EVALUATING LAND USE REGULATIONS IN THE FRASER RIVER ESTUARY

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About this Report

This report was produced as part of the UBC Sustainability Scholars Program, a partnership between the University of British Columbia and various local governments and organizations in support of providing graduate students with opportunities to do applied research on projects that advance sustainability across the region. This project was conducted under the mentorship of West Coast Environmental Law staff. The opinions and recommendations in this report and any errors are those of the author and do not necessarily reflect the views of West Coast Environmental Law or of the University of British Columbia.

Acknowledgements

The work for this project took place on the unceded ancestral lands of the xwməθkwəy̓əm (Musqueam), Skwxwú7mesh (Squamish), Stó:lō and Səl̓ílwətaʔ/Selilwitulh (Tsleil-Waututh) Nations, and studies settler colonial land use regulations within these lands, as well as the traditional and unceded territory of the QayQayt, Kwantlen, q̓ic̓əy̓ (Katzie), Semiahmoo, Tsawwassen, and kʷikʷəƛ̓əm (Kwikwetlem) First Nations**.** Many other nations also frequented the sites within this study area, a testament to the abundance of this estuary; abundance that was governed for thousands of years by Indigenous peoples. Efforts to revitalize the Indigenous laws that govern these lands and waters are underway across the province.

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Executive Summary

Over 150 years of colonial development have seriously harmed the ecological health of the Fraser estuary through destruction, harmful modification and pollution of its lands and waters. Colonial laws and regulations have largely enabled and facilitated harmful activities without adequate attention to ecological consequences for the estuary. The consequences of such activities have been immense. In the lower Fraser River, "85% of the wetlands and floodplain have been lost to diking, draining and ditching, 64% of the streams have been lost or are inaccessible because of dams, floodgates and road culverts, and surrounding forests have been logged" (Chalifour 2022). As a result, 102 species are at risk of extinction in the Fraser River estuary (Kehoe et al 2021). Colonial laws have also supported the forcible displacement of Coast Salish peoples, along with their Indigenous laws and management practices that had supported successful and sustainable management of human activities in the estuary for millennia.

Efforts to rehabilitate the estuary have mainly focused on addressing large, visible problems (such as jetties blocking habitat; see Scott 2022) or those linked to identifiable sources of pollution (such as the upgrade of the Iona Wastewater Treatment Plant to secondary/tertiary liquid waste treatment), but this is only part of the overall picture, which includes "death by a thousand cuts" through many smaller developments and activities that chip away at overall ecological health.

This report focuses on one component of "routine" planning and management in the estuary by examining existing land use designations and regulations for shorelines in the estuary. This was selected as one step towards building a better understanding of how human activities – outside of larger projects and developments that are subject to environmental assessment processes – are currently managed in the estuary. It contains

an inventory of these land use regulations and related policies, including the characteristics of existing environmental protection, identification of the responsible authority, as well as a framework for how to evaluate the effectiveness of such policies in managing cumulative effects.

The objective of this report is to provide consolidated information about how shorelines are presently being managed in the estuary from the perspective of land use planning and regulation. From these findings, a next step will be the production of a map which contains each of these overlapping regulations, which will also allow for further spatial analysis of shoreline land use designation in the Fraser estuary. It is hoped that this can inform future environmental research and management efforts.

Key Findings:

Overall, this report finds that current land use regulations do not strongly align with the restoration and protection of the health of the Fraser estuary. Crucially, **very little shoreline within the study area is managed exclusively or primarily for habitat values.** While much of the shoreline is recognized as ecologically sensitive, and some of this area is subject to policies protecting important ecological features, most of these areas overlap with those zoned for industrial or residential developments, leading to limited protections overall. Moreover, even where requirements do exist to protect ecological integrity through the development process, **existing colonial land use policy has very weak protections that are hard to enforce on shorelines.** Further, these regulations do not take into consideration the environmental management principles of shifting baselines, cumulative effects, or adaptive management. This means that even those areas subject to additional environmental permitting processes have weak requirements, both in that they are not aligned with the most updated science on ecological management and that they

prove hard to enforce for municipalities. The result of these various land use plans is that **most of the shoreline of the Fraser estuary is not well protected and collaborative efforts are needed to improve the strength of this regulatory system.**

Audience for this report

This report is developed primarily for individuals and organizations working to improve the ecological health of the Fraser River estuary. The report is structured as an overview of all relevant land use planning authorities and their regulation of shorelines in the estuary. This report may also be useful to those conducting research or restoration in these places, who seek to either understand or strengthen these overlapping policies in various places along the shoreline.

Introduction

Like all rivers, the Fraser, or Sto:lo,[1] is defined by its connections. It brings water down from the Rocky Mountains to the Salish Sea, it brings salmon up to freshwater spawning grounds, and it has been and continues to be used to move people and materials across its expansive 1375 kilometers. Unlike most rivers, however, the scale of the Fraser watershed, river, and estuary make it one of the most trafficked and populated rivers – by both humans and other living things – on the west coast of North America. As an important part of Coast Salish territories, the Fraser estuary has long been known for its abundance, and has been governed by Indigenous people to support that abundance.

[1] Sto:lo is the Halq'eméylem name for the Fraser, and is a name widely used within this region.

Today, however, it is evident that over 150 years of colonial development have seriously harmed the Fraser estuary through the destruction, degradation, and pollution of its ecosystems. Successful and sustainable Indigenous governance mechanisms and Indigenous peoples themselves have been displaced by colonial laws and settlers. Further, while it is well understood that development has dramatically changed the ecological health of the estuary, decision making continues to be siloed across jurisdictions without reference to the cumulative impacts on the estuary and without reference to maintaining or restoring ecological health in the estuary. Recently, however, Indigenous groups have been working to change this, including by requesting a full regional environmental assessment of the Salish Sea (Ngo 2022).

This report does not attempt to do justice to the extent of ecological richness, nor historical conflicts over protection, within this area; it takes as a given that the estuary requires significantly increased protection and restoration, to the benefit of all those who call the estuary home. Taking this as a starting point, this report focuses on the regulations that govern land use and land use change within this region, with the objective of improving management coordination and informing ecological governance at this primary level of regulation. Land use is a particularly important frame through which to understand the existing governance in the estuary, as these regulations determine (1) **what** types of development activities can occur within their boundaries and **where**; (2) **how** these developments are expected to consider and mitigate their impact on the estuary; and (3) **who** is responsible for establishing land use regulations and their application and enforcement. Unlike some other human activities with impact on the estuary (such as fishing or recreating) these activities on the shoreline can have an enduring impact upon the crucial and (now) rare shoreline habitats upon which the health of the estuary ecosystem depends. Taking stock of existing land use regulations can provide input to future work to assess ecological harm related to shoreline habitat loss and modification

and measures needed for rehabilitation. Ultimately land use plans and regulations should be enforceable, science-based, and aligned with the long-term health of the estuary.

Background

Indigenous people, ecologists, and other concerned residents have long warned of the risks of habitat destruction and pollution to the long-term health of the Fraser estuary. These warnings began to be heard by the Canadian federal and provincial governments only once the abundance of estuary habitats had dropped significantly, and water pollution threatened the quality of life for all living things across this area. In 1976, the Federal and Provincial Ministers of the Environment initiated the Fraser River Estuary Study to respond to these issues, and to guide the collaborative management across the various government entities legally responsible for management and decision-making in various parts of the estuary. This initial study program was followed by the establishment of the Fraser River Estuary Management Program (FREMP), a multi-agency body tasked to work together to improve environmental management in the Estuary.[2] The management program was supposed to find ways "to improve environmental quality in the Fraser River Estuary while providing economic development opportunities and sustaining the quality of life in and around the estuary" (FREMP 1994, quoted in Langer 2019). This dual mandate – for economic development and environmental protection – was reflected in some improvements in environment management, including water quality and sewage treatment, and increased parks and Wildlife Management Areas. **But overall, the 'rich**

[2] These agencies included: Environment Canada, Fisheries and Oceans Canada, the Greater Vancouver Regional District, the BC Ministry of Environment, Lands, and Parks, the Fraser River Harbour Commission, and the North Fraser River Harbour Commission.

productivity of the Estuary's ecosystem' has become further imperiled, while economic development has continued. This can be seen in the precipitously declining salmon returns and the 102 threatened species within the estuary (Kehoe et al 2021). It can be seen in the 85% of historical salmon habitat that is estimated to be lost, with remaining habitats being only selectively accessible (Finn et al 2021), only a third of marsh habitat compensation projects deemed successful (Lievesley et al 2016). It is clear from these numbers that while economic development has continued apace, environmental protection has not been achieved.

Why has the latter of these dual mandates not been upheld as recommended in studies that led to the formation of FREMP, and became one of its objectives? FREMP itself was disbanded in 2013, but even during its existence it did not have any independent authority to limit economic development in the estuary.[3] Regarding land use regulation for the shoreline, specifically, which is the focus of this report, FREMP introduced a color-coded habitat classification system that was intended to direct development away from sensitive shoreline areas, but this was not compulsory for any government authority to adopt. As well, there is currently no federal or provincial government entity that collectively monitors shoreline conditions for the estuary. Similarly, there is no tracking of the impacts of shoreline activities that are permitted by existing land use regulation.

This is a significant gap in environmental management in the estuary, which may be contributing to "death by a thousand cuts" for the health of the Fraser estuary. Harmful

[3] While the FREMP secretariat did not have the power to change policies or make decisions, it did work to create knowledge about the state of the estuary and make some aspects of environmental permitting collaborative. Without decision-making authority, however, it mostly served to bring individuals from different agencies together.

impacts may include losses or changes to habitat, and habitat connectivity, for example. This report seeks to inventory these regulations to support further analysis of how they may be contributing to cumulative effects in the estuary.

Approach and Next Steps

This report aims to identify what regulations are governing land use along the shoreline in the Fraser estuary and provide a framework to assess their effectiveness, in principle, in protecting the ecological health of the estuary. The report catalogues land use regulations at different levels of coastal jurisdiction within the study area (an infographic describing these various jurisdictions can be found in Appendix A). Following the original Fraser River Estuary Study/Management Program study area, this report considers its study area to extend along the Lower Fraser from where Kanata Creek meets the Fraser (in Maple Ridge) and the outlet of Pitt Lake to the estuary drop off in the Salish Sea, extending down to include Boundary and Semiahmoo Bays. The original study area included land that was "outside the sea and river dykes and approximately 1,000 metres of waterfront lands behind the dykes." Consistent with FREMP's parameters, this report's emphasis is on the land use designation for parcels proximate to the foreshore or the sea or river dikes: land use regulations within the shoreline (usually defined as 15 meters from the high-water mark) and foreshore (defined as the boundary from the high-water mark of the river to the low water mark of the river) of the Fraser estuary. Notably, the boundaries of these current designations will change with climate change, sea level rise, and dike subsidence, making the adaptive management of the shoreline an even more important area for renewed attention.

The inventory of these land use regulations and designations is meant to assist efforts to revitalize the ecological health of the Fraser Estuary by collecting information about

existing land use regulations, given that there is no overarching (i.e. estuary-wide) coordination, oversight or standard for these regulations. This report also proposes a framework for the desktop evaluation of these regulations in terms of their potential effectiveness in protecting ecological health in the Fraser estuary. The findings of this report raise red flags that suggest further attention and assessment of actual conditions is warranted to understand current impacts and support future management and planning.

The maps within this report are drawn from various land use plans and planning authorities. They are included here as they appear in land use planning documents to make this report an immediately useful resource for those seeking to understand or reference the degrees of protection for different areas within the study area. Next steps from this report include contacting municipalities and agencies to gather shapefiles for each of the various layers of regulations and existing land uses. Once these are compiled in a single map (which can be updated to keep track of re-zoning and other regulatory changes) they will prove easier to use in practice and allow for further spatial analysis of the amount of land under protection in general, and under various degrees of protections. Each of the maps that is included within the body of this report indicates a set of GIS data to be requested from the appropriate authorities as a next step from this initial report.

CROWN LAND USE REGULATIONS IN THE FRASER RIVER ESTUARY

First Nations Rights and Title

This report identifies and evaluates colonial, i.e. federal, provincial and local, laws and regulations related to land use, but recognizes that this and other aspects of colonial law not considered here (e.g. environmental assessment, fisheries law, marine law) are only part of the legal picture in the Fraser estuary, which is in the overlapping and shared territories of multiple Coast Salish Indigenous nations[4] and has been governed according to their Indigenous laws for millennia. From a Crown/colonial law perspective, Indigenous rights and title are affirmed in s.35(1) of the Canadian Constitution, and in federal and provincial legislation implementing the United Nations Declaration on the Rights of Indigenous Peoples, although the reality is that there is much work to be done to realize these legal commitments.

Federal Land Use

Federal government lands within the study area include: the Port of Vancouver, the Vancouver International Airport, the George C. Reifel Migratory Bird Sanctuary, and the Alaksen National Wildlife Refuge. Under the *Fisheries Act*, the federal government also has authority over the management of all estuarine fish species, and responsibility for

[4] Within Metro Vancouver, the focus of this report, this includes Katzie First Nation, Kwantlen First Nation, Kwikwetlem First Nation, Matsqui First Nation, Musqueam Indian Band, Qayqayt First Nation, Semiahmoo First Nation, Squamish Nation, Tsawwassen First Nation, and Tsleil-Waututh Nation (Metro Vancouver 2022).

protecting fish habitat, which translates into a requirement to obtain an authorization for many activities occurring in the foreshore if they will harmfully impact fish or fish habitat.

Port of Vancouver

All images from Vancouver Fraser Port Authority (2020) unless otherwise noted.

The Port of Vancouver is a federal authority with a mandate under the *Canada Marine Act* and has its own ability to designate activities in the lands under its control. The Port lands are federal lands (Figure 1), though the Port has also leased land from the province previously.[5] The Port also maintains navigational authority along the waters within the study area. The land use plans shown below (Figures 3-7) indicate the current zoning of the

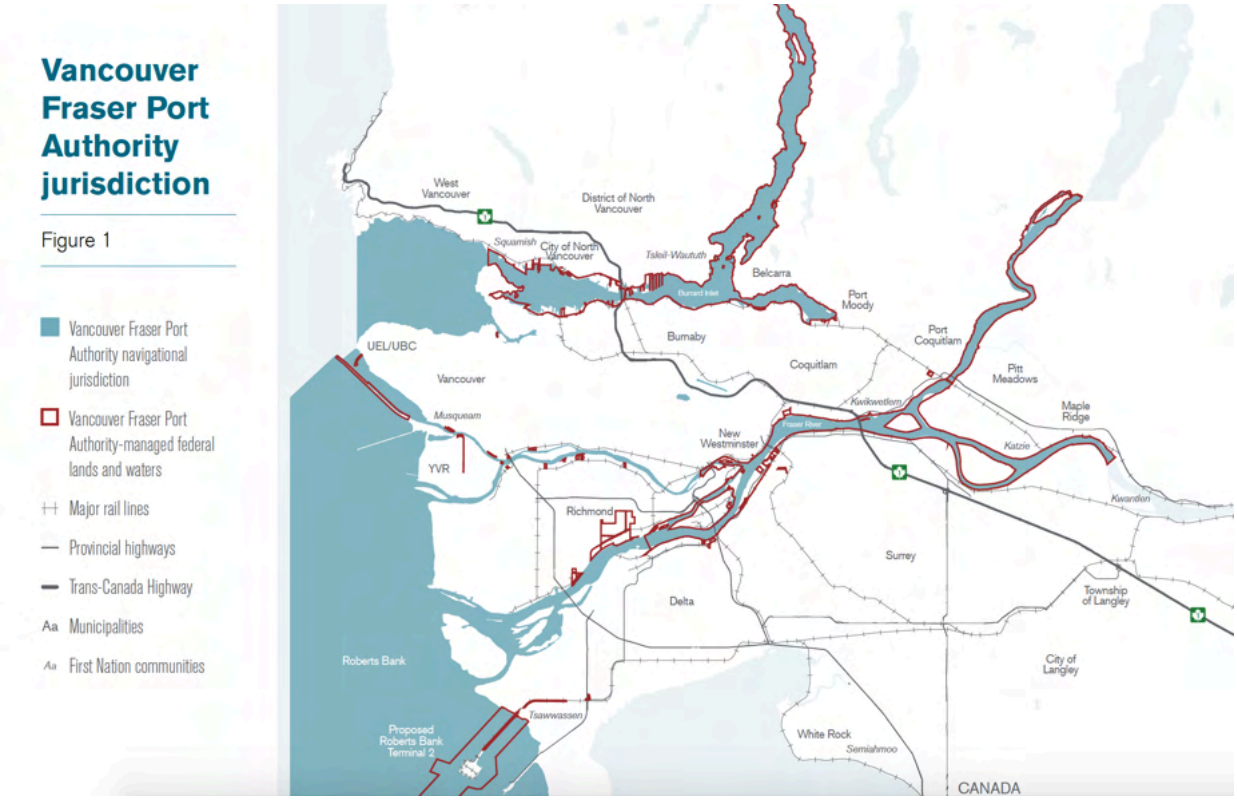

Figure 1. Vancouver Fraser Port Authority Jurisdiction.

[5] The Port of Vancouver previously held a lease from the province for lands and waters closer to the mouth of Fraser on the South Arm, but this land has since returned to provincial management.

Port of Vancouver lands and their acceptable uses for the areas that are located within the study area. These plans are "intended to convey the general distribution of land uses in each area and are not intended to identify the land use designations for specific sites," (Vancouver Fraser Port Authority 2020, p. 53) though more detailed land use maps are available through the Port of Vancouver's GIS data.[6] Figure 2 shows the general uses

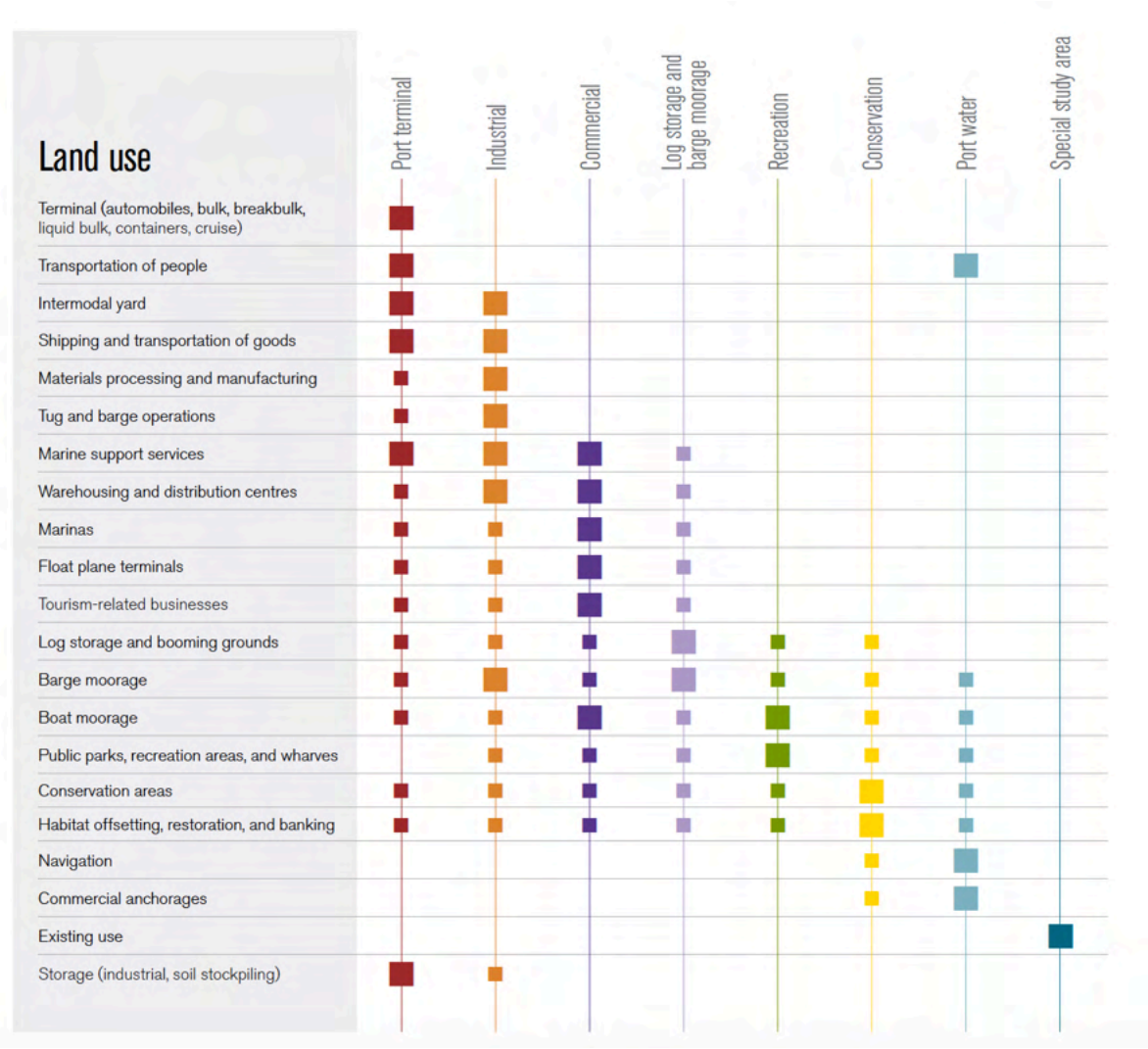

Figure 2. Port of Vancouver Primary and Conditional Land Uses.

