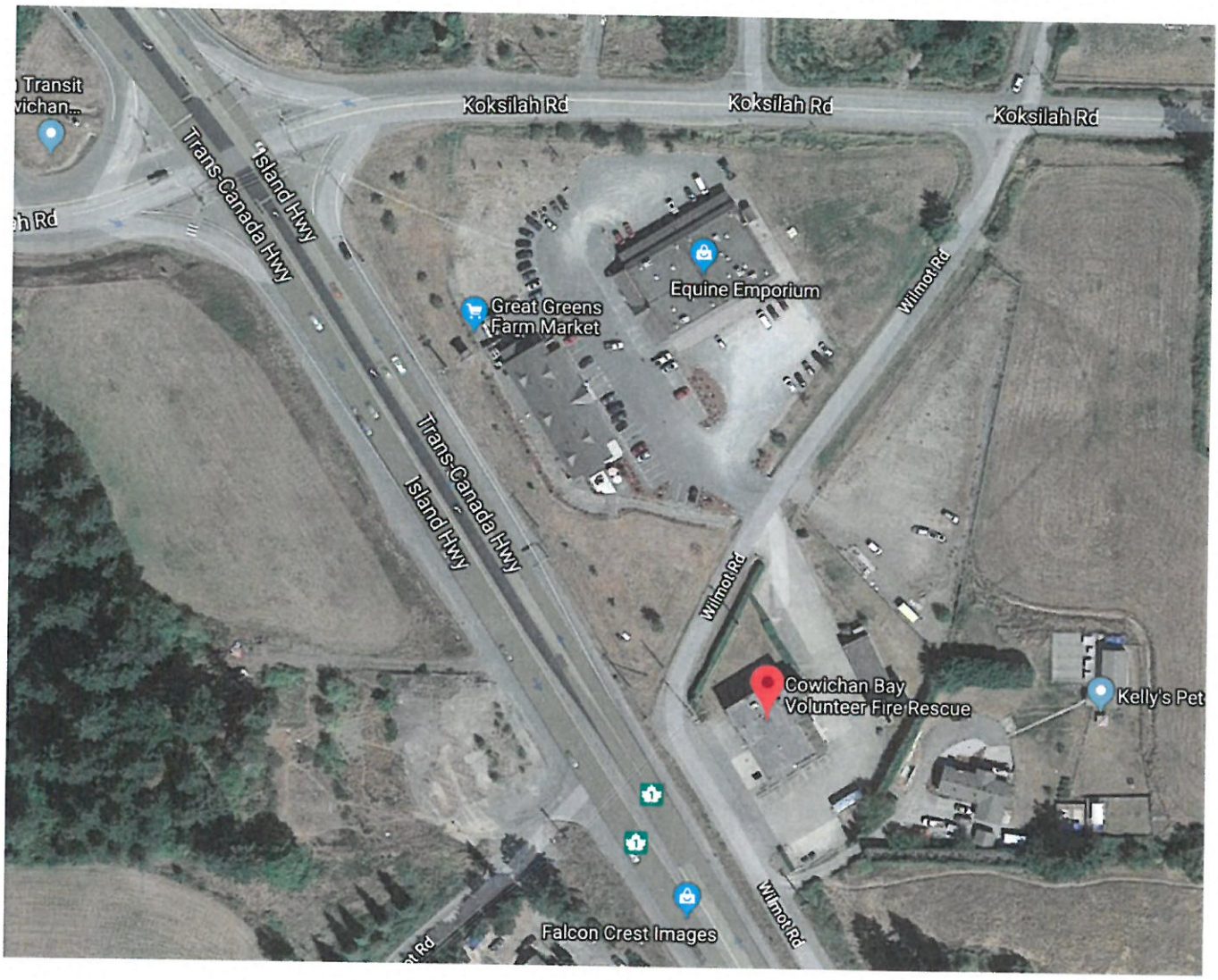
Firehall Feasibility Study

Cowichan Bay Improvement District &
Cowichan Bay Volunteer Fire Department



cowichan bay volunteer firehall
feasibility study

issued: 2018- december - 3

johnston davidson architecture + planning inc. suite 301 - 877 east hastings street, vancouver, bc V6A 3Y1 t. 604. 684. 3338 f. 604. 684. 3600 www.jdarch.ca

cowichan bay improvement district
firehall feasibility study

TEAM LIST

client:

Cowichan Bay Improvement District
Cowichan Bay Volunteer Firehall
4461 Trans Canada Highway
Cowichan Bay, BC
V0R 1N1

Contact: Chris Duggan

e-mail: cbid@cbvfr.com
tel: 250-743-7111

consultant team:

Architect / Prime Consultant:
Johnston Davidson Architecture + Planning Inc.
Suite 301 – 877 East Hastings Street, Vancouver, BC V6A 3Y1
T 604 684 3338

Contact: Kimberly Johnston, Architect AIBC, MRAIC, LEED® AP, Principal
e-mail: kim@jdarch.ca

Contact: John Botelho, LEED® AP, Senior Associate
e-mail: john@jdarch.ca

Structural Consultant:
Herold Engineering
3701 Shenton Road, Nanaimo, BC V9T 2H1
T 250 751 8558

Contact: Lee Rowley, M.A.Sc., P.Eng., Struct.Eng., S.E.
e-mail: lrowley@heroldengineering.ca

cowichan bay improvment district
firehall feasibility study

TABLE OF CONTENTS

sections

cowichan bay improvement district
firehall feasibility study

EXECUTIVE SUMMARY

1.0 executive summary

The Fire Rescue Services is an essential service for the safety and well being of any community. The Cowichan Bay Volunteer Fire Rescue (CBVFR) was established in 1947 under the Cowichan Bay Fire Department and operated from a gas station in a similar location to where the current hall stands today with an adapted 3 ton Dodge pick-up and a 1938 Bickles Seagrave. Since that time, the Service has grown to include over 30 volunteer members all operating out of their main firehall on Wilmot Road. The CBVFR responds to over 171 emergency calls per year, covering over 104 square kilometers and protecting approximately 10,000 constituents. The current firehall was built in 1977 to house the growing community and the much needed fire service.

existing conditions

However, after over 41 years in service, the firehall building is facing deteriorating conditions, non- compliance with post disaster standards, and significant programmatic deficiencies despite the best efforts of the CBVFR. The building has met the end of its respective service life and will need to be extensively upgraded or replaced in order to meet the demands on the fire service today and into the future. The building is suffering from physical deficiencies such as lack of an energy efficient building envelope, seismic deficiencies and non compliance with BC Building Code requirements. In addition, the spaces found in the CBVFH can no longer provide suitable accommodations, nor sufficient operational spaces to sustain the required level of service for the community. The following sections will outline these deficiencies in more detail.

needs analysis - program / facilities

A needs analysis regarding the spatial programming of firehall functional spaces revealed several gaps between the existing facility and the needs of modern day firehalls. Unfortunately, the Cowichan Bay Firehall has issues with lack of essential functional spaces to accommodate fire department administration, decontamination, gender neutrality and industry standard key operational spaces required to meet the need of current fire department industry standards, both for today and for the future.

siting studies

The last portion of this study examines option for developing the existing site in order to aid in addressing the current deficiencies found in the current facility and narrows down the possibilities to 3 fundamental options in more detail. This is outlined in more detail in **Section 4.0.** along with high level costing for each option outlined in **Section 5.0.**

conclusion

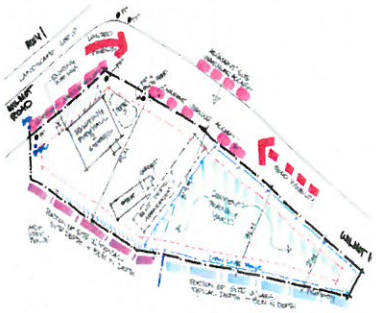
All three siting studies within the report provide viable options each with their own compromises; however, Option 1 and 3 provide the most successful options from an operational perspective but need to examined from the Cowichan Bay Improvement District's perspective for feasibility from a cost and operational interruption perspective.

Please do not hesitate to contact us if there are any follow-up concerns regarding this report, Johnston Davidson Architecture + Planning will be more than happy to discuss any issues in person or present to the Council if required.

Sincerely,

Kimberly Johnston, Architect AIBC, MRAIC, LEED AP
Principal

2.0 existing building / site conditions



2.0 existing building

"You can't manage what you don't measure."
W. Edwards Deming

the process

This report was created through discussions with the Cowichan Bay Improvement District and the Cowichan Bay Volunteer Fire Department Fire Department to ensure that all concerns have been addressed and reviewed. This included discussions and progress reviews which outlined the findings and assessment of the buildings and site conditions for Cowichan Bay Volunteer Firehall (CBVFH) and subsidiary buildings.

This section of the report outlines the collection of data regarding the current state of the CBVFH which was assessed and reviewed under three main categories: site analysis, spatial program / needs analysis and code compliance. In addition, structural consultants have provided a brief report on the existing building structural condition assessment.

introduction

The Fire Rescue Services is an essential service for the safety and well being of any community. The Cowichan Bay Volunteer Fire Rescue (CBVFR) was established in 1947 under the Cowichan Bay Fire Department and operated from a gas station in a similar location to where the current hall stands today with an adapted 3 ton Dodge pick-up and a 1938 Bickles Seagrave. Since that time, the Service has grown to include over 30 volunteer members all operating out of their main firehall on Wilmot Road. The CBVFR responds to over 171 emergency calls per year, covering over 104 square kilometers and protecting approximately 10,000 constituents. The current firehall was built in 1977 to house the growing community and the much needed fire service.

However, after over 41 years in service, the firehall building is facing deteriorating conditions, non- compliance with post disaster standards, and significant programmatic deficiencies despite the best efforts of the CBVFR. The building has met the end of its respective service life and will need to be extensively upgraded or replaced in order to meet the demands on the fire service today and into the future. The building is suffering from physical deficiencies such as lack of an energy efficient building envelope, seismic deficiencies and non compliance with BC Building Code requirements. In addition, the spaces found in the CBVFH can no longer provide suitable accommodations, nor sufficient operational spaces to sustain the required level of service for the community. The following sections will outline these deficiencies in more detail.

The CBVFR Firehall which houses the main suppression crew quarters and apparatus bays, was renovated in 1997 to accommodate the growing needs to the department by adding a storage building to the north of the hall increasing the amount of storage and providing additional program space separate from the main firehall. It is important to note that no structural upgrades have been implemented to the firehall since the original designs in 1979.

The following is historical population data from the BC Government - Stats Municipal Census Data for the Cowichan Bay Improvement District:

- 2006 Population census data 2,823
- 2011 Population census data 2,971
- 2018 Population census data 3,243

Given that the nature of the fire service has changed so drastically with the need to address increased equipment sizes, technology, gender, inclusion, decontamination and the nature of the services provided, it would be unreasonable to expect another 39 years of service from this facility. This building was appropriate for the era and

population base of the time, however, it was never strategically built to allow for for the number of changes in the building code and the challenges facing the fire services today.

Over those past 41 years, the advancements in both fire fighting and the associated equipment have necessitated larger firehalls with increased functional requirements for items such as gender inclusivity, decontamination, Self-Contained Breathing Apparatus (SCBA) maintenance, Personal Protective Equipment (PPE) cleaning and storage, training, fitness and other programmatic requirements needed to meet current industry standards. Many of these items aid in the containment of continual exposure to harmful contaminants and reducing the incidents of presumptive cancers in Firefighters.

In addition, the existing structure presents several physical concerns ranging from building code issues, seismic capacity limitations, and environmental performance with regards to energy efficiency and requirements of the BC building code.

facility statistics

Currently the Cowichan Bay Volunteer Fire Rescue operates out of a single and provides services for over an estimated 10,000 constituents (2016) and a response area of over 104 square kilometers. The following is a brief overview of the existing building:

Cowichan Bay Volunteer Firehall (Headquarters):

- Location: 4461 Trans Canada Highway, Cowichan Bay, BC
- Built: Original firehall (1977).
  Addition and renovation: (1997)
- Building Size: Total Building = 9,978sf (927 sm)
- Site Size: 1.799 acre (7,280 sm / 78,361 sf)
- Construction: 2 storey structure: 1 storey = concrete block 2 storey = wood frame. concrete block with wood / metal trusses, wood cladding (siding and shingles). + exposed concrete block around the apparatus bays.
- Function: suppression crews, fire department administration, office of the fire chief, training officers, cowichan bay improvement district offices.
- Apparatus Bays: 3 bays - 18.9m (62'-0") long (single, drive through bays)
  1 front-line engine, 1 aerial/ladder truck,
  1 heavy rescue, 3 command units, 1 wildlands truck,
- Other:
  minimal on site training + parking area for 6-10 spots currently on site.
  additional storage building at the north side of the site.
  septic field with chamber
  small generator with limited fuel.

There is currently the following reports which have been complied for the project to date outside of this reports and drawings:

1. Cowichan Bay Firehall existing building drawings - structural sheet only.
2. Cowichan Bay Property survey.
3. Cowichan Bay Storage Building - existing building drawings.

A. site data

The existing Cowichan Bay Firehall Firehall Site is located at the civic address of 4461 Trans Canada Highway, Cowichan Bay, BC at the corner of Wilmot Road close to the two main arterial roads connecting the area with the the remainder of Vancouver Island. This location is central to the local business district and local residential properties, with quick access to both the highway and the surrounding residential neighborhoods.

The Fire Hall facility is currently zoned P-3 (Outdoor Recreation) which does not allow for a "Firehall" use permitted under this zone. The site would need to be rezoned to P-1 (Parks and Institutional) which has "Firehall" under its permitted uses, in order for any redevelopment to take place. This process would need to be undertaken with the Cowichan Valley Regional District (CVRD) and it is anticipated at this time that this process would take approximately 5 months to complete. A checklist of the drawings and information required for the Rezoning Application have been included in the **Appendix A** of this report for information purposes. It is recommended that the application process be reviewed in more detail with the CVRD before further action is taken.

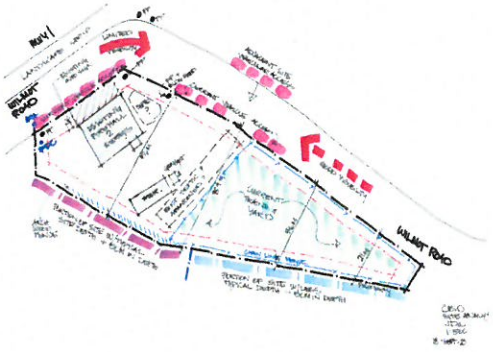
The current firehall site is a triangular piece of land which is bordered along the northern and eastern sides by primary agricultural and roadways to the south and west. Vehicular access is currently provided along the southern and western sides of the property with a slight grade change running down across the site from south to north. Wilmot Road surrounds the site on two sides running East / West in front of the hall, then turning north along the western edge of the site providing secondary access points into the site and training yards. Trans Canada Hwy runs directly parallel to the southern portion of Wilmot Road creating a "frontage road" to the Highway with access to this main arterial network only through an intersection located further west.

The overall site dimensions are a reasonable width for accommodating exiting emergency vehicles for the souther half of the site where the current firehall is located; however, the site shape does not accommodate the required depths for the northern half of the site due to the triangular configuration of this portion of the property. The minimum depth are noted on the Typical Apparatus Bay Layout included in the drawing portion of this report. Minimum site depth for the typical scenario would be between 60-65m. The site depth at its maximum is 56-54m. this will require some compromises in the overall design which can be handled without too much impact on the overall performance of the project.

Wilmot Road is a relatively reasonable width with no significant grade impediments and limited traffic which it makes suitable for exiting emergency vehicles. However, the western arm of Wilmot has shared access with the commercial development located across from the western side of the Firehall property. This brings one addition access point/ exit to evaluate as part of the site analysis in terms of relocation of the apparatus bays. Street parking is not permitted on any part of Wilmot Road as it runs in front the Firehall site nor is parking permitted across from the site on the opposite side of Wimot Road. The turn in Wilmot Road, does create some visibility issues for the existing Emergency vehicles which need to be addressed within the siting studies.

The site measures approximately 1.799 of an acre (7,280 sm) with setbacks of 6m setbacks required on all 4 sides of the site. This reduces the overall usable site area to 1.208 acres (4,888 sm) which by industry standards is a good size site for a development of this type. The site has a slight grade change running down from south to north across the site with vehicular site access currently being established from two sides - along the western side of the site (Wilmot Road) as well as along the southern side where Wilmot Road runs parallel to Highway 1. It is recommended that the topography of the site be confirmed by the production of a topographical survey created by a by a registered surveyor in the next stage of the project.

Approximately 43% of the site is currently paved or covered with building leaving a substantial portion of the site as undeveloped space and is being used as a training yard for the Fire Service. The majority of vehicular traffic enters the site from either the western or southern edges of the property with the vehicle apron along the southern side to accommodate returning and exiting emergency vehicles.



Site servicing / utility connections are similar to many communities throughout Vancouver Island. Power is provided from three main power poles located at the south / western corner firehall site as Wilmot Road turns north. These power poles provide the overhead power to the existing building as well as serve the adjacent commercial businesses. There is no main sanitary, storm or water connections in the area. To address these services there is a septic field located in an undefined location to the north of the storage building and the site is serviced by a well currently located on the western side of the existing building. There is no municipal hydrant system within this area of Cowichan Bay so collected water should be examined as a reasonable possibility. The accommodation of storm water is addressed through open ditches along the roadways as there is no civil storm system in the area. Site servicing needs have not been analyzed in further detail as part of this feasibility study.

The site plan drawings, site analysis and site photographs are located at the end of **Section 2.0** of this Report for further information.

B. site analysis

The existing site currently houses two main buildings: the firehall and storage building. The firehall has a building area of approximately 927sm (9,979 sf) including the main floor, upper floor and apparatus bays. The associated storage building is approximately 83sm (893sf) mostly located on the main floor with a small upper level for a portion of the building. The firehall facility is comprised of two main components within the building footprint- the first being the firehall quarters containing the administration quarters, training rooms, society room, radio room, offices, storage and the second being the apparatus bays along with the CBFR gear storage, workshop, SCBA and additional storage areas.

The positioning of the current apparatus bays is fairly ideal for exiting from this site directly onto a relatively low traffic street with the only issues being a lack of depth of the front apron and any visibility issues with traffic at the south western corner of the site due to the 60 degree turn which occurs directly at the edge of the site. Both of these items in combination can produce a less than ideal situation - the turn in the road creates some visibility issues for emergency vehicles leaving the site. A front apron which would allow for the vehicles to fully leave the bays before entering the street creating a safe approach to the road as the vehicles increase their speed and reducing the restricted visibility of on coming vehicles approaching around the corner from the west.

Staff parking is situated to the east and north of the apparatus bays. There is presently no physical separation of Public access from the Paid On Call (POC) members parking and site access which can cause a conflict / safety concerns when crews are arriving for a call, emergency vehicles are leaving and the Public is arriving. There are two main access vehicular points to the site - one from the west and the other from the south. The site is only 66% paved and developed with the remaining 34% left undeveloped and operating as the CBVFR training yard.

The current layout of the Firehall occupies approximately 6.5% of the overall site area for the entire site and 9.7% of the developable site area. The apparatus bays are single, drive-through type bays with a front apron of 7.3m in depth which is utilized for positioning, and trucks checks. The CBID Firehall facility is located on a reasonable sized site overall based on industry standards, which is impacted by the shape of the site which renders approximately 3,276 sm or 45% of the site less favorable for building development due to the depth of the property. It currently does not share site access with any other colocated municipal user groups - in order

to accommodate the current and future needs of the CBID, redevelopment would require the following design considerations:

The following points identify the prime design concerns with the site:

- From an operational perspective the concerns relate to the movement of emergency response vehicles and personnel when responding to a call.
    - Emergency response vehicles must use the front apron to assist with visibility and safety allowing the emergency vehicles to exit the bays before entering the site; therefore the apron should be between 16 - 21m in depth.
    - Crews arrive at the site rapidly and need to get access to parking without conflict with emergency vehicles leaving the site. There is currently enough parking to accommodate most of the crew members on site but consideration for movement of vehicles around the site should be considered.
    - Public parking is currently undesignated and not required for operation of the hall. However, as a Public Building this normally would need to be provided to bring the building up to By-Law standards unless a relaxation was to be provided. This includes a accessible parking space.
    - Parking is located along the west side of the site using the same driveway that incoming crew may use when arriving on site. On this rare occasion, there could be conflict with emergency response vehicles leaving the site.
- The building currently sits inside the setbacks as shown on the site plan included in this report.
- In order to house the current number of vehicles, 4 tandem or single apparatus bays would be required to meet current industry standards. This foot print would occupy a larger portion of the buildable area and would increase the apron size along the road.
- With the depth of the new apparatus bays, access to the site for all users, water storage, septic field and relocation of a generator would need to be carefully considered.
- Permitted site coverage under zoning P1 is undefined; as a result, this may require a variance as part of the future project depending on the further development in the next stages project.
- A minimum of 4 tandem drive-through bays are recommended for any future redevelopment to allow for flexibility of deployment. The use of single bays would take up too much of the available site area due to the fact that there would need to be 8 single bays in a row.
- The development of the site in a manner in which the existing building could remain operational while the new building was being built would bring a serious advantage from a costing perspective. It would mean that the available developable area would be less than evaluated previously. Limiting shape and size of the new building.
- The maintaining of the existing building would also allow for the project to be developed in phases - now or into the future.

C. current space program

The CBID Firehall is the main headquarters hall for the CBVFR and has functioned reasonably as the home for the Fire Service over the past 41 years. In order to understand the size and organization of this facility, please refer to the existing floor plan drawings following this Section. Space for decontamination, separation of PPE gear, inclusive washrooms to address gender issues, facilities to act as a first responder EOC are not allocated within the current design.

Due to the size and changing industry standards, this building no longer meets the current needs of the CBVFR for various reasons which will be outlined below. A comparison of the existing space program to that of the current needs of the Fire Services will be found in **Section 3.0** of this report.

A summary sheet of the current space program is attached to this Section which catalogues the current size and types of spaces found at the Firehall. Included on this chart are spaces which would be found in a Typical firehall built in accordance with today's best practices and NFPA standards. Those spaces are currently not present in the CBID Firehall. In addition to any missing programmatic spaces, many of the present spaces are undersized or oversized for the current services that the Fire Department provides and / or the changing operational requirements of the department.

