VII.

KITSAP COUNTY COURTHOUSE FINAL REPORT

CONSULTANT REPORTS

CONSULTANT REPORT - CIVIL

SCJ ALLIANCE
CONSULTING SERVICES

TECHNICAL MEMORANDUM

TO:	Amos Callender, Project Manager Thomas Architecture Studios
FROM:	Amy M. Head, PE Jared VerHey, PE
DATE:	May 23, 2018
PROJECT #:	1835.11
SUBJECT:	Kitsap County Courthouse Existing Site Conditions Assessment
ENCLOSURES:	#1: Site Map #2 Stormwater System Map

The purpose of this memorandum is to summarize the condition and availability of the existing civil infrastructure and utilities as well as evaluate and identify potential improvements to the infrastructure based upon the proposed improvements. The memo will also discuss additional requirements such as grading, existing paved and gravel parking, demolition/utility relocation and frontage improvements.

The information in this memorandum was based on the following resources: The Kitsap County Courthouse – Feasibility and Space Needs Assessment prepared by Thomas Architecture Studios provided on 5/4/18, the site walk completed with Kitsap County Courthouse facilities personnel on 5/14/18 and Kitsap County Utility Mapping.

PROPOSED IMPROVEMENTS

Proposed improvements to the property may include renovations to the existing Courthouse Offices, construction of a new Courthouse and associated offices paired with renovations to portions of the existing facility, construction of a new Courthouse and offices, improvements to existing paved and gravel parking lots within and surrounding the Courthouse and jail as well as new parking facilities within the adjacent properties owned by the County.

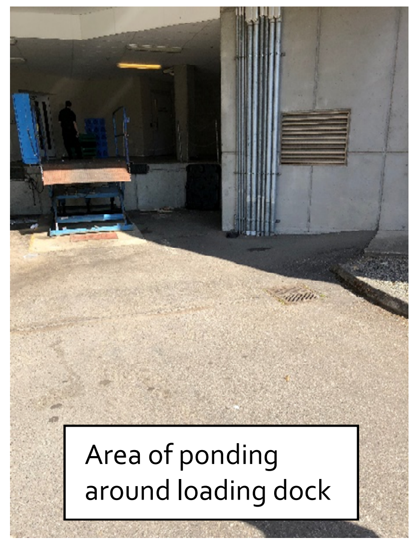
EXISTING AND PROPOSED INFRASTRUCTURE

The courthouse has existed on this site since the early 1900's. Due to the multiple expansions and renovations and remodels over the history of the courthouse the existing utility infrastructure on the property is erratic, complicated and difficult to identify and assess without the benefit of a utility survey and/or additional utility mapping.

At the time of the site walk the Courthouse facilities personnel did not identify any significant or apparent issues relating to the utility infrastructure with the exceptions or a few locations discussed in detail within the sections below:

Storm Drainage Infrastructure

Based upon the stormwater system map available from Kitsap County Utility Mapping (See Enclosure #2), stormwater appears to be collected from the parking and surrounding areas within a closed conveyance system south and west of the existing courthouse and routed beneath a portion of the existing jail building to a stormwater detention facility northwest of the of the jail. Upon exiting the detention facility stormwater is discharged within the drainage basin east of the existing Bullard building where it continues north beneath Division Street and ultimately to the Puget Sound.



Area of ponding around loading dock

The following issues were identified during the site walk by Kitsap County Courthouse facilities personnel:

- Ponding within the existing loading dock area north and east of the existing jail.
- Numerous existing stormwater structures are not within localized low points and stormwater flow paths and functionally unable to collect stormwater. The overall grading within the area of concern drains to the loading dock area discussed above, and likely contributes to the ponding issues noted.

In addition, the following items of concern were noted by SCJ during the site walk:

- The existing gravel parking lots currently lack flow control and quality control facilities.
- The existing fuel pump appeared to lack treatment prior to discharge.

Stormwater will be required to meet the 2005 Department of Ecology Stormwater Management Manual for Western Washington (SMMWW). It is anticipated that improvements and or modifications to the existing paved and gravel parking lots will trigger flow control and water quality control facilities. As refined improvement options are developed, stormwater plans and models will be developed to accommodate the proposed site conditions in accordance with the SMMWW. In addition, further assessment of the existing issues noted during the site walk along with an existing storm utility and topographic survey will help to determine the scope of storm drainage improvements required.

Existing Fuel Pump

Future design and layout will be regulated by the City of Port Orchard and be in accordance with their requirements and specifications.

Water System Infrastructure

No existing water system service maps were available at the time of the site walk. Based upon the visual presence of water valves and fire hydrants, there appears to be a looped waterline system within Division Street, Sidney Avenue, Taylor Street and Cline Avenue surrounding the existing Kitsap County Courthouse and jail facility. The waterlines are owned and operated by the City of Port Orchard. Waterline sizes within the roadway are currently unknown.


Existing Backflow Location

The primary water service to the Courthouse and Jail enters the facility east of the jail and appears to extend from Sidney Avenue to the East (See Enclosure #1). An existing backflow device was located east of the existing jail building. An existing domestic service meter is located approximately 20' southwest of the existing backflow device.

Based upon visual observation the waterline entering the jail appears to be 10" diameter ductile iron. The domestic service size is currently unknown. It is assumed that the existing service connection is adequate for the existing facility needs. Proposed improvements will either be served by the existing domestic and fire services or by new services sized to accommodate the proposed improvements fire flow needs and conveniently located to service the proposed improvements.

Existing fire hydrants are present around the periphery of the existing courthouse along Division Street Sidney Avenue, Taylor Street and Cline Avenue (See Enclosure #1). Spacing of hydrants is governed by the International Fire Code and the fire flow requirements for the type of building construction. The scope of the proposed improvements will determine the number of hydrants and spacing requirements. If it is determined the existing fire hydrants do not provide complete coverage around the Courthouse and jail additional hydrants can be added as required along with the associated waterlines by connecting to the existing water system within the adjacent roadways.

The need for a new service connections and fire hydrants will be dependent on the impact and location of the proposed improvements.

Future design and layout will be regulated by the City of Port Orchard and be in accordance with their requirements and specifications.

Sewer System Infrastructure

No existing sanitary sewer service maps were available at the time of the site walk. The location of the existing sewer service(s) to the existing Courthouse and jail facility were not able to be identified in the field. It is assumed that the existing Courthouse and jail facility is served by multiple service locations that enter the existing sanitary sewer lines located within Cline Avenue to the west and Sidney Avenue to the east. Buildings separate for the main Courthouse and jail facility likely have separate service locations to these roadways. Existing sewer line and lateral sizes are currently unknown.

Based upon discussions with the Courthouse facilities personnel, there does not seem to be apparent issues with service to the facility.

The need for a new service will be dependent on the impact and location of the proposed improvements.

Future design and layout will be regulated by the City of Port Orchard and be in accordance with their requirements and specifications.

Gas/Power/Communication Infrastructure

No existing gas, power or communication maps were available at the time of the site walk. Based upon visual observations during the site walk, the facility is primarily serviced by gas, power and communications, from Cline Avenue near the southwest corner of the existing Courthouse building (See Enclosure #1). Other service locations may exist to separate buildings.

Existing Gas Service

Based upon discussions with the Courthouse facilities personnel, there does not seem to be apparent issues with services.

The need for a new service will be dependent on the impact and location of the proposed improvements.

Additional Considerations

Grading

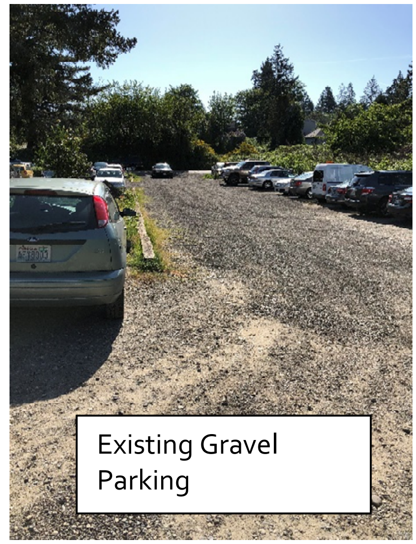
The existing Kitsap County Courthouse property generally slopes from the east and west property extents in to the property center and from the south to the north towards the drainage basin east of the Bullard building.

Varying Existing Grades

Generally, grading around the proposed improvements shall promote drainage away from structures and provided ADA accessibility. Given the elevations around the facility retaining walls will likely be necessary to achieve desired grades. In addition, it is likely that earthwork will not balance and that import, or export may be required depending on proposed improvements.