[6] See Vancouver Fraser Port Authority 2022.

permitted within these land use designations – both the primary land use (represented by larger boxes) as well as the conditional land uses that may be permitted within those areas (smaller boxes). For example, under the land use designation of "Conservation" the primary uses are "Conservation areas" and "Habitat offsetting, restoration and banking," while the conditional uses of these areas include "Log storage and booming grounds, Barge moorage, Boat moorage, Public parks, recreation areas and wharves, Navigation, and Commercial anchorages." This figure demonstrates how land use designations don't always describe all potential or permitted uses of the area.

Figure 3. Port of Vancouver Land Use Plan Key.

Notably, the Port of Vancouver Land Use Plan expresses concern over the loss of industrial land in this region and states its objective to develop more land along the shoreline. In addition to land use planning and regulations, the Port's projected expansion will have an impact on ecosystems beyond land development, given the increase in shipping traffic on the waters within the estuary, though this is outside the scope of this report. While all the Port's land use practices must comply with federal environmental regulations (e.g., the *Fisheries Act*), it is crucial to note that none of the municipalities within which the Port has land or jurisdiction over the foreshore have authority over the land use decisions made by the Port.

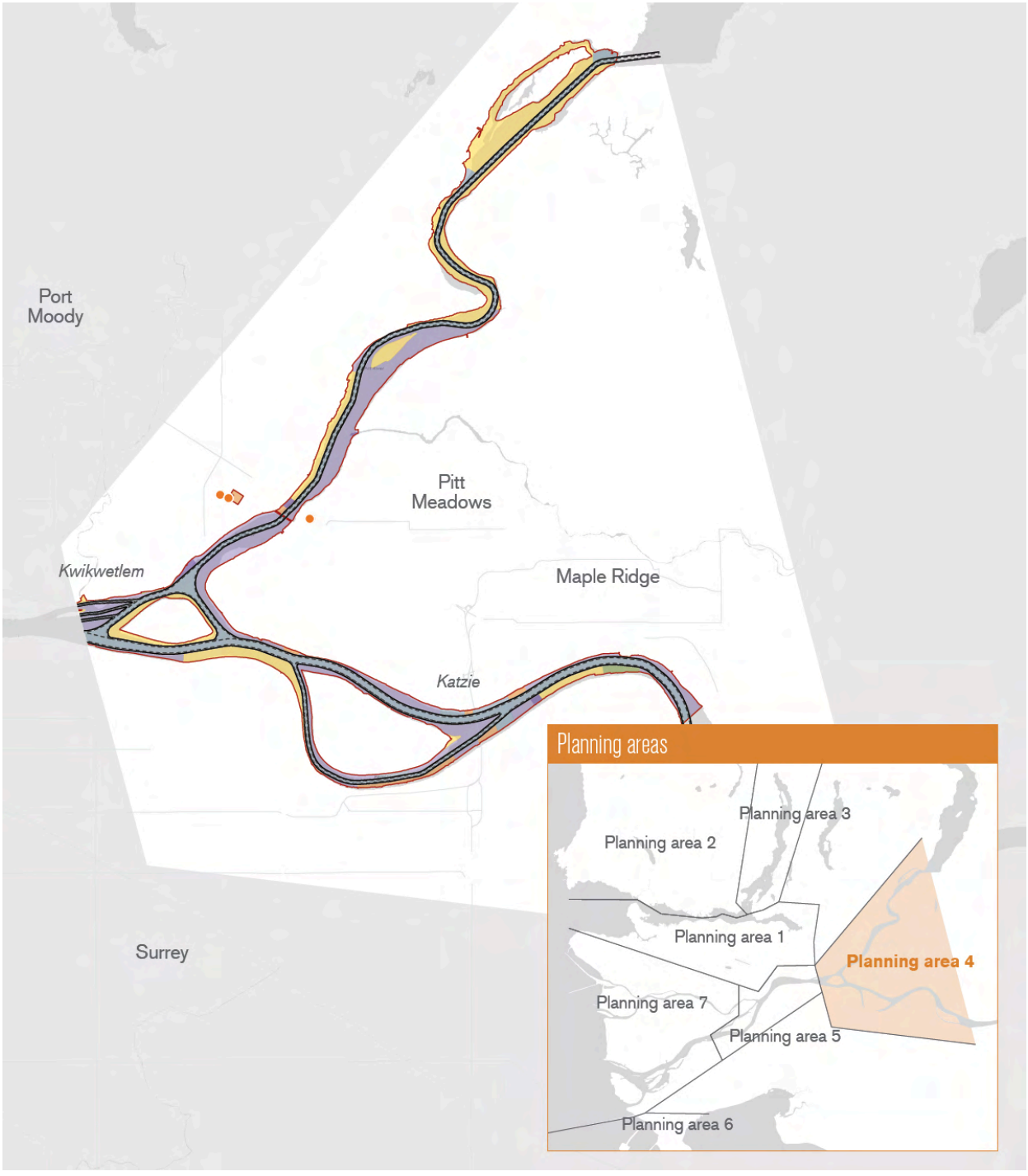

Figure 4. Port of Vancouver Planning Area 4.

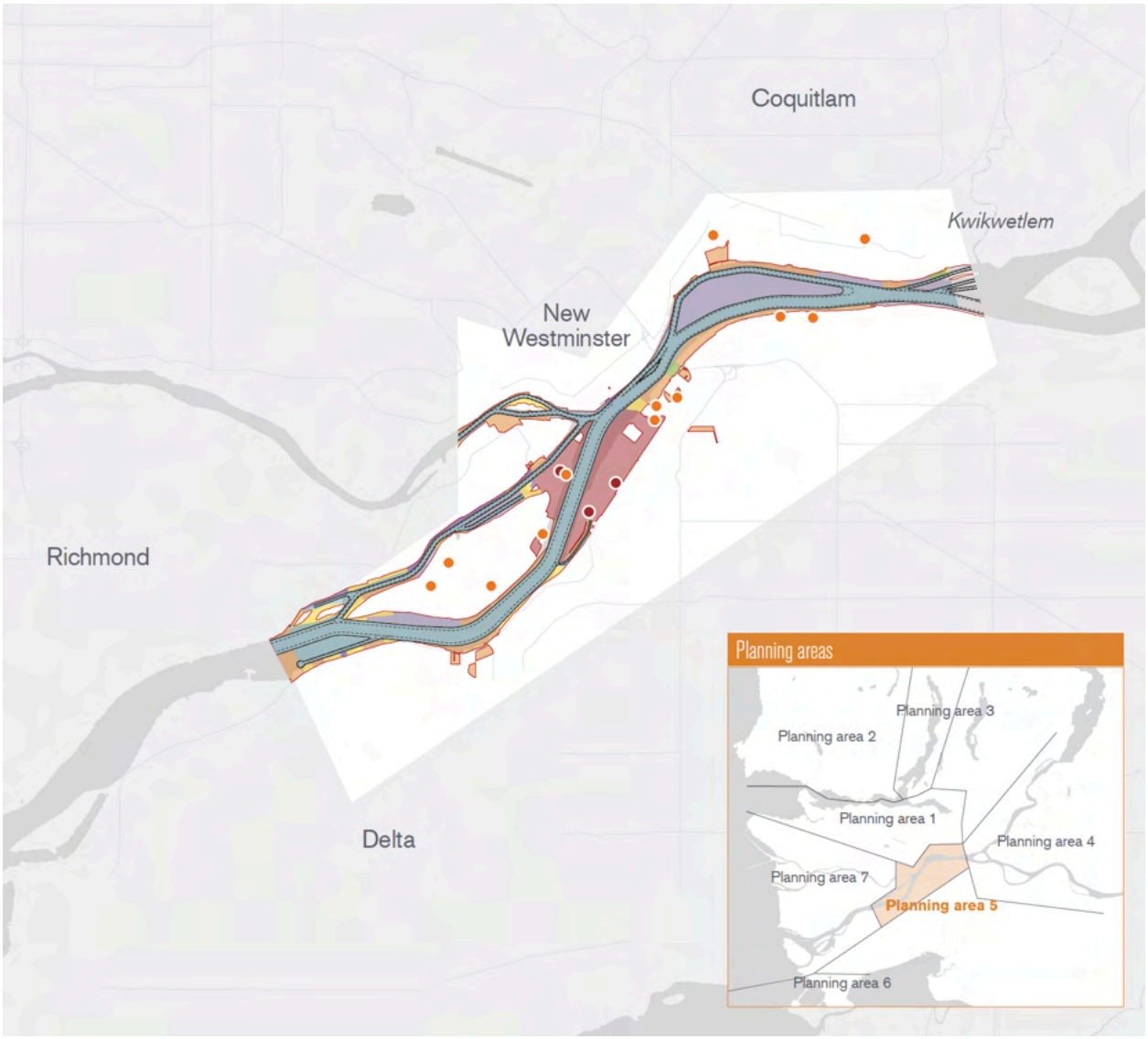

Figure 5. Port of Vancouver Planning Area 5.

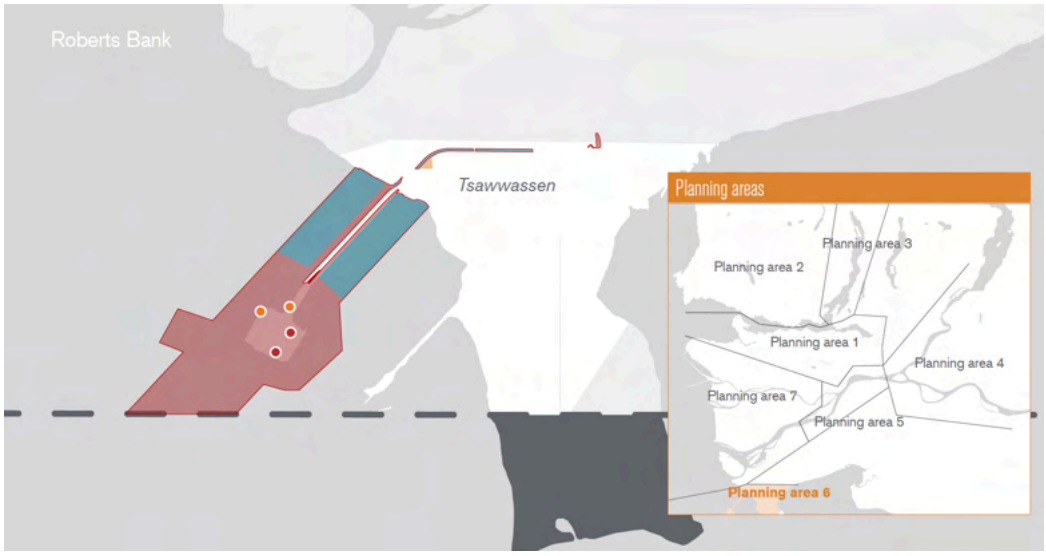

Figure 6. Port of Vancouver Planning Area 6.

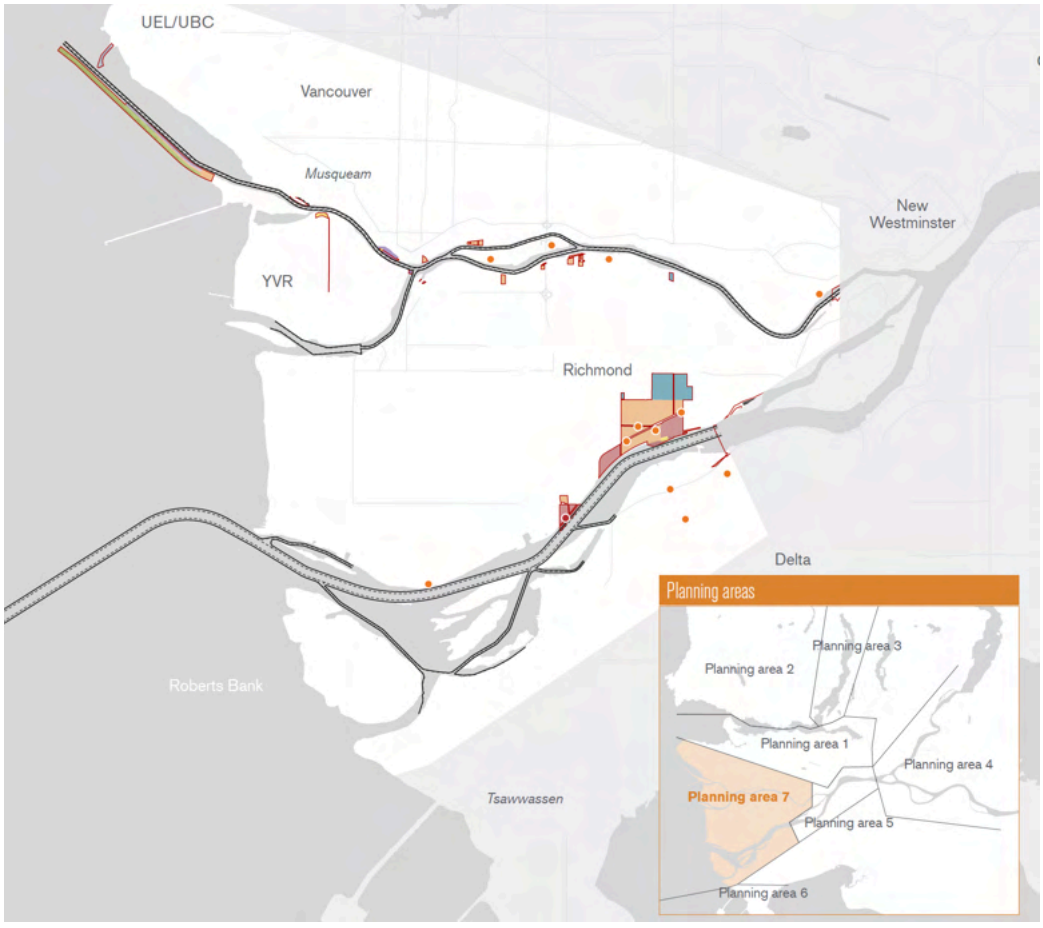

Figure 7. Port of Vancouver Planning Area 7.

Vancouver International Airport

Land Use Plan last updated 2022; all images from YVR (2022).

The Vancouver International Airport (YVR) is on federal lands, and as such the land use planning must be approved by the Canadian Ministry of Transport. The YVR 2037 Master Plan includes a land use strategy which was last amended in 2022 and can be seen below (Figure 8). Most significant for land use regulations in the case of this report are the small strips of recreation area along the dikes southeast of the airport; all else is highly developed. The potential foreshore runway is not expected to be needed until 2052, though it is unclear what environmental actions to protect the shoreline and foreshore would be required by the province, given that this extends into a provincial Wildlife Management Area. The Sea Island Conservation Area near the airport (to the North of the YVR boundary above) is also managed by Environment Canada to protect wildlife.

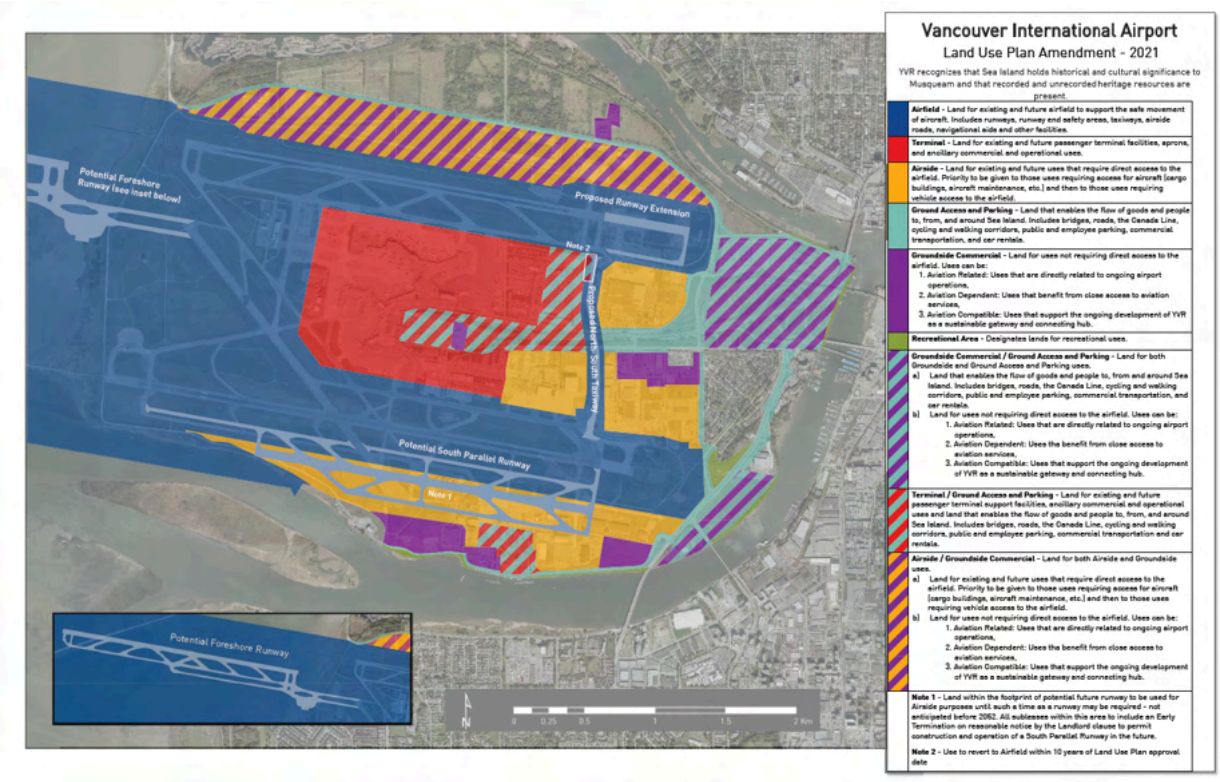

Figure 8. YVR Land Use Amendment 2021.

George C. Reifel Migratory Bird Sanctuary and Alaksen National Wildlife Refuge

The George C. Reifel Migratory Bird Sanctuary and the Alaksen National Wildlife Refuge (a combined management unit) are federally managed conservation areas. A large portion of Alaksen is managed as a farm, which the Federal government says serves a similar ecological function as the seasonally flooded wet meadows which used to be present throughout the estuary (Environment and Climate Change Canada 2022). As one of the only protected areas in the study area, this area is significant in that the proposed management plan states that:

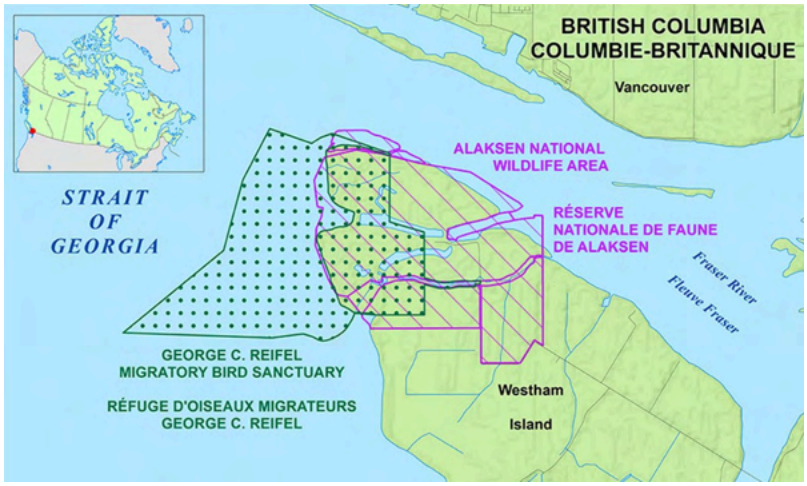

Figure 9. Alaksen and Reifel Areas.

> "*To protect important wildlife values, all activities within the Alaksen NWA are restricted unless otherwise permitted. Agricultural activities are permitted under specified conditions laid out in individual agreements and permits between each farmer and the Canadian Wildlife Service. Additionally, walking on designated dyke trails within the NWA during regular business hours is allowed" (Ibid).*

This is a strong degree of protection compared to other conservation areas within the estuary. As a Party to the Ramsar Convention on Wetlands, the Government of Canada has designated the Fraser River Estuary as Wetland of International Importance and agreed to manage it as such. The site is made up of six disparate protected areas governed by separate jurisdictions: Burns Bog (City of Delta) Sturgeon Bank, South Arm Marshes, Boundary Bay, Serpentine (Provincial) and Alaksen National Wildlife Refuge (Federal).

Provincial Land Use

As confirmed by the *Reference Re: Ownership of the Bed of the Strait of Georgia and Related Areas*, the lands below the waters within the Strait of Georgia are the property of the province under Crown law. This is reflected in the designation of various protected areas for wildlife and habitat in the foreshore and nearshore areas of the Fraser estuary (Figure 10). BC Crown Land is governed under the *Land Act*. Unlike municipal governments and the Port of Vancouver, the province does not create land use plans. The province instead issues permits for what it deems acceptable uses of Provincial Crown Land, using a framework of evaluative policies to determine if the permit will be granted.[7] The result is a system that is primarily administrative and without overall management or coordination, especially without consideration of cumulative effects from the various permits that are issued.[8]

[7] These uses, as they apply to the estuary and shoreline, include: community and institutional use, commercial, industrial, general industrial, floating home communities, and log handling. For more information about what the province permits on its lands, see Province of British Columbia 2022a.

