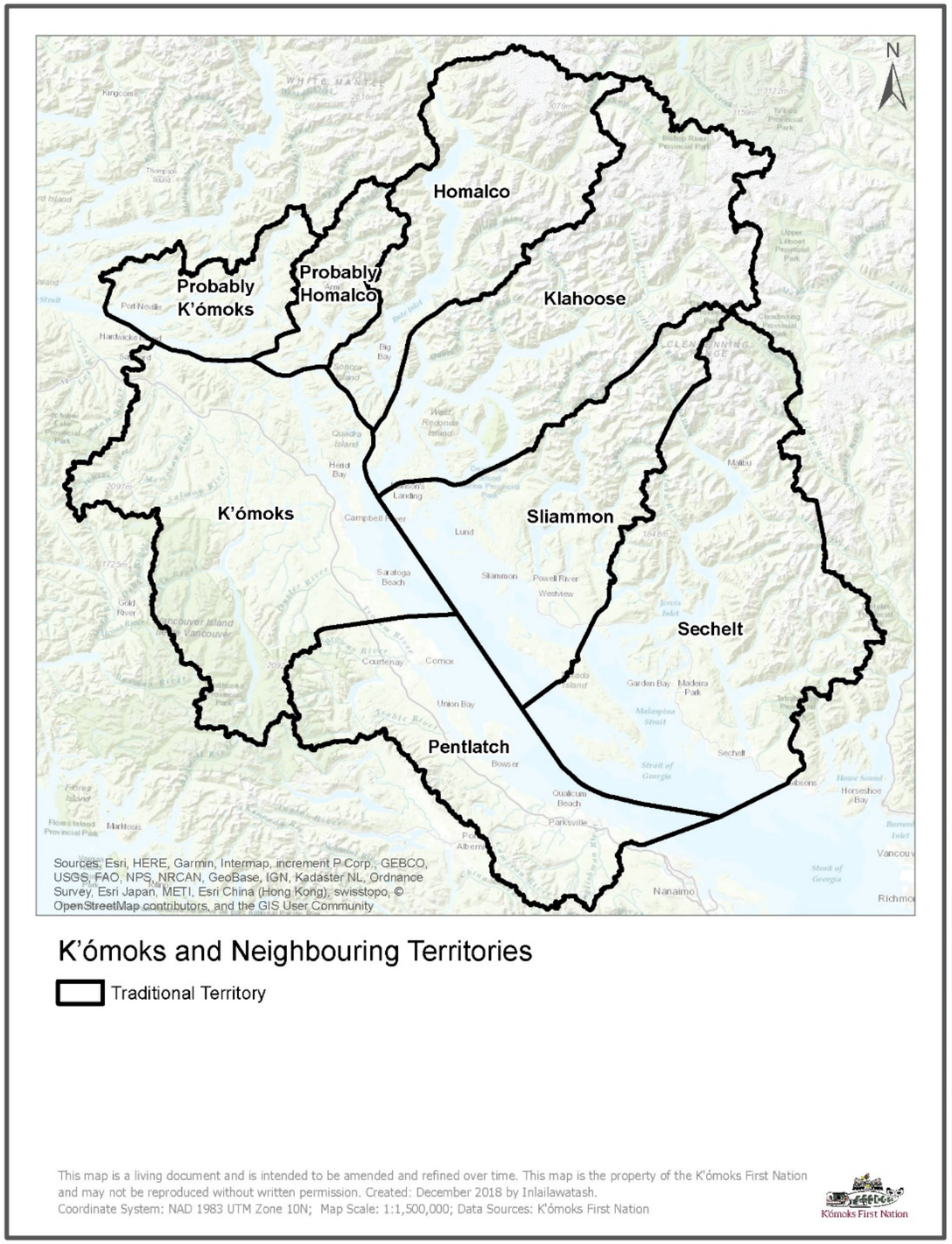
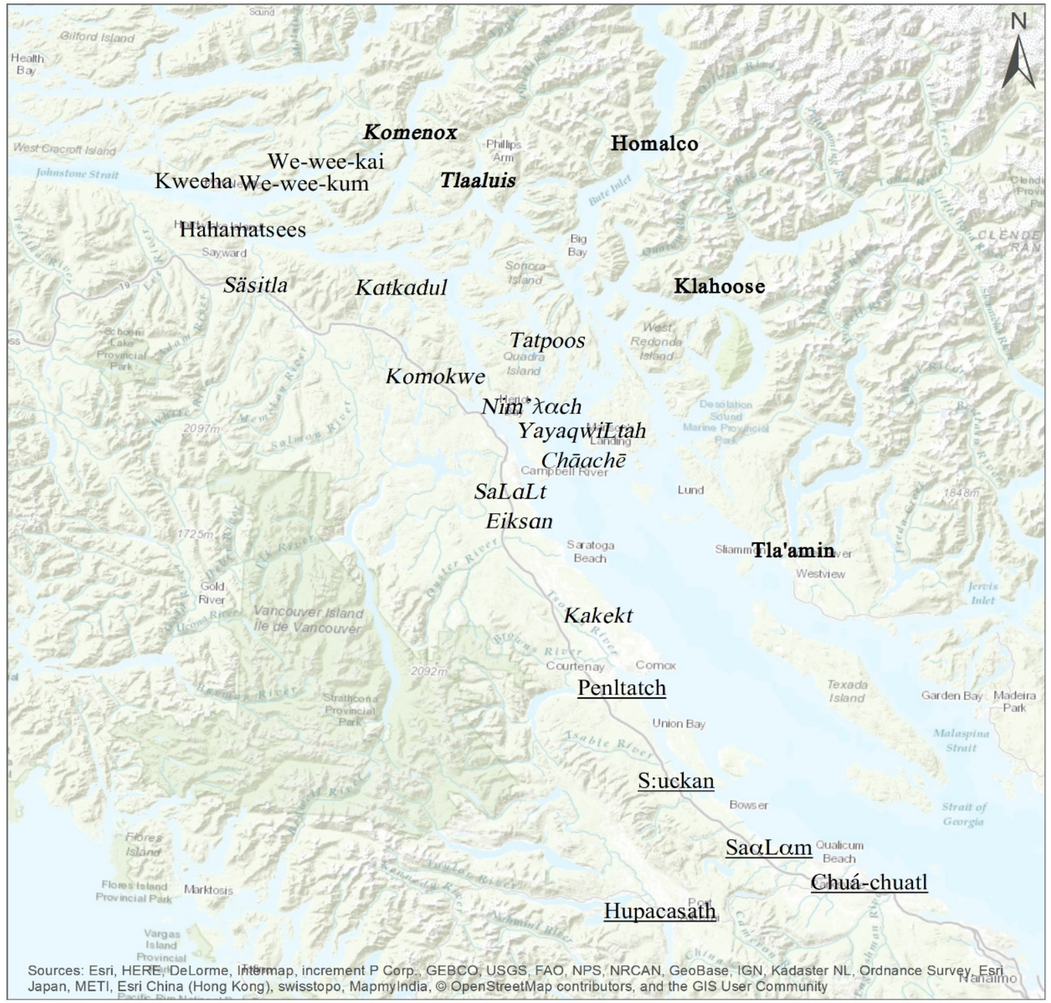
Bringing K'ómoks to Comox (i.e., Pentlatch)

KFN village, circa 1860s, Courtenay River (here!)

Who Is K'ómoks First Nation?





Tribal Groups by Language Affiliation

Identity

K'ómoks/Salułtxʷ

Mainland Comox

K'ómoks or Mainland Comox

Lekwiltok

Pentlatch

Coordinate System: NAD 1983 UTM Zone 10N; Map Scale: 1:1,250,000; Data Sources: K'ómoks First Nation

K'ómoks First Nation

Cape Mudge K'ómoks Village: Ch’k̲wúwutn

- **Earliest depiction of a K'ómoks village by a European**
- **Original sketch by John Sykes (on the Vancouver Expedition AD 1792), “Indian Village, Point Mudge”, watercolor by William Alexander (AD 1798), K'ómoks village until around AD 1846**

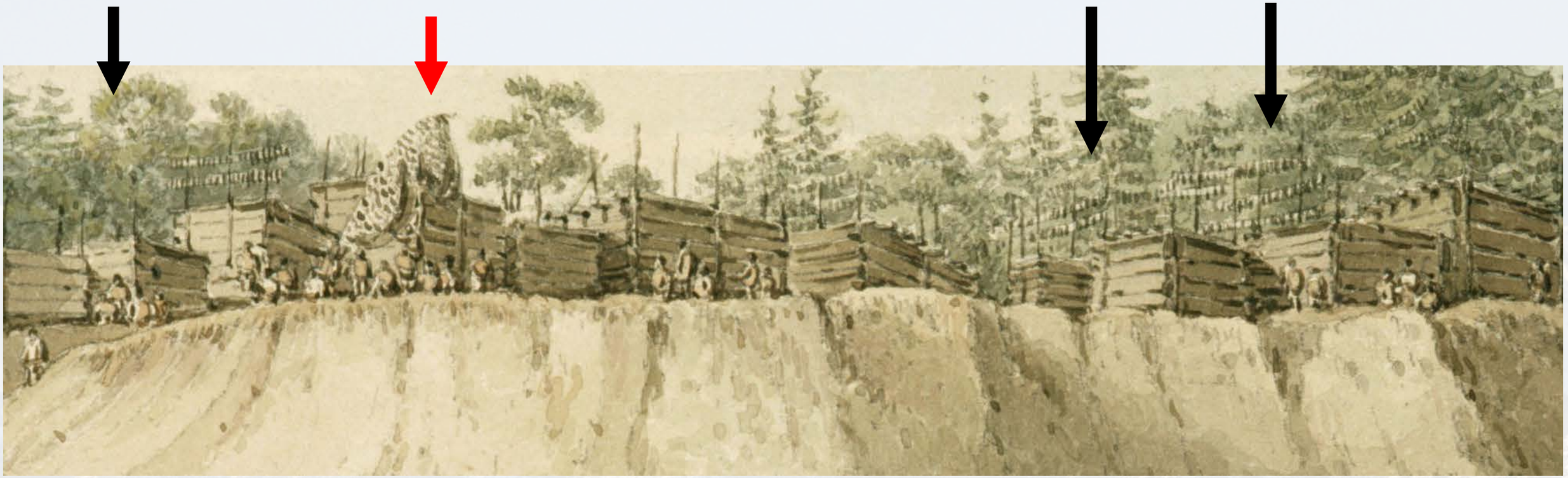
K'ómoks house, circa 1860s, Courtenay River (here!)