Existing Paved and Gravel Parking

Existing paved and gravel parking facilities in and around the facility are in general need of maintenance and resurfacing in some locations. Evaluation of striping and parking layout may also be able to yield additional parking and improve internal circulation within the parking areas.



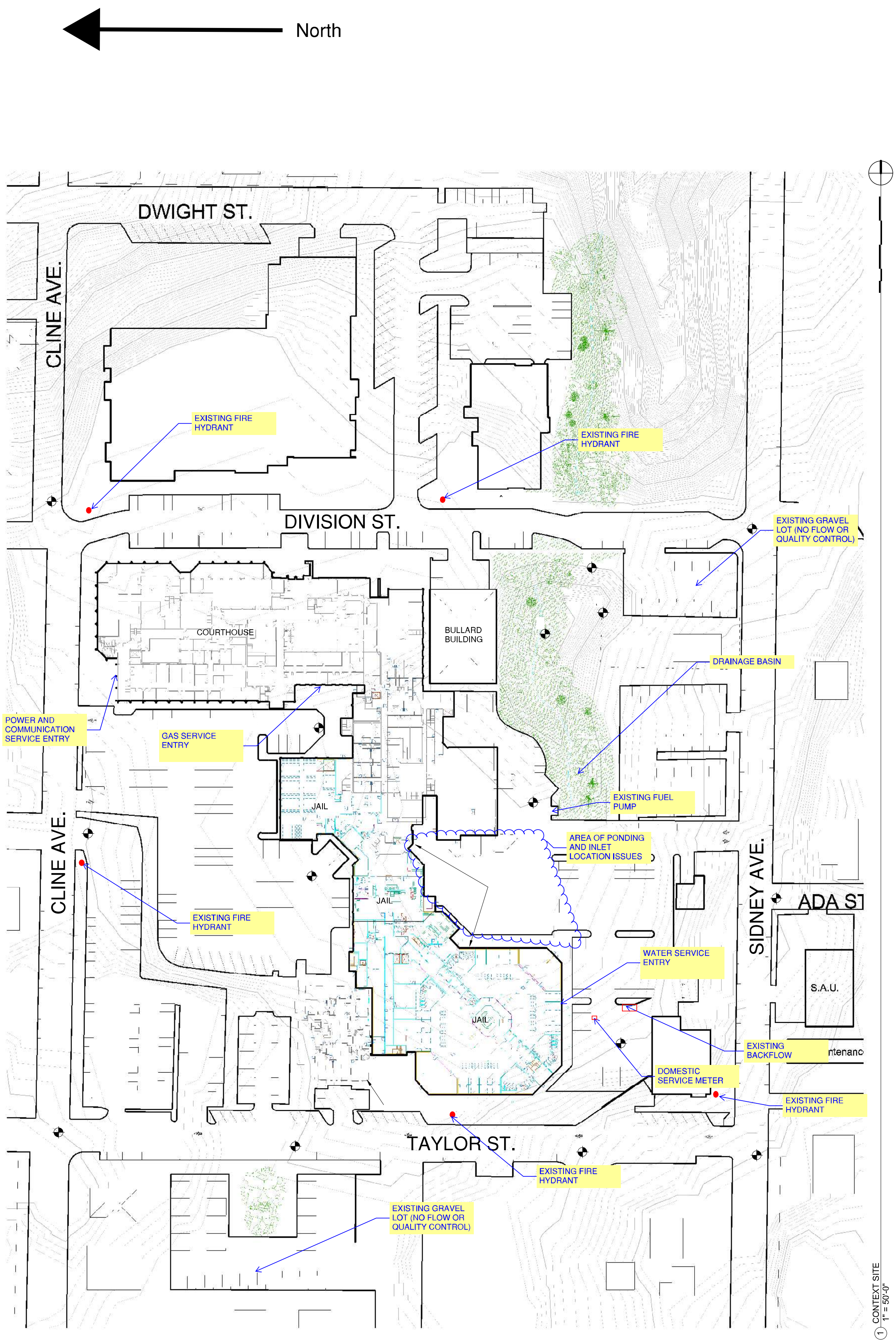
Existing Gravel Parking

Demolition/Utility Relocations

A majority of the existing Kitsap County Courthouse property is developed except for some properties and gravel parking areas around the periphery of the Courthouse and jail. Proposed improvements will require demolition and disposal and/or reuse and recycling of parking surfaces as appropriate. The construction of new or expanded building will require the relocation of water, sewer and stormwater facilities. The extent of the relocations required will depend on the proposed improvements and can be further identified with receipt of additional existing utility mapping and/or utility survey.

Street Frontages

Taylor Street is an existing one-way along the southern Kitsap County Courthouse limits, with direction of travel from Sidney Ave to the east to Cline Ave to the west SCJ understands that there may be an intent to accommodate two-way travel along Taylor Street. These improvements would include the removal of parking as well as curb, gutter and sidewalk improvements to accommodate the required pavement widths associated with two-way travel.


North
DWIGHT ST.
CLINE AVE.
EXISTING FIRE HYDRANT
EXISTING FIRE HYDRANT
DIVISION ST.
EXISTING GRAVEL LOT (NO FLOW OR QUALITY CONTROL)
COURTHOUSE
BULLARD BUILDING
DRAINAGE BASIN
POWER AND COMMUNICATION SERVICE ENTRY
GAS SERVICE ENTRY
JAIL
EXISTING FUEL PUMP
CLINE AVE.
AREA OF PONDING AND INLET LOCATION ISSUES
SIDNEY AVE.
ADA ST
JAIL
EXISTING FIRE HYDRANT
WATER SERVICE ENTRY
S.A.U.
JAIL
EXISTING BACKFLOW
ntenanc
DOMESTIC SERVICE METER
EXISTING FIRE HYDRANT
TAYLOR ST.
EXISTING FIRE HYDRANT
EXISTING GRAVEL LOT (NO FLOW OR QUALITY CONTROL)
1 CONTEXT SITE
1" = 50'-0"

Enclosure #2 - Stormwater System Map

SCJ ALLIANCE
CONSULTING SERVICES

TECHNICAL MEMORANDUM

TO: Amos Callender, Project Manager
Thomas Architecture Studios

FROM: Amy M. Head, PE
Jared VerHey, PE

DATE: June 4, 2018

PROJECT #: 1835.11

SUBJECT: Kitsap County Courthouse
Design Recommendations

PURPOSE

The purpose of this memorandum is to discuss four options for potential future development for the Kitsap County Courthouse as well as improvements to the existing gravel parking facilities around the periphery of the courthouse property. The four proposed courthouse options are similar in that they primarily focus on a new building fronting Cline Avenue, and be located to the south, west of the existing courthouse and jail facility, Therefore the four proposed courthouse options have similar design recommendations.

EXISTING COURTHOUSE SITE

The existing courthouse site is located at 614 Division St. in Port Orchard. Division St. is along the north side of the existing courthouse facility. The east, west and south limits are constrained by Sidney Ave, Cline Ave and Taylor St. respectively. See the Existing Conditions Assessment prepared by SCJ dated 5/23/18 for additional existing condition information.

PROPOSED OPTIONS

The proposed options are based upon the four design options provided via email on 5/25/18. All four proposed options include the construction of a new building along the western extents of the existing courthouse and jail property and will require similar parking, utility and grading improvements on the property.

Proposed civil improvements to the property include modifications to the existing utility services, stormwater improvements, grading and retaining walls to maximize site utilization/ parking. Utility improvement may also include new stormwater, sanitary sewer, domestic water, fire water, gas, power and communication service connections to the proposed building (if existing service connections cannot be utilized). Parking lot improvements include grading and resurfacing existing surface parking areas surrounding the proposed building options are expected. The design recommendations also include parking lot improvements, including surface and/or structure parking within the existing gravel parking lots around the periphery of the courthouse and jail.

DEMOLITION/UTILITY RELOCATIONS

A majority of the existing Kitsap County Courthouse property is developed except for some properties and gravel parking areas around the periphery of the Courthouse and jail. Proposed improvements will require demolition and disposal and/or reuse and recycling of parking surfaces as appropriate. The proposed building options will require the relocation of existing utilities and/or installation of new utilities if existing utility service connections cannot be utilized.

PARKING

The four options provided require the removal of a significant portion of the employee parking south and west of the existing courthouse facility. Reconfiguration of the existing courthouse employee parking lots would largely consist of removing existing parking with the addition of the proposed building option. Any building footprint removal proposed as part of the proposed options may also include new parking facilities.

