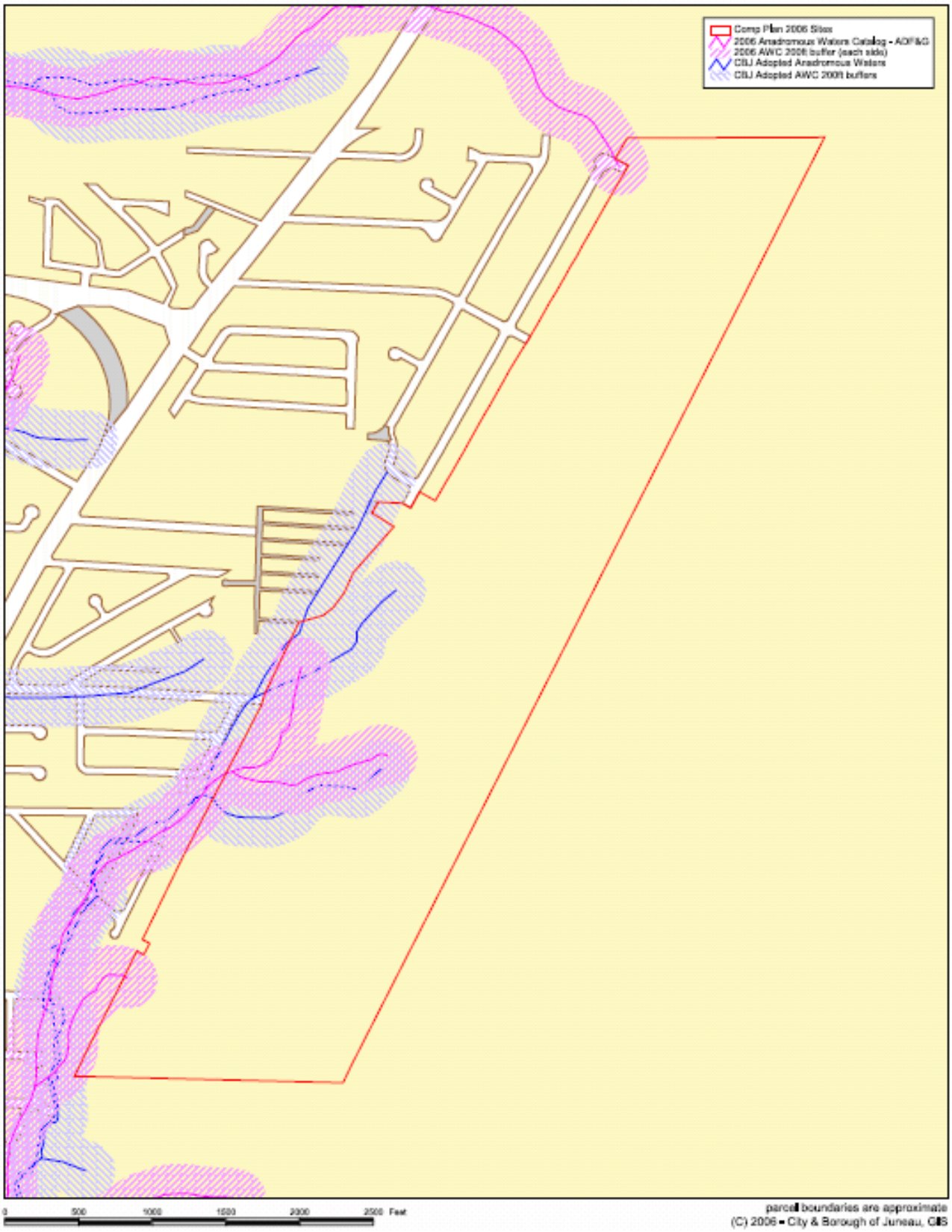

Figure 70 - Site 5 - Anadromous waters map

Figure 71 - Site 5 - 2001 aerial photo with 1987/2006 wetlands

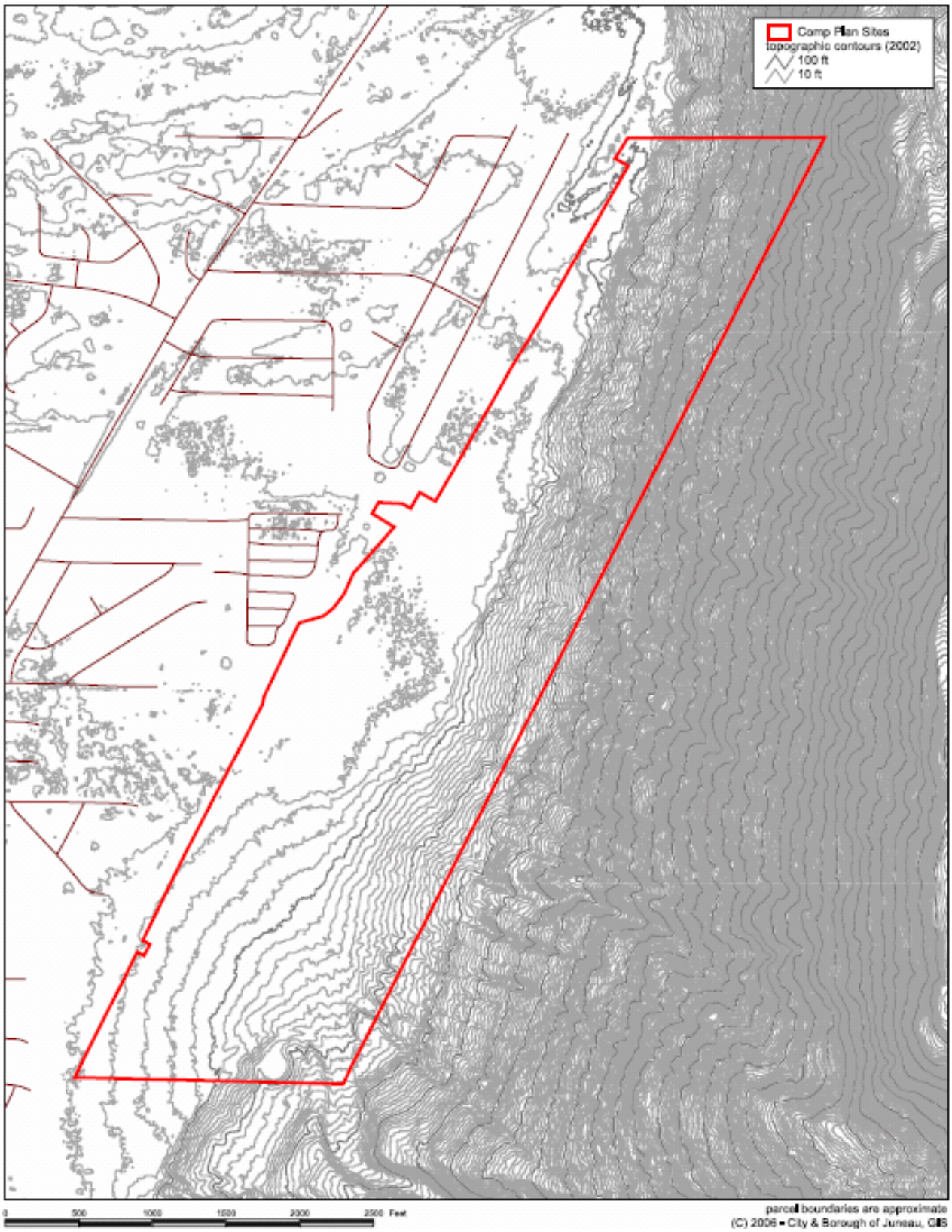

Figure 72 - Site 5 - Topographic contours

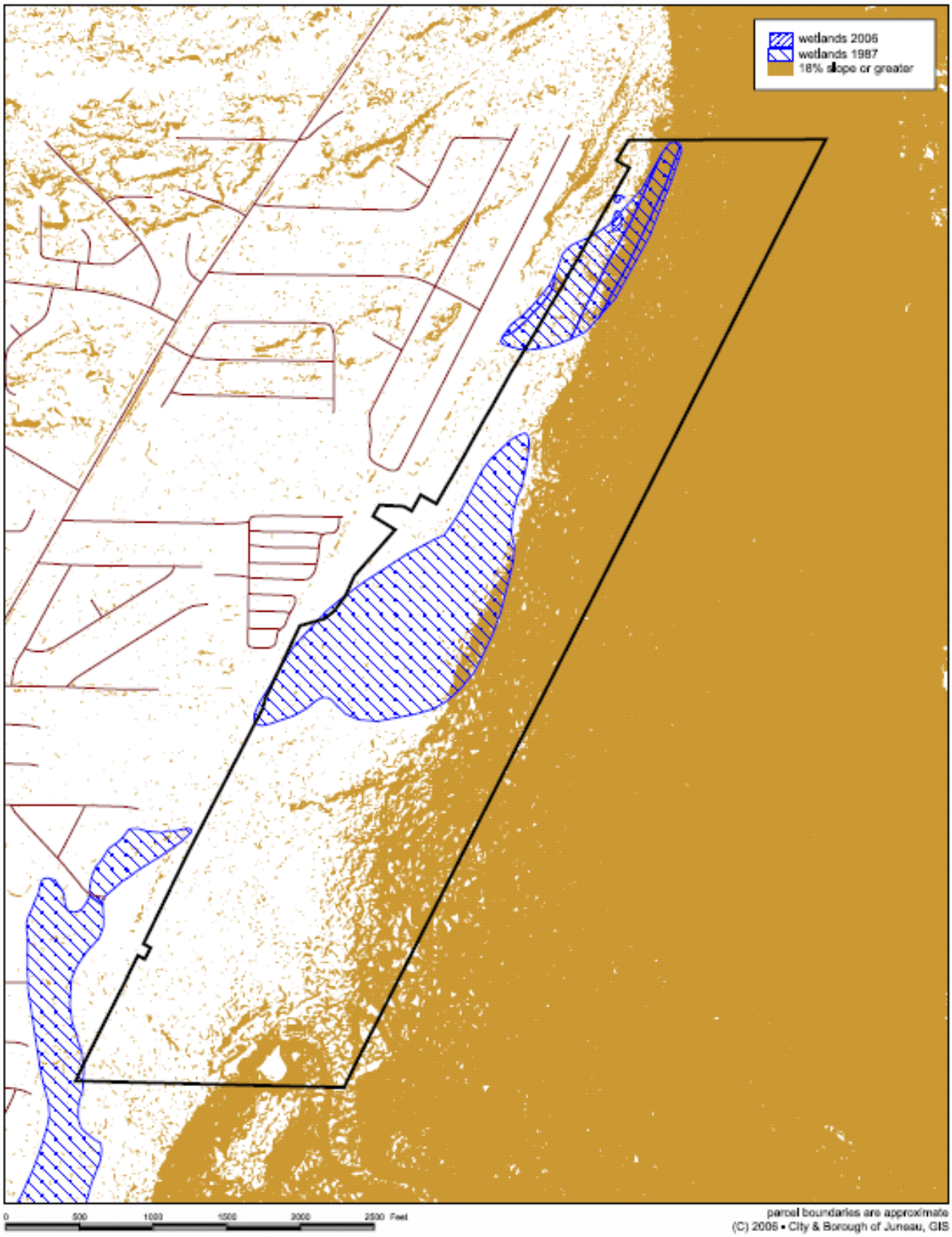

Figure 73 - Site 5 - 18% slope or greater and 1987/2006 wetlands

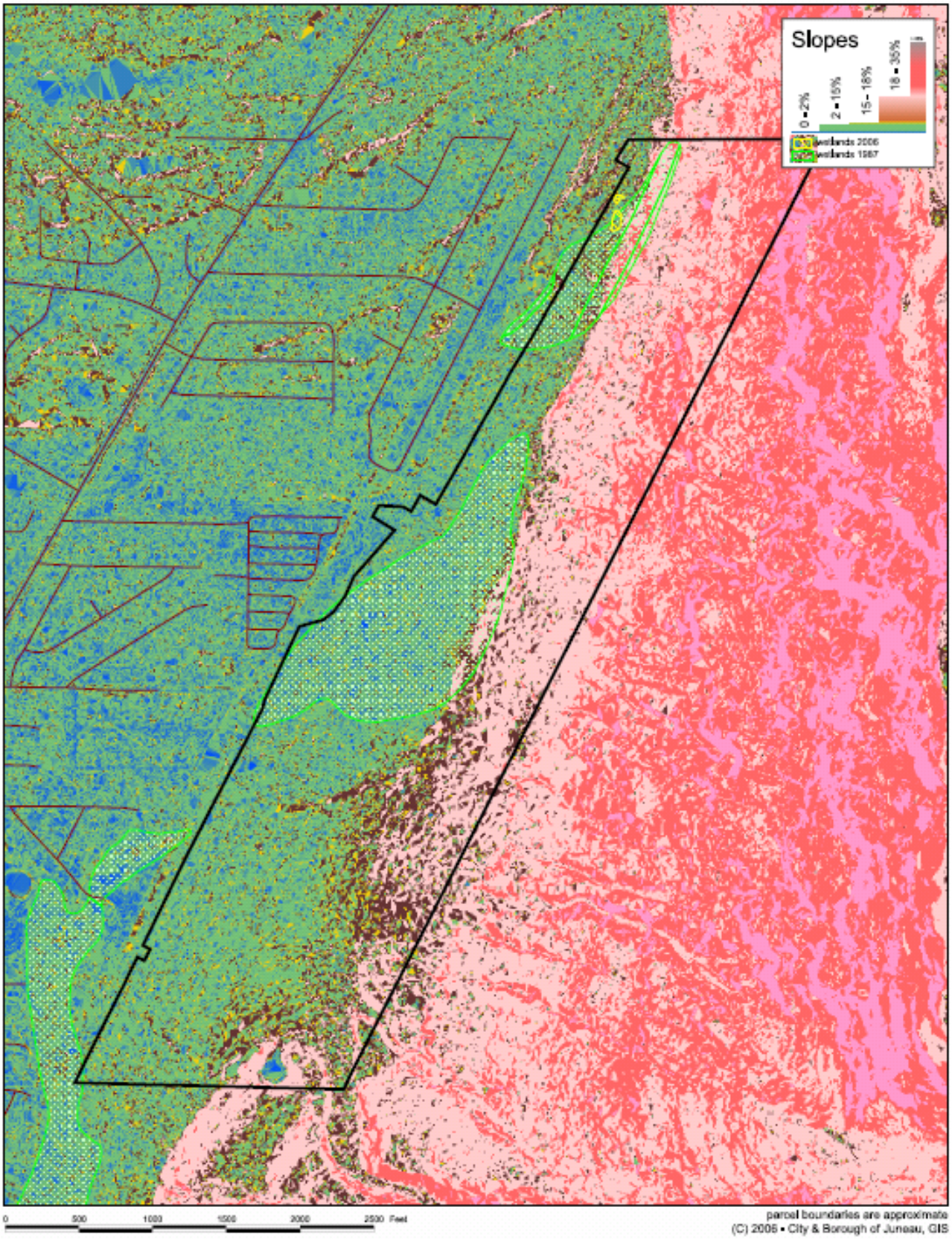

Figure 74 - Site 5 - Slope map w/ 1987/2006 wetlands

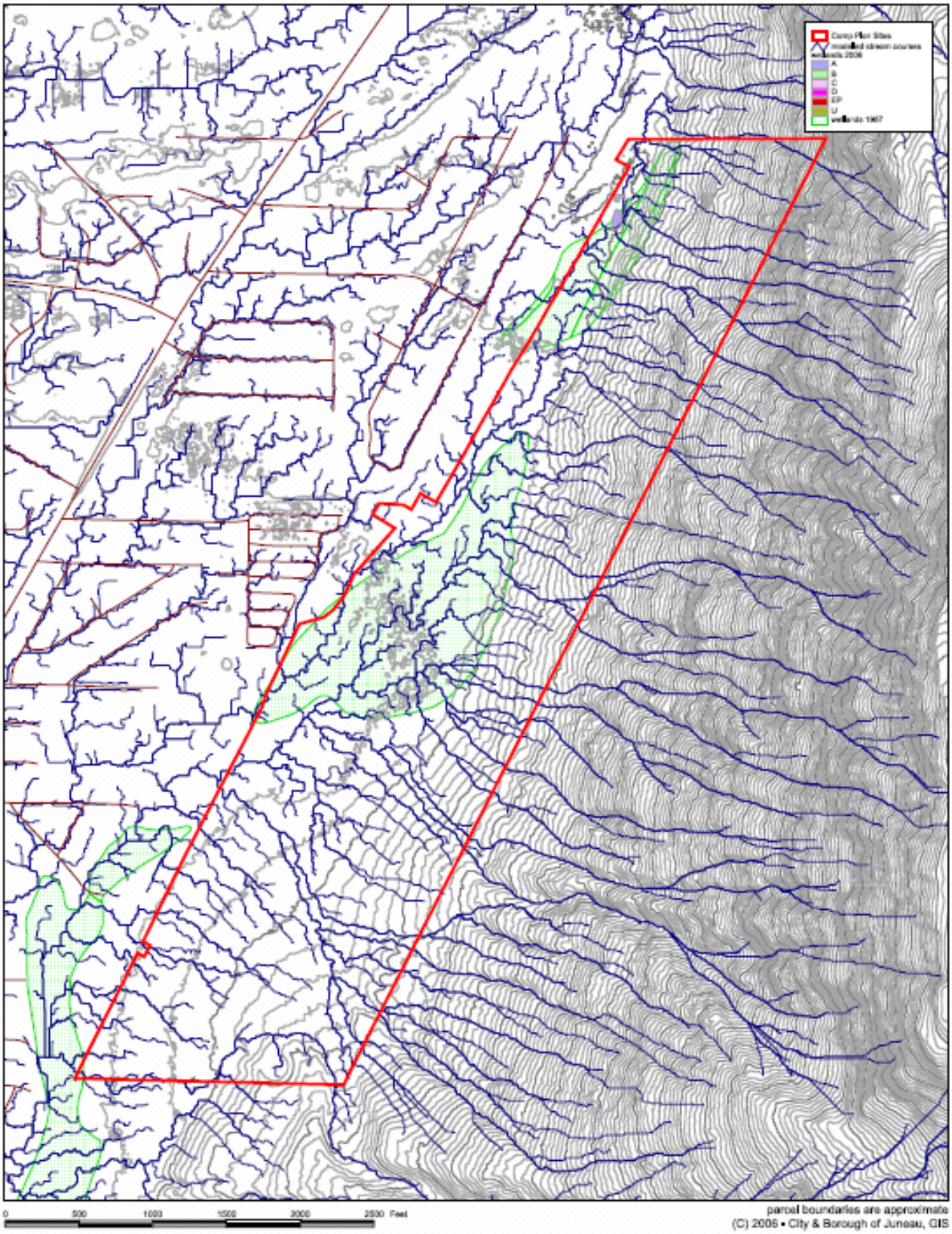

Figure 75 - Site 5 - Preliminary modeled streams and drainages

3.6 Parcel Unit #6

This parcel unit is in the Blueberry Hill area of Douglas Island. It was found to contain 4 distinct wetlands, all of them assigned to category B. However, the geographically closest wetland to this parcel unit in the 1997 Juneau Wetlands Management Plan was labeled DE3 and the Plan assigned it to category A. During our survey we covered all but the very steep northern and southern areas of this unit. The exact areas visited are shown on the field survey map (Fig.2).

