SCHEDULE A
This forms part of application
ARP24-0001 OCP24-0012
Planner Initials MT
City of Kelowna
DEVELOPMENT PLANNING

Schedule A – Proposed Text Amendment

No.	Section	Current Wording	Proposed Wording	Reason for Change
1.	**Chapter 5 : The Core Area,** Policy 5.2.6 Burtch / Harvey Area Redevelopment Plan	Consider greater heights and densities than afforded in the Core Area Neighbourhood designation in the Burtch / Harvey Area as outlined on Map 16.1, only at such time as an Area Redevelopment Plan initiated by the property owners is completed.	Support development in the Burtch / Harvey area as outlined on Map 16.1 that is generally consistent with the Burtch / Harvey Area Redevelopment Plan.	To reflect Council endorsement of the Burtch / Harvey Area Redevelopment Plan.

BURTCH / HARVEY

AREA REDEVELOPMENT PLAN

APRIL 2025

DIALOG® | PMC (HARVEY) HOLDINGS CORP

Image Landsat / Copernicus

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01

INTRO

The following report outlines the current conditions analysis and preferred concept for the Burtch / Harvey site (1574-1634 Harvey Avenue). The contents of this report are founded upon the guidelines set forth in the Terms of Reference mutually agreed upon by the City of Kelowna and the landowner.

1.1 Executive Summary

This report outlines the site analysis, planning process, and preferred concept for Burtch/ Harvey (574-1634 Harvey Avenue). It is the second submission as part of the Burtch/ Harvey Area Redevelopment Plan process, as outlined in the Terms of Reference for this project, which were mutually agreed upon by the City of Kelowna and the property owners.

The first portion of this report details the analysis of the physical baseline for the site, as well as existing and in-stream Federal, Provincial, and Municipal policies and regulations that specifically relate to or guide the redevelopment potential of the site and its surrounding context. This includes the 2040 City of Kelowna Official Community Plan, Capri-Landmark Urban Centre (CLUC) Plan, Healthy Housing Strategy, and the 2023 Housing Needs Assessment. Within the 2040 City of Kelowna Official Community Plan, this potential is recognized in Policy 5.2.6: Burtch/Harvey Area Redevelopment Plan, which calls for the consideration of greater heights and densities than those afforded in the Core Area Neighbourhood designation and for this potential to be explored through an Area Redevelopment Plan to be initiated by the property owners.

As the report outlines, the site has exciting development potential. Harvey Avenue and Burtch Road, the two intersecting and adjacent streets, are designated as future transit corridors, ensuring convenient accessibility to the site and favorable potential for growth and increased activity. The proximity of the studied area to key destinations in Kelowna, such as downtown, Knox Mountain, and Mission Creek Regional Park, further adds to its appeal.

Three preliminary concepts were developed and outlined within Submission #1 of the ARP process. The project team then shared these concepts with the public through two public information meetings and gathered helpful feedback on what was working within the concepts and what could be improved. Details on the feedback received are outlined within the Public and Indigenous Engagement section of this report on page 13. Additional feedback on the three concepts was received from the City of Kelowna. This feedback informed the development of a preferred concept for the site, which is outlined in this document.

02

PLANNING PROCESS

Burtch / Harvey is a unique site, located at the intersection of Burtch Road and Harvey Avenue (Highway 97) in Kelowna, British Columbia. With the Official Community Plan for the City of Kelowna, the site is identified as having potential for greater heights and densities that afforded in the Core Area Neighbourhood designation. To achieve this, the landowners would need to undertake an Area Development Plan process which provides a link between Kelowna's 2040 Official Community Plan (OCP) and specific land development applications. Where an OCP is too broad and where a single development application (rezoning or development permit) is too narrow, ARPs provide the necessary framework that allow City Staff, the community, and Council to conduct the necessary investigations to examine development potential.

The intent of the ARP process is to determine a viable development plan that best suits the objectives of the City including issues such as landuse, density, massing, transportation, servicing, environmental considerations, public benefits, and urban design. This report is the third submission of this ARP process, the Concept Plan, and represents the preferred concept for the site which has been developed through technical analysis and public engagement.

2.1 Vision & Objectives

Burtch / Harvey is a vibrant site with a strategic position along Harvey Avenue, a key commercial route and transportation corridor in the region. The site plan includes dynamic public spaces that harmonize with its surroundings, including the adjacent Parkinson Recreation Centre. The incorporation of Mill Creek into the site design underscores a commitment to the preservation and enhancement of its natural attributes.

Burtch / Harvey presents a combination of retail establishments and diverse housing options, thereby enriching the overall diversity of the area. It serves as a practical model for the community development objectives that Kelowna seeks to advance and is a reflection of the community's aspirations in action.

OBJECTIVE 1

Providing Housing Diversity

OBJECTIVE 2

Supporting Equitable City Building

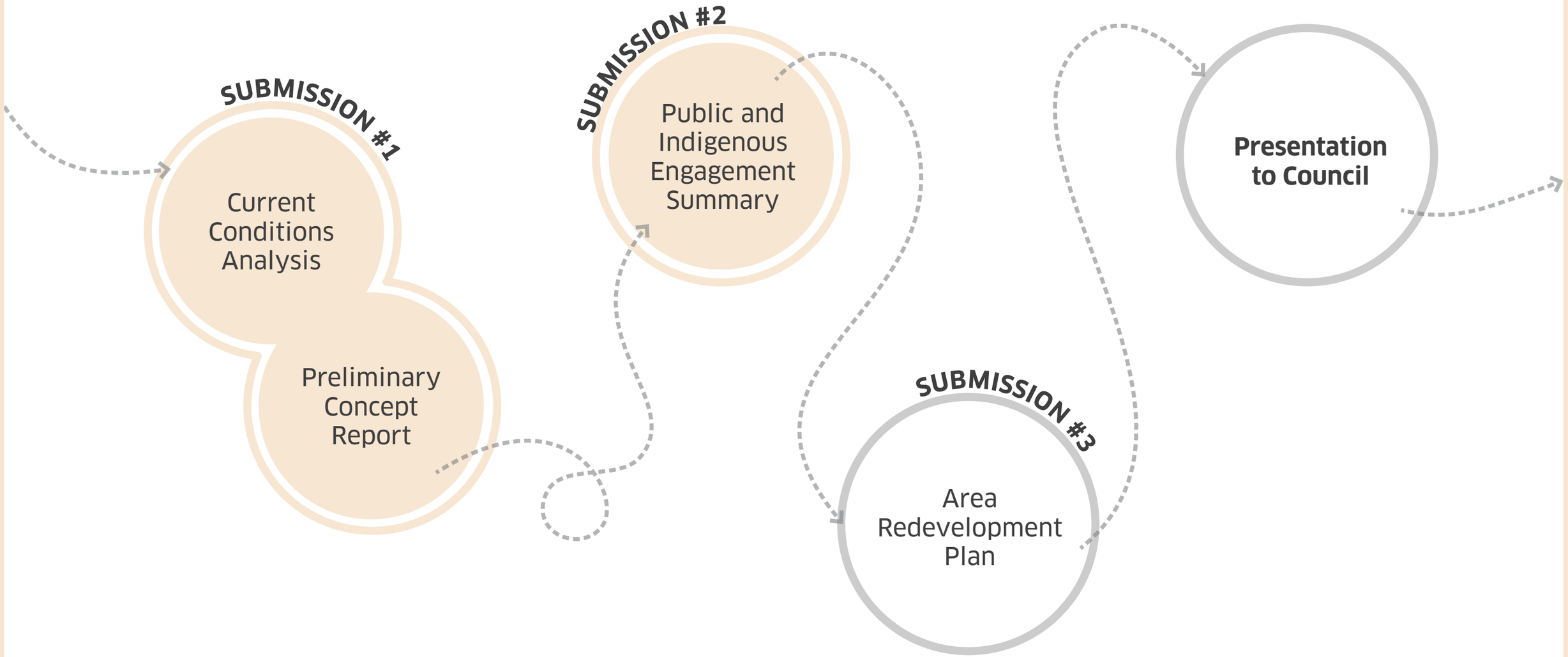
OBJECTIVE 3

Growth Along Transit Corridors

OBJECTIVE 4

Enhanced Sustainability

2.2 The Planning Process & Timeline



2.3 Policy Context

Imagine Kelowna (2018)

Imagine Kelowna is a visioning document for what the municipality and community strives to be by 2040. The document articulates a vision and principles for the future that focuses on acknowledging Kelowna's agricultural roots and heritage while anticipating change and transformation in the city. The vision is centred around four values:

- Putting people first
- Valuing Kelowna's history
- Encouraging curiosity and creativity
- Recognizing the changing roles of individuals, businesses, governments, and community organizations.

Vision

In 2040, Kelowna is a thriving mid-sized city that welcomes people from all backgrounds. We want to build a successful community that honours our rich heritage and also respects the natural wonders that contribute to our identity. As a place with deep agricultural roots, Kelowna understands the need to protect our environment, manage growth and be resilient as our future unfolds.

Relevance

- Utilize underused land by building upon the urban fabric of Kelowna and limiting sprawl.
- Integrates into the neighbourhood to help fulfill the vision of Kelowna 2040.
- Nurtures entrepreneurship as retail will be located on ground floor.
- Creates equitable public spaces and amenities.

Official Community Plan 2040 (2021)

Kelowna's Official Community Plan (OCP) was adopted by the Municipal Council of the City of Kelowna on January 10th, 2022. This OCP is positioned to support and create a pathway towards Imagine Kelowna's 2040 vision. By 2040, Kelowna is expected to be home to an additional 45,000 people. The OCP describes Kelowna as a city that is becoming more urban and dynamic.

The OCP establishes 10 OCP pillars as a foundation on which to build more detailed policy:

Relevance

- Sets forth clear direction for densification along transit corridors, with focused investment in Urban Centres
- Calls for the delivery of a diversity of housing types

2040 Transportation Master Plan (2022)

The 2040 Transportation Master Plan (TMP) is a long-term, citywide plan for transportation that sets the direction for a vibrant and connected Kelowna. The TMP supports diverse transportation options in the city with a focus on cutting carbon emissions and car-dependency. The three core targets include:

1. Doubling transit ridership
2. Quadrupling the number of trips made by bicycle
3. Reducing the average distance driven per person by 20 per cent.

Aligning with other Kelowna initiatives and Imagine Kelowna, the TMP aims to help 12 goals:

1. Improve travel choices
2. Enhance urban centres
3. Ensure value for public investment
4. Optimize travel times
5. Be innovative and flexible
6. Improve health
7. Enhance travel affordability
8. Improve safety
9. Promote inclusive transportation
10. Foster a growing economy
11. Protect the environment
12. Support livable communities

Relevance

- Embrace transportation options by capitalizing on Harvey as a major Rapid Transit Corridor.
- Embrace transportation options by utilizing Burtch as a Transit Supportive Corridor.
- Take into account the effects of Burtch as a corridor for active transportation featuring bike lanes.

Housing Needs Assessment (2023)

The Housing Needs Assessment (HNA) is tasked with articulating specific housing challenges in Kelowna and identify focus areas to address these challenges. The HNA aligns with two key strategies in Kelowna:

- The *Journey Home Strategy* focused on supporting underhoused members of society.
- The *Healthy Housing Strategy* focuses on policy, regulations, and procedures for Housing with Supports (e.g., subsidized rental housing, rental housing, and ownership housing).

The HNA generated "The Wheelhouse", a visualization of the housing need in Kelowna. The Wheelhouse identifies three categories of housing in Kelowna including:

1. Safety Net (e.g., emergency shelter, short-term supportive housing)
2. Housing with Supports (e.g., subsidized rental housing, long-term supportive housing)
3. Market housing (e.g., ownership housing, rental housing).

The HNA shows that homelessness is in a "severe" condition today with a constrained rental market status.

Relevance

- Promote a wide range of housing tenure choices, to ensure a diverse population residing within the community.

Healthy Housing Strategy (2018)

In partnership with the Interior Health Authority, the City of Kelowna developed the Healthy City Strategy in 2014. Part of this included the creation of the Healthy Housing Strategy, a five-year strategy that aims to address the community's most pressing housing issues. The strategy has four key directions and subsequent actions including:

1. Promote and protect rental housing
2. Improve housing affordability and reduce barriers for affordable housing
3. Build the right supply
4. Strengthen partnerships and align investment

Relevance

- Advocate for housing program partnerships aimed at fostering more inclusive development.
- Incorporate rental alternatives alongside condominiums with targeted investment.
- Target added density along transit supportive corridors.

Commercial Demand Study (2018)

Overall, the study forecasts steady population growth in the city in the next 20 years. As the commercial core of the Okanagan, the following forecasts and recommendations were provided:

- Retail and Service Commercial: While there are no pressing concern regarding land shortage, the study suggests that the City creates 2.36m ft² of new retail space; a 38% increase from the 2018 inventory. This would require 27 acres of new industrial land (included in the industrial land forecast below).
- Industrial: Kelowna is not currently meeting demand for industrial space (the city has an extremely low vacancy rate of 1.5%). Stakeholders mention that industrial spaces are unaffordable causing land to have unusually high industrial floor space ratios and preference for mixed use, retail-friendly business park developments. The study forecasts that Kelowna will need about 299 acres of industrial land by 2040.
- Office: While Kelowna had an oversupply of office space in 2017, office employment has been growing in Kelowna, particularly in the tech sector. The study forecasts that about Kelowna will need about 1.6m ft² of new office space by 2040. The recommendation includes a suggested incremental increase of about 49,000 ft² per year for the next two years, and then 70,000 ft² to 80,000 ft² per year after that.

Relevance

- Craft a landuse strategy that reflects the needs of Kelowna residents and market growth dynamics.
- Incorporate suitable commercial, office, and retail spaces into the development, considering neighborhood demands and offerings across various scales.
- Ensure alignment with broader Kelowna policies and regulations governing landuse designations.

Community Climate Action Plan (2018)

Kelowna's Community Climate Action Plan creates six themes/ strategic focus areas for climate action in the city:

- The Way We Get Around: Providing options to reduce vehicle trips and accelerate transition to low carbon transportation options.
- The Energy We Use in Our Buildings: Improving energy performance and reducing GHG emissions in new and existing buildings.
- The Waste We Create: Increasing the diversion of waste from the landfill.
- Encouraging Renewable Energy: Encouraging the use of renewable energy alternatives.
- Planning Our Community: Managing energy and emissions by focusing growth in urban areas so residents and workers are located closer to transit and services.
- Other: Other actions that support Kelowna moving towards a low carbon future.

10-Year Capital Plan (2023)

The 10-Year Capital Plan (the Capital Plan) forecasts infrastructure investment for 2023 – 2032. The Capital Plan anticipates current and future cost pressures, stretches the limits of revenues by source, and makes the necessary decisions to put in place essential infrastructure to support a future Kelowna.

In the next 10-years, the City plans to invest $2.04 billion in infrastructure that supports growth, improves services and renews existing assets. Overall, the City's infrastructure investment has increased $411 million from the previous plan across 12 capital cost centres. Seventy percent of total infrastructure investment is in Parks, Buildings, Transportation and Airport.

The Capital Plan has identified several infrastructure projects that do not have sufficient funding. This funding shortfall or 'infrastructure deficit' has remained relatively constant at $612 million compared to last year's plan. It is worth noting that many of these projects would not proceed without significant external funding from grants or partnerships, so the infrastructure deficit is a conservative estimate.

Despite these challenges, the City continues to deliver world-class infrastructure and services. Many capital projects continue to be completed; delivering on Council priorities, meeting the needs of the community.

Relevance

- Align with Kelowna's Climate Action Plan to steer the city and the development toward a lower carbon-intensive future.
- Integrate low carbon-intensive transportation alternatives such as walking and biking infrastructure.
- Envision the development with a proactive approach towards a greener future, embracing renewable energy alternatives, and minimizing GHG emissions.

Relevance

- Adhere to the City's policy aimed at enhancing the infrastructure capacity of the development.
- Provide abundant and superior infrastructure to accommodate the increased density of the development.

2.4 The 2040 Official Community Plan Landuse and Urban Design

As per Policy 5.2.6. of Kelowna 2040 Official Community Plan, regarding the Burtch/Harvey Area Redevelopment Plan, the sites (outlined in figure 3-20), are to be considered for greater heights and densities than afforded in the Core Area Neighbourhood designation. This is only applicable at such time as an Area Redevelopment Plan initiated by the property owners is completed.

Connections to our Neighbours

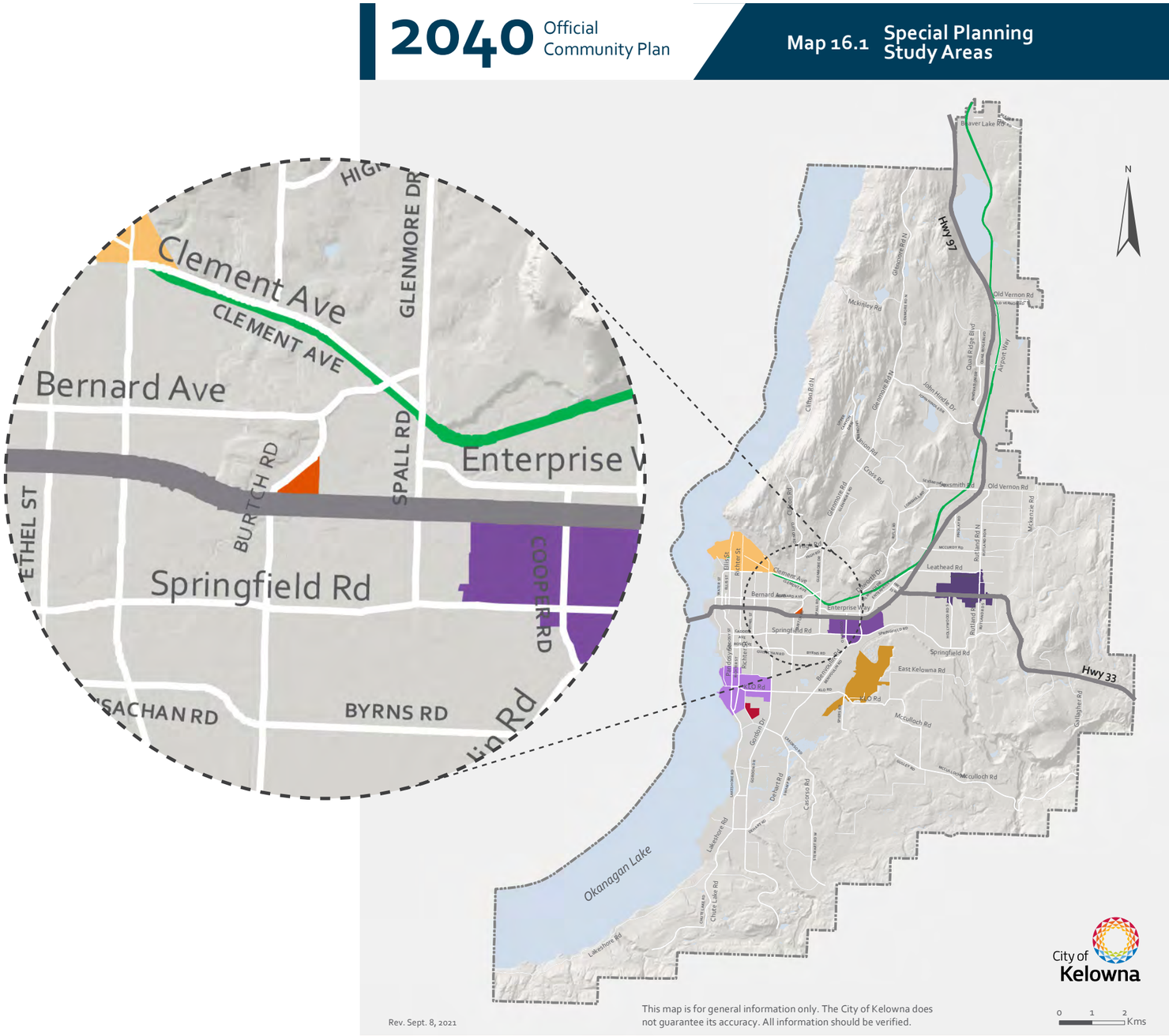
Within the OCP Policy 5.2.6.: Burtch/Harvey Area Redevelopment Plan, the study area identified included our neighbour to the west which currently is owned by JABS. This site is currently zoned CA1, a zone which is focused on mixed commercial and residential uses, outside Urban Centres. The current zoning permits heights of up to 6 storeys & 22m for any lot fronting a transit supportive corridor. However, as part of the Burtch/Harvey Area identified within the OCP, it is also identified as a site with potential for future development including greater heights and densities than those currently outlined within the Core Area Neighbourhood Designation should the landowner also go through an ARP process. The preferred concept outlined within this report makes consideration for connections to the west including opportunities for future connections to the central pedestrian and vehicular circulation. We look forward to continued engagement with the neighbouring property owner to ensure that the concept and future development are well coordinated and integrated with current and future plans for their site.

Legend

- Okanagan Rail Trail Landuse Study
- Rutland Urban Centre Plan
- Midtown Urban Centre Plan
- Pandosy Urban Centre Plan
- Burtch / Harvey Area Redevelopment Plan
- North End Area Plan
- Hall Road Neighbourhood Plan
- Casorso Road Neighbourhood Plan
- Highway

Area boundaries are subject to change

Figure 2-1 2040 Official Community Plan Special Planning Study Areas



2.5 Public & Indigenous Engagement Strategies

The Burtch / Harvey Team have developed a Public and Stakeholder Engagement Consultation Strategy that is based on International Association of Public Participation (IAP2) principles and aligns with Council Policy #372: Engage and Council Policy #367 for guidelines for community engagement and notifications. Consideration for diversity, equity, and inclusion for specific demographic audiences shall be included. The plan makes consideration for how to reach voices that are seldom heard and equity-seeking groups. The diagram below outlines the proposed engagement approach.

PUBLIC ENGAGEMENT

ONGOING

NEIGHBOUR OUTREACH

MARCH 2024

PUBLIC NOTIFICATION

MARCH 2024

PUBLIC INFORMATION MEETING (P.I.M)

MARCH 2024

WHAT WE HEARD REPORT

MAY 2024

Concurrent to the Public Engagement activities, the project team has been working with Burtch/ Harvey Planning Team to engage with the Westbank First Nation as well as the Okanagan Indian Band. A summary of this process is outlined in the diagram below.

INDIGENOUS ENGAGEMENT AND OUTREACH

OKANAGAN INDIAN BAND - ONGOING

PRELIMINARY OUTREACH

FEBRUARY 2024

SUBMISSION OF PROJECT INFORMATION

MARCH 2024

INVITATION TO P.I.M TO CHIEF AND COUNCIL

MARCH 2024

OKIB RESPONSE & REQUEST FOR ADDITIONAL INFORMATION

APRIL 2024

RESPONSE WITH ADDITIONAL INFORMATION

APRIL 2024

WESTBANK FIRST NATION - ONGOING

PRELIMINARY OUTREACH – PHONE INQUIRY AND FOLLOW UP SUBMISSION THROUGH REFERRALS PORTAL

FEBRUARY 2024

INVITATION TO P.I.M TO CHIEF AND COUNCIL

MARCH 2024

FOLLOW UP ON REQUEST TO ENGAGE

MAY 2024

2.6 Engagement Outcomes

The project team hosted two Public Information Meeting (P.I.M) sessions on April 10 & 17, 2024 for neighbours, existing tenants, gym users, the neighbourhood, commercial tenants and the community at large. Each session provided a full presentation of the policy background, proposed concepts and process information, along with an invitation to provide written or verbal feedback. A total of 120 people attended the two PIM forums. The bubbles below highlight key themes that emerged from these sessions.

Expressions of Support:

Integrated ***green spaces*** and ***gathering places*** for future residents

Improved ***traffic*** management and pedestrian ***safety*** at Burtch and Kelglen

Respect for the ***interface*** between the property and the PRC plan/space

Commercial, retail and restaurants on the ***ground floor*** to serve local needs

Maximize ***bike*** paths and ***pedestrian*** routes for internal areas (no cars)

Tree Retention

Opportunities for Improvement:

Potential ***shadowing*** on PRC and neighboring residential areas

Insufficient ***sunlight*** on greenspaces

Building ***Heights***

Insufficiency of ***parking*** for residents and visitors

03

BACKGROUND

This chapter details the contextual aspects of the site and its environment, encompassing factors such as location, historical context, amenities, landuse, technical and environmental features, as well as transportation characteristics. Visual maps are utilized to illustrate these elements, aiding in understanding the opportunities and constraints posed by these factors.

3.1 Location & Context

The project site consists of two pre-existing parcels situated along the western border of Parkinson Recreation Park, positioned between Harvey Avenue, a key vehicular thoroughfare in Kelowna, and Burtch Road.

Conveniently located, the site is in close proximity to Downtown Kelowna (a 6-minute drive), Rail Trail (a 15-minute walk), Mission Creek Regional Park (a 10-minute drive), and Knox Mountain Park (a 10-minute drive).

Additionally, Mill Creek flows along the eastern edge of the site, establishing a connection to broader ecological resources in the vicinity.

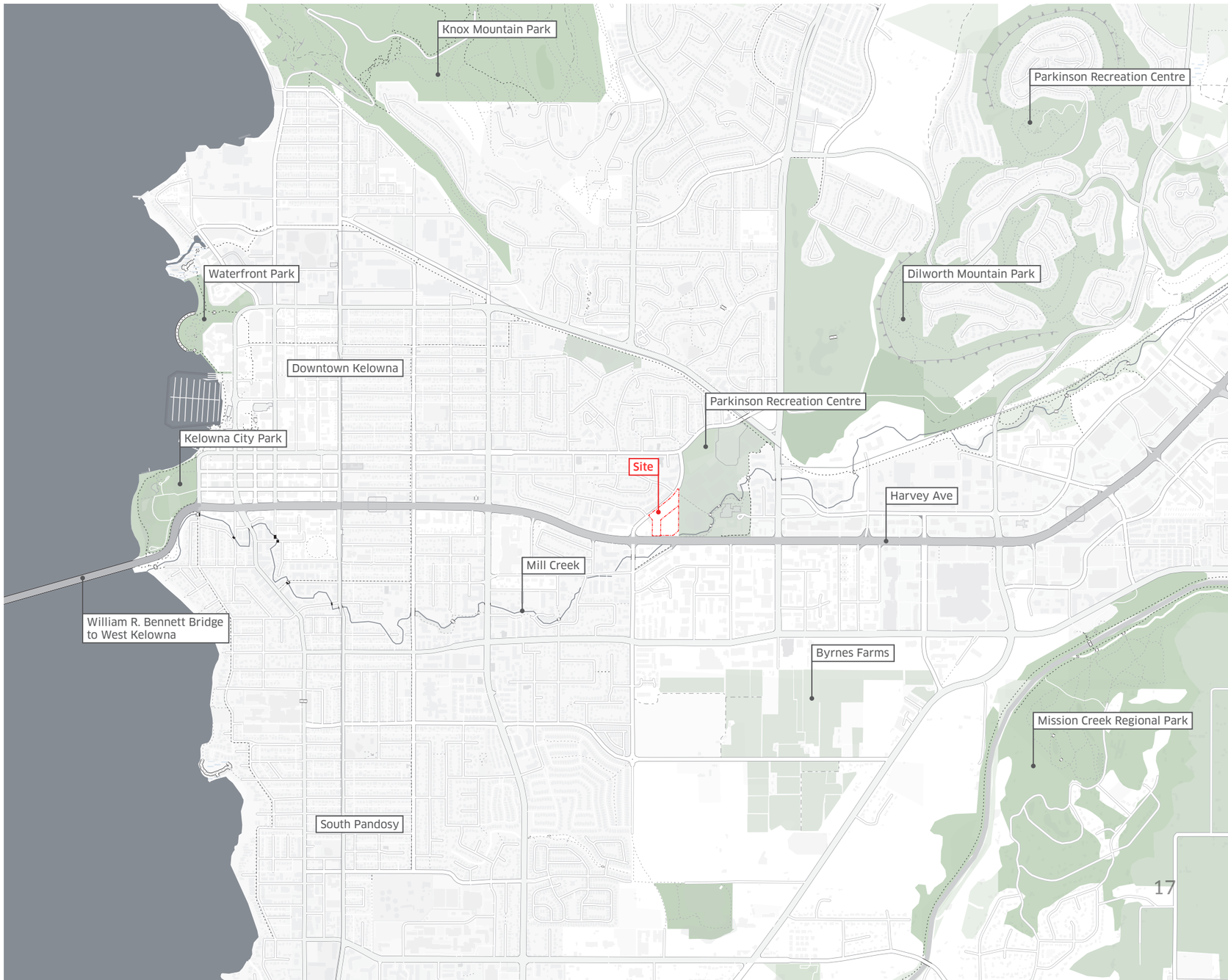


Figure 3-2 Site Larger Context in Kelowna

3.2 Burtch / Harvey Site Survey

The site survey was conducted in November of 2023.

The subject site comprises two adjacent properties, which will be merged as part of the development permit application. The properties to be amalgamated are:

1574 Harvey Ave, Kelowna, BC, Plan KAP32159 Lot 3; and,
1634 Harvey Ave, Kelowna, BC, PLAN KAP16186 Lot B.

Upon amalgamation, the site will form an irregular-shaped lot spanning approximately 27,567 m2. Currently, the lots accommodate two commercial buildings situated in the western and southern sections, with recreational sports courts located in the northern part. The site's terrain slopes gently from north to south, with elevations ranging approximately from 357 to 356 meters above sea level.

The subject site is bordered by Highway 97 to the south, Parkinson Recreation Park to the east, Burtch Road to the north, and a commercial development consisting of three single-story buildings to the west. Additionally, during the desktop review, it was observed that the southeast corner of 1634 Harvey Ave is approximately 12 meters from the center of Mill Creek, as indicated on the City of Kelowna map viewer.

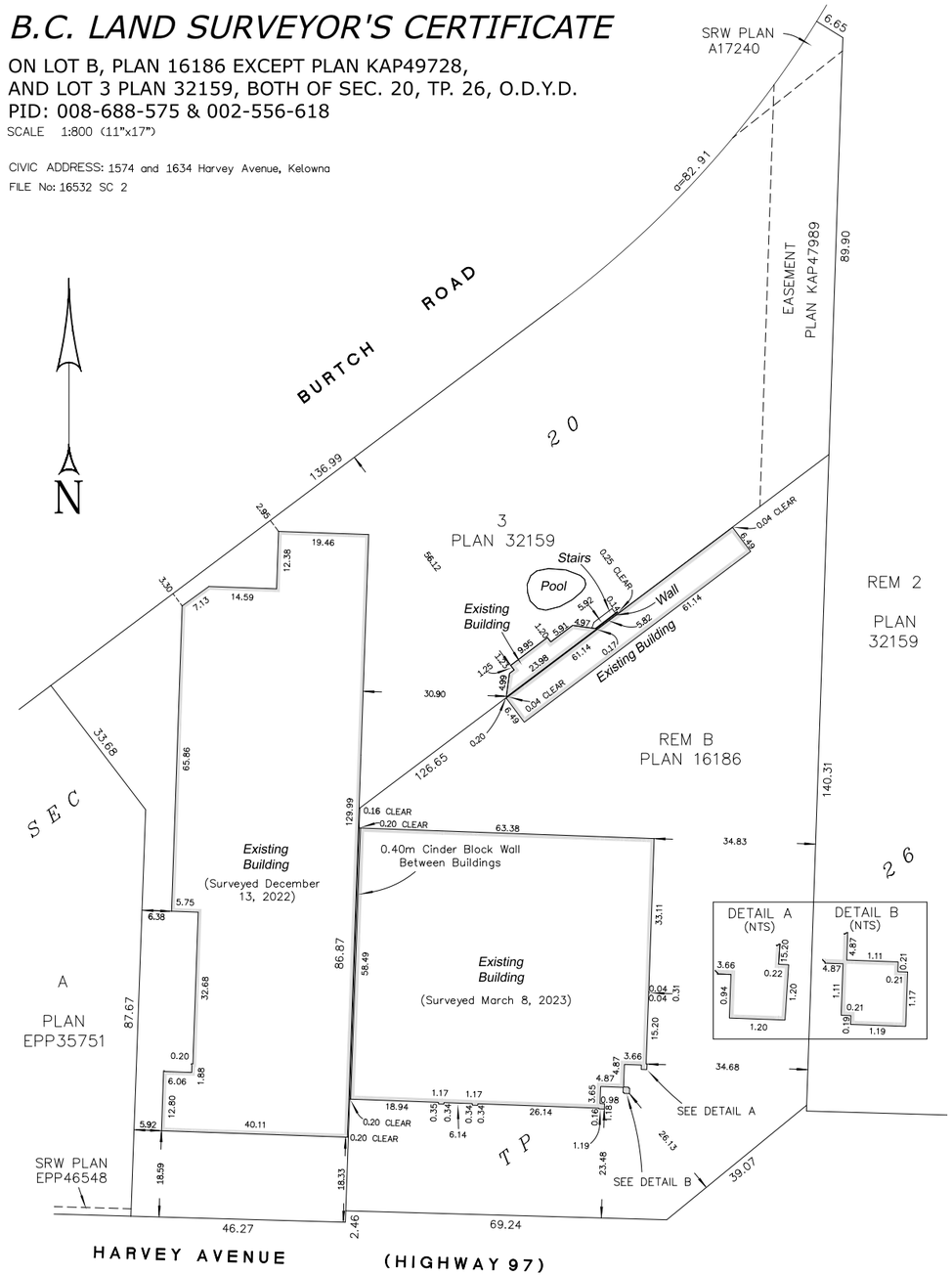


Figure 3-3 Site Survey

3.3 Burtch / Harvey Today

Figure 3-4 View towards site from Harvey Ave. South West

Figure 3-5 View towards site from Harvey Ave.

Figure 3-6 View from site from Harvey Ave. Access

Figure 3-7 View towards site from Burtch Rd. North East

Figure 3-8 View along Burtch Rd. North West

Figure 3-9 View along Burtch Rd. from Harvey Intersection

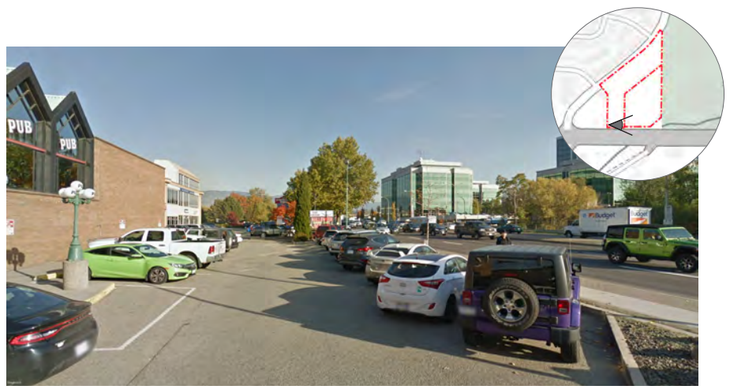


Figure 3-10 View from site along Harvey Ave.

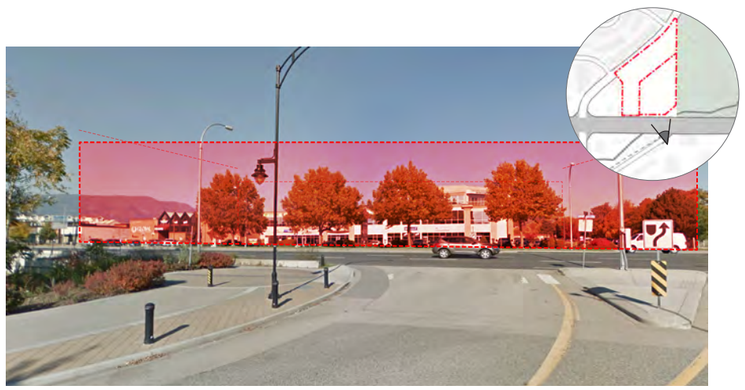


Figure 3-11 View from Sutherland Ave. across from the site

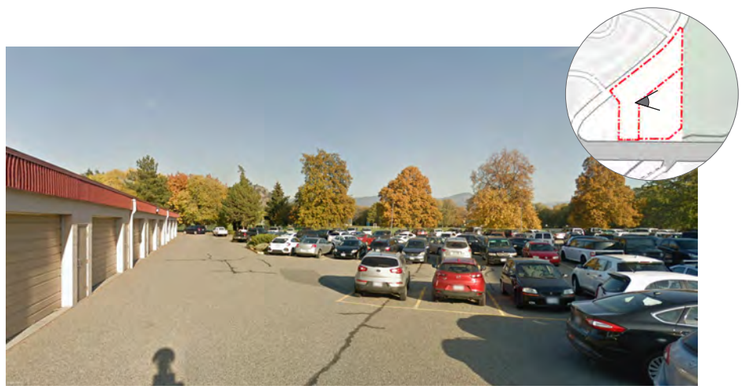


Figure 3-12 View from the centre of the site towards PRC

3.4 History of Plan Area & Surrounding

Kelowna is located on the traditional, ancestral, unceded territory of the syilx/ Okanagan people. The syilx/Okanagan people thrived on hunting, fishing, gathering, and trading and had deep connection and stewardship of the land. According to Provincial records, there are no known archaeological sites recorded on the subject properties. Archaeological potential modeling for the area does not indicate a high potential for previously unidentified archaeological sites to be found on the subject property.

In 1859, the first European settlement began with three Oblate missionaries setting up a mission. In 1893, Canada's Governor General bought tracts of land in the valley to capitalize on the areas fruit growing potential. By 1905, with nearly 600 residents, Kelowna was incorporated as a City.

In this early photo from the Kelowna Public Archives (G.H.E. Hudson - 1906), you can see Harvey Avenue was established early as an early East - West road.

Figure 3-14 Early Aerial of Kelowna

Figure 3-13 1922 Orographic Map by John Bartholomew and Son

The following three photos show development in proximity to the site (the Capri Landmark site is outlined in Blue) as it progressed.

Figure 3-17 1938 - No Development

Figure 3-15 1973 - Capri Landmark Partially Developed, some development on the Burtch/Harvey site

Figure 3-16 1996 - Capri Landmark Fully Developed, Butch/Harvey developed

Results of Provincial Archaeological Inventory Search

According to Provincial records, there are no known archaeological sites recorded on the subject properties. Archaeological potential modeling for the area does not indicate a high potential for previously unidentified archaeological sites to be found on the subject property.

Archaeology Branch Advice

The Archaeology Branch does not identify a need for archaeological study or Provincial heritage permit(s) at the time of this information request.

Rationale and Supplemental Information

- Archaeological study and Provincial heritage permit(s) are not required in the absence of an archaeological site.
- There is always a possibility for previously unidentified archaeological sites to exist on the properties.
- Archaeological sites are protected under the Heritage Conservation Act and must not be damaged or altered without a Provincial heritage permit issued by the Archaeology Branch. This protection applies even when archaeological sites are previously unidentified or disturbed.

3.5 Site Analysis

3.5.1 Topography

The site is situated at an elevation of around 356 meters above sea level and boasts a favorable development potential due to its minimal grade changes.

The elevation variations to the east of the site and the presence of green open spaces are comparatively less pronounced than those found to the north and west of the site towards the residential neighbourhoods and Capri-Landmark community.

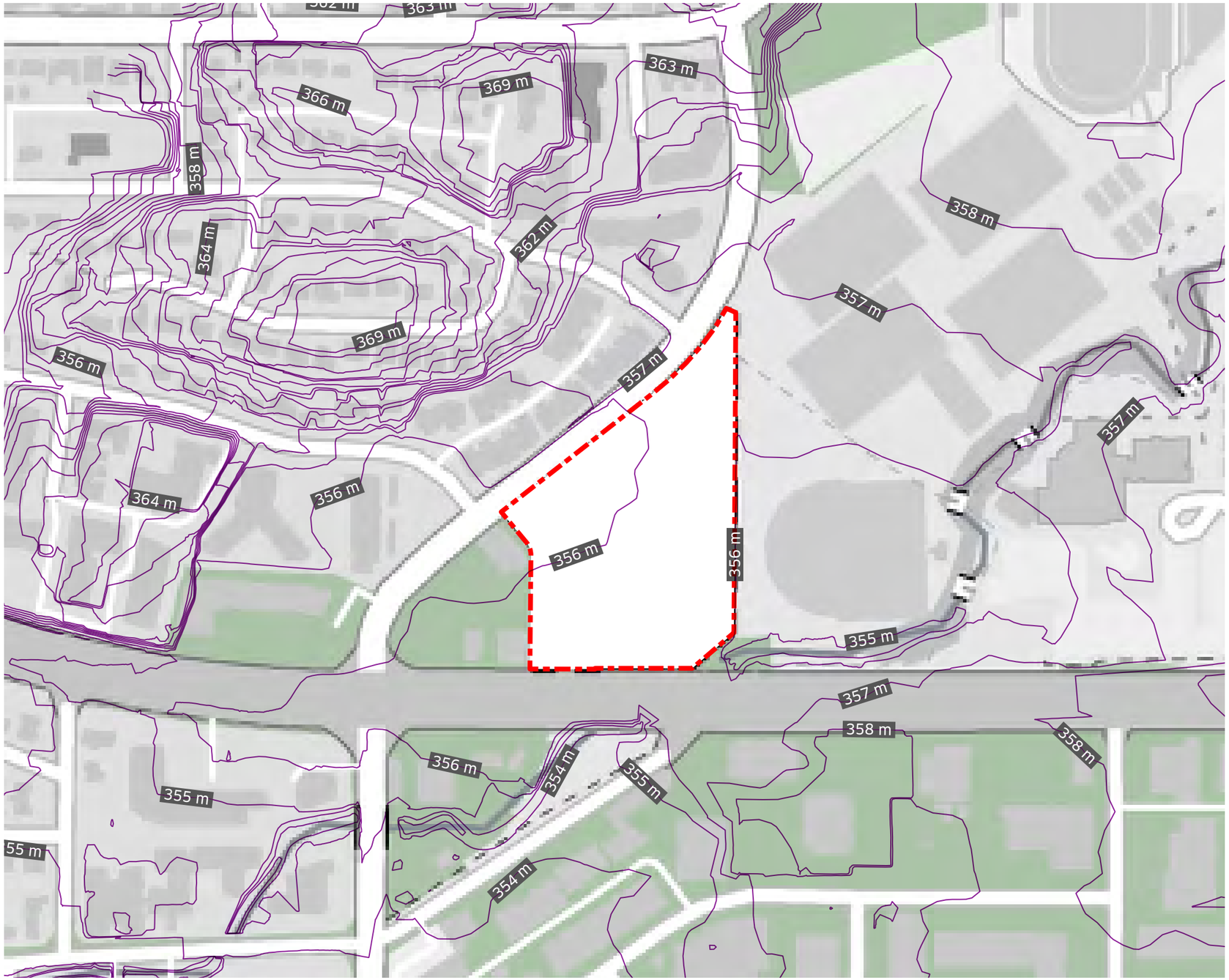


Figure 3-18 Context Topographic Contour Lines at 1m Apart

3.5.2 Current Zoning

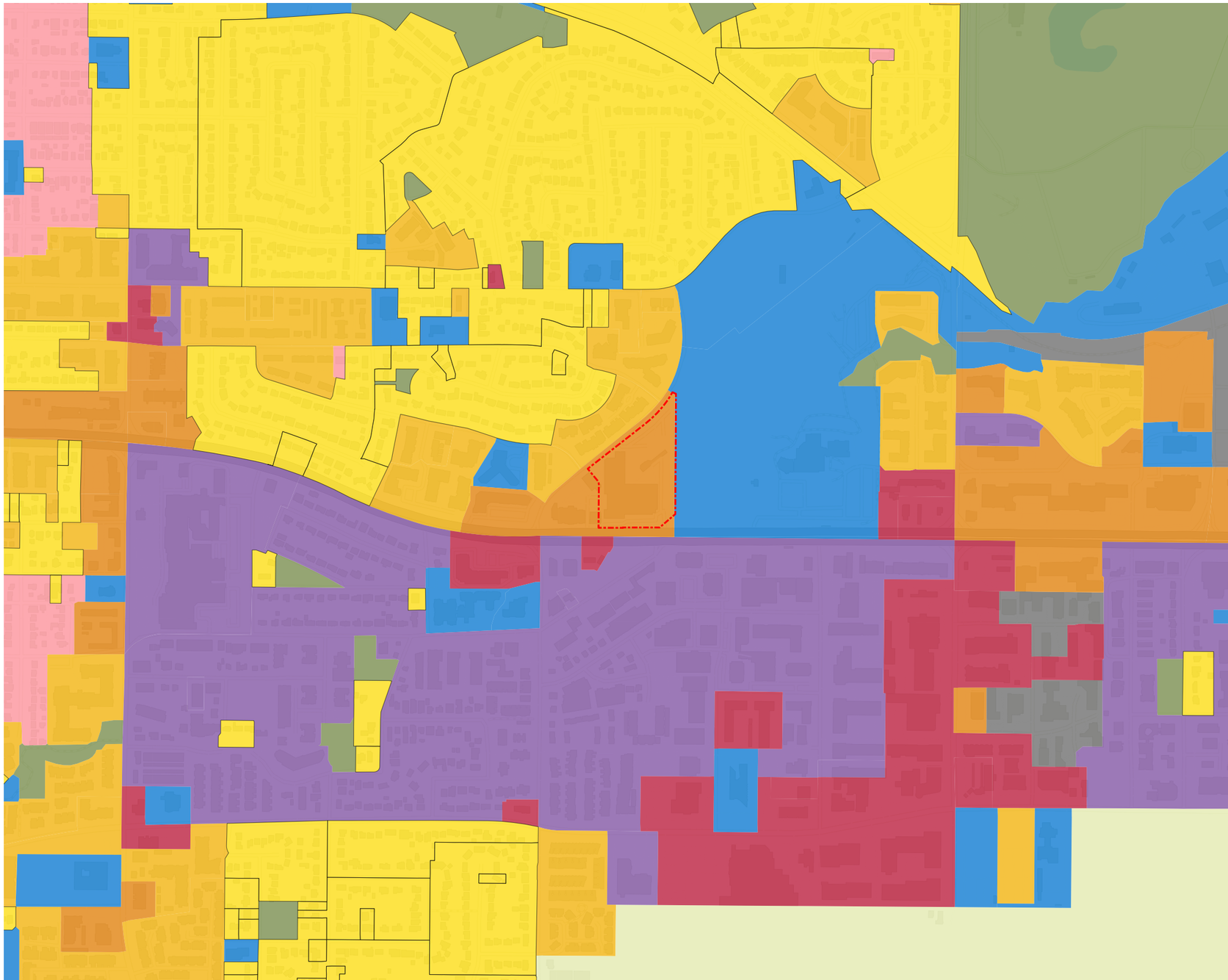
The current zoning of the site falls within the Core Area Mixed Use designation in the City of Kelowna, a classification reserved for a limited number of areas. This zoning allows for a mix of landuses, fostering the development of lively neighborhoods, transit-friendly corridors, and service-oriented commercial spaces.

