PORT ANGELES FIRE HOUSE

Condition Assessment

Prepared by

BOLA Architecture + Planning
159 Western Avenue West
Suite 486
Seattle, Washington 98119
(206) 447-4749

Swenson Say Faget, Structural Engineers
2124 Third Avenue,
Suite 1000
Seattle, Washington 98121
(206) 443-6212

July 2011

Table of Contents

Appendices

A. Construction Cost Estimate

B. Photographs

C. Existing Condition Drawings & Seismic Recommendations

D. Original Drawings

E. Seismic Calculations, Foundation Underpinning Calculations & ASCE 31-03 Basic Structural Checklist

F. Hazardous Construction Materials Survey

G. Geotechnical Engineering Investigation

H. Masonry Observation & Mortar Analysis

Executive Summary

CONDITION REPORT

Swenson Say Faget, Structural Engineers and BOLA Architecture + Planning were contracted to provide a Condition Report for the 215 S. Lincoln Street, city-owned, historic fire house for the City of Port Angeles. The significance of the Fire House derives from its prominence as a public institution and its use over the years by many different organizations and occupants. Its prominent location within the Port Angeles Civic Historic District (which was listed on the National Register in May 2011), along with the 1919 Carnegie Library and the 1915 Clallam County Courthouse, and its public ownership make it worthy of study and restoration planning.

Our initial step was to research existing documentation, photographs, drawings, references, notations, and descriptions of the building. The subsequent condition assessment is a review of the condition of the building, including geotechnical and hazardous construction material investigations, and provides observations, recommendations, and photographs of the existing features and conditions. The scope of this phase also included schematic floor plans and elevations for use in descriptions, code analysis, and cost estimate take-offs.

The engineering and architectural team visited the Port Angeles Fire House in April 2011 to assess its existing condition and deficiencies for a yet undetermined public use, possibly as a veteran's center, offices, or a food service establishment.

Additional phases could include programming to evaluate goals and priorities for a new use and possible modifications to the building. The programming phase would addresses new functional requirements such as accessibility and code compliance issues. Later phases would include illustrated floor plans, room layouts and exterior elevation drawings and cost estimates for the proposed work.

FINDINGS

The S. Lincoln Street, city-owned, historic fire house is typical of many buildings of its vintage in that many of its systems and components are outdated and should be repaired, modified or replaced. The building structure is generally sound and was recently strengthened to improve seismic performance. Non-structural seismic hazards remain, but can be mitigated with relative ease. The exterior masonry walls are in poor condition and should be repaired to restore their appearance and function. The roofing and insulation is deteriorated and should be replaced. The mechanical and electrical systems, plumbing fixtures, windows and doors are antiquated and should be replaced to improve their functionality and performance. The exterior ramp that accesses the upper floor levels is in poor condition and does not comply with ADA accessibility requirements. It should be removed and replaced with a compliant ramp or stair and elevator.

A hazardous construction materials survey was conducted by Resolve Environmental and Geotechnical as a part of the assessment to identify regulated and potentially regulated materials. Asbestos is a regulated material and was detected in 7 of 33 samples. Lead containing paint is also a regulated material and was detected in 7 of 11 samples. Potentially regulated materials include PCB's that are likely contained in the fluorescent light ballasts and mercury that is likely contained in the fluorescent lamps and thermostatic switches. All of these materials should be removed in conjunction with any re-occupancy of the building. A geotechnical investigation by Resolve found soft, moisture sensitive soils that are unsuitable for foundation support and the likely cause of the apparent settlement of the eastern portion of the building. Foundation underpinning is recommended. Hydrocarbons were detected in the soils, some of which may have been transported by groundwater from an offsite source and some of which may have been from a

storage tank on site. The slope to the east of the structure is likely to retreat incrementally at a gradual rate through occasional sliding or rotational slumping and may become unstable during a large seismic event. Stabilization of the slope is recommended.

ESTIMATED CONSTRUCTION COSTS

A construction cost estimate was made by Town and Country Building and Design Consultants based on the findings and recommendations described in the condition assessment. A core budget of $1.05 million is suggested to improve and modernize the building shell and core in preparation for a new occupancy. The suggested budget for tenant improvements (in addition to the core budget) is subject to the occupancy and varies from approximately $0.8 million for a government office use to approximately $1.2 million for a more commercial use such as a restaurant.

RECOMMENDATION

We recommend that the City restore the building's exterior to protect existing historic features and provide a weather tight envelope, provide seismic and systems improvements as needed, upgrade accessibility to the building, improve energy performance, and improve exterior site features. This will ensure this historic structure remains a viable structure in the City of Port Angeles. We envision this document will serve as a planning and fund-raising tool for the rehabilitation of the Port Angeles Fire House as a safe, lively, and improved civic and community facility.

General Information

Institution Name:	Port Angeles Fire House
Address:	215 South Lincoln, Port Angeles, WA 98362
Contact Person:	Derek Beery, Archeologist City of Port Angeles P.O. Box 1150 321 East Fifth Street Port Angeles, WA 98362 Phone: (360) 417-4704 Fax: (360) 417-4711 E-Mail: dbeery@cityofpa.us
Preservation Architects:	Rhoda A. R. Lawrence and Abby Inpanbutr BOLA Architecture + Planning E-Mail: rlawrence@bolarch.com; ainpanbutr@bolarch.com
Structural Engineers	Paul Faget and Dan Say Swenson Say Faget Email: pfaget@swensonsayfaget.com; dsay@swensonsayfaget.com
Survey Date:	April 2011
Site Area:	37,500 SF (150' x 250')

Building Statistics

No. of Stories:	2 Stories with Basement
Area:	Basement: 520 sf Ground Floor: 3,113 sf Second Floor: 3,135 sf
Historic Uses:	
Basement:	Storage, Boiler Room
Ground Floor:	Firehouse (original); Café (recent past)
Second Floor:	Court Room and Fire Fighters' Quarters (original); Dance Studio and Office (recent past)
Present Uses:	
Partial Basement:	Storage
1st Floor:	Vacant
2nd Floor:	Vacant and Office

Construction:	
Structure:	Reinforced Concrete
Exterior Cladding:	Brick and Concrete
Exterior Trim:	Terra Cotta
Roof:	Concrete Slab, Insulated Built-up Roof with Skylights
Chimneys:	None
Interior Walls:	Brick, Gypsum Block, Plaster, Wood Frame
Interior Ceilings:	Plaster, Acoustical Drop-Ceiling, Exposed Concrete Slab
Interior Floors:	Concrete, Vinyl Tile, Sheet Vinyl, Carpet, Raised Wood

Brief History of the Building

In 1891, the Gate City Fire Department was founded in Port Angeles, Washington. The fire department was originally manned by 23 volunteers, until 1893 when the department began to be compensated for its service (as a whole, not individually). For the first 40 years of its operation the Fire Department headquarters was located in the City Hall building at First and Oak Streets.

In 1931 a new building was constructed as the first permanent headquarters for the Fire Department at 215 S. Lincoln. The new Fire House was located between the Carnegie Library and Central Park (now Veterans Memorial Park). Also included in the design of the building were spaces for the City Jail and City Council chambers. The Fire House is a two-story reinforced concrete and brick structure, designed by Seattle architect William Aitken and built by S. S. Mullen. The building is in the Art Deco style, detailed with ornamental terra cotta and decorative brick patterns. The terra cotta is notable for its middle-eastern influenced Art Deco design. The new Fire House was an object of pride for the city, and a grand open house was advertised in the local newspaper to celebrate its completion.

The apparatus room of the Fire House, which housed the horses and trucks, was located on the main floor directly off of Lincoln. Early equipment included a four-wheel, two-horse ladder wagon and a double chemical tank on wheels. Three large pairs of wooden doors on the front (west) façade of the building allowed the wagon to exit quickly. Dormitory and common areas for the firefighters were located on the second floor, and were connected to the apparatus bay by two fire poles. The City Jail was located on the east end of the main floor, accessed from the south side of the building. The City Council Chambers were on the second floor, also at the east end of the building. The second floor of the building was accessed by an exterior stair. Both of these areas were completely separated from those designated to the fire department.

The Fire House was intended to be the first of three contiguous buildings constructed on the site, all designed by Aitken. The other two buildings, which were never built, were to eventually house the Clallam County Courthouse and the Police Department. The planned connection between the buildings is evident on the east side of the Fire House, where the brick is a different color and type than the rest of the exterior, as it was intended to serve as an interior wall. The depression of the 1930s is the likely cause for the project's interruption. The jail and City Council were to eventually be relocated into the additional buildings, but instead remained in the Fire House. Other irregularities of the existing Fire House can be explained by the disruption of the intended design, such as rooms at different floor levels that have since been connected and the lack of an interior stair.

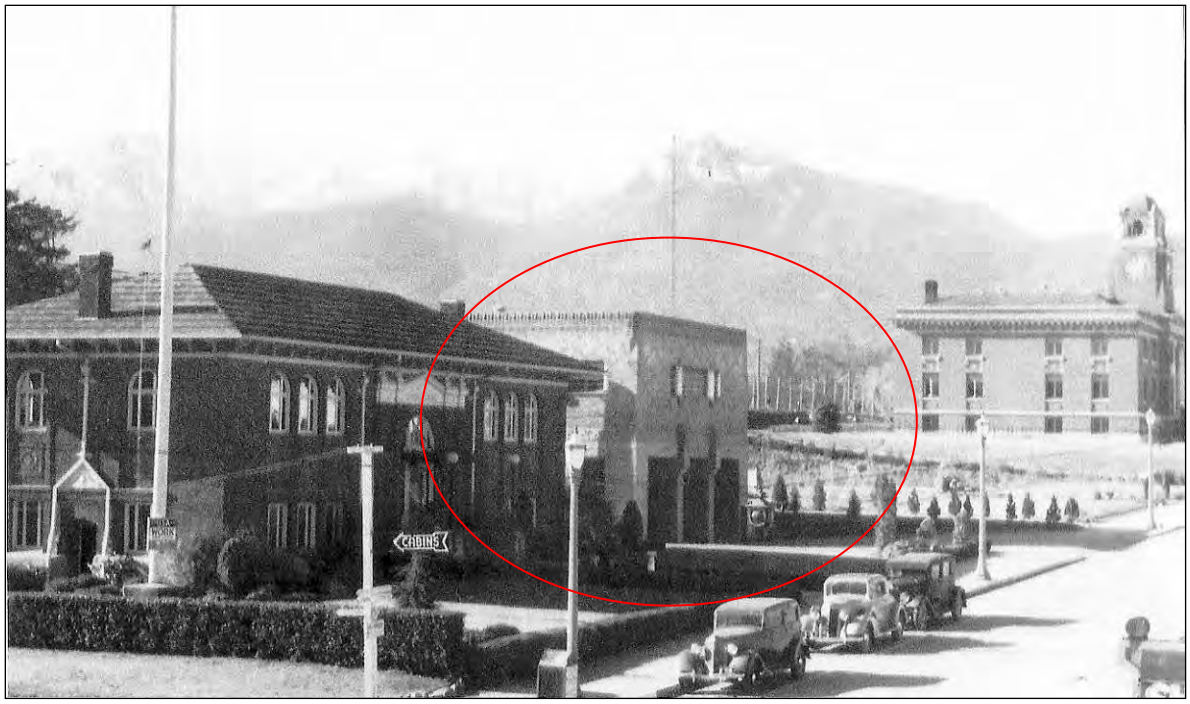
The Fire House remained in service until the 1950s. After this time, a Community Study recommended the building for use as a juvenile home, which it was for some time. Over time, the building also housed the city's first YMCA, the City Sanitation Department, and the Senior Center. By the 1980s the building was mostly used for private businesses including restaurants, offices and a dance studio. The building was strengthened to mitigate seismic hazards in the 1990s. The main space of the first floor was last occupied by a restaurant until 2006. Currently the building is vacant except for one occupied office at the southeast corner of the second floor.

SOURCES:

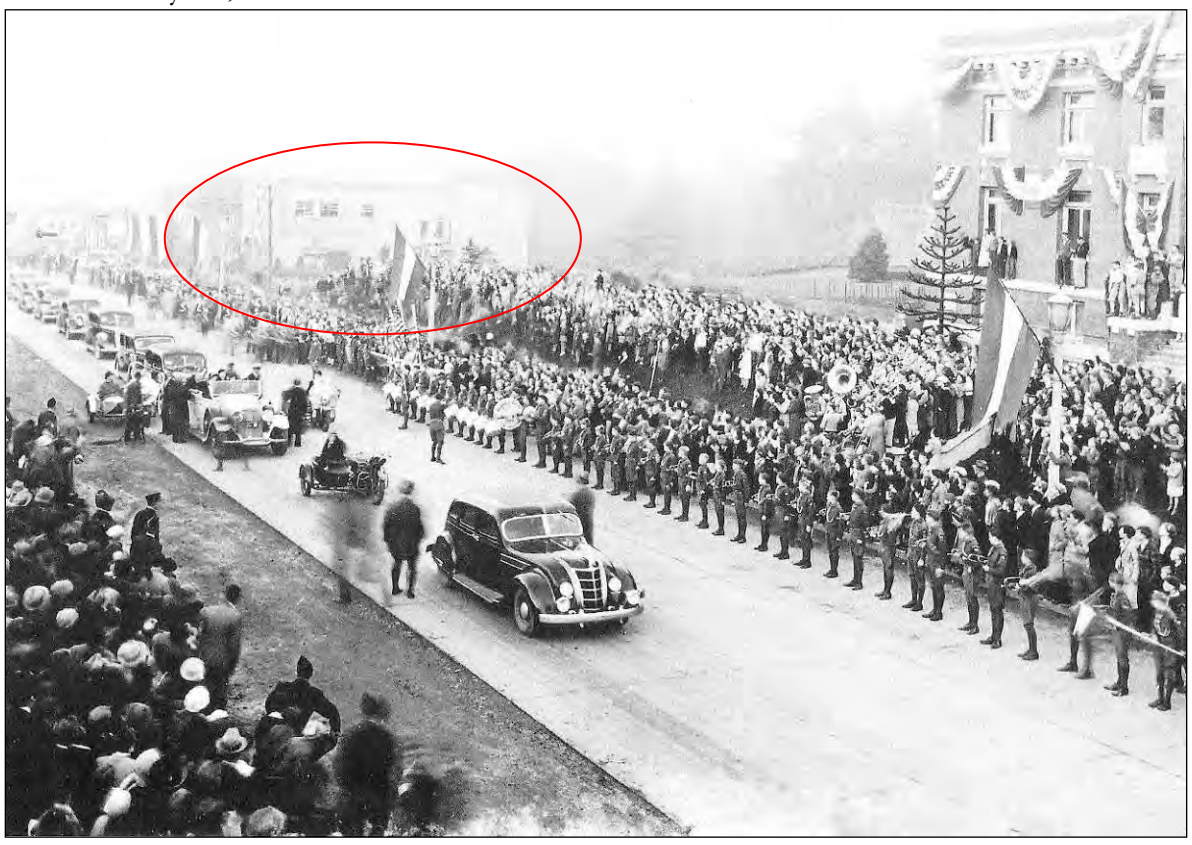
City of Port Angeles Fire Department. www.cityofpa.us/firedeptHistory.htm

Kidd, Cherie. 'Port Angeles Civic Historic District, Nomination to the National Register of Historic Places.' July 2010.

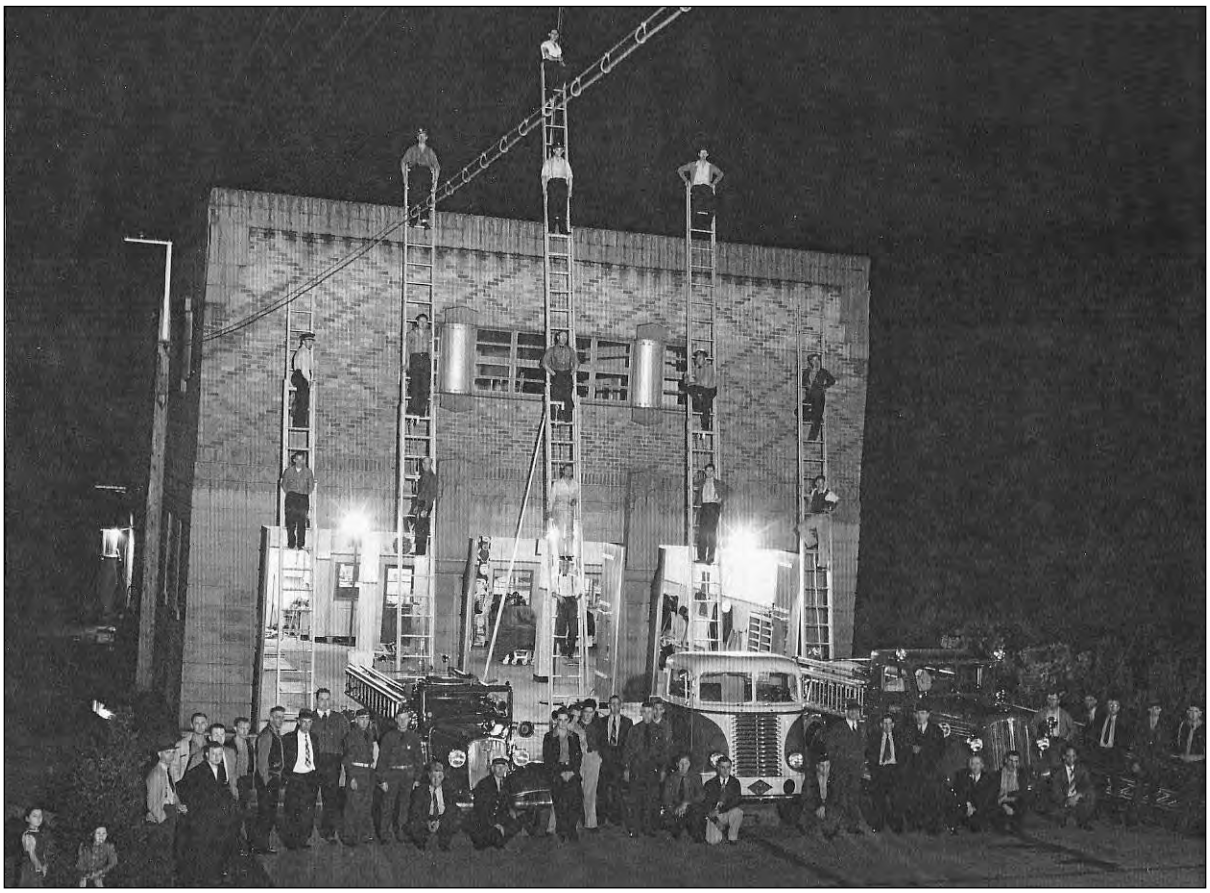
Neal, Pat. 'Community Cultural Resource Survey of the Port Angeles Fire Department.' Clallam County Parks & Recreation, 1980.



View of Port Angeles Fire House on Lincoln with the Carnegie Library in foreground, and the Courthouse beyond, ca. 1935.



View of Lincoln St, parade for visit from President Roosevelt, 1937. Courthouse in foreground and Fire House in background.



View of the Fire House, its firefighters and its equipment.

View of the Fire House with its doors opened.

Condition Assessment

INTRODUCTION

The Condition Assessment is the first phase of a comprehensive rehabilitation for the Port Angeles Fire House. The comprehensive survey identifies structural, mechanical, electrical, and architectural conditions and deficiencies that were apparent from our site visits and gleaned from discussions with Derek Beery, City Archeologist. We have identified problems and specific issues and included recommended actions to address deficiencies in the building, with the understanding that it is the City's desire to utilize the building for a public use. Some recommendations may be modified in response to future program requirements. The site observations and current photographs included in this report date from the spring of 2011.

The Condition Assessment of the Fire House is an important step in preserving the remaining historic fabric and integrity of this building, as well as identifying those features that are not significant or detract from its integrity. It will also serve as a guide for future modifications and upgrades. The assessment method included a site visit for visual interior and exterior inspections, brief documentation of the building, and a preliminary fire and life-safety code review.

CHARACTER-DEFINING FEATURES

One of the first steps in preserving an historic building is to identify the materials, features, and spaces that contribute to its visual character–its character-defining features. Those character-defining elements typically include visual aspects and physical properties such as overall shape, exterior and interior materials and features, craftsmanship, and decorative details, as well as aspects of the site and surrounding conditions.

For the Port Angeles Fire House the following elements should be taken into account in order to preserve them to the fullest extent possible:

- tall, two-story flat roof massing
- banded concrete finish at the first story
- patterned brickwork at the second story
- tan and speckled terra cotta details and banding at the first floor line, parapet top, and corner and window details
- large, former equipment bay openings at front (west) façade
- horizontal wood windows with paired sections and elongated proportions
- painted steel diamond patterned "columns" at original window bands
- intact interior volumes at a portion of the original equipment bays and at the interior sky-lighted central hall at the original fire fighters dormitory and original city council chambers. The remainder of the interior of the building has been extensively altered and no longer retains character-defining features.

It is important to be aware of, retain, and protect these elements when considering the new use or rehabilitation of the building. Alterations made without such consideration can irreversibly damage or change the building's character, for example by inappropriate repointing of the masonry, by changes to the window configuration, or by inappropriate changes to the setting around the building.

GENERAL RECOMMENDATION AND PRIORITIES FOR REHABILITATION

Our site visit did not reveal any serious life-threatening or building safety concerns that require immediate attention. However, many elements of the building will require attention and modifications within the next twelve months and as the final program is identified for the Fire House. These elements include:

- repair and stabilization of spalled brick masonry walls
- repointing of deteriorating mortar
- repair and stabilization of parapet
- replacement of saturated insulation at the built-up roof
- repair of water damage to second floor interior
- repair of damaged floor areas
- removal (or stabilization of interior unreinforced masonry partitions
- underpinning of foundations
- abatement of hazardous materials such as asbestos, lead and PCBs

It is important that future changes to the building retain the remaining historic materials and minimize the impact on the historic integrity of the building. Recommendations for the work undertaken for the building stability and changes in program and function should be made in accordance with *The Secretary of Interior's Guidelines for Rehabilitation*. Based on those guidelines, the first priority for the building is protection and maintenance of deteriorated or damaged architectural elements. Secondly, repair and replacement are recommended after the damaged historic material has first been stabilized and protected from further deterioration or failure. The third level of work is the exterior and interior alterations needed for the physical and functional upgrade of the building. New work shall be clearly different from the old and should not radically change, obscure or destroy character-defining features or materials.

The priorities and recommendations listed below are made based on the assumption that a public use will be established for the building. The Priority 1 items are especially important if the building remains vacant for an extended period of time. The priorities may change as the building's future use becomes more defined.

PRIORITY 1: PROTECT, MAINTAIN, AND STABILIZE

The following actions are recommended to be undertaken as soon as possible to address problems that present life-safety issues and cause continued long-term damage to the physical characteristics of the building:

- repair and stabilize parapet
- replace saturated roof insulation; and provide new roofing
- abatement of hazardous materials such as asbestos, lead and PCBs
- underpin foundation

PRIORITY 2: REPAIR AND REPLACE

The following actions are recommended to occur within the next two years to assure continued preservation of the historic elements, improve energy efficiency, and provide a weathertight exterior envelope for the building. These recommendations may change if a new use is identified for the building:

- repair and stabilize spalled brick and terra cotta masonry at exterior walls
- repoint approximately 75% of exterior mortar
- remove (or stabilize) interior unreinforced masonry partitions
- repair water damage at second floor interior
- repair damaged floor areas
- construct new code compliant exterior exit stair or new interior secondary means of egress
- remove existing fire escape stair and install new code-compliant egress stair

PRIORITY 3: PHYSICAL AND FUNCTIONAL UPGRADE

The following recommendations respond to the issues of the desired building and program upgrades, and should be undertaken systematically, as budget and funding allows, and to provide increased usability and universal access for the building:

- reconstruct original fountain on south side of building
- rebuild exterior stair/ramp to be ADA compliant, if no elevator is provided
- construct interior stair and/or elevator
- construct exterior elevator and lobby enclosure
- provide ADA and code compliant restroom facilities
- provide new mechanical, heating, plumbing, security, and lighting systems
- remove non-historic copper canopies and aluminum storefront windows; install historically appropriate windows/door openings and canopies

Building Description

The report is organized in accordance with building systems, such as framing, roofing, structure, electrical system, interior finishes, etc. Within each sub-section, the building system as it exists is described, and apparent deficiencies, problems, or appropriateness to the period of historic significance are identified. The period of significance for the Civic District within which the Fire House is located is 1915 -1931.

GENERAL

The Port Angeles Fire House is classified by the International Building Code (I.B.C.) as Type III-B, with a structural concrete frame of fire resistive construction. The building consists of two full stories, with a small partial basement at the back of the building. The building footprint is approximately 80' by 42', with a total area of 3,356 sq ft (to outside of exterior walls) and a gross square footage of 7,728 sq ft., including the ground and second floors. The building is constructed of reinforced concrete with brick veneer. Reinforced concrete columns support the upper floor, roof and exterior walls.

The building is divided horizontally by its exterior materials, which identify the interior floor levels. The ground floor is enclosed in banded concrete which has been coated with a thin stucco finish. The second floor is clad in decorative brick masonry on three façades. The decorative brick patterning is a diagonal hatch, comprised of two types of brick—the diamond pattern in rug-textured dark orange brick and the main color field of buff brick. There is a horizontal band of decorative Art Deco glazed terra cotta at the mid-level, between the stucco and brick masonry, and around the top of the building parapet. Decorative terrace cotta also accents the large windows at the front and side elevations.

The building is rectilinear in form, with generally flat facades. The primary façade faces generally west, toward Lincoln Avenue. At the front façade, large bay windows have been inserted into two of the original fire house apparatus door openings, projecting approximately 3' out from the front of the building. The northernmost apparatus bay door opening now serves as the front entry to the ground floor, with a pair of doors; the bay windows are each covered with a non-original segmented copper roof, and the main entrance is covered with a non-original segmented copper canopy.

The main entry to the ground floor space is on the west façade of the building, at grade level with a slight ramp up to the entry. There is no internal stair, as the building was intended to have an addition that contained an interior public stair. There were originally two fire poles connecting the upper and lower stories, but these have been removed and floor openings infilled. The second story is currently accessed by a freestanding exterior ramp on the south side of the building. The ramp on the building's south side is covered, of wood construction, and is relatively steep.

The second floor has two primary areas, with a difference in floor level of approximately 35". The west side of the building was originally dedicated to the firefighters' dormitory and living spaces, and the east side of the building housed the City Council Chambers. The two areas were not originally connected, but have since been connected with a door and wood-frame stair with landing. Both these areas have entries off of the exterior access ramp.

The restrooms on ground floor of the building are not original to the building and appear to date from the period when the building was used as a café and bakery. The configuration of the central toilet room on the second floor, Toilet 4, probably dates from the original construction. Two others, Toilet 3 and Toilet 5 were added at a later date.

SITE

The original siting placed the Fire House on the north end of a large property, 150' x 250', on which the City Hall and Jail building were also planned. At the time of construction, the Carnegie Library was located to the north of the site (constructed in 1919) and Central Park was located to the south (acquired in 1917). The site is bordered by Lincoln Street on the West, the former Port Angeles Carnegie Library (now the Museum at the Carnegie) to the north, and a wooded ravine to the east. The Clallam County Courthouse is located across the park, south of the old Fire House. Veterans Memorial Park occupies the same site, to the south.

The front façade of the Fire House is located approximately 60' from the edge of Lincoln Avenue. The area between the front façade and Lincoln originally served at the driveway for the fire house and is paved concrete. There is presently a rise in grade from the building entry to the sidewalk, a condition that does not appear original. The south edge of the paved area is bordered by benches and raised planters. The portion of the site to the south of the Fire House is at a higher grade, approximately 3', which drops down again to the parking lot at the southeast corner of the site.

Access to the second floor is provided by a narrow, exterior wooden ramp on the south side of the building. The ramp is dog-legged in shape and is approximately 4' wide.

RECOMMENDATIONS

- remove all debris from building perimeter
- improve planting, paving and parking areas
- stabilize slope at ravine (east side of building)

STRUCTURE

Foundation, Wall and Floor Structure:

The building foundation walls and floors are of reinforced concrete, supported on concrete beams and columns. The exterior bearing walls are a combination of concrete and masonry, with masonry veneer. The amount of concrete reinforcement is well detailed in the original drawings, but the details of the masonry ties are not known.

The reinforced concrete structure appears to be in generally sound condition. Foundation settlement is indicated by diagonal cracks in the north and south walls and is evident in the deformed floor level in the northeast quadrant of the building. The exterior masonry walls have been damaged by the foundation settlement and the mortar has been further deteriorated by weathering over time.

In some areas it appears that the masonry veneer is bulging, and there are some significant cracks visible in the veneer areas. There is also evidence of significant staining and biological growth on all of the exterior wall surfaces, and the mortar is soft, crumbling and deteriorating in a number of areas.

The original mortar appears to have been a lime-rich mortar, which has weakened over time due to weather exposure and original workmanship. There is evidence of tuckpointing is some areas. An engineer's report from 1987 notes that there was serious masonry and concrete deterioration. Some of this appears to have been addressed since that time, as the existing conditions did not appear as egregious, but the dates of the improvements are unknown.

Review of upgrade drawings from 1995 and 1997 and on-site investigation revealed that five concrete shear walls at the second floor and two at the ground floor have been installed to enhance the lateral force resistance in the original building design. However, the second floor slabs, especially in the lower area of Offices along the northeast side of the building, exhibit a significant downward slope, which would indicate settlement in the northeast corner of the building.

The back of the building, virtually concealed from public view is of uncoated, cast-in-place board-formed concrete. With the exception of the new section of concrete infill, the surface appears to be original. It is heavily stained and has ivy growing on the lower sections.

Roof Structure and Insulation:

The building roof is also of concrete construction – 4-1/2" slab supported by concrete beams. The roofing material is a built-up roof installed in circa 1990, over a thick layer of foam insulation. The roof slopes to two internal roof drains located along the long (north-south) sides of the building. There are areas of localized ponding and vegetation growth on the roof surface, and the function of the roof drains appears compromised by a significant amount of grass growing in the drain pans. The overflow scuppers that are still evident on the east side of the building have been rendered useless by the installation of the new foam insulation. No provision was made to provide overflow drains in the present roof configuration.

Acrylic domed skylights have been installed in the location of the original steel-framed hipped units. There is evidence of condensation at the interior of the existing skylights, and areas where paint and interior surfaces are deteriorating.

The building has a parapet of approximately 18" high around the entire perimeter of the roof, constructed of brick and terra cotta masonry on front, north side, and the front portion of the south side.

On the back the parapet is concrete, and at the back of the south side, the parapet is constructed of brick. In a few areas the parapet is topped with painted, standing seam sheet metal in poor condition. The other portions have no protective cap metal or coating. Around the perimeter, the built-up roofing sheets lap up the sides, but do not have any form of edge sealant or protection from water intrusion. This condition has likely contributed to the saturation of the existing foam roof insulation, and to the vegetation growth and biological staining at the exterior brick and terra cotta masonry.

Structurally, the parapet has been partially strengthened by the installation of steel angles along the top edge, intermittently fastened to exposed bolts and bent aluminum braces. The purpose of the bracing is not immediately obvious, and is clearly not adequate to protect the terra cotta cap stones from becoming dislodged and falling off the top of the parapet.

Small holes and investigations of the roof insulation revealed that the foam insulation is completely saturated in the high spots around the building and in proximity to the perimeter edges. It can be expected that the low spots are also saturated.

The roof of the entry ramp is in poor condition, with failing coating at the built-up roofing, moss growth adjacent to the wall, and disconnected flashings.

RECOMMENDATIONS

- remove existing roof insulation and roofing, and provide new; provide new roof drains
- provide structural parapet bracing
- provide weatherproofing and ventilation at skylights
- provide new standing seam parapet cap and roof membrane termination
- provide overflow roof drainage
- replace roofing on ramp if ramp is to remain

SEISMIC ASSESSMENT

The original structure was deficient with respect to modern seismic standards and was strengthened in 1997 with reinforced concrete. A seismic analysis based on current methodology (ASCE 41-06 and IBC 2009) for the evaluation of existing structures indicates that the strengthened lateral force resisting system is adequate and requires no additional strengthening. Our calculations are included in the appendix.

Although our analysis of the building structure indicates sufficient strength to safely resist anticipated ground motions associated with the maximum considered earthquake, life safety hazards associated with non-structural elements have been identified. Many of the original unreinforced masonry walls are slender (large height relative to thickness) and are vulnerable to collapse during a large seismic event. Although the masonry walls are non-structural in that they are not required for the support or stability of the building, they represent a seismic hazard to building occupants. The masonry parapets present a similar life safety hazard if they dislodge during an earthquake. Although bracing has been added to the parapets, the bracing is incomplete and was not installed in conformance with the seismic retrofit drawings.

RECOMMENDATIONS

- Underpin building foundations to mitigate future settlement. Geotechnical investigations reveal poor soils to a depth of about 35 feet below grade that are unsuitable for support of the building

foundations. Additional investigations may be required to determine the extent of the required underpinning, but it is likely that at least the middle third and eastern third of the building foundations should be underpinned. We estimate 46 pipe piles, 6" in diameter, are required. If the entire building requires underpinning, we estimate 78 pipe piles are required. We have included a schematic plan for cost estimating in the appendix.

- Install strong-back bracing at the exterior masonry walls with excessive slenderness. The unreinforced masonry walls on the north and south exterior of the back (eastern) half of the building at the second floor and the south wall at the first floor below should be strong-backed. Metal studs, 6" deep, 18 gauge, spaced at 24", and attached to the inside face of the exterior walls will adequately enhance the ability of the walls to remain intact during a seismic event.
- Remove interior unreinforced masonry partition walls. All of the original interior partitions constructed with unreinforced masonry are excessively slender and should be removed. Alternately, they may be strong-backed as described above for the exterior walls, in which case 4" deep metal studs may be used to strengthen the 4" wide gypsum block walls. The floor plans identify the interior masonry walls that require strong-backing.
- Brace all unreinforced masonry parapets. The parapet bracing currently in place is incomplete and inadequate. We suggest removing the bracing and providing new bracing similar to the bracing shown in the seismic retrofit drawings by Craig Owen dated 1995. A copy of the parapet bracing detail is included in the appendix for cost estimating.
- Restore exterior masonry walls. Broken and missing masonry units should be replaced and mortar should be re-pointed as described below.

EXTERIOR CLADDING

Brick and Terra Cotta Masonry

The exterior brick and terra cotta masonry and mortar on the exterior walls of the structure is in poor condition. There are several areas of significant cracking, biological growth, deteriorated and missing mortar, spalled brick faces, and missing masonry units in several locations.

The exterior cladding on the north side of building has an apparent drop down toward the center of the building at the east end. The drop is evident in the stucco-coated concrete wall as well as in the brick veneer, which may be an indication of settlement that occurred shortly after construction. That said, there is significant diagonal cracking in the veneer above the settled area. Evidence shows that this long crack has been repaired at least once over the years and may be continuing to move. The south side of the building also exhibits diagonal cracking in the brick veneer, between the two upper windows and at the southwest corner of the building. There is also a significant amount of missing mortar on the southwest portion of the south façade. In general, the faces of the exposed decorative brick are in good condition. On the east end of the south wall, where the brick was originally intended to be covered with the future addition, the brick used was of a lesser quality and is exhibiting slight deterioration of the mortar joints and the brick faces.

In general, the decorative terra cotta elements on the building are in good condition. The glazed surfaces are intact, and there is no significant cracking observed. There is one large section missing from the top of the parapet on the west side, which appears to have been missing for some time. The joints in the parapet terra cotta, however, have a significant amount of moss, grass, and other plant growth at sky-facing ledges, and at mortar joints where moisture appears to be collecting.

The mortar on all elevations is in very poor condition. The worst of it has a thin, but crusty top surface, that is easily rubbed away, and very soft, powdery surface behind. From visual observations, the original mortar appears to be a very light gray (almost white) hydrated lime based mortar with fine sands. In some areas, there is a different, more grayish material with coarser sands / fractures rock, which would indicate that those areas were probably tuck pointed at some point in time.
The condition of the joints differs on different elevations of the building, which could be an indication of the weather conditions during construction, the skill of the masons installing the work, and the quality control techniques used during the setting of the masonry.

Concrete and Stucco Coated Concrete

At the first story, the building is accentuated with banded, lightly sanded, stucco-coated concrete, painted in a light beige color. The type of paint coating is unknown, but it is generally in satisfactory condition. Light biological growth and mildew is evident, and there are a few areas near the base of the walls where the coating is peeling. Evidence suggests that the original stucco coating was a reddish color, designed to blend in with the red/orange brick and terra cotta masonry above.

At the north side, there are a number of vertical cracks, projecting from the base up to the window sills, and areas where the stucco coating has fallen off of the concrete substrate. Additionally, areas of the stucco sound hollow when tapped, indicating that the stucco has become debonded from the concrete substrate below. On the south side under the entry ramp, areas of stucco are delaminating from the concrete and brick substrate, and areas where it is missing completely.

RECOMMENDATIONS

- remove vegetation from around building facades and at the base (especially at the east side)
- clean all masonry surfaces using tested and approved methods and materials; remove staining and biological growth
- remove deteriorated mortar and replace with material to match original (evidence suggests this may be a soft, lime based mortar, according to the mortar analysis)
- install missing brick and terra cotta masonry pieces
- sound stucco coating; remove and replace loose areas; recoat with dark red breathable coating to match original

DOORS AND WINDOWS

Windows:

Most of the fenestration is original to the building, with a few instances of infill or covering on the interior. The original windows are of wood construction with a unique exterior "sticking" and an awning-type operation. At the lower floor, the original windows are single, punched openings in a 3:3 configuration, with the lower one-third being operable. At the upper floor, the original windows are assembled in pairs, separated by an over-sized painted steel "column" and terra cotta medallions, and flanked by simple steel and terra cotta edge trim. One window, on the north side has been completely blocked up on the exterior. At the lower floor, on the north side, the windows are also a unique arrangement of a 3:2 fixed sash on the top with a 1:3 awning at the bottom.

The south and east sides of the building have a variety of original and later openings, reflective of the changes in use from the original intent. Where the original equipment bay doors are removed, aluminum storefront-type, single-glazed bay windows are installed.

Some of the windows are still operable, but all of the units are single-glazed, and wood sash and glazing compound are in very poor condition. A large kitchen exhaust fan is installed at one lower window, and there is fan vent blocked into a window on the south side. These should be removed if no longer needed.

Doors:

With the exception of the large equipment bay door on the north side of the building, none of the existing doors appear to be original. The extant doors range from a pair of double doors at the front entry, to a miscellaneous collection of wood and steel materials. Most are in fair to poor condition.

RECOMMENDATIONS

- replace all windows with new, double glazed sections, matching the original details, glass opening sizes and configurations
- replace all doors; include new hardware and weatherstripping

INTERIOR CONSTRUCTION, FINISHES, AND ACCESSORIES

Floor Finishes:

The floor construction at the Fire House is concrete. The floor finishes vary throughout the building with sheet vinyl, vinyl tile, painted concrete and carpet at the ground floor, and vinyl tile, carpet and raised wood flooring at the second floor. All of the existing finishes are in poor condition.

Wall Finishes and Trim:

In recent years the ground floor of the building was used as a restaurant and café. In those areas, the wall surfaces are a combination of painted gypsum wall board and painted plaster. It is generally in fair condition. The amount of exterior wall insulation behind the finish surfaces is unknown.

The second floor is comprised of some original finishes – painted cement plaster over a fire-proof gypsum block known as “Pyrobar”, and painted wood wainscot and door and window trim.

Ceilings:

Ceilings throughout the front portion of the ground floor are a combination of painted concrete, suspended acoustic tile and suspended gypsum wall board. In some areas the electrical conduit and mechanical piping is concealed above the ceiling finishes; in other areas the systems are exposed.

At the second floor, where the original skylights still provide ample natural light to the interior spaces, the ceilings appear to be painted cement plaster over metal lath. In the area that was originally the Council Chambers, portions of the original suspended plaster ceiling are extant, and other areas have been replaced with suspended acoustic tile and recessed light fixtures. Due to water penetration at the skylights, many areas of the ceilings are in very poor condition.

RECOMMENDATIONS

- remove all existing floor finishes; prep for new
- repair all damaged wall and ceiling plaster area: prep and paint
- install wall insulation where exterior wall surfaces are removed (prior to installing new finish surfaces)
- repair wall and ceiling trim; prep and paint
- remove existing suspended acoustic tile surfaces; install new or consider alternate material depending on eventual use

INTERIOR PLUMBING

The existing interior plumbing on the ground floor appeared to be functional, and is in fair condition. The fixtures and toilet rooms on the ground floor are newer than those on the upper floor. The fixtures on the west end of the upper floor do not appear to have been used in a significant amount of time, and may not be functional. There is a small restroom on the east side of the building with functioning fixtures. None of the fixtures in the building appear to meet the current energy code, and many are deficient in meeting the ADA accessibility requirements.

RECOMMENDATIONS

- install new code complaint fixtures; including partitions, railings, and accessories

MECHANICAL HEATING AND VENTILATION

Heating and ventilation systems in the building were not evaluated for condition report, as it assumed new systems will be required for the future use(s).

ELECTRICAL AND LIGHTING SYSTEMS

Lighting and electrical systems in the building were not evaluated for condition, as it assumed new systems will be required for the future use(s).

ADA AND BUILDING CODE ASSESSMENT

SITE

The site surrounding the Fire House on the north and west sides is generally flat. There is an accessible route of travel; i.e., flat from the parking lot at the south side of the building, but depending on the future configuration of the building interior, may not provide a suitable entrance to the building from the side versus the primary entrance. The location and surface finish of the accessible route of travel will need to be reviewed along with the design for the building interior.

INTERIOR

The ground floor is provided with one ADA accessible entrance. Depending on the future use, and the calculated occupant load, a second accessible egress may need to be provided, if the occupant load is over 49 persons.

The second floor presently does not have an accessible means of entry. The existing ramp to the second floor does not meet current code for slope and width, and provides access only to one portion of the bi-level story. A second code-complaint exit stair and/or an area of refuge will need to be provided depending on the future use of the second floor.

Future use may dictate the need for an interior or exterior stair/elevator insertion or addition, to provide an accessible route to the second floor. An alternative to the construction on a new elevator includes a new, covered ramp to each of the second floor levels, and/or an interior lift to the upper level of the second story.

BUILDING CODE REVIEW

Project Name:	Port Angeles Fire House
Project Description:	The scope of work of this project is to provide a Condition Analysis of the existing building, guided by site investigation, research and *The Secretary of the Interior's Standards for Historic Preservation*. The Port Angeles Fire House was built in 1931, one of three structures within the Port Angeles Civic Historic District and is a contributing historic structure.
Project Location:	215 South Lincoln, Port Angeles, Washington
Building Code:	International Building Code, 2009 Edition with WA State Amendments (IBC); International Existing Building Code, 2009 (IEBC)
Local Building Authority:	City of Port Angeles, Washington
Total Proposed Area:	First Floor = 3,135 sf Ground Floor = 3,113 sf Basement = 520 sf **Total = 6,768 SF**

Occupancy Options: The building program could potentially have three different occupancy groups as defined by IBC Chapter 3:

A-2 Assembly (Restaurant, Banquet Hall, Bar)
A-3 Assembly (Gallery, Community Hall, Dance Hall, Lecture Hall)
B Business (Civic Administration, Professional Services, Educational)

Any storage occupancies can be considered incidental uses as found in IBC Section 302.1.1 and Table 302.1.1.

Construction Type:

Construction Type is Type III-B by virtue of its reinforced concrete structural frame and exterior brick walls, per IBC Table 601.

Exterior Walls:	Reinforced Concrete (Basement & Foundation); Unreinforced Brick, Reinforced Concrete (ground floor); Unreinforced Common Bond Brick (second floor)
Interior Walls:	Cast-in-place Concrete, 'Pyrobar' Gypsum Block, Brick, Wood frame w/ Plaster Finish
Interior Columns:	Reinforced Concrete Columns
Roof:	Reinforced Concrete Slab, Built-up Roof on top
Flooring:	Concrete Slab throughout

Allowable Height of Buildings

Allowable Height 55 Feet Table 503

Existing Building Total Height from Grade Plane = 31'-1" ∴ Existing Building OK

Proposed Building Total Height from Grade Plane = 31'-1" ∴ Proposed Building OK

Max. Number of Stories Allowed (A-2)	2	Table 503
Max. Number of Stories Allowed (A-3)	2	Table 503
Max. Number of Stories Allowed (B)	3	Table 503

Existing Total Number of Stories: 2 stories with potential basement
(First Floor above Ground Floor with Partial Unfinished Basement)

Allowable Area Calculations:

Type III-B - Occupancy A-2
IBC Table 503 Allowable Area: 9,500 SF/story

Type III-B - Occupancy B
IBC Table 503 Allowable Area: 19,000 SF/story

Maximum Area is determined by multiplying the allowable area per floor by the number of stories.

Allowable Increases

IBC Section 506 allows an area increase where at least 25% of the building's frontage perimeter fronts on a public way or open space which is over 20' in width.

If sprinklers are provided throughout the building, the area limitation is permitted to be increased up to 200% for multi-story buildings. (Section 506.3)

If sprinklers are provided throughout the building, the height limitation is permitted to be increased by one story and 20 feet. (Section 504.2)

Maximum Floor Area Allowances per Occupant (Table 1004.1.2)

Option 1- Office use for entire building

Second Floor

Business (Office Space) 100 sf per person gross
3,135 SF/100 = 31 persons max

Total First Floor Occupants = 31 persons max for office use

Ground Floor:

Business (Office Space) 100 sf per person gross
3, 1135 SF/100 = 31 persons max

Total Ground Floor Occupants = 31 persons max for office use

Option 2- Office use for second floor, Restaurant use for ground floor

Business (Office Space) 100 sf per person gross
3,135 SF/100 = 31 persons max

Total First Floor Occupants = 31 persons max for office use

Ground Floor:

Assembly without fixed seats (A-3 Occupancy) 15 sf per person net
Unconcentrated (tables and chairs) – assume 50% of 3,113 SF = 1,550 SF
2,500 SF/15 = 103 persons max for restaurant

Total Ground Floor Occupants = 103 persons max for restaurant

Plumbing Fixtures (IBC Table 2902.1)

Option 1- Office use for entire building

Water Closets

B (Clerical / Administrative use – 6,248 sf @ 200 sf/person /2)
Male : 2 WC per 16-35 (16 persons) = 2 Water Closets
Female : 2 WC per 16-35 (16 persons) = 2 Water Closets

Total of 2 WCs for women, and 1 WC and 1 urinal for men (where urinals are provided, one water closet less than the number specified may be provided for each urinal installed). Facilities are split between both floors, but all are accessible at times of operation.