[8] The only element of Provincial Crown Land Use Policies that addresses cumulative effects is a requirement that "Disposition of Crown shoreland is to be limited such that a minimum of 25% of the shoreland around each water body is to be retained in public use to ensure protection of beaches and other public recreational opportunities. This is over and above the public road access to the waterfront provided for in subdivision plans" (See FLNRO 2021).

Under section 4 of the *Wildlife Act*, Wildlife Management Areas (WMA) are designated by the province and managed by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (Province of British Columbia 2022b). These areas are supposed to have management plans, however, follow through on these plans has been uneven (for example, the Boundary Bay management plan was drafted in 1993 but never fully completed; part of this confusion may be due to unclear jurisdiction of the Province over marine areas, though the Province is presently developing a coastal strategy). There are 7 provincial Wildlife Management Areas (WMAs) in this study area. These include Sturgeon Bank WMA (5,152 ha), Roberts Bank WMA (8,770 ha), South Arm Marshes WMA (937 ha), Boundary Bay WMA (11,470 ha) Serpentine WMA (71 ha), Coquitlam River WMA (16.7), and Pitt-Addington Marsh WMA (2,972 ha). Each of these WMAs has different regulations regarding what activities are allowed, and some are managed in conjunction with conservation organizations and land trusts. The total hectares within a WMA within the study area is therefore around 29,388, with most of this area being with aquatic, tidal or estuarine areas. There is also the Annacis Island (2 ha), Surrey Bend (5 ha), and Coquitlam River (27 ha) Conservation Lands Complex. There are limited protected areas within the Fraser River estuary.

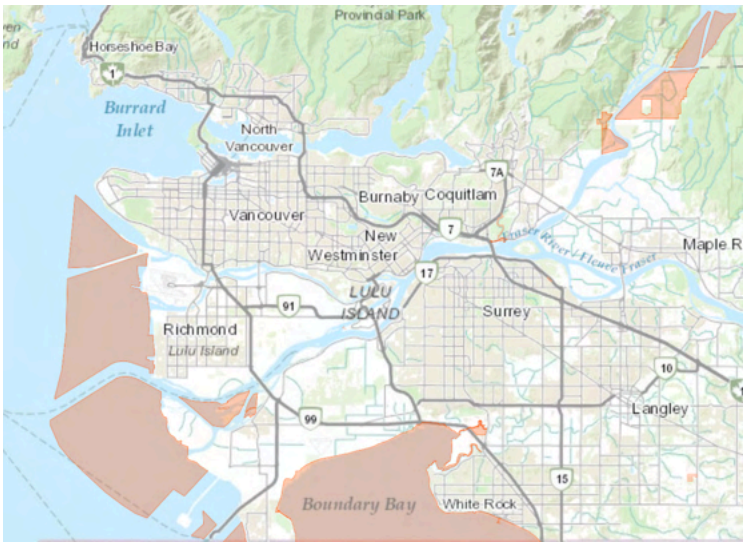

Figure 10. Provincial WMAs and Conservation Land Complexes.

See Figure 10 for a map of these areas, from the British Columbia Conservation Lands – WMAs and Administered Complexes Map (Government of BC 2022).

According to the BC Government:

> *"The primary management focus for conservation lands is conservation and management of fish and wildlife habitat. Other specific uses or activities may sometimes be accommodated on conservation lands if they are compatible with the conservation objectives for a site or represent pre-existing rights such as a utility right of way…written consent from the Ministry's appropriate Regional Manager under the Wildlife Act is generally required for any new use of land or resources in a conservation land. Uses or activities may also be constrained by related legal agreements or commitments such as leases, covenants, management agreements or government approved strategic* plans" (Province of British Columbia 2022c).

This means that while these areas are managed primarily as wildlife habitat, resource-based activities may be permitted within these areas (Ibid), unlike protected areas. According to the *Wildlife Act*, there are only four overarching regulations within WMAs: no camping, no campfires, no dogs in March or April, and dogs on leash during the rest of the year (*Wildlife Management Area Use and Access Regulation*).

Metro Vancouver

Metro Vancouver manages regional parks, which are areas of significant habitat within the estuary. The Regional Parks Plan was last updated in 2022. The Metro Vancouver Regional District also has 2040 Land Use Designations based on these plans, which can be accessed via the Metro Vancouver GIS data viewer (And as seen below in Figure 11). Official

Community Plans must be aligned with the Metro Vancouver Regional Growth Strategy, in addition to other objectives.

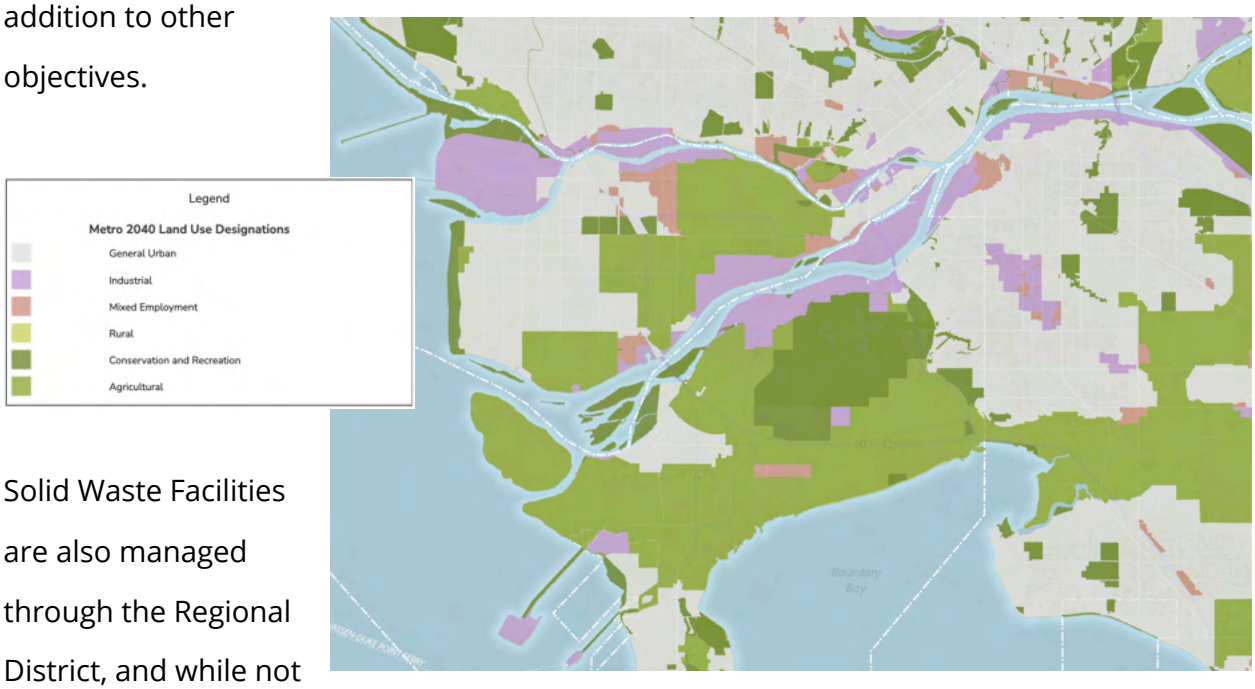

Figure 11. Metro Vancouver Land Use 2040.

Solid Waste Facilities are also managed through the Regional District, and while not strictly included under land use planning, it would be worth including within any final mapping outputs from this report, as their location may be of significance to ecological planners.

Municipal Land Use

The overarching tool for municipal land use planning is each municipality's Official Community Plan (OCP), which is passed as bylaw under the authority of the Province of British Columbia's *Local Government Act*. OCPs must also meet certain legislative requirements, for example on Green House Gas targets, housing policies, and alignment with the Metro Vancouver Regional Growth Strategy. Once an Official Community Plan is established and passed by city councils, all subsequent laws passed by the municipality should be consistent with this plan. However, OCPs can be amended on a case-by-case basis, by city councils, to allow for development that differs from the OCP land use

designations. When it comes to municipal land use policy, there are two overlapping regulations within Official Community Plans that determine how the land can be used and the ecological protections upon it:

1. Municipal Zoning

Municipal zoning indicates what the primary uses (including future uses) of parcels of land can be. A map with broad overall zoning for the lands found within the Study Area that are a part of Metro Vancouver is shown in Figure 11. When an area is zoned for a certain use, it means that new development within those parameters can be approved by municipal staff. This zoning is subject to changes in two ways: individual parcel rezoning applications and blanket rezoning. Individual parcels of land can be rezoned via application to city council, but this can be a long and contentious process, making development within existing zoning regulations preferable under certain conditions. While the rezoning process can be long and financially risky for developers, if successful it can be lucrative for both developers and municipalities. This is in contrast with blanket rezoning, in which large areas are rezoned all at once to make different land uses possible. This is to say that zoning is not a constant and can change in big and small ways through both overarching municipal policy and individual applications for changes to the bylaw.

2. Development Permit Areas

The *Local Government Act* also authorizes municipalities to issue Development Permits to meet certain objectives, including protection of the natural environment. Development Permit Areas (DPAs), where are-specific development permits are required, have special conditions which determine the objectives that must be met by land use change within those areas. Development within a DPA therefore requires an additional development permit before most building activities

(exceptions include new buildings on Agricultural Land Reserve land, for example). However, Development Permit Areas are additional to zoning, and cannot change the underlying zoning; the conditions of the DPA, even for ecologically sensitive areas, cannot change the zoning use. This means if an area is zoned as Industrial Land, but there is also an Ecologically Sensitive Area that requires a DPA, the stipulations attached to the DPA are intended to make the Industrial Development as aligned with environment protection as possible. DPAs therefore function to try to safeguard the natural environment (or cultural heritage, or hazard zones) while land use change or redevelopment is occurring. This is an important distinction when considering the strength of this tool for the protection of sensitive ecosystems.

The recommendations from the Fraser River Estuary Study included creating area designations for appropriate uses of the foreshore and site-specific development controls on the ecological impacts of this use. FREMP would later go on to create these area designations, which were meant to align municipal zoning with FREMP's objectives and were accepted by municipalities with varying degrees of success (See Figure 12 for differences between some of these municipalities, from Delta Civic Web 2022).

Despite their uneven uptake, these area designations continue to influence municipal policies such as zoning and DPAs today. In what follows, this report details the zoning and DPA plans for the shoreline of nine municipalities in the Study Area: Vancouver, Richmond, Burnaby, New Westminster, Coquitlam, Port Coquitlam, Pitt Meadows, Surrey, and Delta. The purpose of gathering this information is to understand what the current and future outlook of municipal land use change is, and to what extent there are considerations or regulations pertaining to ecologically sensitive areas. Though zoning outside of shorelines certainly does have an impact on the estuary, this report includes only those maps

pertaining to shoreline zoning and relevant DPAs. Again, maps from these municipalities are used for reference, though links to more granular spatial data are included where available.

Municipality	Date of agreement	Date agreement signed	Approach taken with respect to OCP	Rationale
Burnaby	May 10, 1993 Revised Oct 19, 1999	1993 (revised 1999)	OCP contains reference to spirit of area designations and intent to consider them in all planning activities. Extra set of compatible upland designations developed by municipality to complement foreshore designations.	Reference integrates Statement of Intent with OCP but does not require 4 readings in Council to make amendments
Coquitlam	Oct 19, 1999	2002 (partners signed in 2000)	Designation descriptions and map contained in OCP.	Municipality viewed this as an effective means to ensure foreshore considerations harmonized with upland planning activities.
New Westminster	Oct 19, 1999	2000	Designation descriptions and map contained in OCP.	Municipality viewed this as an effective means to ensure foreshore considerations harmonized with upland planning activities.
Richmond	July 24, 1991 Revised May 1, 2000	1991 (revised 2000)	1999 OCP review will amend OCP to reference Area Designation Statement of Intent as a supporting document that will be used in foreshore planning.	Reference integrates Statement of Intent with OCP but does not require 4 readings in Council to make amendments
Surrey	1997	n/a (partner signed in 2000 but Surrey did not)	Designation descriptions and map contained in OCP.	Municipality viewed this as an effective means to ensure foreshore considerations harmonized with upland planning activities.
White Rock	July 3, 1997	1997	Future OCP review will reference Statement of Intent as a supporting document that will be used in foreshore planning.	As White Rock was between OCP reviews, it felt that an agreement would be the quickest way to recognize consensus on foreshore uses.

Figure 12. FREMP Area Designations Statements of Intent.

Across the OCPs of the Study Area, there were no shoreline specific DPAs (as encouraged by initiatives such as the Green Shores Initiative). However, shorelines were frequently subject to several other DPA requirements, an overlap of Hazard DPAs (flood zones and steep slopes), and intertidal or watercourse protection DPAs. Below is an elaboration of each of these types of DPAs that cover the shorelines within these municipalities and what zoning overlaps with these areas that have been identified as ecologically important. While many OCPs include general policy objectives related to environmental protection, this report has an emphasis on the stipulations of the DPAs. Crucially, not all stipulations of each DPA are relevant for each site: rather, the city determines what is required of the development during the Development Permit Application process. Therefore, rather than listing all possible requirements of the DPAs, this report tries to describe the stated purpose of the DPA and includes examples of requirements where appropriate. A next step from this research is to compile this information into a map that can both (1) show practitioners what protections are in place for what parts of the remaining terrestrial estuary habitat and (2) use spatial analysis to understand what percentage of the shoreline is zoned for what kinds of development, and to what extent.

Vancouver

Vancouver Plan last updated 2022. Images from City of Vancouver (2018).

The City of Vancouver has its own charter and is therefore not subject to the same municipal legislation as other cities within the study area. As a result, Vancouver does not have an OCP, and they do not have any DPAs. However, in 2022, the City of Vancouver released the Vancouver Plan, which acts in some similar ways to an OCP. This plan marks all the shoreline of the North arm of the Fraser as an “ecological corridor, ecologically

sensitive zone," though these lands largely remain zoned as industrial or are rezoned to enable missing middle housing. This plan also proposes policies that will establish environmental setbacks around water bodies, "land use designations and development permit requirements for Ecologically Sensitive Zones to protect and enhance ecological functions" and ensure management plans for natural areas through collaboration with Vancouver's Host Nations (City of Vancouver 2022). The 2018 *Coastal Adaptation Plan – Fraser River Foreshore*, from the City of Vancouver shows the zoning for Vancouver's shoreline on the Fraser (which has been upheld by the Vancouver Plan); see Figures 13 and 14 (City of Vancouver 2018).

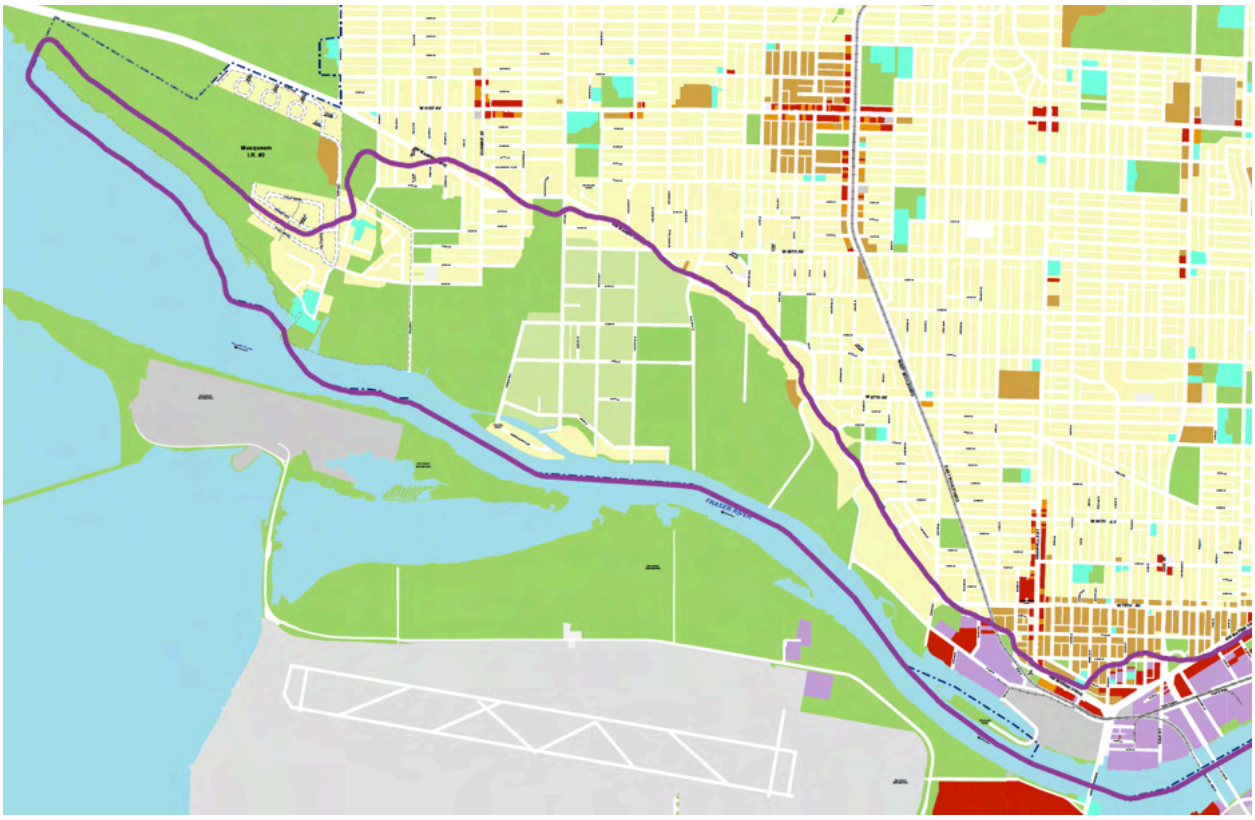

Figure 13. City of Vancouver Fraser River Foreshore Zoning (1).

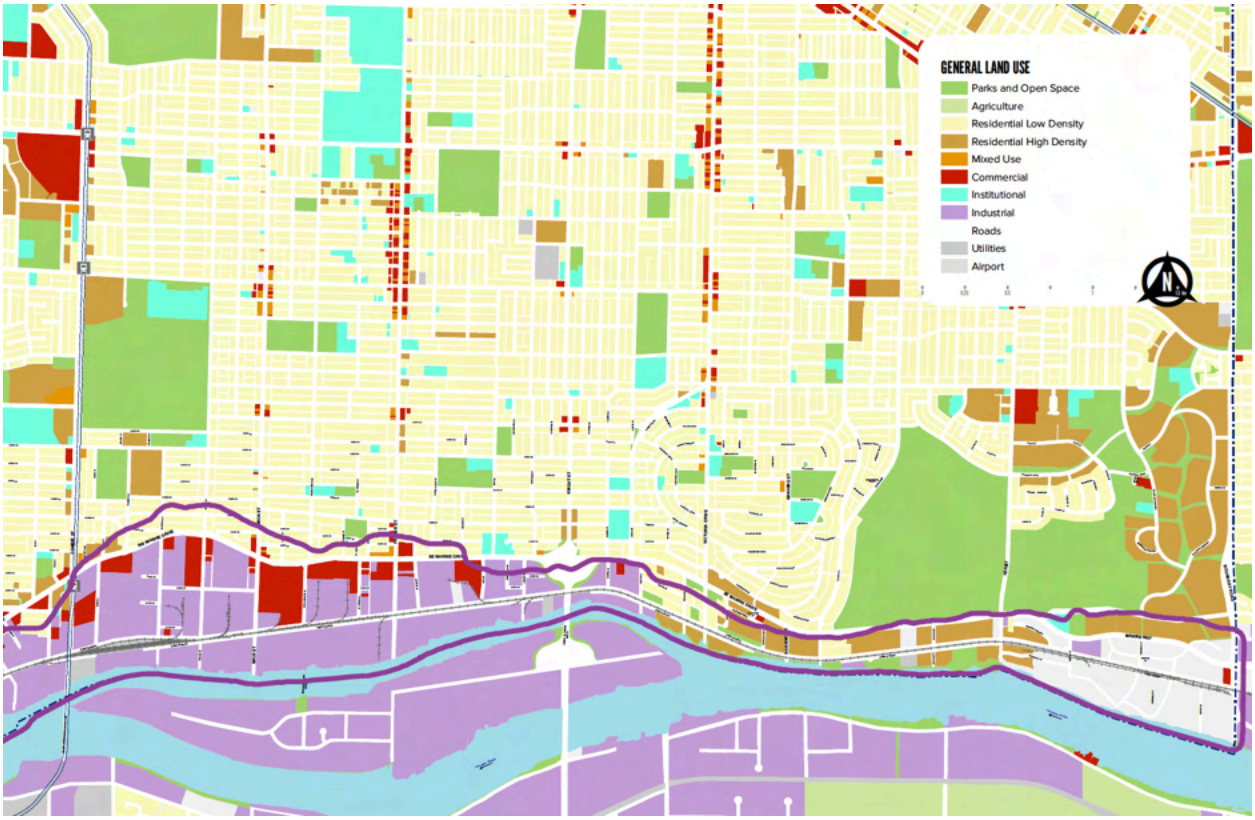

Figure 14. City of Vancouver Fraser River Foreshore Zoning (2).

Richmond

Official Community Plan last updated 2012. All images from the City of Richmond (2012).

The City of Richmond is surrounded by dikes. The 2041 OCP has identified all the areas outside of the dikes as "environmentally sensitive areas," (Figure 15-16), though what can be done to protect or restore habitat in these areas is limited by the dikes themselves. Moreover, much of these areas are zoned as Commercial, Industrial, or Agricultural, meaning that most of the land inside of the dikes is not being managed primarily for habitat values, with some small exceptions (See the bright green areas proximate to the shoreline in Figure 17). Each of these zoning bylaws have their own stipulations: for

example, if an area was zoned as industrial, it could be used as a concrete plant or an animal day care, and the building could be as big as 75% of the land parcel.