The objective of this zoning category is to encompass a variety of housing types, promote the creation of pedestrian-friendly and dynamic neighborhoods that are both inclusive and easily accessible, and establish and maintain cultural infrastructure to enhance the vibrancy of the core area

Within Kelowna's Core Growth Area, as outlined in the 2040 Official Community Plan (OCP), there is a requirement for increased density within the studied sites.

Situated in proximity to the site are areas zoned as Multi Family Residential to the north, Urban Centre to the south, and Public/Institutional zoning to the east, at the Parkinson Recreation Centre.

Figure 3-19 Existing Zoning Designations



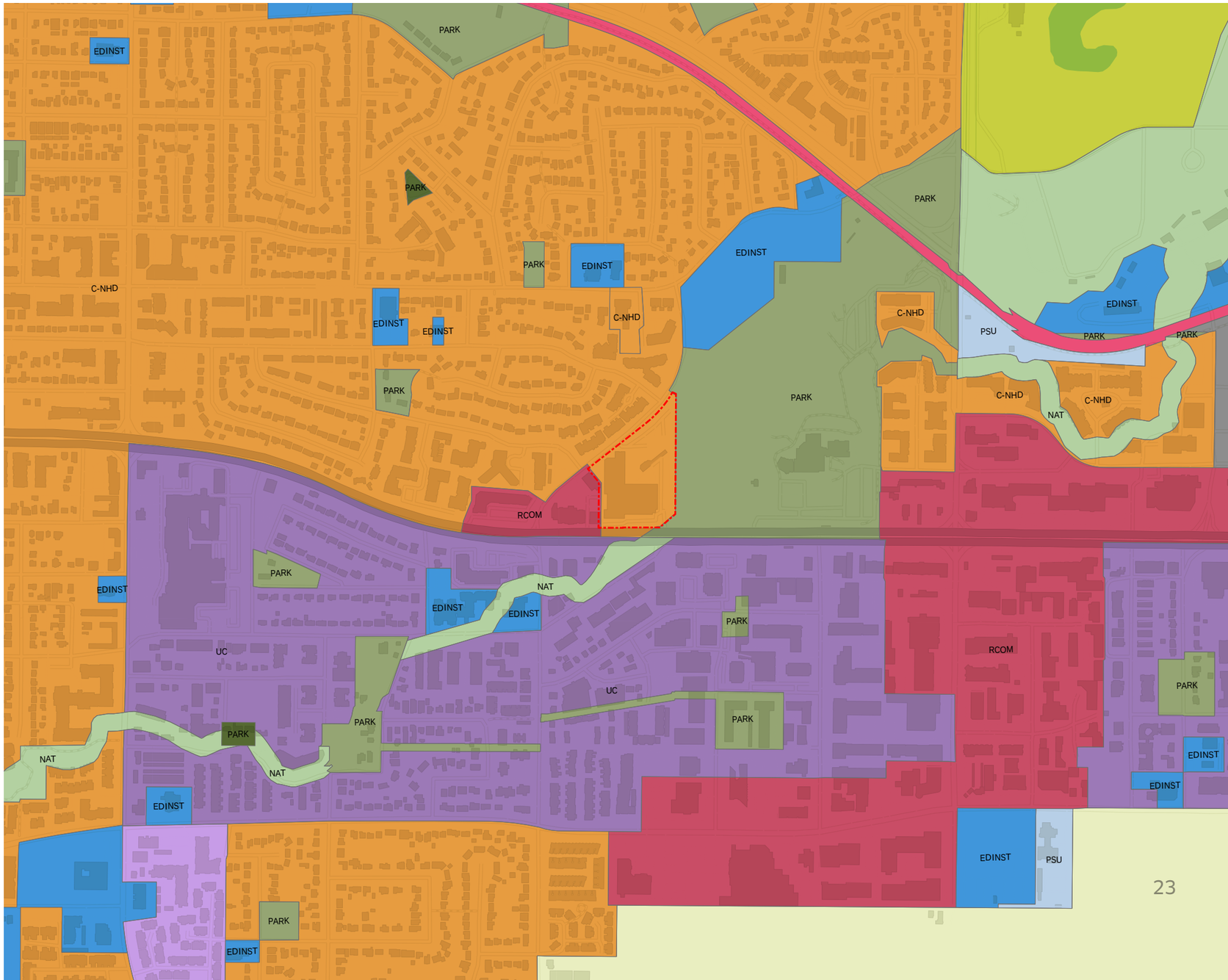
3.5.3 Future Landuse

The Future Landuse Designations of the Official Community Plan depicted in Map 3.19 stem from comprehensive studies of the city's growth strategies, residential unit goals, and the aims outlined in transportation masterplans.

The site falls under the designation of C-NHD (Core Area Neighbourhood), where, with the exception of areas along Transit Supportive Corridors, new developments are expected to harmonize predominantly with the existing scale and building orientation of the neighborhood, ensuring the preservation of its overall character.

Core Area Neighbourhoods are intended to accommodate a range of ground-oriented housing types, as well as small-scale local commercial and institutional uses, catering to the needs of the surrounding residents.

Figure 3-20 OCP Future Landuse Designations



3.5.4 Environmental Conditions

Keystone Environmental Ltd (Keystone Environmental) conducted a reconnaissance level desktop review of the existing environmental conditions relating to the site, including instream and riparian habitats, presence of other aquatic features such as wetlands and determination of applicable riparian setbacks associated with the property.

In consideration of these, Illustration 3.24 shows the 15 m Riparian Management Area (RMA) measured from top of bank for both Reach 1 & 2 of Mill Creek that is required under the OCP.

Additionally, it was found that half of the property has a Vulnerable Groundwater Aquifer buffer that will need to be considered prior to development.

The groundwater aquifer buffer will be taken into consideration when considering underground parking in some areas of the site.

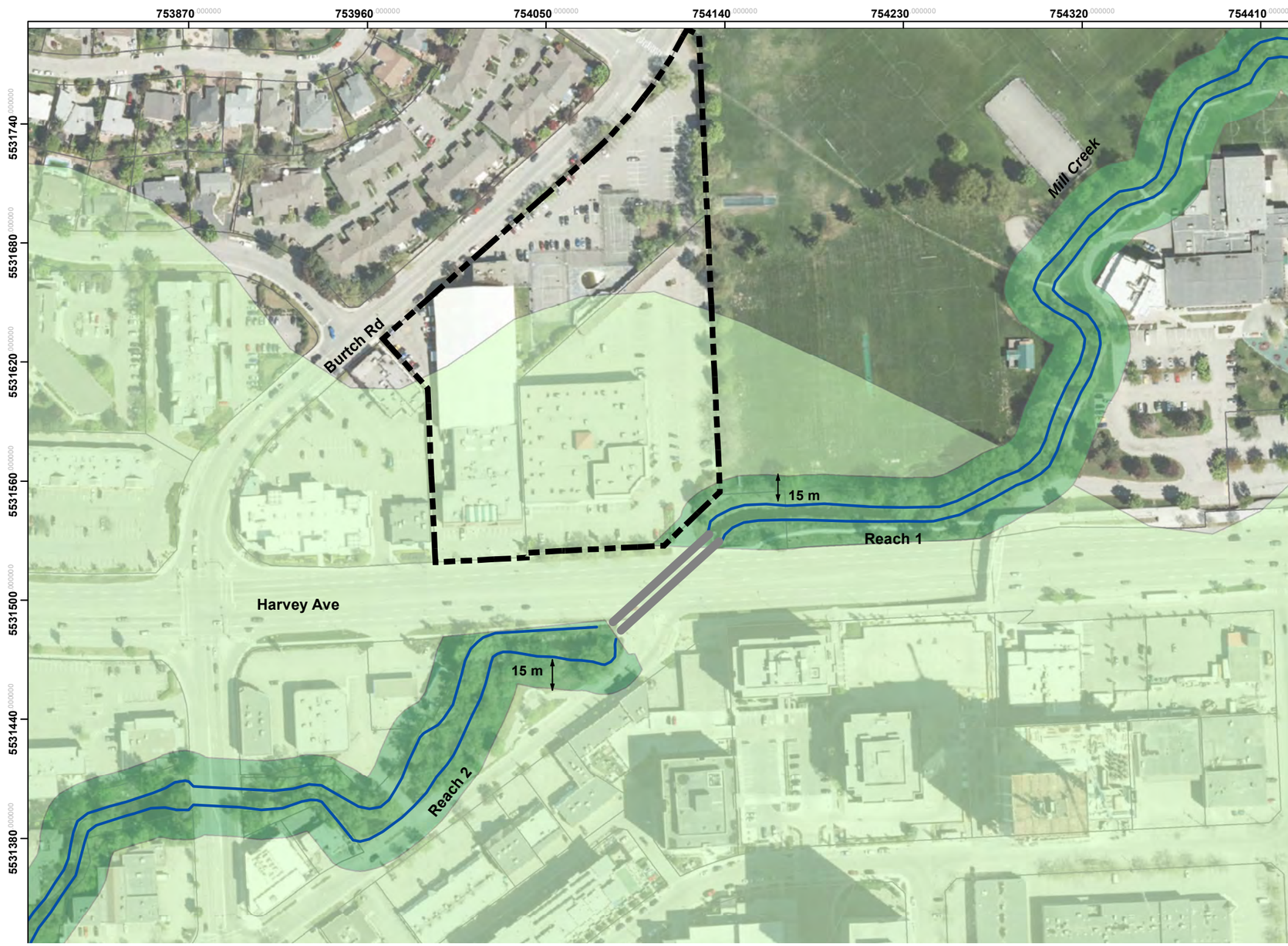


Figure 3-21 Wetland Assessment

3.5.5 Parks & Open Spaces

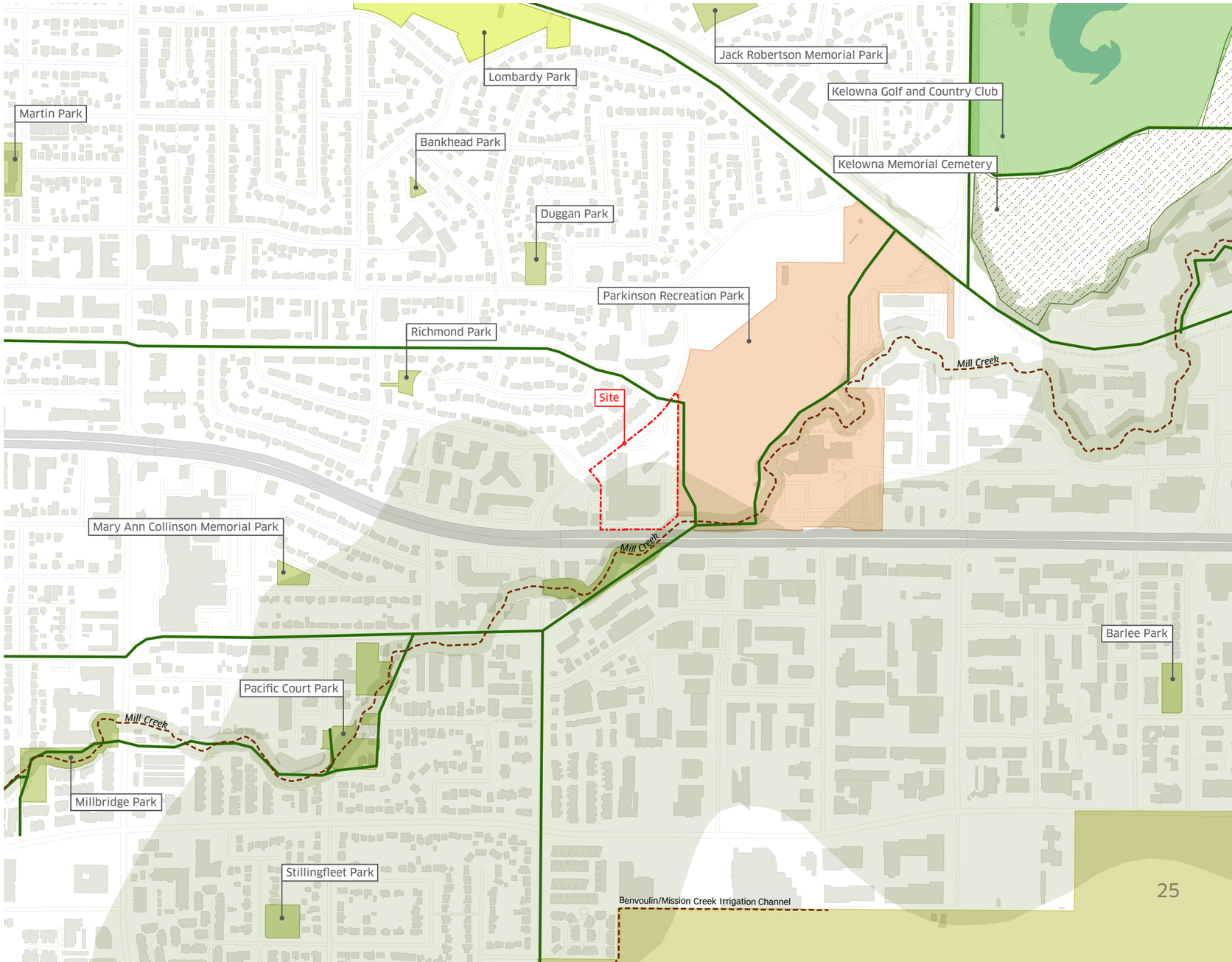
The location is situated at the crossroads of diverse natural and human-made parks, surrounded by green open spaces.

More than half of the site is designated as an OCP Natural Environment Area, and Mill Creek flows through the southeastern edge, with plans for a linear park development along the creek.

Adjacent to the eastern edge of the site is the Parkinson Recreation Site, playing a vital role in attracting residents to the area on a regional scale.

The site is positioned at the western terminus of a green belt, which encompasses the UBCO campus, agricultural lands, Kelowna Golf Club, and Memorial Park Cemetery.

Figure 3-22 Context Parks and Green Open Spaces

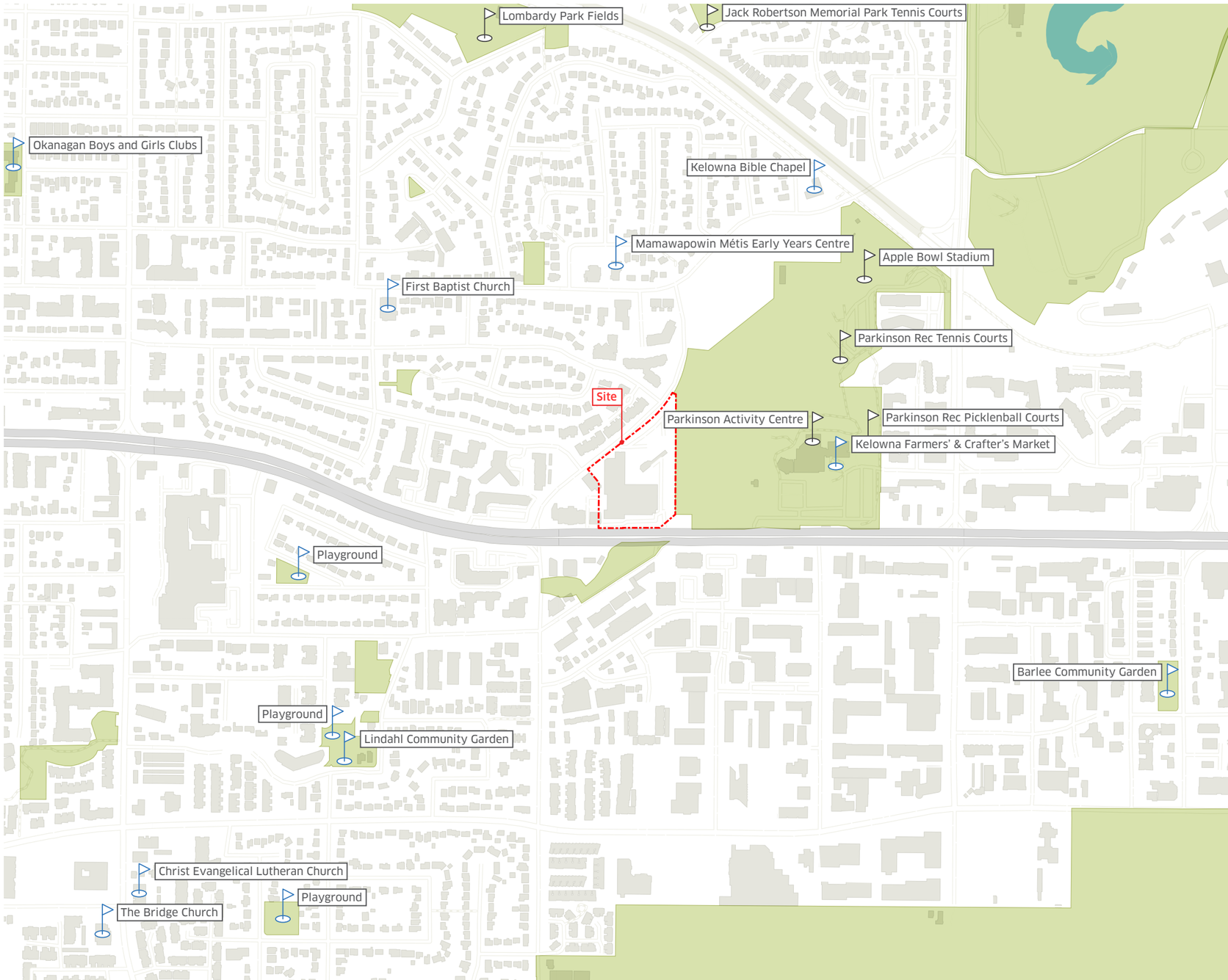


3.5.6 Recreational & Cultural Facilities

The site is surrounded by community spaces and cultural facilities that are closely integrated with green open areas, offering numerous recreational amenities.

Its proximity to a significant recreational facility and adjacency to a major transit corridor position the site advantageously for accessibility and visibility.

Figure 3-23 Context Amenity Map



3.5.7 Transportation Network

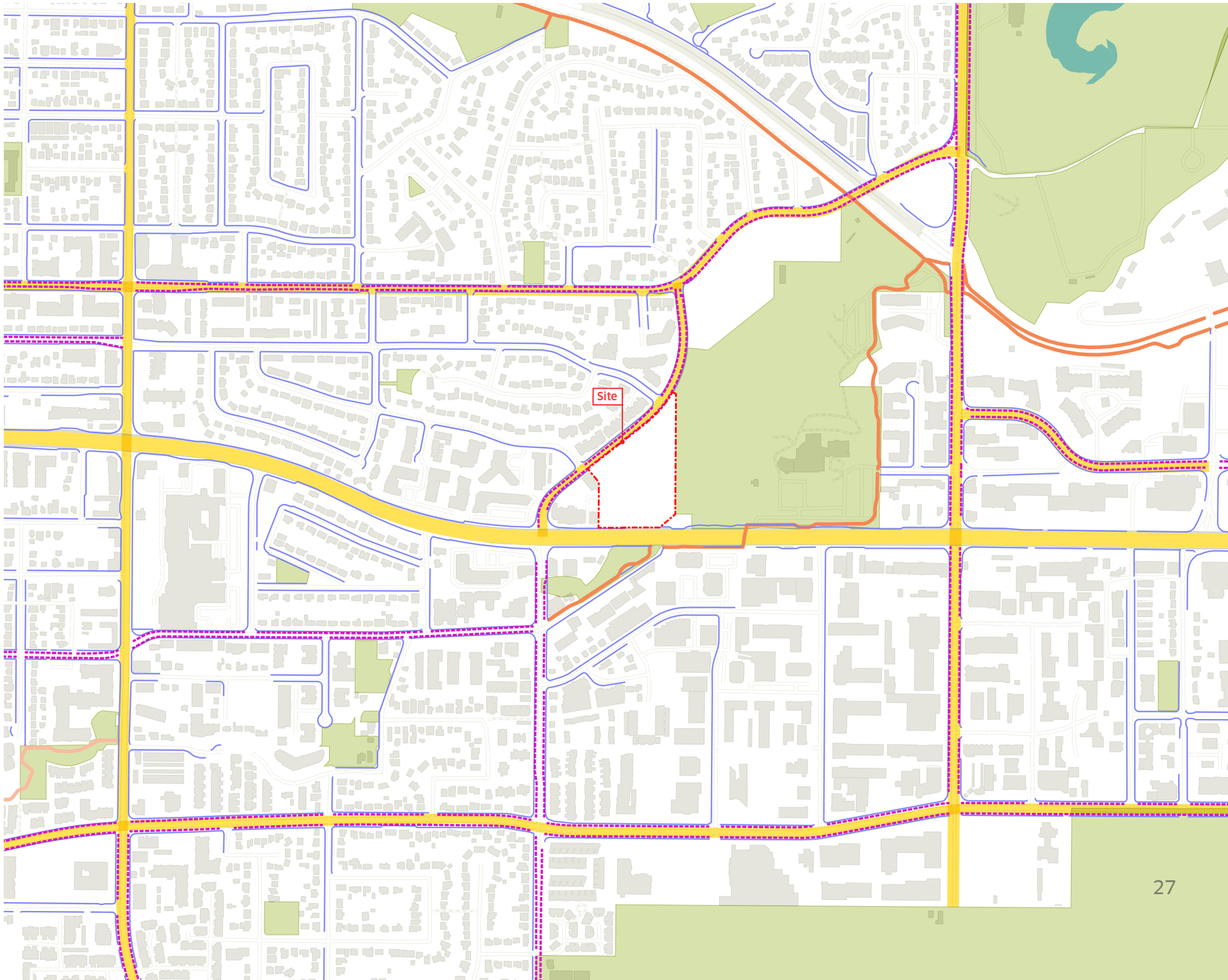
The site, as outlined in the Area Redevelopment Plan, is positioned between two Transit Supportive Corridors: Harvey Ave, a prominent thoroughfare in Kelowna, and Burtch Rd. Harvey Ave serves as a vital connection, linking East Kelowna across Okanagan Lake to West Kelowna.

Presently, the rapid bus route traverses Harvey Ave, providing convenient access within walking distance of the site. Additionally, the site enjoys close proximity to the Rail Trail, a significant regional multi-use pathway that draws cyclists and pedestrians.

The biking infrastructure in the vicinity of the site is both extensive and well-connected.

As per the Capri Landmark Urban Centre Plan, the goal is to reshape transportation patterns by improving the street network to accommodate all modes of transportation, enhancing infrastructure for pedestrians, cyclists, and transit users, and creating inviting and comfortable streets conducive to active transportation.

Figure 3-24 Transportation Network

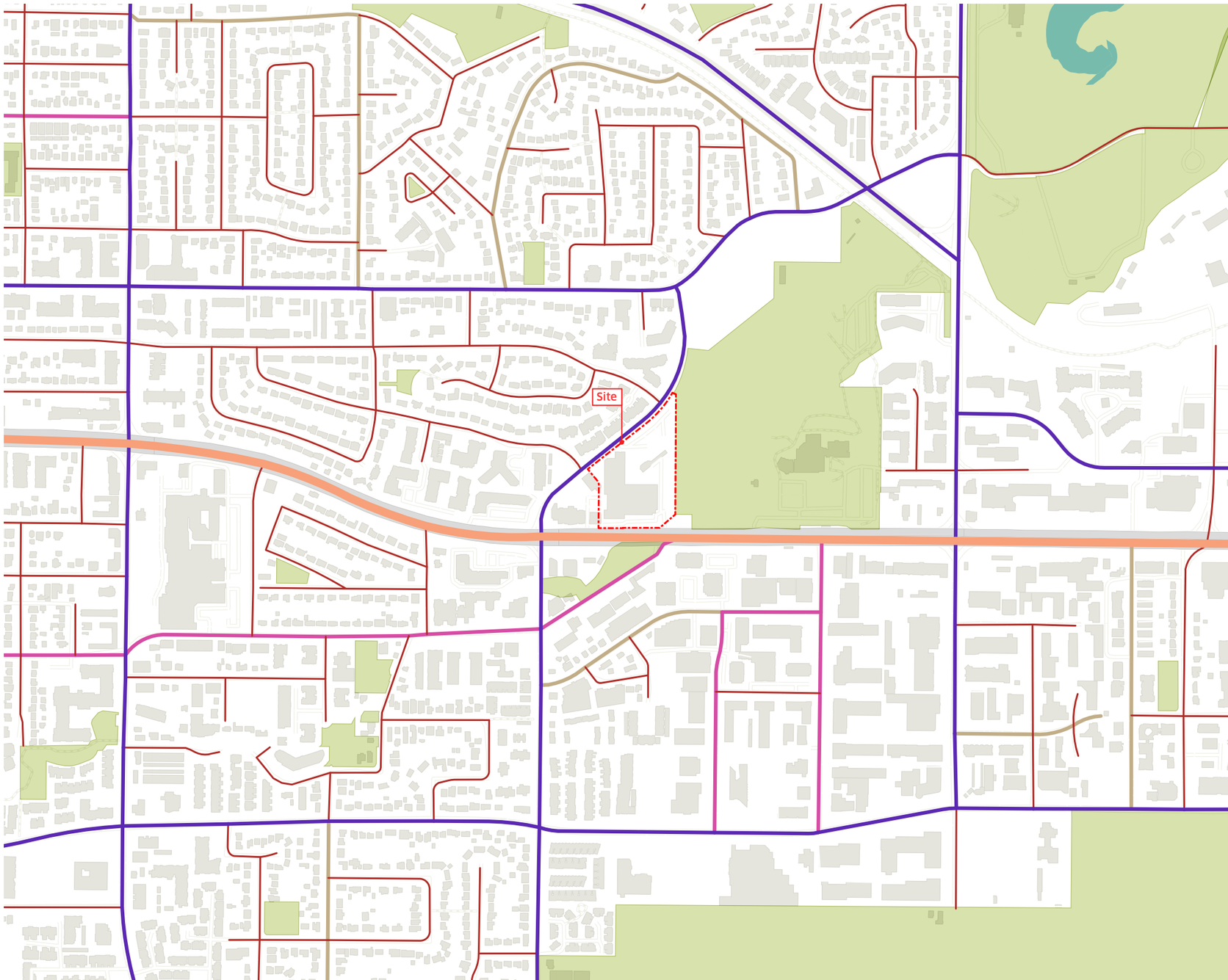


3.5.8 Road Classification

Map 3.23 depicts the road classification in the vicinity of the study area. Primary access to the site is facilitated by Harvey Ave, recognized as a MOTI (Ministry of Transportation and Infrastructure) road, and Burtch Rd, categorized as an arterial road.

The site is linked to the residential neighborhood through a network of local roads.

Figure 3-25 Road Classification Map



3.5.9 Geotechnical Analysis

Tetra Tech Canada Inc. (Tetra Tech) carried out a desktop geotechnical review, a geotechnical site investigation and provided preliminary foundation options for the Burtch / Harvey site.

Subsurface Conditions

The following interpreted soil profile was encountered within the subject site:

ASPHALT 0.05 m thick.

FILL comprising dense sand and gravel, trace silt from 0.05 m to 0.6 m deep.

Fine Alluvial Fan Sediments comprising very loose silty sands with interbedded lenses of fine to medium sand from 0.6 m to 2.1 m deep.

Coarse Alluvial Fan Sediments comprising loose to compact gravel and sands, with varying amounts of silt from 2.1 m to 8.5 m deep.

Glaciolacustrine Sediments comprising firm to stiff clay with varying amounts of silt, trace sand and is present from a depth of approximately 8.5 m to the maximum extents.

Groundwater Conditions

Groundwater was encountered at a depth of 2.1 m within BH24-01; which corresponds to a geodetic elevation of 354.5 m.

Preliminary Simplified Liquifaction Triggering Assessment

The results of the preliminary simplified liquefaction triggering analysis indicate that there are layers of potentially liquefiable sand approximately ranging from 5.8 to 7.6 m. The cumulative liquefaction induced vertical settlement is estimated to be in the range of 60 mm to 100 mm. After the conceptual design of the development is finalized, a detailed geotechnical investigation and seismic assessment should be performed to verify the seismic site classification utilizing Seismic Cone Penetration Testing (SCPT).

Outcome

Based on Tetra Tech's understanding of the proposed development, Tetra Tech considers that from a geotechnical perspective, the site is generally suitable for the intended purpose and development of the subject property is feasible.

3.5.10 Hydrotechnical Conditions

The Hydrotechnical report aims to outline the existing site conditions before development and pinpoint any drainage issues that could affect the proposed project. An evaluation of the post-development conditions will be necessary in subsequent phases, once the lot layout has been finalized.

The existing stormwater connection data is primarily sourced from the City of Kelowna's map viewer. The map indicates that there is a single 200 mm diameter PVC stormwater connection at the south side of the lot 1634 Harvey Avenue and no outside connection identified for the lot 1574 Harvey Avenue. However, a drawing for the storm system along Burtch Road indicates that there is a 200 mm PVC stormwater connection at the northwest corner of lot 1574 Harvey Avenue.

Both lots have been identified as being within the Mill Creek Floodplain as per the Mill Creek Flood Plain Bylaw No. 10248. The Flood Construction Level (FCL) ranges between 354.5 and 355.5 masl. The elevation of the terrain in the lot ranges from about 355 to 357 masl. This ground elevation appears to be above the existing FCL elevations. The lot elevation should remain 600 mm above the Burtch Rd. storm main obvert and minor lot grading may be required to achieve this.

The minimum setback from a watercourse to any fill foundation or structural support required to elevate a floor system or pad above the flood level is 15 m for the Project Area.

As part of ongoing efforts to adapt to climate change, Bylaw 7900 requires that capacity of storm works include an additional 15% upward adjustment to the Intensity-Duration-Frequency (IDF) curve.

Outside drainage concerns are limited to the length of Burtch Road that does not have any curb or gutter. During large storm events, overflow from the road may be directed into the north end of the 1574 Harvey Avenue.

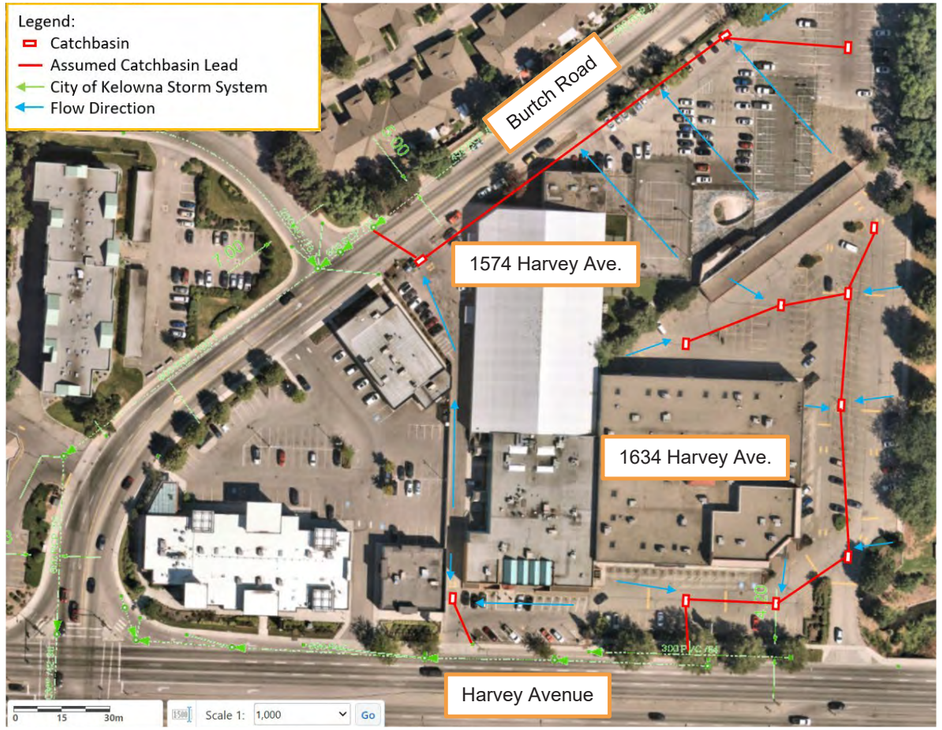


Figure 3-26 Assumed Stormwater Network at Subject Properties

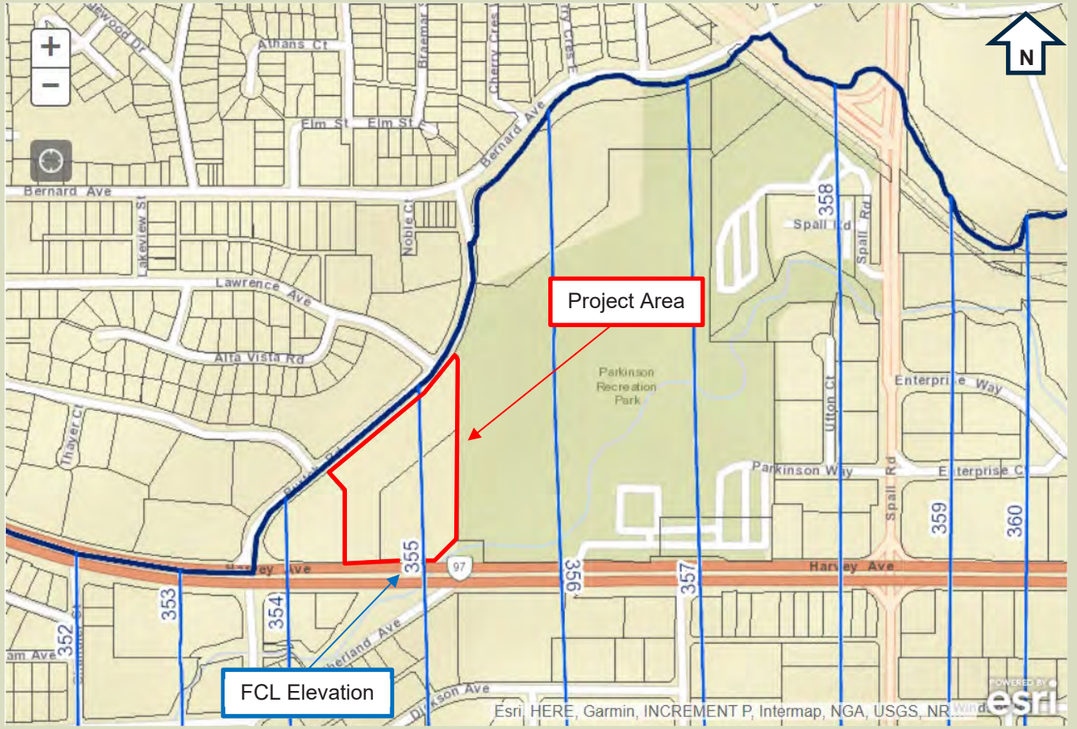


Figure 3-27 Flood Construction Level for Lots 1574 and 1634

3.5.11 Hydrogeology Assessments

Piteau has conducted a comprehensive review of soil and hydrogeological conditions within the site and its surroundings to pinpoint potential impacts of development on aquifers and stream baseflows, evaluate the viability of stormwater infiltration, and offer insights regarding subgrade excavations. The main discoveries and recommendations are:

- Surficial geology mapping and a test borehole reveal that sediments at the site consist of an alluvial fan deposit comprising approximately 2 meters of sandy silt overlying an additional 7 meters of gravel and sand.
- Given that the site is already developed, with approximately 94% of its area covered by hardened surfaces (rooftops/asphalt), redevelopment is unlikely to escalate runoff rates.
- Infiltration of stormwater through shallow features like swales, buffer strips, and rain gardens seems viable at the site. However, the upper sandy silt layer may impede infiltration, necessitating the removal of this material in areas where infiltration is desired, followed by backfilling with granular material connected to the underlying sand and gravel.
- During wetter months, infiltration rates might be constrained by the depth to the water table. When infiltration systems cannot keep up with the rate of inflow, drainage systems must possess adequate local storage capacity or overflow into other infiltration systems, eventually leading to a detention system.
- To maximize infiltration capacity, infiltration systems should evenly distribute stormwater throughout the site rather than concentrating flows in limited areas.
- If foundations extending below the water table are to be constructed at the site, it is advisable to consider a fully tanked or hybrid design.
- For any proposed construction extending below the water table, the potential for settlement to affect neighbouring properties or roadways should be assessed by a geotechnical engineer.

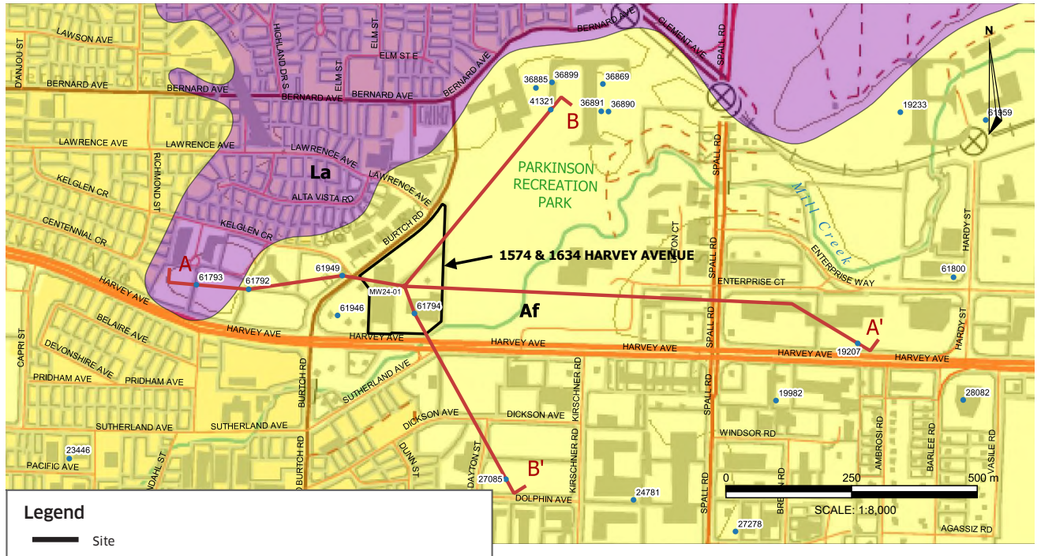


Figure 3-28 Site Surficial Geology

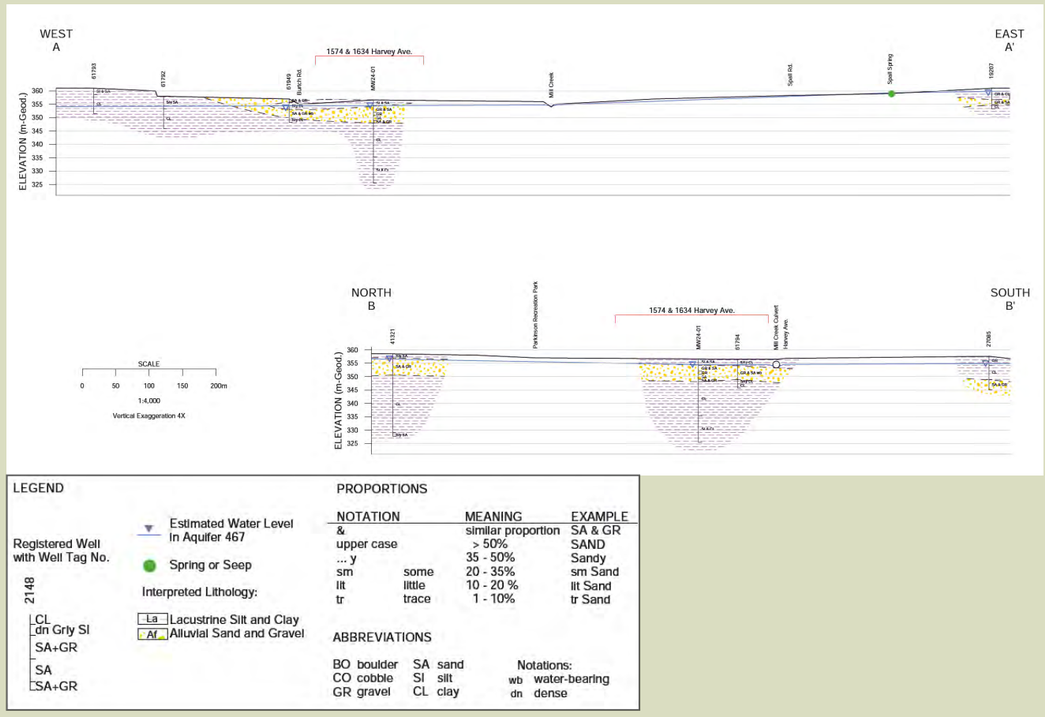


Figure 3-29 Site Surficial Geology Cross Sections

3.5.12 Existing Tree Inventory

Mumby's Arboriculture Consulting (MAC) inventoried the existing trees on the Burtch / Harvey site.

These were the findings by area:

Burtch Road - 17 trees in total, 15 are invasive tree species and the remaining two are not healthy enough to retain. None of the trees in this area should be retained.

Inside east edge of the property - 20 trees in total, 10 should be retained and the other 10 are invasive and should be removed. It is recommended that Tree Protection Zone TPZ fencing should be installed outside the driplines of the 10 remaining trees prior to construction.

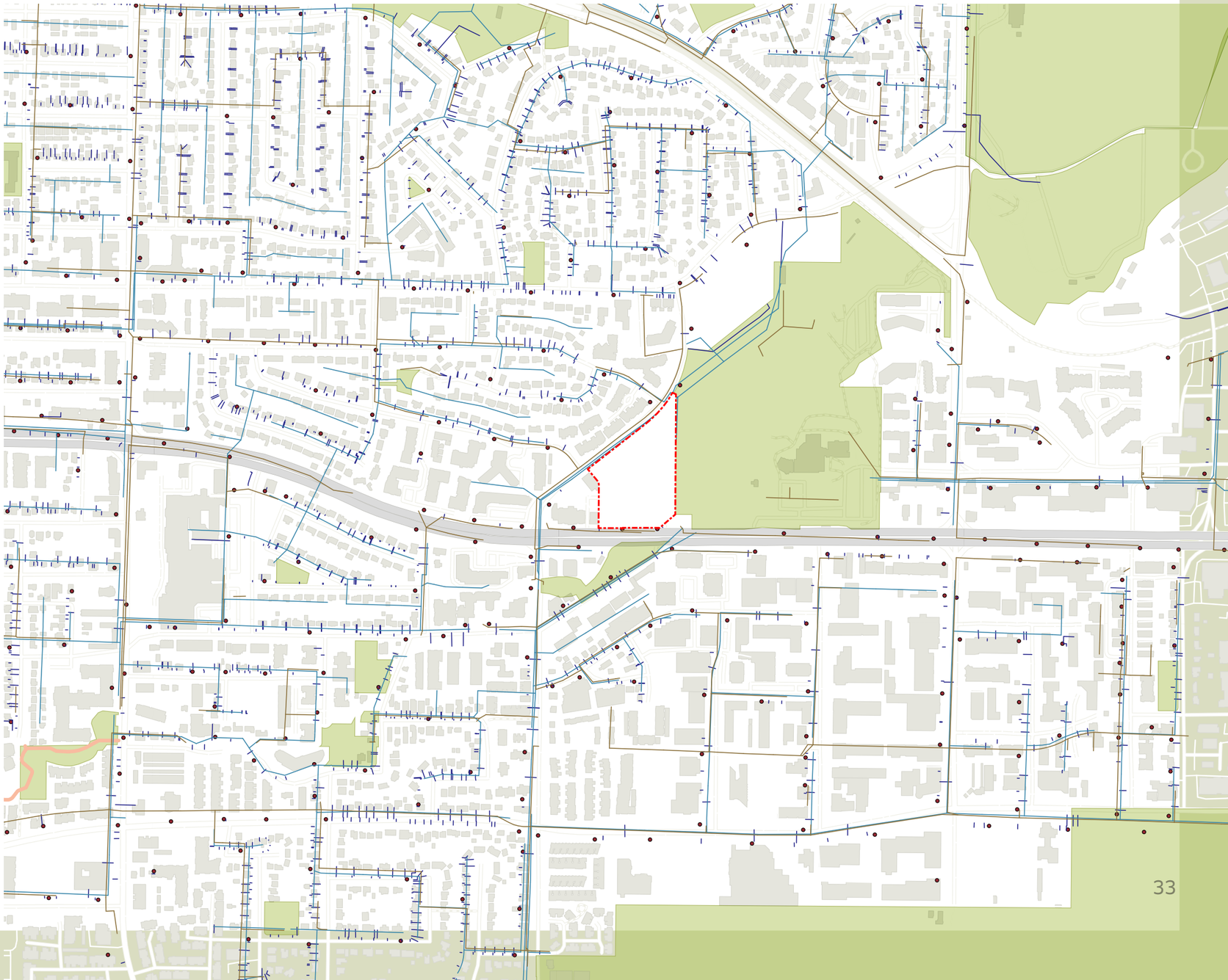
Harvey Avenue - 8 trees on public property. It is recommended that TPZ fencing should be installed prior to construction.