Option 2- Office use for first floor, Restaurant / Lounge use for ground floor of building

Water Closets

B (Clerical / Administrative use – 3,135 sf @ 200 sf/person /2)
Male : 1 WC per 1-15 (8 persons) = 1 Water Closet
Female : 1 WC per 1-15 (8 persons) = 1 Water Closet
A (Restaurant, Lounge use – 1,550 sf @ 30 sf/person /2)
Male: 2 WC per 26-75 (26 persons) = 2 Water Closets
Female: 2 WC per 26-75 (26 persons) = 2 Water Closets

Total of 3 WCs for women, and 2WCs and 2 urinals for men (where urinals are provided, one water closet less than the number specified may be provided for each urinal installed). Facilities are split equally between both floors, according to division of use.

Lavatories
Option 1- Office use for entire building

B (Clerical, Administrative use – one lavatory per 2 water closets)
Male : 1 Lav per 2 water closets = 1 Lav
Female : 1 Lav per 2 water closets = 1 Lav

Option 2- Office use for first floor, Restaurant / Lounge use for ground floor of building

A (Restaurant, Lounge – one lavatory per 2 water closets)
Male: 1 Lav per 1 WCs = 1 Lav
Female: 1 Lav per 1 WCs = 1 Lav
B (Clerical, Administrative use – one lavatory per 2 water closets)
Male: 1 Lav per 2 water closets= 1 Lav
Female: 1 Lav per 2 water closets = 1 Lav

Total of 1 lav for women, and 1 lav for men in Option 1. Facilities are split between both floors, but all are accessible at times of operation. Total of 2 lavs for women and 2 lavs for men in Option 2, divided equally according to division of use.

* With the limited use of the S occupancy, we are not proposing facilities for those areas.

Drinking Fountains (Section 2093.4)
1 per 150 persons — 1 drinking fountain per floor
Option 2:
1 per 150 persons — 2 drinking fountains per ground floor
1 drinking fountain per second floor

Service Sink — 1 service sink per floor

Summary

If the Type III-B building is sprinklered, the A-2 and B (primary) occupancies can be 2 stories and 9,500 sf and 19,000 sf respectively. Thus, the fire resistance rating for all components of the building remains 0 hours. The entire First Floor is A-3 occupancy per Chapter 3. The primary use of the Ground Floor can be considered either A-2 (Assembly; Restaurant / Lounge (per 302.2.1), Mechanical, Bathrooms) or B (Clerical / Administrative), and the primary use for the second floor can be considered B (Clerical / Administrative.)

A Mechanical Room likely meets the thresholds of Table 302.1.1, requiring either 1 HR separation OR an automatic fire extinguishing system (and smoke barrier

APPENDIX A

CONSTRUCTION COST ESTIMATE

TOWN & COUNTRY BLDG & DESIGN CONSULTANTS

Modified 7/18/2011

PORT ANGELES FIRE STATION

Budget Proposal

Town and Country Bldg & Design Consultants was requested to produce a cost budget estimate for the City of Port Angeles to restore the existing building for future tenant improvements.

The cost budget was prepared using the information provided by the Condition Assessment Report as prepared by Bola Architecture & Planning and Swenson Say Faget, Structural Engineers dated May 2011.

The budgeted costs are only for those items noted on the enclosed summary sheet. The guidelines and directions received from the report were the only basis for establishing the budget proposal.

The scope of work is intended to restore, upgrade, stabilize and bring the building to code for future tenant improvements. At this time, since the actual use of the building is not determined, the budget includes a square foot budget cost for the Tenant Improvements.

This budget proposal should not be construed as a prediction of low bid. Budget costs are based on assumptions when unknown conditions exist and prevailing wage rates at the time this budget is prepared. Future pricing expects competitive bidding for all the work on the open bid market from General Contractors.

Town and Country has no control over the material items selected, scope of work, labor costs, market and bidding conditions at time of the bid. Therefore Town &Country does not guarantee that the bids received will not vary from this budget proposal.

Sincerely

Rebecka Owens
President
Town & Country Bldg & Design Consultants

PORT ANGLES FIRE STATION

BUDGET ANALYSIS FOR BLDG UPGRADE &
BUDGET ANALYSIS FOR FUTURE TENANT IMPROVEMENT

	DESCRIPTION	QTY	UNIT	TOTAL
DIV 1	**GENERAL CONDITIONS**			
		1	budget	$ 79,676
DIV 2	**DEMOLITION AND SITEWORK**			
		1	budget	$ 221,611
DIV 3	**CONCRETE**			
		1	budget	$ 22,390
DIV 4	**MASONRY RESTORATION**			
		1	budget	$ 110,000
DIV 5	**METALS**			
		1	budget	$ 26,004
DIV 6	**CARPENTRY**			
		1	budget	$ 8,850
DIV 7	**THERMAL & MOISTURE PROTECTION**			
		1	budget	$ 57,090
DIV 8	**WINDOWS & DOORS**			
		1	budget	$ 65,755
DIV 9	**FINISHES**			
		1	budget	$ 4,500
DIV 10	**SPECIALTIES**			
		1	budget	$ 8,680
DIV 11	**EQUIPMENT**			
		1	budget	$ 58,500
DIV 15	**MECHANICAL**			
		1	budget	$ 106,650
DIV 16	**ELECTRICAL**			
		1	budget	$ 76,660
	TOTALS			$ 846,366
	B&O tax	0.75%		$ 6,348
				$ 852,714
	Insurance	1.50%		$ 12,791
				$ 865,504
	Bond	2%		$ 17,310
				$ 882,815
	OH&P	8%		$ 70,625
				$ 953,440
	Contingency	10%		$ 95,344
	TOTAL CORE BUDGET EXCLUDING WSST			$ 1,048,784

THE FOLLOWING ARE PROVIDED FOR CONSIDERATION OF ADDITIONAL SCOPE OR WORK ITEMS

ALT #1	RESTAURANT EQUIPMENT	$ 42,000
ALT #2	PROPANE PIPING AND TANK	$ 8,500
ALT #3	REPLACE WOOD STAIRS AT SOUTH	$ 24,000
ALT #4	REMOVE COPPER CANOPIES & PATCH EXISTING	$ 2,100
ALT #5	TENANT IMPROVEMENTS @ $125/SF	$ 778,250
ALT #6	UPGRADE TENANT IMPROVEMENTS ADD $50/SF	$ 311,300
ALT #7	FIRE SPRINKLER SYSTEM	$ 33,130
	TOTAL ALTERNATES	$ 1,199,280
	CORE BUDGET	$ 1,048,784
	TOTAL BUDGET	$ 2,248,064

PORT ANGLES FIRE STATION

BUDGET ANALYSIS FOR BLDG UPGRADE &
BUDGET ANALYSIS FOR FUTURE TENANT IMPROVEMENT

UPDATED 7/18/2011

	DESCRIPTION	QTY	UNIT	UNIT COSTS LABOR	UNIT COSTS MAT'L	sub/sup QUOTE	EXTENSIONS LABOR	EXTENSIONS MAT'L	EXTENSIONS TOTAL	
DIV 1										
	GENERAL CONDITIONS	1	summary	62240	17436		$ 62,240	$ 17,436	$ 79,676	Intent is to remove all leaving nothing but building shell for future TI
DIV 2	DEMOLITION AND SITEWORK									
	REMOVE EXISTING PARAPET BRACING	1	EST	2080	85		$ 2,080	$ 85	$ 2,165	
	REMOVE INTERIOR UNREINFORCED MASONRY WALL--DEMO/REMOVE ALL NON LOAD BEARING INTERIOR WALLS AND FALSE FLOORS INCL EXT. STAIR ON SOUTH SIDE BLDG	1	EST	37200	5600		$ 37,200	$ 5,600	$ 42,800	
	STABILIZE EAST SLOPE OF BLDG	1	EST	6200	10000		$ 6,200	$ 10,000	$ 16,200	equip/operator 40hrs along with stabilization of slope with mesh and landscape
	REMOVE PLANTING/PAVING AND PARKING SOUTH SIDE BLDG	1	EST	3410	1500		$ 3,410	$ 1,500	$ 4,910	
	NEW PARKING AND LANDSCAPE	1	ALLOW			$ 65,000	$ -	$ -	$ 65,000	
	NEW PILING PER SHEET A.0	48	ALLOW	453	704		$ 21,744	$ 33,792	$ 55,536	
	ABATEMENT	1	ALLOW		35000		$ -	$ 35,000	$ 35,000	
							$ -	$ -	$ -	
DIV 3	CONCRETE									
	NEW CONCRETE PILE CAPS ETC	1	EST	7440	14950		$ 7,440	$ 14,950	$ 22,390	condition unknown-allowance only
							$ -	$ -	$ -	
DIV 4	MASONRY RESTORATION									
	CLEAN AND REPOINT TERRA COTTA & BRICK	1	EST			$ 52,000	$ -	$ -	$ 52,000	
	REPAIR AND REPLACE TERRA COTTA	1	EST			$ 22,000	$ -	$ -	$ 22,000	
	INSTALL SEISMIC PINS	1	EST			$ 18,000	$ -	$ -	$ 18,000	
	REPAIR PLASTER ON CONCRETE	1	EST			$ 8,000	$ -	$ -	$ 8,000	
	EQUIPMENT ETC	1	EST			$ 10,000	$ -	$ -	$ 10,000	
DIV 5	METALS									
	METAL STUD FRAMING (stabilization of brick masonry)	242	sf	11.50	15.25		$ 2,783	$ 3,691	$ 6,474	
	REPLACE METAL STAIRS NORTH FACE OF BUILDING	42	RISERS	55	410		$ 2,310	$ 17,220	$ 19,530	
DIV 6	CARPENTRY									
	REBUILD FALSE FLOOR GND LEVEL/TREATED TIMBERS	200	EST	27.5	16.75		$ 5,500	$ 3,350	$ 8,850	this cannot be determined at this time with info available. Budget only
							$ -	$ -	$ -	
DIV 7	THERMAL & MOISTURE PROTECTION									
	REMOVE INSTALL NEW ROOF INSULATION	3113	SF		4.25		$ -	$ 13,230	$ 13,230	
	REMOVE REPLACE EXISTING ROOF (incl new scuppers)	31	SQ		750		$ -	$ 23,250	$ 23,250	
	NEW EXTERIOR WALL INSULATION	6870	SF	1	2		$ 6,870	$ 13,740	$ 20,610	
							$ -	$ -	$ -	
DIV 8	WINDOWS & DOORS									
	REMOVE/REPLACE ALL WINDOWS	1	BUDGET			$ 41,000	$ -	$ -	$ 41,000	
	REMOVE/REPLACE ALL EXTERIOR DOORS/HRD	11	ALLOW	325	750		$ 3,575	$ 8,250	$ 11,825	
	NEW HARDWARE	11	ALLOW	130	400		$ 1,430	$ 4,400	$ 5,830	
	NEW STOREFRONT	1	ALLOW			$ 7,100	$ -	$ -	$ 7,100	
							$ -	$ -	$ -	
DIV 9	FINISHES									
	MISC PAINT AT NEW WINDOWS AND INT. DOOR TRIM	1	ALLOW	4000	500		$ 4,000	$ 500	$ 4,500	first floor: 2 split system heat pumps with economizers & RR exhaust fans
DIV 10	SPECIALTIES									
	MISC TOILET ACCESSORIES	1	ALLOW	520	3500		$ 520	$ 3,500	$ 4,020	
	NEW TOILET PARTITIONS	1	EST	750	2250		$ 750	$ 2,250	$ 3,000	
	FE	4	EST	65	350		$ 260	$ 1,400	$ 1,660	
							$ -	$ -	$ -	
DIV 11	EQUIPMENT									
	TWO STOP ELEVATOR including finishes	1	EST			$ 58,500	$ -	$ -	$ 58,500	second floor: 2 packaged roof top heat pumps with economizers & RR exhaust fans
							$ -	$ -	$ -	
DIV 15	MECHANICAL									
	HVAC FIRST FLOOR	1	EST			$ 74,650	$ -	$ -	$ 74,650	
	HVAC SECOND FLOOR						$ -	$ -	$ -	
	(system will also include cooling for elevator equipment room)						$ -	$ -	$ -	
	(system does include any ducting-this will be done when use is determined)						$ -	$ -	$ -	
	PLUMBING						$ -	$ -	$ -	
	ASSUMPTION (make RR 1&2 ADA first floor)	1	EST		14000		$ -	$ 14,000	$ 14,000	
	(make RR 3,4&5 ADA and new fixtures etc)	1	EST		18000		$ -	$ 18,000	$ 18,000	

PORT ANGLES FIRE STATION

BUDGET ANALYSIS FOR BLDG UPGRADE &
BUDGET ANALYSIS FOR FUTURE TENANT IMPROVEMENT

UPDATED 7/18/2011

	DESCRIPTION	QTY	UNIT	UNIT COSTS LABOR	UNIT COSTS MAT'L	EXTENSIONS sub/sup QUOTE	EXTENSIONS LABOR	EXTENSIONS MAT'L	EXTENSIONS TOTAL
DIV 16	**ELECTRICAL**								
	ELECTRICAL	1	EST			$ 68,200	$ -	$ -	$ 68,200
	includes 800amp 120/240 single phase service						$ -	$ -	$ -
	(6) 200amp meters w/future 400amp capability						$ -	$ -	$ -
	(2) 200amp panels one each floor/separate meters						$ -	$ -	$ -
	(2) connections to 5 ton roof top units						$ -	$ -	$ -
	(2) connections to 5 ton heat pumps on bldg ext						$ -	$ -	$ -
	(4) connections to RR fans						$ -	$ -	$ -
	service receptacles for mechanical units						$ -	$ -	$ -
	(6) exit lights with power						$ -	$ -	$ -
	(6) strip lights for temp lighting						$ -	$ -	$ -
	(1) 4ft wrap light each RR						$ -	$ -	$ -
	power to new elevator						$ -	$ -	$ -
	New security for building core only	1	EST			$ 8,460	$ -	$ -	$ 8,460
	(excludes all other interior electrical)						$ -	$ -	$ -
				TOTALS		**$ 432,910**	**$ 168,312**	**$ 245,143**	**$ 846,365**
							B & O/AGC	0.75%	$ 6,348
							PERMITS		$ -
							SUB-TOTAL		$ 852,713
							LIAB INSURANCE	1.50%	$ 12,791
							BLDR RISK	by owner	$ -
							PERFORMANCE BOND	2.00%	$ 17,310
							SUB-TOTAL		$ 882,814
							PROFIT/OVERHEAD	8.00%	$ 70,625
							CONTINGENCY	10.00%	$ 95,344
							MARKET RECOVERY		$ -
							MAINTENANCE BOND (NA)	0.00%	$ -
							TOTAL (excluding WSST)		$ 1,048,783

FOR BUDGETING PURPOSES USE $1.0M TO $1.1M

	ADDITIVE ALTERNATES	
ALT#1	ADD FOR GREASE HOOD AND MAKEUP AIR FOR FIRST FLOOR RESTAURANT INCLUDES CHASE TO ROOF TOP ALONG WITH HOOD AND FIRE SUPPRESSION SYSTEM	$ 42,000
ALT #2	ADD FOR PROPANE PIPING AND TANK	$ 8,500
ALT #3	REPLACE EXISTING WOOD STAIRS SOUTH FACE BLDG	$ 24,000
ALT #4	REMOVE COOPER CANOPIES & PATCH EXISTING	$ 2,100
ALT #5	TENANT IMPROVEMENTS @ $125/SF	$ 778,250
ALT #6	UPGRADE TENANT IMPROVEMENTS @ $50.00/SF	$ 311,300
ALT #7	FIRE SPRINKLER BUILDING @	$ 33,130
	TOTAL ADDITIVE ALTERNATES INCLUDING MARKUPS	$ 1,199,280

TOTAL BUILDING SHELL BUDGET	$ 1,048,783
TOTAL ADDITIVE ALTERNATES	$ 1,199,280
TOTAL BUDGET	$ 2,248,063

7/20/11 2:03 PM

BUDGET ANALYSIS FOR BLDG UPGRADE &

Cost Code	DESCRIPTION	QTY	UNIT	UNIT COSTS LABOR	UNIT COSTS MAT'L	EXTENSIONS LABOR	EXTENSIONS MAT'L	QUOTE	TOTAL
	PROJECT MANAGER-	8	WKS	1950		15600	0		**15600**
	SUPERINTENDENT-	20	WKS	2200		44000	0		**44000**
	FOREMAN		NA			0	0		**0**
	TRUCK/TRAVEL TRUCK	20	WKS		125	0	2500		**2500**
	PROJECT ENGINEER		WKS			0	0		**0**
	ONSITE SECURITY SERVICE		NA			0	0		**0**
	TRANSPORTATION & DOCUMENTATION		NA			0	0		**0**
	JOB PHOTOS	1	EST		75	0	75		**75**
	PLAN COPIES & PRINTING	1	EST		150	0	150		**150**
	PERMITS		by owner			0	0		**0**
	SCHEDULE CONSULTANT		NA			0	0		**0**
	TESTING-BY OWNER		NA			0	0		**0**
	SURVEY ENGINEERING		by owner			0	0		**0**
	MOBILIZATION		NA			0	0		**0**
	JOB OFFICE		use bldg			0	0		**0**
	JOB OFFICE - DEILIVERY / SET UP		LS			0	0		**0**
	OWNER/ARCH FIELD OFFICE		NA			0	0		**0**
	OWNER/ARCH FIELD OFFICE - D / SET UP		NA			0	0		**0**
	OFFICE EQIUPMENT/SUPPLIES	5	MO		25	0	125		**125**
	SAFETY REQUIREMENTS	1	NA		225	0	225		**225**
	PROJECT SIGN	1	EST		1100	0	1100		**1100**
	CLEAN -UP PROGRESSIVE	1	est	2200		2200	0		**2200**
	SITE DUMPSTER	4	est		850	0	3400		**3400**
	TEMP TOILETS		use existing		210	0	0		**0**
	TEMP HEAT	5	mo		250	0	1250		**1250**
	TEMP FANS / VENTILATION					0	0		**0**
	TEMP WATER					0	0		**0**
	TEMP STORAGE	5	mo		85	0	425		**425**
	TEMP POWER(USER FEE)		EST			0	0		**0**
	including/ SET-UP		LS			0	0		**0**
	including/ DISTRIBUTION/LIGHTING		EST			0	0		**0**
	TEMP FENCE/BARRICADES		NA			0	0		**0**
	TEMP PHONE	5	MO		110	0	550		**550**
	SCAFFOLD/STAGING		incl subs			0	0		**0**
	SMALL TOOLS @ .2%	1	LS			0	0		**0**
	EQUIPMENT RENTALS	5	MO		250	0	1250		**1250**
	Dehumidifier - (4)		MO			0	0		**0**
	Miscellaneous	1	LS			0	0		**0**
	CRANE RENTAL	0	NA			0	0		**0**
	FORKLIFT/boom truck	1	MO		1050	0	1050		**1050**
	RENTAL EQUIP	2	MO		550	0	1100		**1100**
	RENTAL EQUIP. GAS/FUEL	1	LS			0	0		**0**
	FINAL CLEAN	6226	SF		0.6	0	3736		**3736**
	WINDOW CLEAN		incl final			0	0		**0**
	MATERIAL PICKUP / HAULING	1	est	440	500	440	500		**940**
	DUST PROTECTION INT. REMODEL	1	NA			0	0		**0**
						0	0		**0**
					TOTALS	**62240**	**17436**	**0**	**79676**

Appendix B

PHOTOGRAPHS

Figure 1 Above: View of primary west façade and partial north façade, and pave plaza in front, circa 1995.

Figure 2 Above: View of building from the west (April 2011)

Figure 3 Below: View of building from south (April 2011)

Figure 4 Above: View of east façade of the building from the southeast (April 2011)

Figure 5 Below: View of building from the south (April 2011)

Figure 6 Above: View of main entry, west facade (April 2011)

Figure 7 Below: View of Veterans Park, located to the south of the Fire House (April 2011)

Figure 8 Left: Detail view of bay window, west façade, and freestanding wood access ramp (April 2011)

Figure 9 Below: View of freestanding wood access ramp, on the south side of the building looking north (April 2011)

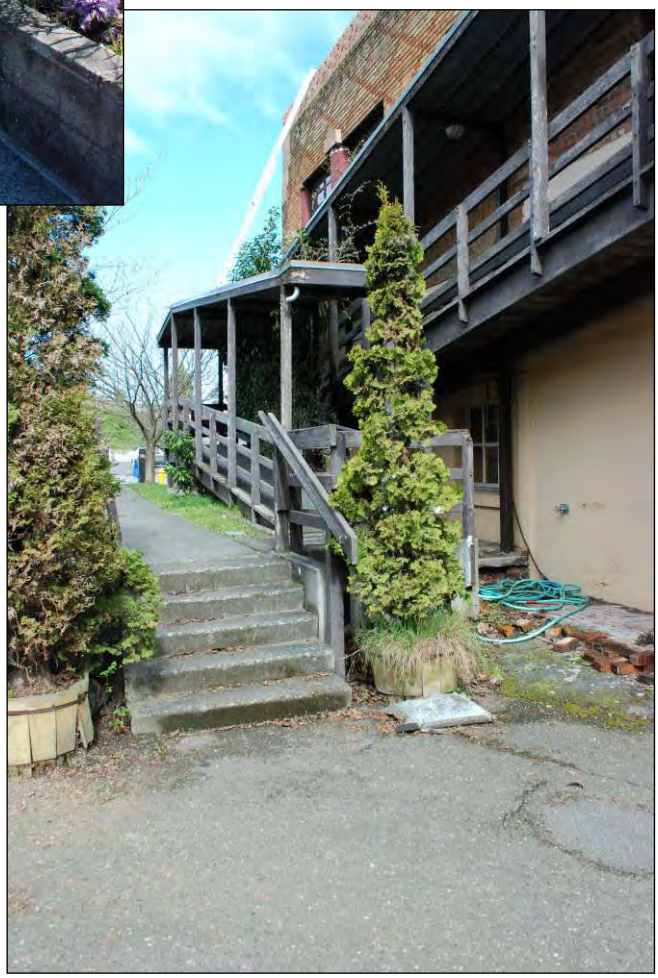


Figure 10 Left: Detail view of fire escape, looking across the parking lot north of the building towards the west (April 2011)

Figure 11 Below: View of south side of building and freestanding access ramp from Veterans Park (April 2011)

Figure 12 Above: Detail view of decorative terra cotta banding (April 2011)

Figure 13 Below: Detail view of second level wood windows, with painted metal columns and decorative terra cotta pieces (April 2011)

Figure 14 Left: View of entry to basement, at southeast corner of building (April 2011)

Figure 15 Below: View of basement level enclosure and ravine at east side of building (April 2011)

Figure 16 Above: Overall view roof looking west (April 2011)

Figure 17 Below: Overall view of roof looking east (April 2011)

Figure 18 Above: Overall view of ground floor interior space looking west (April 2011)

Figure 19 Below: Overall view of ground floor interior space looking east (April 2011)

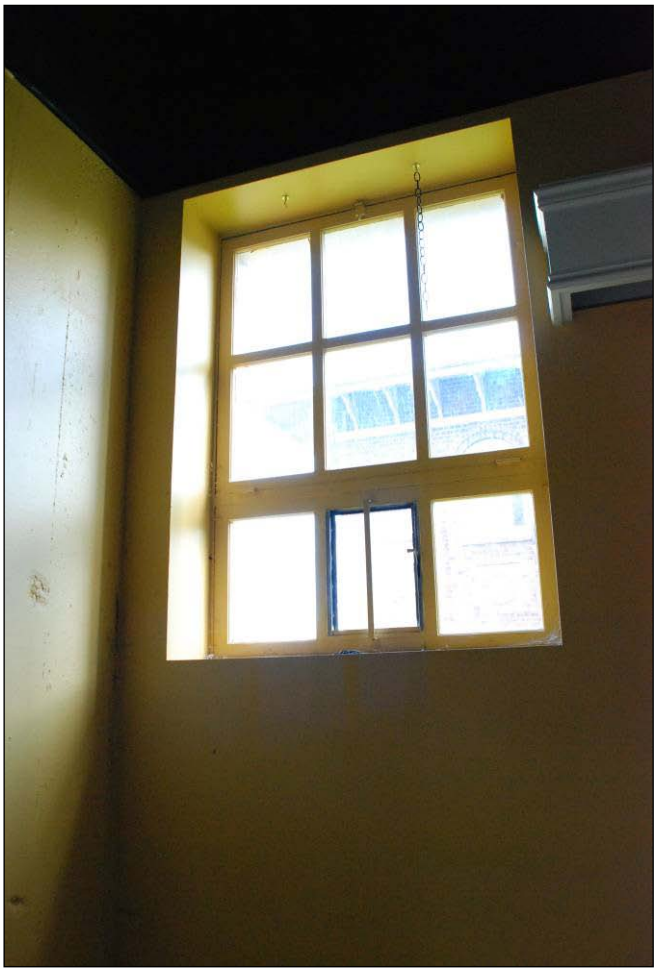


Figure 20 Above: View of kitchen area in ground floor, looking west (April 2011)

Figure 21 Left: View of typical window on the ground floor, north facade (April 2011)

Figure 22 Left: View of ground floor hall, looking east (April 2011)

Figure 23 Below: View of utility corridor on ground floor, between main east and west areas of building, looking north (April 2011)

Figure 24 Above: View of ground floor Office 1, looking northwest (April 2011)

Figure 25 Left: View of ground floor Office 1, looking southeast (April 2011)

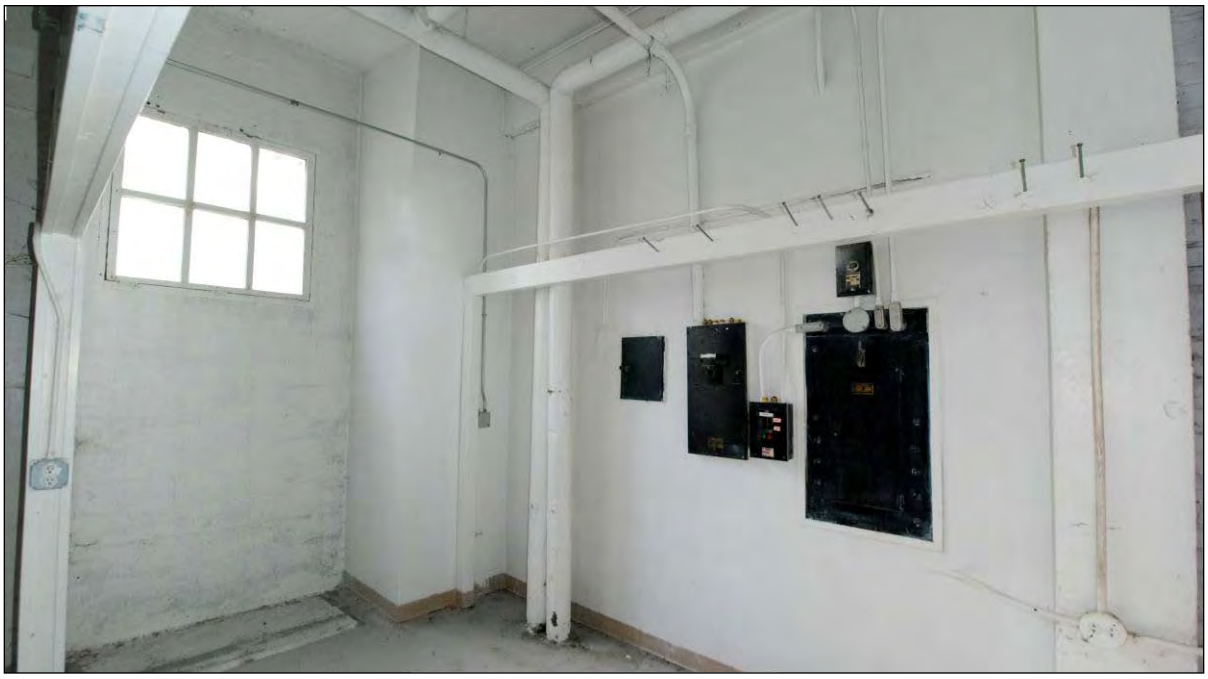


Figure 26 Above: View of ground floor Office 2, looking southeast (April 2011)

Figure 27 Left: View of ground floor Office 2, looking east (April 2011)

Figure 28 Above: Overall view of storage room at northeast corner of ground floor, looking north (April 2011)

Figure 29 Below: Overall view of storage room at northeast corner of ground floor, looking south (April 2011)

Figure 30 Left: View of ground floor corridor, looking south (April 2011)

Figure 31 Below: View of ground floor ramp from down to southeast corner of building, looking west (April 2011)

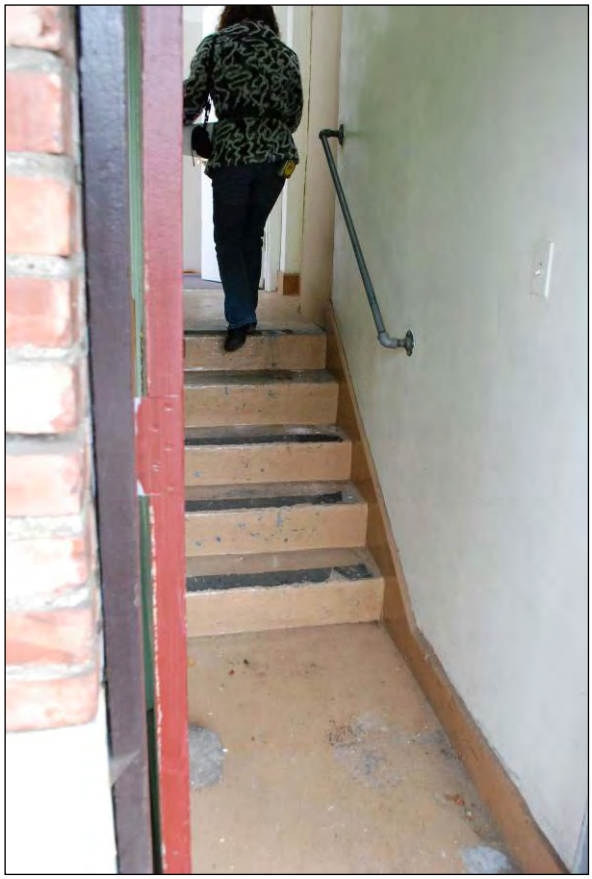


Figure 32 Right: View of entry vestibule to western half of second floor (April 2011)

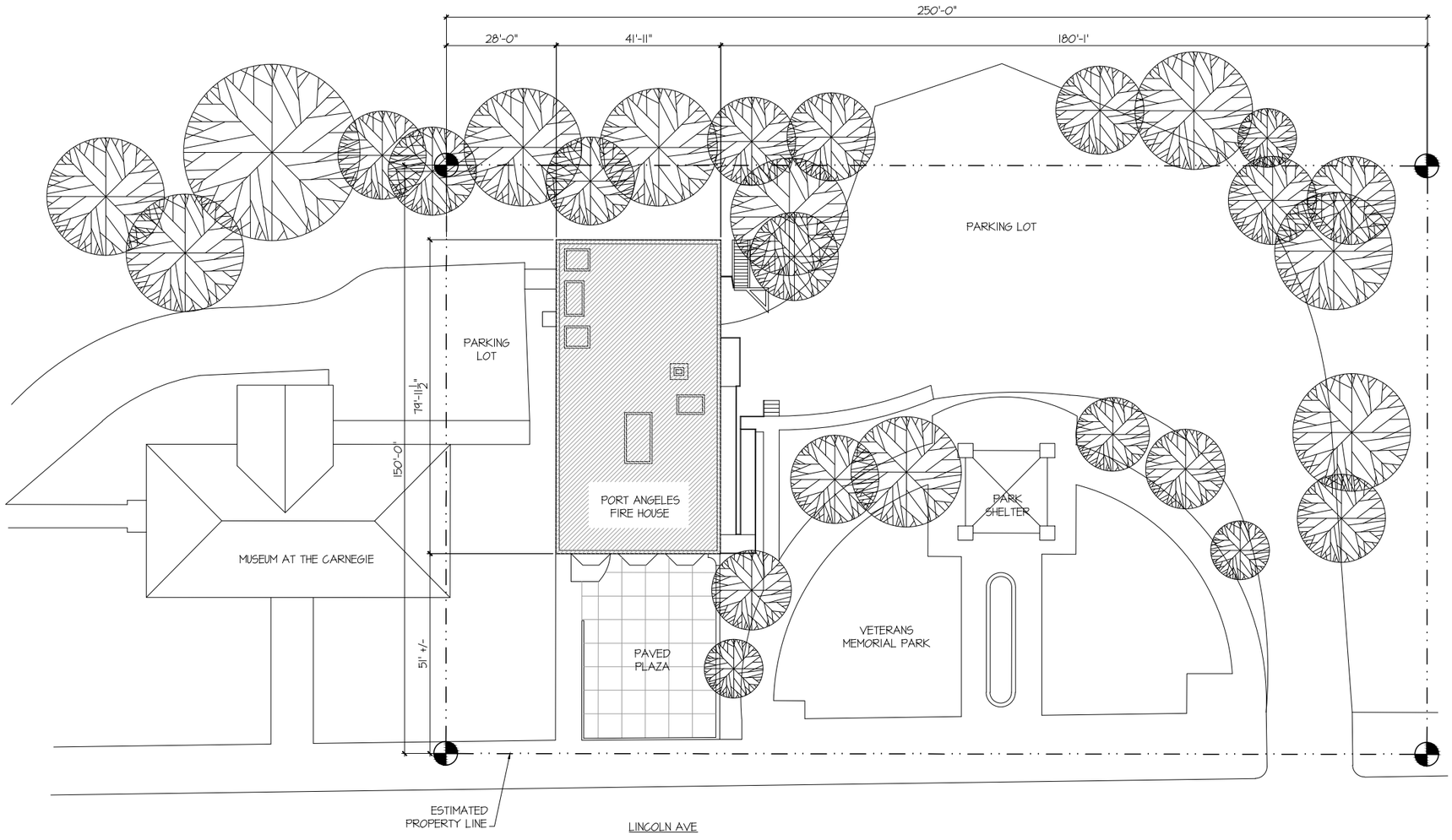
Figure 33 Below: roof of skylight over original roof access stair at entry vestibule to western half of second floor (April 2011)

APPENDIX C

EXISTING CONDITION DRAWINGS

&

SEISMIC RECOMMENDATIONS



PROJECT NORTH

11-478_AP01

Site Plan

Scale: 1/32" = 1'-0"

0' 4' 8' 16' 32'

PORT ANGELES FIRE HOUSE

CITY OF PORT ANGELES

BUILDING CONDITION REPORT

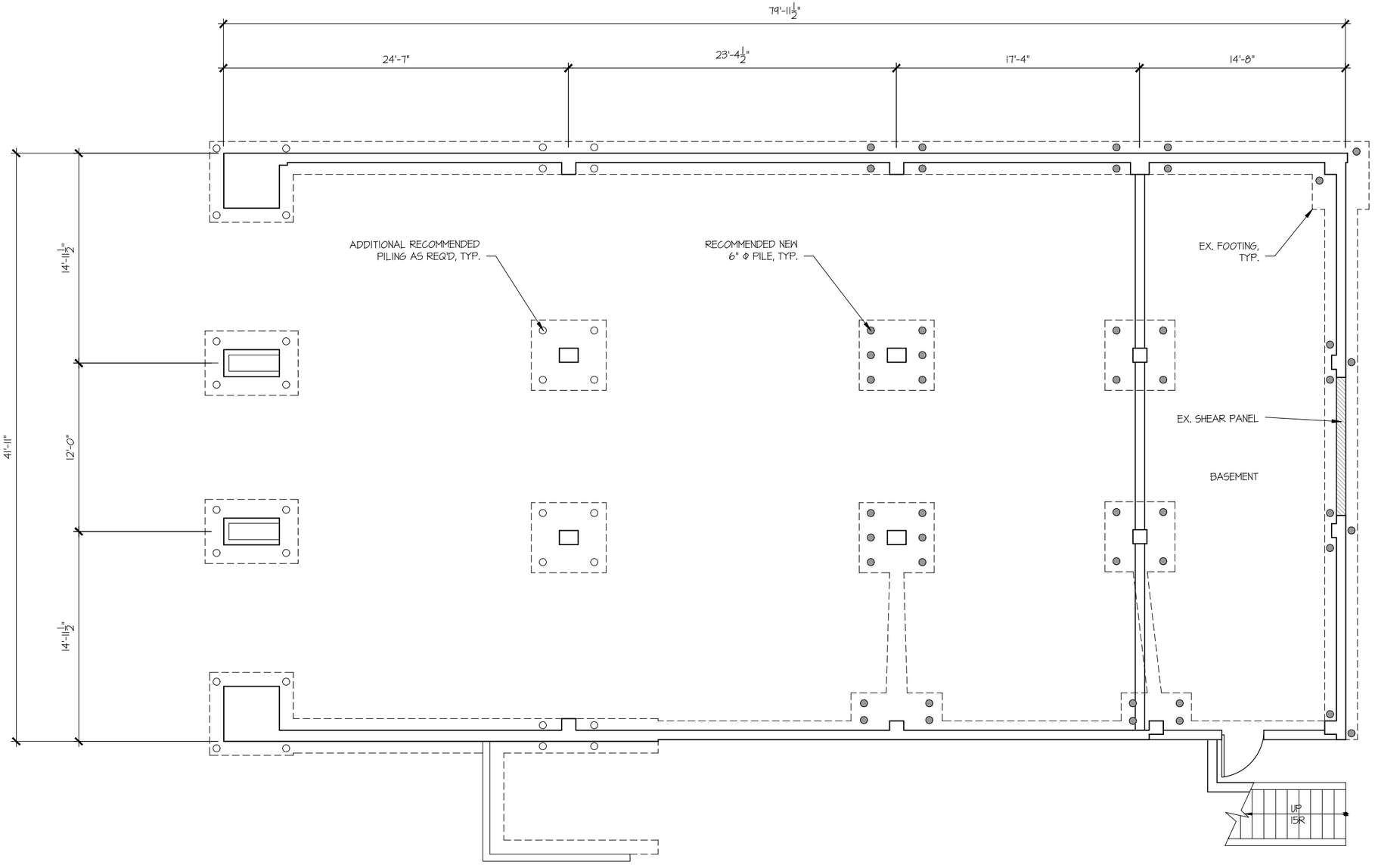
May 2011

BOLA ARCHITECTURE + PLANNING

159 WESTERN AVE. W. SUITE 486 SEATTLE, WA 98119

TEL 206.447-4749 FAX 206.447-6462

A.0



PROJECT NORTH

11-418_AP00

Foundation / Basement Plan

Scale: 1/8" = 1'-0"

0' 1' 2' 4' 8'

PORT ANGELES FIRE HOUSE

CITY OF PORT ANGELES

BUILDING CONDITION REPORT

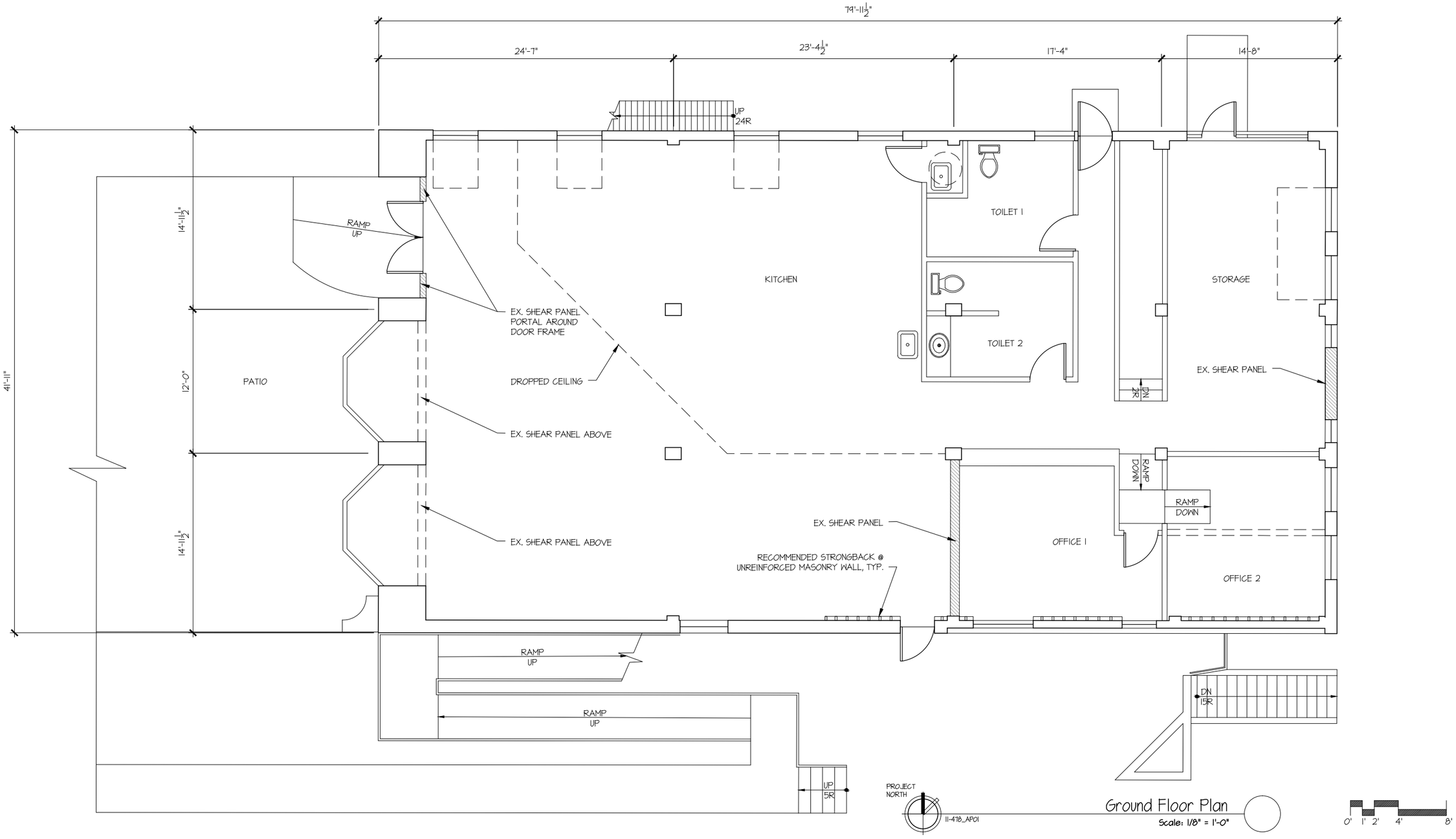
May 2011

BOLA ARCHITECTURE + PLANNING

159 WESTERN AVE. W. SUITE 486 SEATTLE, WA 98119

TEL 206.447-4749 FAX 206.447-6462

A.0



Ground Floor Plan

Scale: 1/8" = 1'-0"

0' 1' 2' 4' 8'

PORT ANGELES FIRE HOUSE

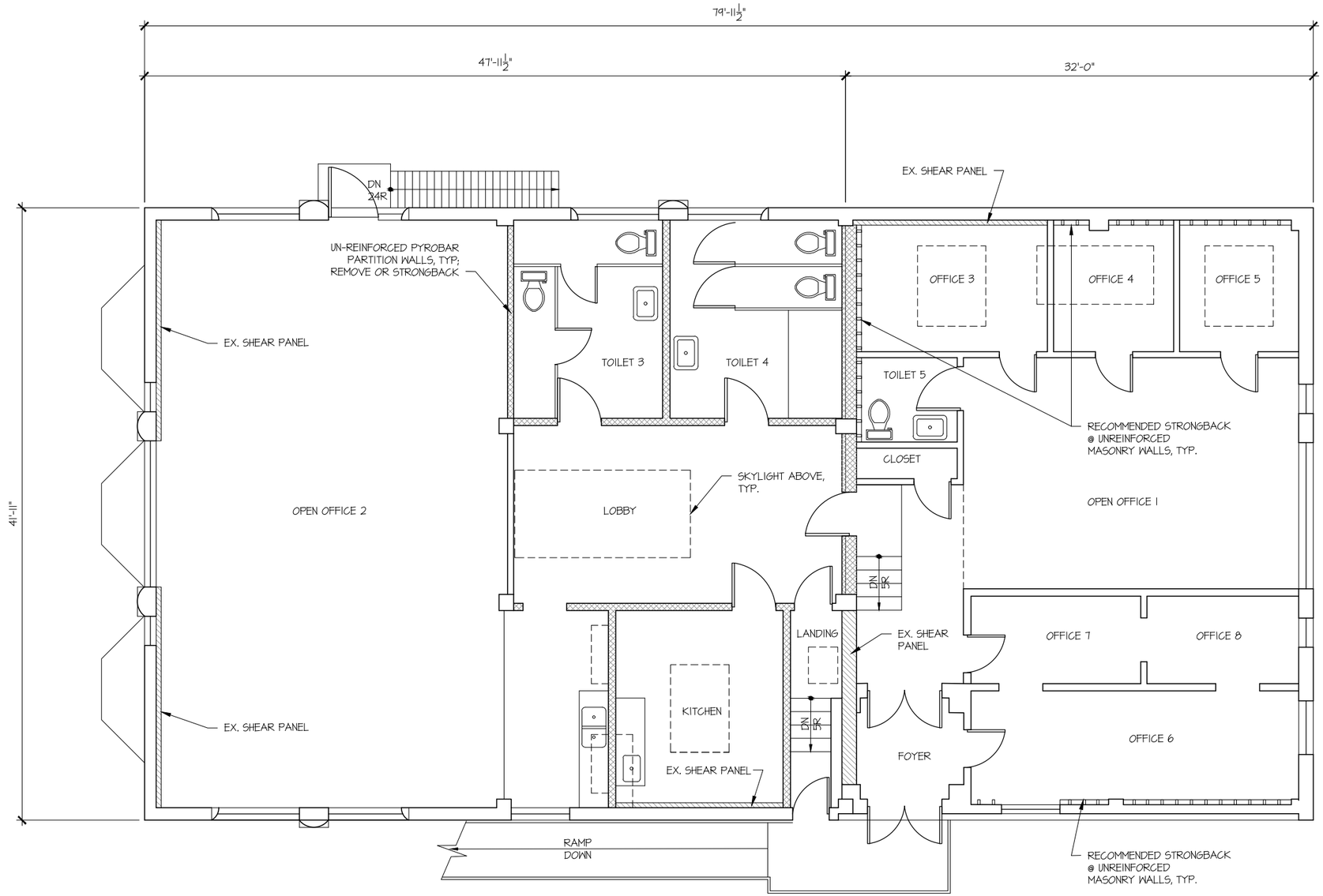
CITY OF PORT ANGELES

BUILDING CONDITION REPORT

May 2011

BOLA
ARCHITECTURE + PLANNING
159 WESTERN AVE. W. SUITE 486 SEATTLE, WA 98119
TEL 206.447-4749 FAX 206.447-6462

A.1



PROJECT NORTH

11-418_AP02

Second Floor Plan

Scale: 1/8" = 1'-0"