D. space program - areas of concern

The description below summarizes the major spatial deficiencies found at the CBID Firehall. (See the Space Program in **Section 3.0** for future space program recommendations).

The current building program utilizes 9,978sf (927sm) of programmed space. The following is a summary of those spaces on the project and areas of concern related to the current layout.

- **Public Areas:**
  - The currently layout has a reasonably sized entry and vestibule area allocated for the public. There is not enough space within the current layout to accommodate the separation of the Public areas from the operational and administration spaces.
  - There is no security at the current time separating Fire Rescue Services from incoming public other than door at the entry to the building. Once in the building, people are no longer physically separated from the operational / crew quarters of the Firehall. This may not be a major concern for the operation currently; however, in the building evaluation, needs to be recognized.
  - The Public access of the Firehall is located on the main level with a single access point. There are no handicapped door access buttons to the building, or other accessible access currently provided. It is acceptable to have the crew quarters unavailable from an accessible perspective with the British Columbia Building Code; however, the remainder of the administration, and meetings rooms should be designed to meet the accessibility standards of the BC Building Code (BCBC).
  - There is no H/C washroom available for the Public, retired personnel or visiting groups.

- **Administration (Fire Chief, Deputy Chief, Training):**
  - current floor space is maximized.
  - there is one office provided in this location for all Fire Service administration officers and staff. This office is approximately 18 sm and is shared by three different groups within the hall. Additional Administration space for the CBID is provided within the current meeting room on the main level and additional crew administration of e-learning space is located with the radio room. Separate office space for the Chief , Deputy Chief and Training should be provided within the space program.
  - medium size meeting space for public consultation and fire department training required to be separate from the office area and the crew quarters. This space does currently exist but is being shared as the CBID administration area which has made the size and shape of the room in appropriate for the number of functions and the amount of storage. Storage for CBID confidential files should be allocated.
  - office space required for crews should be added into the

space program. There is currently only the radio room which is designated for report writing and educational area for crews. It is fine for spaces to double up, as long as the rooms can function in both capacities effectively. Acoustics, privacy, work space and security are areas of evaluation required for Administration spaces.

- These areas are key in providing spaces for future development of the department and keeping volunteers separated from the dirty spaces of the hall.

- **FH Operational Areas:**
  - Apparatus Bays - three single bays - these bays are too short to accommodate two engines with space in between for personnel to move quickly and efficiently to the vehicles.
  - The current bays themselves are too small to accommodate the current standard for emergency vehicle sizes in a tandem arrangement. Width and length of the bays being the most crucial deficiency.
    - typical firehall design in today's standards would create apparatus bays 26 - 27m (85'-90') in length for tandem bays. These lengths are crucial in order to accommodate two average engines 10.5m (33' -0") in length with space in front, between and behind in order for personnel to safely move quickly and efficiently around the vehicles to get out the door to a call.
    - Widths of 5.2m (17.25') for internal bays and 5.6m (18.25')for exterior bay of clear inside space, with overhead doors being a minimum of 14' wide to accommodate larger vehicles and reduce the need for custom vehicles to be purchased.
    - This will also allow for vehicles to be seamlessly relocated between various bays without restriction.
  - The apparatus bays can house up to 3 vehicles. Additional vehicles are stored outdoors or off-site which is undesirable, as it requires additional costs for maintenance and difficulties for access.
  - There is currently a space within the storage building allocated to store / repair the archive vehicle.
  - Gear storage, SCBA, workshop, general storage, hose storage are all currently exposed to the general apparatus bays mixing clean and dirty spaces which allows for contaminates to spread from operational areas into living quarters and home with volunteers.
  - Swing of the doors from the entry and radio room to the bays should be in the direction of travel to aid in travel time and conflicts.
  - Vehicle Exhaust Systems: there is a vehicle exhaust system located within the apparatus bays. This is major element which impacts Work Safe and the overall safety of the firefighter's gear within the hall and is now one of the mainstays of the current industry standards for the design of apparatus bays. This would need to be updated to current industry standards.
  - The current standards of best practice for decontamination are not able to be followed due to the current building design. BC Building Code Standards have changed since the design of the current firehall and these could be costly to address; in some cases, the issues are simply unable to be achieved with the current building design.
    - there is no definite separation of clean and dirty spaces - creating an approach which does not limit exposure to crews and all that visit the hall to contaminants.
    - there is a decontamination washroom located on the dirty side of the hall. This helps ensure that contaminants stay out of the clean areas reducing the risk the spread of these carcinogens.
    - gear washing facilities- the current hall no gear washing available in the hall. There is a gear washer located within

the storage building which is located across the rear yard from the firehall. This item would be better located within the main building to limit transport of clear or dirty gear.
- The hall should also have residential wash and dryer facilities within the clean side of the hall.
- turnout gear (Personal Protection Equipment = PPE) is currently stored within a the apparatus bays. This is no longer industry standard as is exposes clean gear to contaminants and provides no proper drying area for the PPE equipment.
    - There is no sink in this area for wash down of contaminated equipment as it returns from a call. This includes masks, cylinders, SCBA equipment.

- **Hose / Training Tower:**
    - There existing hose drying / training tower which is considered unusable.
    - A hose tower provides the space for hose drying as well as training opportunities and is still used in many modern, multi-functional towers. Hose and Gear Dryers are available for small sites or buildings where necessary but this does not address the need for training off the hose tower.

- **Suppression Crew Quarters.**
    - There is no direct access from the operational quarters on the second level to an access route directly into the bays. this flow helps increase time but keep Public areas separated from operation areas. This types of quick access and separation helps to manage the separation of the "clean" and "contaminated zones" within the hall.
    - there is a large single kitchen area located within this hall which serves the volunteers as well as functions within the hall. There is no kitchenette on the main level.
    - there are currently no spaces allocated to temporary sleeping quarters.
    - there is no exercise room within the hall.
    - there are no personal lockers for the crews - these do not have to be large but enough to provide crew members with privacy and security for personal items when on call and training.
    - there are not enough washrooms suitable for the number of staff and crews.
        - Currently there are 8 fixtures with the hall: 2 assigned to women and 6 assigned to men. This does not addressed the gender issues on the operational floor.
        - There are two showers within the hall. Both located on the dirty side of the hall in one single washroom limiting use by multiple groups by both genders.
    - gender inclusive solutions are addressed in **Item D of Section 3.0.**

E. existing building

This section aims to compare existing conditions to best practices using the following three categories. This information is then used in **Section 3.0** to assess the gaps between existing and new program outlined to identify the current and future spatial needs.

1. building code issues
2. environmental concerns
3. building systems

E.1 building code issues

The building code requirement under the 2012 British Columbia Building Code (BCBC) and the new upcoming 2018 Building Code have different requirements from previous versions of the BC Building Code which have been upgraded over the past 41 years since the building was built in 1977. As a result, it is not unusual for buildings in this situation to not comply with current code nor is it always necessary that the existing building issues be upgraded; however, as part of this report we have outlined the current deficiencies in order to give a full picture of the gaps between existing conditions and current standards.

- Seismic Concerns: In British Columbia, firehalls are designated to be constructed to meet post-disaster design standards which technically means the buildings are designed to withstand 1.5 times the seismic force of conventional buildings during an earthquake. This is required so essential services maintain operations during these types of emergencies. In general, the building does not meet seismic standards of the current BC Building Code for the following general requirements:
  - A comprehensive seismic review of the existing building has been completed as part of this review and is located in the **Appendix.**
  - A summary is as follows:
    - The lateral resistance systems in all directions, connectivity and load paths do not meet the requirements of the current BCBC for a post disaster building.
    - The majority of the original firehall was designed in 1977. There have been 7 updates to the BCBC since the design was completed and built. The post disaster standards for structural systems have greatly changed since this time.
    - Upgrades to the existing building for life safety are relatively minor and could be accomplished within a relatively low budget. Seismic upgrades to bring the building up to post disaster standards would be invasive affecting the operation of the building and expensive to complete approaching the value of full replacement.

- BCBC Classification: The current Firehall is classified under BCBC 3.2.2.81, Group F, Division 3 up to 4 storeys - non sprinklered.
  - The building is 2 storeys, facing 2 streets which allows for a maximum building area of 3,000 sm unsprinklered.
  - The building is permitted to be non-sprinklered and built of non - combustible or combustible construction.
  - Floor assemblies are required to have a fire separation of not less than 45 minutes.
  - Load bearing walls must be rated to 45 minutes or built out of non combustible construction.
  - Roof must be rated to 45 minutes or built out of non combustible construction.
  - Many of the walls in the original design were built out of concrete block which should meet the requirements of a standard 1 hour separation; however, the current code asks for a 1.5 hour separation. It can not be confirmed if this concrete block located in the wall between the apparatus bays and the remainder of the hall will meet the more stringent requirements.

- BCBC 2012: fire separations between the living quarters and the apparatus bays / operation spaces are to be 1.5 hours meaning that spaces such as the SCBA / workshop /apparatus bays / gear storage should all be separated from the living / training / office areas by a 1.5 hour fire separation.
  - the doors in this separation must be rated to 1.5 hours and all should be rated to this effect and have closers. Currently, this is not the case.
  - all fire stopping separation should be reviewed to meet the 1.5 hour rating of this wall.

- Handicapped accessibility: BCBC 2012 Section A3.8.1.1 "to make buildings accessible for persons with disabilities". In protective services buildings, a reasonable case can be made that in order to perform as a fire fighter one must be able bodied; therefore, much of building does not need to be accessible. This exception would not apply to areas such as the Public Areas, Administration, EOC, Emergency Programs, CBID offices or anywhere where persons with disabilities may work. As suppression crew areas would fall under this exception, accessibility in the firehalls would only be required for areas accessed by the Public such as the following in the CBIDFH.
    - The front entry does not have a handicapped door opener.
    - The entry itself would need to ensure that door widths and slopes in all cases met accessible requirements.
    - There would need to be a handicapped accessible washroom available.
    - Meeting room where CBID has their office spaces does not meet accessibility requirements for access.
    - Training rooms, society spaces, outdoor spaces and kitchen area unless these areas were solely used by the CBVFR.

- Exiting requirements: BCBC 3.4.2.1 for an F3 classification: The floor area break downs are as follows:
        - Main Floor- Apparatus Bays/Operational = 454sm (4,886,sf).
        - Admin and Training = 473sm (5,091sf)
    - A building which is unsprinklered, can have only one exit if the follow two items have been met under the F3 classification:
        - the floor area is not greater than 200sm.
        - travel distance to the exit is not greater than 15m
    - The upper floor is greater than 200sm and as a result needs more than 1 exit. There currently are two exits from the upper level- one through the front entry and the other an exterior exit.
    - The original apparatus bays have no pedestrian exits directly to the exterior - BCBC requires that there must be at least 2 exits directly from the apparatus bays positioned 1/2 diagonal distance of the bays apart from each other in order to meet travel distance. This requirement has not been met under the current layout.
    - the upper floor administration / training areas of the hall:
        - Size of the floor plate: on this basis the exiting requirements have been met as there are two stairs provided; however, the original stair does not meet exiting requirements as it is not enclosed at the top or bottom. As a result it needs to be eliminated from the equation.
        - The exterior exit stair is currently exposed to the exterior and does not meet BCBC Code as per Section 3.4.2.3.
        - As a result, currently none of the stairs can be considered an exit from the upper floor. This is not acceptable as the area of the upper floor is greater than 200sm;
        - In addition, the travel distance to an exit can not be over 15m. In both cases, the travel distance is greater than 15m which is non compliant to BCBC.

- Sprinklers: under BCBC 3.2.2.81 sprinklers are not required. The building is permitted to be non sprinklered and constructed of both/ either combustible and non-combustible construction.

- Washrooms: BCBC 3.1.17.1.
    - Occupant load is calculated by area and type of building.
    - Firehall occupant load for the updated building estimated at:
        - 322sm / 46 = 7 (apparatus bays)
        - 605sm / 9.6 = 63.33 (living quarters)
    - Total occupant load = /2 (per gender) = 35 persons of each

gender.

- Total Washrooms required by Code (BCBC 3.7.2.2.C) = 6 fixtures in total - 3 male and 3 female. If there are gender neutral or accessible individual washrooms, the total load can be reduced by 10, reducing further the overall requirement for only 2 fixtures per gender.
- The current Firehall does meet code as there are 8 fixtures in total; however, as previously noted there is no accessible washroom facility provided within the hall which is in non compliance of the BCBC.

E.2 environmental

The building code requirement under the 2012 British Columbia Building Code (BCBC) requires that the building meet new energy standards as outlined by ASHRAE 90.1 (2010) or NECB 2010. This requirement means that Architectural, Mechanical and Electrical components of new buildings must meet the environmental energy performance as outlined in these standards. When identifying the gaps between existing and current best practices it needs to be recognized that this Firehall would **not** meet the current energy code requirements for following reasons. These building requirements are likely to increase with the acceptance of the new BCBC 2018 and the BC Energy Step Code.

1. Building Envelope: a high performance building envelope is to be designed to equal the R values as required by the BCBC and outlined below.
2. From review of the existing conditions only, it appears as if the building envelope has limited insulation in the walls and roof, leaving the building exterior with low energy performance. As a result, the building would not likely meet the R-values as summarized below.
   - R Value definition: the capacity of an insulating material to resist heat flow. The higher the R-value, the greater the insulating power.
   - Each building material has an established insulating power and together the items which make up the roof, walls and floors must meet the following requirements as outlined be ASHREA 90.1 (2010).
   - Walls = R11.4 - R16.8 (varies with construction type)
   - Roofs = R20 + floors = R10 - R30 (varies with construction type)
   - Slab on Grade (Heated) R-15.

3. Electrical: The revised ASHRAE standards will require that the electrical systems be approximately 27% more efficient than the previous Code requirements. This includes lighting and power. The current Firehall would not meet this code requirement.

E.3 building content

The space program of the Firehall has been reviewed under **Section 3.0** of this Appendix and outlines existing spaces as well as those which are missing from a typical contemporary Firehall. This section is an initial evaluation of the content of the project from a building stand point. The following points are general to the overall building and apply for most scenarios.

- <u>Apparatus Bays:</u>
  - The bays are seisimically unstable and there is no operational hose tower. There have been no structural improvements since 1977 and to do so at this stage would be increasingly expensive and disruptive to the operation of the fire department.

- <u>Security:</u>
  - Currently there are no doors located between the front entry and the remainder of the hall to help keep visitors from accessing the hall beyond the front entry without permission. There should be engineered controls for administrative safety and security and or a small weather / security vestibule which could address these

concerns.
- Proximity readers have not been installed on the exterior doors to the hall. Access is currently though key access only.
- HQ offices are directly accessible from the main entry where there is a low level or security between the Public interface and these spaces.

- Personnel Flow:
  - Flow from the operation quarters on the main floor is reasonably acceptable from space to space as there is a general circular circulation path needed. However, the PPE gear is located adjacent to the trucks which creates a conflict in flow as crews need to shimmy past the vehicles, to get to their gear. This greatly limits the response time and creates a dysfunctional flow between crews and the equipment and vehicles.
  - The current NFPA 1710 + 1720 standards set separate benchmark times for Fire and EMS responses with the same compliance criteria for Turnout. Turnout time represents the elapsed time from the moment a call is dispatched, until the assigned Emergency Response Unit(s) is physically en route.
  - NFPA 1720 standard states:
    - 90% of all emergency responses to fire calls must turnout within 80 seconds or less.
    - 90% of all emergency responses to EMS calls must turnout within 60 seconds or less.
  - Current firehall design standards would keep this access to PPE gear separate from any other rooms in order to provide an unimpeded route to the emergency vehicles improving response times.

- Equipment:
  - Gear storage drying system, SCBA room and equipment in clean room, (fill station and compressor), AV training systems are all areas of deficiency from a contemporary typical firehall design.
  - Emergency genset is present but would need to be evaluated to assess how much of the building could be powered. Current best practice would be to power the entire building, minus any cooling systems for a minimum of 72 hours. This would require fuel storage to support this operation on site as well as the generator.

- Systems:
  - Environmentally, low flow fixtures, LED lighting and a high efficiency mechanical system would be some of the usual areas where older buildings do not match current design and BCBC standards.
  - Traffic preemption control is not required.

F. existing building photographs

Exterior view of the Cowichan Bay Volunteer Fire Department: Front and southern facade looking north east.

Exterior view of the Cowichan Bay Volunteer Fire Department - eastern facade looking west from the eastern parking area.

F. existing building photographs

Exterior view of the Cowichan Bay Volunteer Fire Department - North facade looking south-west from parking area between storage building.

Exterior view of the Cowichan Bay Volunteer Fire Department - western facade looking west from the eastern parking area.

F. existing building photographs

Exterior view of the Cowichan Bay Volunteer Fire Department - looking east from the western site entrance towards the storage building

Exterior view of the Cowichan Bay Volunteer Fire Department - looking north from the western site entrance towards the training yard and down Wilmot Road

F. existing building photographs

PPE area located within the apparatus bays instead of separate room. Limits movement around vehicles.

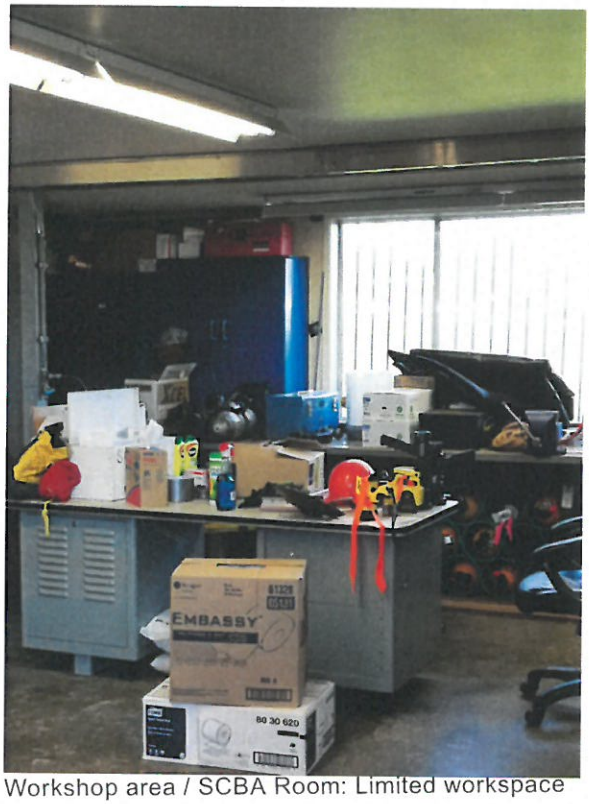
PPE equipment exposed to vehicle exhaust and contaminants. Exposed to apparatus bays is no longer industry standard.

Size of the apparatus bays limits available movement around the vehicles which restricts response time and safety of crews.

Electrical systems and wiring - located directly off he bays.

F. existing building photographs

Workshop area is combined with work station and SCBA. Limited workspace and storage.



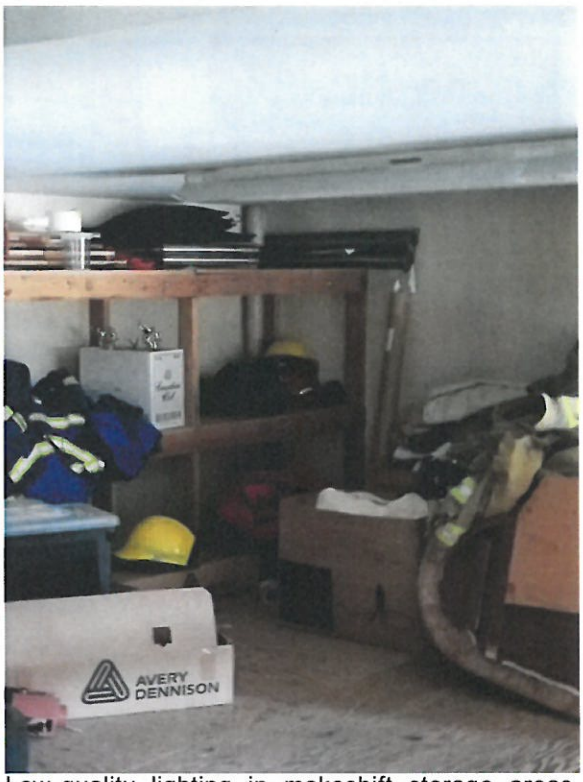
Workshop area / SCBA Room: Limited workspace and storage which is open to the bays

SCBA equipment, general storage and workshop all stored in one area with no separation between clean and dirty.

SCBA fill station and compressor located directly off the apparatus bays

F. existing building photographs

Makeshift storage located above workshop area.



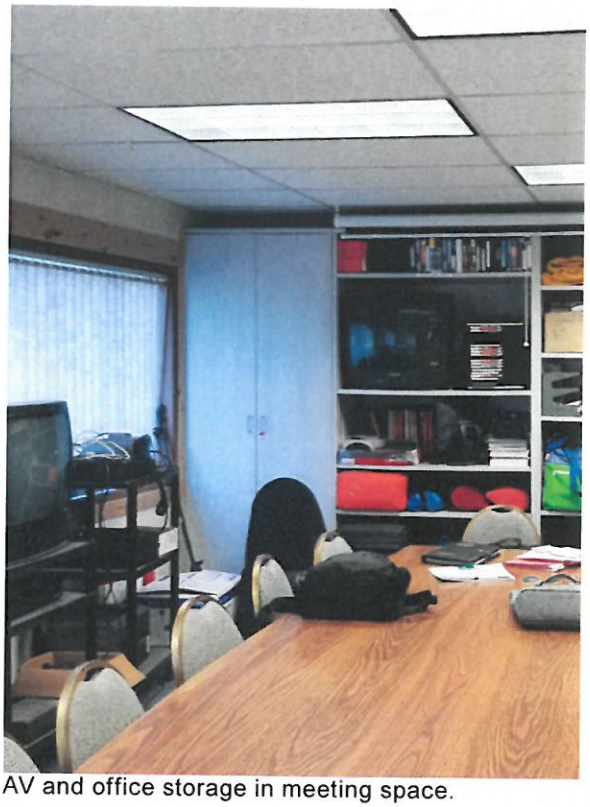
Low-quality lighting in makeshift storage areas. Storage areas make good use of odd spaces.

Cleaning equipment in hose tower.