Parking around the existing courthouse facility is insufficient for current demand. The potential for additional spaces within the existing parking areas is expected to include striping reconfiguration, regrading, storm facilities and paving of the existing gravel surface parking lots and/or the construction of a new parking structure.

UTILITIES

The existing courthouse and jail is currently served by utilities which are extended to the site from the adjacent roadways surrounding the property and in the case of stormwater, serviced by facilities currently on site. With nearby access to existing utilities the requirement for new utility construction to service the building options will be limited, assuming sufficient capacity is present.

Storm Drainage Infrastructure

Stormwater will be required to meet the 2005 Department of Ecology Stormwater Management Manual for Western Washington (SMMWW). Given the fully developed nature of the area where the four proposed building options are located, it is anticipated that there will be minimal to no net change in the existing impervious areas for all four options. It is anticipated that the existing detention system is adequately sized to accommodate the proposed building options and associated impervious areas as the existing impervious parking areas will be replaced with impervious building areas

The presence of existing stormwater treatment facilities for the proposed improvement area is not known at this time. It is assumed that the proposed parking areas modified as result of the four options will include stormwater treatment facilities for the replaced impervious areas. Bioretention facilities will be used to the greatest extent feasible although areas of mechanical treatment devices (ie. storm filters) may be necessary due to grades and availability of space to accommodate bioretention facilities.

During the existing conditions walk conducted on 5/14/18, Ponding within the existing loading dock area north and east of the existing jail was identified. This area is functionally separate from the proposed building options and should be considered independent of the proposed options. Resolving these drainage issues will include removal and replacement of existing pavement. Removal and replacement of existing storm pipes and storm structures as well as regrading to facilitate surface flows to proposed stormwater facilities. Replaced pavement in this area will trigger the need for stormwater treatment. Given that a minimal amount of space is available, mechanical treatment devices are expected in this area.

The existing gravel surface parking facilities may be reconstructed to facilitate additional parking. The existing gravel parking facilities currently do not have any stormwater quality and quantity controls. With the addition of paved facilities, surface parking, stormwater improvements will including new detention and treatment facilities. The type of facilities will be dependent on parking utilization goals (ie. high parking utilization minimizes available space for less expensive surface facilities and ponds while low parking utilization increases available space for surface facilities and ponds).

Existing gravel surface parking facilities may also be replaced with new structured parking solution. Stormwater from covered structure parking will be required to be connected to and oil water separator and routed to the existing sanitary sewer system.

Water System Infrastructure

Based upon the visual presence of water valves and fire hydrants, there appears to be a looped waterline system within Division Street, Sidney Avenue, Taylor Street and Cline Avenue surrounding the existing Kitsap County Courthouse and jail facility.

A new domestic and fire line service to the proposed building from Cline Ave shall be assumed as the connection to the existing domestic and fire service is unfeasible due to its location east of the existing jail. The new domestic and fire service will include meters, backflow devices, valves and fire department connections as necessary to meet fire code requirements.

Existing fire hydrants are present around the periphery of the existing courthouse along Division Street Sidney Avenue, Taylor Street and Cline Avenue. Spacing of hydrants is governed by the International Fire Code and the fire flow requirements for the type of building construction. The building type will determine the number of hydrants and spacing requirements. If it is determined the existing fire hydrants do not provide adequate coverage around the Courthouse and jail, additional hydrants can be added as required along with the associated waterlines by connecting to the existing water system within the adjacent roadways around the courthouse property.

Sewer System Infrastructure

The location of the existing sewer service(s) to the existing Courthouse and jail facility were not able to be identified in the field. It is assumed that the existing Courthouse and jail facility is served by multiple service locations that enter the existing sanitary sewer lines located within Cline Avenue to the west and Sidney Avenue to the east.

A new sanitary sewer service to the proposed building off of Cline Ave shall be assumed as the locations and elevations of the existing service locations are unknown.

Gas/Power/Communication Infrastructure

The existing location of existing gas power and communication was noted to be near the southwest corner of the existing courthouse facility along Cline Ave. The proposed options are expected to be serviced from the same locations with extensions to the new structures provided.

SOILS

According to the NRCS soils survey, the site soils consist largely of Harstine gravelly ashy sandy loam. These soils are moderately to well-drained and are expected to be acceptable for reuse in fill areas.

GRADING

Given the elevations around the proposed building options, retaining walls in excess of 10+ feet will likely be necessary to achieve desired grades for all options. In addition, it is likely that earthwork will not balance and that import, or export may be required depending on the proposed and parking utilizations goals adjacent the proposed building options.

ACCESS

The site has multiple points of access around the property. Given the improvement options provided, the existing access locations from Cline Avenue and/or Taylor St will most likely be reused and reconstructed to accommodate the proposed options and grade changes.

Circulation within the site is challenging given the existing parking infrastructure and grades. Circulation will be further evaluated as a specific site plan is developed.

TRANSIT

The existing site is currently served by the #5 Sidney Route of Kitsap Transit. Existing service locations are expected to remain.

ADA ACCESSIBILITY

Site upgrades will require compliance with ADA and connectivity between structures and ADA accessible parking will be required. This may be challenging between structures due to site elevation changes.

CONSULTANT REPORT - MEP

Here is our report of our review of the mechanical and electrical systems for the Kitsap County Courthouse Building.

MECHANICAL

HVAC Equipment

The building is served by a variety of HVAC equipment. The equipment includes:

- Multiple rooftop packaged gas heating DX cooling units
- Two rooftop multizone units, with DX cooling and hot water heat
- Two penthouse air handlers with DX cooling
- Multiple rooftop air conditioning units with hot water heat
- Multiple split system air conditioning units
- Two central gas fired boiler

Figure 1 Typical Rooftop HVAC Equipment

The units typically match the ages of the various building additions/revisions; except that a number of units were replaced as part of a year 2000 energy services project. The newer equipment (still approximately 18 years old) includes the boilers (and pumps), mulitzone units, penthouse AHU's, two rooftop air conditioning units, some of the gas packs units, and some split system air conditioning units. The other existing equipment is past its useful life and should be scheduled for replacement.

The penthouse air handlers serve a variable-air-volume (VAV) system in the east area of the building with aged VAV terminal units (Trane "Varitrac" units) that are well past their useful life. The penthouse air handler relief fan has failed (and is scheduled for replacement). The condenser/compressor units serving these penthouse air handlers are also past their useful life.

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Figure 2 Basement Aged AC Unit

HVAC Distribution

Air is distributed with ductwork from the units to ceiling air outlets. The majority of duct appears to be constructed of galvanized steel. The ductwork appears to be in fair condition, but due to its age should be cleaned and resealed.

Hydronic System

The hydronic system is a hot water heating type, using two central gas fired boilers, located in the basement. The units were installed in 2000, and are Weil McClain sectional cast iron type with 2700 MBH input capacity. The boilers have had newer burners installed, manufactured by Weishaupt. The boilers appear to be in good condition however one boiler was down for repairs. These are considered low efficiency boilers as compared to new condensing type. The piping system is black steel (or copper) and is in fair condition; there is an on-going chemical treatment for the system.

Figure 3 Gas Fired Boiler

HVAC Controls

The existing controls are the Direct Digital Control (DDC) type, manufactured by Andover. The system is monitored via a central computer in the maintenance office. These controls were installed as part of the year 2000 energy service project, and appear to be functioning fine. The thermostats typically have push button overrides for after hours operation.

Plumbing Piping

Waste and vent piping systems uses cast iron and galvanized steel piping, and appears to be in fair condition. The domestic water piping is of galvanized steel and copper, and is in poor condition. There have been leaks and the system valves no longer allow for isolation of parts of the building, requiring the entire building water supply to be shut down for maintenance.

Figure 4 Domestic Water Piping

Water Heaters

Domestic hot water is generated by a basement gas fired water heater in conjunction with a solar water preheat system (uses rooftop solar panels, basement storage tank and pump). Circulation pumps located in the basement boiler room maintain hot water circulation through the building hot water system. Other small electric water heaters for dedicated are located in other areas in the building.

Fuel Piping

Natural gas is supplied to the building; the meter is located outside the boiler room at grade. Piping is black steel and is in good condition.

Fire Suppression

The building is not fire sprinklered except for an office area located in the basement. The alarm assembly for this has poor access which does not comply with current code (located high on wall behind cabinet door). A halon fire suppression system serves the basement server room. Halon is no longer allowed to be manufactured due to environmental issues, but is allowed to remain in place as a fire suppression agent. Current code would require that the entire building be fire sprinklered. We recommend that the halon system be phased out since its discharge is harmful to the environment.