Outside east edge of the property (public park) - 15 existing trees. It is recommended the overhanging branches be pruned prior to construction under the guidance of a City aroborist and that TPZ is installed along the property line.

Figure 3-30 Aerial photo and tree inventory plan with numbers

3.5.13 Utility Infrastructure

The map to the right depicts the existing offsite utility infrastructure. This information was gathered through the City of Kelowna's open data portal. Future demand has not been determined at this conceptual stage. If offsite servicing is later to be determined as needing upgrading, a servicing agreement will be developed during the Rezoning phase.



3.6 Surrounding Developments

3.6.1 Capri-Landmark Urban Centre Plan

Capri-Landmark is one of Kelowna's 2030 Official Community Plan established urban centres beside City Centre, South Pandosy, Rutland, and Midtown.

Capri-Landmark neighbourhood plan is guided by the following principles:

- **Mix it Up:** Promote vitality through a mix of landuses.
- **Places for People:** Encourage building and street proportions that are inviting for people.
- **Healthy Housing Mix:** Ensure a diversity of housing types.
- **Social Spaces:** Establish public spaces that promote social interaction.
- **Placemaking:** Promote local character and sense of place.
- **Going Green:** Design for environmental resilience.
- **People First Transportation:** Prioritize alternative transportation options and connections.
- **Make it Walkable:** Create streets and blocks that are walkable and comfortable for all.

The neighbourhood is set to incorporate two high-density focal points: the redeveloped Capri-Centre Mall site and the Landmark District. Residential zones will establish a connection between these hubs, offering a diverse array of housing options. These two hubs will also be connected to water, by linear paths serving as natural amenities that link important destinations.

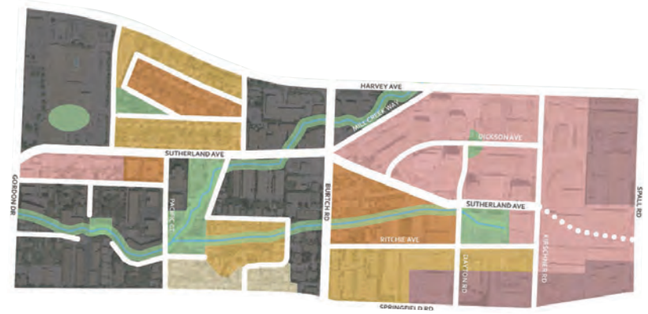


Figure 3-31 Capri-Landmark Future Landuse Map

Figure 3-32 Capri-Landmark Building Heights Map

Figure 3-33 Capri-Landmark Building Heights Map

Figure 3-34 Capri-Landmark Illustrative Vision

3.6.2 Parkinson Recreation Centre Redevelopment

Parkinson Recreation Centre (PRC) is more than just a building it has strengthened the core of communities in Kelowna for decades with inclusive, accessible programming for people of all ages, abilities and incomes. The redevelopment of PRC will give people a place to grow, thrive, connect and belong for generations to come.

As part of the redevelopment of the Parkinson Recreation Centre and Parkinson Recreation Park site, there are several important amenities that contribute to the overall user experience, including:

- Unique spaces for people of all ages and abilities to recreate and be 'Active for Life'
- Social spaces which serve as the 'community living room' with sufficiently sized lobby and additional social spaces scattered throughout
- Integration with the outdoors to make full use of the park setting
- A kitchen for community programs, capable of supporting large-scale events
- Event-hosting support space capable of hosting indoor and outdoor tournaments
- Appropriately sized and equipped amenities (ie, gymnasium, pools) to accommodate competitive sports
- Space for swimming that: engages the needs of health and wellness users, recreational users and meets the standards for aquatic sports; has a strong focus on wellness amenities; has a pool that is appropriately sized and that can be flexible enough to provide different programming options
- Space focused on youth and space dedicated to childcare

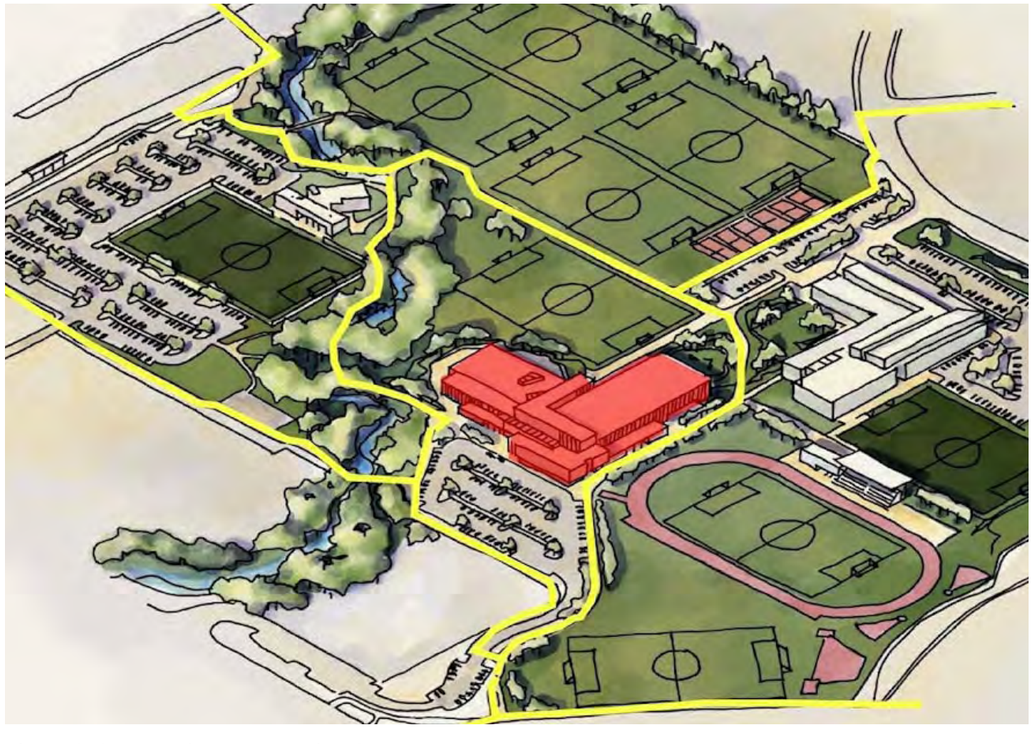


Figure 3-35 Parkinson Recreation Centre Future Development

Figure 3-36 Parkinson Recreation Centre Future Development Site Plan

3.7 Summary of Site Opportunities and Constraints

Map 3.34 outlines a summary of the site's opportunities and constraints.

On a positive note, the presence of social infrastructures in the surrounding area serves as a valuable asset, attracting people to the site.

The redevelopment plans for the Parkinson Recreation Centre and the community plan for Capri Landmark are contributing to significant enhancements on both edges of the site, enriching the livability and vibrancy of the overall site context.

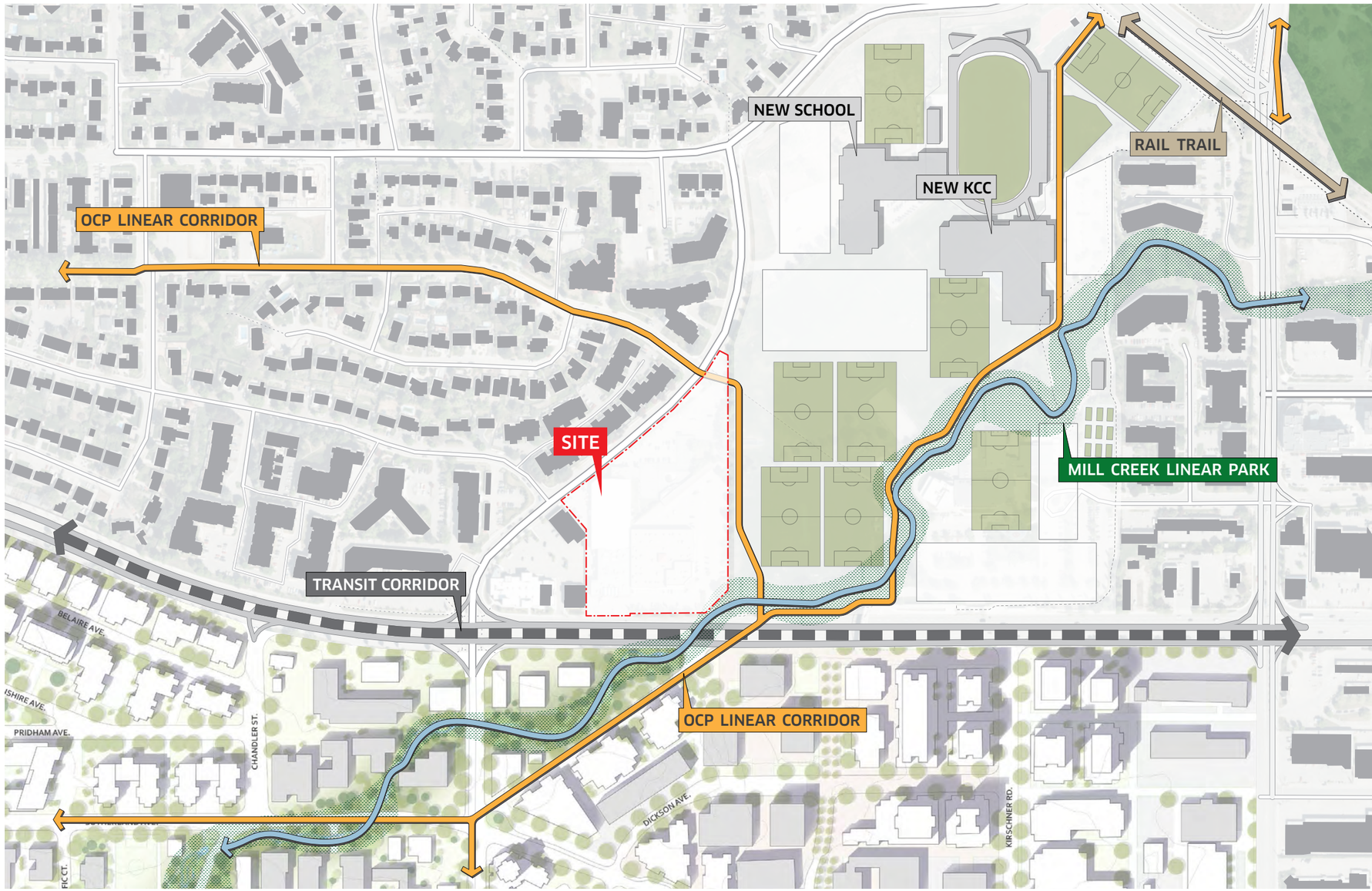
Additionally, in accordance with the Official Community Plan, linear corridors are strategically positioned throughout the city, with one passing along the edge of the site, connecting it to the expansive active transportation network, Mill Creek Park, and the Rail Trail.

Both Harvey Ave and Burtch Road, the two streets surrounding the site, are earmarked as future transit corridors, ensuring ample access to the site.

The studied area enjoys close proximity to key destinations in Kelowna, including downtown, Knox Mountain, and Mission Creek Regional Park.

Additionally, its location along an important thoroughfare creates opportunities for the site to position itself favorably for growth and increased activity.

Figure 3-37 Site Opportunities and Constraints Map



04

CONCEPT PLAN

The concept for this site focuses on drawing people in, creating a dynamic pedestrian focused public realm and creating a transition from the urban throughfare of Harvey to the residential neighbourhood to the North. The concept makes connection with Parkinson Recreation Centre, a major community amenity, however, respects the intended placement of premier league sports fields by and will take into consideration limiting pedestrian connectivity between the two sites.

This plan is responsive to key policy direction coming from the 2040 Official Community Plan, the Capri-Landmark Urban Centre (CLUC) Plan, Healthy Housing Strategy, and the 2023 Housing Needs Assessment. Alignment with existing policy is explored on pages 9, 10, 12. As the project moves into more detailed design and development, more specific details can be given about how this plan would support housing policy and objectives for the City of Kelowna.

4.1 Concept Plan

COMMUNITY STAGE

A STRETCH OF GREEN TO THE HEART OF COMMUNITY

A Launching Place:

The term “community stage” signifies emphasis on public realm and pedestrian priority. It also signifies the how the site design serves as a connector of Parkinson Recreation and Capri-Landmark.

Retail Fronted Park Space:

The Side Park is designated for smaller and more frequent on-site events, providing a venue for activities like night markets and community events. The retail frontage is designed to complement and support the happenings in the park.

A Site of Connection:

This idea creates an inviting entrance to the development, connecting it with the residential community at the rear while preserving density along the edges of Harvey Avenue. Walking paths seamlessly link all the spaces together

Responding to the Communities Aspirations:

This plan seeks to create a vision for future development which will benefit and augment the existing community. Careful consideration has been given to existing policy directives from 2040 Official Community Plan, the Capri-Landmark Urban Centre (CLUC) Plan, Healthy Housing Strategy, and the 2023 Housing Needs Assessment. The plan also aligns with Council Priorities 2023 – 2026, such as those outlined within the Transportation and Climate and Environment categories.

This includes designing to emphasize green connections to key community amenities such as Mill Creek and Parkinson Recreation Park, plugging in to a City-wide Parks and Open spaces network and strategy. It also includes aligning with strategic transportation planning directives, including responding to the rapid bus route on Harvey, and emphasizing the pedestrian realm within the site itself and making consideration for the Rail Trail.

4.1.1 Core Idea

The central theme of the preferred concept is to encapsulate the shift from a bustling urban thoroughfare to a residential neighbourhood. This concept is an evolution of Concept #2, which was presented as part of three concepts in the first submission of this ARP Process. Through engagement with the public and the City of Kelowna, feedback was received that gave direction to reconsider podium heights and permeability between Burtch/Harvey and Parkinson Recreation, specifically potential conflict by pedestrian connections that might encourage short cutting across the future planned sports fields. As a direct result of this feedback, podium heights were reduced to 4 storeys and consideration was given to the alignment of potential connections with Parkinson Recreation.

The resulting final concept includes blocks near Harvey Avenue that are more substantial and less permeable, while those situated to the north become more linear and porous.

In this concept, given the site's location at the periphery of a green open space network there is an intentional consideration of the connectivity to this network that is also sensitive to potential conflict between pedestrian cut-throughs and future planned premier league sports fields to the east. The site also responds to Mill Creek and the need for a buffer to protect the ecological function of this important creek.

The site is planned to be pedestrian oriented, with retail to activate the internal high street.

Legend
- Site
- Green Open Spaces
- 15m OCP Setback
- Mill Creek
- Major Access
  - Pedestrian
  - Vehicular
  - Natural

Figure 4-38 Concept Core Idea Diagram

4.1.2 Illustrative Massing

The concept takes a more intentional approach to blending with Parkinson Recreation Park and the forthcoming OCP Corridors situated along the eastern periphery of the site.

The arrangement of towers and density aligns with Concept 1, gradually reducing towards the northern residential neighborhood.

By situating retail spaces near the suggested green areas, it enlivens the eastern boundary and fosters an inviting atmosphere for community gatherings and events.

Figure 4-39 Concept Illustrative Site Plan

4.1.3 Illustrative Massing

In this concept, the high street takes on a more community-oriented character, meandering east to west at the heart of the development.

Primary retail hubs align along this high street, strategically positioned at the major access point on Harvey Avenue to draw people into the development.

The highest density is concentrated on the southwestern border along Harvey Avenue, gradually decreasing towards the east and north.

Parking Strategy

Half front of the development above grade, half back partially underground

Figure 4-40 Concept Landuse Diagram

Figure 4-41 Concept Massing Diagram

4.1.4 Illustrative Elevation Analysis

The proposed concept for Burtch / Harvey aims to align with the ongoing and approved developments in the City of Kelowna, including the approach to tall buildings and building heights.

The following diagram provides a visual comparison of the potential proposed height on the site with the Capri-Landmark development across the highway and other developments in the downtown area.

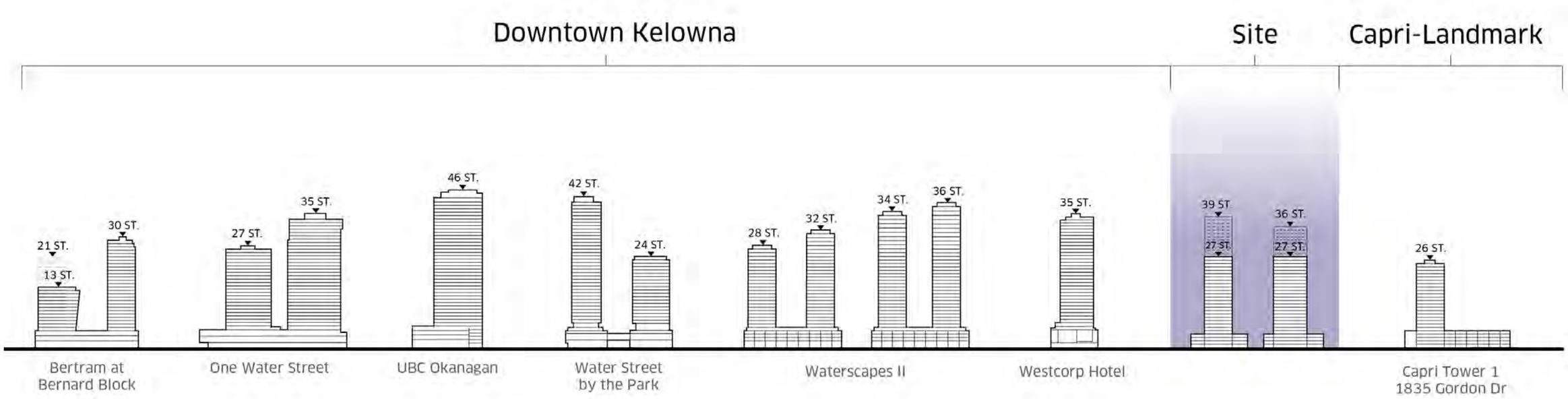
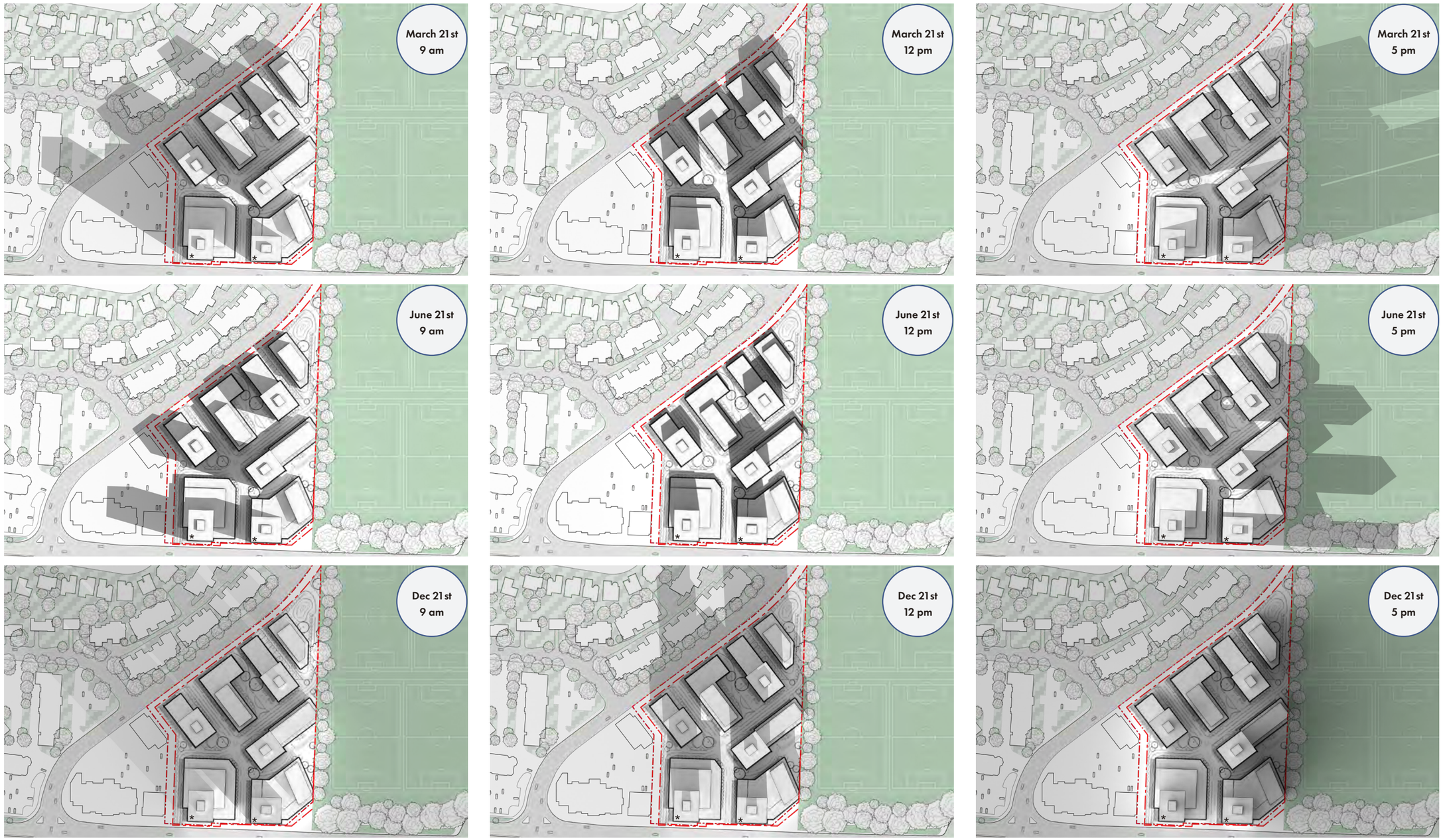


Figure 4-42 Proposed concept height comparison to Kelowna's approved/under construction developments

4.1.5 Illustrative Shadow Analysis



* Shadows are calculated based on a height of 26 storeys along Harvey Ave.

DIALOG | PMC (HARVEY) HOLDINGS CORP

4.1.6 Community Design Framework

COMMUNITY STAGE
A STRETCH OF GREEN TO THE HEART OF COMMUNITY

A Launching Place:

The term “community stage” signifies emphasis on public realm and pedestrian priority. It also signifies the how the site design serves as a connector of Parkinson Recreation and Capri-Landmark.

Retail Fronted Park Space:

The Side Park is designated for smaller and more frequent on-site events, providing a venue for activities like night markets and community events. The retail frontage is designed to complement and support the happenings in the park.

A Site of Connection:

This idea creates an inviting entrance to the development, connecting it with the residential community at the rear while preserving density along the edges of Harvey Avenue. Walking paths seamlessly link all the spaces together

Responding to the Communities Aspirations:

This plan seeks to create a vision for future development which will benefit and augment the existing community. Careful consideration has been given to existing policy directives from 2040 Official Community Plan, the Capri-Landmark Urban Centre (CLUC) Plan, Healthy Housing Strategy, and the 2023 Housing Needs Assessment. The plan also aligns with Council Priorities 2023 – 2026, such as those outlined within the Transportation and Climate and Environment categories.

This includes designing to emphasize green connections to key community amenities such as Mill Creek and Parkinson Recreation Park, plugging in to a City-wide Parks and Open spaces network and strategy. It also includes aligning with strategic transportation planning directives, including responding to the rapid bus route on Harvey, and emphasizing the pedestrian realm within the site itself and making consideration for the Rail Trail.

4.1.7 Street Typologies - Burtch Rd

- Creating a welcoming and vibrant community.
- Smaller building footprints makes it porous with interior streets foster an inviting atmosphere, enhancing public interaction and accessibility in-between. This approach not only encourages social engagement but also integrates residential spaces seamlessly into the urban fabric, promoting a cohesive and pedestrian-friendly environment that prioritizes human scale and comfort.

Figure 2-1 View from site from Burtch Rd. Access

Figure 2-2 Active Street Frontage - Tree buffer

Figure 2-3 Street Frontage - Green Buffer

Figure 2-4 Residential Friendly Interface

Figure 2-5 Residential Street Frontage

Figure 2-6 Green Buffer with Seating

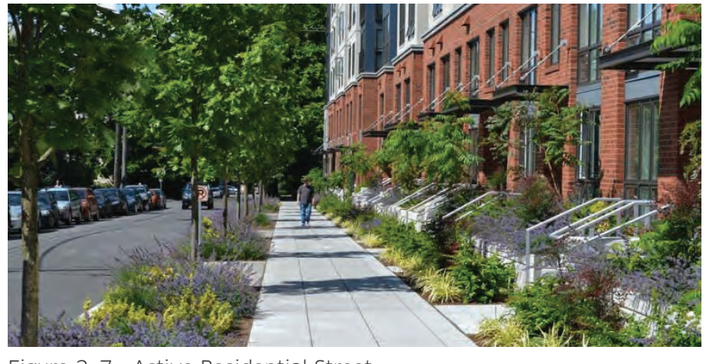


Figure 2-7 Active Residential Street

4.1.8 Street Typologies - Harvey Ave

- Providing an active pedestrian freindly street front.
- As Harvey Avenue is a major east/west vehicualr thoroughfare, the transition from road to a mixed use development is critical. The interface is encouraged to have pedestrian activity, access to retail, vegetation, open area and art.
- The frontage will also provide adjacent access to Parkinson Park and the Mill Creek pathway.

Figure 3-2 Active Retail Street Frontage

Figure 3-5 Sidewalks and Seating

Figure 3-3 Dedicated paths - Buffer from Busy Traffic

Figure 3-6 Active Retail Edges

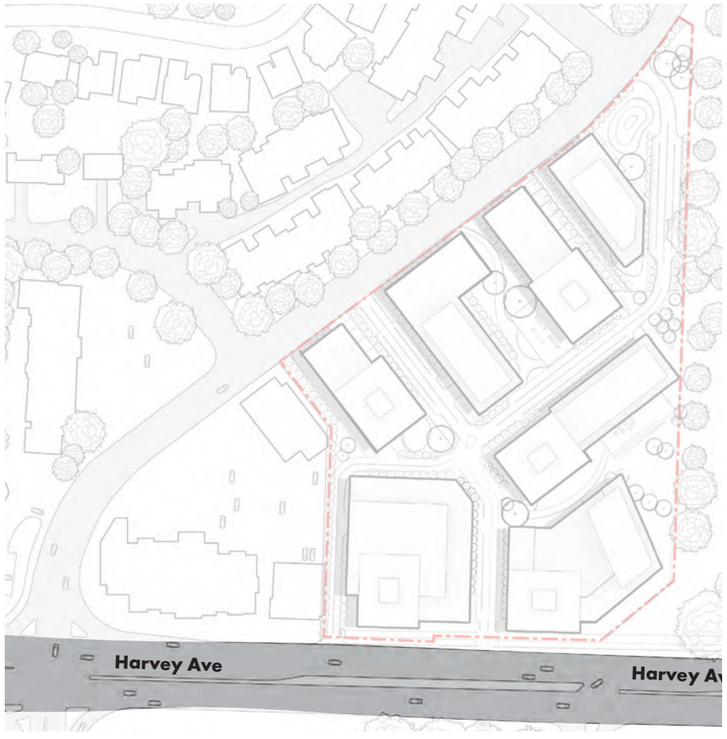


Figure 3-1 View from site from Harvey Ave. Access

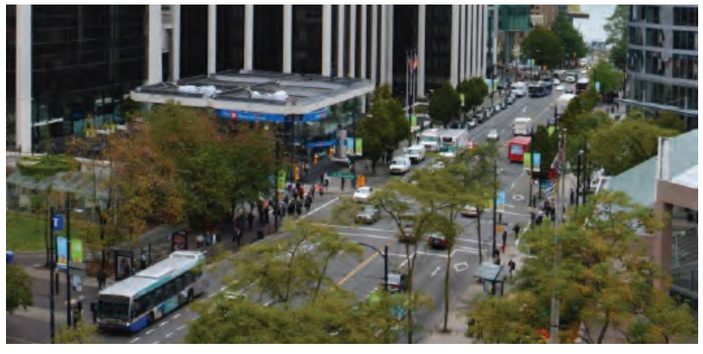


Figure 3-4 Public Realm adjacent to busy corridors

Figure 3-7 Dedicated paths - Green Buffer

4.1.9 Street Typologies - Internal Streets

- Interior open-air streets, allowing for an engaging and leisurely atmosphere where public can comfortably browse stores and enjoy the outdoors.
- Human scale approach, narrow car lanes, wide continuous sidewalks, and ample greenery, creating an supportive pedestrian-friendly experience.
- The parcel to the west, 1544 Harvey Ave, is a private and separately owned property. Site planning will consider future opportunities to accommodate vehicle access to the adjacent parcel.

Figure 4-1 View from site from Harvey Ave. Access

Figure 4-2 Active Retail Frontage

Figure 4-3 Active Retail Street Frontage with Green Buffers

Figure 4-4 Paved pathways - Mixed use streets

Figure 4-5 Active Residential Frontage

Figure 4-6 Seating and Plant Buffer From Street

Figure 4-7 Office / Mixed Use Street Frontage

4.1.10 Street Typologies - Pedestrian and Bicycle Connectivity

- Thoughtfully integrated pathways to enhance safety, encourage walkability and foster community interactions.
- Dedicated pathways, Traffic calming measures for shared lanes with bikes and cars
- Mixed-use center that caters to pedestrians, cyclists, and public transit users, seamlessly blending into the natural and cultural surroundings.
- North-south pedestrian permeability will be provided through the site to provide necessary connections to adjacent neighbourhoods, transit stops, businesses, and recreational facilities. Layout and specifications will be considered in conjunction with the overall design of internal circulation through the Development Permit process.

Figure 5-1 View from site from Harvey Ave. Access

Figure 5-2 Dedicated Pedestrian Pathway

Figure 5-3 Active Plaza Frontage

Figure 5-4 Shared Pathways

Figure 5-5 Shared Pathways and spill out patios

Figure 5-6 Dedicated Residential Frontage

Figure 5-7 Art Representations for Crossings

4.1.11 Street Typologies - Parking

Balance accessibility and space efficiency - aim to create a walkable, vibrant community while accommodating the necessary vehicular access

Indoor parkades provide secure, weather-protected parking further reducing street congestions and big dead parking lots

Street parking is strategically limited and often regulated to prioritize short-term parking, encouraging turnover and supporting local businesses.

On-street parking maximizes space efficiency on narrower streets while maintaining pedestrian-friendly sidewalks

Figure 6-2 Parkade building

Figure 1-4 On-Street Parking - Active Street

Figure 1-2 Integrated Parking

Figure 1-5 Alternative Parking Treatment

Figure 6-1 View from site from Harvey Ave. Access

Figure 1-3 Underground Parkade with Rooftop Garden

Figure 1-7 Indoor Parkade Building

4.1.12 Greenspaces - Public

Creating vibrant and dynamic environments.

With the Burtch/Harvey Area Redevelopment Plan Lands designed to be a vibrant and active mixed-use development, the intent is to have contiguous publicly accessible green space that will complement the Parkinson Park to the east.

While this ARP does not provide detailed design, the subsequent re-zoning of the lands will specify a minimum contiguous green space of 0.25 acres which will be designed and developed as publicly-accessible parkland.

Figure 7-1 Park

Figure 7-2 Pocket Plaza Spaces

Figure 7-3 Plaza

Figure 7-4 Park

Figure 7-5 Sidewalk Patio

Figure 7-6 Playarea

Figure 7-7 Park Plaza

4.1.13 Greenspaces - Private

Valuable extensions of living and working spaces

Providing accessible, elevated environments for relaxation, socializing, and connecting with nature, all while optimizing limited urban space.

Sustainability and aesthetic appeal of the development

Active Rooftop

Seating along Edge

Rooftop Gathering/Event Space

Rooftop Dog Parks

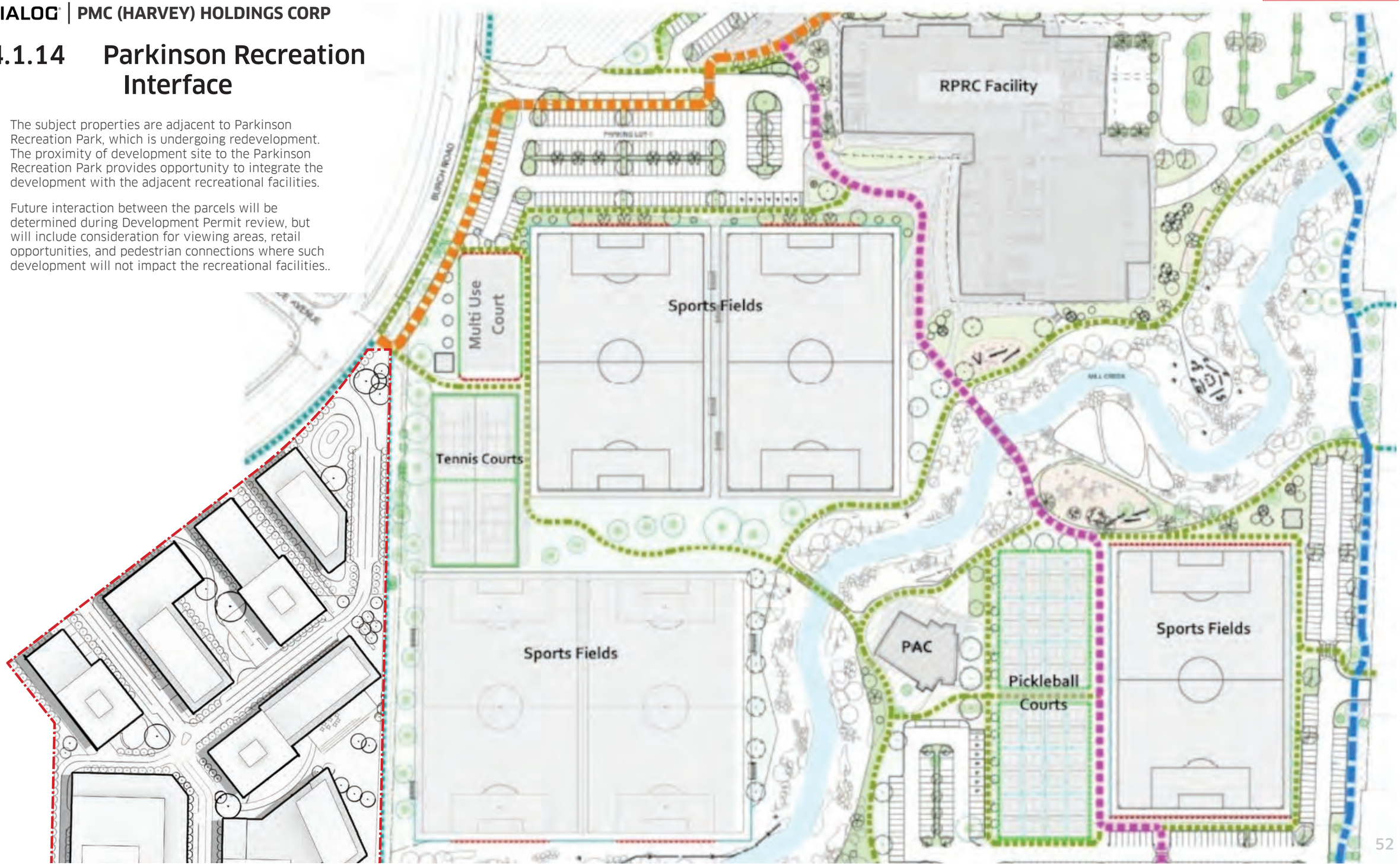
Rooftop Lounge/Seating

Rooftop Garden and Walking pathways

4.1.14 Parkinson Recreation Interface

The subject properties are adjacent to Parkinson Recreation Park, which is undergoing redevelopment. The proximity of development site to the Parkinson Recreation Park provides opportunity to integrate the development with the adjacent recreational facilities.

Future interaction between the parcels will be determined during Development Permit review, but will include consideration for viewing areas, retail opportunities, and pedestrian connections where such development will not impact the recreational facilities..



Massing Strategy

Much like the rationale used in the Capri Landmark OCP, the Burtch Harvey heights/massing are set from high to low, moving south to north-west. The intent is to minimize the shadowing on the residential developments to the north.

Harvey Avenue to the south would dictate the highest structures, with tower heights of 39 and 36 stories.

As the site moves to the northwest, the base height of 6 stories would set a residential street edge to Burtch Road.

Community Benefit

The Butch Harvey Area Redevelopment Plan will provide public benefit for the City of Kelowna. In addition to the benefit of providing more housing to the market, additional public benefits will be provided through the rezoning process. Considerations for public benefit include:

- Provision of affordable housing units;
- Cash contribution to the Housing Opportunities Reserve Fund;
- Provision or cash contribution to off-site improvements (examples may include: a new stairway access to the Dayton Street Overpass, upgrades to nearby transit facilities, contributing to further improvements of Parkinson Recreation Park);
- Provision of public art;
- On-site amenities such as child care or community facilities; and/or
- Other public benefits.

Phasing Strategy

With larger development sites in Kelowna such as the Capri Landmark lands, a Phasing Strategy can be a power tool to understand the development benefits to the City of Kelowna, adjacent land owners and residents of the City.

As the Burtch Harvey lands consist of only 7 acres, the site may done in one phase, or by sub-areas. With the site being quite compact, there currently isn't a clear Phase Strategy to present.

4.2 Summary

In conclusion, this report provides a comprehensive overview of the physical baseline, planning process, and preferred concept for the Burtch/Harvey (574-1634 Harvey Avenue) Area Redevelopment Plan project. The site assessment highlights the development potential and the best approaches to future development, taking into account the surrounding context, anticipated growth, Kelowna's 2040 OCP and ecological and environmental considerations.

The preferred concept emerged directly from the Area Redevelopment Plan planning process. Initially, three preliminary concepts were developed to explore various responses to the site context. These concepts were then presented to the public and the City of Kelowna for feedback. The input gathered through these engagements was instrumental in refining the preferred concept, ensuring it aligns with the community's and the City's expectations and needs.

05

APPENDIX

- Community Engagement Summary
- Site Survey
- Site Tree Survey
- Results of Provincial Archaeological Inventory Search
- Watercourse Assessment
- Geotechnical Site Due Diligence
- Hydrotechnical Site Due Diligence
- Hydrogeology Assessment for Property Development
- Arborist Report

Mary Lapointe
Community Relations/Development Consulting

May 9, 2024

City of Kelowna
1435 Water Street
Kelowna, B.C. V1Y 1J4

Attention: Trisa Atwood

Re: Community Engagement Summary – 1574 Harvey and 1634 Harvey (Harvey & Burtch)

On behalf of PMC (Harvey) Holdings and Dialog Design, I am providing this letter summarizing the community engagement activities that support the Area Redevelopment Plan (ARP) process currently underway for the above-noted properties and meets the requirements of the Summary of Public Engagement and Indigenous consultation as described in the Terms of Reference for this project.

Background:

PMC (Harvey) Holdings is undertaking an Area Redevelopment Planning process as a prerequisite for the consideration of an OCP amendment that will create alignment of the future land use designation with community objectives, as identified within the Kelowna 2040 OCP.

Meeting Community Engagement Objectives:

Community engagement is a key component of the ARP planning process, and the property owner has undertaken initiatives described here to achieve engagement objectives.

- Direct communications with commercial neighbours and area landowners;
- A formal **Public Information Meeting** for neighbours, existing tenants, gym users, the neighbourhood and the community at large. A second information meeting was held for commercial tenants one week after the PIM.

The Public Information Meeting provided a full presentation of the policy background, proposed concepts and process information, along with an invitation to provide written or verbal feedback. Attendees were informed that the feedback period would be open for three (3) weeks and that submissions could be made in person at the meeting or by email. The opportunity to engage was widely advertised and notification for the Public Information Meeting, beyond the City's requirements, included:

- An information letter distributed to current tenants and more than 15,000 past and present Global Fitness members;
- 1,566 'postcard' style invitations mailed out to neighbours (including and exceeding the distribution list provided by City of Kelowna) and delivered two weeks in advance of the PIM;
- Print advertisement published in Kelowna Capitol News for two weeks in advance of the PIM;
- Multi-day electronic advertising of the PIM ran in both Castanet and Infotel during the week before the PIM;
- Standard development signage on each of the property frontages; and
- An email address was included within promotional materials and at the in-person events to allow an opportunity for people to submit feedback electronically.

- Formal requests to engage with WFN and OKIB, an invitation to attend the Public Information Meeting and response to requests for additional information.

Engagement Outcomes:

A total of **120 people** attended the two PIM forums. Attendees were primarily comprised of gym members, existing commercial tenants and a smaller number of residential neighbours. Very few people provided written feedback (1 feedback form and several comments posted by 'sticky' note on the information panels). The following key themes emerged from these and the verbal comments our team members received:

Expressions of Support:

- Integrated green spaces and gathering places for future residents.
- Respect for the interface between the property and the PRC plan/space.
- Commercial, retail and restaurants on the ground floor to serve local needs.
- Tree retention.
- Improved traffic management and pedestrian safety – Burtch and Kelglen.
- Reduced heights along the Burtch frontage with higher buildings oriented to the highway – for less impact on residential neighbours.
- Maximize bike paths and pedestrian routes for internal areas (no cars).

Expressions of Concern:

- Timing and loss of Global Fitness facility.
- Building heights.

- Potential shadowing on PRC and neighboring residential areas;
- Insufficiency of parking for residents and visitors.
- Insufficient sunlight on greenspaces (primarily Concept 3).

Next Steps:

As the planning and approvals process advances, PMC (Harvey) Holdings and Dialog Design will continue to respond to community interests and feedback and will work with the City of Kelowna address the input that is received through engagement.

Please do not hesitate to contact the undersigned with any questions you may have regarding the program described here.

Respectfully,

Mary Lapointe

Attachment:
Copies of Notification Materials

BURTCH & HARVEY
AREA REDEVELOPMENT PLAN

PLEASE SHARE YOUR THOUGHTS

BURTCH & HARVEY

AREA REDEVELOPMENT PLAN

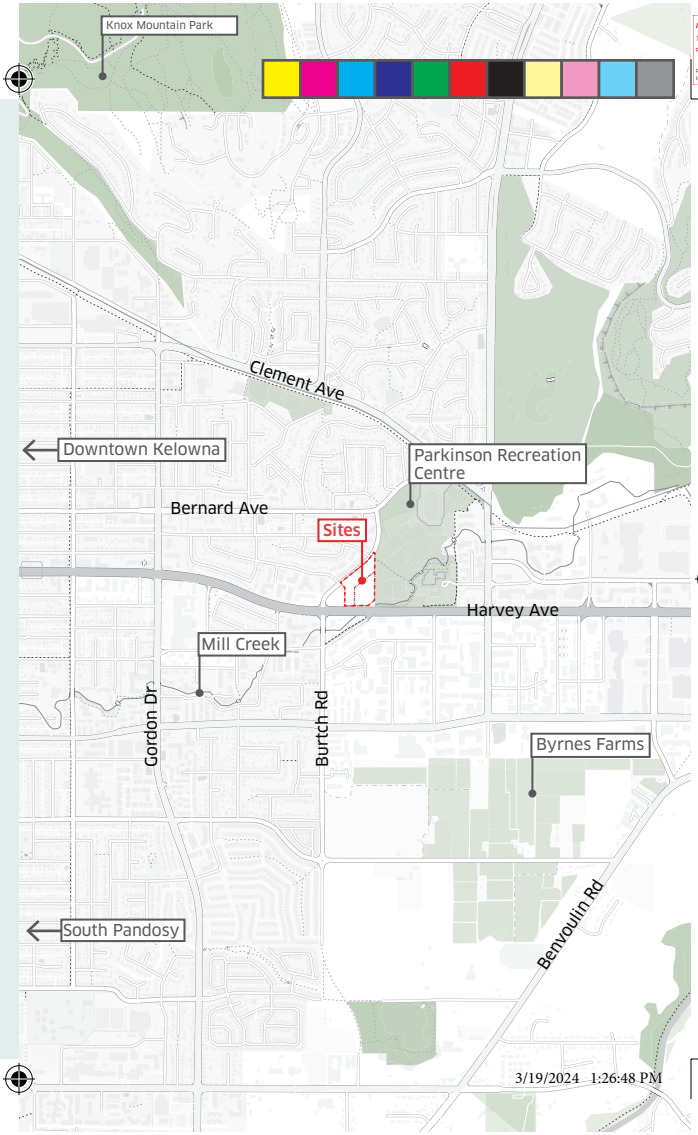
1574 Harvey Ave and 1634 Harvey Ave,
Kelowna, BC

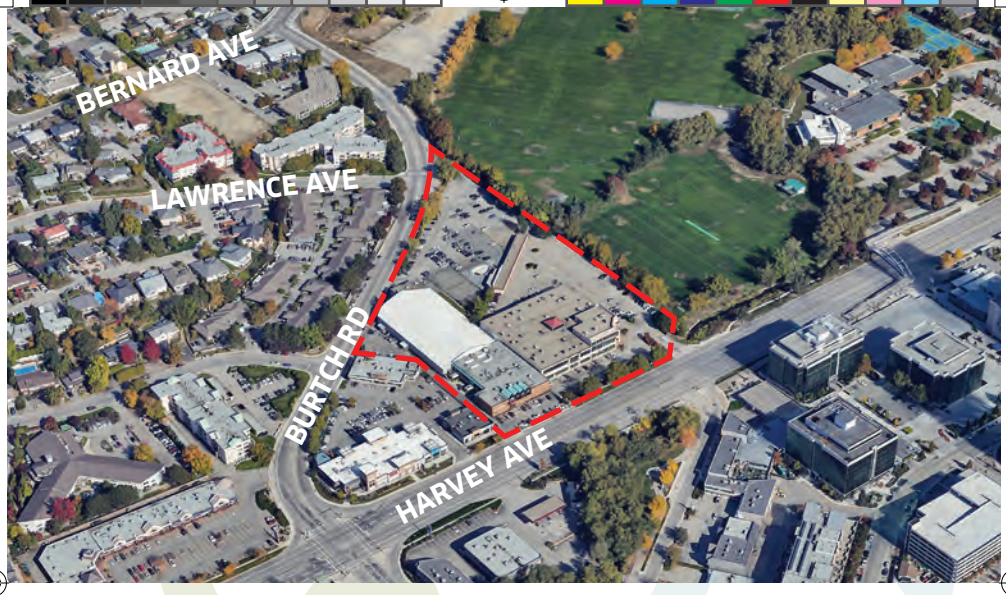
Property owner PMC (Harvey) Holdings Corp. is working to create an updated plan to guide future development for these properties. Community input is an important part of the planning process.

