



HALCYON CONDUIT RELOCATION – FEASIBILITY STUDY

CREDIT VALLEY HOSPITAL

PROJECT NO.: CA0003678.3329

CLIENT REF: 23014

DATE: OCTOBER 15, 2024

WSP

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1 EXECUTIVE SUMMARY

This report provides recommendation on re-routing the underground conduits located below the renovation areas of the new Orthovoltage Room, Halcyon Room 1, 2 and 3 as part of the Halcyon Accelerator project at Credit Valley Hospital. Both the Orthovoltage and Halcyon machines require radiation shielding similar to the existing Linear Accelerator bunkers. The hospital has provided scanning reports indicating conduits embedded in the ground and discovered there are numerous conduits sitting at 6" to 8" below grade. Structural engineers have confirmed that these underground conduits are interfering with the construction of the concrete footings needed to support the radiation shielding walls for the new Orthovoltage and Halcyon rooms.

For Halcyon Room #1, the scanning report revealed underground conduits located below the future shielding wall which are mostly being fed between the Main Electrical Room of Block F and the existing Mechanical Space on 3rd level of Block FA. WSP is providing three options to re-route these conduits and they are as follows:

1. Trench part of the existing Staff Lounge 1F170 (future Clean Utility 1F170) to expose the underground conduit and splice into existing conduits with wall mounted junction boxes, then run new conduits from the junction boxes to Main Electrical Room in ceiling space.
2. Install new conduits and feeders through the corridor space from Main Electrical Room to Existing Mechanical Space on 3rd level of Block FA.
3. Install new conduits and feeders from Main Electrical Room through the Electrical Riser Rooms up to the roof towards the existing Mechanical Space on 3rd level of Block FA.

For Halcyon Room #2, the scanning report revealed four (4) conduits consisted of multiple data cables coming from Communication Room #18 running towards Bunker #1, 2, 3 and 4. After the site investigation with Connect Canada Ltd., WSP discovered that each of the noted conduits runs to the data cable junction box within the I.T. closet next to each Bunker control area respectively.

For Halcyon Room #3, the scanning report revealed approximately ten (10) underground conduits from panel PP-1F-32, PP-1F-E32 and PP-1F-33 going through the proposed Orthovoltage 1F426 and Halcyon 3 1F425. After the investigation, WSP can provide the content of these conduits as follows:

1. Conduits #3, #7 and #8 are the main incoming feeder for panel PP-1F-32, PP-1F-33 and PP-1F-E32 respectively which fed from the Electrical Closet #19.
2. Conduits #1, #2, #9 and #10 feeds the lobby lighting, controls for AHU ACS4F and Bunker #4 lighting from panel PP-1F-E32.
3. Conduits #4, #5 and #6 feeds lighting and receptacles from Bunker #4, #5 and #6 and the associated control room from panel PP-1F-33.



2 INTRODUCTION AND BACKGROUND

2.1 INTRODUCTION

Trillium Health Partner (THP) – Credit Valley Hospital (CVH) is preparing for a renovation project to install three Halcyon Accelerators and one Orthovoltage machine in Block F of the hospital. The project will require installation of radiation shielding for each of the machines, each requiring structural reinforcing below the concrete slab to support the shielding walls around each room. These radiation shielding walls will typically require new footings approximately 12” deep into the ground foundation of the hospital. The hospital has provided scanning reports indicating existing conduits and services located below the slab near the renovation area which will interfere with the installation of the radiation shielding walls’ footing and the 12” deep floor pit below each Halcyon Accelerator. WSP has been given the opportunity to investigate and provide potential options to relocate the noted conduits for all the Halcyon rooms and the Orthovoltage Room.

WSP conducted site reviews of the Credit Valley Hospital and has produced this report to provide preliminary engineering information, design principles and criteria identifying the scope of Electrical systems anticipated for the proposed modifications to the existing underground conduits.

This report reviews the existing electrical infrastructure for the conduits of concern, the possible route for relocation of conduits, and alternative options to be considered. This report does its best to note all conduits identified with the scans, however there may be other conduits and wires under the slab which may be discovered only after removing the existing concrete slab.

2.2 CODES AND STANDARDS

The report has into account the following codes and standards:

- CSA C282, Emergency Electrical Power Supply for Buildings
- CSA Z32, Electrical Safety and Essential Electrical Systems in Health Care Facilities
- Ontario Building Code (OBC)
- Ontario Electrical Safety Code (OESC)

Per article 3.2.7.10 of the OBC, conductors serving emergency equipment are required to be minimum 2-hr fire rated. The emergency systems covered by the OBC include:

- Fire Alarm
- Smoke Control
- Elevators
- Smoke venting
- Central Alarm and Control Facility (CACF)
- Voice Communication System

Per the article 46-108 of the OESC, the conductors serving the emergency systems noted above are to be protected from mechanical damage either by construction of the cable or by other physical means.

2.3 DOCUMENTS OBTAINED

The following relevant documents were provided to WSP at the beginning of the project:

- Existing floor plans, lighting and power layouts, site plans and single line diagrams for The Credit Valley Hospital dated back in 2004.
- Electrical Issued for Construction set for Credit Valley Hospital Brachytherapy project.
- Scanning reports conducted by ResolveTech, for areas below the Halcyon accelerator (1, 2 and 3) locations and the Orthovoltage location.

3 OBSERVATIONS

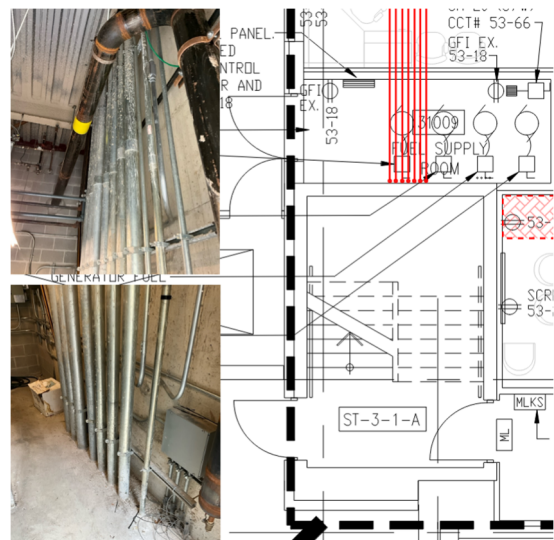
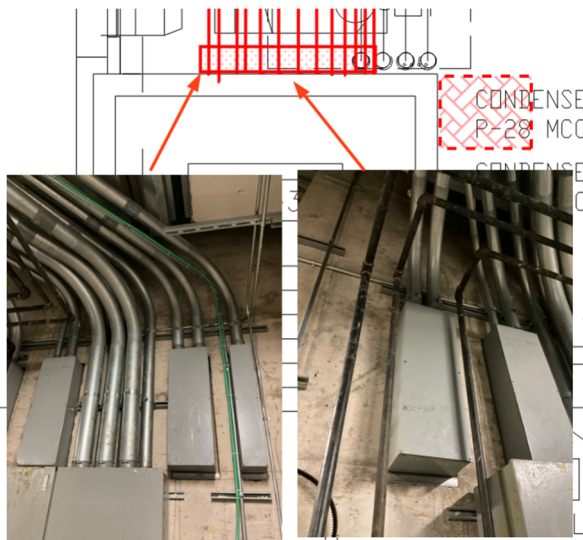
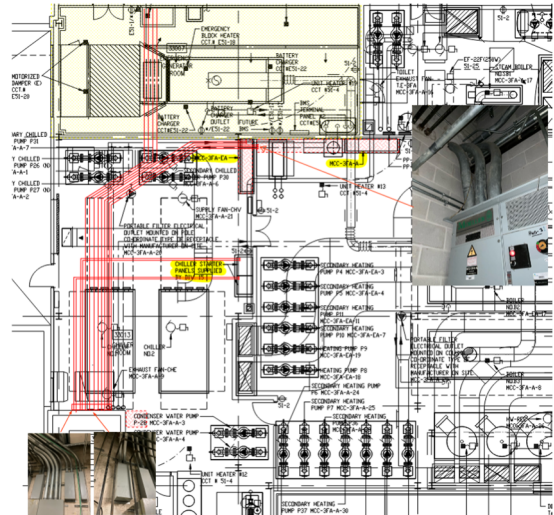
3.1 INFORMATION GATHERING

Quincy Cheung, P. Eng., (Project Engineer) and Brian Jaeger (Manager of Construction Administration group) from WSP visited the site between July 2024 to October 2024 to review existing site conditions, identify sources of the underground conduits/feeders and investigate potential options to modify the existing underground conduits being impacted by the Orthovoltage and Halcyon renovation project.

3.2 SOURCE OF UNDERGROUND CONDUITS FOR HALCYON ROOM #1

After reviewing the underground conduit scan reports for Halcyon #1 (Photo 3.2-1), it is noted that most of the underground conduits are serving the generator, MCC-3FA-A, MCC-3FA-EA, MCC-4F-B, Chiller #1 and Chiller #2. Based on the existing drawings and site investigation, the noted generator, MCCs and Chillers are located on the 3rd floor in the Mechanical Space #33007 and #33013 in Block FA (Photo 3.2-2). Conduits were traced from this equipment through the Mechanical Space #33013 towards the back wall of a stairwell ST-3-3-A where a portion of the conduits enter through the cavity of the staircase ST-3-3-A wall (Photo 3.2-3). The rest of the conduits penetrate the slab, creating a riser going down to the ground level Fuel Supply Room #31009 (Photo 3.2-4). Inside the Fuel Supply Room #31009, we noted this conduit riser adjacent to the stairwell continues down into the grade foundation. However, the cavity wall of the staircase is not accessible, therefore the conduits could not be traced further any further from the 3rd floor of the Mechanical Space #33013. The following is a list of the conduits and sized as noted in existing drawings:

- Generator – 4 runs of 3#500MCM + 1/0G in 3” conduits
- MCC-3FA-A – 3 runs of 3#500MCM + 2/0G in 4” conduits
- MCC-3FA-EA – 2 runs of 3#350 + #2G in 3” conduits
- MCC-4F-A – 3#250MCM + #2G in 3” conduits
- MCC-4F-B – 3#500MCM + 2/0G in 4” conduit
- TX-XRA – 3#500MCM + 2/0G in 4” conduit
- Chiller#1 – 2 runs of 3#350MCM + 1/0G in 3” conduits
- Chiller#2 – 2 runs of 3#350MCM + 1/0G in 3” conduits