Figure 5 Fire Sprinkler Valves

ELECTRICAL

Power Distribution

The building is served by a 500 kva pad mounted transformer located at the southwest corner of the building. This transformer serves a 1200 amp 480/277 volt 3-phase main distribution switchboard which serves the main HVAC loads and a 400 kva 120/208 volt indoor transformer. This transformer serves a 1200 amp sub-distribution switchboard for lighting, convenience outlets, and small mechanical loads. In addition the building is served by another pad mounted transformer located at the south side of the building, which is connected to a 2500 amp 120/208 3-phase main distribution switchboard. This panel serves the pre-1978 areas of the building.

Figure 6 Aged Electrical Panel

The building electrical panels are typically manufactured by Square D, with some aged Trumbell panels noted. This newest of this distribution equipment and panels were installed in 1978 and appear to be in fair good condition. However, with an economic useful life of 40 years should be considered for replacement, along with the other panels which are older.

The building is served by a generator located at the Jail, with a 225 amp transfer switch located in the Courthouse basement electrical room. The transfer switch serves a 480 volt panel and a 150 kva 120/208 transformer; installed in 1984 as part of a Jail project. Loads served include server room equipment and some cooling equipment.

Lighting

The building interior lighting consists of ceiling fixtures with fluorescent lamps and electronic ballasts. The lighting appears adequate. There are no automated interior lighting controls. This lighting should be upgraded to energy efficient LED type fixtures with daylight and occupancy controls.

Fire Alarm System

The existing fire alarm system is a non-addressable type with old fire alarm devices. The system has 12 different zones. The system has had the main panel upgraded recently with a new panel, by Silent Knight. The system devices are obsolete and should be replaced with an addressable system with voice evacuation.

Here are our recommended mechanical and electrical systems for the four options for the Kitsap County Courthouse Building.

Option 1

HVAC System

We would recommend the use of a central hydronic plant and central air handlers, with a variable-air-volume (VAV) air distribution system. The central plant would utilize multiple high efficiency gas fired boilers, generating heating hot water. Cooling would be by central water cooled chillers, rotary screw type, with rooftop (or at grade) cooling towers.

The air handlers would consist of at least four units, with variable speed supply and return fans. Ductwork would be constructed of galvanized steel, serving VAV terminal units. The VAV terminal units would be the shut-off type with hot water heating coils. The hydronic system would use steel and copper piping, with variable speed pumps.

The controls would be the Direct Digital Control (DDC) type, with system graphics, and energy metering. Conference rooms, Court Rooms and similar densely occupied areas would have CO_2 demand ventilation controls.

Plumbing System

Waste and vent piping systems would use cast iron piping; domestic water piping would utilize copper with soldered or mechanically coupled joints. Valves would be the ball type, bronze construction.

Domestic hot water would be generated by multiple gas fired water heaters. The system would be circulated with pumps located at the water heaters.

Plumbing fixtures would be the vitreous china type. Water closets and urinals would have automatic sensor operated flush valves; lavatories would have sensor operated faucets with tempered water.

Fire Suppression

The building would be fully fire sprinklered, per NFPA 13 and local requirements. A fire pump may be needed due to the height of the building. IT areas could utilize pre-action or FM200 chemical suppression systems.

Lighting Systems

Interior and outdoor light fixtures would be the LED type. Lighting controls would include occupancy sensors and light level controls for day lit areas, as required to comply with the energy code. Outdoor lighting fixtures would be controlled by photo sensors and time schedule.

Power Distribution

The building would be served with a single metered 480/277 volt electrical service. Step down transformers would provide 208/120 volt distribution for convenience power and small appliance loads. 480 volt switchgear and distribution panels would have fusible switches or circuit breakers.

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Separate panel boards would be provided for HVAC equipment to facilitate meeting the metering requirements of the energy code.

A diesel generator is proposed to provide emergency power for egress lighting (life safety) and for standby power.

Feeders and branch circuits would consist of copper conductors installed in conduit. MC cable would be an approved alternative for branch circuits except homeruns would consisting of conductors installed in minimum 3/4 inch diameter conduit. Conduit installed above grade would be electrical metallic tubing (EMT) or rigid galvanized steel (RGS). Conduit below grade would be schedule 40 PVC. Wiring devices would be specification grade 20 ampere rated.

Fire Alarm

An addressable fire alarm system would be provided. Detection devices would be provided to comply with minimum Code requirements to include smoke detectors in HVAC fan systems rated above 2000 CFM. Manual stations, horns and visual alarm signals would be installed per code. System would include alarm and supervision of the building sprinkler system and operational interface with building fire/smoke dampers. An Emergency Voice/Alarm Communication System would be incorporated into the fire alarm system.

<u>Options 2, 3, and 4</u>

Systems would be the same as described in Option 1, but with these changes:

HVAC System

The systems would match what is proposed for Option 1, but with the central plant installed in the Phase 1 building. Air handlers could be rooftop.

Fire Suppression

A separate fire service and fire riser could be utilized in the Phase 2 instead of extending the building system from the Phase 1 building.

Power Distribution

The primary electrical service sized to accommodate the entire building would be sized and configured in Phase 1 to serve the entire facility. The Phase 2 construction area which links the two buildings (lobby area) appears to be proposed near the existing electrical service to the campus, so site power distribution revisions would be required to maintain electrical service to the Jail complex.

CONSULTANT REPORT - STRUCTURAL

STRUCTURAL EVALUATION

FOR

KITSAP COUNTY COURTHOUSE
PORT ORCHARD, WASHINGTON

PREPARED BY

PCS STRUCTURAL *SOLUTIONS*

JUNE 1, 2018
18-439

I. EXECUTIVE SUMMARY

The Kitsap County Courthouse is a structure that was originally designed in 1935 and has had several additions and remodels in the past 80 years. It is our understanding that additions were designed in 1947, 1969, 1970, 1971, 1974, and 1978. The method of construction varied greatly between the different additions. Therefore, the overall structure has components of wood, concrete, and masonry.

Overall, the structural concerns noted for each of the buildings are common for their age and type of construction. Globally, the gravity framing systems appear to have performed well during the life of the structure; we did not observe significant signs of structural distress or differential settlement within these elements. The majority of the structural concerns identified relate to the buildings' lateral resisting systems, and are generally the result of lateral system layout and construction details that are not consistent with current seismic code requirements and methodologies.

Building codes and construction methods have changed over the years, incorporating lessons learned from past experience in relation to vertical and lateral (wind and seismic) design. The current state of the art in structural design is focused on performance based design. A Life/Safety seismic performance objective level was used as the basis for analysis of each of the buildings in the evaluation. This level of performance addresses the life/safety of the building occupants, and is primarily concerned with the potential for partial or total collapse of the building systems and/or components. Two types of collapse issues were considered in the review: those where eminent collapse or failure may occur under normal vertical loading conditions, and those that may occur in the event of moderate to major wind or seismic event.

Summary

In summary, the ASCE 41-13 Tier 1 Evaluation procedure indicates multiple lateral structural deficiencies for the building. An upgrade of the global lateral system – a process that would most likely consist of the addition of concrete shear walls and footings - would address the deficiencies indicated.

II. INTRODUCTION

A) SCOPE OF WORK

a) Field Investigation

- Walked through the complex, looking for signs of structural distress, differential settlement or deterioration.
- Visually verified vertical and lateral systems.
- Reviewed structural concerns identified in the ASCE 41-13 Checklist along with field observations identified in the checklists.
- Viewed structure wherever visible.
- Testing or selective demolition was not completed at this time.

b) Initial Review of Construction Drawings

- Reviewed available construction drawings.
- Utilized the ASCE 41-13 Building Checklists as a guideline to help identify common structural deficiencies for the building.
- Where no drawings were available, or the drawings did not adequately describe as-built conditions, recommendations were based on field investigation and observations.

c) Report Preparation and Further Construction Drawing Review

- Further evaluated drawings with respect to structural concerns identified in the initial review or field investigation.
- Brainstormed conceptual ideas to mitigate structural concerns identified.
- Structural Report
  - Described vertical and lateral load resisting system for each building.
  - Summarized visual observations of building condition, signs of structural distress, and differential settlement.
  - Identified structural concerns from observations and ASCE 41-13 checklists.
  - Provided a summary of the structural recommendations.
  - Identified areas where additional analysis is warranted to verify assumptions made beyond the scope of this evaluation.