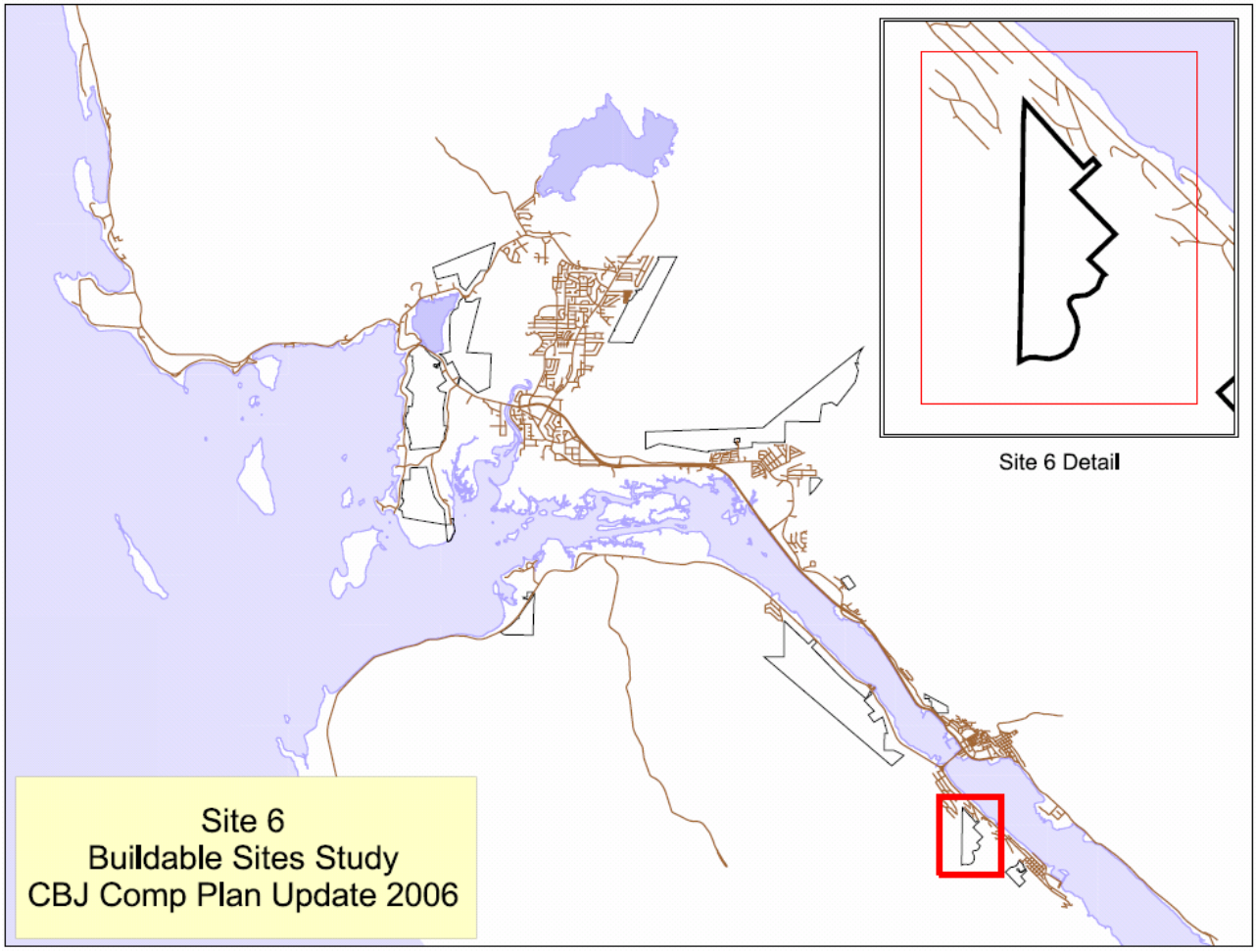

Figure 76 - Site 6 detail map

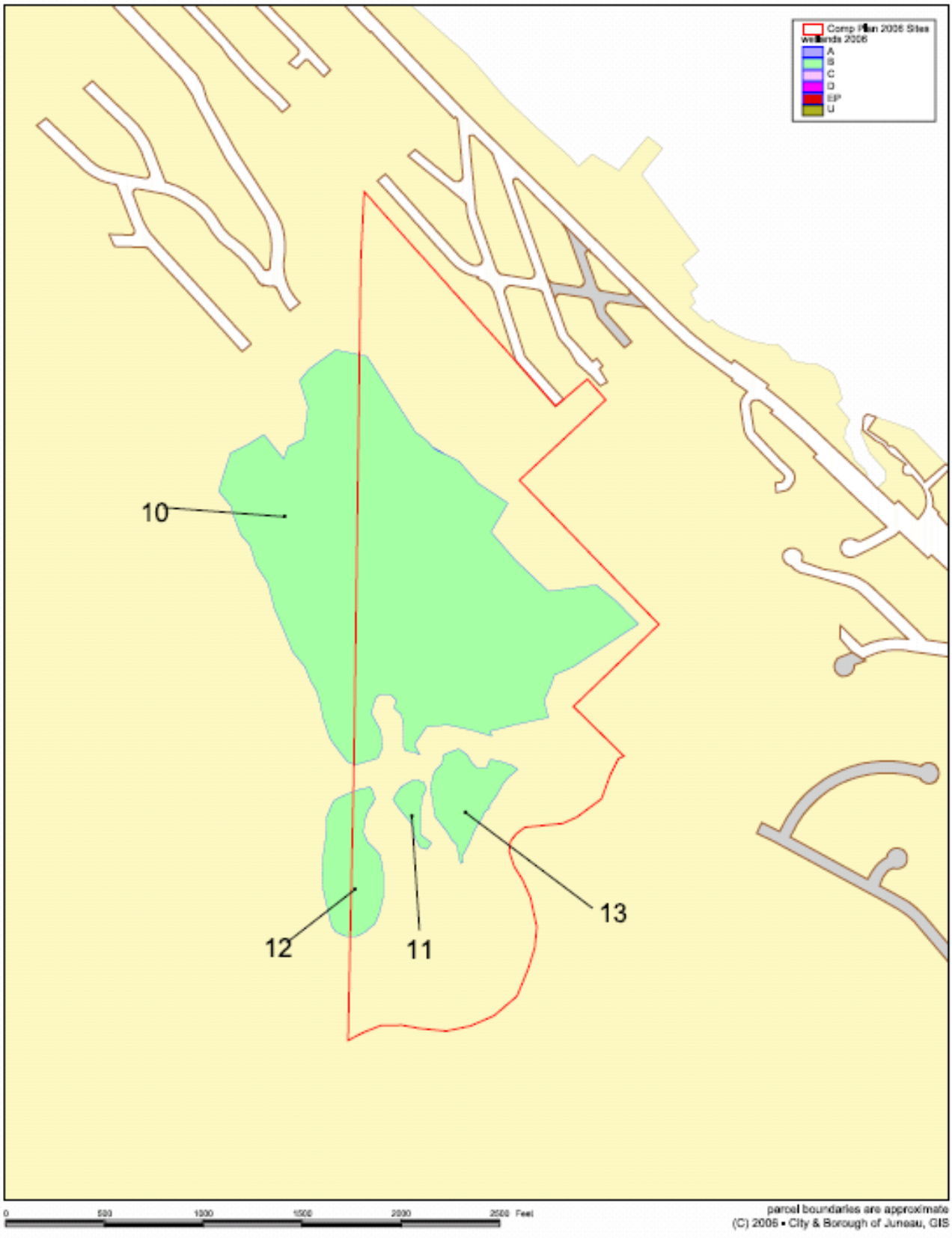

Figure 77 – Site 6 - Wetland polygon labels

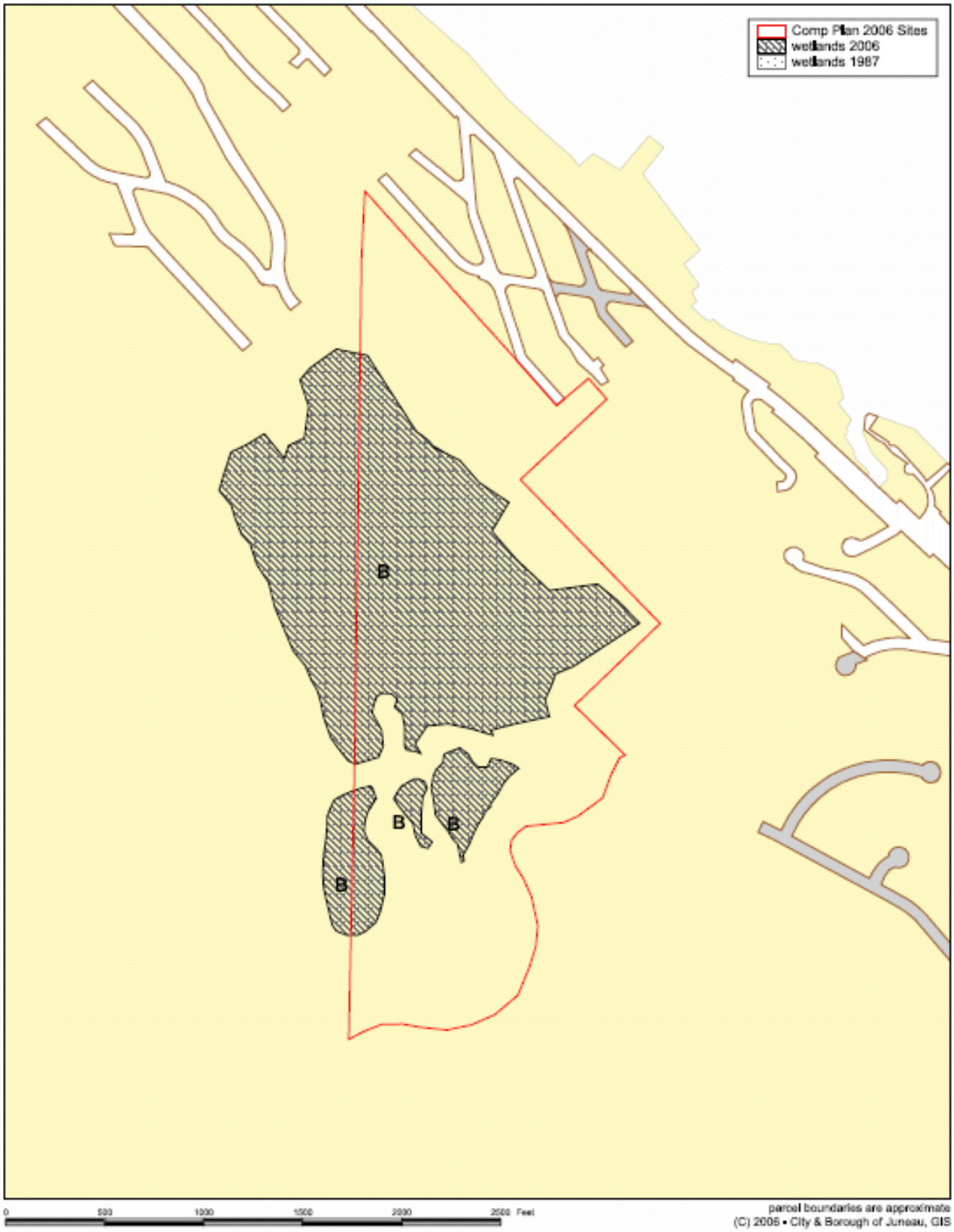

Figure 78 - Site 6 - 1987/2006 wetland map w/wetland values

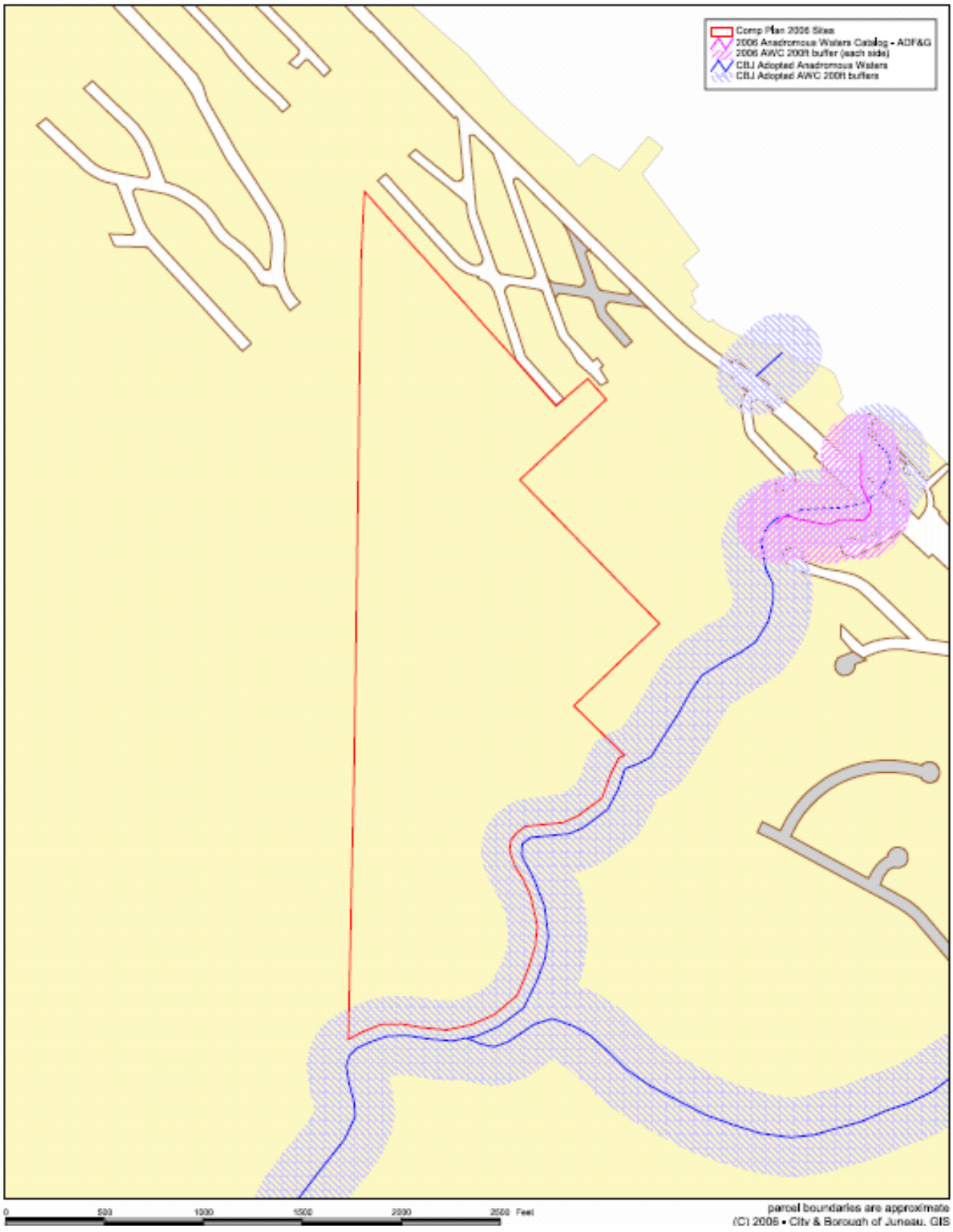

Figure 79 - Site 6 Anadromous waters map

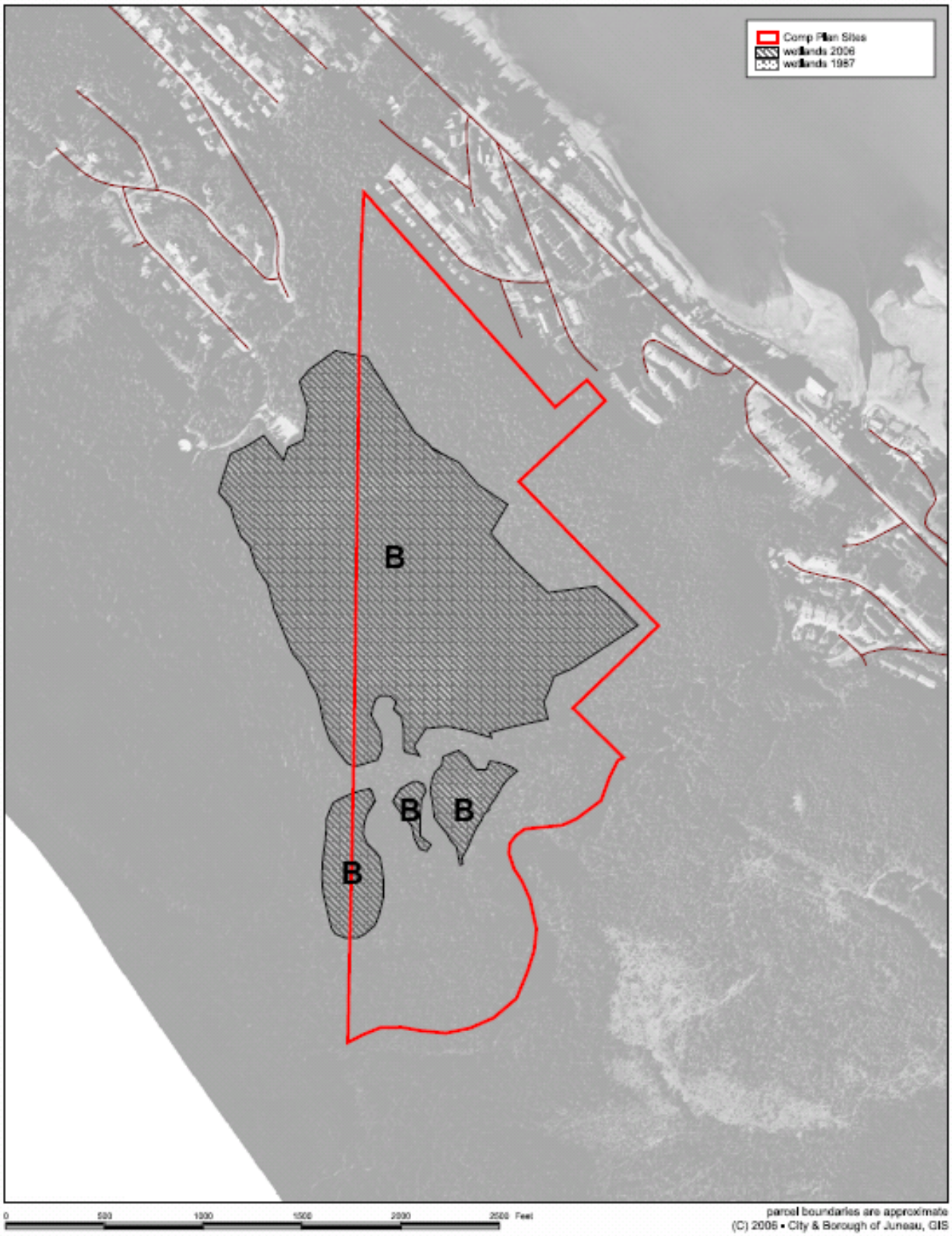

Figure 80 – Site 6 2001 aerial photo w/wetlands

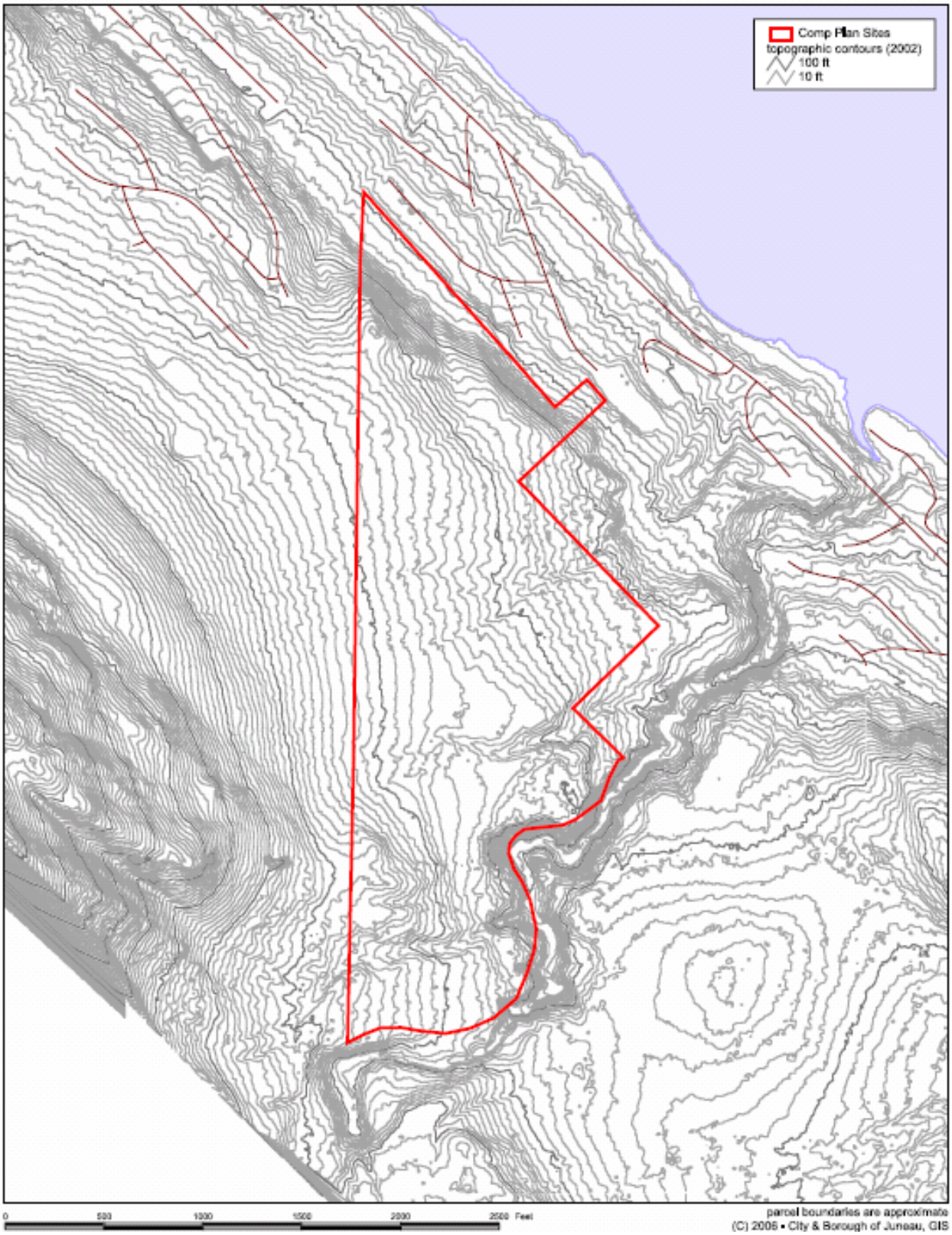

Figure 81 - Site 6 topographic contours map

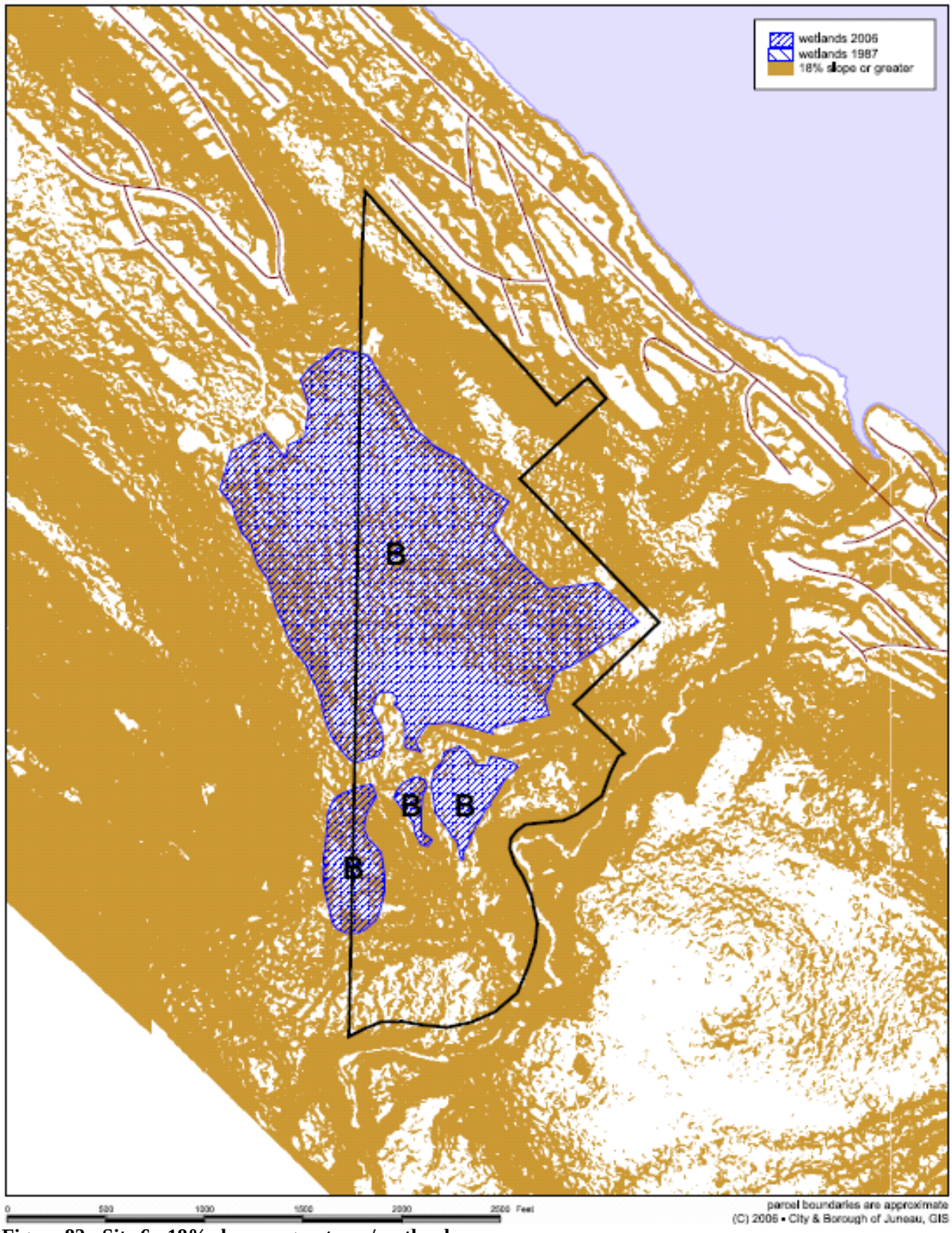

Figure 82 - Site 6 - 18% slope or greater w/ wetlands

Figure 83 - Site 6 slope map w/ wetlands

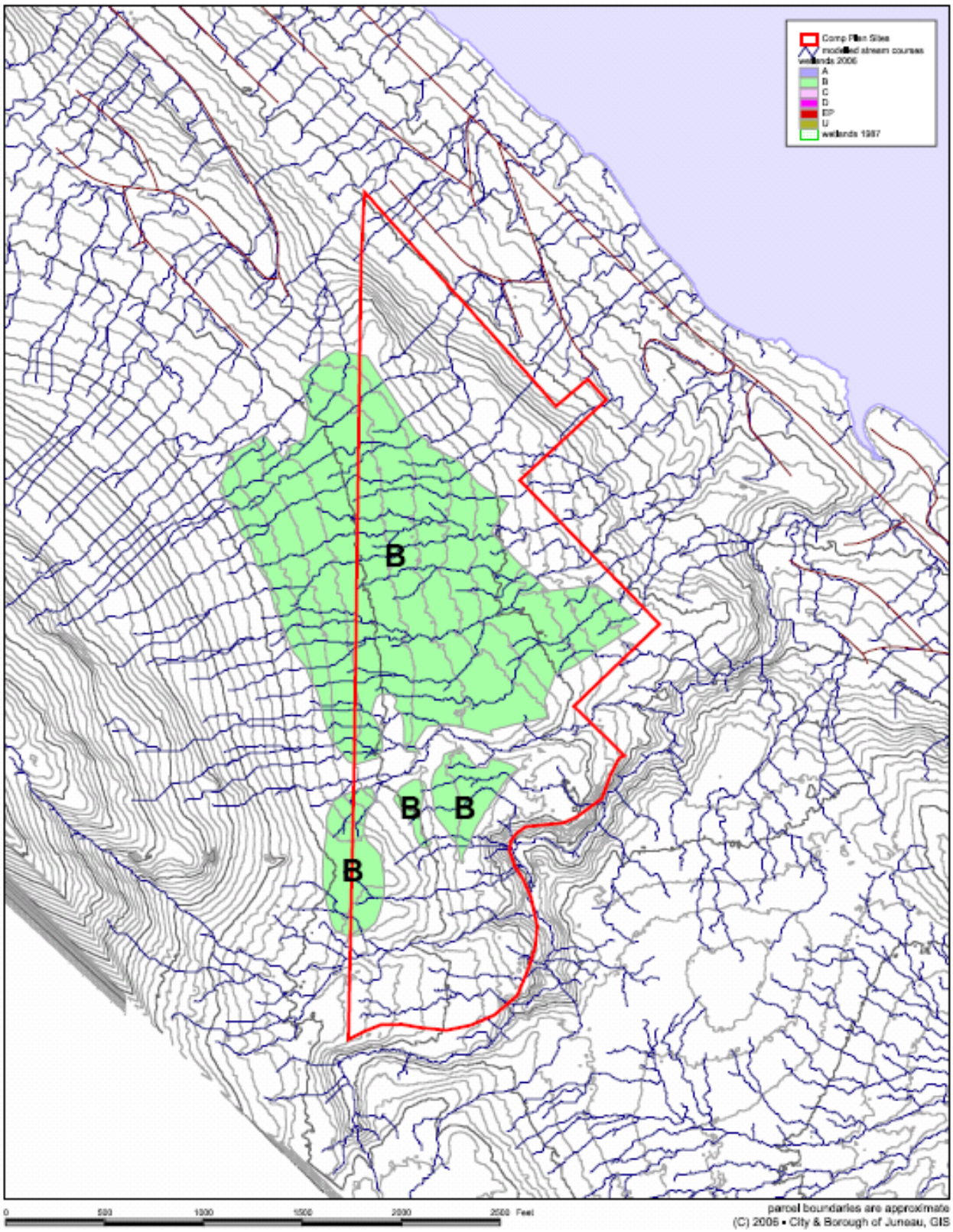

Figure 84 - Site 6 - Preliminary modeled streams and drainages

3.6.1 Wetland #10

This large sloping wetland is in the center of the parcel unit. It was assigned to category B based partly on high ratings for Groundwater Discharge and Erosion Sensitivity (Table 2). Fish cannot access any part of this wetland. This wetland has an ericaceous bog at the north and the south ends of the wetland and a large forested wetland in between. The ericaceous bog is dominated by *Sphagnum* moss, Canadian dogwood, and stunted shore pine and hemlock. The forested wetland is dominated by western hemlock, blueberry, goldthread and skunk cabbage. The soils are all hydric, of the Kina and Maybeso Series and the water table was at or near the surface over all the wetland except for scattered hummocks.

3.6.2 Wetland #11

This small sloping wetland is uphill from wetland #10. It was assigned to category B based partly on high ratings for Groundwater Discharge and Erosion Sensitivity (Table 2). Fish cannot access any part of this wetland. This wetland has an sedge bog at the center of it and forested wetland around its edges. The sedge bog is dominated by *Sphagnum* moss, *Trichophorum*, and stunted shore pine and hemlock. The forested wetland is dominated by western hemlock, blueberry, goldthread and skunk cabbage. The soils are all hydric, of the Kina and Maybeso Series, and the water table was at or near the surface over all the wetland except for scattered hummocks.

3.6.3 Wetland #12

This small sloping wetland is uphill from wetland #10. It was assigned to category B based partly on high ratings for Groundwater Discharge and Erosion Sensitivity (Table 2). Fish cannot access any part of this wetland. This wetland has an sedge bog at the center of it and forested wetland around its edges. The sedge bog is dominated by *Sphagnum* moss, *Trichophorum*, and stunted shore pine and hemlock. The forested wetland is dominated by western hemlock, blueberry, goldthread and skunk cabbage. The soils are all hydric, of the Kina and Maybeso Series, and the water table was at or near the surface over all the wetland except for scattered hummocks.