Learn about this planning initiative, enjoy some light refreshments and share your thoughts at the **Public Information Meeting:**

Wednesday, April 10, 2024
4:30 p.m. to 7:30 p.m.
Tennis Courts at Global Fitness,
1574 Harvey Ave, Kelowna, BC

If you have questions about this initiative, please contact: burtchharvey@gmail.com





BURTCH & HARVEY

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1574 Harvey Ave, Kelowna, BC

If you have questions about this initiative, please contact:
burtchharvey@gmail.com

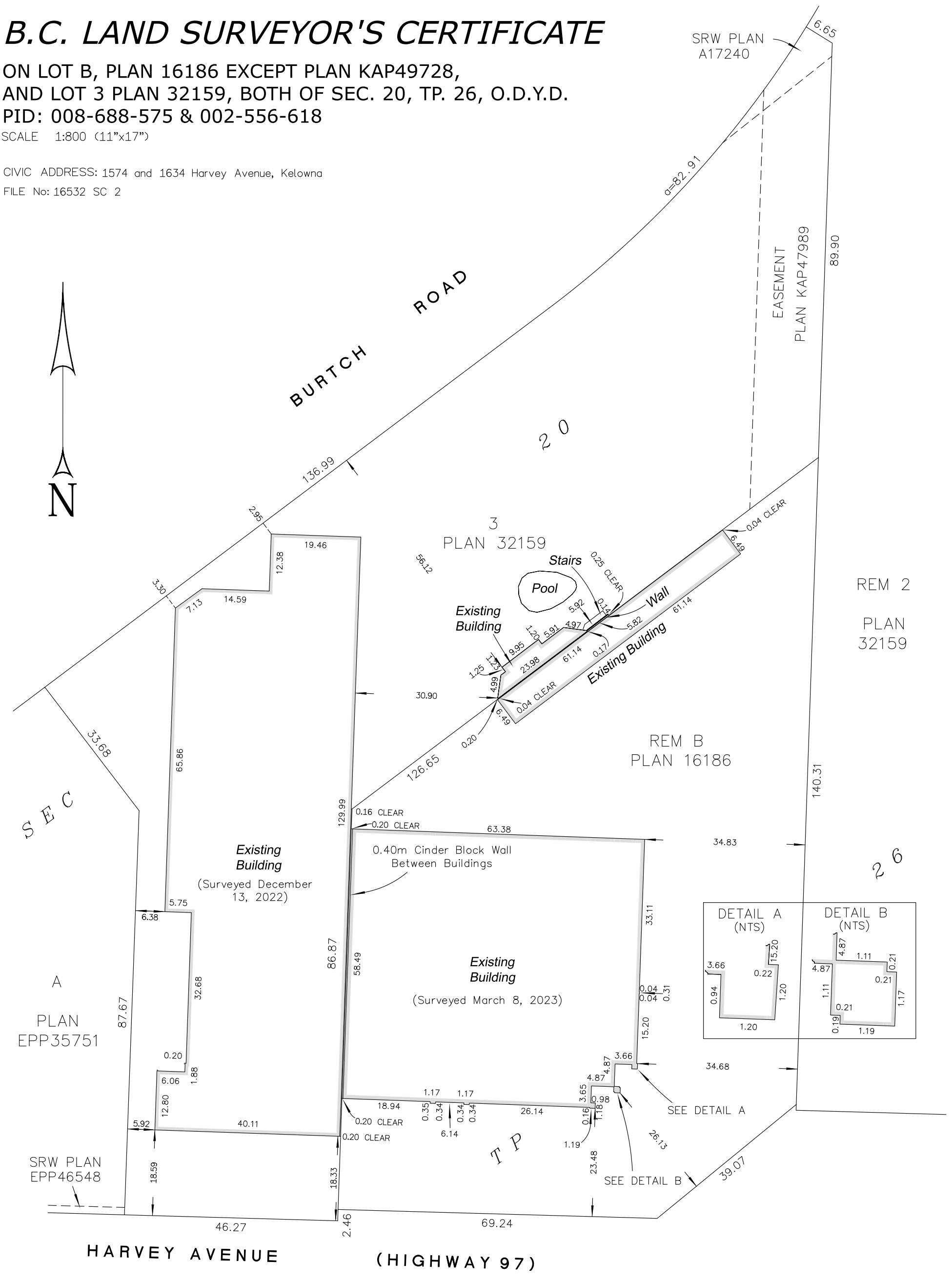
B.C. LAND SURVEYOR'S CERTIFICATE

ON LOT B, PLAN 16186 EXCEPT PLAN KAP49728,
AND LOT 3 PLAN 32159, BOTH OF SEC. 20, TP. 26, O.D.Y.D.
PID: 008-688-575 & 002-556-618

SCALE 1:800 (11"x17")

CIVIC ADDRESS: 1574 and 1634 Harvey Avenue, Kelowna

FILE No: 16532 SC 2



Certified correct this 13th day of March, 2023.

ROBERT T. MACDONALD B.C.L.S.

THIS DOCUMENT IS NOT VALID UNLESS DIGITALLY SIGNED

ATTACHMENT A
This forms part of application
ARP24-0001 OCP24-0012
City of Kelowna
DEVELOPMENT PLANNING
Planner Initials MT

THIS PLAN HAS BEEN PREPARED BASED ON LAND TITLE AND SURVEY AUTHORITY RECORDS AND FIELD SURVEYS COMPLETED ON DECEMBER 13, 2022, AND MARCH 8, 2023.

TIES AND MEASUREMENTS TO EXTERIOR OF CINDER BLOCK WALLS FOR LOT 3, PLAN 32159, AND STUCCO FOR LOT B, PLAN 16186.

THIS DOCUMENT WAS PREPARED FOR MORTGAGE AND MUNICIPAL PURPOSES AND IS FOR THE EXCLUSIVE USE OF OUR CLIENT, PRAIRIE MERCHANT CORP.

THIS DOCUMENT SHOWS THE RELATIVE LOCATION OF THE SURVEYED STRUCTURES AND FEATURES WITH RESPECT TO THE BOUNDARIES OF THE PARCEL DESCRIBED ABOVE. THIS DOCUMENT SHALL NOT BE USED TO DEFINE PROPERTY LINES OR PROPERTY CORNERS.

THE SIGNATORY ACCEPTS NO RESPONSIBILITY OR LIABILITY FOR ANY DAMAGES THAT MAY BE SUFFERED BY A THIRD PARTY AS A RESULT OF ANY DECISIONS MADE, OR ACTIONS TAKEN BASED ON THIS DOCUMENT.

A COMPREHENSIVE LEGAL SURVEY MAY REVEAL OFFSETS TO BOUNDARIES THAT DIFFER FROM THOSE SHOWN.

UNREGISTERED INTERESTS HAVE NOT BEEN INCLUDED OR CONSIDERED.

RUNNALLS DENBY
british columbia land surveyors
259A Lawrence Avenue
Kelowna, B.C. V1Y 6L2
Phone: (250)763-7322
Fax: (250)763-4413
Email: rob@runnallsdenby.com

Burtch / Harvey Tree Survey

NOTE:

Survey Date: November 24, 2023.

Elevations are geodetic (CVD 28 HTV2.0) and derived from GPS observations.

This plan is not to be used to define property line locations.

ATTACHMENT A
This forms part of application
ARP24-0001 OCP24-0012
City of Kelowna
DEVELOPMENT PLANNING
Planner Initials MT

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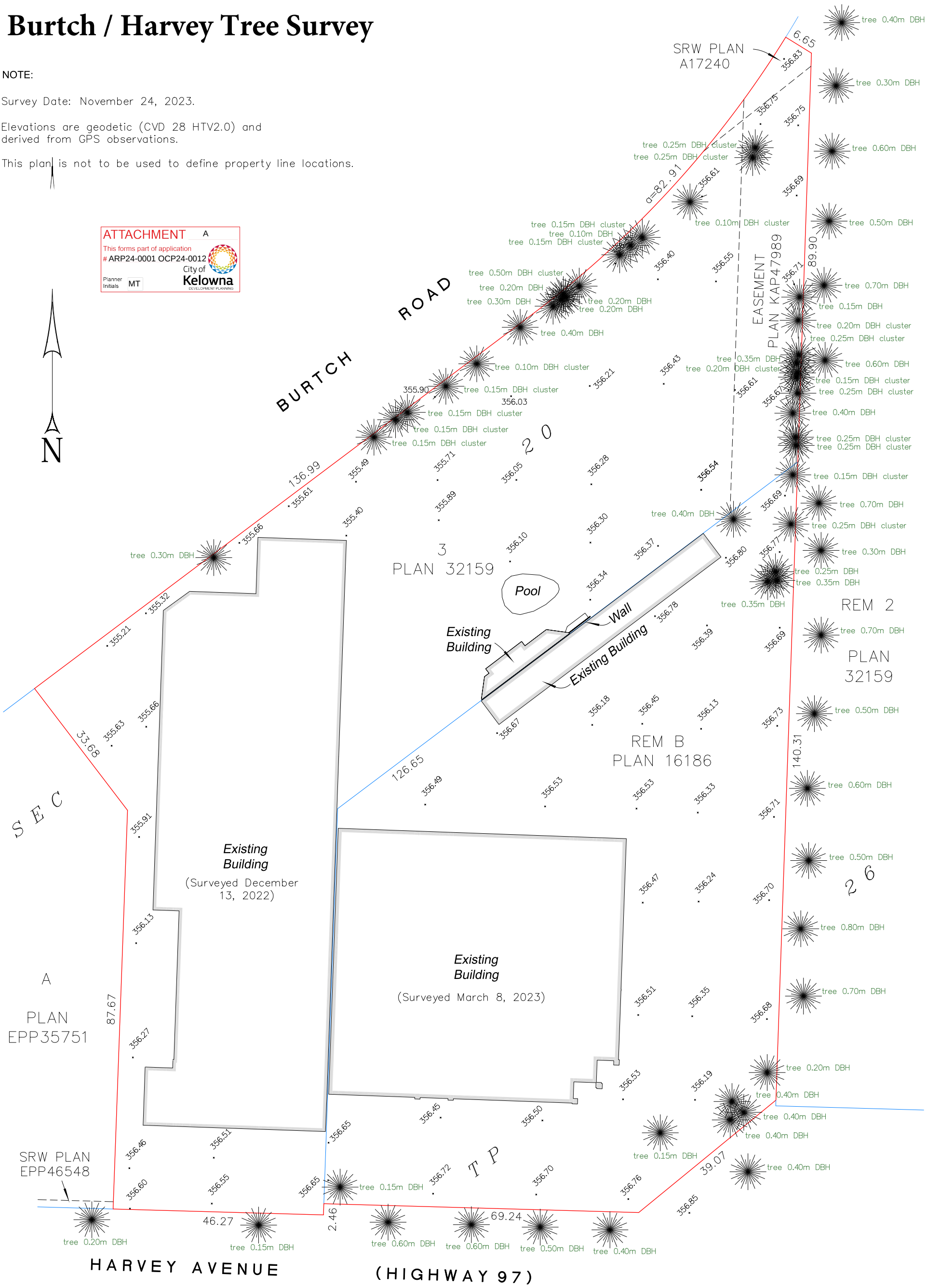


TITLE:

SITE PLAN OF LOT 3, PLAN 32159, AND LOT B, PLAN 16186, EXCEPT PLAN KAP49728, BOTH OF SEC. 20, TP. 26, O.D.Y.D. (1574 & 1634 HARVEY AVENUE, KELOWNA)

DRAWN BY:	RUNNALLS DENBY *british columbia land surveyors* 259A Lawrence Avenue Kelowna, B.C. V1Y 6L2 Phone: (250)763-7322 Email: jen@runnallsdenby.com	SCALE:	1:800 (11" x 17")
		DATE:	November 30, 2023
		DWG:	16532 SITE
CLIENT:	PRAIRIE MERCHANT CORP	FILE No.: 16532	REV. 0

Maryam Ahmadi

From: Partridge, Erin FOR:EX <Erin.Partridge@gov.bc.ca>
Sent: Thursday, January 18, 2024 9:05 AM
To: Maryam Ahmadi
Subject: RE: Data Request: Maryam Ahmadi - DIALOG

Good morning Maryam,

Thank you for your archaeological information request regarding 1574 Harvey Avenue, Kelowna, BC, PID 002556618, LOT 3 SECTION 20 TOWNSHIP 26 OSOYOOS DIVISION YALE DISTRICT PLAN 32159; and 1634 Harvey Avenue, Kelowna, BC, PID 008688575, LOT B SECTION 20 TOWNSHIP 26 OSOYOOS DIVISION YALE DISTRICT PLAN 16186 EXCEPT PLAN KAP49728. Please review the screenshot of the properties below (outlined in yellow) and notify me immediately if it does not represent the properties listed in your information request. For future requests, please include the PID for each subject property.

Results of Provincial Archaeological Inventory Search

According to Provincial records, there are no known archaeological sites recorded on the subject properties.

Archaeological potential modelling for the area does not indicate a high potential for previously unidentified archaeological sites to be found on the subject property.

Archaeology Branch Advice

The Archaeology Branch does not identify a need for archaeological study or Provincial heritage permit(s) at the time of this information request.

Please notify all individuals (e.g., owners, developers, equipment operators) involved in land-altering activities (e.g., home renovations, property redevelopment, landscaping, service installation) that if archaeological material is encountered during development, they **must stop all activities immediately** and contact the Archaeology Branch for direction at 250-953-3334.

Rationale and Supplemental Information

- Archaeological study and Provincial heritage permit(s) are not required in the absence of an archaeological site.
- There is always a possibility for previously unidentified archaeological sites to exist on the properties.
- Archaeological sites are protected under the *Heritage Conservation Act* and must not be damaged or altered without a Provincial heritage permit issued by the Archaeology Branch. This protection applies even when archaeological sites are previously unidentified or disturbed.

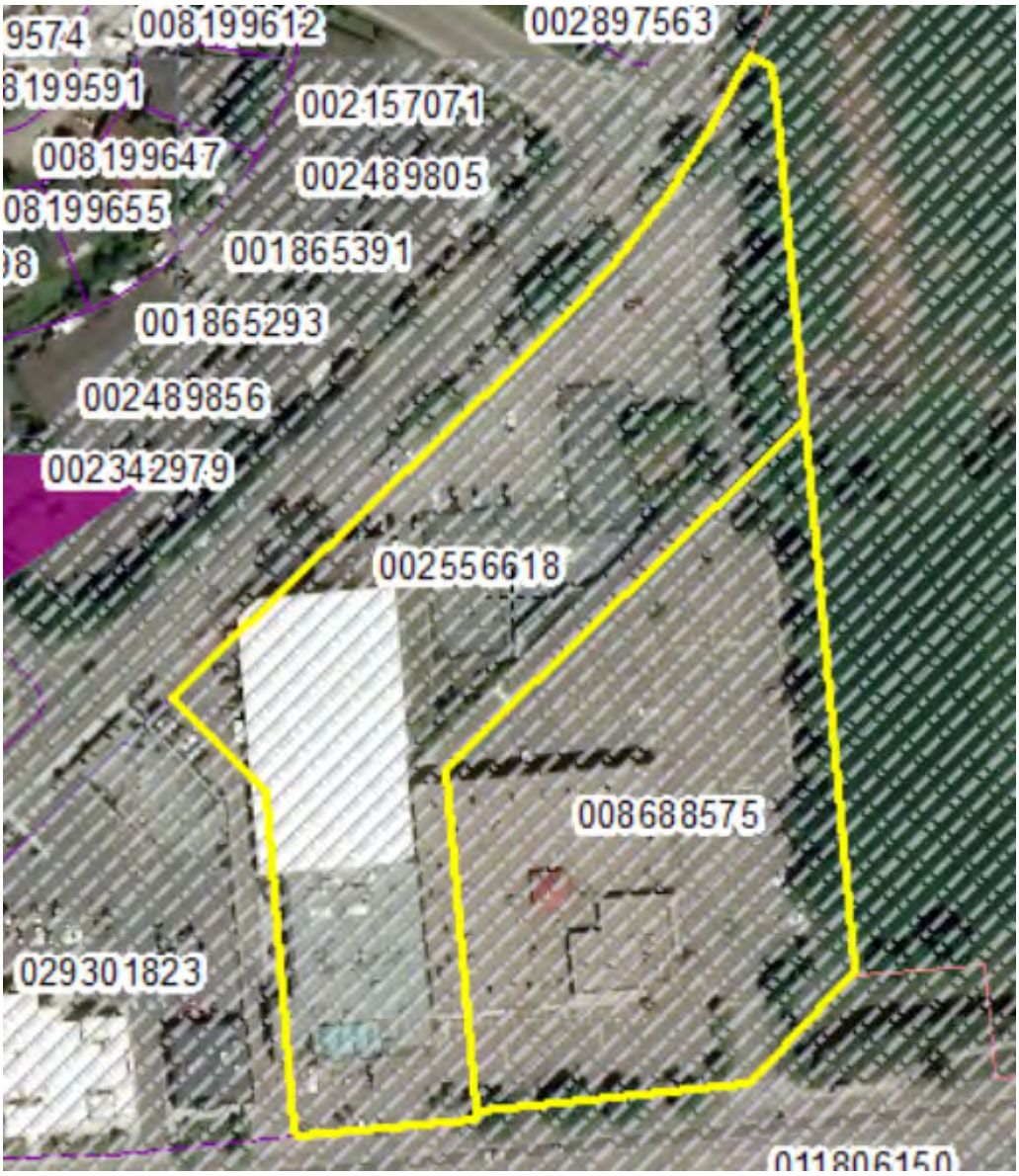
Questions?

For questions about the archaeological permitting and assessment process, please contact the Archaeology Branch at 250-953-3334 or archaeology@gov.bc.ca.

For more general information, visit the Archaeology Branch website at www.gov.bc.ca/archaeology.

Warm regards,
Erin

ATTACHMENT A
This forms part of application
ARP24-0001 OCP24-0012
City of Kelowna
DEVELOPMENT PLANNING
Planner Initials MT



Please note that subject lot boundaries (yellow) and areas of archaeological potential (purple = high potential, white hashed lines = moderate potential) indicated on the enclosed screenshot are based on information obtained by the Archaeology Branch on the date of this communication and may be subject to error or change. Archaeological site boundaries may not be identical to actual site extent.

BRITISH COLUMBIA
Ministry of Forests

Erin Partridge (they/them)
Archaeological Information Specialist |
Inventory Archaeologist

Archaeology Branch
Ministry of Forests
Erin.Partridge@gov.bc.ca

Keystone Environmental
Knowledge-Driven Results

February 9, 2024

PMC (Harvey) Holdings Corp.
Suite 200, 1029 17th Avenue SW
Calgary, AB T2T 0A9

Attn: Lee Dowd

Re: Watercourse Assessment
1574 and 1634 Harvey Avenue, Kelowna, BC
File No. 18643 Rev 1

INTRODUCTION

Keystone Environmental Ltd. (Keystone Environmental) was retained by DIALOG to prepare a watercourse assessment report for the redevelopment of 1574 and 1634 Harvey Avenue, Kelowna, BC (the Property). The scope of this assessment included conducting a reconnaissance level desktop review of the existing environmental features applicable to the Property redevelopment, including instream and riparian habitats, presence of other aquatic features such as wetlands and determination of applicable riparian setbacks associated with the Property. This study also included a field component to document existing conditions.

METHODS

Desktop Review

Desktop analysis included a review of the following information sources:

- City of Kelowna online mapping[1],
- BC Government's Habitat Wizard[2],
- BC Government's iMapBC[3].

Field Assessment

Keystone Environmental conducted a site visit on December 20, 2023, to verify results of the desktop review and document existing site conditions. During the field assessment, aquatic features within the Property and a 30 m buffer from the Property Line (PL) were investigated to document and confirm their spatial extent.

[1] City of Kelowna. 2024. Interactive Map. Available at: https://maps.kelowna.ca/public/mapviewer/
[2] BC Government. 2023. Habitat Wizard. Available at: https://maps.gov.bc.ca/ess/hm/habwiz/
[3] BC Government. 2023. IMapBC. Available at: https://delivery.maps.gov.bc.ca/ess/hm/imap4m/

REGULATORY CONSIDERATIONS

CITY OF KELOWNA 2040 OFFICIAL COMMUNITY PLAN[4]

Chapter 21 of the City of Kelowna 2040 Official Community Plan (OCP) outlines natural environment development permit requirements including minimum Riparian Management Areas (RMA). The minimum RMA is defined for 35 streams within the City of Kelowna which meet or exceed the requirements of RAPR. The setbacks defined in the OCP are measured from TOB except where poorly defined where natural boundary or HWM will be used. Watercourses not listed in the OCP are subject to RAPR requirements.

RIPARIAN AREA PROTECTION REGULATION (RAPR)

The RAPR[5] requires local governments to protect riparian areas during residential, commercial, and industrial development. This is achieved by ensuring that a Qualified Environmental Professional (QEP) conducts a science-based assessment with consideration of the proposed development activities. RAPR detailed assessment utilizes stream width, reach breaks, potential vegetation type, and channel type to determine the Streamside Protection and Enhancement Area (SPEA). SPEA width is measured from the High-Water Mark (HWM) of streams and the Top of Bank (TOB) of ditches.

The RAPR defines a stream as:

> *(a) a watercourse or body of water, whether or not usually containing water, and*
>
> *(b) any of the following that is connected by surface flow to a watercourse or body of water referred to in paragraph (a);*
>
> *(i) a ditch, whether or not usually containing water;*
>
> *(ii) a spring, whether or not usually containing water;*
>
> *(iii) a wetland.*

BC WATER SUSTAINABILITY ACT[6] (WSA)

The WSA manages the diversion and use of water resources in BC. Under the WSA[6] , a stream is defined as:

> *a) a natural watercourse, including a natural glacier course, or a natural body of water, whether or not the stream channel of the stream has been modified, or*

[4] City of Kelowna. 2024. 2040 Official Community Plan. Available at: https://www.kelowna.ca/our-community/planning-projects/2040-official-community-plan/ch-21-natural-environment-dp-area

[5] BC Government. 2024. Riparian Area Protection Regulation. Available at: https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/fish/aquatic-habitat-management/riparian-areas-regulation/riparian-areas-regulation-model

[6] BC Government. 2024. *Water Sustainability Act.* Available at: https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/14015

b) a natural source of water supply,

including, without limitation, a lake, pond, river, creek, spring, ravine, gulch, wetland or glacier, whether or not usually containing water, including ice, but does not include an aquifer.

RESULTS

DESKTOP REVIEW

The Property is comprised of two lots; 1574 and 1634 Harvey Avenue in Kelowna, BC, which together have a total area of 23,640 m^2 (Figure 1). The only mapped watercourse in the study area is Mill Creek (WSC: 310-808200[2]) which is approximately 11 m southeast of the PL (Figure 1). Mill Creek flows for approximately 4 kilometers (km) west until it drains into the Okanagan Lake. Mill Creek is a fish bearing watercourse with species such as kokanee (*Oncorhynchus nerka*), rainbow tout (*O. mykiss*), mountain whitefish (*Prosopium williamsoni*), longnose dace (*Rhinichthys cataractae*), and largescale sucker (*Catostomus macrocheilus*).

The Property also has a Vulnerable Groundwater Aquifer buffer and a watercourse buffer under the Natural Environment DPA (Figure 1). The vulnerable groundwater aquifer buffer comprises approximately 16,734 m^2 of the Property (Figure 1). Within this area land disturbance that would impact the groundwater recharge is prohibited[6].

FIELD ASSESSMENT

The field assessment was conducted on December 20, 2023, during which known aquatic features were assessed, and a review of the site was conducted to locate any potential unmapped features. No unmapped features were identified within the study area. Two reaches of Mill Creek were identified within the study area on either side of Harvey Avenue separated by the two large, corrugated steel culverts (Photographs 1 and 2).

Reach 1 of Mill Creek is the section upstream (north) of Harvey Avenue (Figure 1). This reach is within a relatively straight section of the meandering creek with a low gradient, and an average width of 8.6 m. The instream substrate is dominated by fines. The right (northern) bank is hardened with a rock wall and the riparian area is primarily comprised of reed canarygrass (*Phalaris arundinacea*), cattail (*Typha latifolia*), mown grass and English oak (*Quercus robur*) (Photographs 3 and 4). The left (south) bank is comprised of a mix of invasive species including reed canarygrass, Canada thistle (*Cirsium arvense*), great mullein (*Verbascum thapsus*) and planted native species such as common snowberry (*Symphoricarpos albus*), tall Oregon-grape (*Berberis aquifolium*), and red-osier dogwood (*Cornus sericea*) (Photographs 5 and 6).

Reach 2 of Mill Creek begins approximately 70 m downstream (south) of Reach 1, south of Harvey Avenue (Figure 1). It is a sinuous section of creek with a dominant substrate of fines and cobble as the subdominant substrate, with some boulders making up weirs (Photograph 7). The riparian area lacks a shrub layer and is primarily made up of large Pacific willows (*Salix lasiandra*) with some reed canary grass and tall Oregon-grape in the understory (Photographs 8 and 9).

No other significant environmental features or aquatic features were observed within the remainder of the Site which is fully developed with commercial buildings and parking lots (Photograph 10).

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5531740.000000 5531680.000000 5531620.000000 5531560.000000 5531500.000000 5531440.000000 5531380.000000

Burtch Rd

Mill Creek

15 m

Reach 1

Harvey Ave

15 m

Reach 2

N

LOCATION MAP

ATTACHMENT A
This forms part of application
ARP24-0001 OCP24-0012
Planner Initials MT
City of Kelowna
DEVELOPMENT PLANNING

LEGEND

- CULVERTS
- TOB

2040 OCP DP AREA NATURAL ENVIRONMENT

- VULNERABLE GROUNDWATER AQUIFER
- 15 M OCP SETBACK
- SITE
- LEGAL PARCEL

Keystone Environmental

NOTES:
1. THIS DRAWING IS FOR GENERAL INFORMATION ONLY. LOT BOUNDARIES AND FEATURES ARE APPROXIMATE.
2. DATE OF AERIAL PHOTO IS 2019.
3. OFFSITE WATERCOURSE DATA OBTAINED FROM ABBOTSFORD WEBMAP.

50 0 100 m

SCALE: 1:4,000 (approx.)

1356 Sumas Way
Abbotsford, B C
Bakerview EcoDairy

REVISION No.	DATE	PROJECT No.
0	Feb. 2024	18282

Figure 1
Wetland Assessment

DRAWN BY: NL Document Path: I:\18600-18699\18643 Harvey Ave Kelowna\6 Figures\2 Draft\Data\18643 Figure1-Watercourse-Assessment.mxd

RIPARIAN SETBACKS

City of Kelowna 2040 OCP

Under Chapter 21 of the City of Kelowna 2040 OCP, the section of Mill Creek downstream of Hardy Street requires a 15 m riparian setback measured from TOB (Table 1; Figure 1). This includes both Reach 1 and Reach 2 of Mill Creek.

Table 1 Summary of City of Kelowna Riparian Setbacks

Watercourse	2040 OCP Setback (m)
Mill Creek – Reach 1	15
Mill Creek – Reach 2	15

RAPR

RAPR setback calculations were not carried forward for this assessment.

Vulnerable Groundwater Aquifers

The property overlaps with the Vulnerable Groundwater Aquifer[4]. City of Kelowna OCP prohibits land disturbance that may have negative impact on groundwater recharge.

SUMMARY AND CLOSURE

The purpose of this letter report is to provide a preliminary assessment of environmental development constraints applicable to 1574 and 1634 Harvey Avenue, Kelowna, BC. A 15 m RMA measured from TOB for both Reach 1 and Reach 2 of Mill Creek is required under the City of Kelowna 2040 OCP. Additionally, approximately half of the Property overlaps with the Vulnerable Groundwater Aquifer layer. No other environmental constraints were identified on the Property.

This letter report has been prepared based on our existing understanding of the proposed development, existing municipal mapping, our previous experience with similar projects, our best judgement, and applicable regulations. If you require any further clarification, please contact the undersigned at 778-238-9536.

Sincerely,

Keystone Environmental Ltd.

Prepared by:

Nicole Lamarche, B.Sc., BIT
Biologist

Reviewed by:

Afshin Parsamanesh, M.Sc., R.P.Bio.
Project Manager

I:\18600-18699\18643 Harvey Ave Kelowna\7 Reporting\1 Draft\1 Internal Drafts\18643 240209 1634 Harvey Ave Kelowna Watercourse Assessment-rev.docx

ATTACHMENT:
- Photographs

LIMITATIONS

Keystone Environmental Ltd. confirms that this letter has been prepared in a manner consistent with the level of care and skill normally exercised by other member of the environmental science profession practising under similar circumstances in the area at the time of the performance of the work. This letter report has been prepared based on our existing understanding of the proposed development, existing municipal mapping, our previous experience with similar projects, our best judgement, and applicable regulations.

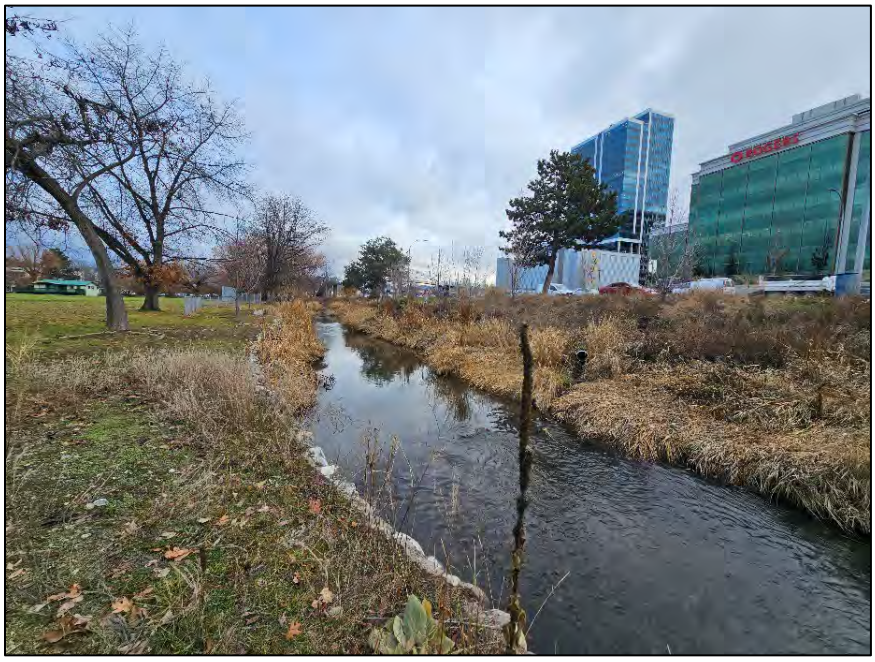
This report has been prepared solely for the use of PMC (Harvey) Holdings Corp. pursuant to the agreement between Keystone Environmental and PMC (Harvey) Holdings Corp. By using the report, PMC (Harvey) Holdings Corp. agrees that they will review and use the report in its entirety. Any use, reliance or decisions made based on this report by other parties without prior written approval by Keystone Environmental are the responsibility of such parties and Keystone Environmental accepts no responsibility for damages, if any, suffered by other parties as a result of decisions made or actions based on this report.

We trust that this report provides the information you require at this time.

PHOTOGRAPHS

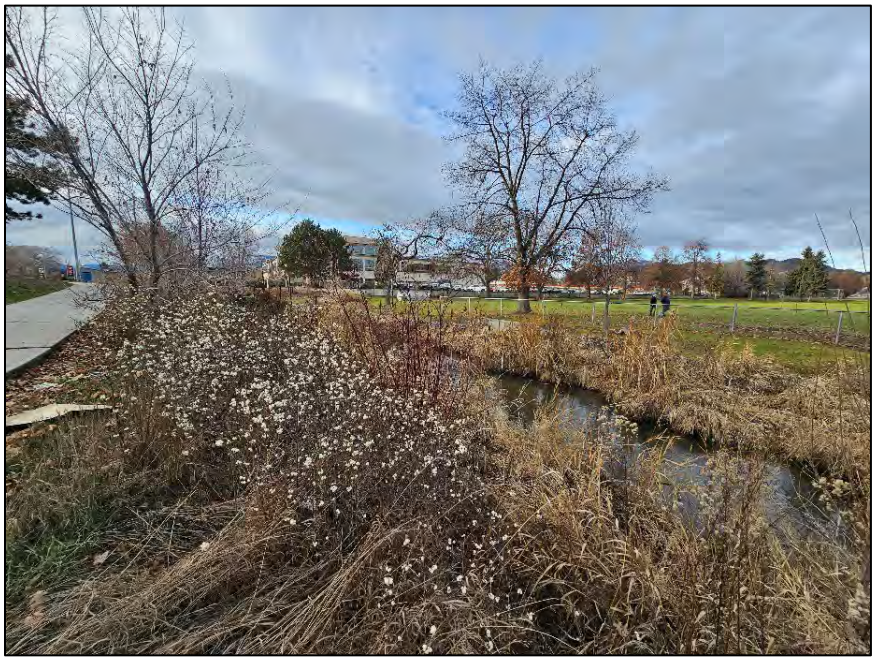
Photograph 1: Looking downstream (southwest) at the two corrugated steel culverts that convey Mill Creek under Harvey Avenue (December 20, 2023).

Photograph 2: Looking south at the downstream end in Reach 2 of the two corrugated steel culverts that convey Mill Creek under Harvey Avenue (December 20, 2023).



Photograph 3: Looking upstream (east) Mill Creek, Reach 1 (December 20, 2023).

Photograph 4: Looking downstream at the right bank of Mill Creek in Reach 1 (December 20, 2023).



Photograph 5: Looking downstream (west) along the south bank of Mill Creek in Reach 1 (December 20, 2023).

Photograph 6: Looking downstream (west) of Mill Creek Reach 1 (December 20, 2023).

Photograph 7: Looking downstream (south) of a weir in Mill Creek Reach 2 (December 20, 2023).

Photograph 8: Looking upstream (northeast) of the riparian area of Mill Creek Reach 2 (December 20, 2023).

Photograph 9: Looking downstream (south) of the Mill Creek Reach 2 riparian area (December 20, 2023).

Photograph 10: Looking south from the northern perimeter of the Site along Burtch Road (December 20, 2023).

January 16, 2024

ISSUED FOR USE
FILE: 704-ENG.KGEO3920-01

Dialog BC Architecture Engineering Interior Design Planning Inc.
#300 134 – 11 Avenue SE
Calgary, AB T2G 0X5

Email: gdoering@dialogdesign.ca

Attention: Gerry Doering, Partner

Subject: Geotechnical Site Due Diligence at 1574 & 1634 Harvey Lands, Kelowna, BC

1.0 INTRODUCTION

1.1 General

Tetra Tech Canada Inc. (Tetra Tech) has been retained by Dialog BC Architecture Engineering Interior Design Planning Inc. on behalf of PMC (Harvey) Holdings Corp to undertake a geotechnical site due diligence report to satisfy the City of Kelowna Area Redevelopment Plan (ARP) application.

This geotechnical report summarizes the findings of our desktop review, the geotechnical site investigation, and includes preliminary foundation options while identifying the presence and extent of any geotechnical constraints associated with the proposed development. Tetra Tech has also included a preliminary geohazard analysis to help qualify and characterize hazards and provide guidance for future works, as well as a seismic site classification as per BC Building Code (BCBC) 2018 requirements and liquefaction assessment.

The proposed scope of work was set out in Tetra Tech's proposal "Proposal for Geotechnical and Hydrotechnical Site Due Diligence at 1574 & 1634 Harvey Lands, Kelowna, BC" dated November 6th, 2023, and approval to proceed with the proposed scope of works was provided by Brett Wilson in a Tetra Tech Signed Services Agreement dated December 11, 2023.

It should be noted that this report only covers the geotechnical scope, as the hydrotechnical and hydrogeological scopes will be provided in separate covers.

1.2 Project Description

It is Tetra Tech's understanding at this time that specific details of the proposed development are yet to be finalized/confirmed; however, it is anticipated that the proposed development will comprise several mid to high rise structures ranging between six (6) and twenty-eight (28) stories with the tallest structures likely being situated within the southeast concern of the subject property. The structures will likely fall within the requirements of Part 4 of the British Columbia Building Code (BCBC) 2018.

1.3 Site Description

The subject site consists of two (2) neighbouring properties, which will be amalgamated during the development permit application. The following properties will be amalgamated are:

- 1574 Harvey Ave, Kelowna, BC, Plan KAP32159 Lot 3; and,
- 1634 Harvey Ave, Kelowna, BC, PLAN KAP16186 Lot B.

The amalgamated site will comprise an approximate 27,567 m^2 irregular shaped lot. The lots are currently occupied by two commercial buildings along the western and southern sections of the property with recreational sports courts situated within the northern part of the property. The site topography gently slopes from north to south from an approximate elevation of 357 to 356 masl, respectively. The subject site is bounded by Highway 97 to the south, Parkinson Recreation Park to the east, Burtch Road to the north, and a commercial development comprising of three single storey buildings to the west. During the desktop review it was also noted that the southeast corner of 1634 Harvey Ave is approximately 12 m from the center of Mill Creek as indicated on the City of Kelowna map viewer.

A site plan showing the existing site is shown in Figure 1.

2.0 BACKGROUND REVIEW

2.1 Surficial Geology

The surficial geology map of Kelowna (Paradis, 2009) shows the surficial geology at the subject is underlain by alluvial fan sediments comprising poorly sorted gravel, sand, silt and clay. Typically, these deposits occur mainly as fan shaped forms where creeks or streams debouch in lakes or at the toe of slopes where creeks or streams debouch on valley floors.

At the subject site the alluvial fan sediments are anticipated to be found only at shallow depths, and likely this layer is underlain by glaciolacustrine sediments typically comprising clay.

2.2 Published Bedrock Geology

The bedrock geology map (Okulitch, 2013) indicates that the bedrock underlying the subject site comprises of lava, malic phonolite, with anorthoclase phenocrysts. It is anticipated that the bedrock elevation is at a significant depth. The surficial geology map (Paradis, 2009) indicates that the bedrock elevation likely would be below 250 masl; however, bedrock elevations vary and could be encountered at shallower depths in certain areas.

2.3 Groundwater Monitoring Wells

Reference to the Provincial Groundwater Well Database, iMapBC, shows three water wells within 150 m of the subject property. The water well data is summarized in Table 1 and the water well logs have been appended within Appendix B.

Table 1: Water Well Summary

Water Well No.	Approx. Distance from Center of Site (m)	Lithology	Depth (m bgl)	Static Groundwater (m bgl)
61794	0	Sand and Gravel with cobbles (fill)	0.0 – 0.9	3.4
		Sandy Clay & Silty Sands & Gravels	0.9 – 2.4	
		Gravel and Cobbles with Sand	2.4 – 7.6	
		Blue Clay w / sand & gravel	7.6 – 9.1	
		Blue Clay	9.1 – 10.7	
61949	130 m W	Black and Silty Clay	0.0 – 0.3	3.4
		Sand & Gravel	0.3 – 1.2	
		Silty Brown Clay	1.2 – 3.4	
		Sand and Gravel	3.4 – 4.0	
		Silty Clay	4.0 – 8.7	
61946	150 m SW	Sand and Gravel	0.0 – 0.6	2.4
		Silty Clay	0.6 – 1.2	
		Sandy Moist Clay	1.2 – 2.3	
		Black Sand and Gravel	2.3 – 3.2	
		Black Gravel and Sand	3.2 – 4.4	
		Silty Gravel	4.4 – 5.0	
		Sand and Gravels	5.0 – 7.8	

*Data taken from iMapBC Water Well Reports (https://maps.gov.bc.ca/ess/hm/imap4m/)

2.4 Mill Creek Flood Plain Considerations

2.4.1 Flood Construction Level

The City of Kelowna (the City) Flood Construction Level (FCL) boundary for the subject site as shown in Schedule "A" of the Mill Creek Flood Plain Bylaw No. 10248 (City of Kelowna, 2011; Bylaw No. 10248) ranges between 355 and 356 masl. A FCL is the elevation of the lowest habitable floor of a building under construction. Tetra Tech has shown an excerpt of Figure 1 A for reference in Figure 2 of this report. The Mill Creek Flood Plain Bylaw No. 10248 also states that construction levels are the higher of:

- "600 mm above the elevation of the storm main obvert, known or anticipated high groundwater table or 100-year Hydraulic Line within the storm main, whichever is higher, as enacted in the City of Kelowna Subdivision, Development, and Servicing Bylaw No. 7900."
- "As identified on the Schedule 'A' Mill Creek Flood Plain Map."

The bylaw states that no building shall be constructed with the top of a concrete slab of any area used for basement, entrance, foyer, habitation, institutional use, assembly use, tourist accommodation use, business, or storage of goods damageable by floodwaters lower than as defined by the higher of the two points above.

General exemptions to the flood plain are covered in Section 5 of the bylaw. An applicable exemption that may be applicable is BL10474 amended 5.1(b):

- Parking areas, including enclosed underground parking areas, except that in the case of an enclosed underground parking area, an unobstructed means of pedestrian ingress and egress must be provided above the flood level, and a sign must be posted at all points of entry notifying users that the parking area is not protected from inundation by floodwaters.

2.4.2 Setback From a Watercourse (Mill Creek)

The minimum setback from a watercourse of any landfill or structural support required to elevate a floor system or pad above the flood level is defined by the City of Kelowna 2020 Official Community Plan Bylaw 7600 for the Mill Creek main stem as 15 m downstream of Hardy Road. The specified setback distance shall be measured from the top-of-ravine bank, top-of bank, or from the natural boundary where the top-of-bank is not clearly defined.

The specified setback distance shall be measured to the nearest part of the building or structure including roofs, eaves, and any over hanging components or cantilevered portions of a building, or to the toe of a fill slope.

3.0 GEOHAZARD ASSESSMENT

3.1 Method of Assessment

The Association of Engineers and Geo-scientists of British Columbia (EGBC) is clear that defining levels of safety is “not the role of a Professional Engineer or Professional Geoscientist”; rather acceptable risk must be “established and adopted by the local government or provincial government after considering a range of social values.” Within Kelowna and the Province, there is no established geohazard acceptability threshold for development approvals. Therefore, a subjective assessment of the geohazards present on the subject property was undertaken based on “Hazard Acceptability Thresholds for Development Approvals by Local Government” by Dr. Peter Cave (Cave, 1993).

In this assessment, we reviewed the hazards that could potentially affect the subject properties and provide recommendations for the safe use of the site. In regards to geohazards, seven types of development applications are distinguished by Cave and based on Tetra Tech’s understanding of the proposed project, this development falls under the category of “New Building.”

Tetra Tech assessed the subject area and immediate surroundings to determine its susceptibility to the following geohazards:

- Inundation by Flood Waters
- Debris Floods
- Stream Erosion or Avulsion
- Debris Flow/Debris Torrent
- Small Scale Localised Land Slip
- Snow Avalanche
- Rock Fall – Small Scale Detachment
- Major Catastrophic Landslide

3.2 Site Reconnaissance

In addition to the desktop review, a geohazard site reconnaissance was undertaken on January 11, 2024 which involved a site walkover of the property and adjacent properties to evaluate the presence of potential geohazards as discussed in Section 3.1.

Relevant observations regarding potential geohazards made during the site reconnaissance include:

- Slopes across the subject site range from flat to up to approximately 10 degrees (~0% -17%) (see Figure 3). The surrounding area to the subject site is typically flat; however, the area to the north slopes downwards towards the site at an approximate 10-degree slope. Due to the gentle grades and no rock outcrops surrounding the subject site, there is negligible risk of localized landslide, rockfall, or major catastrophic landslide.
- Mill Creek was approximately 12 m southeast of the southeast corner of the subject property. Based on the hydrotechnical studies of Mill Creek performed by Associated Engineering for the Mill Creek Bylaw, the subject property may by susceptible to inundation by flood waters, particularly during spring thaw or periods of heavy rainfall. The City of Kelowna has provided Flood Construction Levels and Setbacks from Mill Creek for a 1:200 Annual Exceedance Probability as discussed in Section 2.4.
- Mill Creek presently has minimal potential for stream erosion or avulsion. Erosion involves the gradual destruction of a stream over time while avulsion occurs when erosion is rapid and becomes unpredictable due to the speed at which floodwaters can move. During avulsion, sudden changes in creek alignment can occur due to flood flows. Given that the subject property is approximately set back 12 m from the creek, the risk of erosion or avulsion negatively affecting the subject property is considered negligible.