0' 1' 2' 4' 8'

PORT ANGELES FIRE HOUSE

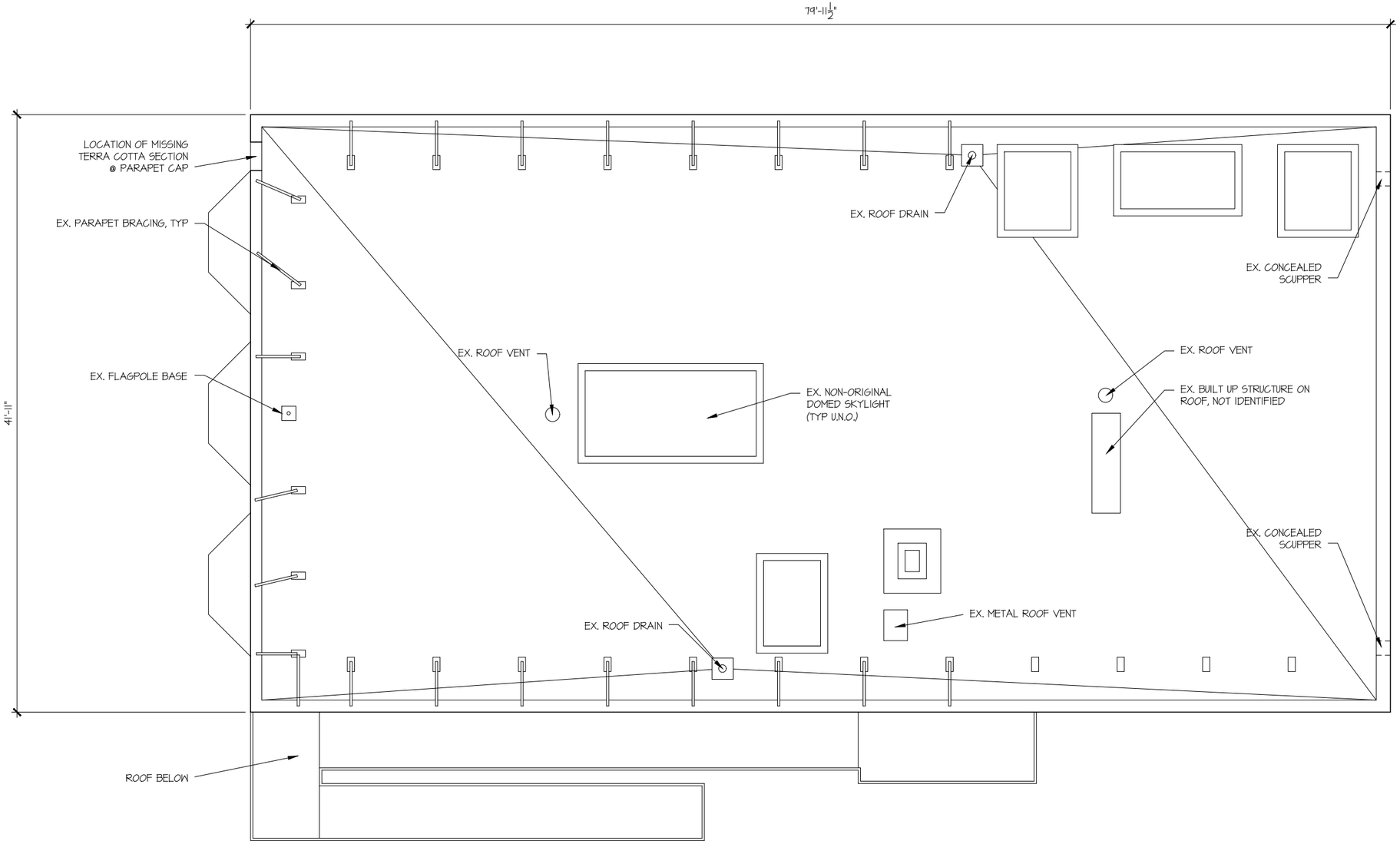
CITY OF PORT ANGELES

BUILDING CONDITION REPORT

May 2011

BOLA
ARCHITECTURE + PLANNING
159 WESTERN AVE. W. SUITE 486 SEATTLE, WA 98119
TEL 206.447-4749 FAX 206.447-6462

A.2



PROJECT NORTH

11-478_AP03

Roof Plan

Scale: 1/8" = 1'-0"

0' 1' 2' 4' 8'

PORT ANGELES FIRE HOUSE

CITY OF PORT ANGELES

BUILDING CONDITION REPORT

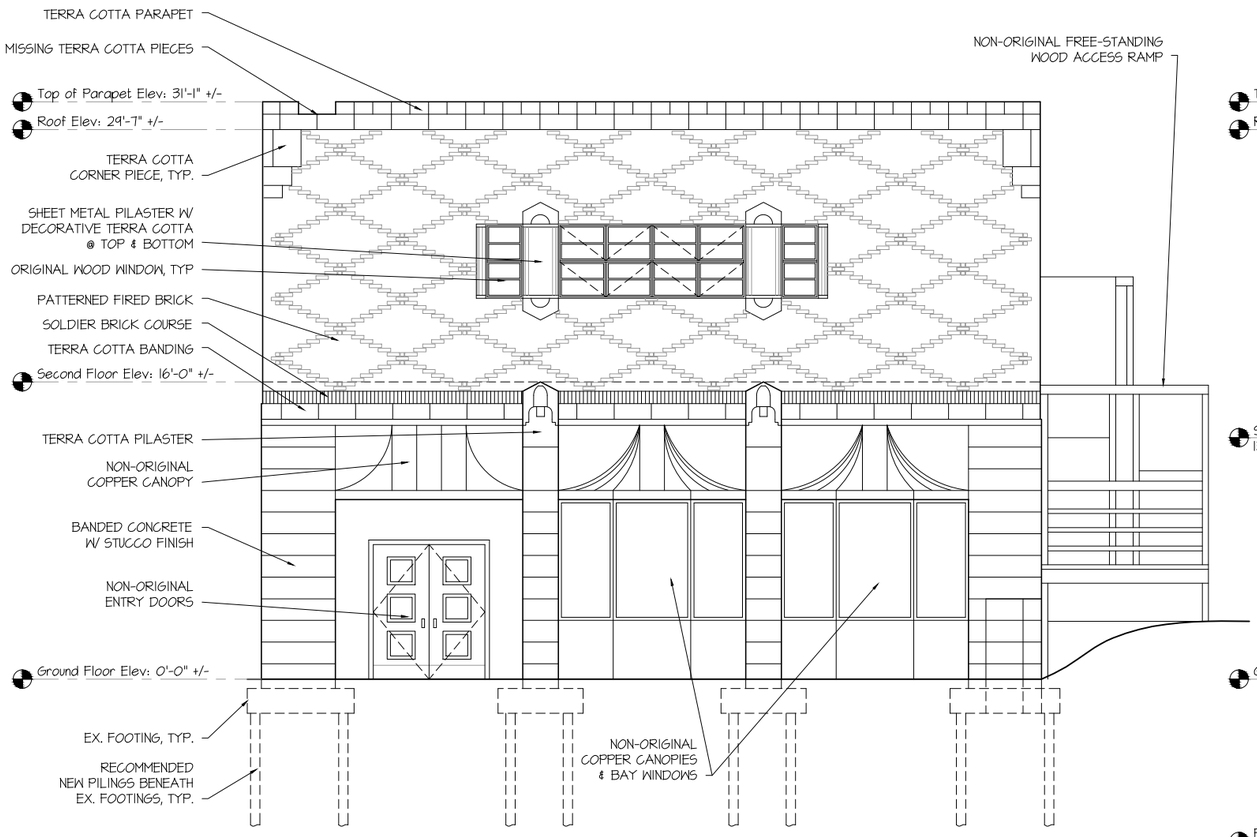
May 2011

BOLA ARCHITECTURE + PLANNING

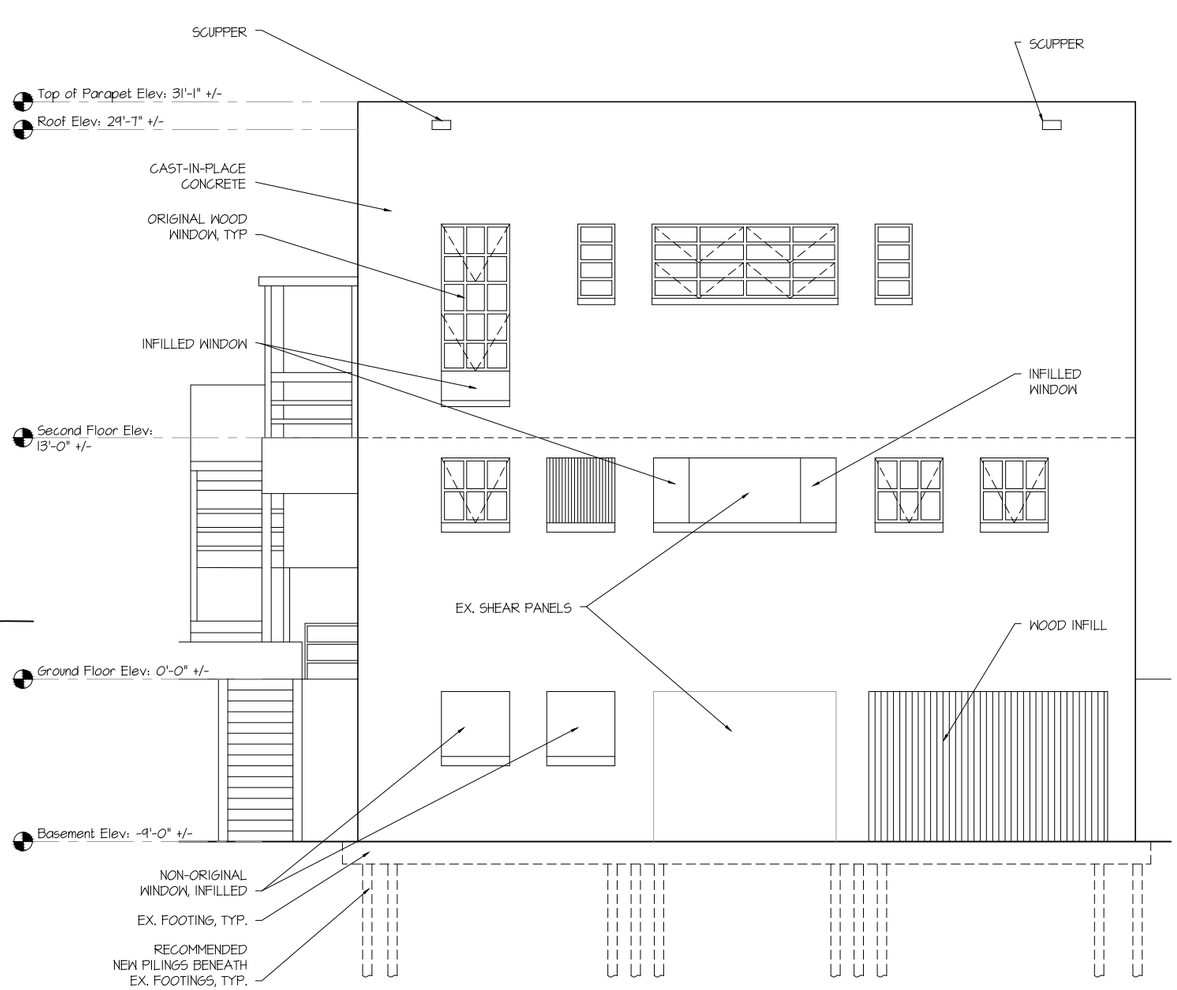
159 WESTERN AVE. W. SUITE 486 SEATTLE, WA 98119

TEL 206.447-4749 FAX 206.447-6462

A.3



West Elevation
11-478_EE01
Scale: 1/8" = 1'-0"



East Elevation
11-478_EE01
Scale: 1/8" = 1'-0"

0' 1' 2' 4' 8'

NOTE: ALL FEATURES SHOWN ARE EXISTING U.N.O.

PORT ANGELES FIRE HOUSE

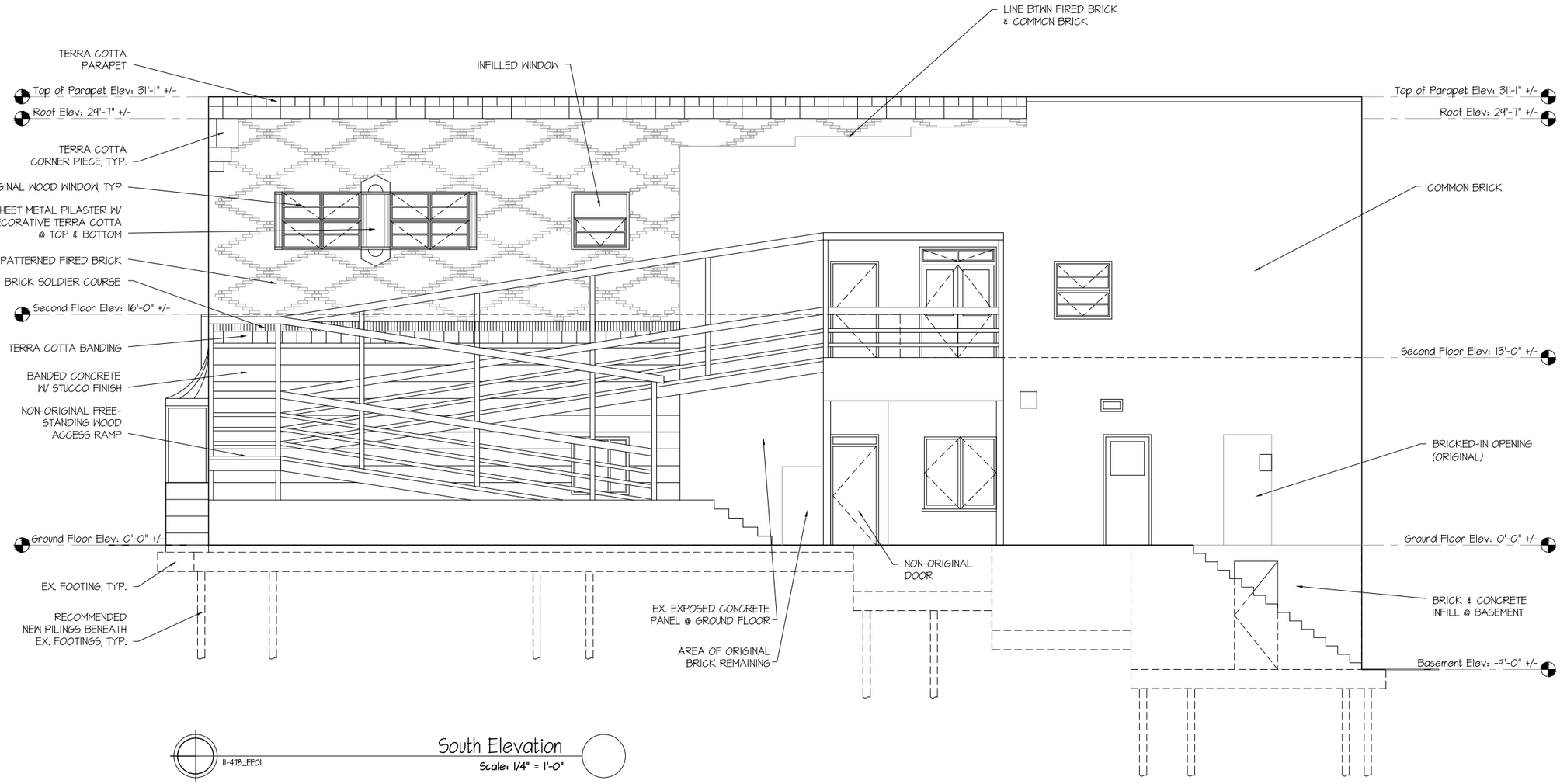
CITY OF PORT ANGELES

BUILDING CONDITION REPORT

May 2011

BOLA
ARCHITECTURE + PLANNING
159 WESTERN AVE. W. SUITE 486 SEATTLE, WA 98119
TEL 206.447-4749 FAX 206.447-6462

A.4



11-478_EE01

South Elevation

Scale: 1/4" = 1'-0"

NOTE: ALL FEATURES SHOWN ARE EXISTING U.N.O.

PORT ANGELES FIRE HOUSE

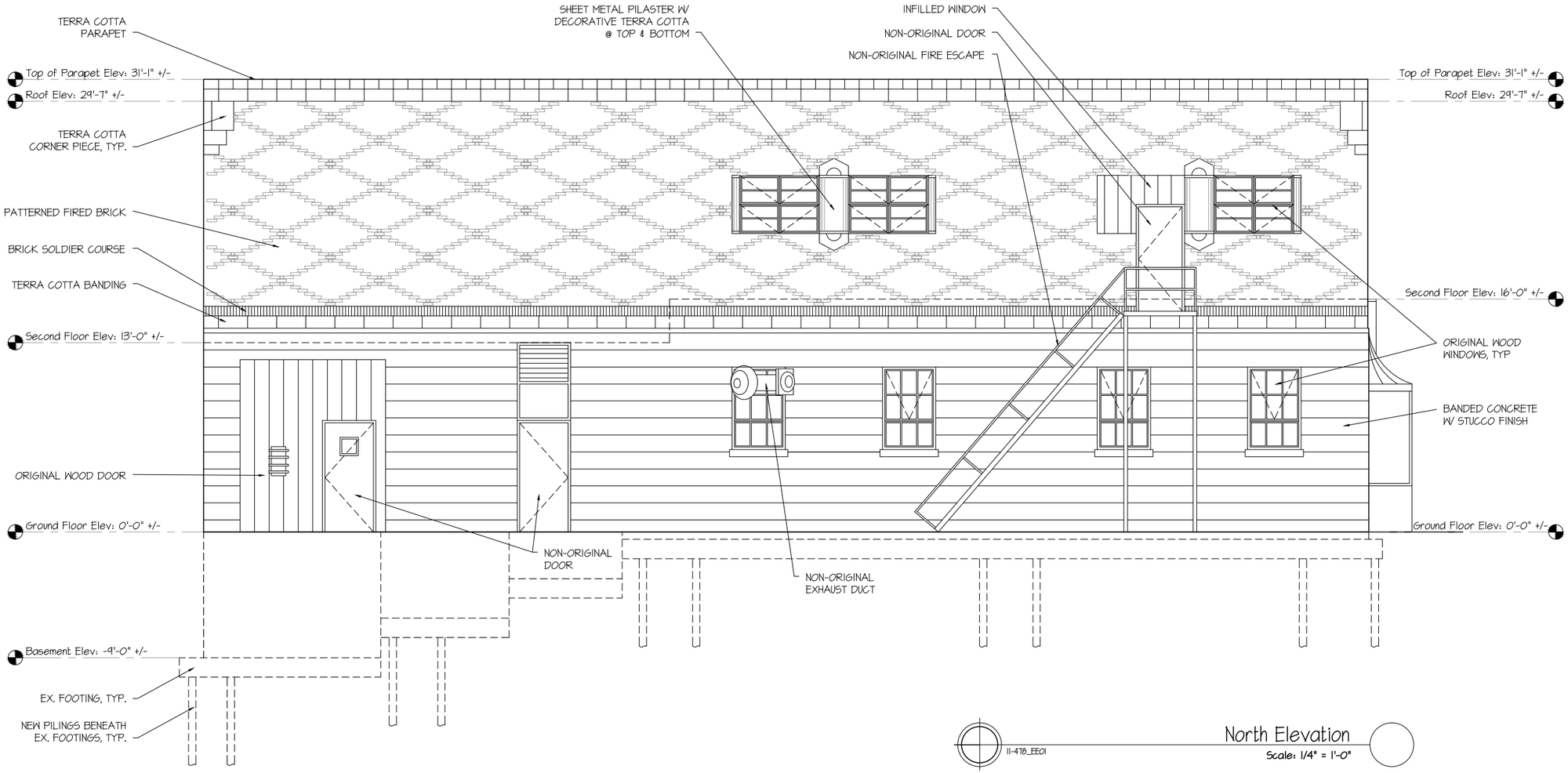
CITY OF PORT ANGELES

BUILDING CONDITION REPORT

May 2011

BOLA ARCHITECTURE + PLANNING
159 WESTERN AVE. W. SUITE 486 SEATTLE, WA 98119
TEL 206.447-4749 FAX 206.447-6462

A.5



11-478_EE01

North Elevation

Scale: 1/4" = 1'-0"

0' 1' 2' 4' 8'

NOTE: ALL FEATURES SHOWN ARE EXISTING U.N.O.

PORT ANGELES FIRE HOUSE

CITY OF PORT ANGELES

BUILDING CONDITION REPORT

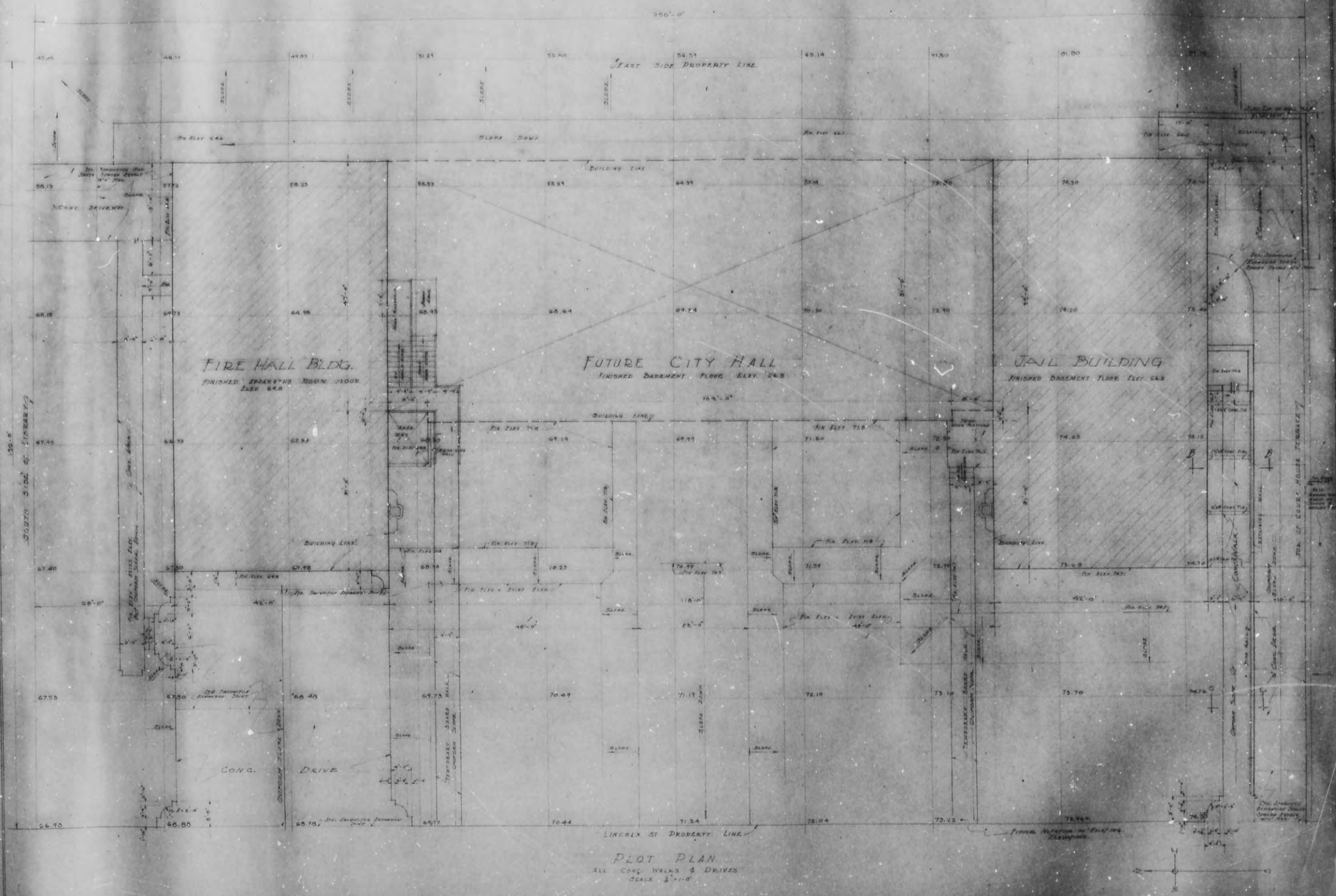
May 2011

BOLA ARCHITECTURE + PLANNING
159 WESTERN AVE. W. SUITE 486 SEATTLE, WA 98119
TEL 206.447-4749 FAX 206.447-6462

A.6

APPENDIX D

ORIGINAL DRAWINGS



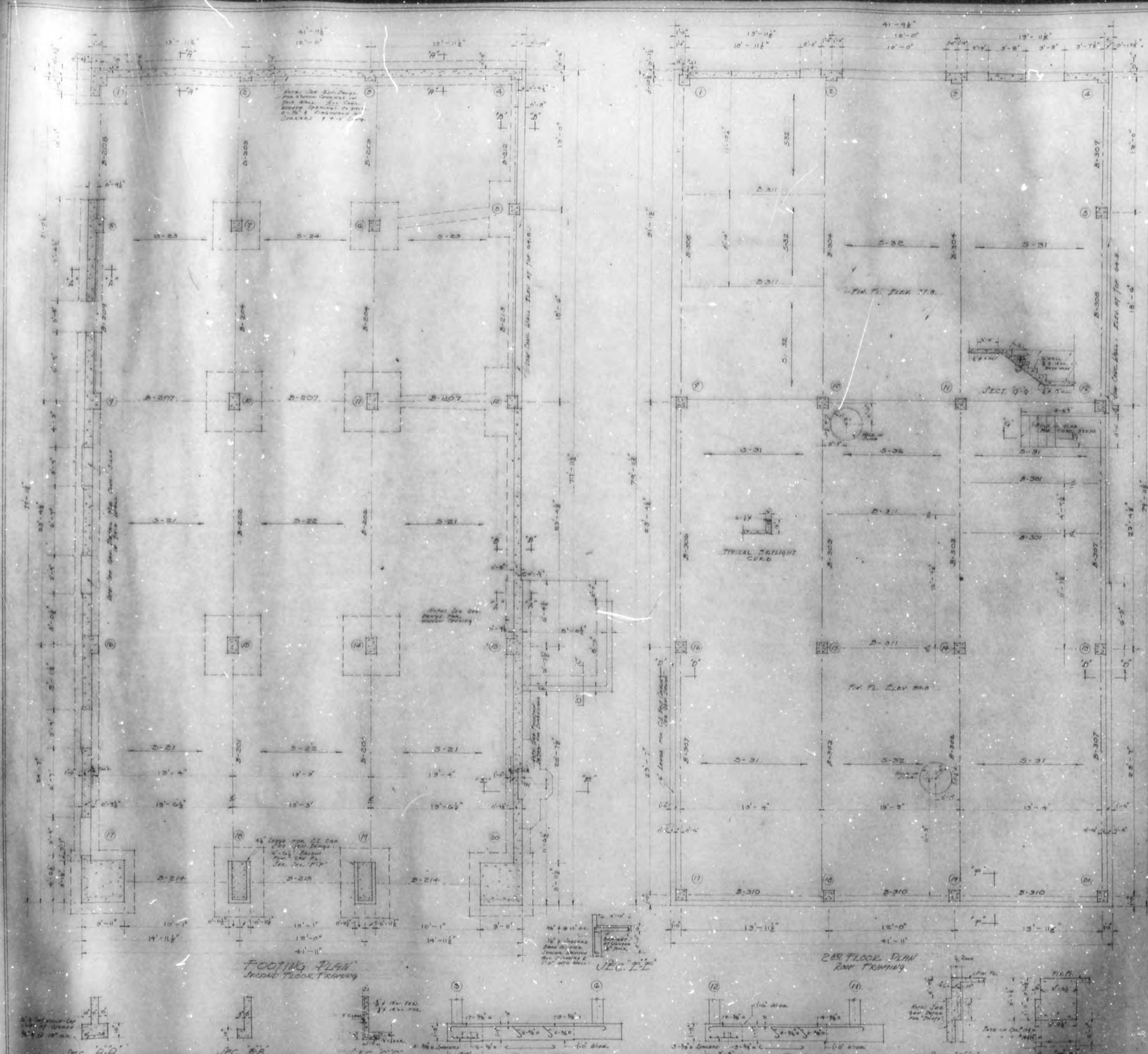
PLOT PLAN
ALL CONC. WALKS & DRIVES
SCALE 1/8"-1'-0"

NOTES
ALL ARROWS (→) EXCEPT AT CIRCLES INDICATE "FINISH GRADE" SLOPE DOWN AT ARROW POINTS

FIRE HALL & JAIL BUILDING
CITY OF PORT ANGELES
PORT ANGELES

WILLIAM ATKIN
ARCHITECT
320-334 LEARY BLDG. SEATTLE
SCALE 1/8"-1'-0" | JUNE 1940

ATK 5



ALL CONC. WINDOW OPENINGS TO HAVE 2-½ φ DIAGONALS AT CORNERS 4'-0" LONG.

FOOTING SCHEDULE			
No.	SIZE	DEPTH	REINFORCING
(1)	4'-6" x 4'-6"	1'-6"	8-½ □ ⟶ EACH WAY
(2) (3) (4)	WALL FOOTING		(SEE DETAIL)
(5)	3'-3" x 3'-6"	1'-6"	SEE DETAIL
(6) (7)	4'-6" x 4'-6"	1'-6"	7-½ □ ⟶ EACH WAY
(10) (11) (14) (15)	5'-6" x 5'-6"	1'-8"	9-½ □ ⟶ EACH WAY
(17) (20)	4'-6" x 4'-6"	1'-6"	6-½ □ ⟶ EACH WAY
(18) (19)	4'-6" x 6'-6"	1'-8"	½ □ ⟶ 6" o.c. EACH WAY
(12)	3'-6" x 3'-6"	1'-8"	SEE DETAIL
(9) (13) (16)	WALL FOOTING		SEE DETAIL

COLUMN SCHEDULE		
No.	BASEMENT	FIRST FLOOR
(1)	12" x 14" 6-½" φ	12" x 12" 4-½" φ
(2) (3)	12" x 18" 6-½" φ	12" x 12" 4-½" φ
(4)	12" x 12" 4-½" φ	12" x 12" 4-½" φ
(5)	12" x 12" 4-½" φ	12" x 12" 4-½" φ
(6) (7) (8)	12" x 12" 4-½" φ	
(9)	12" x 18" 6-½" φ	12" x 12" 4-½" φ
(12)	12" x 14" 4-½" φ	12" x 12" 4-½" φ
(10) (11) (13) (14) (15)	12" x 16" 6-½" φ	12" x 12" 4-½" φ
(16)	12" x 20" 6-½" φ	12" x 12" 4-½" φ
(17) (20)	SEE PLAN	12" x 12" 4-½" φ
(18) (19)	12" x 36" 6-⅝" φ	12" x 12" 4-½" φ
ALL COLUMNS - ⅜" φ HOOPS - 8" o.c.		

SLAB SCHEDULE		
No.	THICKNESS	REINFORCING
S 31	4½"	½" φ - 8" o.c.
S 32	4½"	½" φ - 9½ o.c.
S 21	5"	½" φ - 6½ o.c.
S 22	5"	½" φ - 10½" o.c.
S 23	5½"	½" φ - 6½ o.c.
S 24	5½"	½" φ - 10½ o.c.
TEMPERATURE RODS ⅜" φ 12" o.c.		

BEAM SCHEDULE			
No.	SIZE	STEEL	STIRRUPS
B 201	12" x 22"	[illegible]	⅜" φ [illegible]
B 202	12" x 22"	[illegible]	⅜" φ [illegible]
B 203	12" x 18"	[illegible]	⅜" φ [illegible]
B 204	12" x 18"	[illegible]	⅜" φ [illegible]
B 207	8" x 41½"	2-½" φ BOTTOM 2-½" φ TOP	⅜" φ - 18" o.c.
B 208	8" x 24"	2-½ □ TOP 2-½ □ BOTT	⅜" φ [illegible]
B 209	8" x 24"	2-½ □ TOP 2-½ □ BOTT	⅜" φ [illegible]
B 212	8" x 24"	[illegible]	⅜" φ [illegible]
B 213	8" x 24"	[illegible]	⅜" φ [illegible]
B 214	SEE SECTION	[illegible]	
B 215	SEE SECTION	[illegible]	
B 301	8" x 12"	[illegible]	
B 302	12" x 22"	[illegible]	⅜" φ [illegible]
B 303	12" x 22"	[illegible]	⅜" φ [illegible]
B 304	12" x 28"	[illegible]	⅜" φ [illegible]
B 305	8" x 38½"	[illegible]	⅜" φ [illegible]
B 306	8" x 38½"	[illegible]	⅜" φ [illegible]
B 307	8" x 38½"	[illegible]	⅜" φ [illegible]
B 308	8" x 22"	[illegible]	⅜" φ [illegible]
B 309	8" x 22	[illegible]	⅜" φ [illegible]
B 310	[illegible]	[illegible]	
B 311	10" x 14"	[illegible]	⅜" φ [illegible]

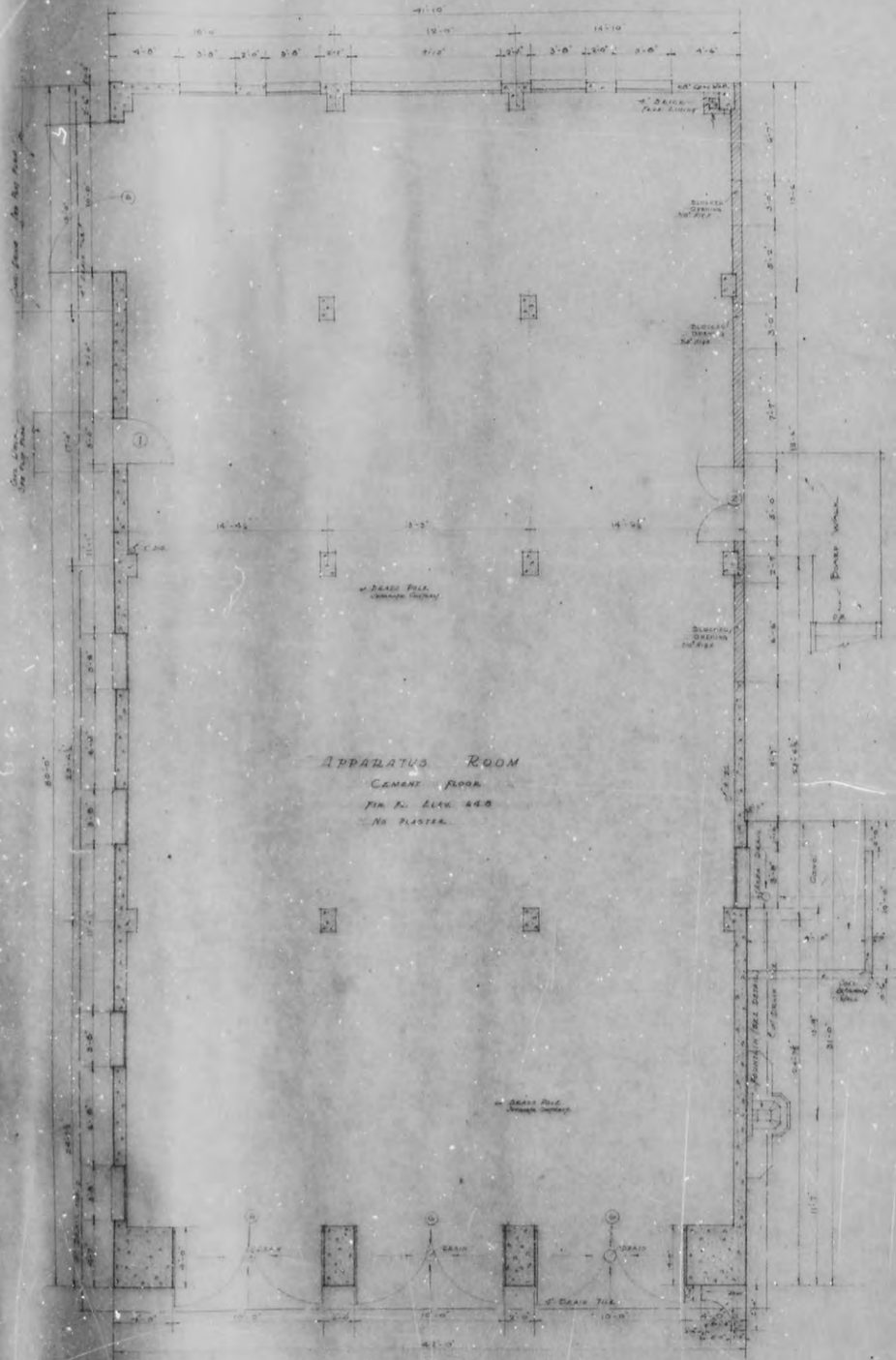
BEAM STEEL TO BE 1½" CLEAR INSIDE SURFACE.
SLAB STEEL TO BE ¾" CLEAR INSIDE SURFACE.

NOTES
FOOTING STEEL TO BE 4" CLEAR INSIDE SURFACE UNLESS OTHERWISE NOTED. ALL CONC. WALLS EXCEPT AS NOTED TO BE REINFORCED WITH ½" φ - 15" O.C. BOTH WAYS. LAP 1'-3" AT SPLICES & BEND [illegible]

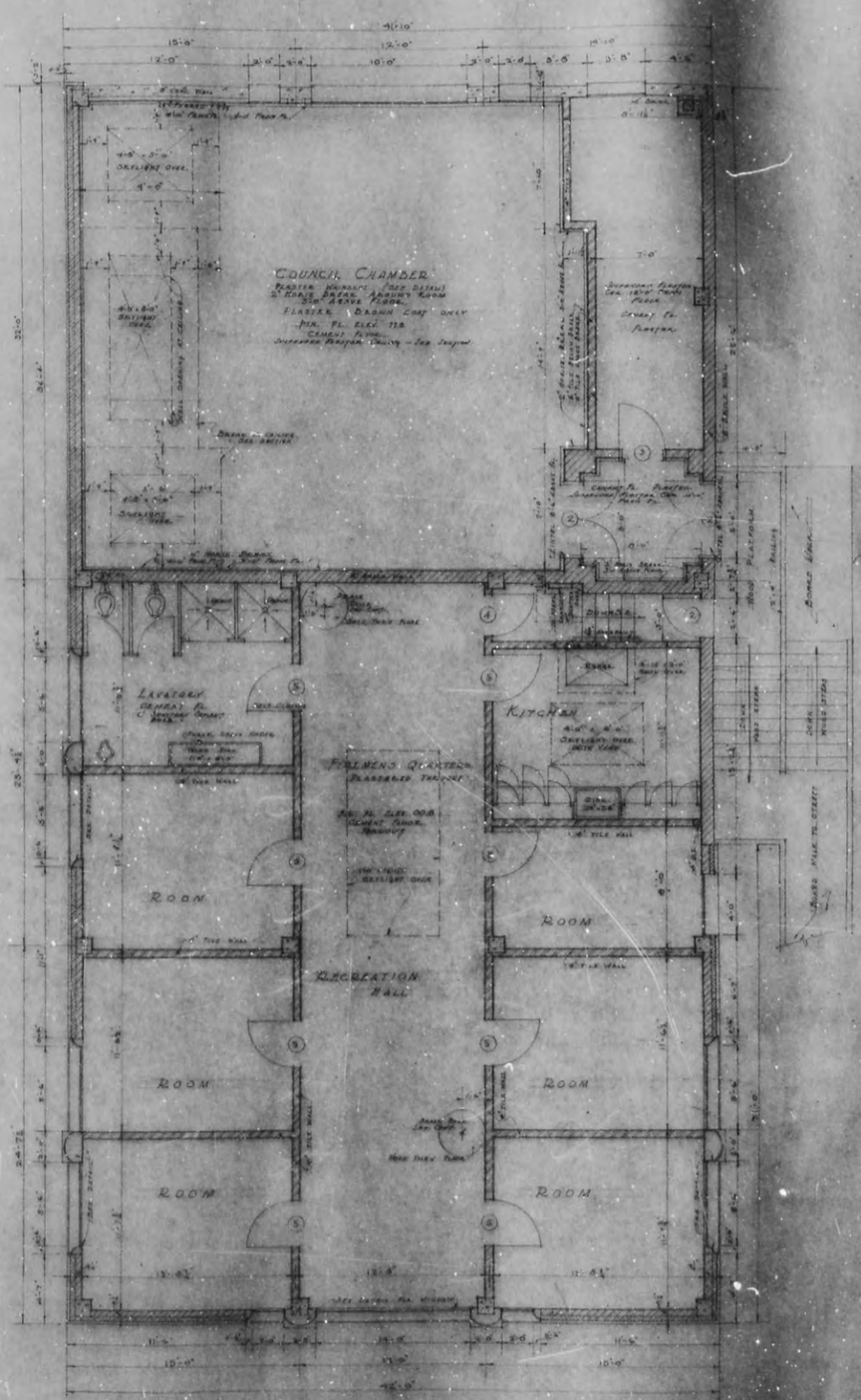
FIRE HALL BUILDING
CITY OF PORT ANGELES · PORT ANGELES WASHINGTON

WILLIAM AITKEN
ARCHITECT
330-334 LYON BLDG. SEATTLE
SCALE: ⅛" = 1'-0"
JUNE 1930

SHEET No. 6S



BASEMENT PLAN
SCALE 1/4"=1'-0"



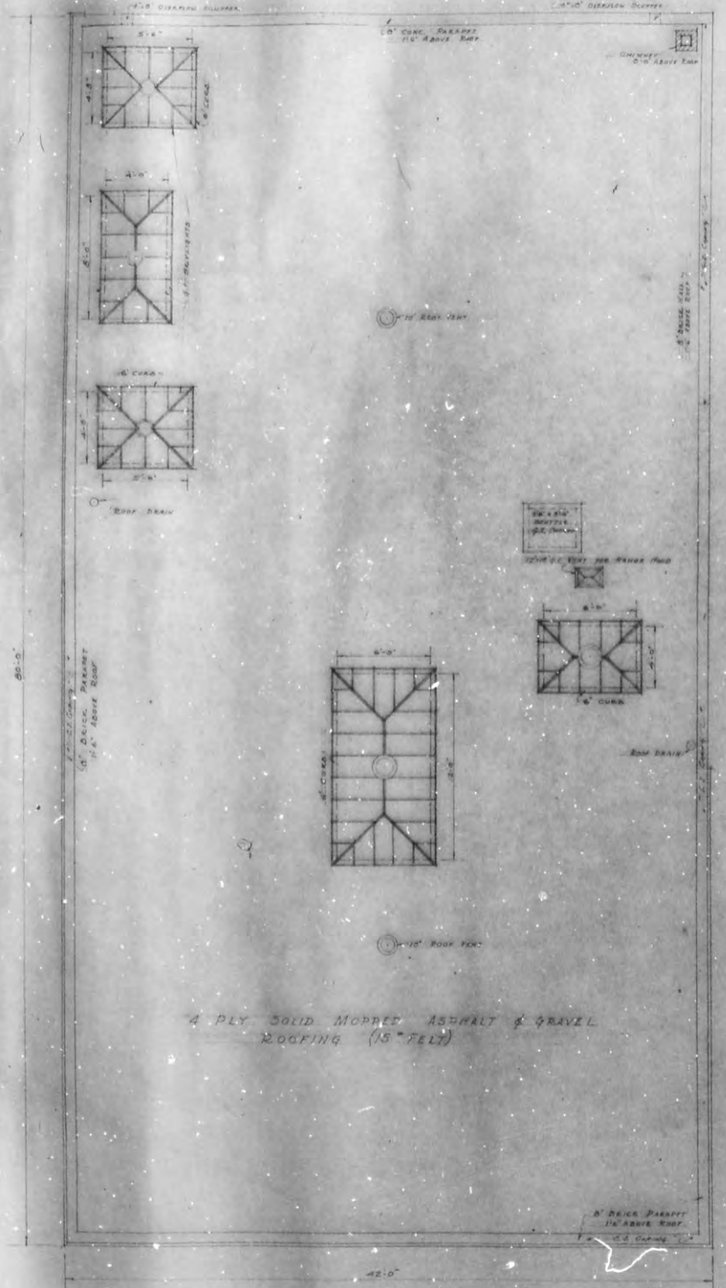
FIRST FLOOR PLAN
SCALE 1/4"=1'-0"