3.6.4 Wetland #13

This small sloping wetland is uphill from wetland #10. It was assigned to category B based partly on high ratings for Groundwater Discharge and Erosion Sensitivity (Table 2). Fish cannot access any part of this wetland. This wetland has an sedge bog at the center of it and forested wetland around its edges. The sedge bog is dominated by Sphagnum moss, *Trichophorum*, and stunted shore pine and hemlock. The forested wetland is dominated by western hemlock, blueberry, goldthread and skunk cabbage. The soils are all hydric, of the Kina and Maybeso Series, and the water table was at or near the surface over all the wetland except for scattered hummocks.

3.7 Parcel Unit #7

This parcel unit is in the Goat Hill area northeast of Auke Lake. It was found to contain 2 distinct wetlands, both of them assigned to category B. The exact areas visited are shown on the field survey map (Fig. 2).

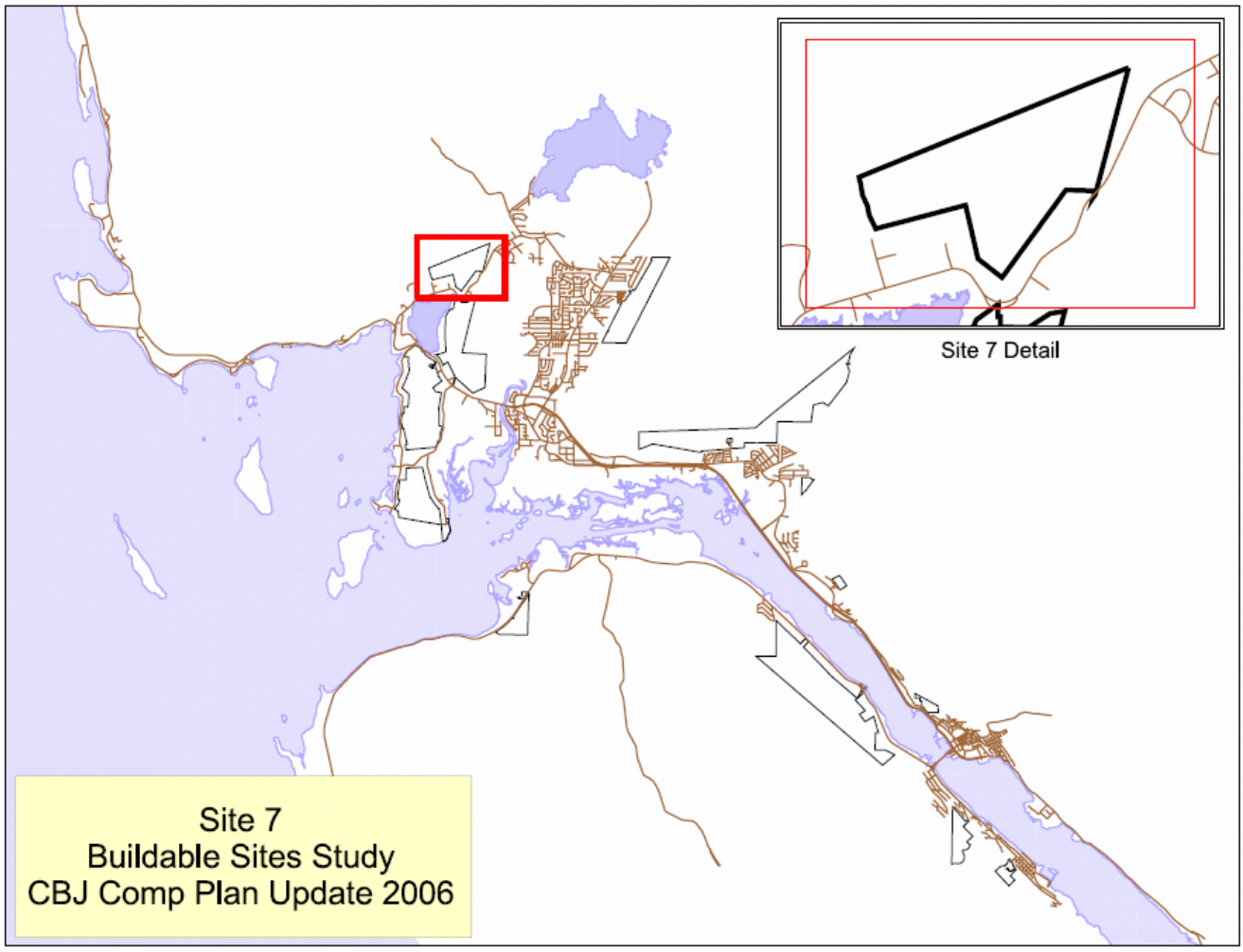

Figure 85 - Site 7 - detail map

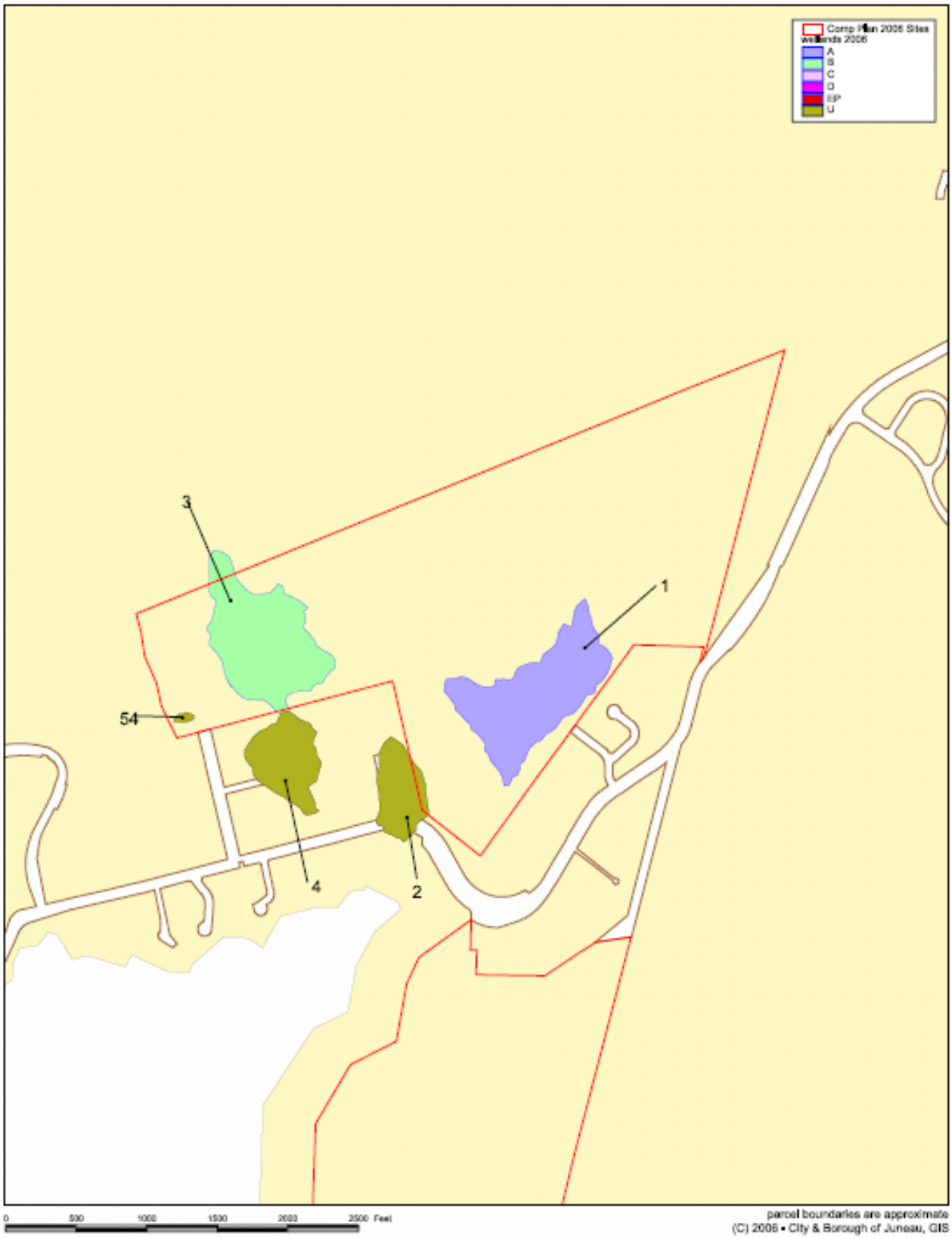

Figure 86 – Site 7 - Wetland polygon labels

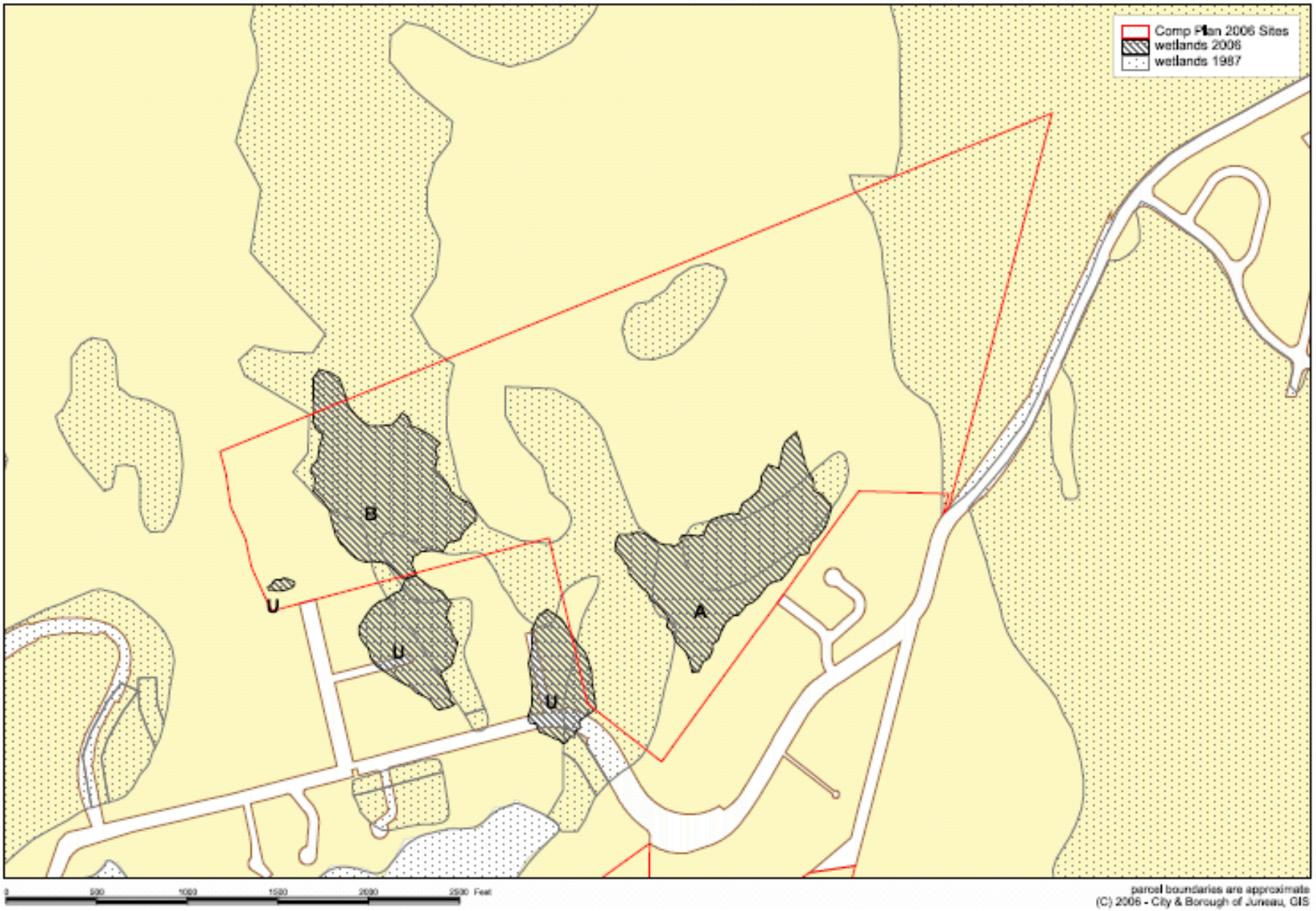

Figure 87 - Site 7 - 1987/2006 wetland map

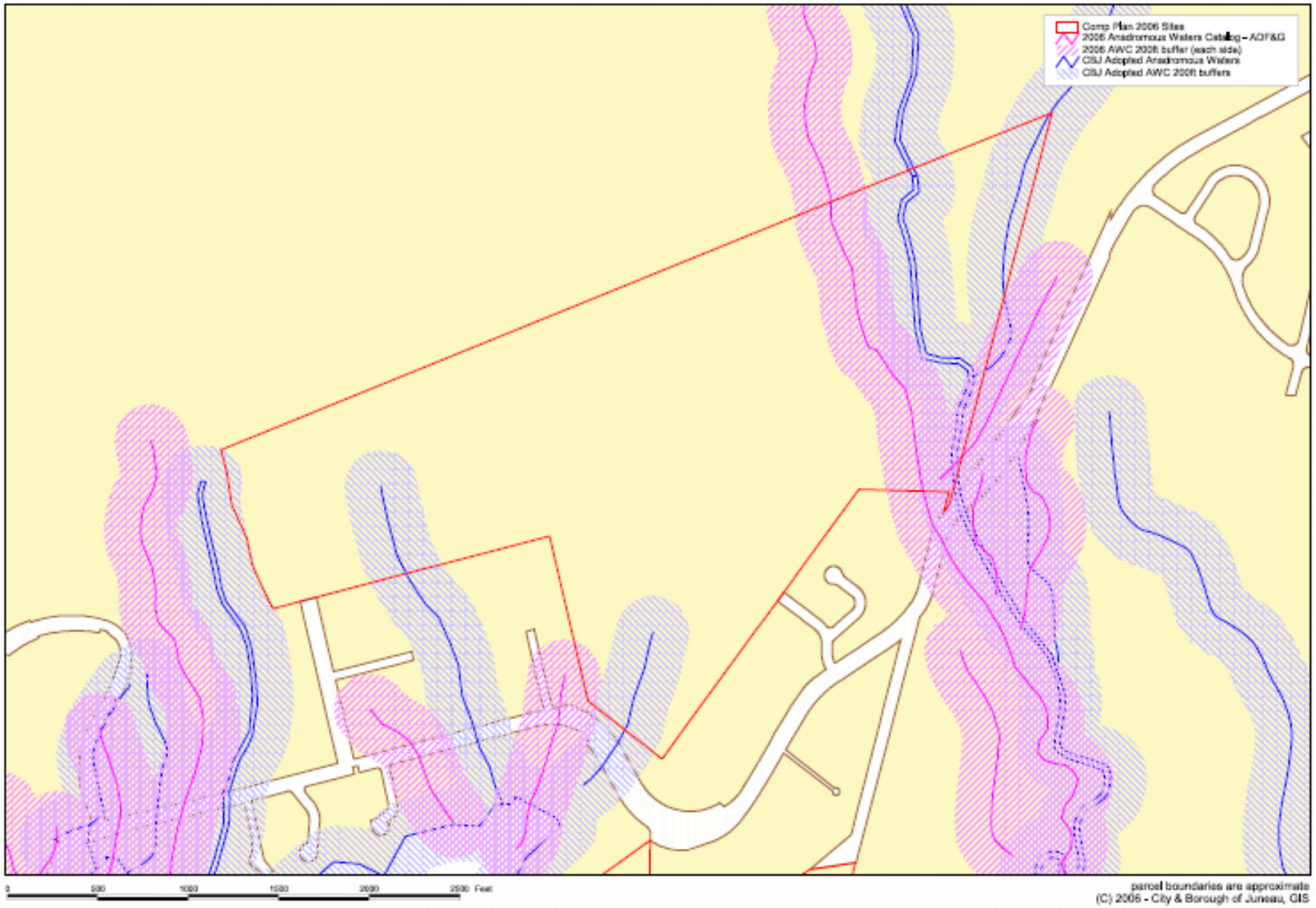

Figure 88 - Site 7 Anadromous waters map

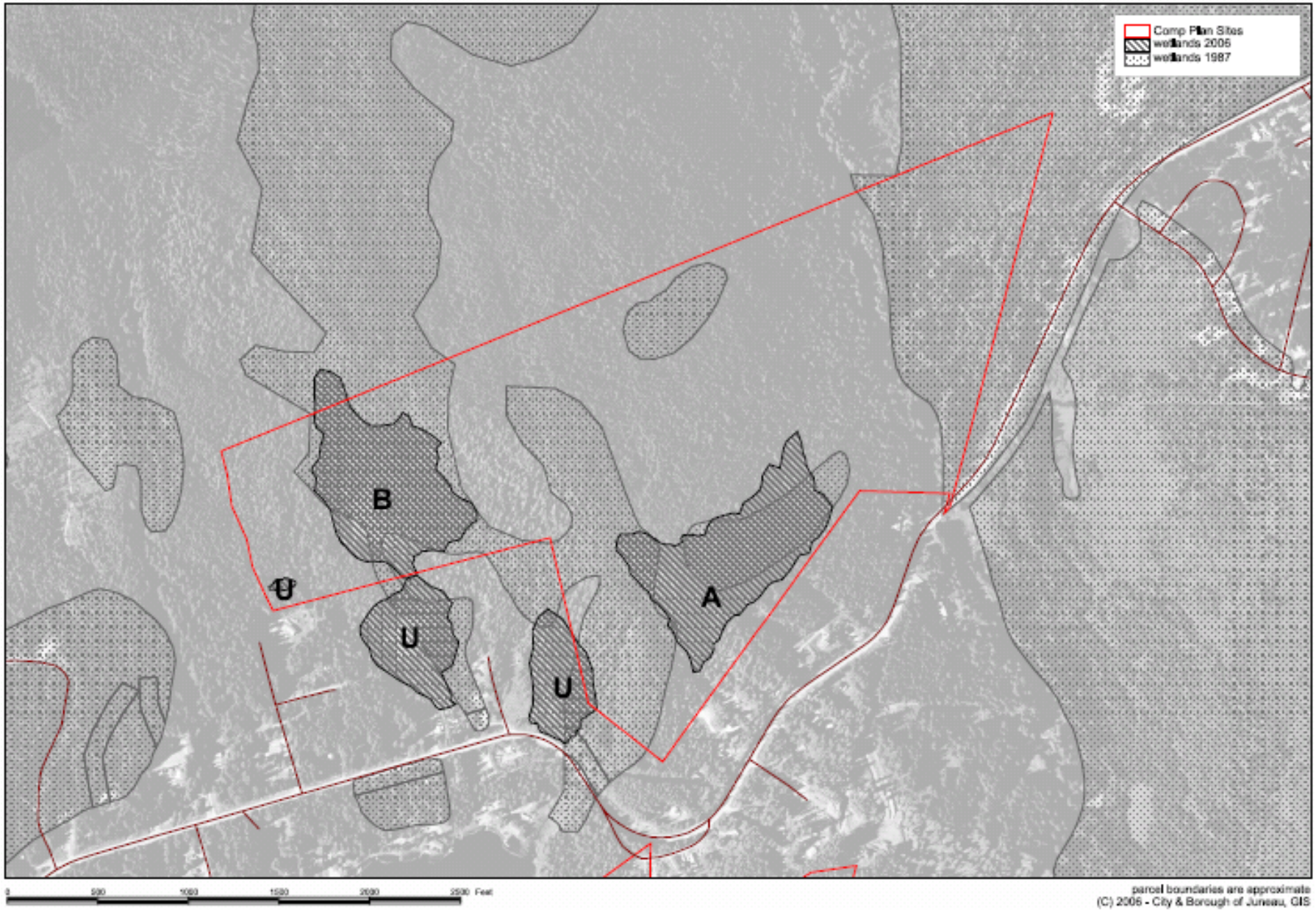

Figure 89 - Site 7 2001 aerial photo and 1987/2006 wetlands

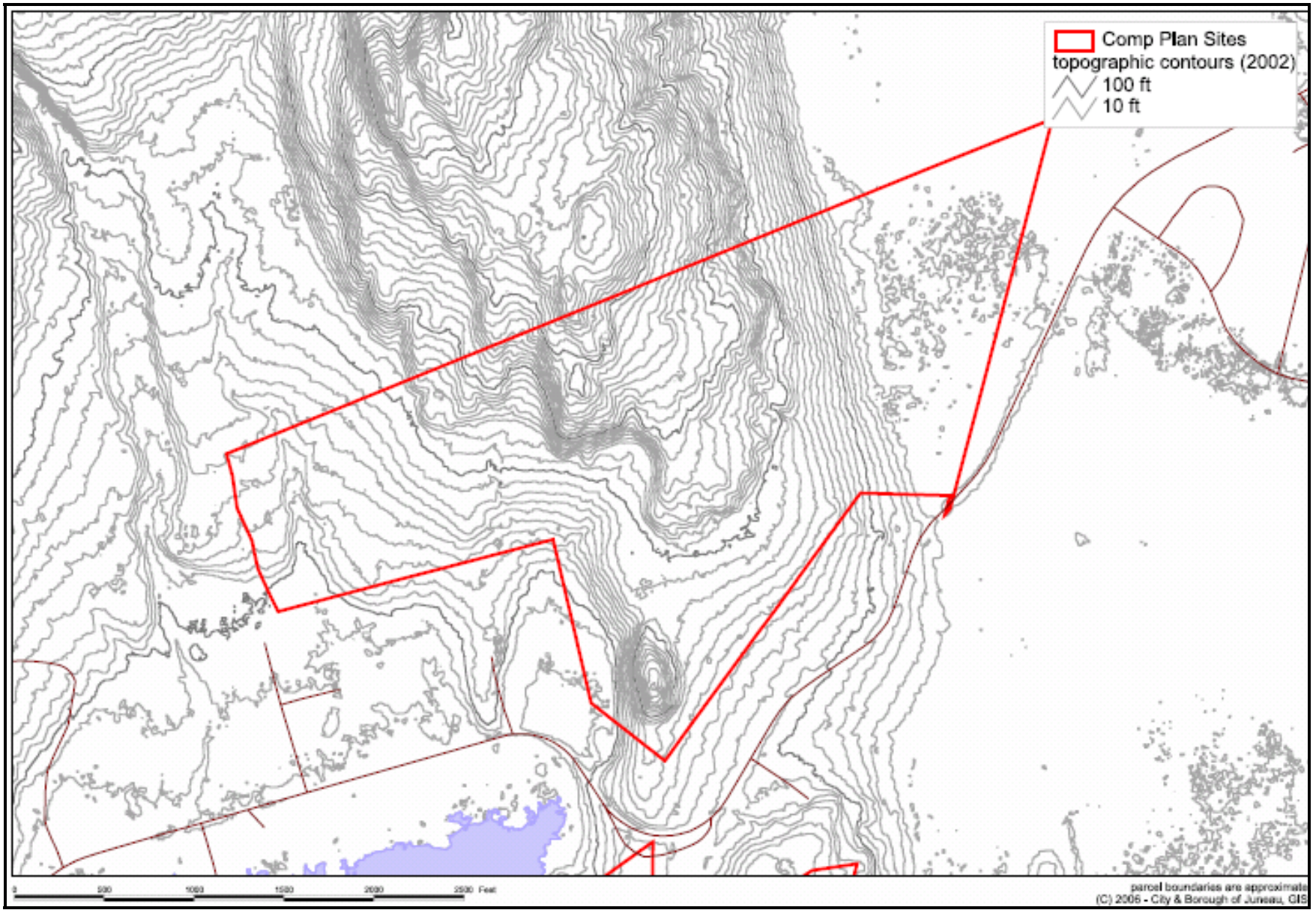

Figure 90 - Site 7 topographic contours map

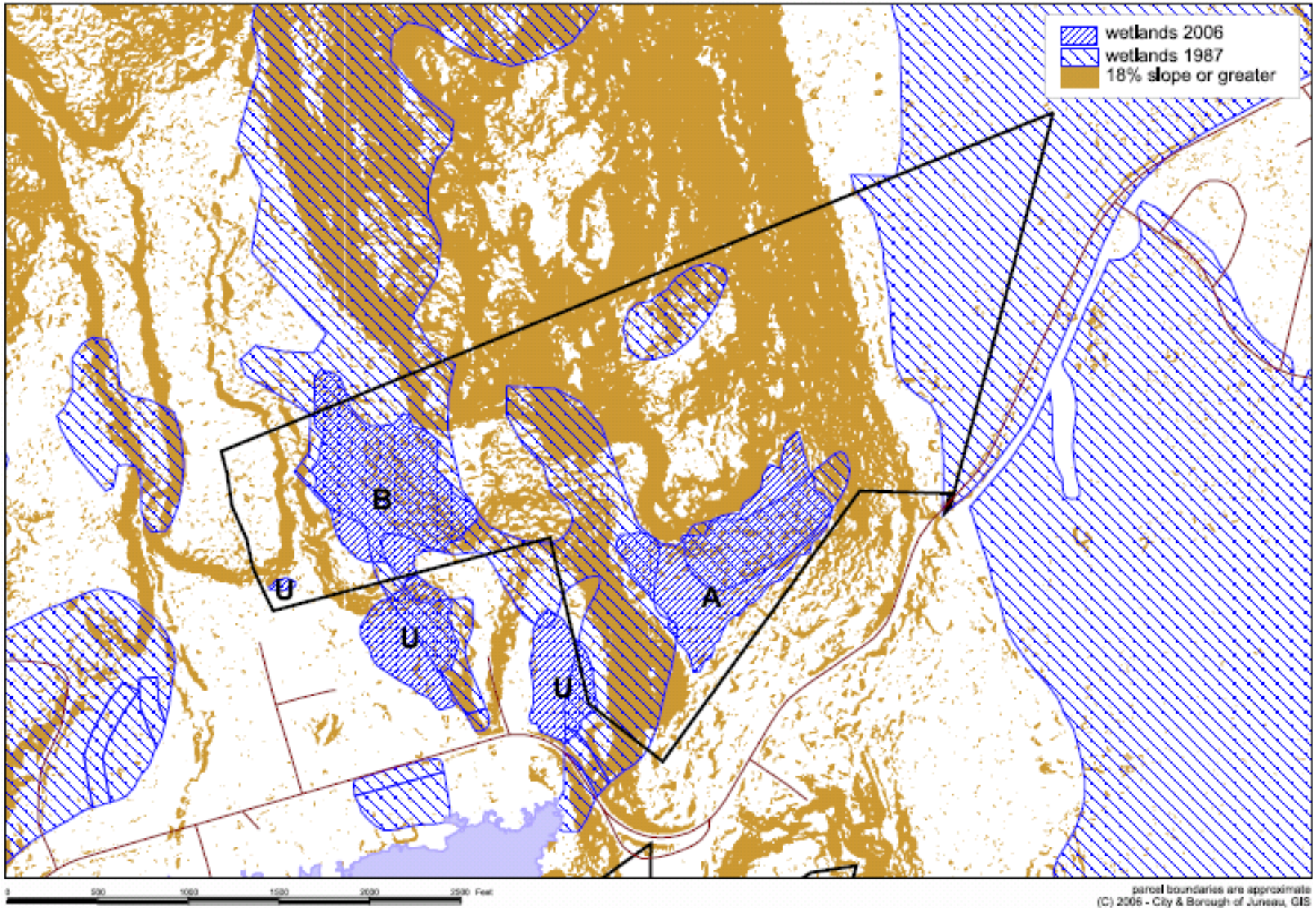

Figure 91 - Site 7 - 18% slope or greater w/ wetlands

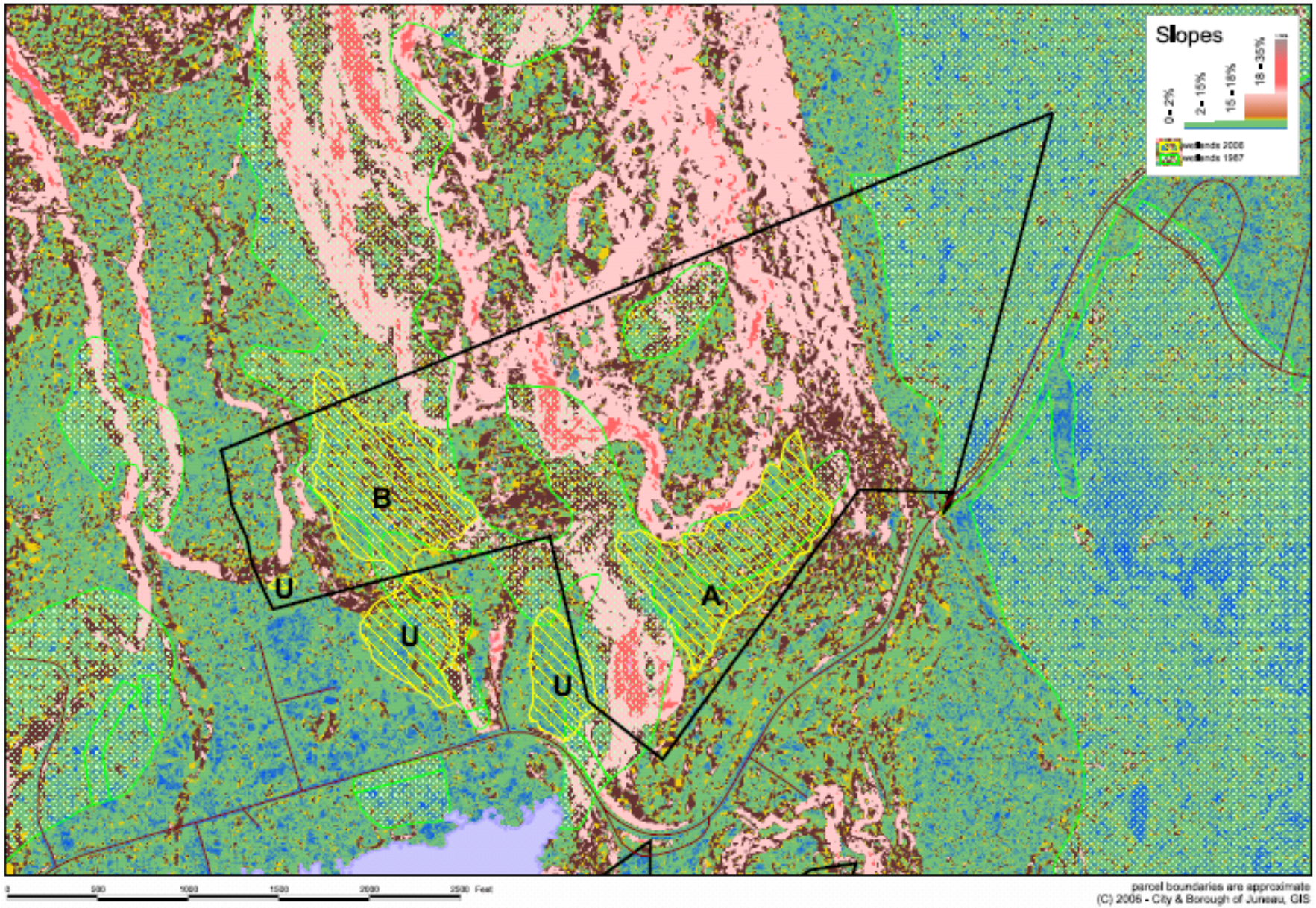

Figure 92 - Site 7 slope map w/ wetlands

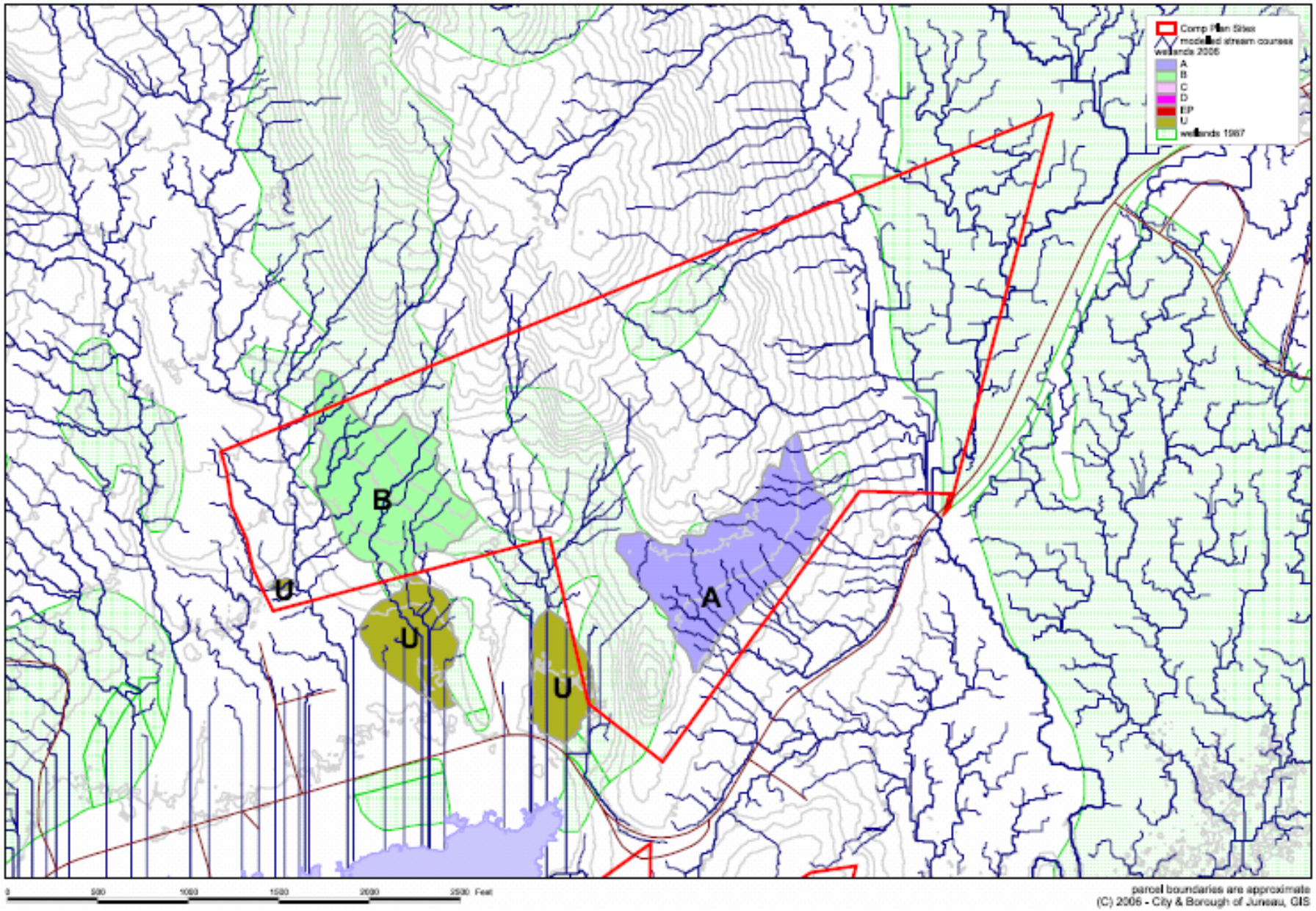

Figure 93 - Site 7 - Preliminary modeled streams and drainages

3.7.1 Wetland #1