3.3 Recommended Level of Risk for Identified Geohazards

Based on the geohazards identified in Section 3.3, Tetra Tech recommends that the client follow the recommended geohazard acceptability thresholds and associated geohazard related responses (Cave, 1993) as a guideline during the conceptual planning and development and the anticipated development approval application process.

The associated geohazard related responses to development approval applications have been adopted by several municipalities in BC and provide the client with a good reference on what works may be required based on the potential geohazards identified at the subject property.

- 1 – Approval without conditions relating to hazards;
- 2 – Approval, without siting conditions or protective works conditions, but with a covenant including “save harmless” conditions;
- 3 – Approval, but with siting requirements to avoid the hazard, or with requirement for protective works to mitigate the hazard;
- 4 – Approval as (3) above, but with a covenant including “save harmless” conditions as well as siting conditions, protective works or both.

Table 2: Inundation by Flood Waters Recommended Acceptability Thresholds (Cave, 1993)

Development Type	Hazard Related Responses with Annual Exceedance Probability 1:40	Hazard Related Responses with Annual Exceedance Probability 1:40-1:200	Hazard Related Responses with Annual Exceedance Probability <1:200
New Building	4	3	1

Notes: Hazard Related Responses from Cave, 1993

Table 3: Stream Erosion or Avulsion Recommended Acceptability Thresholds (Cave, 1993)

Development Type	Hazard Related Responses with Annual Exceedance Probability 1:10	Hazard Related Responses with Annual Exceedance Probability 1:10-1:100	Hazard Related Responses with Annual Exceedance Probability 1:100-1:200	Hazard Related Responses with Annual Exceedance Probability 1:200-1:500	Hazard Related Responses with Annual Exceedance Probability <1:500
New Building	5	5	4	2	1

Notes: Hazard Related Responses from Cave, 1993

3.4 Preliminary Geohazard Recommendations

Based on Tetra Tech's preliminary geohazard assessment, the subject property is within an inundation zone of the 1:200 Annual Exceedance Probability based on the Mill Creek Bylaw Flood Plain Maps. Mill Creek may also slowly erode/avulse towards the subject site; however, if the recommended setbacks and flood construction levels that were presented in Section 2.4 are adhered to, it is likely that the effect of the geohazards on the subject property can be mitigated with minor protective measures.

Avoidance measures against the geohazard such as setbacks from waterways, and elevating construction above the flood line are typically the most desirable means of mitigating the geohazard to reduce the exposure to risk by simple avoidance.

If avoidance measures are not preferred, protective measures can be implemented, however, the results are typically not as favourable as avoidance measures and may require maintenance. Protective measures for the geohazards presented typically include protective berms to protect against flooding or rip-rap protection of the creek banks to prevent future erosion.

4.0 GEOTECHNICAL INVESTIGATION

4.1 Subsurface Drilling

Tetra Tech conducted a geotechnical investigation on January 3rd, 2024 utilizing a B53 truck mounted drill rig operated by On the Mark Locates Ltd., from West Kelowna, BC. The geotechnical investigation comprised the advancement of one (1) borehole utilizing the overburden drilling eccentric to a depth of 10.0 m due to fine-grained soils being encountered at 9.4 m. The drilling methodology then switched to mud rotary drilling to the termination depth of 31.1 m.

Standard Spoon Penetration Tests (SPT) were performed at regular 1.5 m intervals to determine the consistency of the soils within the top 18.3 m. The SPT frequency was spaced to 3.0 m at depths greater than 18.3 m due to the consistency of the soils at greater depths.

The geotechnical site investigation was supervised by Tetra Tech field personnel, Mr. Dylan Bryce, P.Eng, who logged the encountered material and collected representative soil samples for laboratory testing. A monitoring well was installed adjacent to BH24-01 to a depth of 6.1 m and was fitted with an automated water pressure sensor to regularly measure groundwater levels to evaluate seasonal groundwater fluctuations.

The location of the borehole was established using a handheld GPS receiver with an estimated horizontal accuracy of +/- 3.0 m. The borehole elevation was estimated from the BC Provincial Lidar Portal 2018. Table 4 provides a summary of the borehole location, elevation, and termination depth. The geodetic location is also shown in Figure 1 and detailed logs are included in Appendix C.

Table 4: Geotechnical Investigation Summary

Borehole No.	Northing[1] (m NAD83)	Easting[1] (m NAD83)	Collar Elevation[2] (m)	Termination Depth (m)	Termination Reason
BH24-01	5528528	323050	356.6	31.1	Target Depth Reached

Notes: 1 - NAD = North American Datum 1983, Zone 11
2 - Elevations were estimated from BC Provincial Lidar Portal 2018

4.2 Soil Laboratory Testing

Following the completion of the geotechnical investigation, laboratory testing was conducted on a select number of representative soil samples at Tetra Tech's Canadian Council of Independent Laboratories (CCIL) certified laboratory. Testing was carried out in general conformance with the relevant ASTMs and results are summarized in Table 5 and Table 6, with detailed results presented in Appendix C.

Table 5: Summary of Particle Size Distribution and Moisture Contents

Borehole No.	Depth (m)	Moisture Content (%)	Grain Size Analysis (%)			
			Gravel	Sand	Fines	
					Silt	Clay
BH24-01	1.5 – 2.1	19.5	1	45	54	
BH24-01	7.6 – 8.2	13.9	40	57	3	
BH24-01	10.7 – 11.3	50.6	0	1	22	77
BH24-01	21.3 – 21.9	45.0	0	1	58	41

Table 6: Summary of Atterberg Limits

Borehole No.	Depth (m)	Moisture Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Above or Below A-Line	USCS Soil Classification Description
BH24-01	10.7 – 11.3	50.6	32	87	55	Above	CH
BH24-01	21.3 – 21.9	45.0	24	45	21	Above	CL

5.0 SUBSURFACE CONDITIONS

5.1 Soil Conditions

The following interpreted soil profile was encountered within the subject site:

- **ASPHALT** approximately 0.05 m thick.
- **FILL** comprising dense sand and gravel, trace silt. The fill material is typically described as tan in color, moist, fine to coarse sand and fine to coarse subangular to angular gravel with an SPT “N-value” of 30. The fill material approximately extended in depths from 0.05 m to 0.6 m.
- **Fine Alluvial Fan Sediments** comprising very loose silty sands with interbedded lenses of fine to medium sand. The fine alluvial fan sediments are typically described as tan, damp to wet, fine sand with an SPT “N-value” of 3. The fine alluvial fan sediments approximately extend in depth from 0.6 m to 2.1 m.
- **Coarse Alluvial Fan Sediments** comprising loose to compact gravel and sands, with varying amounts of silt. The coarse grained alluvial fan sediments are typically described as brown to grey, wet, fine to coarse sand and fine to coarse rounded to subangular gravel with SPT “N-values” in the range of 4 to 21 (average of 14). The coarse alluvial fan sediments approximately extend in depth from 2.1 m to 8.5 m.
- **Glaciolacustrine Sediments** comprising firm to stiff clay with varying amounts of silt, trace sand. The glaciolacustrine sediments are typically described as grey, moist, medium to high plastic, and fine-grained sand; however, interbedded lenses of clayey gravelly sand was noted between 8.5 m and 10 m. The SPT “N-values” were recorded in the range of 5 to 10 (average of 7.5). The liquid and plastic limit within the predominately clay material is 87 and 32, respectively; while the liquid and plastic limits of the predominately silt material is 45 and 24, respectively. The glaciolacustrine sediments is present from a depth of approximately 8.5 m to the maximum extents investigated by BH24-01 (i.e., 31.1 m).

5.2 Groundwater Conditions

At the time of the geotechnical investigation, groundwater was encountered at a depth of 2.1 m within BH24-01; which corresponds to a geodetic elevation of 354.5 m.

The soil samples above the groundwater table were typically described as damp to moist, with coarse grained samples below the water table described as “wet” and fine-grained samples described as “moist”. It should be noted that groundwater levels may fluctuate during certain times of year, particularly during periods of heavy rainfall and snow melt where groundwater levels may be higher than those recorded.

Tetra Tech installed a standpipe piezometer with a slotted screen from 3.0 m to 6.1 m with a continuous pressure sensor to measure the seasonal fluctuations of the groundwater table within BH24-01. Tetra Tech will collect the data two weeks after the well has been installed to verify that the continuous pressure sensor is functioning as intended and after one year of measurements to provide the seasonal groundwater fluctuations for the subject site.

6.0 SEISMIC CONDITIONS

6.1 General

The British Columbia Building Code (BCBC) (2018) is substantially based on the 2015 National Building Code (NBC). The NBC 2015 primary objective of seismic design is to provide an acceptable level of life safety for building occupants and the general public as the building responds to strong ground motion. The BCBC states although there may be extensive and non-structural damage during the design ground motion, there is a reasonable degree of confidence that the building will not collapse. The NBC defines a strong ground motion in terms of the mean ground motion amplitude having a probability of exceedance of 2% in 50 years which corresponds to an annual rate of exceedance of 1/2,475 years. This design ground motion (DGM) is the earthquake ground motion to be considered for life safety design.

The NBC seismic provisions only primarily consider damage to buildings through induced forces and displacements due to ground shaking, and soil failures caused by shaking including lateral spreading, settlement caused by liquefaction, and slope instability. Other hazards can be addressed through planning and site selection; however, if they cannot be eliminated their consequences must be considered in the design of the structure and its foundations.

It should be noted that the seismic values for the design of buildings in Canada under Part 4 of the National Building Code of Canada 2020 as prescribed in Article 1.1.3.1 of Division B has been released and will supersede the 2015 NBC values on March 8th, 2024 once the 2024 BCBC comes into effect.

6.2 Seismicity

Canada's 5th Generation Seismic Hazard Model (Halchuk, et.al., 2015) forms the basis of the seismic design provisions of the National Building Code of Canada 2015. Peak Ground Accelerations (PGA) and Spectral Acceleration (Sa(t)) values for a reference "Class C" site can be obtained using Natural Resources Canada (NRC) online hazard calculator tool (NRC, 2022) for various return periods. Seismic hazard values for the project area are presented in Table 7.

Table 7: Reference (Class C) Design PGA and S_a(T) for 1574 and 1634 Harvey Ave, Kelowna

Return Period	PGA (g)	Sa(0.2) (g)	Sa(0.5) (g)	Sa(1.0) (g)	Sa(2.0) (g)	Sa(5.0) (g)	Sa(10.0) (g)
475 years	0.026	0.058	0.059	0.044	0.028	0.010	0.004
1,000 years	0.041	0.088	0.083	0.062	0.041	0.017	0.006
2,475 years	0.066	0.142	0.121	0.091	0.063	0.029	0.009

6.3 Site Classification for Seismic Response

Based on Table 4.1.8.4.A, BCBC, 2018 along with the results of the geotechnical site investigation, a seismic site classification of Class E is considered appropriate for the subject site due to the average SPT "N-value" within the top 30 m of BH24-01 being 8.

In 2018 BCBC, the amplification effects on local ground conditions are represented by site coefficients. The site coefficient factor for PGA, PGA_{ref} F(PGA), for level ground was calculated based on Section 4.1.8.4 of the 2015

NBC based on Class E and the reference ground conditions “Class C” seismic hazard values in Table 7 based on a 1/2475-year annual exceedance probability seismic event. Table 8 summarizes the design PGA values.

Table 8: Seismic Design Criteria for 1574 and 1634 Harvey Ave, Kelowna

Annual Exceedance Probability (AEP)	PGA_{ref} (g)	F(PGA)	Design PGA (g)
1/2,475	0.066	1.81	0.120

The relative contribution of the earthquake sources to the seismic hazard in terms of distance and magnitude can be obtained by deaggregation of the seismic hazard. The deaggregation data from the NBC 2015 design model has been obtained from Earthquakes Canada, which provided a mean earthquake magnitude of 6.33 near the subject site.

6.4 Preliminary Simplified Liquefaction Triggering Assessment

A simplified liquefaction triggering analysis was undertaken for the 2,475-year return period seismic event for the subject site at 1574 and 1634 Harvey Ave, Kelowna, BC. The simplified liquefaction triggering analysis was based on a design PGA of 0.120 g for Site Class E structures. The Cyclic Stress Ratio (CSR) was adjusted to a 6.33 magnitude event based on the hazard deaggregation data. The Cyclic Resistance Ratio (CRR) was calculated based on Boulanger and Idriss (2014) and adjusted to account for the fines content based on visual descriptions and laboratory testing.

The analyses were focused on identifying “sand-like” layers that are susceptible to liquefaction, as well as “silt” layers that are susceptible to cyclic softening/cyclic failure. Soil layers with a factor of safety less than 1.1 are considered susceptible to liquefaction. If the factory of safety is greater than 1.1 but less than 1.4, some degree of strength and stiffness degradation is expected.

The results of the preliminary simplified liquefaction triggering analysis indicate that there are layers of potentially liquefiable sand approximately ranging from 5.8 to 7.6 m. The cumulative liquefaction induced vertical settlement is estimated to be in the range of 60 mm to 100 mm. The material beneath this layer is typically fine-grained in nature with a factor of safety greater than 1.1, so liquefaction is unlikely to occur at greater depths. Summary plots of the preliminary simplified liquefaction triggering assessment are presented in Appendix D.

After the conceptual design of the development is finalized, a detailed geotechnical investigation and seismic assessment should be performed to verify the seismic site classification utilizing Seismic Cone Penetration Testing (SCPT). The recommended foundation options below all address the potential of liquefaction, therefore, Site Class E is still deemed appropriate for use of the subject site.

7.0 RECOMMENDED FOUNDATION OPTIONS

7.1 General

Based on our understanding of the proposed development and the simplified site soil stratigraphy model, Tetra Tech considers that from a geotechnical perspective, the site is generally suitable for the intended purpose and development of the subject property is feasible. Tetra Tech assessed various potential foundation options and summarized pertinent/cost-effective alternatives below.

However, the options provided below are conceptual in nature and were assessed based on inferred stratigraphy solely assumed from simplified soil profile. As such, Tetra Tech recommends a detailed geotechnical investigation of the subject property be undertaken to further characterize the subsurface/groundwater conditions along with any potential geotechnical concerns that may be encountered at the property. The geotechnical investigation will be prepared based on the conceptual design of the development at a later date.

Based on the simplified soil profile and our desktop review, it appears that the following foundation options may be feasible for mid rise construction:

- Vibratory Stone Columns (VSCs)
- Dynamic Compaction
- Sub-Excavate and Rapid Impact Compaction (RIC)

Highrise structures likely will require a raft slab foundation supported by the use of deep foundations or a combination of ground improvement techniques:

- Continuous Flight Auger (CFA) Pile Foundations
- Vibratory Stone Columns in conjunction with Vibratory Concrete Columns (VCCs)

Detailed descriptions of each foundation option and ground improvement techniques are provided below.

7.2 Vibratory Stone Columns (VSCs)

Vibratory Stone Columns are continuous columns of compacted aggregate that are typically formed using a vibratory probe to create vertical inclusions of high stiffness, shear strength and improved drainage characteristics. This technique would be used to densify the surficial granular soils within the top 10 m of the subject site.

VSCs can increase bearing capacity, mitigate total and differential settlements, and prevent liquefaction by increasing shear strength within the soil through the vertical inclusions draining characteristics. The vertical columns are installed in a grid pattern beneath the building foundation and can range in diameter between 450 mm and 1,000 mm. The VSCs are typically spaced at distances ranging between 1.8 and 3.0 m.

The limitation of VSCs consist of the potential for vibrations during densification to cause structural damage to nearby buildings, utilities, and roadways. Special considerations for vibratory stone columns on this site include vibration monitoring and pre- and post-construction condition assessment of neighboring buildings and utilities.

7.3 Dynamic Compaction

Dynamic compaction involves the use of a steel concrete block tamper typically 10-30 tonnes and dropped in free-fall from heights of up to 30 m using heavy crawler cranes. DDC compacts to depths ranging between 8 - 10 m; however, heavier weights can be utilized to improve soils at greater depths, sometimes to as much as 12 - 15 m depending on the subsurface conditions.

The impacts are normally applied in increments, each complete coverage of the working surface being referred to as a phase. The early phases are designed to improve the deeper layers with impact points at a spacing dictated by the depth of the layer to be densified. Typically, the early phases are followed by a low-energy phase with contiguous impacts which is mainly designed to densify the surficial soils.

This technique is typically low cost, rapid execution, and applicable to loose natural sandy or relatively free-draining soils similar to the surficial soils found at the subject site. Although the process is effective on saturated free-draining soils, complications can arise in fine-grained soils due to the creation of increased porewater pressure during compaction. This could be mitigated by removing the shallow fine-grained material prior to dynamic compaction.

Potential negative impacts for this construction methodology are potential damage to neighbouring infrastructure due to vibrations and noise pollution to the surrounding population.

7.4 Sub-Excavate and Rapid Impact Compaction

This option would require the sub-excavation of the surficial silt and sands prior to performing rapid impact compaction (RIC) on the exposed gravel and sand subgrade. RIC involves the use of a hydraulic hammer/weight, typically 7.5 – 12 tonnes, which is dropped from 0.3 to 2 m onto a 1.5 – 2.0 m diameter plate at an approximate rate ranging between 40 – 60 blows/minute. RIC follows the same principles as Dynamic Compaction but utilizes smaller equipment and a faster construction technique.

This technique is typically effective in densification of surficial soils to depths of approximately 5 m to 6 m, thereby reducing the static settlement, liquefaction potential and improving the bearing capacity. The area of densification typically extends at least 5 m beyond the building footprint area; however, this would be determined during detailed design.

Similar to the VSCs, limitations to this foundation option consist of the potential for vibrations during densification to cause structural damage to nearby buildings, utilities, and roadways.

7.5 Continuous Flight Auger (CFA) Pile Foundation

CFA piles are constructed by rotating a hollow stem continuous flight auger into the soil to a designed depth. Concrete or grout is pumped through the hollow stem, maintain static head pressure, to fill the cylindrical cavity created as the auger is slowly removed. The grout pressure and volume is carefully controlled to achieve a continuous pile without defects. The reinforcement cage is placed through the freshly placed concrete. If required, a specially developed vibrator unit can help accurately locate the reinforcement cages.

Quality control of the installation process is essential to ensure the highest quality pile construction. Typically, CFA rigs are equipped with sensitive instrumentation that monitors all aspects of CFA piling, including pile depth, auger rotation, penetration rate, concreting pressure, extraction rate and over-break. The instrumentation produces an individual log for each pile that includes element identification, date, time and operator details. Quality assurance can be achieved through a range of non-destructive testing methods to evaluate both pile integrity and/or load-settlement performance.

7.6 Vibratory Stone Columns and Vibratory Concrete Columns

The first phase of this foundation option would comprise densify the surficial granular soils using VSCs as discussed in section 7.2. Tetra Tech would anticipate the VSC depth would be the entire extent of the surficial granular soils which is approximately 10.0 m.

The second phase would comprise the vibratory concrete column (VCC) technique involving the construction of concrete columns with a bottom-feed, down-hole vibratory probe to place ready-mix concrete with an unconfined compressive strength ranging from 20 to 25 Mpa. VCCs can reduce foundation settlement, increase bearing capacity, and mitigate potential for liquefaction by increasing the soil stiffness and shear strength to depths up to

20 – 25 m. The VCCs are a versatile ground improvement method that can be adjusted to a wide variety of soil conditions and foundation requirements that are installed in a grid pattern similar to VSCs and can range in diameter between 250 and 500 mm. VCCs constructed with a low vibration and are unlikely to cause structural damage or disturbance to nearby buildings and utilities.

8.0 ADDITIONAL COMMENTS

In summary, the above presented options are considered viable for the simplified soil profile from the geotechnical investigation. A full-scale detailed geotechnical investigation, including Cone Penetration Tests (CPT) and SCPT, would be required to verify these assumptions and carry out a final design. Tetra Tech can provide, upon Dialog's request, estimated costs and the required scope of work for the impending investigation and foundation design, once a conceptual design is in place.

9.0 CLOSURE

We trust this proposal meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.

Dylan Bryce

Prepared by:
Dylan Bryce, P.Eng.
Geotechnical Engineer
Direct Line: 236.970.4215
dylan.bryce@tetratech.com

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
G. MARTINEZ
29912

Jan 16, 2024

Reviewed by:
German Martinez, P.Eng.
Senior Geotechnical Engineer
Direct Line: 778.940.1224
german.martinez@tetratech.com

/sa

FIGURES

Figure 1: Borehole Location Plan
Figure 2: Flood Plain Elevations
Figure 3: Existing Slope Angles

LEGEND

- Approximate Borehole Location with Piezometer
- Approximate Property Boundary

ATTACHMENT A
This forms part of application
ARP24-0001 OCP24-0012
City of Kelowna
DEVELOPMENT PLANNING
Planner Initials MT

NOTES

Base data source:
- Inset Map sourced from ESRI Topographic Basemap Service
- Orthoimagery provided by City of Kelowna (2021)

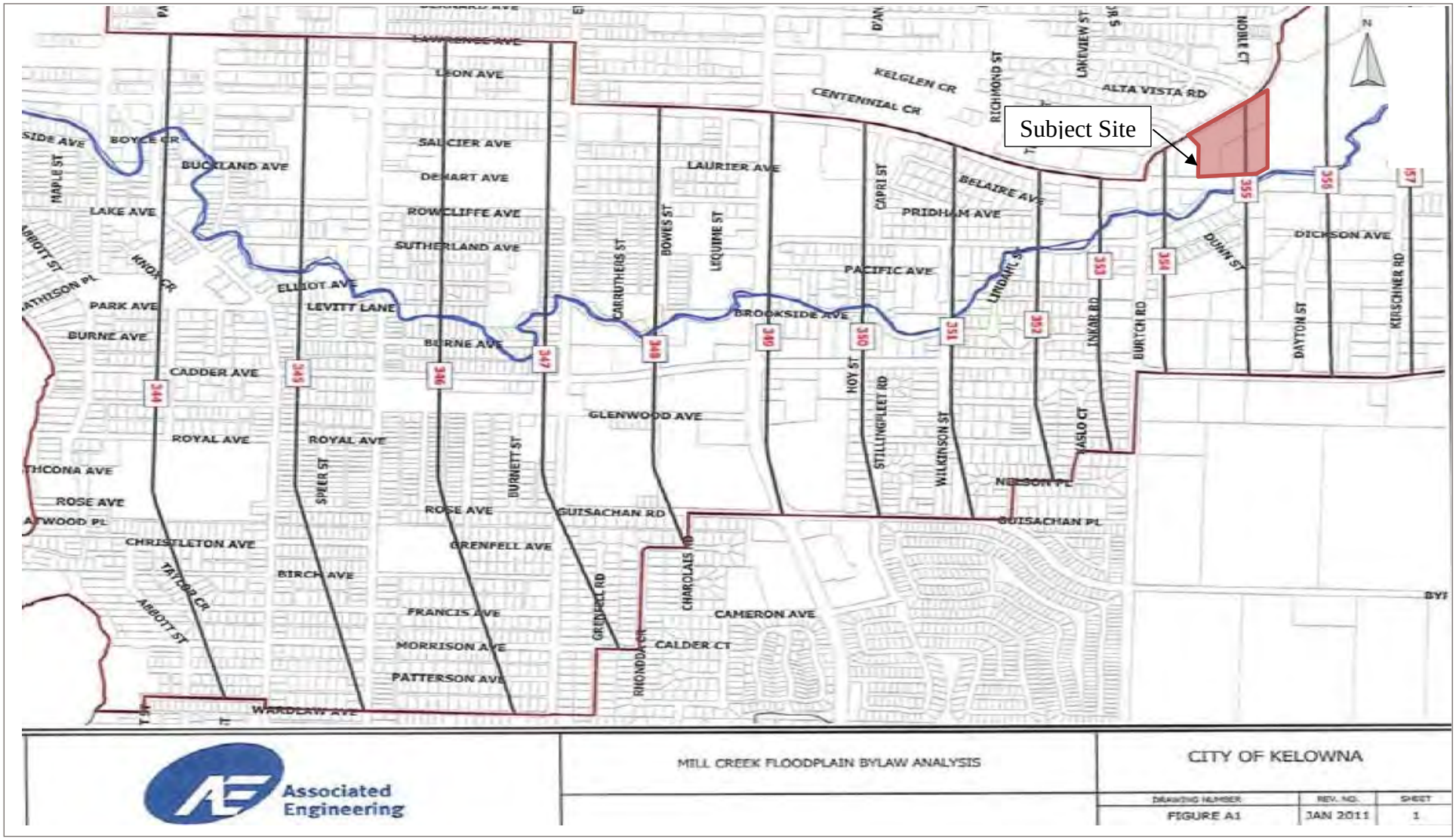
STATUS
ISSUED FOR USE

1574 and 1634 Harvey Ave Geotechnical Services Report

Borehole Location Plan

PROJECTION UTM ZONE 11		**DATUM** NAD83	**CLIENT** Dialog
Scale: 1:1,400 — 20 10 0 20 — Metres			TETRA TECH
FILE NO. KGEO03920-01 Figure 1.mxd			
OFFICE Kelowna	**DWN** MG / **CKD** SL / **APVD** DB / **REV** 0		**Figure 1**
DATE January 9, 2024	**PROJECT NO.** ENG.KGEO3920-01		

G:\ENGINEERING\KGEO\KGEO03920-01 1574 and 1634 Harvey Ave Kelowna\Maps\KGEO03920-01 Figure 1.mxd modified 1/9/2024 by MURRAY.GAFFNEY



Associated Engineering

MILL CREEK FLOODPLAIN BYLAW ANALYSIS

CITY OF KELOWNA

DRAWING NUMBER	REV. NO.	SHEET
FIGURE A1	JAN 2011	1

LEGEND

ATTACHMENT A
This forms part of application
ARP24-0001 OCP24-0012
Planner Initials MT
City of Kelowna
DEVELOPMENT PLANNING

NOTES

Reproduction from City of Kelowna Bylaw No 10248 Figure A1

STATUS
ISSUED FOR USE

CLIENT
DIALOG

TETRA TECH

1574 and 1634 Harvey Ave Geotechnical Services Report

Flood Plain Elevations

PROJECT NO.	DWN	CKD	APVD	REV
704-ENG.KGEO03920-01	DB	GM	GM	0

OFFICE	DATE
Kelowna	January 9, 2024

Figure 2

LEGEND

- Approximate Property Boundary

Slope Angle (Degrees)

- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50

ATTACHMENT A
This forms part of application
ARP24-0001 OCP24-0012
Planner Initials MT
City of Kelowna
DEVELOPMENT PLANNING

NOTES

Base data source:
- Slope data sourced from LiDAR data from Lidar BC - Open Data Portal
- Inset Map sourced from ESRI Topographic Basemap Service
- Orthoimagery provided by City of Kelowna (2021)

STATUS
ISSUED FOR USE

1574 and 1634 Harvey Ave Geotechnical Services Report

Existing Slope Angles

PROJECTION UTM ZONE 11	**DATUM** NAD83	**CLIENT** Dialog
Scale: 1:1,750 (20 10 0 20 Metres)		TETRA TECH
FILE NO. KGEO03920-01 Figure 2.mxd		
OFFICE Kelowna	**DWN** MG / **CKD** - / **APVD** DB / **REV** 0	Figure 3
DATE January 11, 2024	**PROJECT NO.** ENG.KGEO3920-01	

G:\ENGINEERING\KGEO\KGEO03920-01 1574 and 1634 Harvey Ave Kelowna\Maps\KGEO03920-01 Figure 2.mxd modified 1/11/2024 by MURRAY.GAFFNEY

APPENDIX A

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOTECHNICAL

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the sole use of TETRA TECH's Client (the "Client") as specifically identified in the TETRA TECH Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH.

Any unauthorized use of the Professional Document is at the sole risk of the user. TETRA TECH accepts no responsibility whatsoever for any loss or damage where such loss or damage is alleged to be or, is in fact, caused by the unauthorized use of the Professional Document.

Where TETRA TECH has expressly authorized the use of the Professional Document by a third party (an "Authorized Party"), consideration for such authorization is the Authorized Party's acceptance of these Limitations on Use of this Document as well as any limitations on liability contained in the Contract with the Client (all of which is collectively termed the "Limitations on Liability"). The Authorized Party should carefully review both these Limitations on Use of this Document and the Contract prior to making any use of the Professional Document. Any use made of the Professional Document by an Authorized Party constitutes the Authorized Party's express acceptance of, and agreement to, the Limitations on Liability.

The Professional Document and any other form or type of data or documents generated by TETRA TECH during the performance of the work are TETRA TECH's professional work product and shall remain the copyright property of TETRA TECH.

The Professional Document is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the Document, if required, may be obtained upon request.

1.2 ALTERNATIVE DOCUMENT FORMAT

Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this document, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, TETRA TECH has not been retained to explore, address or consider and has not explored, addressed or considered any environmental or regulatory issues associated with development on the subject site.

1.8 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems, methods and standards employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. TETRA TECH does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

1.9 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

1.10 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historical environment. TETRA TECH does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional exploration and review may be necessary.

1.11 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

1.12 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

1.13 INFLUENCE OF CONSTRUCTION ACTIVITY

Construction activity can impact structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques, and construction sequence are known.

1.14 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, and the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

1.15 DRAINAGE SYSTEMS

Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function. Where temporary or permanent drainage systems are installed within or around a structure, these systems must protect the structure from loss of ground due to mechanisms such as internal erosion and must be designed so as to assure continued satisfactory performance of the drains. Specific design details regarding the geotechnical aspects of such systems (e.g. bedding material, surrounding soil, soil cover, geotextile type) should be reviewed by the geotechnical engineer to confirm the performance of the system is consistent with the conditions used in the geotechnical design.

1.16 DESIGN PARAMETERS

Bearing capacities for Limit States or Allowable Stress Design, strength/stiffness properties and similar geotechnical design parameters quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition used in this report. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions considered in this report in fact exist at the site.

1.17 SAMPLES

TETRA TECH will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

1.18 APPLICABLE CODES, STANDARDS, GUIDELINES & BEST PRACTICE

This document has been prepared based on the applicable codes, standards, guidelines or best practice as identified in the report. Some mandated codes, standards and guidelines (such as ASTM, AASHTO Bridge Design/Construction Codes, Canadian Highway Bridge Design Code, National/Provincial Building Codes) are routinely updated and corrections made. TETRA TECH cannot predict nor be held liable for any such future changes, amendments, errors or omissions in these documents that may have a bearing on the assessment, design or analyses included in this report.

APPENDIX B

GROUNDWATER WELL LOGS

Well Summary

Well Tag Number: 61794
Well Status: New
Observation Well Number:
Well Identification Plate Number:
Well Class: Unknown
Observation Well Status:
Owner Name: BOND ELEVATORS
Well Subclass:
Environmental Monitoring System (EMS) ID:
Intended Water Use: Other
Aquifer Number: 467
Alternative specs submitted: No
Artesian Condition: No
Technical Report: N/A
Drinking Water Area Indicator: No

Licensing Information

Licensed Status: Unlicensed
Licence Number:

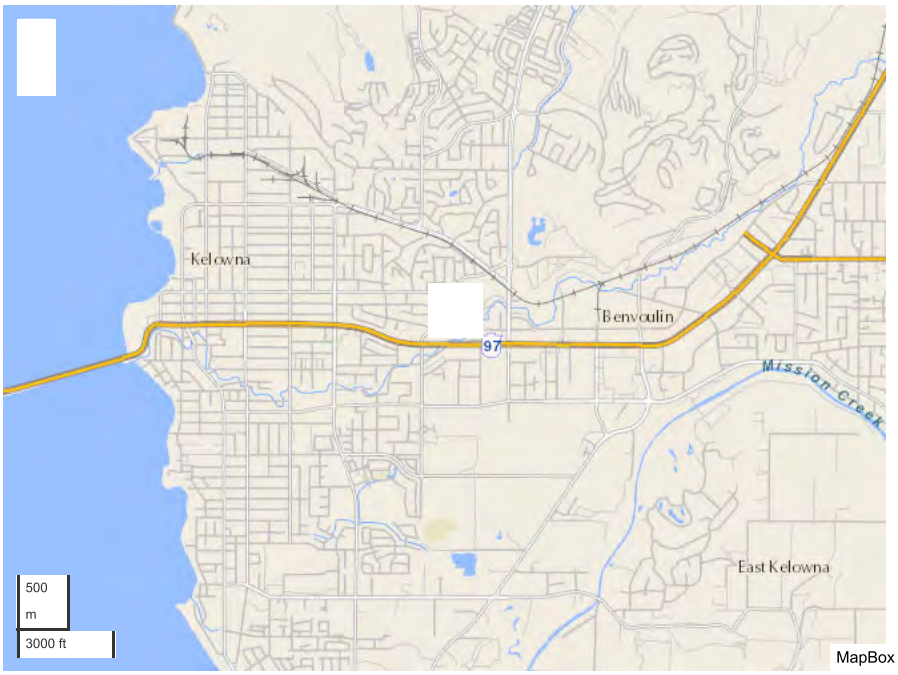
Location Information

Street Address: 1634 HARVEY AVE
Town/City: KELOWNA

Legal Description:

Lot	B
Plan	16186
District Lot	
Block	
Section	20
Township	26
Range	
Land District	41
Property Identification Description (PID)	

Description of Well Location:



MapBox | Government of British Columbia, DataBC, GeoBC

Geographic Coordinates - North American Datum of 1983 (NAD 83)
Latitude: 49.882486
Longitude: -119.462907
UTM Easting: 323070
UTM Northing: 5528474
Zone: 11
Coordinate Acquisition Code: (100 m accuracy) Digitized from old Dept. of Lands, Forests and Water Resources maps

Well Activity

Activity	Work Start Date	Work End Date	Drilling Company	Date Entered
Legacy record	1991-12-31		Capri Drilling	August 13th 2003 at 8:36 AM

Well Work Dates

Start Date of Construction	End Date of Construction	Start Date of Alteration	End Date of Alteration	Start Date of Decommission	End Date of Decommission
1991-12-31					

Well Completion Data

Total Depth Drilled:
Estimated Well Yield: 0 USgpm
Static Water Level (BTOC):
Finished Well Depth: 35 ft bgl
Well Cap:
Artesian Flow:
Final Casing Stick Up:
Well Disinfected Status: Not Disinfected
Artesian Pressure (head):
Depth to Bedrock:
Drilling Method: Other
Artesian Pressure (PSI):
Ground elevation:
Method of determining elevation: Unknown
Orientation of Well: VERTICAL

Lithology

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
0	0	bearing from 11'						
0	3	Tight sand & gravel w/ cobbles (fill)						
3	8	Loose sandy clay, silty sands & gravel						
8	25	Tight gravel & cobbles w/ sand, water-						
25	30	Blue clay w/ sand & gravel						
30	35	Blue clay						

Casing Details

From	To	Casing Type	Casing Material	Diameter	Wall Thickness	Drive Shoe
There are no records to show						

Surface Seal and Backfill Details

Surface Seal Material: Other
Backfill Material Above Surface Seal:
Surface Seal Installation Method:
Backfill Depth:
Surface Seal Thickness:
Surface Seal Depth:

Liner Details

Liner Material:
Liner Diameter:
Liner Thickness:
Liner from:
Liner to:
Liner perforations

From	To
There are no records to show	

Screen Details

Intake Method:
Type:
Material: Other
Opening:
Bottom:
Installed Screens

From	To	Diameter	Assembly Type	Slot Size
There are no records to show				

Well Development

Developed by:
Development Total Duration:

Well Yield

Estimation Method:
Estimation Rate:
Estimation Duration:
Static Water Level Before Test:
Drawdown:
Hydrofracturing Performed: No
Increase In Yield Due to Hydrofracturing:

Well Decommission Information

Reason for Decommission:
Method of Decommission:
Sealant Material:
Backfill Material:
Decommission Details:

Pumping Test Information and Aquifer Parameters

Start Date	Description	Test Duration (min)	Boundary Effect	Storativity	Transmissivity (m^2/day)	Hydraulic Conductivity (m/day)	Specific Yield	Specific Capacity (L/s/m)	Analysis Method	Comments
There are no records to show										

Comments

METHOD OF DRILLING = DRILLED

Documents

Well Number	Document Type	Date Of Upload	Document Status	Uploaded Document
61794	Unknown	Date Unknown	Public Document	WTN 61794_Well Record.pdf

Disclaimer

Well Summary

Well Tag Number: 61946
Well Status: New
Observation Well Number:
Well Identification Plate Number:
Well Class: Water Supply
Observation Well Status:
Owner Name: O'CONNOR ASSOCIATES
Well Subclass:
Environmental Monitoring System (EMS) ID:
Intended Water Use: Commercial and Industrial
Aquifer Number: 467
Alternative specs submitted: No
Artesian Condition: No
Technical Report: N/A
Drinking Water Area Indicator: No

Licensing Information

Licensed Status: Unlicensed
Licence Number:

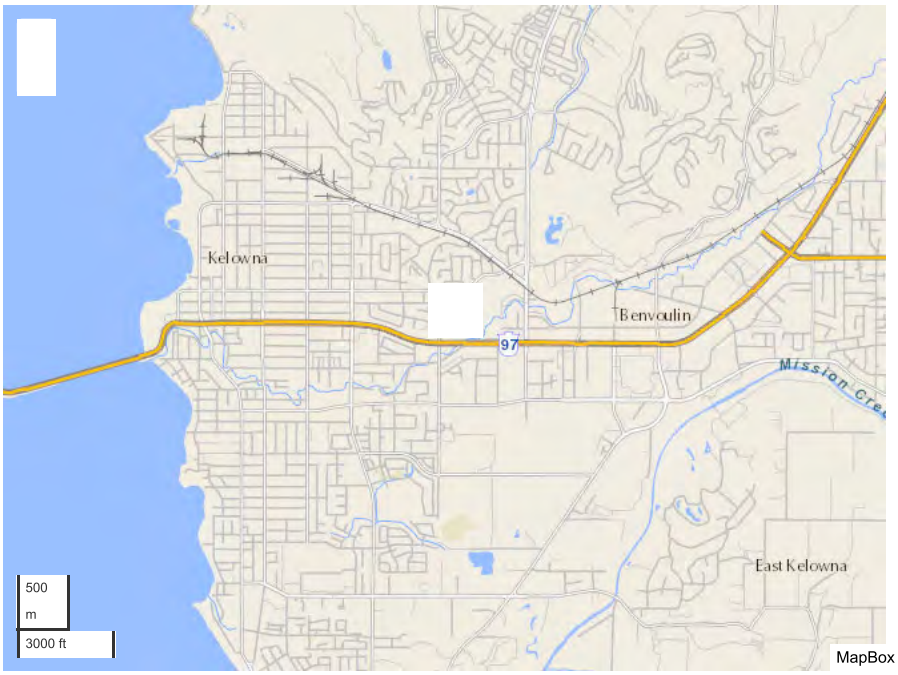
Location Information

Street Address: (MOHAWK) HWY 97 & BURTCH
Town/City: KELOWNA

Legal Description:

Lot	Z
Plan	14043
District Lot	
Block	
Section	
Township	
Range	
Land District	41
Property Identification Description (PID)	

Description of Well Location:



MapBox | Government of British Columbia, DataBC, GeoBC

Geographic Coordinates - North American Datum of 1983 (NAD 83)
Latitude: 49.882405
Longitude: -119.465033
UTM Easting: 322917
UTM Northing: 5528470
Zone: 11
Coordinate Acquisition Code: (50 m accuracy) Digitized from 1:20,000 mapping

Well Activity

Activity	Work Start Date	Work End Date	Drilling Company	Date Entered
Legacy record	1991-10-04		Capri Drilling	August 13th 2003 at 8:37 AM

Well Work Dates

Start Date of Construction	End Date of Construction	Start Date of Alteration	End Date of Alteration	Start Date of Decommission	End Date of Decommission
1991-10-04					

Well Completion Data

Total Depth Drilled:
Estimated Well Yield: 50 USgpm
Static Water Level (BTOC): 8 feet btoc
Finished Well Depth: 25.5 ft bgl
Well Cap:
Artesian Flow:
Final Casing Stick Up:
Well Disinfected Status: Not Disinfected
Artesian Pressure (head):
Depth to Bedrock:
Drilling Method: Other
Artesian Pressure (PSI):
Ground elevation:
Method of determining elevation: Unknown
Orientation of Well: VERTICAL

Lithology

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
0	0	fine sands						
0	0	gravel						
0	2	Sand & gravel						
2	4	Moist brown silty clay						
4	7.5	Sandy moist clay						
7.5	10.5	Black sand & gravel (smell)						
10.5	14.5	Water-bearing black gravel & sand						
14.5	16.5	Water-bearing gravel w/ some silty &						
16.5	21	Water-bearing medium & coarse sands &						
21	25.5	Water-bearing gravel w/ coarse sands						

Casing Details

From	To	Casing Type	Casing Material	Diameter	Wall Thickness	Drive Shoe
There are no records to show						

Surface Seal and Backfill Details

Surface Seal Material: Other
Backfill Material Above Surface Seal:
Surface Seal Installation Method:
Backfill Depth:
Surface Seal Thickness:
Surface Seal Depth:

Liner Details

Liner Material:
Liner Diameter:
Liner Thickness:
Liner from:
Liner to:
Liner perforations

From	To
There are no records to show	

Screen Details

Intake Method:
Type:
Material: Other
Opening:
Bottom:
Installed Screens

From	To	Diameter	Assembly Type	Slot Size
There are no records to show				

Well Development

Developed by:
Development Total Duration:

Well Yield

Estimation Method:
Estimation Rate:
Estimation Duration:
Static Water Level Before Test:
Drawdown:
Hydrofracturing Performed: No
Increase In Yield Due to Hydrofracturing:

Well Decommission Information

Reason for Decommission:
Method of Decommission:
Sealant Material:
Backfill Material:
Decommission Details:

Pumping Test Information and Aquifer Parameters

Start Date	Description	Test Duration (min)	Boundary Effect	Storativity	Transmissivity (m^2/day)	Hydraulic Conductivity (m/day)	Specific Yield	Specific Capacity (L/s/m)	Analysis Method	Comments
There are no records to show										

Comments

METHOD OF DRILLING = DRILLED

Documents

Well Number	Document Type	Date Of Upload	Document Status	Uploaded Document
61946	Unknown	Date Unknown	Public Document	WTN 61946_Well Record.pdf

Disclaimer

Well Summary

Well Tag Number: 61949
Well Status: New
Observation Well Number:
Well Identification Plate Number:
Well Class: Water Supply
Observation Well Status:
Owner Name: O'CONNOR ASSOCIATES
Well Subclass:
Environmental Monitoring System (EMS) ID:
Intended Water Use: Commercial and Industrial
Aquifer Number: 467
Alternative specs submitted: No
Artesian Condition: No
Technical Report: N/A
Drinking Water Area Indicator: No

Licensing Information

Licensed Status: Unlicensed
Licence Number:

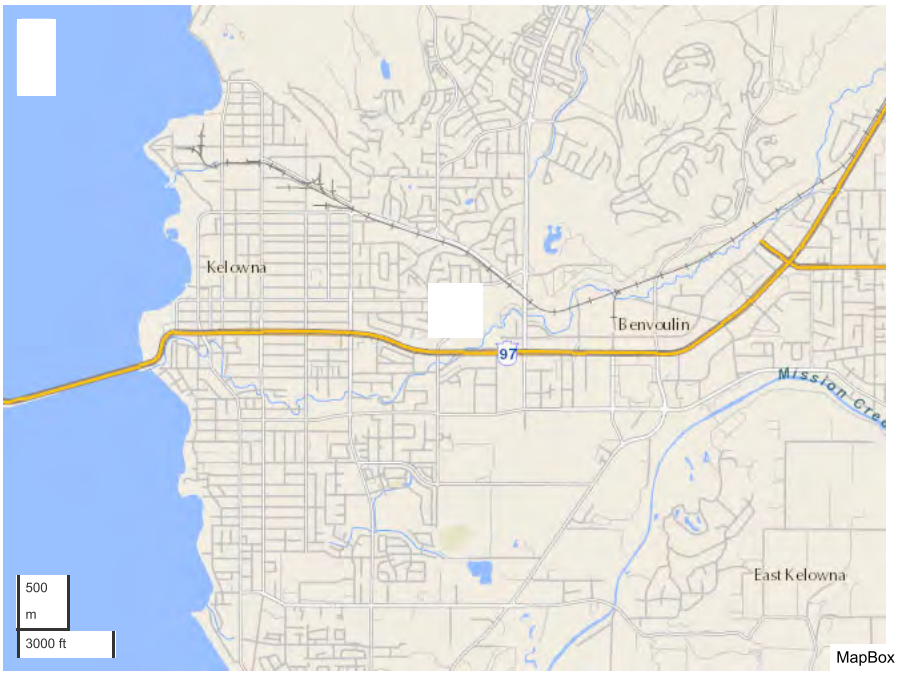
Location Information

Street Address: (ESSO) HWY 97 & BURTCH
Town/City: KELOWNA

Legal Description:

Lot	5
Plan	32159
District Lot	
Block	
Section	
Township	
Range	
Land District	41
Property Identification Description (PID)	

Description of Well Location:



MapBox | Government of British Columbia, DataBC, GeoBC

Geographic Coordinates - North American Datum of 1983 (NAD 83)
Latitude: 49.88312
Longitude: -119.46494
UTM Easting: 322926
UTM Northing: 5528549
Zone: 11
Coordinate Acquisition Code: (50 m accuracy) Digitized from 1:20,000 mapping

Well Activity

Activity	Work Start Date	Work End Date	Drilling Company	Date Entered
Legacy record	1991-10-04		Capri Drilling	August 13th 2003 at 8:37 AM

Well Work Dates

Start Date of Construction	End Date of Construction	Start Date of Alteration	End Date of Alteration	Start Date of Decommission	End Date of Decommission
1991-10-04					