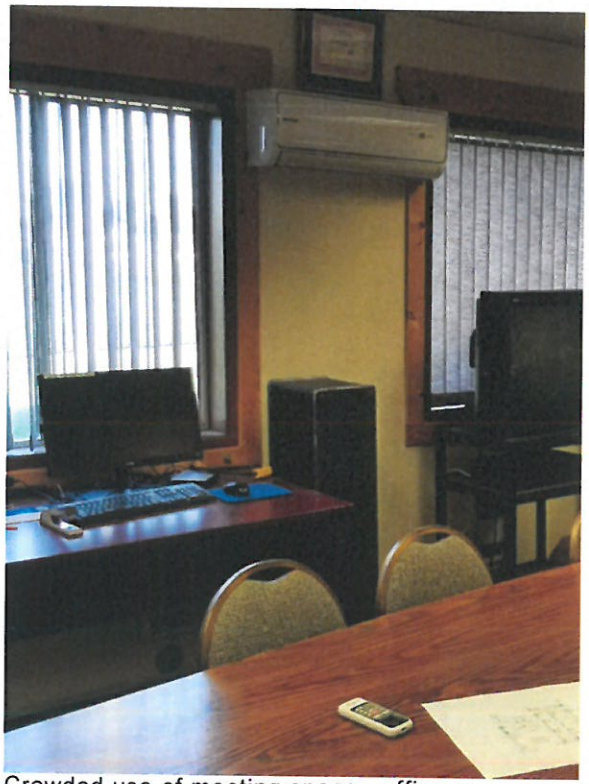
Gear washing and health and wellness in same area - out in the storage building away from the main firehall

F. existing building photographs

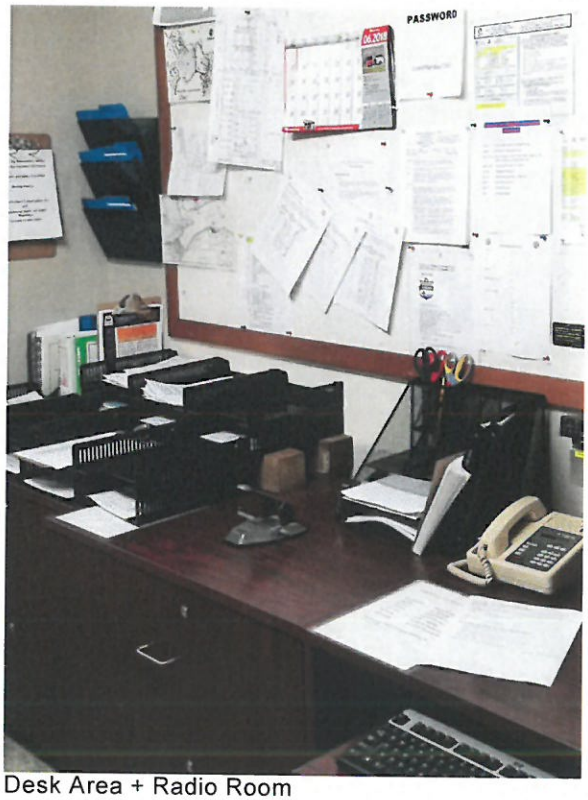
Hose storage and additional general workshop area located outside the hall in the storage building.



AV and office storage in meeting space.



Crowded use of meeting space - office spaces are located in meeting room.



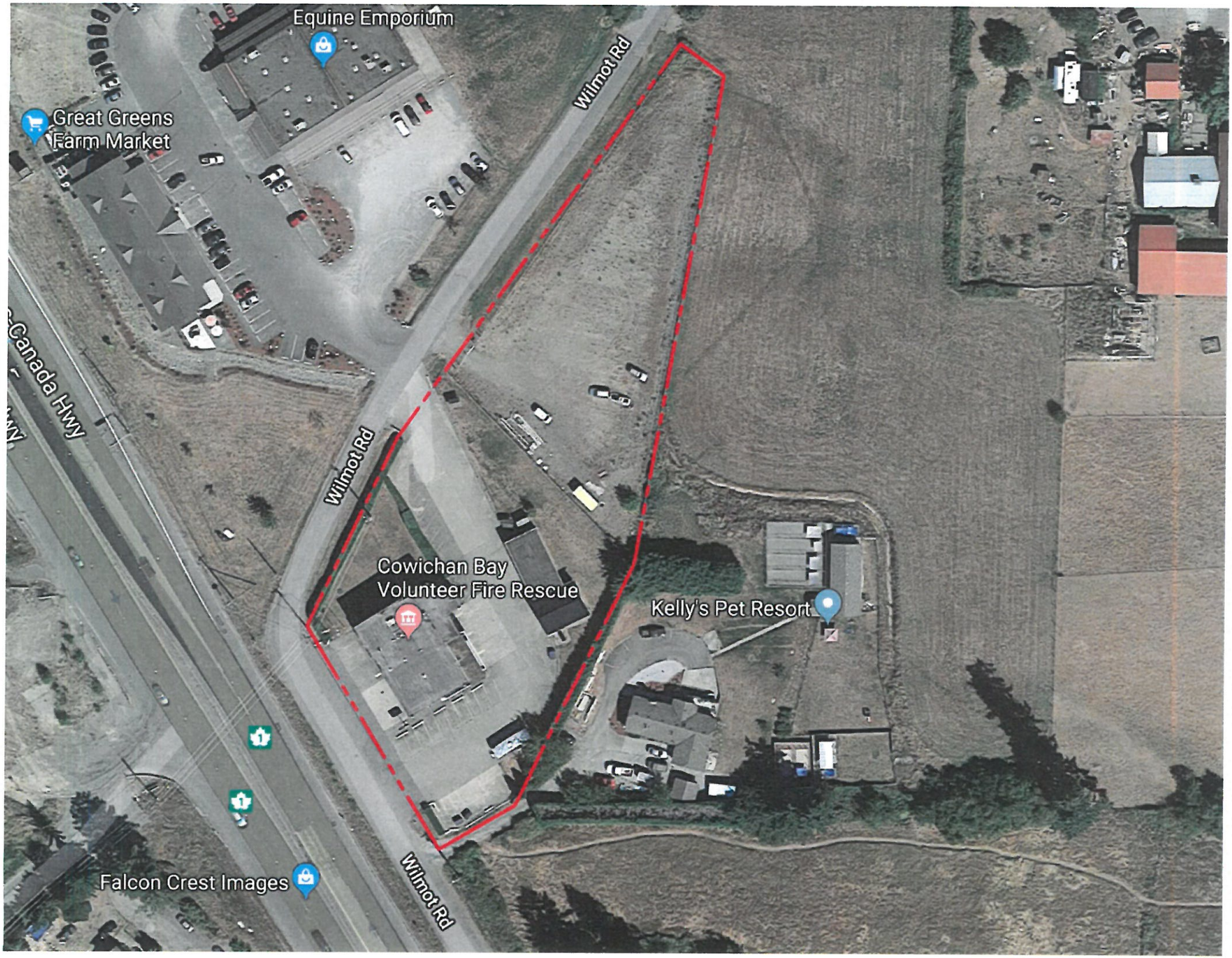
Desk Area + Radio Room

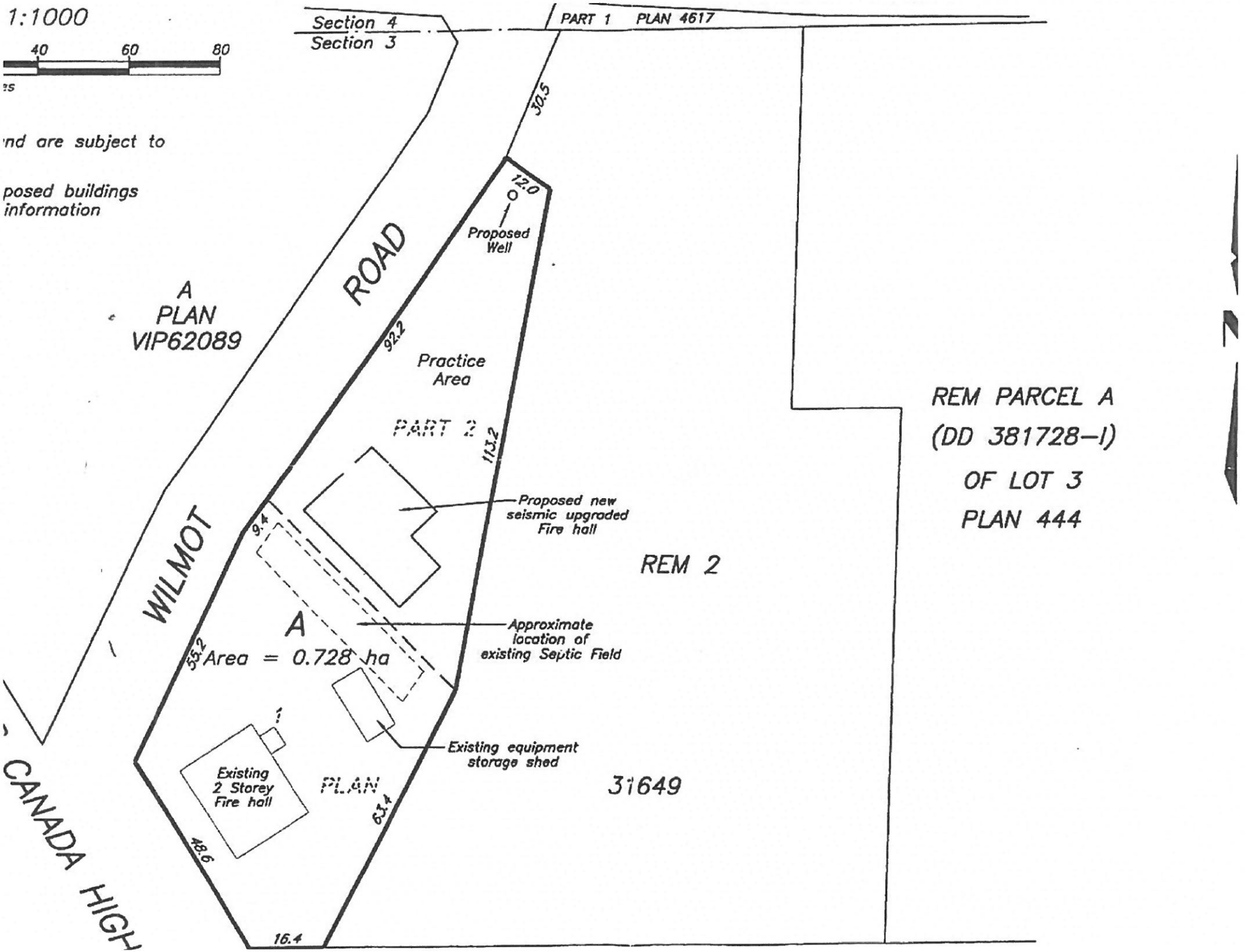
F. existing building photographs

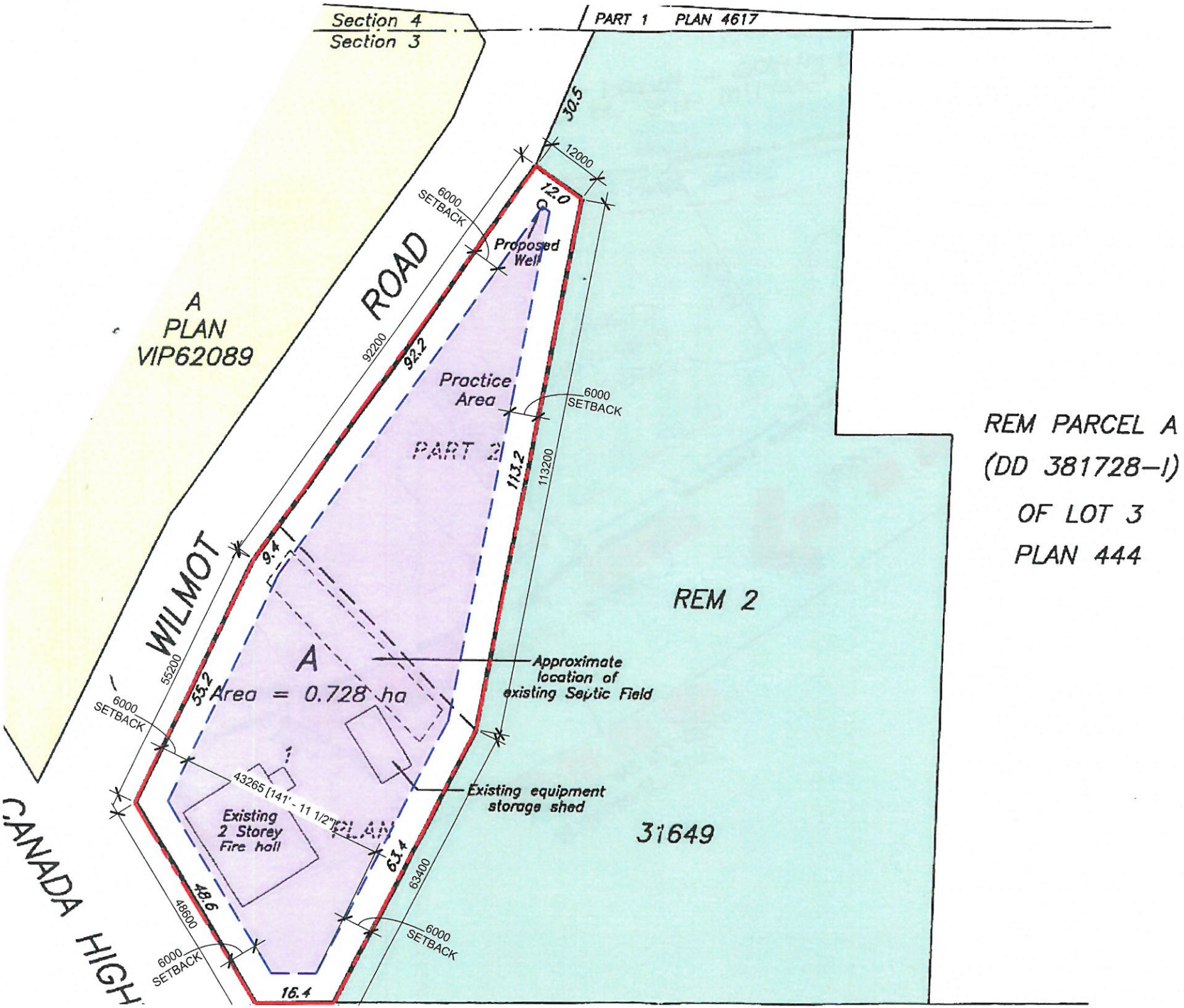
Shared office space for Chief, Deputy Chief and Training Officer.

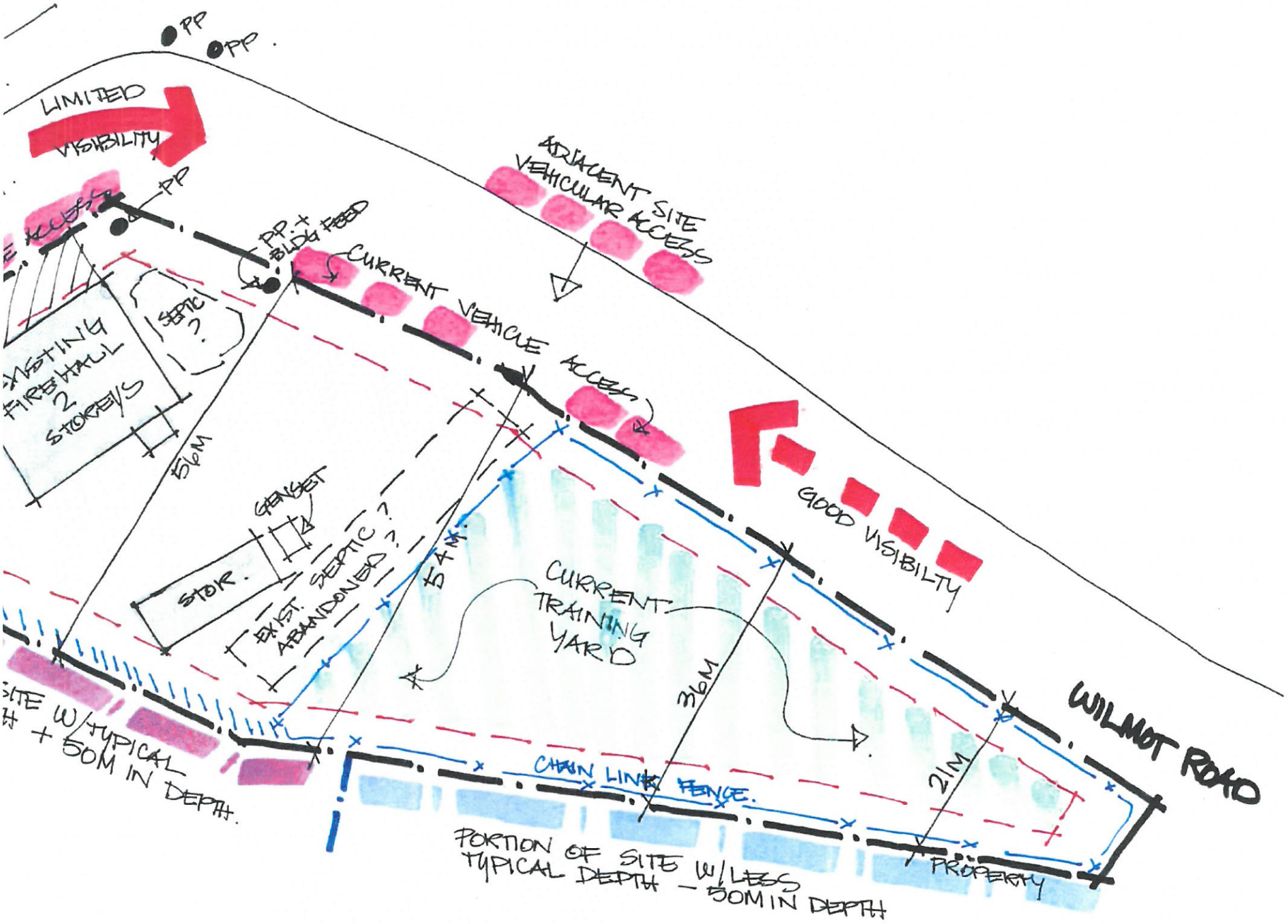
Great size kitchen with good equipment. Millwork could use an update with countertops redone for longevity.

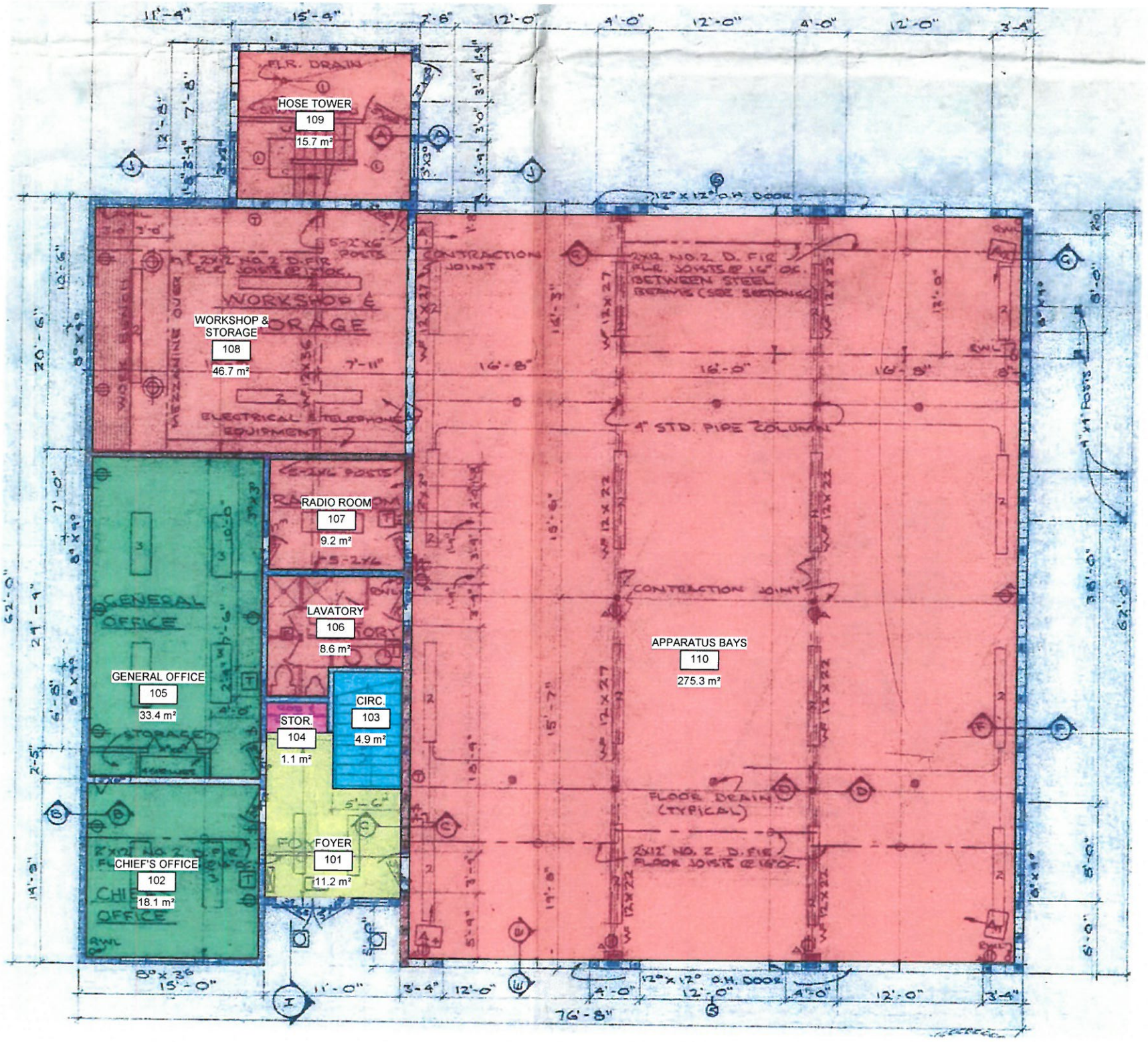
Training Room, Chair Storage + Day Room Area in shared space.