This small forested wetland is in the eastern part of the parcel unit. It was assigned to category A based partly on high ratings for Groundwater Discharge, Erosion Sensitivity, and Wildlife Habitat (Table 2). Part of this wetland overlaps a wetland labeled as A5B in the 1997 Juneau Wetlands Management Plan, and the Plan assigned that part to category C. Fish cannot access any part of this wetland. This is a forested wetland dominated by western hemlock, *Sphagnum* moss and skunk cabbage. The soils are hydric, mostly of the Wadleigh Series, and the water table was at or within 12 inches of the surface over all of the wetland but scattered hummocks.

3.7.2 Wetland #3

Figure 94 – Site 7 - Wetland #3 - ericaceous bog

Figure 95 –Site 7 - wetland #3 - forested wetland

This wetland is in the western part of the parcel unit and is mostly bog with forested wetland edges. It was assigned to category B based partly on high ratings for Groundwater Discharge and Erosion Sensitivity (Table 2). Part of this wetland overlaps a wetland labeled as A5 in the 1997 Juneau Wetlands Management Plan, and the Plan assigned that part to category A. Fish cannot access any part of this wetland. This wetland is a complex of forested wetland and ericaceous bog. The forested wetland is dominated by small hemlock, *Sphagnum* moss and skunk cabbage. The ericaceous bog is dominated by Labrador tea, stunted pine, spruce, hemlock and *Sphagnum* moss. The soils are all hydric, of the Kina and Maybeso Series, and the water table was at or near the surface over all the wetland except for scattered hummocks.

3.8 Parcel Unit #8

This parcel unit is on the south side of the highway in western Douglas Island, just west of Fish Creek. It was found to contain 3 distinct wetlands, all of them assigned to category B. The geographically closest wetlands to this parcel unit in the 1997 Juneau Wetlands Management Plan are labeled DW12 and DW13 and the Plan assigned them to category C. The exact areas visited are shown on the field survey map (Fig. 2).