Cape Mudge K'ómoks Village: Ch’k̲wúwutn

- **K'ómoks people carrying salmon-sized fish**

Cape Mudge K'ómoks Village: Ch’k̲wúwutn

- Salmon-sized fish (black arrows) and probable seine net drying (red arrow) on roofs: fishing.



“…& we saw some Fishing-Nets drying upon stakes before the houses…” (Archibald Menzies, July 13, 1792, at *Ch’k̲wúwutn*) (Newcombe 1923:83)

Cape Mudge K'ómoks Village: Ch’k̲wúwutn

- Salmon-sized fish (black arrows) and probable seine net drying (red arrow) on roofs: fishing.

Examples of Shell Middens

- **Shell midden caps the bluff top location here.**

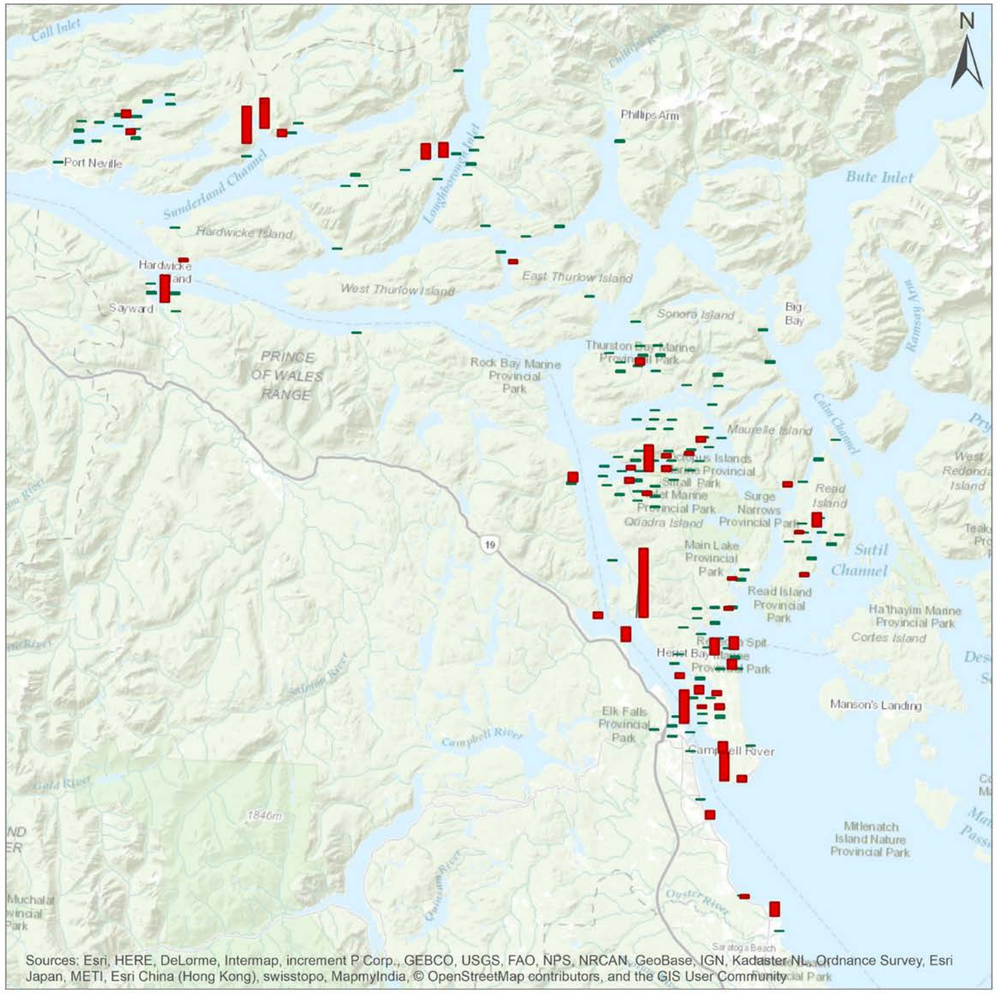
- **Cape Mudge 1792.**

- **Cape Mudge 2015.**

Examples of Shell Middens

- **Excavation of shell midden at DjSf 26 at Union Bay**

- **Most former KFN settlements are marked by shell middens composed of discarded shellfish, fire-cracked rocks, stone tools, and other materials.**

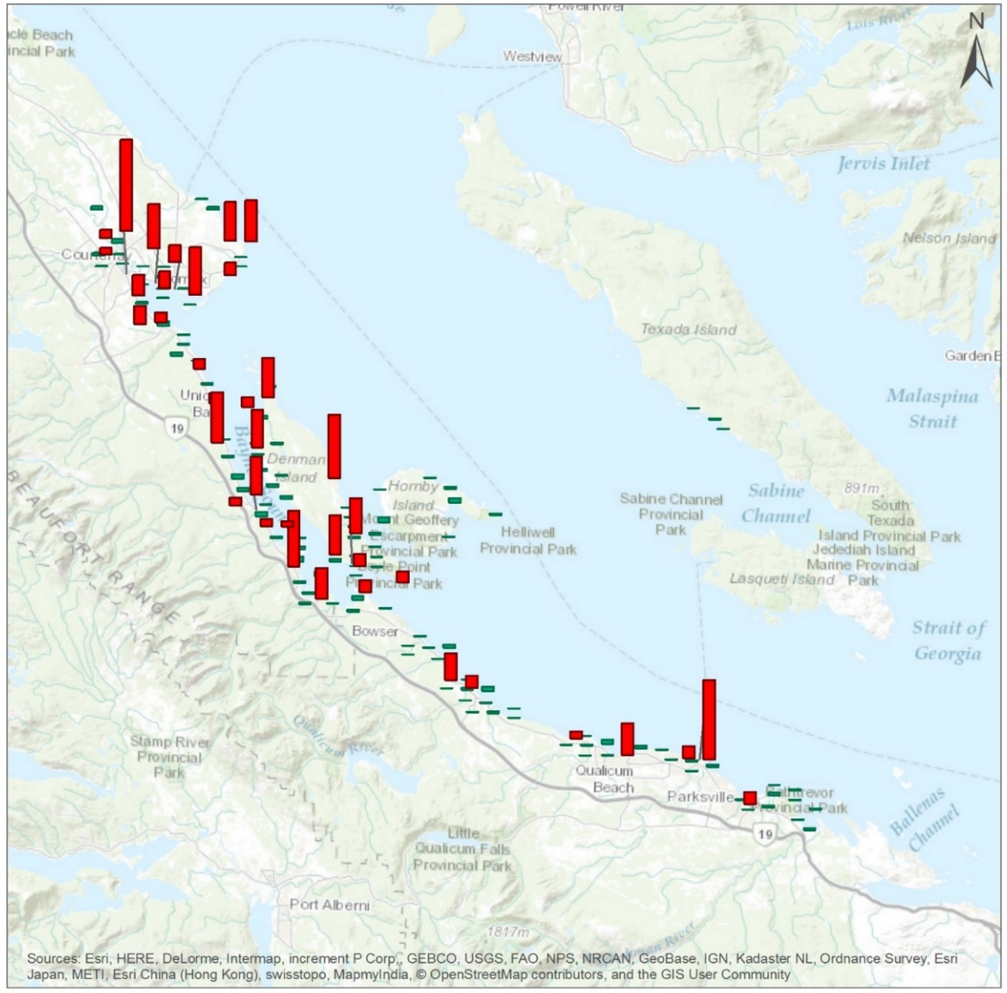


Settlements and Camps by Shell Midden Area

Camp Shell Midden Site Area in Square Meters

Settlement Shell Midden Site Area in Square Meters

K'ómoks First Nation



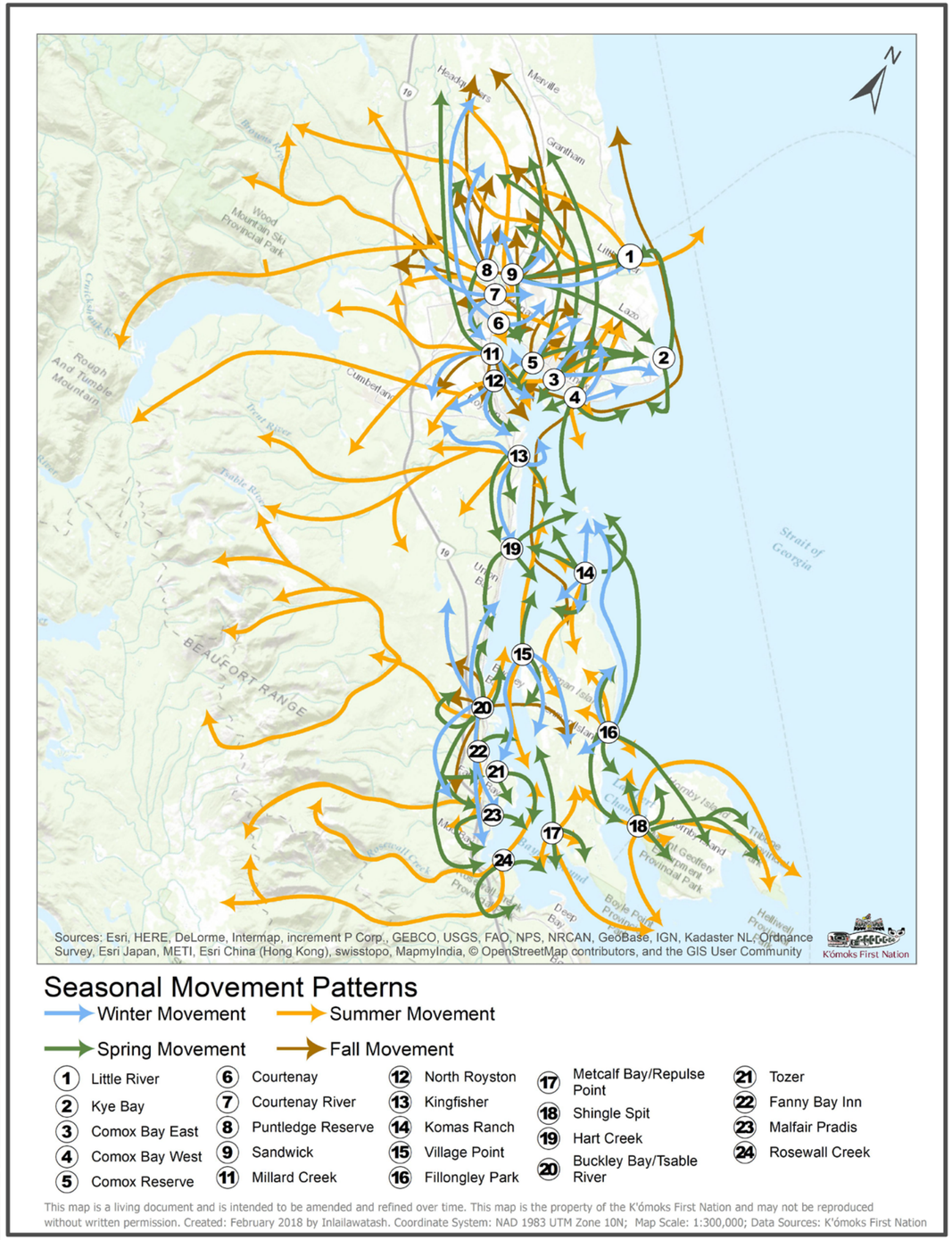
Settlements vs. Camps in the Pentlatch Area