B) PUGET SOUND SEISMICITY

The Puget Sound is considered a seismically active region. Within this region, there are three basic types of earthquake that can occur:

- Shallow crustal earthquakes
- Benioff Zone (intra-plate) earthquakes
- Subduction zone (inter-plate) earthquakes

Movement of tectonic plates creates the mechanism that drives all three types of earthquake, as the Juan de Fuca Plate, comprising the bottom of the Pacific Ocean floor several miles off of the Washington and Oregon coasts, is forced into and below the North American Plate. The level of seismic hazard assigned to any particular building is related to the type of earthquake that may occur in the region, and can vary significantly based on the magnitude of earthquake and proximity of a given site to the epicenter.

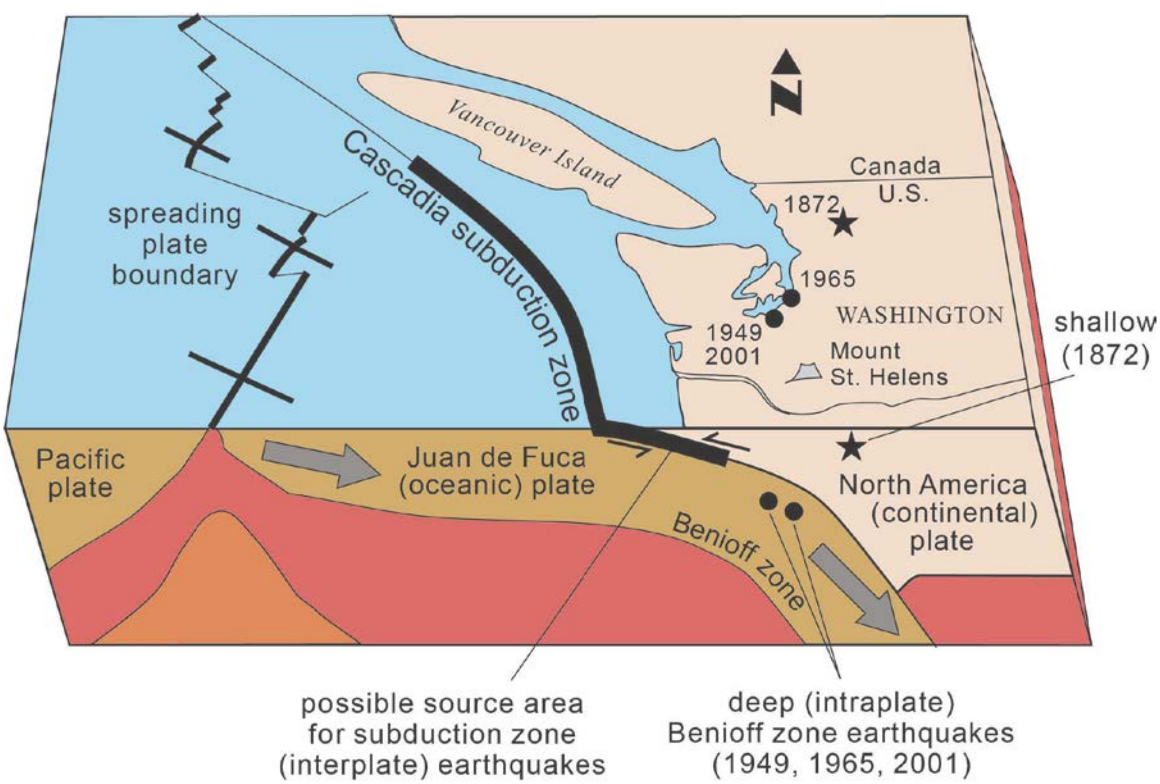

Figure A: Cross Section of the Cascadia Subduction Zone
(Source: Washington State Department of Natural Resources)

B) PUGET SOUND SEISMICITY cont.

Shallow crustal earthquakes occur in the overriding North American plate and are generally at depths less than 25 miles. There are at least six significant faults that have been identified in the Puget Sound region with concentrations in three primary locations; Seattle, Tacoma and South Whidbey Island. These groupings of faults run generally in an east-west orientation and cut across the heavily populated zones of the region. These earthquakes have a relatively long average recurrence interval at approximately 330 years and are capable of generating moderate to large events registering M5.5-M7 on the Richter Scale. This type of earthquake is generally expected to be of shorter duration and more localized as it relates to strong ground motions.

Intra-plate earthquakes occur in the portion of the Juan de Fuca plate that moves beneath the overriding North American plate. This type of earthquake occurs deep below the ground surface (typically 25 to 40 miles) and has the ability to generate moderate to large events of M6-M7 on the Richter Scale. They have a much shorter recurrence interval of approximately 35 to 50 years on average. Earthquakes of this variety tend to have shorter durations, but can still generate significant ground shaking over large areas of land.

Inter-plate earthquakes, also known as subduction zone earthquakes, occur directly at the interface of two plates and are more likely to be large magnitude events. They have the potential of registering upwards of M9 on the Richter Scale, with a relatively long average time of approximately 500 years between occurrences. These earthquakes are generally expected to have long durations, and can generate significant ground shaking over very large areas.

C) METHODOLOGY

Evaluation

The Kitsap County Courthouse was evaluated using the methodology of the ASCE 41-13 “Seismic Evaluation and Retrofit of Existing Buildings” Tier 1 evaluation, addressing the Life/Safety Performance level. The ASCE 41-13 document provides building checklists that identifies common seismic concerns for typical building types (i.e. Concrete Shear Walls Buildings with Flexible Diaphragms, Concrete Shear Walls Buildings with Stiff Diaphragms, Unreinforced Masonry Bearing Wall Buildings with Flexible Diaphragms, etc). Each question on the checklist may be answered by “compliant”, “non-compliant” or “not applicable”. For those items that are non-compliant, additional evaluation or mitigation of the structural concern is recommended. Detailed calculations were not performed for this study.

C) METHODOLOGY cont.

The ASCE 41-13 is a performance based design/evaluation manual with varying performance objectives. The performance objective is selecting based up the acceptable level of risk, as well as the tier level used in the evaluation. In general, there are three primary performance levels for existing buildings:

Immediate Occupancy: a higher level performance that focuses on maintaining building functionality after an earthquake. Light damage is anticipated in the event of a major earthquake; however, the building function is expected to be maintained with little to no disruption in service. Fire Stations, Hospitals, Police Stations and other critical facilities are buildings that are designed for this level.

Life Safety: focuses on protecting the occupants of the building. This is the most common level of performance for building design. In the event of a major earthquake, the building may suffer moderate damage with a small margin of total or partial collapse. The facility may be unusable after an earthquake, with low overall risk of injury from structural damage. This is the performance based objective by which the WSDOT Dayton Avenue building was evaluated.

Collapse Prevention: a low level of performance, where the damage to the building after a moderate earthquake may be severe. The lateral resisting system would have little residual strength, and large permanent deformations would occur. The building would likely be near collapse.

Once the Performance Level is selected it can be determined which procedural tier review to use in the evaluation:

- *Tier 1* is a screening process utilizing Building Checklists to help identify common structural deficiencies for typical buildings types. The owner/designer has the option of possibly mitigating the structural concern identified by Tier 1 or performing a more detailed analysis outlined in Tiers 2 and 3. This is the analysis procedure used to evaluate the WSDOT Dayton Avenue building.

- *Tier 2* is a deficiency-based evaluation and renovation procedure. This methodology includes analyzing specific elements or areas within a building to determine if potential deficiencies identified in a Tier 1 review actually require mitigation. Analysis of the entire building may not be necessary. This tier can be used for both evaluation and retrofit.

- *Tier 3* is a systematic evaluation and retrofit procedure, and involves a computationally extensive approach towards a complete analysis of the facility. The performance of the building as structural elements begin to yield, also known as a non-linear analysis, is considered. This tier is applicable for both the evaluation and retrofit of a facility.

IV. STRUCTURAL EVALUATION

KITSAP COUNTY COURTHOUSE
PORT ORCHARD, WA

The Kitsap County Courthouse was evaluated using the methodology of the ASCE 41-13 "Seismic Evaluation and Retrofit of Existing Buildings" Tier 1 evaluation, addressing the Life/Safety Performance level. Completion of non-structural checklists and evaluation of other non-structural components such as ceilings, partitions, lights, mechanical piping and equipment were beyond the scope of this evaluation.

