



Technical Memorandum

Date: Friday, April 19, 2019

Project: GPC6, C-2012668-02, Task Order #39 Dallas CBD Second Light Rail Alignment (D2 Subway)

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Subject: **FINAL DRAFT Technical Memorandum #15 - REVIEW**
Condition Inspection of the Elm Street Parking Garage

Revision: A

Contents

EXECUTIVE SUMMARY	3
1 INTRODUCTION.....	3
1.1 Purpose	3
1.2 Scope.....	3
2 BACKGROUND.....	4
2.1 Existing Information	4
2.1.1 ELECTRICAL DRAWINGS	4
2.1.2 ELM STREET GARAGE STACK PLANS.....	4
2.1.3 ELM STREET PARKING GARAGE PLANS	4
2.2 Assumptions.....	5
3 OBSERVATIONS.....	5
3.1 Overall Conditions.....	5
3.1.1 CONCRETE.....	5
3.1.2 STEEL.....	5
3.1.3 DRAINAGE	6
4 CONCLUSIONS.....	6
4.1 Underpinning Viability	6
4.2 Recommendations	6
5 REFERENCES.....	6



Figures

Figure 1. ELEVATION VIEW OF THE ELM STREET PARKING GARAGE, LOOKING SOUTH.....	7
Figure 2. VIEW OF THE EXPANSION JOINT IN THE CEILING.	8
Figure 3. VIEW OF TYPICAL CONNECTIONS FOR THE PRE-CAST SLABS.....	8
Figure 4. VIEW OF CONCRETE SLAB AT GRADE LEVEL.	9
Figure 5. VIEW OF A TYPICAL STAIRWELL WITHIN THE GARAGE.	10
Figure 6. VIEW OF TYPICAL DETERIORATION SEEN IN MULTIPLE STAIRWELLS, ACROSS MULTIPLE LEVELS.	11
Figure 7. VIEW OF PONDING WITHIN THE GARAGE WHERE THE DRAIN IS CLOGGED/NOT FUNCTIONING PROPERLY.....	12
Figure 8. VIEW OF PONDING WITHIN THE GARAGE WHERE THERE IS NO DRAIN PRESENT.	12

Appendices

Appendix A. Elm Street Parking Garage – Photos

Appendix B. Plan of Proposed Alignment under Parking Garage



EXECUTIVE SUMMARY

GPC6 conducted a condition inspection of the Elm Street Parking Garage located at 2000 Elm Street (**Figure 1**). This inspection was performed to enable the evaluation of the Commerce Alignment, which places the proposed tunnel and Central Business District (CBD) East station below the garage. **Reference 1** discusses three potential construction scenarios for this, two of which involve underpinning of the structure, which was the impetus for performing this inspection.

The inspection, performed on September 21, 2018, did not identify any major deficiencies or defects in the structure, that would be exacerbated by potential future underpinning of the structure. Therefore, with further investigation into the foundation system of the structure, potential settlements and structural analysis of the structure subjected to such settlements, underpinning may be considered as a viable option for the construction of the tunnel.

1 INTRODUCTION

1.1 Purpose

In 2016 and 2017, multiple alignment concepts for the Dallas CBD Second Light Rail (D2) were considered. As all the concepts for the alignment travel under Commerce Street, the alignment is referred to as the “Commerce Alignment”. After feedback and input from the stakeholders and technical committees, as well as the public, the Commerce Alignment was eventually refined to a single concept that was advanced for further analysis and design.

This alignment resulted in part of the tunnel and station to be placed below the Elm Street Parking Garage. As indicated in **Reference 1**, this results in three potential construction scenarios. The first would require the demolition and rebuilding of the parking garage, while the remaining two would employ underpinning and preserve the parking garage in place. It is these last two construction scenarios, involving the use of underpinning, that constitute the basis of this inspection.

A visual condition inspection was conducted on September 21, 2018, in order to determine if there were any existing conditions that would affect or preclude the use of underpinning during construction. See **Appendix A** for general photos from the inspection, and **Appendix B** for the current proposed alignment under the garage. This document presents the findings of a visual inspection only of publicly accessible areas. No destructive, non-destructive, or other inspection methods were performed as part of this survey.