FIRE HALL BUILDING
CITY OF PORT ANGELES PORT ANGELES

CONCRETE
TILE
FACE BRICK
COMMON BRICK

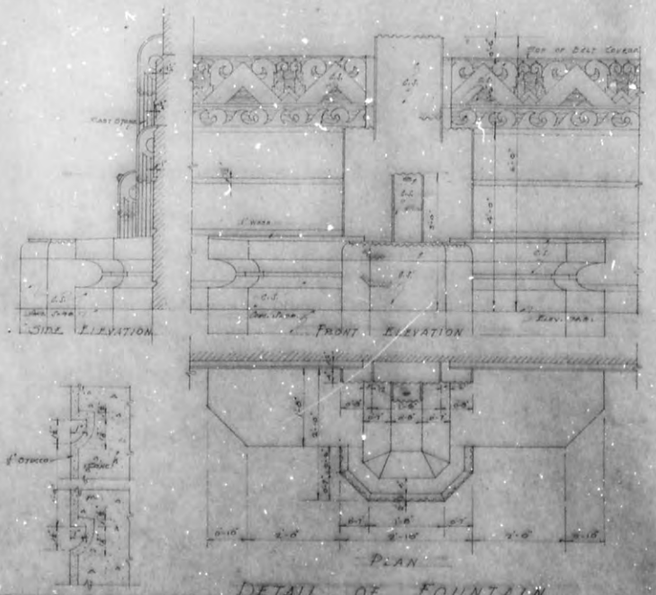
WILLIAM [illegible]
ARCHITECT
333-334 LYON
SCALE 1/4"=1'-0"

SHEET 3



4 PLY SOLID MOPPED ASPHALT & GRAVEL ROOFING (15 "FELT)

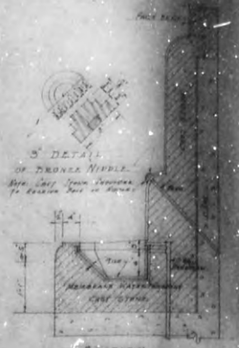
ROOF PLAN
SCALE 1/8" = 1'-0"



SIDE ELEVATION
FRONT ELEVATION
PLAN

DETAIL OF FOUNTAIN
SCALE 3/4" = 1'-0"

DETAIL TYPICAL JOINT IN BASE
SCALE 1 1/2" = 1'-0"



3" DETAIL OF BRONZE NIPPLE

SECTION

SECT A-A
SCALE 3/4" = 1'-0"

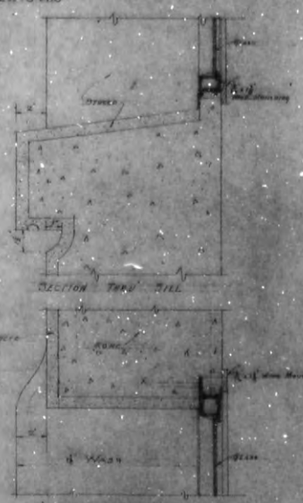
SECT B-B
SCALE 3" = 1'-0"

SECT C-C
SCALE 3" = 1'-0"

SECT D-D
SCALE 3" = 1'-0"

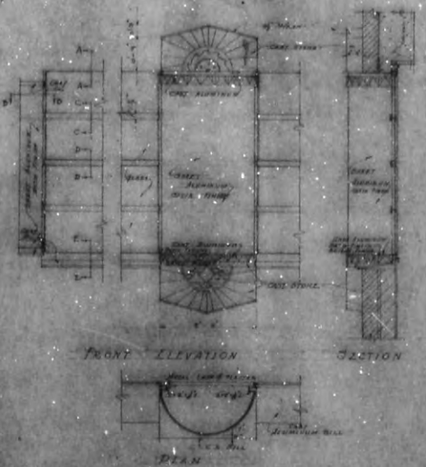
VENT MEETING RAIL
SCALE 3" = 1'-0"

SECT E-E
SCALE 3" = 1'-0"



SECTION THRU SILL
SECTION THRU JAMB

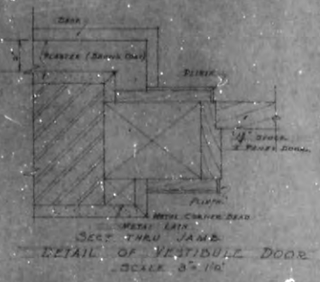
NORTH SIDE APPARATUS DOOR
SCALE 3" = 1'-0"



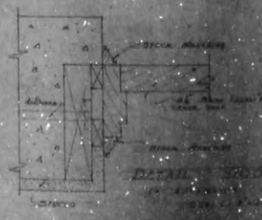
FRONT ELEVATION
SECTION
PLAN

DETAIL OF HORIZONTAL WINDOWS
ON NORTH, EAST & SOUTH ELEVATIONS
SCALE 3/4" = 1'-0"

NO.	WIDTH	HEIGHT	DESIGN
1	3'-0"	7'-0"	1 3/4" 2 PANEL FIR.
2	2'-6"	7'-0"	1 3/4" 2 PANEL FIR.
3	3'-0"	7'-0"	1 3/4" 2 PANEL FIR.
4	3'-0"	6'-8"	1 3/4" 2 PANEL FIR.
5	3'-6"	6'-8"	1 3/4" 2 PANEL FIR.
6	3'-0"	12'-0"	



SECT THRU JAMB
DETAIL OF VESTIBULE DOOR
SCALE 3" = 1'-0"



DETAIL DOOR NO. 1

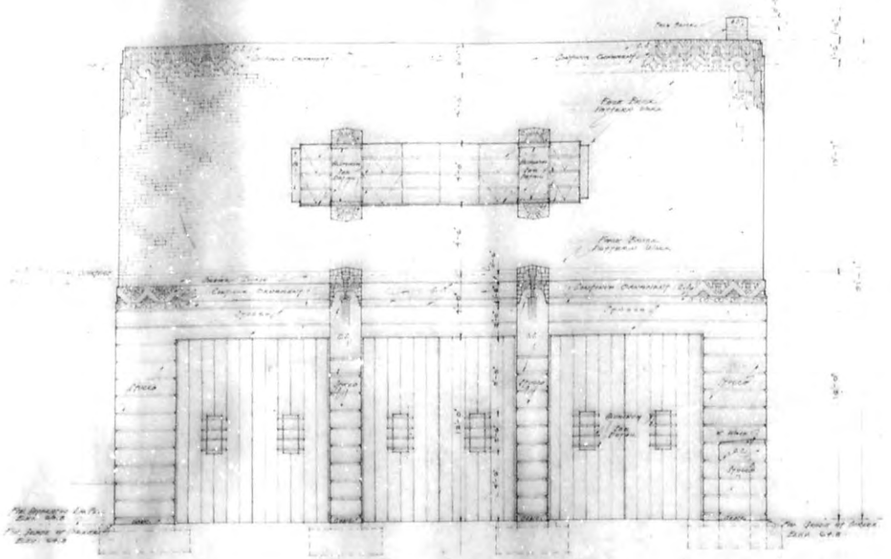
NOTE:
ALL WINDOW DETAILS ON THIS SHEET ARE FOR STEEL SASH ALTERNATE - ALL ALUMINUM & C.S. TYPICAL USE BOTH WOOD & STEEL SASH

FIRE WALL BUILDING
CITY OF PORT ANGELES
PORT ANGELES
WASHINGTON

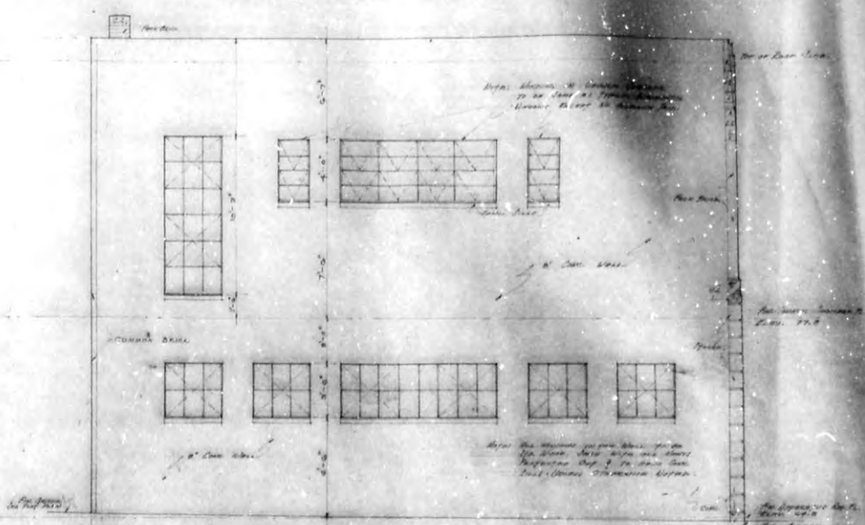
WILLIS POLK AND COMPANY
ARCHITECTS
SAN FRANCISCO

SCALE
DATE
DRAWN
CHECKED

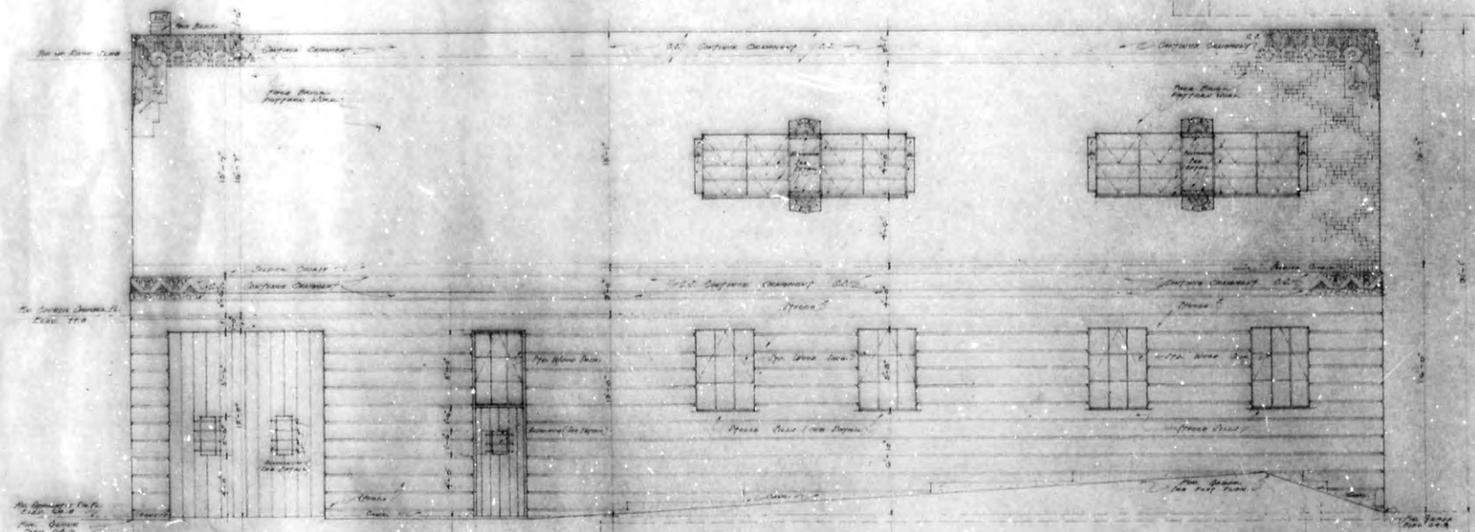
4



WEST ELEVATION

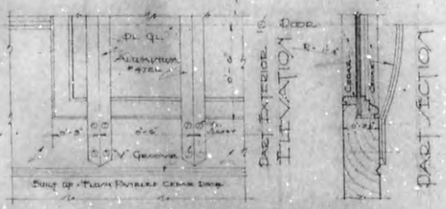


EAST ELEVATION

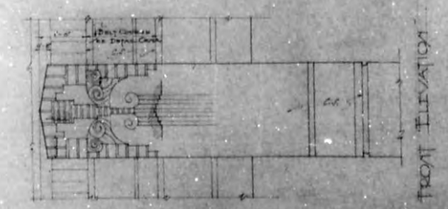


NORTH ELEVATION

TYPICAL COPING DETAIL
SCALE: 3"=1'-0"



DOOR WICKET DETAIL
SCALE: 3"=1'-0"



PIER CAP DETAIL
SCALE: 3"=1'-0"

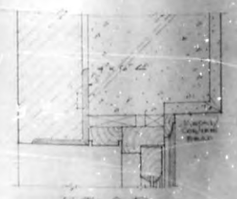
SIDE ELEVATION

NOTES

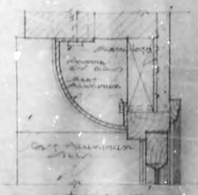
FIRE HALL BUILDING
CITY OF PORT ANGELES
PORT ANGELES
WASHINGTON

WILLIAM AITKEN
ARCHITECT
SEATTLE

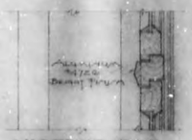
SHEET 1



HEAD



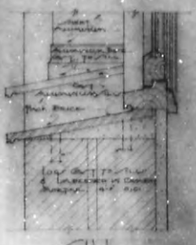
JAMB



MEETING RAIL
(HORIZONTAL)

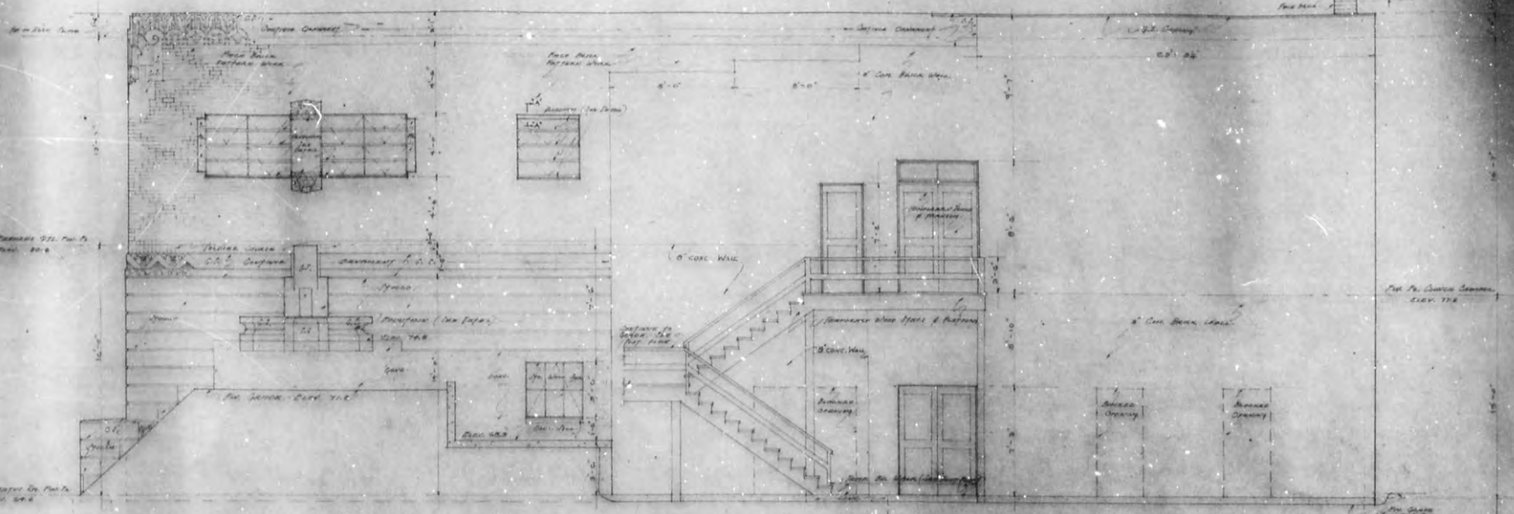
MULLION
(HORIZONTAL)
VERTICAL MULLIONS ARE
EXCEPT AS ALUMINUM

MEETING RAIL
(VERTICAL)

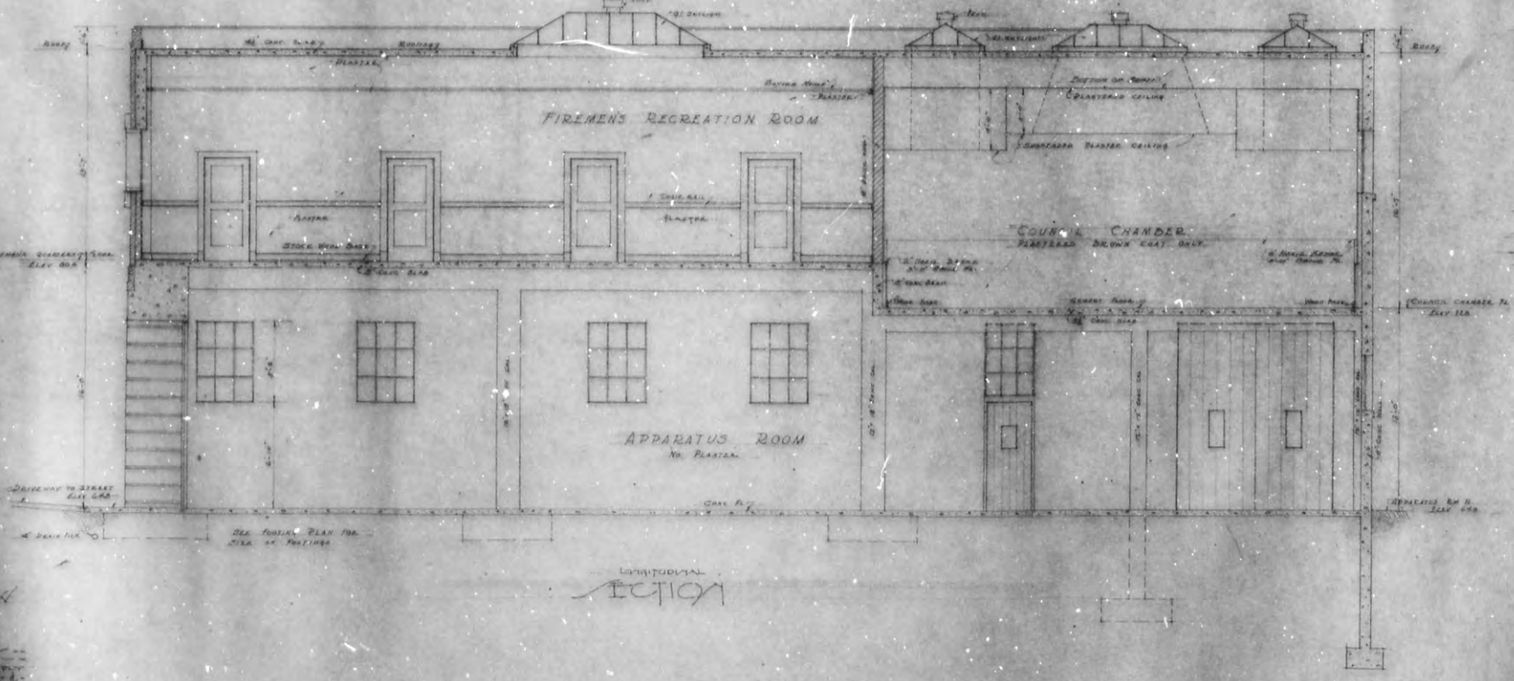


SILL

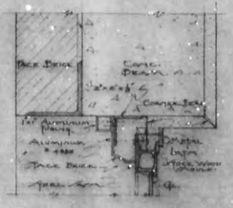
HORIZONTAL WINDOW
TYPICAL DETAIL
SCALE: 3"=1'-0"



SOUTH ELEVATION



LONGITUDINAL
SECTION



SECTION AA
SOUTH ELEVATION
SCALE: 3"=1'-0"

FIRE HALL BUILDING
CITY OF PORT ANGELES
WASHINGTON

WILLIAM CUTLER
ARCHITECT
330-334 LYON BLDG SEATTLE
SCALE: 1/4"=1'-0" 1950

SHEET 2

APPENDIX E

SEISMIC CALCULATIONS,

FOUNDATION UNDERPINNING CALCULATIONS

&

ASCE 31-03 BASIC STRUCTURAL CHECKLIST

Port Angeles Fire House

Seismic Calculations
Foundation Underpinning Calculations

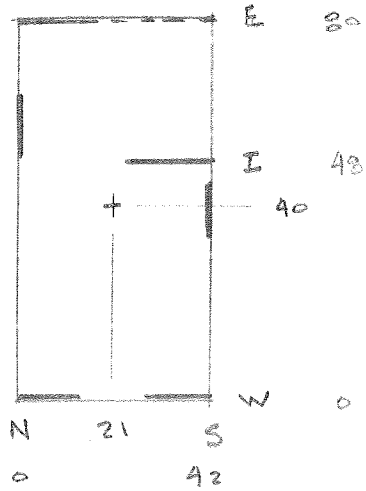
IBC analysis w/ R = 4 of retrofit structure w/ conc. walls

$S_{DS} = \frac{2}{3} \cdot 1.0 \cdot 1.12 = .747$ $\quad V = \frac{.747}{4} W_D = .187 W_D$

$V_R = \frac{562.30}{562.30 + 737.14} \cdot .187 \cdot (562 + 737) = 143^k$

$V_F = \frac{737.14}{562.30} \cdot 143 = 100^k$

note: see L12 & L14 for weights and site criteria



level	wall	h FT	d FT	t IN	Δ_c	R_c	Δ_f	R_F	$\Sigma\Delta$	ΣR
R	N	11.5	15	5				18.1		18.1
	S	8.5	10.5	5				16.9		16.9
	W	8.5	13	6				22.5		45.0
		8.5	13	6				22.5		
	E	14	42	1	.136					
		− 12	42	1	−.097					
					.039					
		+	5					1.571		
		4	2					.714		
		4	2					.714		
		4	12					9.797		
							.078	12.57		
		7.5	34				.067			
							.145	6.90		
		11.5	4.5					.91		
							.137	7.31	.174	45.5
				8						
	I	12.5	12.5	6		8.57				8.57

SWENSON SAY FAGÉT
A STRUCTURAL ENGINEERING CORPORATION

Seattle: 2124 Third Avenue · Suite 100 · Seattle · WA 98121
Tel: 206·443·6212 Fax: 206·443·4870

Tacoma: 934 Broadway · Suite 100 · Tacoma · WA 98042
Tel: 253·284·9470 Fax: 253·284·9471

Project

Date

Proj. No.

Design

Sheet L 1

Roof distribution $V = 143^{k}$ $M_x = M_y = 572^{k\text{-}ft}$

wall	R	Y_T	x	y	$\bar{x}$	$\bar{y}$	R_x^2	R_y^2	Y_R	Y_D
N	18.1	74.0	0		20.3		7459		± 1.3	75.3
S	16.9	69.0	42		21.7		7958		± 1.3	70.3
E	45.5	65.7		80		39.1		69561	± 6.3	72.0
I	8.57	12.4		48		7.1		432	± 0.2	12.6
W	45.0	65.0		0		40.9		75276	± 6.5	71.5

$x' = 20.3$ $e_x = 4$
$y' = 40.9$ $e_y = 4$

level	wall	h	d	t	Δ_c	R_c	Δ_f	R_f	$\Sigma\Delta$	ΣR
F	N	16	67.5	1	.074					
		12	67.5		-.055					
					.019					
		5	11					6.939		
		5	6.5					3.615		
		5	11					6.939		
		5	6.5					3.615		
		5	4.5					2.129		
							.043	23.2		
		7	55				.039			
							.082	12.20		
		12	9.5					1.73		
							.072	13.93	.091	
				8						87.9
	S	16	40	1	.146					
		8.5	40		-.064					
					.082					
		3.5	25.5					23.66		
		3.5	11					10.07		
		5	40				.030	39.99		
							.039			
							.069		.151	
				8						53.0
	E	13	41.5	1	.105					
		7.5	41.5		-.070					
					.035					
		3.5	4.5					3.55		
		3.5	2					.94		
		3.5	2					.94		
		3.5	5					4.09		
		3.5	2					.94		
		3.5	2					.94		
		3.5	4					3.01		
		6	41.5				.049	14.41		
							.062			
							.111		.146	54.8
				8						
	I	12	12.5	6				15.9		15.9

SWENSON SAY FAGÉT
A STRUCTURAL ENGINEERING CORPORATION
Seattle: 2124 Third Avenue · Suite 100 · Seattle · WA 98121
Tel: 206·443·6212 Fax: 206·443·4870
Tacoma: 934 Broadway · Suite 100 · Tacoma · WA 98042
Tel: 253·284·9470 Fax: 253·284·9471

Project
Date
Proj. No.
Design
Sheet 62

wall	h	d	t	Δ_L	R_C	Δ_F	R_F	$\Sigma\Delta$	ΣR
W	11.5	91.5	1	-.093					
	2.5	9.5		-.061					
				.032					
	8.5	14				-.174			
	7	16				-.141			
						.033	.714		
	7	3.5					1.707		
	7	5.5			.913		2.421		
							2.292	.496	
	8.5	2					.112		
	5.5	4					.623		
					.336		2.997	.368	
			10						27.2

Floor distribution $V = 243^{K}$ $M_x = 1264^{K\text{-FT}}$ $M_y = 3062^{K\text{-FT}}$

Wall	R	V_T	x	y	$\bar{x}$	$\bar{y}$	$R_{\bar{x}}^2$	$R_{\bar{y}}^2$	V_R	V_D
N	87.9	151.6	0		15.8		21943		- 10.0	151.6
S	53.0	91.4	42		26.2		36381		+ 10.0	101.4
E	54.8	136.0		50		27.4		41142	-26.3	136.0
I	15.9	39.5		42		4.6		336	+ 1.3	40.8
W	27.2	67.5		0		52.6		75256	+ 25.0	92.5

$x' = 15.8$ $e_x = 5.2$

$y' = 52.6$ $e_y = 12.6$

SWENSON SAY FAGÉT
A STRUCTURAL ENGINEERING CORPORATION

Seattle: 2124 Third Avenue · Suite 100 · Seattle · WA 98121
Tel: 206·443·6212 *Fax:* 206·443·4870

Tacoma: 934 Broadway · Suite 100 · Tacoma · WA 98042
Tel: 253·284·9470 *Fax:* 253·284·9471

Project

Date

Proj. No.

Design

Sheet 63

shear : $V_u = \frac{V_D}{.8dt}$

level	wall	segment	R	V_D	t	V_u	reinf.	IBC capacity	ASCE 31.03
R	N	15	18.1	75.3	5	105	#4@8 EWEF	316	
	S	10.5	16.9	70.3	↓	140	↓	↓	
	E	3	5.29	8.4	8	37	(ex) #4@15 EW	33	112
		2	2.43	3.8		25			
		2	2.43	3.8		25			
		12	32.8	52.0		56			
	↓	4.5	2.55	4.0	↓	12	↓	↓	↓
	I	12.5	8.57	12.6	6	18	#4@18 EWEF	165	
	W	13	22.5	35.8		48	#4@8 EWEF	276	
↓	↓	13	22.5	35.8	↓	48	↓	↓	
F	N	11	23.0	39.6	8	47	(ex) #4@15 EW	33	112
		6.5	12.0	20.7		42			
		11	23.0	39.6		47			
		6.5	12.0	20.7		42			
		4.5	7.05	12.2		35			
	↓	9.5	10.9	18.8		26			
	S	25.5	37.2	71.2		36			
	↓	11	15.8	30.2		36			
	E	4.5	13.5	33.5		97			
		2	3.57	8.9		58			
		2	3.57	8.9		58	↓	↓	↓
		5	15.6	38.7		101	#4@8 EWEF	226	
		2	3.57	8.9		58	(ex) #4@15	33	112
		2	3.57	8.9		58	↓	↓	↓
	↓	4	11.4	28.3	↓	92	↓	↓	↓
	I	12.5	15.9	40.8	6	57	#4@6 EWEF	343	
	W	3.5	6.04	20.6	10	61	#4@5 EWEF	268	
		5.5	14.4	49.1		102			
		2	1.02	3.5		18			
↓	↓	4	5.69	19.4	↓	51	↓	↓	

all walls adequate in shear

SWENSON SAY FAGÉT
A STRUCTURAL ENGINEERING CORPORATION
Seattle: 2124 Third Avenue · Suite 100 · Seattle · WA 98121
Tel: 206·443·6212 Fax: 206·443·4870
Tacoma: 934 Broadway · Suite 100 · Tacoma · WA 98042
Tel: 253·284·9470 Fax: 253·284·9471

Project

Date

Proj. No.

Design

Sheet L4

Shear capacity (IBC)

if $\rho \geq .0025$ & (2) layers : $v \geq .6(2\sqrt{f'_c} + A_s f_y / b s) \leq .6 \cdot 10\sqrt{f'_c}$

if $\rho \geq .0025$: $v \geq .6 \cdot 2\sqrt{f'_c}$

if $\rho < .0025$: $v \geq .6\sqrt{f'_c}$

use $f'_c = 4$ ksi for new shotcrete

use $f'_c = 3$ ksi for existing concrete

use $F_y = 40$ (conservative @ new shotcrete)

actual capacity

use $.6(2\sqrt{f'_c} + A_s F_y / b s) \times 1.06$

---

weighted average of existing wall DCR's using IBC capacity

level	wall	segment	DCR	weighted average
R	E	3	1.1	
	2@	2	.8	
		12	1.7	
		4.5	.4	1.2
F		4.5	2.9	
	4@	2	1.8	
		4	2.8	2.3
	S	25.5	1.1	
		11	1.1	1.1
	N	2@ 11	1.4	
	2@	6.5	1.3	
		4.5	1.1	
		9.5	.8	1.2

SWENSON SAY FAGÉT
A STRUCTURAL ENGINEERING CORPORATION
Seattle: 2124 Third Avenue · Suite 100 · Seattle · WA 98121
Tel: 206·443·6212 Fax: 206·443·4870
Tacoma: 934 Broadway · Suite 100 · Tacoma · WA 98042
Tel: 253·284·9470 Fax: 253·284·9471

Project

Date

Proj. No.

Design

Sheet L5

method 1

Scale results using ASCE 31-03 methodology for existing walls:

Pseudo Lateral Force $V = C_s a W = 1.2 \cdot .762 W = .914W$

using $m = 2.5$, $V = .366W$

IBC force w/ $R = 4$, $V = .137W$

$\frac{.366}{.137} = 1.96$

Deformation Controlled Capacity: 1.25 · actual strength

IBC strength: .6 · actual strength

$\frac{1.25}{.6} = 2.08$

∴ Scale results for capacity by $\frac{2.08}{1.96} = 1.06$

All existing wall segments adequate in shear

SWENSON SAY FAGÉT
A STRUCTURAL ENGINEERING CORPORATION
Seattle: 2124 Third Avenue · Suite 100 · Seattle · WA 98121
Tel: 206·443·6212 Fax: 206·443·4870
Tacoma: 934 Broadway · Suite 100 · Tacoma · WA 98042
Tel: 253·284·9470 Fax: 253·284·9471

Project

Date

Proj. No.

Design

Sheet L6

method 2

exclude east wall from IBC analysis

revised distribution

level	wall	R	V_T	x	y	$\bar{x}$	$\bar{y}$	$R\bar{x}^2$	$R\bar{y}^2$	V_R	V_D	ratio increase
R	N	18.1	74.0	0		20.3		7459		±6.6 / 63.5	80.6	1.09
	S	16.9	69.0	42		21.7		7958		±6.6 / 63.5	75.6	1.08
	I	8.57	22.9		45		40.3		13918	+59.8	82.7	6.56
	W	49.0	120.1	0		7.7		2668		-59.8	120.1	1.68
				$y' = 7.7$		$e_y = 32.3$		$M_y = 4619$				
F	N	87.9	151.6	0		15.8		21943		-21.6 / 92.4	151.6	1.00
	S	53.0	91.4	42		26.2		36381		+21.6 / 92.4	113.0	1.11
	I	15.9	89.6		45		30.3		14598	+32.1	121.7	2.98
	W	27.2	153.4	0		17.7		8521		-32.1	153.4	1.66
				$y' = 17.7$		$e_y = 22.3$		$M_y = 5419$				

revised shear stress

level	wall	segment	previous V_u	increase	revised V_u	capacity	DCR
R	N	15	105	1.07	112	316	.4
	S	10.5	140	1.08	151	↓	.5
	I	12.5	18	6.56	118	165	.7
	W	2@13	48	1.68	80	296	.3
F	N	2@11	47	1.00	47	112	.4
		2@6.5	42	↓	42	↓	.4
		4.5	35		35		.3
		9.5	26		26		.2
	S	25.5	36	1.11	40		.4
		11	36	↓	40		.4
	I	12.5	57	2.98	170	343	.5
	W	3.5	61	1.66	101	268	.4
		5.5	102	↓	169	↓	.6
		2	18		30		.1
		4	51		85		.3

SWENSON SAY FAGÉT
A STRUCTURAL ENGINEERING CORPORATION
Seattle: 2124 Third Avenue · Suite 100 · Seattle · WA 98121
Tel: 206·443·6212 Fax: 206·443·4870
Tacoma: 934 Broadway · Suite 100 · Tacoma · WA 98042
Tel: 253·284·9470 Fax: 253·284·9471

Project

Date

Proj. No.

Design

Sheet 47

Flexural Capacity (IBC)

Roof (excluding east wall)

North wall, 5" w/ (2) #5 ea. end, (2) #4 @ 8 x 15'

$M_u = 80.6 \cdot 11.5 \cdot 12 = 11{,}123$

capacity @ $\rho_{min} = .9 \cdot \rho_D = .9[(30.7).095 + (11.5 \cdot 15).10] = 33.5^k$

$M_u = 42{,}170^{k\text{-in}}$ DCR = .26 ✓

$f_a + f_b = \frac{1.2}{.9}\frac{33.5}{5 \cdot 13^2} + \frac{6 \cdot 11123}{5 \cdot 13^2} = .46 < .2f'_c = .80$ ✓

South wall, 5" w/ (2) #5 ea. end, (2) #4 @ 8 x 10.5'

$M_u = 75.6 \cdot 8.5 \cdot 12 = 7711^{k\text{-in}}$

$P_{min} = .9[(22.7).095 + (8.5 \cdot 10.5).10] = 21.2^k$

$M_u = 20830^{k\text{-in}}$ DCR = .37 ✓

$f_a + f_b = .62 < .80$ ✓

Intermediate wall, 6" w/ (2) #5 ea. end, (2) #4 @ 18 x 12.5 FT

$M_u = 82.7 \cdot 12.5 \cdot 12 = 12405^{k\text{-in}}$

capacity @ $P_{min} = .9(12.5 \cdot 12.5).075 = 10.5^k$

$M_u = 13596^{k\text{-in}}$ DCR = .91 ✓

$f_a + f_b = .57 < .80$ ✓

West walls, (2) @ 5" w/ 12 #4 @ 8 x 13 FT

$M_u = \frac{120.1}{2} \cdot 8.5 \cdot 12 = 6125^{k\text{-in}}$ ea.

capacity @ $P_{min} = .9(13 \cdot 2.5).10 = 9.9^k$

OK by comparison

SWENSON SAY FAGÉT
A STRUCTURAL ENGINEERING CORPORATION
Seattle: 2124 Third Avenue · Suite 100 · Seattle · WA 98121
Tel: 206·443·6212 Fax: 206·443·4870
Tacoma: 934 Broadway · Suite 100 · Tacoma · WA 98042
Tel: 253·284·9470 Fax: 253·284·9471

Project

Date

Proj. No.

Design

Sheet L8

North wall, t = 8"

Segment	M_u	req'd A_s @ P_u = 0, d = .8 L_w	
11	39.6 × 5 × 12 = 2376	.42	
6.5	20.7 × 5 × 12 = 1242	.37	
4.5	12.2 × 5 × 12 = 732	.32	
9.5	18.8 × 12 × 12 = 2707	.55	OK

South wall, t = 8"

Segment	M_u	req'd A_s	
25.5	79.0 × 8 × 12 = 7584	.58	
11	33.5 × 8 × 12 = 3216	.57	OK

little or no reinforcement required for flexure if axial load and restraint above and below openings considered

Interior wall, 6" w/ (2) #5 ea. end, (2) #4 @ 16 × 12.5'

M_u = 121.7 × 12 × 12 = 17524

M_u capacity @ P_{min} = 21^k = 36792 ber = .48

$f_a + f_b$ = .80 ✓

SWENSON SAY FAGÉT
A STRUCTURAL ENGINEERING CORPORATION
Seattle: 2124 Third Avenue · Suite 100 · Seattle · WA 98121
Tel: 206·443·6212 Fax: 206·443·4870
Tacoma: 934 Broadway · Suite 100 · Tacoma · WA 98042
Tel: 253·284·9470 Fax: 253·284·9471

Project

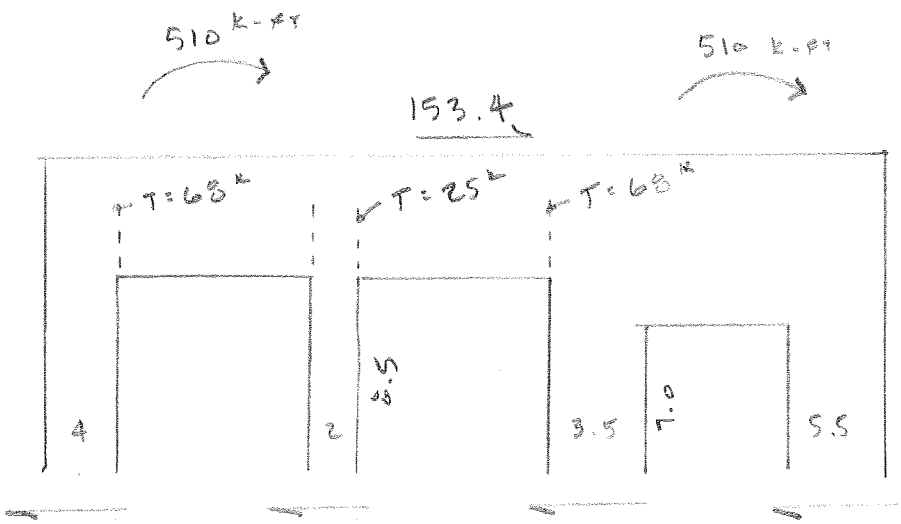
Date

Proj. No.

Design

Sheet L9

lower west wall



M_u = 3274 592 2864 6829 k-in

LS×3×5/8 : $f_t = \frac{68}{9.61} = 7.1$ ksi ✓

68/12 = 5.7 k / each 7/8" ϕ epoxy anchor ✓

upper spandrel: $M_u \approx 3274$, b = 10, d ≈ 72

$A_{s\,req'd} = .85\ in^2$ (4) #5 + ok

3.5 FT pier: $M_u = 2864$, b = 10, d = 39.5

$A_{s\,req'd} = 1.39\ in^2$ (4) #5 + ok

5.5 FT pier: $M_u = 6829$, b = 10, (4) #5 each end, (2) #5 @ 7" × 5.5'

M_u @ $P_u = 0$ = 11774, DCR < .58 ok

lower spandrel: $M_u \approx 6829$, b = 10, d ≈ 90

$A_{s\,req'd} = 1.93\ in^2$ (4) #5 + ok

SWENSON SAY FAGÉT
A STRUCTURAL ENGINEERING CORPORATION
Seattle: 2124 Third Avenue · Suite 100 · Seattle · WA 98121
Tel: 206·443·6212 Fax: 206·443·4870
Tacoma: 934 Broadway · Suite 100 · Tacoma · WA 98042
Tel: 253·284·9470 Fax: 253·284·9471

Project
Date
Proj. No.
Design L10
Sheet

URM wall slenderness ratios

level	wall	h	t	h/t	strongback	remove
upper	exterior, front	8.5 FT	8 IN	12.8	no	
	ext. north, rear	11.25 FT	8 IN	16.9	yes	
	ext. south, rear	14.25 FT	8 IN	21.4	yes	
	int. transverse	13 FT	8 IN	19.5	OK	yes
	int. partition	13 FT	4 IN	39	OK	yes
lower	ext. south rear	11 FT	8 IN	16.5	yes	

strongback w/ 6" x 18 ga. studs @ 16" oc

SWENSON SAY FAGÉT
A STRUCTURAL ENGINEERING CORPORATION
Seattle: 2124 Third Avenue · Suite 100 · Seattle · WA 98121
Tel: 206·443·6212 Fax: 206·443·4870
Tacoma: 934 Broadway · Suite 100 · Tacoma · WA 98042
Tel: 253·284·9470 Fax: 253·284·9471

Project

Date

Proj. No.

Design

Sheet L11

ASCE 31-03 analysis of original structure

building type C3 : concrete frames with infill masonry shear walls
or C2 : concrete shear walls

Pseudo Lateral Force: $V = C S_a W = 1.2 \cdot .762 W = .914W$

$C = 1.2$

$S_a = \frac{S_{D1}}{T}$, $T = C_t h_n^{A} = .02 \cdot 29.5^{.75} = .25$

$S_{D1} = \frac{2}{3} F_v S_1 = \frac{2}{3} \cdot 1.53 \cdot .467 = .476$

$S_a = \frac{.476}{.25} = 1.91 > S_{DS}$ $\therefore$ $S_a = S_{DS} = .762$

$S_{DS} = \frac{2}{3} F_a S_s = \frac{2}{3} \cdot 1.02 \cdot 1.12 = .762$

Weight (W)

Roof: roofing 10
slab + beams + rails 56 + 25 + 4 = 85
ceiling + mech + elec 10 $\quad \Sigma 105 \cdot 42 \cdot 80 = 353^K$
walls $90 \cdot 9.5 \cdot 24 = 209^K$ $\quad \Sigma = 562^K$

Floor: flooring 15
slabs + beams + rails 63 + 25 + 5 = 96
ceiling + mech + elec 9 $\quad \Sigma 120 \cdot 42 \cdot 80 = 403^K$
walls $(90 \cdot 8 + 100 \cdot 6.5) 24 = 334^K$ $\quad \Sigma = 737^K$

$V_R = \frac{2.562}{2.562 + 737} (562 + 737) \cdot .914 = 717^K$

$V_F = 717 \frac{737}{2.562} = 470^K$

SWENSON SAY FAGÉT
A STRUCTURAL ENGINEERING CORPORATION
Seattle: 2124 Third Avenue · Suite 100 · Seattle · WA 98121
Tel: 206·443·6212 Fax: 206·443·4870
Tacoma: 934 Broadway · Suite 100 · Tacoma · WA 98042
Tel: 253·284·9470 Fax: 253·284·9471

Project
Date
Proj. No.
Design
Sheet L12

Distribution

level	wall	V k	l ft	t in	material	m	v psi	element
	N	359	52	9	brick	1.5	43	wall
	S	↓	54	9	brick	1.5	41	↓
roof	E		22	8	concrete	4.0	43	
	W		23	9	brick	1.5	96	
	N	594	53	8	concrete	4.0	29	
	S	↓	36	8	↓	4.0	43	
floor	E		17	8		4.0	91	↓
	W	↓	6	42	↓	2.0	98	column

SWENSON SAY FAGÉT
A STRUCTURAL ENGINEERING CORPORATION

Seattle: 2124 Third Avenue · Suite 100 · Seattle · WA 98121
Tel: 206·443·6212 *Fax:* 206·443·4870

Tacoma: 934 Broadway · Suite 100 · Tacoma · WA 98042
Tel: 253·284·9470 *Fax:* 253·284·9471

Project

Date

Proj. No.

Design

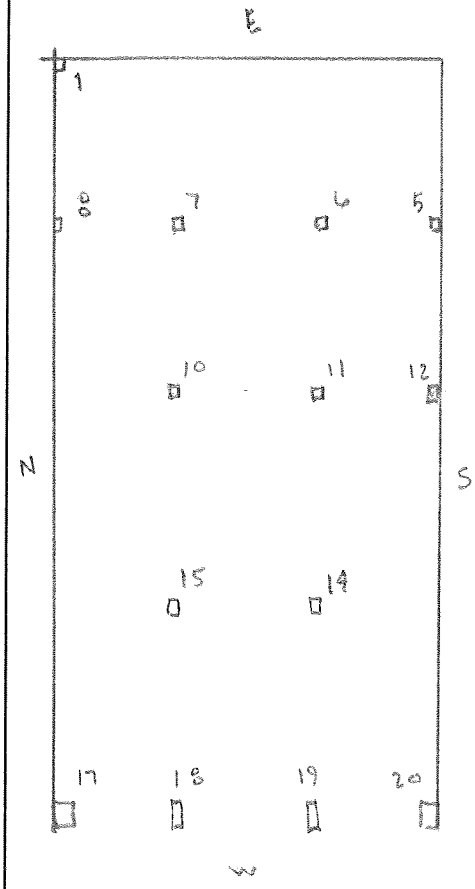
Sheet L13

Conterminous 48 States
2009 International Building Code
Latitude = 48.12
Longitude = -123.43
Spectral Response Accelerations Ss and S1
Ss and S1 = Mapped Spectral Acceleration Values
Site Class B - Fa = 1.0 ,Fv = 1.0
Data are based on a 0.01 deg grid spacing

Period (sec)	Sa (g)
0.2	1.119 (Ss, Site Class B)
1.0	0.467 (S1, Site Class B)

L14

Foundation Underpinning



approx. bearing pressure

unit loads	DL psf	25% LL psf
roof	105	–
upper floor	120	25
lower floor	120	25
walls	100	–

element	roof A	roof D	upper floor A	upper floor D	upper floor L	lower floor A	lower floor D	lower floor L	wall	total	footing size	bearing pressure
(south ½) north wall	7	0.74	7	0.84	0.18	–	–	–	3.10	4.86	2.33	2.09
east wall	15.5	1.63	7	0.84	0.18	7	0.84	0.18	4.00	7.67	2.33	3.29
(east) south wall	7	0.74	7	0.84	0.18	–	–	–	1.20	2.96	1.33	2.23
col. 6 & 7	–	–	209	25.1	5.2	95	11.4	2.4	–	44.1	20.3	2.17
col. 5	109	11.4	109	13.1	2.7	49	5.9	1.2	27.9	62.2	17.3	3.60
col. 10 & 11	365	38.3	270	32.4	6.8	–	–		16.9	94.4	29.3	3.22
col. [illegible]	141	15.4	141	17.6	3.7	–	–		[illegible]	[illegible]	22.5	2.50
col. 14 & 15	310	32.6	310	39.2	7.8	–	–		–	77.6	29.3	2.65
col. 18 & 19	175	18.4	175	21.0	4.4	–	–		30.7	74.5	29.3	2.54
col. 17 & 20	91	9.60	91	10.9	2.3	–	–		48.9	71.7	36.0	1.99
col. 8	–	–	49	5.9	1.2	49	5.9	1.2	12.6	26.8	5.2	4.62
col. 1	109	11.4	49	5.9	1.2	49	5.9	1.2	12.6	35.2	18.7	2.04

SWENSON SAY FAGÉT
A STRUCTURAL ENGINEERING CORPORATION

Seattle: 2124 Third Avenue · Suite 100 · Seattle · WA 98121
Tel: 206·443·6212 Fax: 206·443·4870

Tacoma: 934 Broadway · Suite 100 · Tacoma · WA 98042
Tel: 253·284·9470 Fax: 253·284·9471

Project

Date

Proj. No.