Camp Shell Midden Site Area in Square Meters

Settlement Shell Midden Site Area in Square Meters

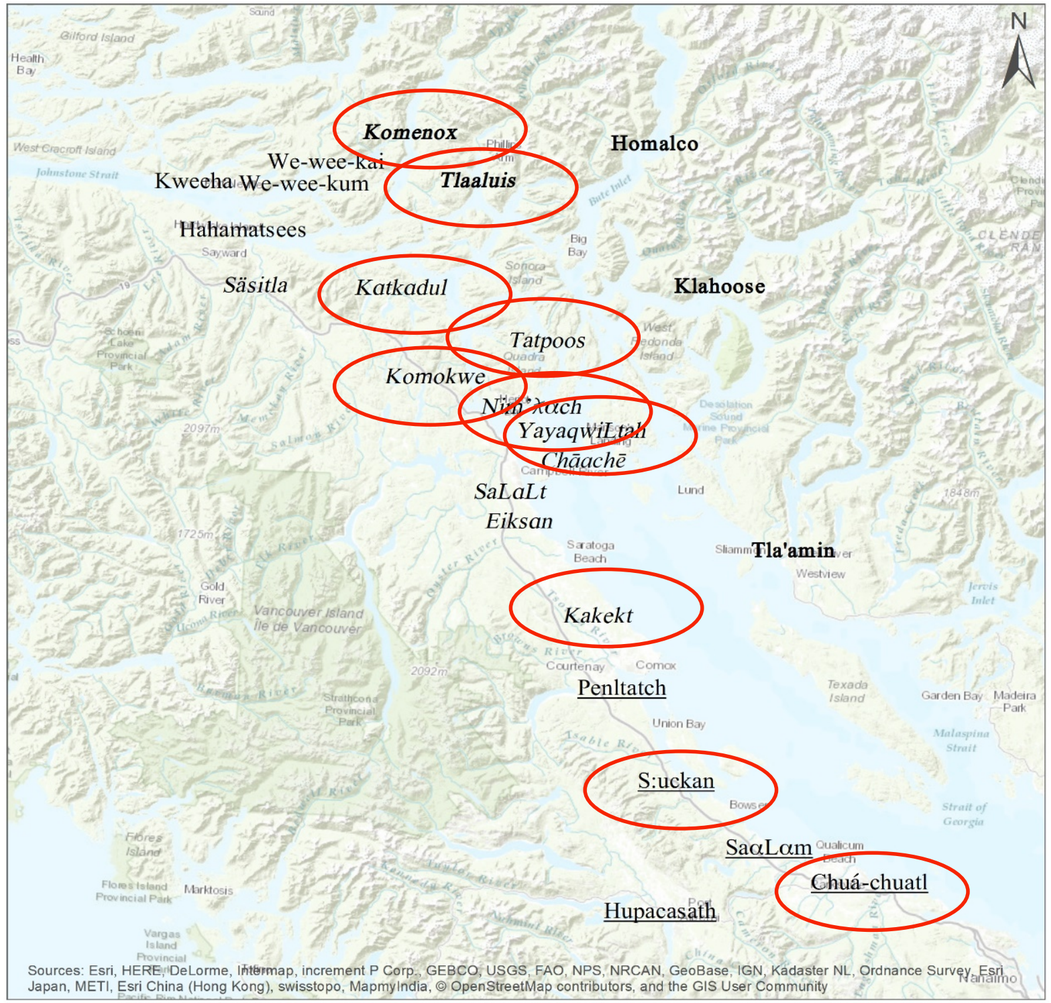
K'ómoks First Nation

- **Pentlatch seasonal movements**



Nearly the End of the World in AD 1775

- **AD 1782 smallpox epidemic among the Coast Salish**
- **Population loss estimates range from a low of 50% to a high of 90%**
- **Entire tribes wiped out, including several Pentlatch-speaking and K'ómoks-speaking groups**
- **Subsequent decades witnessed considerable shifts in populations and a marked increase in conflict**
- **An by AD 1852, K'ómoks had moved from their ancestral homeland and lived alongside the Pentlatch**



Tribal Groups by Language Affiliation

Identity

K'ómoks/Salułtxʷ

Mainland Comox

K'ómoks or Mainland Comox

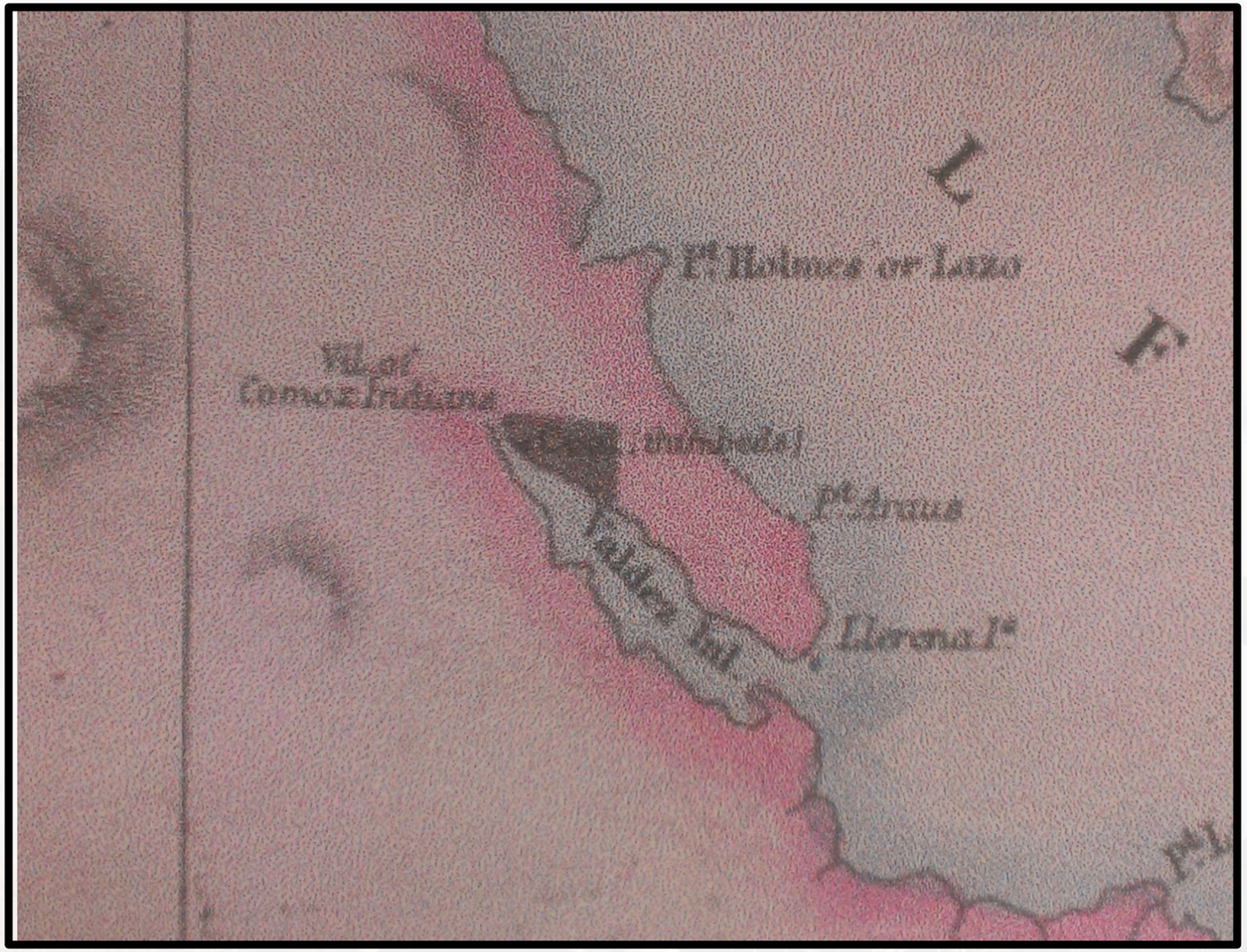
Lekwiltok

Pentlatch

Coordinate System: NAD 1983 UTM Zone 10N; Map Scale: 1:1,250,000; Data Sources: K'ómoks First Nation

K'ómoks First Nation

- Red circles indicate groups that were wiped out.