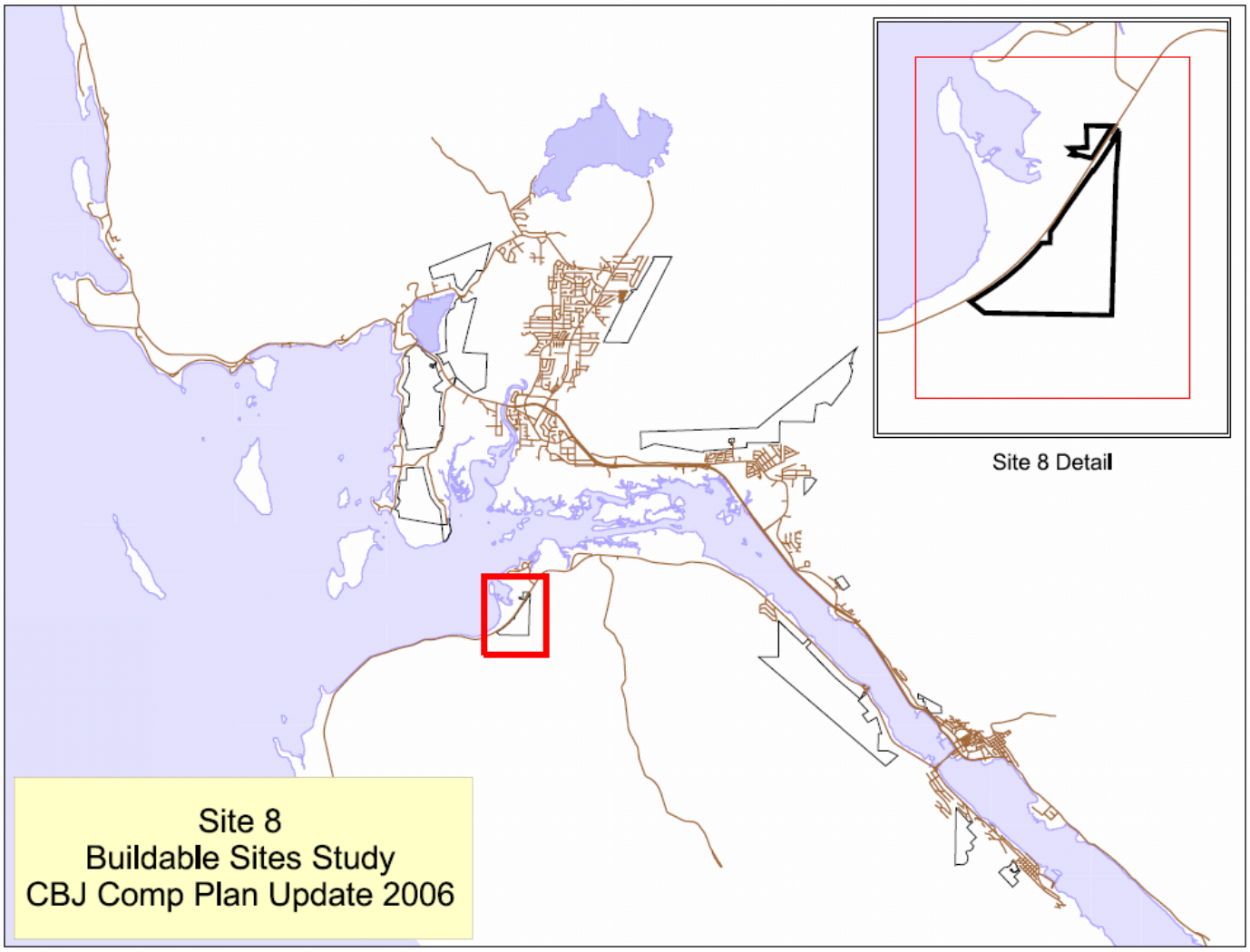

Figure 96 - Site 8 - Detail map

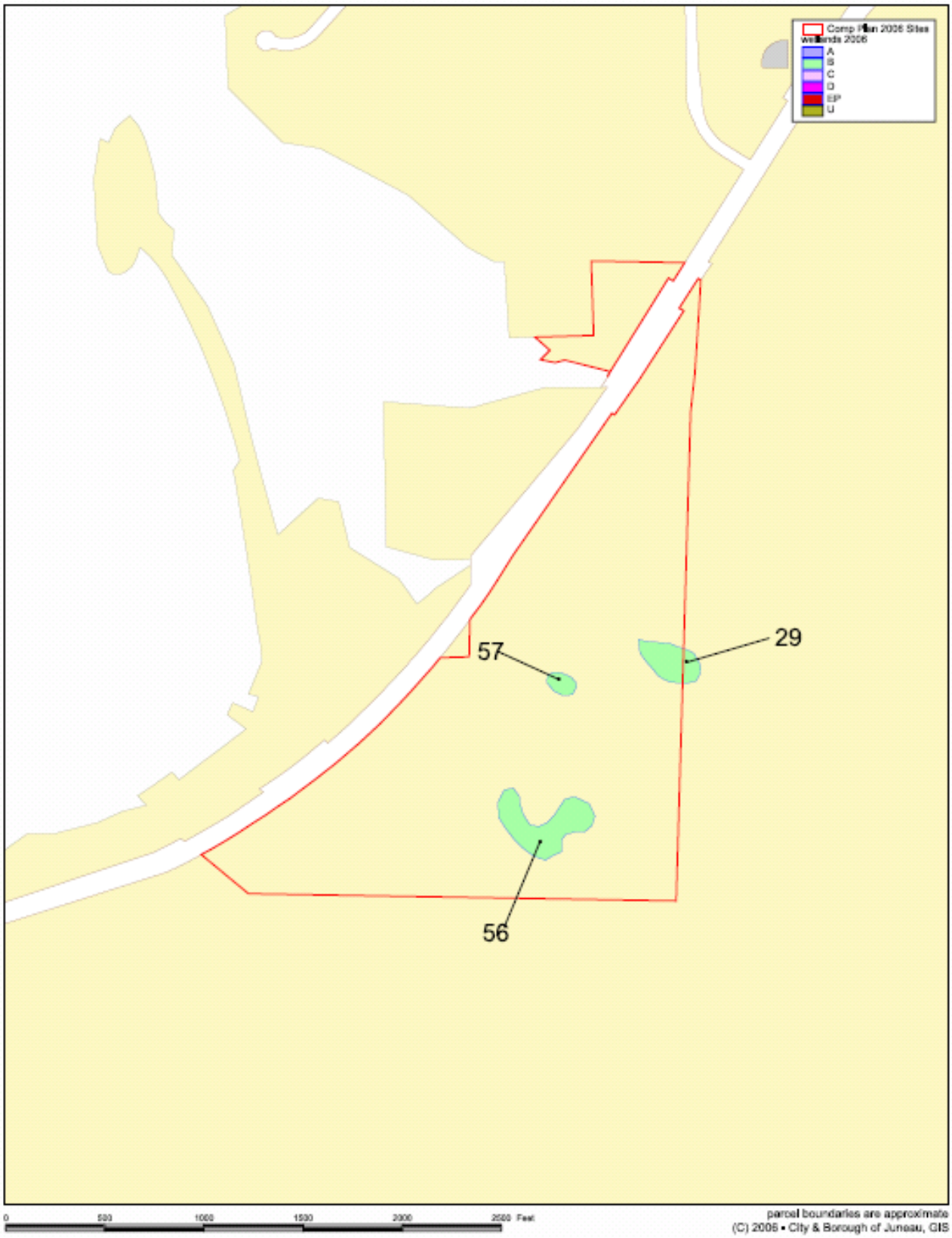

Figure 97 – Site 8 - Wetland polygon labels

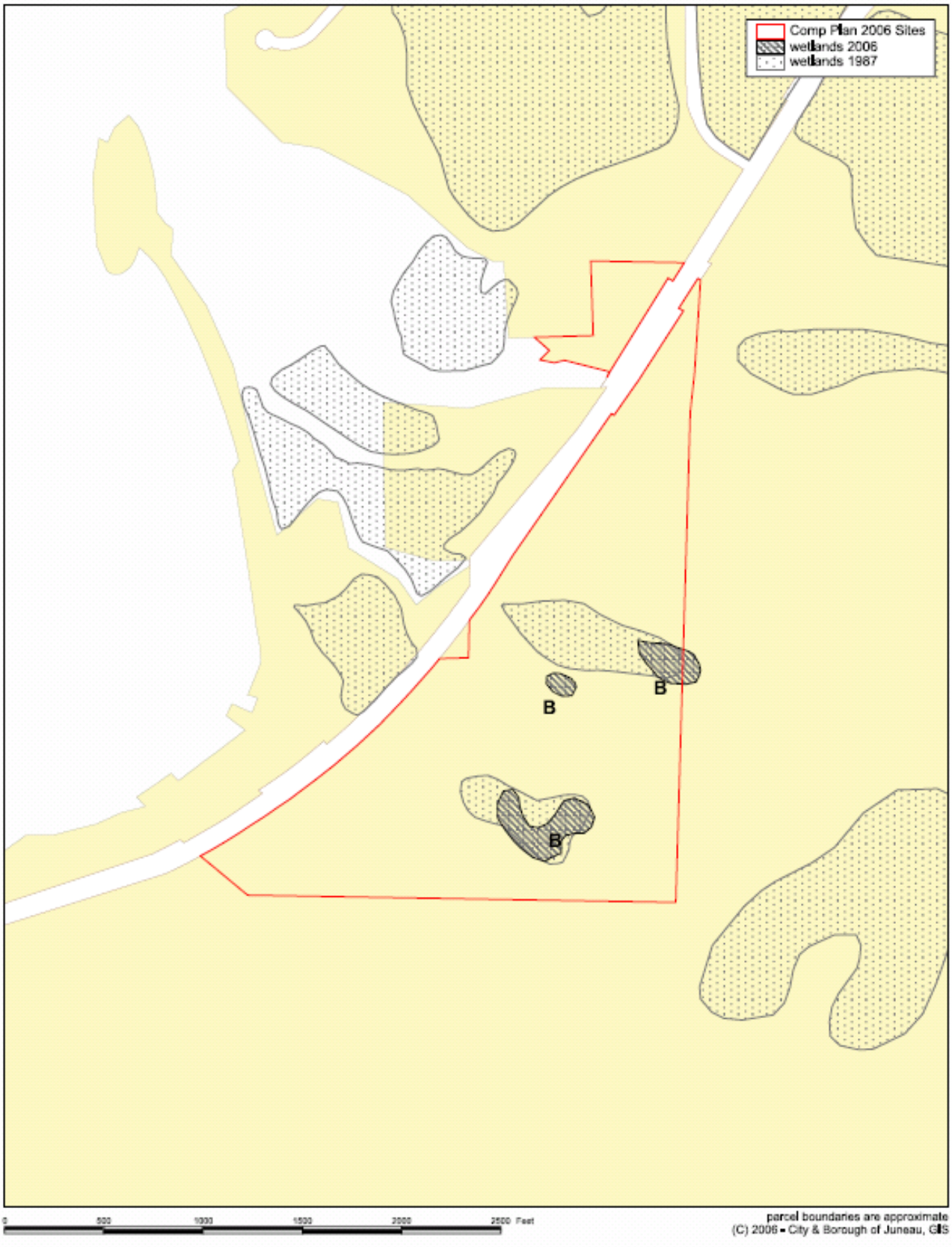

Figure 98 - Site 8 - 1987/2006 Wetlands map w/wetland ratings

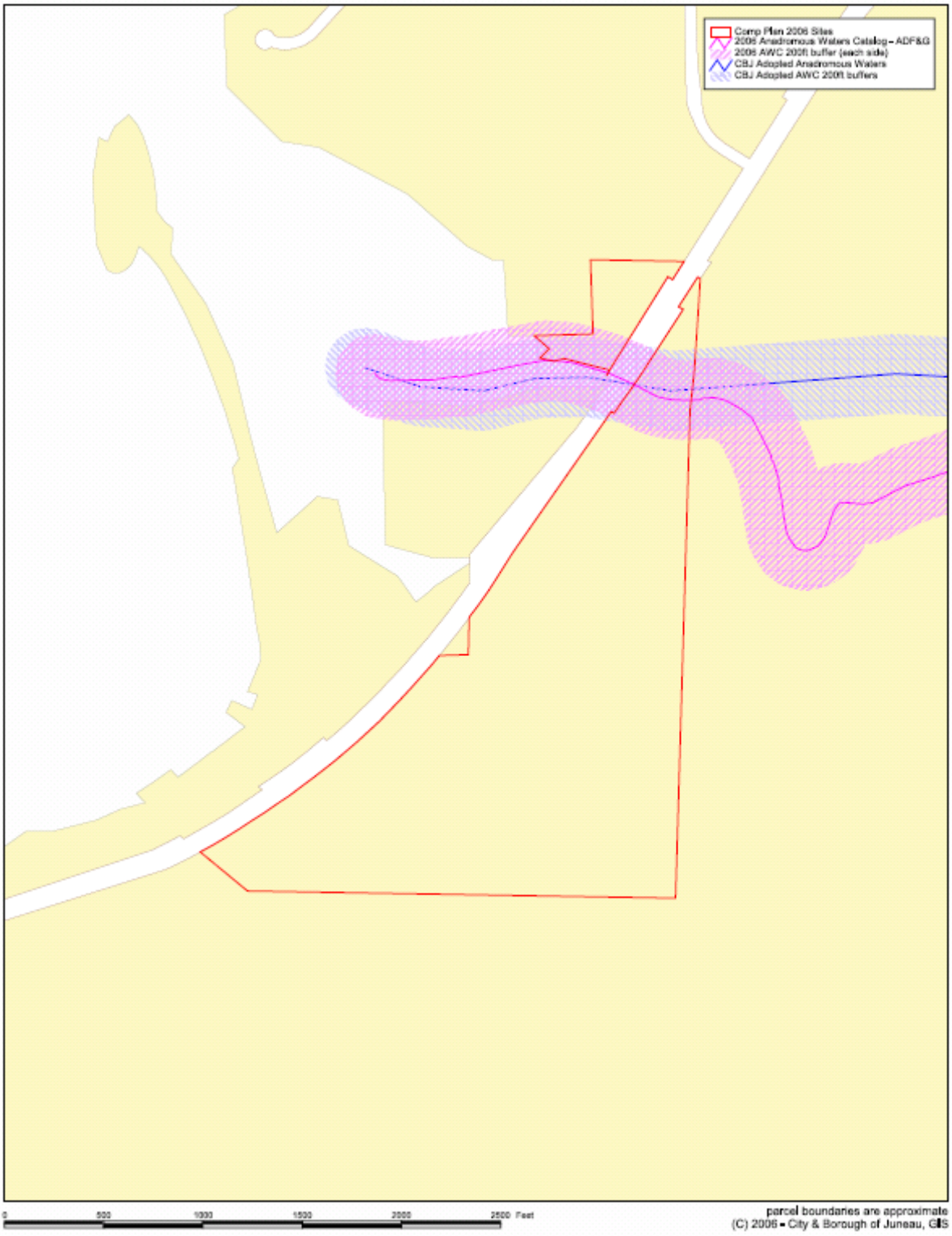

Figure 99 - Site 8 - Anadromous waters

Figure 100 - Site 8 - 2001 Aerial photo w/wetlands

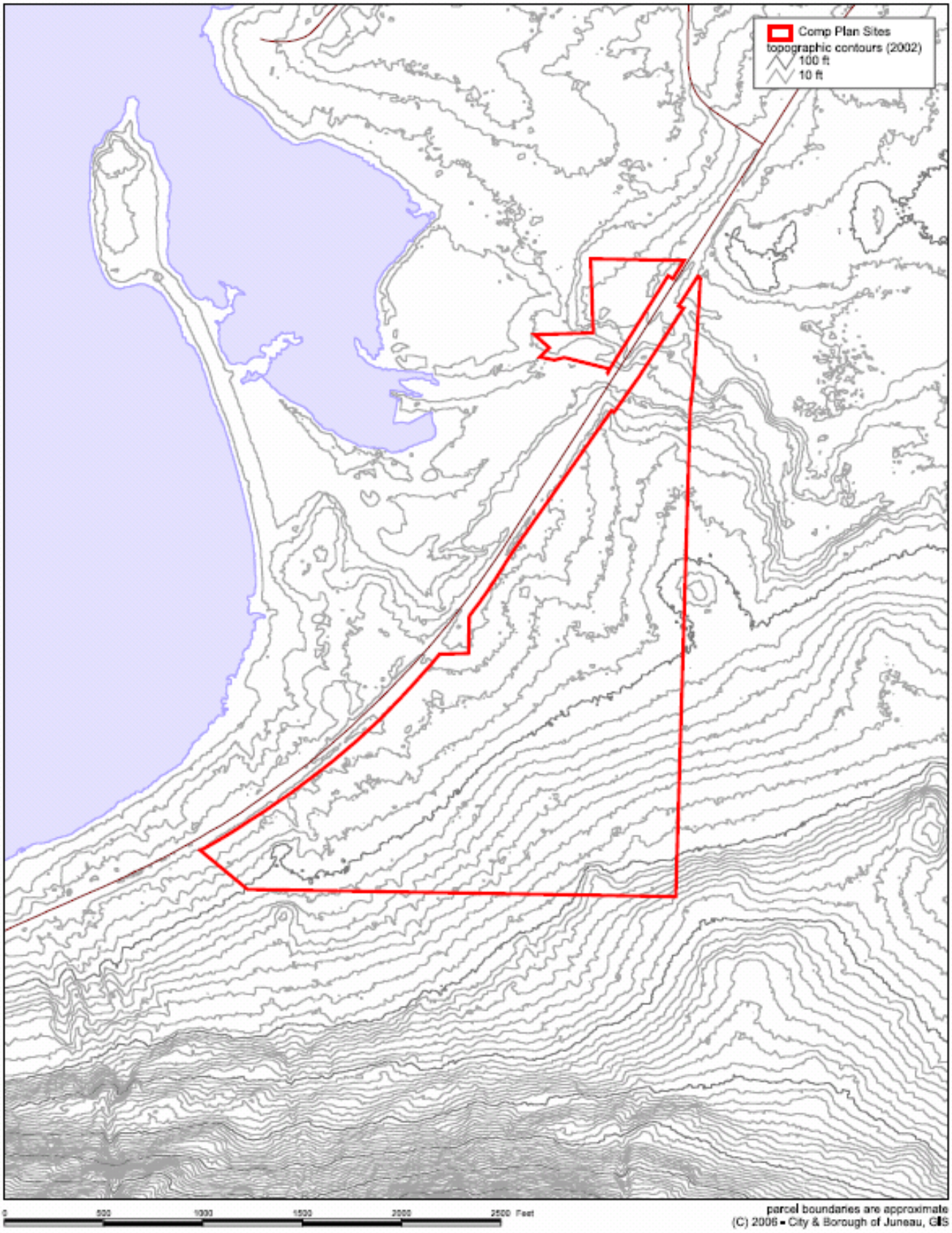

Figure 101 - Site 8 - Topographic contours map

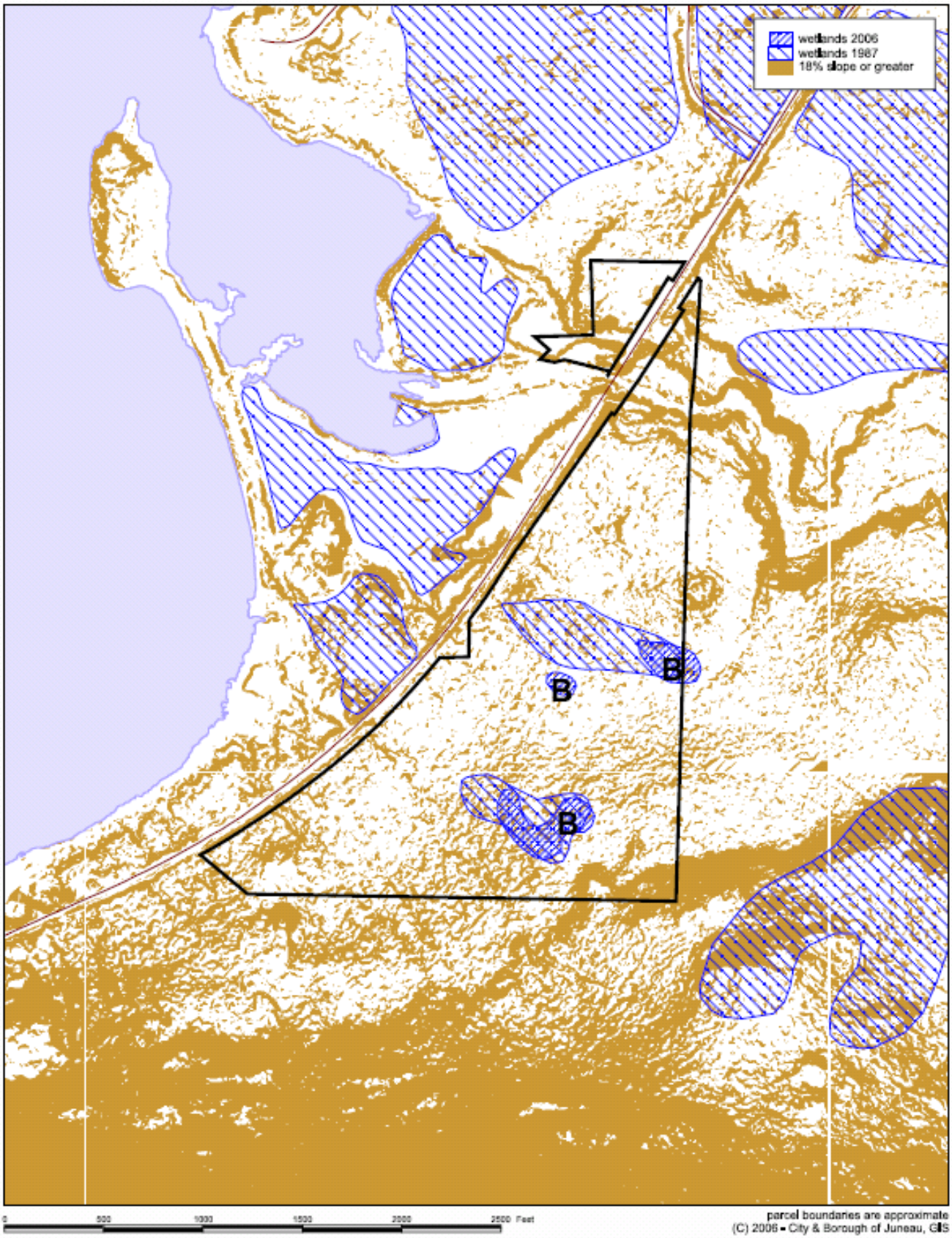

Figure 102 - Site 8 - 18% slope and greater

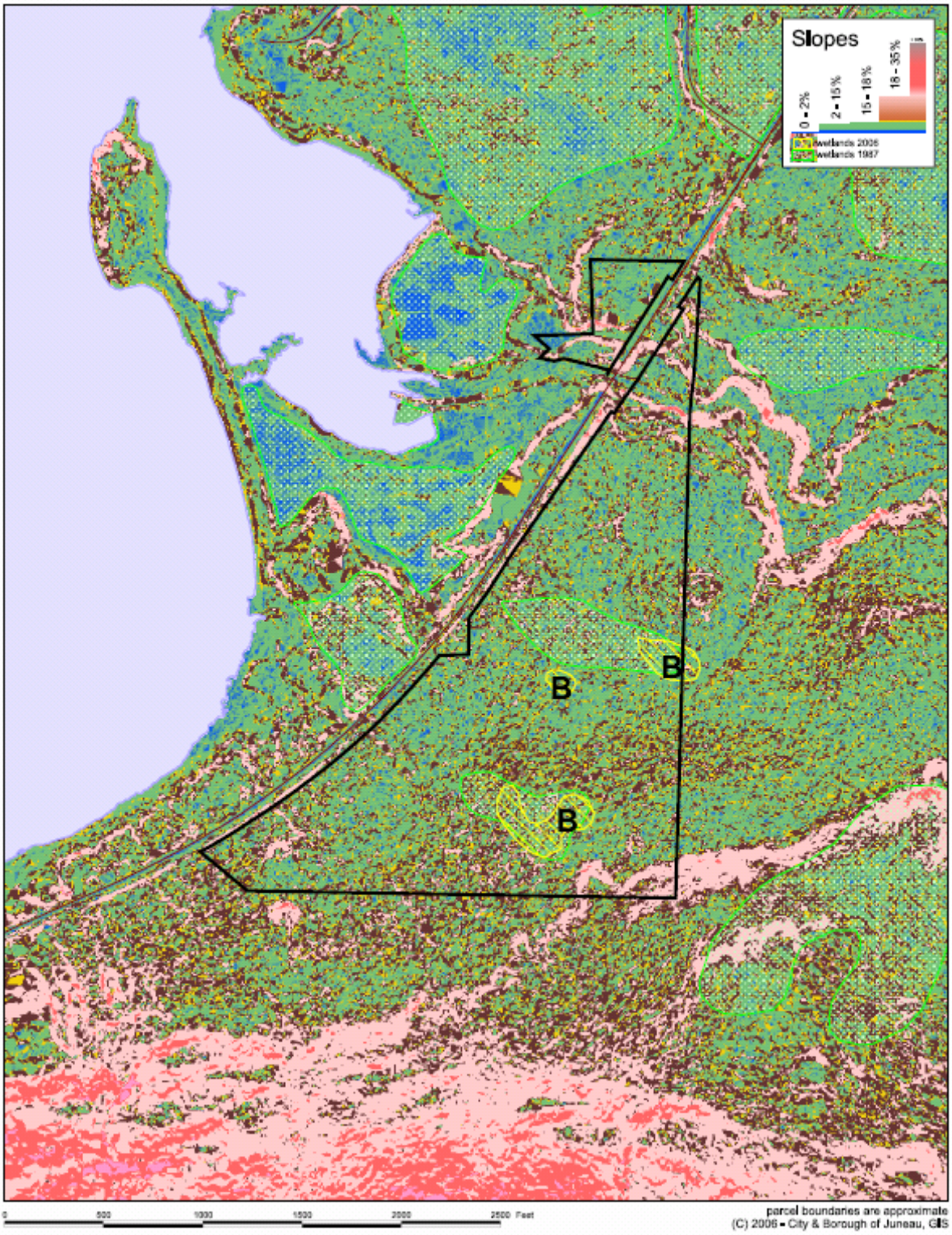

Figure 103 - Site 8 - Slope map w/wetlands

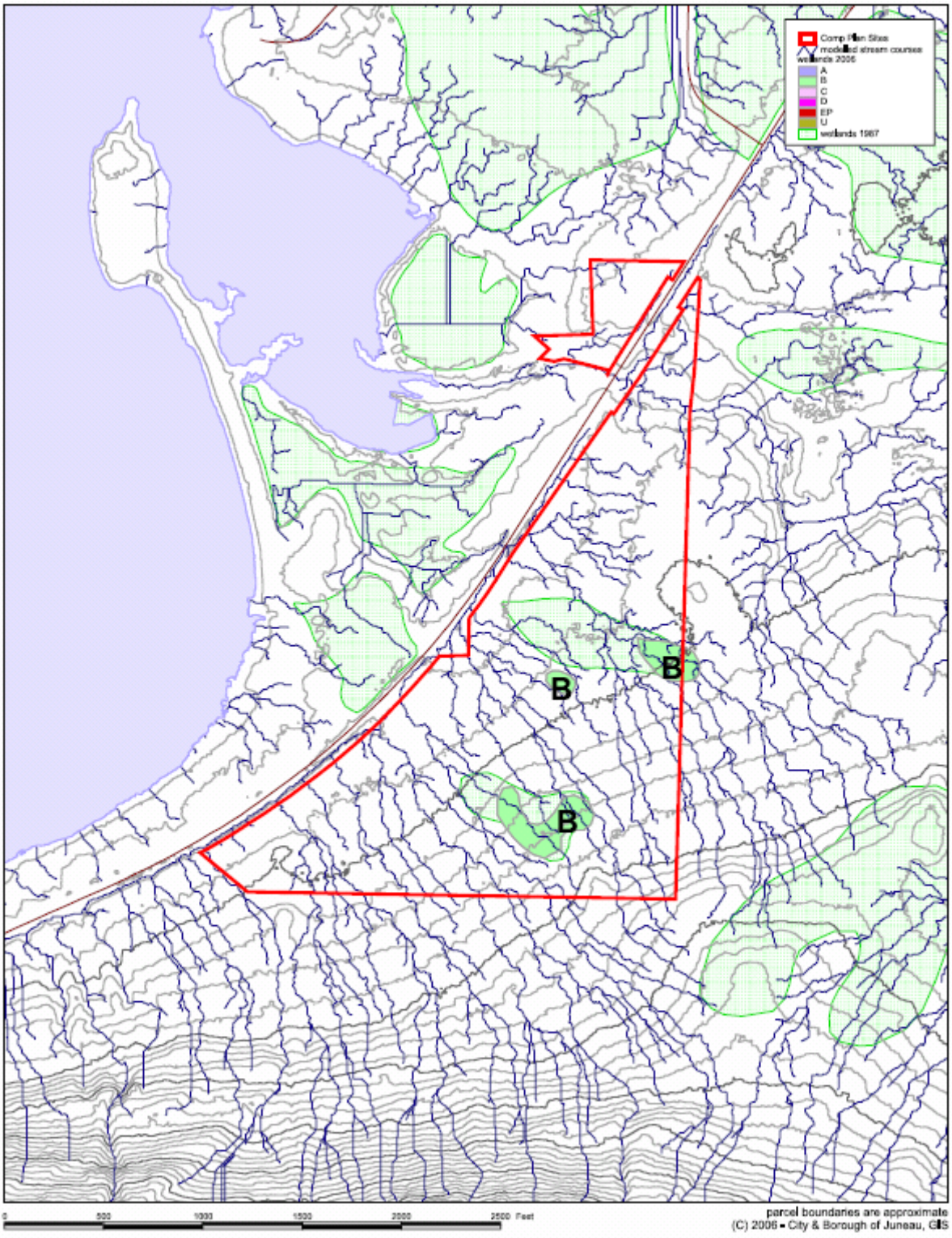

Figure 104 - Site 8 - Preliminary modeled streams and drainages

3.8.1 Wetland #29

This wetland is in the northeastern part of the parcel unit. It was assigned to category B based partly on high ratings for Sediment/Toxicant Retention and Wildlife Habitat (Table 2). Fish cannot access any part of this wetland. The wetland is mostly shrubby fen with forested wetland around the edges. The fen is dominated by stunted western hemlock, rusty menzisia, skunk cabbage and *Sphagnum* moss. The soils are all hydric, mostly Kina and Maybeso Series, and the water table was at or within 12 inches of the surface at the time of the survey.

3.8.2 Wetland #56

This very small wetland is in the center of the parcel unit. It was assigned to category B based partly on high ratings for Groundwater Discharge, Sediment/Toxicant Retention, and Wildlife Habitat (Table 2). Fish cannot access any part of this wetland. The wetland is mostly sedge fen with a little forested wetland around the edges. The sedge fen was dominated by Sitka sedge, skunk cabbage and *Sphagnum* moss. The soils are all hydric, mostly Kina Series, and the water table was at or within a few inches of the surface at the time of the survey.

3.8.3 Wetland #57

This wetland is in the southern part of the parcel unit. It was assigned to category B based partly on high ratings for Sediment/Toxicant Retention and Wildlife Habitat (Table 2). Fish cannot access any part of this wetland. This wetland is a sloping *Sphagnum* bog with forested wetland around the edges. The bog is dominated by *Sphagnum* moss bluejoint grass. The soils are hydric; of the Kina and Maybeso Series, and the water table was at or within 12 inches of the surface at the time of the survey.

3.9 Parcel Unit #9

This parcel unit is uphill from the Gastineau School area of Douglas Island. It was found to contain 3 distinct wetlands, two of them assigned to category A and one to category B. The geographically closest wetland to this parcel unit in the 1997 Juneau Wetlands Management Plan was labeled DE3 and the Plan assigned that wetland to category All but the steep NW corner of this unit was surveyed. The exact areas visited are shown on the field survey map (Fig. 2).