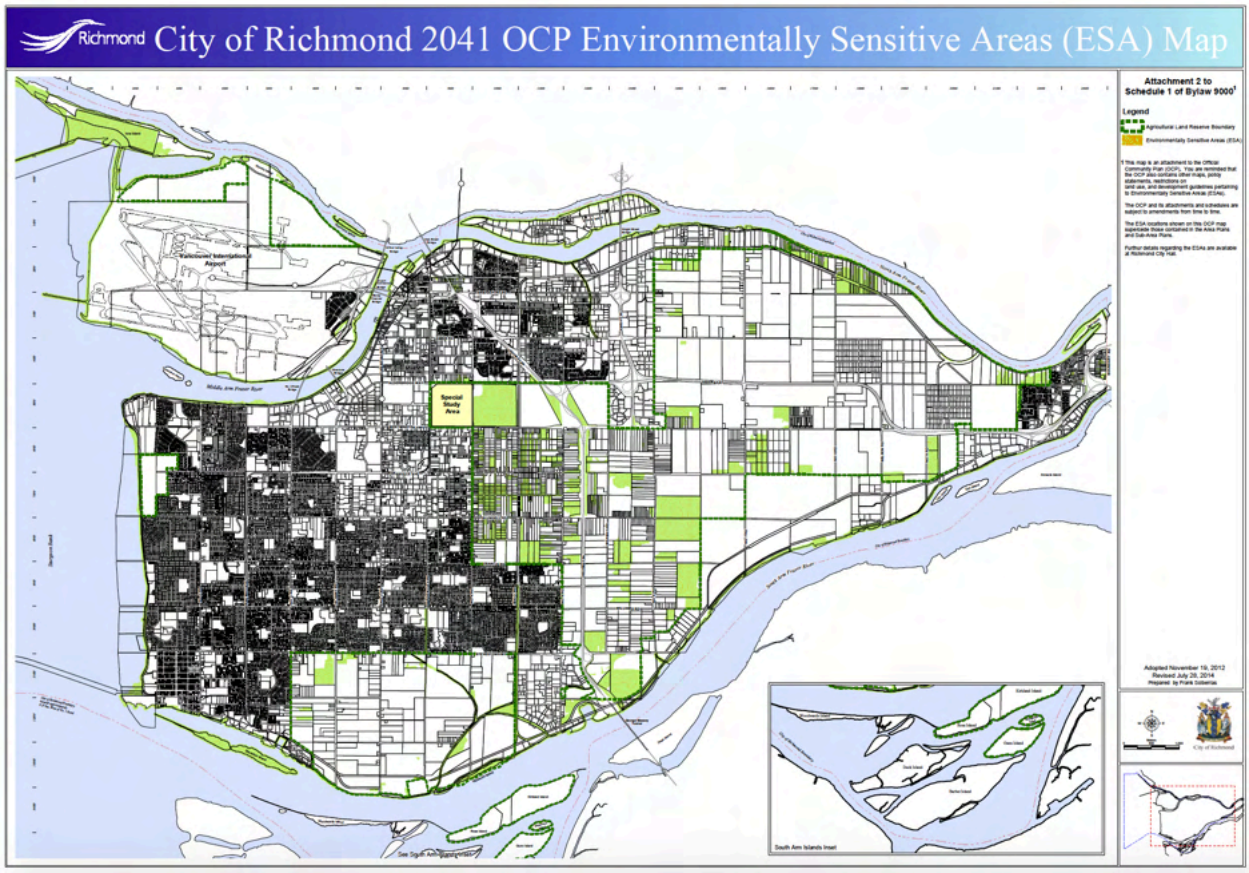

Figure 15. City of Richmond Environmentally Sensitive Areas.

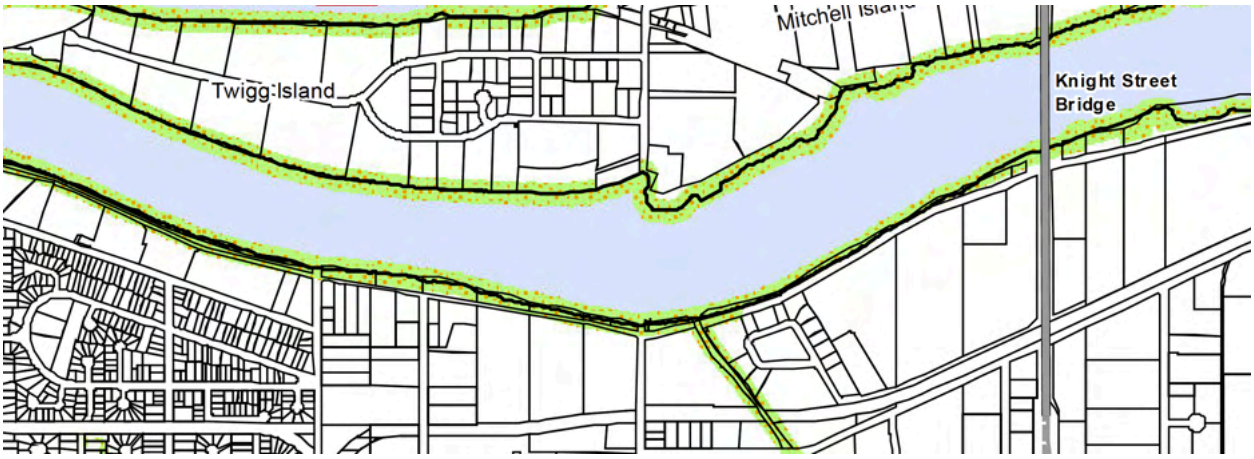

Figure 16. Close up of ESA identification outside of Richmond dikes.

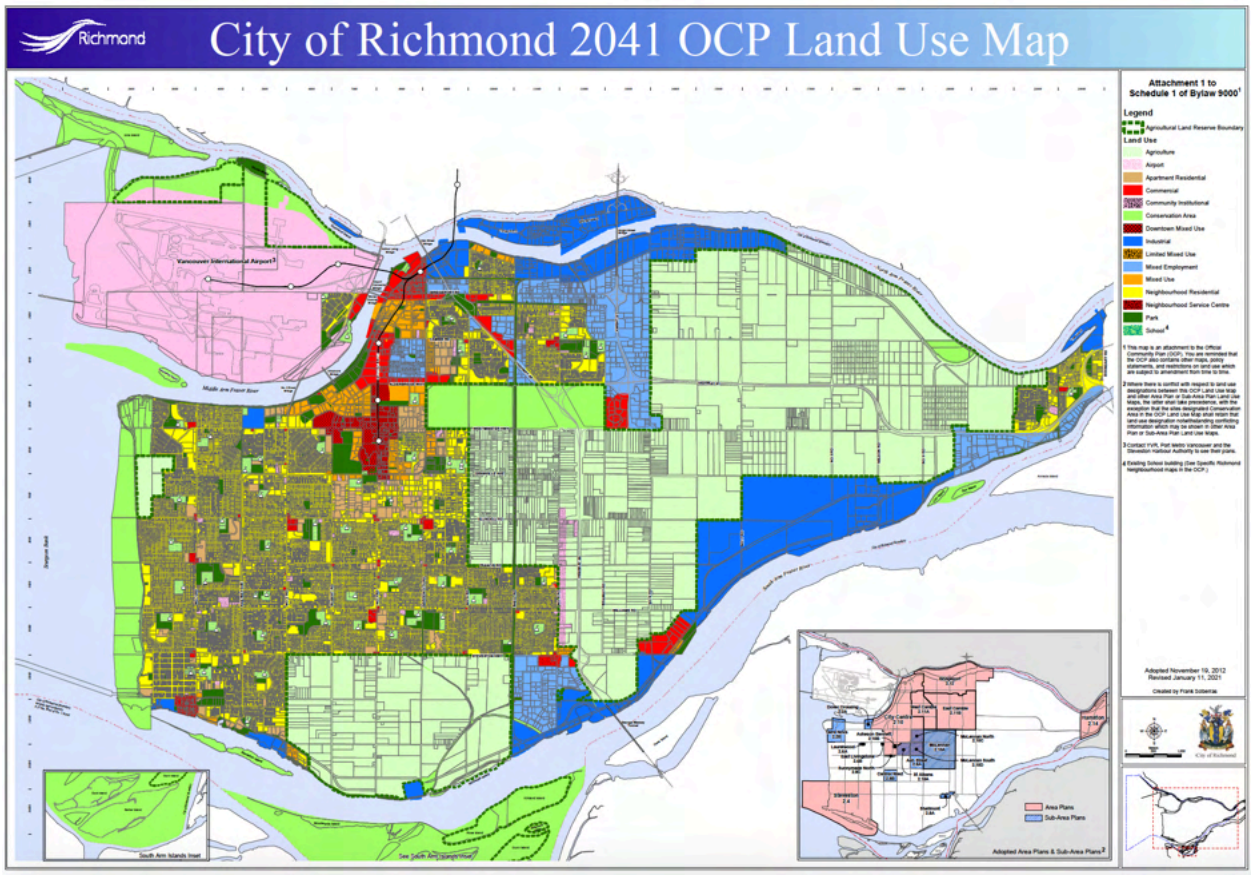

Figure 17. City of Richmond Zoning Map.

Delta

Official Community Plan last updated 2005. Images from City of Delta (2005).

Delta's OCP was written while FREMP was still in existence. Perhaps for this reason, Delta's Development Permit Areas still somewhat align with the FREMP area designations and policies, though these policies often have exemptions that are worthy of considering. For example, in the Ladner Village DPA:

> *"No building shall be constructed or located within thirty (30) metres of the natural boundary of the Fraser River unless construction on piles is used or fill is placed in such a*

manner that the toe of the protected embankment does not project beyond the natural boundary of the Fraser River. Where landfill is used to achieve the elevation provisions, the face of the landfill slope shall be adequately protected against erosion from floodwater" (City of Delta 2005, Schedule E).

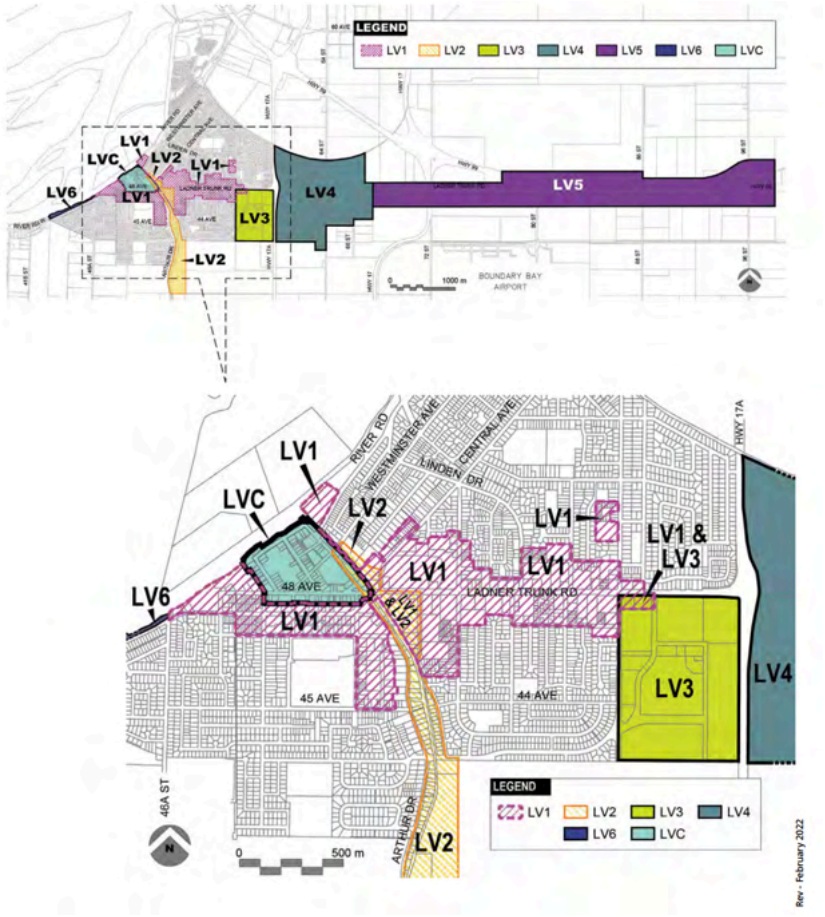

Figure 18. Chillukthan Slough/Ladner Canal (LV2) and Riverside (LV6).

There is, however, a unique emphasis on the use of native and habitat-appropriate species within the Delta DPA plans:

"Landscape designs should prioritize enhancement of the riparian / foreshore environment. Utilize a palette of site adapted native plants that, beyond habitat restoration, serve to link the pedestrian realm to an expanded natural space along the waterfront and slough" (Ibid).

Overall, Delta has 4 DPAs (Chillukthan Slough/Ladner Canal [LV2, Figure 18], Riverside [LV6, Figure 18-19], Boundary Bay Foreshore and Southlands [SD3, Figure 20], and Fraser River

Escarpment [ND1, Figure 21]) in which protection of natural environment is determined as its purpose.[9] According to the OCP, the purpose of these natural environment DPAs is to "prevent damage to natural environment and to improve development through siting and design control" (Ibid). The Riverside DPA has some of the most explicit protections for shoreline habitats, with developments required to "protect, restore and enhance the riparian habitat" through a series of requirements, including a review by a Registered Professional Biologist. In the case of this DPA, the OCP states that "the developer and his [sic] agents will be held accountable: (a) through the provision of a monetary security equal to the amount of the estimate for implementing the habitat conservation and enhancement plan within the leave area; (b) through the provision of bonding to secure on-site and off-site construction works required to implement the habitat conservation and enhancement plan

Figure 19. Riverside (LV6) Development Permit Area.

[9] A fifth DPA might be included for the Streamside Protection and Enhancement DPA, which applies to all streams with the City of Delta. While this DPA certainly has influence on the overall health of the Fraser estuary, this report does not evaluate inland riparian protections within these municipalities, choosing instead to focus exclusively on shorelines. However, on a final map it might be worth including where these streams meet the shoreline of the study area, in order to give a full picture of the regulations on that area.

within the leave area." This represents a comparatively strong environmental DPA within the estuary shoreline.

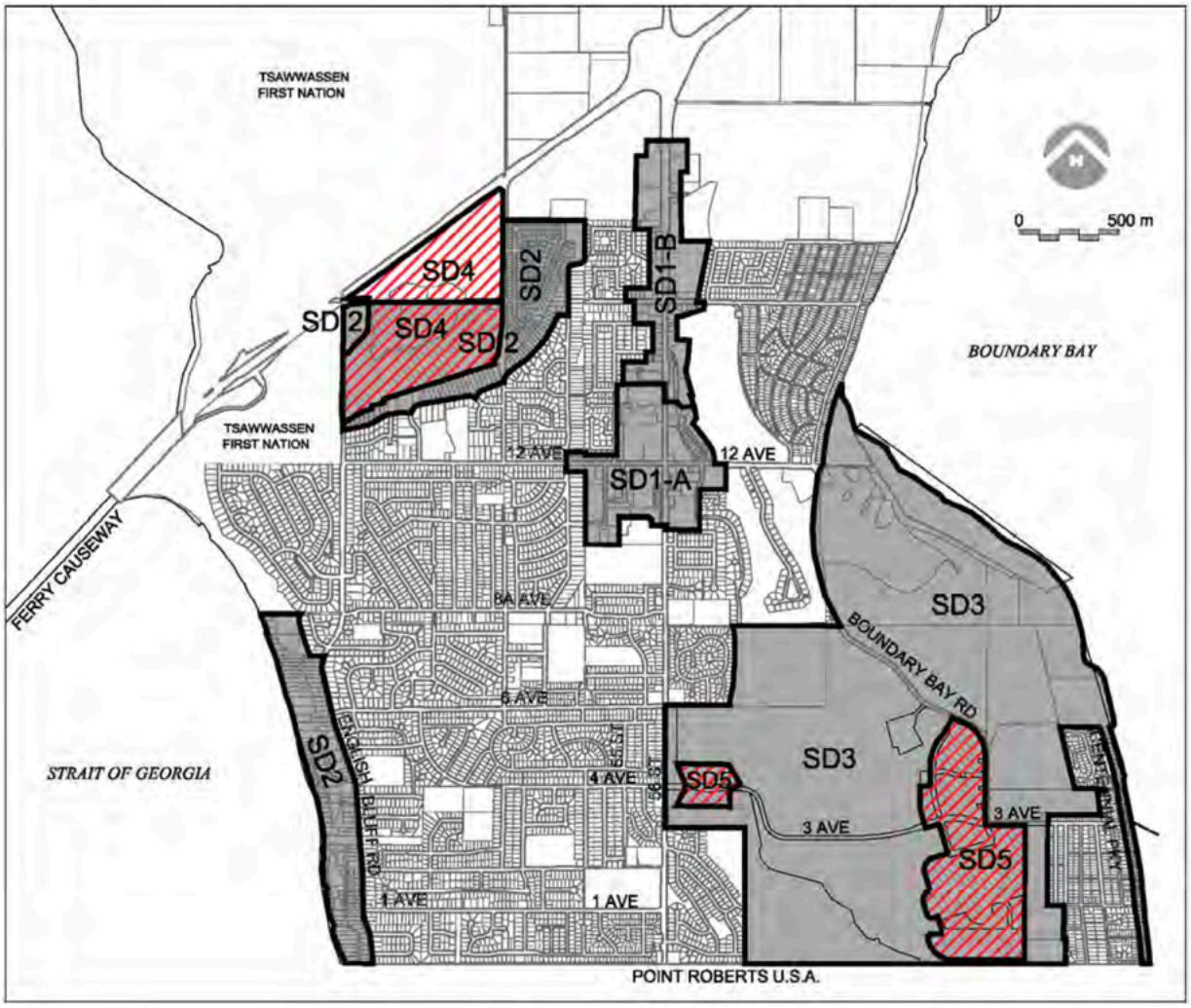

Figure 20. Boundary Bay Foreshore and Southlands DPA (SD3).

Notably, much of Delta is Agricultural Reserve Land, and the OCP mainly determines zoning within a few developed centers in Ladner, North Delta and Tsawwassen. The Riverside DPA is currently zoned as mixed use, the Boundary Bay DPA is mostly zoned as a park, the Chillukthan Slough is partially zoned commercial, and the Fraser River Escarpment is zoned across many different uses (industrial, commercial, parks, residential).

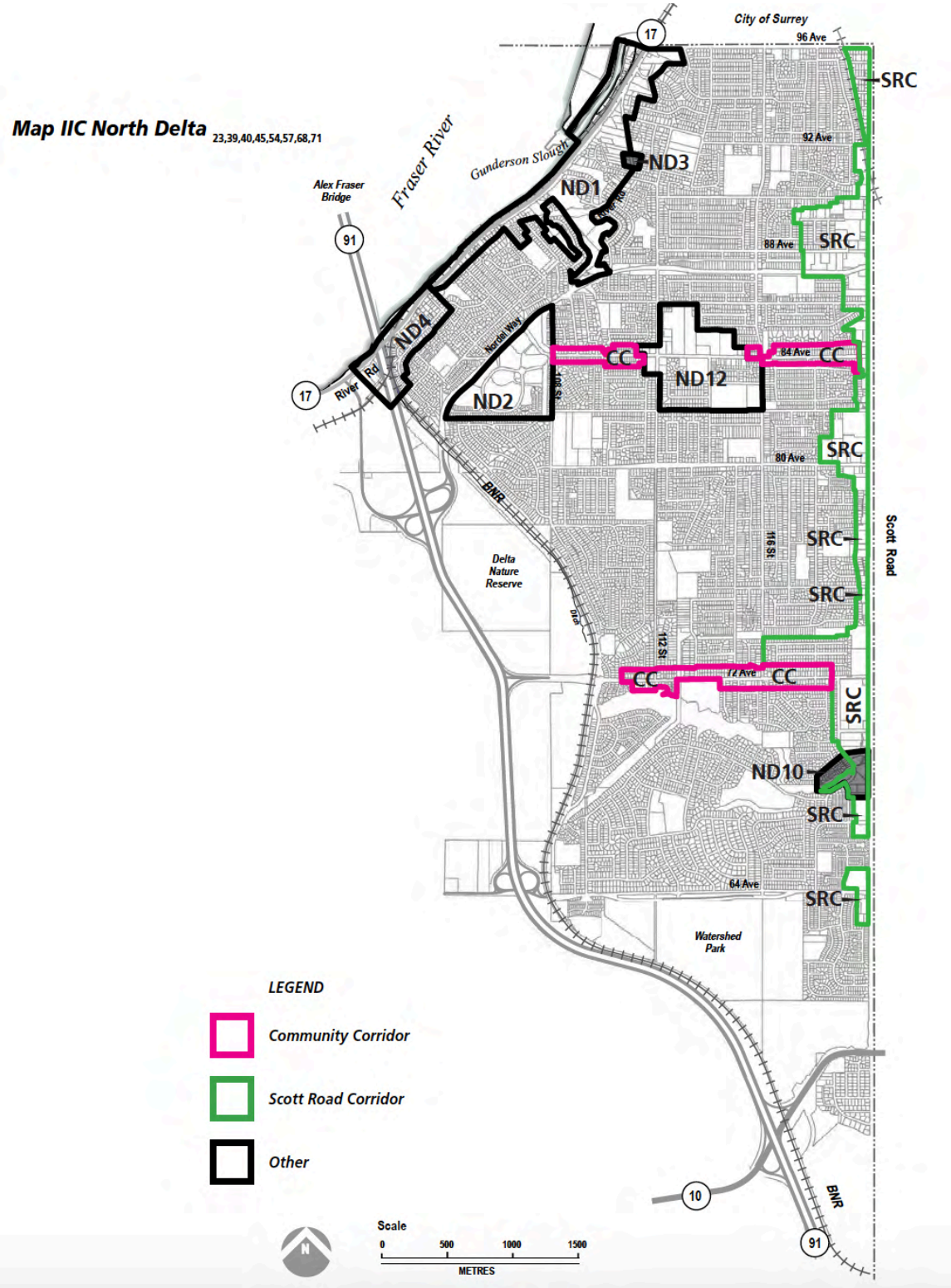

Figure 21. Fraser River Escarpment DPA (ND1).