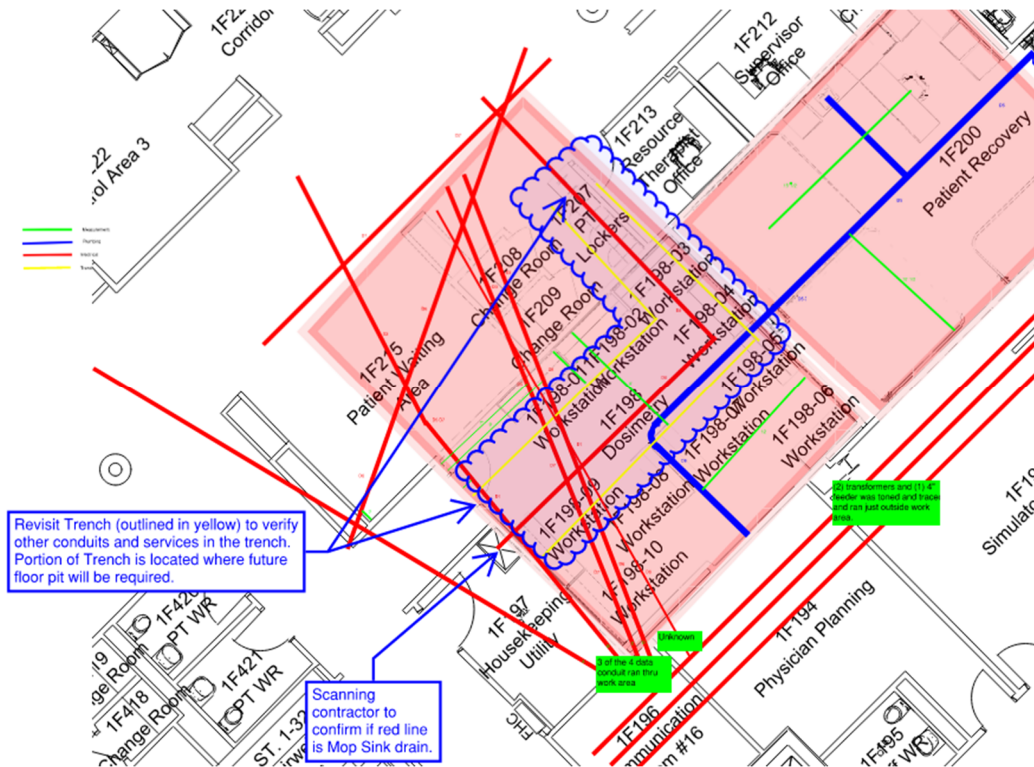


Photo 3.3.1-1: Underground conduit scan report for Halcyon #2

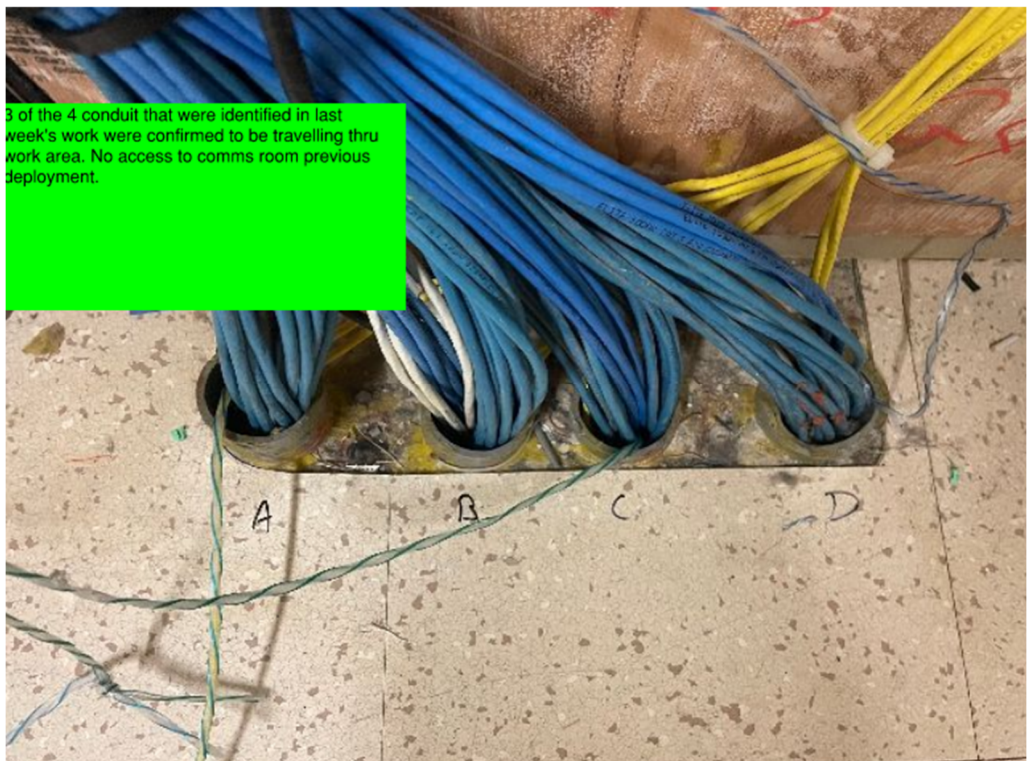


Photo 3.3.1-2: Underground conduits A, B, C and D inside Communication Room #16 1F196

During the site investigation visit dated October 3rd, 2024, WSP representatives met with Scott Cotton from Connect Canada Ltd. to investigate the conduits runs noted in the Underground conduit scan report for Halcyon #2 (Photo 3.3.1-1). We have traced the noted data conduits from the Communication Room #18 terminated in a data cable junction box (Photo 3.3.1-3) within the I.T. closet of each respective Control Area.



Photo 3.3.1-3: Existing Data Cable Junction Box Inside Closet of Control Area 1F222

Based on the Underground conduit scan report and the noted direction of each conduit on the report, our assumption for each conduit A, B, C and D are as follows and shown in Figure 3.3.1-1 below:

- Data Conduit 'A' goes to the data junction box located in the I.T. Closet of Control Area 4 1F226
- Data Conduit 'B' goes to the data junction box located in the I.T. Closet of Control Area 3 1F222
- Data Conduit 'C' goes to the data junction box located in the I.T. Closet of Control Area 2 1F219
- Data Conduit 'D' goes to the data junction box located in the I.T. Closet of Control Area 1 1F216

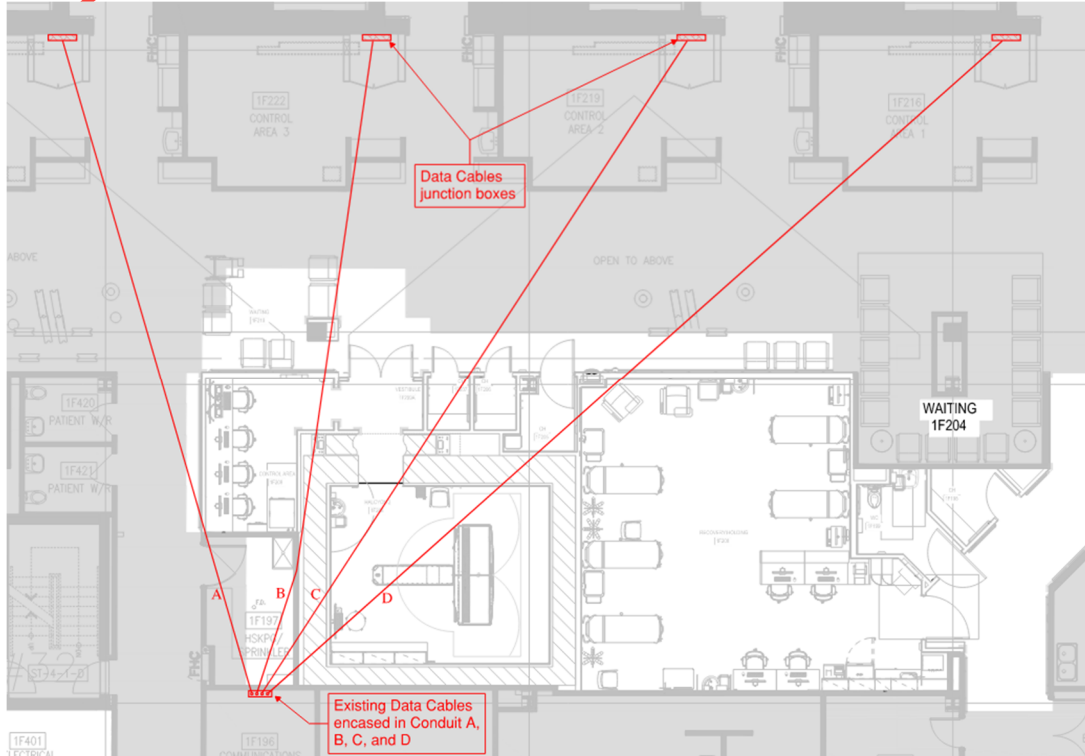


Figure 3.3.1-1: Existing Underground Conduit Run to Bunkers 1, 2, 3 and 4

3.3.2 MECHANICAL FINDINGS

There are big discrepancies between the received existing drawing for underground piping in this area, and the scan of underground objects drawing as shown in Figure 3.3.2-1 below.

The blue line in the scan of underground objects drawing (Right: Figure 3.3.2-1) is identified as underground sanitary that serves fixtures that will be demolished, so that the pipe can be considered as a part of scope of demolition. However, this line is not shown in the received existing drawing for underground piping (Left: Figure 3.3.2-1).

The pink line is not depicted in the existing underground drawing (M5401), from the origins of the pipe at the mop sink, it is most likely, the sanitary pipe for the existing mop sink which is highlighted in yellow below. The alternative route for this sanitary pipe is shown as the cyan line in Figure 3.3.2-1 below, which is shown for diagrammatical purposes only and the actual path of the new sanitary pipe to be determine during construction.

References for Figure 3.3.2-1 below:

1. Left: UNDERGROUND DRAINAGE - PLAN BLOCK F - PLUMBING (M5401),
2. Middle: GROUND FLOOR – PARTIAL DEMO PLUMBING (MD-300),
3. Right: The scan of underground objects drawing.

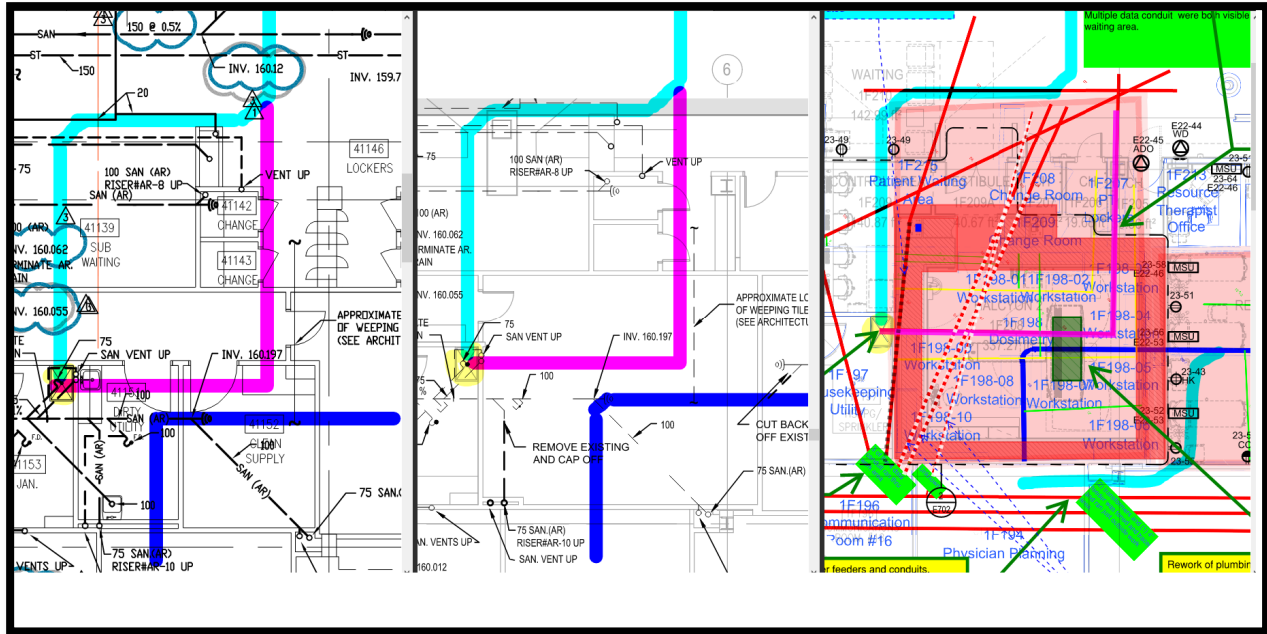


Figure 3.3.2-1: Comparison between underground piping scan for Halcyon #2 and existing drawings

3.4 SOURCE OF UNDERGROUND CONDUITS FOR HALCYON ROOM #3

3.4.1 ELECTRICAL FINDINGS

After reviewing the underground conduit scan reports for Halcyon #3 (Photo 3.4.1-1), it is noted that there are ten (10) underground conduits serving lighting and receptacle load from the lobby, Bunker #4, #5, #6 and their respective control areas. Based on the existing drawings and site investigation, we have identified these conduits are coming off panel PP-1F-32, PP-1F-33 and PP-1F-E32 as shown in Photo 3.4.1-2, 3.4.1-3 & 3.4.1-4 below.

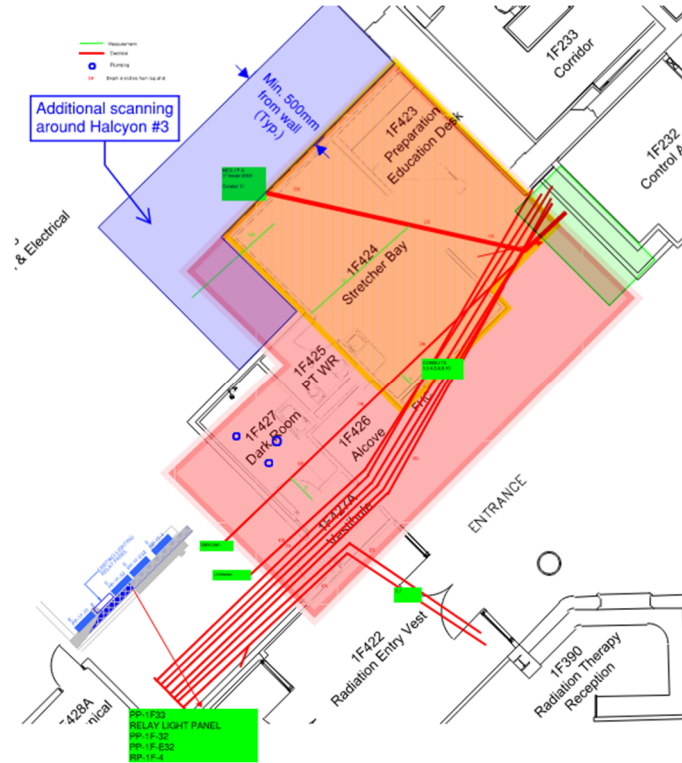


Photo 3.4.1-1: Underground conduits scan



Photo 3.4.1-2: Conduits from PP-1F-E32



Photo 3.4.1-3: Conduits from PP-1F-32



Photo 3.4.1-4: Conduits from PP-1F-33



WSP confirmed conduit #3 from PP-1F-32, conduit #7 from PP-1F-33 and conduit #8 from PP-1F-E32 are the main incoming feeders for each of the panel respectively from DP-1F-E3 and DP-1F-3 in Electrical Closet #19 as shown in Photos 3.4.1-5 & 3.4.1-6 below. According to the conduit scan report, conduit #3 and #7 runs down south towards the Electrical Closet #19, however, conduit #8 which is supposed to be feeding from Electrical Closet #19 runs towards the Bunker #6 area.