1.2 Scope

The inspection consisted of performing visual observations and general condition survey of the structure by a walkthrough and recording the observed features. Observations and



general features were documented and recorded via photographs during the walkthrough. The building itself consists of two structures that are connected and function as one large parking garage. The original structure, built in 1982, consisted only of the 10-story parking garage. Later, in 1986, a seven-story parking structure was built directly adjacent to it. The two are connected internally to make one larger parking structure, and an expansion joint exists between the two structures.

The inspection team visited and visually inspected all 11 floors and stairwells of the combined parking garage. The stairwells go from ground floor to the roof level. There is also an elevator bank located on the south side of the garage towards the center, however the structure of the bank is not visible. Only the visible and publicly accessible areas of the structure were permitted to be inspected. The findings were documented via photographs and this memo. It should be noted that while as-builts were not available, the areas visited match what is shown on the available project records (see section 2.1).

2 BACKGROUND

2.1 Existing Information

Prior to visiting the structure, the inspection team reviewed available existing information. The following information currently exists for the Elm Street Parking Garage:

2.1.1 ELECTRICAL DRAWINGS

Electrical drawings by Verizon Wireless from September 2011 are available (**Reference 4**). These drawings show the work related to providing wireless communications at the garage.

2.1.2 ELM STREET GARAGE STACK PLANS

This set of plans show the overall plan of the floors of the parking garage (**Reference 3**). It shows parking space markings, elevator and stair numberings. This was primarily used as a map to locate the team within the garage. No other structural or other information is provided.

2.1.3 ELM STREET PARKING GARAGE PLANS

Project record drawings from 1986 for the parking garage were found and reviewed (**Reference 2**). These drawings included civil, architectural, Mechanical-Electrical-Plumbing (MEP) and structural drawings. It should be noted that these drawings are for the seven-story parking garage, built in 1986. The 10-story portion of the parking garage was previously built, and no existing drawing information has been found to date.

STRUCTURE PROPERTIES

Based on the plans from 1986, the parking garage structure is supported by reinforced concrete piers that have an approximate depth of +/- 35' below grade. These piers range from 18" to 46" in diameter, with reinforcement that varies with the diameter. As the drawings are not as-builts, the exact depths of the piers are not known. At the street level, there is a-slab-on grade. The remainder of the structure (columns, beams, and slabs) are post-tensioned concrete, with the slabs also being pre-cast.

2.2 Assumptions

It is assumed that construction for the originally built 10-story parking garage is similar to that of the 7-story parking garage. Therefore, conclusions reached for the newer structure may generally apply to the other as well. It is important, however, that the structural plans of the 10-story garage be located and reviewed.

3 OBSERVATIONS

3.1 Overall Conditions

Overall, the parking garage is in good condition. The concrete surfaces exhibit normal level of cracking and slight spalling in locations, none of which is a structural concern. The steel stairs show corrosion, however in the context of future potential underpinning, this would not have any structural impact during underpinning. In total, there are five ground floor-to-roof level stair cases, and one elevator bank.

In addition, the inspection team noted ponding at multiple locations. It rained heavily on the day the inspection was conducted, and therefore, drainage issues were readily apparent. See the following sections for more detailed information.

3.1.1 CONCRETE

Overall, the concrete is in good condition. The parking garage has an easily identifiable expansion joint between the two parking structures (**Figure 2**). The parking decks are made of pre-cast concrete and are connected to the exterior walls through a series of typical joint details (**Figure 3**). These joints are also in relatively good condition. There is a slab-on-grade at street level, which does exhibit some cracking, likely due to settlement (**Figure 4**).

3.1.2 STEEL

The only steel structures seen within the building are the staircases. These staircases consist of painted steel members, with reinforced concrete landings (**Figure 5**). The stairs do show signs of corrosion, warped treads, and overall deterioration of the concrete landings (**Figure 6**). This is expected to worsen over time if periodic maintenance to remedy

corrosion is not timely implemented. Existing conditions and repair or replacement of these elements would not impact the structural integrity of the overall parking garage, but may have some negative impacts of the garage's functional use.

3.1.3 DRAINAGE

This visual inspection of the parking garage was conducted during a heavy rainfall. Therefore, it was possible to observe the drainage of the structure. The structure does have areas where the drains are clogged and/or not working properly (**Figure 7**), as well as areas of ponding where there is no drain at all (**Figure 8**). With the passage of time, this could lead to additional long-term and/or permanent issues or problems with the structure.