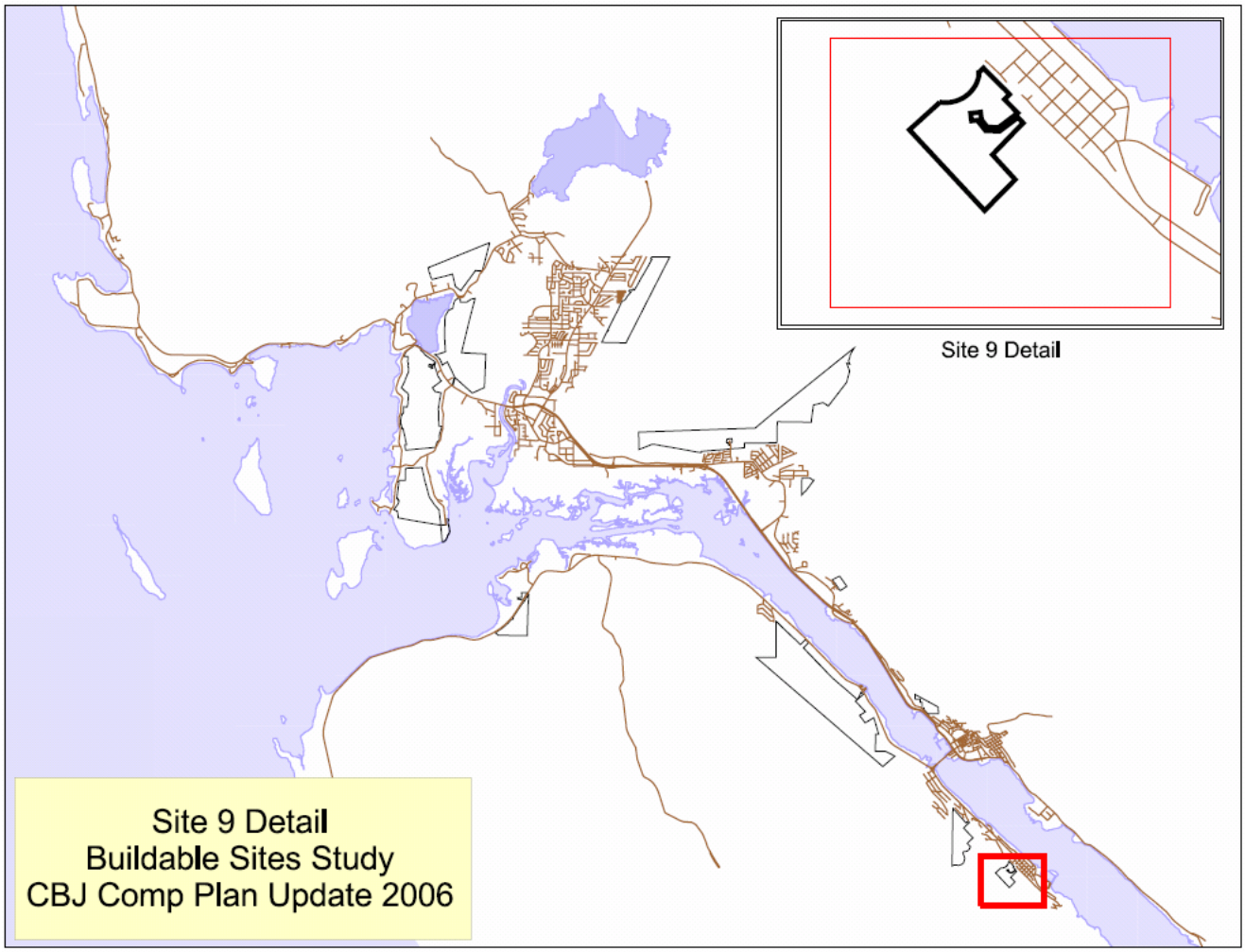

Figure 105 – Site 9 – detail map

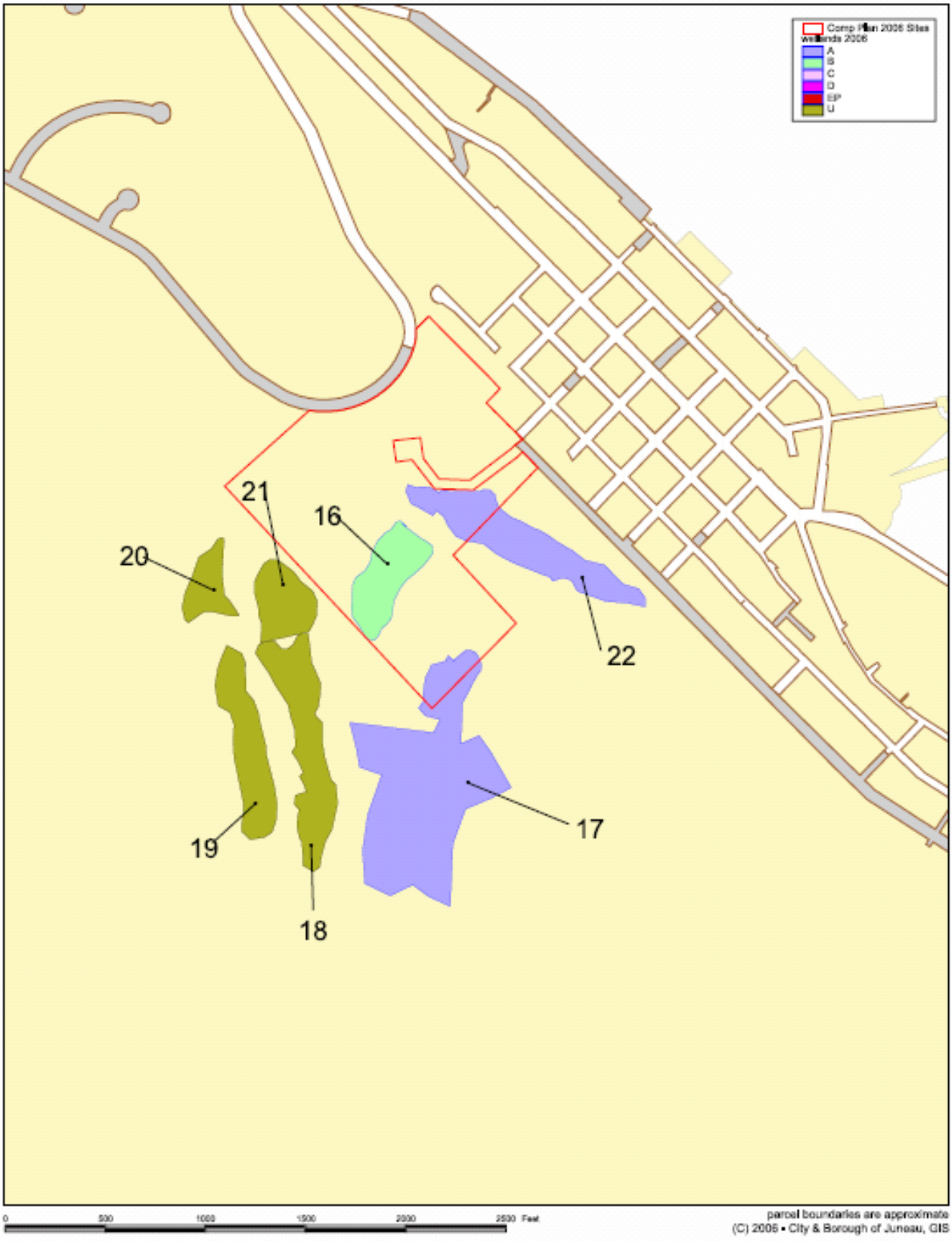

Figure 106 – Site 9 - Wetland polygon labels

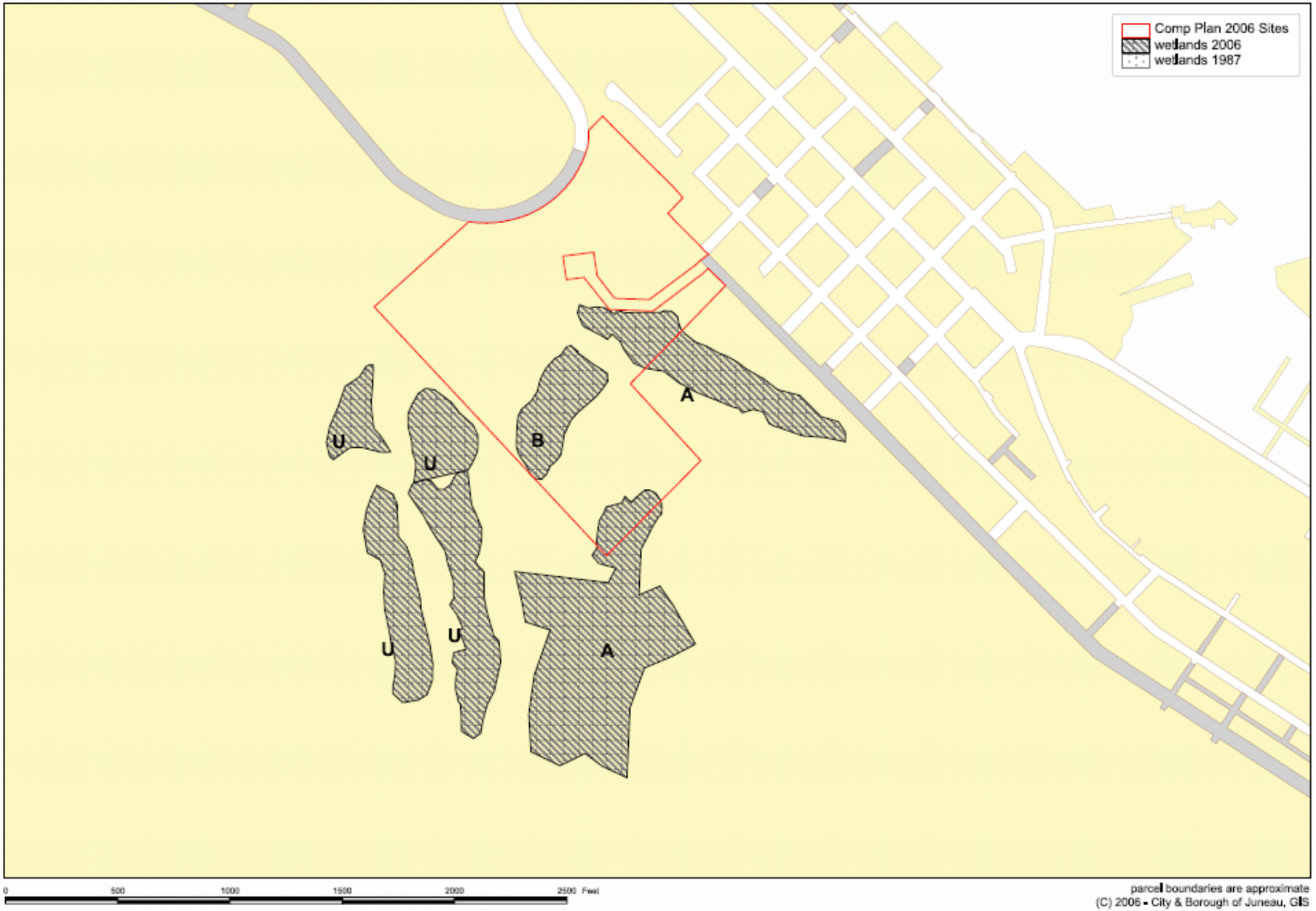

Figure 107 - Site 9 - 1987/2006 wetlands map w/wetland ratings

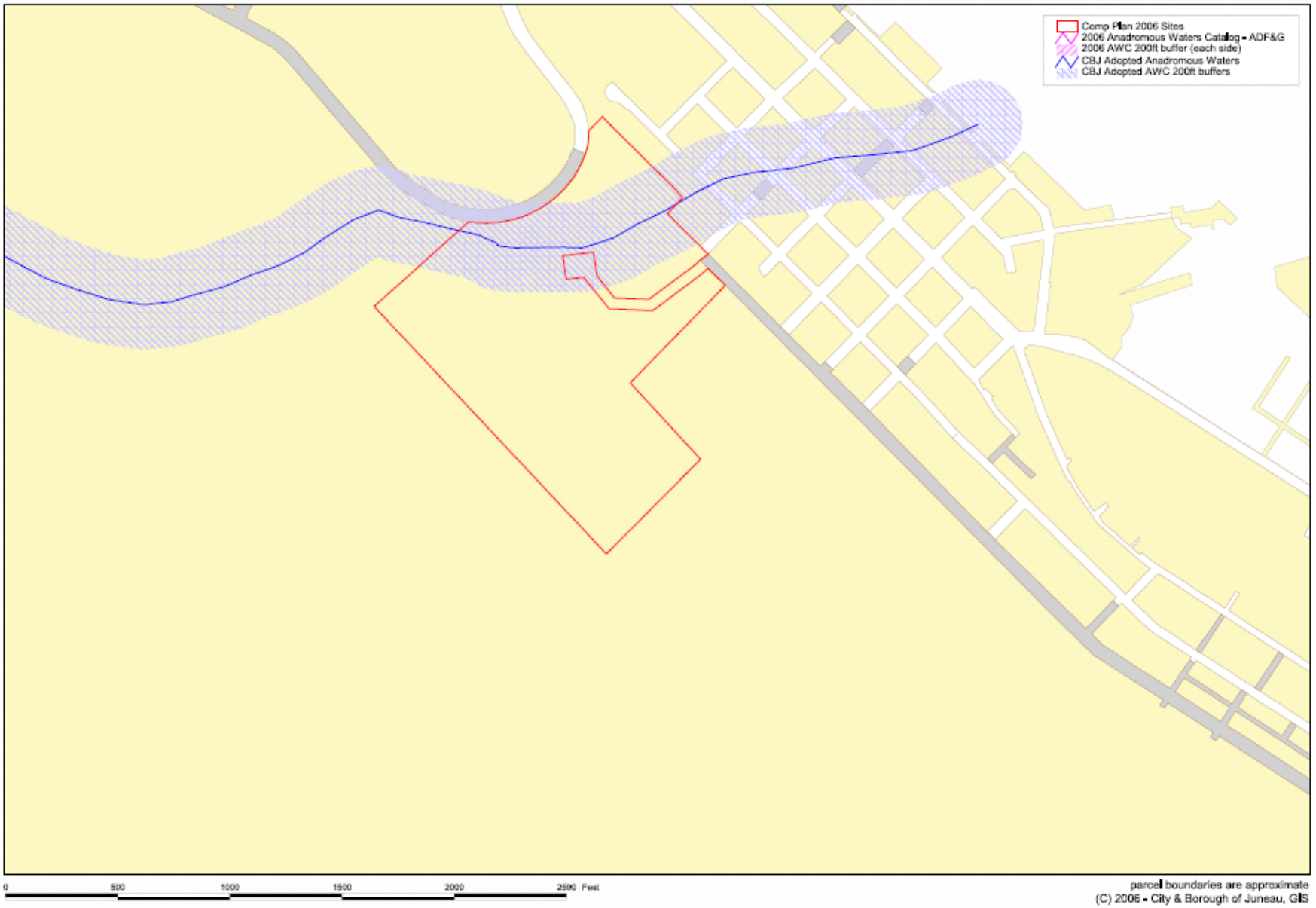

Figure 108 - Site 9 - Anadromous waters map

Figure 109 - Site 9 - 2001 Aerial photo w/wetlands

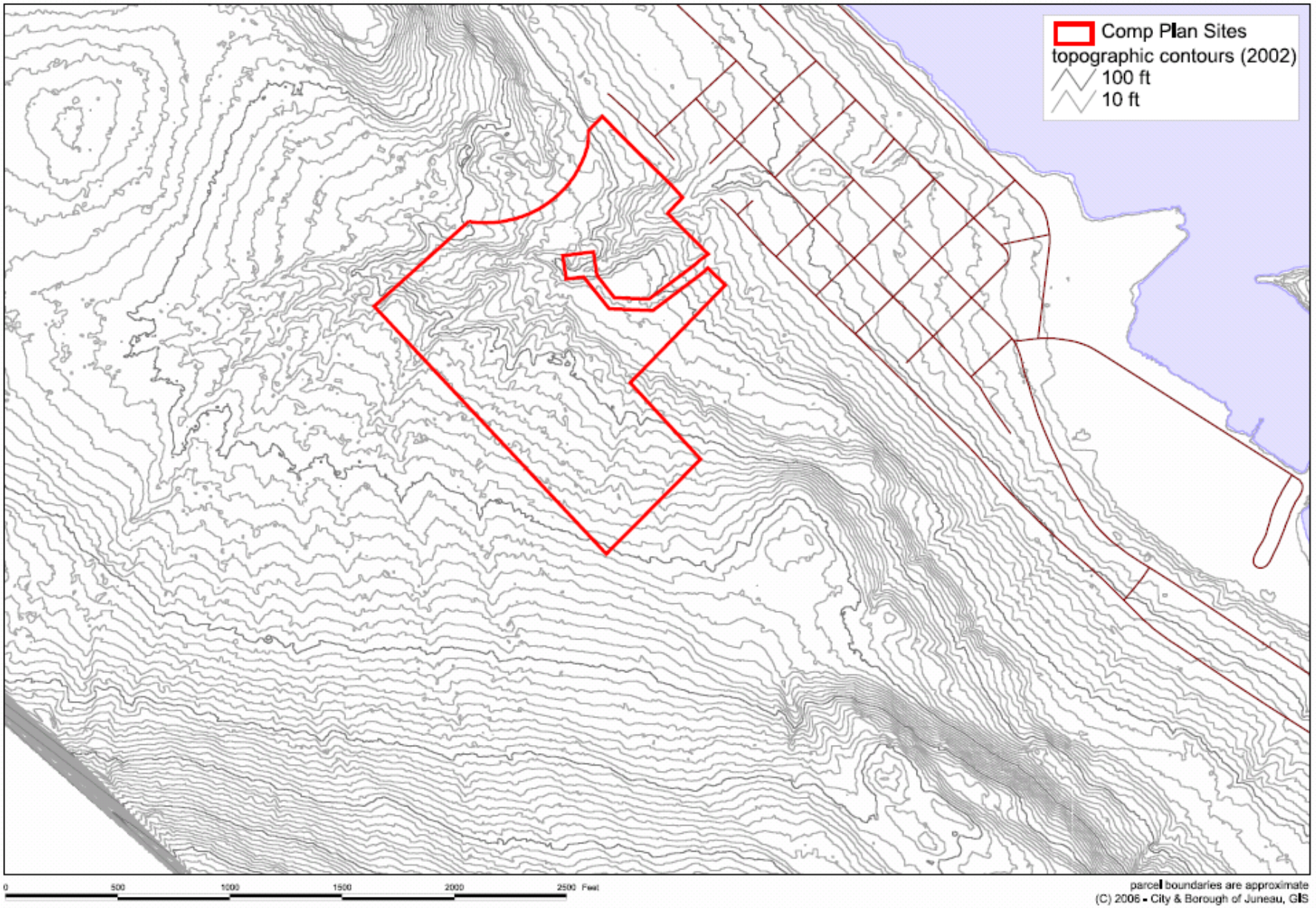

Figure 110 - Site 9 topographic contours

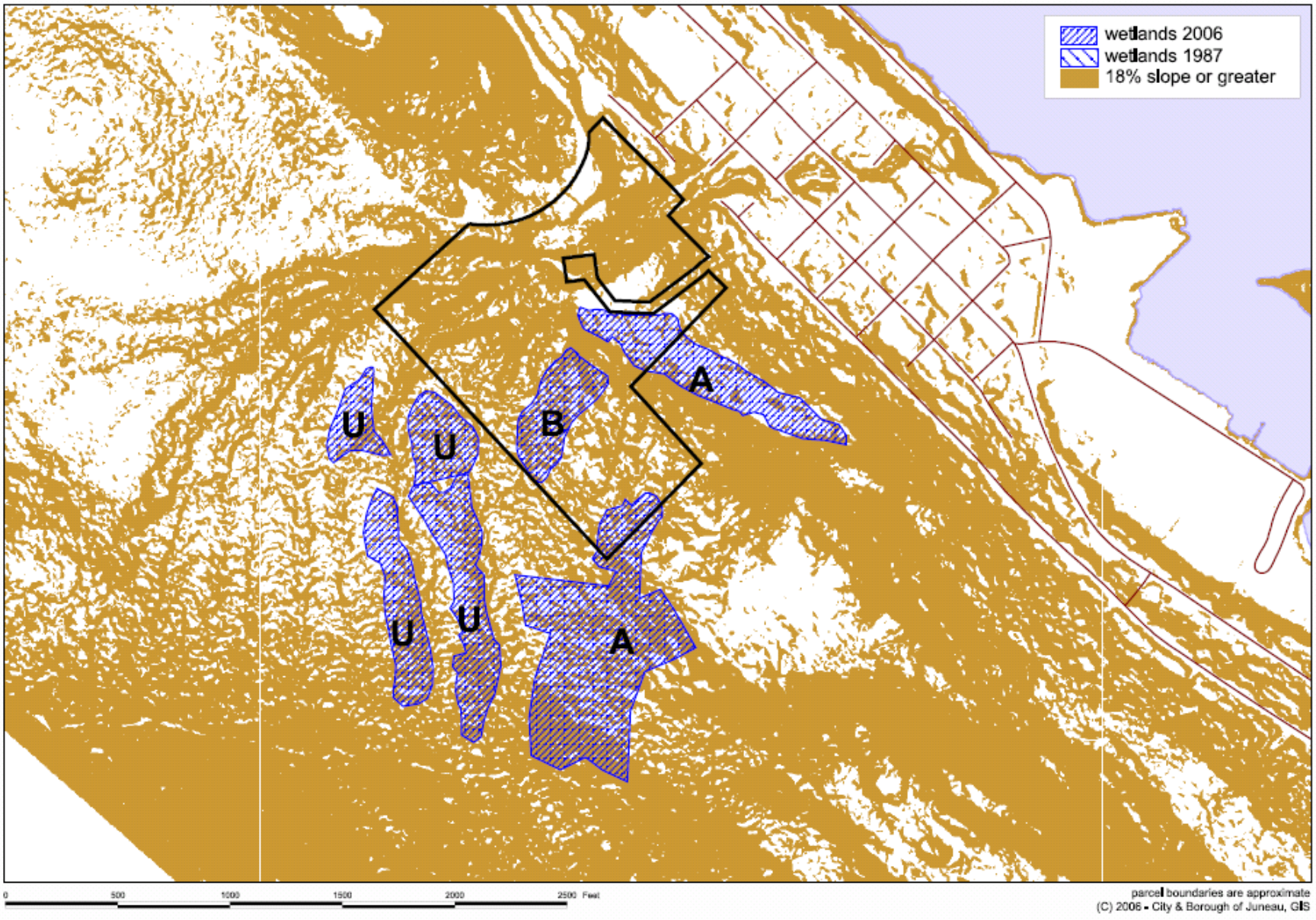

Figure 111 - Site 9 - 18% slope and greater

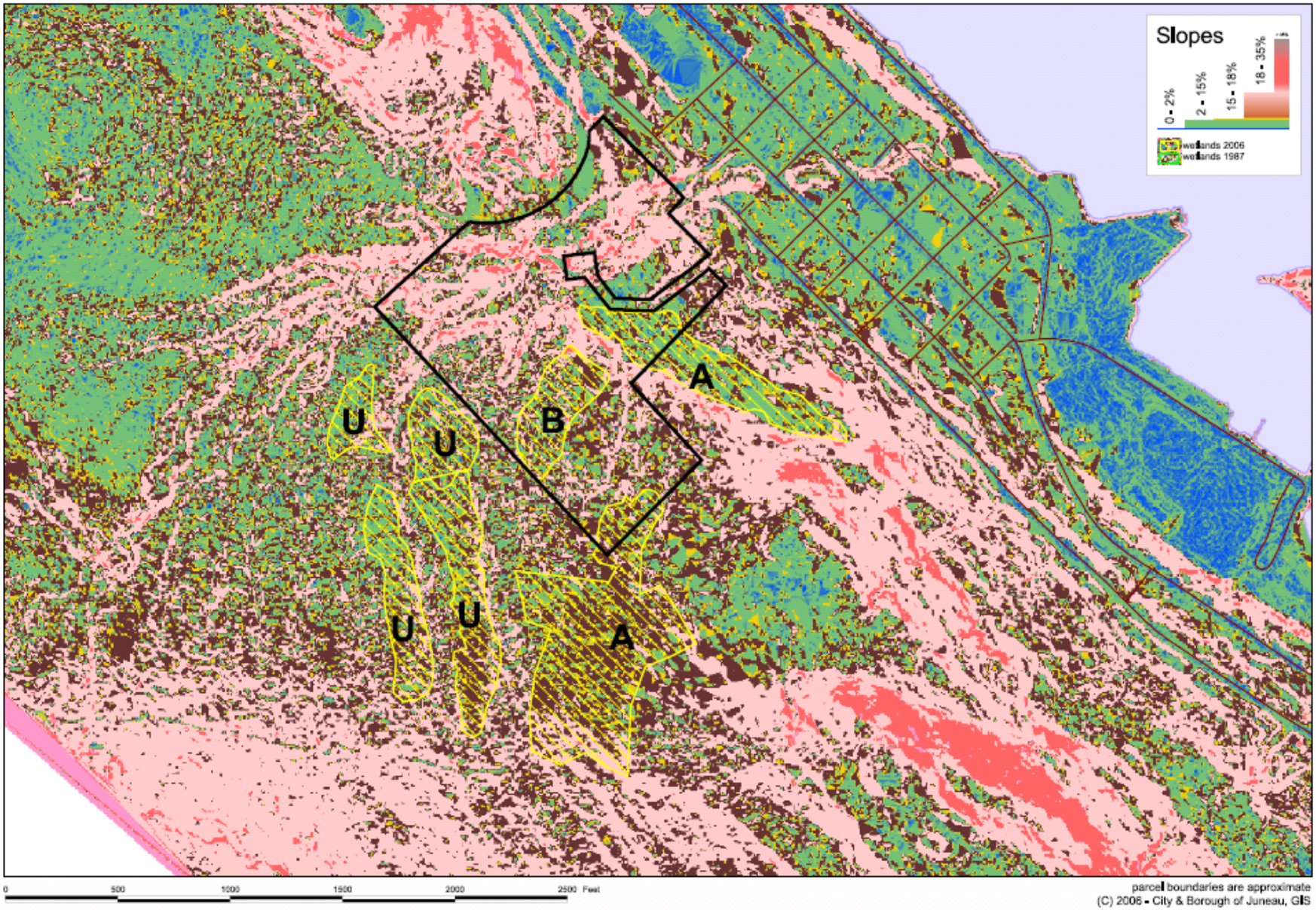

Figure 112 - Site 9 - Slope map w/wetlands

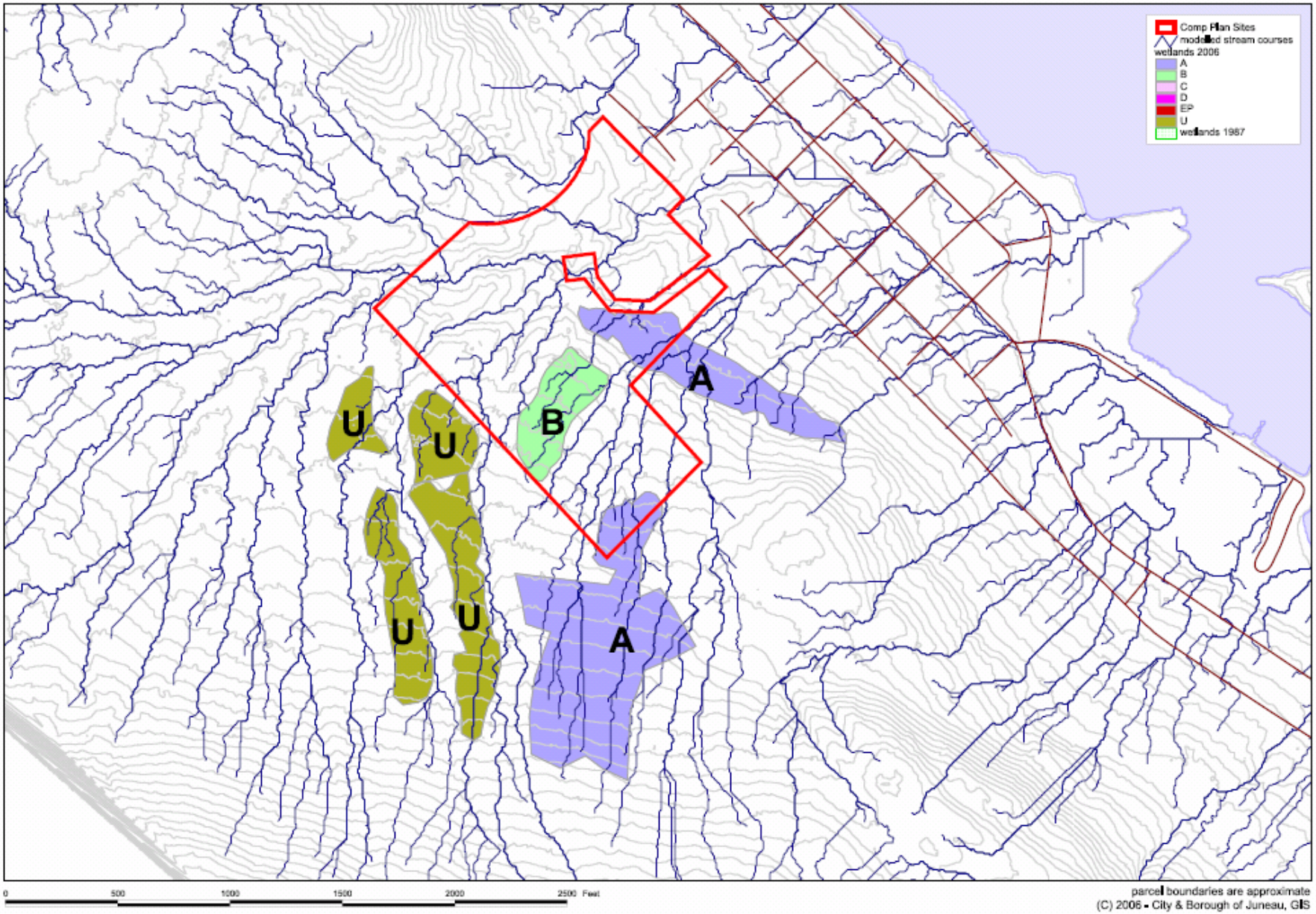

Figure 113 - Site 9 - Preliminary modeled streams and drainages

3.9.1 Wetland #16

Figure 114 – Site 9 - Wetland #16 - ericaceous bog

This wetland is in the south-central part of the parcel unit and is mostly herbaceous, grading into forested wetland around the edges. It was assigned to category B based partly on high ratings for Groundwater Discharge and Erosion Sensitivity (Table 2). Fish cannot access any part of this wetland. This wetland is a complex of ericaceous bog – alder fen and forested wetland. The forested wetland is dominated by scrubby hemlock and skunk cabbage, the alder fen by Sitka alder and crabapple. The ericaceous bog is dominated by Labrador tea, stunted pine, spruce, hemlock and *Sphagnum* moss. The soils are all hydric, of the Kogish and Maybeso series, and the water table was at or near the surface over all the wetland except for scattered hummocks.

3.9.2 Wetland #17

This wetland is in the southern corner of the parcel unit and extends beyond it as a large open bog on the bench above this unit. It was assigned to category A based partly on high ratings for Groundwater Discharge, Erosion Sensitivity, Recreational Use, and Wildlife Habitat (Table 2). Fish cannot access any part of this wetland. The wetland is primarily an ericaceous bog dominated by ericaceous subshrubs, stunted pine, hemlock and spruce, and *Sphagnum* moss. The soils are hydric, of the Kogish series, and the water table was at or within 12 inches of the surface at the time of the survey.

3.9.3 Wetland #22

Figure 115 – Site 9 - Wetland #22 - alder fen

This wetland is on a narrow bench at the toe of a slope and just from wetland #16. It was assigned to category A based partly on high ratings for Groundwater Discharge, Sediment/Toxicant Retention, Recreational Use, and Wildlife Habitat (Table 2). Fish cannot access any part of this wetland. The wetland is a narrow strip of alder fen all along the base of the slope that trends northwest-southeast through the unit. The hydrology of the wetland might have been changed by the construction of a dirt access road that runs below it. The alder fen is dominated by Sitka alder, salmonberry and skunk cabbage. The soil is hydric; a mucky peat of the Maybeso Series, and the water table was at the surface at the time of the survey.

3.10 Parcel Unit #11, Wetland #8

This parcel unit is a triangle shaped area in the Vanderbilt Creek area. It contains a single wetland (#8) that is intersected by the new route for the Lemon Creek trail and Vanderbilt Creek, which allows year-round access of fish to part of the wetland. The wetland was assigned to category B based partly on high ratings for Groundwater Discharge and Salmonid Habitat (Table 2). This wetland was not assigned to category A partly because of its relatively high PP (lower public preference) and PA (more numerous practicable alternatives) scores based on 1987 information for the closest wetland (L14) assessed at that time. In general, the wetland grades from west to east, from an open sedge marsh just outside the western edge, to alder fen, to hummocky forested wetland. The alder fen is dominated by Sitka alder, skunk cabbage and lady fern, and the forested wetland is dominated by Sitka spruce, western hemlock and skunk cabbage. The soils were hydric, mucky peats of the Maybeso Series, and the water table was above the surface in all but the hummocks of the forested wetland.