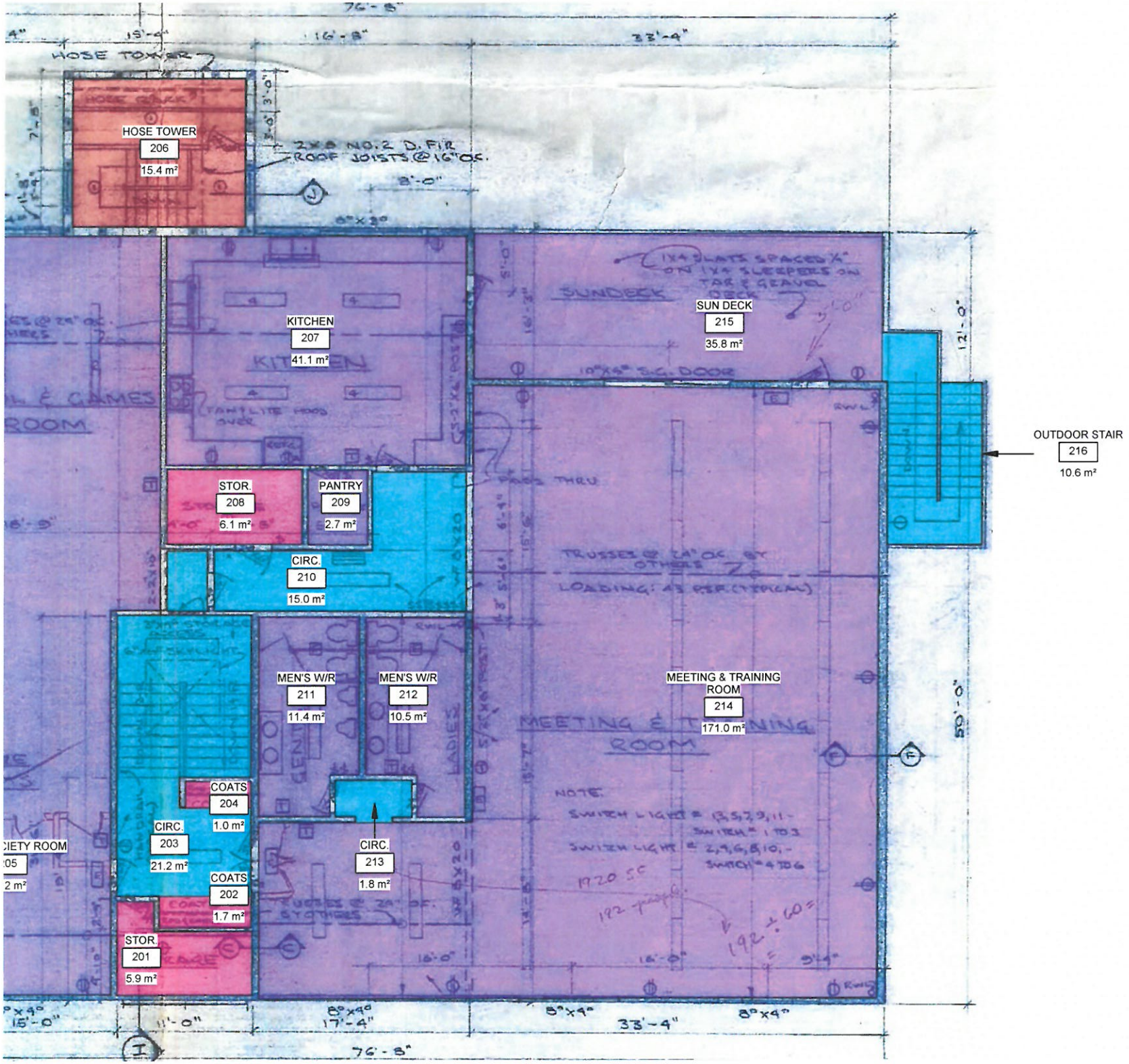

Equine Emporium
Great Greens
Farm Market
Wilmot Rd
Canada Hwy
Wilmot Rd
Cowichan Bay
Volunteer Fire Rescue
Kelly's Pet Resort
Falcon Crest Images
Wilmot Rd


1:1000
40
60
80
nd are subject to
posed buildings
information
Section 4
Section 3
PART 1 PLAN 4617
30.5
12.0
Proposed Well
ROAD
A
PLAN
VIP62089
92.2
Practice Area
PART 2
113.2
REM PARCEL A
(DD 381728–I)
OF LOT 3
PLAN 444
Proposed new seismic upgraded Fire hall
9.4
WILMOT
REM 2
A
Approximate location of existing Septic Field
55.2
Area = 0.728 ha
1
Existing equipment storage shed
Existing 2 Storey Fire hall
PLAN
31649
63.4
48.6
16.4
CANADA HIGH

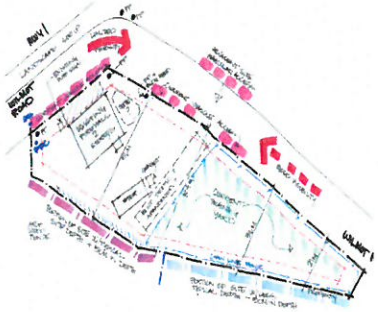

Section 4
Section 3
PART 1 PLAN 4617
30.5
12000
12.0
6000 SETBACK
Proposed Well
A PLAN VIP62089
ROAD
92200
92.2
Practice Area
6000 SETBACK
PART 2
113.2
113200
REM PARCEL A
(DD 381728-I)
OF LOT 3
PLAN 444
REM 2
WILMOT
9.4
A
Area = 0.728 ha
55.2
55200
6000 SETBACK
Approximate location of existing Septic Field
Existing equipment storage shed
43265 [141' - 11 1/2"]
PLAN
31649
Existing 2 Storey Fire hall
63.4
63400
48.6
48600
6000 SETBACK
6000 SETBACK
16.4
CANADA HIGH


PP
PP
LIMITED VISIBILITY
PP
PP + BLDG FEED
ADJACENT SITE VEHICULAR ACCESS
CURRENT VEHICLE ACCESS
EXISTING FIREHALL 2 STOREYS
SEPTIC ?
51.6M
GENSET
STOR.
EXIST. SEPTIC ? ABANDONED ?
54M
GOOD VISIBILTY
CURRENT TRAINING YARD
36M
WILMOT ROAD
CHAIN LINK FENCE.
21M
PROPERTY
PORTION OF SITE W/LESS TYPICAL DEPTH — 50M IN DEPTH
SITE W/TYPICAL + 50M IN DEPTH.


HOSE TOWER
109
15.7 m²
WORKSHOP & STORAGE
108
46.7 m²
RADIO ROOM
107
9.2 m²
LAVATORY
106
8.6 m²
GENERAL OFFICE
105
33.4 m²
CIRC.
103
4.9 m²
STOR.
104
1.1 m²
FOYER
101
11.2 m²
CHIEF'S OFFICE
102
18.1 m²
APPARATUS BAYS
110
275.3 m²
12'x12' O.H. DOOR
CONTRACTION JOINT
4" STD. PIPE COLUMN
FLOOR DRAIN (TYPICAL)
ELECTRICAL & TELEPHONE EQUIPMENT
76'-8"


HOSE TOWER
206
15.4 m²
KITCHEN
207
41.1 m²
SUN DECK
215
35.8 m²
OUTDOOR STAIR
216
10.6 m²
STOR.
208
6.1 m²
PANTRY
209
2.7 m²
CIRC.
210
15.0 m²
MEN'S W/R
211
11.4 m²
MEN'S W/R
212
10.5 m²
MEETING & TRAINING ROOM
214
171.0 m²
COATS
204
1.0 m²
CIRC.
203
21.2 m²
CIRC.
213
1.8 m²
COATS
202
1.7 m²
STOR.
201
5.9 m²
2X8 NO.2 D.FIR ROOF JOISTS @16" OC.
1X4 SLATS SPACED ½" ON 1X4 SLEEPERS ON TAR & GRAVEL DECK
SUNDECK
LOADING: 43 PSF (TYPICAL)
MEETING & TRAINING ROOM
76'-8"
33'-4"
16'-8"
19'-4"
15'-0"
17'-4"
11'-0"

3.0 needs analysis - programming



3.0 needs analysis - program / facilities

All buildings are based on an initial architectural 'program', which in its simplest definition; is a combination of client wants and needs that the Architect then interprets to create a feasible list or arrangement of spaces, which ultimately becomes the pragmatic basis of the built structure.

A survey of the building program was conducted to primarily review function, size and relationship of spaces in order to establish if the existing facility is suitable to maintain effective fire and rescue services to meet current standards. In addition to evaluating the existing architectural programs, recommendations have been made to modify or add functional spaces to meet the current standards; in short, this report aims to identify the current needs of the fire service as well those projected into the future. This is determined by staff interviews, industry standards and recommending programmatic spaces which are not only typically required for modern firehalls but dictated by best practice methodologies, British Columbia building codes, and the National Fire Protection Association guidelines.

The following is a brief overview of the primary program for a replacement firehall and is intended to lend context to the program scope. This hall focuses on providing suppression and rescue services and as such requires facilities which accommodate equipment + staff necessary to these functions. In addition, the building also needs to house supplementary suppression crew functions such as kitchen, society room, day room, training and fitness for the crews. As a Headquarters hall, CBIDFH needs to house a larger collection of functions, such as Senior Level Management and Administration, Fire Prevention, Training, and act as a Departmental EOC.

Building Program:
The existing and proposed spatial program has been compared in two key documents which have been organized into a matrix type chart for ease of use.

1. Proposed Space Program Chart
   (A full list of proposed programmatic spaces with associates area sizes in square metres and square feet).

2. Programming Spatial Diagram
   (Graphic representation of the space program and a comparison with the existing).

The first of these two documents compares the spatial program of the current hall and types of spaces with that of current and future needs of the Department. The second document compares these spaces graphically for an easy visual comparison.

Upon completion of the programming needs analysis, the next stage of the report tested the program on the existing site to examine if the new space program could fit in a variety of layouts. The report at this point examines the pros and cons of these two option final site options in **Section 4.0**.

A. current industry standards

The current hall does not meet best practice industry standards in terms of flow, decontamination, security and building code. CBVFR has made the best of the situation but as technology, equipment and training needs of the Fire Services changes so do the requirements for facilities which house them. This issue pertains to those spaces which are considered to be standard practice for today's fire fighter.

Some examples are as follows:

- Fire fighters are exposed to micro carcinogenic particles during an event which need to be kept from contaminating other equipment or being dragged into the clean portions of the hall.

- Decontamination Washroom: a washroom should be positioned directly off the apparatus bays, or directly off a vestibule adjacent to the apparatus bays, to allow for the fire fighters to perform a first stage decontamination when returning from a fire. This room allows them to shower and bag their soiled uniforms before entering the remainder of the hall which limits the spread of contaminants which are potentially harmful.
    - Currently the existing hall does have a decontamination washroom for multiple users - this is a gender specific approach.

- Personal Protective Gear (Turnout Gear) is required to be worn by firefighters to every emergency. Currently the firehall has PPE Gear stored in the apparatus bays which is no longer ideal - a dedicated room should have the following considerations:
    - PPE is exposed to vehicle exhaust, grease, oil, fuel and other similar pollutants.
    - Cleaned and ready-to-wear PPE Gear which is stored in the apparatus bays are exposed to contaminants from other dirty gear + equipment. Storing this equipment in a separate room meets today's industry standards.
    - There should be provisions for an on site official gear washer to ensure that gear is able to be cleaned to limit the spread and exposure of contaminants.
        - this is available in the CBIDFH currently but located in the storage building.
    - A separate room for PPE also allows for the gear to dry effectively and in a timely manner; if located in a large, open space such as the bays, slow drying can deteriorates it over time and requires the storage of additional gear incase there is another call before the gear is dry.
    - The gear clutters the apparatus bays making quick access to vehicles slower and works against NFPA 1710 + 1720 standards.
    - Current industry standards dictate a dedicated and environmentally controlled room, designed to store and dry PPE Gear is required for a new firehall.

- SCBA room: industry standards for Firehall design requires a SCBA room which is limited to this function only. The SCBA area houses the filling station and usually located adjacent to the SCBA compressor to maintain the breathing apparatus and masks essential to fighting fires. This equipment should be washed, dried and maintained in a clean environment as this equipment plays a crucial role in protection of fire fighters in the field.
    - Currently the hall does not have a dedicated SCBA room and currently the compressor and filling station are located within the apparatus bays. The compressor should be located in its own room due to the noise and impact on crews when they would be working in the room.

- NFPA 1500 specifies the minimum requirements for an occupational safety and health program for fire departments or organizations that provide rescue, fire suppression, emergency medical services, hazardous materials mitigation, special operations, and other emergency services.

- WorkSafe BC has recognized 10 presumptive cancers associated with Firefighting. Under the Workers Compensation Act of BC, when a firefighter who was regularly exposed to the hazards of a fire scene contracts a prescribed occupational disease, the disease must be presumed to be due to the nature of the worker's employment as a firefighter. The Firefighters' Occupational Disease Regulation lists the following ten cancers as prescribed occupational diseases that are causally related to the occupation of firefighting:

    1. Primary leukemia
    2. Primary non-Hodgkin's lymphoma
    3. Primary site bladder cancer
    4. Primary site brain cancer
    5. Primary site colorectal cancer
    6. Primary site kidney cancer
    7. Primary site lung cancer
    8. Primary site testicular cancer
    9. Primary site ureter cancer
    10. Primary site esophageal cancer

- Provision of current industry standard Decontamination Washrooms, PPE Gear Washing and Storage Rooms and SCBA Rooms are required to comply with current the NFPA 1500 Standard and assist with the mitigation of presumptive cancers associated with firefighting.

B. gender neutrality

The fire department "family" is a much different entity in 2018 compared to when the current firehall was built 41 years ago. In the 1970's, departments were primarily made-up of male dominated crews who would work and live together in the firehall. Dorms and washrooms were designed in an open style, with beds or cots all contained within one large room and male only washrooms with gang-type shower facilities.

- As this hall was not originally designed to accommodate crew quarters, these facilities do not have dorms of any kind within the current arrangement.
- The building was designed with limited washroom facilities which were focused on serving one gender and with limited privacy, as well as no dorms spaces and no separate locker areas.

Over the years, women firefighters on suppression crews have become more and more prevalent. In addition, privacy is equally important regardless of gender so the old days of group dorms and washrooms are being quickly phased out.

The general approach today dictates that all Fire Department members be treated equally and with dignity. The simple fact before us is that the current building does not have enough or appropriate accommodations to address crew changes now or into the future. There is a need to provide the opportunity to accommodate women, men and transgender crew members under one roof as a unified team. These issues have a level complexity which flows between encouraging camaraderie, personal privacy, and cost. The CBVFR has established a policy to address these issues first hand with the current layout of the hall, but due to lack of available space, this is clearly a deficiency which needs to be addressed with the next reiteration of facility.

C. specialized programmatic needs

As the nature of the fire services has evolved, so has the scope of work for the firefighter. Additional services, such as Medical Response, Motor Vehicle Accidents, Search and Rescue and Hazardous Materials handling have firefighters expanding their skill sets well beyond the suppression of a traditional structure fire. Current training needs, both classroom and physical, require adequate classroom facilities with modern teaching aids. Physical training requires an outdoor yard with life-size props to simulate real life scenarios, which can also test and certify specific apparatus equipment, such as a Pumper test-pit. In addition to maintaining the training and certification levels of firefighters, specialized facilities are required to respond to current industry standards for PPE Gear Washing and Storage, SCBA and Mask Repair and Fleet Maintenance to keep moving the CBVFR into the future.

- The establishment of training facilities and associated interior spaces at the Firehall is a necessary step to maintain required training and certification levels for the firefighters. A large, dedicated classroom-style training room(s) is necessary to allow for the frequency of training and expanded skill set requirements for today's firefighter. The classroom should be located with exterior access to the training yard and possess modern teaching aids and technology.
    - The current building has a good sized training room which does not have storage and IT needs or a more modern training room. It is also located on the upper floor of the building which limits its access by the Public.
    - This space can be used effectively as the EOC space to create a multifunctional use of the training rooms.

- PPE Gear Washing and Storage Room will allow the CBVFR to wash and maintain their own gear on site within a decontamination room on the dirty side of the hall, which reduces costs and provides quality control in order to meet current industry and NFPA standards. A dedicated Gear Storage Room will also allow the Service to meet current industry and NFPA standards for decontamination and preservation of PPE Gear.

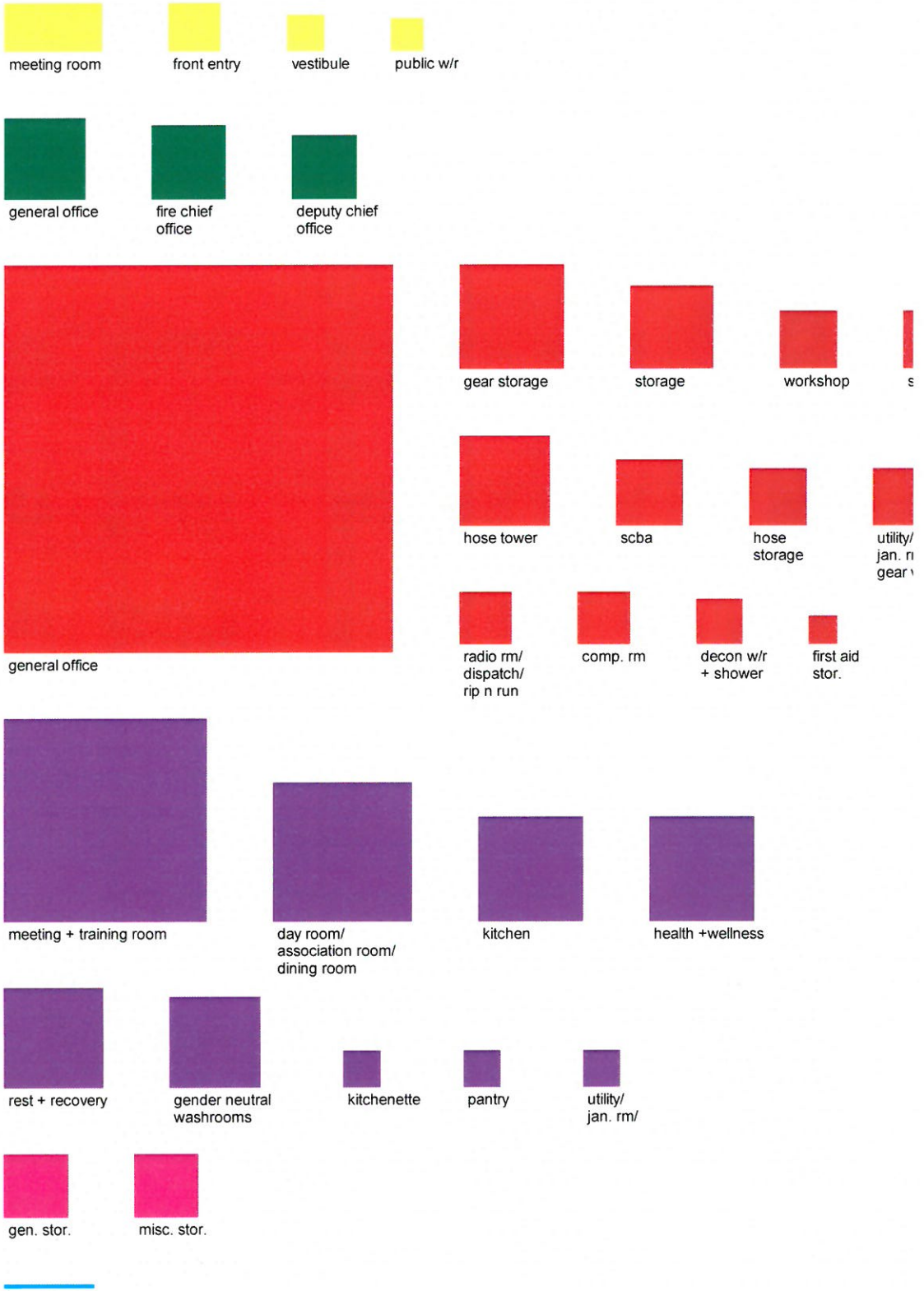
- Specialized Suppression Crew Teams needs to have the ability for specialized training, storage of purpose-built vehicles and props.

- Departmental Emergency Operation Centre: The firehall is often one of the only post disaster buildings in a community which make it ideal to serve as the department's EOC. The intention for this building would be to design the training rooms so that they are easily adaptable to become an Departmental EOC. This would include the ability to quickly set up in EOC mode and flexibility within the rooms to handle multiple desking situations. In addition, associated storage room would be provided within the near vicinity of the main EOC rooms.