Photo 3.4.1-5: DP-1F-E3



Photo 3.4.1-6: DP-1F-3

During the site investigation visit dated September 19th, 2024, WSP representative met with Electricians from CVH (Elmer and Oliver) to trace the circuits within the underground conduits of panel PP-1F-E32 and PP-1F-33. After reviewing the content of the underground conduits from panel PP-1F-E32 and PP-1F-33 without the panel covers, the following circuits highlight in red in Photos 3.4.1-7 & 3.4.1-8 below were confirmed feeding into those conduits. We have also verified some of the circuits for emergency lighting and receptacles within Bunker #6 are being fed from panel PP-1F-E32 and PP-1F-33 as shown in Photo 3.4.1-9 & 3.4.1-10 below.

For Service Call: **Guild Electric Limited**
470 Midwest Road,
Toronto, Ontario
Telephone: 416-288-8222

Guild
Electric Limited

PANEL: PP-1F-E32

1 Lighting 1F42°	2 Lobby Lighting
3 Light	4 Lobby Lighting
5 Spare <i>Hand Wall (Vikram)</i>	6 Lobby Lighting
7 Spare	8 Spare
9 L.V. Lighting Panel 1F428	10 Spare
11 Air Handling Unit ACS4F	12 Bunker Lighting
13 Stretcher Bay 1F424	14 Spare
15 Stretcher Bay 1F424	16 Bunker Lighting
17 Space	18 Bunker #4 Receptacles
19 Space	20 Bunker Lighting
21 Gas Alarm Panels	22 Bunker Lighting
23 Spare	24 Bunker #4 Lighting
25 Cameras (2)	26 Bunker Lighting
27 Space	28 Bunker Lighting
29 Space	30 Bunker Lighting
31 Space	32 Bunker Lighting
33 Space	34 <i>Smoke Detector</i>
35 Space	36 Spare
37 Space	38 Exhaust Fan EF-14F
39 Space	40 Spare
41 Space	42 Bunker #4

Photo 3.4.1-7: Circuits in Conduits #1, 2 and 9

Credit Valley Hospital Job No: 21-7271	PP-IF-33	STATE GROUP INC 905-672-2772
CIRCUIT		CIRCUIT
LIGHTING IF428	1 2	LOBBY LIGHTING
LOBBY LIGHTING	3 4	SPARE
LOBBY LIGHTING	5 6	LOBBY LIGHTING
LOBBY LIGHTING	7 8	SPARE
LOBBY LIGHTING <i>Lighting Control IF-4</i>	9 10	LOBBY LIGHTING
RM 4108 RECEPT	11 12	SPARE
RM 4108 RECEPT	13 14	LOBBY LIGHTING
OUTSIDE LIGHTS CONTROLS	15 16	PLUG WEST WALL
RM 4108 FURNITURE	17 18	LIGHTING IF 235
RM 4108 FURNITURE	19 20	BUNKER #4
RM 4108 FURNITURE	21 22	BUNKER #4
FC-1	23 24	BUNKER #4 VIEW BOX
SPARE	25 26	BUNKER #4
BUNKER #4	27 28	BUNKER #4
BUNKER #4	29 30	BUNKER #4
BUNKER #4	31 32	BUNKER #4
BUNKER #4	33 34	BUNKER #4
BUNKER #4	35 36	BUNKER #4
BUNKER #4 NCRC RECEPT	37 38	BUNKER #4
BUNKER #4 LIGHTING	39 40	BUNKER #5 NCRC RECEPT-SIGN
BUNKER #4 LIGHTING	41 42	BUNKER #5 LIGHTING

Credit Valley Hospital Job No: 21-7271	PP-IF-33	STATE GROUP INC 905-672-2772
CIRCUIT		CIRCUIT
BUNKER #4 LIGHTING	43 44	BUNKER #5 LIGHTING
BUNKER #4 LIGHTING	45 46	BUNKER #5 FCU + SINK
BUNKER #4 LTC + NCRC	47 48	BUNKER #5 LIGHTING
BUNKER #4	49 50	MOTORIZED DOOR/LIGHTS IF422
BUNKER #4 FCU + SINK	51 52	RECEPT BUNKER #5 TREATMENT RM
BUNKER #4 RAD SIGN	53 54	RECEPT BUNKER #5 TREATMENT RM
BUNKER #4 LTC	55 56	RECEPT BUNKER #5 TREATMENT RM
COMP CLOSET CIRC FANS BUNKER 4.5A	57 58	PURGE
	59 60	FURNITURE 4108
RECEPT BUNKER #6 MOD RM	61 62	FURNITURE 4108
RECEPT BUNKER #6 TREATMENT RM	63 64	FURNITURE 4108
RECEPT BUNKER #6 TREATMENT RM	65 66	SPACE
DOOR CONT. PNL WARNING SIGNS + VIBRATION DETECT BUNKER #5	67 68	DOOR CONT. PNL WARNING SIGNS + VIBRATION DETECT BUNKER #5
CCTV/INTERCOM BUNKER #6	69 70	CCTV/INTERCOM BUNKER #5
BUNKER #6 (SPARE)	71 72	BUNKER #5 (SPARE)
	73 74	

Photo 3.4.1-8: Circuits in Conduits #4, 5 and 7

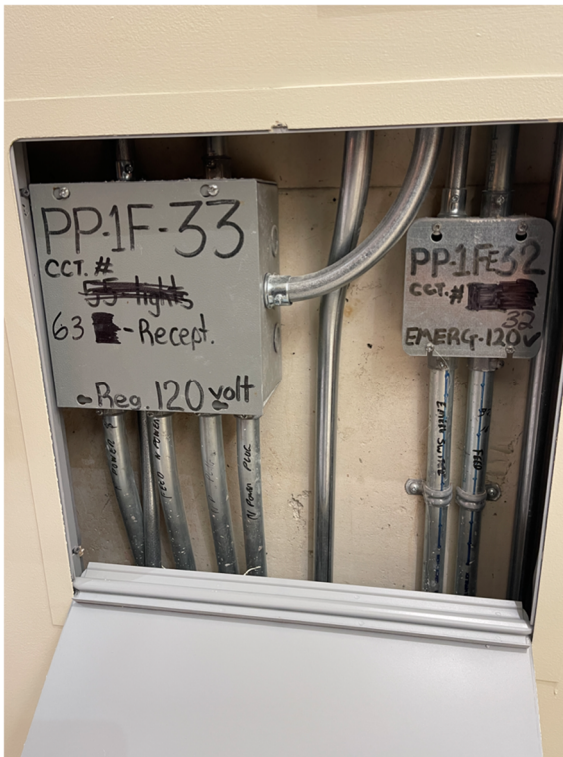


Photo 3.4.1-9: Junction box within Bunker #6



Photo 3.4.1-10: Receptacles in Bunker #6 Control Server Area

3.4.2 MECHANICAL FINDINGS

The green-tagged unknown items (Right: Figure 3.4.2-1) were not identified as any type of mechanical services piping in the scan of underground objects drawing. These two lines are not shown in the received existing drawing for underground piping either. Since the noted unknown lines could not be verified visually on site and on drawings, further scanning of the existing space will be required to identify the noted pipes/conduits.

Shown on the existing drawing (Left: Figure 3.4.2-1), the sanitary line and the storm water drainage line is located closer to the vestibule wall. On the latest OrthoVoltage layout dated September 13, 2024 (Figure 3.4.2-2), the noted drainage lines appear to be away from the new foundation wall footings based on the Mechanical As-Built obtained from CVH. Further excavation could reveal draining that might need to be addressed in the future.

References Figure 3.4.2-1 below:

1. Left: UNDERGROUND DRAINAGE - PLAN BLOCK F - PLUMBING (M5401),
2. Middle: GROUND FLOOR – PARTIAL DEMO PLUMBING (MD-300),
3. Right: The scan of underground objects drawing.

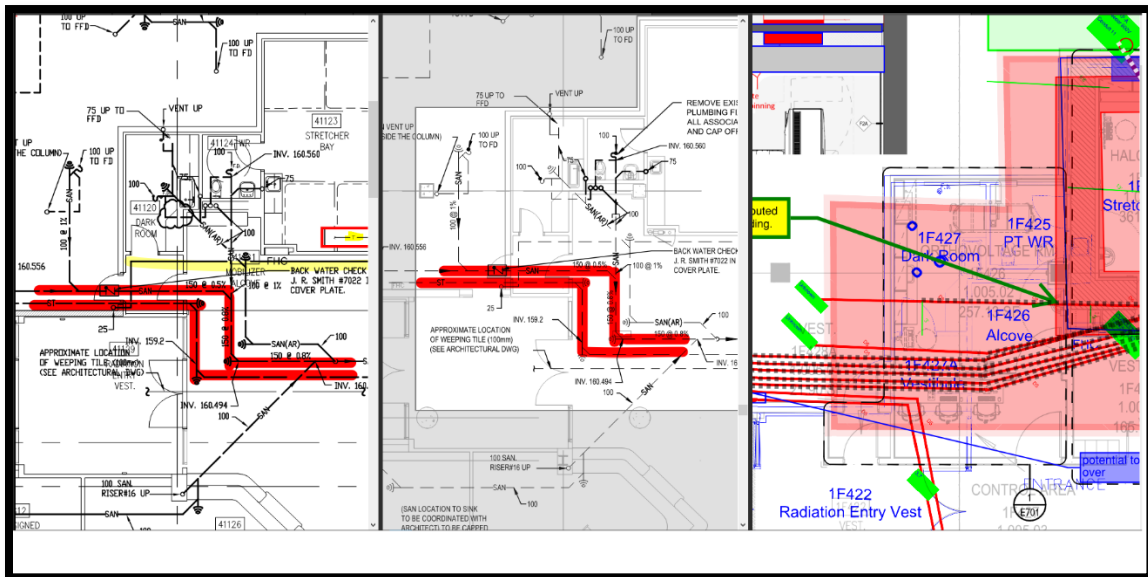


Figure 3.4.2-1: Comparison between underground piping scan for Halcyon #3 and existing drawings

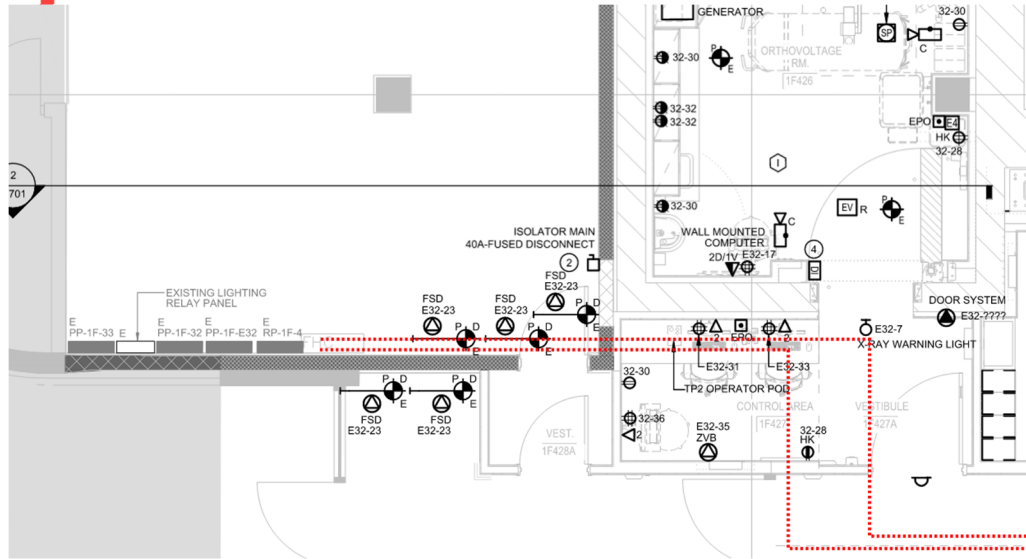


Figure 3.4.2-2: Existing drainage lines shown against new OrthoVoltage layout

4 RESOLUTION DISCUSSIONS

4.1 PROPOSED OPTIONS FOR HALCYON ROOM #1

Based on the underground conduit scan for Halcyon #1, conduit #8 was noted as the “XRA 4” feeder 3rd floor” which has been identified as the feeder for the transformer TX-XRA inside Electrical Closet #30 3F327. The existing underground conduit for the transformer TX-XRA appears to penetrate through the floor slab of Electrical Closet #17 1F401 and stub up along the sleeves of the stacked Electrical Closets. A splicing junction box can be provided in Electrical Closet #17 for new 3#500MCM + 2/0G in 4” conduit run back to the Main Electrical Room 1F113 through new Halcyon #2 renovation area and corridor 1F352 as shown Figure 4.1-1 below.