Well Completion Data

Total Depth Drilled:
Estimated Well Yield: 36 USgpm
Static Water Level (BTOC): 11 feet btoc
Finished Well Depth: 28.5 ft bgl
Well Cap:
Artesian Flow:
Final Casing Stick Up:
Well Disinfected Status: Not Disinfected
Artesian Pressure (head):
Depth to Bedrock:
Drilling Method: Other
Artesian Pressure (PSI):
Ground elevation:
Method of determining elevation: Unknown
Orientation of Well: VERTICAL

Lithology

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
0	0	gravel						
0	1	Bark & silty clay						
1	4	Sand & gravel						
4	11	Moist silty brown clay						
11	13	Silty clay w/ trace of gravel (smell)						
13	17	Water-bearing sand & gravel						
17	23	Water-bearing sand & gravel w/ more						
23	28.5	Wet silty clay						

Casing Details

From	To	Casing Type	Casing Material	Diameter	Wall Thickness	Drive Shoe
There are no records to show						

Surface Seal and Backfill Details

Surface Seal Material: Other
Backfill Material Above Surface Seal:
Surface Seal Installation Method:
Backfill Depth:
Surface Seal Thickness:
Surface Seal Depth:

Liner Details

Liner Material:
Liner Diameter:
Liner Thickness:
Liner from:
Liner to:
Liner perforations

From	To
There are no records to show	

Screen Details

Intake Method:
Type:
Material: Other
Opening:
Bottom:
Installed Screens

From	To	Diameter	Assembly Type	Slot Size
There are no records to show				

Well Development

Developed by:
Development Total Duration:

Well Yield

Estimation Method:
Estimation Rate:
Estimation Duration:
Static Water Level Before Test:
Drawdown:
Hydrofracturing Performed: No
Increase In Yield Due to Hydrofracturing:

Well Decommission Information

Reason for Decommission:
Method of Decommission:
Sealant Material:
Backfill Material:
Decommission Details:

Pumping Test Information and Aquifer Parameters

Start Date	Description	Test Duration (min)	Boundary Effect	Storativity	Transmissivity (m^2/day)	Hydraulic Conductivity (m/day)	Specific Yield	Specific Capacity (L/s/m)	Analysis Method	Comments
There are no records to show										

Comments

METHOD OF DRILLING = DRILLED

Documents

Well Number	Document Type	Date Of Upload	Document Status	Uploaded Document
61949	Unknown	Date Unknown	Public Document	WTN 61949_Well Record.pdf

Disclaimer

APPENDIX C

BOREHOLE LOGS

Borehole No: **BH24-01**

Dialog

ATTACHMENT A
This forms part of application
ARP24-0001 OCP24-0012
Planner Initials MT
City of Kelowna DEVELOPMENT PLANNING

Project: 1574 and 1634 Harvey Lands, Engineering Services	Project No: 704-ENG.KGEO03920-01
Location: 1574 and 1634 Harvey Ave	
Kelowna	UTM: 323050 E; 5528528 N; Z 11 NAD83

Depth (m)	Method	Core Diameter (mm)	Soil Description	Graphical Representation	Sample Type	Sample Number	Particle Size Distribution: Gravel (%)	Sand (%)	Silt & Clay (%): Silt (%)	Silt & Clay (%): Clay (%)	Field Blowcount (blows/300 mm) SPT	Field Vane (kPa) Post-Peak / Peak	Plastic Limit / Moisture Content / Liquid Limit	BH24-01	Depth (ft)
0			Asphalt												0
			SAND and GRAVEL (FILL), trace silt, well graded, moist, dense, tan, fine to coarse sand, fine to coarse subangular to angular gravel			SPT1					30				
1			SILT and SAND, poorly graded, damp, very loose, tan, fine sand, 50 mm lenses of interbedded fine to medium sand disseminated throughout												1–5
			-becomes wet at 1.8 m			SPT2	1	45		54					6
2 ▽ 01/03/2024			-water table encountered at 2.1 m												7
			GRAVEL and SAND, trace to some silt, poorly graded, wet, compact, brown, fine to coarse sand, fine to coarse subrounded to subangular gravel												8–9
3						SPT3					30				10
4															11–14
5	Odex		GRAVEL, sandy, trace silt, well graded, wet, grey, compact, fine to coarse sand, fine to coarse rounded to subangular gravel			SPT4					30				15–19
6			SAND, trace to some gravel, trace silt, poorly graded, wet, grey, loose, fine to medium sand, fine rounded to subrounded gravel			SPT5					10				20–25
7															26
			-becomes compact SAND and GRAVEL at 7.6 m			SPT6	40	57		3	30				27–30
8															31
			CLAY, silty, trace sand, moist, firm, high plasticity, grey												32
9						SPT7					10				
10															

Field Vane (kPa): Post-Peak / Peak — 10 20 30 40
Plastic Limit / Moisture Content / Liquid Limit — 20 40 60 80

TETRA TECH

Contractor: OTM	Completion Depth: 31.1 m
Equipment Type: B53	Start Date: January 3, 2024
Logged By: DB	Completion Date: January 3, 2024
Reviewed By: GM	Page 1 of 4

Borehole No: **BH24-01**

Dialog

ATTACHMENT A
This forms part of application
ARP24 0001 OCP24 0012
Planner Initials MT
City of Kelowna DEVELOPMENT PLANNING

Project: 1574 and 1634 Harvey Lands, Engineering Services	Project No: 704-ENG.KGEO03920-01
Location: 1574 and 1634 Harvey Ave	
Kelowna	UTM: 323050 E; 5528528 N; Z 11 NAD83

Depth (m)	Method	Core Diameter (mm)	Soil Description	Graphical Representation	Sample Type	Sample Number	Particle Size Distribution: Gravel (%)	Sand (%)	Silt & Clay (%): Silt (%)	Silt & Clay (%): Clay (%)	Field Blowcount (blows/300 mm)	Field Vane (kPa) / Plastic Limit, Moisture Content, Liquid Limit	BH24-01	Depth (ft)
10											SPT; 10 20 30 40	Post-Peak / Peak: 10 20 30 40; Plastic Limit / Moisture Content / Liquid Limit: 20 40 60 80		33
11	Mud Rotary					SPT8	0	1	22	77				36
12			-becomes stiff at 12.2 m			SPT9								40
13														43
14			-150 mm lens of clayey, gravelly sand at 13.72 m			SPT10								46
15			-becomes firm at 15.24 m			SPT11								50
16														53
17						SPT12								56
18														59
19						SPT13								62
20														65

TETRA TECH

Contractor: OTM	Completion Depth: 31.1 m
Equipment Type: B53	Start Date: January 3, 2024
Logged By: DB	Completion Date: January 3, 2024
Reviewed By: GM	Page 2 of 4

Dialog

ATTACHMENT A
This forms part of application
~~ARP24-0001 OCP24-0012~~
City of Kelowna
DEVELOPMENT PLANNING
Planner Initials MT

Borehole No: **BH24-01**

Project: 1574 and 1634 Harvey Lands, Engineering Services	Project No: 704-ENG.KGEO03920-01
Location: 1574 and 1634 Harvey Ave	
Kelowna	UTM: 323050 E; 5528528 N; Z 11 NAD83

Depth (m)	Method	Core Diameter (mm)	Soil Description	Sample Type	Sample Number	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Field Blowcount (blows/300 mm) SPT	Field Vane (kPa) / Plastic Limit, Moisture Content, Liquid Limit	Depth (ft)
20	Mud Rotary		SILT and CLAY, trace sand, wet, firm, medium plasticity, grey	SPT	SPT14							66
21.6				SPT	SPT15	0	1	58	41			71
24.7				SPT	SPT16							81
27.7				SPT	SPT17							91
30												98

Contractor: OTM	Completion Depth: 31.1 m
Equipment Type: B53	Start Date: January 3, 2024
Logged By: DB	Completion Date: January 3, 2024
Reviewed By: GM	Page 3 of 4

TETRA TECH

Borehole No: **BH24-01**

Dialog

ATTACHMENT A
This forms part of application
ARP24-0001 OCP24-0012
Planner Initials MT
City of Kelowna DEVELOPMENT PLANNING

Project: 1574 and 1634 Harvey Lands, Engineering Services	Project No: 704-ENG.KGEO03920-01
Location: 1574 and 1634 Harvey Ave	
Kelowna	UTM: 323050 E; 5528528 N; Z 11 NAD83

Depth (m)	Method	Core Diameter (mm)	Soil Description	Graphical Representation	Sample Type	Sample Number	Particle Size Distribution: Gravel (%)	Sand (%)	Silt & Clay (%): Silt (%)	Silt & Clay (%): Clay (%)	Field Blowcount (blows/300 mm) □ SPT 10 20 30 40	Field Vane (kPa) Post-Peak ◇ Peak ◆ 10 20 30 40; Plastic Limit Moisture Content Liquid Limit 20 40 60 80	BH24-01	Depth (ft)
30														99
	Mud Rotary		-becomes stiff at 30.48 m											100
31						SPT18					□			101
			END OF BOREHOLE AT 31.1 m. TARGET DEPTH REACHED											102
														103
32														104
														105
														106
33														107
														108
														109
34														110
														111
														112
35														113
														114
														115
36														116
														117
														118
37														119
														120
														121
38														122
														123
														124
39														125
														126
														127
40														128
														129
														130
														131

TETRA TECH

Contractor: OTM	Completion Depth: 31.1 m
Equipment Type: B53	Start Date: January 3, 2024
Logged By: DB	Completion Date: January 3, 2024
Reviewed By: GM	Page 4 of 4

APPENDIX D

LABORATORY TESTING

MOISTURE CONTENT TEST RESULTS

ASTM D2216

Project:	1574 and 1634 Harvey Lands, Engineering Services	Sample No.:	KS-10637
Project No.:	ENG.KGEO03920-01	Date Tested:	January 5, 2024
Client:	Dialog	Tested By:	MV
Address:	1574 and 1634 Harvey, Kelowna, B.C.	Page:	1 of 1

B.H. Number	Depth (m)	Moisture Content (%)	Visual Description of Soil
BH24-01 SPT 2	1.5 - 2.1	19.5	
BH24-01 SPT 6	7.6 - 8.2	13.9	
BH24-01 SPT 8	10.6 - 11.2	50.6	
BH24-01 SPT 15	21.2 - 21.8	45.0	

Reviewed By: _____ C.Tech.

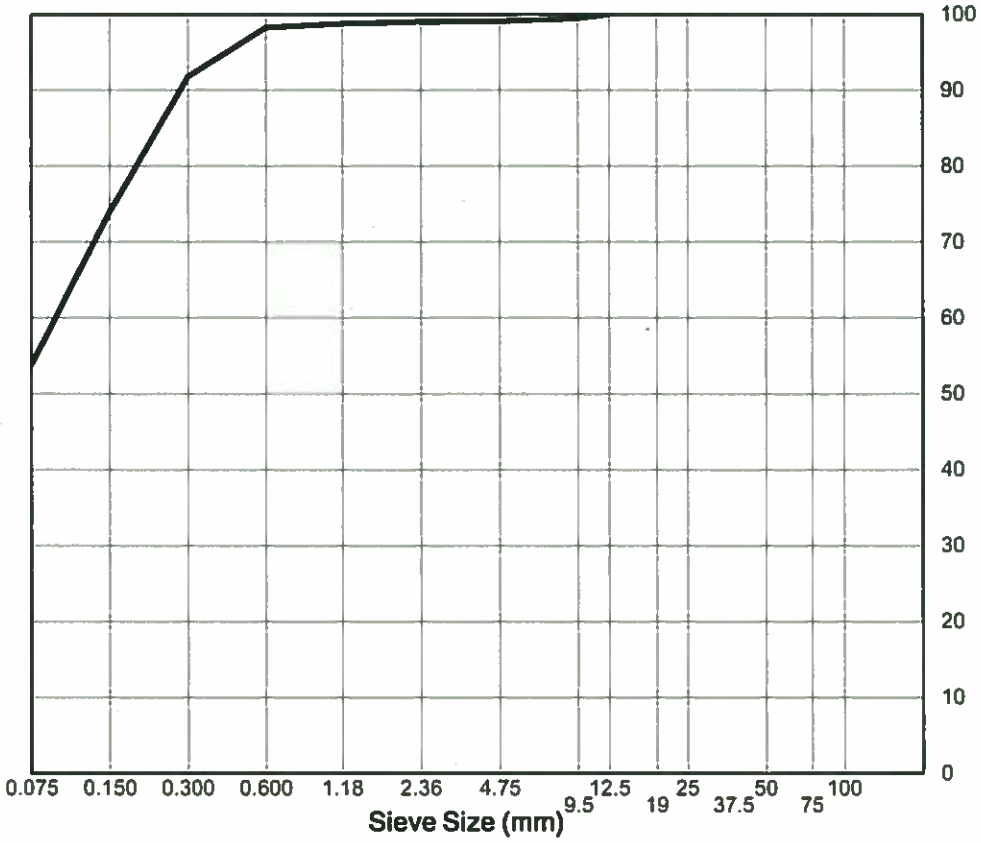
TETRA TECH

SIEVE ANALYSIS REPORT

Washed Sieve: ASTM C136 and C117

Project No.:	ENG.KGEO03920-01	Sample No.:	KS-10638
Project:	1574 and 1634 Harvey Lands, Engineering Services	Date Sampled:	January 3, 2024
		Sampled by:	DB
Client:	Dialog	Date Tested:	January 5, 2024
Attention:	See e-mail distribution	Tested by:	MV Office: Kelowna
Email:	See e-mail distribution	Moisture Content (as received):	19.5%
Description:	12.5 mm (-) SILT and SAND, trace gravel	No. Crushed Faces:	One (1) or Two (2)
Source:	BH24-01, SPT 2	By particle mass:	
Supplier:	N/A		
Depth:	1.5 - 2.1 m		
Specification:	N/A		

Sieve Size	Percent Passing
12.5	100
9.5	99
4.75	99
2.36	99
1.18	99
0.600	98
0.300	92
0.150	74
0.075	53.8



Remarks:

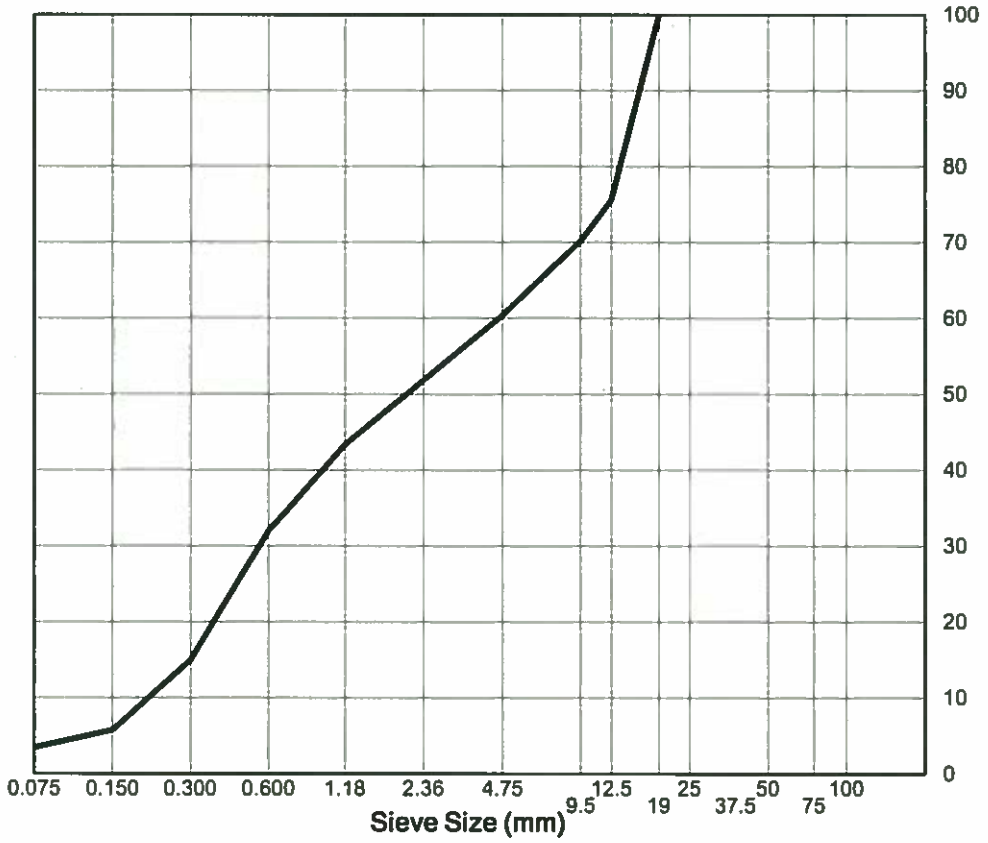
Reviewed By: _____ C.Tech.

SIEVE ANALYSIS REPORT

Washed Sieve: ASTM C136 and C117

Project No.:	ENG.KGEO03920-01	Sample No.:	KS-10639
Project:	1574 and 1634 Harvey Lands, Engineering Services	Date Sampled:	January 3, 2024
		Sampled by:	DB
Client:	Dialog	Date Tested:	January 5, 2024
Attention:	See e-mail distribution	Tested by:	MV Office: Kelowna
Email:	See e-mail distribution	Moisture Content (as received):	13.9%
Description:	19 mm (-) SAND and GRAVEL, trace silt	No. Crushed Faces:	One (1) or Two (2)
Source:	BH24-01, SPT 6	By particle mass:	
Supplier:	N/A		
Depth:	7.6 - 8.2 m		
Specification:	N/A		

Sieve Size	Percent Passing
19	100
12.5	76
9.5	70
4.75	60
2.36	52
1.18	43
0.600	32
0.300	15
0.150	6
0.075	3.4



Remarks:

Reviewed By: _____ C.Tech.

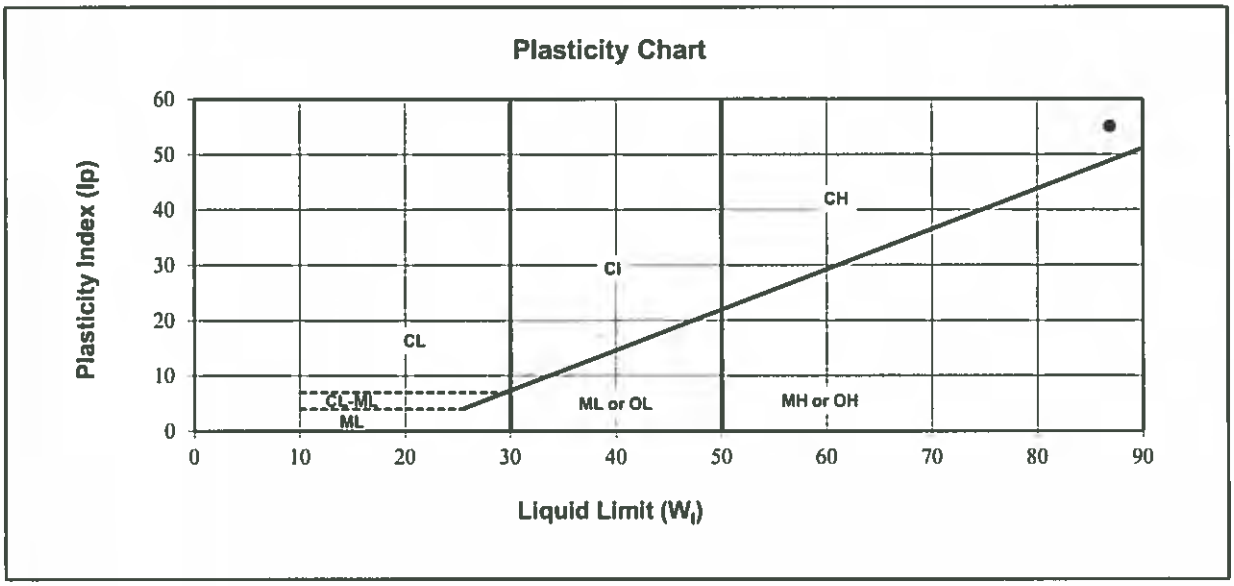
TETRA TECH

ATTERBERG LIMITS TEST REPORT

ASTM D4318

Project:	1574 and 1634 Harvey Lands, Engineering Services	Sample Number:	KS-10640
		Borehole Number:	BH24-01, SPT 8
Project No:	ENG.KGEO03920-01	Depth:	10.6 - 11.2 m
Client:	Dialog	Sampled By:	DB Tested By: MV
Attention:	See e-mail distribution	Date Sampled:	January 3, 2024
Email:	See e-mail distribution	Date Tested:	January 5, 2024

Sample Description: CLAY, High Plasticity (CH)



Liquid Limit ($W_{1)}$:	87	Natural Moisture (%)	50.6
Plastic Limit :	32	Soil Plasticity:	High
Plasticity Index (Ip) :	55	Mod.USCS Symbol:	CH

Remarks:

Reviewed By: _____ C.Tech

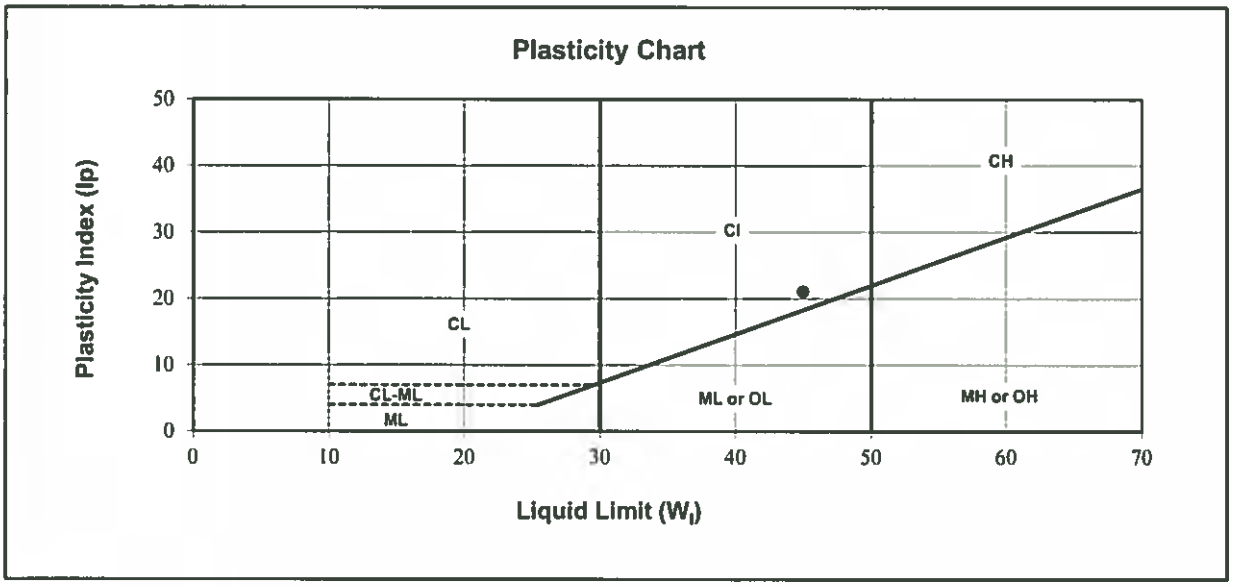
TETRA TECH

ATTERBERG LIMITS TEST REPORT

ASTM D4318

Project:	1574 and 1634 Harvey Lands, Engineering Services	Sample Number:	KS-10641
		Borehole Number:	BH24-01, SPT 15
Project No:	ENG.KGEO03920-01	Depth:	21.2 - 21.8 m
Client:	Dialog	Sampled By:	DB Tested By: MV
Attention:	See e-mail distribution	Date Sampled:	January 3, 2024
Email:	See e-mail distribution	Date Tested:	January 5, 2024

Sample Description: CLAY, Medium Plasticity (CI)



Liquid Limit (W_1):	45	Natural Moisture (%)	45.0
Plastic Limit :	24	Soil Plasticity:	Medium
Plasticity Index (Ip) :	21	Mod.USCS Symbol:	CI

Remarks:

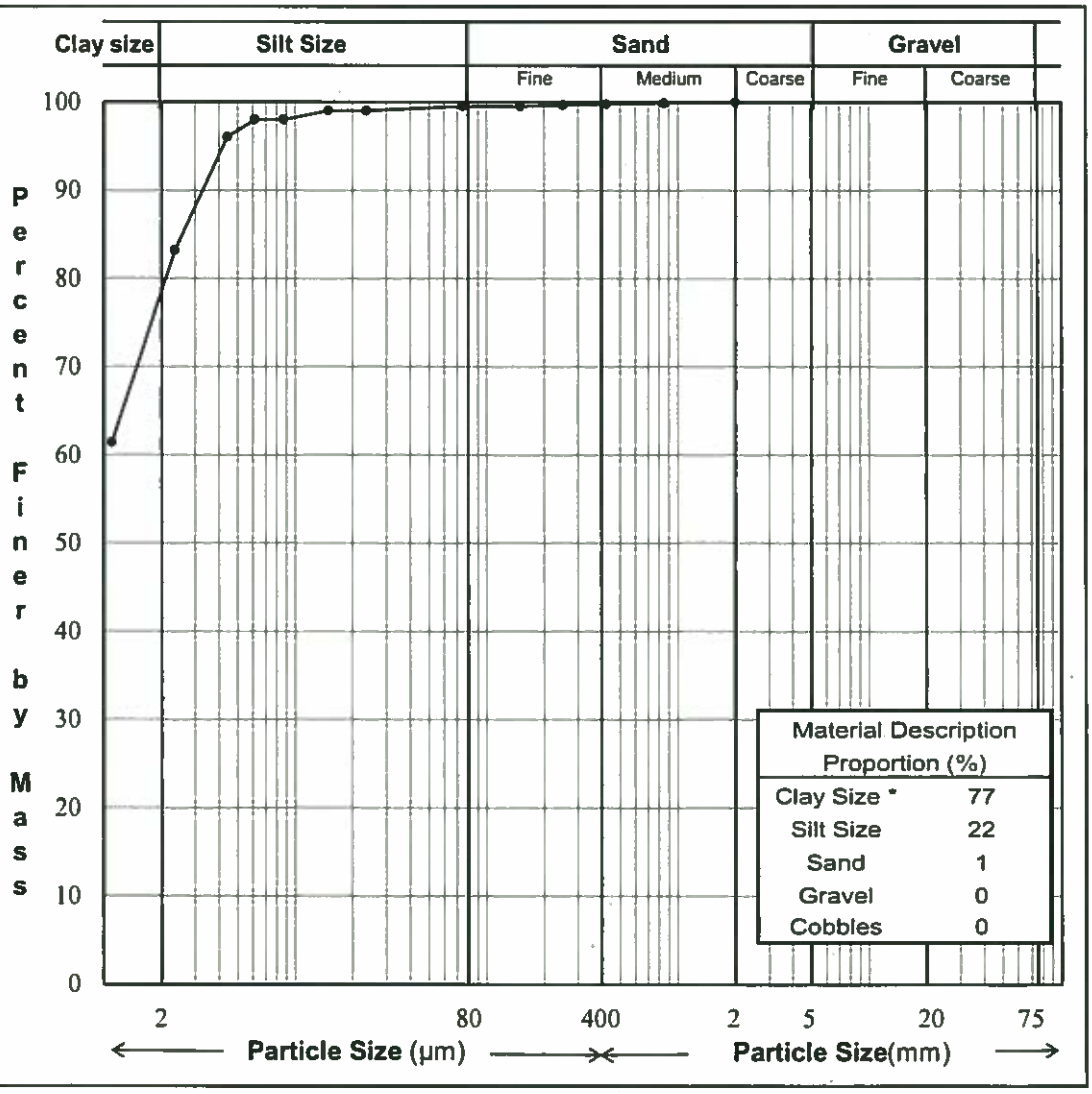
Reviewed By: _____ C.Tech.

PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D7928

Project:	1574 and 1634 Harvey Lands, Engineering Services	Sample No.:	KS-10642
Client:	Dialog	Borehole/ TP:	BH24-01, SPT 8
Project No.:	ENG.KGEO03920-01	Depth:	10.6 - 11.2 m
Location:	1574 and 1634 Harvey, Kelowna, B.C.	Date Tested	January 9, 2024
Description **:	CLAY, silty, trace sand	Tested By:	MV

Particle Size	Percent Passing
100 mm	
75 mm	
50 mm	
38 mm	
25 mm	
19 mm	
13 mm	
10 mm	
5 mm	
2 mm	100
850 µm	100
425 µm	100
250 µm	100
150 µm	100
75 µm	100
24 µm	99
15 µm	99
9 µm	98
6 µm	98
4 µm	96
2 µm	83
1 µm	61



Remarks: * The description is behaviour based & subject to Tetra Tech description protocols.

Reviewed By: _____ C.Tech.

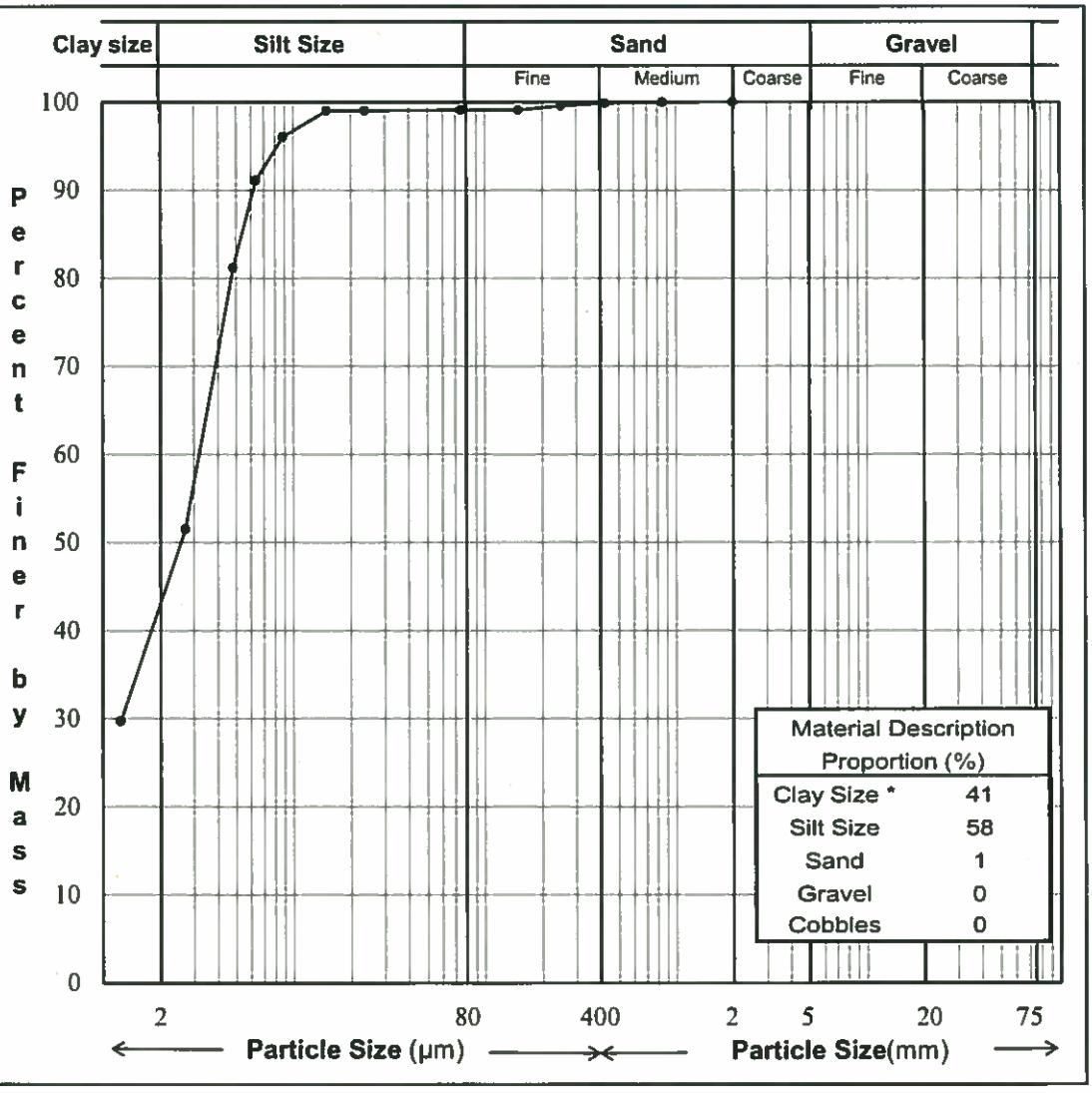
TETRA TECH

PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D7928

Project:	1574 and 1634 Harvey Lands, Engineering Services	Sample No.:	KS-10643
Client:	Dialog	Borehole/ TP:	BH24-01, SPT 15
Project No.:	ENG.KGEO03920-01.001	Depth:	21.2 - 21.8 m
Location:	1574 and 1634 Harvey, Kelowna, B.C.	Date Tested	January 9, 2024
Description **:	SILT, clayey, trace sand	Tested By:	MV

Particle Size	Percent Passing
100 mm	
75 mm	
50 mm	
38 mm	
25 mm	
19 mm	
13 mm	
10 mm	
5 mm	
2 mm	100
850 µm	100
425 µm	100
250 µm	100
150 µm	99
75 µm	99
24 µm	99
15 µm	99
9 µm	96
6 µm	91
5 µm	81
3 µm	51
1 µm	30



Remarks: * The description is behaviour based & subject to Tetra Tech description protocols.

Reviewed By: _____ C.Tech.

TETRA TECH

APPENDIX E

PRELIMINARY SIMPLIFIED LIQUEFACTION ANALYSIS

TETRA TECH

SPT BASED LIQUEFACTION ANALYSIS REPORT

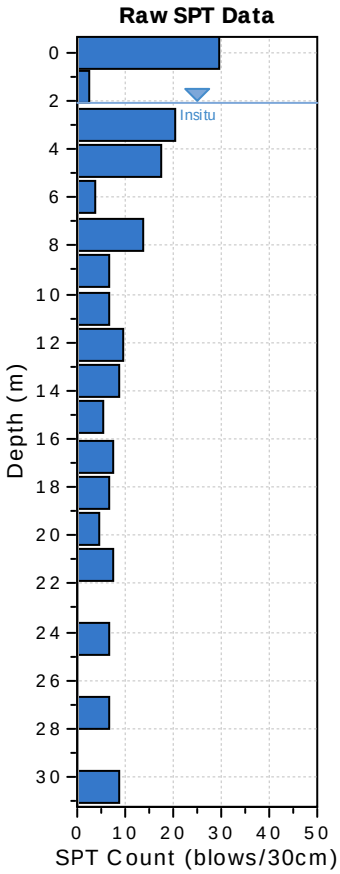
Project title : 1574 and 1634 Harvey Lands

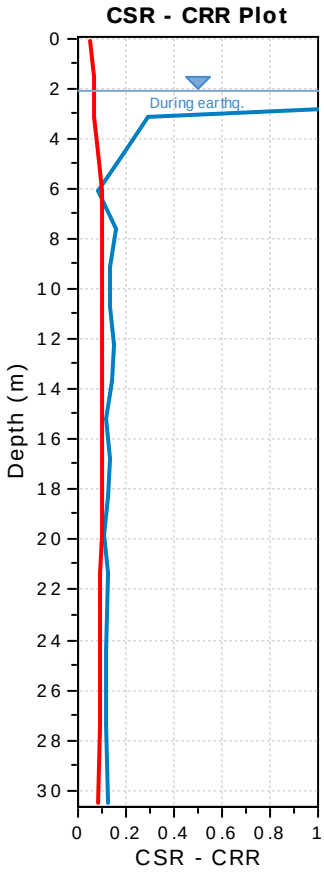
SPT Name: BH23-01

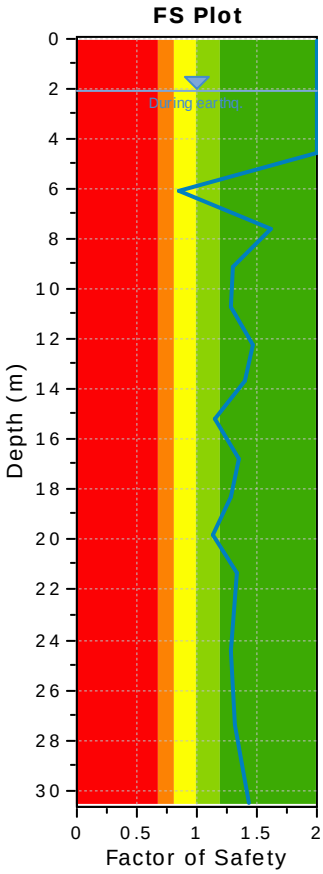
Location :

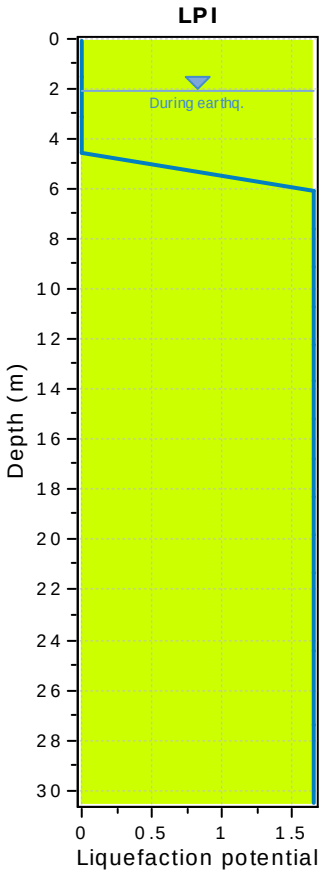
:: Input parameters and analysis properties ::

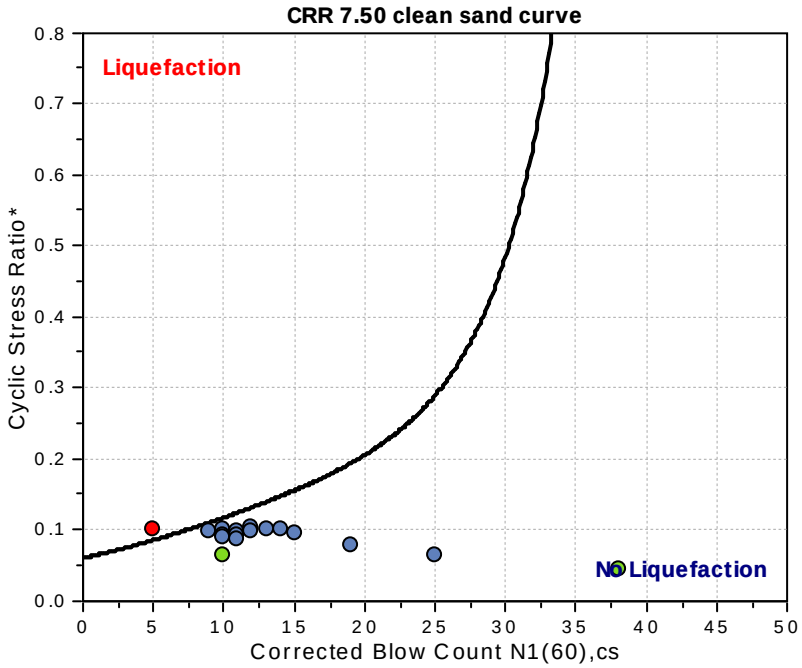
Analysis method:	Boulanger & Idriss, 2014	G.W.T. (in-situ):	2.10 m
Fines correction method:	Boulanger & Idriss, 2014	G.W.T. (earthq.):	2.10 m
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	6.33
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.12 g
Rod length:	1.00 m	Eq. external load:	0.00 kPa
Hammer energy ratio:	1.00		











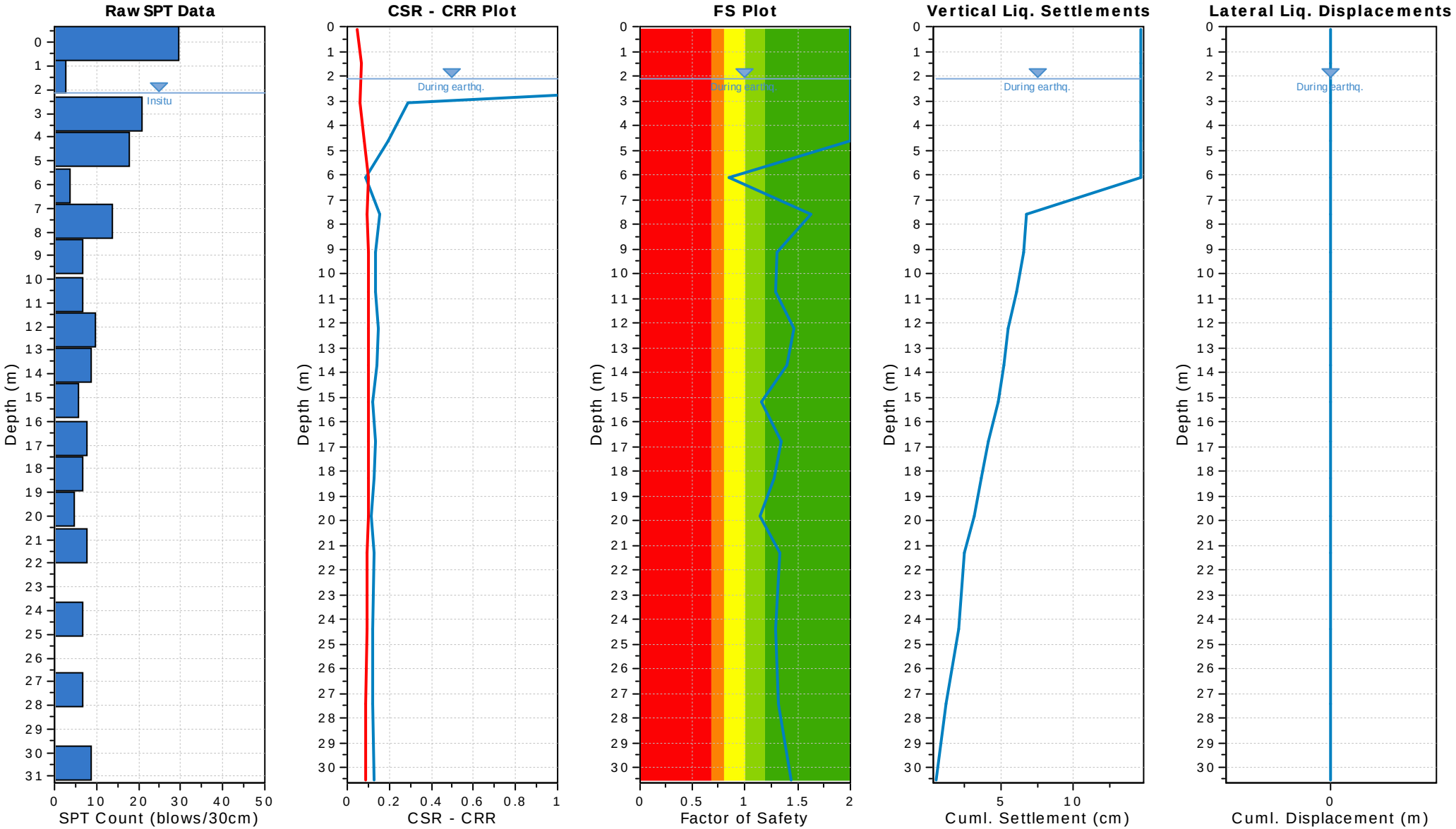
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



February 2, 2024

ISSUED FOR USE
FILE: 704-ENG.KGEO03920-01

Dialog BC Architecture Engineering Interior Design Planning Inc.
#300 134 – 11 Avenue SE
Calgary, AB T2G 0X5

Via Email: gdoering@dialogdesign.ca

Attention: Gerry Doering, Partner & Architect

Subject: Hydrotechnical Site Due Diligence at 1574 & 1634 Harvey Lands, Kelowna, BC

1.0 INTRODUCTION

1.1 General

Tetra Tech Canada Inc. (Tetra Tech) has been retained by Dialog BC Architecture Engineering Interior Design Planning Inc. (Dialog) on behalf of PMC (Harvey) Holdings Corp to undertake a hydrotechnical site due diligence report to satisfy the City of Kelowna Area Redevelopment Plan (ARP) application.

This hydrotechnical report summarizes the findings of our desktop review, site walkover, and includes information on the current understanding of the stormwater management of the site.

The proposed scope of work was set out in Tetra Tech's proposal "Proposal for Geotechnical and Hydrotechnical Site Due Diligence at 1574 & 1634 Harvey Lands, Kelowna, BC" dated November 6th, 2023, and approval to proceed with the proposed scope of works was provided by Brett Wilson in a Tetra Tech Signed Services Agreement dated December 11, 2023.

This report only covers the hydrotechnical scope of work and geotechnical and hydrogeological tasks associated with the ARP will be provided in separate documents.

1.2 Project Description

It is Tetra Tech's understanding that specific details of the proposed development are yet to be finalized/confirmed; however, at the time this report was written, the proposed development was assumed to comprise of several mid to high rise structures ranging between six (6) and twenty-eight (28) stories with the tallest structures likely being situated within the southeast corner of the subject property. The purpose of this report is to summarize the current site conditions prior to the development and to identify any drainage concerns that may impact the proposed development. An assessment of the post development conditions will need to take place in future phases when the lot layout has become formalized.

1.3 Site Description

The subject site consists of two (2) neighboring properties, which will be amalgamated during the development permit application and will be referred to as the Project Area. The subject properties are:

Tetra Tech Canada Inc.
150, 1715 Dickson Avenue
Kelowna, BC V1Y 9G6 CANADA
Tel 250.862.4832 Fax 250.862.2941

- 1574 Harvey Ave, Kelowna, BC, Plan KAP32159 Lot 3; and,
- 1634 Harvey Ave, Kelowna, BC, PLAN KAP16186 Lot B.