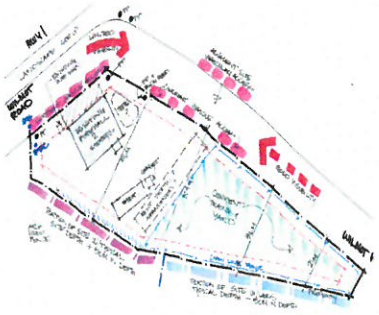
cbid firehall — R2

Space Program			EXISTING	EXISTING		PROPOSED	PROPOSED	
BASE BUILDING						AREA	NET AREA	NOTES
Item	FL		SF	SM		SF	SM	
		PUBLIC AREAS						
1		Front entry	120.51	11.20		107.60	10.00	NEW: no reception desk
2		VESTIBULE	0.00	0.00		53.80	5.00	NEW: Weather vestibule
3		PUBLIC WASHROOM (HC	0.00	0.00		43.04	4.00	
4		MEETING ROOM	0.00	0.00		376.60	35.00	NEW: Council Room
5		ARCHIVAL DISPLAY	0.00	0.00		377	35.00	
		Sub Total	120.51	11.20		957.64	89.00	
		ADMIN						
6		Fire Chief Office	194.76	18.10		215.20	20.00	NEW: room for table
7		General Office	359.38	33.40		258.24	24.00	NEW: 3-4 work stations for suppression crew
8		DEPUTY CHIEF OFFICE	0.00	0.00		193.68	18.00	
9		CAPTAIN'S OFFICE	0.00	0.00		161.40	15.00	
10		TRAINING OFFICE	0.00	0.00		161.40	15.00	
11		FILE STORAGE	0.00	0.00		53.80	5.00	
12		PUBLIC WASHROOM	0.00	0.00		32.28	3.00	NEW: Gender Neutral
13		PUBLIC WASHROOM	0.00	0.00		0.32	3.00	NEW: Gender Neutral
		Sub Total	554.14	51.50		1076.32	103.00	
		OPERATIONAL AREAS						
14		Decon Washroom + Shower	92.54	8.60		80.70	7.50	under lavatory on main floor plan
15		Radio Room / Dispatch / Rip n Run	98.99	9.20		107.60	10.00	NEW: 1 - 2 workstations.
16		Workshop	502.49	46.70		129.12	12.00	
17		Apparatus Bays 2 bays @ 25.5m(85')L x 5.6m(18.3') W 2 bays @ 25.5m(85')L x 5.2m(17.0') W	2,962.23	275.30		5,920.15	550.20	NEW: 4 tandem bays to suit 8 vehicles.
18		Mezzanine Storage	204.44	19.00		0.00	0.00	TBD
19		Hose Tower	168.93	15.70		322.80	30.00	
20		HOSE STORAGE	0.00	0.00		129.12	12.00	
21		Storage	269.00	25.00		269.00	25.00	
22		SECURE STORAGE	0.00	0.00		129.12	12.00	NEW: for additional sets of Gear
23		GEAR STORAGE ROOM (40 units)	0.00	0.00		430.40	40.00	EXIST: located in the bays
24		SCBA	0.00	0.00		172.16	16.00	EXIST: currently shown in Work shop area
25		UTILITY / JANITOR'S ROOM w/ GEAR WA	0.00	0.00		129.12	12.00	
26		COMPRESSOR ROOM	0.00	0.00		107.60	10.00	
27		FIRST AID STORAGE	0.00	0.00		32.28	3.00	Room or Cabinet
		Sub Total	4298.62	399.50		7959.17	739.70	
		FIREHALL QUARTERS						
28		Dayroom / Association Room / Dining Room	970.55	90.20		753.20	70.00	NEW: to suit 50 members.
29		Kitchen	442.24	41.10		430.40	40.00	
30		Pantry	29.05	2.70		53.80	5.00	
31		FD Washrooms - Men's	122.66	11.40		161.40	15.00	NEW: 2 gender neutral @ 7.5sm ea. Includes showers.
32		FD Washrooms - Women's	112.98	10.50		161.40	15.00	NEW: 2 gender neutral @ 7.5sm ea. Includes showers.
33		Meeting + Training Room	1,639.95	171.00		1,614.00	150.00	

cbid firehall								R2
Space Program			**EXISTING**	**EXISTING**		**PROPOSED**	**PROPOSED**	
BASE BUILDING						***AREA***	***NET AREA***	**NOTES**
Item	**FL**		**SF**	**SM**		**SF**	**SM**	
34		Health and Wellness	0.00	0.00		430.40	40.00	EXIST: in storage building
35		KITCHENETTE	0.00	0.00		53.80	5.00	NEW: only required if there is a new quaretrs building.
36		JAN / UTILITY RM	0.00	0.00		53.80	5.00	
37		REST & RECOVERY	0.00	0.00		387.36	36.00	NEW: Rooms for 4 gender neutral areas.
		Sub Total	**3517.44**	**326.90**		**4099.56**	**381.00**	
		STORAGE						
38		General Storage	107.60	10.00		161.40	15.00	
39		Miscellaneous Storage	86.08	8.00		161.40	15.00	
		Sub Total	**86.08**	**18.00**		**161.40**	**15.00**	
		CIRCULATION						
40		Stair	52.72	4.90		0.00	30.00	NEW: All other circulation outlined in mark-up below.
41		Stair	228.11	21.20		0.00	0.00	
42		Corridor	161.40	15.00		0.00	0.00	
43		Washroom Entrance	19.37	1.80		0.00	0.00	
44		Outdoor Stair	114.06	10.60		0.00	0.00	
		Sub Total	**575.66**	**53.50**		**0.00**	**30.00**	
		SERVICE SPACES						
45		ELECTRICAL ROOM	0.00	0.00		107.60	10.00	
46		MECHANICAL ROOM	0.00	0.00		215.20	20.00	
47		IT CLOSET + SERVER ROOM	0.00	0.00		107.60	10.00	
		Sub Total	**0.00**	**0.00**		**430.40**	**40.00**	
		Building Total (Pre Mark-up) sm	**9,206.26**	**865.60**		**14,684.49**	**1,397.70**	
		Mark-up 25% (new building)	2,301.56	43.28		3,671.12	349.43	
		Mark-up 10% (new building)	920.63	21.64		0.00	0.00	
		TOTAL FIREHALL	12,428.45	930.52		18,355.62	1,747.13	


meeting room
front entry
vestibule
public w/r
general office
fire chief office
deputy chief office
workshop + storage
radio room
hose tower
lavatory
society room
kitchen + pantry
hen's
general office
gear storage
storage
workshop
hose tower
scba
hose storage
radio rm/ dispatch/ rip n run
comp. rm
decon w/r + shower
first aid stor.
meeting + training room
day room/ association room/ dining room
kitchen
health +wellness
rest + recovery
gender neutral washrooms
kitchenette
pantry
utility/ jan. rm/
gen. stor.
misc. stor.

4.0 siting options



4.0 siting options

The siting studies for the Cowichan Bay Firehall began with the development of an elementary site analysis, defining general site characteristics, context influences and zoning impacts. The focus of this study was to identify feasible options for redevelopment of a new firehall based on a needs assessment, using the existing site. The goal of all site development is to try to use existing site if possible to the best advantage. In this case, the existing site has a number of challenges in examining redevelopment which impacted the various options such as site shape, dimensions and the location of the existing building.

Preliminary fit test studies were completed by positioning the space program onto the site for further study. Each site study examined the possible orientation of the firehall on the site, potential for Public interface, functionality for the CBVFR, parking on site, site access etc.

Upon completion of an initial site analysis of the existing site, the number of options were narrowed down to 3 potential development strategies which will be outlined this section of the report. All associated drawings are at the end of this section.

A. general layout considerations

The siting options shown after this written section will outline a high level layouts for discussion. The following is a list of concerns which need to be addressed for all options.

- One of the main objectives in siting the firehall is to position the apparatus bays as perpendicular to the road as possible so that the wear and tear on the vehicles is not extensive upon exiting and response time is as quick as possible. – all layouts shown are based on this premise.

- programmatic zoning of the site in all layouts: current industry standards for a composite department recommends a separation of the vehicular traffic between the general Public, exiting / arriving emergency vehicles and P.O.C + Career staff. This is especially crucial as these groups converge on the Firehall and as vehicles leave to address emergent events. Keeping these zones separate is key in protecting the safety of the surrounding public and the Fire Fighters.

- The depth and the width of the ideal site are crucial in the building orientation. The minimum depth of the site should be 60m and minimum width needs to be 62 - 65m to accommodate the apparatus bays, return road, fire truck turning radii, and the firehall portion of the space program. This will ensure that the fire fighters have the room they need for training, completion of their regular duties and that site development will not create additional cost or maintenance over time.

- The ability to keep the existing firehall operational while the new building is being constructed was a key consideration in the overall approach to the new project and thus affects possible development for the new apparatus bays in particular.

B. existing site - summary

The existing site is located at the civic address of 4991 Trans Canada Hwy, directly off a frontage road which runs parallel to the Highway and is a main arterial network through the Cowichan Bay District. This location is central to the business district, mercantile and residential properties, with quick access to both area towards the north and those located off the Trans Canada Highway. This Headquarters facility is a 10,000sf building with approximately 25 surface parking stalls and a 1000 sf storage building built in the middle of the site.

Although the existing site measures approximately 1.799acres (7,280sm), in overall size, which is a good size site in terms of industry standards, the shape of the site somewhat limits the options for redevelopment for the Firehall. This is identified further in both the typical bay layout and the site analysis included at the end of this section.

The site grades are extremely uncomplicated which makes for easier construction and less cost overall. The redeveloped site should have minimal slope and grade changes if possible as emergency vehicle exiting should try to be kept to a maximum of 5% slope. Set backs on the property are 6.0m on all sides leaving approximately 0 1.21 acres (4,883sm) of the site for development.

C. siting study 1R1: existing FH + new apparatus bays

This option examines the possibility not only of keeping the existing firehall operational during construction; but, keeping the old as part of the final development of the site. The premise in this layout is to design a new set of apparatus bays and operational spaces essential to the operation of the firehall in a new post disaster building which meets all current industry standards. The old firehall would be connected to the new building and separated through a seismic joint. The old building would be renovated functionally and to meet general code requirements ; however,the building would NOT be updated to current post disaster standards.

pros:

- Site size has enough area and the right amount of depth to house both sets of apparatus bays and provide parking on site for both public and crews.
- Uses the deepest part of the site for the addition of the new main vehicle bays and the triangular portion of the site for the training yard.
- The public access and crew access can be easily separated due it being on a corner site, which provides multiple access points and safer movement around the site reducing conflict.
- Enough room for a 16m apron which provides a safe approach for emergency vehicles exiting the Bays and allows for vehicles to fully exit the Bays before entering the street.
- Site size permits drive through apparatus bays.
- Allows for the existing hall to remain operational during construction.
- Considers keeping the existing building with renovations to meet Code.
- Operational spine (gear storage, radio room, SCBA, workshop, utility etc.) are located directly adjacent to the crew parking providing quick access from the parking area to the key spaces for deployment.
- Shows the possibility of water collection on site for the fire fighter use.
- Places the generator and fueling system close to the building and to emergency vehicle traffic so both are ideally located for use in an economic way.
- Good size training yard directly off the Hose Tower so this can be used as a training structure. Training yard should be a minimum of 20 metres from the rear of the Hose Tower for training or hose work.
- An economical approach to upgrading the facility.

cons:

- The apron could only be 16m in depth maximum to enable drive through bays. This dimension is to the property line with a bit more distance to the road , allowable but not counted in this measurement.

- The renovation of the existing hall would result in still having a non post disaster portion of the facility. This situation would likely only be viable if this existing structure does NOT have to be upgraded. This would require acceptance of this idea by the "Authority Having Jurisdiction" (CVRD) but has been done before in other CVRD communities.
- The Public uses the same drive aisle as returning Emergency vehicles to access the site. Because the vehicles are returning at a slower rate this is usually not an issue.
- The renovation to the existing building can be a risk due to the unknown conditions of the building.

D. siting study 2R1: new building

This option examines the possibility repositioning the apparatus bays. The premise in this layout is to design a new post disaster firehall building which meets all current industry standards. The old firehall would remain during construction to house the existing operations. Once construction was complete, the existing building would be demolished. This siting study also looks at using the triangular portion of the site for the development of the quarters side of the hall rather than the training area. This option still looks to keep the apparatus bays in the middle of the site using as much of the depth of the site as possible.

pros:

- Site size has enough area and the right amount of depth to house both sets of apparatus bays and provide parking on site for both public and crews.
- Because of the position of the existing firehall, the new bays are located to exit onto the western side of the site.
- Operational spine (gear storage, radio room, SCBA, workshop, utility etc.) are located directly adjacent to the crew parking providing quick access from the parking area to the key spaces for deployment.
- The public access and crew access can be easily separated due it being on a corner site, which provides multiple access points and safer movement around the site reducing conflict.
- Crews use the same drive aisle as returning Emergency vehicles to access the training area and crew parking.
- Enough room for a 16m apron which provides a safe approach for emergency vehicles exiting the Bays and allows for vehicles to fully exit the Bays before entering the street.
- Allows for the existing hall to remain operational during construction.
- Considers keeping the existing building for other users but would reduce the size of the training yard.
- Places the generator and fueling system close to the building which is cost effective.
- Good size training yard directly off the Hose Tower for so this can be used as a training structure.
- Start with new program and none of the complications when dealing with a renovation.

cons:

- The apron could only be 16m in depth maximum to enable drive through bays. This dimension is to the property line with a bit more distance to the road allowable but not counted in this measurement. This apron is not larger enough to aid with back in bays.
- Site size only permits drive through apparatus bays for half of the bays. This could be adjusted if the bays were to move further south but this would reduce the parking and training areas. The smaller apron would not be large enough to assist with drive in bays; as a result, backing into the bays would need to take place within the street. This may require the addition of traffic control measures for this scenario.
- There is less opportunity for the possibility of water collection on site due to the proximity of the building to the training yard and the lack of ability for emergency vehicles to use the north end of the site to access

water collection tanks.
- From a planning perspective, the training yard is positioned at the key corner of the site with the firehall building almost becoming secondary to the training yard. This puts more emphasis on the training yard and exposes those activities more readily to the Public as well as reducing the civic presence of this community building.
- Access to the fueling system in this location is not ideal.
- A less economic approach to upgrading the facility.

E. siting study 3: new firehall phased approach.

This option examines the possibility keeping the existing firehall operational during construction, building the new bays / operational quarters and then rebuilding the firehall quarters portion of the building once the bays are open and operational. These two elements could be phased over time; however, it would not be recommended to spend funds renovating the existing hall if these two phases were to be spread apart over an extended period of time. In this option, all elements of the firehall would become post disaster, designed to accommodate the needs of the CBVFR now and into the future as well as designed to meet the BCBC in all aspects including energy efficiency. This will present the best option for the CBID to move forward into the next 50 + years and create a building which is operationally efficient by reducing operating costs over the life of the building.

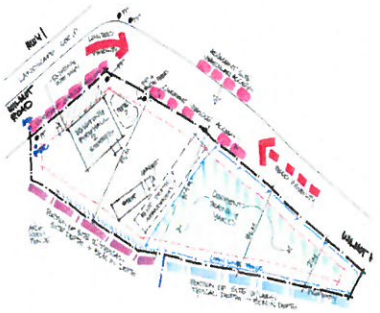
pros:

- More compact layout of the new quarters resulting in operational efficiencies. Provides a replacement for the quarters portion of the project which removes the risk of renovation and provide the department with a fully post disaster and programmatically specific project which will take the CBVFR into the next 50+ years without compromise.
- Reduces the uncertainty of the renovation process.
- Site size has enough area and the right amount of depth to house both sets of apparatus bays and provide parking on site for both public and crews.
- Uses the deepest part of the site for the addition of the new main vehicle bays and the triangular portion of the site for the training yard.
- The public access and crew access can be easily separated due it being on a corner site, which provides multiple access points and safer movement around the site reducing conflict.
- Enough room for a 16m apron which provides a safe approach for emergency vehicles exiting the Bays and allows for vehicles to fully exit the Bays before entering the street.
- Site size permits drive through apparatus bays.
- Allows for the existing hall to remain operational during construction.
- Operational spine (gear storage, radio room, SCBA, workshop, utility etc.) area located directly adjacent to the crew parking providing quick access from the parking are to the key spaces for deployment.
- Shows the possibility of water collection on site.
- Places the generator and fueling system close to the building and to emergency vehicle traffic so both are ideally located for use in an economic way.
- Good size training yard directly off the Hose Tower for so this can be used as a training structure. Training yard should be a minimum of 20 metres from the rear of the Hose Tower for training or hose work.

cons:

- A less economic approach to upgrading the facility and would require more funding to move the project forward.
- The apron could only be 16m in depth maximum to enable drive through bays. This dimension is to the property line with a bit more distance to the road allowable but not counted in this measurement.
- The Public uses the same drive aisle as returning Emergency vehicles to access the site. Because the vehicles are returning at a slower rate this is usually not an issue.

5.0 high level costing + final comments



A. high level costing

The following information has been provided at the very high level in order to provide some context to the Options as noted above. The costs listed below are construction related costs only and do not include soft costs such as Consultants, Land, Permitting etc.

These costs do not include a rate of escalation which is projected to be within 5 - 6% for 2018 - 2019. Examples of projects similar to this project built over the past few years are attached in the appendix section of this report.

- Geotechnical information pending in the next stage of this process.
- If the existing building was not to be kept operational, Relocation Costs would be as follows: $7,500 - 10,000 per month for approximately 18 months = $135,000 - $180,000.00.

a. Option 1R1: new apparatus bays (post disaster) / renovation of existing building (non post disaster / life safety upgrade) :

- Total square footage: 17,243 sf (1,602 sm)
- Demolition Costs: $100,000.00
- Renovation costs: $150.00 / sf @ 9,978 sf (927 sm) = $1,496,700.00
- New Building Costs: $ 400.00/sf @ 7,674 sf (713 sm) = $3,069,000.0
- Total anticipated construction costs: $ 4,556,300.00

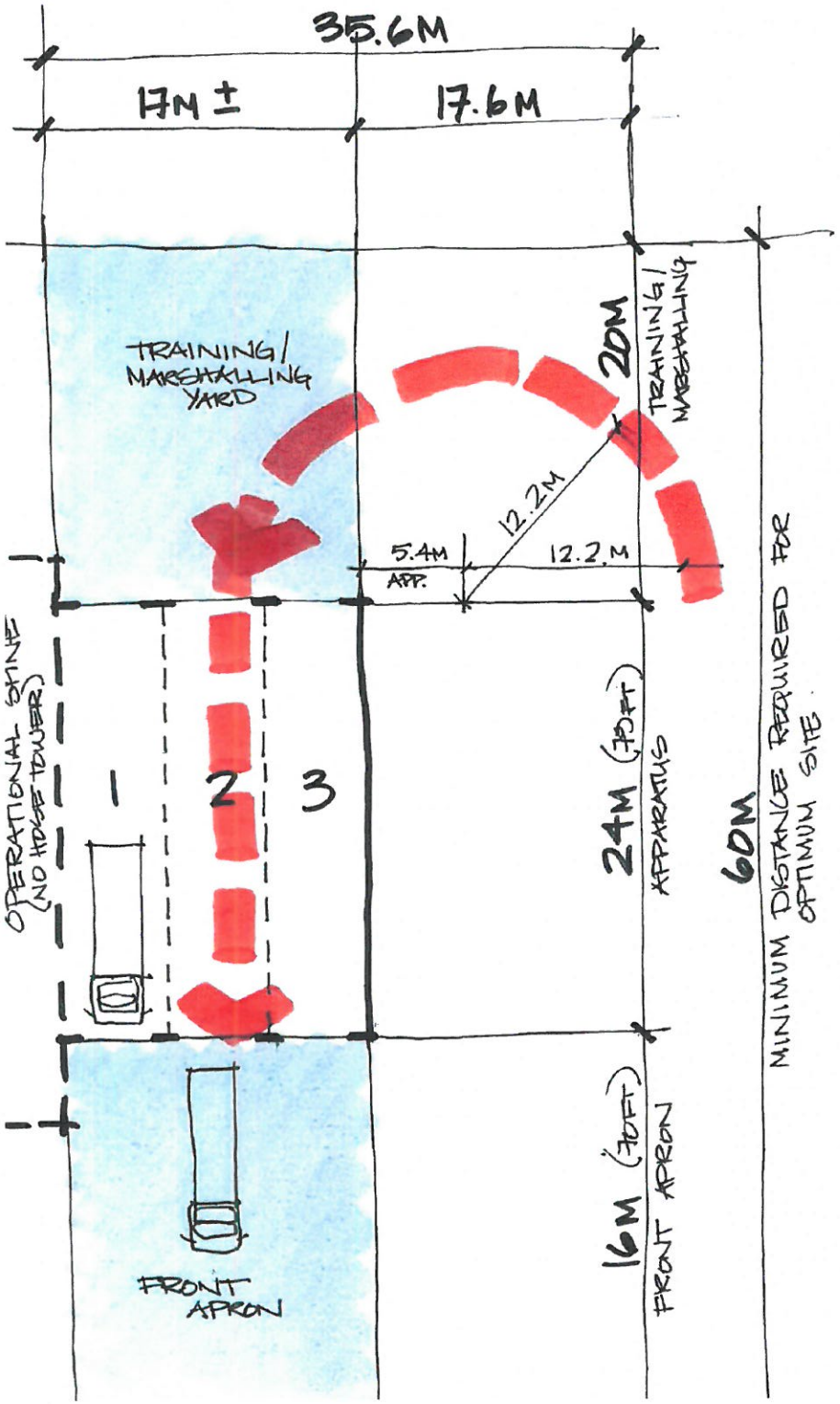
b. Option 2R1: existing site + new building (post disaster) :

- Total square footage: 18,348 sf (1,742 sm)
- Demolition Costs: $100,000
- New Building Costs: $400.00/sf @ 18,348 sf (1,742 sm) = $7,339,200.00.
- Total anticipated construction costs: $ 7,439,200.00

c. Option 3: existing site + new building (post disaster) :

- Total square footage: 18,348 sf (1,742 sm)
- Demolition Costs: $100,000
- New Building Costs: $400.00/sf @ 18,348.00 (1,742 sm) = $7,339,200.00.
- Total anticipated construction costs: $ 7,439,200.00

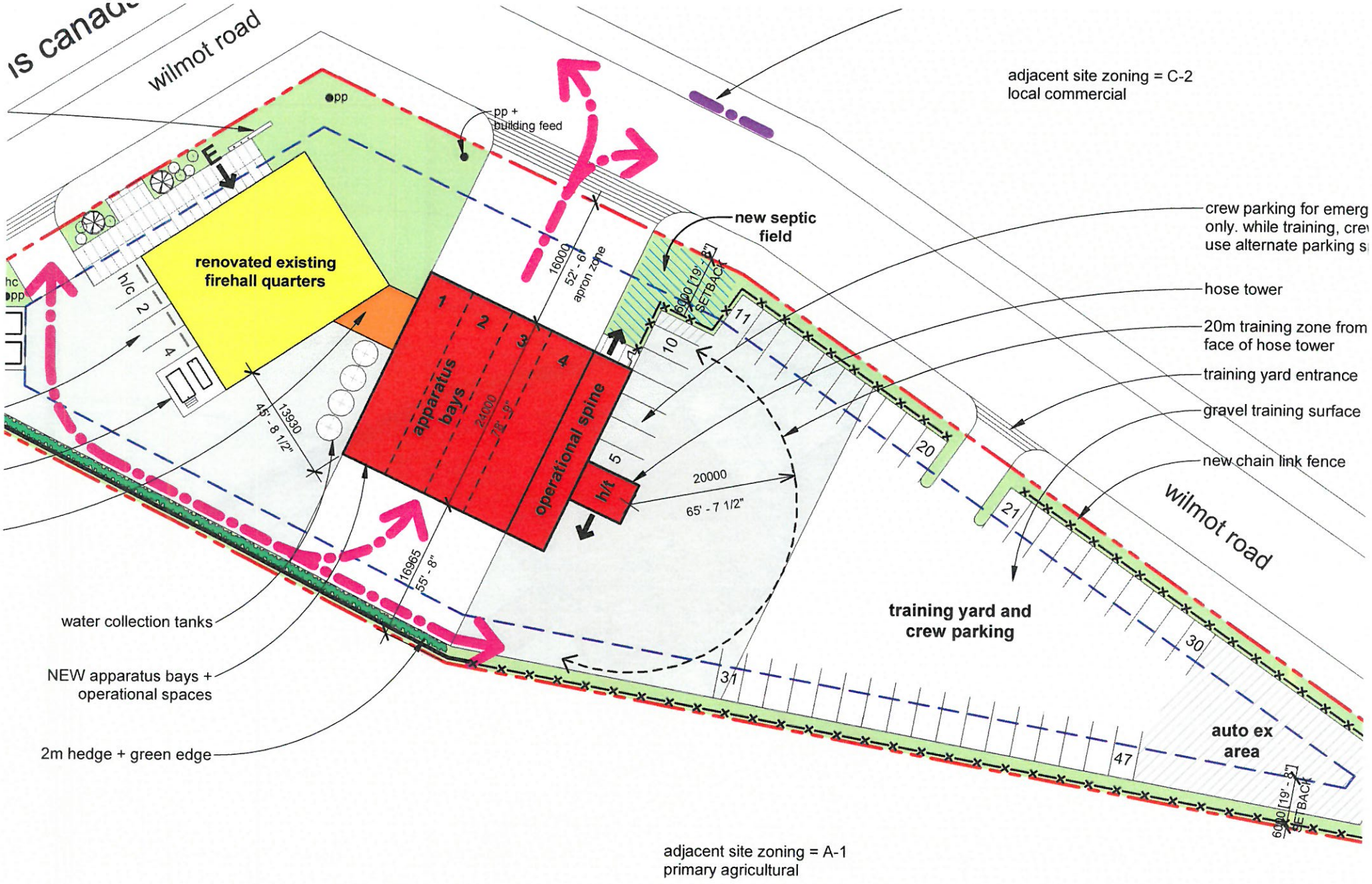
All three siting studies within the report provide viable options each with their own compromises; however, Option 1 and 3 provide the most successful options from an operational perspective but need to examined from the Cowichan Bay Improvement District's perspective for feasibility from a cost and operational interruption perspective.