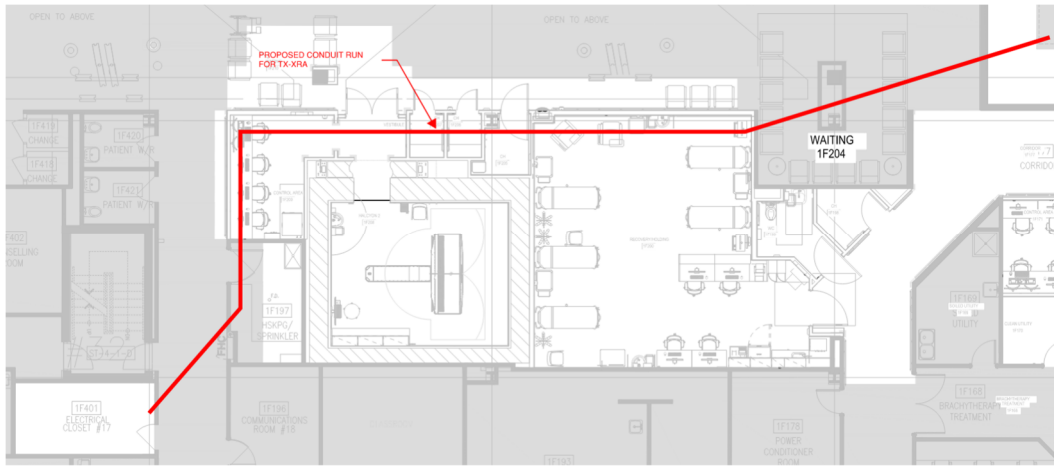


Figure 4.1-1: Proposed conduit runs from Main Electrical Room 1F113 to Electrical Closet #17 1F401

The remaining conduits shown in the underground conduit scan for Halcyon #1 which pass through the Staff Lounge 1F171 and Radiation Therapy Student Classroom 1F175 enter Electrical Closet #15 1F109. These conduits serve equipment in Electrical Closet #15 and the feeder MCC-4F-B. Each of these conduits can be relocated through High Voltage Room 1F108 along the corridor of the Main Electrical Room 1F113 back to the source as shown in Figure 4.1-2 below.

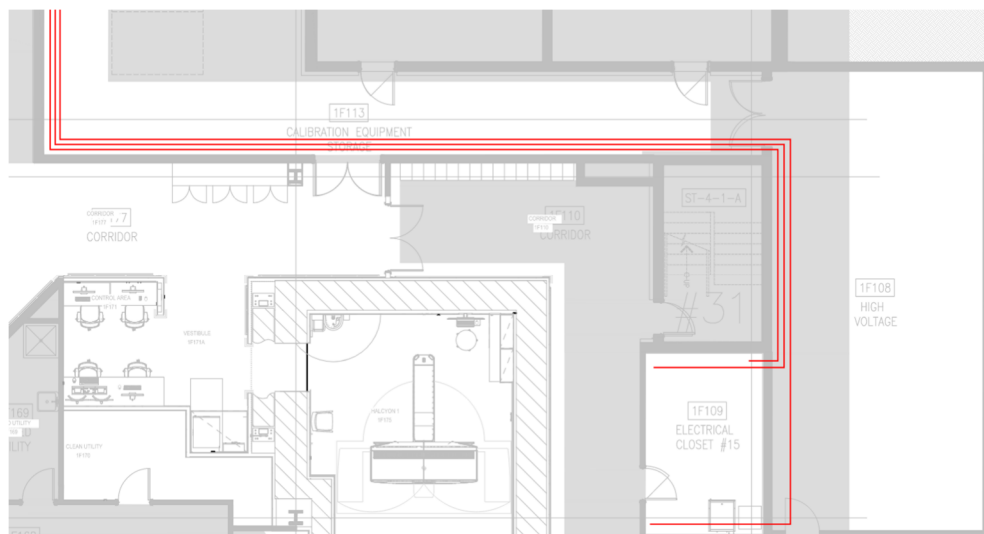


Figure 4.1-2: Proposed conduit runs from Main Electrical Room 1F113 to Electrical Closet #15 1F109

4.1.1 OPTION #1 (TRENCH PART OF THE EXISTING STAFF LOUNGE 1F171 / FUTURE CLEAN UTILITY ROOM 1F170)

4.1.1.1 ELECTRICAL REVIEW

Based on the underground conduit scans noted in Photo 3.2-1, many of the conduits which interfere with the installation of the footing for the Halcyon radiation shielding walls are feeding MCC-3FA-EA, Generator, transformer TX-XRA and MCC-4F-B. We are proposing that portion of the future Clean Utility Room 1F170 be allocated for splicing of the existing underground conduits and feeders.

The existing Staff Lounge 1F171 can be trenched to expose the existing underground conduits for MCC-3FA-EA, Generator and Chillers. The contractor will need to run new feeders to this area and splice the existing feeders in the underground conduits using wall mounted junction boxes for each conduit. The portion of the new conduits and feeders would be routed from the Main Electrical Room 1F113 through the ceiling space as shown below in Figure 4.1.1.1-1 into the wall mounted junction boxes. The proposed routing shown in Figure 4.1.1.1-1 is required to avoid the existing mechanical ductwork in the corridor outside of the Staff Lounge 1F171.

The relocation strategy for existing conduits for TX-XRA and MCC-4F-B has been noted in Section 4.1, where there would be no benefit to splicing the noted conduits and wiring within this trenching option.

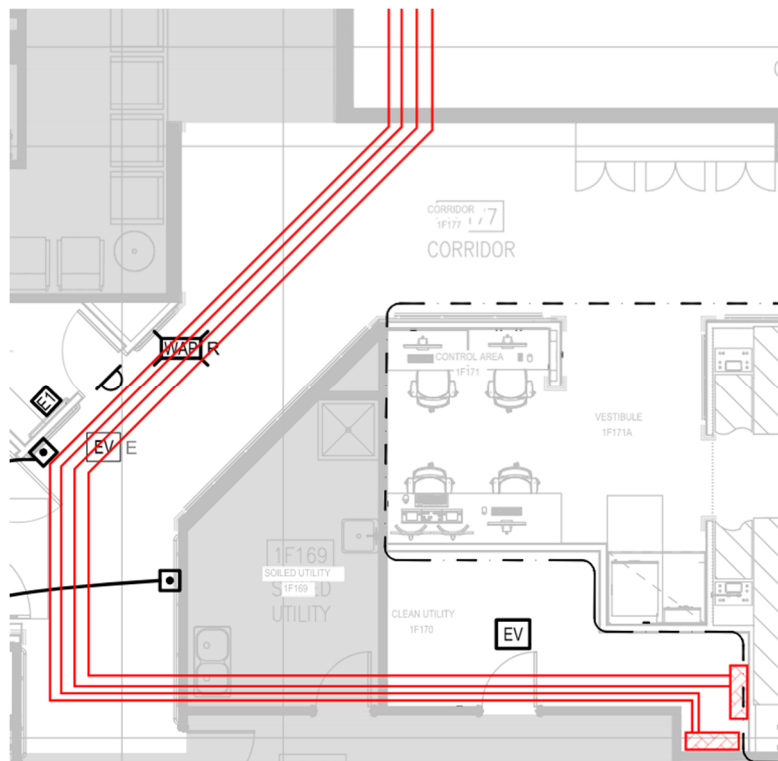


Figure 4.1.1.1-1: Proposed conduit runs from junction box through ceiling space

Benefits:

- Impacted area of the existing hospital is limited to the corridor within the renovation scope of work area.
- Shortest run of new conduits from the source to the splicing point.

Drawbacks:



- Extensive impact to the operation of the hospital due to multiple shutdowns involved. The contractor requires multiple days to remove existing feeders from the underground conduits, in addition to installing new conduits and feeders from the Main Electrical room to the splicing area.
- Each shutdown could last upwards of 5+ hours for each conduit splicing and connection back to the main switchboard. Scheduling of shutdowns
- While splicing of emergency power feeders is deemed acceptable by the Hospital, it is not recommended.
- During the trenching work, the area surrounding the Staff Lounge 1F171 and Vestibule 1F172 will be impacted.



**Photo 4.1.1.1-1: Corridor 1F177 Above Ceiling
outside 1F198**



**Photo 4.1.1.1-2: Corridor 1F177 Above Ceiling
outside Main Electrical Room**

4.1.1.2 ARCHITECTURAL REVIEW

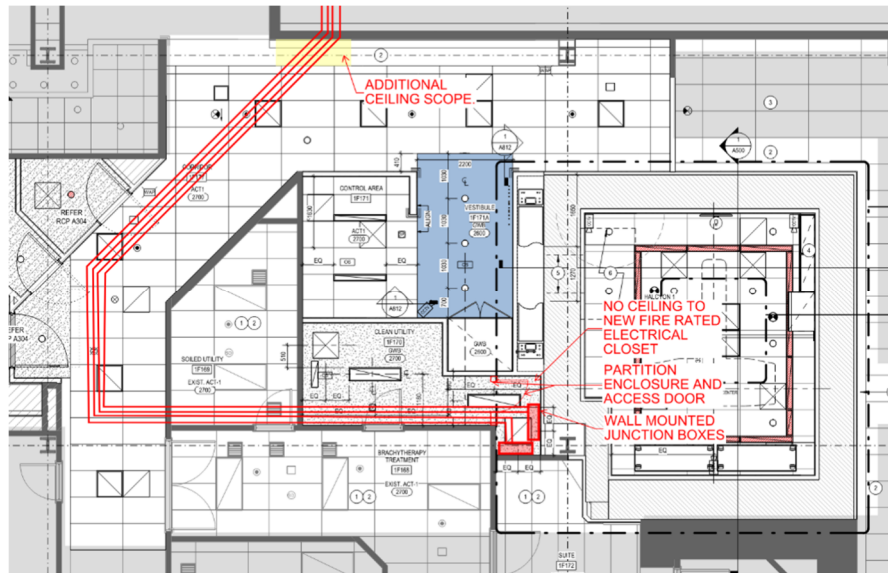


Figure 4.1.1.2-1: Ceiling Scope in Corridor 1F177 and Adjacent Rooms.

Based on the proposed rerouting outlined in 4.1.1.1 Halcyon #1, Option 1 will result in a small amount of work outside of the already identified scope areas for the Cancer Care Project.

The areas outlined in yellow indicate additional ceiling scope (above what has been outlined for the project).

A two-hour fire rated electrical closet could be accommodated in the corner of the reconfigured clean room.



It is likely that the ceiling in the Brachytherapy Treatment Corridor 1F168 will need to be either completely or partially removed to perform the work relocation work. This will result in disruptions to the Brachytherapy suite.

4.1.2 OPTION #2 (INSTALL NEW CONDUIT THROUGH THE CORRIDOR CEILING SPACE)

4.1.2.1 ELECTRICAL REVIEW

After inspecting the above ceiling space of corridor 1F110, 1F104 and 1F123, Option #2 involves installing all new conduits and wiring for MCC-3FA-EA, Generator and Chillers from the Main Electrical room to the mechanical room in Block FA level 3 through the corridor ceiling space of 1F110, 1F104 and 1F123 in Level 1 as shown in Figure 4.1.2.1-1 below.

Based on the site investigation above the ceiling, it was discovered, there are existing abandoned cove lights on one side of the corridors along the proposed path, shown in as shown in Photo 4.1.2.1-3. We propose to remove these cove lights to allow for a fire-rated enclosure/bulkhead to be installed to provide the conduits with the necessary 2-hour fire rating.

As shown in Photo 4.1.2.1-4, the above ceiling space outside Waiting Area 1F552 are quite empty to install pull boxes for conduits to turn into the Fuel Supply Room north of Staircase ST-3-1-A. New conduits can be run from the Fuel Supply Room up to the Level 3 Chiller Room in Block FA. Pull boxes will be required to place in the ceiling space of major conduits turn within the corridor ceiling space.

Similarly to Option #1, the relocation strategy for existing conduits for the remaining underground conduits, including feeders for TX-XRA and MCC-4F-B, have been noted in Section 4.1.