The City of Delta OCP does not provide one map of its zoning areas, but a PDF of each layer of these zoning designations can be found online through the OCP. A few of these map layers are included below for context, which show Agricultural Land Reserve (Figure 22) and Industrial Lands (Figure 23) as the most dominant zoning type for the shoreline area. Below these is also a map of the environmentally sensitive areas for the City of Delta (Figure 24).

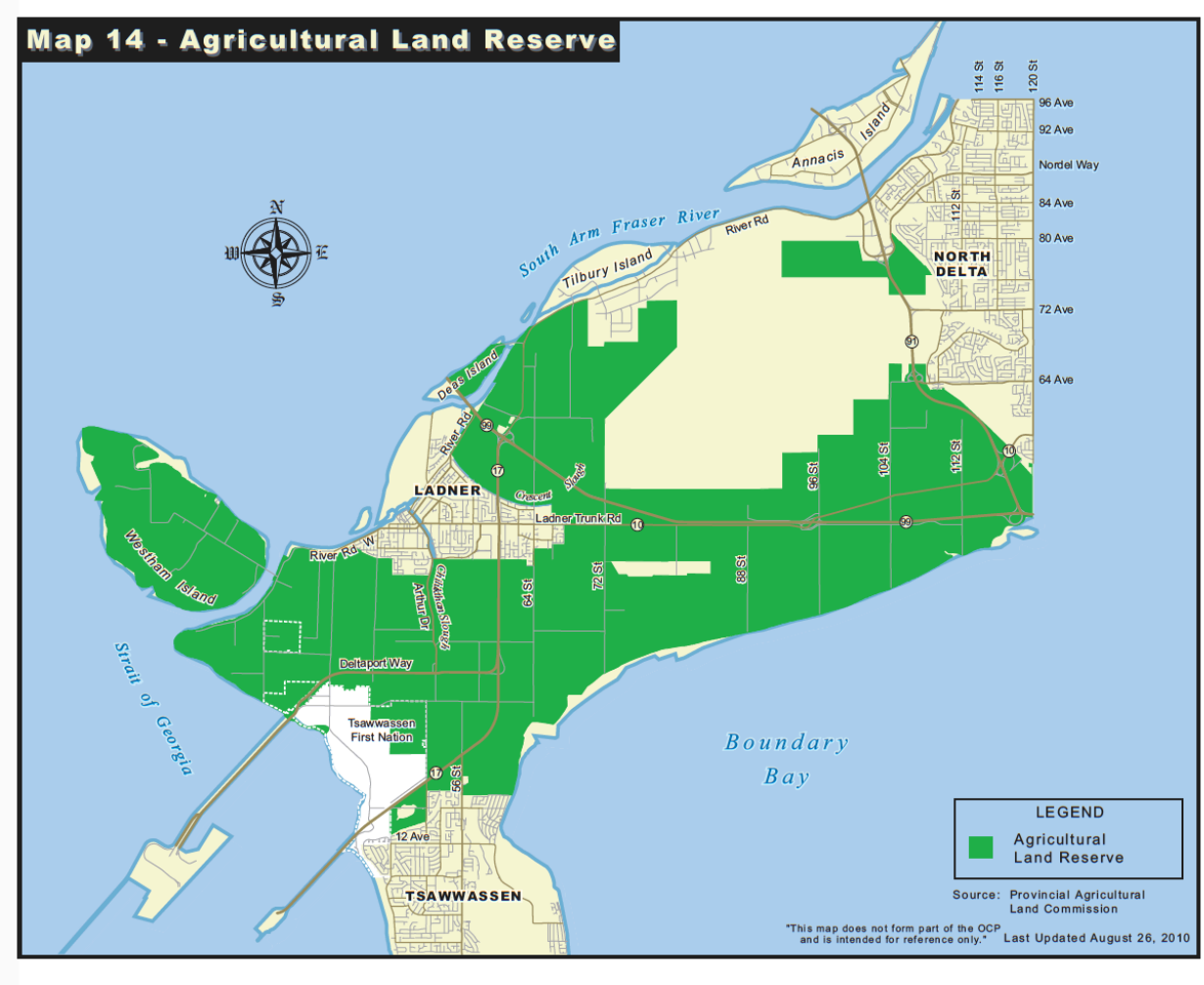

Figure 22. City of Delta Agricultural Land Reserve.

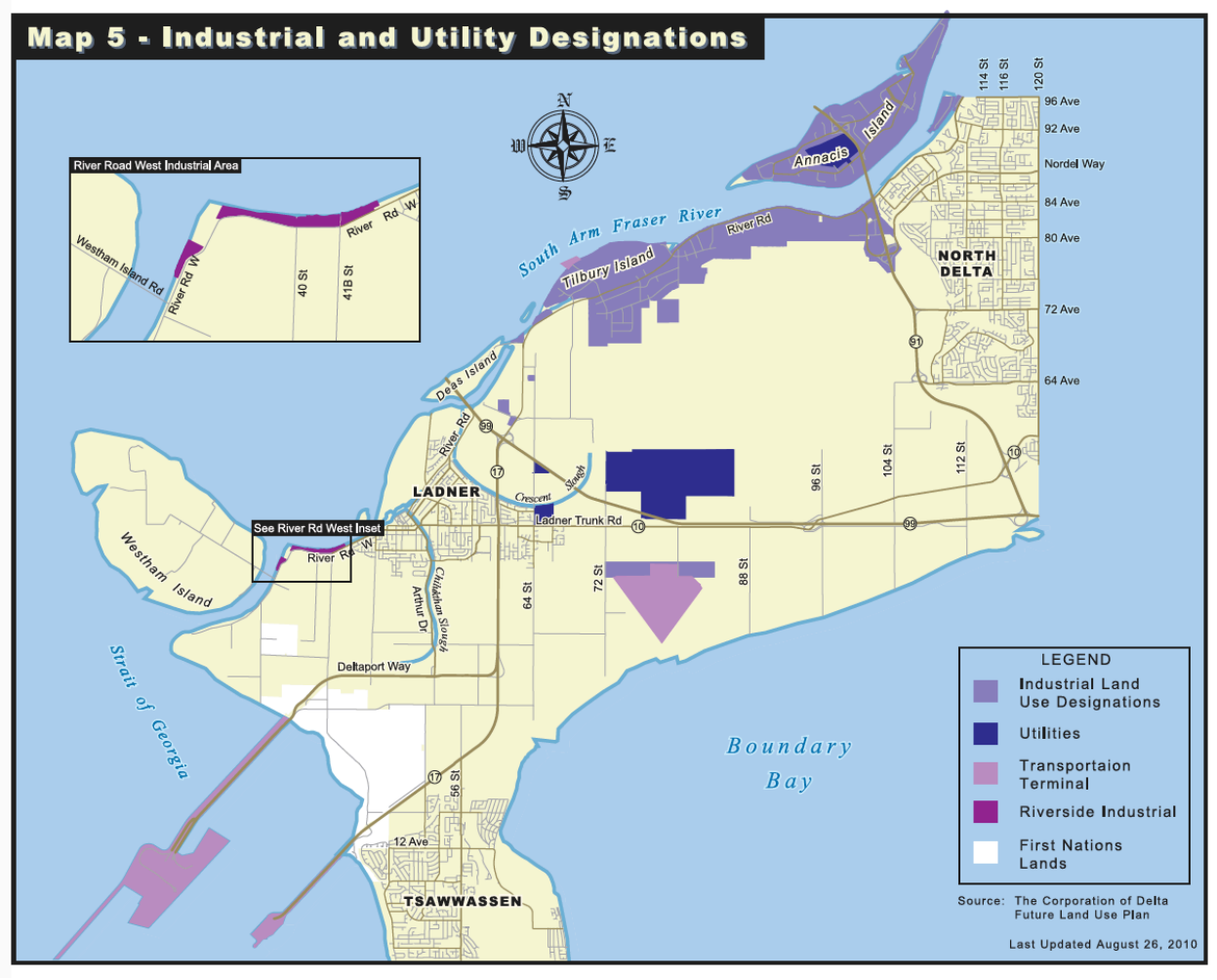

Figure 23. City of Delta Industrial and Utility Zoning.

Burns Bog

Burns Bog is a globally rare and significant estuarine bog ecosystem within the City of Delta (See Figure 24; Burns Bog is the largest green area on the map). The Bog is managed by the City of Delta along with the Province of BC, the Government of Canada, and the Metro Vancouver Regional District under a legally binding conservation covenant. This establishes Burns Bog as a protected area, meant to be managed as a natural ecosystem (although notably it is also home to the Vancouver Landfill).

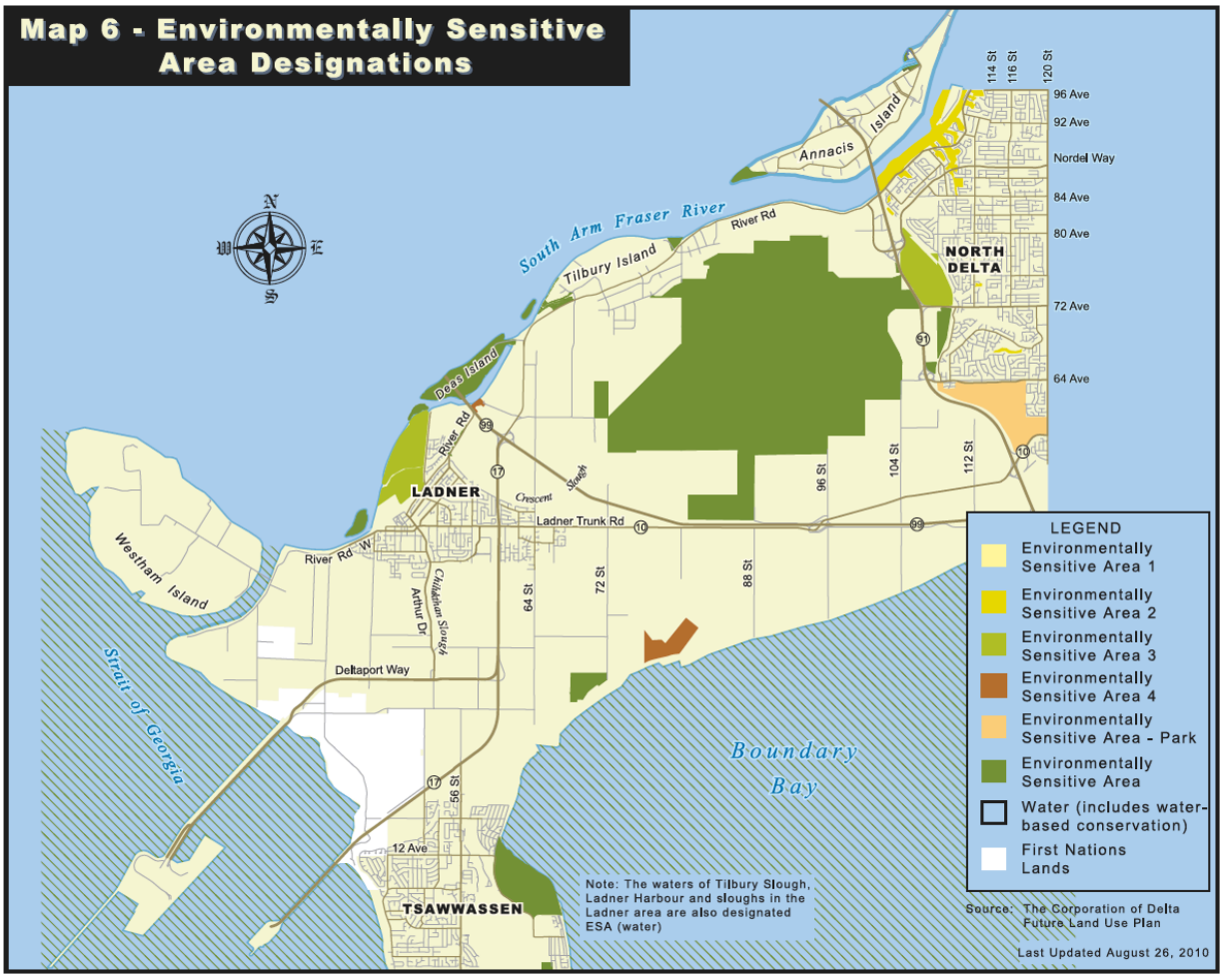

Figure 24. City of Delta Environmentally Sensitive Area Designations.

Burnaby

Official Community Plan from 1998, last revised in 2014. All images from City of Burnaby (2014).

The Burnaby OCP is very limited in terms of DPAs or environmental protection, making it hard to say exactly how the shoreline is being protected. In the most recently updated version of the Burnaby OCP, DPAs are not mentioned, though there is reference to Environmentally Sensitive Areas (ESAs). Since Burnaby is currently undergoing a new Official Community Plan process, these designations are likely to change in the coming

years. Below (Figure 25) is one map of parks along the Fraser River, from the Burnaby OCP. Figure 26 shows the land use designations (zoning) from this plan as well.

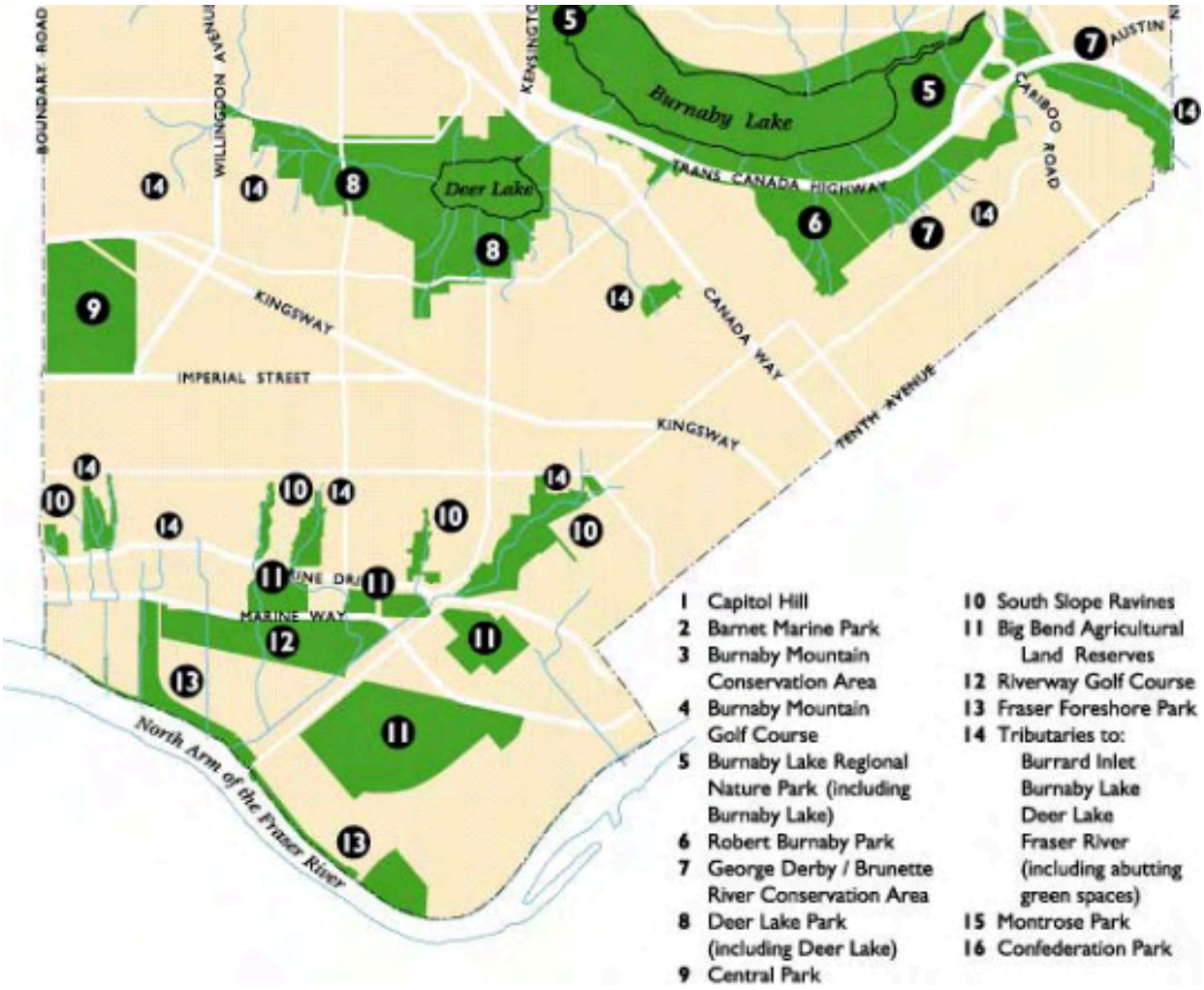

Figure 25. Parks along the Fraser River shoreline in Burnaby.

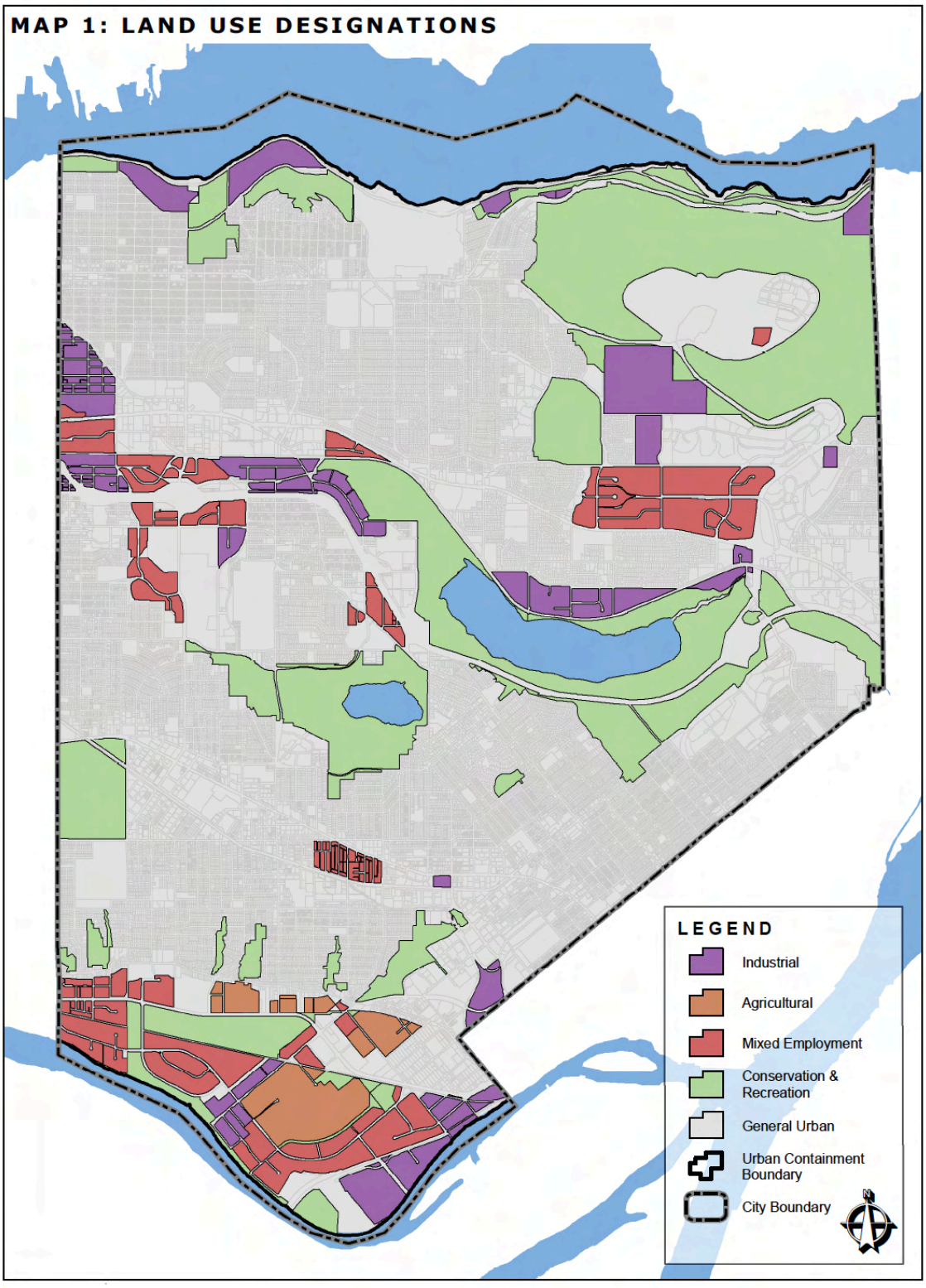

Figure 26. Burnaby Land Use Designations.