4 CONCLUSIONS

4.1 Underpinning Viability

Based only on the visual inspection, there are no apparent issues that would preclude the consideration of underpinning of the building during construction of the tunnel and cavern directly below. Based on the review of record documents, including drawings, GPC6 recommends that the structure's deep foundations be investigated to determine its depth, structural features, subsurface condition during the original construction, and relationship with the proposed tunnel and station alignment beneath. Existing records should be further sought and examined to determine definitive viability of the structure's potential future underpinning.

4.2 Recommendations

If it is determined that underpinning will be done for this structure, an additional investigation documenting all defects should be undertaken. As the construction will not happen for at least a few years, conditions may change, and so investigations should be performed as close to construction commencement as possible. It is suggested to also investigate the structure after a rainfall to observe any drainage or ponding issues. In addition, sensitivity analysis should be performed, based on the original design, to determine range of differential settlement and structural distortion that the structure would be able to tolerate if required underpinning activities are to be implemented.

5 REFERENCES

1. GPC6, 2017, Technical Memorandum "DART Dallas CBD Second Light Rail Alignment (D2) - Alignment Evaluation of Impact to Elm Street Parking Garage – Commerce Alignment"

2. Cadillac Fairview Urban Development Inc., 1986, “Elm Street Parking Garage”, Project Record
3. Interprise – The Design Resource, 2001, “Elm Street Garage Stack Plans”
4. Verizon Wireless, 2011, “Elm Street”

FIGURES

FIGURE 1. ELEVATION VIEW OF THE ELM STREET PARKING GARAGE, LOOKING SOUTH.



FIGURE 2. VIEW OF THE EXPANSION JOINT IN THE CEILING.



FIGURE 3. VIEW OF TYPICAL CONNECTIONS FOR THE PRE-CAST SLABS.



FIGURE 4. VIEW OF CONCRETE SLAB AT GRADE LEVEL.



FIGURE 5. VIEW OF A TYPICAL STAIRWELL WITHIN THE GARAGE.