A. TYPE OF CONSTRUCTION/STRUCTURAL SYSTEM

1935 Building
The original building is a two-story structure that was designed in 1935. Existing structural drawings were not available for review. However, buildings that were constructed in this time period were not designed for current seismic loading or with current detailing. We would anticipate that this building would be substantially seismically deficient.

1947 Building
The 1947 building is a two-story concrete structure. This building was constructed to the north of the 1935 building.

SYSTEM DESCRIPTIONS

<u>Vertical Load Resisting System</u>:

The primary gravity framing consists of concrete floor and roof beams that support reinforced concrete floor and roof slabs. Reinforced concrete columns and concrete bearing walls support the floor and roof structure. Conventional spread footings support the isolated columns at the interior of the building. Strip footings support the exterior frame columns, concrete walls and basement walls.

The lower level floors consist of a 4" concrete slab on grade with #10 wires at 6" on center each way.

A stone veneer is located on the exterior face of some of the concrete elements on the north side of the facility.

<u>Lateral Force Resisting System</u>:

The concrete floor and roof systems act as a rigid diaphragm that transfers lateral seismic/wind forces to concrete shear wall elements. The lateral forces are transferred through the shear walls and are ultimately resisted by the passive soil pressure and friction on the concrete foundation.

1969 Building
The 1969 building is a two-story wood framed structure. This building was constructed to the north of the 1935 building between the 1935 and 1947 buildings. Existing structural drawings were not available for review.

SYSTEM DESCRIPTIONS

Vertical Load Resisting System:

While on site we were able to observe that the vertical load resisting system consisted of wood open web joists. The joists supported plywood floor and roof sheathing.

Lateral Force Resisting System:

The lateral force resisting system consists of plywood floor and roof diaphragms that transfer the lateral forces to the existing 1935 and 1947 buildings.

1970 Building
The 1970 building is a two-story concrete and wood framed structure. This building was constructed to the west of the 1947 building.

SYSTEM DESCRIPTIONS

Vertical Load Resisting System:

The primary gravity framing consists of a two-way reinforced concrete floor slab. Reinforced concrete columns and concrete bearing walls support the floor structure. Conventional spread footings support the isolated columns at the interior of the building. Strip footings support the exterior frame columns and concrete walls.

The roof framing consists of open web wood joists spaced at 16” on center. The joists support 2x wood framing cut to suit the roof slope and ¾” plywood sheathing. These joists span between the existing 1947 building and exterior concrete masonry unit (CMU) bearing/shear walls.

The lower level floors consist of a 4” concrete slab on grade with #10 wires at 6” on center each way.

A stone veneer is located on the exterior face of some of the masonry elements on the north side of the facility.

Lateral Force Resisting System:

The lateral force resisting system consists of a plywood roof diaphragm and a concrete floor diaphragm that transfers lateral wind and seismic forces to the exterior CMU and concrete shear walls as well as to the existing concrete shear walls of the 1947 building.

The lateral forces are transferred through the shear walls and are ultimately resisted by the passive soil pressure and friction on the concrete foundation.

1971 Building
The 1971 building is a two-story concrete structure. This building was constructed to the east of the 1935 building. Existing structural drawings were not available for review. However, buildings that were constructed in this time period were not designed for current seismic loading or with current detailing. We would anticipate that this building would be substantially seismically deficient.

1974 Building
The 1974 building is a two-story concrete, masonry, and wood framed structure. This building was constructed to the south of the 1947 and 1970 buildings.

SYSTEM DESCRIPTIONS

<u>Vertical Load Resisting System</u>:

The primary gravity framing consists pre-cast concrete planks at the floor slab. These planks span between reinforced masonry shear/bearing walls at the perimeter of the building and in some interior locations in the building. Conventional spread footings support the isolated columns at the interior of the building. Strip footings support the exterior frame columns and concrete walls.

The roof framing consists of 4" tongue and groove decking spanning between 5 1/8"x 22 ½" glu-laminated roof beams. Plywood sheathing that is 3/8" thick extends over the entire roof diaphragm. The wood roof framing is supported by interior and exterior reinforced masonry shear/bearing walls.

The lower level floors consist of a 4" concrete slab on grade with #10 wires at 6" on center each way.

<u>Lateral Force Resisting System</u>:

The lateral force resisting system consists of a plywood roof diaphragm and a concrete floor diaphragm that transfers lateral wind and seismic forces to the interior and exterior CMU shear walls.

The lateral forces are transferred through the shear walls and are ultimately resisted by the passive soil pressure and friction on the concrete foundation.

1978 Building
The 1978 building is a two-story wood framed structure. This building was constructed to the north of the 1947 and 1970 buildings.

SYSTEM DESCRIPTIONS

Vertical Load Resisting System:

The primary gravity framing consists of wood "I" joists at the floor and roof. These joists support plywood sheathing at the floor and roof diaphragms. These joists are supported by the adjacent existing structures, exterior concrete masonry unit (CMU) bearing/shear walls and glu-laminated wood girders. A portion of the 1978 building is constructed over the top of the existing 1970 building.

Lateral Force Resisting System:

The lateral force resisting system consists of plywood floor and roof diaphragms that transfers lateral wind and seismic forces to the exterior CMU and concrete shear walls. The lateral forces are transferred through the shear walls and are ultimately resisted by the passive soil pressure and friction on the concrete foundation.

B. OBSERVATIONS AND COMMENTS

- In general, the building appears to have been well maintained. We observed no signs of significant structural distress, structural deterioration or differential settlement.
- There were minimal temperature and shrinkage cracks in the floor slabs and columns, but the amount observed is typical for a building of this size and age.
- Possibly the most significant issues observed occurred in the 1974 building where water appeared to have flowed into a reinforced cell of the exterior masonry wall pier. Deterioration then occurred on the reinforcing within the cell causing the reinforcing to swell and crack the end of the masonry pier. This cracking and exposing of reinforcing occurred a several masonry piers.
- Per the existing drawings of the 1974 building, reinforcing should be located between the concrete floor slabs and the interior shear/bearing walls. Visible gaps were noticed in these areas and therefore we question if the reinforcing indicated on the plans was installed.
- While it is beyond our scope of services to review the non-structural components throughout the building, we noted that the majority of the mechanical duct work, piping, electrical conduit, and non-structural walls were not braced. The lack of bracing could result in substantial damage during a seismic event.

C. ASCE 41-13 "Seismic Evaluation and Retrofit of Existing Buildings" Checklist – Non-Compliant – Structural Concerns

The structural items noted below outline the structural concerns related to the anticipated seismic performance and overall structural performance of the existing building. Conclusions are based on a walk-through evaluation, review of the available construction drawings, and on experience in renovations of similar building types in the Puget Sound area. The ASCE 41-13 structural checklists were used as guidelines to identify building deficiencies that have historically resulted in damage or collapse of structures under seismic loading. Checklists are provided for buildings where existing drawings were available for review. The following issues are a summary of deficiencies identified for the Phase 1 Building. The checklists reflecting the findings of the analysis can be found in Appendix A.

ASCE 41-13 Non-Compliant or Unknown Items:

1947 Building

- Transfer to Shear Walls – The existing drawings do not clearly indicate all wall connection details. However, it appears that the reinforced concrete floor and roof diaphragms are connected with #3 reinforcing at 16" on center in some locations.
- Foundation Dowels – A single straight dowel is indicated on the existing drawings as a tie between the concrete walls and foundation. The size and detailing of this dowel does not meet current code requirements.
- Deflection Compatibility – Secondary components not part of the lateral system do not appear to have the sufficient shear capacity to accommodate lateral movement of the structure during seismic events. When the building moves during an earthquake, all components of the structure move with it. This results in increased forces within those elements that they may not have been designed for, which can overstress the components and diminish their capacity to resist the loads for which they were designed to resist.

1970 Building

- Wall Anchorage – The out-of-plane wall anchorage between the CMU walls and wood roof diaphragm is not well defined and does not appear to meet current code practices. Without proper anchorage concrete and masonry walls could fall away from the building causing partial or total collapse of sections of the building.
- Wood Ledgers – The out-of-plane wall straps are not indicated in the existing structural drawings. It appears that cross grain bending could be induced by the connection of the 2x stripping to the wood ledger connection.
- Transfer to Shear Walls - The existing drawings do not clearly indicate all wall connection details. It appears that there is little connection for in-plane or out-of-plane forces.
- Spans – The roof diaphragm spans greater than 24 feet and does not contain cross ties in the long direction of the building.