Within these general land use designations on the shoreline (Industrial, Agricultural, Mixed Employment, General Urban) there are variable policies based on subtypes of these categories. For example, Industrial areas can be differentiated into Heavy, Special, or Light Industrial, with various regulations for each of these. It is hard to generalize what uses occur on the shoreline without surveying the area directly, however, the city zoning bylaws\ can give a sense of what types of activities are permitted and how. For example, the General Industrial zoning bylaw states that maximum lot coverage shall be 60%, and requires side yards, a rear yard, and includes conditions about noise impacts, health impacts, traffic congestion, etc.

New Westminster

OCP last updated June 2020. All images from City of New Westminster (2020).

New Westminster's shoreline is highly developed and used as Industrial lands; the remaining areas that are considered ecologically sensitive for the purpose of DPAs are mapped below (Figure 27); these are the two "Natural Area" DPAs, the Brunette River and the North Arm – Bay Area (Figure 30). Only the North Arm DPA is on the shoreline of the Fraser. There is also some zoning for Habitat/Natural Areas and Parks along the shoreline (Figure 28). There are also areas zoned/given DPAs (as seen on the maps below) as "Intertidal." Most of the area listed as "Intertidal" under the Development Permit Area Plan is zoned as Employment or Industrial Lands, though a small part is zoned as residential.

Stipulations for these Intertidal DPAs in Queensborough include:

1. "The Intertidal area, identified as Development Permit Area 6.5 is designated in order to allow waterfront development associated with the working river and to provide an opportunity for continued commercial and industrial development. It is

also expected that, wherever possible, opportunities to increase the shoreline habitat value and to develop the riverfront trail, should be integrated into new development" (City of New Westminster, 2020).

2. "Wherever possible, increase the shoreline habitat value and connectivity (i.e. improve from green to yellow FREMP coded classification, and improve from yellow to red FREMP coded classification)" (City of New Westminster, 2020). These code classifications, designed by FREMP, indicate, and measure the health of the estuary ecosystems, with red representing the most intact ecosystems.

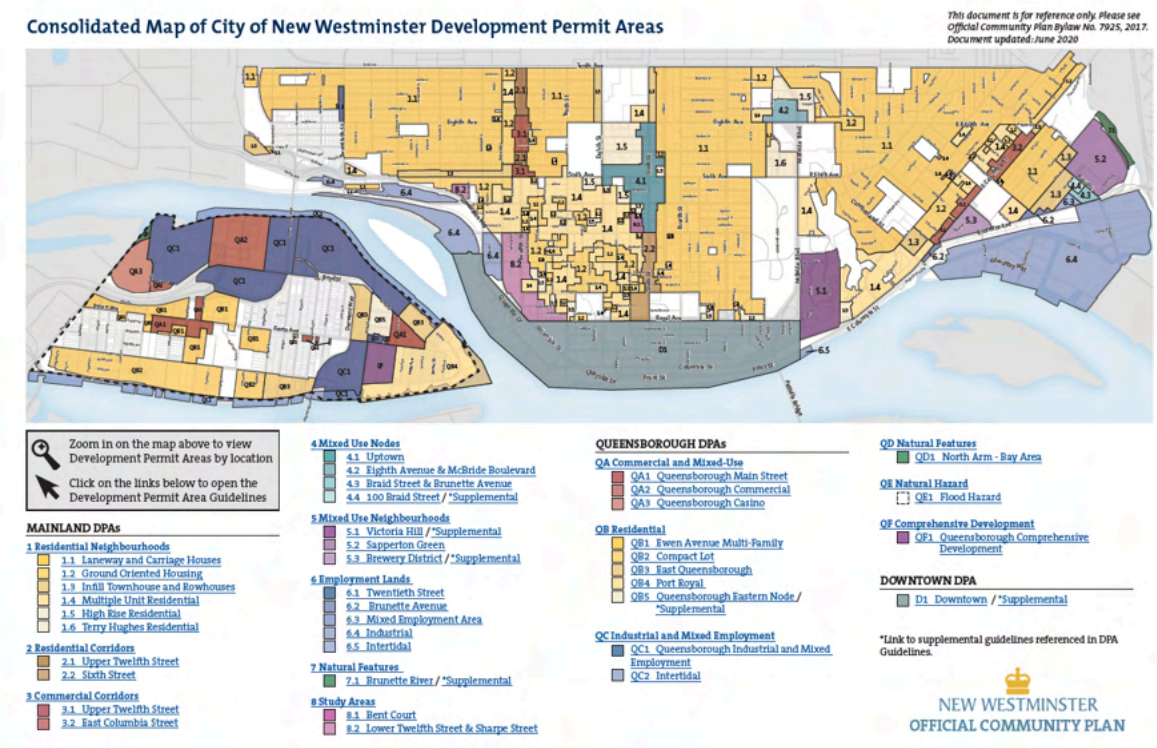

Figure 27. New Westminster DPA Map.

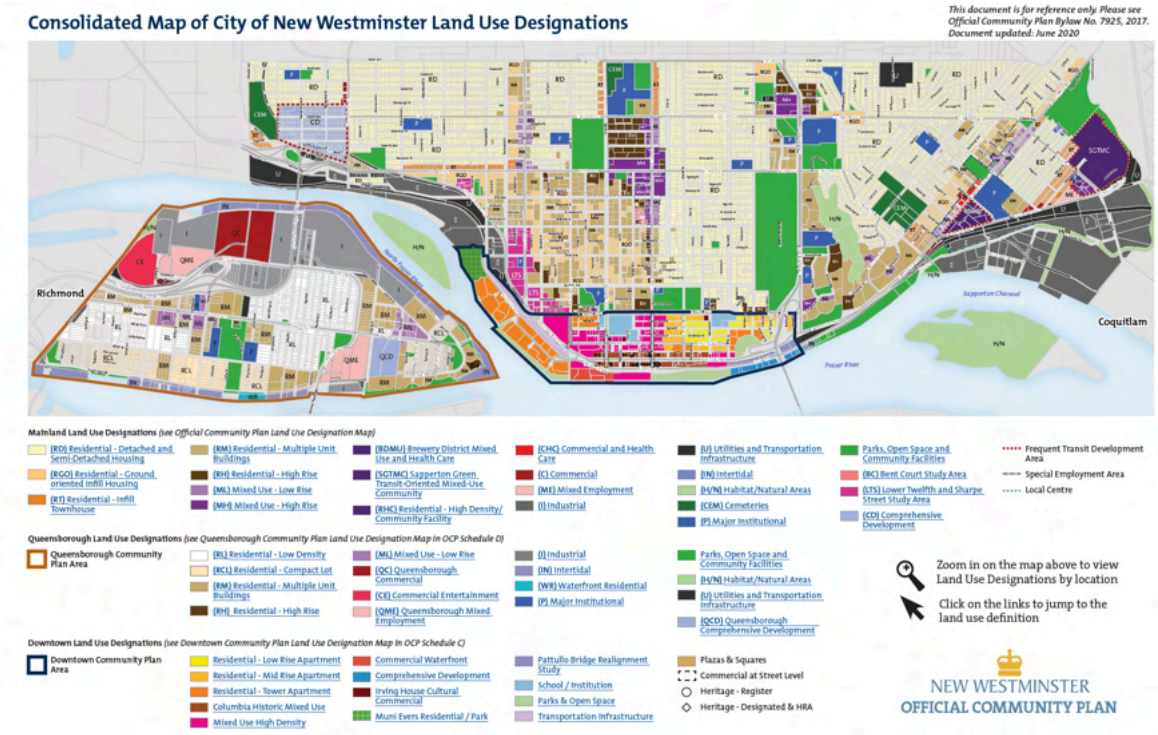

Figure 28. New Westminster Land Use Designation Map.

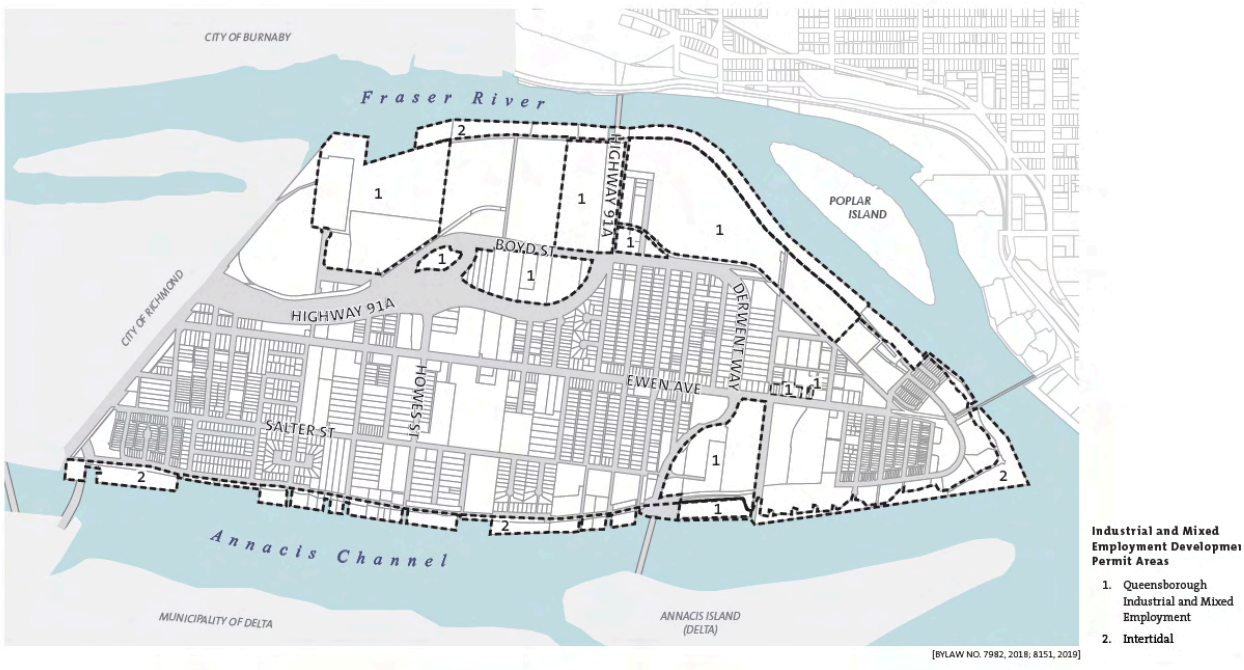

Figure 29. Close-up of Queensborough (New Westminster) Intertidal Areas.

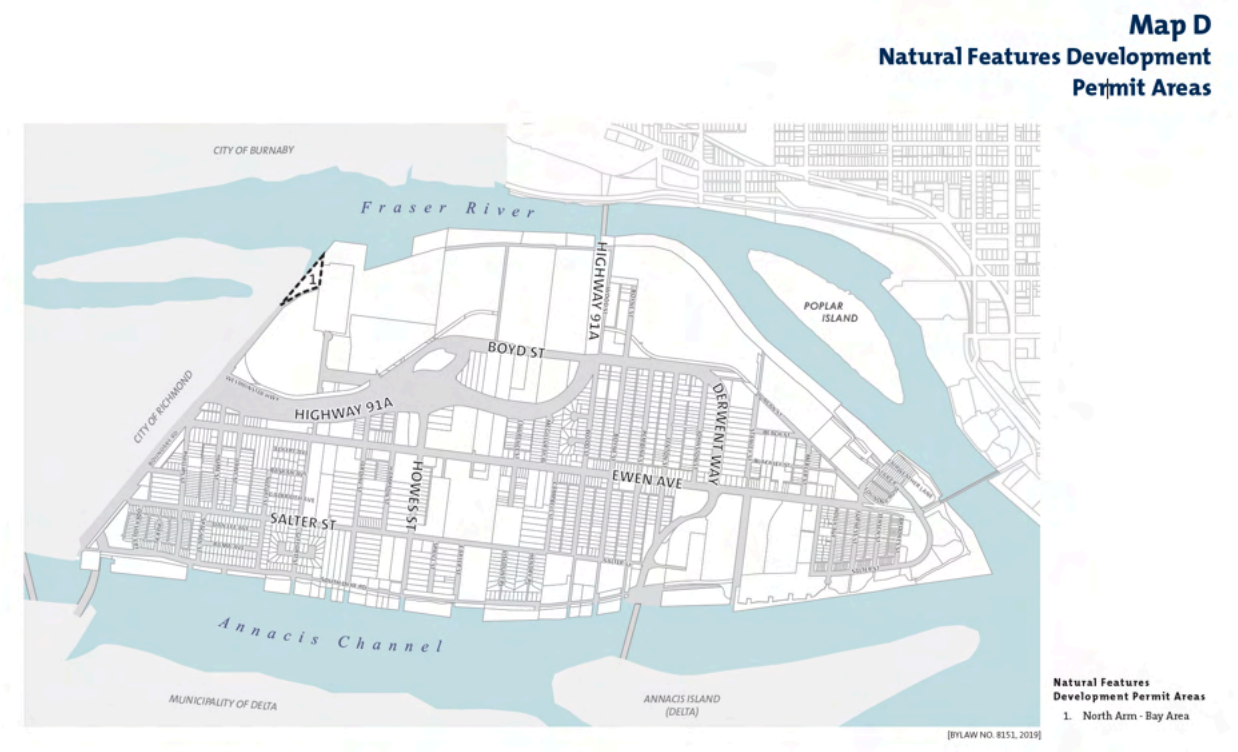

Figure 30. The North Arm - Bay Area Natural Area DPA, New Westminster.

For the Mainland Intertidal DPAs, these stipulations are generally the same, but also:

1. "This Development Permit Area encourages best practices for protection of the natural environment, its ecosystems and biological diversity" (City of New Westminster, 2020).
2. Additionally, Permit seekers must: "Obtain the necessary approvals and comply with the requirements of relevant environmental approval agencies such as Environment Canada, Fisheries and Oceans Canada, BC Ministry of Environment or Port of Vancouver" (City of New Westminster, 2020).

The New Westminster OCP notes that "Any project affecting the foreshore must go through Port of Vancouver's approval process and must comply with Port of Vancouver's Land Use Plan. As a federal entity, Port of Vancouver is not required to follow New Westminster's

protocols, but a cooperative relationship is maintained" (2020). That is, the Port retains authority up to the high-water mark, and the municipality makes decisions above this mark.

The OCP also addresses the need to improve riparian habitat DPAs in the future to support the overall health of the Fraser River and the estuary:

> *"This Plan also acknowledges the potential impacts of developed lands adjacent to watercourses and encourages restoration and enhancement of ecological functions in riparian areas as part of future development. This Plan recognizes the need for a new Development Permit Area (DPA) that will protect and enhance the Brunette River, which serves as a critical ecological linkage to the Fraser River. Many of the highest-value riparian systems found within Metro Vancouver, including the Burnaby Lake and Still Creek watersheds reach the Fraser River via the Brunette" (City of New Westminster, 2020).*

City of Coquitlam

Official Community Plan created 2001. All images from City of Coquitlam (2001).

The City of Coquitlam's Citywide Official Community Plan establishes the goal of the plan to provide "A Compact, Complete Community by Nature."[10] And indeed, Coquitlam has both an urban center and extensive conservation and agricultural lands (See Figure 31 for the City's Land Use Designations). While the majority of the City's frontage on the Fraser River is zoned as Mixed Employment (mostly Industrial and Commercial zoning), there is a

[10] CWOCP

significant area on the Pitt River (within the study area) that is zoned as Conservation and Recreation.

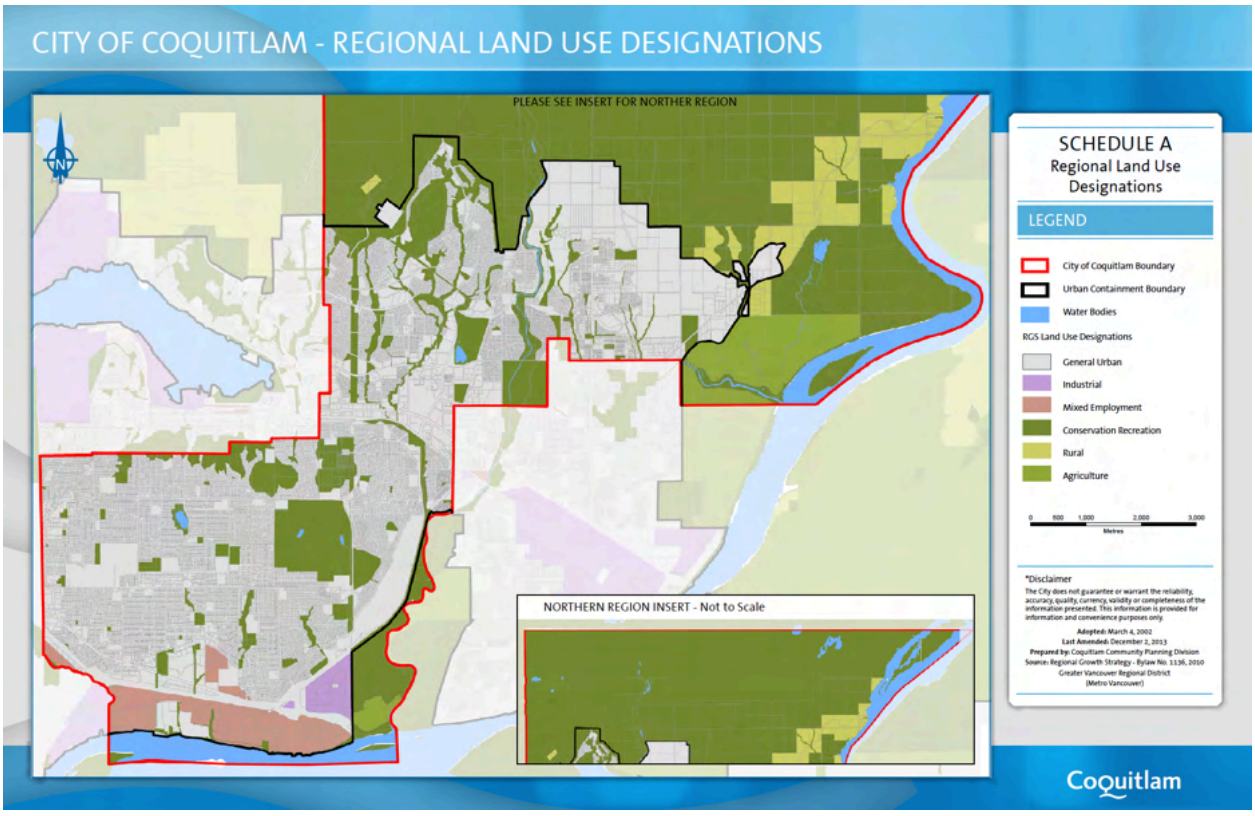

Figure 31. City of Coquitlam Regional Land Use Designations.

There are only two Environmental DPAs in the City of Coquitlam, and they are small (Figure 32). However, this plan also designates Watercourse Protection Development Permit Areas within the City: All lands within 50 meters of the top of bank or top of the ravine bank of a watercourse in the Northeast Coquitlam Area Plan (NECAP) and 30 meters in all other neighborhood plans. It is presumed by this report that the Fraser and Pitt River frontage is included in these DPAs, though it is not explicit in the city plan or maps. The Scott Creek DPA (not on the shoreline) is explicitly meant to protect fisheries during any construction process, while the Braid Street Fill Site DPA (on the shoreline) is an environmental hazard, needing to be evaluated before construction takes place.

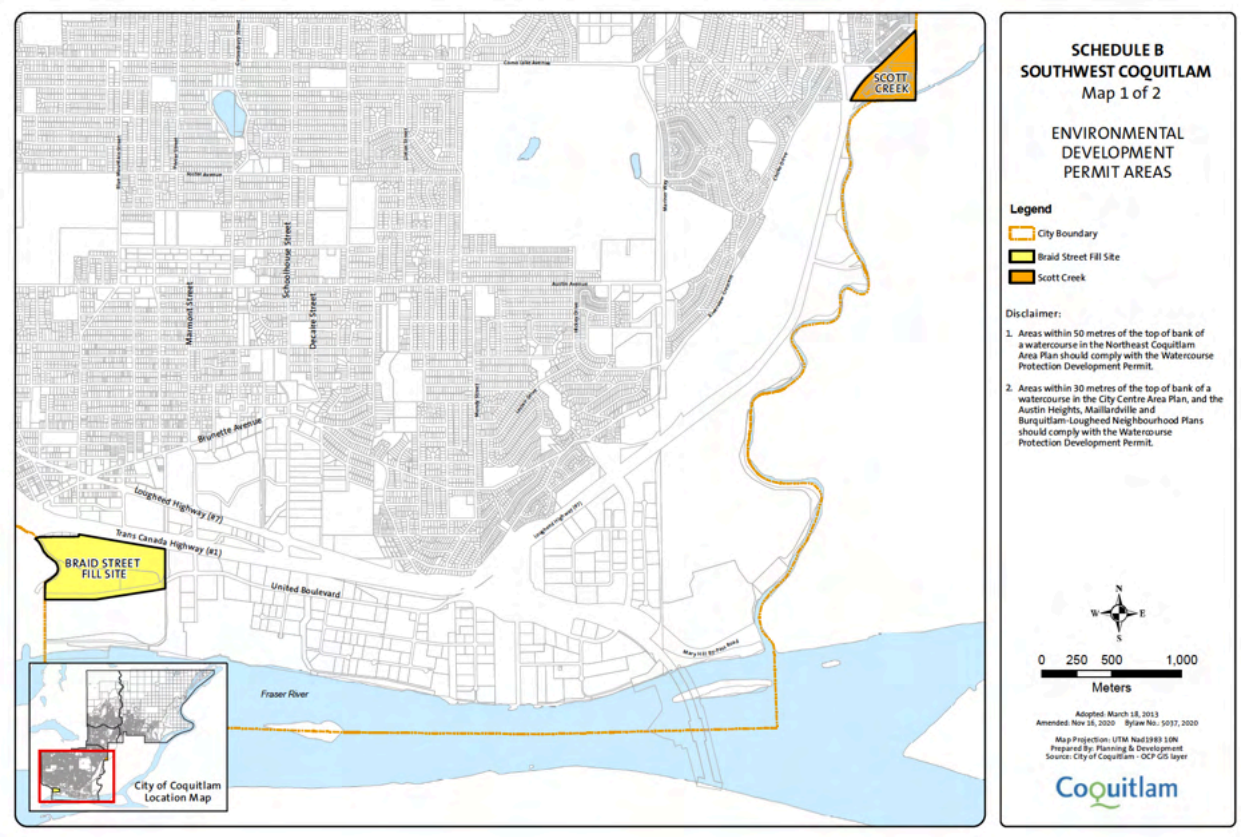

Figure 32. City of Coquitlam Environmental DPAs.