A site plan showing the arrangement of the existing site is shown in Figure 1.3.

The amalgamated site will comprise an approximate 27,567 m^2 irregular shaped lot. The lots are currently occupied by two commercial buildings along the western and southern sections of the property with recreational sports courts situated within the northern part of the property. The remainder of the lot serves as a paved parking lot. The elevation of the site ranges from 355 to 357 masl. The subject site is bounded by Highway 97 to the south, Parkinson Recreation Park to the east, Burtch Road to the north, and a commercial development comprising of three single story buildings to the west. Mill Creek runs parallel with Highway 97 prior to crossing the highway near the southeast corner of the lot.

Figure 1.3: Site Overview

2.0 BACKGROUND REVIEW

2.1 General

As part of Tetra Tech's background review, the following documents were reviewed for use in this report:

- Mill Creek Flood Plain Bylaw No. 10248 (City of Kelowna, 2011; Bylaw No. 10248)

- Subdivision, Development & Servicing Bylaw No. 7900 (City of Kelowna 2023, Bylaw No 7900)
- City of Kelowna & Regional District of Central Okanagan Flood Mapping and Mitigation Planning, Mill Creek Flood and Hazard Mapping (AECOM, 2020.
- City of Kelowna Map Viewer. 2024. (https://maps.kelowna.ca/public/mapviewer/)
- Geotechnical Site Due Diligence at 1574 & 1634 Harvey Lands, Kelowna, BC. Rev.0. (Tetra Tech, 2024).
- Storm Sewer Design Burtch Rd., Kelglen Cr. – Lawrence Ave. Drawing No. A-1963-1A (City of Kelowna, 1981).
- Record Drainage. Highway 97 Transportation Improvements. Gordon Dr. to Highway 33. Drawing No. R2-690-703 (MMM Group, 2009).

2.2 Subsurface Conditions

The subsurface soil conditions at the site were assessed using geotechnical borehole information collected by Tetra Tech at 323050 E, 5528528 N, in January 2024. These results were also compared to the soil survey data available through the BC Soil Information Finder Tool (SIFT). The soil condition of the upper strata recorded in the borehole indicated a 0.1 m depth of asphalt followed by a 0.5 m layer of imported granular fill and a 1.5 m layer of silt and sand material, which was assumed to be native material. The ground water table was encountered at 2.1 m depth.

2.3 Site Stormwater System

The City of Kelowna (the City) Subdivision Servicing Bylaw indicates that all flows must be routed through sewer pipe, ditching, water courses, riparian areas, or road allowances with the required capacity and right of way access for operation and maintenance. The City requires that major system flows must be safely routed downstream to an adequately sized municipal drain or natural watercourse without impacting private property. The assumed existing stormwater drainage, based on this stormwater management approach, is summarized in this section.

Within Lot 1574, runoff from the parking lot is collected in one of four catch basins. Once collected, it is assumed to be directed towards City stormwater systems in Harvey Ave. and Burtch Rd. Roof top drainage was not reviewed and Tetra Tech can't confirm where roof drainage is directed. For Lot 1634, runoff form the parking lot is collected in one of eight catch basins and is assumed to be directed towards the City stormwater system in Harvey Ave. In general, both Lot 1574 and 1634 have been graded so the terrain drains towards the identified catch basins. As such, there do not appear to be any major depressions for standing water, aside from the abandoned pool located in Lot 1574. Due to the lack of marked stormwater service connections, subsurface pipe networks were assumed. The presence of storage within the onsite stormwater system could not be confirmed during the site visit.

Current City stormwater connection information is limited to details that are available through the City of Kelowna's map viewer. The map viewer indicates that there is a single 200 mm diameter PVC stormwater connection (Service ID 15791) at the south side of the lot 1634 Harvey Avenue. A 200 mm service for Lot 1574 is shown in available drawings connecting to the system along Burtch Road however this connection is not shown in the Kelowna Map Viewer.

The stormwater connections drain water collected by the parking lot catch basins and directs it into the City stormwater system. The connection from Lot 1634 is to a pipe length that consists of a 300 mm diameter PVC pipe which connects to a catch basin to the west and a drywell to the east. Based on the location of the existing City stormwater infrastructure, it is assumed that the four catch basins within Lot 1574 Harvey Avenue drain to some combination of catch basin 118094 (at Harvey Ave.) and catch basin 198643 at (Burtch Rd.). Figure 2.2 below

shows the catch basin locations and assumed drainage pathways for the Project Area. The map viewer identifies the install date of 1992 and 2009 for the offsite infrastructure along Harvey Avenue and 1981 for the storm system along Burtch Road.

Figure 2.2: Assumed Stormwater Network at Subject Properties

2.4 Mill Creek Floodplain

2.4.1 General

Both lots have been identified as being within the Mill Creek Floodplain as per the Mill Creek Flood Plain Bylaw No. 10248 (City of Kelowna, 2011; Bylaw No. 10248). The Mill Creek Floodplain bylaw provides guidance for the Flood Construction Level (FCL) and the minimum setback distance from the creek with the current flood mapping dated as 2011. Recent flood reports include a 2020 Mill Creek Flood and Hazard Mapping study completed by AECOM for the Regional District of Central Okanagan and the City of Kelowna. This recent floodplain mapping has not been incorporated into bylaws, so it is assumed that the 2011 mapping remains current.

2.4.2 Flood Construction Level

The Flood Construction Level (FCL) boundary for the subject site as shown in Schedule “A” of the Mill Creek Flood Plain Bylaw No. 10248 (City of Kelowna, 2011; Bylaw No. 10248) ranges between 354.5 and 355.5 masl within the Project Area. The FCL usually dictates the elevation of the lowest habitable floor of a building under construction. The Mill Creek Flood Plain Bylaw No. 10248 also states that construction levels are the higher of:

- “600 mm above the elevation of the storm main obvert, known or anticipated high groundwater table or 100-year Hydraulic Line within the storm main, whichever is higher, as enacted in the City of Kelowna Subdivision, Development, and Servicing Bylaw No. 7900.”
- “As identified on the Schedule ‘A’ Mill Creek Flood Plain Map.”

The bylaw also states that no building shall be constructed with the top of a concrete slab of any area used for basement, entrance, foyer, habitation, institutional use, assembly use, tourist accommodation use, business, or storage of goods damageable by floodwaters lower than as defined by the higher of the two points above.

General exemptions to the flood plain are covered in Section 5 of the bylaw. An applicable exemption that may be applicable is BL10474 amended 5.1(b):

- Parking areas, including enclosed underground parking areas, except that in the case of an enclosed underground parking area, an unobstructed means of pedestrian ingress and egress must be provided above the flood level, and a sign must be posted at all points of entry notifying users that the parking area is not protected from inundation by floodwaters.

Figure 2.3 below shows the FCL for the subject area as shown in bylaw No. 10248.

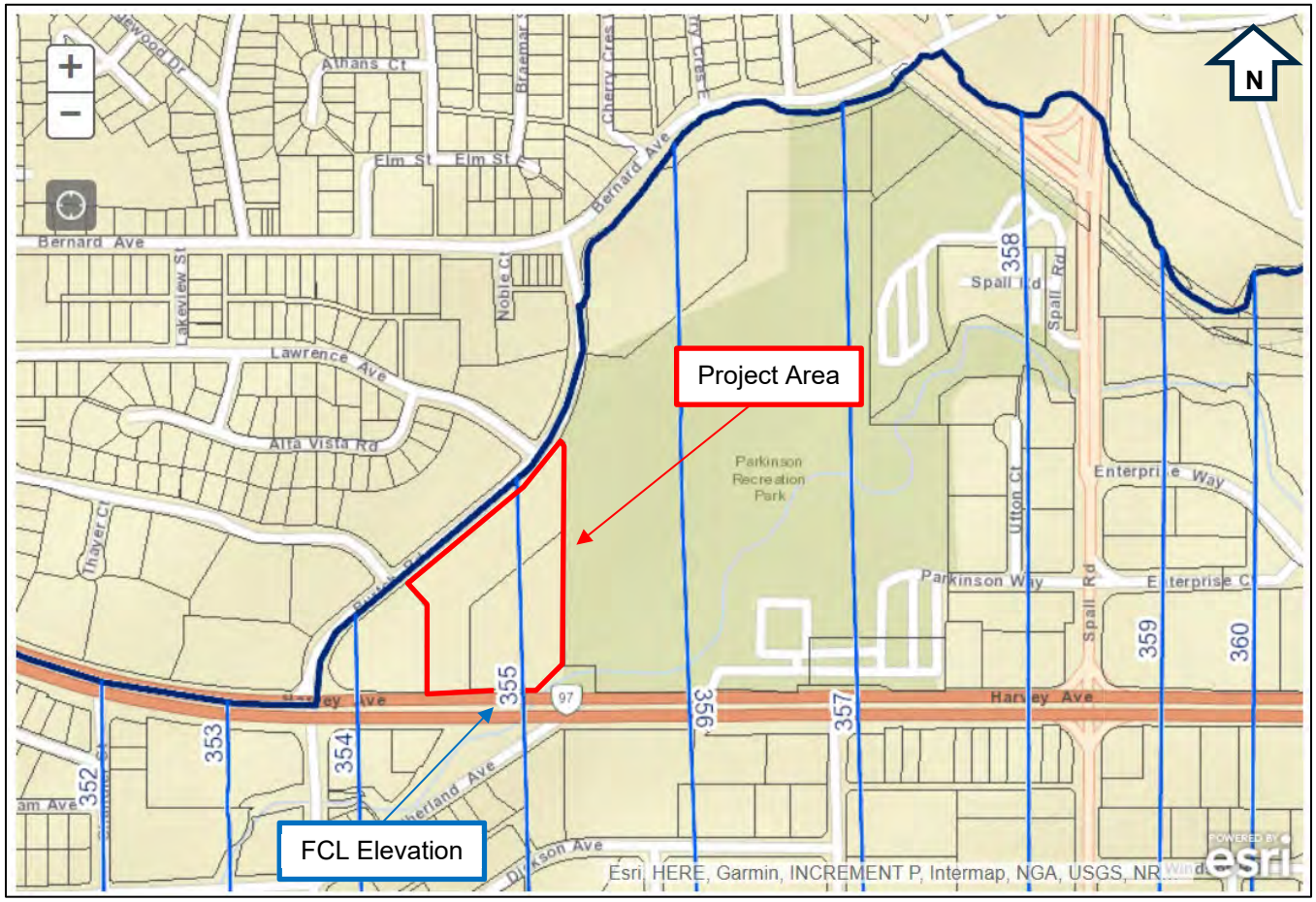


Figure 2.3: Flood Construction Level for Lots 1574 and 1634 (retrieved from: https://www.kelowna.ca/city-hall/city-government/bylaws-policies/mill-creek-flood-plain-bylaw)

As noted previously, the elevation of the terrain in the lot ranges from about 355 to 357 masl. This ground elevation appears to be above the existing FCL elevations.

The obvert of the storm main in Harvey Ave. is 354.8 masl. The obvert of the storm main in Burtch Rd. is 354.7 masl at the identified storm connection. The lot elevation should remain 600 mm above both storm main obverts.

2.4.3 Setback From a Watercourse (Mill Creek)

The minimum setback from a watercourse for any fill foundation or structural support required to elevate a floor system or pad above the flood level is defined by the City of Kelowna 2020 Official Community Plan Bylaw 7600 for the Mill Creek main stem. Since Lots 1574 and 1634 are located along Mill Creek, downstream of Hardy Road, a setback distance of 15 m would be required. The specified setback distance shall be measured from the top-of-ravine bank, top-of bank, or from the natural boundary where the top-of-bank is not clearly defined. The specified setback distance shall be measured to the nearest part of the building or structure including roofs, eaves, and any overhanging components or cantilevered portions of a building, or to the toe of a foundation fill slope.

2.5 Storm System Design Standards

The Subdivision, Development & Servicing Bylaw No. 7900 (City of Kelowna, Bylaw No 7900) provides the minimum design standards for stormwater management within a development. In addition to the Bylaw, the storm system

must conform to regulations set out by provincial and federal agencies. Bylaw No. 7900 provides a list of relevant provincial and federal acts.

As part of ongoing efforts to adapt to climate change, Bylaw 7900 requires that capacity of storm works include an additional 15% upward adjustment to the Intensity-Duration-Frequency (IDF) curve featured in the bylaw. The station used to develop the IDF curve is the Kelowna A station which is located at Kelowna International Airport and is operated by Environment Canada.

Detailed design criteria for the stormwater system are listed in the subdivision servicing bylaw. Key points from the bylaw include:

- Minimum depth of stormwater pipes is 1.0 m for untraveled areas and 1.2 m for traveled areas. The maximum bury depth is 4.5 m. Catch basin leads have a minimum depth of 0.90 m.
- Detention storage should be used to capture and store water on site to assure that storm releases are limited to the pre-development release rate for a 1 in 5-year storm.
- Detention storage options include the following:
  - Parking Lot Storage
  - Underground Storage
  - Dry Detention Ponds
  - Wet Detention Ponds
  - Subsurface Disposal / Infiltration Systems
- Service connections to the City's storm system are required for all multi-family, commercial, industrial and institutional land uses. The minimum storm service diameter for any property is 150 mm with the minimum grade from the property line to storm sewer main being 2%.
- Where permissible, roof water is expected to be contained on site to meet requirements for the pre-development storm rate. Acceptable practices include splashpad onto green space, rain harvesting systems or appropriately sized rock pits where soil infiltration parameters permit.
- Minimum grades of storm sewers are as required to obtain the minimum velocity of 0.6 m/s when experiencing the design flow except for catch basin leads and service connections, for which minimum grades are as indicated in Section 3.9.12 of the Bylaw.

3.0 STORMWATER FLOW ESTIMATES

3.1 Rainfall

Bylaw 7900 indicates that at a minimum, hydrographs are to be generated at key points of the drainage system for a 5-year and 100-year design storms with durations of 1, 2, 6, 12, and 24 hours for each development condition. As the proposed development is still in the initial planning phase, the ultimate layout of the new development is not yet known and thus, the post development condition cannot be assessed.

Rainfall magnitudes used in runoff modelling were obtained from the IDF curve featured in Bylaw 7900, Environment Canada's "Kelowna A" rainfall gauge station located at the Kelowna International Airport, approximately 10 km to the northeast of the Project Area. The rainfall intensity magnitudes are provided below in Table 3.1 for the 5-year and the 100-year events.

Table 3.1: IDF Rainfall Intensities from Kelowna A Station

Storm Duration	5 Year Return Period		100 Year Return Period	
	Historical (mm/hr)	15% Climate Change (mm/hr)	Historical (mm/hr)	15% Climate Change (mm/hr)
5 min	65.2	75.0	121.5	139.7
10 min	43.5	50.0	79.9	91.9
15 min	35.7	41.1	67.9	78.1
30 min	22.1	25.4	42.1	48.4
1 hr	12.7	14.6	22.9	26.3
2 hr	7.7	8.9	13.1	15.1
6 hr	3.3	3.8	5.3	6.1
12 hr	2.0	2.3	3.1	3.6
24 hr	1.2	1.4	1.7	2.0

3.2 Stormwater Modelling

PCSWMM Version 7.5.3406 developed by Computation Hydraulics International was used to conduct the hydrologic and hydraulic modelling to assess the current levels of runoff for the site. Information on the current stormwater system was limited to information publicly available through the City of Kelowna web map and what was observable on site. It is assumed that the information available is accurate and representative of the site.

The model's geometry was constructed using a digital terrain model (DEM) of the 2017 LiDAR data available through LidarBC. The watershed area of Lot 1634 was estimated as 1.14 ha and 1.62 ha for Lot 1574. The catchment area for both lots are limited to the lots themselves with the surrounding areas flowing away from the properties. Flow paths were estimated based on the shape of topography and slopes were calculated using the slope tool in PCSWMM. Infiltration was modelled using the SCS curve number (CN) method. A CN of 98 was used to represent the paved parking lots and roof tops within the site. It was estimated that Lot 1574 is roughly 95% impermeable and Lot 1634 is 97% impermeable due to paved surfaces and roofs. The limited area of permeable area is confined to planters or the small gravel parking area around the pool.

Using an SCS Type II hydrograph, the peak flow for the current development condition was determined for the 5-year and 100-year events. Both the historical and climate change rainfall magnitudes for the current site were modelled and are summarized in Table 3.2 below.

Table 3.2: PCSWMM Peak Flow and 24-hour Volume Estimates

Lot	Return Period	Peak Runoff for Current Development (m^3/s)	24-hour Storm Volume for Current Development (m^3)
1574	5-year Historical	0.145	425
	5-year CC	0.170	494
	100-year Historical	0.216	619
	100-year CC	0.253	717
1634	5-year Historical	0.077	299
	5-year CC	0.091	347
	100-year Historical	0.115	435
	100-year CC	0.135	504

Based on the PCSWMM model, significant infiltration is expected during a pre-development rainfall event and would have minimal concentrated overland flow.

3.3 Rational Method

The rational method as detailed in the subdivision servicing bylaw was utilized as a check to the PCSWMM model results. A secondary analysis was undertaken to provide a preliminary estimate of the predevelopment conditions using the Rational Method. Bylaw 7900 defines the “Pre-development condition as the natural condition prior to any development changes, including those resulting from past development activities”. Equation inputs were based on rough approximations from the digital terrain model. The equation for the rational method is shown below.

$$Q = RAIN$$

Where:

Q = Peak Flow (m^3/s)

R = Runoff Coefficient (C) x Adjustment Factor (C_{AFs})

A = Area of Catchment (ha)

I = Intensity of Rainfall (mm/hr)

N = 1/360

The runoff coefficient used for the current development was 0.85 and 0.90 for the minor (5-year) and major (100-year) storms under current conditions. For pre-development conditions, runoff coefficients of 0.20 and 0.30 was assumed for the minor (5-year) and major (100-year) storms respectively. A runoff coefficient adjustment factor (C_{AF}) of 0.9 was used corresponding to sandy soil with flat slopes.

The Inlet Time (T_i) was estimated from the equation below and was used to select the appropriate rainfall intensity.

$$T_i = \frac{3.26\,(1.1 - C)L^{0.5}}{S^{0.33}}$$

Where:

T_i = Inlet Time (minutes)

C = Runoff Coefficient

L = Travel Distance (m)

S = Slope of Travel Path (%)

Based on the results of the equation above, a rainfall intensity for the 15-minute storm duration was selected for Lot 1634 and 10 minutes for Lot 1574 (for current conditions). The estimated intensity for pre-development conditions was based on a 1-hour storm duration for Lot 1634 and 30 minutes for Lot 1574. The peak flows calculated using the Rational Method are detailed below in Table 3.3.

Table 3.3: Rational Method Peak Flow Estimates

Lot	Return Period	Pre-development Peak Runoff (m^3/s)	Current Peak Runoff (m^3/s)
1574	5-year Historical	0.018	0.166
	5-year CC	0.021	0.191
	100-year Historical	0.051	0.324
	100-year CC	0.059	0.372
1634	5-year Historical	0.007	0.096
	5-year CC	0.008	0.111
	100-year Historical	0.020	0.194
	100-year CC	0.022	0.223

4.0 SUMMARY

Key points of the hydrotechnical review discussed in this report are:

- Current stormwater connection information is limited to details that are available through the City of Kelowna's map viewer. The map indicates that there is a single 200 mm diameter PVC stormwater connection at the south side of the lot 1634 Harvey Avenue and no outside connection identified for the lot 1574 Harvey Avenue. However, a drawing for the storm system along Burtch Road indicates that there is a 200 mm PVC stormwater connection at the northwest corner of lot 1574 Harvey Avenue.
- Due to the age of development in the area, obtaining an accurate picture of pre-development conditions before any development is not possible. A rough estimate of the pre-development condition has been provided based on typical values using the regional analysis. Actual historic conditions may vary.
- Both lots have been identified as being within the Mill Creek Floodplain as per the Mill Creek Flood Plain Bylaw No. 10248. The Flood Construction Level (FCL) ranges between 354.5 and 355.5 masl. The elevation of the terrain in the lot ranges from about 355 to 357 masl. This ground elevation appears to be above the existing FCL elevations. The lot elevation should remain 600 mm above the Burtch Rd. storm main obvert and minor lot grading may be required to achieve this.
- The minimum setback from a watercourse to any fill foundation or structural support required to elevate a floor system or pad above the flood level is 15 m for the Project Area.

- Rainfall estimates have been provided in Section 3.1. As part of ongoing efforts to adapt to climate change, Bylaw 7900 requires that capacity of storm works include an additional 15% upward adjustment to the Intensity-Duration-Frequency (IDF) curve.
- The 5 and 100-year peak flows and volumes developed in a PCSWMM model are detailed in Section 3.2 for the current conditions. Section 3.3 provides peak flow results using the Rational Method as a check and includes both current and predevelopment conditions. These flow estimates can be used as a base to inform future design, and will be refined as a better understanding of the future development is received.
- Outside drainage concerns are limited to the length of Burtch Road that does not have any curb or gutter. During large storm events, overflow from the road may be directed into the north end of the 1574 Harvey Avenue.

5.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Dialog BC Architecture Engineering Interior Design Planning Inc. and their agents. Tetra Tech Canada Inc. (operating as Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Dialog BC Architecture Engineering Interior Design Planning Inc., or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix or Contractual Terms and Conditions executed by both parties.

6.0 CLOSURE

We trust this document meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.

FILE: 704-ENG.KGEO03920-01
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APPENDIX A

TETRA TECH'S SERVICES AGREEMENT AND LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

HYDROTECHNICAL

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Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

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This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 ENVIRONMENTAL AND REGULATORY ISSUES

Unless expressly agreed to in the Services Agreement, TETRA TECH was not retained to explore, address or consider, and has not explored, addressed or considered any environmental or regulatory issues associated with the project.

1.8 LEVEL OF RISK

It is incumbent upon the Client and any Authorized Party, to be knowledgeable of the level of risk that has been incorporated into the project design, in consideration of the level of the hydrotechnical information that was reasonably acquired to facilitate completion of the design.

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TECHNICAL MEMORANDUM

DATE: February 14, 2024

TO: Dylan Bryce
Dialog BC c/o Tetra Tech

FROM: Arnd Burgert, P.Geo.
Email: aburgert@piteau.com

RE: Hydrogeology Assessment for Property Development
1574 & 1634 Harvey Avenue, Kelowna

Piteau Associates Engineering Ltd. (Piteau) was retained by Dialog BC to assess hydrogeology in the vicinity of the above-noted properties (the Site) in Kelowna to assist in the early planning stage of property redevelopment.

INTRODUCTION

We understand that structures ranging from 6 to 28 stories are being considered and an underground parkade would be desirable if feasible to construct. City of Kelowna guidelines require any future development to maintain current runoff and recharge rates.

The objectives of the study described in this report have included reviewing surficial geology and groundwater conditions in the vicinity of the Site, identifying potential effects of redevelopment on groundwater conditions and stream baseflows, estimating groundwater seepage rates into an excavation at the Site, and providing recommendations for mitigation.

Work completed has included review of published information on geology and groundwater conditions, review of on-site geotechnical borehole information, and reconnaissance in the vicinity of the Site by Piteau hydrogeologist K. McCulloch on February 9, 2024. The results of this program of investigation are summarized in this technical memorandum.

BACKGROUND

Location and Land Use

The Site lies between Harvey Avenue and Burtch Road in the Landmark neighbourhood of Kelowna (Figure 1). It is a commercial site with three large buildings up to three stories high surrounded by paved parking lots. The Site covers 2.76 Ha, of which about 94% consists of hardened surfaces (pavement or roof). Parkinson Recreational Park lies immediately to the east.

Topography and Vegetation

Topography is nearly flat, with elevations varying by less than 2 m across the Site (Photo 1). The Mill Creek drainage is situated within a channel incised about 3 m below the level grade at the southeast end of the Site.

As this region of Kelowna is fully developed, vegetation consists mostly of sparsely distributed mature deciduous trees and shrubs in landscaped areas. Parkinson Park features large turf playing fields. A strip of mature deciduous timber and shrubs are found along the Mill Creek corridor.

Surface Water Hydrology and Flood Construction Level

The main drainage traversing East Kelowna is Mission Creek, situated 2.1 km southeast of the Site (Figure 1). Its catchment encompasses an area of 8,110 Ha[1]. Discharge gauging[2] in East Kelowna (08NM116 on Figure 1) indicates the annual maximum discharge typically occurs in May (Figure 2).

Mill Creek is situated adjacent to the southeast end of the Site where it passes through a culvert under Harvey Avenue (Photo 2), and has a760 Ha catchment. Flow data are available from a gauging station situated 3.5 km northeast (upstream) of the Site (08NM053 on Figure 1[3]). The annual maximum discharge typically occurred during May (Figure 2).

Brandt Creek is situated 950 m north of the Site (Figure 1) and has a 320 Ha catchment area. A 2 km reach of the stream passing through the Glenmore neighbourhood north of Clement Avenue is culverted. A discharge hydrograph for a station near the mouth at Okanagan Lake (08NM152 on Figure 1[4]) indicates the annual maximum discharge occurs in March (Figure 2). This peak is about two months earlier than in Mill and Mission Creeks, a result of their larger watersheds and discharge contributed from melting snow.

Fascieux Creek is situated 1.8 km south of the Site. West of Gordon Drive it follows anthropogenically modified channels and culverts.

As summarized in Tetra tech's recent geotechnical report, the Flood Construction Level at the Site shall be the higher of 600 mm above the elevation of the storm main obvert or as indicated on the City's Mill Creek flood plain mapping. The latter ranges between 355 and 356 m-asl at the Site[5], which is equivalent to about 0.5 m-bgl. Accordingly, any subgrade development will require exemption or variance.

Surficial Geology

A sand and gravel outwash deposit (Bessette Sediments) lies below the Site at a depth of about 50 m-below ground level (m-bgl). It was deposited by rivers during the Olympia non-glacial

[1] Golder Associates, 2004. Initial Phase Groundwater Protection Planning Greater Kelowna Aquifer Kelowna, BC. Report to Kelowna Joint Water Committee. August 10.
[2] Water Survey of Canada, 2024. Historical Hydrometric Data Search - Water Level and Flow - Environment Canada (ec.gc.ca) Downloaded on February 6, 2024.
[3] Identified as Kelowna Creek station
[4] Water Survey of Canada records indicate this station is situated about 950 m south of the main Brandt Creek channel. The reason for the apparent discrepancy is unclear.
[5] Tetra Tech, 2024. Geotechnical Site Due Diligence at 1574 & 1634 Harvey Lands, Kelowna, BC. Report to Dialog BC. January 16.

interval between the Fraser and Okanagan Centre glaciations, between 50,000 and 35,000 years before present[6].

The Bessette Sediments are overlain by a deposit of lacustrine silt and clay about 40 m thick that was formed when glacial damming of the Okanagan Valley had created Lake Penticton. While the lacustrine sediments have been eroded by fluvial action at the Site, they are exposed along a terrace 100 m to the northwest (Figure 3).

The uppermost unit at the Site is the Mission Creek alluvial fan. It consists of unconsolidated sand and gravel with silt interbeds deposited by Mission and Mill creeks after the latest glaciation (beginning about 11,000 years before present). A log for a monitoring well constructed at the Site (MW24-01) indicates the fan deposit is 8.5 m thick at this location (Appendix A).

The uppermost portion of the fan at the Site consists of a sandy silt deposit with varying admixture of clay, interpreted as an overbank stream deposit. It is 2.3 m thick at MW24-01. This is the only unit exposed along Mill Creek adjacent to Parkinson Park and the Site (Photos 2 and 3).

Surficial deposits are depicted in the cross sections on Figure 4, drawn along the red lines on Figure 3.

Groundwater Resources

Aquifers in the Kelowna area have been mapped by the provincial government[7], and a 2018 Piteau study[8] included three-dimensional modeling of the aquifers. Table 1 summarizing the geologic period, environment, hydrostratigraphic unit, and diagnostic features of surficial stratigraphy at the Site is modified after the 2018 Piteau study.

Table 1: Summary of hydrostratigraphic units present at the Site.

Period	Environment	Hydraulic Unit	Aquifer Number	Diagnostic Character
Holocene	modern	Mission Creek Aquifer	467	modern shallow deposits; <30 m depth
Late Fraser Glaciation (Late Wisconsin)	glacial lake	Lake Penticton aquitard		varved silts and clays; Lake Penticton highstand 360 m-elev; higher elevation perched lakes in Glenmore, Airport and Black Mountain
Fraser Glaciation (Late Wisconsin)	glacial ice sheet	Fraser till aquitard		diamicton (clay + gravel, sand etc), hardground; at surface or up to 100m deep
	ice contact	Bellevue and Greater Kelowna Aquifers	462, 464	sand and gravel interlayered or closely associated with till; kame, esker or other glacial morphology
Bessette Sediments (Mid-Wisconsin)	non-glacial, subaerial			highly productive sand and gravel aquifer bracketed by glacial deposits; artesian below low lying areas

[6] Lesemann, J., T. Brennand, O. Lian, and P. Sanborn, 2013. A refined understanding of the paleoenvironmental history recorded at the Okanagan Centre station, an MIS 4 stratotype, south-central British Columbia, Canada. Journal of Quaternary Science (2013) 28(8) 729-747.

[7] Kreye, R., Ronneseth K., and Wei, M., 1994. An Aquifer Classification System for Ground Water Management in British Columbia. *In* Proceedings, 6th National Drinking Water Conference, Victoria, BC.

[8] Stewart, M. and R. Allard, 2018. A revised geological model and hydrostratigraphic framework for the Kelowna-Mission Aquifers. BC Ministry of Environment Water Science Series, WSS2018-03.

Information pertaining to the two aquifers present at the Site is summarized in the following sections.

Aquifer 464 (Greater Kelowna Aquifer)

Aquifer 464 is confined aquifer lying at a depth of more than 31 m-bgl at the Site (Figure 5). It extends from Okanagan Lake to Okanagan Mission to the south, through downtown Kelowna, east through Southeast Kelowna and Rutland and north to Ellison Lake[9].

The deposit consists of non-glacial alluvial sand and gravel beds deposited between the two latest glacial intervals (Bessette Sediments). The aquifer is confined by glacial till and lacustrine silt-clay units except where the aquifer is draped onto bedrock near its eastern extent, or where the confining layers are incised by drainages, particularly where Mission Creek exits Gallaghers Canyon 7 km southeast of the Site.

The low-permeability confining layers results in the aquifer having low vulnerability to pollution from surface sources. Aquifer productivity is high, and the aquifer is a source for wells providing municipal, industrial, irrigation, and domestic supplies.

Interpreted sources of recharge to Aquifer 464 include infiltration along the elevated margins where confinement is thin or absent, discharge from underlying fractured bedrock, and exfiltration from Mission Creek below Gallaghers Canyon where the stream valley is incised through the confining layers.

In the Kelowna City area Aquifer 464 exhibits artesian heads, with the water level in wells rising above the top of the aquifer. In this area the thick confining layer prevents direct connectivity between the aquifer and streams.

Aquifer 467 (Mission Creek Aquifer)

Aquifer 467 is hosted within alluvial sand and gravel belonging to the Mission Creek fan overlying the lacustrine silt-clay sediments that confine the deeper Aquifer 464. At monitoring well MW24-01 at the Site the aquifer is 6.4 m thick. Although considered unconfined[10] the aquifer at this location is covered by 2.3 m of sandy silt. Aquifer 467 extends across the lowland area from Okanagan Lake to Gallagher Canyon, and north to Kelowna Airport (10 km northeast of the Site).

As the aquifer is generally unconfined, its vulnerability to pollution from surface sources is high. Productivity is moderate to high. The average reported yield of the 94 wells in the Mission Creek aquifer is 3.8 L/s (61 USgpm). This is a relatively high rate given that most of the wells are either small-diameter domestic wells or shallow dug wells, neither of which was designed to deliver large flows. The maximum recorded flow rate for the aquifer is 41.0 L/s (650 USgpm). The granular sediments and high well yields indicates a highly transmissive aquifer.

MW24-01 has a screen in Aquifer 467 between 3.0 and 5.9 m-bgl. At 2.1 m-bgl, the water table on January 3, 2024 was slightly above the top of the sand and gravel unit. The elevation of the water table is expected to reach a maximum in late spring and a minimum in late summer.

[9] BC Ministry of Environment, 2018. Aquifer Mapping Report, Aquifer 464. https://s3.ca-central-1.amazonaws.com/aquifer-docs/00400/AQ_00464_Aquifer_Mapping_Report.pdf. Downloaded February 5, 2024.
[10] BC Ministry of Environment, 2018. Aquifer Mapping Report, Aquifer 467. https://s3.ca-central-1.amazonaws.com/aquifer-docs/00400/AQ_00464_Aquifer_Mapping_Report.pdf. Downloaded February 5, 2024

Continual water level monitoring is in progress to facilitate preparation of a hydrograph following freshet in late spring.

Recharge to the aquifer is by direct precipitation, leakage from streams, and irrigation return flow from domestic and agricultural land use. The aquifer is interpreted to have high hydraulic connectivity to watercourses including Mill Creek. The reach crossing the City of Kelowna is reported to lose water via seepage through the stream bed to the aquifer[11,12]. However, water table levels measured in MW24-01 at the Site suggest the creek may be gaining at some times of the year. This can be confirmed when water level monitoring results for MW24-01 are available.

The inferred groundwater flow direction in Aquifer 467 at the Site is from east to west. As the reach of Mill Creek in Kelowna City is interpreted to be losing at most times of the year, the annual maximum water table in the aquifer can be expected to roughly coincide with the peak discharge in Mill Creek (i.e., May).

Shallow Saturated Zones, Interflow, and Ponding

We understand ponding of water occasionally occurs on the ground surface withing the sports fields in Parkinson Park east of the Site. Such ponding likely results from surface runoff perching atop the sandy silt deposit; it is not considered representative of the water level in Aquifer 467. Surface ponding may be most prevalent near the beginning of a precipitation event when the upper part of the soil column is unsaturated and air-locking of pore spaces can hamper vertical percolation. Drainage may improve once a saturated front is hydraulically connected to the underlying aquifer.

ESTIMATE OF GROUNDWATER INFLOWS

Piteau has used simple equilibrium equations for radial groundwater flow to estimate the potential magnitude of groundwater inflow to an excavation measuring 100 m long by 50 m wide, and extending 4 m below the water table[13]. Estimated steady-state inflows for both construction dewatering and permanent footing drains range from about 9 to 17 L/s (135 to 270 USgpm). Higher flows can be expected during the initial stages of dewatering before equilibrium conditions are reached and flows can be expected to increase in the rainy season when recharge occurs directly within the zone of drawdown influence around the building perimeter. As these estimates are based on assumed material properties, and excavation area and depth, actual groundwater inflows values may be more or less.

ASSESSMENT AND MITIGATION OF EFFECTS

Potential Effects of Development on Aquifer and Hydrology

Impacts that could result from a commercial development include diversion of rain water from soils as surfaces are hardened by rooftops and paved areas. Reduced infiltration and groundwater recharge may result in less groundwater being stored to sustain creek base flows, particularly in the late summer and fall.

[11] Neumann, N., 2018. Mission Creek groundwater – surface water interactions project: Analysis of discharge and water level records. BC Ministry of Environment Water Science Series, WSS2018-06.
[12] Alloisio S. and H. R. Smith., 2016. Monthly groundwater budget for the aquifers in the Kelowna BC area. BC Ministry of Environment Water Science Series WSS2016-10.
[13] Estimated using Dupuit's equation with assumed hydraulic conductivity values ranging from 5 x 10^{-5} to 1 x 10^{-4} m/s, based on literature values for a sand and gravel deposit.

Direct discharge of stormwater to surface watercourses may also pose water quality risks. This is particularly significant during the early stages of a runoff event when particulates and films that have accumulated on the ground surface (e.g., oil and grease, grit, metals, nutrients, and other low-level contaminants), concentrate in the initial flows (i.e., “first flush”).

Traditional stormwater management approaches could result in degradation of streams and riparian areas associated with direct drainage of high flows from impermeable areas. Runoff from these areas can have shorter times of concentration compared to the undeveloped condition. The resulting flows can lead to scouring of stream banks, and removal of sand and gravel beds used by fish for spawning.

To help mitigate potential physical and chemical impacts, infiltration of stormwater is desirable as a means of attenuating peak flows and contaminants, and maintaining seepage that sustains baseflows. This can be achieved by incorporating infiltration features such as roadside swales, rain gardens, buffer strips, etc., into lot grading plans. When the inflow rate exceeds their infiltrative capacity, these features can overflow to drainage systems leading to a detention system.

Since the Site has already been developed and most of the area is already occupied by hardened surfaces, adverse changes in runoff and recharge rates are unlikely to result from redevelopment provided measures for infiltration are incorporated into new designs.

Infiltration Measures

Based on regional surficial geology mapping, a site reconnaissance, and experience with similar sediments in other areas, the potential for infiltration into sand and gravel deposits at the Site appears high. An upper layer of silty topsoil (2.2 m thick at MW24-01) contains over 50% fines (silt and clay)[14], and will present a rate-limiting unit for percolation. Infiltration features should be designed to bypass this layer by removing it and replacing it with a granular medium having the design transmissivity.

The relatively shallow water level at the Site may limit potential infiltration rates at some times of the year. The long-term infiltration capacity will be controlled by the capacity for water to be transmitted laterally through the sediments.

Mapping areas with higher or lower infiltrative capacity is not necessary provided that infiltration is distributed as far as practicable throughout the Site area. For example, linear features such as vegetated swales or buffer strips can be laid out along roadways to passively distribute water to locations where infiltration can occur. Backfill in utility trenches could be designed to act as infiltration galleries providing temporary in-ground storage for stormwater, subject to the inclusion of check dams to prevent lateral seepage along trenches.

Aquifer Protection

Groundwater in aquifers is an important source of water for both human use and for maintaining base flows to aquatic habitats. Management of this shared resource should seek to maintain or enhance aquifer recharge while preventing pollutants from making their way into the groundwater. The aforementioned infiltration features provide an opportunity for runoff to be renovated by processes such as bacterial biodegradation, adsorption, and physical straining. Studies

[14] Tetra Tech, 2024. Geotechnical Site Due Diligence at 1574 & 1634 Harvey lands, Kelowna, BC. Report to Dialog BC. January 16.

assessing the performance of passive infiltration systems have demonstrated their effectiveness in capturing suspended pollutants. Water seeping into the ground is typically renovated within a few centimetres or decimetres of an infiltration feature.

Aquifer 467 is covered with a relatively thin layer of silty sediments and it may be desirable to infiltrate storm water into the underlying sand and gravel comprising the aquifer. To mitigate the risk of infiltrating potential pollutants directly into the aquifer, a 0.4 m layer of construction sand should be placed along the base of infiltration features to provide an opportunity for filtration of water seeping into the underlying native sediments.

Preventing Preferential Pathways

Permanent buried check dams must be incorporated in backfill in all utility trenches excavated in the sandy silt unit to prevent preferential seepage along backfill materials. Check dams should consist of a mixture of 7 to 10% granular (<3.2 mm or 1/8”) or powdered bentonite and sand. They should be at least 0.3 m thick, extend across the entire width and depth of trench, and come as near as practicable to ground surface. A check dam spacing of 12 to 15 m along trenches is recommended, with final locations to be field fit as convenient.

Site Suitability

Wherever possible it is desirable to infiltrate runoff. This will require sufficient soil permeability and unsaturated thickness. Estimated water levels in wells screened in Aquifer 467 are shown as blue triangles on Figure 5. These indicate that at the Site water levels may pose a constraint on infiltration from ground surface, particularly during heavy or prolonged precipitation events. Accordingly, infiltration features should be incorporated into lot grading plans and designed to allow overflow from each feature to decant to a surface detention feature for release to Mill Creek.

CONSTRUCTION DESIGN

Methods for long-term groundwater control will be required for future buildings that may extend below the water table. Options include the use of a permanent foundation sub drain system connected to a sump to intercept groundwater that would otherwise come into contact with the foundation, or incorporating waterproofing and additional strength and weight to the foundation to prevent water ingress and to withstand hydrostatic pressure and counteract buoyancy (i.e., “tanked” foundation). A hybrid design incorporating a foundation and sub-drain system constructed within a groundwater cutoff may also be feasible.

Potential effects of these methods are discussed in this section along with mitigation strategies to reduce potential effects on Mill Creek.

Tanked Foundation

A tanked foundation would avoid the need for long-term groundwater extraction, and thus there will be no direct long-term effect on aquifer levels or discharges to streams. As indicated above, this can be achieved by a waterproof foundation with sufficient strength and weight withstand hydrostatic pressure and counteract buoyancy.

Foundation Sub Drain System

Use of a permanent foundation sub drain system to intercept groundwater and prevent it from coming into contact with the foundation walls or underside of the floor slab can be expected to divert seepage away from Mill Creek during times of the year when the water table is high and in

communication with the creek. Conversely, during the summer when the water table is assumed to be below the creek invert, the rate of vertical seepage through the stream bed would likely not be affected by groundwater abstraction at the Site. Under these assumptions the summertime baseflow in Mill Creek would likely not be affected by withdrawal of groundwater at the Site. The water table and stream channel invert elevations would need to be confirmed to validate these assumptions.

The aforementioned relatively high projected inflow rate may cause operation of a sub drain system to be undesirable as it would necessitate continuous operation of pumping equipment. Operation of pumps at the projected flow rates could be considered a non-conformance with EGBC Sustainability Guidelines that promote sustainable engineering design[15].

As discharge of pumped groundwater to the storm sewer or Mill Creek are likely to be prohibited, groundwater pumped from a sub drain would likely need to be infiltrated. Given the relatively high projected flow rate, infiltration within the Site may not be feasible without a substantial proportion of infiltrated water recirculating back into the subdrain, or causing local flooding. Characterizing the aquifer sufficiently to design a pumping system will require additional field testing. Accordingly, successful operation of a foundation drain system at the Site may not be feasible.

Hybrid Approach

A hybrid design for a foundation below the water table elevation may be feasible at the Site. This would include a conventional foundation with a sub-drain system that is completely surrounded by a groundwater cutoff and excavation shoring system that penetrates from surface into low permeability sediments underlying Aquifer 467 (approximate depth = 8.5 m). This could be expected to reduce inflows into the foundation drains to a fraction of the previously estimated range, and it is possible this amount of seepage can be dissipated on-Site via infiltration or injection wells on the exterior side of the cutoff wall.

Construction Dewatering

To the extent practicable, any groundwater pumped from the excavation during construction should be infiltrated at the Site. Since the water pumped during construction will be relatively turbid, consideration should be given to establishing a settling pond draining to an infiltration swale lined with a sacrificial layer of filter sand that can be reworked or replaced, as required, to prevent plugging off with fine sediment.

Potential Settlement

Settlement can occur when compressible sediments are dewatered. Since dewatering will be required during construction of any foundation extending below the water table, the potential for settlement to affect neighbouring properties or roadways should be assessed once the design depth for any new construction, and the seasonal water table range at the Site, are available.

CONCLUSIONS AND RECOMMENDATIONS

Planning for future development at 1574 & 1634 Harvey Avenue in Kelowna is underway, and an improved understanding of the surficial geology and hydrogeology was required to assist with the planning of stormwater infiltration infrastructure and potential subgrade construction. Piteau has reviewed soil and hydrogeologic conditions within the Site and its vicinity to identify potential

[15] EGBC, 2023. Professional Practice Guidelines Sustainability. Version 2. April 20.

effects of development on aquifers and stream baseflows, assess the feasibility of infiltrating stormwater, and provide comments with respect to subgrade excavations. Key findings and recommendations are summarized below:

1. Surficial geology mapping and a test borehole indicate that sediments at the Site comprise an alluvial fan deposit that includes about 2 m of sandy silt overlying a further 7 m of gravel and sand.
2. Aquifer 467, hosted in the fan deposit at the Site, has a high permeability. The water level on January 3, 2024 was 2.1 m-bgl, and this is expected to reach a maximum in spring and a minimum in late summer. Continual water level monitoring is in progress.
3. The reach of Mill Creek adjacent to the southeast end of the Site appears to follow a channel incised into the sandy silt unit. The creek is interpreted as gaining in the spring when aquifer levels are high, and losing during summer. This interpretation can be confirmed when water level monitoring data are available.
4. As the Site is already developed with about 94% of area hardened (rooftops/asphalt), redevelopment is unlikely to result in increased runoff rates provided infiltration measures are incorporated into designs.
5. Infiltration of stormwater via shallow features such as swales, buffer strips, and rain gardens, appears feasible at the Site. As the upper sandy silt layer will limit infiltration, it may be desirable to remove this material where infiltration is desired and backfill with granular material connected to the underlying sand and gravel.
6. Infiltration rates may be constrained by depth to the water table, particularly during wetter months. When they become incapable of infiltrating water at the rate of inflow, drainage systems should have adequate local storage capacity, or should overflow to other infiltration systems, and ultimately to a detention system.
7. Infiltration of stormwater runoff into the shallow sediments at the Site is not expected to result in aquifer pollution provided that a layer of construction sand is applied on the infiltrative surface to provide an opportunity for filtration of suspended solids.
8. To optimize the amount that can be infiltrated, to the extent possible, infiltration systems should distribute stormwater throughout the Site rather than concentrating flows in a few small areas.
9. The rate of groundwater inflow into a 100 x 50 m excavation extending 4 m below the water table ranges from about 9 to 17 L/s (135 to 270 USgpm). These relatively high rates render a pumped foundation subdrain system undesirable. Utilization of a fully tanked or hybrid design is recommended if foundations extending below the water table will be constructed at the Site.
10. For any proposed construction extending below the water table, the potential for settlement to affect neighbouring properties or roadways should be assessed by a geotechnical engineer.