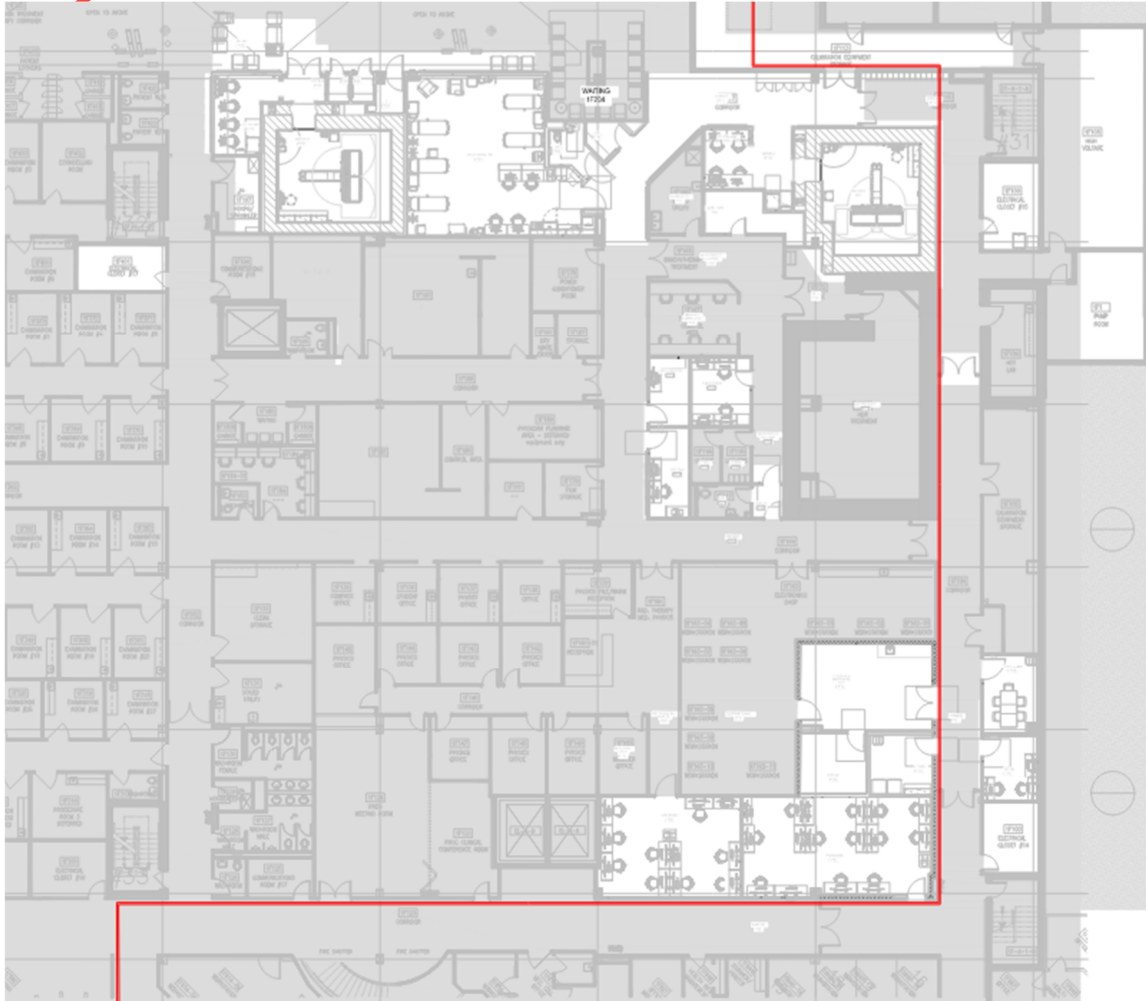


Figure 4.1.2.1-1: Proposed conduit runs through corridors above ceiling space

Benefits:

- Existing underground conduits serving MCC-3FA-EA, Generator and Chillers, would be abandoned below the slab. Concerns for possible future renovations encountering the same underground interference issue would be reduced.
- Impact to the existing hospital due to shutdowns would be minimized. New conduits and feeders could be installed ahead of termination in the Main Electrical room and splicing in the Level 3 Chiller Room in Block FA.

Drawbacks:

- Major disruption to the existing hospital to install new conduits within the space above the ceiling of main hospital corridors. There will be considerable wiring time, especially with the MI cabling and ceilings being open for most of the wiring duration.
- IPAC Considerations will be extensive through the run of the conduits.
- Additional cost for new architectural enclosure/bulkhead may need to be built to provide the feeders with the necessary 2-hour fire rated protection.
- Additional cost for running MI cables for emergency power run where 2-hour fire rating of feeders is required.



Photo 4.1.2.1-1: Corridor 1F110 Above Ceiling outside 1F173



Photo 4.1.2.1-2: Corridor 1F104 Above Ceiling outside 1F103

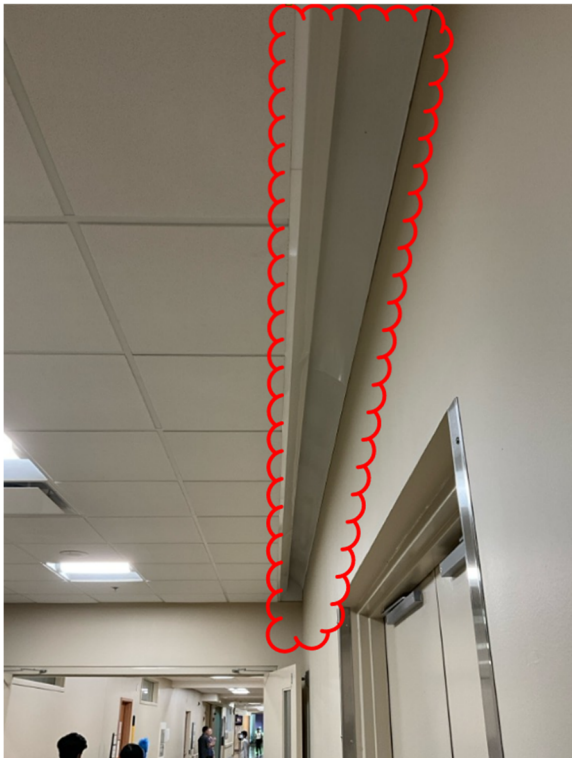


Photo 4.1.2.1-3: Corridor 1F123 abandoned cove lightings



Photo 4.1.2.1-4: Corridor 1F123 Above Ceiling outside Electrical Closet #16 looking towards Waiting 1F552

4.1.2.2 ARCHITECTURAL REVIEW

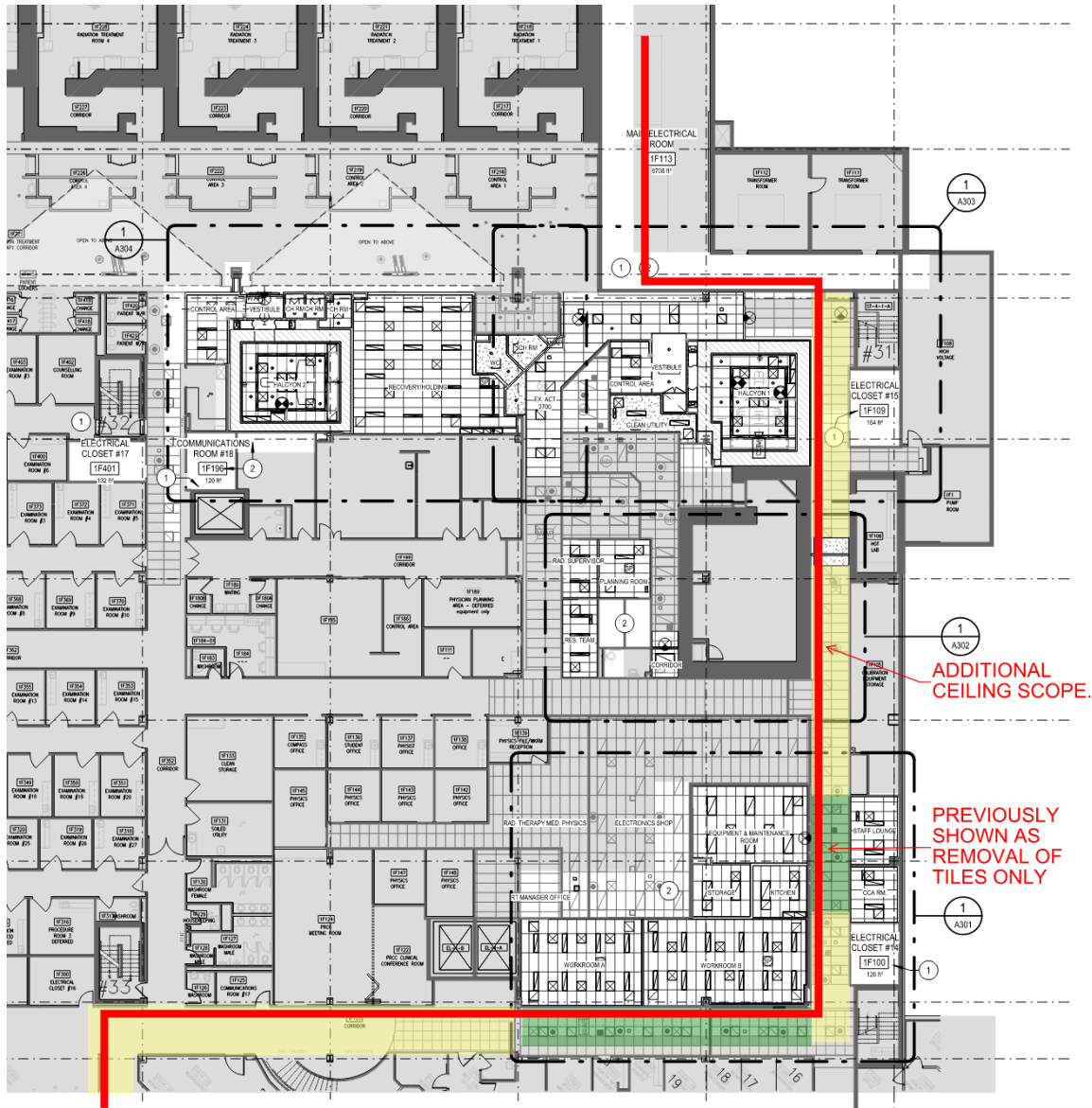


Figure 4.1.2.2-1: Corridor 1F123 Additional Architectural Ceiling Scope

Based on the proposed rerouting outlined in 4.1.1.2 Halcyon #1, Option 2 will result in an extensive amount of work outside of the already identified scope areas for the Cancer Care Project.

The areas outlined in yellow indicate additional ceiling scope (above what has been outlined for the project) and areas outlined in green have previously only been intended for minor scope, consisting of removal of tiles only (while maintaining the ceiling grid).

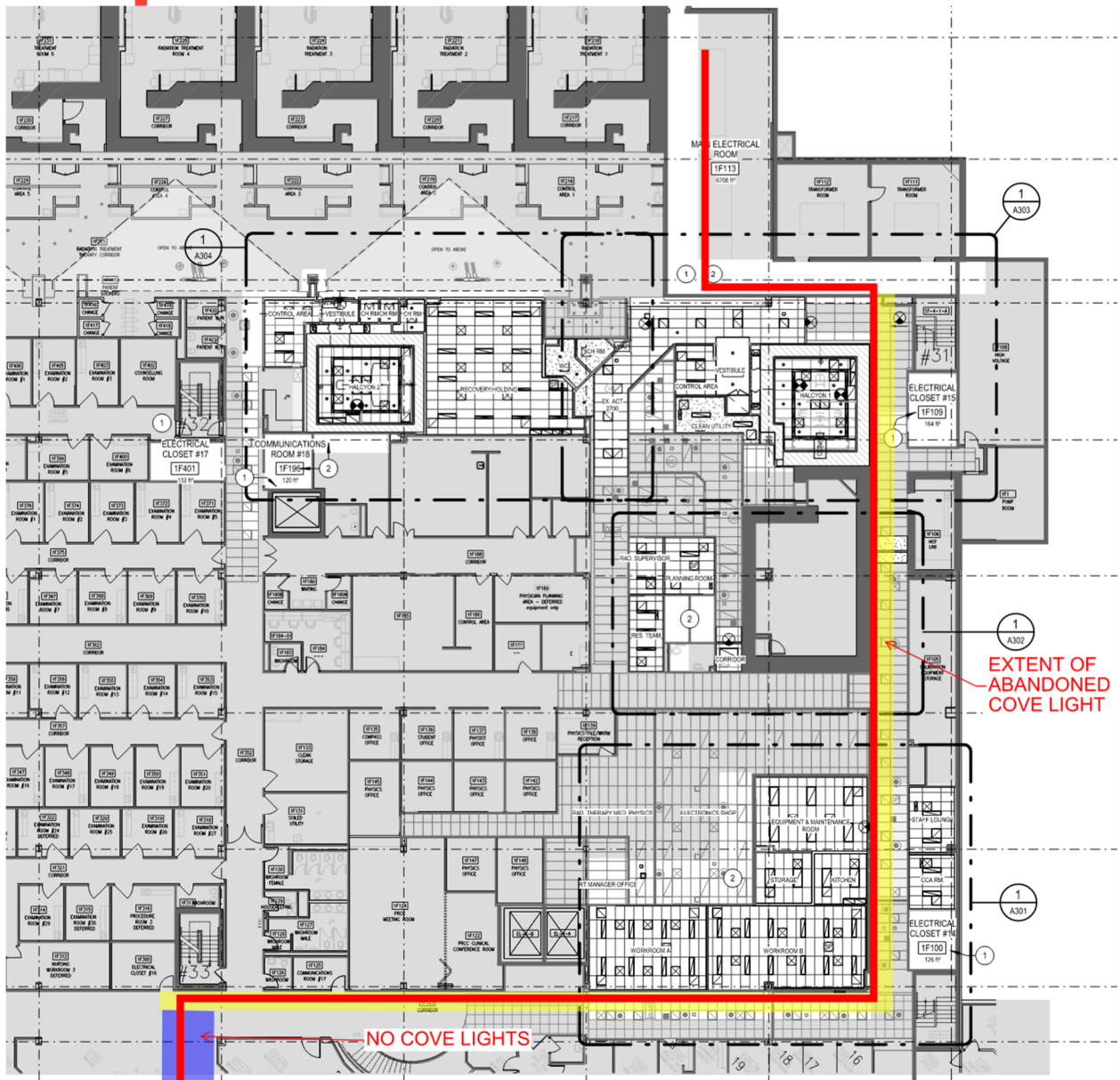


Photo 4.1.2.2-2: Corridor 1F123 Extent of Abandoned Cove Light

The use of abandoned light coves will serve to drastically mitigate the ceiling re&re scope. The area shown yellow above illustrates the extent of the light cove which could be utilised to reroute conduits. The area shown in blue does not have a cove light and will require more extensive ceiling renovations.