Typical Apparatus Bay Layout

a. The Apparatus Bays house and preserve some of the Fire Department's most important and expensive equipment – the Fire Trucks.

b. Optimal Design Parameters:
   - Apparatus Bays to be a minimum 24 - 27 metres long (90'-0"). This distance allows for both current and future vehicle needs.
   - Apparatus Bay widths are determined by number of bays and proximity to exterior walls. Typical inside bays should be a minimum 5.2 metres wide with outside bays (against exterior walls) should be a minimum 5.6 metres wide. To accomodate hose storage, 6m wide is recommended.
   - Front Apron to be between 14 to 16 metres long which this allows for vehicles to fully exit the Bays before entering the street.
   - Training Yard usually is a minimum 20 metres from the rear of the Firehall for training or hose work. If a Hose / Training Tower is required, it is best located at the rear of the central spine for optimal usage.
   - Turning Radius of 12.2 metres (or 40 feet) will accommodate the majority of Fire Trucks (including most Ladder Trucks). This also provides easier driving for all driver levels and reduces 'wear-and-tear' on vehicles by avoiding harsh turning or 3-point parking.
   - Spine functions along one or both sides of the Apparatus Bays. These locations provide direct bay access for key functions, such as the Radio Room, Gear Storage, SCBA Room, Workshop, Decontamination Washroom, etc.



CONCRETE PAVERS

ASPHALT

NEW SEPTIC FEILD

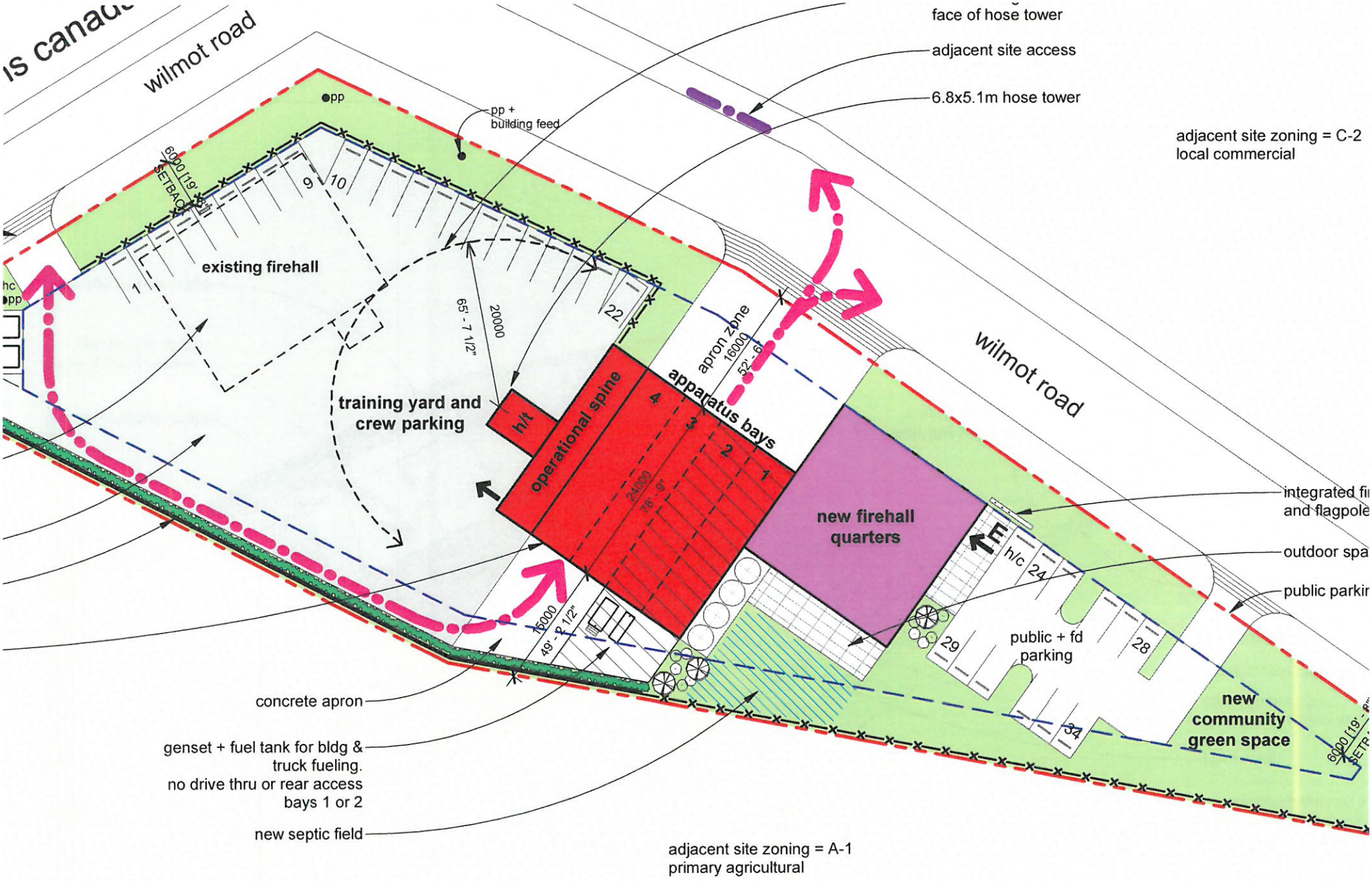
NEW CHAIN LINK FENCE

pp NEW SEPTIC FEILD

fdc FIRE DEPARTEMENT

BUILDING AREAS:

APPARATUS BAYS	= 436.65 m²	(4,700 ft²)
EXISTING FH	= 673.7 m²	(7,251.6 ft²)



CONCRETE PAVERS

ASPHALT

NEW SEPTIC FEILD

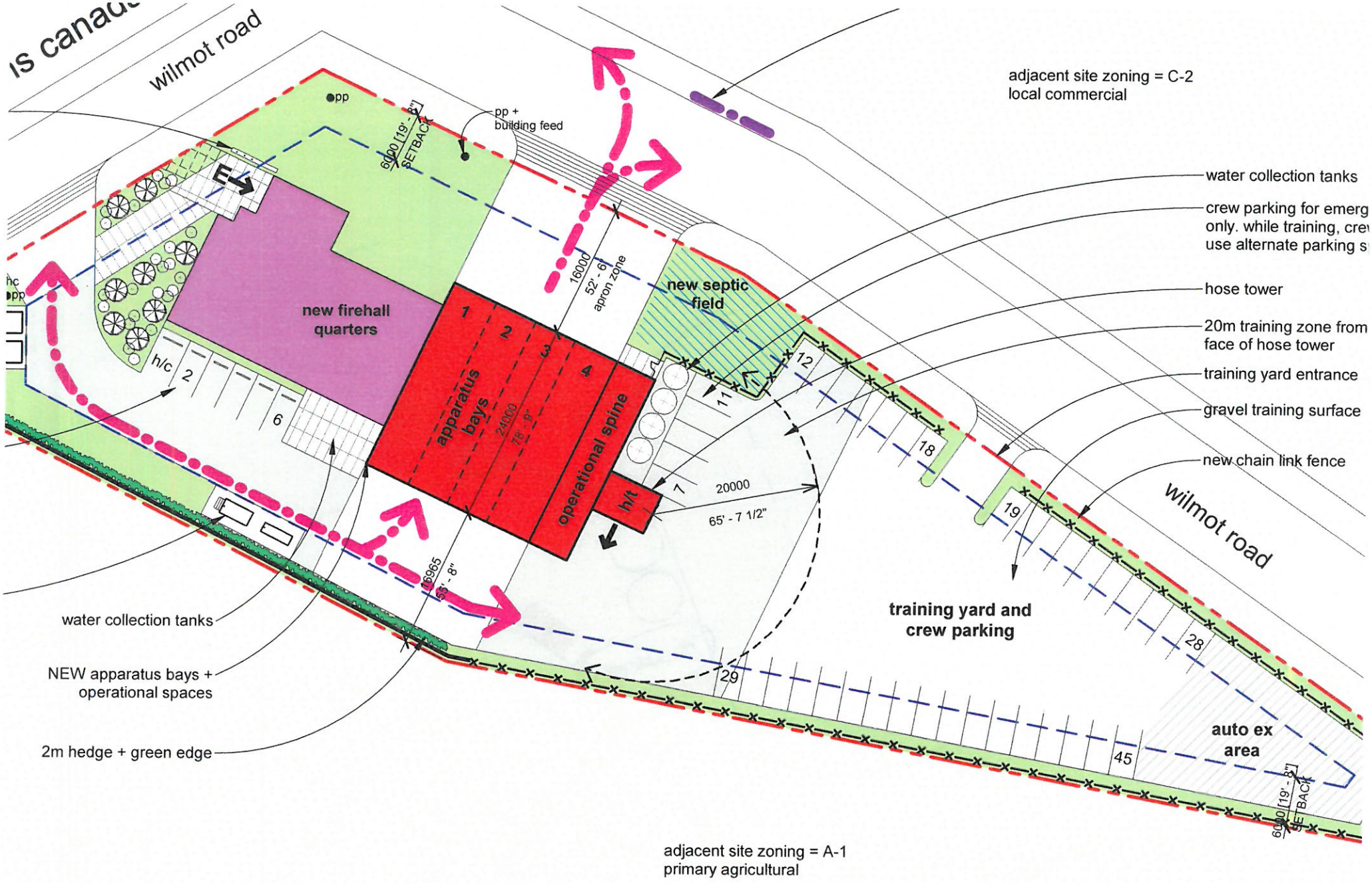
NEW CHAIN LINK FENCE

pp NEW SEPTIC FEILD

fdc FIRE DEPARTEMENT

BUILDING AREAS:

APPARATUS BAYS	= 436.65 m²	(4,700 ft²)
NEW FH QUARTERS	= 428.5 m²	(4,612.2 ft²)



CONCRETE PAVERS

ASPHALT

NEW SEPTIC FEILD

NEW CHAIN LINK FENCE

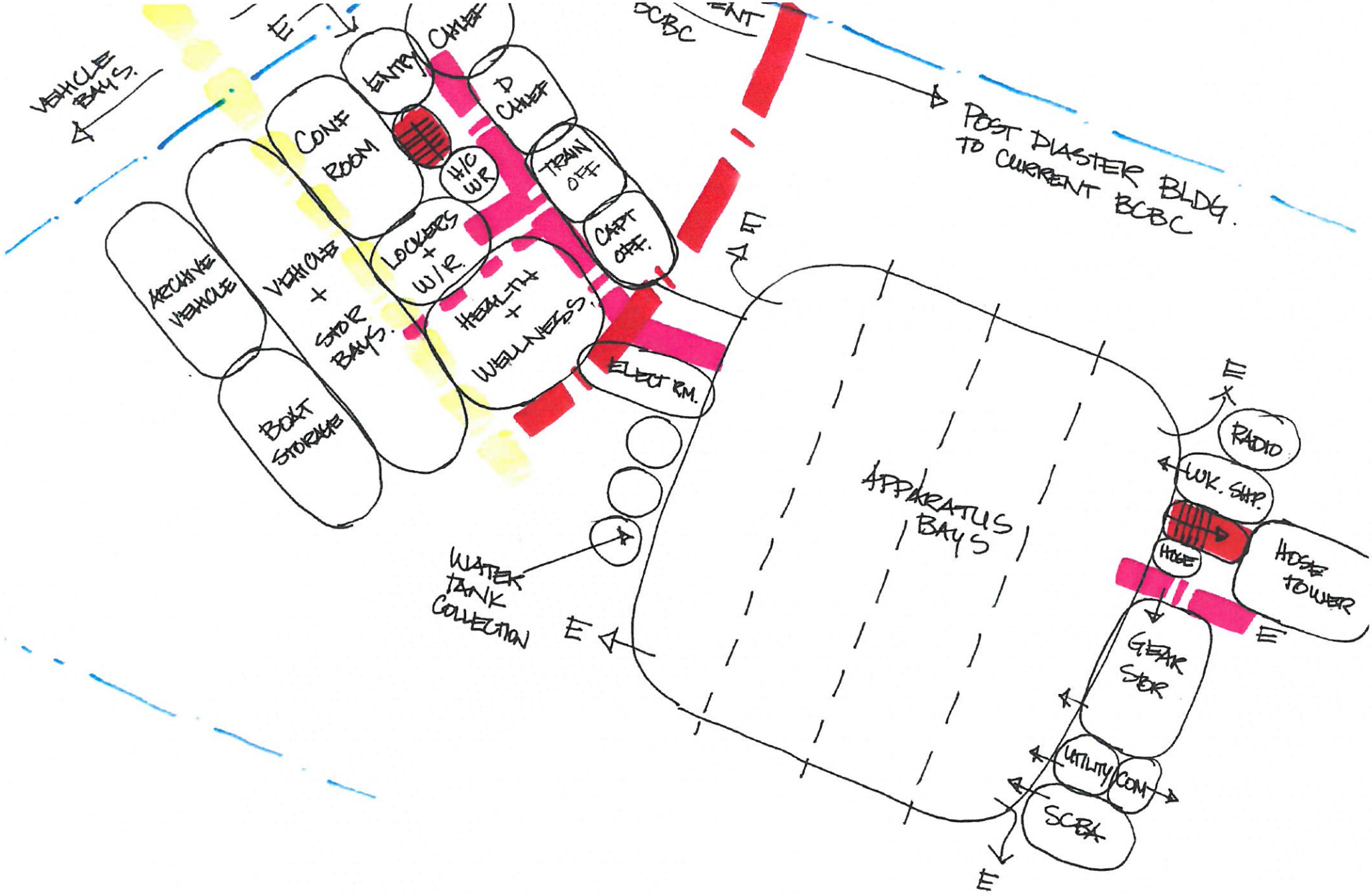
pp NEW SEPTIC FEILD

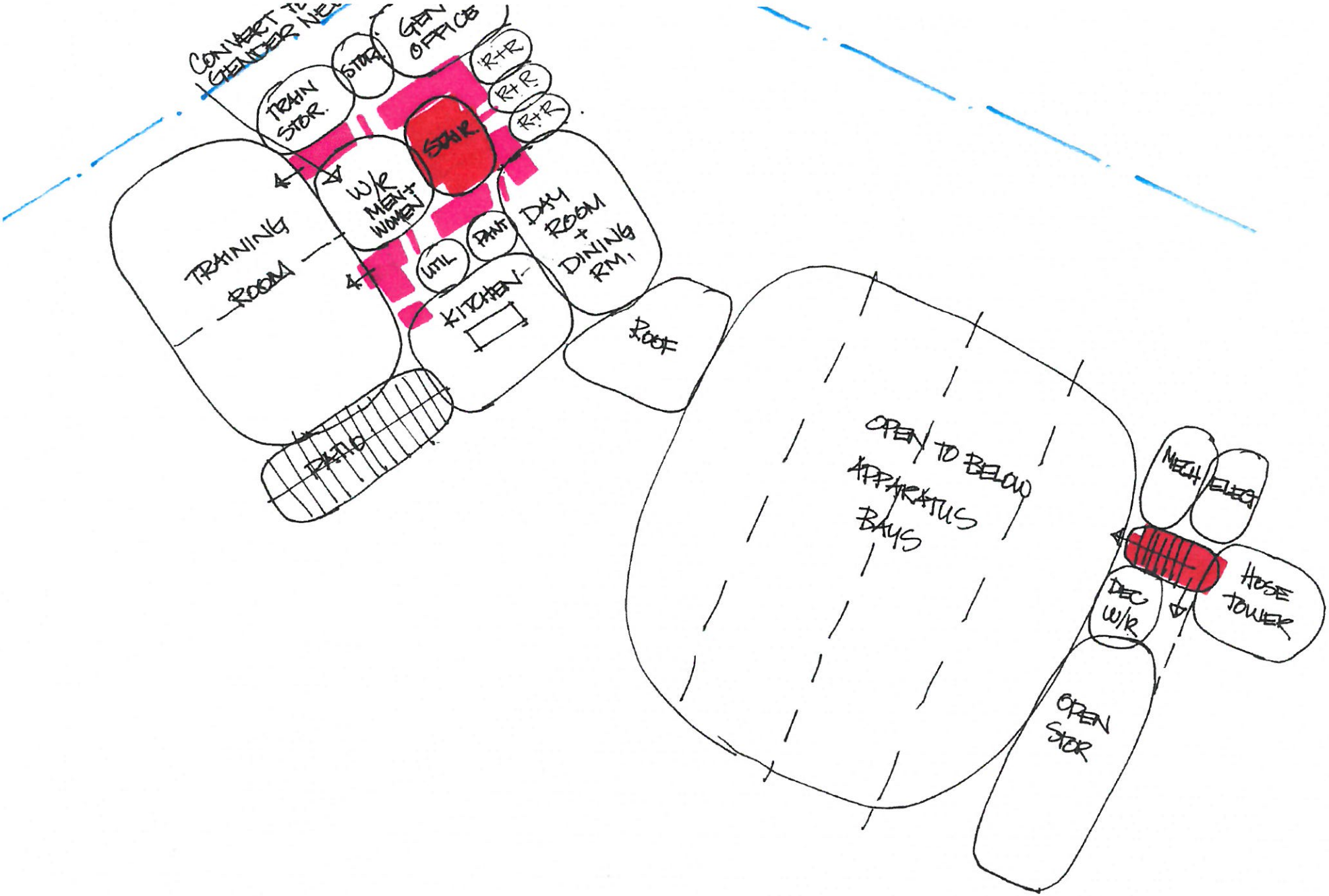
fdc FIRE DEPARTEMENT

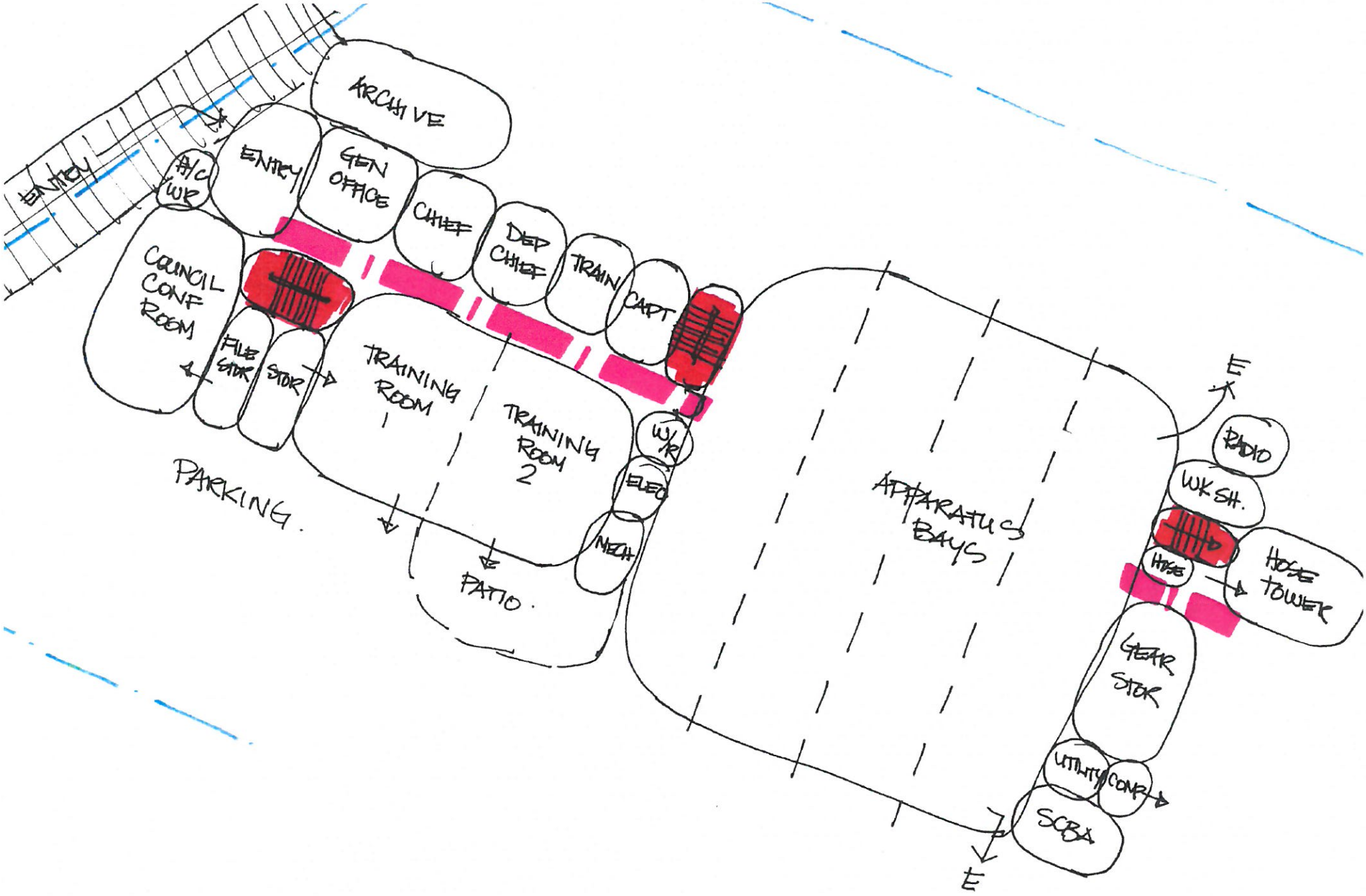
BUILDING AREAS:

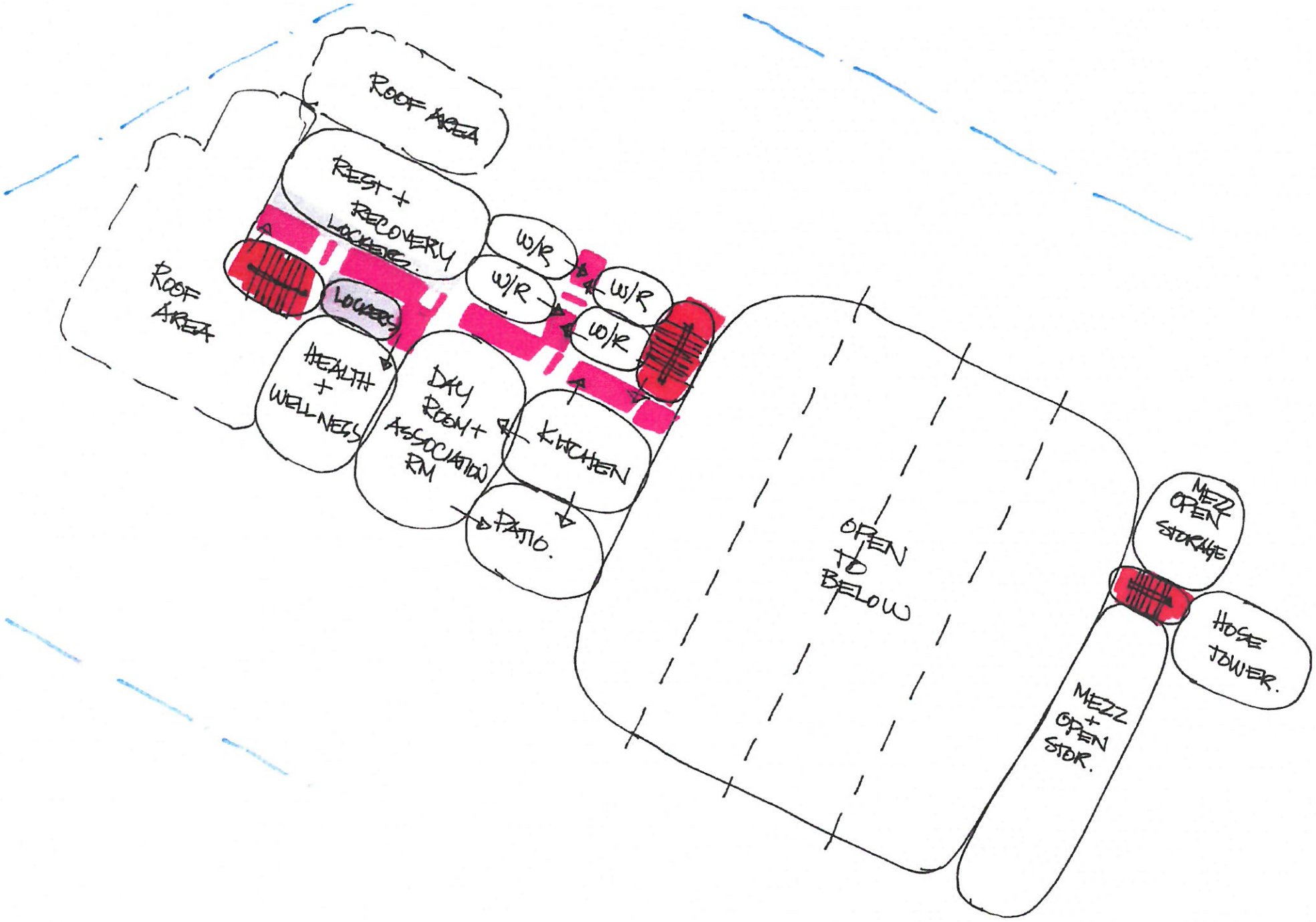
APPARATUS BAYS = 436.65 m² (4,700 ft²)

NEW FH QUARTERS = 510 m² (5,489.6 ft²)


VEHICLE BAYS.
E
ENTRY
CHIEF
D CHIEF
CONF ROOM
H/C W/R
TRAIN OFF.
CAPT OFF.
LOCKERS + W/R.
HEALTH + WELLNESS.
ELECT RM.
ARCHIVE VEHICLE
VEHICLE + STOR BAYS.
BOAT STORAGE
WATER TANK COLLECTION
SCBC
ENT
POST PLASTER BLDG. TO CURRENT BCBC
APPARATUS BAYS
RADIO
WK. SHP.
HOSE
HOSE TOWER
GEAR STOR
UTILITY
COM
SCBA

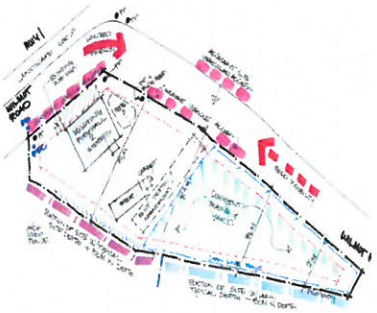

CONVERT TO GENDER NEU
STOR.
GEN OFFICE
TRAIN STOR.
R+R
R+R
R+R
STAIR
W/R MEN + WOMEN
DAY ROOM + DINING RM.
TRAINING ROOM
UTIL
PANT
KITCHEN
ROOF
PATIO
OPEN TO BELOW
APPARATUS BAYS
MECH
ELEC
DEC W/R
HOSE TOWER
OPEN STOR


ENTRY
ARCHIVE
ENTRY
GEN OFFICE
CHIEF
DEP CHIEF
TRAIN
CAPT
A/C WR
COUNCIL CONF ROOM
FILE STOR
STOR
TRAINING ROOM 1
TRAINING ROOM 2
W/R
ELEC
MECH
PARKING.
PATIO.
APPARATUS BAYS
E
RADIO
WK SH.
HOSE
HOSE TOWER
GEAR STOR
UTILITY/CONF
SCBA
E


ROOF AREA
REST + RECOVERY
LOCKERS.
W/R
W/R
W/R
W/R
ROOF AREA
LOUVRES
HEALTH + WELLNESS
DAY ROOM + ASSOCIATION RM
KITCHEN
PATIO.
OPEN TO BELOW
MEZZ OPEN STORAGE
HOSE TOWER.
MEZZ + OPEN STOR.

5.0 appendix

- project summary
- structural report
- rezoning information
- cbid fh preliminary code analysis
- existing building drawings



cbid firehall **feasibility study**
project summary

October 15, 2018

A. Project Data:

General

1. **Exist12ing firehall:** designed as headquarters hall for volunteer suppression crew service delivery. Hall currently contains HQ administration offices, training room, and required functionality volunteer suppression crew quarters.
2. **Current Needs:** Firehall HQ Administration office, Improvement District Meeting Room, training room, volunteer suppression crew quarters which address inclusivity, additional suppression crew operational quarters such as turn-out gear storage room, gear washer area, dedicated SCBA room, decontamination washrooms, etc.) See attached space program form more information.
3. Post Disaster Standards required. Building designed to meet the 2015 NBCC and the 2018 BCBC.
4. **Building: is NOT to be sprinklered due to the well service. Building to have provisions for sprinklers in the future.**
5. Sustainability: project is follow CVRD guidelines for sustainability. Approach is to try to be as Carbon Neutral as possible.
6. DOC or EOC operation to be considered.
7. Regulatory:
    i. Site Size: 1.79acres (7280 sm / 78361 sq ft.)
    ii. Current zoning: Site is currently zoned **P-3 (Outdoor Recreation)**.
        1. Height: all buildings and structures on site shall not exceed 7.5m (25 ft)
        2. Set backs:
            a. Front: 6.0m
            b. Side (Interior): 6.0m
            c. Side (Exterior): 6.0m
            d. Rear: 6.0m
    iii. Future Zoning: Site to be zoned as **P-1 (Parks and Institutional)**
        1. Height: all buildings and structures on site shall not exceed 12m (39 ft)
        2. Set backs:
            a. Front: 6.0m
            b. Side (Interior): 6.0m
            c. Side (Exterior): 6.0m
            d. Rear: 6.0m
    iv. Rezoning : Required from P3 to P1.
    v. Development Permit: required.
    vi. Design Panel: not required.

    b. Site services:
    i. Gas: no natural gas – propane to be provided.
    ii. Water: Collection and provided by on site well.
        1. Water storage for 30,000L to be considered in the design.
    iii. Sanitary: Septic field on site with chamber.
    iv. Power: Overhead from pole on Western site of site
        1. Onsite generator to be provided to run the entire building.
        2. On site fuel to be provided to last 7 days.
        3. Fuel storage to used for truck fueling to ensure freshness of fuel.
    v. Storm: No civil storm system – open ditch.
    vi. Telus and Cable: Shaw service but no fibre.
8. Civic Address: 4461 Trans-Canada Hwy, Cowichan Bay, BC V0R 1N1
9. Legal Address: PID 026-301-482, Plan Number 78945, Lot A, Section 3, Range 3, Land District Cowichan

B. Functional Requirements:

General:

1. Main Firehall 2 administration offices, open office with training workstations, an entry space that is secure with a washroom and meeting room access, associated crew support spaces (please refer to the space program) and gear storage for up to 40 volunteer firefighters. (provisions for some growth in the volunteer numbers.
2. Male and female firefighters:
    - Individual gender neutral washrooms facilities.
3. Apparatus Bays:
    - 4 tandem drive thru Apparatus Bays
        - 24-27m (79-88.5 ft) deep x 15.7m (51 ft) for all four bays. These dimensions are clear inside.
    - Front apron should be big enough to handle the ladder truck – recommendation to be a minimum of 16m (52.5 ft) in depth and extend the full width of the apparatus bays. In this case the apron will be extended to accommodate slope to road at no greater than 5%.
    - Client to confirm list of vehicles for this facility.

Site:

1. Parking space sizes to be 3m x 6m where possible.
    i. Numbers as follows:
        1. 40 parking spaces provided.
        2. Public Parking (Visitor) spaces to be reviewed with By-Law. Numbers will include h/c parking space.
        3. Provision for electric vehicle charging spaces.
2. Generator and Fueling Station: Building to be fully operational on generator. Genset to be able to run for 72 hours fueling to be provided on site with the ability to use the fuel for truck filling.
3. Site Security:
    a. 1800mm (6') fence around training yard complete with automatic entry gate accessed with Card reader.
    b. Alarm system – integrate activation with lighting system.
        i. Conduit for future cameras.
        ii. All exterior doors to have fob system.
4. Garbage / Hazardous material / Recycling area pick required access at rear yard.
5. Antennas: antenna locations and numbers – information to be provided by CBID FD. Location will be mounted on the face the building.
6. Training Yard: on site.

Note: *This document should be considered a work in progress and will be altered and changed to reflect decisions and information provided at all design meetings. The items shown in yellow are intended for the client group to provide a response, or discussion. This document should be read in conjunction with the space program.*

cbid firehall **feasibility study**
preliminary code review

SECTION	CONDITION
	Defined Terms
1.4.1.2	***Post-disaster building*** means a *building* that is essential to the provision of services in the event of a disaster, and includes fire rescue stations. ***Building*** means any structure used or intended for supporting or sheltering any use or occupancy.

3.2.2.81	**Occupancy – Group F, Division 3, up to 4 storeys, Non-Sprinklered**
	- New Firehall total area as defined by code = approximately 1,700 m^2
	- Building is facing 2 streets.
	- Permitted building area for a two storey building in this classification:
	  o 2,400 m^2 for a 2 storey building.
	  o 4,800 m2 for a 1 storey building.
	- Combustible or non-combustible construction permitted. (Used either singly or in combination).
	- Floor assemblies – Fire Separation required:
	  o Combustible construction = F.R.R. @ 45 minutes.
	  o Non-combustible construction = non-rated fire separation.
	  o Mezzanines shall be rated to 45 minutes.
	- Load bearing walls, columns and arches – Fire Resistance Rating required:
	  o Combustible construction = F.R.R. @ 45 minutes. **OR**
	  o Be of non-combustible construction
	- Roof :
	  o Is required to be rated if built out of non combustible materials.
	  o Could be waived if the building was considered to be 1 storey in height and was no more than 2,400sm in size.

	Standpipe Systems
3.2.5.8	- Standpipe: Not required.
	Janitors' Rooms
3.3.1.21(2+3)	- 1 hour FRR separation from the remainder of the building if the building is not sprinklered. - No F.R.R. required if the building is sprinklered throughout.
	Common Laundry Rooms
3.3.1.22(2+3)	- 1 hour FRR separation from the remainder of the building if the building is not sprinklered. - No F.R.R. required if the building is sprinklered throughout.
	EXIT Signs in Service Spaces
3.3.1.24(1)	- Illuminated exit signs within service space to indicate the direction to egress is required.
	Number of Exits

3.4.2.1(2)	- 2 exits required when the following applies to a 2 storey bldg;
	  o Floor area is greater than 200sm if not sprinklered
	  o Floor area is greater than 300m if sprinklered.
	- This building only has one storey + basement – basement square footage is less than 300m SM.

	Distance Between Exits
3.4.2.3(1)	- Distance between exits be at least 1 half the diagonal distance but not less than 9m and not greater than 15m in a non-sprinklered building.
	Location of Exits
3.4.2.5(1)(b)	- Travel distance not more than 45 m to one exit if it is sprinklered throughout. - Travel distance not more than 30m to one exit if it is NOT sprinklered throughout. - Travel distance not more than 60m to one exit in a storage garage.
	Exit width
3.4.3.2(8)	- Min width of corridors = 1100mm - Min width stairs = 1100mm
	Fire Separation of Exits
3.4.4.1(1)	- 45 minutes. - 1.5 hour fire separation between apparatus bays and remainder of hall.
	Fire Separations for Service Rooms
3.6.2.1(1) 3.6.2.1(6)	- 1 hour required if fuel fired appliance exists – door to swing out - 3.6.2.6 - 1 hour required for Electrical Rooms
	Persons With Disabilities
3.8.2.3(2a)	- Min. of one "universal toilet room" to be provided. - Access from the street to at least one main entrance - Access from parking area to one entrance
	Occupant Load
	The building is comprised of the following occupancy types: • Major occupancy = F-3 (*Low Hazard Industrial)* • Minor occupancy = A-2 (*Assembly occupancy)*
3.1.17.1	Storage garages = 46.0
3.1.17.1	Assembly space with non-fixed seats and tables = 0.95
3.1.17.1	Office = 9.30
	Occupancy Load : BIM FH
	Storage Garage: 675sm / 46 = 14.6
	Quarters: 115sm / 0.95 = 121
	Total Occupant Load 165 people – 10 for universal toilet = 155 / 2 = 77.5 of each gender.
	Washroom Fixtures
A- 3.7.2.2.(1)	Water Closet for an Assembly Occupancy – number of washrooms containing a single toilet would suffice to serve both female and male. • Number of person of each sex 35-50: Minimum number of water closets: ○ Male - 3 ○ Female – 3
	Persons with Disabilities
3.8.2.3(2a) 3.8.2.38 3.8.3.2 (c)	- Min. of one "universal toilet room" to be provided. - Access from the street to at least one main entrance. - Access from parking area to one entrance. - Access shall be provided to all areas to which the public is admitted. - Path of travel to main entrance min. 1500mm, unobstructed.

3.8.3.4.1 (a,b,c,d) 3.8.3.4.2	- Parking stall for persons with disabilities to meet required width (3700mm), have firm, slip-resistant and level surface, located close to accessible entrance and clearly identified for the sole use of parking for persons with disabilities. - One parking stall for persons with disabilities provided, as required under this occupancy type.

Cowichan Bay Improvement District

Cowichan, BC

Preliminary Seismic Review of Cowichan Bay Volunteer Fire Rescue Centre

HEROLD ENGINEERING

Prepared For:	Prepared by:
Cowichan Bay Improvement District 4461 Trans-Canada Highway Cowichan Bay, BC V0R 1N0 Attn: Dave Ferguson, Administrative Assistant	Herold Engineering Limited 3701 Shenton Road Nanaimo, BC V9T 2H1
Submitted: DRAFT November 21, 2016	Project No. 4032-001

DRAFT

Table of Contents

P16-4032

1. Introduction

Cowichan Bay Improvement District requested that Herold Engineering Limited provide a seismic review of the Cowichan Bay Fire Rescue Centre. The purpose of this review is to establish the expected performance of this building in a code level seismic event and make recommendations for possible upgrading work that may be necessary.

Lee Rowley P.Eng. met with representatives from the Board of Trustees on the 28th of September, 2016 to discuss the expected outcomes of this report. Key items agreed were as follows:

- The review would be done using the most recent code available, which is the 2015 National Building Code (NBC). This has significantly higher seismic values than the present 2012 British Columbia Building Code (BCBC). The BCBC typically adopts the NBC seismic requirements but will not be replaced until next year at the earliest. However to make the report relevant to the possible time of construction, the newer code was chosen as the basis of the report.

- The report will look at several options including:
    - The practicality of upgrading the building to meet the Post Disaster requirements of the NBC.
    - The requirements for upgrading the building to meet the some of the Post Disaster requirements of the NBC.
    - The requirements to upgrade the building to meet the Life Safety Requirements of the NBC.

- The review will look at the opportunities the recent Energy Audit Report by City Green Solutions provides to combine seismic upgrading with energy saving work such as adding a new building envelope.

- Provide capital-planning options for discussion by the board, making recommendations for next steps.

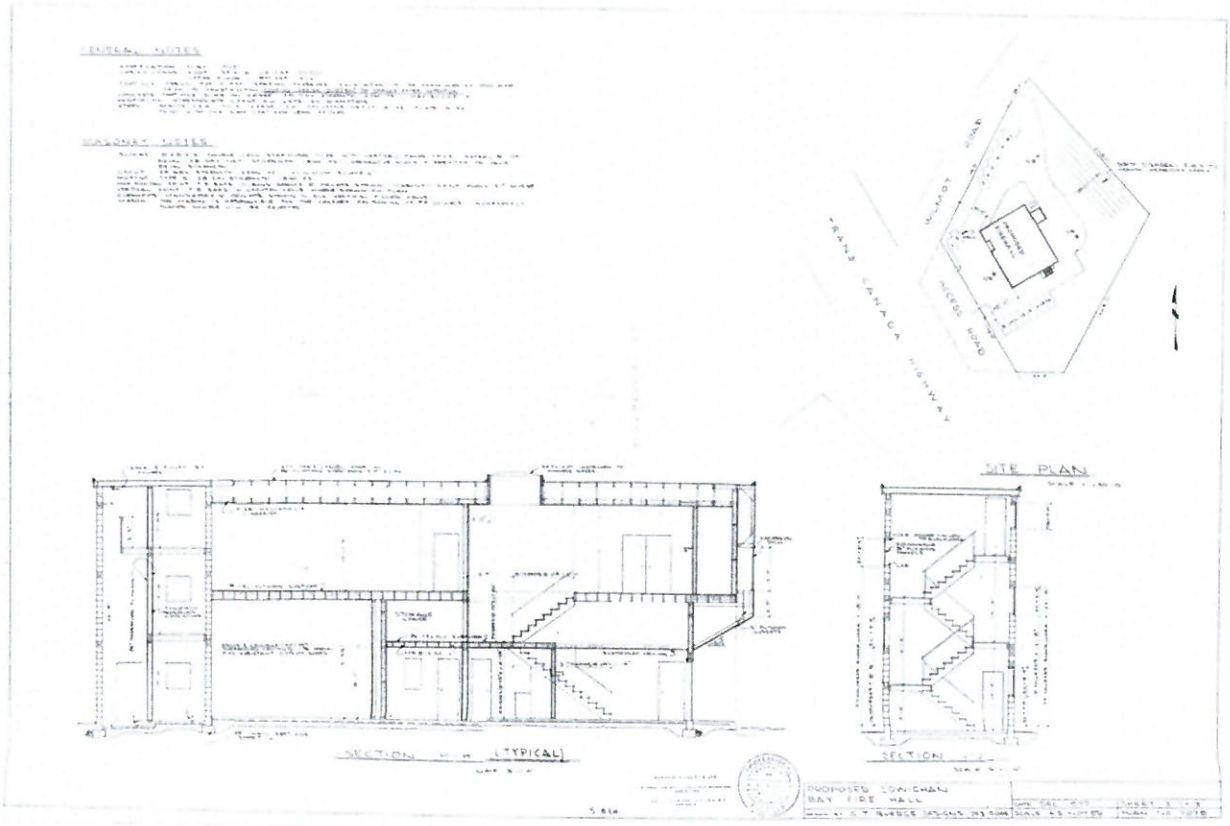
2. Building Description

The building was designed in 1977 and sealed structural drawings were made available for review. The building was designed to the National Building Code of 1975 as a fire hall and appears substantially unchanged since construction.

The building is a two-storey structure of approximately 860m^2 and comprises a three bay apparatus bay, storage and offices at the main level. On the second floor is meeting, kitchen and function space. On the rear elevation is an attached hose tower, which extends up to the same height as the main building.