1974 Building

- Wall Anchorage – The out-of-plane wall anchorage between the CMU walls and wood roof diaphragm is not well defined and does not appear to meet current code practices. Without proper anchorage concrete and masonry walls could fall away from the building causing partial or total collapse of sections of the building.
- Transfer to Shear Walls - The existing drawings do not clearly indicate all wall connection details. It appears that there is little connection for in-plane or out-of-plane forces.

- Spans – The roof diaphragm spans greater than 24 feet and does not contain cross ties in the east-west direction of the building.

1978 Building

- Wall Anchorage – The out-of-plane wall anchorage between the CMU walls and wood roof diaphragm is not well defined and does not appear to meet current code practices. Without proper anchorage concrete and masonry walls could fall away from the building causing partial or total collapse of sections of the building.
- Wood Ledgers – The out-of-plane wall straps are not indicated in the existing structural drawings. It appears that cross grain bending could be induced by the connection of the 2x stripping to the wood ledger connection.
- Transfer to Shear Walls - The existing drawings do not clearly indicate all wall connection details. It appears that there is little connection for in-plane or out-of-plane forces.
- Spans – The roof diaphragm spans greater than 24 feet and does not contain cross ties in the long direction of the building.

D. SUMMARY

The building appears to have performed well for the eras in which it was constructed; however, it does not meet the minimum performance standards prescribed by the Tier 1 Analysis. The structural concerns noted above are common for concrete, masonry and wood buildings of these generations. However, the primary concern with the above-listed deficiencies is the overall anticipated seismic performance of the building.

In order to bring these structures up to current code standards a substantial seismic retrofit would be required throughout. Some of the required retrofit would be as follows:

- Provide new in-plane and out-of-plane connections between the floor and roof diaphragms. Especially where wood roof diaphragms are used to brace concrete or masonry walls.
- Provide adequate lateral load resisting elements to resist current code wind and seismic forces. This would include the addition or strengthening of concrete and masonry shear walls throughout the facility as seismic design forces have increased approximately 50% since the most recent design.
- Additional diaphragm strengthening especially in the wood roof diaphragms would be required.
- Foundation work to support the new/reinforced lateral elements would be required.
- Connections between the lateral elements and the floor/roof diaphragms would need to be updated.
- Concrete elements such as columns and shear walls would likely need to be wrapped with composite fiber to bring up to current code detailing/strength standards

While structural retrofit is a possibility, the overall cost of the retrofit may be prohibitive as the only building that appears to have detailing similar to current code standards would be the 1978 building.

V. APPENDIX A – COMMON SEISMIC TERMINOLOGY

COMMON SEISMIC TERMINOLOGY – SEISMIC PERFORMANCE GOALS

Major Earthquake: Also known as the "Design" earthquake since its criteria is used for most codes. It is an earthquake that produces ground motions (shaking) at the site under consideration that have a 10% probability of being exceeded in 50 years. A 30% of gravity (0.3g) ground acceleration would be anticipated in the Puget Sound area.

Moderate Earthquake: An earthquake that produces ground motions (shaking) at the site under consideration that have a 50% probability of being exceeded in 50 years. The 1949, 1965 and 2001 earthquakes in the Puget Sound area are classified as moderate earthquakes.

Minor Earthquake: An earthquake that produces ground motions (shaking) at the site under consideration less than a moderate earthquake and would be short in duration. The recent Richter scale 5.5 earthquakes in the Puget Sound area would be considered minor earthquakes.

Probability of Exceedance: The probability that the ground shaking level or damage level will be exceeded.

International Building Code (IBC): The IBC is a comprehensive set of national regulations for building systems consistent with and inclusive of the scope of originally regional legacy codes. The IBC is the current nationally recognized building code and has been adopted by a majority of states and building jurisdictions.

Anticipated Seismic Performance of New Construction Built to Comply with the International Building Code:

1. Resist a minor level earthquake ground motion without structural or nonstructural damage.
2. Resist moderate level of earthquake ground motion without structural damage, but possibly experience some nonstructural damage.
3. Resist a major level of earthquake ground motion having an intensity equal to the strongest either experienced or forecast for the building site, without collapse, but possibly with some structural, as well as nonstructural damage.
4. Essential facilities are designed for force levels 25% to 50% greater than standard buildings. The building is intended to have minimal structural and nonstructural damage after a major earthquake. The repair of the damage that has occurred would generally not be required prior to re-occupancy, or in other words, be in an operable condition after a major earthquake. Hospitals, Police and Fire Stations are common essential facilities.

International Existing Building Code (IEBC): Building Code Standard that addresses older buildings not constructed under current codes and specifically older unreinforced masonry buildings, concrete tilt-up building, wood buildings and concrete buildings. Its provisions for rehabilitation of unreinforced masonry buildings are less stringent requirements than are demanded for new construction, and were developed considering and balancing the expense of retrofit, the value of the existing building stock and the desired reduction in seismic risk.

ASCE 41-13 – Seismic Evaluation and Retrofit of Existing Buildings: A comprehensive standard based on performance based design, it identifies areas of seismic vulnerability with each common building type based on past seismic performance. The performance level design criteria include Collapse Prevention, Life Safety, Immediate Occupancy and Operational (the last for new construction only). ASCE 41-13 has become the accepted standard in the building industry.

Anticipated Seismic Performance of Building Renovated to International Existing Building Code or ASCE 41-13 Life/Safety Performance Level: The seismic performance would be less than that of new construction. The goal is to reduce life/safety hazards as best as possible with available resources. This code is directed at insuring a coherent load path for lateral loads, reduction of out-of-plane wall failures, reduction of loss of support for floors and roofs and reduction of falling parapets or ornamentation. Anticipated post-earthquake condition would be similar to life/safety design performance for moderate earthquakes and near collapse for major earthquakes as described below.

Immediate Occupancy Seismic Performance Level: Post-earthquake condition of the building would be such that only limited structural damage has occurred. The basic vertical and lateral load resisting systems of the building retain nearly all of their pre-earthquake strength and stiffness. The risk of life- threatening injury as a result of structural damage is very low, although some minor structural repairs may be appropriate; these would generally not be required prior to re-occupancy.

Life/Safety Performance Level: The post-earthquake condition of the building would be that the building may suffer significant structural damage with some anticipated margin against either partial, or total structural collapse. Injuries may occur during the earthquake; however, it is expected that the overall risk of life-threatening injury as a result of structural damage is low. It should be possible to repair the structure; however, for economic reasons this may not be practical. While the damaged structure is not an imminent collapse risk, it would be prudent to implement structural repairs or install temporary bracing prior to re-occupancy.

Collapse Prevention Seismic Performance Level: The post-earthquake condition of the building would be such that the building would be on the verge of experiencing partial or total collapse. Substantial damage to the structure has occurred, potentially including significant degradation in stiffness and strength of the lateral force resisting system, large permanent lateral deformation of the structure and to a more limited extent, degradation in the vertical load carrying capacity. The primary vertical gravity load resisting system should still be able to support its load demand. Significant risk of injury due to falling hazards from structural debris may exist. The structure may not be technically practical to repair and is not safe for re-occupancy, as aftershock activity could induce collapse.

Hazard Reduction/Mitigation of Seismic Hazard: Objective is met with the removal or strengthening of elements of the building which have commonly performed poorly in past earthquakes or presents a life/safety threat to the building occupants.

Structural Damage: Damage to the structural elements of the building. A building with structural damage may require evacuation after an earthquake until structural components are repaired.

Nonstructural Damage: Damage to architectural, mechanical, electrical or building components that do not affect the overall structural integrity of the building. Examples are window breakage, shelves overturning, and ceilings falling down. This is the most common and may be the most expensive damage caused by an earthquake.

Lateral Force Resisting System: Those elements of the structure that provide its basic lateral strength and stiffness (to resist lateral forces due to wind or earthquake motion), and without which the structure would be laterally unstable.

Vertical Load Resisting System: Those elements of the structure that provide a load path for the gravity loads to the foundation.

Ductility: A measure of the ability of a material, elements or system to deform beyond yield. (Yielding after material, element, system has exceeded its initial design strength without a significant loss in load-carrying capacity).

Redundancy: The presence of multiple structural support systems, such that if one or several elements have substantial strength or stiffness loss, continuing lateral displacement and vertical loads may be resisted by the other structural or nonstructural elements in the system.

Brittle Systems: Systems that do not have a defined yield phase (ductility) and that have a significant strength degradation immediately after the displacement associated with peak strength. (Unreinforced clay tile and brick masonry bearing wall systems would be considered brittle systems.)