Assuming that the cove lights are removed without damage, the cove lights could be replaced in situ, alternatively, the resultant opening could be closed with a simple drywall bulkhead.



4.1.3 OPTION #3 (NEW CONDUIT THROUGH THE ROOF SPACE)

4.1.3.1 ELECTRICAL REVIEW

After some more investigation, it was discovered another option for the conduit run from the Main Electrical Room 1F113 to the 3rd floor Mechanical space in Block FA. We propose running all new conduit and feeders from the Main Electrical room 1F113 to the mechanical room in Block FA level 3 through Electrical Riser Room to the roof and running all conduits on roof level. MI cable would be installed for emergency power feeders serving life safety loads.

New conduits for MCC-3FA-EA, Generator and Chillers will run from the Main Electrical Room 1F113 through High Voltage Room 1F108 through the walls into Electrical Closet #15 (1F109) as shown in Figure 4.1.3.1-1. Proposed conduits stub up location in Electrical Closet #15 (1F109) noted in red shaded box shown in Photo 4.1.3.1-1.

After reviewing the space within Electrical Closets #22, #28 and #34, we recommend having the wall mounted unit heater to be relocated and have conduits stub up in the south wall of each Electrical Closets as shown in Photo 4.1.3.1-2, 4.1.3.1-3 and 4.1.3.1-4 respectively.

Once the conduits penetrate through the ceiling of Electrical Closet #34, a ladder-type, ventilated cable tray with solid cover will be installed to support the new cabling. The proposed cable tray will run along the perimeter of the Block F roof as shown in Figure 4.1.3.1-2. The cable tray will be installed down the side of the building Block F onto the roof of the building Block FA as shown in Photo 4.1.3.1-5. Proposed run of the conduits from the side of the building Block F into the Generator Room in building Block FA is shown in Photo 4.1.3.1-6. There is approximately 18” of wall space on both sides of the generator intake louver as shown in Photo 4.1.3.1-7 and 4.1.3.1-8.

Similar to Option #1, the relocation strategy for existing conduits for the remaining underground conduits, including feeders for TX-XRA and MCC-4F-B, have been noted in Section 4.1.

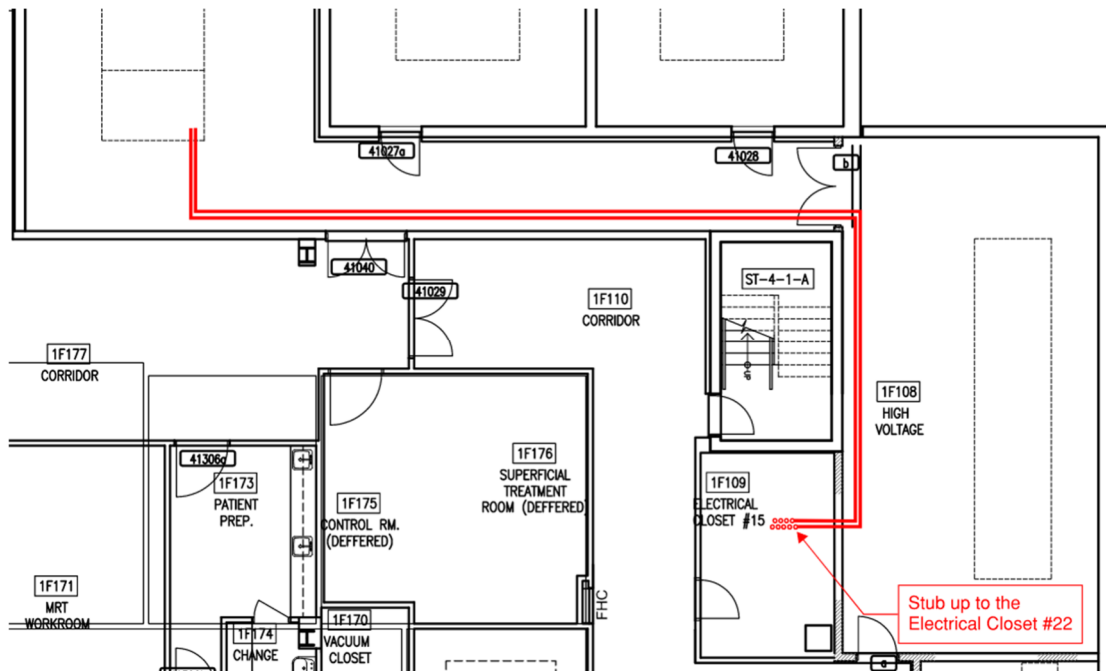


Figure 4.1.3.1-1: Proposed conduit runs to Electrical Closet #15

Benefits:

- Existing underground conduits serving MCC-3FA-EA, Generator and Chillers, would be abandoned below the slab. Concerns for possible future renovations encountering the same underground interference issue would be reduced.
- Construction area within the hospital will be limited since all new conduits will be run in service area
- Impact on shut down with this option can be minimized, since the new conduits can be run ahead of time on the roof before terminating in the Main Electrical room 1F113 and Level 3 Generator Room in Block FA.
- Construction risk is significantly lower due to all conduits being run within accessible areas.
- Installing new conduits and feeders from source to load eliminates the splicing concern and contractor can make the final termination on both the load and source within the same shut down window.

Drawbacks:

- Additional cost for running MI cables for emergency power feeders requiring 2-hour fire rating of feeders.
- May interfere with any future vertical expansion of the existing hospital.



Photo 4.1.3.1-1: Electrical Closet #15 Ceiling

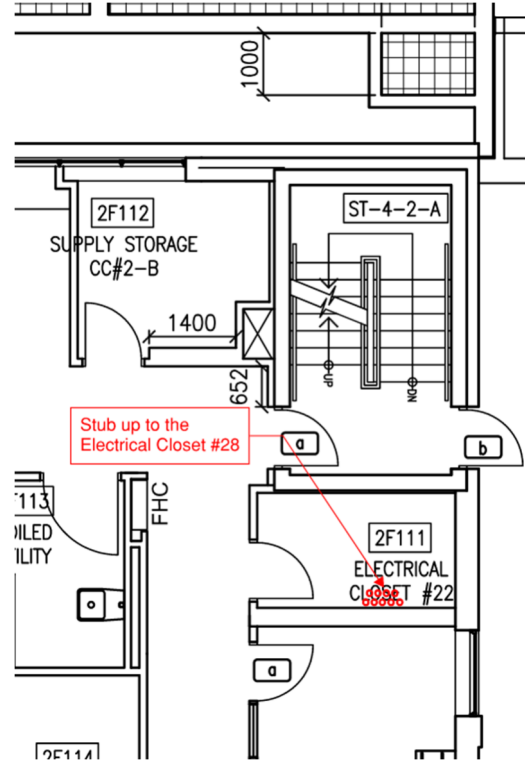


Photo 4.1.3.1-2: Proposed conduits stub up in Electrical Closet #22

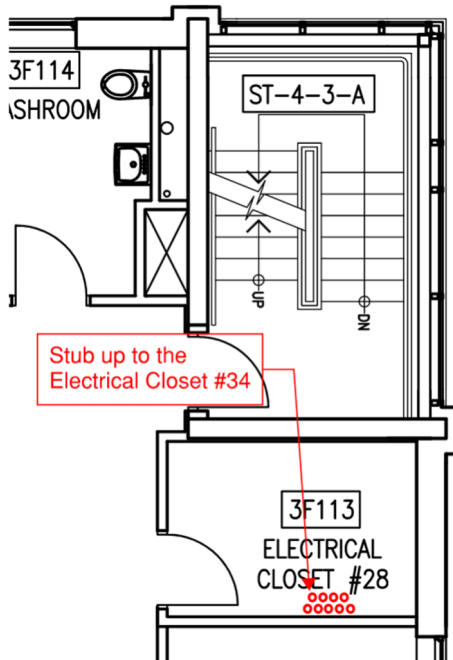


Photo 4.1.3.1-3: Proposed conduits stub up in Electrical Closet #28

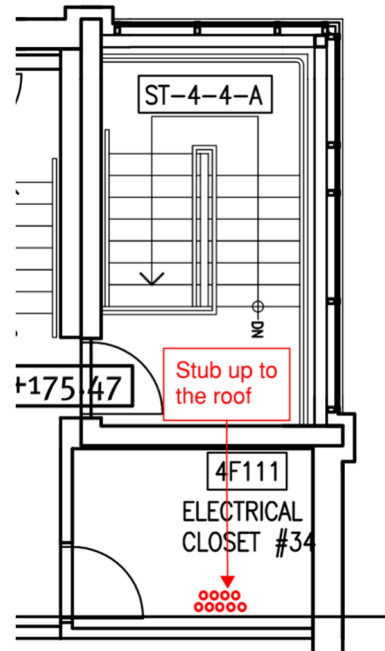


Photo 4.1.3.1-4: Proposed conduits stub up in Electrical Closet #34

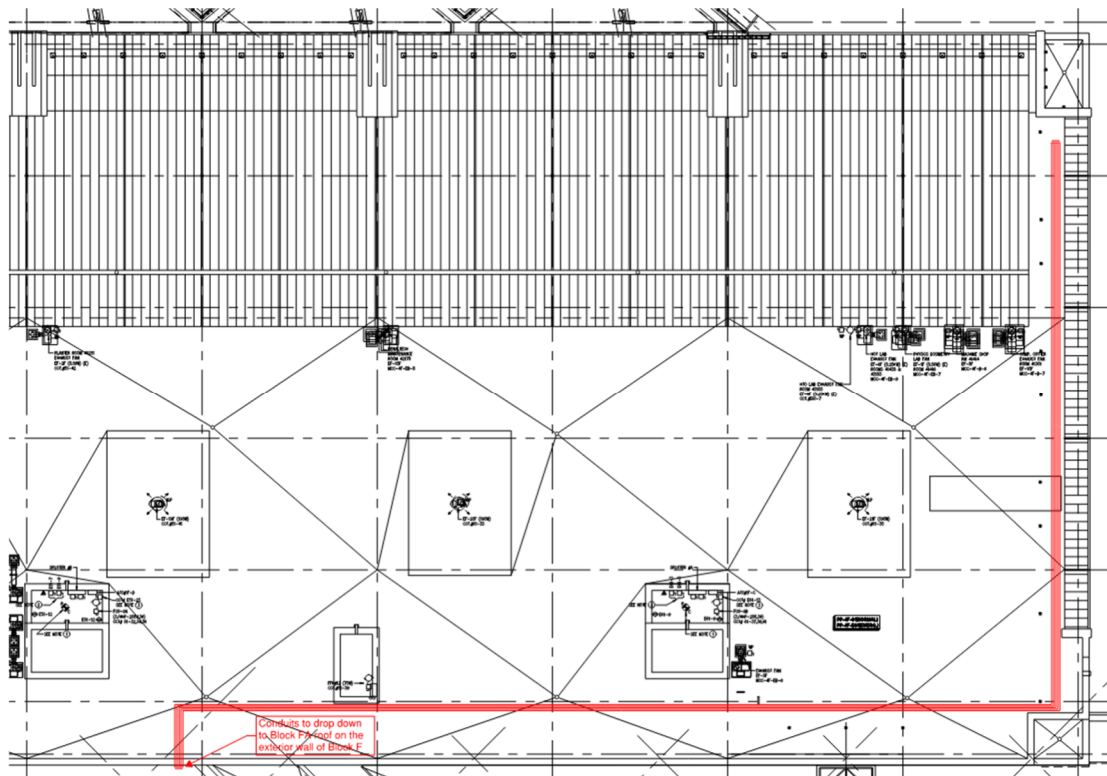


Figure 4.1.3.1-2: Proposed conduit runs on the roof

Architectural drawing of a roof layout, showing a new roof section and an existing roof section. The drawing includes dimensions, elevations, and labels for various roof components.