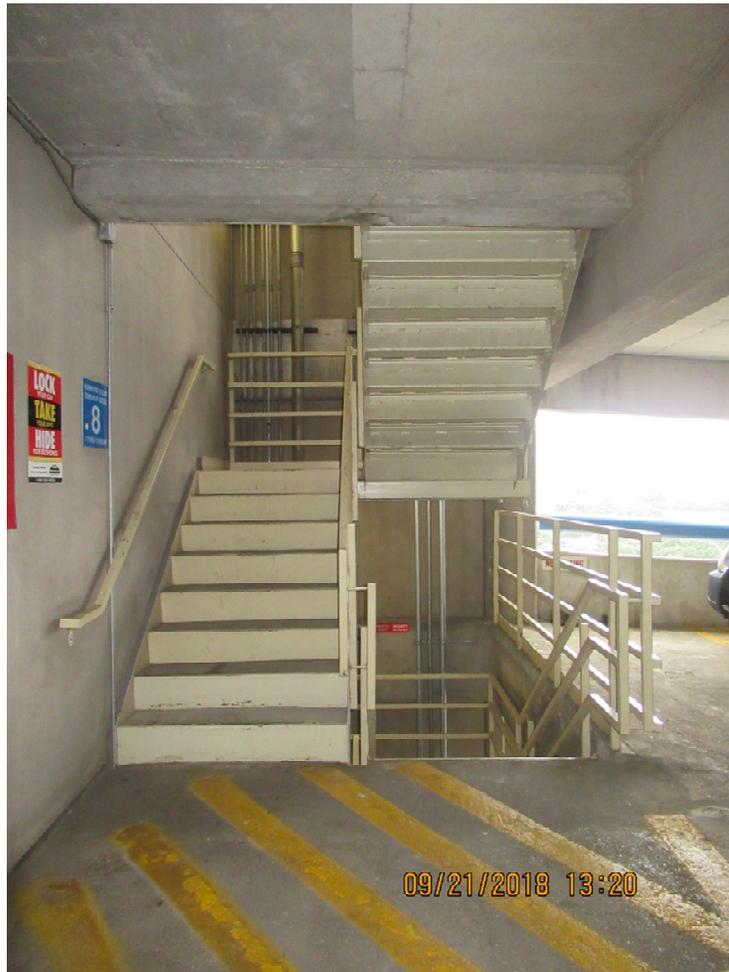


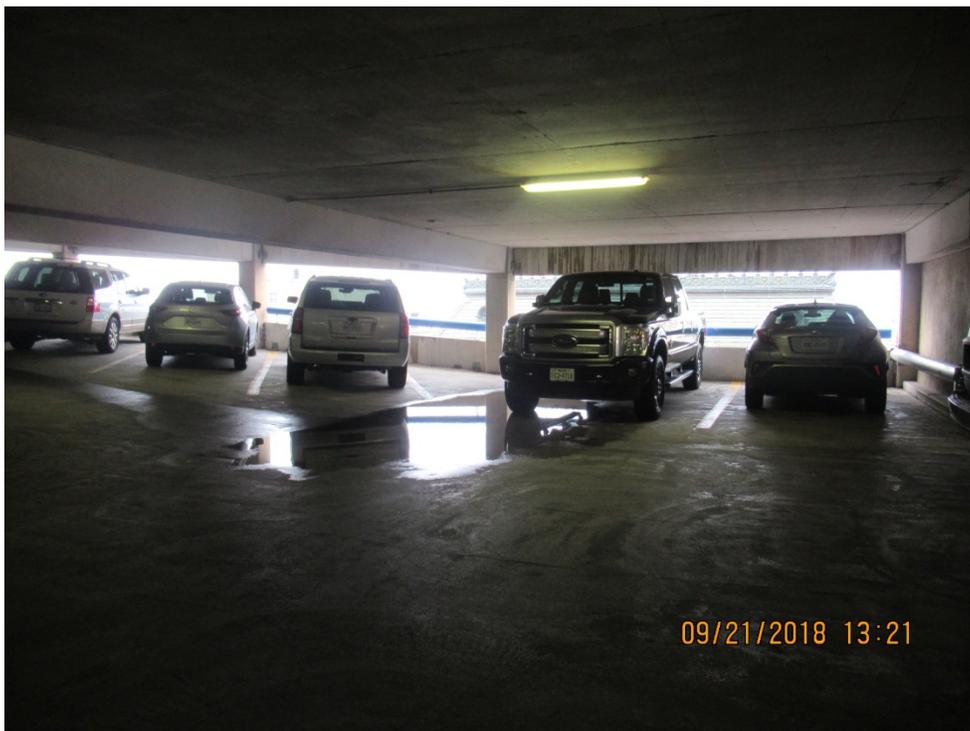
FIGURE 6. VIEW OF TYPICAL DETERIORATION SEEN IN MULTIPLE STAIRWELLS, ACROSS MULTIPLE LEVELS.



FIGURE 7. VIEW OF PONDING WITHIN THE GARAGE WHERE THE DRAIN IS CLOGGED/NOT FUNCTIONING PROPERLY.



FIGURE 8. VIEW OF PONDING WITHIN THE GARAGE WHERE THERE IS NO DRAIN PRESENT.



ATTACHMENT A

ELM STREET PARKING GARAGE – PHOTOS

FIGURE A- 1. GENERAL VIEW OF THE CEILING, FROM GROUND LEVEL, WHERE A CONSTRUCTION JOINT IS PRESENT.



FIGURE A- 2. VIEW OF THE SECTION WHERE THE PARKING GARAGE STRUCTURES MEET.



FIGURE A- 3. VIEW FROM ENTRANCE ON ELM STREET.



FIGURE A- 4. GENERAL VIEW OF PARKING GARAGE.



FIGURE A- 5. TYPICAL PRE-CAST CONNECTIONS.



FIGURE A- 6. PRE-CAST CONCRETE CONNECTIONS AT ROOF LEVEL.



FIGURE A- 7. VIEW OF THE 10-STORY PARKING GARAGE FROM THE ROOF OF THE 7-STORY PARKING GARAGE.



FIGURE A- 8. TYPICAL CEILING VIEW.



ATTACHMENT B

PLAN OF PROPOSED ALIGNMENT UNDER PARKING GARAGE

FIGURE B-1. PLAN VIEW OF THE PROPOSED ALIGNMENT UNDER THE PARKING GARAGE.



Note: In the 10% alignment submitted on March 8, 2019, the CBD East Subway Station has been relocated to the east of this parking garage structure.