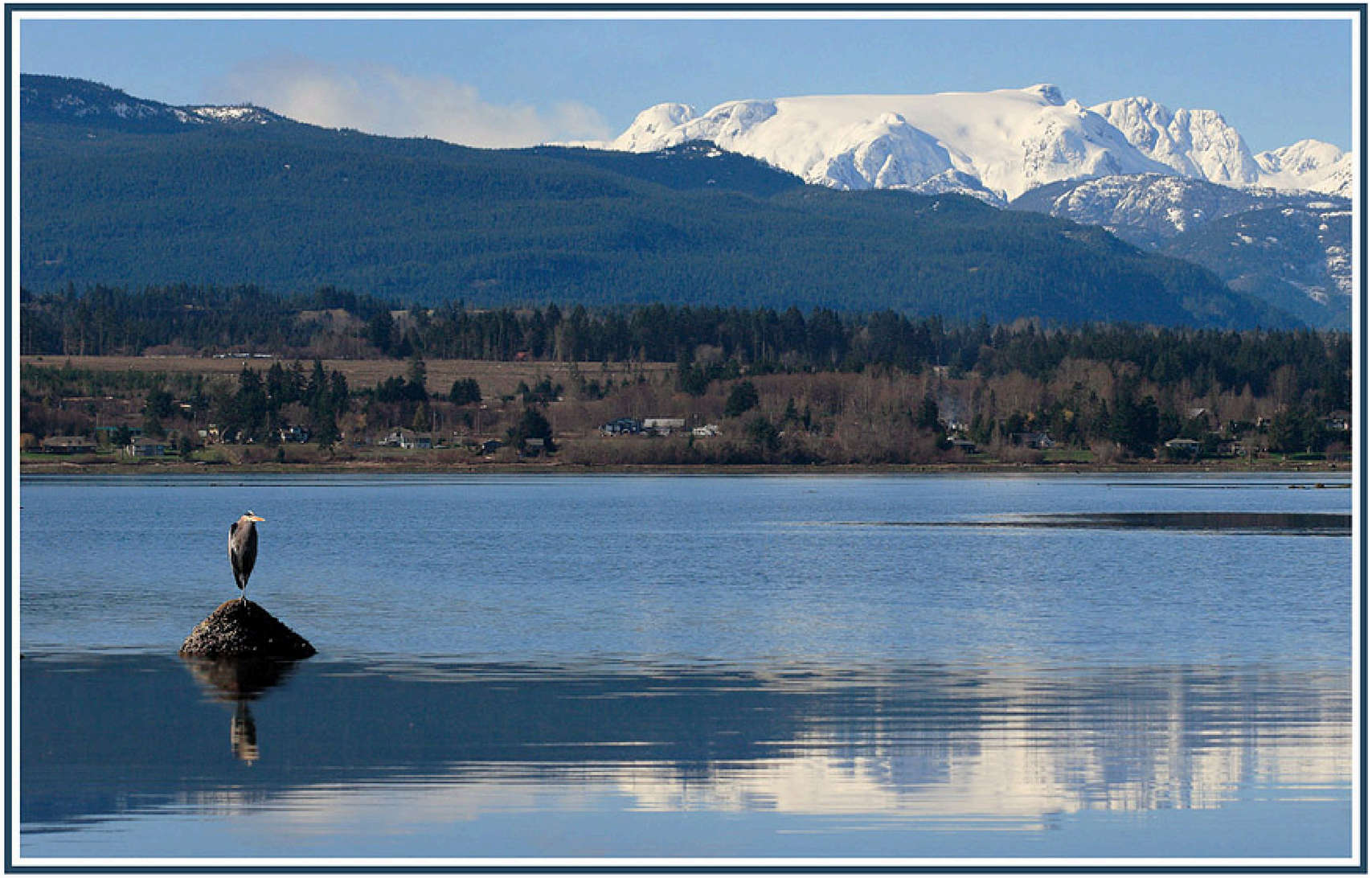
- **Earliest first hand account of K'ómoks people living in the Comox Valley area is AD 1852, on Village Point on Denman Island (McKay 1852).**

Arrowsmith Map (185348, National Archives UK, FO 925/1238) indicating a K’ómoks village near Village Point (“Vil. Of Comox Indians”) (note Baynes Sound used to be called Valdez Inlet).

Conclusions:

- **KFN has a very complex history, including multiple group origins and various amalgamations.**
- **The prior K'ómoks/Pentlatch groups had populations of several thousand each, spread across about 80 settlements from near Salmon River to Englishman River.**
- **These dense populations were maintained by a complex technology applied to rich marine resources.**
- **Smallpox, other diseases, and warfare devastated K'ómoks/Pentlatch populations, likely reducing them by 90% from AD 1782-1862.**
- **K'ómoks survivors relocated south to Comox/Baynes Sound around AD 1847.**
- **Over about a century, the number of K'ómoks/Pentlatch settlements decreased from ~80 to ~4.**
- **In AD 1876, the creation of Indian Reserves froze this settlement pattern at moment in time**
- **Thus, the recent and current single KFN community at the mouth of the Courtenay River, represents the culmination of a century of profound historical changes.**
- **Former K'ómoks/Pentlatch land use and occupation was far more extensive.**

Thank You



LWMP Decision Making Process

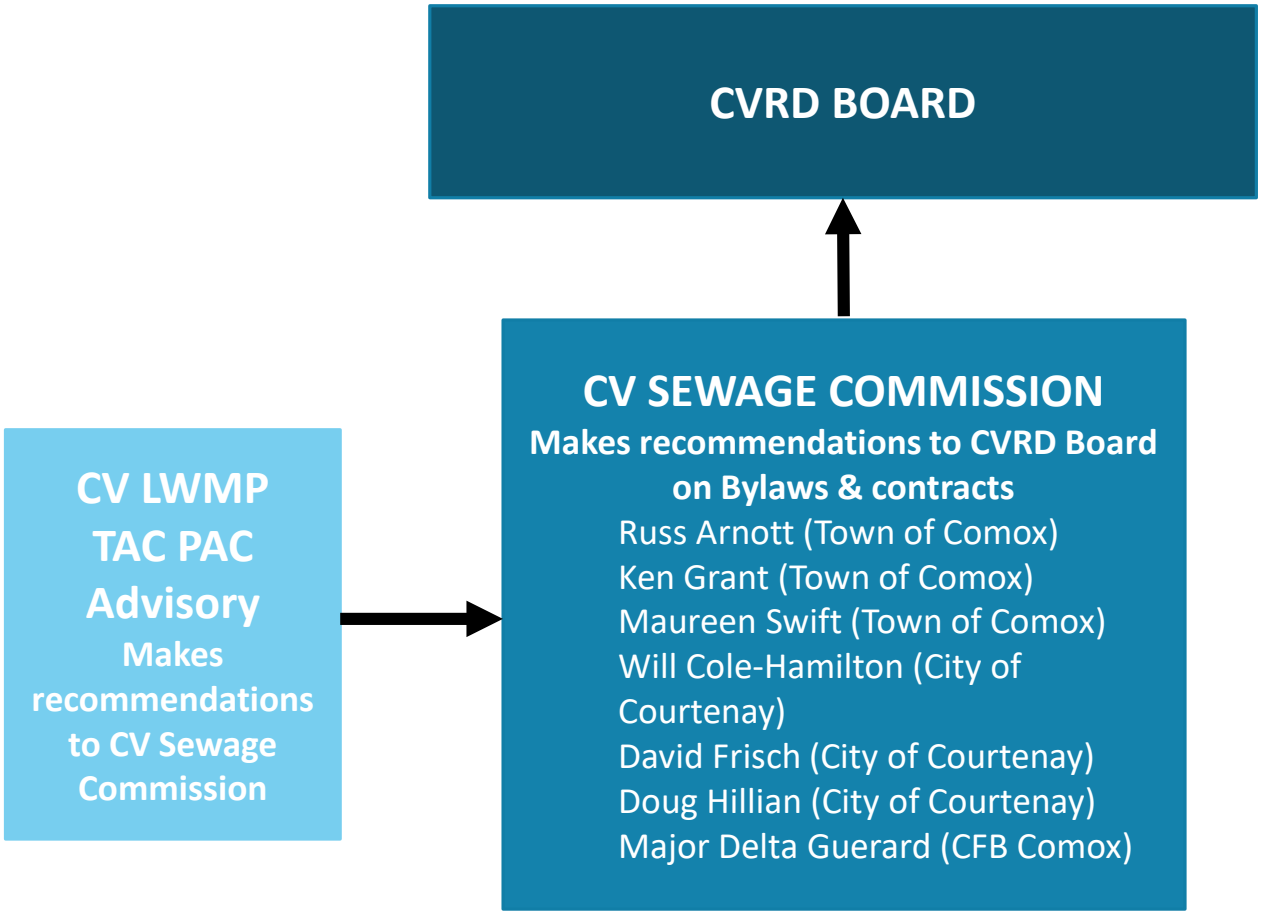
Role of the Committees and the PAC

While the responsibility for the management of the LWMP ultimately rests with the CVRD Board of Directors, the Steering Committee, TAC and PAC will assist in this responsibility by providing input, perspective, specific expertise and recommendations. Members of the committees are expected to participate in meetings and assist with:

- Identifying goals and challenges;
- Generating and reviewing ideas to meet them; and
- Working towards consensus solutions.

It is intended that recommendations to the Steering Committee will be made by consensus, though there may be some that are recorded as non-consensus. A consensus recommendation may include the identification of a specific interest or concern to be noted in the record but not as a limiting factor. A non-consensus recommendation will be made if, after adequate deliberation, the member(s) is/are still not in accord with other members. The non-consensus party must provide a written submission for the record, outlining the rationale for the non-consensus recommendation, within one week of the distribution of the draft meeting notes.

LWMP Decision Making Structure



Provincial Government Review (1)

Ministry of Environment

LWMP Stage 2

- Ensure that the environment is protected;
  - Goal is to meet the Municipal Wastewater Regulation
  - Some variances – greater or lesser – in special situations

LWMP Stage 3

- Must be satisfied that there has been proper public consultation.

Provincial Government Review (2)

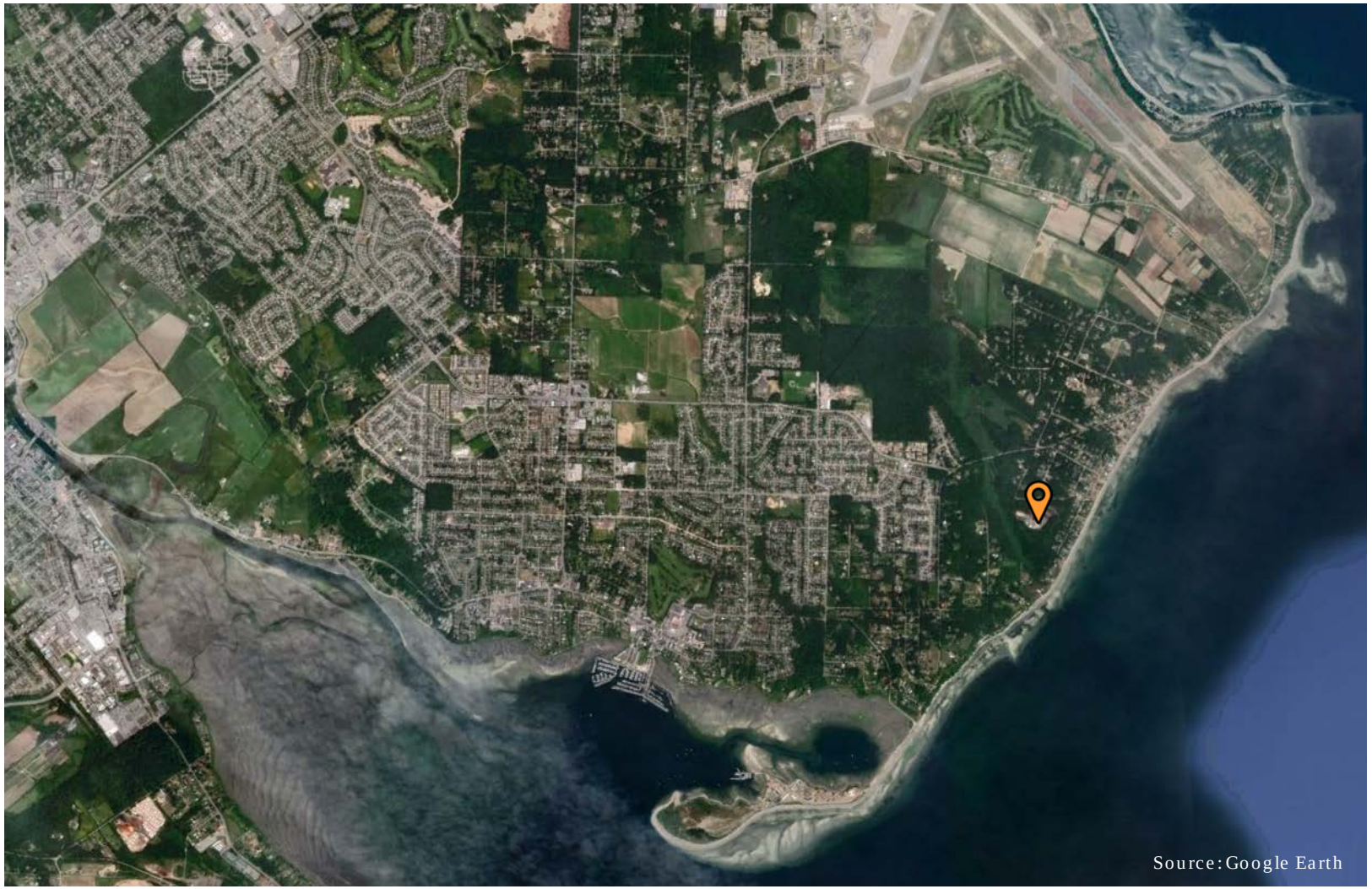
Ministry of Municipal Affairs –LWMP Stage 3