Design

Sheet F1

pin pile requirements

element	load @ 100% live	f_p	16 k/ea 4" ϕ	24 k/ea 6" ϕ
north wall	5.40 klf	2.32	7 FT / 10	10 FT / 8
east wall	8.75	3.76	4.5 FT / 10	6 FT / 8
south wall	3.50	2.63	6 FT / 8	9 FT / 6
col. 6 & 7	66.7 K	3.30	4	4
col. 5	73.9	4.27	6	4
col. 10 & 11	115	3.92	8	6
col. 12	68.0	2.98	4	4
col. 14 & 15	101	3.45	6	4
col. 18 & 19	87.7	2.99	6	4
col. 17 & 20	78.6	2.13	6	4
col. 8	34.0	5.54	2	2
col. 1	45.4	2.43	4	2
			104	78 total

SWENSON SAY FAGÉT
A STRUCTURAL ENGINEERING CORPORATION

Seattle: 2124 Third Avenue · Suite 100 · Seattle · WA 98121
Tel: 206·443·6212 *Fax:* 206·443·4870

Tacoma: 934 Broadway · Suite 100 · Tacoma · WA 98042
Tel: 253·284·9470 *Fax:* 253·284·9471

Project

Date

Proj. No.

Design

Sheet F2

3.7.10 Basic Structural Checklist for Building Type C3: Concrete Frames with Infill Masonry Shear Walls and Stiff Diaphragms

This Basic Structural Checklist shall be completed where required by Table 3-2.

Each of the evaluation statements on this checklist shall be marked Compliant (C), Non-compliant (NC), or Not Applicable (N/A) for a Tier 1 Evaluation. Compliant statements identify issues that are acceptable according to the criteria of this standard, while non-compliant statements identify issues that require further investigation. Certain statements may not apply to the buildings being evaluated. For non-compliant evaluation statements, the design professional may choose to conduct further investigation using the corresponding Tier 2 Evaluation procedure; corresponding section numbers are in parentheses following each evaluation statement.

C3.7.10 Basic Structural Checklist for Building Type C3

This is an older type of building construction that consists of a frame assembly of cast-in-place concrete beams and columns. The floor and roof diaphragms consist of cast-in-place concrete slabs and are stiff relative to the walls. Walls consist of infill panels constructed of solid clay brick, concrete block, or hollow clay tile masonry. The seismic performance of this type of construction depends on the interaction between the frame and infill panels. The combined behavior is more like a shear wall structure than a frame structure. Solidly infilled masonry panels form diagonal compression struts between the intersections of the frame members. If the walls are offset from the frame and do not fully engage the frame members, the diagonal compression struts will not develop. The strength of the infill panel is limited by the shear capacity of the masonry bed joint or the compression capacity of the strut. The post-cracking strength is determined by an analysis of a moment frame that is partially restrained by the cracked infill. The shear strength of the concrete columns, after cracking of the infill, may limit the semiductile behavior of the system.

Building System

(C)	NC	N/A	LOAD PATH: The structure shall contain a minimum of one complete load path for Life Safety and Immediate Occupancy for seismic force effects from any horizontal direction that serves to transfer the inertial forces from the mass to the foundation. (Tier 2: Sec. 4.3.1.1)
C	NC	(N/A)	MEZZANINES: Interior mezzanine levels shall be braced independently from the main structure, or shall be anchored to the lateral-force-resisting elements of the main structure. (Tier 2: Sec. 4.3.1.3)
(C)	NC	N/A	WEAK STORY: The strength of the lateral-force-resisting system in any story shall not be less than 80 percent of the strength in an adjacent story, above or below, for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.1)
C	(NC)	N/A	SOFT STORY: The stiffness of the lateral-force-resisting system in any story shall not be less than 70 percent of the lateral-force-resisting system stiffness in an adjacent story above or below, or less than 80 percent of the average lateral-force-resisting system stiffness of the three stories above or below for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.2)
(C)	NC	N/A	GEOMETRY: There shall be no changes in horizontal dimension of the lateral-force-resisting system of more than 30 percent in a story relative to adjacent stories for Life Safety and Immediate Occupancy, excluding one-story penthouses and mezzanines. (Tier 2: Sec. 4.3.2.3)
(C)	NC	N/A	VERTICAL DISCONTINUITIES: All vertical elements in the lateral-force-resisting system shall be continuous to the foundation. (Tier 2: Sec. 4.3.2.4)

C NC N/A MASS: There shall be no change in effective mass more than 50 percent from one story to the next for Life Safety and Immediate Occupancy. Light roofs, penthouses, and mezzanines need not be considered. (Tier 2: Sec. 4.3.2.5)

C NC N/A TORSION: The estimated distance between the story center of mass and the story center of rigidity shall be less than 20 percent of the building width in either plan dimension for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.6)

C NC N/A DETERIORATION OF CONCRETE: There shall be no visible deterioration of concrete or reinforcing steel in any of the vertical- or lateral-force-resisting elements. (Tier 2: Sec. 4.3.3.4)

C NC N/A MASONRY UNITS: There shall be no visible deterioration of masonry units. (Tier 2: Sec. 4.3.3.7)

C NC N/A MASONRY JOINTS: The mortar shall not be easily scraped away from the joints by hand with a metal tool, and there shall be no areas of eroded mortar. (Tier 2: Sec. 4.3.3.8)

C NC N/A CRACKS IN INFILL WALLS: There shall be no existing diagonal cracks in the infilled walls that extend throughout a panel greater than 1/8 inch for Life Safety and 1/16 inch for Immediate Occupancy, or out-of-plane offsets in the bed joint greater than 1/8 inch for Life Safety and 1/16 inch for Immediate Occupancy. (Tier 2: Sec. 4.3.3.12)

C NC N/A CRACKS IN BOUNDARY COLUMNS: There shall be no existing diagonal cracks wider than 1/8 inch for Life Safety and 1/16 inch for Immediate Occupancy in concrete columns that encase masonry infills. (Tier 2: Sec. 4.3.3.13)

Lateral-Force-Resisting System

C NC N/A REDUNDANCY: The number of lines of shear walls in each principal direction shall be greater than or equal to 2 for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.1.1)

C NC N/A SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than 70 psi for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.4.1)

C NC N/A SHEAR STRESS CHECK: The shear stress in the unreinforced masonry shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than 30 psi for clay units and 70 psi for concrete units for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.5.1)

C NC N/A WALL CONNECTIONS: Masonry shall be in full contact with frame for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.6.1)

Connections

C NC N/A TRANSFER TO SHEAR WALLS: Diaphragms shall be connected for transfer of loads to the shear walls for Life Safety and the connections shall be able to develop the lesser of the shear strength of the walls or diaphragms for Immediate Occupancy. (Tier 2: Sec. 4.6.2.1)

C NC N/A CONCRETE COLUMNS: All concrete columns shall be doweled into the foundation for Life Safety, and the dowels shall be able to develop the tensile capacity of reinforcement in columns of lateral-force-resisting system for Immediate Occupancy. (Tier 2: Sec. 4.6.3.2)

3.7.10S Supplemental Structural Checklist for Building Type C3: Concrete Frames with Infill Masonry Shear Walls and Stiff Diaphragms

This Supplemental Structural Checklist shall be completed where required by Table 3-2. The Basic Structural Checklist shall be completed prior to completing this Supplemental Structural Checklist.

Lateral-Force-Resisting System

(C) NC N/A — DEFLECTION COMPATIBILITY: Secondary components shall have the shear capacity to develop the flexural strength of the components for Life Safety and shall meet the requirements of Sections 4.4.1.4.9, 4.4.1.4.10, 4.4.1.4.11, 4.4.1.4.12 and 4.4.1.4.15 for Immediate Occupancy. (Tier 2: Sec. 4.4.1.6.2)

(C) NC N/A — FLAT SLABS: Flat slabs/plates not part of lateral-force-resisting system shall have continuous bottom steel through the column joints for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.6.3)

C NC (N/A) — REINFORCING AT OPENINGS: All wall openings that interrupt rebar shall have trim reinforcing on all sides. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.4.3)

C (NC) N/A — PROPORTIONS: The height-to-thickness ratio of the infill walls at each story shall be less than 9 for Life Safety in levels of high seismicity, 13 for Immediate Occupancy in levels of moderate seismicity, and 8 for Immediate Occupancy in levels of high seismicity. (Tier 2: Sec. 4.4.2.6.2)

(C) NC N/A — SOLID WALLS: The infill walls shall not be of cavity construction. (Tier 2: Sec. 4.4.2.6.3)

(C) NC N/A — INFILL WALLS: The infill walls shall be continuous to the soffits of the frame beams and to the columns to either side. (Tier 2: Sec. 4.4.2.6.4)

Diaphragms

C (NC) N/A — DIAPHRAGM CONTINUITY: The diaphragms shall not be composed of split-level floors and shall not have expansion joints. (Tier 2: Sec. 4.5.1.1)

(C) NC N/A — OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls shall be less than 25 percent of the wall length for Life Safety and 15 percent of the wall length for Immediate Occupancy. (Tier 2: Sec. 4.5.1.4)

(C) NC N/A — OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls shall not be greater than 8 feet long for Life Safety and 4 feet long for Immediate Occupancy. (Tier 2: Sec. 4.5.1.6)

(C) NC N/A — PLAN IRREGULARITIES: There shall be tensile capacity to develop the strength of the diaphragm at re-entrant corners or other locations of plan irregularities. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.1.7)

(C) NC N/A — DIAPHRAGM REINFORCEMENT AT OPENINGS: There shall be reinforcing around all diaphragm openings larger than 50 percent of the building width in either major plan dimension. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.1.8)

Connections

C NC (N/A) — UPLIFT AT PILE CAPS: Pile caps shall have top reinforcement and piles shall be anchored to the pile caps for Life Safety, and the pile cap reinforcement and pile anchorage shall be able to develop the tensile capacity of the piles for Immediate Occupancy. (Tier 2: Sec. 4.6.3.10)

3.7.9 Basic Structural Checklist for Building Type C2: Concrete Shear Walls with Stiff Diaphragms

This Basic Structural Checklist shall be completed where required by Table 3-2.

Each of the evaluation statements on this checklist shall be marked Compliant (C), Non-compliant (NC), or Not Applicable (N/A) for a Tier 1 Evaluation. Compliant statements identify issues that are acceptable according to the criteria of this standard, while non-compliant statements identify issues that require further investigation. Certain statements may not apply to the buildings being evaluated. For non-compliant evaluation statements, the design professional may choose to conduct further investigation using the corresponding Tier 2 Evaluation procedure; corresponding section numbers are in parentheses following each evaluation statement.

C3.7.9 Basic Structural Checklist for Building Type C2

These buildings have floor and roof framing that consists of cast-in-place concrete slabs, concrete beams, one-way joists, two-way waffle joists, or flat slabs. Floors are supported on concrete columns or bearing walls. Lateral forces are resisted by cast-in-place concrete shear walls. In older construction, shear walls are lightly reinforced but often extend throughout the building. In more recent construction, shear walls occur in isolated locations and are more heavily reinforced with boundary elements and closely spaced ties to provide ductile performance. The diaphragms consist of concrete slabs and are stiff relative to the walls. Foundations consist of concrete spread footings, mat foundations, or deep foundations.

Building System

(C) NC N/A	LOAD PATH: The structure shall contain a minimum of one complete load path for Life Safety and Immediate Occupancy for seismic force effects from any horizontal direction that serves to transfer the inertial forces from the mass to the foundation. (Tier 2: Sec. 4.3.1.1)
C NC (N/A)	MEZZANINES: Interior mezzanine levels shall be braced independently from the main structure, or shall be anchored to the lateral-force-resisting elements of the main structure. (Tier 2: Sec. 4.3.1.3)
(C) NC N/A	WEAK STORY: The strength of the lateral-force-resisting system in any story shall not be less than 80 percent of the strength in an adjacent story, above or below, for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.1)
C (NC) N/A	SOFT STORY: The stiffness of the lateral-force-resisting system in any story shall not be less than 70 percent of the lateral-force-resisting system stiffness in an adjacent story above or below, or less than 80 percent of the average lateral-force-resisting system stiffness of the three stories above or below for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.2)
(C) NC N/A	GEOMETRY: There shall be no changes in horizontal dimension of the lateral-force-resisting system of more than 30 percent in a story relative to adjacent stories for Life Safety and Immediate Occupancy, excluding one-story penthouses and mezzanines. (Tier 2: Sec. 4.3.2.3)
(C) NC N/A	VERTICAL DISCONTINUITIES: All vertical elements in the lateral-force-resisting system shall be continuous to the foundation. (Tier 2: Sec. 4.3.2.4)
(C) NC N/A	MASS: There shall be no change in effective mass more than 50 percent from one story to the next for Life Safety and Immediate Occupancy. Light roofs, penthouses, and mezzanines need not be considered. (Tier 2: Sec. 4.3.2.5)

C NC N/A TORSION: The estimated distance between the story center of mass and the story center of rigidity shall be less than 20 percent of the building width in either plan dimension for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.6)

C NC N/A DETERIORATION OF CONCRETE: There shall be no visible deterioration of concrete or reinforcing steel in any of the vertical- or lateral-force-resisting elements. (Tier 2: Sec. 4.3.3.4)

C NC N/A POST-TENSIONING ANCHORS: There shall be no evidence of corrosion or spalling in the vicinity of post-tensioning or end fittings. Coil anchors shall not have been used. (Tier 2: Sec. 4.3.3.5)

C NC N/A CONCRETE WALL CRACKS: All existing diagonal cracks in wall elements shall be less than 1/8 inch for Life Safety and 1/16 inch for Immediate Occupancy, shall not be concentrated in one location, and shall not form an X pattern. (Tier 2: Sec. 4.3.3.9)

Lateral-Force-Resisting System

C NC N/A COMPLETE FRAMES: Steel or concrete frames classified as secondary components shall form a complete vertical-load-carrying system. (Tier 2: Sec. 4.4.1.6.1)

C NC N/A REDUNDANCY: The number of lines of shear walls in each principal direction shall be greater than or equal to 2 for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.1.1)

C NC N/A SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than the greater of 100 psi or $2\sqrt{f'c}$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.2.1)

C NC N/A REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area shall be not less than 0.0015 in the vertical direction and 0.0025 in the horizontal direction for Life Safety and Immediate Occupancy. The spacing of reinforcing steel shall be equal to or less than 18 inches for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.2.2)

Connections

C NC N/A TRANSFER TO SHEAR WALLS: Diaphragms shall be connected for transfer of loads to the shear walls for Life Safety and the connections shall be able to develop the lesser of the shear strength of the walls or diaphragms for Immediate Occupancy. (Tier 2: Sec. 4.6.2.1)

C NC N/A FOUNDATION DOWELS: Wall reinforcement shall be doweled into the foundation for Life Safety, and the dowels shall be able to develop the lesser of the strength of the walls or the uplift capacity of the foundation for Immediate Occupancy. (Tier 2: Sec. 4.6.3.5)

3.7.9S Supplemental Structural Checklist for Building Type C2: Concrete Shear Walls with Stiff Diaphragms

This Supplemental Structural Checklist shall be completed where required by Table 3-2. The Basic Structural Checklist shall be completed prior to completing this Supplemental Structural Checklist.

Lateral-Force-Resisting System

(C) NC N/A — DEFLECTION COMPATIBILITY: Secondary components shall have the shear capacity to develop the flexural strength of the components for Life Safety and shall meet the requirements of Sections 4.4.1.4.9, 4.4.1.4.10, 4.4.1.4.11, 4.4.1.4.12 and 4.4.1.4.15 for Immediate Occupancy. (Tier 2: Sec. 4.4.1.6.2)

(C) NC N/A — FLAT SLABS: Flat slabs/plates not part of lateral-force-resisting system shall have continuous bottom steel through the column joints for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.6.3)

C (NC) N/A — COUPLING BEAMS: The stirrups in coupling beams over means of egress shall be spaced at or less than $d/2$ and shall be anchored into the confined core of the beam with hooks of 135° or more for Life Safety. All coupling beams shall comply with the requirements above and shall have the capacity in shear to develop the uplift capacity of the adjacent wall for Immediate Occupancy. (Tier 2: Sec. 4.4.2.2.3)

(C) NC N/A — OVERTURNING: All shear walls shall have aspect ratios less than 4-to-1. Wall piers need not be considered. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.4)

C NC (N/A) — CONFINEMENT REINFORCING: For shear walls with aspect ratios greater than 2-to-1, the boundary elements shall be confined with spirals or ties with spacing less than $8d_b$. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.5)

C NC (N/A) — REINFORCING AT OPENINGS: There shall be added trim reinforcement around all wall openings with a dimension greater than three times the thickness of the wall. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.6)

(C) NC N/A — WALL THICKNESS: Thickness of bearing walls shall not be less than 1/25 the unsupported height or length, whichever is shorter, nor less than 4 inches. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.7)

Diaphragms

C (NC) N/A — DIAPHRAGM CONTINUITY: The diaphragms shall not be composed of split-level floors and shall not have expansion joints. (Tier 2: Sec. 4.5.1.1)

(C) NC N/A — OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls shall be less than 25 percent of the wall length for Life Safety and 15 percent of the wall length for Immediate Occupancy. (Tier 2: Sec. 4.5.1.4)

(C) NC N/A — PLAN IRREGULARITIES: There shall be tensile capacity to develop the strength of the diaphragm at re-entrant corners or other locations of plan irregularities. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.1.7)

(C) NC N/A — DIAPHRAGM REINFORCEMENT AT OPENINGS: There shall be reinforcing around all diaphragm openings larger than 50 percent of the building width in either major plan dimension. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.1.8)

3.7.8 Basic Structural Checklist for Building Type C1: Concrete Moment Frames

This Basic Structural Checklist shall be completed where required by Table 3-2.

Each of the evaluation statements on this checklist shall be marked Compliant (C), Non-compliant (NC), or Not Applicable (N/A) for a Tier 1 Evaluation. Compliant statements identify issues that are acceptable according to the criteria of this standard, while non-compliant statements identify issues that require further investigation. Certain statements may not apply to the buildings being evaluated. For non-compliant evaluation statements, the design professional may choose to conduct further investigation using the corresponding Tier 2 Evaluation procedure; corresponding section numbers are in parentheses following each evaluation statement.

C3.7.8 Basic Structural Checklist for Building Type C1

These buildings consist of a frame assembly of cast-in-place concrete beams and columns. Floor and roof framing consists of cast-in-place concrete slabs, concrete beams, one-way joists, two-way waffle joists, or flat slabs. Lateral forces are resisted by concrete moment frames that develop their stiffness through monolithic beam-column connections. In older construction, or in levels of low seismicity, the moment frames may consist of the column strips of two-way flat slab systems. Modern frames in levels of high seismicity have joint reinforcing, closely spaced ties, and special detailing to provide ductile performance. This detailing is not present in older construction. Foundations consist of concrete spread footings, mat foundations, or deep foundations.

Building System

(C)	NC	N/A	LOAD PATH: The structure shall contain a minimum of one complete load path for Life Safety and Immediate Occupancy for seismic force effects from any horizontal direction that serves to transfer the inertial forces from the mass to the foundation. (Tier 2: Sec. 4.3.1.1)
(C)	NC	N/A	ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building shall be greater than 4 percent of the height of the shorter building for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.1.2)
C	NC	(N/A)	MEZZANINES: Interior mezzanine levels shall be braced independently from the main structure, or shall be anchored to the lateral-force-resisting elements of the main structure. (Tier 2: Sec. 4.3.1.3)
(C)	NC	N/A	WEAK STORY: The strength of the lateral-force-resisting system in any story shall not be less than 80 percent of the strength in an adjacent story, above or below, for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.1)
C	(NC)	N/A	SOFT STORY: The stiffness of the lateral-force-resisting system in any story shall not be less than 70 percent of the lateral-force-resisting system stiffness in an adjacent story above or below, or less than 80 percent of the average lateral-force-resisting system stiffness of the three stories above or below for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.2)
(C)	NC	N/A	GEOMETRY: There shall be no changes in horizontal dimension of the lateral-force-resisting system of more than 30 percent in a story relative to adjacent stories for Life Safety and Immediate Occupancy, excluding one-story penthouses and mezzanines. (Tier 2: Sec. 4.3.2.3)
(C)	NC	N/A	VERTICAL DISCONTINUITIES: All vertical elements in the lateral-force-resisting system shall be continuous to the foundation. (Tier 2: Sec. 4.3.2.4)

C NC N/A — MASS: There shall be no change in effective mass more than 50 percent from one story to the next for Life Safety and Immediate Occupancy. Light roofs, penthouses, and mezzanines need not be considered. (Tier 2: Sec. 4.3.2.5)

C NC N/A — TORSION: The estimated distance between the story center of mass and the story center of rigidity shall be less than 20 percent of the building width in either plan dimension for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.6)

C NC N/A — DETERIORATION OF CONCRETE: There shall be no visible deterioration of concrete or reinforcing steel in any of the vertical- or lateral-force-resisting elements. (Tier 2: Sec. 4.3.3.4)

C NC N/A — POST-TENSIONING ANCHORS: There shall be no evidence of corrosion or spalling in the vicinity of post-tensioning or end fittings. Coil anchors shall not have been used. (Tier 2: Sec. 4.3.3.5)

Lateral-Force-Resisting System

C NC N/A — REDUNDANCY: The number of lines of moment frames in each principal direction shall be greater than or equal to 2 for Life Safety and Immediate Occupancy. The number of bays of moment frames in each line shall be greater than or equal to 2 for Life Safety and 3 for Immediate Occupancy. (Tier 2: Sec. 4.4.1.1.1)

C NC N/A — INTERFERING WALLS: All concrete and masonry infill walls placed in moment frames shall be isolated from structural elements. (Tier 2: Sec. 4.4.1.2.1)

C NC N/A — SHEAR STRESS CHECK: The shear stress in the concrete columns, calculated using the Quick Check procedure of Section 3.5.3.2, shall be less than the greater of 100 psi or $2\sqrt{f'c}$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.1)

C NC N/A — AXIAL STRESS CHECK: The axial stress due to gravity loads in columns subjected to overturning forces shall be less than $0.10f'_c$ for Life Safety and Immediate Occupancy. Alternatively, the axial stresses due to overturning forces alone, calculated using the Quick Check procedure of Section 3.5.3.6, shall be less than $0.30f'_c$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.2)

Connections

C NC N/A — CONCRETE COLUMNS: All concrete columns shall be doweled into the foundation for Life Safety, and the dowels shall be able to develop the tensile capacity of reinforcement in columns of lateral-force-resisting system for Immediate Occupancy. (Tier 2: Sec. 4.6.3.2)

3.7.8S Supplemental Structural Checklist for Building Type C1: Concrete Moment Frames

This Supplemental Structural Checklist shall be completed where required by Table 3-2. The Basic Structural Checklist shall be completed prior to completing this Supplemental Structural Checklist.

Lateral-Force-Resisting System

C NC N/A — FLAT SLAB FRAMES: The lateral-force-resisting system shall not be a frame consisting of columns and a flat slab/plate without beams. (Tier 2: Sec. 4.4.1.4.3)

C NC N/A — PRESTRESSED FRAME ELEMENTS: The lateral-force-resisting frames shall not include any prestressed or post-tensioned elements where the average prestress exceeds the lesser of 700 psi or $f'_c/6$ at potential hinge locations. The average prestress shall be calculated in accordance with the Quick Check procedure of Section 3.5.3.8. (Tier 2: Sec. 4.4.1.4.4)

C NC N/A — CAPTIVE COLUMNS: There shall be no columns at a level with height/depth ratios less than 50 percent of the nominal height/depth ratio of the typical columns at that level for Life Safety and 75 percent for Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.5)

C NC N/A — NO SHEAR FAILURES: The shear capacity of frame members shall be able to develop the moment capacity at the ends of the members. (Tier 2: Sec. 4.4.1.4.6)

C NC N/A — STRONG COLUMN/WEAK BEAM: The sum of the moment capacity of the columns shall be 20 percent greater than that of the beams at frame joints. (Tier 2: Sec. 4.4.1.4.7)

C NC N/A — BEAM BARS: At least two longitudinal top and two longitudinal bottom bars shall extend continuously throughout the length of each frame beam. At least 25 percent of the longitudinal bars provided at the joints for either positive or negative moment shall be continuous throughout the length of the members for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.8)

C NC N/A — COLUMN-BAR SPLICES: All column bar lap splice lengths shall be greater than $35d_b$ for Life Safety and $50d_b$ for Immediate Occupancy, and shall be enclosed by ties spaced at or less than $8d_b$ for Life Safety and Immediate Occupancy. Alternatively, column bars shall be spliced with mechanical couplers with a capacity of at least 1.25 times the nominal yield strength of the spliced bar. (Tier 2: Sec. 4.4.1.4.9)

C NC N/A — BEAM-BAR SPLICES: The lap splices or mechanical couplers for longitudinal beam reinforcing shall not be located within $l_b/4$ of the joints and shall not be located in the vicinity of potential plastic hinge locations. (Tier 2: Sec. 4.4.1.4.10)

C NC N/A — COLUMN-TIE SPACING: Frame columns shall have ties spaced at or less than $d/4$ for Life Safety and Immediate Occupancy throughout their length and at or less than $8d_b$ for Life Safety and Immediate Occupancy at all potential plastic hinge locations. (Tier 2: Sec. 4.4.1.4.11)

C NC N/A — STIRRUP SPACING: All beams shall have stirrups spaced at or less than $d/2$ for Life Safety and Immediate Occupancy throughout their length. At potential plastic hinge locations, stirrups shall be spaced at or less than the minimum of $8d_b$ or $d/4$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.12)

C NC N/A — JOINT REINFORCING: Beam-column joints shall have ties spaced at or less than $8d_b$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.13)

C NC N/A — JOINT ECCENTRICITY: There shall be no eccentricities larger than 20 percent of the smallest column plan dimension between girder and column centerlines. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.1.4.14)

C NC N/A STIRRUP AND TIE HOOKS: The beam stirrups and column ties shall be anchored into the member cores with hooks of 135° or more. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.1.4.15)

C NC N/A DEFLECTION COMPATIBILITY: Secondary components shall have the shear capacity to develop the flexural strength of the components for Life Safety and shall meet the requirements of Sections 4.4.1.4.9, 4.4.1.4.10, 4.4.1.4.11, 4.4.1.4.12 and 4.4.1.4.15 for Immediate Occupancy. (Tier 2: Sec. 4.4.1.6.2)

C NC N/A FLAT SLABS: Flat slabs/plates not part of lateral-force-resisting system shall have continuous bottom steel through the column joints for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.6.3)

Diaphragms

C NC N/A DIAPHRAGM CONTINUITY: The diaphragms shall not be composed of split-level floors and shall not have expansion joints. (Tier 2: Sec. 4.5.1.1)

C NC N/A PLAN IRREGULARITIES: There shall be tensile capacity to develop the strength of the diaphragm at re-entrant corners or other locations of plan irregularities. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.1.7)

C NC N/A DIAPHRAGM REINFORCEMENT AT OPENINGS: There shall be reinforcing around all diaphragm openings larger than 50 percent of the building width in either major plan dimension. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.1.8)

Connections

C NC N/A UPLIFT AT PILE CAPS: Pile caps shall have top reinforcement and piles shall be anchored to the pile caps for Life Safety, and the pile cap reinforcement and pile anchorage shall be able to develop the tensile capacity of the piles for Immediate Occupancy. (Tier 2: Sec. 4.6.3.10)

APPENDIX F

HAZARDOUS CONSTRUCTION MATERIALS SURVEY

Resolve Environmental & Geotechnical, Inc

HAZARDOUS CONSTRUCTION MATERIALS SURVEY FORMER FIREHOUSE 215 SOUTH LINCOLN STREET PORT ANGELES, WASHINGTON

Resolve Project 11-009
April 18, 2011

Prepared for:

Krazan & Associates, Incorporated
1230 Finn Hill Road; Ste. C
Poulsbo, Washington 98370

Prepared by:

Resolve Environmental & Geotechnical, Inc.
8842 NE Lacey Street
Indianola, Washington 98342
(360) 297-8870

TABLE OF CONTENTS

LIST OF APPENDICES

April 18, 2011 Resolve Project 11-009

HAZARDOUS CONSTRUCTION MATERIALS SURVEY
FORMER FIREHOUSE; 215 SOUTH LINCOLN STREET
PORT ANGELES, WASHINGTON

1.0 INTRODUCTION

Resolve Environmental & Geotechnical (Resolve) was retained by Krazan & Associates to conduct an assessment of potentially-regulated building materials that may be impacted during potential retrofit and restoration of the former firehouse building structure located at 215 South Lincoln Street, Port Angeles, Washington. The regulated materials included as part of this study include potential asbestos containing materials (ACM) and lead (Pb)-containing paint (LCP/LBP), as well as other potentially-regulated building materials such as polychlorinated biphenyls (PCB)-containing fluorescent light ballasts and mercury (Hg)-containing fluorescent tubes and thermostatic switches. Site inspection and sample collection was conducted by an AHERA-certified building inspector (Resolve representative Mr. Ronald Nance, P.G.) on April 7, 2011. This survey was performed in accordance with Resolve's proposal 11-009, dated February 1, 2011, and with federal, state and local regulatory requirements.

1.1 Objective

The objective of the survey was to evaluate and collect samples sufficient to document the presence (or absence) of asbestos, lead, and other potentially-regulated materials within the structure on the subject site prior to demolition. This assessment did not include areas beyond the „footprint' of the structure or the main body of the roof of the structure (unless specifically noted within this report). The asbestos survey was conducted in accordance with the "Good Faith" asbestos survey requirements in the Washington Administrative Code (WAC) 296-62-07721, (Communication of Hazards to Employees) as required by the Puget Sound Clean Air Agency (PSCAA) for buildings that are scheduled for remodel or demolition. The lead-containing paint assessment was conducted to provide information to assist the owner and/or general contractor in complying with WAC 296-155-176 (Lead in Construction) and the Washington State Department of Ecology (WDOE) Dangerous Waste Regulations (WAC 173-303). The identification and assessment of other potentially regulated building materials was conducted to provide information to assist in complying with the WDOE Dangerous Waste Regulation WAC 173-303-9904.

1.2 Scope of Work

The scope of services for the regulated materials assessment was limited to the following tasks:

- Perform a "Good Faith" inspection to identify the presence, location, and quantity of ACM and presumed asbestos-containing materials (PACM) that may be impacted by the potential retrofit project. Materials identified as suspect or presumed materials were sampled in accordance with Asbestos Hazard Emergency Response Act (AHERA) sampling requirements Code 40 of Federal Regulations (CFR) 763.86, and analyzed by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory for the presence and quantity of asbestos. Samples were analyzed using polarized light microscopy (PLM) per Environmental Protection Agency (EPA) Method 600/R-93/116.

- Lead-containing paint assessment to provide information to assist in complying with WAC 296-155-176 (Lead in Construction) and the Washington State Department of Ecology (WDOE) Dangerous Waste Regulations (WAC 173-303). Samples were analyzed by Atomic Absorption Spectrophotometric Analysis, per Method SW 846-7420 for weight percent of lead.

- Visual identification/quantification of other potentially regulated building materials such as PCB-containing electrical devices (i.e. fluorescent lighting ballasts), as well as potentially Hg-containing fluorescent lighting lamps and thermostatic switches.

- Incorporation of the results of the survey into this report which includes a description of survey methodology, material descriptions, sample location drawings, results of sample analysis, and approximate material quantities (if determined to be asbestos containing) as applicable.

Building inspection and sample collection was performed while the former firehouse was unoccupied. Other inspectors and persons representing other organizations were present in the building part-time during the survey. The area was first briefly inspected by walkthrough, in order to determine that materials in the building were represented in samples collected for homogeneous (miscellaneous), thermal system insulation (TSI), surfacing materials, and other potential hazardous materials. At the time of the building inspection, energized utilities were servicing the structure. A generalized photo log of the building was undertaken prior to initiation of the inspection. Selected photographs are attached to this report.

2.0 SITE DESCRIPTION

The subject site consists of the former firehouse building structure located at 215 South Lincoln Street, Port Angeles, Washington. The attached Figure 1 is a vicinity map for the location of the site. The structure inspected in this study was a two-story structure and associate utility areas. The structure is masonry, concrete, and some interior and exterior wood framed areas. Please refer to Figures 2A, 2B, and 2C; Sample Location Diagrams, for building layout and sample locations.

The main and upper floors of the site had areas covered by floor tiles, vinyl sheeting, and paint. The interior walls of the building are mostly wallboard coated with paint. The basement floor was concrete. Some plaster-coated walls, wooden walls, and brick walls were observed in some areas. Ceilings were varied, with drop-down panels of a composite material in some areas, mesh and plaster in other areas, and wood or wallboard in other areas. Fluorescent lighting was observed throughout the building.

3.0 ASBESTOS

Asbestos is a naturally occurring mineral fiber that was widely used as an insulating and binding material in building construction and commercial products. Asbestos is a recognized human carcinogen and has come under stringent regulatory action regarding its handling and application. In the mid-1970s, the use of asbestos was severely restricted in the United States by the Environmental Protection Agency (EPA). The EPA defines ACM as any material which contains more than one percent asbestos.

Typically, the more hazardous forms of asbestos are those that are considered "friable". Friable refers only to ACM that, when dry, may be crumbled, pulverized or reduced to powder by hand pressure. Occupational exposure to asbestos is regulated by the Federal Government through the Occupational Safety and Health Administration (OSHA) and at the state level by the Washington State Department of Labor and Industries (WSDLI). Regulation of asbestos emissions in most of western Washington is regulated by the Puget Sound Clean Air Agency (PSCAA). PSCAA also defines ACM as any material which contains more than one percent asbestos. However, WSDLI may consider materials containing trace amounts (e.g. less than one percent) of asbestos a potential health hazard to those employees handling such materials.

3.1 Sampling Methodology

A „walk-through' inspection of accessible areas was conducted to identify suspect ACM and PACM. The asbestos survey was performed by an AHERA-certified building inspector in accordance with sampling protocol appropriate for the demolition or remodeling of such structures. The sampling

protocol was modeled after 40 CFR 763, the PSCAA, Regulation III, Article 4, and by Washington State Department of Labor and Industries (WSDLI) Regulation WAC 296-62-077021.

Due diligence was exercised to collect samples in a manner sufficient to determine whether the suspect materials were ACM or not ACM. Selective demolition to access hidden or concealed materials was conducted in those locations where past experience has shown suspect ACM may be located. However, construction techniques can render portions of the building inaccessible. As a result, additional ACM may be present in inaccessible areas (e.g., within wall cavities, under debris or similarly inaccessible areas). *If suspect ACM not identified in this report are found during the demolition, such materials should be presumed to contain asbestos until characterized.*

3.1.1 Sampling and Sample Documentation

Suspect ACM were grouped into homogeneous sampling areas (HSA) and categorized according to 40 CFR 763, as thermal systems insulation (TSI), surfacing material, or miscellaneous material. The sampling plan included, at a minimum, the collection and analysis of samples as follows:

Thermal System Insulation

- *In a distributive manner, the collection of a minimum of three (3) samples of each HSA that was not presumed to contain asbestos.*
- *At least one (1) bulk sample from each homogenous area of patched TSI if the patch was less than six square feet.*

Surfacing Material

- *In a distributive manner, a minimum of three (3) samples were collected from each homogenous area that was 1,000 square feet or less.*
- *A minimum of five (5) samples were collected from each homogenous area that was greater than 1,000 square feet but less than or equal to 5,000 square feet. A minimum of seven (7) samples were collected from each homogenous area that was greater than 5,000 square feet.*

Miscellaneous Material

- *In a distributive manner as deemed sufficient by the Inspector. At least one (1) sample was collected of each suspect miscellaneous material not presumed to contain asbestos.*

Non-Suspect Materials

- *According to 40 CFR 763-86(4), sampling of the following materials are not required where the accredited inspector has deemed the material to be fiberglass, foam glass, rubber, or other recognized non-ACM.*

Representative samples were selected for laboratory analysis from each of the homogeneous areas. Samples were collected by carefully removing small portions of the suspect material with a sharp knife or other hand tool suitable to the material being sampled. Each sample was placed in a labeled plastic container immediately after collection. Sample containers were then placed in a large re-sealable plastic bag for transportation to the laboratory. The sampling instrument was wiped with a clean moist cloth to decontaminate the tool and minimize the potential release of asbestos fibers or contamination of subsequent samples. Data pertinent to each sample (e.g., date, sample number, material description, and material category) was recorded on a field data sheet. Figures 2A, B, and C are floor plans that have been modified to identify approximate asbestos sample locations. Photographs of selected building areas noted during the survey, are Attached to this report. Other photographs are available upon request.

3.1.2 Laboratory Analysis

A total of 33 bulk samples were sent to the laboratory as part of the survey. Asbestos bulk samples were transported the morning following the survey under chain-of-custody to Seattle Asbestos Testing (SAT) Laboratories for testing utilizing appropriate protocol for asbestos analysis. SAT Laboratories participates in the NVLAP for quality control procedures. As specified in 40 CFR Chapter I (1-187 edition) Part 763, Subpart F, Appendix A, each sample was analyzed using PLM/dispersion staining techniques, in accordance with EPA Method 600/R-93/116. The regulated benchmark for determining whether a material is considered asbestos-containing is approximately one percent by volume. Materials containing more than one percent asbestos are considered to be ACM. The laboratories perform re-analysis of 10 percent of bulk samples for the purpose of internal quality control. Laboratory analytical data reports and chain of custody forms are provided in Appendix A.

3.2 Asbestos Sample Results

Table 1 (*Bulk Asbestos Fiber Analysis*) includes the sample number, sample location, sample description, percent asbestos, and homogeneous sampling area and is listed below. Samples shown to contain greater than one percent asbestos by volume are shown in bold text.

Table 1 – Summary of Asbestos Sample Analytical Data

Sample Number	Sample Location	Sample Material Description	Percent Asbestos / Friable or Non Friable[1]	Homogenous Area Type
M-1	Main floor NW	Carpet and mastic	None Detected	Miscellaneous
M-2	Main floor entry	Beige vinyl and mastic	None Detected	Miscellaneous
M-3	**Main floor general**	**Whitish beige vinyl and mastic**	**Gray fibrous material with mastic 50%**	**Miscellaneous**
M-4	**Main floor subfloor**	**Leveling compound/mortar**	**Trace mastic 2%; Brown brittle material 2%**	**Miscellaneous**
M-5	Main Floor E. and sporadic	Beige base and mastic	None Detected	Miscellaneous
M-6	Main floor bathrooms	Layer 1 of floor tiles and glue	None Detected	Miscellaneous
M-7	Main floor bathroom hallway	Dk. base and mastic	None Detected	Miscellaneous
M-8	**Main floor bathrooms**	**Layer 2 of floor tiles and glue**	**Gray material and mastic 50%**	**Miscellaneous (Potentially friable)**
M-9	**Main floor bathrooms**	**Layer 3 of floor tiles and glue**	**Gray material and mastic 50%**	**Miscellaneous (Potentially friable)**
M-10	Main floor main room/ SE corner room.	Wallboard and paper	None Detected	Miscellaneous
M-11	Main floor east	9 x 9 floor tiles and mastic (poss. 2 varieties?)	None Detected	Miscellaneous

Sample Number	Sample Location	Sample Material Description	Percent Asbestos / Friable or Non Friable[1]	Homogenous Area Type
M-12	**Main floor SW**	**Pipe joint compound and cloth**	**Cloth Non-detect Powder 16%**	**TSI (Friable)**
M-13	**Main floor SW**	**Pipe wrap and cloth**	**Cloth Non-detect Powder 55%**	**TSI (Friable)**
M-14	Main floor North side	Wallboard, mud, tape	None Detected	Miscellaneous
M-15	Main floor South side	Wallboard, mud, tape	None Detected	Miscellaneous
M-16	Main floor west room	Carpet and Mastic/glue	None Detected	Miscellaneous
M-17	Main floor dividing hall	Inner wall mortar/plaster/concrete	None Detected	Miscellaneous
M-18	Roof around edges	Black tar-like sealant	None Detected	Miscellaneous
M-19	Roof of bldg	Roofing materials	None Detected	Miscellaneous; Friable
M-20	Main floor south side	Beige base and mastic	None Detected	Miscellaneous
U-1	Upper floor ceiling	Dropdown ceiling material	None Detected	Miscellaneous
U-2	Upper floor central	Purple/blue carpet and glue	None Detected	Miscellaneous
U-3	Upper floor south side	White spotted tile and mastic	None Detected	Miscellaneous
U-4	Upper floor storage rooms	Red, blue, gray tiles and mastic	None Detected	Miscellaneous
U-5	Upper floor common	Wallboard and tape	None Detected	Miscellaneous
U-6	Upper floor central attic	Pyrobar blocks/insulation	None Detected	TSI
U-7	Upper floor central walls and ceiling	Mesh plaster	None Detected	Miscellaneous
U-8	Upper floor east central	Wallboard, mud, tape	None Detected	Miscellaneous
U-9	Upper floor ceiling east/central	White square ceiling tiles	None Detected	Miscellaneous
U-10	**Upper floor kitchen/shelf area**	**Ceramic tile and glue**	**Brown/Gray mastic 3%**	**Miscellaneous (Non-friable)**

Sample Number	Sample Location	Sample Material Description	Percent Asbestos / Friable or Non Friable[1]	Homogenous Area Type
B-1	Basement central	Brick mortar	None Detected	Miscellaneous
B-2	Basement windows, south side	Window putty	None Detected	Miscellaneous
E-1	Exterior east	Window putty	None Detected	Miscellaneous
EA-2	W. Central exterior wall	Mortar	None Detected	Miscellaneous
EA-3	W. wall main bricks	Mortar	None Detected	Miscellaneous
EA-4	Large brick basement area	Mortar	None Detected	Miscellaneous
EA-5	Exterior east	Concrete and mortar	None Detected	Miscellaneous

[1]Notes. The friability listed is an assessment of the materials during inspection and is based upon general consulting practices. Friability may be a function of how the material is handled during removal. The reference listed herein is based upon the material in its in-place condition. Owners/General Contractors should rely upon the properly-trained asbestos-abatement professionals and specifications to determine friability during removal/demolition processes.

3.3 Asbestos Conclusions

Laboratory analysis identified detectable percentages of asbestos in seven of the samples collected from the structure with concentrations greater than 1%. These samples were from the whitish-beige vinyl and mastic in the entry of the main floor; the leveling compound/mortar in the subfloor in the main room of the main floor; layers 2 and 3 of the tile and mastic of the main floor bathrooms; the powder and fiber compound within the heating pipe wrap and elbows; and the ceramic tile and glue on the trim of the upstairs kitchen area. Should any additional materials be identified which are considered suspect which have not already been sampled as part of this study, Resolve recommends that such materials be sampled prior to their disturbance.

When any materials are identified as asbestos during the course of the demolition project, current federal, state, and local regulations require that a licensed asbestos-abatement contractor and trained workers remove ACM. Prior to abatement of ACM, current regulations require that a "Notice of Intent" form be filed with the WSDLI and PSCAA at least 10 days prior to commencement of the removal project. The WSDLI requires pre-abatement air monitoring and clearance air sampling upon completion of the asbestos abatement project. An asbestos removal project is not complete until the analytical results from clearance samples indicate that the residual fiber levels in the ambient air are within acceptable limits.

Following removal of the ACM and assumed ACM, asbestos-containing debris must be disposed of at a landfill that accepts asbestos waste in accordance with the current federal, state, and local regulations. As previously noted, there is a possibility that other suspect materials may be present. Contractors should use caution when performing demolition activities within the project areas even after the completion of asbestos abatement. Should demolition activities discover additional concealed suspect ACM not already sampled, workers should avoid damaging those materials until they have been properly sampled, analyzed and abated in accordance with local, state, and federal regulations.

A copy of this report must be provided to contractors bidding on work and each contractor must have a copy of this report during any scheduled demolition activities at the site. However, it is important to note

that this document is not intended to be used for abatement bidding or specification purposes and should not be used as such.

4.0 LEAD-CONTAINING COATINGS

Lead containing paint (LCP), also known as Lead Based Paint (LBP) is a potential hazard because paint may contribute to dust inside or outside of a structure. Abrasion of friction surfaces (opening and closing windows), peeling, flaking or chalking as leaded paint ages, or as a result of disturbance such as scraping, sanding, or demolition of lead paint coated materials may contribute to lead dust. Lead dust is of concern because the smaller particles are more easily absorbed by the body. In 1971, the federal government passed the Lead-Based Paint Poisoning Prevention Act (LBPPPA), which defined lead-based paint for the first time. In 1977, the LBPPPA was amended and the definition of lead-based paint was changed to paint containing more than 0.06% lead by weight or 600 parts per million (ppm). In 1990, the United States Department of Housing and Urban Development (HUD) published the first national compilation of technical protocols, practices, and procedures on testing and abatement of lead-based paint. In 1995, HUD published *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*, which replaces the 1990 HUD guidelines. The 1995 HUD guidelines consider a lead-based paint hazard to exist and require abatement if paint contains lead of an amount greater than or equal to 0.5% by weight (5,000 ppm), or greater than or equal to 1.0 milligram per square centimeter (mg/cm^2). The HUD guidelines only apply to Public Housing Agencies and Indian Housing Authorities, but do serve as a guideline with which to compare.