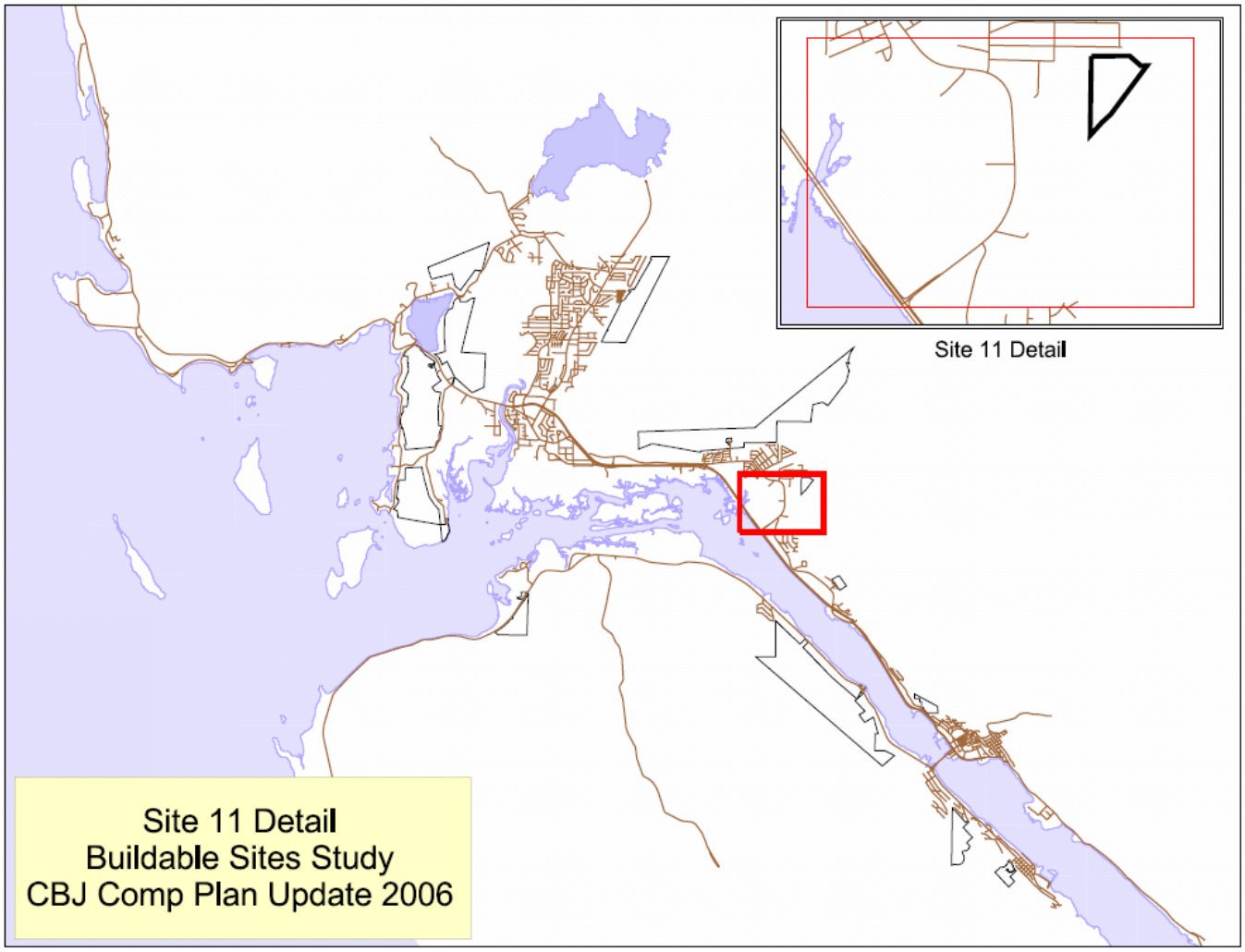

Figure 116 - Site 11 - detail map

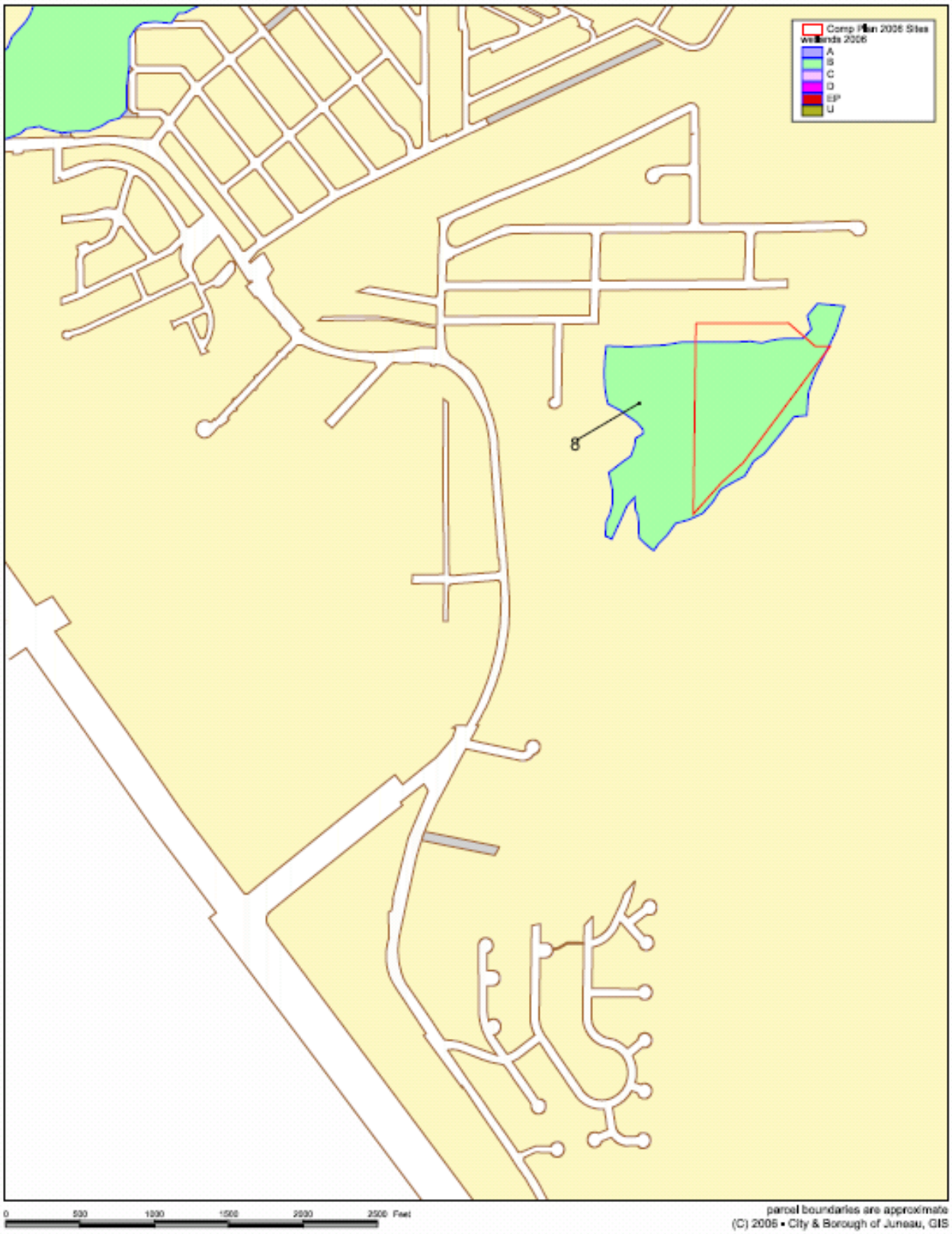

Figure 117 – Site 11 - Wetland polygon label

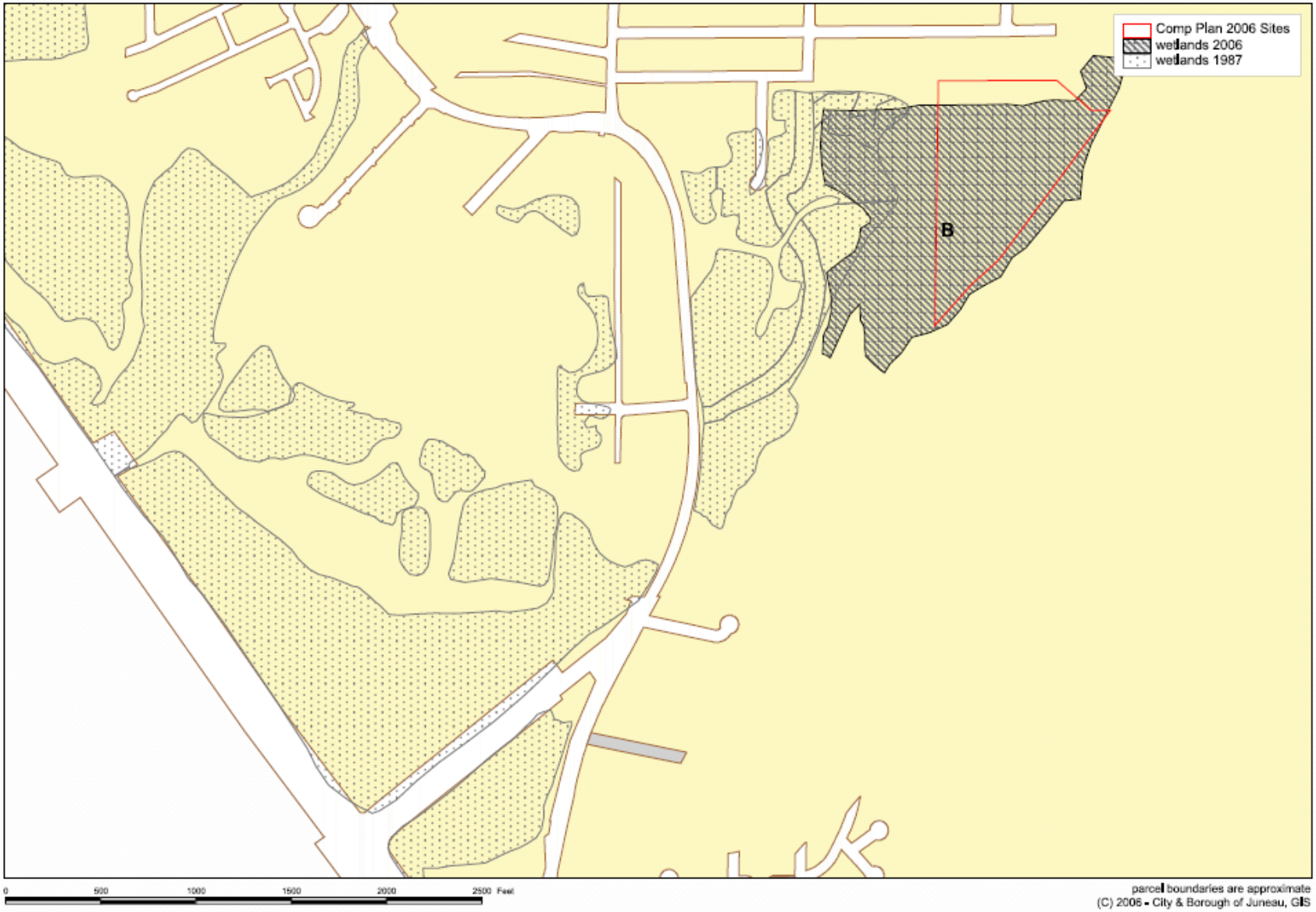

Figure 118 - Site 11 - 1987/2006 wetland map w/wetland ratings

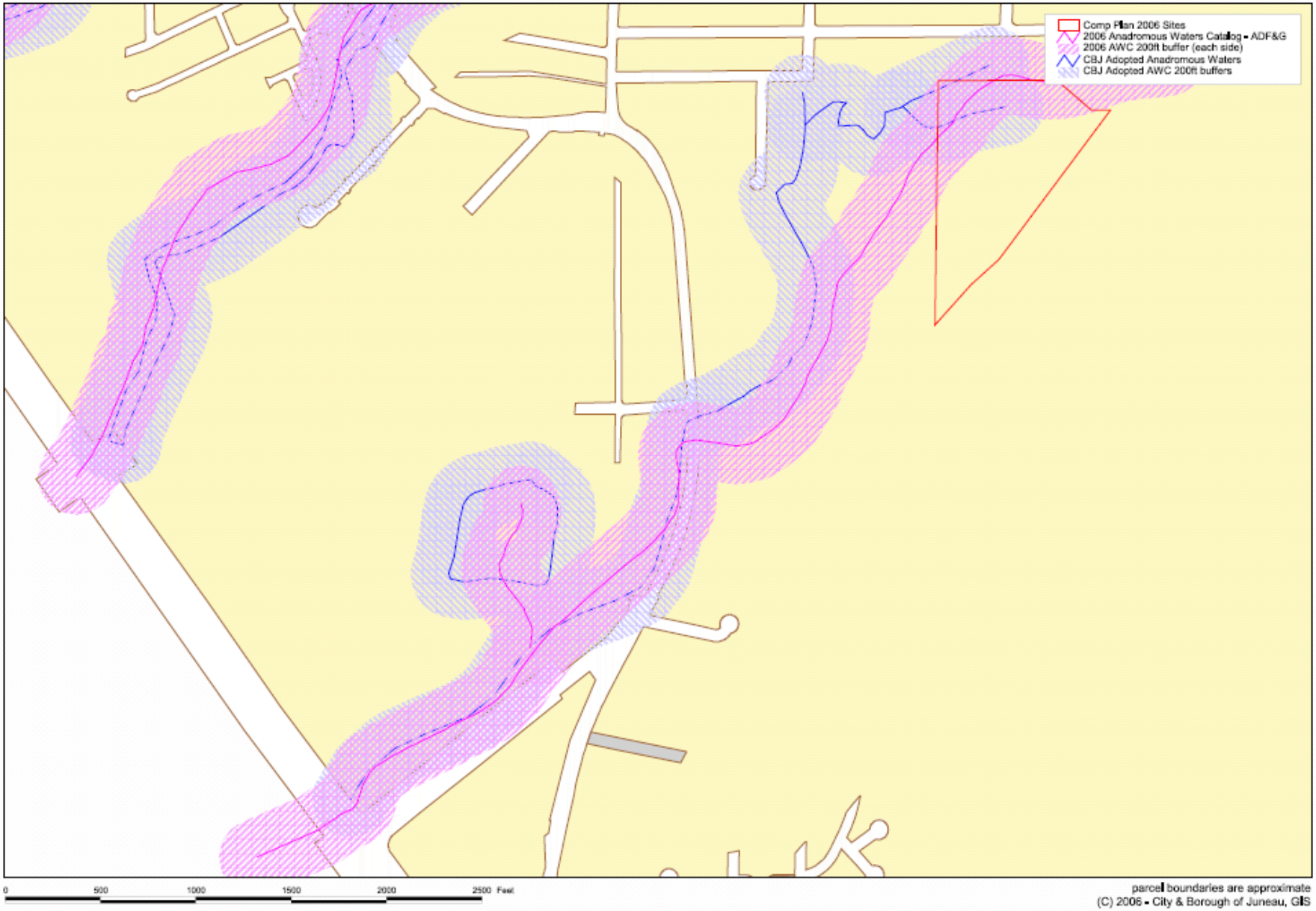

Figure 119 - Site 11 - Anadromous waters

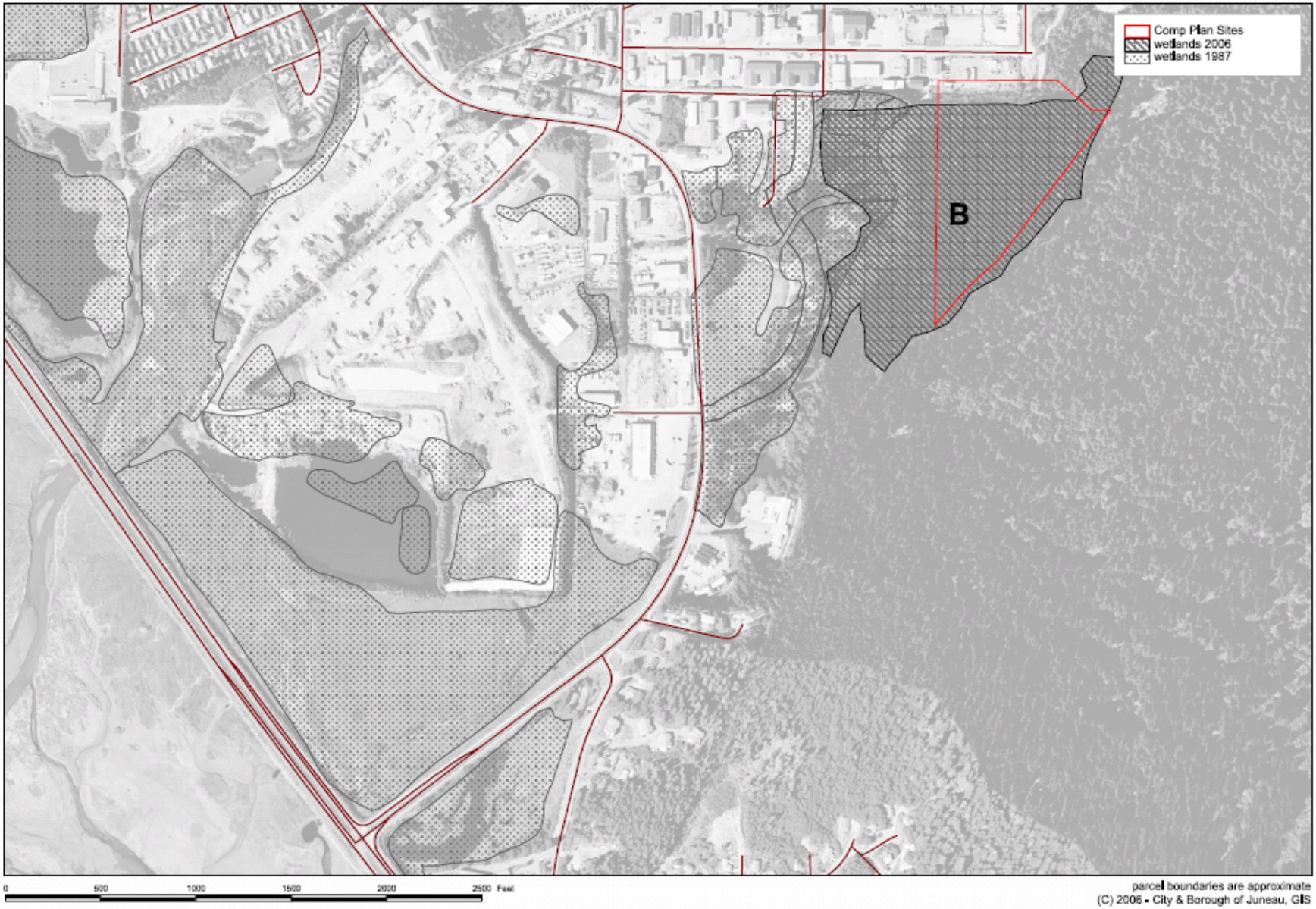

Figure 120 - Site 11 - 2001 Aerial photo w/wetlands

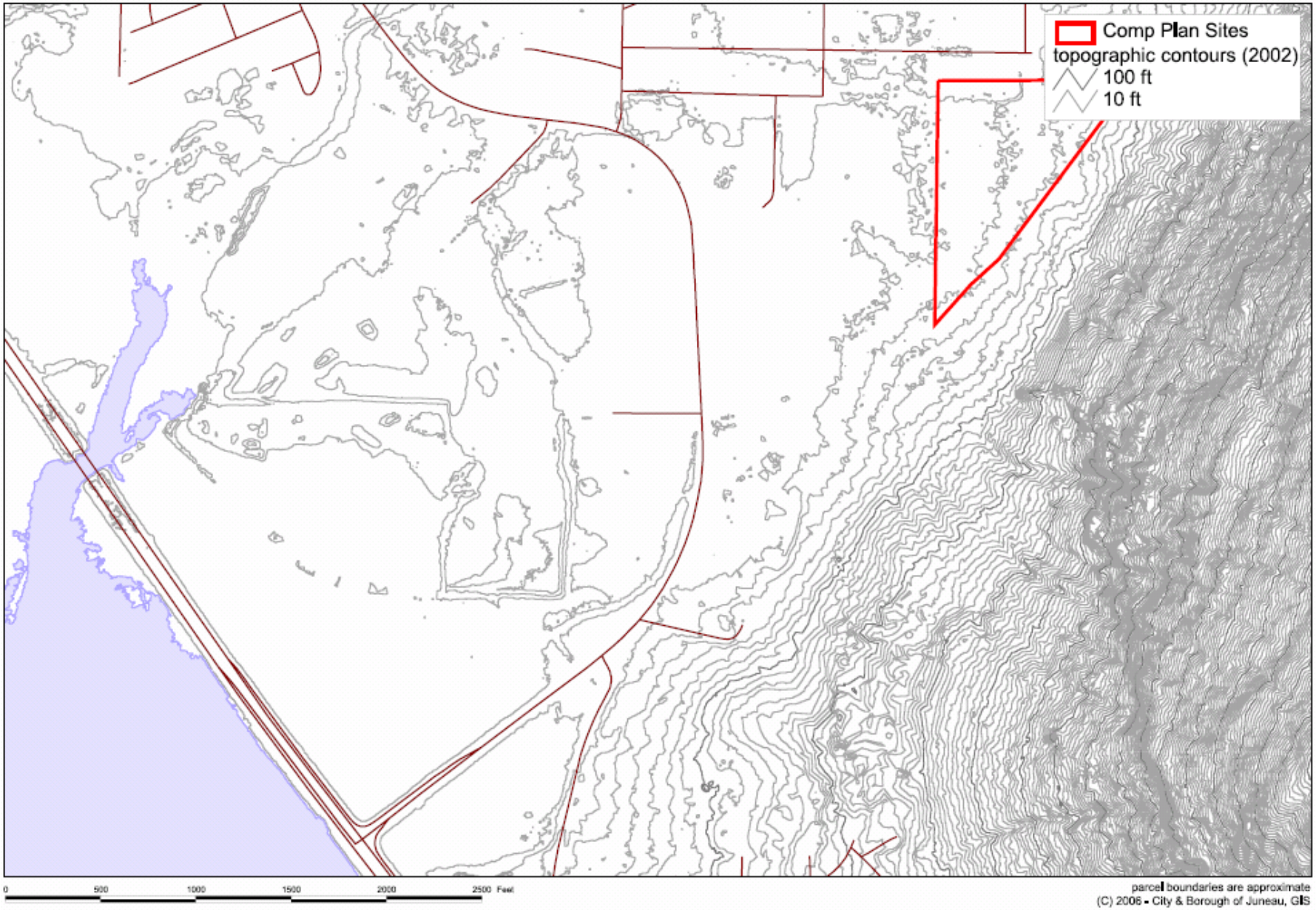

Figure 121 - Site 11 - Topographic contours map

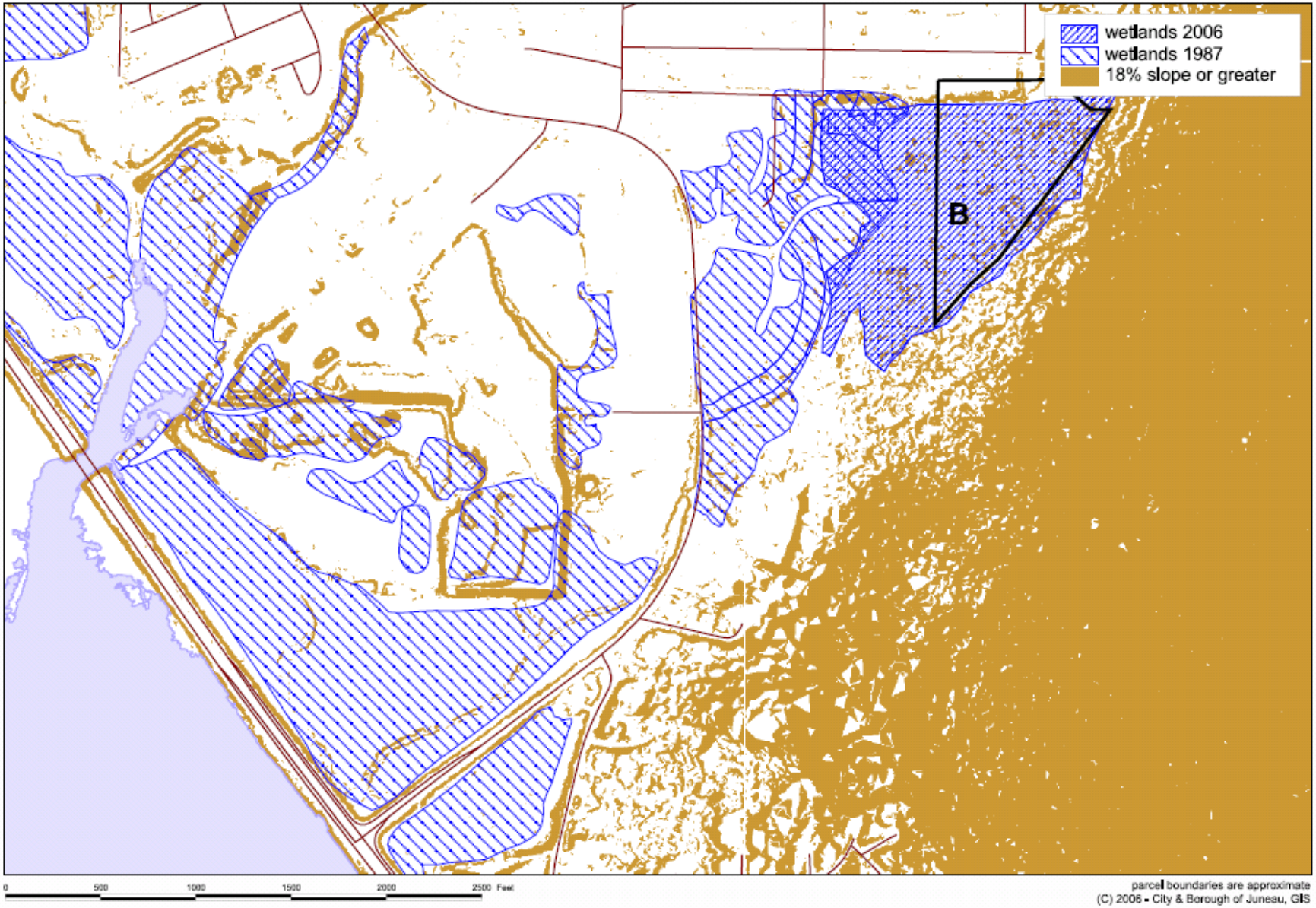

Figure 122 - Site 11 - 18% slope or greater

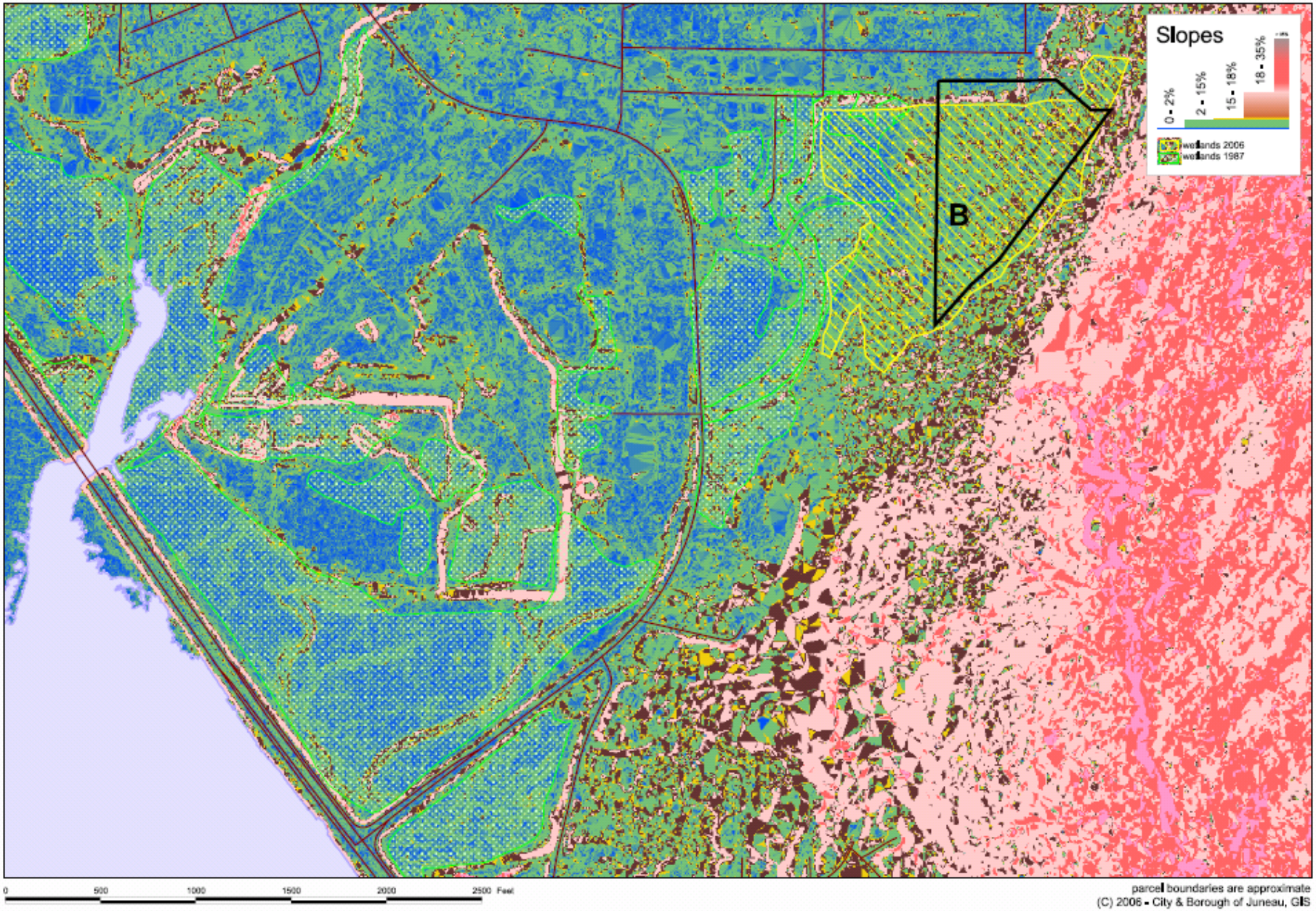

Figure 123 - Site 11 - Slope map w/ wetlands

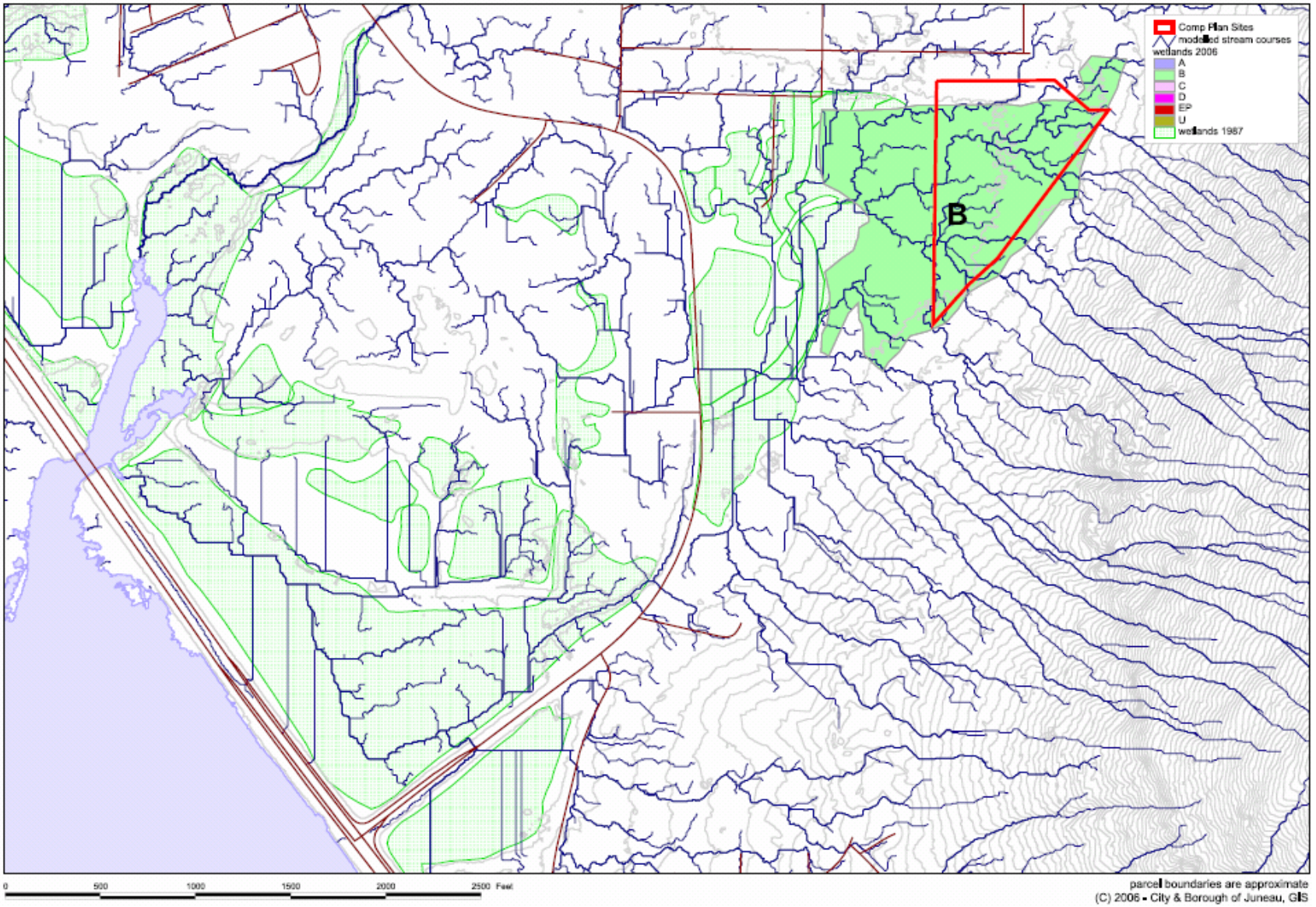

Figure 124 - Site 11 - Preliminary modeled streams and drainages

Figure 125 – Site 11 - Wetland #8 - forested wetland edge

Figure 126 – Site 11 - Wetland #8 - alder fen edge

Figure 127 – Site 11 - Wetland #8 - forested wetland

4.0 Future Directions

This study has highlighted several needs for additional effort. These are listed in no particular order. Matching funds for some of these tasks might be obtained by submitting proposals to the USEPA (Region 10 Office) and other sources.

1. Validation of Wetland Boundaries Mapped by NWI in 1987. Our field work has highlighted significant imprecision in the boundaries of some of the wetlands mapped by the National Wetland Inventory (NWI) in 1987. Those boundaries have been used as the basis for the Juneau Wetlands Management Plan. Their spatial imprecision is due mainly to the fact that they were based mainly on interpretation of aerial photographs with very little ground-truthing. We noted several errors of both commission (areas mapped as wetlands that are not) and omission (areas that are wetland but were not mapped as such by NWI). Thus, there may be a need to ground-truth the existing maps as extensively as possible, and also use GIS with existing data layers (slope, soils) to model and predict locations where wetlands were most likely to have been missed by the NWI maps, and to also field check those locations. Estimated cost: ~$100-200K, depending on extent of private land that can be accessed.

2. Improved Technical Criteria for Wetland Functions and Management Categories. As noted earlier, scientific understanding of the indicators of wetland functions has advanced considerably in the 20 years since function-based management categories were first assigned to Juneau's wetlands. In some states, government agencies are required to use best available science and to update their wetland ordinances and management plans accordingly. Although we made some preliminary efforts to update the technical criteria used in Juneau's Wetland Management Plan, a significantly greater effort is required that would involve an expanded literature review, an intensified GIS effort, inclusion of components of a hydrogeomorphic (HGM) method for southeast Alaska (Powell et al. 2003), and peer review by many resource scientists from throughout southeast Alaska. Estimated cost: ~$80K (1 year). Add ~$120-160K and 1 year if field validation using scientific measurements of functions is desired.

3. Function Rating of More Juneau Wetlands. The present function criteria, or preferably the ones modified as described above, should be applied at a minimum to additional potentially-developable parcel units throughout the City-Borough of Juneau once a preliminary delineation of their wetlands has been conducted. Estimated cost (excluding delineations): ~$50-100K depending on number of parcels. Ideally, the improved criteria should be applied as well to all accessible wetlands throughout Juneau that were rated in 1987, plus estuarine and near-estuarine areas (uplift meadows) whose area and characteristics have changed as a result of glacial rebound. Estimated additional cost: ~$50K-150K (excluding any new delineations) depending on number of the original wetlands that can be accessed.

4. Categorization of Riparian Segments by Level of Functions Performed. Many riparian areas along streams in Southeast Alaska are of extreme importance, but most current regulations consider all stream segments to be of equal function and value, or categorize them only broadly. An expanded effort is needed to develop a rapid method that could be used to pinpoint which segments contribute the most and least to the overall functioning of Juneau's stream systems, and consequently, where regulations and landowner incentives might be intensified or relaxed, e.g, buffer zone widths. Estimated cost: ~ $60K (0.5 year) to develop the method plus ~$50K-$150K to apply throughout Juneau. Add ~$120-140K and 1 year if field validation using scientific measurements of functions is

desired. Validation with regard to determining pollution removal effectiveness of alternative buffer widths is highly recommended because the alternative is to rely on buffer width recommendations from parts of the United States that have conditions very different from those of southeast Alaska.

5.0 Literature Cited

Adamus Resource Assessment, Inc.(ARA) 1987. Juneau Wetlands: Functions and Values. Report to the Community Development Department, City and Borough of Juneau, AK.

Community Development Department (CDD), City and Borough of Juneau. 1997. Revised City and Borough of Juneau Wetlands Management Plan. CDD, Juneau, AK.

Powell, J, D. D'Amore, R. Thompson, T. Brock, P. Huberth, B. Bigelow, and M.T. Walter. 2003. Wetland functional assessment guidebook operational draft guidebook for assessing the functions of riverine and slope river proximal wetlands in coastal Southeast & Southcentral Alaska using the HGM approach. Report to the Alaska Dept. of Environmental Conservation, Juneau, AK.

Reed, P.B, Jr. 1988. National List of Plant Species That Occur in Wetlands: 1988 National Summary. Biological Report 88(24). U. S. Fish and Wildlife Service, Washington, DC.

U.S. Army Corps of Engineers. 1987. Corps of Engineers Wetland Delineation Manual. Technical Report Y-87-1, US Army Waterways Experiment Station, Vicksburg, MS.

U.S. Army Corps of Engineers. 2006. Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region. ERDC/EL TR-06-3. Environmental Laboratory, US Army Engineer Research and Development Center, Vicksburg, MS.

USDA Soil Conservation Service (NRCS). 1974. Soils of the Juneau Area, Alaska.

Appendix A. Wetland Indicators Used to Rapidly Assess the Relative Capacity of Wetland Functions

#	Rapid Indicator of Wetland Function(s)	Conditions Assessed
C4	geomorphic setting	most of the wetland is: M= muskeg-bog; AF= alluvial fan; AC= avalanche chute; S= on another slope type
C5	slope position	TS= within 100 ft of toe of slope >20% (and that area is larger than wetland), MS= midslope or bench; P= plateau or topslope; F= lowland flat
C6	wetland gradient (slope)	Median slope within the wetland polygon is L= <7%; M= <15%; H= >15%
C7	mapped soil type predominating in wetland is a peat	Y= yes, N= no
C8	mapped soil type predominating upslope is a peat	Y= yes, N= no
C9	tidal influence	Y= yes, at any time of year & regardless of salinity; N=no
C10	fish access to any part of wetland	P= perennial (year-round), S= seasonal, 0= never
C11	nearest downhill proximity to a stream	PI= intersects perennial, Ei= intersects ephemeral, P50= within 50 ft of perennial, P200= within 200 ft of perennial, Ei50=within 50ft of ephemeral, Ei200=within 200 ft of ephemeral, NS= no stream intersected or within 200 ft [select the one that represents the closest & most perennial]
C12	annual floodplain	FP= a river or stream overtops its banks and flows into >10% of the vegetated part of the wetland at least once during most years; 0= not true
C13	water level fluctuation	during most years the difference between high (winter) and low (late summer) surface water levels in portions of the wetland that are flooded only seasonally is: H= >1 ft, M= 0.5 to 1 ft, L= < 6 inches fluctuation