- Review financing plan
- Review and approve of proposed borrowing bylaw.

Stage 2 Wastewater Treatment Level Assessments and Discussion

December 5th, 2019

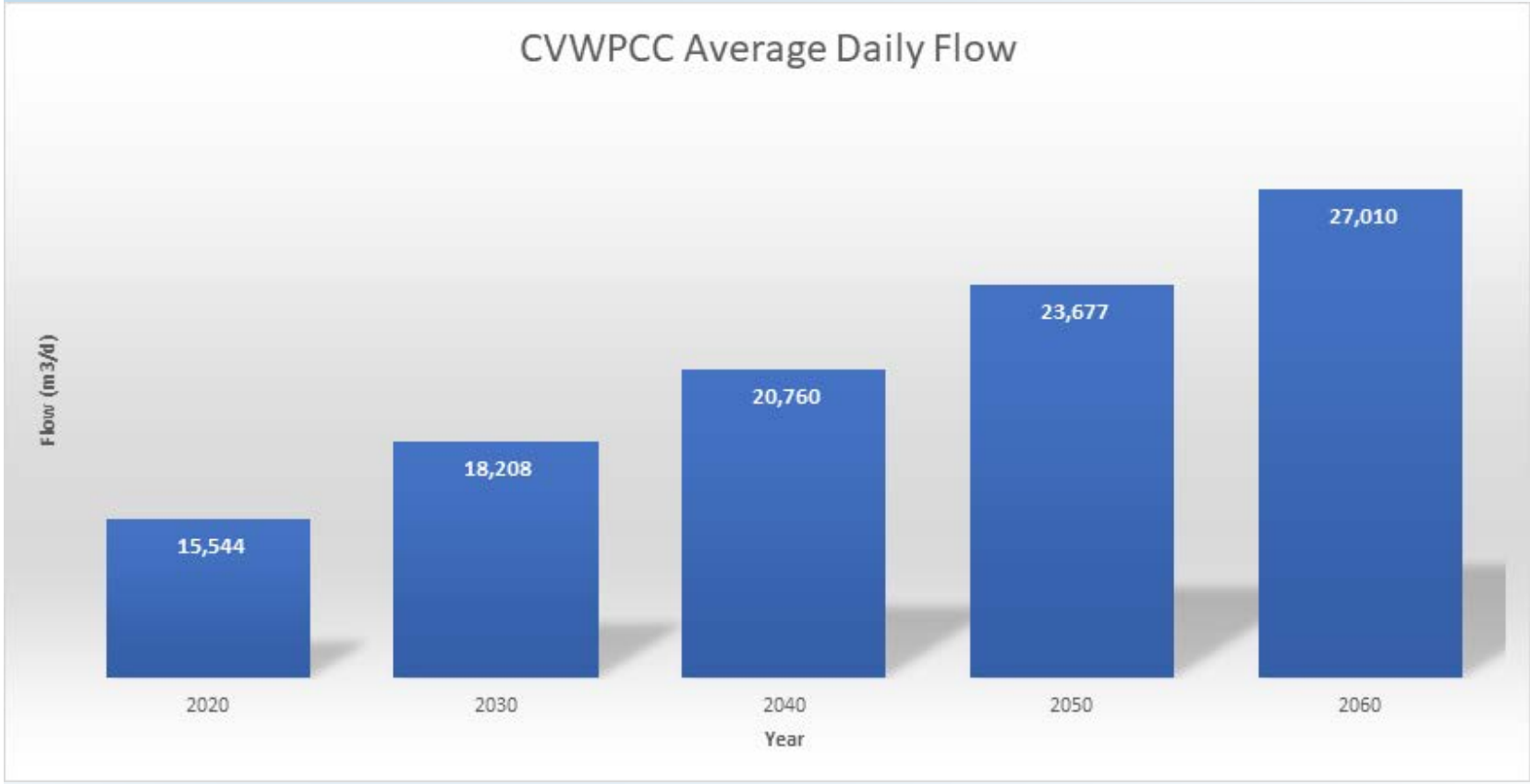
CVWPCC Location



Discussion Points for Wastewater Treatment

- Higher effluent quality = higher cost
- Capital cost for treatment often supported by grants
- Operating costs entirely borne by local government
- Emerging contaminants – treatment processes are still in development and effectiveness is uncertain
- Future proofing of facilities when designing upgrades and expansions recommended (i.e., allow for additional processes to be added or existing processes replaced later on when new technologies are proven)

CVWPCC Capacity Review



Updated Wastewater Flow Projections

Typical influent values:
BOD ~200 - 250 mg/L
TSS ~200 – 250 mg/L

1

Preliminary Treatment

— Influent Screens: channel capacity adequate until 2040 (one new 6 mm screen recommended)
— Grit Removal: today's loads exceed recommended design values, upgraded grit removal recommended

Gravity Settling

2 Primary Treatment

— Primary Clarifiers: adequate until 2040

Typical effluent quality after Primary Treatment:
BOD ~140 mg/L (30% reduction)
TSS ~100 mg/L (50% reduction)

Activated Sludge Aeration Basins

3 Secondary (Biological) Treatment

— Aeration Basins: today's loads exceed recommended design values, additional aeration basins are required
— Aeration Blowers: adequate until 2040

Separation of Biological Solids from Treated Effluent

4

Secondary Clarification

— additional unit is required to meet 2040 loads

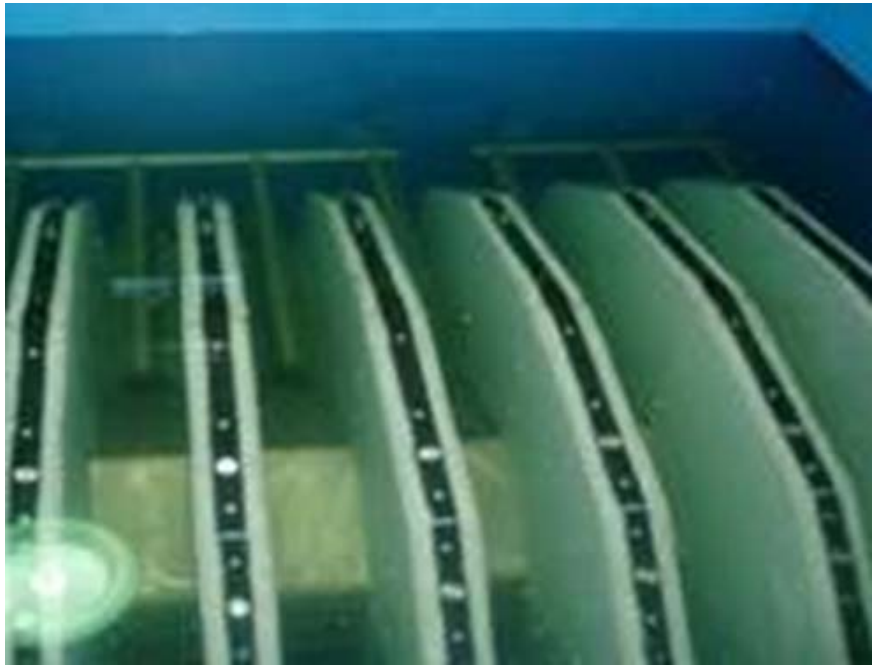
Typical effluent quality after Secondary Treatment & Clarification:
BOD < 25 mg/L (~90% reduction)
TSS < 25 mg/L (~90% reduction)

UV Disinfection inactivates pathogens

5

Disinfection

not currently installed at the CVWPCC



Effluent Filtration with Disk Filters

6

Advanced Treatment

not currently installed at the CVWPCC

Typical effluent quality after advanced filtration:
BOD < 10 mg/L (~95% reduction)
TSS < 10 mg/L (~95% reduction)

Centrifuges ‘dewater’ the solids

4 Solids Dewatering

- Waste Sludge Thickeners
  - Primary sludge (gravity): today’s loads exceed recommended design values, recommend removal or upgrade
  - Biological sludge (Dissolved Air Flotation): adequate until 2040
- Sludge Dewatering Centrifuges: adequate until 2040