The U.S. Department of Labor and the Washington State Department of Labor and Industries require that Washington State Construction Standards for Lead be followed during "new construction, alteration, repair, or demolition of structures, substrates, or portions thereof that contain lead, or materials containing lead." These standards consider any detectable concentration of lead to be a potential hazard during such construction activities. Therefore employees performing certain activities at a site where there is a possibility of exposure to lead dust may be required to wear respirators until air sample results can document that exposure to lead is below the permissible exposure limit (50 $\mu g/m^3$). Under working conditions, an action level of 30 $\mu g/m^3$ in air as an eight hour TWA has been established by OSHA (29 CFR 1910) and Washington State Construction Standard for Lead (WAC 296-155).

4.1 Sampling Methodology

The LCP survey was conducted under the supervision of an AHERA-Certified Building Inspector experienced with and certified in identification and collection of LCP samples (Mr. Ronald Nance). In an effort to evaluate the possible presence of lead containing surface coatings, representative samples of paint and varnished surfaces were collected from each surface with a distinct painting history. Sample locations were selected to be representative of paint color combinations found within the buildings. Paint color, condition, evidence of layering, type of substrate, and location of painted areas were factors for selecting sample locations.

Paint chip samples were obtained by scraping paint layers away from substrates with a steel knife blade. Approximately one square inch of paint coating was removed for each sample. Samples were then placed into two-ounce, puncture resistant, poly bags and labeled with individual sample numbers. After each sample, the sampling blade was cleaned to reduce the possibility of sample cross-contamination.

Most paint surfaces were inspected for signs of deterioration and found to be in generally fair to good condition, with some exceptions as noted in Table 2. Specific paint-coated surfaces on the structure included interior gypsum wall systems, utility areas, exterior metal trim and railings, and well as interior and exterior wooden and concrete surfaces.

4.1.1 Laboratory Analysis

A total of 10 paint chip samples were obtained from representative coatings during this survey. Samples were transported the day following the survey under chain-of-custody to Friedman & Bruya (F&B)

Laboratories of Seattle for testing utilizing appropriate protocol for lead analysis. F&B Laboratories participates in the NVLAP for quality control procedures. It is understood that the samples are processed by a United States Environmental Protection Agency (EPA)-accredited laboratory. Samples were analyzed by Atomic Absorption Spectrophotometric Analysis, Method SW 846-7420 for weight percent of lead.

4.1.2 Lead Sample Results

Table 2 (*Summary of Lead Analytical Data*) below includes the sample number, sample description, sample location, detectable lead concentration, and the condition of the painted areas sampled:

Table 2 – Summary of Lead Analytical Data

Sample Number	Sample Description (color)	Sample Location	Lead in ug/g (ppm) & Percentage	Condition
MLBP-1	Orange and yellow	Main floor n wall	265	good
MLBP -2	White	Main floor E wall	<10	good
MLBP -3	Red	Main floor E wall	<10	fair
MLBP -4	Dark Green	Main floor Ceiling area	15.9	good
ULBP -1	**Gray green**	**Upper floor stairway and rails**	**22,900**	**good**
ULBP -2	Salmon	Upper floor concrete floor	1,290	good
ELBP-1	Brown	Exterior of bldg, rails	47.4	Fair to poor
ELBP-2	Salmon	Exterior of bldg, ubiquitious	1,210	good
ELBP-3	**Brown/blk**	**Exterior of bldg, windows and trim**	**6,980**	**good**
ELBP-4	**Blue**	**Exterior of bldg, west side entrance**	**11,300**	**Fair to good**

4.2 Lead Conclusions

Laboratory analysis identified paint chips from seven of the samples submitted for analysis as containing lead in concentrations less than 0.5 percent by weight (5,000 ppm). However, as seen in the table above, three of the ten samples submitted for analysis were reported as containing concentrations of lead greater than 5,000 ppm. While those painted surfaces less than 5,000 ppm do not exceed the HUD standard for „Lead-Based Paint', they are reported to contain detectable concentrations of lead. The U.S. Department of Labor and the Washington State Department of Labor and Industries require that the Washington State Construction Standards for Lead is followed during "new construction, alteration, repair, or demolition of structures, substrates, or portions thereof that contain lead, or materials containing lead." These standards consider *any* detectable concentration of lead to be a potential hazard during such construction activities, and therefore employees performing certain activities at a site where there is possible exposure to lead dust will be required to wear respirators until air sample results can document that exposure to lead is below the permissible exposure limit of 50 $\mu g/m^3$. Under working conditions, an action level of

30 μg/m^3 in air as an eight hour TWA has been established by OSHA (29 CFR 1910) and Washington State Construction Standard for Lead (WAC 296-155). Based upon the construction/demolition activities proposed at the subject site it is considered likely workers' exposures would exceed the WSDLI action limit of 30 micrograms per cubic meter (μg/m3) in some areas during demolition.

Those samples with detected concentrations above 5,000 ppm are subject to abatement requirements, as described in the introduction to this section (Section 4.0). Those paints with greater than 5,000 ppm are the gray/green paint on the upper floor stairways and rails; the brown and black exterior paints on trim and windows; and, the blue paint on the exterior of the building, west side entrance. These paints should be treated as hazardous materials.

For the paints with less than 5,000 ppm, if the materials coated with LCP is to be disposed of as part of demolition, some or all of the demolition debris may be subject to the requirements of WSDOE (WAC 173-303-090). According to WAC 173-303-090, a solid waste which exceeds five milligrams per liter [mg/l (ppm)] in the Toxicity Characteristic Leachate Procedure (TCLP) for lead would be designated a *dangerous* waste for the purposes of disposal (vs. *hazardous*). Based upon lead concentrations reported from the laboratory, it is anticipated that general demolition of the painted debris stream may classify as dangerous waste. It may be considered prudent to conduct TCLP sampling for the purpose of waste characterization be conducted prior to demolition to determine if the demolitions debris classifies as a dangerous waste as defined by 173-303-090. This procedure estimates the overall percentage of lead in the waste stream.

5.0 OTHER REGULATED BUILDING MATERIALS

5.1 Fluorescent Light Ballasts

If ballasts do not carry a "No PCBs" label, it should be assumed that the ballast is PCB-containing unless determined otherwise by laboratory analytical testing. The EPA through the Toxic Substance Control Act (TSCA) PCB Regulations 40 CFR 761 governs the handling and transportation of PCBs. Special precaution should be applied to prevent skin contact if leaking PCB ballasts are encountered. Leaky ballasts and light fixtures affected by PCB-containing oils must be handled in accordance with EPA's PCB Regulations 40 CFR 761. Workers with 40 hour hazardous waste training may be required for removal or handling of leaking PCB ballasts. The disposal of assumed or confirmed PCB-containing ballasts is regulated under the Dangerous Waste Regulations as a dangerous waste source (WAC 173-303-9904). However, ballasts are sometimes excluded from these regulations when regulated by the federal Toxic Substances Control Act. These exclusions are identified in WAC 173-303-071(3) (k). In addition, used, non-leaking ballasts may be recycled whether or not they contain PCBs.

Approximately 10 percent of fluorescent light ballasts were examined in the course of the investigation. Many of the ballasts were older, however most were labeled as containing "No PCBs". Resolve recommends that all fluorescent light ballasts in the structure be handled and disposed of as if they were PCBs-containing (due to the cost of analytical testing versus disposal costs).

5.2 Fluorescent Lamps

Some fluorescent lamps commonly contain mercury (Hg) which is considered harmful to the environment and human health. Currently, the EPA is contemplating the regulatory status of spent fluorescent lamps under the federal Resource Conservation and Recovery Act (RCRA). The WSDOE has adopted an interim policy on the disposal of fluorescent lamps and provides the following guidance:

- The recycling of fluorescent lamps by a reputable recycling company is the preferred management method.
- If fluorescent lamps are disposed of in solid waste landfills permitted under Chapter 173-351 WAC to receive municipal solid waste, WSDOE will not take enforcement action.
- Fluorescent lamps may not be sent to a municipal waste incinerator or demolition landfill.

- The crushing of fluorescent lamps prior to transport is not recommended for recycling or disposal unless equipment specifically designed to control the loss of mercury vapor is used. In addition, measures should be taken to prevent breakage of fluorescent lamps while the lamps are in transit to their destination.
- Generators who suspect that their lamps would be designated as hazardous waste may wish to send them to a permitted hazardous waste treatment, storage and disposal (TSD) facility for liability reasons.

It is noted that fluorescent tube manufacturers are changing production methods so that lower levels of mercury are injected into each lamp. Typically, "green tipped" tubes do not contain enough mercury to be considered a hazardous waste. These green-tipped tubes can therefore legally be disposed at landfills, although landfills have ultimate discretion over what they will accept. During our site inspection, the vast majority of the fluorescent light lamps observed appeared not to be "green tipped". Resolve recommends that if fluorescent lamps are observed that are not green tipped, they should be a part of the demolition waste stream that is disposed of in at a permitted waste facility. Resolve notes that it may be economically preferable to dispose of green tipped bulbs with the general waste stream.

5.3 Thermostatic Switches

Thermostatic switches often contain mercury (Hg) which is considered harmful to the environment and human health. Resolve observed likely Hg-containing thermostatic switches on two of the walls of the structure, although two others were electronic and contained no mercury. If such switches are found during demolition they should be disposed of properly if they are planned for removal.

6.0 LIMITATIONS

This survey and review of the subject property has been conducted in good faith and was limited in scope to those areas reasonably accessible at the time of the inspection. This investigation is undertaken with the risk that visual observations and random sampling alone would not reveal the presence, full nature, and extent of asbestos-containing materials. Resolve makes no representation as to the asbestos content of materials not sampled or that were inaccessible to our inspector (i.e., between walls, beneath floors, in pipe chases, etc.). The asbestos and lead sample locations are approximate, and are based on field notes and photos of sample locations. The opinions presented herein apply to the site conditions existing at the time of the investigation, and are based upon the interpretation of current regulations pertaining to asbestos, lead and other regulated materials. Opinions and recommendations provided herein may not apply to future conditions that may exist at the site. The findings presented in this report were based on field observations, random sampling and analysis, review of available data, and discussions with local regulatory and advisory agencies. Therefore, the data obtained are clear and accurate only to the degree implied by the sources and methods used. The information presented herein is based on professional interpretation using presently accepted methods with a degree of conservatism deemed proper as of the report date. We do not warrant that future technical developments cannot supersede such data.

Although some general quantities are listed on our sampling chain of custody forms in the Laboratory Results section of the report, ***this hazmat survey is not intended to be the sole basis for asbestos or lead containing paint removal bids. Confirmation of the condition and volume of the ACMs should be conducted by prospective removal contractors prior to accepting removal bids.***

Laboratory analysis was conducted by a laboratory accredited under the guidance of the EPA. The results of the analyses are accurate only to the degree of care exercised by the independent laboratories and the representative nature of the samples obtained.

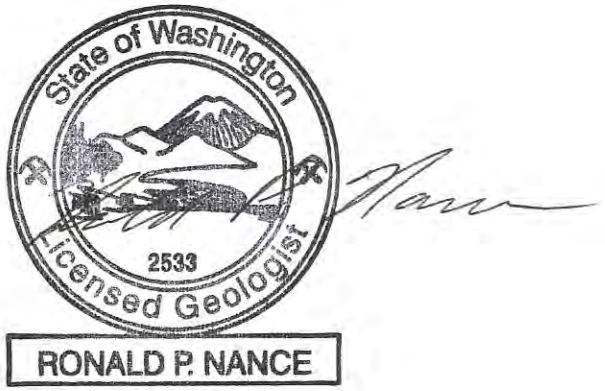
This report is provided for the exclusive use of the client noted on the cover page (Krazan & Associates) and their assigns, and is subject to the terms and conditions in the applicable contract between the client and Resolve. The named client is the only party to whom Resolve has explained the risks involved and has been involved in the shaping of the scope of services needed to satisfactorily manage those risks, if

any, from the client's point of view. Any third party use by the client's lender, prospective purchaser, or lessee will be subject to the terms and conditions governing the contractual work between the client and Resolve. The unauthorized use of, reliance on, or release of the information contained in this report, without the expressed written consent of Resolve is strictly prohibited and will be without risk or liability to Resolve.

We appreciate the opportunity to provide this service for you, and hope it provides the information needed for your project. Please feel free to call at any time if there are questions or concerns regarding this report, or if other services are required for the property. Our office phone number is (360) 297-8870, and the cell is (360) 865-1843.

Sincerely,

Resolve Environmental & Geotechnical, Inc.

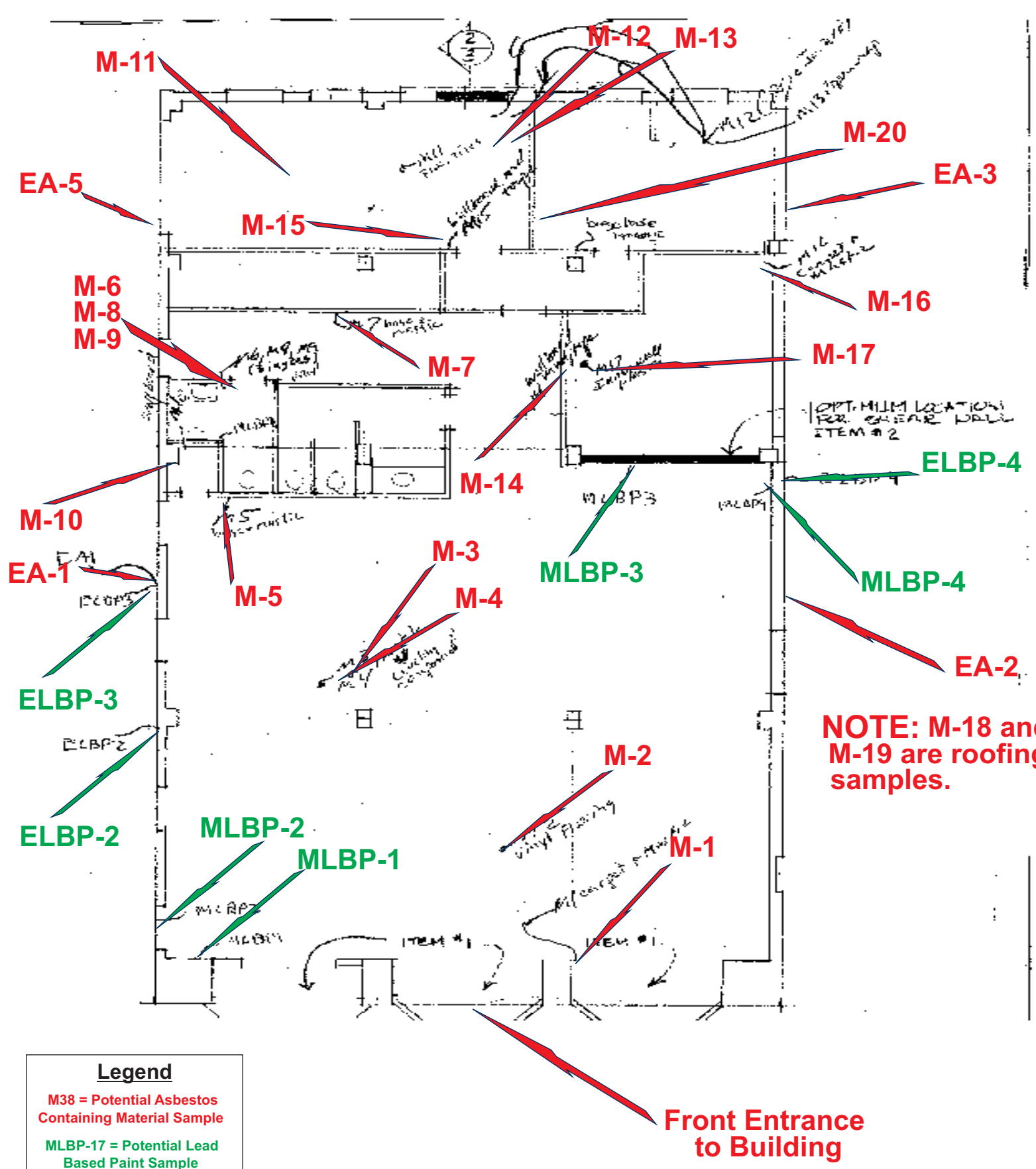


Ronald P. Nance, P.G.

Senior Geologist, Environmental Professional

VICINITY MAP

Resolve Environmental & Geotechnical, Inc. (360) 297-8870; Cell (360) 865-1843 resolveeg@comcast.net	**Figure 1** VICINITY MAP **Project No. 11-009** **Date: April, 2011**	**PROJECT:** **Hazardous Construction Materials Survey** **Former Firehouse** **215 South Lincoln Street** **Port Angeles, Washington** **Prepared for:** **Krazan & Associates, Inc.** N

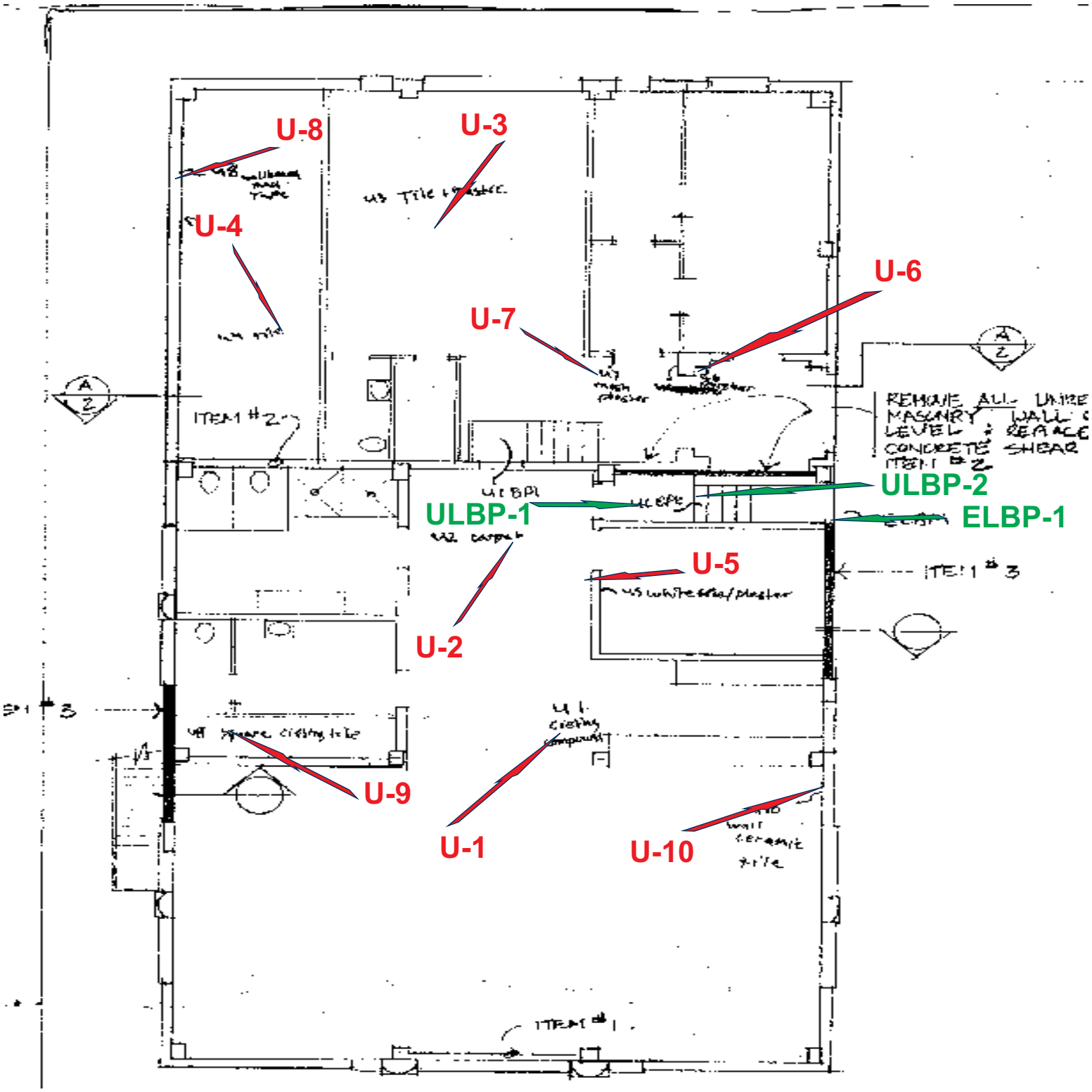


Legend

M38 = Potential Asbestos Containing Material Sample

MLBP-17 = Potential Lead Based Paint Sample

Resolve Environmental & Geotechnical, Inc. (360) 297-8870; Cell (360) 865-1843 resolveeg@comcast.net	FIGURE 2A Main Floor Sample Location Diagram PROJECT NO. 11-009 DATE: APRIL, 2011	PROJECT: Former Firehouse Hazmat Survey 215 South Lincoln Street Port Angeles, Washington Prepared for: Krazan & Associates N

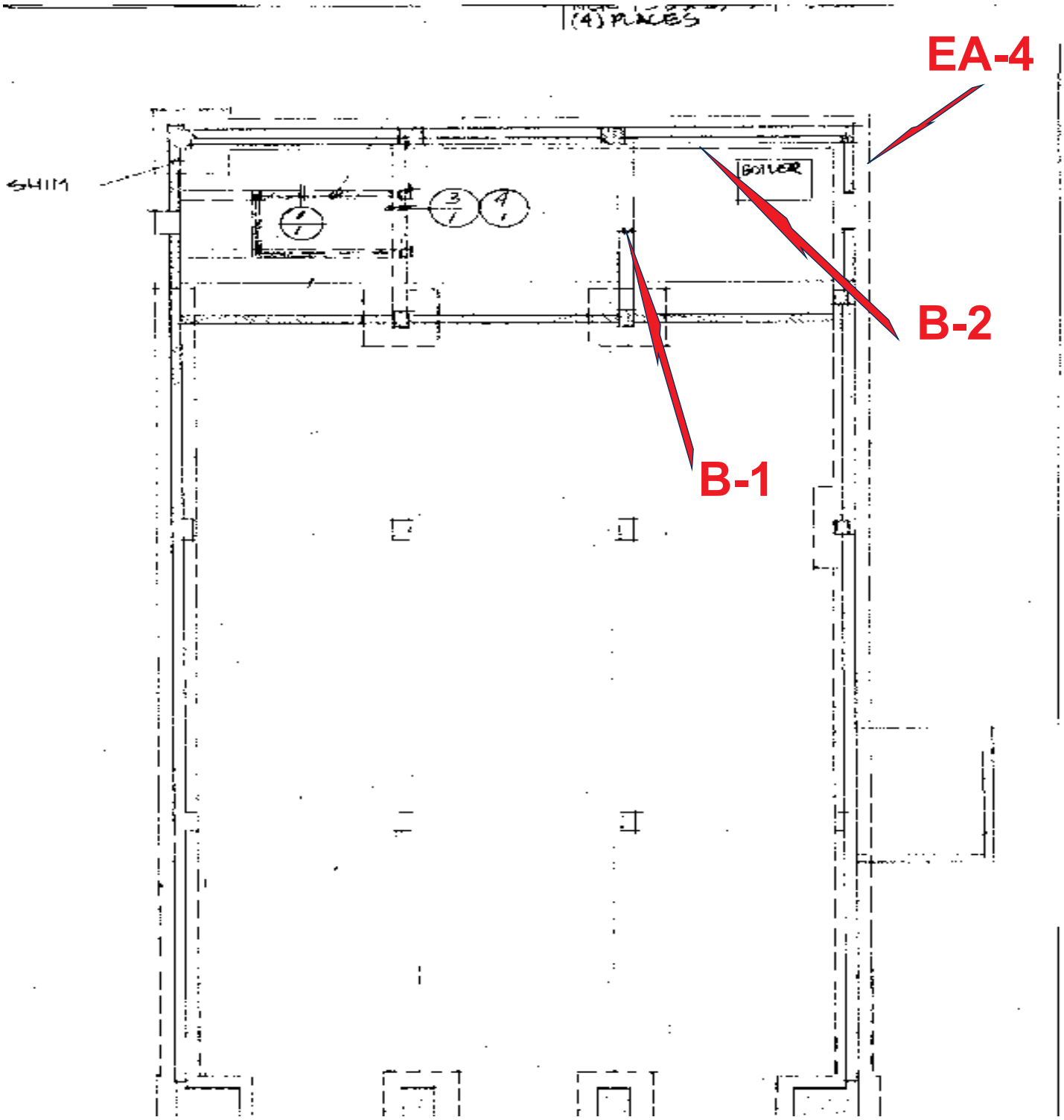


Legend

U38 = Potential Asbestos Containing Material Sample

ULBP-17 = Potential Lead Based Paint Sample

Resolve Environmental & Geotechnical, Inc. (360) 297-8870; Cell (360) 865-1843 resolveeg@comcast.net	FIGURE 2B Upper Floor Sample Location Diagram PROJECT NO. 11-009 DATE: APRIL, 2011	PROJECT: Former Firehouse Hazmat Survey 215 South Lincoln Street Port Angeles, Washington Prepared for: Krazan & Associates N



Legend

B-9 = Potential Asbestos Containing Material Sample

MLBP-17 = Potential Lead Based Paint Sample

Resolve Environmental & Geotechnical, Inc.

(360) 297-8870; Cell (360) 865-1843
resolveeg@comcast.net

FIGURE 2C
Basement Sample Location Diagram

PROJECT NO. 11-009
DATE: APRIL, 2011

PROJECT:
Former Firehouse Hazmat Survey
215 South Lincoln Street
Port Angeles, Washington
Prepared for:
Krazan & Associates

N

LABORATORY RESULTS

201110582

4/7/11

SEATTLE ASBESTOS TEST, LLC
19711 Scriber Lake Road, Suite D, Lynnwood, WA 98036
Tel: (425) 673-9850 Fax: (425) 673-9810
www.seattleasbestostest.com
Accredited, Experienced, Insured, and Well Managed!

NVLAP Accredited, 200768-0

CHAIN OF CUSTODY

ANALYSIS: BULK ASBESTOS TEST___, POINT COUNT (400)___, POINT COUNT (1000)___, POINT COUNT (Gravimetric)___, Other_____

Client Name Resolve E+G
Address 8842 NE Lacey ST City Indianola ST WA ZIP 98342
Phone: Fax: Email: resolveE&G@comcast.net
Project Location: PA Firehouse 215 S. Lincoln Proj. Manager: Jeff Bowers
Turn Around Time 5D Number of Samples ____ Client Job # 11-009
Sample Condition: Good_____ Damaged_____ Severe Damage(Spillage)_____

	SEQ#	CLIENT SAMPLE #	SAMPLE DESCRIPTION	LAB ID	A/R
± 40 sf	1	[redacted] M1	NW Carpet + Mastic		
± 200 sf	2	M2	Beige Vinyl + Mastic Near Entrance		
± 800 SF Ubiquitous	3	M3	Main Room Beige-Whitish Vinyl + Mastic		
	4	M4	Concrete/mortar/Levelling Subfloor		
	5	M5	E. Base + Mastic (Beige - Throughout)		
± 225 SF	6	M6	Layer 1 of 3 Bathrooms		
≈ 40 LF	7	M7	S. Base + Mastic		
± 225 SF each	8	M8	Layer 2 of Bathroom Floor		
	9	M9	Layer 3 of Bathroom Floor		
≈ 400 SF	10	M10	wallboard Sink Rm, SE corner of Main Entrance/lobby		
300 SF	11	M11	9x9 floor tiles + mastic (2 types??)		
≈ 30 LF	12	M12	Pipe Joint Compound + cloth		
≈ 6'	13	M13	Pipe wrap + cloth		
ubiq. ubiq.	14	M14	N. side wallboard, mud tape		
	15	M15	S. side wallboard, mud, tape		
150 SF	16	M16	carpet + mastic		
?	17	M17	Inner wall mortar/concrete subst.		
Roof	18	M18	Roof Tar Sealant		
Roof	19	M19	Roofing Material + Flue		
	20	M1	Ceiling Panel Material Main		

	Print Name	Signature	Company Name	Date	Time
Sampled	Ronald P. Vance	Ronald P. Vance	Resolve E+G	4/ /11	
Relinquished					
Delivered					
Received	H. Mummey	H. Mummey	SAT	4/8/11	1135
Analyzed	H. Mummey	H. Mummey	SAT	4/14/11	1015
Reported					

Result reporting method: Phone___, Fax___, Email X, Pick-up report___

201110582

SEATTLE ASBESTOS TEST, LLC

Lynnwood Lab: 19711 Seriber Lake Road, Suite D, Lynnwood, WA 98036, T:425.673.9850, F:425.673.9810
Bellevue Lab: 12727 Northup Way, Suite 24, Bellevue, WA 98005, T:425.861.1111, F:425.861.1118
Email: admin@seattleasbestostest.com, website: www.seattleasbestostest.com
NVLAP Lab Code: Lynnwood: 200768-0, Bellevue: 200876-0

Analyzing Quality

4/7/11

Batch#: _____

CHAIN OF CUSTODY

CLIENT INFORMATON

Select from list, or type a new location

METHOD (SELECT ONE)

◯ Bulk Asbestos (PLM) ◯ PointCount400 ◯ PointCount1000 ◯ Pt. Count Gravimetric ◯ Other (Specify)

PROJECT INFORMATION

# of Samples: _____ Job#: See Page 1 Project Location: _____

PROJECT MANAGERS (SELECT ONE OR MORE)

	Name	Phone	Email
☐	Amjad Khan		amjadkhan@krazan.com
☐	Jeff Mercer		jeffmercer@krazan.com
☐	Matthew Glennon		matthewglennon@krazan.com
☐	Phyllis Okello		phyllisokello@krazan.com
☐			

	Name	Phone	Email
☒	Ron Nance	360 865 1843	resolveEQ@comcast.net
☐	Eric Liaw		ericliaw@krazan.com
☐	Michael Angeles		michaelAngeles@Krazan.com
☐			
☐			

TURNAROUND TIME

◯ 1 Hour ◯ 2 Hours ◯ Same Day (4 to 6 hrs) ◯ 1 Day ◯ Number of Days:

SEQ#	CLIENT SAMPLE #	SAMPLE DESCRIPTION	GROUP	COMPOSITE	PT. COUNT
21	BA1	Mortar Brick Central Partition Wall			
22	BA2	Putty South Window			
23	E A1	Putty Around East window			
24	U2	Carpet Blue/Purple Central			
25	U3	White spotted Tile +Mastic South End			
26	U4	Red/Blue/grey Tile in Storage Room			
27	U5	White Plaster/Wallboard			
28	U6	~~Plaster Central South wall~~ pyro bar block			
29	U7	mesh Plaster ciel'ing South/Central			
30	U8	Wallboard/Mud/Tape East Central			
31	U9	White square ciel'ing tile east/central			
32	U10	Wall ceramic tile + glue			
33	M20	Biege Base +Mastic			
54					
55					
56					
57					
58					
59					
60					

	Print Name	Signature	Company Name	Date	Time
Sampled by	Select or Enter Name		~~Terracon~~ ResolveEQ	4/7/11	
Relinquished by			~~Terracon~~		
Delivered by					
Received by	H.Mummey		Seattle Asbestos Test, LLC	4/8/11	1135
Analyzed by	H.Mummey		Seattle Asbestos Test, LLC	4/14/11	1015
Reported by			Seattle Asbestos Test, LLC		

PREFERRED REPORTING METHOD ☐ Phone ☐ Fax ☐ Email ☐ Postal Mail

SEATTLE ASBESTOS TEST, LLC NVLAP Accredited - Bellevue:200876; Lynnwood:200768
Lynnwood Laboratory: 19711 Scriber Lake Rd, Suite D, Lynnwood, WA 98036; Tel: 425.673.9850, Fax:425.673.9810
Bellevue Laboratory: 12727 Northup Way, Suite 1, Bellevue, WA 98005; Tel: 425.861.1111, Fax: 425.861.1118
Website: http://www.seattleasbestostest.com, E-mail: admin@seattleasbestostest.com

ANALYTICAL LABORATORY REPORT

PLM by Method EPA/600/R-93/116

Attn.: Mr. Ronald Nance
Client: Resolve Environmental & Geotechnical, Inc.
Address: 8842 NE Lacey Street
Indianola, WA 98342

Client Job #: 11-009
Laboratory Batch #: 201110582
Date Received: 4/8/2011
Samples Received: 33
Date Analyzed: 4/13/2011
Samples Analyzed: 33

Project: PA Firehouse 215 S. Lincoln

Lab ID	Client Sample ID	Layer	Description	%	Asbestos Fibers	Non-Fibrous Components	%	Non-asbestos Fibers
1	M1	1	Gray woven fibrous material		None detected	Filler, Binder	87	Synthetic fibers
		2	Yellow mastic		None detected	Mastic/binder	3	Cellulose
		3	Gray sandy/brittle material		None detected	Sands, Filler	2	Cellulose
2	M2	1	Beige sheet vinyl		None detected	Vinyl/binder		None detected
		2	Gray fibrous material with mastic		None detected	Binder/filler, Mastic/binder	69	Cellulose
3	M3	1	Beige sheet vinyl		None detected	Vinyl/binder		None detected
		2	Gray fibrous material with mastic	50	Chrysotile	Binder/filler, Mastic/binder	33	Cellulose
4	M4	1	Trace mastic	2	Chrysotile	Mastic/binder, Filler	6	Cellulose
		2	Brown brittle material	2	Chrysotile	Sands, Filler	4	Cellulose
5	M5	1	Beige rubbery material		None detected	Rubber/binder	2	Cellulose
		2	White mastic		None detected	Mastic/binder	3	Cellulose
6	M6	1	Beige sheet vinyl		None detected	Vinyl/binder		None detected
		2	Gray fibrous material with mastic		None detected	Binder/filler, Mastic/binder	71	Cellulose
7	M7	1	Black rubbery material		None detected	Rubber/binder	2	Cellulose
		2	Brown mastic		None detected	Mastic/binder	6	Cellulose
8	M8	1	Beige sheet vinyl		None detected	Vinyl/binder		None detected
		2	Gray fibrous material with mastic	50	Chrysotile	Binder/filler, Mastic/binder	35	Cellulose
9	M9	1	Beige sheet vinyl		None detected	Vinyl/binder		None detected
		2	Gray fibrous material with mastic	50	Chrysotile	Binder/filler, Mastic/binder	34	Cellulose
10	M10	1	White chalky material with paper and paint		None detected	Binder/filler, Paint, Gypsum/binder	39	Cellulose, Glass fibers

Analyzed by: Heather Mummey

Report reviewed by: Steve (Fanyao) Zhang, President

SEATTLE ASBESTOS TEST, LLC NVLAP Accredited - Bellevue:200876; Lynnwood:200768
Lynnwood Laboratory: 19711 Scriber Lake Rd, Suite D, Lynnwood, WA 98036; Tel: 425.673.9850, Fax:425.673.9810
Bellevue Laboratory: 12727 Northup Way, Suite 1, Bellevue, WA 98005; Tel: 425.861.1111, Fax: 425.861.1118
Website: http://www.seattleasbestostest.com, E-mail: admin@seattleasbestostest.com

ANALYTICAL LABORATORY REPORT

PLM by Method EPA/600/R-93/116

Attn.: Mr. Ronald Nance
Client: Resolve Environmental & Geotechnical, Inc.
Address: 8842 NE Lacey Street
Indianola, WA 98342

Client Job #: 11-009
Laboratory Batch #: 201110582
Date Received: 4/8/2011
Samples Received: 33
Date Analyzed: 4/13/2011
Samples Analyzed: 33

Project: PA Firehouse 215 S. Lincoln

Lab ID	Client Sample ID	Layer	Description	%	Asbestos Fibers	Non-Fibrous Components	%	Non-asbestos Fibers
11	M11	1	White tile		None detected	Vinyl/binder, Mineral grains	3	Cellulose
		2	Yellow mastic		None detected	Mastic/binder	5	Cellulose
12	M12	1	White powdery material with woven fibrous material	16	Chrysotile	Binder/filler, Filler	33	Cellulose
13	M13	1	Gray woven fibrous material with paint		None detected	Binder/filler, Paint	68	Cellulose
		2	Gray fibrous material	55	Chrysotile	Filler, Fine particles	31	Cellulose
14	M14	1	Gray sandy/brittle material with paint		None detected	Sands, Filler, Paint	3	Cellulose
		2	White chalky material with paper		None detected	Binder/filler Gypsum/binder	24	Cellulose
15	M15	1	White powdery material with paint		None detected	Binder/filler, Paint	5	Cellulose
		2	White chalky material with paper		None detected	Binder/filler Gypsum/binder	28	Cellulose, Glass fibers
16	M16	1	Red/gray woven fibrous material		None detected	Filler, Binder	86	Synthetic fibers
		2	Yellow mastic		None detected	Mastic/binder	5	Cellulose
17	M17	1	White sandy/brittle material with paint		None detected	Sands, Filler, Paint, Perlite	3	Cellulose
18	M18	1	Black asphaltic material		None detected	Asphalt/binder, Binder/filler	4	Cellulose
19	M19	1	Black asphaltic material with sand		None detected	Asphalt/binder, Sand	31	Glass fibers
20	U1	1	Gray fibrous material with paint		None detected	Paint, Filler, Perlite	67	Cellulose
21	BA1	1	Red brittle material		None detected	Filler, Binder	3	Cellulose
		2	Gray sandy/brittle material		None detected	Sands, Filler	4	Cellulose
22	BA2	1	Beige brittle material with paint		None detected	Paint, Filler, Binder	2	Cellulose
23	EA1	1	Beige brittle material with paint		None detected	Paint, Filler, Binder	3	Cellulose

Heather Mummey

Analyzed by: Heather Mummey

Report reviewed by: Steve (Fanyao) Zhang, President

SEATTLE ASBESTOS TEST, LLC NVLAP Accredited - Bellevue:200876; Lynnwood:200768
Lynnwood Laboratory: 19711 Scriber Lake Rd, Suite D, Lynnwood, WA 98036; Tel: 425.673.9850, Fax:425.673.9810
Bellevue Laboratory: 12727 Northup Way, Suite 1, Bellevue, WA 98005; Tel: 425.861.1111, Fax: 425.861.1118
Website: http://www.seattleasbestostest.com, E-mail: admin@seattleasbestostest.com

ANALYTICAL LABORATORY REPORT

PLM by Method EPA/600/R-93/116

Attn.: Mr. Ronald Nance
Client: Resolve Environmental & Geotechnical, Inc.
Address: 8842 NE Lacey Street
Indianola, WA 98342

Client Job #: 11-009
Laboratory Batch #: 201110582
Date Received: 4/8/2011
Samples Received: 33
Date Analyzed: 4/13/2011
Samples Analyzed: 33

Project: PA Firehouse 215 S. Lincoln

Lab ID	Client Sample ID	Layer	Description	%	Asbestos Fibers	Non-Fibrous Components	%	Non-asbestos Fibers
24	U2	1	Gray/blue woven fibrous material		None detected	Filler, Binder	89	Synthetic fibers
		2	Yellow mastic		None detected	Mastic/binder	4	Cellulose
25	U3	1	White sheet vinyl		None detected	Vinyl/binder		None detected
		2	Woven gray fibrous material with mastic		None detected	Binder/filler, Mastic/binder	71	Cellulose
		3	Black vinyl		None detected	Vinyl/binder		None detected
		4	Woven gray fibrous material with mastic		None detected	Binder/filler, Mastic/binder	68	Cellulose
26	U4	1	White/gray vinyl		None detected	Vinyl/binder		None detected
		2	Woven gray fibrous material with mastic		None detected	Binder/filler, Mastic/binder	70	Cellulose
27	U5	1	White brittle material with paint		None detected	Filler, Binder, Paint	3	Cellulose
28	U6	1	White brittle material with paint		None detected	Filler, Binder, Paint	2	Cellulose
29	U7	1	Gray sandy/brittle material with paint		None detected	Sands, Filler, Paint	4	Cellulose
30	U8	1	Gray sandy/brittle material with paint		None detected	Sands, Filler, Paint	3	Cellulose
		2	White chalky material with paper		None detected	Binder/filler Gypsum/binder	27	Cellulose
31	U9	1	Brown fibrous material with paint		None detected	Filler, Paint	90	Cellulose
32	U10	1	White ceramic		None detected	Ceramic/binder		None detected
		2	Brown/gray mastic	3	Chrysotile	Mastic/binder	6	Cellulose
		3	White brittle/sandy material		None detected	Binder, Sands	3	Cellulose
33	M20	1	Beige rubbery material		None detected	Rubber/binder	2	Cellulose
		2	White mastic		None detected	Mastic/binder	4	Cellulose

Analyzed by: Heather Mummey

Report reviewed by: Steve (Fanyao) Zhang, President

SEATTLE ASBESTOS TEST, LLC
19711 Scriber Lake Road, Suite D, Lynnwood, WA 98036
Tel: (425) 673-9850 Fax: (425) 673-9810
www.seattleasbestostest.com
Accredited, Experienced, Insured, and Well Managed!

NVLAP Accredited, 200768-0

201110699

CHAIN OF CUSTODY

ANALYSIS: BULK ASBESTOS TEST X, POINT COUNT (400)___, POINT COUNT (1000)___, POINT COUNT (Gravimetric)___, Other_____

Client Name Resolve E+G

Address 8842 NE Laney ST City Indianola ST WA ZIP 98342

Phone: 360 297-8870 Fax: 360 865-1843 Email: resolveE&G@comcast.net

Project Location: PA Firehouse Proj. Manager: Ron Nance

Turn Around Time Same Day Number of Samples 4 Client Job # 11-009

Sample Condition: Good X Damaged_____ Severe Damage(Spillage)_____

SEQ#	CLIENT SAMPLE #	SAMPLE DESCRIPTION	LAB ID	A/R
1	EA2	Mortar; W. Central Bricks		
2	EA3	Mortar; West Wall High Bricks		
3	EA4	Mortar; Lg. Bricks around basement		
4	EA5	Concrete + Mortar; Lg Blocks E wall		
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

	Print Name	Signature	Company Name	Date	Time
Sampled	Ronald P. Nance	Ronald P. Nance	Resolve E+G	4/15/11	
Relinquished	same	→	→	→	→
Delivered	H. Mummey	H. Mummey	SAT	4/15/11	1020
Received					
Analyzed	H. Mummey	H. Mummey	SAT	4/16/11	1110
Reported					

RECEIVED

Result reporting method: Phone___, Fax___, Email X, Pick-up report___

Seattle Asbestos Test warrants the test results to be of a precision normal for the type and methodology employed for each sample submitted and disclaims any other warrants, expressed or implied, including warranty of fitness for a particular purpose and warranty of merchantability. Seattle Asbestos Test accepts no legal responsibility for the purpose for which the client uses the test results. By signing on this form the clients agree to relieve Seattle Asbestos Test of any liability that may arise from the test results. Invoices paid late may be charged of interest, and invoices go to collection may be charged 17% to 25% of collection fee. Checks with NSF will be charged $50.

SEATTLE ASBESTOS TEST, LLC

NVLAP Accredited - Bellevue:200876; Lynnwood:200768

Lynnwood Laboratory: 19711 Scriber Lake Rd, Suite D, Lynnwood, WA 98036; Tel: 425.673.9850, Fax:425.673.9810

Bellevue Laboratory: 12727 Northup Way, Suite 1, Bellevue, WA 98005; Tel: 425.861.1111, Fax: 425.861.1118

Website: http://www.seattleasbestostest.com, E-mail: admin@seattleasbestostest.com

ANALYTICAL LABORATORY REPORT

PLM by Method EPA/600/R-93/116

Attn.: Mr. Ronald Nance
Client: Resolve Environmental & Geotechnical, Inc.
Address: 8842 NE Lacey Street
Indianola, WA 98342

Client Job #: 11-009
Laboratory Batch #: 201110699
Date Received: 4/15/2011
Samples Received: 4
Date Analyzed: 4/15/2011
Samples Analyzed: 4

Project: PA Firehouse

Lab ID	Client Sample ID	Layer	Description	%	Asbestos Fibers	Non-Fibrous Components	%	Non-asbestos Fibers
1	EA2	1	Gray sandy/brittle material		**None detected**	Sands, Filler	6	Cellulose
2	EA3	1	Red brittle material		**None detected**	Filler, Binder	2	Cellulose
		2	Gray sandy/brittle material		**None detected**	Sands, Filler, Mica	3	Cellulose
3	EA4	1	Gray sandy/brittle material		**None detected**	Sands, Filler	4	Cellulose
4	EA5	1	Red brittle material with paint		**None detected**	Filler, Binder, Paint	3	Cellulose
		2	Gray sandy/brittle material		**None detected**	Sands, Filler	5	Cellulose

Analyzed by: Heather Mummey

Report reviewed by: Steve (Fanyao) Zhang, President

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Charlene Morrow, M.S.
Yelena Aravkina, M.S.
Bradley T. Benson, B.S.
Kurt Johnson, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
TEL: (206) 285-8282
FAX: (206) 283-5044
e-mail: fbi@isomedia.com

April 18, 2011

Ron Nance, Project Manager
Resolve E&G
8842 NE Lacey St
Indianola, WA 98342

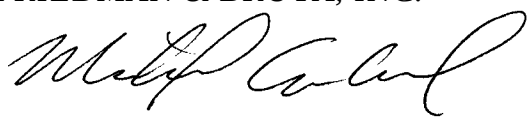
Dear Mr. Nance:

Included are the results from the testing of material submitted on April 8, 2011 from the Port Angeles Firehouse 11-009, F&BI 104081 project. There are 14 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl
Project Manager

Enclosures
RSL0418R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on April 8, 2011 by Friedman & Bruya, Inc. from the Resolve E&G Port Angeles Firehouse 11-009, F&BI 104081 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Resolve E&G
104081-01	MLPP-1
104081-02	MLBP-2
104081-03	MLBP-3
104081-04	MLBP-4
104081-05	ULBP-1
104081-06	ULBP-2
104081-07	ELBP-1
104081-08	ELBP-2
104081-09	ELBP-3
104081-10	ELBP-4

All quality control requirements were acceptable.