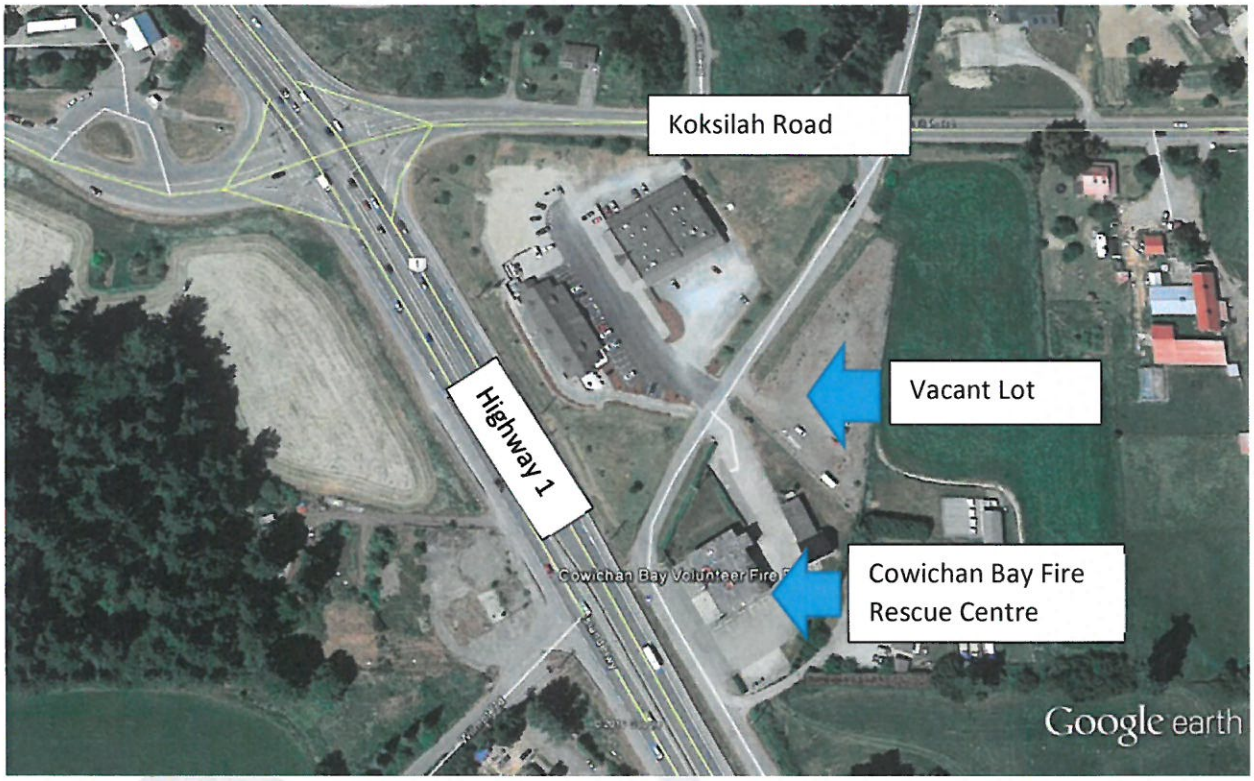
The apparatus bay is constructed in masonry with a post and beam steel structure supporting the wood floor above. The hose tower is constructed in masonry and is built to the rear of the apparatus bay. Adjacent the apparatus bay is the wood frame storage and office areas also supporting a wood floor above.

The second floor comprises 2x12 floor joists spanning over the post and beam frames in the apparatus bay and the 2 x 6 stud walls in the administration and storage areas. Walls at the second floor are 2 x 6 studs, which support parallel-chord timber roof trusses. The exterior walls, floor and roof are sheathed in 3/8" plywood.



3. Building location

The building is located near the intersection of Highway 1 and Koksilah Rd approximately 5 Km south of Duncan. There is a vacant lot to the rear of the site, which could be used for replacement fire hall if so desired.



4. Seismic Performance of Existing Building

We have performed a desk top review based on the original 1977 drawings. In the 1975 NBC some consideration of seismic detailing was required. We have reviewed the performance of various elements of the building relative to the 2015 NBC way of comparison.

Three code related options were considered:

1. Life Safety – Normal Occupancy
2. Post Disaster – Full Code Compliance (Rd = 2.0)
3. Post Disaster – Partial Code Compliance* (Rd = 1.5)

For option 3: the building is designed for the strength needed for post disaster but not the ductility. In this case, although the detailing requirements are much simpler the applied loads are increased.

Our findings are as follows:

Main Floor Masonry Structure

The 197 masonry code required minimum reinforcing for seismic loads. This is shown on the drawings. Using the reinforcing arrangement and material strengths indicated on the drawings we have found the following:

In the north-south direction there is very little seismic resistance provided by the masonry piers separating the apparatus bay doors. Some resistance could be provided by the adjacent wood frame structure however, it is unlikely that the two sections are adequately connected together. We estimate in this direction there is resistance ranging from 5% to 10% of NBC 2015 seismic requirements for life safety and post disaster occupancies.

In the east-west direction, the masonry walls are longer and have greater capacity. The walls meet the life safety requirements of the NBC 2015. However, the walls only meet the 73% of Post Disaster requirements and do not have the required ductility to meet code.

The floor diaphragm comprises wooden floor joists overlaid with plywood sheathing. The sheathing is 68% of the NBC 2015 life safety requirements and 45% of the NBC 2015 post disaster requirements.

Second Floor Wood Frame Structure

We have assumed only the stud walls bearing on the masonry walls are actually carrying seismic loading, as they are the most direct route to the foundations. Based on this the walls running above the apparatus bay doors have resistances ranging from 5% to 10% of NBC 2015 seismic requirements for life safety and post disaster occupancies.

In the east-west direction less windows are present there are higher resistances but the floor diaphragm comprises wooden floor joists overlaid with plywood sheathing. The sheathing is 47% of the NBC 2015 life safety requirements and 31% of the NBC 2015 post disaster requirements.

Foundations

No geotechnical report was provided for this review. An allowable bearing pressure for the soils was given on the drawings as 2000psf or 100kPa. For the analysis and estimated Ultimate Bearing of 200kPa was assumed and a site class D. All assumptions require verification for the purposes of detailed design.

Foundations appear to be shallow strip footings and are likely the governing factor in the reduced seismic resistance of the masonry walls in the north south direction. The mode of failure is rocking of the masonry piers, between the apparatus-bay door openings.

In the east west direction, the masonry walls are longer and so rocking is less likely to be an issue. However, the ultimate bearing pressure capacity of the soil may govern the capacity of the walls. This will need checking as part of a more detailed seismic review.

Connectivity and Load Path

Due to the age of the building, attention to detailing of building connections for seismic loading will not be adequate. For example the attachment of the roof trusses to the stud walls will only be designed for significantly lighter wind forces. The following connections require upgrading:

- Roof diaphragm and trusses to top of stud walls.
- Floor Diaphragm to masonry and stud walls.
- Second floor stud walls to masonry walls.
- Second floor stud walls to first floor stud walls.
- Masonry and stud walls to foundations.

Summary of Building Lateral Resisting System Capacity (north-south direction)

Element	% of NBC 2015		
	% of Life Safety: Rd = 1.5	% of Post Disaster: Rd = 2.0	% of Post Disaster: Rd = 1.5
Roof Diaphragm	47%	42%	31%
2nd Floor Walls	5%	7.5%	10.0%
Floor Diaphragm	68%	60%	45%
1st Floor Walls	5%	7.5%	10.0%
Foundations	5%	7.5%	10.0%

Summary of Building Lateral Resisting System Capacity (east-west direction)

Element	% of NBC 2015		
	% of Life Safety: Rd = 1.5	% of Post Disaster: Rd = 2.0	% of Post Disaster: Rd = 1.5
Roof Diaphragm	32%	28%	21%
2nd Floor Walls	5%	7.5%	10.0%
Floor Diaphragm	46%	40%	30%
1st Floor Walls	136%	97%	90%
Foundations	TBD	TBD	TBD

Note these are based on preliminary calculations only and require verification by more detailed study.

5. Upgrading Options

Based on the findings above it is easy to conclude that the building requires a seismic upgrade. It is particularly weak in the east west direction due to the apparatus bay doors.

We can categorize the options as follows:

- No upgrade
- Upgrade to Life Safety requirements of Code.
- Upgrade to full Post Disaster Compliance of Code
- Upgrade to Strength only requirements for Post Disaster

No Upgrade

There is a high likelihood of a seismic event occurring near or on Vancouver Island in the next 50 years. Therefore, as this is a critical piece of infrastructure needed in such an event some mitigation of the risk to this buildings function should be considered. This could be a new building, a seismic upgrade or a change of location or function.

Life Safety

A life safety upgrade is for normal occupancy suitable for an administrative or general assembly type space. Note that this is lowest level of upgrade recommended.

Percentages of code less that 100 percent are allowed down to 60% in certain jurisdiction however, we recommend that 100 percent should be strived for where possible.

In this case, the scope of a 60 percent upgrade would be similar to a 100 percent upgrade as the same elements would still need to be upgraded.

Full Post Disaster Compliance

To achieve full compliance for the Post Disaster Requirements of the Code not only does the building have to resist higher seismic loading but also the detailing and construction requirements are far more restrictive.

With the masonry portion of the building these detailing requirements will require replacement with or the addition of, lateral resisting elements that fully comply with the today's standards.

With the wood frame elements the shear walls, roof and floors will require extensive blocking requiring removal and replacement of the exterior plywood or the interior drywall surfaces.

This would be a very expensive solution approaching the replacement value of the fire hall. We can investigate this option further if requested to do so, however at this time it is considered the most costly option of the four discussed in this report.

Post Disaster Upgrading for Strength (Rd = 1.5)

This is fundamentally the same as the Life Safety Retrofit however the building is designed for 1.5 more loading.

Due to low ductility of the elements in the building, more damage is likely to occur during a NBC 2015 sized event than the full Post Disaster Upgrade. This is because the detailing is not as good as dissipating the energy of the earthquake. This is a result of the lack of ductility in isolated structural members required to dissipate seismic energy through deformation and yielding.

However, for smaller earthquakes the stronger design will mean the building will resist damage well.

This is considered the second most cost effective upgrade for the building.

3701 Shenton Road, Nanaimo BC V9T 2H1
mail@heroldengineering.com
(250) 751-8558

6. Combining Seismic Upgrading with a Building Envelope Project

Combining a building envelope upgrade does save costs rather than doing the work separately. However the costs savings are not significant. What it does avoid is doing elements of work twice, especially if the envelope work is after the seismic upgrade.

Ideally, the seismic upgrade is done before the envelope upgrade, if available, funding means only one scope of work can be done at a time. Doing this first avoids redoing elements of the building envelope in order to do the seismic upgrading work later.

We have reviewed the City Green Solutions Energy Audit report dated March 11, 2016 and identified that the biggest overlap of scope which is the recommendation to provide exterior insulation and cladding to the Apparatus Hall. This would allow exterior areas of blockwork to be upgraded and covered for aesthetic reasons.

In addition, recommendations for insulating the wood frame walls and roof were also made. Blown-in insulation was suggested as a solution that did not require the ceiling drywall or roof/floor sheathing to be replaced. As the upgrade would involve installing blocking on the plywood panel edges in the shear wall and diaphragm locations, the framing will need to be exposed. The blocking may also make blown-in insulation difficult to do and so batt insulation or surface applied rigid insulation may be easier to install.

3701 Shenton Road, Nanaimo BC V9T 2H1
mail@heroldengineering.com
(250) 751-8558

7. Capital Planning Considerations

With the variety options for upgrading and their cost, other options may be worth considering further. Some options are listed below with some advantages and disadvantages for discussion. Note costs are construction only. Project costs are typically upwards of 1.25 x construction costs:

Option 1

Full post disaster upgrade: Fire hall remains in service with minor repairable damage

Advantages

1. Building remains in service and performs well during a major seismic event

Disadvantages

1. Other systems with the possible exception of building envelope remain unchanged.
2. Operational costs remain the same. Unless energy efficiency measures taken.
3. Expensive. Budget construction cost $2500/m^2 (approximately $2,150,000).

Option 2

Post Disaster Equivalent Upgrade: Continue use as a fire hall with minor damage due to poor detailing.

Advantages

1. Building remains in service and performs well during a major seismic event.

Disadvantages

1. Other systems with the possible exception of building envelope remain unchanged.
2. Operational costs remain the same. Unless energy efficiency measures taken.
3. More repairs likely after the earthquake.
4. Expensive. Budget construction cost $2000/m^2 (Approximately $1,720,000).
5. Temporary Fire Hall required during construction.

Option 3

Life Safety Upgrade: Building is safe but likely damaged needing significant repair.

Advantages

1. Building keeps occupants safe.
2. Still can function as a community facility.
3. Lowest cost upgrading option. Budget construction cost $1,500/m^2 (Approximately $1,290,000).

Disadvantages

1. Doesn't function as a fire hall after the event.
2. Operational costs remain the same. Unless energy efficiency measures taken.

3. Possibly cannot get vehicles out of bays.
4. Possible need to demolish building after the earthquake.

Option 4

Demolish Fire hall and Build New purpose built facility to provide same level of services.

Advantages

1. A brand new fully code compliant facility.
2. Energy efficient with low operating costs.

Disadvantages

1. Requires a new site (adjacent lot is available).
2. Costs. Budget construction cost $3,500/m^2. Code will likely require a bigger building. Budget construction cost of $3,600,000.

Option 5

Keep and upgrade old hall to life safety and build new smaller hall nearby.

Advantages

1. New hall that is post disaster compliant.
2. New hall is energy efficient.
3. Keeps community functionality in upgraded structure.

Disadvantages

1. Two facilities to maintain and operate.
2. Costs. Allowing for a simple fire hall of pre-engineered or wood construction of similar area as the ground floor of the existing hall at $2500/m^2. Budget construction cost of $1,290,000 plus $1,075,000 for the new hall is $2,365,000.

8. Conclusion and Recommendation

The new 2015 National Building Code highlights a significant increase in seismic knowledge of the Vancouver Island Region. As such seismic design criteria have been increased significantly.

The current fire hall (although well-built and in good condition) is at significant risk of damage in a seismic event. In a code level seismic event partial collapse is a possibility.

We would therefore recommend some form of seismic mitigation be performed. We have outlined five tentative options for consideration.

To summarize:

The lowest operational cost solution is a new fire hall, however this has the highest capital cost (Option 4).

The lowest capital cost solution is a life safety upgrade, however the operational costs remain high and the fire hall would likely be out of service following an earthquake (Option 3).

The post disaster upgrades (options 1 and 2) have high construction costs and high operational costs.

Option 5 is a compromise solution that provides the fully code compliant fire hall facility at the lowest cost. It also allows phasing of the project for budgeting purposes with the new hall being Phase 1 and the seismic upgrading of the existing hall Phase 2.

3701 Shenton Road, Nanaimo BC V9T 2H1
mail@heroldengineering.com
(250) 751-8558

9. Closing Comments

We trust the information contained within this report satisfies your current requirements.

Should you have any comments, questions or concerns, please do not hesitate to contact the undersigned.

Please refer to the attached Schedule 1c for liability.

Yours truly,

HEROLD ENGINEERING LIMITED

Prepared By:

Lee Rowley P.Eng.

3701 Shenton Road, Nanaimo BC V9T 2H1
mail@heroldengineering.com
(250) 751-8558

Payment

The Client will pay Herold Engineering the fees as described in the proposal plus all applicable taxes and duties including without limitation the Goods and Services Tax (GST) as applicable. In addition to the Services, the Client will also pay for any and all additional services requested of Herold Engineering even if those services are not listed as Services ("Additional Services").

Herold Engineering will submit invoices to the Client requesting payment for that portion of the Services and Additional Services completed to the date of the invoice. The Client agrees to pay the invoice within 30 days of the date of the invoice (the "Due Date"). Invoices unpaid by the Due Date will be charged interest at a rate of 18% per annum from the date of the invoice until paid.

Herold Engineering may, at its sole discretion, suspend the provision of any and all Services or Additional Services in respect to the Project if one or more invoices remain unpaid for more than 60 days from the Date of Invoice.

General Provisions

The Client shall not assign the whole or any part of this Agreement without the express written consent of Herold Engineering. Herold Engineering may assign to subcontractors and agents such part of the Services or Additional Services as Herold Engineering in its sole discretion shall determine. This proposal, if accepted, shall be governed by and construed in accordance with the laws of the Province of British Columbia.

Herold Engineering shall visit the project site at intervals appropriate to the stage of construction as Herold Engineering, in its sole discretion, considers necessary to ascertain whether the contractor is carrying out the work in general conformity with the contract documents.

Obligations of Client

The Client will assist Herold Engineering by providing all available and necessary information that Herold Engineering reasonably requires to provide the Services (or Additional Services). The Client will examine all requests, reports or other documents presented by Herold Engineering relating to the Services and Additional Services and will promptly provide in writing decisions or general instructions pertaining thereto so as not to delay the provision of the Services or Additional Services.

Termination

Herold Engineering may, without prejudice to any other right or remedy it may have, terminate this agreement if:

(a) the Client is in breach of any of its obligation under this Agreement; or

(b) the Client is insolvent or makes a general assignment for the benefit of creditors or if a receiver is appointed; or

(c) Herold Engineering is prevented from performing the Services (or Additional Services) for a period of thirty days or more as the result of an event which is unavoidable and beyond the control of Herold Engineering that includes without limitation an order of a Court or other public authority, a labour dispute, a communication line failure, power failure or any other natural disaster or Act of God.

If Herold Engineering terminates this Agreement under (a), (b) or (c) above, Herold Engineering shall be entitled to be paid for all Services or Additional Services performed to the date of termination. Further, if Herold Engineering terminates this Agreement under (a) or (b) then Herold Engineering is also entitled to receive from the Client an amount that Herold Engineering, acting reasonably, determines is equivalent to the profit that Herold Engineering has lost as a result of not completing all of its Services or Additional Services, as the case may be, under this Agreement.

If Herold Engineering terminates this Agreement under (a), (b) or (c) above the Client releases and discharges Herold Engineering of and from any and all of its obligations under this Agreement.

Confidentiality

Except as may be required to advance or protect the legal interests of the Client or Herold Engineering or as may be required by law, the parties will keep strictly confidential and will not, without the written consent of the other party, disclose to anyone, either before, during or after termination of this Agreement, the information which comes to the knowledge of a party as a result of this Agreement.

Ownership of Documents and Designs

All right, title and interest in and to any products, technology or other intellectual property developed by Herold Engineering in performing the Services or Additional Services pursuant to the terms of this Agreement including without limitation all drawings, designs, reports, working papers, computations, manuals, documentation and documents of every kind (the "Work Product") shall remain the property of Herold Engineering. Provided the Client has completed all of its obligations under the Agreement, the Client shall be entitled to receive copies of the Work Product at the Client's expense. No part of the Work Product may be reproduced or re-used without the express written consent of Herold Engineering.

Liability

Herold Engineering is only liable to the Client for loss and damage that is directly attributable to its negligent acts or omissions (the "Recoverable Loss and Damage") and in the event of a claim for Recoverable Loss and Damage, the Client agrees that the maximum liability of Herold Engineering to the Client, whether in contract, tort or under any theory of liability, is limited to the lesser of: (a) the amount of fees paid by the Client to Herold Engineering on account of Services (or Additional Services) in relation to the Project as of the date the claim is made or (b) if Herold Engineering has insurance coverage that will respond to the claim for Recoverable Loss and Damage (the "Policy"), then the applicable coverage limit of the Policy.

In no event will Herold Engineering be liable for any indirect, incidental, special, consequential or punitive damages as a consequence of any breach by Herold Engineering or the failure of Herold Engineering to satisfy and/or perform, any term or provision of this Agreement and without limiting the generality of the foregoing, Herold Engineering shall not, under any circumstances, be liable for loss or damage resulting from delays in the completion of the Project, or loss of earnings or loss of profits, howsoever caused.

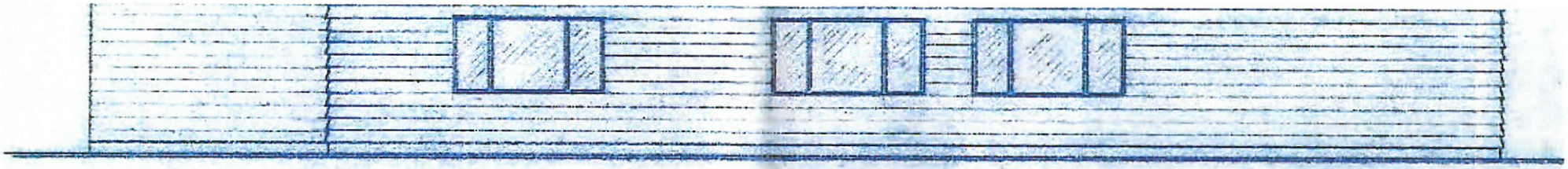
The Client acknowledges that mould, mildew, or other fungus substances that can present health hazards may develop or exist within the constructed buildings (or existing buildings). The Client agrees that Herold Engineering's Services (or Additional Services) specifically do not include Environmental audits, the identification or treatment of asbestos, moulds, fungus, mildew, radioactive materials or other contaminants (the "Environmental Services") and that if the Client wishes to have these Environmental Services completed, the Client will retain a consultant other than Herold Engineering to perform these Environmental Services.

Dispute Resolution

The purpose of this clause is to establish a process whereby any dispute or difference of opinion under or in connection with this Agreement can be resolved in a fair, efficient and cost-effective manner. Both parties shall use their best efforts to resolve any dispute or difference of opinion under or in connection with this Agreement by good faith amicable negotiations on a "without prejudice" basis, and shall provide frank, candid and timely disclosure of all relevant facts, information and documents to facilitate negotiations. If a dispute or difference of opinion is not resolved to the reasonable mutual satisfaction of the parties within 10 Business Days of the commencement of negotiations, or within such longer period as may be agreed to by the parties, the dispute or difference of opinion shall be submitted to mediation. Both parties agree not to make a request for arbitration or to commence litigation without first seeking agreement through the mediation process.

Mediation shall consist of structured, non-binding negotiations with the assistance of a mediator on a "without prejudice" basis. The mediator shall be appointed by agreement of the parties and shall be impartial and free from any actual or apparent conflict of interest. The costs of mediation shall be shared equally by both parties. If the dispute or difference of opinion is not resolved to the reasonable mutual satisfaction of both parties within 30 calendar days of the appointment of the mediator, or within such longer time as may be mutually agreed to by the parties, the dispute or difference of opinion may, upon the mutual written agreement of the parties, be submitted to binding arbitration in accordance with the laws of the Province of British Columbia.

If the parties are unable to agree on the Arbitrator within 7 days, the Arbitrator shall be appointed under the Commercial Arbitration Act, R.S.B.C. 1996, c.55, as amended and the arbitration shall take place in Nanaimo. The decision of the Arbitrator shall be final and binding on the parties. If the parties do not agree to arbitration, each party shall be free to commence litigation without further notice.



LEFT ELEVATION