Key Features and Labels:

- NEW ROOF:** Indicated by a dashed line and an arrow pointing to the left side of the drawing.
- Existing Roof Section:** Shaded area on the right side of the drawing.
- Elevations:**
 - H.P. +170.47 (High Point)
 - L.P. +170.37 (Low Point)
 - H.P. +170.47 (High Point)
 - H.P. +170.47 (High Point)
- Dimensions:**
 - 2700W X 3000H KNOCK OUT PANEL
 - 1500W X 800H
 - EQ. 1000
 - EQ.
 - 6401
 - 3600W X 4725H EXHAUST LOUVER
 - 3301a
 - 3301b
 - 3301c
 - 3301d
 - 3301e
 - 3301f
 - 3301g
 - 3301h
 - 3301i
 - 3301j
 - 3301k
 - 3301l
 - 3301m
 - 3301n
 - 3301o
 - 3301p
 - 3301q
 - 3301r
 - 3301s
 - 3301t
 - 3301u
 - 3301v
 - 3301w
 - 3301x
 - 3301y
 - 3301z
- Other Labels:**
 - AD-07-016
 - 1685
 - W10
 - 3301g

A close-up photograph showing a person's hands holding a yellow tape measure against a white vertical slat of a garage door. The tape measure is extended horizontally across the slat, and the person is holding the end of the tape. The slat is part of a larger set of vertical slats, and the background is a light-colored wall.

A close-up photograph of a person's arm holding a yellow measuring tape against a grey door. The person is wearing a black wristband and a silver bracelet. The measuring tape is extended horizontally across the door, showing measurements in inches and centimeters. The door has vertical panels.

4.1.3.2 ARCHITECTURAL REVIEW

Based on the proposed rerouting outlined in 4.1.3.1 Halcyon #1, Option 3 will result in the least amount of architectural scope outside of the already identified work areas for the Cancer Care Project.

Additionally, rerouting of services outside of clinical hospital space will be the least disruptive to patients and staff, barring shorter shutdowns for changing over from existing to new conduits.

4.2 PROPOSED CONDUITS RUN FOR HALCYON ROOM #2

4.2.1 PROPOSED DATA CONDUITS RUN FOR BUNKER #1, #2 AND #3

4.2.1.1 ELECTRICAL REVIEW

After reviewing the above ceiling space in the existing Lobby Area and Patient Waiting Area, we propose to run new data cables in 2" conduit in the ceiling space as shown in the Figure 4.2.1.1-1 below and terminate each conduit in each Control Area I.T. Closet respectively. New data cables are then to refeed existing equipment through the existing Data Junction box located within the I.T. Closet.

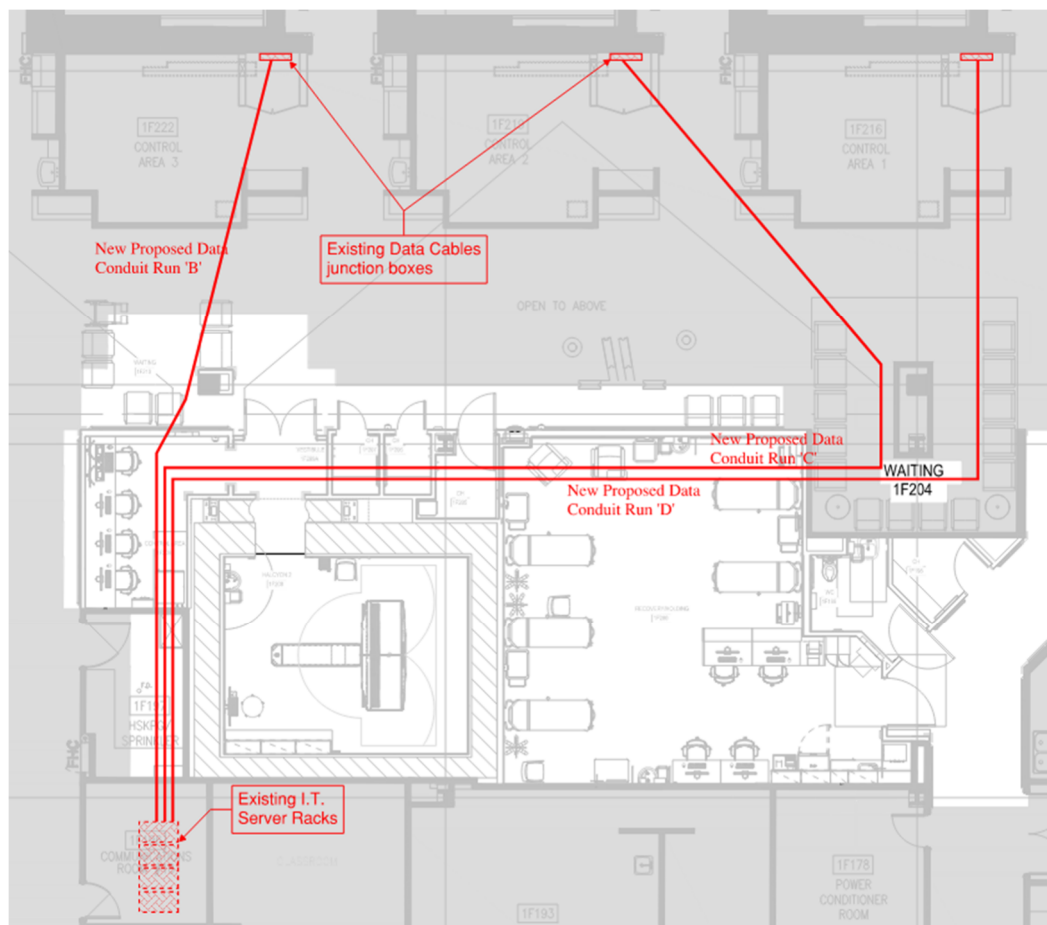


Figure 4.2.1.1-1: Proposed Data Conduits run to Bunker #1, #2, and #3

4.2.1.2 ARCHITECTURAL REVIEW

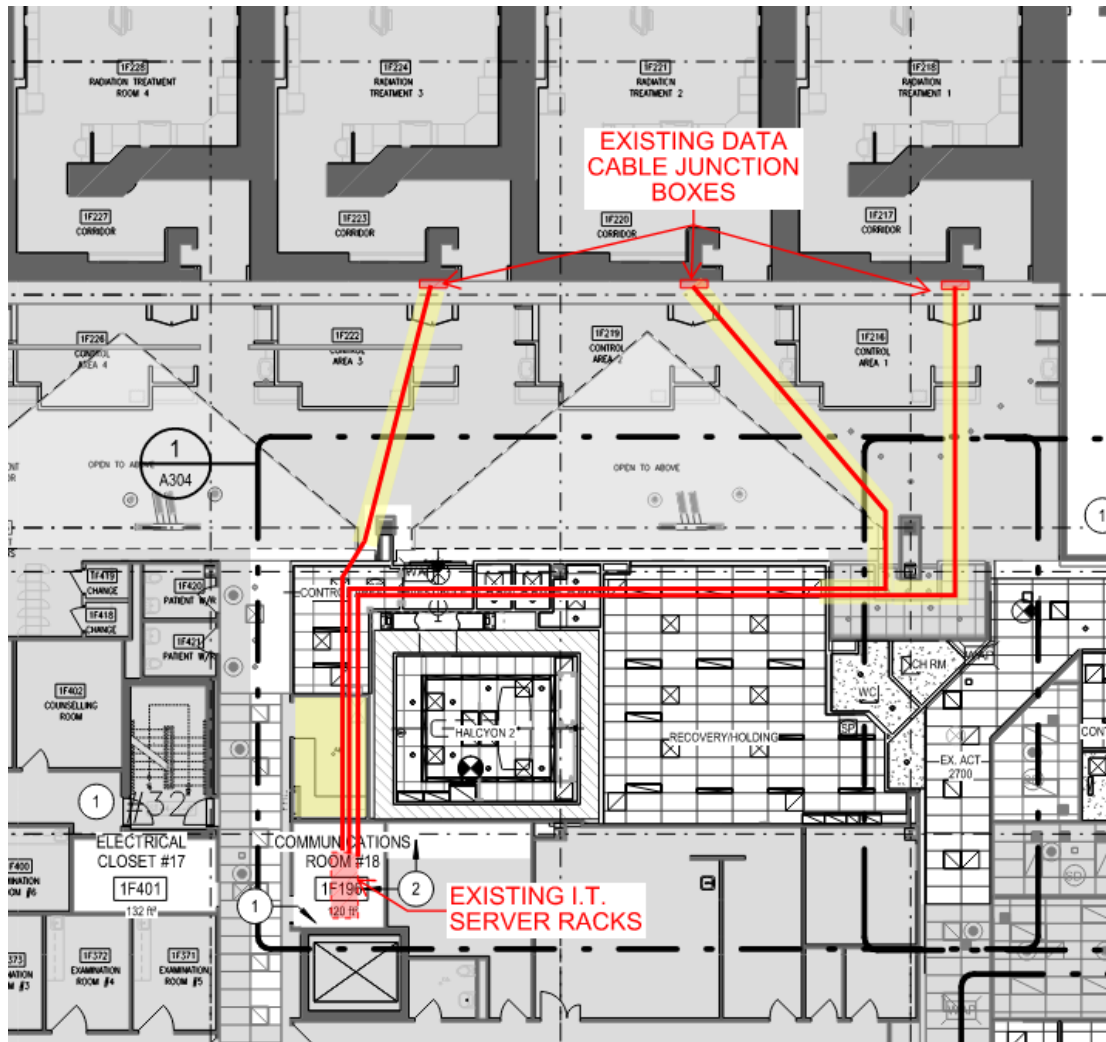


Figure 4.2.1.2-1: Scope of ceiling rework in Radiation Therapy Corridor

Based on the proposed rerouting outlined in 4.2.1 Halcyon #2 Option 1 will result in an extensive amount of work outside of the already identified scope areas for the Cancer Care Project.

The areas outlined in yellow indicate additional ceiling scope (above what has been outlined for the project). The ceiling over the Radiation Treatment Therapy Corridor is a smooth painted drywall finish, there is no ceiling in HSKP. Sprinkler Room 1F197.

Crossing the public corridor will need to be coordinated with Trillium, to schedule work to mitigate disruption to patient care and treatments in Bunkers 1, 2 and 3.

4.3 PROPOSED CONDUITS RUN FOR HALCYON ROOM #3

4.3.1 PROPOSED MAIN FEEDERS RUN FOR PP-1F-32, PP-1F-33 & PP-1F-E32

4.3.1.1 ELECTRICAL REVIEW

As noted in Section 3.4, the main incoming feeders for PP-1F-32, PP-1F-33 and PP-1F-E32 are from DP-1F-3 and DP-1F-E3 inside Electrical Closet #19 1F385 as shown in Figure 4.3.1.1-1 below.

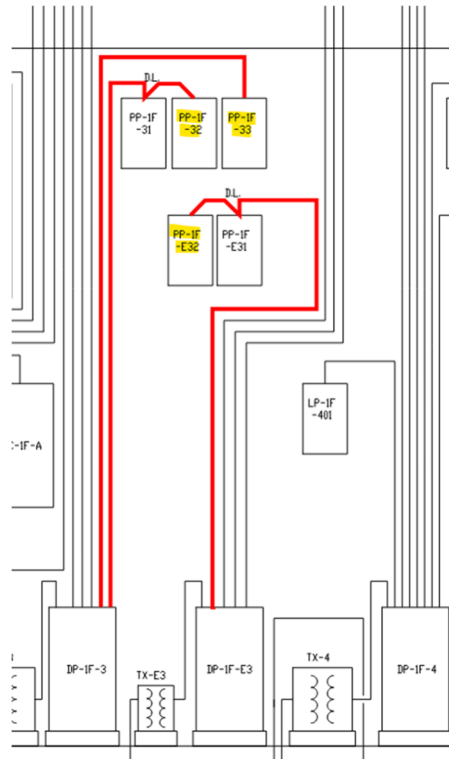


Figure 4.3.1.1-1: Riser Diagram of DP-1F-3 and DP-1F-E3

WSP proposes to run new wiring and conduits for each of the panels PP-1F-32, PP-1F-33 and PP-1F-E32 from the Electrical Closet #19 1F385 through the ceiling spaces of Workroom 1F387 (Photo 4.3.1.1-1) and Vestibule 1F422 (Photo 4.3.1.1-2) back into the Mechanical Room 1F428 as shown in Figure 4.3.1.1-2 below.