Reclaimed Effluent for In-Plant Use

Reclaimed Water

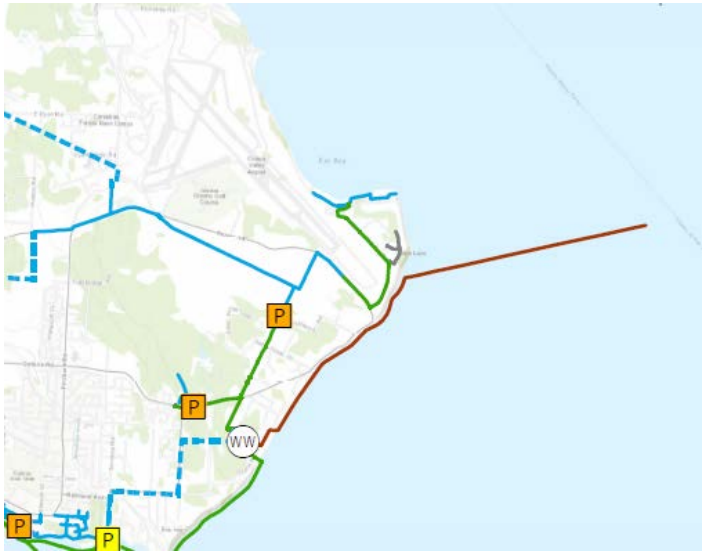
not currently installed at the CVWPCC

Campbell River

Nanaimo Five Fingers

Cape Lazo Outfall

— at capacity, upgrade or replacement recommended



Cape Lazo Outfall

- installed 1983:
  - *onshore section is 2,830m of 900mm diameter prestressed concrete lined cylinder pipe*
  - *marine section is 2,825m of 860mm diameter steel pipe encased in concrete terminating with a diffuser approx. 60 m below sea level*
- marine section:
  - *dive survey (ROV) in 2012 noted surface corrosion on pipe exterior, failure of concrete casing in places*
  - *ultrasonic thickness testing in 2014 noted reasonable pipe thickness remaining (estimated approx. 7% to 10% loss)*
  - *effluent not discharging from 26 of 99 diffuser ports*
- pumping is required during high flow/high tide events – there is an equalization basin at the outfall pumping station but system is at capacity and additional equalization storage is being added
- capacity assessment in 2016: options for outfall improvements $22.8M to $24.4M (staging possible for some options)

Other Considerations for Next CVWPCC Upgrade

- Age of equipment, concrete tanks and structures - corrosion, wear and tear (plant originally constructed in 1982)
- Older facilities may not meet today's standards and codes
  - Electrical Codes
  - Worker Safety
  - Seismic Resilience (BC Building Code for post disaster facilities)
  - Process Reliability (redundancy)
- Site investigation prior to construction of new facilities to determine if ground improvements for seismic resilience are needed
- Identify which assets can continue in use for the long term
- Site layout, space requirements for expansion and future addition of new processes (e.g., solids digestion)

Wastewater Treatment Level Options Assessment

Cost Estimates for Comparison of Treatment Level Options

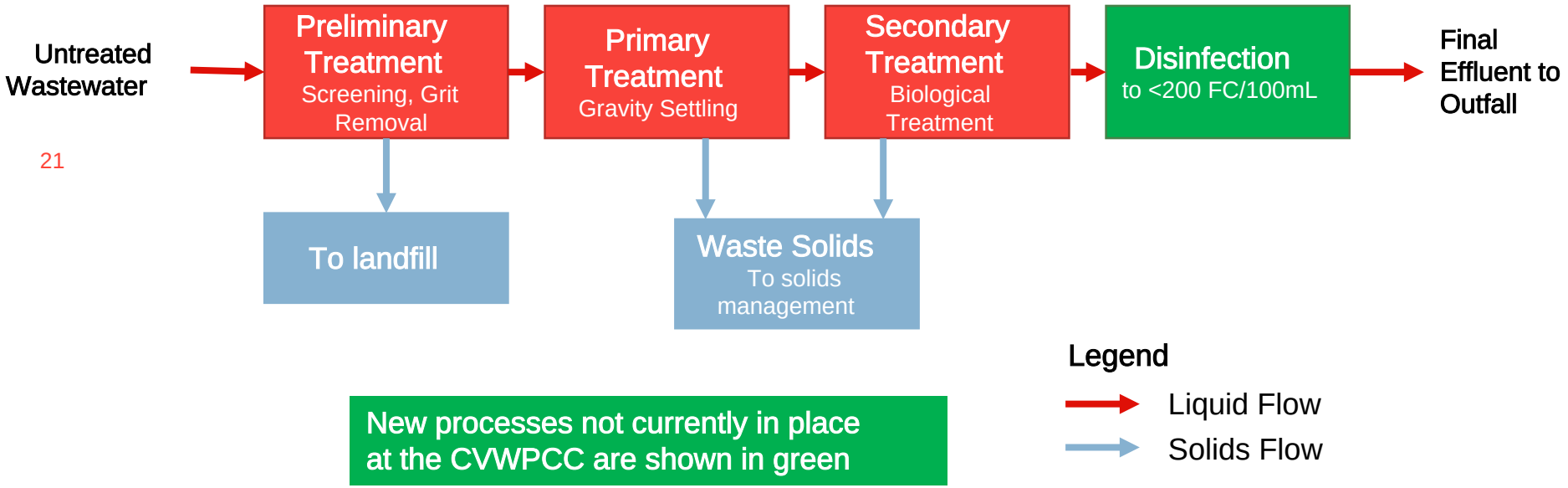
- Based on CVWPCC upgrade to meet projected 2040 flow and load
- Replacement/refurbishment of existing facilities and equipment not incl.
- Assume continued use of existing processes and technologies
- Effluent UV disinfection to meet regulatory requirements for shellfish protection (fecal coliforms) is included for all options
- Configuration and site layout of upgraded facilities TBD before detailed design of next plant upgrade – based on assumptions for now
- Cost estimates do not include ground improvements for seismic resilience (requires site investigation and earthquake modelling)
- Outfall improvements are required but this will not be affected by the selected level of treatment

Wastewater Treatment Options Advanced From Stage 1

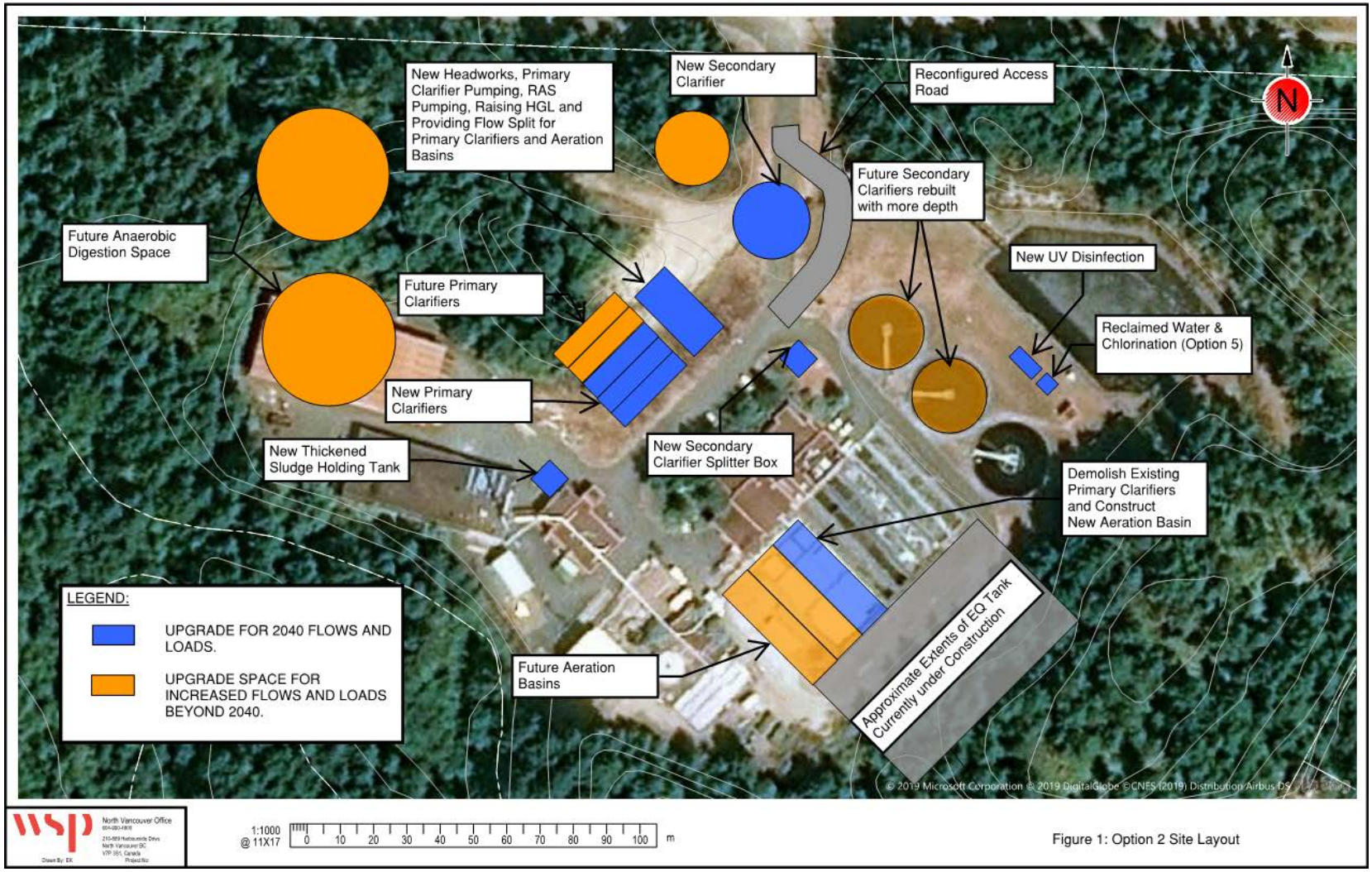
- Continue with centralized treatment at the CVPCC
- Option 2: secondary treatment for entire flow with disinfection
- Option 3: Add advanced effluent filtration for 2xADWF
- Option 4: Add advanced effluent filtration for entire flow
- Option 5: Add reclaimed water for in-plant use (can apply to all options)
- Note that Option 1 (secondary treatment for up to 2x ADWF) was not advanced, since it would represent a step back from the existing treatment level