Diaphragm: A horizontal, or nearly horizontal system designed to transmit lateral forces to vertical elements (shear walls, braced frames, etc.) of the lateral-force-resisting system. Common diaphragm types are plywood sheathing, reinforced concrete, metal decking or concrete topping over metal decking.

Shear Wall: A wall designed to resist lateral forces acting in the plane of the wall (parallel to the wall). Common shear wall types are plywood, reinforced masonry or concrete walls.

Braced Frame: An essentially vertical truss, or its equivalent. Two common braced frame types are concentric (members meet at a common point) or eccentric (to resist lateral loads, some members do not meet at common point). Braced frames are most commonly constructed of steel members.

Redundant Load Path: Secondary load path, normally independent of primary load path, to provide vertical support of floors and roof, if bearing walls or vertical frame fail.

Unreinforced Masonry Wall: Masonry walls, such as solid brick masonry, hollow clay tile or concrete masonry unit (CMU), that rely on the tensile strength of masonry units, mortar and grout to provide structural support. (Current code (IBC) requires reinforced masonry walls to resist tensile forces in our seismic risk zone.)

Unreinforced Concrete Wall: Concrete walls lacking reinforcing that rely on the tensile strength of the concrete to provide structural support. Nominally or minimally reinforced concrete walls act in a similar manner. (Current code (IBC) requires reinforcing steel to resist tensile forces in our seismic risk zone.)

Shotcrete: Concrete that is pneumatically sprayed on vertical, or near vertical, surfaces typically with a minimum use of concrete form work.

Re-Entrant Corner: Plan irregularity in a building, such as an extending wing, plan inset or E, T, X, and L shaped configuration, where large tensile and compression forces can develop at “inside corner configurations”.

Strong Back System: A secondary system, such as a wood or steel frame wall or columns, used to provide out-of-plane support to an unreinforced or under-reinforced masonry wall.

Sub-Diaphragm: A portion of a larger diaphragm used to distribute loads between members. Sub-diaphragms are commonly used to distribute tension loads from anchorage of masonry or concrete walls to tension ties (crossties) across the building.

Crosstie: A beam, girder, or other structural member that accumulates tension loads from wall anchorage and distributes them over the entire width of the building (diaphragm).

Richter Scale: A measurement of the amount of energy released in an earthquake. It utilizes a base-10 logarithmic scale, so every magnitude level increase (i.e M6 to M7) corresponds to 10 times the energy released.

Interplate/Subduction Zone Earthquake: An earthquake that occurs directly at the interface of two tectonic plates. They typically have long reoccurrence levels (500 years or more), and have the ability to produce the largest magnitude earthquakes, upwards of M9 on the Richter Scale.

Intraplate Subduction Zone Earthquake: A deep earthquake, with an epicenter typically 25 to 40 miles below the surface, that has the ability to produce large magnitude earthquakes, upward of M6 to M7 on the Richter Scale. They have a short reoccurrence level, often in the 35 to 50 year range.

Shallow Earthquake: An earthquake that occurs at depths less than 25 miles. While they may release less energy than other earthquake (M5.5 to perhaps M7 on the Richter Scale), they shallow nature of the earthquake can often lead to more ground disruption, and therefore more geographically isolated damage.

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Structural Design Narrative

DESCRIPTION OF PROJECT

The new proposed Kitsap County Courthouse is located in Port Orchard, Washington. There are four (4) options for the construction of the new facility. All options include an approximate 220,000 square foot of new construction. Some options also include the construction of space to the west and/or to the north of the existing jail. A summary of the various options is as follows:

Option 1:

The facility is estimated to be 7-stories with all levels constructed to the west of the existing jail.

Option 2:

The facility is estimated to be 4-stories constructed to the west and 3-stories constructed to the north of the existing jail.

Option3:

The facility is estimated to be 4-stories constructed both to the north and west of the existing jail.

Option 4:

The facility is estimated to be 6-stories constructed to the west and 2-stories constructed to the north of the existing jail.

DESIGN CRITERIA

- Code: 2015 International Building Code
- Roof Loads:
  - Dead Load (Steel Framed Roof) – 20psf
  - Dead Load (Steel Frame with Concrete Topping) – 80psf
  - Live Load – 25psf
- Floor Loads:
  - Dead Load (Steel Frame with Concrete Topping) – 80psf
  - Live Load:
    - Office – 40psf + Partitions
    - Fixed Seat Assembly – 60psf
    - Public Spaces/Lobbies and Corridors Serving Them – 100psf
    - Stairs – 100psf
    - Mechanical Floors – 40psf + Mechanical Equip. Weight and Housekeeping Pads
- Site/Soil Properties (Assumed):
  - Soil Bearing Pressure – 2,000 psf + 1/3 increase for seismic loading
  - Site Class "D"
  - Retaining Walls:
    - Active Pressure: 35pcf + $15.5H^2$ (seismic)
    - Restrained Pressure: 55pcf + $15.5H^2$ (seismic)
  - Passive Pressure: 250pcf (neglecting top 1')
  - Coefficient of Friction: 0.32

Structural Design Narrative Cont.

- Seismic Design:
  - S_S=1.576, S_1=0.607, S_{DS}=1.051, S_{D1}=0.607
  - Importance Factor, I=1.25
  - Response Modification Coefficient, R=5 (Special Reinforced Concrete Shear Walls – Bearing Wall System), R=8 (Special Steel Moment Frame)
- Wind Design:
  - Basic Wind Speed: 115mph
  - Exposure Category: "B"

FOUNDATION SYSTEM

The foundations will be traditional continuous and spread concrete footings. Typically, the tops of the footings will be located 1'-0" below the lower level finish floor elevation. Minimum size for strip footings will be 2'-0" at the 2-story structures and 3'-0" +/- at the taller structures. We assume that the exterior footings will be supporting non-bearing metal stud framing.

The ground floor will be conventional 5" concrete slabs on grade reinforced with #4 reinforcing at 16" on center each way. A shrinkage reducing admixture to help prevent cracking should be added in areas where architecturally exposed concrete is required.

FLOOR FRAMING SYSTEM

All elevated floors will be constructed with a composite steel floor system, utilizing steel beams (spaced between 7'-0"o.c. and 8'-0"o.c. typically) and steel girders. It is estimated that 2" metal decking and concrete topping totaling 5½" in thickness (including metal deck) will be provided at all levels. Steel wide flange columns will be used to support the framing.

ROOF FRAMING SYSTEM

Typically the roof framing will utilize structural steel joist framing (W14x or W12x spaced approximately 7'-6"o.c.) supporting 1½" deep metal decking. Structural steel girders and columns will be used to support the gravity loads.

OPTIONAL FRAMING SCHEME

It is possible to utilize a post-tensioned framing scheme for the construction of the new courthouse. If this option were selected we estimate a two-way flat plate method of construction supported by concrete columns. The thickness of the slab would vary based on the column spacing.

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Structural Design Narrative Cont.

LATERAL LOAD RESISTING SYSTEM

Lateral wind and seismic forces will be transferred through the floor and roof diaphragms and will be resisted by buckling restrained braced frames or special reinforced concrete shear walls. The metal decking at the roof levels will act as a diaphragm to transfer lateral loads to the frame elements. The lateral forces will be resisted by conventional concrete grade beams and mat footings.

MATERIAL QUANTITY ESTIMATES – INITIAL SCHEMATIC PRICING

The following quantity estimates can be used for pricing:

Kitsap County Courthouse: Material Quantity Estimates for Initial Pricing Concrete	
Item	Reinforcing Steel
Mat Foundations under walls and cores	350#/Cu. Yd
Spread Footings	80#/Cu. Yd
Slab on Grade	90#/Cu.Yd
Basement Wall Foundations	235#/Cu.Yd
Concrete Walls	275#/Cu.Yd
Concrete Columns	500#/Cu. Yd
Stair Core Shear Walls	450#/Cu.Yd

Kitsap County Courthouse: Material Quantity Estimates for Initial Pricing Structural Steel	
Item	Reinforcing Steel
Roof Framing	20 PSF
Miscellaneous	See Note 1 Below

Note 1: Additional steel quantities should be estimated for all miscellaneous steel including stairs, railings, cladding supports, window washing supports, mechanical supports, operable partition supports, canopies, trellises, other architectural features, elevator supports, etc.

Kitsap County Courthouse
Feasibility and Space Needs Assessment

ESTIMATED MARKET VALUE REPORT

An estimated market value report was generated by Dick Beeson for assessment of 20 properties surrounding the existing Kitsap County Courthouse and Administration buildings. This report will be maid available electronically upon request.

Contact:
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