Photo 4.3.1.1-1: Ceiling space of Workroom 1F387



Photo 4.3.1.1-2: Ceiling space of Vestibule 1F422

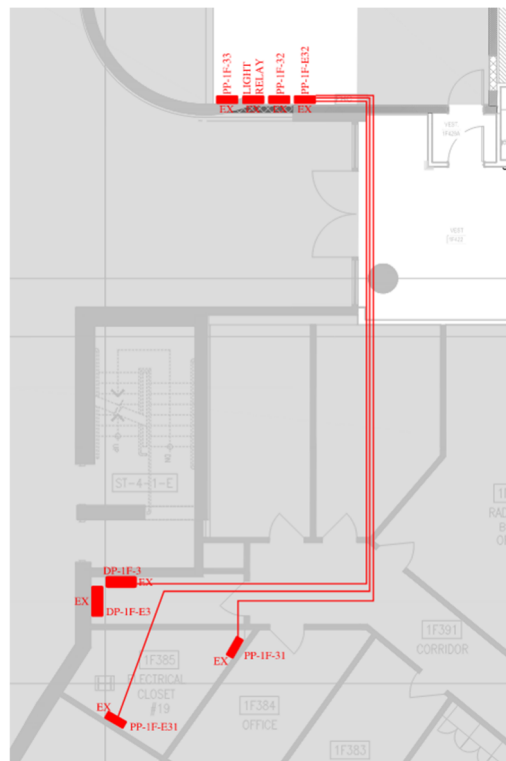


Figure 4.3.1.1-2: Proposed conduits run for PP-1F-32, PP-1F-33 & PP-1F-E32

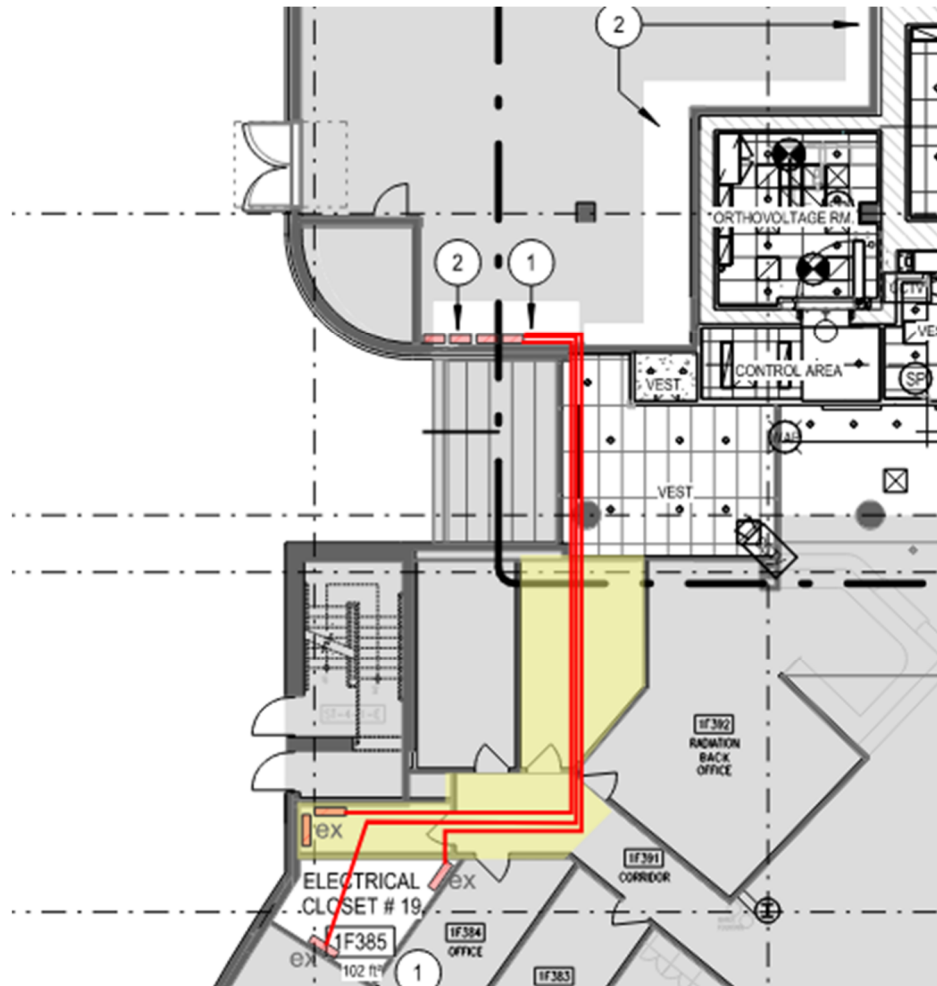


Figure 4.3.1.2-1: Ceiling Scope around Halcyon 3

Based on the proposed rerouting outlined in 4.3.1 Halcyon #3, this proposal will result in an extensive amount of work in offices outside of the already identified scope areas for the Cancer Care Project. The areas outlined in yellow indicate additional ceiling scope (above what has been outlined for the project). The ceilings in the offices are ACT/T-Bar.

4.3.2 PROPOSED OPTION FOR BRANCH CIRCUITS OF PP-1F-E32 & PP-1F-33

4.3.2.1 ELECTRICAL REVIEW

After verifying all the circuits that go into conduits #1, 2, 4, 5, 6, 9 & 10 and comparing it with the associated panel schedules, we can conclude that conduits #1, 2, 4, 5 & 6 feed the Bunker #4, #5 and #6, whereas conduits #9 and #10 goes to Exhaust Fan EF-14 and controls for AHU-ACS4F in the same Mechanical Room respectively.

It is noted that Exhaust Fan EF-14 will be decommissioned and removed in the Halcyon Project, therefore, power to Exhaust Fan EF-14 is not longer required, and this wiring and conduit will be removed back to source. As for the power to the controls for AHU-ACS4F can be easily refed from panel PP-1F-E32 as shown in Figure 4.3.2.1-1 below.

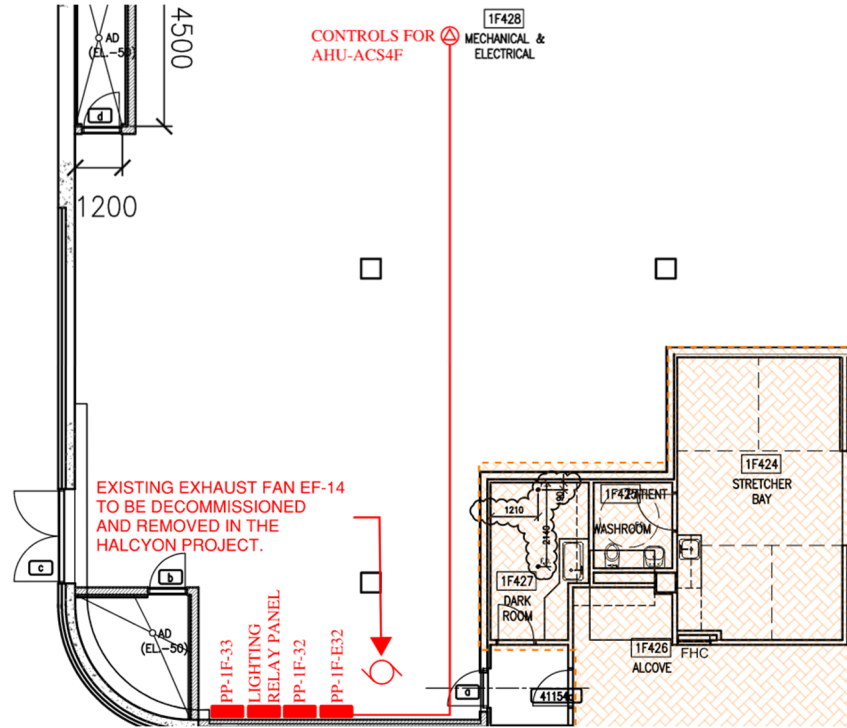


Figure 4.3.2.1-1: Proposed conduits run for AHU-ACS4F from PP-1F-E32

During the trenching work for Halcyon #3, the underground conduits that feeds Bunker #4, #5 & #6 will be exposed and based on the underground conduit scan reports for Halcyon #3, we are certain that these conduits are heading in the direction towards Control Area 6 1F232. We are proposing to place junction boxes in the northwest corner of Control Area 6 (shown in Figure 4.3.2.1-2 below) to intercept and splice all the circuits from the underground conduits and run new feeds from panel PP-1F-E32 and PP-1F-33 via the ceiling space as shown in Figure 4.3.2.1-2 below.

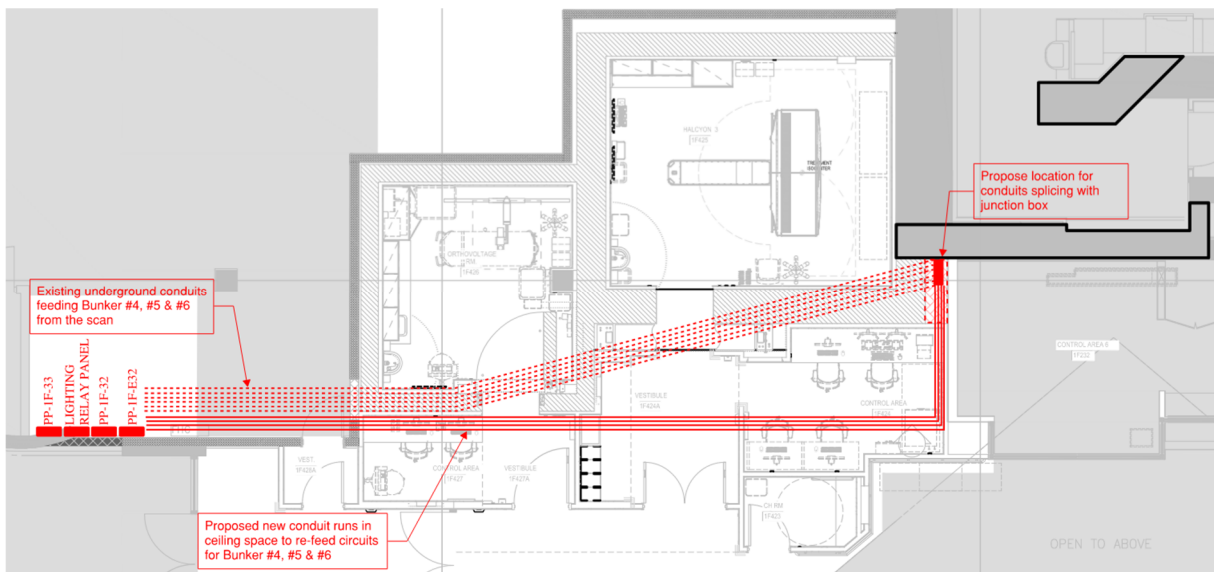


Figure 4.3.2.1-2: Proposed conduits run for branch circuits from PP-1F-33 & PP-1F-E32



4.3.2.2 ARCHITECTURAL REVIEW

Based on the proposed rerouting outlined in 4.3.2 Halcyon #3 no work outside of the already identified scope areas for the Cancer Care Project.

5 RECOMMENDATIONS

5.1 HALCYON ROOM #1

WSP recommend hiring a cost consultant to do a cost estimate on all the options for Halcyon #1 relocating underground conduits.

We recommend OPTION #3 for relocating the underground conduits from Main Electrical Room 1F113 to Level 3 Generator Room in Block FA. The main reason being that the disruption to the hospital will be minimal, and the path of conduits travel are visible and easy to work on, where there will be no unforeseen conditions. All new conduits and wirings are running through back of house or service area, where the contractor can lay down all the conduits and wiring before doing a quick termination at the equipment with minimal shut down time.

5.2 HALCYON ROOM #2

Before running of new data conduits to replace the existing underground conduit 'B', 'C', and 'D', WSP recommend that the structural engineer to confirm if all three (3) noted underground conduits will be interfering with the foundation wall footing.

WSP recommend identifying the actual number of data cable require for each Bunker before the start of running new data cables to each Control Area I.T. closet. During the site visit dated October 3rd, 2024, Scott Cotton from Connect Canada Ltd. did notice that out of the 20 CAT6 cables within each conduit about half of them are not being used. If the hospital can confirm that those unused CAT6 cables are no longer required for each Linear Accelerator, then the running of the new CAT6 cable from the Communication Closet #18 can be reduced.

5.3 HALCYON ROOM #3 / ORTHOVOLTAGE ROOM

WSP recommend identifying the exact underground conduits which will be interfering with the foundation wall footings during trenching of the Halcyon #3 surrounding area. Based on the latest Halcyon #3 and Orthovoltage Room layout, it appears that some of the underground conduits might be out of the way of the new foundation wall footings and may not require to re-work.