Existing Site Layout

Option 2
Secondary Treatment for all Flows + Disinfection



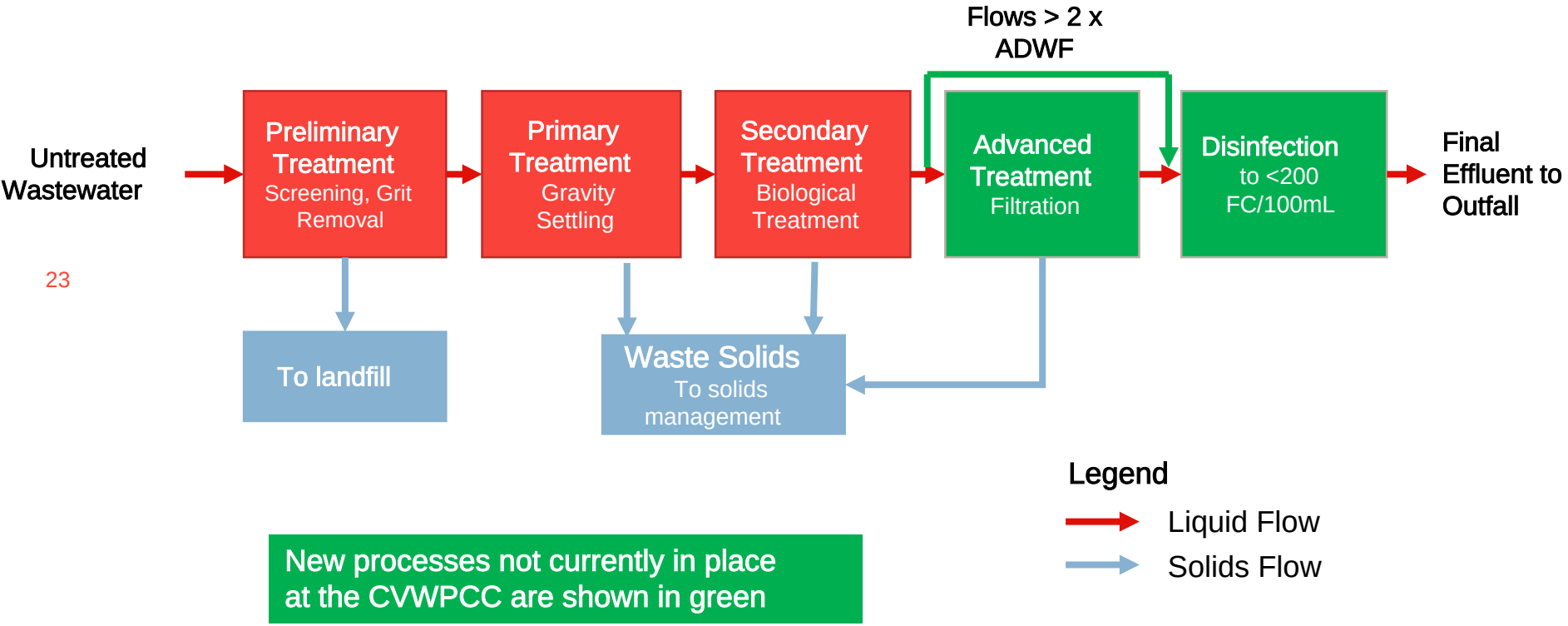
New processes not currently in place at the CVWPCC are shown in green



Option 2
Secondary Treatment for all Flows + Disinfection

Upgrade Capital Costs	$ 29,700,000
Additional Annual O&M Costs	$ 190,000
Net Present Value	$32,000,000

Option 3
Advanced Filtration for up to 2xADWF + Disinfection



New processes not currently in place at the CVWPCC are shown in green

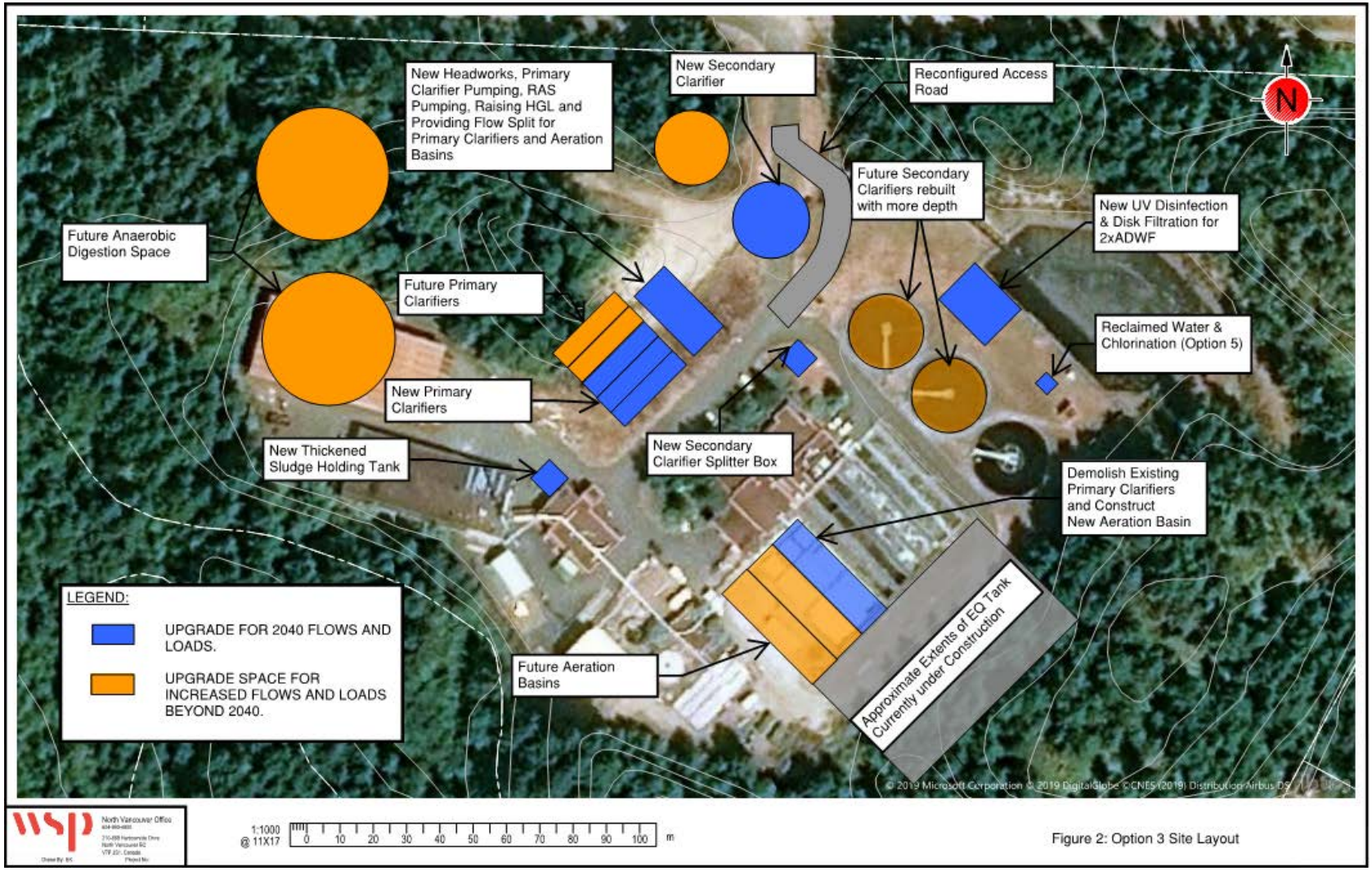
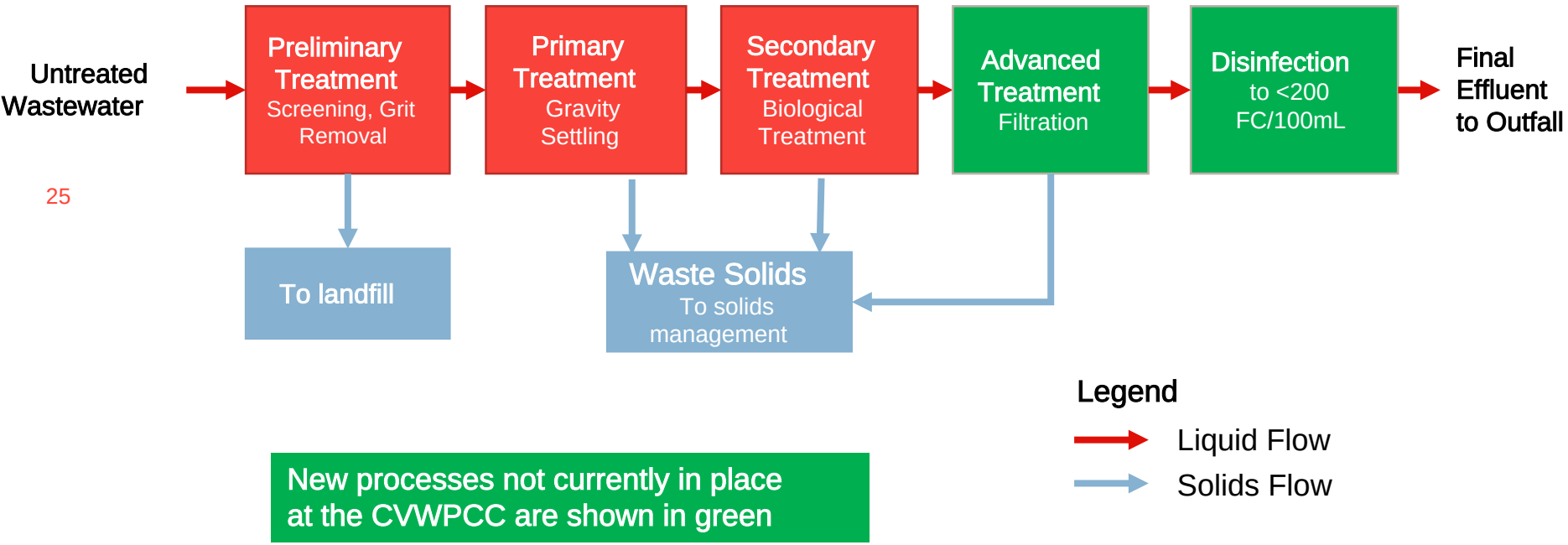