Port Coquitlam

Official Community Plan last updated 2013. All images from City of Port Coquitlam (2013) unless otherwise noted.

Port Coquitlam has Environmentally Sensitive DPAs (Figure 32) which are somewhat based on the environmental assessment (Figure 31) which shows the areas of Port Coquitlam which are of high sensitivity, including most of the shoreline. Port Coquitlam also has Watercourse Protection DPAs, which include all the Fraser and Pitt Rivers, according to the city GIS data (PoCo Map 2022).

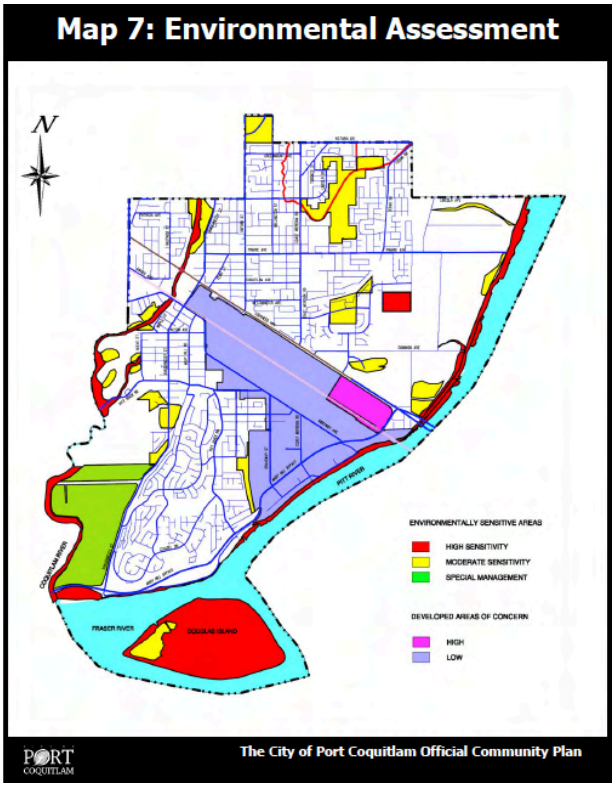

Figure 34. Port Coquitlam ESAs.

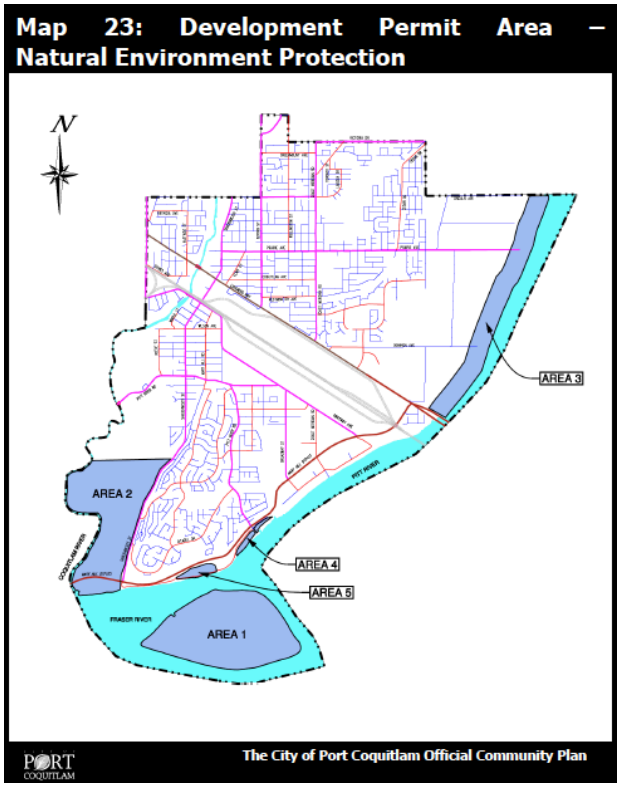

Figure 33. Port Coquitlam DPAs.

Development Proposals in DPA areas 1, 2, and 3, must include an environmental impact assessment, including a vegetation survey and a plan to mitigate impact on fish in rivers. DPA Area 2 is unique in that its environmental impact assessment must address "habitat requirements for existing wildlife species in terms of types and amount and optimal locations/orientation of old fields to maintain the diversity wildlife" (City of Port Coquitlam 2013, p. 128). Several other stipulations can be found in the Port Coquitlam OCP. Most of the areas covered by the DPA are zoned as Parks Reserve in the Official Community Plan Maps (See Figure 34), however the current zoning map on the Port Coquitlam GIS website shows a discrepancy, with some of these areas zoned as agricultural (See Figure 35).

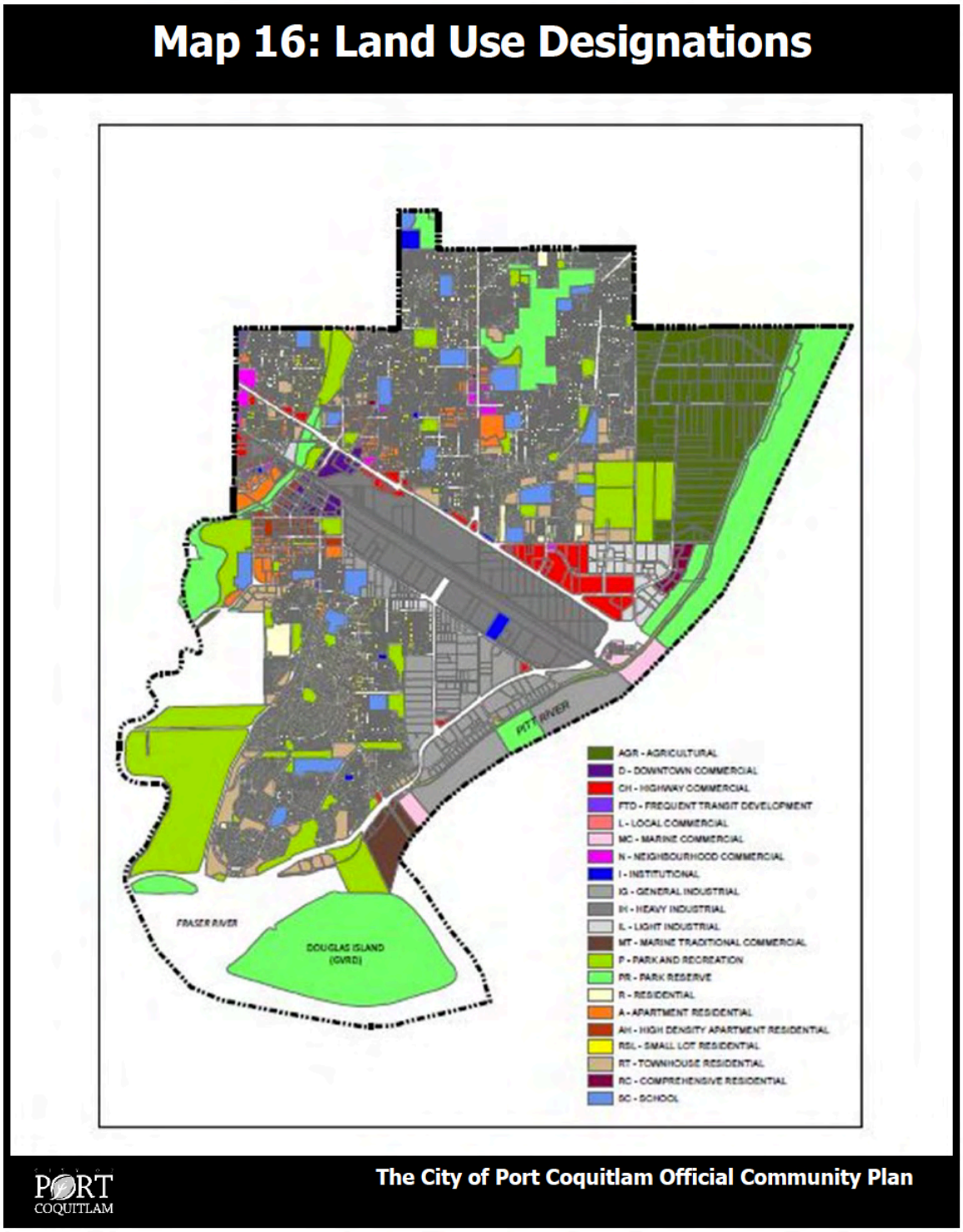

Figure 35. Port Coquitlam Land Use Designations.

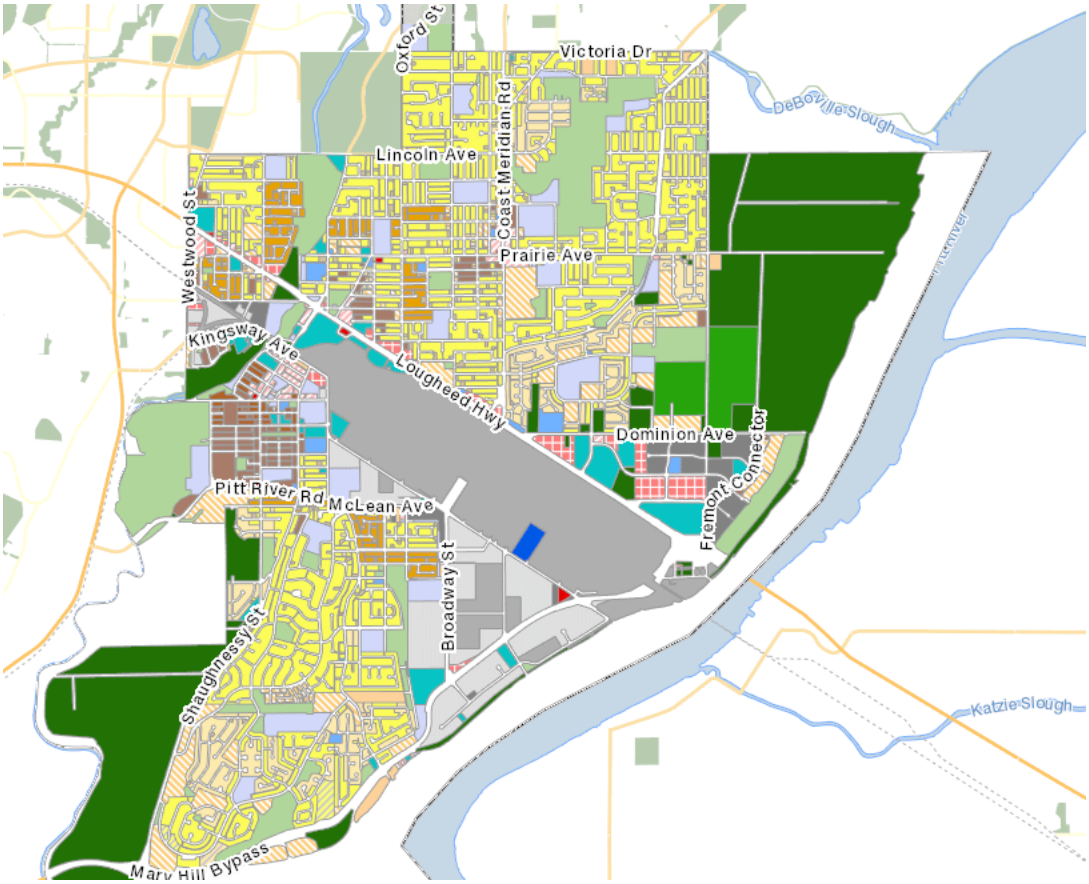

Figure 36. Port Coquitlam Zoning, (PoCoMap 2022).

Surrey

Official Community Plan created 2014. All images from City of Surrey (2014).

The City of Surrey uses Sensitive Ecosystem DPAs, which are split into Streamside Areas and Green Infrastructure Areas (while there are no Shoreline-specific DPAs, many of Surrey's shorelines are protected under this other DPA (Figure 36). Exemptions to these DPAs include: municipal operations or utility works and services undertaken by the City of Surrey, or farm buildings or production of agricultural products, in accordance with the Right to Farm Act, for those areas that are also within Agricultural Land Reserve. Sensitive Ecosystem Development Permit Areas green infrastructure includes an estimated 30% of

Fraser River frontage and 50-60% of Boundary Bay shoreline. Development in DPA areas requires developers to undertake an Ecosystem Development Plan and submit an Impact and Mitigation Plan if found to be required by the municipality.

Figure 51: Regional Growth Strategy Land Use Designations

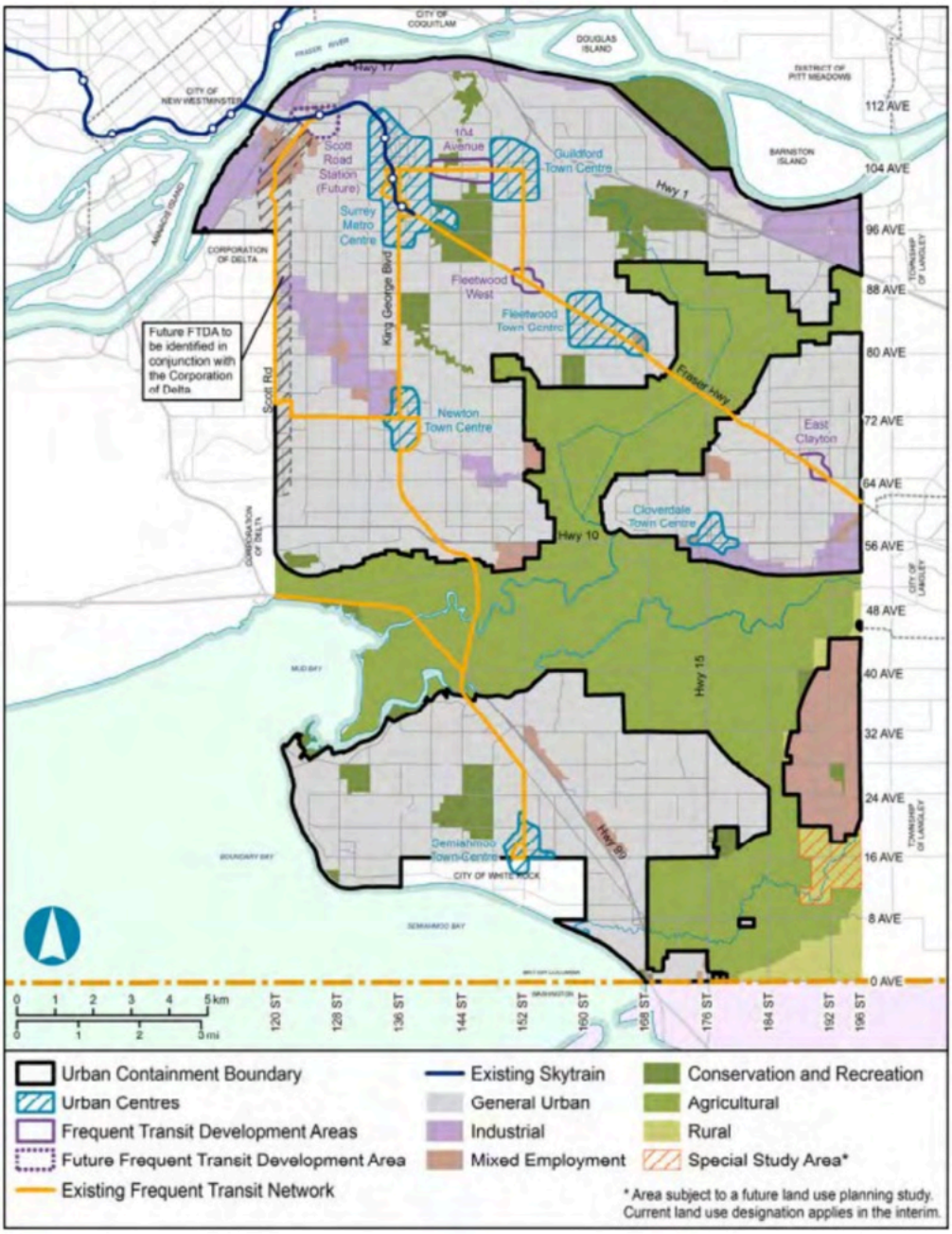

Figure 37. Surrey Land Use Designations.

Pitt Meadows

Official Community Plan Adopted in 2022. All images from City of Pitt Meadows (2022).

The City of Pitt Meadows has two distinctly zoned areas: an Urban Containment Area (Figure 38) and a Rural Area/Agricultural Reserve Lands (Figure 37); 78% of Pitt Meadows is Agricultural Land. There are two Natural Area DPA within Pitt Meadows, but it is not along the shoreline of the Fraser or Pitt Rivers. Zoning along these two rivers is showed in Figure 39; a good portion of the Environmentally Sensitive Areas (Figure 40) along the river are zoned as Parks.

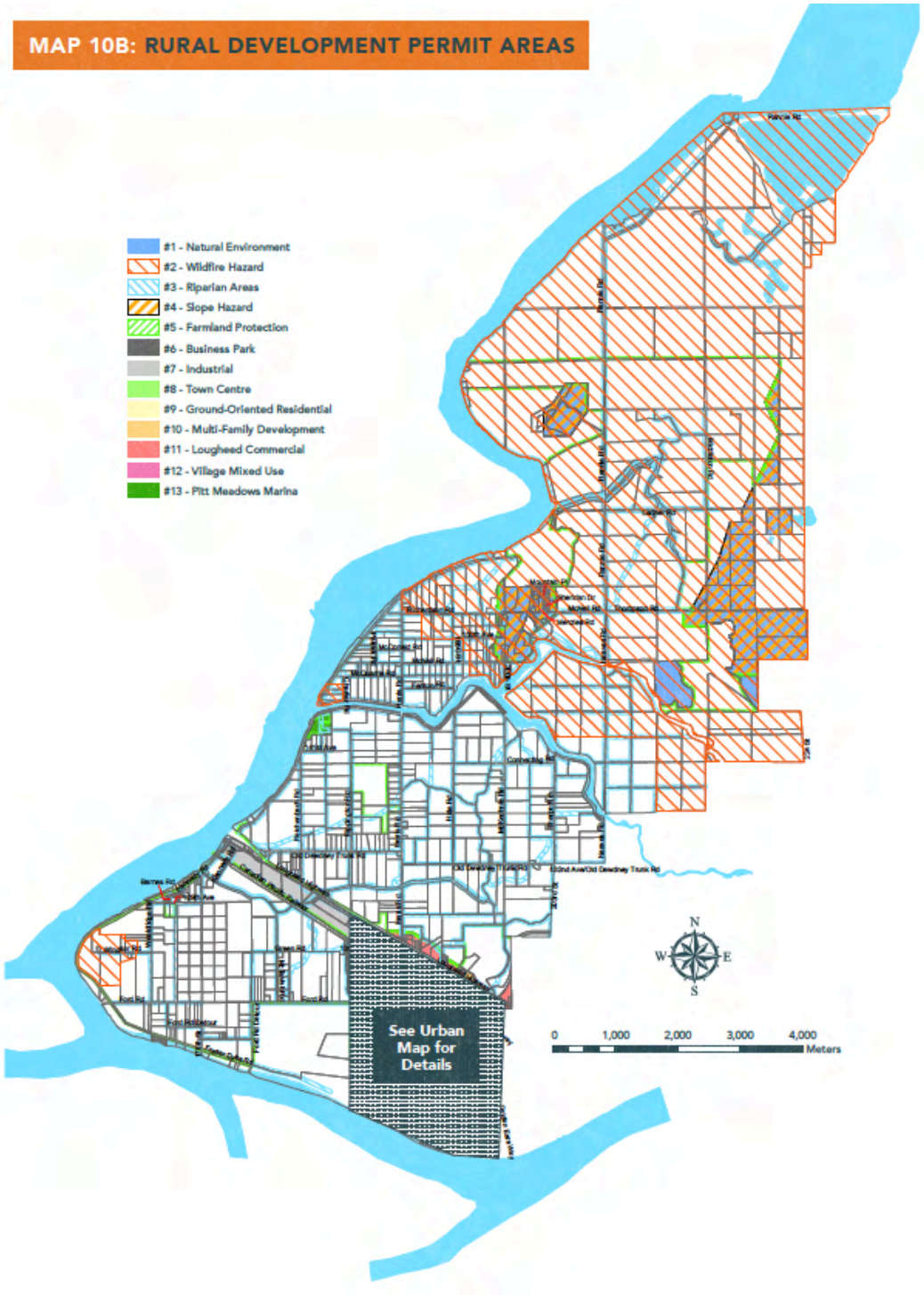

Figure 38. Pitt Meadows Rural Development Permit Areas.