LIMITATIONS

This investigation has been conducted using a standard of care consistent with that expected of scientific and engineering professionals undertaking similar work under similar conditions in BC. No warranty is expressed or implied.

This memorandum is prepared for the sole use of Dialog BC. Any use, interpretation, or reliance on this information by any third party, is at the sole risk of that party, and Piteau Associates accepts no liability for such unauthorized use.

CLOSING

We trust the above is adequate for your current needs. If you have any questions regarding the above, or we can be of further service, please contact the undersigned.

Respectfully submitted,

PITEAU ASSOCIATES ENGINEERING LTD.

Arnd Burgert, P.Geo.
Sr. Hydrogeologist

Reviewed by:

David J. Tiplady, P.Eng.
Principal Hydrogeologist
Vice President, Hydrogeology

AB/DJT/ld
Att.

FIGURES

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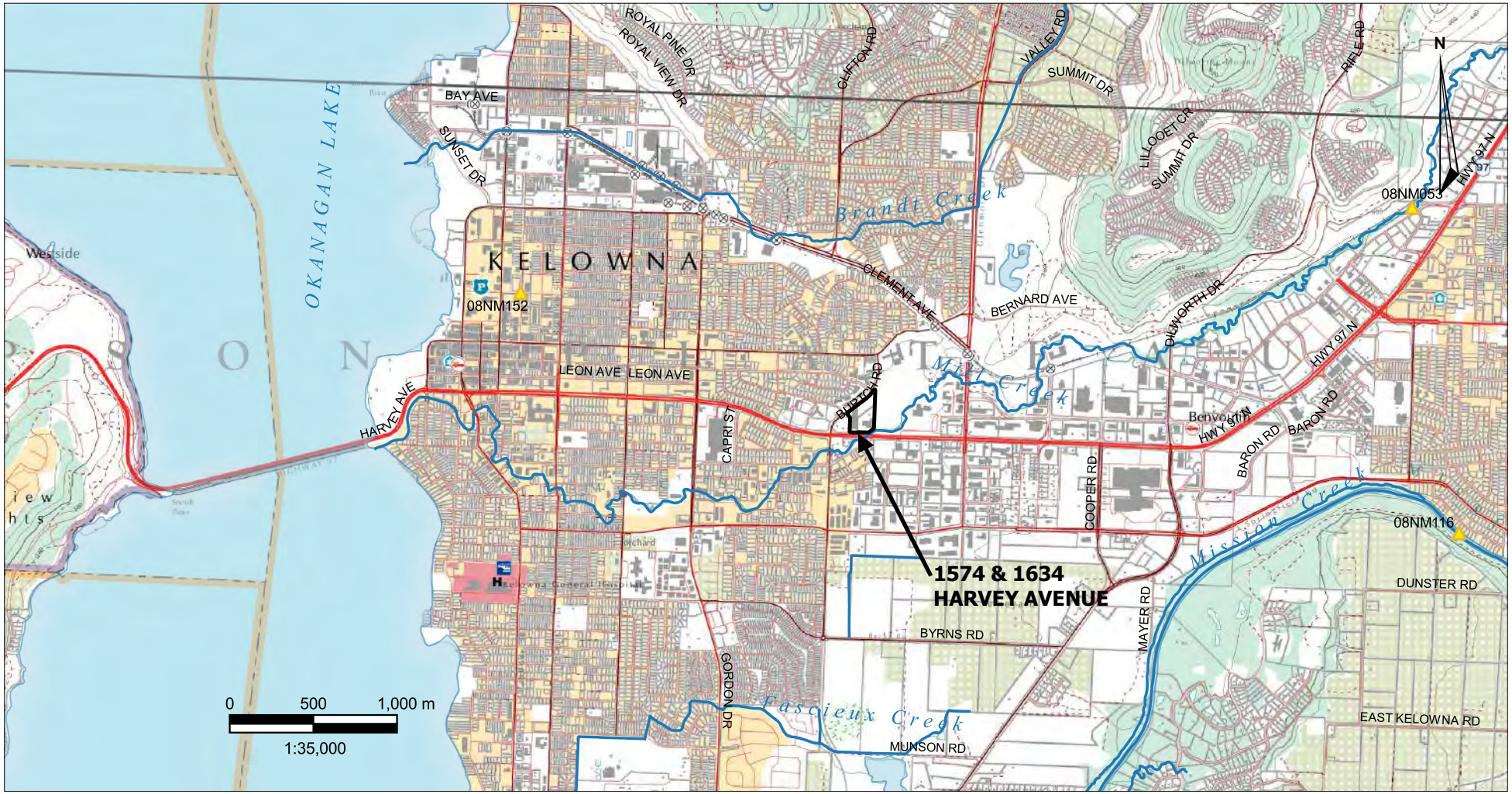

Legend

- WCS Station
- Site

ATTACHMENT A
This forms part of application
ARP24-0001 OCP24-0012
Planner Initials MT
City of Kelowna
DEVELOPMENT PLANNING

DIALOG BC
HYDROGEOLOGY ASSESSMENT FOR
PROPERTY DEVELOPMENT
1574 & 1634 HARVEY AVENUE, KELOWNA

PITEAU ASSOCIATES
GEOTECHNICAL AND WATER MANAGEMENT CONSULTANTS
A TETRA TECH COMPANY

LOCATION PLAN

BY:	DATE:
AB	FEB 24
APPROVED:	FIG:
DJT	1

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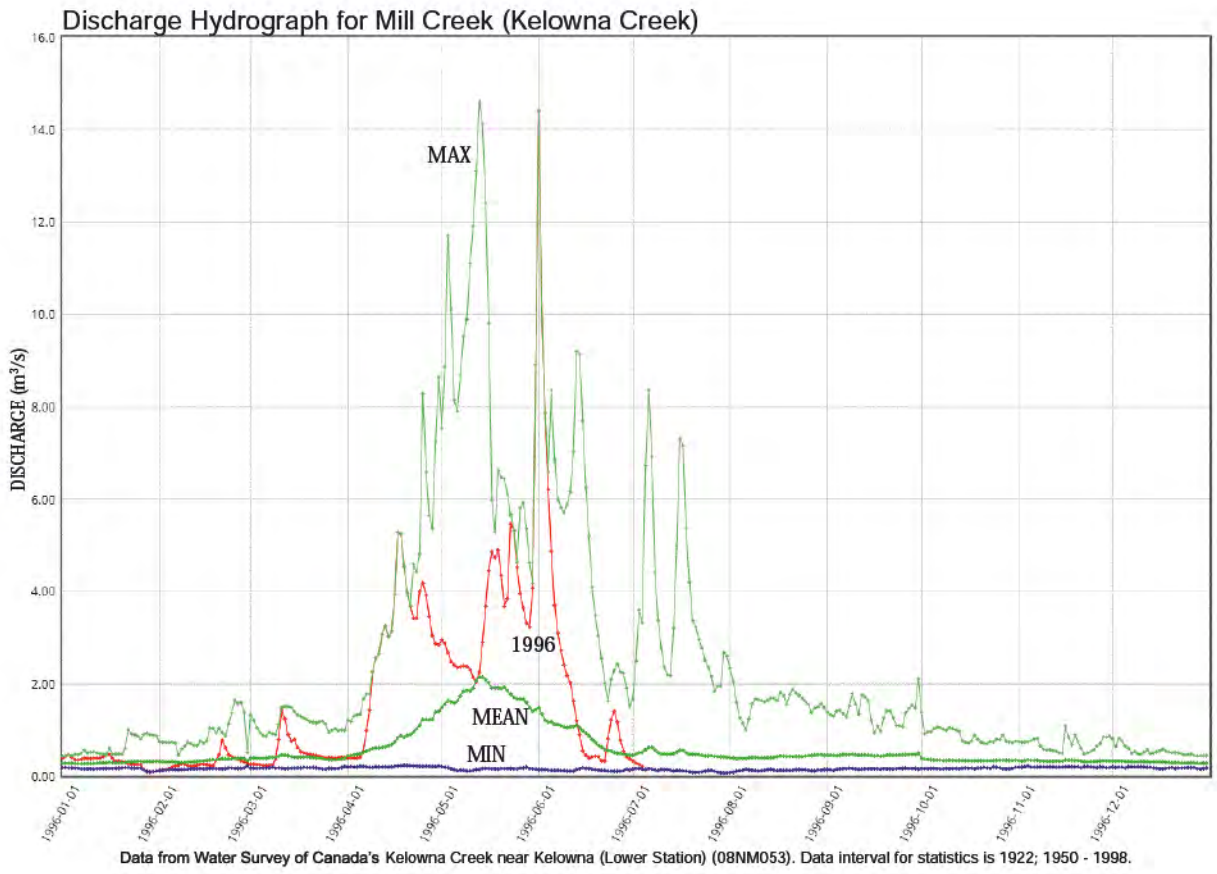

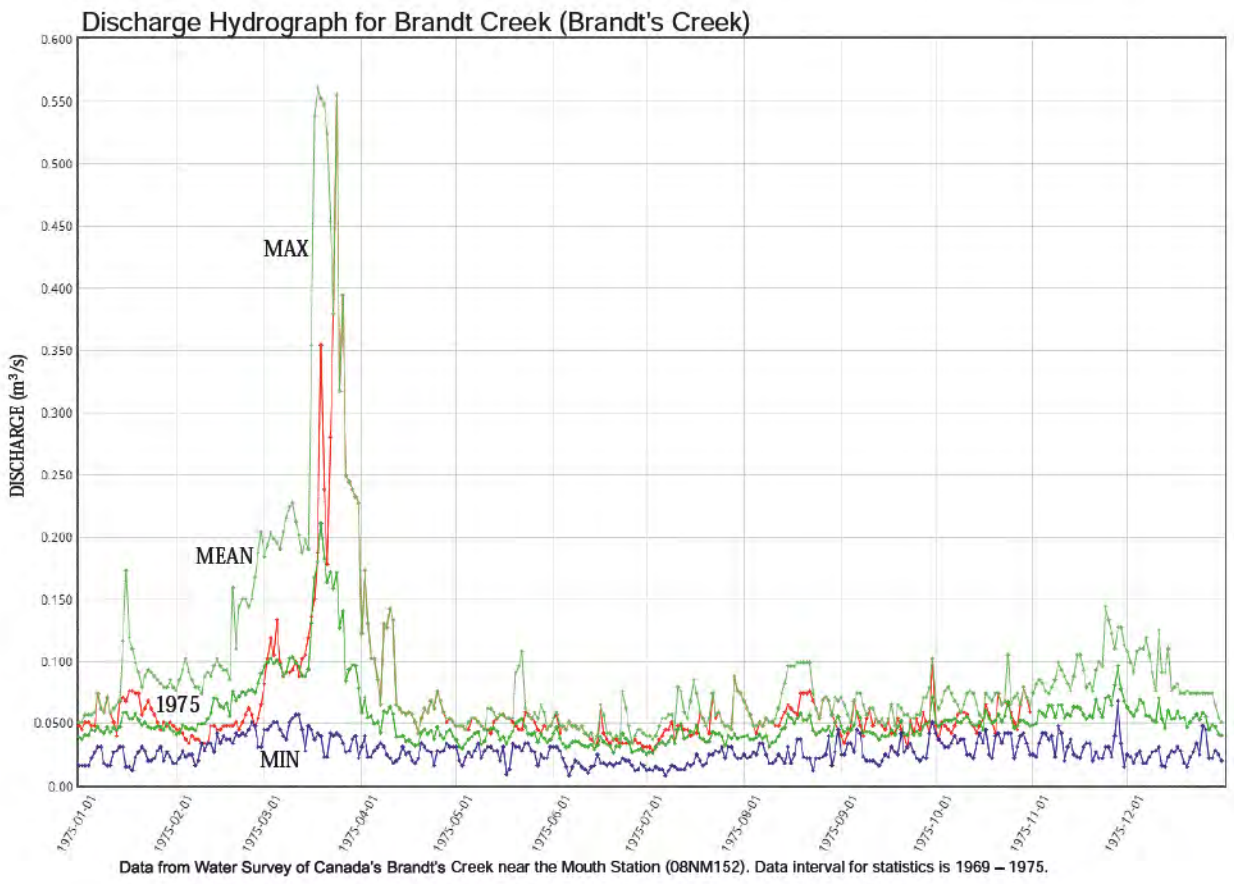

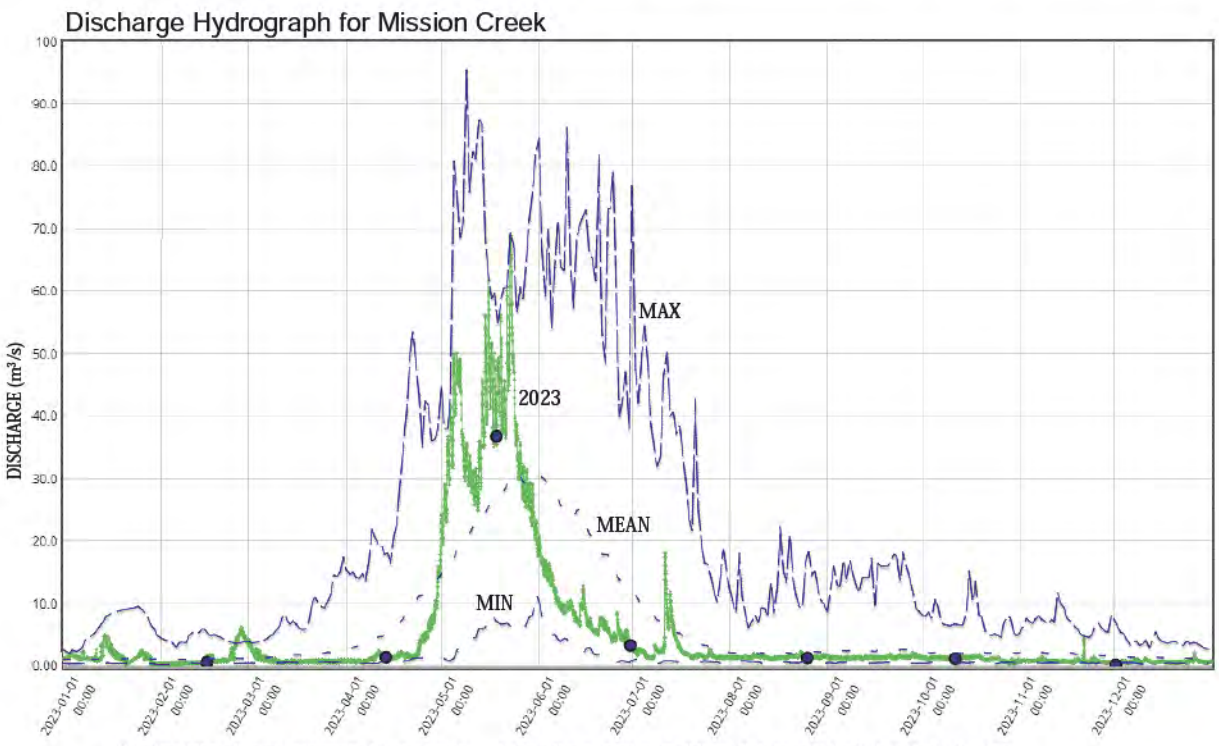

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STREAM DISCHARGE HYDROGRAPHS

BY:	DATE:
AB	FEB 24
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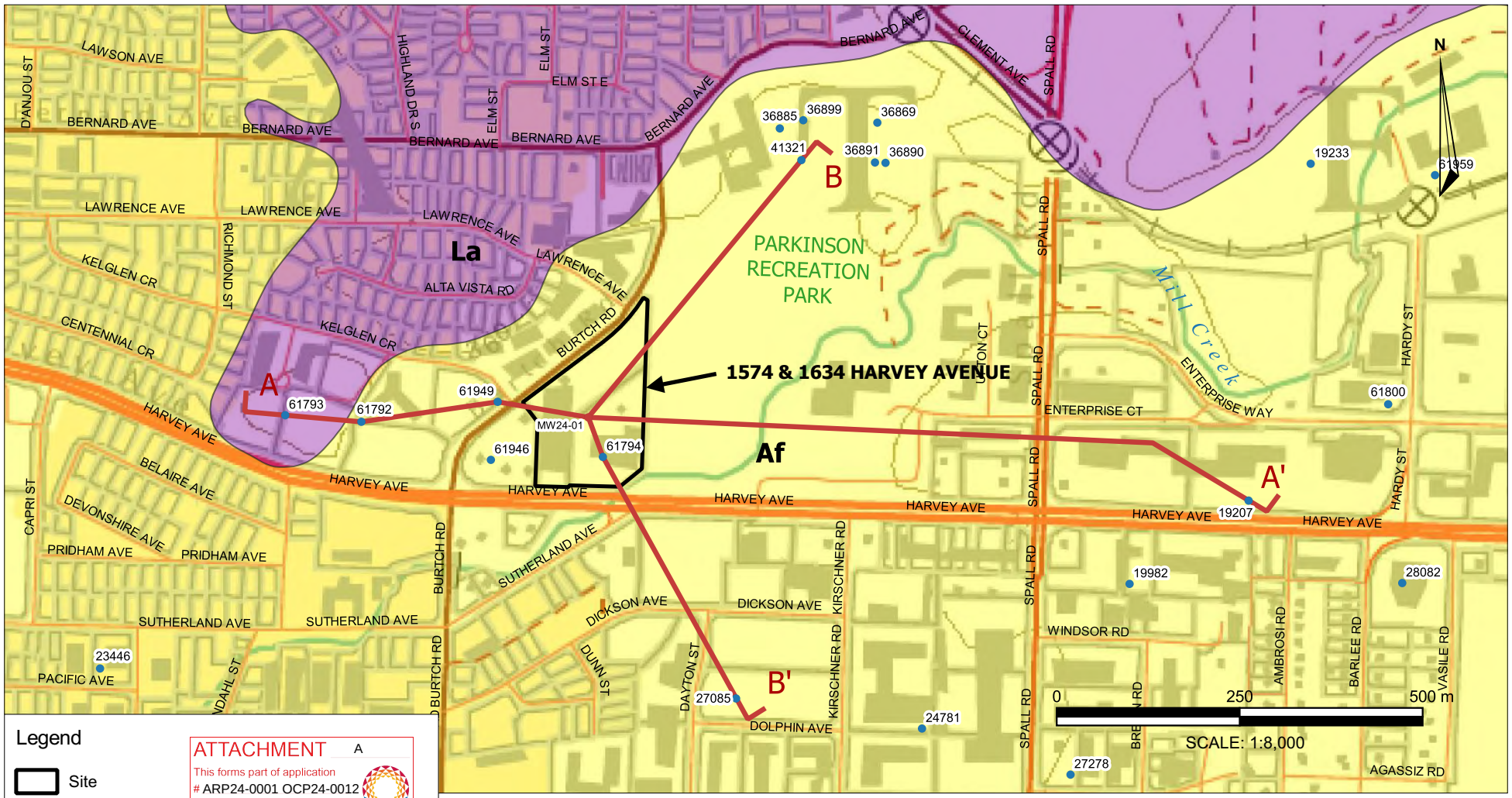
DJT	2



Legend

- Site
- Cross Section

WELL

- Registered Water Well with Well Tag No.
- Monitoring Well

SURFICIAL GEOLOGY

- Af Alluvial Fan - poorly sorted gravel, sand, silt, and clay
- La Glacio-lacustrine deep-water sediments: silt and clay 0.5 to 8 m thick deposited in more than 50 m of water.

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1574 & 1634 HARVEY AVENUE, KELOWNA

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SURFICIAL GEOLOGY

BY:	DATE:
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APPROVED:	FIG:
DJT	3

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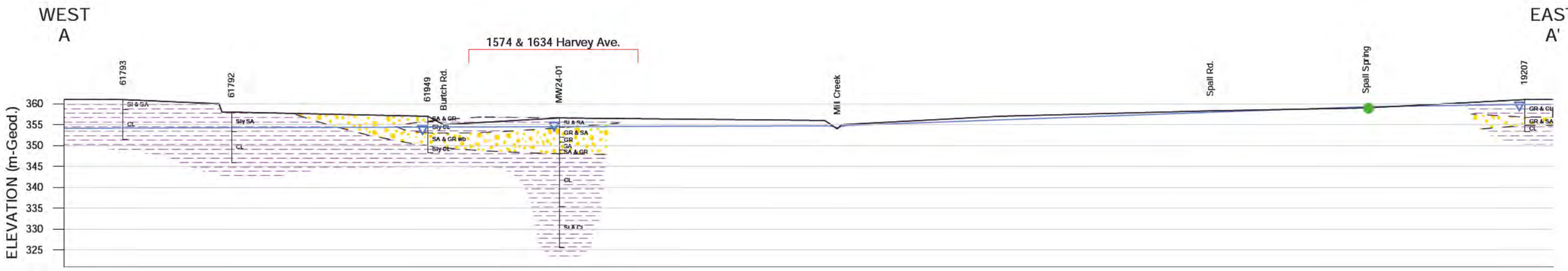
WEST
A



EAST
A'

NORTH
B

SOUTH
B'

SCALE

0 50 100 150 200m

1:4,000

Vertical Exaggeration 4X

LEGEND

Registered Well with Well Tag No.

2148

CL
dn Grly Sl
SA+GR
SA
SA+GR

Estimated Water Level in Aquifer 467

Spring or Seep

Interpreted Lithology:

La Lacustrine Silt and Clay
Af Alluvial Sand and Gravel

PROPORTIONS

NOTATION		MEANING	EXAMPLE
&		similar proportion	SA & GR
upper case		> 50%	SAND
... y		35 - 50%	Sandy
sm	some	20 - 35%	sm Sand
lit	little	10 - 20 %	lit Sand
tr	trace	1 - 10%	tr Sand

ABBREVIATIONS

BO	boulder	SA	sand
CO	cobble	SI	silt
GR	gravel	CL	clay

Notations:
wb water-bearing
dn dense

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1574 & 1634 HARVEY AVENUE, KELOWNA

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CROSS SECTIONS

BY:	DATE:
AB	FEB 24
APPROVED:	FIG:
DJT	4

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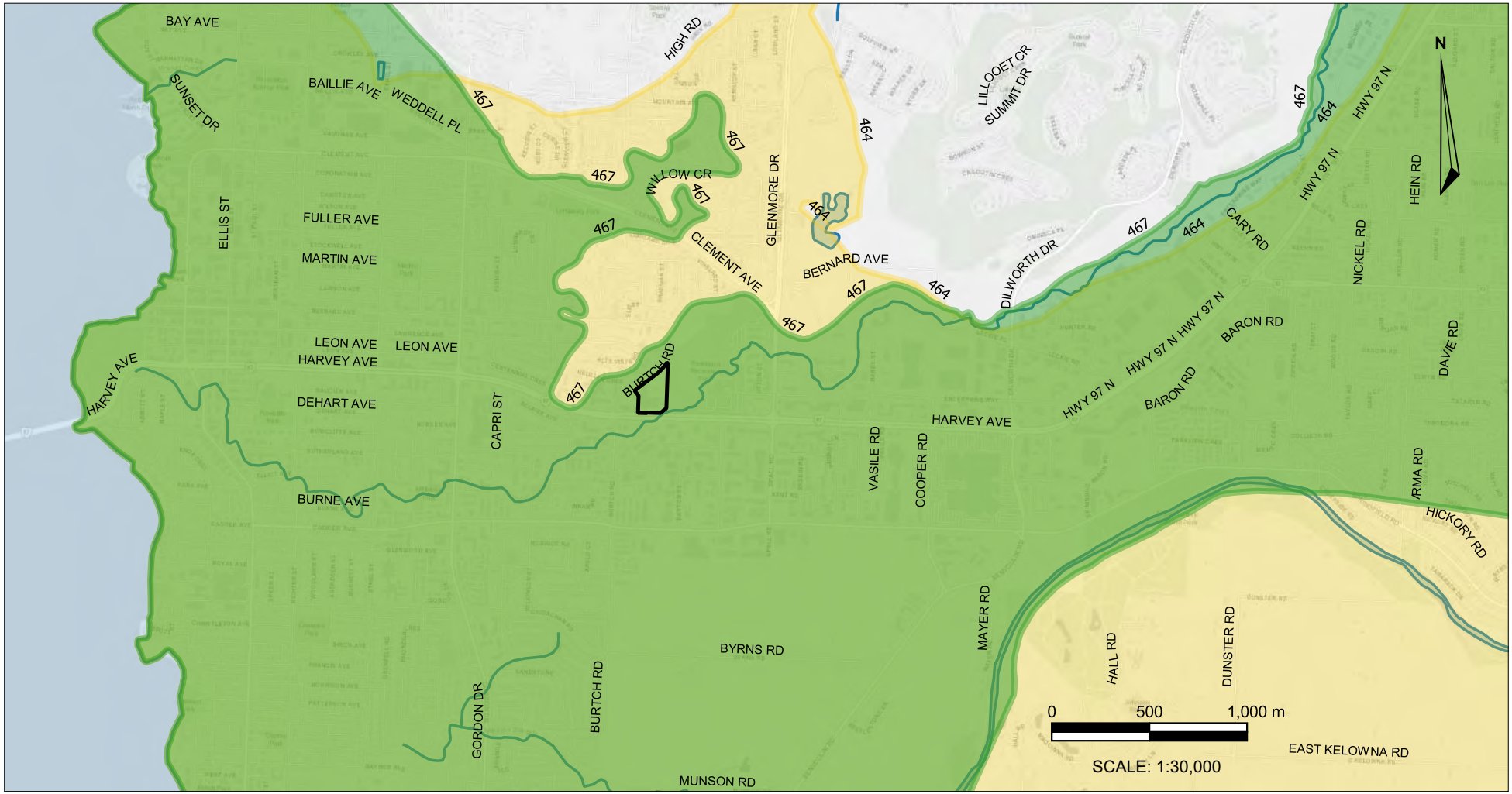

Legend

Site

MAPPED AQUIFER

467

464

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City of Kelowna
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Note: For clarity, only aquifers intertsecting the Site footprint are shown.

DIALOG BC
HYDROGEOLOGY ASSESSMENT FOR
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1574 & 1634 HARVEY AVENUE, KELOWNA

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MAPPED EXTENTS OF AQUIFERS 464 AND 467

BY:	DATE:
AB	FEB 24
APPROVED:	FIG:
DJT	5

PHOTOS

Photo 1: View northwest with Harvey Avenue in the foreground, the Site behind Harvey Avenue at the left of the photo, and Parkinson Park on the Right. The Mill Creek channel follows parallel to the sidewalk. February 9, 2024.

Photo 2: View of Mill Creek at the intake to the Harvey Avenue culvert adjacent to the Site. The banks consist of sandy silt with some clay. February 9, 2024.

Photo 3: View of Mill Creek looking upstream adjacent to the Parkinson Park parking lot. The bank in the foreground consists of sandy silt. February 9, 2024.

APPENDIX A

LOG FOR MW24-01

Borehole No: **BH24-01**

Dialog

ATTACHMENT A
This forms part of application
ARP24-0001 OCP24-0012
Planner Initials MT
City of Kelowna DEVELOPMENT PLANNING

Project: 1574 and 1634 Harvey Lands, Engineering Services	Project No: 704-ENG.KGEO03920-01
Location: 1574 and 1634 Harvey Ave	
Kelowna	UTM: 323050 E; 5528528 N; Z 11 NAD83

Depth (m)	Method	Core Diameter (mm)	Soil Description	Graphical Representation	Sample Type	Sample Number	Particle Size Distribution: Gravel (%)	Sand (%)	Silt & Clay (%)	Silt (%)	Clay (%)	Field Blowcount (blows/300 mm) SPT	Field Vane (kPa) Post-Peak / Peak	Plastic Limit / Moisture Content / Liquid Limit	BH24-01	Depth (ft)
0			Asphalt													0
			SAND and GRAVEL (FILL), trace silt, well graded, moist, dense, tan, fine to coarse sand, fine to coarse subangular to angular gravel			SPT1						30				
1			SILT and SAND, poorly graded, damp, very loose, tan, fine sand, 50 mm lenses of interbedded fine to medium sand disseminated throughout													1–5
			-becomes wet at 1.8 m			SPT2	1	45	54							6
2			-water table encountered at 2.1 m													7
			GRAVEL and SAND, trace to some silt, poorly graded, wet, compact, brown, fine to coarse sand, fine to coarse subrounded to subangular gravel													8–9
3						SPT3						30				10
4																11–14
5	Odex		GRAVEL, sandy, trace silt, well graded, wet, grey, compact, fine to coarse sand, fine to coarse rounded to subangular gravel			SPT4						30				15–16
																17–19
6			SAND, trace to some gravel, trace silt, poorly graded, wet, grey, loose, fine to medium sand, fine rounded to subrounded gravel													20
						SPT5						30				21
7																22–24
			-becomes compact SAND and GRAVEL at 7.6 m													25–26
8						SPT6	40	57	3			30				26
																27–28
			CLAY, silty, trace sand, moist, firm, high plasticity, grey													29–30
9						SPT7						30				31
10																32

01/03/2024

TETRA TECH

Contractor: OTM	Completion Depth: 31.1 m
Equipment Type: B53	Start Date: January 3, 2024
Logged By: DB	Completion Date: January 3, 2024
Reviewed By: GM	Page 1 of 4

Borehole No: **BH24-01**

Dialog

ATTACHMENT A
This forms part of application
ARP24-0001 OCP24-0012
Planner Initials MT
City of Kelowna DEVELOPMENT PLANNING

Project: 1574 and 1634 Harvey Lands, Engineering Services	Project No: 704-ENG.KGEO03920-01
Location: 1574 and 1634 Harvey Ave	
Kelowna	UTM: 323050 E; 5528528 N; Z 11 NAD83

Depth (m)	Method	Core Diameter (mm)	Soil Description	Graphical Representation	Sample Type	Sample Number	Particle Size Distribution: Gravel (%)	Sand (%)	Silt & Clay (%): Silt (%)	Silt & Clay (%): Clay (%)	Field Blowcount (blows/300 mm)	Field Vane (kPa) / Plastic Limit, Moisture Content, Liquid Limit	BH24-01	Depth (ft)
10											SPT; 10 20 30 40	Post-Peak / Peak 10 20 30 40; Plastic Limit / Moisture Content / Liquid Limit 20 40 60 80		33
11	Mud Rotary					SPT8	0	1	22	77				36
12			-becomes stiff at 12.2 m			SPT9								40
13														43
14			-150 mm lens of clayey, gravelly sand at 13.72 m			SPT10								46
15			-becomes firm at 15.24 m			SPT11								50
16														53
17						SPT12								56
18														59
19						SPT13								62
20														65

TETRA TECH

Contractor: OTM	Completion Depth: 31.1 m
Equipment Type: B53	Start Date: January 3, 2024
Logged By: DB	Completion Date: January 3, 2024
Reviewed By: GM	Page 2 of 4

Borehole No: **BH24-01**

Dialog

ATTACHMENT A
This forms part of application
ARP24-0001 OCP24-0012
Planner Initials MT
City of Kelowna DEVELOPMENT PLANNING

Project: 1574 and 1634 Harvey Lands, Engineering Services	Project No: 704-ENG.KGEO03920-01
Location: 1574 and 1634 Harvey Ave	
Kelowna	UTM: 323050 E; 5528528 N; Z 11 NAD83

Depth (m)	Method	Core Diameter (mm)	Soil Description	Graphical Representation	Sample Type	Sample Number	Particle Size Distribution: Gravel (%)	Sand (%)	Silt & Clay (%): Silt (%)	Silt & Clay (%): Clay (%)	Field Blowcount (blows/300 mm) □ SPT	Field Vane (kPa) Post-Peak / Peak	Plastic Limit / Moisture Content / Liquid Limit	BH24-01	Depth (ft)
20											10 20 30 40	10 20 30 40	20 40 60 80		66
															67
															68
21															69
															70
			SILT and CLAY, trace sand, wet, firm, medium plasticity, grey			SPT14									71
															72
22															73
															74
						SPT15	0	1	58	41					75
23															76
															77
															78
24															79
															80
						SPT16									81
25	Mud Rotary														82
															83
															84
26															85
															86
															87
27															88
															89
															90
						SPT17									91
28															92
															93
															94
29															95
															96
															97
30															98

TETRA TECH

Contractor: OTM	Completion Depth: 31.1 m
Equipment Type: B53	Start Date: January 3, 2024
Logged By: DB	Completion Date: January 3, 2024
Reviewed By: GM	Page 3 of 4

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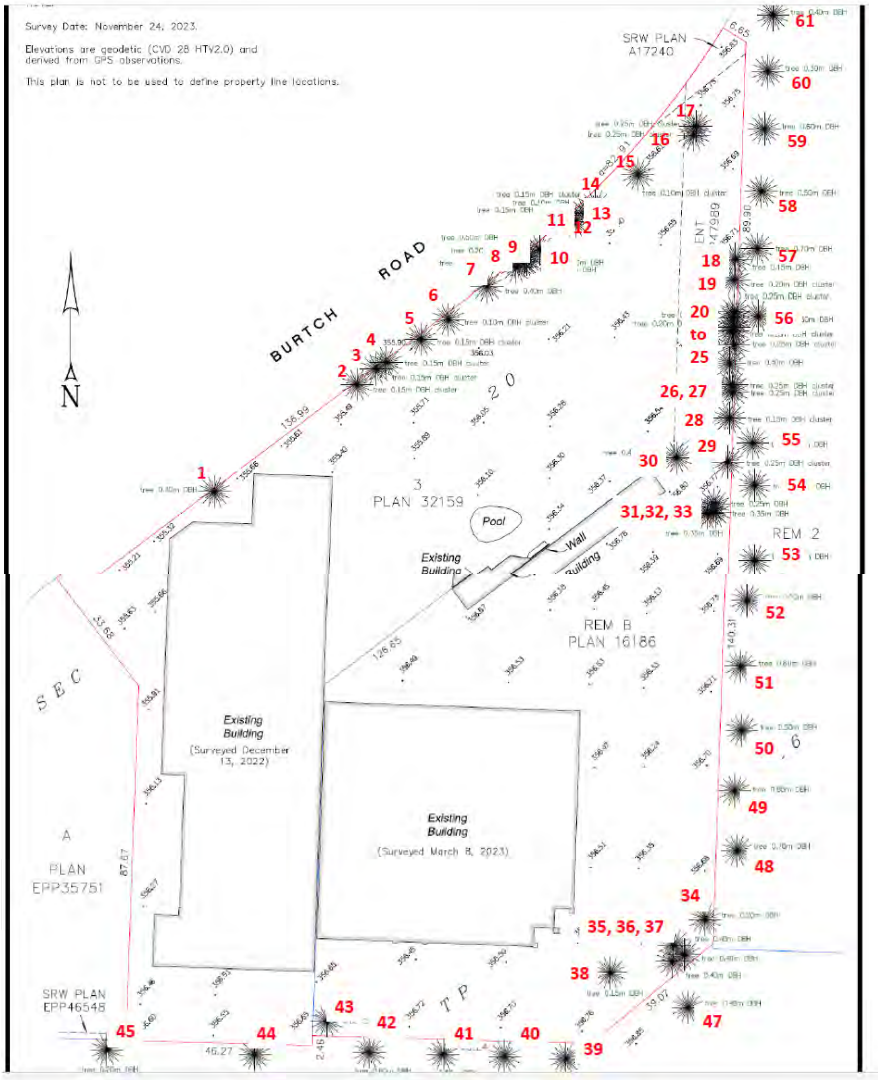
30														99
	Mud Rotary		-becomes stiff at 30.48 m											100
31						SPT18					□			101
			END OF BOREHOLE AT 31.1 m. TARGET DEPTH REACHED											102
32														103
														104
														105
33														106
														107
														108
34														109
														110
														111
35														112
														113
														114
36														115
														116
														117
37														118
														119
														120
38														121
														122
														123
39														124
														125
														126
40														127
														128
														129
														130
														131

TETRA TECH

Contractor: OTM	Completion Depth: 31.1 m
Equipment Type: B53	Start Date: January 3, 2024
Logged By: DB	Completion Date: January 3, 2024
Reviewed By: GM	Page 4 of 4

Assignment

Inventory and assess 61 trees located on and near 1574 and 1634 Harvey following Denby Surveying November 2023 map. Picture 1 is an aerial photo of the area and the tree numbers on the survey.



Picture 1

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Observations

In January 2024, Mumby's Arboriculture Consulting (MAC) associate, inventoried the trees. This report is broken down into four areas of the property.

- Burtch Road
- Inside the east edge of the property
- Harvey Avenue
- Outside east edge of the property (public park)

Burtch Road

Along Burtch Road there are seventeen trees, Table 1 outlines the data. Two Norway maples (*Acer platanoides),* eight Siberian elms (*Ulmus pumila)* and seven Tree of Heaven (*Ailantus)*.

Map #	TYPE	DSH (cm)	Height (m)	Condition (%)	Stem to property (m)	Branch overhang	Roots into property	TPZ (m)	CRZ (m)	Photo #
1	Acer plat.	30	6.1	0.6	0.3	0.3	0	-	-	1
2	Ulmus p.	15	4.8	0.6	0.15	0.5	0	-	-	2
3	Ulmus p.	15	5	0.5	0.15	0.5	0	-	-	3 &4
4	Ulmus p.	15	5.2	0.7	0.15	0.5	0	-	-	3 & 4
5	Ulmus p.	15	5.8	0.7	0.76	0.3	0	-	-	5
6	Ulmus p.	15	7.6	0	0.76	0.2	0	-	-	6
7	Acer plat.	40	7.62	0	0.46	0.5	0	-	-	7
8	Ailanthus	38	9.1	0.9	0.3	0.2	*	-	-	8
9	Ailanthus	45	12.19	0.9	0.3	0.5	*	-	-	9
10	Ulmus p.	45	12.19	0.6	0.61	0.5	0	-	-	10
11	Ailanthus	25	4.5	0.9	0.45	0.2	*	-	-	11
12	Ailanthus	10	3.04	0.9	0.45	0.2	*	-	-	12 & 13
13	Ailanthus	15	4.5	0.9	0.45	0.2	*	-	-	12 & 13
14	Ailanthus	10	2.75	0.9	0.91	0	0	-	-	14
15	Ailanthus	10	2.75	0.9	1.06	0	0	-	-	15
16	Ulmus p.	17	9.14	0.8	0.61	0.2	0.5	-	-	16 & 17
17	Ulmus p.	15	9.14	0.8	0	0.8	0.5	-	-	16 & 17

According to the City of Kelowna tree bylaw #8041 Siberian elms and Tree of Heaven are listed as invasive tree species. Removal of the 8 elms and 7 Tree of Heaven along Burtch Road will be welcomed by the City. The remaining 2 Norway maples, one is dead and the other (tree #1) has extensive paving around the roots and its' condition is not favorable to retain.

As a result of these finding, the 17 trees along the Burtch Road property edge should not be retained for a development project.

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Inside the east edge of the property

Eleven Siberian elms, one Mountain Ash, 7 pine, one juniper and one Japanese maple are located along the east edge.

Map #	TYPE	DSH (cm)	Height (m)	Condition (%)	Stem to property (m)	TPZ (m)	CRZ (m)	Photo #
18	Sorbus sp.	15	6.09	0.9	0	2	1	18
19	Ulmus p.	20	9.14	0.8	0	-	-	19
20	Ulmus p.	29	10	0.8	0	-	-	20, 21, 22
21	Ulmus p.	28	9.14	0.7	0	-	-	20, 21, 22
22	Ulmus p.	15	10.5	0.6	0	-	-	20, 21, 22
23	Ulmus p.	23	10.97	0.8	0	-	-	23
24	Ulmus p.	32	10.67	0.8	0.61	-	-	n/a
25	Ulmus p.	14	10.67	0.8	0	-	-	25 & 26
26	Ulmus p.	28	7.62	0.5	0	-	-	25 & 26
27	Ulmus p.	4	4.57	0.8	0	-	-	27
28	Ulmus p.	16	9.14	0.8	0	-	-	28
29	Ulmus p.	29	9	0.6	0	-	-	29
30	Pinus	43	12.19	0.6	3.5	3	2	30
31	Pinus	24	7.62	0.6	1.5	3	2	31, 32, 33
32	Pinus	35	7.62	0.6	2.4	3	2	31, 32, 33
33	Pinus	36	7.62	0.7	1.5	3	2	31, 32, 33
34	Juniperus scopulorum	16	5.48	0.99	1.5	2.5	2	34
35	Pinus	42	40	0.8	1.5	3	2	-
36	Pinus	44	5.48	0.8	2.4	3	2	-
37	Pinus	46	7.01	0.8	1.5	3	2	-
38	Acer palmatum	12	4.26	0.55	4	2.5	2	-

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Trees that are good to retain along this eastern edge are the two groves of pine (#30-33 and #35 – 37) along with the Juniper (#34) and Japanese maple. See Pictures 2-5.

Picture 2

Picture 3

Picture 4

Picture 5

Harvey Avenue

Along Harvey Avenue there are 4 London plane trees, 1 Japanese maple, I juniper and 2 Honey Locusts.

Map #	TYPE	DSH (cm)	Height (m)	Condition (%)	Stem to property (m)	Branch overhang	Roots into property	TPZ (m)	CRZ (m)	Photo #
39	Platanus a.	39	10.67	0.9	2.43	0.2	0	In report	In report	39
40	Platanus a.	43	11.58	0.9	2.43	0.2	0			40
41	Platanus a.	46	14.02	0.9	2.43	0.2	0			41
42	Platanus a.	47	12.8	0.9	2.43	0.2	0			42
43	Acer palmatum	12	4.26	0.8	0.91	0	0			43
44	Juniperus scopulorum	18	6.7	0.9	0.8	0	0			44
45	Gleditsia	22	7.62	0.8	1.82	0.1	0			45
46	Gleditsia	22	7.62	0.8	1.82	0.1	0			46

Standard TPZ fencing should be installed from curb to sidewalk to encompass width and length of the fencing to the tips of the outer branches. This will be rectangle fencing versus circular. Picture 6 shows example of width. Pictures 7 and 8 examples of trees along Harvey.

Picture 6

Picture 7

Picture 8

Public Park (east of property)

One Douglas fir, 2 oaks, 2 horse chestnut, 2 Honey Locust, 7 Linden (Basswood) and one Siberian elm are growing in the park next to the property.

Map #	TYPE	DSH (cm)	Height (m)	Condition (%)	Stem to property (m)	Branch overhang	Roots into property	TPZ (m)	Photo #
47	Ulmus p.	38	7.62	0.8	-	0	0	Property line	47
48	Gleditsia	70	13.1	0.9	6.09	0.03	0	"	48
49	Gleditsia	70	14.02	0.9	5.18	0.03	0	"	49
50	Tilia	68	15.84	0.75	6.09	0.03	0	"	50
51	Tilia	63	14.02	0.8	5.18	0.03	0	"	51
52	Tilia	58	14.93	0.8	6.09	0	0	"	52
53	Tilia	66	18.28	0.7	6.4	0	0	"	53
54	P. menziesii	28	17.67	0.55	4.9	0	0	"	54
55	Quercus	70	17.06	0.8	6.09	0.2	0	"	55
56	Quercus	70	16.76	0.8	6.09	0	0	"	-
57	Aesculus	76	17.67	0.7	6.09	0	0	"	57
58	Aesculus	58	13.71	0.9	6.09	0	0	"	58
59	Tilia	52	14.63	0.8	6.09	0	0	"	59
60	Tilia	28	13.1	0.6	6.09	0	0	"	60
61	Tilia	49	14.32	0.8	6.09	0	0	"	61

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The construction should not impact any of the roots of the park trees. Site assessment did not find any exposed roots growing into the property.
Tree protection fencing is required along the property line during construction.
Work with the City arborist regarding the pruning of the five trees that are overhanging the property, trees #48 – 51 and 55. Pictures 9 and 10 show the overhang.

Picture 9

Picture 10

Summary

- Of the 17 trees along Burtch Road, 15 are invasive tree species and the remaining two are not healthy enough to retain. None of the trees in this area should be retained.
- Along the east edge of the property, of the 20 trees, ten should be retained and 10 Siberian elms (invasive) should be removed. Proper TPZ fencing must be installed outside the driplines of the 10 remaining trees prior to construction.
- On Harvey Avenue there are 8 trees on public property. Install proper TPZ fencing prior to construction.
- In the public park there are 15 trees. Prune any overhanging branches prior to construction under the guidance of the City arborist. Install TPZ fencing along the property line.

This concludes the preliminary arborist report. Once the site plan is determined, I can provide a three-year tree management plan for the retained trees. I have included photos of the trees in another PDF attached to this report.

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ARBORIST DISCLOSURE STATEMENT

Arborists are tree specialists who use their education, knowledge, training, and experience to examine trees, recommend measures to enhance the beauty and health of trees, and attempt to reduce the risk of living near trees. Clients may choose to accept or disregard the recommendations of the arborist or seek additional advice.

Arborists cannot detect every condition that could possibly lead to the structural failure of a tree. Trees are living organisms that fail in ways we do not fully understand. Conditions are often hidden within trees and below ground. Arborists cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period of time. Likewise, remedial treatments, like any medicine, cannot be guaranteed. Treatment, pruning, and removal of trees may involve considerations beyond the scope of the arborist's services such as property boundaries, property ownership, site lines, disputes between neighbors, landlord-tenant matters, etc.

Arborists cannot take such issues into account unless complete and accurate information is given to the arborist. The person hiring the arborist accepts full responsibility for authorizing the recommended treatment or remedial measures. Trees can be managed, but they cannot be controlled. To live near a tree is to accept some degree of risk.

The only way to eliminate all risks is to eliminate all trees. I further certify that I am a member in good standing of the American Society of Consulting Arborists and the International Society of Arboriculture. I have been involved in the field of Arboriculture in a full-time capacity for a period of more than twenty-five years.