Analysis For Total Metals By EPA Method 200.8

Client ID:	MLPP-1	Client:	Resolve E&G
Date Received:	04/08/11	Project:	Port Angeles Firehouse 11-009, F&BI 104081
Date Extracted:	04/13/11	Lab ID:	104081-01
Date Analyzed:	04/13/11	Data File:	104081-01.056
Matrix:	Solid	Instrument:	ICPMS1
Units:	mg/kg (ppm)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	94	60	125

Analyte:	Concentration mg/kg (ppm)
Lead	265

Analysis For Total Metals By EPA Method 200.8

Client ID:	MLBP-2	Client:	Resolve E&G
Date Received:	04/08/11	Project:	Port Angeles Firehouse 11-009, F&BI 104081
Date Extracted:	04/13/11	Lab ID:	104081-02
Date Analyzed:	04/13/11	Data File:	104081-02.057
Matrix:	Solid	Instrument:	ICPMS1
Units:	mg/kg (ppm)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	94	60	125

Analyte:	Concentration mg/kg (ppm)
Lead	<10

Analysis For Total Metals By EPA Method 200.8

Client ID:	MLBP-3	Client:	Resolve E&G
Date Received:	04/08/11	Project:	Port Angeles Firehouse 11-009, F&BI 104081
Date Extracted:	04/13/11	Lab ID:	104081-03
Date Analyzed:	04/13/11	Data File:	104081-03.058
Matrix:	Solid	Instrument:	ICPMS1
Units:	mg/kg (ppm)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	96	60	125

Analyte:	Concentration mg/kg (ppm)
Lead	<10

Analysis For Total Metals By EPA Method 200.8

Client ID:	MLBP-4	Client:	Resolve E&G
Date Received:	04/08/11	Project:	Port Angeles Firehouse 11-009, F&BI 104081
Date Extracted:	04/13/11	Lab ID:	104081-04
Date Analyzed:	04/13/11	Data File:	104081-04.059
Matrix:	Solid	Instrument:	ICPMS1
Units:	mg/kg (ppm)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	97	60	125

Analyte:	Concentration mg/kg (ppm)
Lead	15.9

Analysis For Total Metals By EPA Method 200.8

Client ID:	ULBP-1	Client:	Resolve E&G
Date Received:	04/08/11	Project:	Port Angeles Firehouse 11-009, F&BI 104081
Date Extracted:	04/13/11	Lab ID:	104081-05
Date Analyzed:	04/13/11	Data File:	104081-05.060
Matrix:	Solid	Instrument:	ICPMS1
Units:	mg/kg (ppm)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	97	60	125

Analyte:	Concentration mg/kg (ppm)
Lead	22,900

Analysis For Total Metals By EPA Method 200.8

Client ID:	ULBP-2	Client:	Resolve E&G
Date Received:	04/08/11	Project:	Port Angeles Firehouse 11-009, F&BI 104081
Date Extracted:	04/13/11	Lab ID:	104081-06
Date Analyzed:	04/13/11	Data File:	104081-06.061
Matrix:	Solid	Instrument:	ICPMS1
Units:	mg/kg (ppm)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	97	60	125

Analyte:	Concentration mg/kg (ppm)
Lead	1,290

Analysis For Total Metals By EPA Method 200.8

Client ID:	ELBP-1	Client:	Resolve E&G
Date Received:	04/08/11	Project:	Port Angeles Firehouse 11-009, F&BI 104081
Date Extracted:	04/13/11	Lab ID:	104081-07
Date Analyzed:	04/13/11	Data File:	104081-07.063
Matrix:	Solid	Instrument:	ICPMS1
Units:	mg/kg (ppm)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	97	60	125

Analyte:	Concentration mg/kg (ppm)
Lead	47.4

Analysis For Total Metals By EPA Method 200.8

Client ID:	ELBP-2	Client:	Resolve E&G
Date Received:	04/08/11	Project:	Port Angeles Firehouse 11-009, F&BI 104081
Date Extracted:	04/13/11	Lab ID:	104081-08
Date Analyzed:	04/13/11	Data File:	104081-08.064
Matrix:	Solid	Instrument:	ICPMS1
Units:	mg/kg (ppm)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	97	60	125

Analyte:	Concentration mg/kg (ppm)
Lead	1,210

Analysis For Total Metals By EPA Method 200.8

Client ID:	ELBP-3	Client:	Resolve E&G
Date Received:	04/08/11	Project:	Port Angeles Firehouse 11-009, F&BI 104081
Date Extracted:	04/13/11	Lab ID:	104081-09
Date Analyzed:	04/13/11	Data File:	104081-09.065
Matrix:	Solid	Instrument:	ICPMS1
Units:	mg/kg (ppm)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	97	60	125

Analyte:	Concentration mg/kg (ppm)
Lead	6,980

Analysis For Total Metals By EPA Method 200.8

Client ID:	ELBP-4	Client:	Resolve E&G
Date Received:	04/08/11	Project:	Port Angeles Firehouse 11-009, F&BI 104081
Date Extracted:	04/13/11	Lab ID:	104081-10
Date Analyzed:	04/13/11	Data File:	104081-10.066
Matrix:	Solid	Instrument:	ICPMS1
Units:	mg/kg (ppm)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	95	60	125

Analyte:	Concentration mg/kg (ppm)
Lead	11,300

Analysis For Total Metals By EPA Method 200.8

Client ID:	Method Blank	Client:	Resolve E&G
Date Received:	Not Applicable	Project:	Port Angeles Firehouse 11-009, F&BI 104081
Date Extracted:	04/13/11	Lab ID:	I1-272 mb
Date Analyzed:	04/13/11	Data File:	I1-272 mb.053
Matrix:	Solid	Instrument:	ICPMS1
Units:	mg/kg (ppm)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	93	60	125

Analyte:	Concentration mg/kg (ppm)
Lead	<10

Date of Report: 04/18/11
Date Received: 04/08/11
Project: Port Angeles Firehouse 11-009, F&BI 104081

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOLID SAMPLES FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Lead	mg/kg (ppm)	500	106	106	81-120	0

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

A1 – More than one compound of similar molecule structure was identified with equal probability.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for this range fell outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte indicated may be due to carryover from previous sample injections.

d - The sample was diluted. Detection limits may be raised due to dilution.

ds - The sample was diluted. Detection limits are raised due to dilution and surrogate recoveries may not be meaningful.

dv - Insufficient sample was available to achieve normal reporting limits and limits are raised accordingly.

fb - Analyte present in the blank and the sample.

fc – The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. The variability is attributed to sample inhomogeneity.

ht - Analysis performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of normal control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j – The result is below normal reporting limits. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The analyte result in the laboratory control sample is out of control limits. The reported concentration should be considered an estimate.

jr - The rpd result in laboratory control sample associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the compound indicated is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc – The sample was received in a container not approved by the method. The value reported should be considered an estimate.

pr – The sample was received with incorrect preservation. The value reported should be considered an estimate.

ve - Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

104081

SAMPLE CHAIN OF CUSTODY ME 04/08/11 AE

Page # 1 of 1

Send Report To Ron Vance
Company Resolve E+G
Address 8842 NE Lacey
City, State, ZIP Indianola WA
Phone # 360 297-8870 Fax # 360 585-1843 Call

SAMPLERS (signature) Ronald P Vance
PROJECT NAME/NO. Port Angeles Firehouse
PO # 11-009
REMARKS p/s, email results; resolveE&G@comcast.net

TURNAROUND TIME
☒ Standard (2 Weeks)
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☒ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

Sample ID	Lab ID	Date	Time	Sample Type	# of containers	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260	SVOCs by 8270	HFS	Lead in Paint					Notes
		4/7/11				ANALYSES REQUESTED											
MLPP-1 orange/yellow	01	4/7/11	4/8/11 Milbay	Paint chip	1							X					
MLBP-2 White	02	"	"	"	1							X					
MLBP-3 Red	03	"	"	"	1							X					
MLBP-4 Pk Green	04	"	"	"	1							X					
ULBP-1 Gray-Green	05	"	"	"	1							X					
ULBP-2 Salmon	06	"	"	"	1							X					
ELBP-1 Brown	07	"	"	"	1							X					
ELBP-2 Salmon	08	"	"	"	1							X					
ELBP-3 Brn/Blk	09	"	"	"	1							X					
ELBP-4 Blue	10	"	"	"	1							X					

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Ronald P Vance	Ronald P Vance	Resolve E+G	4/8/11	10:30A
Received by:	Nhan Phan	Nhan Phan	FEBI	4/8/11	1030
Relinquished by:					
Received by:					

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FORMS\COC\COC.DOC

Samples received at 17 °C

SELECTED PHOTOGRAPHS

1. Main entrance to former firehouse. Several exterior paints were sampled to be tested as suspect LBPs.

2. View from main floor interior toward front entrance to building. Visible carpet, vinyl, floor tiles, drop down ceilings, and paints were sampled.

Actual Photo Date: April 7, 2011
Former Firehouse, 215 S. Lincoln, Port Angeles, WA

3. Upper floors also had floor tiles, vinyl, painted concrete, and LBPs. Samples of wallboard and tape, and plaster wall and ceiling coverings were collected.

4. Bathrooms on the upper floors and throughout the building had a variety of floor coverings that were sampled.

Actual Photo Date: April 7, 2011
Former Firehouse, 215 S. Lincoln, Port Angeles, WA

5. Tanks and piping in the basement may have been part of the former heating system. No LBP samples were collected in the basement, as no significant painted surfaces were observed.

6. The relict boiler was located in the basement.

Basement suspect AMC samples included mortar from bricks and window putty.

Actual Photo Date: April 7, 2011
Former Firehouse, 215 S. Lincoln, Port Angeles, WA

7. Exterior samples included mortar, window putty, roofing materials, and mastics.

8. Some plaster coatings and wall materials were found throughout the building. There were other unusual building compounds such as *Pyroblock* and some fibrous "hollow" ceramics.

Actual Photo Date: April 7, 2011
Former Firehouse, 215 S. Lincoln, Port Angeles, WA

APPENDIX G

GEOTECHNICAL ENGINEERING INVESTIGATION

Resolve

Environmental & Geotechnical, Inc.

GEOTECHNICAL ENGINEERING INVESTIGATION
FORMER FIREHOUSE
215 S. LINCOLN STREET
PORT ANGELES, WASHINGTON

RESOLVE PROJECT 11-009-3
MAY 16, 2011

PREPARED FOR:

KRAZAN & ASSOCIATES, INC.
1230 FINN HILL ROAD; STE. C
POULSBO, WASHINGTON 98370

Prepared by:

RESOLVE ENVIRONMENTAL & GEOTECHNICAL, INC.
8842 NE LACEY STREET, INDIANOLA, WA 98342
OFFICE (360) 297-8870; CELL (360) 865-1843

***Resolve** Environmental*
& Geotechnical, Inc

Resolve Project 11-009-3

May 16, 2011

KRAZAN & ASSOCIATES, INC.
1230 Finn Hill Road Ste. C
Poulsbo, Washington 98370

(360) 598-2126

Attention Mr. Jeff Bowers

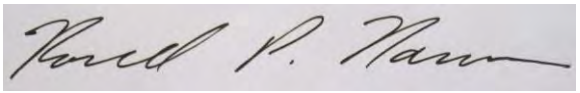
Re: Geotechnical Engineering Investigation Report
Former Firehouse
Port Angeles, Washington

Dear Mr. Bowers:

In accordance with our agreements and our proposal dated February 1, 2011, we have completed the Geotechnical Engineering Investigation for the project referenced above. The results of our investigation are presented in the attached report.

If you have any questions or if we can be of further assistance, please do not hesitate to contact us at (360) 297-8870, or (360) 865-1843.

Respectfully submitted,
Resolve Environmental & Geotechnical, Inc.



Ronald P. Nance, P.G.
Senior Project Geologist

GEOTECHNICAL ENGINEERING INVESTIGATION
FORMER FIREHOUSE
215 S. LINCOLN STREET
PORT ANGELES, WASHINGTON

RESOLVE PROJECT 11-009-3
MAY 16, 2011

PREPARED FOR:

KRAZAN & ASSOCIATES, INC.
1230 FINN HILL ROAD; STE. C
POULSBO, WASHINGTON 98370

Prepared by:

RESOLVE ENVIRONMENTAL & GEOTECHNICAL, INC.
8842 NE LACEY STREET, INDIANOLA, WA 98342
OFFICE (360) 297-8870; CELL (360) 865-1843

TABLE OF CONTENTS

GEOTECHNICAL ENGINEERING INVESTIGATION
FORMER FIREHOUSE
215 S. LINCOLN STREET
PORT ANGELES, WASHINGTON 98362

INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the proposed retrofit/remodel of the former Port Angeles Firehouse, located at 215 South Lincoln Street, Port Angeles, Washington (Figure 1). Discussions regarding site conditions are presented herein, together with conclusions and recommendations pertaining to site preparation, excavations, structural fill, utility trench backfill, erosion control, drainage, foundations, and pavement design if access or parking paving is required.

A site plan showing the approximate exploratory borehole and excavation locations that were undertaken as part of this investigation is presented following the text of this report (Figure 2). The exploratory borehole logs are presented in Appendix A. Appendix B contains particle distribution graphs for selected soils encountered at the site (laboratory results). Appendix C contains selected photographs of the site taken during field exploration.

PURPOSE AND SCOPE of WORK

This investigation was conducted to evaluate the soil and groundwater conditions at the site, to develop geotechnical engineering recommendations for use in design of specific construction elements, and to provide criteria for site preparation and structural fill considerations.

Our scope of services was performed in general accordance with our proposal for this project, presented and accepted by Krazan & Associates, Incorporated (Krazan) and dated February 1, 2011 (Resolve Proposal No. 11-009). The investigation included the following:

- A site reconnaissance by a member of our geotechnical/engineering staff to evaluate the surface conditions at the project site.
- A field investigation consisting of advancing and sampling two exploratory boreholes adjacent to the building and visual observations of the slope to the south of the building. The boreholes were drilled to a total depth of approximately 50 feet below existing site grade (bgs).
- Evaluation of the data obtained from the investigation, laboratory results, and completion of engineering analyses to develop recommendations for use in the project design and preparation of construction specifications.
- Preparation of this report summarizing our findings, the results of our analyses and our conclusions and recommendations for this investigation.

PROJECT DESCRIPTION

Based on our on-site discussion regarding the subject property and review of some site plans, we understand that the proposed retrofit/remodel would include stabilization of the existing building and control of ongoing settlement. We expect that some engineered solutions to settling would be in order, and that some access corridors would need to be constructed. In the event that the structural, grading, or other information detailed in this report is inconsistent with the final design, Resolve should be notified so that we may update this writing as applicable.

SITE DESCRIPTION, RECONNAISSANCE, AND FIELD OBSERVATIONS

The subject site consists of the former Firehouse building structure located at 215 South Lincoln Street, Port Angeles, Washington. The attached Figure 1 is a vicinity map for the location of the site. The structure is a two-story building with a basement and associated utility areas. The structure is masonry, concrete, and some interior and exterior wood framed areas.

The site is currently developed with power service, water, sewer lines and other utilities. Paved community roadways provide general access to the property, with a local monument and building parking area to the west, and indirect eastern access via the Carnegie Library parking area.

The site topography observed in historical photographs of the site indicates that the pre-development property sloped eastward toward a ravine. There was a steeper slope at the eastern edge of the property. The entire area has evidently undergone significant cut and fill over the decades since development was initiated. It was unclear from borehole samples if some of the relict brick and debris retrieved from depths of up to eighteen feet was transported by fluvial/alluvial processes, or dumped and subsequently covered by fill operations. The sediments encountered by the borings were consistent with low energy deposits from stream or stormwater action. These sediments could have easily been moved in historical site operations.

The slope behind the southern edge of the building appears to be retreating to the north, losing face toward the south and the slope and properties below. Some of the young trees in the mid-bluff area were straight, indicating that no very recent sliding has occurred on that part of the slope. However, we understand from discussions with previous engineers who have worked on the site that settlement of the building and slope movement have been concerns for several years. Some relatively small-scale lobate sediment deposits were observed in places, indicating localized sliding/slumping. Traverse of the slope indicated that soft clays and silts made up the near-surface soils, which was also later verified by the boreholes above the slope.

Most of the slope is heavily vegetated with berries, salal bushes, and young trees. Some downed cedars and other large trees were observed on the sides of the hill. Attempts to drill a borehole on the side of the slope were aborted following repeated attempts to access the slope with a track-mounted rig that met with sideways sliding and balance too poor to advance the hole. A pathway was cut with machete, and a winch attached to the track rig from the truck-mounted rig in an attempt to reach a drillable area. The resulting setup proved too precarious to drill safely.

The slope is considered likely to continue to retreat incrementally at a gradual rate through occasional sliding or rotational slumping of soft clays. Retention by geologic/geotechnically engineered methods could be designed to mitigate the retreat and sliding, however costs of bulkheads, nail walls, pilings, etc. should be considered, as they are generally expensive. Given the building is at the top of the slope, it is considered likely that the moisture sensitivity and loose nature of the soils will produce adverse effects to the east side of the building over time. Resolve believes that some method of sliding/slumping control should be implemented for long-term stability of the building and slope.

The areas to the west, north, and south of the site are relatively level and not considered likely to have erosion problems. However, the soft and moisture-sensitive clays encountered on both the east and west sides of the building are considered likely to represent a continuing threat of building settling and other possible problems.

The property is bordered to the west by a parking area and memorial monument; to the east by a parking area and the Carnegie Library building; and to the project north by the expansive concrete entry walkway and Lincoln Street beyond.

GEOLOGIC SETTING

The site lies within the western Puget Lowland. The lowland is part of a regional north-south trending trough that extends from southwestern British Columbia to near Eugene, Oregon. North of Olympia, Washington, this lowland is glacially carved, with a depositional and erosional history including at least four separate glacial advances/retreats. The Puget Lowland is bounded to the west by the Olympic Mountains, and to the east by the Cascade Range. The lowland is filled with glacial and nonglacial sediments consisting of interbedded gravel, sand, silt, clay, till, and peat lenses.

The Washington Division of Geology and Earth Resources, Geologic Map of Washington – Northwest Quadrant (2002), indicates the property is located in an area that is primarily underlain by Quaternary Glacial Drift deposits (Qgd) and Glaciomarine sediments (Qgs). Glacial drift deposits are typically undifferentiated till, sand, gravel, silt, and clay. Many of the local deposits are considered reworked sediments, with human actions plotted in places on USGS maps.

A higher level of complexity of the geology in this area is added by the noted crustal rebound following final retreat of the glaciers, as well as proximity to the Elwha thrust fault. It is common to encounter relict stream/river deposits originating from paleo drainage patterns prior to galciation as well as relict ponded/valley areas that were developed with sediments following cutoff of original drainage. Glacial sediments encountered may have originated in the predominant sandstones of the Olympic Mountains, or from the northern Victorian glaciations that brought in granites and metamorphic rocks and more quartz-rich sands. The variable soil characteristics result from the mixing of all of these materials as they were overridden and incorporated by the glacial ice. Glacial drift is typically medium dense, dense, and very dense.

The United States Department of Agriculture (USDA) reports the site vicinity as being predominantly glacial materials and alluvial deposits, including Clallam Hoypus Gravelly Sandy Loam, Neilton very

Gravelly Loamy Sand, and Dystric Xerothents common to the region. Soils encountered in the field indicated that most are alluvium and outwash deposits, with some dense and very dense reworked glacial outwash at depth. Soils are described in detail in borehole and test pit logs in Appendix A, and in soils descriptions in this report.

FIELD INVESTIGATION

The field investigation of the site consisted of excavation and sampling of two boreholes and visual observations of the slope at the southern edge of the site. The field exploration was completed on April 26, 2011. The exploratory boreholes were advanced with a B-41 Truck-mounted drill rig. EDI Drilling Company performed the drilling work.

Borehole B1, located near the southwestern side of the building, was advanced to a depth of approximately 51.5 feet beneath the existing site grade (bgs). The borehole on the eastern side of the site, B2, was also advanced to a depth of approximately 51.5 feet bgs. Figure 2 shows the approximate locations of the exploratory boreholes. Representative samples of the subsurface soils encountered in the test pits and boreholes were collected and sealed in plastic bags. Selected, representative samples were transported to a laboratory for further examination and verification of the field classifications. All samples collected were examined and visually classified in accordance with the Unified Soil Classification System (USCS).

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. The laboratory testing focused on the evaluation of natural moisture content and gradation of the materials encountered. Details of the laboratory testing results are summarized in Appendix B. This information, along with the field observations, was used to prepare the final exploratory borehole logs, which are presented in Appendix A.

OBSERVED SOIL, SUBSURFACE CONDITIONS, and GROUNDWATER

The majority of the soils encountered in the exploratory boreholes were typical of those found in the geologic unit as described by the USGS and USDA for the area. The soils displayed the typical variations noted in glacial deposits.

Borehole B-1 was drilled about 10.5 feet to the (project) west of the building, and about 13 feet south of the concrete stairway at the first rise from the parking area. It first encountered asphalt, fill, and minor organic materials to about 1.5 feet bgs, with common roadbed materials. This was immediately underlain by light gray and light brown, damp, soft Clay (USCS CL) with silt. N values from this material were 3 to 8 blows per foot. The soft clay continued to about 30 feet bgs, where soils were gray, moist to saturated, medium dense to dense coarse sand (SP) with minor gravel, grading to dark gray, saturated, very dense, coarse sand (SP) with gravel and cobbles. This appeared to be overridden alluvium. Groundwater was encountered at a depth of about 33.5 feet bgs. At about 35 feet bgs, soils contained hydrocarbons, as indicated by odor and sheen on sediments. The dense and very dense sands continued downhole, with density increasing and relatively higher gravel content. Heaving gravel and

cobbles forced drilling refusal at a depth of approximately 51 feet. Terminal depth for the hole was nominally 50 feet bgs.

It is noted that due to the hydrocarbon contamination encountered in borehole B1, drilling tools had to be decontaminated prior to initiation of drilling at borehole B2. Augers and tools were loaded onto a trailer and taken to the local carwash, where an oil-water separator is located. The attendant at the car wash did not have any issues with the decontamination of the rods on the site, as the materials were hydrocarbons (much like engine oils or road oils). Photos of decon are attached to this report in the Selected Photographs section, Appendix. D.

Borehole B-2 was drilled about 12 feet (project) east of the eastern side of the building, and about 12.5 feet from the southern side of the building. This location was selected due to the obvious building settling in that area. Soils were very similar to those encountered in B1. Drilling first encountered asphalt, fill, and minor organic materials to about 1.0 foot bgs, with common roadbed materials. This was immediately underlain by light brown, damp, soft Clay (USCS CL) with silt. N values from this material were 3 to 10 blows per foot. The soft clay continued to about 30 feet bgs, and abruptly contacted the underlying gray, moist to saturated, medium dense to dense coarse sand (SP) with minor gravel. It is noted that the area from about 5 feet bgs to about 10 feet bgs contained hydrocarbons, as indicated by heavy odor and sheen on drilling tools. As in the previous borehole, gravel became a larger fraction downhole, with varying sand and gravel content. The sands graded to dark gray, saturated, very dense, coarse sand (SP) with gravel and cobbles. This appeared to be overridden alluvium. Groundwater was encountered at a depth of about 33.5 to 34 feet bgs. At about 35 feet bgs, soils contained hydrocarbons, as indicated by odor and sheen on sediments. It was not clear if contaminants were in the groundwater, as mixing with soils occurred during drilling. The dense and very dense sands continued downhole, with density increasing and relatively higher gravel content. As with borehole B1, heaving gravel and cobbles forced drilling refusal at a depth of approximately 51 feet. Terminal depth for the hole was nominally 50 feet bgs.

For additional information about exploratory excavations and boreholes, please refer to the logs presented in Appendix A. Specific particle distribution and moisture content graphics from selected samples as determined by laboratory Sieve Analysis are presented in Appendix B.

Groundwater was encountered in both of the boreholes at a depth of approximately 34 feet bgs. It should be recognized that water table elevations may fluctuate with time. The groundwater level will be dependent upon seasonal precipitation, land use, and climatic conditions, as well as other factors. Note that water levels at the time of the field investigation may be different from those encountered during operations on the project. The evaluation of factors such as water table fluctuation in the vicinity is beyond the scope of this report.

SEISMIC CONDITIONS

According to the 2009 International Building Code (IBC), the mapped maximum considered earthquake spectral response acceleration at short periods (S_S) and 1-second period (S_1) is to be determined from Figures 1613.5(1) and 1613.5(2) of the IBC. These maps delineate contours of spectral response acceleration expressed as a percent of gravity (g) at 5 percent critical damping for Site Class B. In this area, the mapped S_S and S_1 values (expressed in decimal form) are 1.17 g and 0.49 g, respectively.

Site class refers to the subsurface geologic conditions of the upper 100 feet of bearing material underlying the site. Site classes are defined in Table 16151.1, *Site Class Definitions* of the 2009 IBC, and range from A to F. The values from the maps are for Site Class B, which is defined as rock. Based on the soil conditions encountered and the local geology, we interpret the upper 100 feet of the underlying material to correspond to Site Class D, defined as medium dense soil with an average standard penetration test blow count (N-value) greater than 15 and less than 50. Accordingly, the values above should be modified per the code for use in the structural design.

Considering the geologic history of the area, and of the vicinity, the site will be subjected to some amount of ground shaking during a seismic event, the magnitude of which will vary depending on the location and magnitude of the earthquake. Although it was not in the scope of services to evaluate it, based on the soil and groundwater conditions we encountered, it is our opinion that the potential exists for slope failure or lateral spreading to occur on the rear portion of the site during an earthquake. The recommended underpinning of the structure (discussed and described below) will only protect the building and may not prevent loss of the slope.

CONCLUSIONS AND RECOMMENDATIONS

General

Based on the findings of this investigation and previous geotechnical experience in the project area, it is our opinion that the soils near the foundation of the structure are moisture sensitive and soft to a depth of up to 35 feet bgs. It is considered likely that settling of the building will continue without mitigation of the adverse geologic conditions. After consideration of the conditions at the site, specific recommendations are provided below:

It is our opinion that building settlement could be mitigated by pin piles or similar structural additions. Auger cast piles or other piling arrangements are also an option for the site, but access for installation would be difficult. Moreover, in advancing the auger cast piles, the upward cycling (or otherwise dealing with) the known hydrocarbon contamination in soils at the site may be exacerbated. We provide the following recommendations regarding structural support:

Pin Piles

In our opinion, pin piles can be used to underpin the foundation to address the settlement issues that have occurred at the southeast corner of the existing warehouse structure. The following recommendations and comments are offered for pin pile design and installation purposes.

Materials: For relatively low loads, pin piles typically consist of 2-inch-diameter Schedule-80 (2.375-inch O.D.) steel pipe. For higher loads, steel pipe diameters of 3, 4, or 6 inches are more commonly

selected. Due to the depth of soft deposits at this site, we recommend either 4 or 6 inch diameter piles. Individual pipe segments typically range from about 3 to 5 feet long and are successively joined with external threaded couplings, internal slip couplings, or butt welds as pile driving progresses.

Corrosion Considerations: Although we did not perform corrosivity tests on the site soils, our experience with similar soils indicates a low probability that the site soils are corrosive to steel. Consequently, we infer that conventional Schedule-80 pipe can be used for pin piles. Galvanized pipe could be used if desired, but soil conditions do not appear to warrant the added cost and complications associated with galvanizing.

Driving Conditions: We tentatively anticipate that the pin piles will first encounter bearing soils, comprised of very dense sand, at tip depths of about 35 feet below the ground surface at the southeast corner of the existing structure. However, because refusal depths are difficult to predict and because soil conditions could vary significantly across the site, the contractor should be prepared for variable pile lengths. Also, it may be necessary to modify pile layouts if rocks or other obstructions are encountered during pile-driving. Pile refusal is typically defined as achievement of a certain penetration rate based on the hammer type and pile size. Once the contractor's proposed equipment and the selected pile type are known, Resolve will be able to develop the refusal criteria for the tabulated loads.

Pile Butt Treatment: When refusal has been achieved, the pile butts can be cut off to a predetermined height or elevation. To provide a good bond between the piles and the existing foundation, reinforcing bars with 90-degree bends can be welded to the top of the pile or, alternatively, the top of the pile can be splayed apart.

Axial Load Capacities: In our opinion, a properly installed 4- or 6-inch-diameter pin pile driven to refusal (as defined above) will provide the following allowable axial capacities. These capacities assume a minimum pile spacing (center to center) of six diameters. Furthermore, the stated uplift capacities would be applicable only to pin piles that are installed with tension-resisting couplings.

Design Parameter	Allowable Value		
		4-inch-diameter	6-inch-diameter
Static Compressive Capacity		16,000 pounds	24,000 pounds
Transient Compressive Capacity		21,000 pounds	32,000 pounds
Transient Uplift Capacity		10,000 pounds	15,000 pounds

Load Testing: We understand that the some regulatory jurisdictions may require load testing for pin piles greater than 2 inches in diameter in order to verify their static compressive capacity. Specifically, they often require load testing of a percentage of all piles installed at the site. All tests must conform with the Quick Load Test Method per ASTM D-1143.

Although the slope behind (south of) the building appears to be relatively stable at this time, it is considered likely that sliding and slumping will continue through time, as soils are also moisture sensitive and vegetation is mostly shrubs and berries. If saturated, the clays on the slope will not be stable, particularly during an earthquake. It is our opinion that some method of slope stabilization would be a prudent addition to any stabilization efforts for the building.

Site Preparation

Should additions or reconstruction be undertaken for the building or on other portions of the site, general site clearing should include removal of former building materials, any wooden pilings, concrete debris, existing abandoned utility lines (if discovered during construction), or other debris in the subsurface that may impact the emplacement of new foundation system elements. These materials and the soft clays in the shallow subsurface will not be suitable for use as structural fill.

During wet weather conditions, typically October through May, subgrade stability problems and grading difficulties may develop due to excess moisture, disturbance of sensitive soils, and/or the presence of shallow groundwater. The on-site soft clay soils are considered very moisture sensitive. Over-excavation would be considered necessary for any utility trenches or interior foundation areas that would be developed, and soils on which these are emplaced should be confirmed through monitoring by a qualified geotechnical engineer or senior geologist. Soils used as structural fill materials that have been emplaced and become unstable may require drying and re-compaction.

Although none were observed in the building site area, any buried foundations or other structures encountered during retrofit or construction should be properly removed and backfilled. For any additions or new construction, excavations, depressions, or soft and pliant areas extending below the planned finish subgrade levels should be cleaned to firm undisturbed soil, and backfilled with structural fill. In general, any relict septic tanks, underground storage tanks, debris pits, cesspools, or similar structures should be completely removed. The resulting excavations should be backfilled with structural fill. As previously mentioned, structural support system should be founded in the dense to very dense materials below 30 feet bgs.

A representative of Resolve should be present during any underpinning operations, site clearing and grading operations, or slope stabilization operations to observe operations associated with geologic conditions and backfill. This testing and observation is considered an integral part of engineering services, as acceptance of construction is dependent upon stability of the material. A geotechnical engineer or engineering geologist may reject materials or conditions that do not meet stability requirements. Further recommendations, contained in this report are predicated upon the assumption that construction and retrofit activities will conform to the recommendations set forth in this section.

Structural Fill

Best Management Practices (BMP's) should be followed when considering the suitability of material for use as structural fill. As previously mentioned, the upper 35 feet of soft clays encountered in the boreholes are generally not considered suitable for structural upgrades or reuse as structural fill. Any imported structural fill material should consist of well-graded gravel or a sand-and-gravel mixture with a maximum grain size of 1½ inches and less than 5 percent fines (material passing the U.S. Standard No. 200 Sieve). Structural fill material should be discussed with or submitted for inspection and approval to the geotechnical engineer at least 48 hours prior to delivery to the site to avoid excess costs of using inappropriate material.

Any fill soils utilized in retrofit or new construction activities should be placed in horizontal lifts not exceeding 10 inches loose thickness, moisture-conditioned as necessary, (moisture content of soil shall not vary by more than ±2 percent of optimum moisture) and the material should be compacted to at least

95 percent of the maximum dry density based on ASTM Test Method D1557. In-place density tests should be performed on structural fill placed in any pad areas to verify proper moisture content and adequate compaction. Additional lifts should not be placed if the previous lift did not meet the compaction requirements or if soil conditions are not considered stable.

Temporary Excavations

Should any be required in the course of building stabilization or re-construction activities, temporary excavations should be sloped no steeper than 1½H:1V (Horizontal:Vertical) in loose weathered glacial soils, sands or undocumented fill, 1H:1V (Horizontal:Vertical) in the medium dense glacial and fluvial soils, and ¾H:1V (Horizontal:Vertical) in dense to very dense glacial and fluvial soils. All temporary cuts should be in accordance with the Washington Administrative Code (WAC) Part N, Excavation, Trenching, and Shoring. The temporary cuts should not encroach on any existing roadways without a proper setback. The typical required setback for a temporary cut is based on a 2H:1V (Horizontal:Vertical) line from the base of the cut to the closest edge of the nearby structure or roadway. The temporary slope cuts should be visually inspected by a qualified person during construction work activities and the inspections should be documented in inspection reports. The contractor is responsible for maintaining the stability of the temporary cut slopes and minimizing slope erosion during construction. Any temporary cut slopes should be covered with plastic sheeting to help minimize erosion during wet weather, and the slopes should be closely monitored until the permanent retaining systems or slope configurations are complete. Heavy bulk soils or other materials should not be stored or equipment operated within 10 feet of the top of any temporary cut slope.

It should be noted that all soil conditions may not be fully described from the geotechnical investigation. Excavation of temporary slope cuts may expose soil lenses or units and conditions not encountered in the excavation. Typically, as excavation work proceeds, the inclination of the temporary slopes should be re-evaluated by the geologist in the field, so that supplemental recommendations can be made where needed. Soil and groundwater conditions can be highly variable. Scheduling for soil work will need to be adjustable to able to accommodate the potential for unanticipated conditions so that the project can proceed on planned schedules.

If any variations or undesirable conditions are encountered during construction, Resolve should be notified so that supplemental recommendations can be made. In some areas, it may not be possible to cut temporary slopes to the maximum angles allowed by the WAC, and temporary shoring of excavation may be required. Although it is not anticipated for this site, if cuts greater than 10 feet in height are proposed, the stability of the planned slope walls should be evaluated and options for temporary shoring should be considered prior to accessing any such areas. The contractor should be responsible for developing temporary shoring systems, if needed. We recommend that Resolve and/or the project structural engineer review any temporary shoring designs prior to installation to verify the suitability of the proposed systems.

Erosion and Sediment Control

Erosion and Sediment Control (ESC) is used to minimize the transportation of sediment to the Sound, wetlands, streams, lakes, drainage systems, and adjacent properties. Sediments at the Firehouse site are considered likely to migrate eastward toward the sound, and southward toward the adjacent slope. Erosion and sediment control measures should be taken if sediments are disturbed around the site during operations, and these measures should be in general accordance with local regulations. At a minimum, the following basic recommendations should be incorporated into the design of the erosion and sediment control features of the site:

1) If possible, phase the soil, foundation, utility, and other work requiring excavation or the disturbance of the site soils to take place during the dry season, which in this vicinity is generally May through September. Using BMP's, grading activities can still be undertaken during the wet season (generally October through April). It should be noted that this typically increases the overall project cost.

2) Complete and stabilize soil disturbing site work as quickly as possible.

3) Utilize silt fences with a higher Apparent Opening Size (AOS), construction of a berm, or other filtration systems to prevent sediment from entering the surface water or migrating down the slope to the south of the site.

4) Treat runoff generated by any dewatering discharge through construction of a sediment trap or catchment pond/sump in order to reduce sediment input to downgradient waters.

Groundwater Influence on Structures/Construction

Groundwater was encountered in both boreholes at about 34 feet bgs at the time of our investigation. At the site location in Port Angeles, groundwater will likely be encountered during any structural support activities. As stated previously, we believe that contamination may also be an issue in the process, as groundwater will be mixing with subsurface soils.

If required, design of temporary dewatering systems to remove groundwater should be the responsibility of the contractor. The contractor should also be made aware of the potential that groundwater may be encountered. If slope stabilization or other earthwork activities are performed during or soon after periods of precipitation, some dewatering of surface areas may be required. Near-surface soils are considered likely to have low permeability based on soil type and density, but these soils are also highly moisture sensitive.

Drainage

The ground surface in the building area should slope away from paved access areas, toward appropriate drainage pathways or channeled surface drainage constructs. In this case, the northern drainage area appears to be the most appropriate. It is recommended that adjacent exterior grades be sloped a minimum of 2 percent for a minimum distance of 5 feet away from the building area. Subgrade soils in any paved areas should be sloped a minimum of 1 percent and drainage gradients maintained to carry all surface water to collection facilities and off-site. These grades should be maintained for the life of the project.

Utility Trench Backfill

Utility trenches should be excavated according to accepted engineering practices following Washington Industrial Safety and Health Administration (WISHA) standards, by a contractor experienced in such work. The responsibility for the safety of open trenches lies with the contractor. Construction traffic and other vibrations adjacent to trenches should be minimized while trenches are open. Wetting of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced, especially during or shortly following periods of precipitation. Some dewatering may be necessary prior to emplacement of utilities.

Any required utility trench backfill should consist of imported structural fill or suitable on-site material. Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. In deep trenches, the upper 5 feet of utility trench backfill placed in pavement areas should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Below 5 feet, utility trench backfill in pavement areas should be compacted to at least 90 percent of the maximum dry density based on ASTM Test Method D1557. Obviously, pipe bedding should be in accordance with the pipe manufacturer's recommendations based on types of pipe. A tracer wire is recommended for future utility location should it be required. Most of the near surface soils at the firehouse site will have to be overexcavated.

The contractor must remove all moisture-sensitive soils from the trenches regardless of the backfill and compaction requirements. As per common practice, the contractor should use equipment and methods that avoid damage to the utilities and/or structures during backfill and compaction operations.

Foundations and Concrete Slabs

It is significant to note that Resolve did not have the final retrofit or remodel plans at the time of production of this report. We were not informed as to final remodeling or new construction plans for the site. The following recommendations are provided as guidance should any new construction or applicable remodeling acitivities be planned:

Foundations

Based on conditions encountered in the borings, it appears that soft clays will be present below footing subgrade elevations. Because the existing soils appear to be moisture sensitive and have the potential to incur some load settling or movement, we recommend that the shallow subsurface be developed for any new construction that may occur during the project. We believe that, at a minimum, loose or soft soils encountered should be overexcavated to a depth of approximately 3 feet bgs (or below footing subgrades). A geofabric should separate the soft clays from overlying fill materials. Four to eight-inch spalls could be emplaced to a depth of about 2 feet bgs, and subsequently be overlain with suitable backfill, which could be ¾ inch crushed gravel, or similar suitable structural fill. Should footing be planned, we recommend that a representative from Resolve examine all footing excavations as they are prepared (and before placing forms or reinforcing steel) to verify that subgrade conditions are as anticipated in this report.

Assuming foundations will bear on dense soil or on structural fill supported by dense soil, we recommend dimensioning foundations for a net bearing capacity of 2,000 pounds per square foot (psf).

We recommend that footings have a minimum width of 18 inches. Foundations exposed to the weather should bear at a minimum depth of 18 inches below final exterior grades to protect from frost heave.

Lateral foundation loads can be resisted by friction between the foundation base and the supporting soil, and by passive earth pressure acting on the face of the embedded portion of the foundation. Foundations must be poured "neat" against undisturbed native soils. In overexcavated areas, structural fill should be used for backfill. A coefficient of 0.35 can be used for frictional resistance. For passive earth pressure, the available resistance can be computed using an equivalent fluid pressure of 250 psf per foot of embedment. These lateral resistance values include a factor of safety of 1.5. For short-term loads, such as wind and seismic, a one-third increase in the allowable capacities can be used.

Differential settlement, along a 20-foot exterior wall footing, or between adjoining column footings, should be less than ½ inch, producing an angular distortion of 0.002. Most settlement is expected to occur during construction, as loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated or if a strong seismic event results in liquefaction of the underlying soils. It should be noted that the risk of liquefaction at this site is considered low given the composition and density of the native, on-site soils and the absence of high groundwater.

Concrete Slabs

If such features are part of plans for the subject site, slab-on-grade floors or walkways may be supported on properly compacted structural fill, provided the subgrade is prepared in accordance with the recommendations in this report. Any loose or soft soil encountered beneath slab areas should be removed and replaced with structural fill. Because ground surfaces may be unintentionally disturbed during construction activities, we recommend that all slab subgrades be recompacted immediately before slab construction. Concrete slabs exposed to vehicle traffic should be supported on at least 4 inches of crushed rock base (CRB). We recommend that CRB aggregate conform to Washington State Department of Transportation (WSDOT) specification for "Top Course of Crushed Surfacing", Section 9-03.9(3).

Testing and Inspection

Testing and inspection will be required for the project This includes inspection and testing of all soils to be used for backfill or structural fill, proctor number production, concrete testing, and other items as defined by the inspection contractor.

Limitations

The Geotechnical Engineering branch of Civil Engineering is evolving as new technologies and understanding of techniques improves. To the best of our knowledge, the Port Angeles Firehouse site was analyzed using the appropriate and current techniques and methods. Some geologic or topographic physical changes in the site either due to excavation or fill placement, or new agency regulations may require the soils report to be professionally reviewed. The owner should be aware that there is a practical limit to the usefulness of this report, and critical review may also be required at some future time. In general, this report should remain valid for a period of about two to three years.

Other limitations are that there is always some risk that in recommendations for foundation and earthwork, due to soil and groundwater conditions that may not have been revealed during the

investigation. Sampling was limited to the immediate areas of borings and observations. The recommendations made in this report are based on the assumption that although conditions may vary in the vicinity, soil conditions across the site do not vary significantly from what was found during our investigation. If any significant variations or conditions are encountered during excavations and general construction, Resolve should be notified so that supplemental recommendations can be made.

It is noted that Resolve did not have design or remodel plans for the site at the time of production of this report, and may have provided information that was not required for current project. The conclusions of this report are based on the limited information provided by architects, engineers, and City of Port Angeles employees regarding the proposed construction. If proposed construction is significantly greater in scope than remodeling and retrofit, the conclusions in this report may not be valid. The final plans for the project should be reviewed by Resolve for conformance with the recommendations of this report.

This report did not include any environmental site assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater or atmosphere, or the presence of wetlands or other biological evaluations. The contamination that was encountered was reported qualitatively, and no tests were undertaken. The geotechnical information presented herein is based upon professional interpretation using standard industry practices and engineering conservatism that we consider proper for this project. We do not warrantee that future geologic, hydrologic, seismic changes, changes to agency rules and procedures or industry standards will remain the same as they are at the time of generation of this report.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (360) 297-8870, or cell at (360) 865-1843.

Sincerely,
RESOLVE ENVIRONMENTAL & GEOTECHNICAL, INC.

Ronald P. Nance, P.G.
Senior Project Geologist

Dean M. White, P.E.
Senior Engineer

VICINITY MAP

Resolve Environmental & Geotechnical, Inc. (360) 297-8870; Cell (360) 865-1843 resolveeg@comcast.net	**Figure 1** VICINITY MAP **Project No. 11-009** **Date: April-May, 2011**	**PROJECT:** **Geotechnical Engineering Investigation** **Former Firehouse** **215 South Lincoln Street** **Port Angeles, Washington** **Prepared for:** **Krazan & Associates, Inc.** N

Resolve Environmental & Geotechnical, Inc.
(360) 297-8870; Cell (360) 865-1843
resolveeg@comcast.net

Figure 2
Borehole Location Diagram

Project No. 11-009
Date: April-May, 2011

PROJECT:
Geotechnical Investigation
Former Firehouse; 215 S. Lincoln
Port Angeles, Washington

For: Krazan & Associates, Inc.