Figure 2: Option 3 Site Layout

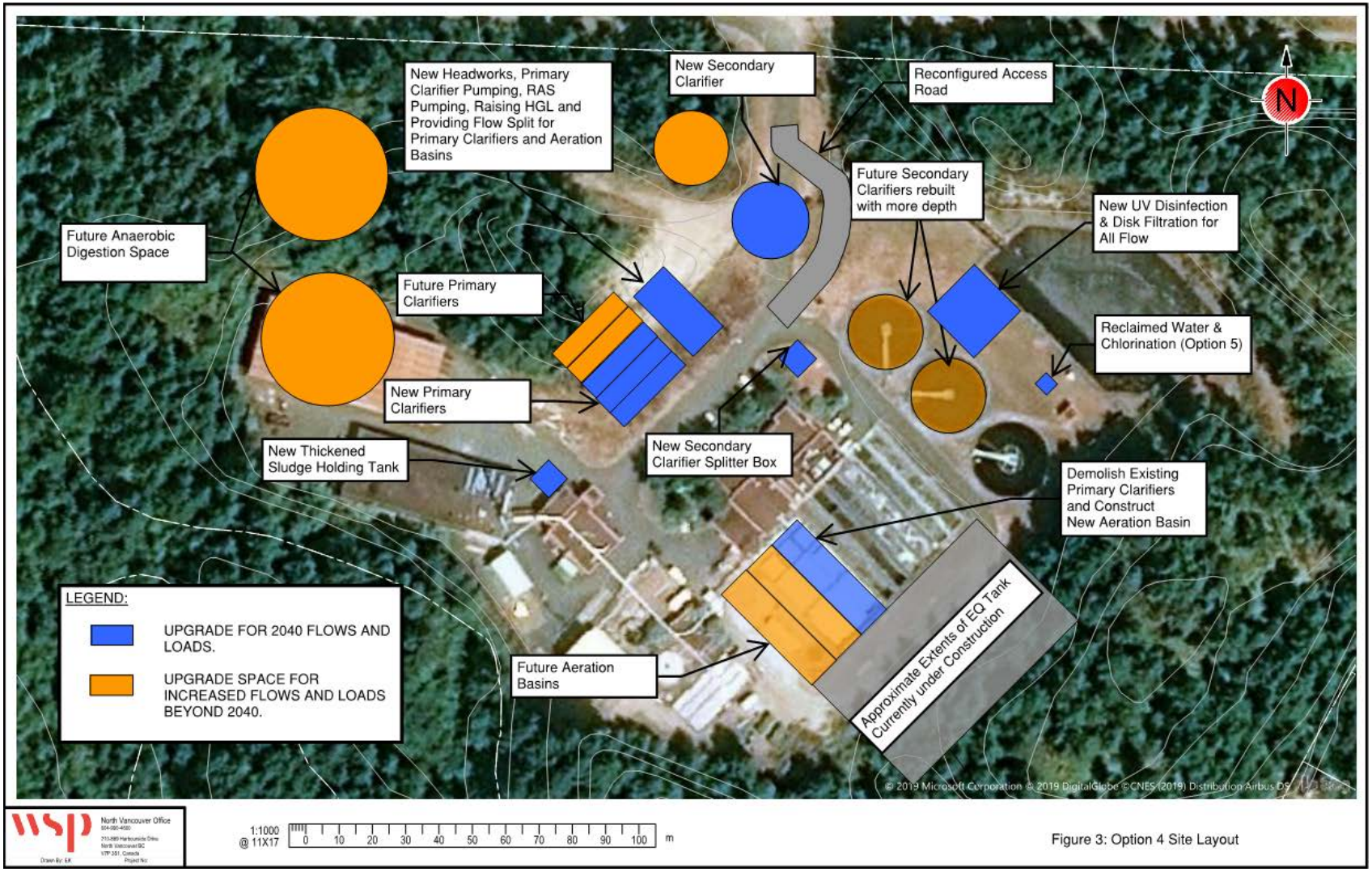
Option 3
Advanced Filtration for up to 2xADWF + Disinfection

Upgrade Capital Costs	$ 38,000,000
Additional Annual O&M Costs	$ 200,000
Net Present Value	$40,500,000

Option 4
Advanced Filtration for all Flows + Disinfection



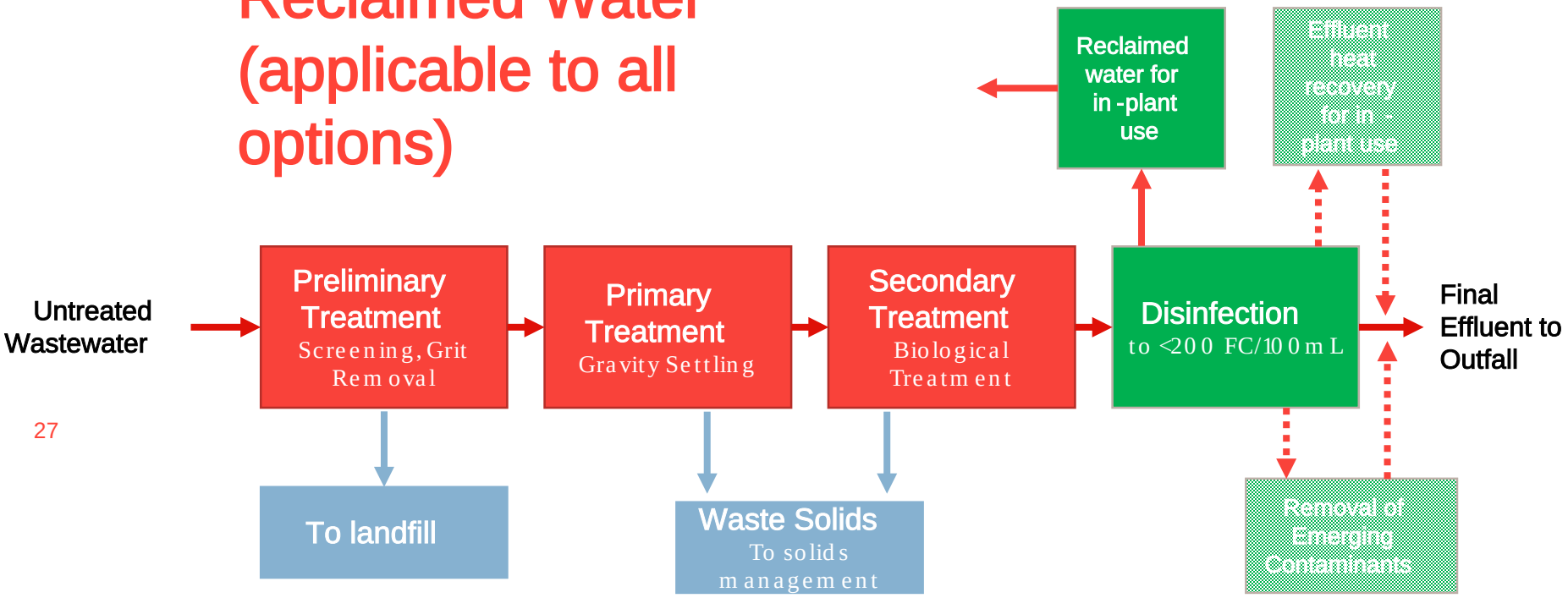
New processes not currently in place at the CVWPCC are shown in green



Option 4
Advanced Filtration for all Flows + Disinfection

Upgrade Capital Costs	$ 40,300,000
Additional Annual O&M Costs	$ 215,000
Net Present Value	$43,000,000

Option 5
Reclaimed Water (applicable to all options)



Note: new processes not currently in place at the CVWPCC are shown in green

27

	OPTION 2: SECONDARY TREATMENT W/ DISINFECTION BASE CASE	OPTION 3: ADVANCED TREATMENT FOR 2XADWF	OPTION 4: ADVANCED TREATMENT FOR ENTIRE FLOW	OPTION 5: RECLAIMED WATER FOR IN -PLANT USE
CVWPCC Upgrade Capital Costs	$ 29,700,000	$ 38,000,000	$ 40,300,000	$780,000
Additional Annual O&M Costs	$ 190,000	$ 200,000	$ 215,000	$7,000
Net Present Value	$32,000,000	$40,500,000	$43,000,000	$864,000
Benefits	— meets capacity and regulatory requirements for the next 20 years — removes 90% of organic material and solids — removes 80 -95% of microplastics — disinfection meets shellfish standards (fecal coliforms) — in - plant use of reclaimed water can be incorporated — allow for future installation of effluent disk filters	— 99% of annual flow volume receives advanced treatment — removes 96% of organic material and solids — removes 95% to 97% of microplastics — disinfection meets shellfish standards (fecal coliforms) — In-plant use of reclaimed water — large scale effluent reuse can be implemented if a user can be found in close proximity	— 100% of annual flow volume receives advanced treatment — removes 96% of organic material and solids — removes 95% to 97% of microplastics — disinfection meets shellfish standards (fecal coliforms) — In-plant use of reclaimed water — large scale effluent reuse can be implemented if a user can be found in close proximity	— generally economical since piping and pumping costs are minimal — resource recovery — offsets use of potable water for washdown, process water, landscape irrigation, etc.
Risks *note costs do not include outfall improvements or ground improvements if required for seismic resilience	— Capital costs are dependent on condition assessment and outcome of a Pre - design study	— Cost premium of approximately $8M for addition of disk filters to treat 2xADWF — Advanced treatment is not a regulatory requirement — Without a user for the reclaimed water, costs may not be justified	— Cost premium of approximately $10.7M for addition of disk filters to treat the full flow — Advanced treatment is not a regulatory requirement — Without a user for the reclaimed water, costs may not be justified	— Requires chlorine residual in distribution system to protect worker health

Studies in Advance of Detailed Design for CVPCC Upgrade

- Pre-design/Master Plan
  - *Develop site layout for long -term future*
  - *Process selection and process design*
  - *Cost Estimates*
- Condition Assessments
  - *Major Equipment*
  - *Concrete Structures and Tanks*
  - *Buildings*
- Site subsurface investigation and earthquake modelling to develop recommendations and costs for ground improvements (if required)

Cost per Connection Impact for Single Family Residential

	OPTION 2	OPTION 3	OPTION 4
Treatment	$57	$79	$85
Outfall Upgrades	TBD		
Conveyance	TBD		

Current SF Residential Sewer Rates:

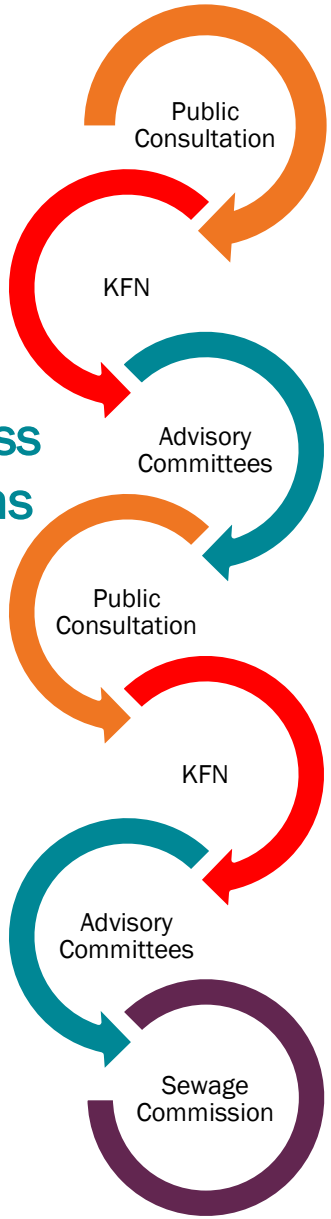
Town of Comox -$369/year

City of Courtenay $345/ year

Begin Evaluation Process
For Conveyance Options

Selection of Preferred
Conveyance Option

Preferred
Option Decision



LWMP Process Timeline