C14	stream habitat quality	0= no perennial stream intersects the wetland; L= perennial stream has <20% pools, little or no instream woody debris, AND >90% of banks lack underwater or low overhanging vegetation or undercut; M= not L or H; H= perennial stream has >70% pools/ponded area,>30% of bank length has underwater or low overhanging vegetation or undercut
C15	seasonally ponded water: maximum extent annually	S= <10% of wetland; M= 10-50%; H= >50%
C16	perennial ponded water (nearest proximity to)	Perennial Ponded Water (or any tidal or lake): PW= >1 acre within or adjoining wetland, P500= >1 acre within 500 ft, P1= > 1 acre within 1 mile, 0= none of these criteria met
C17	pit-mound topography	T25H= >25% of wetland has severe (4+ ft vertical) topographic irregularity, e.g, holes from upturned trees (root masses), boulders, upland inclusions, hummocks, incised channels; T25L= >25% of wetland has mild topographic irregularity, e.g, shallow pools, depressions, downed logs, tussocks; T1H= 1-25% of wetland has severe (4+ ft) topographic irregularity, e.g, holes from upturned trees, boulders, upland inclusions, incised channels; T1L= 1-25% of wetland has mild topographic irregularity, e.g, shallow pools, downed logs, shallow channels; 0= wetland has very little or no microtopographic variation
C18	tree extent	Canopies of woody plants taller than 20 ft occupy: T90= >90% of wetland area or streambank length; T50= 50-90%, T1= 1-50%, 0= none

#	Rapid Indicator of Wetland Function(s)	Conditions Assessed
C19	alder extent	Alder occupies: A90= >90% of wetland area or streambank length; A50= 50-90%, A1= 1-50%, 0= none
C20	deciduous woody (extent of all)	All deciduous shrubs & trees together occupy: D90= >90% of wetland area or streambank length; D50= 50-90%, D1= 1-50%, 0= none
C21	moss extent	Sphagnum moss (obligate species only) occupies: M90= >90% of wetland area or streambank length; M50= 50-90%, M1= 1-50%, 0= none
C22	number of vegetation forms that occupy >10% of wetland	Forms are: Evergreen trees (hemlock), Deciduous trees, Evergreen shrubs, Deciduous shrubs, Graminoids, Herbs, Moss/Liverwort. Enter H, M, or L, where H= 6 or 7 forms; M= 4-5; L= <4
C23	canopy contrast	CC= wetland (in whole or part) is surrounded completely by forest more extensive than the wetland and part of the wetland is mainly graminoids, herbs, moss, and/or water that create a large (>1 acre) gap in that forest canopy, OR, wetland is mainly an island of woody vegetation that is surrounded completely by upland graminoids, herbs, moss; 0= not true
C24	diameter of largest wetland tree	Diameter of the largest standing live tree (FAC or wetter) within wetland is: BT= >40 inches; MT= >20 inches; LT= <20 inches, or no trees present
C25	contiguity to wooded tract >250 acres	Y= yes, N= no
C26	developed extent uphill	Percent of wetland perimeter, or of uphill contributing basin within 200 ft, that is pavement, buildings, lawn, recent logging slash without canopy, or bare artificially-disturbed soil: H= >20%, M= 5-20%; L= <5%
C27	distance to residence (from center of wetland)	Distance from center of wetland to nearest residence: N= <100 ft, M= 100-1000 ft, F= >1000 ft
C28	ditches & roads	Y= there are roadside ditches within 100 ft of wetland that empty into it, or there is a road within 100 ft of the wetland edge in an uphill direction; 0= none
C29	non-native plants	non-native species in the wetland: 0= are absent; L= present but comprise <10% of the vegetated area; H= comprise >10% of the vegetated area
C30	trails	H= developed hiking trails go to or near (within 100 ft of) wetland and wetland is within 0.5 mile of trailhead ; M= trails go to or near wetland but wetland is farther from trailhead; L= no trails within 100 ft of wetland but wetland is within 0.5 mile of a road; 0= no hiking trails go to or near the wetland and wetland is >0.5 mile from road
C31	ownership	C= city-borough, or private with limited public access allowed; P= private with public access prohibited
C32	extent of recreational use from survey results	Pertains to nearest wetland if this particular wetland was not assessed in 1987
C33	Public Preference (PP) for nearest wetland	Quintile rank for the wetland's PP as reported in Appendix D of the 1997 Juneau Wetlands Management Plan; 1= preservation, 4= development; THESE MAY NOT BE VALID IF THE WETLAND IS DIFFERENT THAN THE ONE ASSESSED IN 1997
C34	Practicable Alternatives (PA) for nearest wetland	Quintile rank for the wetland's PP as reported in Appendix D of the 1997 Juneau Wetlands Management Plan; 1= abundant alternatives within uplands of the same zoning category, 4= scarce alternatives within uplands of the same zoning category

Appendix B. Function Assessment Data Matrix for the Visited Wetlands

Note: The following variables are not shown in the table below: tidal influence (C9, all sites were non-tidal), contiguity to wooded tract >250 acres (C25, all sites were contiguous), developed extent uphill (C26, all were "low"), ditches & roads (C28, all were "none"), non-native plants (C29, all were "none"), ownership (C31, all were public), prior rating for Recreation- Actual (C32, see 1997 Plan), Public Preference (C33, see 1997 Plan), Practicable Alternatives (C34, see 1997 Plan).

		Geom	Posit	Slope_	Peat	PeatUp	Access	StrTyp	Floodp	Flux	HQ	Seas	Peren	PitM	Tree	Ald	Decid	Moss	NumV	Can	Dbh	ResD	Trail
Parcel	#	C4	C5	C6	C7	C8	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C26	C30
1	28	AF	TS	L	Y	N	P	P1	O	H	M	S	P1	T25H	T1	A1	D1	O	M	O	MT	M	H
1	30	S	MS	L	Y	N	O	P200	O	L	O	M	P1	T1H	T50	O	D1	O	M	O	LT	N	H
1	31	AF	MS	L	Y	N	O	P50	O	L	O	S	P1	T1L	O	A50	D50	O	L	CC	LT	M	H
1	48	AF	TS	L	Y	N	S	Ei	FP	H	H	H	P1	O	O	A1	D1	O	L	CC	LT	M	L
1	49	AF	TS	L	Y	N	O	Ei	FP	H	H	H	P1	O	O	A1	D1	O	L	CC	LT	M	L
2	7	S	TS	M	Y	Y	O	Ei	O	L	O	S	P1	T25H	T50	A1	D1	M1	H	O	LT	N	L
2	23	S	TS	M	Y	Y	O	Ei	O	L	O	S	P1	T1H	T50	A1	D1	O	M	O	LT	N	L
2	24	S	MS	M	Y	Y	O	NS	O	L	O	S	P1	T1H	T1	A1	D1	M50	M	CC	LT	M	L
2	26	M	P	M	Y	Y	O	NS	O	L	O	S	P1	T1H	T1	A1	D1	M50	M	CC	LT	M	L
2	27	M	P	M	Y	Y	O	NS	O	L	O	S	P1	T1H	T1	A1	D1	M50	M	CC	LT	M	L
3	15	S	TS	M	Y	Y	O	Ei	O	L	M	S	P1	T1L	T50	O	D1	O	M	O	LT	F	L
3	32	S	TS	M	Y	Y	O	Ei	O	L	O	S	P1	T1L	T1	O	D1	M50	M	CC	LT	F	L
3	33	S	MS	H	Y	Y	O	NS	O	L	O	S	P1	T1H	T50	O	D1	M1	M	O	LT	F	L
3	34	S	MS	H	Y	Y	O	P50	O	L	O	S	P1	T1H	T50	O	D1	M1	M	O	LT	F	L
3	35	M	MS	M	Y	Y	O	P50	O	L	O	S	P1	T1L	T1	O	D1	M50	M	CC	LT	F	L
3	36	M	TS	M	Y	Y	O	Ei	O	L	O	S	P1	T1L	T1	O	D1	M50	M	CC	LT	F	L
3	38	M	MS	M	Y	Y	O	Ei	O	L	O	S	P1	T1L	T1	O	D1	M50	M	CC	LT	F	L
3	39	M	MS	M	Y	Y	O	Ei	O	L	O	S	P1	T1L	T1	O	D1	M50	M	CC	LT	F	L
3	40	M	TS	M	Y	Y	O	P50	O	L	O	S	P1	T1L	T1	O	D1	M50	M	CC	LT	F	L
4	5	M	P	M	Y	Y	O	NS	O	L	O	S	P1	T1L	T1	O	D1	M50	H	CC	LT	M	L
4	6	M	P	M	Y	Y	O	NS	O	L	O	S	P1	T1L	T1	O	D1	M50	H	CC	LT	M	L
4	14	S	TS	M	Y	Y	O	NS	O	L	O	S	P500	T1H	T50	O	D1	O	M	O	BT	M	L
5	58	AF	TS	L	N	N	S	P50	FP	M	M	H	P1	T1L	O	A1	D50	O	L	CC	LT	M	H
5	59	AF	TS	L	N	N	S	P50	FP	M	M	H	P1	T1L	O	A1	D50	O	L	CC	LT	M	H
6	10	S	MS	H	Y	Y	O	P50	O	L	O	S	P1	T1H	T50	O	D1	M1	M	O	LT	M	L
6	11	S	MS	H	Y	Y	O	Ei	O	L	O	S	P1	T1L	T1	O	D1	M1	M	CC	LT	F	L

		Geom	**Posit**	**Slope_**	**Peat**	**PeatUp**	**Access**	**StrTyp**	**Floodp**	**Flux**	**HQ**	**Seas**	**Peren**	**PitM**	**Tree**	**Ald**	**Decid**	**Moss**	**NumV**	**Can**	**Dbh**	**ResD**	**Trail**
6	12	S	MS	H	Y	Y	O	Ei	O	L	O	S	P1	T1H	T50	O	D1	M1	M	O	LT	F	L

Parcel	#	Geom	Posit	Slope_	Peat	PeatUp	Access	StrTyp	Floodp	Flux	HQ	Seas	Peren	PitM	Tree	Ald	Decid	Moss	NumV	Can	Dbh	ResD	Trail
		C4	C5	C6	C7	C8	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C26	C30
6	13	S	MS	H	Y	Y	P	P50	O	L	M	S	P1	T1H	T50	O	D1	M1	M	O	LT	F	L
7	1	S	TS	M	Y	N	S	NS	O	L	M	S	P1	T1H	T50	O	D1	O	M	O	MT	M	L
7	3	M	TS	M	Y	N	S	P50	O	L	M	S	P1	T1L	T1	O	D1	M50	M	CC	LT	M	L
8	29	M	MS	M	Y	N	O	NS	O	L	O	S	P1	T1L	T1	O	D1	M1	L	CC	LT	F	L
8	56	M	TS	M	Y	N	O	NS	O	L	O	S	P1	T1L	T1	O	D1	M1	M	CC	LT	F	L
8	57	S	MS	M	Y	N	O	NS	O	L	O	S	P1	T1H	T1	O	D1	O	M	CC	MT	F	L
9	16	S	MS	H	Y	Y	O	E200	O	L	O	S	P1	T1L	T1	O	D1	M1	M	CC	LT	M	L
9	17	S	MS	H	Y	Y	O	NS	O	L	O	S	P1	T1L	T1	O	D1	M1	M	CC	LT	F	H
9	22	S	TS	M	Y	Y	O	NS	O	L	O	S	P1	T1L	T50	A1	D50	O	M	O	MT	M	H
11	8	AF	TS	L	N	N	S	PI	FP	M	M	M	P1	T1H	T90	A1	D1	O	M	O	BT	M	H