N

BOREHOLE LOGS and NRCS INFO

RECORD OF SUBSURFACE EXPLORATION

SHEET 1 OF 2

BORING NO.:	PROJECT NAME:	PROJECT NO:
B1	Port Angeles Firehouse	**11-009-3**

DATE BORING WAS STARTED:	DATE BORING WAS COMPLETED:	OFFSET FROM REQUESTED LOCATION:
26-Apr-11	26-Apr-11	None

GROUNDWATER LEVELS		
DATE	ACTUAL TIME	GW DEPTH BGS
26-Apr-11	8AM	**33.5**

DRILLED BY:	RIG TYPE:	HAMMER DROP & WEIGHT:
EDI	B-61	STD

DEPTH FT.	PL	Sample	Lab Analysis?	DESCRIPTION OF SOIL	Blow Counts, Notes
0				Asphalt, Fill, topsoil to ~1.5' going to Brown, damp, soft clay and silt (CL) going to gray, damp, soft clay	N/A
5		B1-1	N		
7.5		B1-2	N	Same brown and gray clay (CL) with very slightly higher silt and v. minor fine sand.	1 2 5
10					
12.5		B1-3	N	Same	0 3 4
15					
17.5		B1-4	N	Same clays Relict brick debris found in spoon from about 17' bgs.	0 1 2 Possibly transported by fluvial, or fill
20					
22.5				Same	0 2 3
25		B1-5	N		

PREPARED BY: Ronald P. Nance

Rev. 04/2001

RECORD OF SUBSURFACE EXPLORATION

SHEET 2 OF 2

BORING NO.:	PROJECT NAME:	PROJECT NO:
B1	Port Angeles Firehouse	**11-009-3**

DATE BORING WAS STARTED:	DATE BORING WAS COMPLETED:	OFFSET FROM REQUESTED LOCATION:
26-Apr-11	26-Apr-11	None

GROUNDWATER LEVELS		
DATE	ACTUAL TIME	GW DEPTH BGS
26-Apr-11	8AM- 11:30AM	**33.5**

DRILLED BY:	RIG TYPE:	HAMMER DROP & WEIGHT:
EDI	B-61	STD

DEPTH FT.	PL	Sample	Lab Analysis?	DESCRIPTION OF SOIL	Blow Counts, Notes
25				Same brown and gray clay (CL) with higher apparent moisture content	0 3 for 1'
30		B1-1	N		
32.5			N	Same clays with intermittent gray, mosit, fine sand and very minor gravel.	0 1 3 Groundwater @ 33.5'
35		B1-6	Y	Gray, moist to sat, loose, v. fine sand and silt with a minor clay component	Hydrocarbon Odor here Soils Isolated on Plastic 0 2 5
37.5					
40				Same (with some apparent density increase by drill)	
42.5				Dark gray, sat, dense, well sorted, poorly graded medium sand (SP), going to gray, moist to sat, dense to v. dense silty sand with heavy gravel and cobbles (SM).	7 11 13 Fluvial/Alluvial materials or reworked/overridden outwash
45					10 15 31 (45')
47.5		B1-7	Y	Same soils with increasing gravel and cobbles downhole. Heaving gravel becoming problematic	
50				TD AT ~50'bgs	14 28 50 for 3 TD

PREPARED BY: Ronald P. Nance

Rev. 04/2001

RECORD OF SUBSURFACE EXPLORATION

SHEET 1 OF 2

BORING NO.:	PROJECT NAME:	PROJECT NO:
B2	Port Angeles Firehouse	**11-009-3**

DATE BORING WAS STARTED:	DATE BORING WAS COMPLETED:	OFFSET FROM REQUESTED LOCATION:
26-Apr-11	26-Apr-11	None

GROUNDWATER LEVELS		
DATE	ACTUAL TIME	GW DEPTH BGS
26-Apr-11	1:30P-3:30P	**34**

DRILLED BY:	RIG TYPE:	HAMMER DROP & WEIGHT:
EDI	B-61	STD

DEPTH FT.	PL	Sample	Lab Analysis?	DESCRIPTION OF SOIL	Blow Counts, Notes
0				Asphalt, Fill, topsoil to ~1.5' going to Brown, damp, soft clay and silt (CL) going to gray, damp, soft clay	N/A
5		B2-1	N		
7.5				Same brown and gray clay (CL) with a minor variation in minor fine sand and silt content.	0 2 5 Contaminant encountered at about 5' (diesel?)
10		B2-2	N		Contaminant ending here
12.5				Same	2 2 4
15					
17.5				Same clays	0 2 3
20					
22.5				Same	0 2 3
25		B2-3	N		

PREPARED BY: Ronald P. Nance

RECORD OF SUBSURFACE EXPLORATION

SHEET 2 OF 2

BORING NO.:	PROJECT NAME:	PROJECT NO:
B2	Port Angeles Firehouse	**11-009-3**

DATE BORING WAS STARTED:	DATE BORING WAS COMPLETED:	GROUNDWATER LEVELS		
		DATE	ACTUAL TIME	GW DEPTH BGS
26-Apr-11	26-Apr-11	26-Apr-11	8AM- 11:30AM	**33.5**

OFFSET FROM REQUESTED LOCATION: None

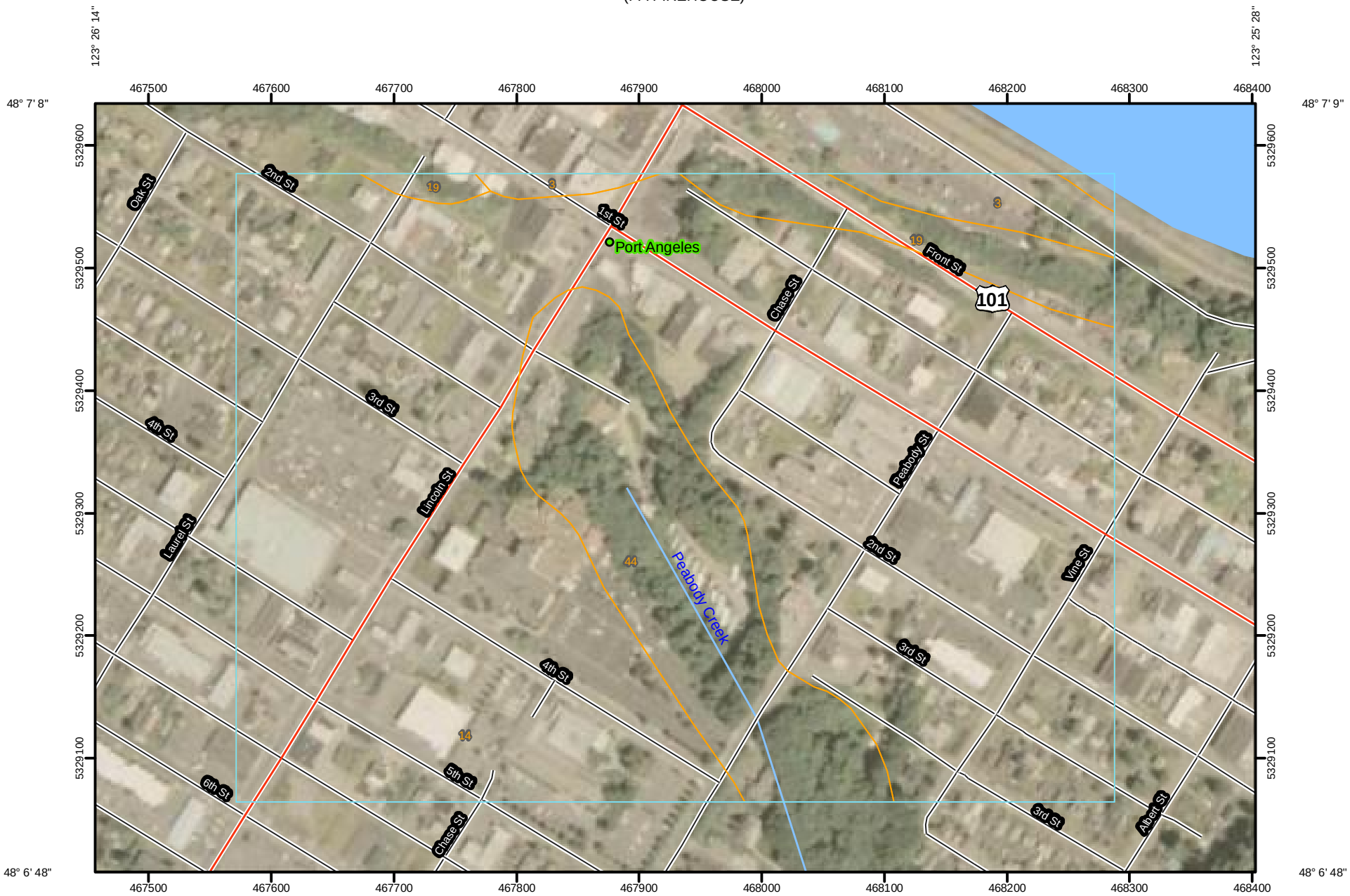
DRILLED BY:	RIG TYPE:	HAMMER DROP & WEIGHT:
EDI	B-61	STD

DEPTH FT.	PL	Sample	Lab Analysis?	DESCRIPTION OF SOIL	Blow Counts, Notes
25				Same brown and gray clay (CL). Appear to be touching surface of sand horizon at 27.5'	2 3 4
30		B2-4	N		
32.5				Gray, saturated, dense, coarse sand (SP)	6 9 11 Groundwater @ 34'
35				Dark gray, saturated, v. dense coarse sand (SW) with varying amounts of gravel and cobble.	Hydrocarbon Odor here again. Possibly in GW. Soil Isolated on plastic
37.5					5 9 15
40				Same with varying amount of sand vs. gravel	Alluvium or reworked outwash
		B2-5	Y		Contaminant faded out here
42.5				Same v. dense soils with heavier gravel and cobbles. Heaving gravels and sands.	14 23 31 Fluvial/Alluvial materials or reworked/overridden outwash
45					12 27 40 (45')
47.5			Y	Same soils with varying gravel and cobbles downhole. Heaving gravel again.	
50				TD AT ~50'bgs	Refusal at heave TD

PREPARED BY: Ronald P. Nance

Rev. 04/2001

Soil Map—Clallam County Area, Washington
(PA FIREHOUSE)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:4,490 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clallam County Area, Washington
Survey Area Data: Version 7, Feb 16, 2011

Date(s) aerial images were photographed: 6/25/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Clallam County Area, Washington (WA609)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
3	Beaches	2.6	2.9%
14	Clallam-Hoypus gravelly sandy loams, 0 to 15 percent slopes	71.7	78.8%
19	Dystric Xerorthents, extremely steep	3.9	4.3%
44	Neilton very gravelly loamy sand, 30 to 70 percent slopes	12.6	13.8%
Subtotals for Soil Survey Area		**90.7**	**99.8%**
Totals for Area of Interest		**90.9**	**100.0%**

LABORATORY RESULTS

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

May, 2, 2011

KA Project No.: 106-11048
Building Permit No.:

Ron Nance
Resolve Environmental & Geological
8842 NW Lacey St.
Indianola, WA 98342

RE: Resolve Env/ Geo 2011 Misc. Lab Work
Various, WA

Dear Mr.Nance:

In accordance with your request and authorization, the following test data are presented on the following reports, which are enclosed:

April 27, 2011	Field Report No. 139704
	Particle Size Distribution Report No. P19126
	Particle Size Distribution Report No. P19125
	Particle Size Distribution Report No. P19124

Referenced concrete reports and compressive strength data will be mailed following 28-day tests, if applicable.If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office.

Respectfully submitted,

Penn Seely, Laboratory Manager
Peninsula Division

PS: md
Enclosures

Krazan & Associates, Inc.
GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING AND INSPECTION

FIELD REPORT NO: 139704

DATE: 4-27-11
PROJECT #: 106-11045 / 11-009
PROJECT: RESOLVE MISC LAB PA FIRE HOUSE
LOCATION: PORT ANGELES
KRAZAN PROJECT MANAGER:

CONTRACTOR: RESOLVE ENV. M
JURISDICTION: CITY OF PORT ANGELES
PERMIT #: —
INSPECTOR: AARON CLYDE
WEATHER: OVERCAST TEMP: 44°

KRAZAN INSPECTOR IN LAB TO RECIEVE SAMPLE FROM CLIENT FOR LABORATORY ANALYSIS. MATERIAL IS NATIVE DARK GRAY SAND, AND GREENISH GRAY SILTY SAND. SAMPLED FROM BORING'S.

SAMPLE #1 NATIVE DARK GRAY SAND
SIEVE
MOISTURE
SAMPLE ID: 19124

SAMPLE #2 NATIVE DARK GRAY SAND
SIEVE
MOISTURE
SAMPLE ID: 19125

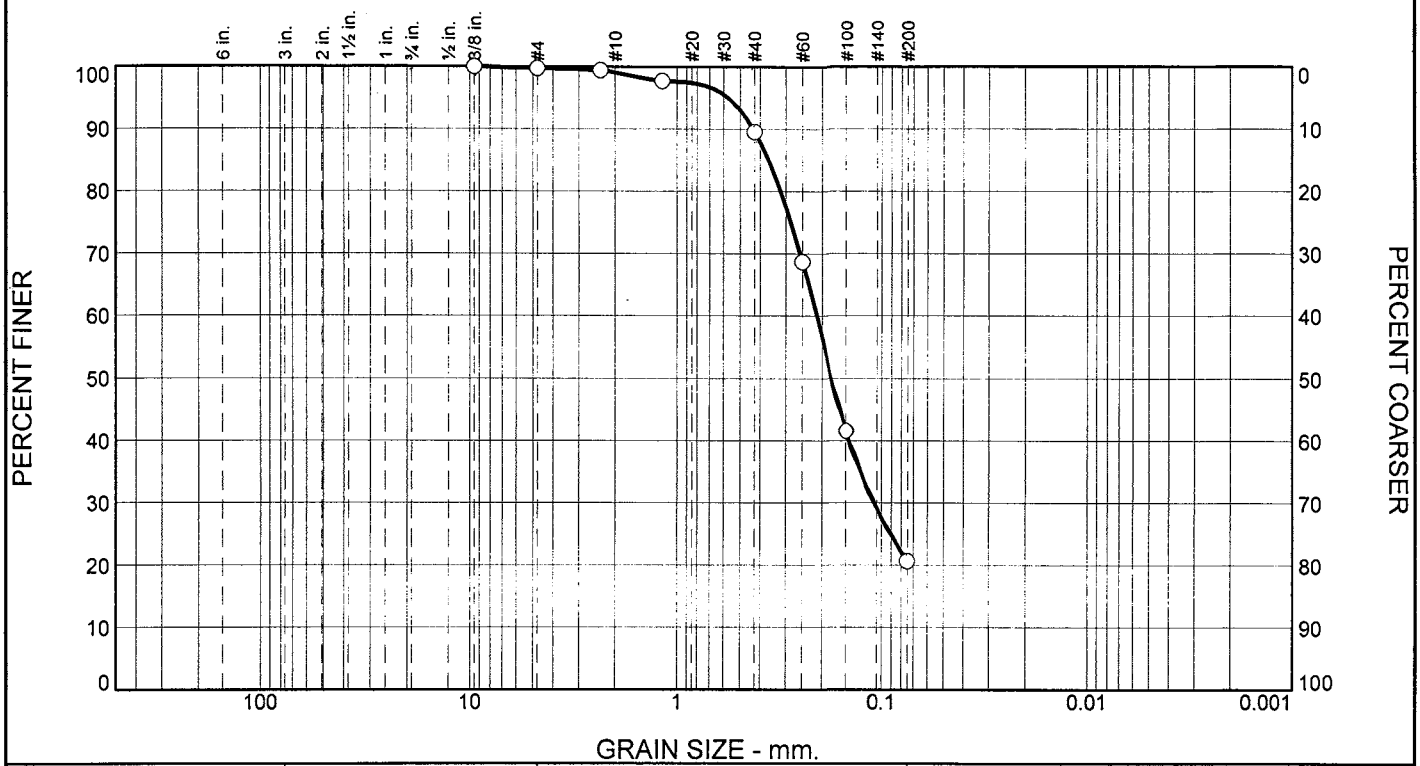
SAMPLE #3 NATIVE ~~DARK GRAY~~ GREENISH GRAY SILTY SAND
SIEVE
MOISTURE
SAMPLE I.D: 19126

Equipment/Asset Number(s):

To the best of my knowledge, the above WAS / **WAS NOT** performed in accordance with the approved plans, specifications, and regulatory requirements.

BC Superintendent/Representative: Technician:

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.7	9.5	68.9	20.7	

Test Results (ASTM C-136 & ASTM C-117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375	100.0		
#4	99.8		
#8	99.4		
#16	97.7		
#40	89.6		
#60	68.7		
#100	41.6		
#200	20.7		

* (no specification provided)

Material Description

SILTY SAND

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI=

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients

D_{90}= 0.4316 D_{85}= 0.3644 D_{60}= 0.2128
D_{50}= 0.1775 D_{30}= 0.1092 D_{15}=
D_{10}= C_u= C_c=

Remarks

REPORT: 139704
FIELD DESCRIPTION: GREENISH GREY SILTY SAND
MOISTURE CONTENT: 21.3%

Date Received: 4/27/11 **Date Tested:** 4/28/11

Tested By: ZL

Checked By: AC

Title: LABORATORY MANAGER

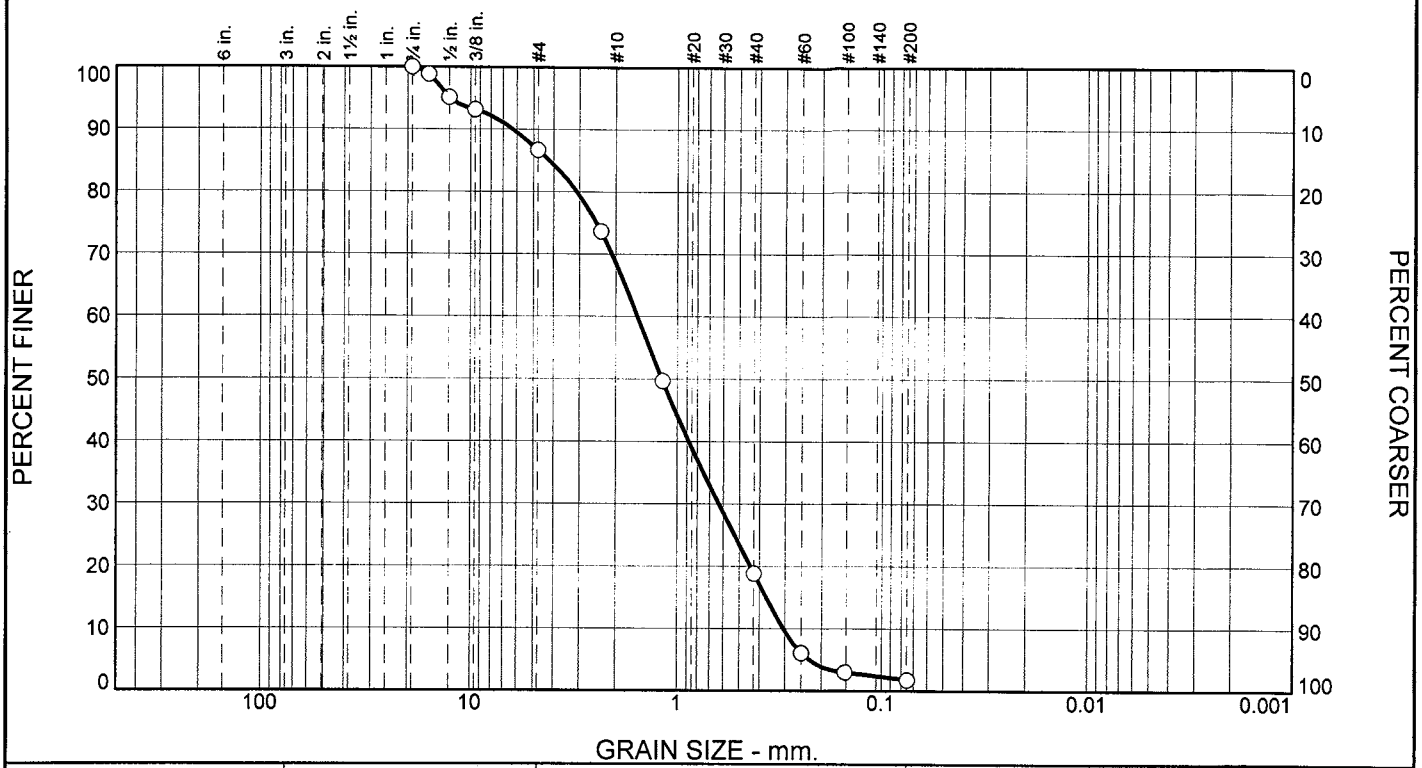
Location: BORING B1-5 35' BGS **Date Sampled:** 4/26/11
Sample Number: P19126

Krazan

Client: RESOLVE ENVIRONMENTAL
Project: PORT ANGELES FIREHOUSE

Project No: 106-11048 **Figure**

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	13.3	18.1	49.7	17.1	1.8	

Test Results (ASTM C-136 & ASTM C-117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.625	98.9		
.5	95.1		
.375	93.2		
#4	86.7		
#8	73.7		
#16	49.6		
#40	18.9		
#60	6.1		
#100	3.0		
#200	1.8		

* (no specification provided)

Material Description

POORLY GRADED SAND

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI=

Classification

USCS (D 2487)= SP AASHTO (M 145)= A-1-b

Coefficients

D_{90}= 6.2861 D_{85}= 4.1821 D_{60}= 1.5677
D_{50}= 1.1920 D_{30}= 0.6306 D_{15}= 0.3706
D_{10}= 0.3055 C_u= 5.13 C_c= 0.83

Remarks

REPORT: 139704
FIELD DESCRIPTION: DARK GREY SAND
MOISTURE CONTENT: 13.6%

Date Received: 4/27/11 **Date Tested:** 4/28/11

Tested By: ZL

Checked By: AC

Title: LABORATORY MANAGER

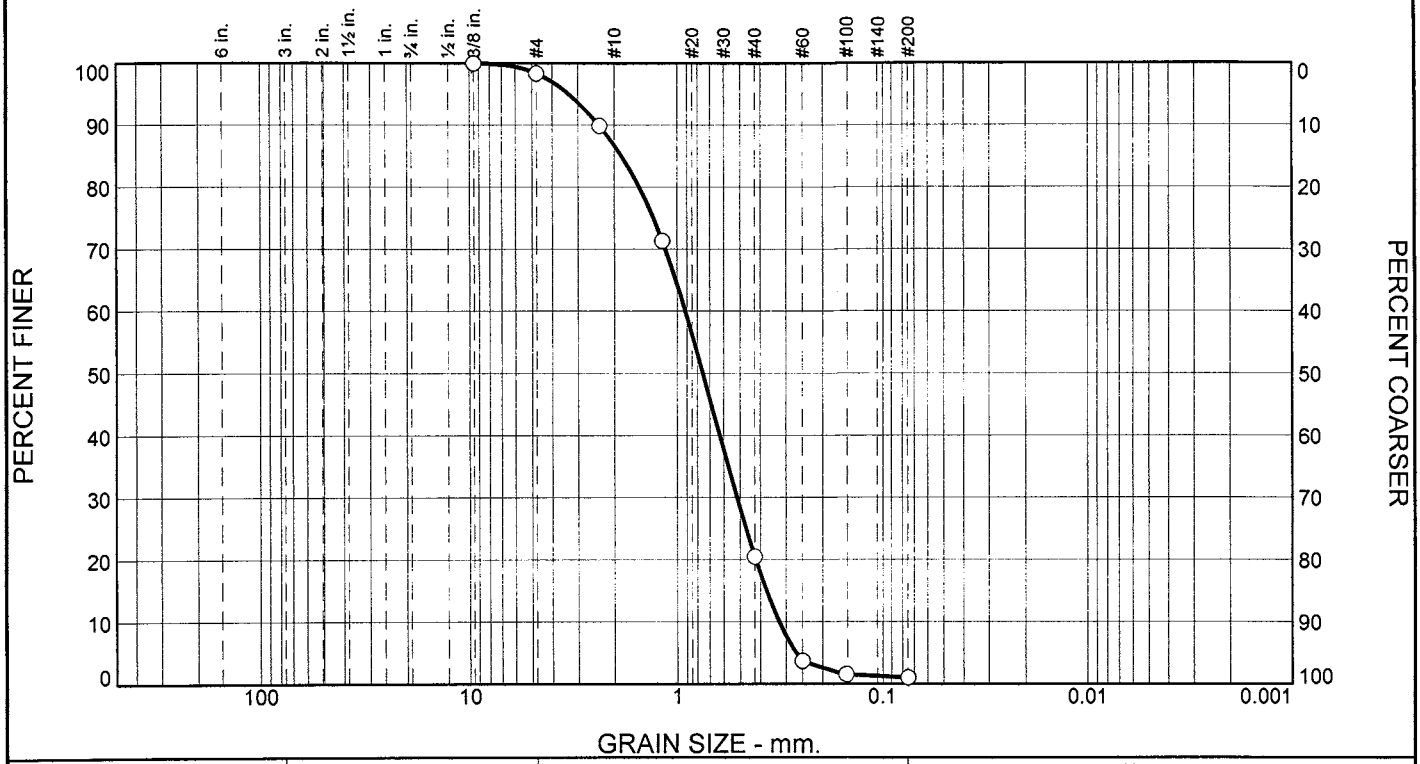
Location: BORING B2-6 48' BGS **Date Sampled:** 4/26/11
Sample Number: P19125

Krazan

Client: RESOLVE ENVIRONMENTAL
Project: PORT ANGELES FIREHOUSE

Project No: 106-11048 **Figure**

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.6	11.7	66.2	19.5	1.0	

Test Results (ASTM C-136 & ASTM C-117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375	100.0		
#4	98.4		
#8	89.9		
#16	71.4		
#40	20.5		
#60	3.7		
#100	1.6		
#200	1.0		

* (no specification provided)

Material Description

POORLY GRADED SAND

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SP AASHTO (M 145)= A-1-b

Coefficients

D_{90}= 2.3769 D_{85}= 1.8473 D_{60}= 0.9167
D_{50}= 0.7550 D_{30}= 0.5176 D_{15}= 0.3728
D_{10}= 0.3240 C_u= 2.83 C_c= 0.90

Remarks

REPORT: 139704
FIELD DESCRIPTION: DARK GREY SAND
MOISTURE CONTENT: 16.8%

Date Received: 4/27/11 **Date Tested:** 4/28/11

Tested By: ZL

Checked By: AC

Title: LABORATORY MANAGER

Location: BORING B1-8 50' BGS **Date Sampled:** 4/26/11

Sample Number: P19124

Krazan

Client: RESOLVE ENVIRONMENTAL

Project: PORT ANGELES FIREHOUSE

Project No: 106-11048 **Figure**

SELECTED PHOTOGRAPHS

1. An attempt to drill with a track rig on the slope to the south of the building was aborted. A winch to the large drill rig was connected, but the slope was too slippery to negotiate.

2. Following the attempt at the slope, the truck-mounted rig was set up on the west side of the building for borehole B1. The hole was scheduled for 40 feet, but was advanced to 50 feet below ground surface (bgs).

Photo Date: April 26, 2011
Former Firehouse, 215 S. Lincoln, Port Angeles, WA

3. Initial soils encountered were soft clays and fine silts with moisture varying from damp to moist. The relict brick suggested the sediments were historically emplaced by human or fluvial/alluvial processes.

4. Groundwater was encountered at about 33.5 feet bgs in B1.

Hydrocarbon odors suggesting contamination was also encountered at about 35 feet. The silty sand and sand with heavy gravel and cobbles shown here became more dense and sandier downhole.

Photo Date: April 26, 2011
Former Firehouse, 215 S. Lincoln, Port Angeles, WA

5. Some lenses of moist to saturated, dense, well sorted, poorly graded fine sands were encountered. See borehole logs for details.

6. After encountering contamination in B1, sheen on rods and augers had to be removed. Decontamination of equipment was undertaken prior to initiation of another borehole.

Photo Date: April 26, 2011
Former Firehouse, 215 S. Lincoln, Port Angeles, WA

7. Borehole B2, also advanced to 50 feet bgs, was on the east side of the building, adjacent to visible building settlement.

8. Soil profiles were very similar in both of the boreholes, with very soft and soft clays encountered to depths of approximately 30 to 35 feet. Note beeding clay cuttings.

Photo Date: April 26, 2011
Former Firehouse, 215 S. Lincoln, Port Angeles, WA

7. Contamination was also encountered in borehole B2, at depths of 5-10 feet bgs, and at about 33 feet bgs. Cuttings were isolated on plastic, wrapped, and left at the site for future disposition.

8. The drilling areas were cleaned up following concrete capping of boreholes. It is noted that the origin of contamination was not known. A magnetometer suggested a UST, but could not definitively locate one near the borehole.

Photo Date: April 26, 2011
Former Firehouse, 215 S. Lincoln, Port Angeles, WA

APPENDIX H

MASONRY OBSERVATION

&

MORTAR ANALYSIS

Krazan & Associates, Inc.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING AND INSPECTION

FIELD REPORT NO: 140139

DATE: 5-27-11
PROJECT #: 10C- 11036
PROJECT: P.A. FIREHOUSE
LOCATION: PA
KRAZAN PROJECT MANAGER: JMB

CONTRACTOR:
JURISDICTION: P.A.
PERMIT #:
INSPECTOR: BILL UGOLINI
WEATHER: OC TEMP: 50's

ON SITE FOR MORTAR, BRICK, AND EXTERIOR INSPECTION OF HISTORICAL FIREHOUSE.

UPON ARRIVAL I PROBED THE MORTAR JOINTS WITH BARE FINGERS AND A SCREWDRIVER. I ALSO INSPECTED GENERAL CONDITIONS OF EACH WALL.

~~WEST~~ ~~NORTH~~ ELEVATION: MORTAR HAS DEGRADED SERIOUSLY AT TOP 4' OF WALL AND AT MORTAR JOINTS AT EACH END OF WALL, MAINLY AT LEVEL LINE AT TOP OF WINDOWS

~~NORTH~~ ~~WEST~~ ELEVATION: SAME DEGRADED MORTAR AT LINE ABOVE WINDOWS AND AT NORTH END OF WALL. MORTAR CRACKING AT ALONG MORTAR JOINTS TOOK PLACE AT EACH END OF WALL WITH MORE SERIOUS CRACKING AT ~~EAST~~ END. AT ~~SOUTH~~ EAST END OF WEST ELEVATION IT APPEARS TO HAVE DEFLECTION AT TERRA COTTA MATERIAL ON TOP OF CONCRETE WALL.

~~SOUTH~~ ~~EAST~~ ELEVATION: THE ORANGE BRICK COMMON ON REST OF BUILDING IS ON 35' OF NORTH END OF WALL WITH THE REMAINDER OF WALL CONSISTING OF A RED BRICK OF LESS QUALITY AND LESS WORKMANSHIP. THE MORTAR ON SAID RED BRICK REMAINS MUCH HARDER THAN THE MORTAR ON THE ORANGE BRICK, APPEARS NEWER VINTAGE.

Equipment/Asset Number(s):

To the best of my knowledge, the above (WAS) / **WAS NOT** performed in accordance with the approved plans, specifications, and regulatory requirements.

BU Superintendent/Representative:

Technician: Wilbur D Ugolini

Krazan & Associates, Inc.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING AND INSPECTION

FIELD REPORT NO: 140152

DATE: 5-27-11
PROJECT #: 106-11036
PROJECT: P.A. FIREHOUSE
LOCATION: P.A.
KRAZAN PROJECT MANAGER: JNB

CONTRACTOR:
JURISDICTION: P.A.
PERMIT #: 1
INSPECTOR: BILL UGOLINI
WEATHER: OC TEMP: 50's

~~EAST~~ SOUTH ELEVATION CON'T: UPON CRUMBLING RED BRICK MORTAR BETWEEN MY FINGERS IT APPEARS TO HAVE LIME CONTENT. BETWEEN UPPER WINDOWS CRACKS AT MORTAR JOINTS SIMILAR TO EAST ELEVATION.

GENERAL: WHAT APPEARS TO BE ORIGINAL MORTAR OF THE BUILDING CAN BE EASILY FLAKED OFF BY RUBBING WITH FINGERS. GRAY AREAS OF MORTAR ARE WHITENED BY REMOVAL OF OUTER LAYER. OTHER THAN TOP 4' MORTAR GENERALLY SEEMS TO BE IN GOOD CONDITION. ORIGINAL BRICK CONSTRUCTION HAD HIGH LEVELS OF WORKMANSHIP AND ATTENTION TO QUALITY, EXCEPT FOR AREA OF RED BRICK, ~~EAST~~ SOUTH WALL IT DOES NOT APPEAR TO HAVE NEWER MORTAR REPLACED TO ANY EXTENT.

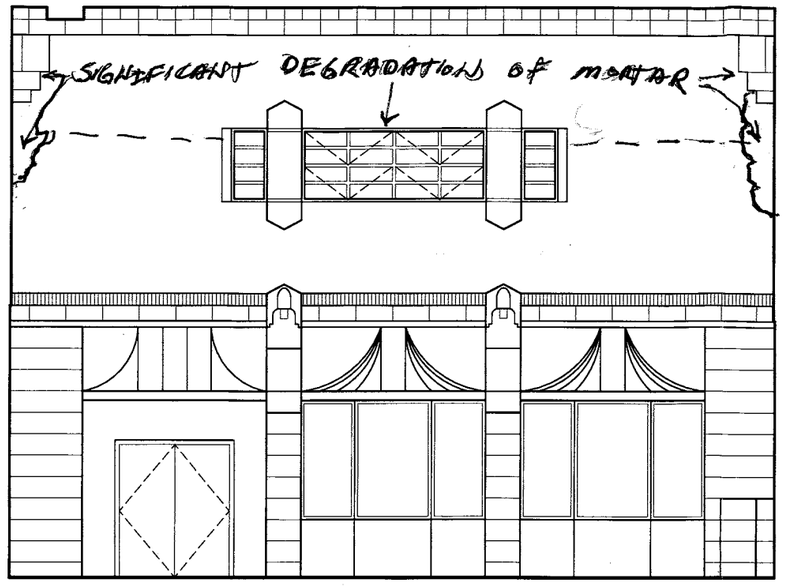
Equipment/Asset Number(s):

To the best of my knowledge, the above WAS / WAS NOT performed in accordance with the approved plans, specifications, and regulatory requirements.

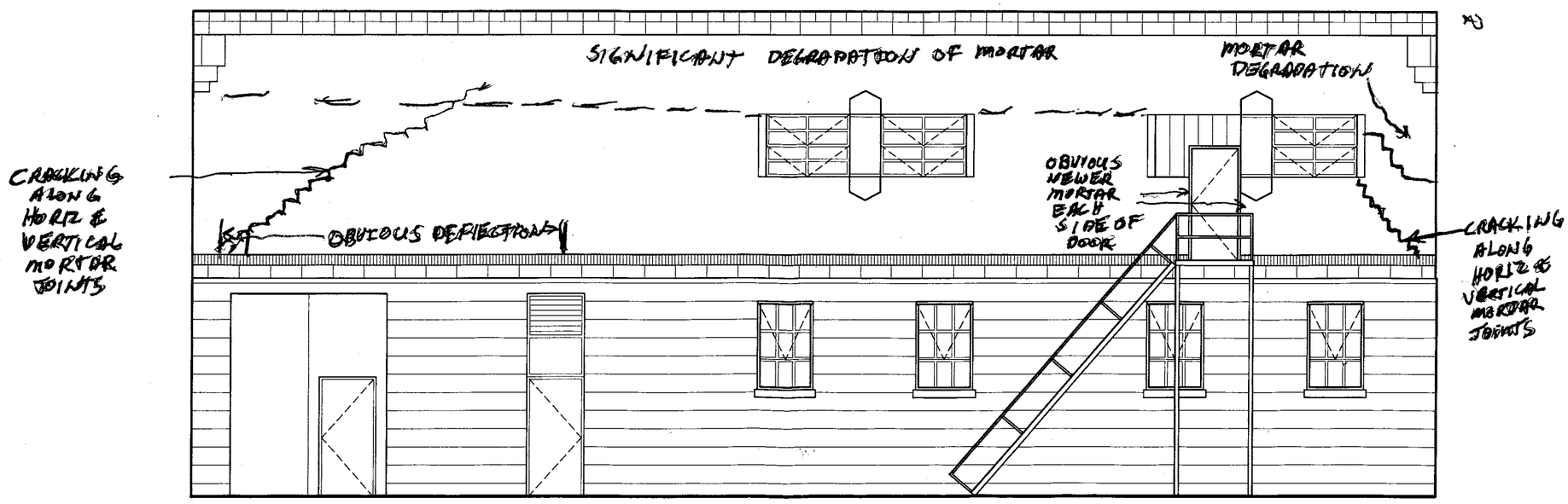
Superintendent/Representative: Bill

Technician: William D Ugolini

5-27-11
106-11036
P.A. FIRE HOUSE
BCI



W

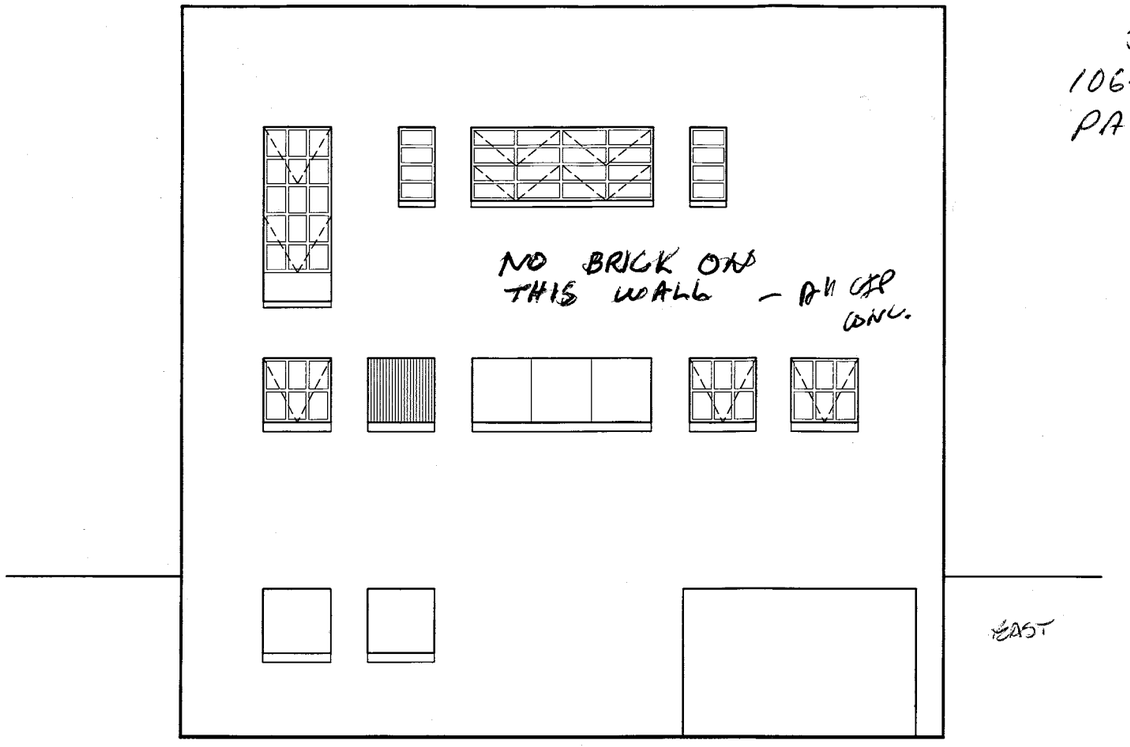


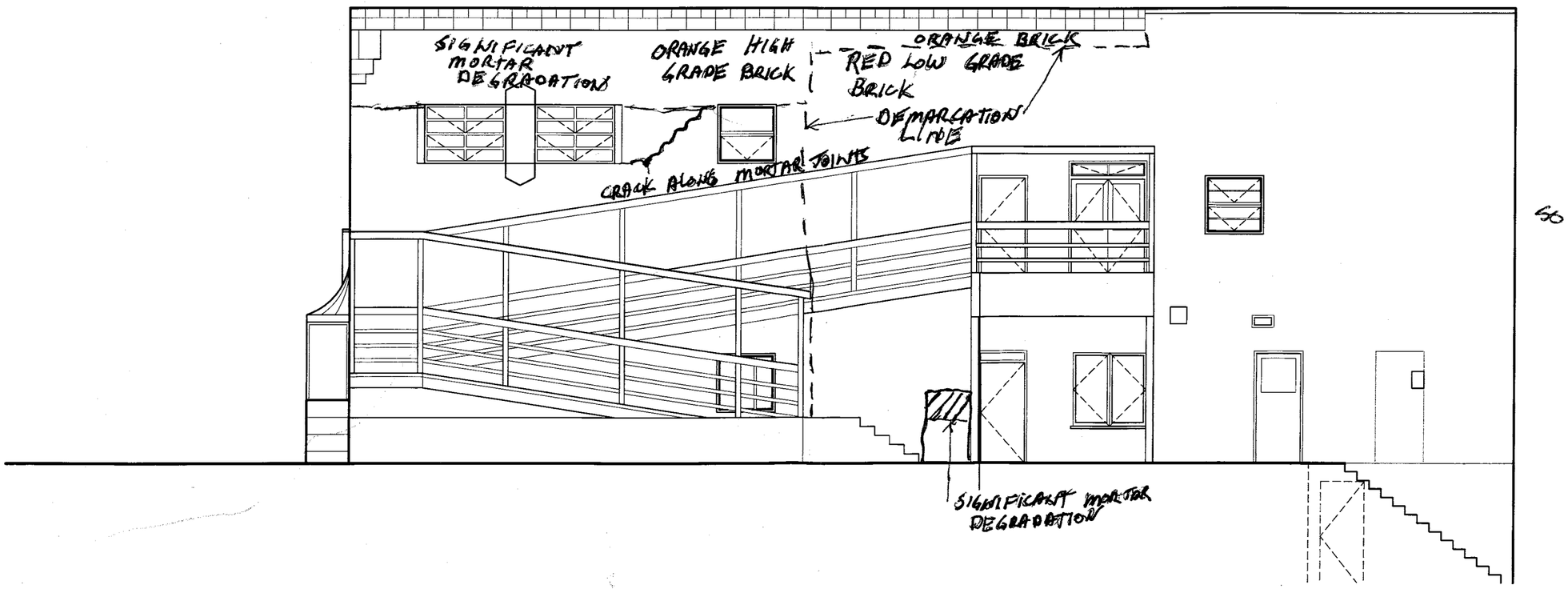
N

PORT ANGELES FIRE HOUSE

West and North Elevations 1/8" = 1' - 0"
April 12, 2011

5-27-11
106-11036
PA FIRE HOUSE
BCL

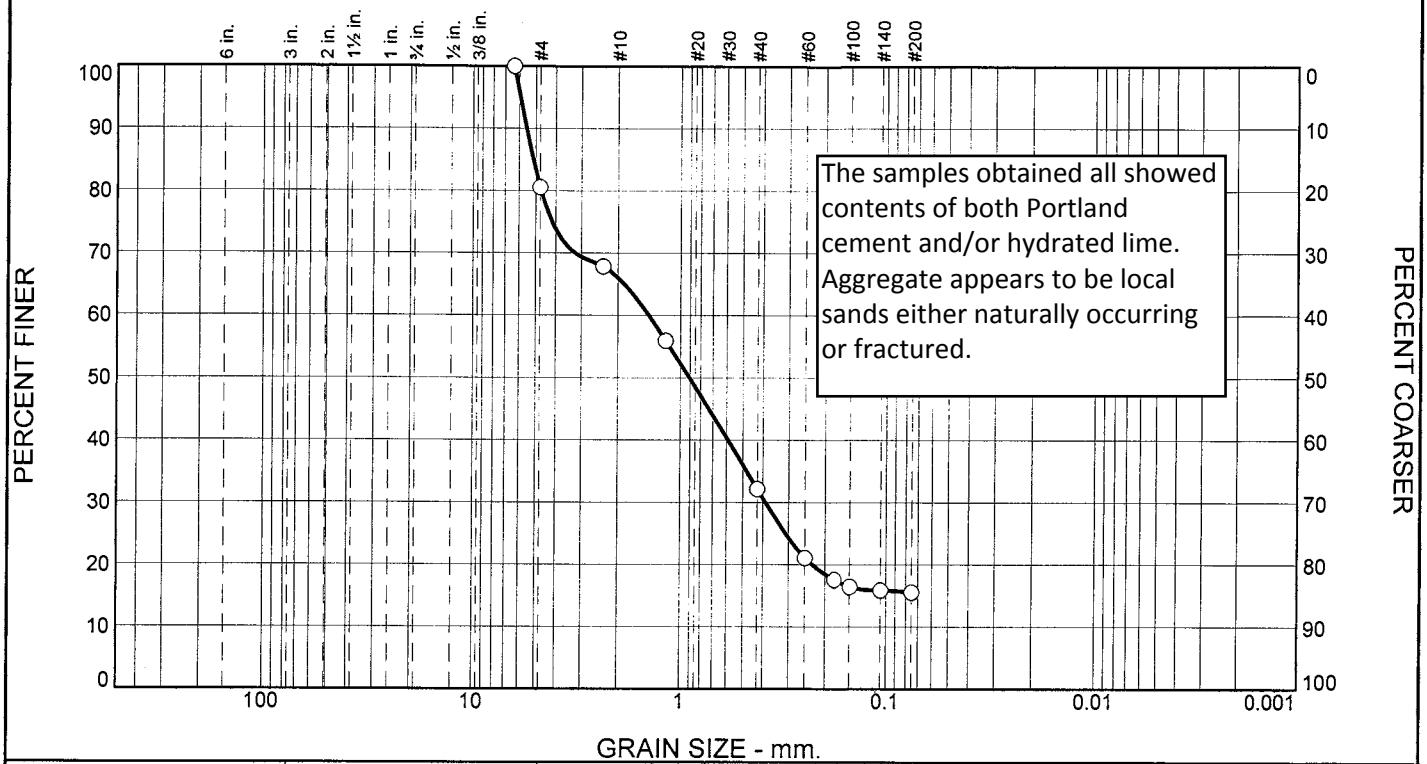




PORT ANGELES FIRE HOUSE

East and South Elevations 1/8" = 1' - 0"
April 12, 2011

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	19.4	14.6	33.8	16.6	15.6	

Test Results (ASTM C 136 & ASTM C117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.25	100.0		
#4	80.6		
#8	67.9		
#16	55.9		
#40	32.2		
#60	21.1		
#80	17.6		
#100	16.4		
#140	15.9		
#200	15.6		

* (no specification provided)

Material Description

SILTY SAND

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients

D_{90}= 5.5374 D_{85}= 5.1343 D_{60}= 1.4238
D_{50}= 0.9077 D_{30}= 0.3882 D_{15}=
D_{10}= C_u= C_c=

Remarks

FIELD DESCRIPTION: EXTERIOR MORTAR SAMPLE

Date Received: 7-20-11 **Date Tested:** 7-20-11

Tested By: AC

Checked By: AC

Title: LABORATORY MANAGER

Location: EXTERIOR MORTAR SAMPLE **Date Sampled:** 7-20-11

Sample Number: P19502

Krazan

Client: SWENSON FAY FAGET

Project: PORT ANGLES

Project No: 106-11036 **Figure** 4