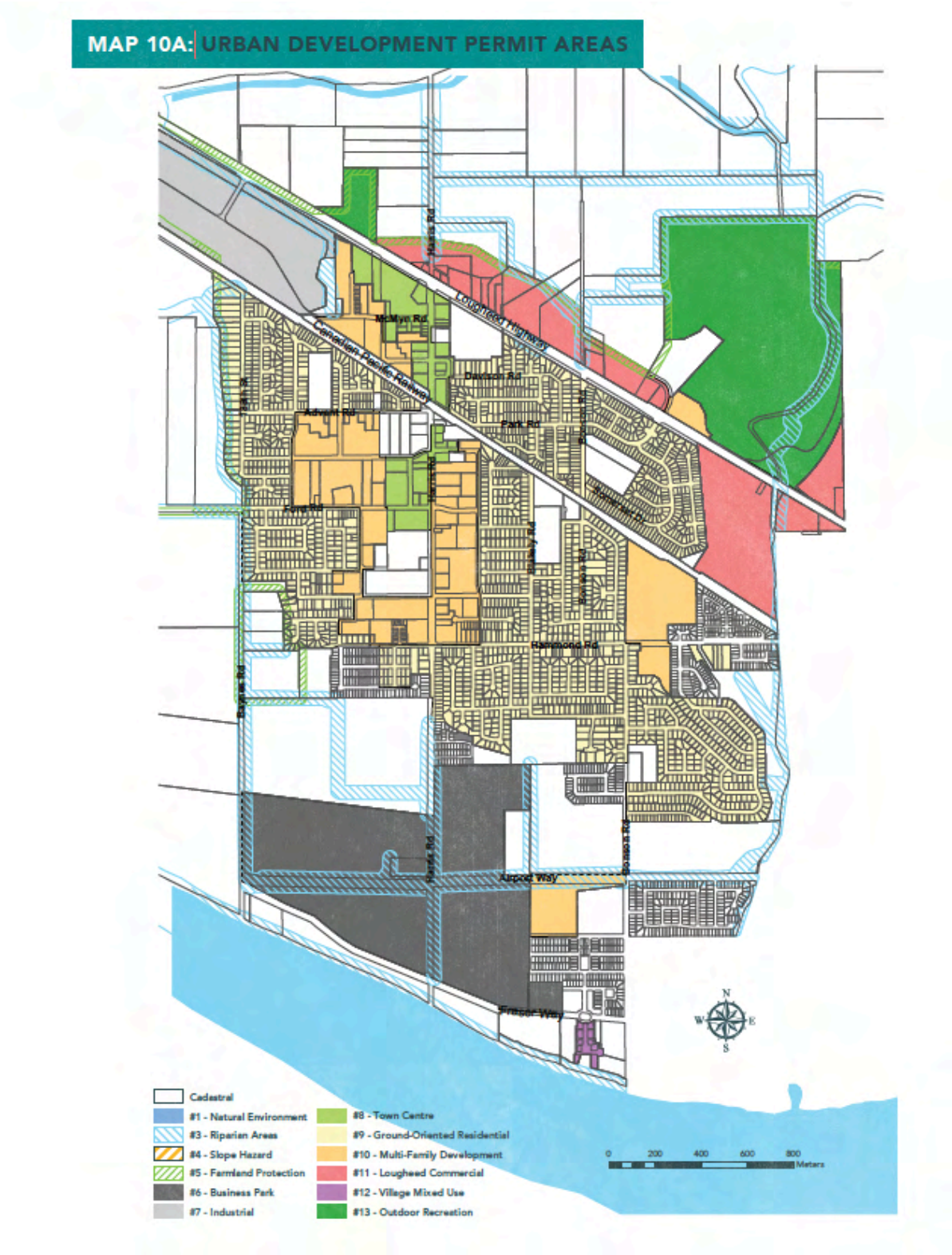

Figure 39. Pitt Meadows Urban Development Permit Areas.

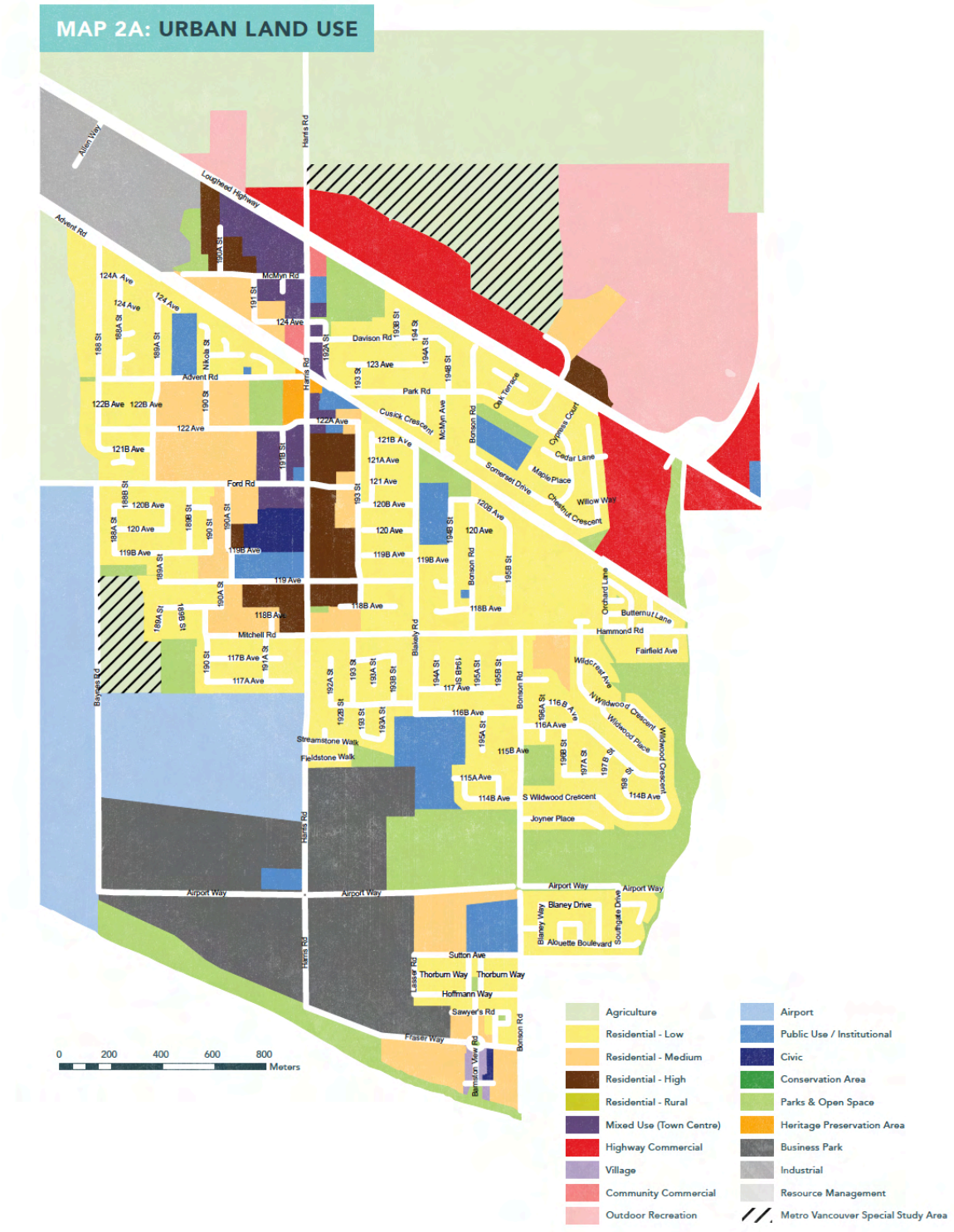

Figure 40. Pitt Meadows Urban Land Use Designations.

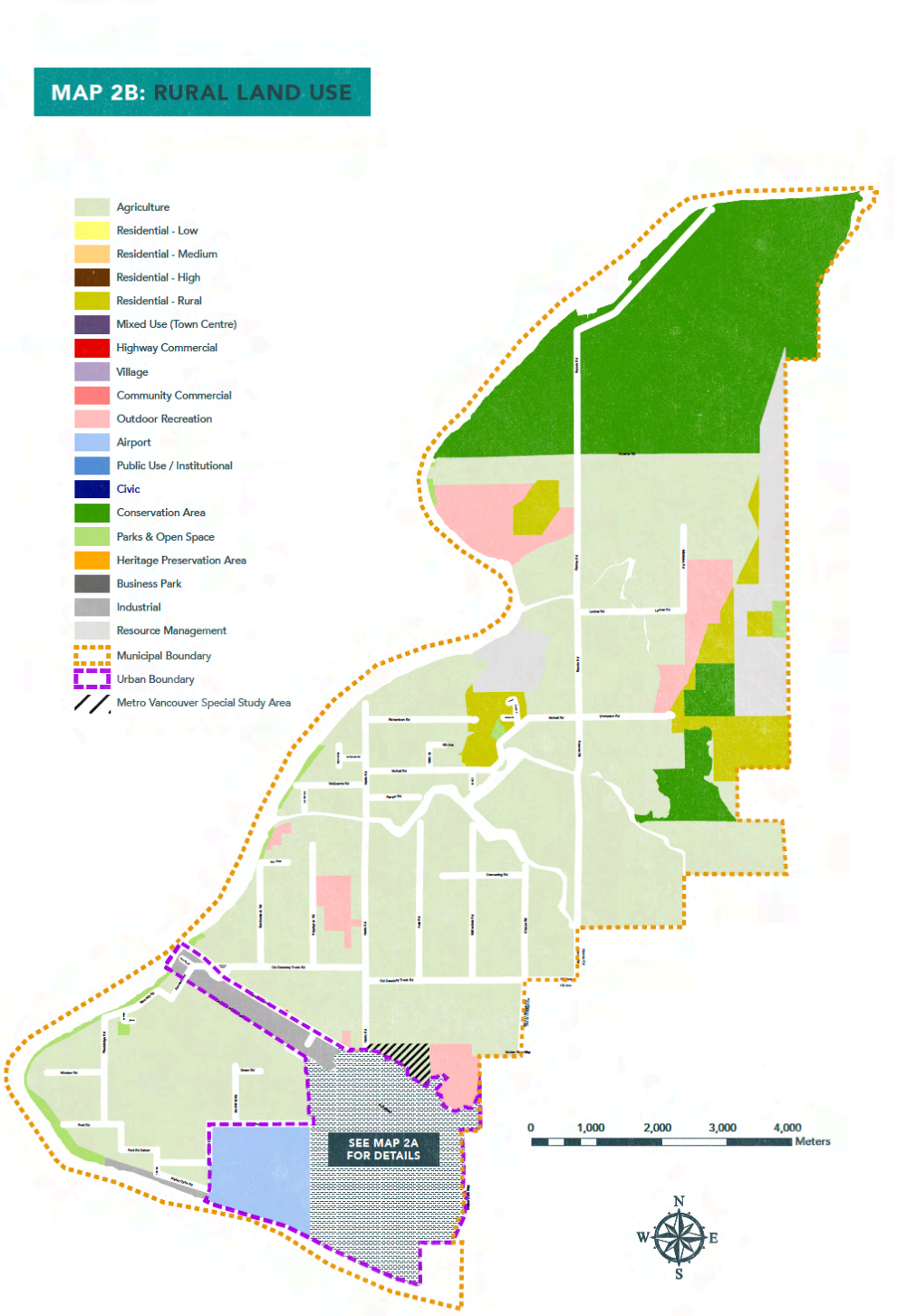

Figure 41. Pitt Meadows Rural Land Use Designations.

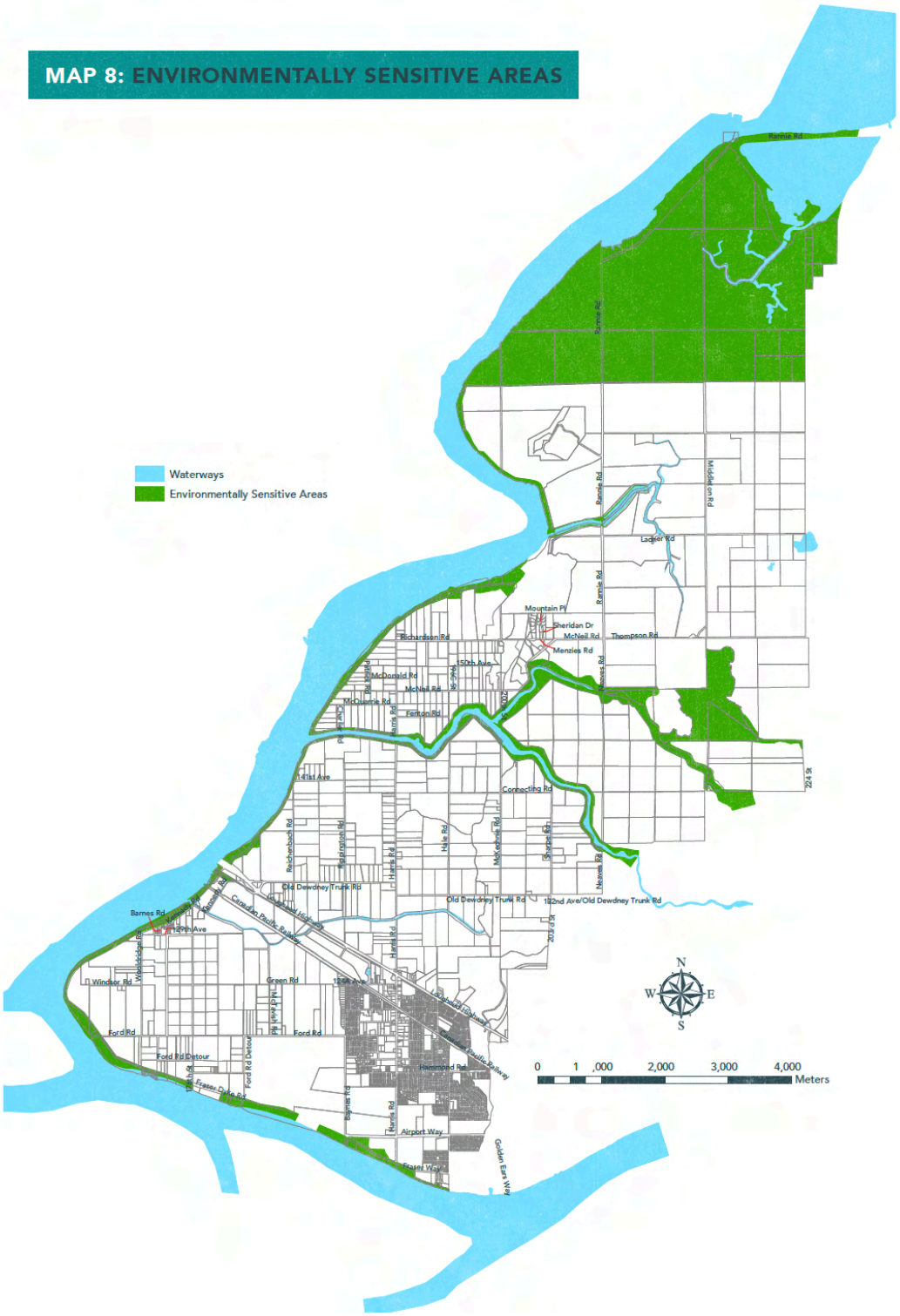

Figure 42. Pitt Meadows Environmentally Sensitive Areas.

Proposed Framework for Evaluating Regulations

In the case of land use policies, both blanket zoning from the Official Community Plan and Development Permit Areas could be updated through bylaws to adapt to new monitoring information, best practices, or revised management objectives, though there is no formal requirement to do so. A more coordinated approach to adaptive management is recommended, which would require an evaluation of the current approach. This framework for evaluation is adapted from Carlson and Baylis (forthcoming).

Quality of land use designation in relation to protection of shoreline habitat

- Are uses that would harm shoreline and nearshore habitats prohibited?
- Are uses restricted in such a way that harm to shoreline and nearshore habitats is intended to be avoided? Limited?
- Is level of protection quantified or subjective?

Spatial component of the land use designation

- Is the designation designed in any way to address considerations of cumulative effects, past and anticipated, within the Fraser estuary?
- Is the designation intended to implement spatial or other relevant objectives for ecological health of the Fraser estuary (such as the FREMP habitat classification)?
- Is the designation the outcome of an integrated management plan or process?

Time component

- Is there any designation that includes rehabilitation?

Adaptive management

- Is there any mechanism to re-calibrate the land use designation or its application in response to monitoring and revised management objectives?

Effective enforcement

- Is there oversight from regulators?

- Is there funding to supporting monitoring and evaluation of this regulation?
- Where professional reliance is part of the regulatory regime, is there appropriate professional guidance related to the application of the regulatory tool?
- Is professional guidance outsourced via private environmental consulting firms paid by those in favor of development?
- Is there capacity and authority to enforce this regulation, and how?

Next Steps

The next phase of this project will require taking the information from this report and creating a map with layers that include zoning and jurisdiction. This map will be used by practitioners seeking to understand what regulatory frameworks govern the habitats they work to protect or restore and will also serve further research efforts through spatial analysis of land use regulations.

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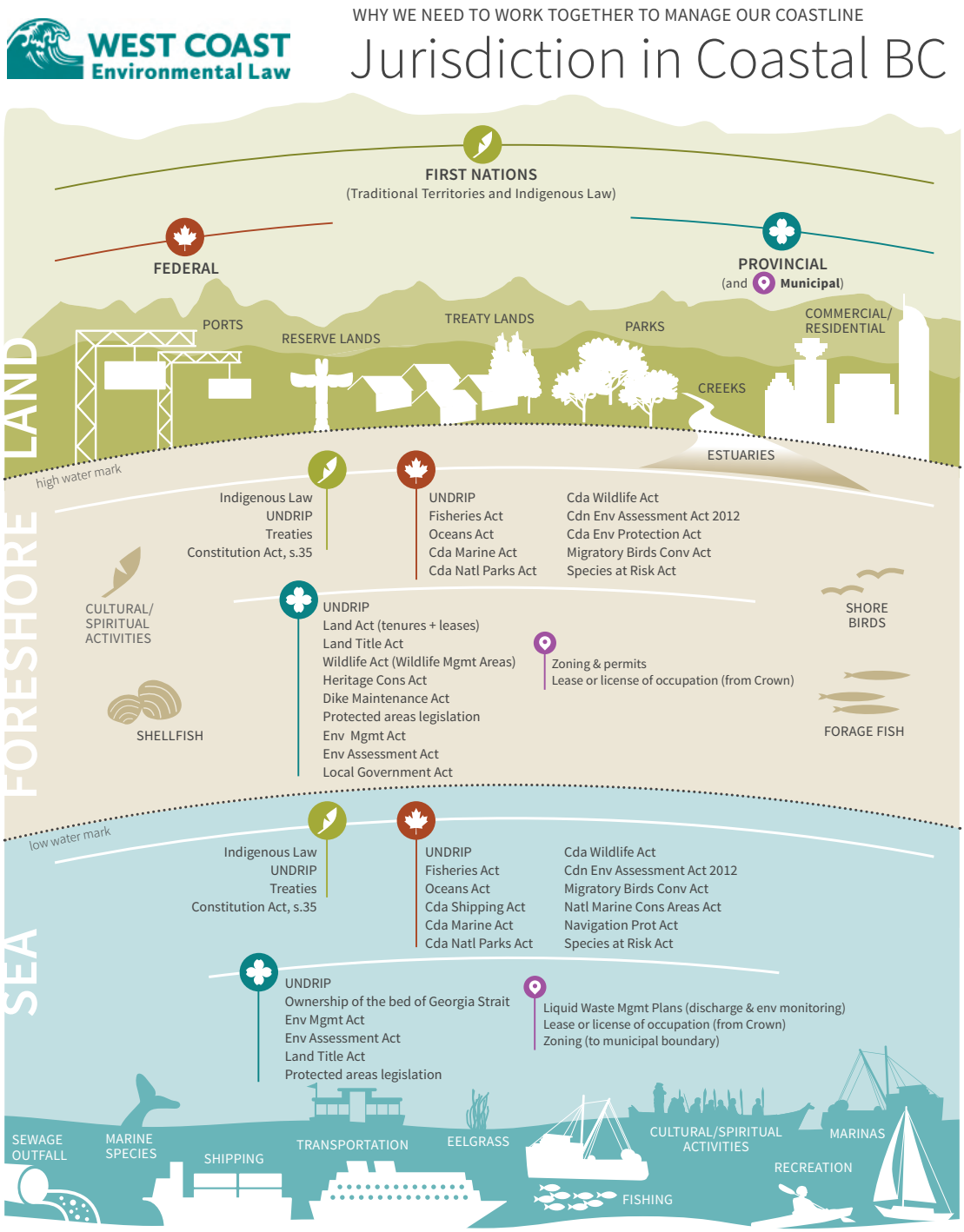

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